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THE UNIVERSITY OF NEW MEXICO
ALBUQUERQUE, NEW MEXICO

QUARTERLY LITERATURE REVIEW of the REMOTE SENSING OF NATURAL RESOURCES

THIRD QUARTER 1977

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QUARTERLY LITERATURE REVIEW

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QUARTERLY LITERATURE REVIEW

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REMOTE SENSING OF NATURAL RESOURCES

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INTRODUCTION

Remote sensing is so strongly an interdisciplinary science that one cannot easily keep abreast of the activity without taking a large portion of the available time for reviewing the literature. The Technology Application Center (TAC) has made a major effort in order to provide a review of this rapidly advancing field with its Quarterly Literature Review of the Remote Sensing of Natural Resources. This service has been initiated to provide the investigator with up-to-date information in a readable and indexed form.

In an attempt to review the literature of remote sensing from the many hundreds of sources and thousands of documents available, a definition of boundaries was necessary. TAC, reviewing abstracted literature sources (see Information Sources), selects documented data and data gathering techniques which are performed or obtained remotely from space, aircraft or groundbased stations. All of the documentation is related to remote sensing sensors or the remote sensing of the natural resources. Meteorology and extraterrestrial sensing are normally not selected. Sensors are primarily those operating within the 10^{-8} to 1 meter wavelength band (ultraviolet through radar). There are exceptions to this when overlapping data is reported, and these have been selected.

Beginning January 1977, following the Information Source descriptions are recent releases concerning remote sensing. Included are NASA Tech Briefs, ARAC Industrial Applications Reports, U.S. Navy Technical Reports, U.S. Patent reports, and other technical articles and reports that come to the attention of the TAC staff. This section has not been key worded or numbered.

Editors

Charles B. Fears
Michael H. Inglis

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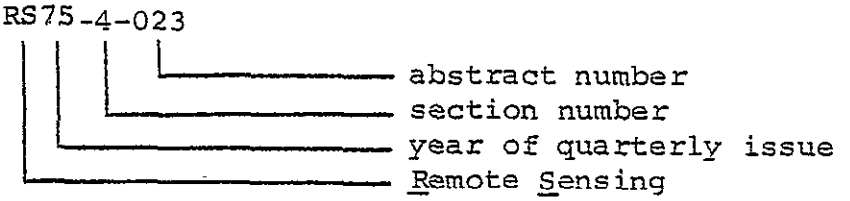
USER GUIDE

This Quarterly Literature Review has been divided into eight sections as shown in the table of contents. Within each section, the abstracts have been provided an RS number. This number indicates the section, as RS74-4 indicates Marine Science or Section 4 in the table of contents. The numbers following the section identification place the abstract in numerical order within that section.



In the absence of page numbers, the section and number provide ready access to the abstract.

All abstracts within this Quarterly Literature Review have been "key-worded" by the TAC staff. Key words include generalized terms used or indicated by the title or abstract. The first author's last name, shown on the abstract, is also used as a key word and is indicated by an asterisk (*). This provides an author index within the key word index found in Section 7, Alphabetical Index of Authors and Key Words. Sample key-wording (key words used are underlined):

> RS75-4-015 Evaluate the Application of ERTS-A Data for Detecting and Mapping Sea Ice; James C. Barnes, Principal Investigator

Section 8 contains an order form for the document service provided by the Technology Application Center. In order to facilitate this service, complete Quarterly numbers, RS numbers and abstract titles are necessary.

INFORMATION SOURCES

The following list describes the information resources currently used by the Technology Application Center for the Remote Sensing Quarterly Review.

I. National Aeronautics and Space Administration (NASA)

The NASA file, dating from 1962, contains more than 600,000 documents and grows at the rate of 70,000 new entries each year. It is approximately 16% NASA-generated, the bulk of the citations being reports collected by NASA from worldwide sources for use in the aerospace program. These articles are abstracted in two semi-monthly journals:

A. International Aerospace Abstracts (IAA)

IAA is an abstractive and indexing service covering the world's published literature in the field of aeronautics and space science and technology. Periodicals, books, meeting papers, conference proceedings, translations of foreign journal articles, and aerospace reports are typically abstracted by IAA.

B. Scientific and Technical Aerospace Reports (STAR)

STAR is a comprehensive abstracting and indexing journal covering current worldwide report literature on the science and technology of space and aeronautics. Publications abstracted in STAR include scientific and technical reports issued by NASA and its contractors, other U.S. Government agencies, corporations, universities, and research organizations throughout the world. Pertinent theses, translations, NASA-owned patents and patent applications, and other separate documents are also abstracted.

II. Engineering Index Monthly (EIM)

The Engineering Index Monthly is a compilation of abstracts and items covering the world's significant technological literature

and conferences encompassing all engineering disciplines. The EIM covers the technological side of Remote Sensing with such subjects as new equipment and techniques, and specific field applications of engineering methods and devices.

III. Selected Water Resources Abstracts

Selected Water Resources Abstracts is published by the Water Resources Scientific Information Center, Office of Water Resources Research, U.S. Department of the Interior. It includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats.

IV. Government Reports Announcements (GRA)

GRA is published by the National Technical Information Service (NTIS), Springfield, Virginia. The NTIS collection now exceeds 730,000 titles, to which some 60,000 new reports are added annually. Abstracts cover environmental surveys, energy source prospecting (minerals, geothermal sources, etc.), oceanography, hydrology, climate, agriculture, geology, tracing of tagged wildlife, and more esoteric aspects of this field.

V. Bibliography and Index of Geology

Bibliography and Index of Geology is published by the Geological Society of America in Boulder, Colorado, and covers the earth science literature of the entire world and theses in North America.

VI. ERDA Energy Research Abstracts (ERA)

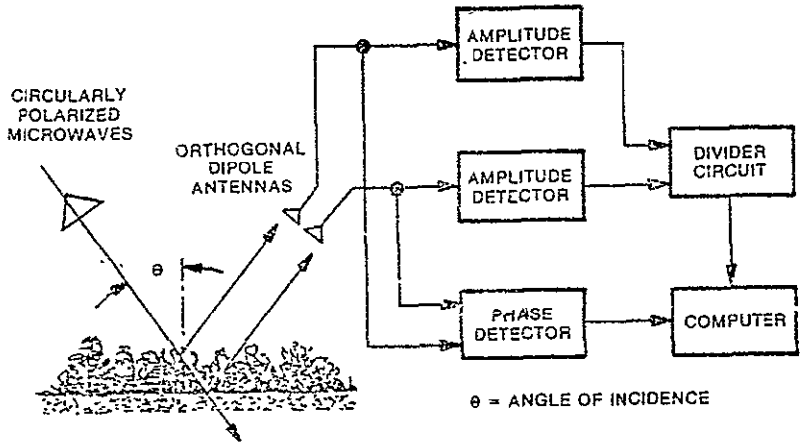
ERA covers scientific and technical reports originated by the U.S. Energy Research and Development Administration and its contractors, other U.S. Government agencies, other governments, universitites, and industrial and research organizations. In addition, books, conference proceedings, individual conference papers, patents, and journal literature on a worldwide basis are abstracted and indexed. Subjects covered by ERA include energy systems, conservation, safety, environmental protection, physical research and biology and medicine.

RECENT RELEASES

REMOTE SENSING OF VEGETATION AND SOIL

Goddard Space Flight Center
Greenbelt, Maryland
GSC-11 '76

The intensity and state of elliptical polarization of reflected microwaves can be used to determine the water content of a soil substrate. Data are taken and analyzed automatically, with a reduction in manpower and cost.



Microwave-Ellipsometry Apparatus is used for remotely detecting soil and vegetation characteristics. There may be as many as five unknown variables. These can include the dielectric constant of the vegetation, the dielectric constant of the soil substrate, and the thickness of the vegetation layer. For a single measurement, three of five variables have to be known to solve for the other two. If only two of the five variables are known, the other three can be determined by taking measurements at two different angles of incidence.

The sensing method used is microwave ellipsometry. A circularly polarized train of microwaves is reflected from vegetation at a predetermined angle of incidence to determine the ratio of intensities of the electric-field components and their phase differences. The refractive index (given by the water content of the vegetation) and the thickness of a layer of vegetation are computed from a formula.

The formula, based on Maxwell's equations, is derived in terms of Fresnel reflection coefficients for the component plane waves. It relates the refractive index of a substrate, the refractive index and thickness of a dielectric film covering the substrate, and the reflection coefficients and absolute phase shifts of the two component plane waves of the electric-field vector of a polarized wave reflected from a film-covered substrate.

Since the theory is valid for all electromagnetic waves, the relationship holds in the microwave region as well as in the optical region. A layer of vegetation on a soil substrate appears to microwaves much

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as a thin film on a thick substrate is seen by visible light. The height of the vegetation corresponds to film thickness, and the effective refractive index of the vegetation (which at microwave frequencies depends on its moisture content) corresponds to the refractive index of the film. The basic difference is that all dimensions are enlarged by a factor between 10,000 and 2 million.

In the system (see figure) a train of circularly polarized microwaves emerges and is directed toward the vegetation. The intensities of the orthogonal field components of the circularly polarized wave (in the plane of incidence and normal to it) are equal and have a phase difference of 90°. The microwaves are reflected from the vegetation and the soil substrate.

After reflection, the components are received by two orthogonal dipole antennas and are detected in amplitude detectors. A phase detector measures phase difference, and a divider circuit determines the ratio of the intensities of the vector components. The information is fed into a computer, and the refractive indices of the vegetation and soil substrate and the thickness of the vegetation are determined.

This work was done by John B. Schutt of Goddard Space Flight Center and Siegfried O. Auer of the National Academy of Sciences. This invention is owned by NASA and a patent application has been filed.

LOW-COST DUAL FREQUENCY MICROWAVE ANTENNA

Lyndon B. Johnson Space Center
Houston, Texas
MSC-16100

A compact circular-polarization antenna has been developed for applications where aerodynamic considerations are of prime importance. The antenna, typically matched to a 50-ohm source, can be operated on the S-band and C-band, making the requirement for the radiation window smaller than for two separate antennas operating at these frequencies. The input impendance of the antenna depends on the feedpoint location relative to the disk center.

The antenna is etched on one side of a copper-clad double-sided laminate. The high-frequency element is a ring. Ring and disk sizes are determined by the operating frequencies and by the dielectric constant of the laminate.

Two metal sections, the phase shifters, are attached to the disk, which can be trimmed to optimize the polarization. The feedpoint is located on the 45° line, intersected to the centerline of these two phase shifters. The input impedance of the antenna at high-band frequency is determined by the location of the feedpoint on the 45° line, the relative dielectric constant (ε_r), and the thickness (t) of the dielectric material. The cloer to the disk edge, the higher the high-band impedance. For a 50-ohm system, for instance, the feedpoint is located at middle of radius away from the disk center (for ε_r = 2.55 and t = 1/16 in.). If the line rotates 45° counterclockwise, the high-band antenna has right-circular polarization; a 45° clockwise rotation affords left-circular polarization.

The ring is limited in its width. High-band frequency, f_H, equals or is greater than 2.25 times low-band frequency, f_L, the low-band antenna loses its circular polarization. Although a dual-frequency radiating element, the disk or the ring can be operated as a single-frequency radiating element as well.

This work was done by I-Ping Yu of Lockheed Electronics Co., Inc.

PORTABLE SOLAR RADIOMETER MEASURES STACK-PLUME EFFLUENTS

Langley Research Center
Hampton, Virginia
LAR-12123

A simple and inexpensive portable instrument monitors stack-plume effluents from ground level. This four-channel solar radiometer uses the Sun as a background source and measures the attenuation of solar radiation through the stack plume.

The radiometer features two optical arrangements: an easy-to-aline pointing optical system that is boresighted to the second radiometric optical system which utilizes four filters to select the wavelengths.

In order to use the radiometer, the Sun must be in an accessible viewing position, and the sky adjacent to the Sun must be free of clouds. The operator selects and inserts the filter system to be used and situates the radiometer as shown as Figure 1.

Attenuation is measured at four selected wavelengths: 310 nm (UV), 400 nm (Visible), 600 nm (Visible), 800 nm (IR). The IR channel measures the effects of particulates and aerosols. The two visible channels superimpose the effects of NO_2 absorption, and the UV channel measures the effects of SO_2. Stack-plume measurements of opacity and of the concentration of NO_2 and SO_2 made with this instrument were found to be in basic agreement with in-stack determinations.

The simple, remote operation eliminates troublesome in-stack measurements, and the radiometer is less expensive than other remote measuring devices such as those utilizing laser backscatter and correlative spectroscopy. The portability and accuracy of this radiometer make it extremely attractive as a low cost, ground level device for monitoring stack pollution at power-plants, factories and other stationary sources.

This work was done by Reginald J. Exton and Ray W. Gregory of Langley Research Center.

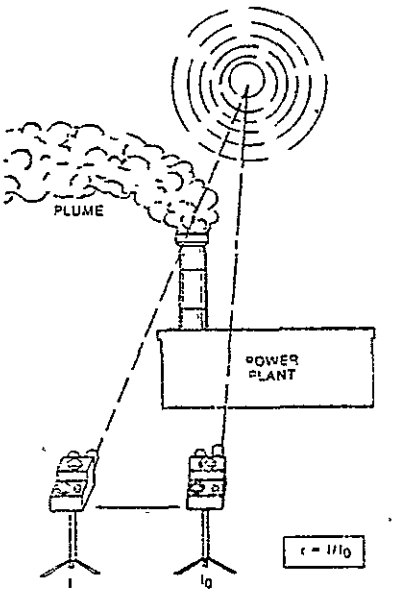

Figure 1. Effluents Are Monitored by aiming the radiometer directly at the Sun. A second measurement is taken with the radiometer aimed at the plume. The transmittance (τ) of the plume is the ratio of the measured solar intensities (I_0 and I).

SIGNAL ENHANCEMENT FILTERS

Lyndon B. Johnson Space Center
Houston, Texas
MSC-14907

Two filters designed to smooth the digital output of a radar tracking system prevent noise-induced inaccuracies and result in an input/output noise-variance reduction on the order of 10:1. Both filters are implemented as microprocessors; one is a special-purpose device with a limited arithmetic-logic unit, and the other is a true programable microprocessor.

The first filter, a cascaded-averaging device, smooths range data over intervals of 1, 2, 3, and 4 seconds, with sample rates of 16, 8, 4, and 2 samples/second, respectively. The output data-rate (range-rate) word is computed from the most recent range word and the 17 previous range words. The smoothed range word is based on the most recent range word and the 15 previous range words.

The second filter smooths over 2, 4, 8, and 16 range words, with sample-rate options of 2, 4, 8, and 16 samples/second for any of the allowed number of range words. It can be also programed to perform other functions. Both filters update the smoothed range word to correct for the time lag resulting when averaging over N words.

The principal components of the cascaded-averaging filter are input/output registers, a 32-word memory, and an arithmetic-logic unit (ALU). Read-only memories containing a programed algorithm direct the various data units which are connected by a data bus.

The contents of the memory are scanned beginning with word 1, the most recent data word. This word, along with the previous 5 data words, is summed by the ALU which functions as an accumulator. Words 7 through 12 are read out of memory but are not added by the accumulator. Beginning with word 13, the next 6 words are read out of memory and are sequentially subtracted from the accumulated sum which represents the first 6 words. If subtraction through zero occurs, the algorithmic complement is used.

After the weighting function is entered, the computed range rate is stored in the output range-rate register and in a scratch pad memory for later use in updating the smoothed range word. After word 18 is logged in memory, the memory is automatically reset to word 1. Memory scan begins, and words 1 through 16 are summed by the ALU. After division the average word is present in the accumulator. The smoothed word is delayed by 8 sample times from the incoming data word. A correction factor equal to half the range rate is added or subtracted from the smoothed word to update the computed range word, which is accomplished by retrieving the range-rate word from the scratch pad memory and either adding or subtracting.

The programable filter includes input/output registers, two 32-word memories, and two arithmetic units. The memories are segmented into two blocks of 16 words each and are identical except that one memory board has pullup resistors for the data bus. The "Data and Error" memory stores incoming data words in one block of 16 words; error words are stored in the second block which, in addition, is used to store computed range words and is the unit which makes it possible to implement the N-parallel filter concept.

Arithmetic-logic unit 1 is utilized for addition, subtraction, and division. When computing error words, the results are stored in the

error memory as a 15-bit error word. Bit 16 is the word sign. For negative words the word is automatically complemented so that the magnitude plus sign is stored. When other add or subtract operations are performed, all 16 bits are used as data.

Arithmetic-logic unit 2 operates as an accumulator to compute the error word. The filter scans the error memory twice: On the first scan, ALU 2 sums up all of the positive words; on the second pass the negative words are sequentially subtracted from the accumulated sum. If subtraction through zero occurs, the contents of the accumulator are complemented, and the remaining negative words are added to the the complemented word.

This word was done by Harold B. Killen and Walter B. Warren of TRW, Inc., for Johnson Space Center. Further information may be found in NASA OR-147537 (N76-21369), "Radar Range Data Signal Enhancement Tracker," a copy of which may be obtained at cost from the National Technical Information Service, Springfield, Virginia 22151. MSC-14907

COSMIC PROGRAM ABSTRACT

Sutie 112, Barrow
University of Georgia
Athens, GA 30602

GRRLMT - General Read Routine for Landsat 1&2 MSS Tapes
(NASA Goddard Space Flight Center)

This is a general purpose read routine for LANDSAT 1&2 CCT tapes genetated by the NASA Data Processing Facility. The program makes available to the user the tape ID and annotation records (the first and second records on the tape) and automatically skips down the tape to the scan line specified by the user as the first line (data record) to be returned. The routine maintains two user accessible variables which contain the next-record-to-be-read and the total number of records processed. The program also makes available to the user the 56 bytes of calibration data at the end of each scan line. A separate entry point in the routine has the facility to rewind the tape at any time, allowing the user to process any number of rectangular areas from a given CCT tape. This program is written in OS ASSEMBLER for the IBM 360 and has a central memory requirement of approximately 75K decimal 8 bit bytes. (Program number GSC-12279).

AEROSPACE RESEARCH APPLICATIONS CENTER (ARAC)

Indianapolis Center for Advanced Research
Indiana University - Purdue University at Indianapolis
1201 East

HIGH PERFORMANCE PYROELECTRIC VIDICON

The pyroelectric vidicon is an infrared imaging closed circuit television system. The sensor used in the camera tube is a thin pyroelectric crystal which requires no cooling for optimum operation. It is a thermal sensor, as opposed to a photon detector, and can therefore be used over a very broad wavelength region. The system is a passive thermal imager which means that it requires, for its operation, only the electromagnetic radiation which is emitted by all objects which are above absolute zero temperature. In addition, the system incorporates optimized 'off the shelf' video electronic circuitry already developed by the television industry and thus total system cost can be kept low. F.C. Petito and J. Thomas Cox. Army Night Vision Lab., Fort Belvoir, VA. 1976. 15 p. I-5453. N77-14301.

MERCURY CADMIUM TELLURIDE INFRARED LASERS

P. Sattler, Bruce A. Weber, and Joseph Nemarich
Harry Diamond Labs., Adelphi, Maryland 1976 14 p., I-5450

We report the development of the first tunable spin-flip Raman laser (SRFL) using crystals of the semiconductor alloy mercury cadmium telluride (Hg(1-x)Cd(x)Te). In addition, tunable recombination laser emission has also been observed. When optically pumped by a carbon dioxide (CO_2) laser, the crystals emit laser radiation that is magnetically tunable in the 9 to 11-micrometer wavelength range. Improved crystal technology should permit extension of this tunable range. Potential applications for these lasers are as local oscillators for infrared heterodyne receivers, as high-brightness, high-resolution sources for determining the laser transmission properties of the atmosphere, and as sources for covert, short-range communications links and isotope separation. Experiments were performed with mercury cadmium telluride crystals that were designed to have their absorption edge in near wavelength coincidence with the various lines available from CO_2 laser. The crystals were held at near-liquid-helium temperature, and placed in the field of a superconductive or conventional electromagnet. Both pulsed and cw tunable laser radiations were achieved. Thus far, most of the spectral gaps between the lines of a conventional CO_2 laser have been filled using these new tunable lasers. N77-14457

AGRICULTURAL, HYDROLOGICAL APPLICATIONS - RADAR

Fawwaz T. Ulaby
Kansas Univ. Center for Research, Inc., Lawrence
July 1976. 90 p.

Program objectives, covering a wide range of disciplines and activities in radar remote sensing, include radar systems development and analysis, data processing and display, and data interpretation in geology, geography and oceanography. Research was focused on the evaluation of radar remote sensing applications in hydrology and agriculture based on data acquired with the Microwave Active Spectrometer (MAS) system. The title, author(s) and abstract of each of the 62 technical reports generated under this contract are appended. N77-12243, I-5423.

NEWS SPECTRA

Optical Spectra
July 1977, V 11, Issue 7, 19 p.

RCA TWIN CAMERAS TO MAP THE EARTH

Princeton, NJ. A new ultra-high resolution TV camera designed and built by RCA Astro-Electronics will enable earth resources spacecraft to map areas of the earth in greater detail than ever before. The Return Beam Vidicon (RBV) two-camera system, recently delivered to NASA's Goddard Space Flight Center in Maryland, is scheduled to fly aboard the Landsat-C spacecraft.

FOTO-LITES
Optical Spectra
July 1977, V 11, Issue 7, 70 p.

An iceberg nearly as big as the state of Rhode Island has been discovered in a high resolution photo taken by the RCA-built NOAA-5 satellite. The iceberg is located in the Antarctic north of James Ross Island. NASA officials estimate that the northward-floating mass contains enough fresh water to supply the needs of California for one thousand years.

NEW PRODUCT ANNOUNCEMENT

Available Computer-Enhanced Landsat Scenes

The geological Survey's EROS Data Center (EDC) recently announced a new capability for processing Landsat imagery, made possible by the installation of an electro optical film recording system and the implementation of advanced digital image processing techniques. Resulting from the announcement and customer demand for this new product the EROS Data Center currently has a list of Computer-Enhanced Landsat scenes that have been produced and are available to the user at a reduced cost. The imagery from these existing Computer-Enhanced scenes will be offered at 3X standard Landsat prices.

The customer can order from the list of existing Landsat Computer-Enhanced scenes that have been processed according to original customer needs. The majority of the scenes that have been produced were processed with all of the enhancement techniques performed.

These improved Landsat products are made possible by an image enhancement system designed around a precise laser beam film recorder. The system uses a Landsat Computer Compatible Tape (CCT), processes this tape through advanced digital image manipulation routines, and produces a modified CCT to process through a laser beam recorder. Output of the system is on 9.5" film. The black-and-white images can be registered and printed to produce false-color composites, as in the present Landsat film reproduction system.

Image products will be provided in black-and-white and color; Cibachrome will be offered as an optional color print product. The user may request film and paper formats similar to those presently offered as Landsat standard products (excluding 70 mm products). For further information, prices, scene list, and order forms, write or call User Services, Attention: Computer-Enhancements, EROS Data Center, Sioux Falls, South Dakota 57198, Telephone (605) 594-6511, Extension 159.

Section 1

GENERAL

Theory, General Surveys, Miscellaneous Studies

RS77-1-325

N77-20546*# National Aeronautics and Space Administration Langley Research Center, Langley Station, Va
FUNDAMENTAL ANALYSIS OF THE LINEAR MULTIPLE REGRESSION TECHNIQUE FOR QUANTIFICATION OF WATER QUALITY PARAMETERS FROM REMOTE SENSING DATA Ph.D. Thesis - Old Dominion Univ.
Charles Henry Whitlock, III May 1977 185 p refs
(NASA-TM-X-74600) Avail NTIS HC A09/MF A01 CSCL 08H

Constituents with linear radiance gradients with concentration may be quantified from signals which contain nonlinear atmospheric and surface reflection effects for both homogeneous and non-homogeneous water bodies provided accurate data can be obtained and nonlinearities are constant with wavelength Statistical parameters must be used which give an indication of bias as well as total squared error to insure that an equation with an optimum combination of bands is selected. It is concluded that the effect of error in upwelled radiance measurements is to reduce the accuracy of the least square fitting process and to increase the number of points required to obtain a satisfactory fit The problem of obtaining a multiple regression equation that is extremely sensitive to error is discussed. Author

RS77-1-326

N77-21520*# Westinghouse Defense and Electronic Systems Center, Baltimore, Md.
GEOMETRIC ASSESSMENT OF IMAGE QUALITY USING DIGITAL IMAGE REGISTRATION TECHNIQUES Final Report
Glenn E Tisdale Aug. 1976 64 p
(Contract NAS5-20947)
(NASA-CR-152481) Avail. NTIS HC A04/MF A01 CSCL 05B

Image registration techniques were developed to perform a geometric quality assessment of multispectral and multitemporal image pairs Based upon LANDSAT tapes, accuracies to a small fraction of a pixel were demonstrated Because it is insensitive to the choice of registration areas, the technique is well suited to performance in an automatic system. It may be implemented at megapixel-per-second rates using a commercial minicomputer in combination with a special purpose digital preprocessor. Author

RS77-1-327

N77-21267* National Aeronautics and Space Administration Langley Research Center, Langley Station, Va.
METHOD OF LOCATING PERSONS IN DISTRESS Patent
Wilford Eugene Sivertson, Jr., inventor (to NASA) Issued 19 Apr. 1977 5 p Filed 27 Feb. 1976 Supersedes N76-18315 (14 - 09, p 1107)
(NASA-Case-LAR-11390-1; US-Patent-4,019,179;
US-Patent-Appl-SN-662176; US-Patent-Class-343-5MM;
US-Patent-Class-340-5H; US-Patent-Class-343-5CM;
US-Patent-Class-343-18B) Avail US Patent Office CSCL 17I

A method for locating any person in distress in a selected area on the surface of the earth who has deployed passive radio frequency (RF) reflectors in a predetermined arrangement is analyzed. A first transparency is made in the spatial frequency domain of an image of said predetermined arrangement of said RF reflectors The said selected area of the surface of the earth is scanned by means of a side-looking radar, on board a satellite or aircraft, to produce radar images. Second transparencies in the conventional image domain are produced from the radar images It is then determined from the first and second transparencies, by means of complex spatial filtering.
Official Gazette of the U S. Patent Office

RS77-1-328

N77-18511*# New Mexico State Bureau of Mines and Mineral Resources, Socorro.
ANALYSIS OF LANDSAT B IMAGERY AS A TOOL FOR EVALUATING, DEVELOPING, AND MANAGING THE NATURAL RESOURCES OF NEW MEXICO Final Report, Mar. 1975 - Aug 1976
David Tabet, Principal Investigator, Michael Inglis (New Mexico Univ Albuquerque), Stanley Morain (New Mexico Univ., Albuquerque), Linda Love (New Mexico Univ., Albuquerque), Sandra Feldman (New Mexico Univ Albuquerque), and Thomas Budge (New Mexico Univ Albuquerque) Aug 1976 116 p refs Original contains color imagery Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S D ERTS
(Contract NAS5-20916)
(E77-10090 NASA-CR-149573) Avail. NTIS HC A06/MF A01 CSCL 08F

The author has identified the following significant results A statewide land use and vegetation map was prepared by visual interpretation of LANDSAT images, geologic structure and metal deposits of the Datil-Mogollon volcanic area were investigated. Computer enhanced images of the San Juan Basin region were studied for evidence of uranium, oil and gas deposits Little success was achieved with the uranium oil, and gas studies, while roughly half the metal targets picked in the Datil-Mogollon area coincided with known area of mineralization.

RS77-1-329

N77-18550# L N K Corp Inc., Silver Spring, Md
INTERACTIVE SCREENING OF RECONNAISSANCE IMAGERY Final Report, 1 Oct. 1974 - 31 Oct. 1975
George C Stockman and Laveen N Kanal Jun 1976 124 p refs
(Contract F33615-75-C-5056)
(AD-A028969; AMRL-TR-76-15) Avail: NTIS HC A06/MF A01 CSCL 08/2

The general aims of this study were (1) To relate symbolic map processing capabilities to capabilities for a reconnaissance imagery screening system, (2) To investigate structural pattern recognition techniques and the use of models for utilization in the segmentation and interpretation of imagery and (3) To study man-machine task allocation in an interactive semiautomatic imagery screening system As the study was to be theoretical, the results are in terms of recommendations and mathematical development and not in terms of any implementation. GRA

RS77-1-330

N77-19565*# Martin Marietta Corp., Denver, Colo
A PRELIMINARY EXPERIMENT DEFINITION FOR VIDEO LANDMARK ACQUISITION AND TRACKING
Roger T Schappell, John C Tietz, Roland L Hulstrom, Robert A. Cunningham, and Gwynn M Reel Dec. 1976 83 p refs
(Contract NAS1-14489)
(NASA-CR-145122) Avail. NTIS HC A05/MF A01 CSCL 05B

Six scientific objectives/experiments were derived which consisted of agriculture/forestry/range resources, land use, geology/mineral resources, water resources marine resources and environmental surveys Computer calculations were then made of the spectral radiance signature of each of 25 candidate targets as seen by a satellite sensor system. An imaging system capable of recognizing, acquiring and tracking specific generic type surface features was defined A preliminary experiment definition and design of a video Landmark Acquisition and Tracking system is given This device will search a 10-mile swath while orbiting the earth, looking for land/water interfaces such as coastlines and rivers Author

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RS77-1-331

N77-20536*# Department of Scientific and Industrial Research Wellington (New Zealand)
DEVELOPMENT OF REMOTE SENSING TECHNOLOGY IN NEW ZEALAND. PART 1. SEISMOTECTONIC, STRUCTURAL, VOLCANOLOGIC AND GEOMORPHIC STUDY OF NEW ZEALAND. PART 2. INDIGENOUS FOREST ASSESSMENT. PART 3. MAPPING LAND USE AND ENVIRONMENTAL STUDIES IN NEW ZEALAND. PART 4 NEW ZEALAND FOREST SERVICE LANDSAT PROJECTS. PART 5. VEGETATION MAP AND LANDFORM MAP OF AUPOURI PENINSULA, NORTHLAND. PART 6. GEOGRAPHICAL APPLICATIONS OF LANDSAT MAPPING. PART 7 Quarterly Report
Mervyn C Probine, Richard P Suggate, Michael G McGreevy, and Ian F Stirling, Principal Investigators Mar 1977 134 p refs Sponsored by NASA Original contains color imagery Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S D 57198 ERTS
(E77-10128; NASA-CR-149875, Rept-568-Pt-1, Rept-568-Pt-2; Rept-568-Pt-3, Rept-568-Pt-4, Rept-568-Pt-5, Rept-568-Pt-6, Rept-568-Pt-7; QR-4) Avail: NTIS HC A07/MF A01 CSCL 05B

The author has identified the following significant results. Inspection of pixels obtained from LANDSAT of New Zealand revealed that not only can ships and their wakes be detected but that information on the size, state of motion, and direction of movement was inferred by calculating the total number of pixels occupied by the vessel and wake the orientation of these pixels, and the sum of their radiance values above the background level Computer enhanced images showing the Waimihia State Forest and much of Kaingaroa State Forest on 22 December 1975 were examined. Most major forest categories were distinguished on LANDSAT imagery However, the LANDSAT imagery seemed to be most useful for updating and checking existing forest maps, rather than making new maps with many forest categories Snow studies were performed using two basins: Six Mile Creek and Mt Robert. The differences in radiance levels indicated that a greater areal snow cover in Six Mile Creek Basin with the effect of lower radiance values from vegetation/snow regions. A comparison of the two visible bands (MSS 4 and 5) demonstrate this difference for the two basins

RS77-1-332

N77-18309*# California Univ., Santa Barbara
APPLICATIONS REVIEW FOR A SPACE PROGRAM IMAGING RADAR (SPIR)
D S Simonett Jul. 1976 231 p refs
(Contract NAS9-14816)
(NASA-CR-151182; GRSU-TR-1) Avail: NTIS HC A11/MF A01 CSCL 17I

The needs, applications, user support, research, and theoretical studies of imaging radar are reviewed. The applications of radar in water resources, minerals and petroleum exploration vegetation resources, ocean radar imaging, and cartography are discussed The advantages of space imaging radar are presented, and it is recommended that imaging radar be placed on the space shuttle. F O.S

RS77-1-333

N77-21531# Indian Space Research Organization, Trivandrum
BIBLIOGRAPHY ON REMOTE SENSING
K Rajarajeswari, comp 31 Mar 1977 246 p refs
Avail: NTIS HC A11/MF A01

An index to 2 667 documents on remote sensing cited in Scientific and Technical Aerospace Reports and International Aerospace Abstracts from 1970 to 1975 is presented Entries are arranged alphabetically by author or title and include report number and document source. An alphabetical keyword index and report number index are also provided. Author

RS77-1-334

N77-17532* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
MISSION TO EARTH: LANDSAT VIEWS THE WORLD
Nicholas M Short, Paul D Lowman, Jr., Stanley C Freden, and William A Finch, Jr. (San Diego State Univ., Calif.) 1976 926 p refs Original contains color illustrations
(NASA-SP-360) Avail. SOD HC $14 00 CSCL 05B

The LANDSAT program and system is described The entire global land surface of Earth is visualized in 400 color plates at a scale and resolution that specify natural land cultural features in man's familiar environments. A glossary is included. A H.

RS77-1-335

N77-22583*# Aerospace Corp., El Segundo, Calif. Systems Engineering Operations
BRAVO ECONOMIC STUDY OF LANDSAT FOLLOW-ON Final Report
Ernest I Pritchard, Richard T Blake, James A. Plough, Orin J. Mead, and John J Dawson Jan 1977 56 p refs
(Contract NAS5-23592)
(NASA-CR-152497; ATR-76(7597)-1) Avail: NTIS HC A04/MF A01 CSCL 05B

The LANDSAT Follow-On satellite consists of two major systems: the instrument module and the Multi-Mission Modular Spacecraft (MMS). The instrument module contains the thematic mapper and the five-band multispectral scanner instruments. The instrument module also includes the solar array, the tracking and data relay satellite (TDRS) antenna, and the wideband data module The MMS contains the modularized and standardized power, propulsion, attitude control, and command and data handling subsystems The Shuttle will be supporting the LANDSAT Follow-On system The LANDSAT Follow-On Project plans two Delta 3910 launches. The first is scheduled for 1981, the second Delta launch will occur as needed to keep one satellite operational on orbit. The second satellite will be ready six months after the first It could be launched any time after that Shuttle support of the system could begin in early 1983 but would be scheduled to start after the second Delta launch. Author

RS77-1-336

N77-21538# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany). Inst. fuer Dynamik der Flugsysteme
OBSERVATION RASTER OF A GIVEN AREA BY A REMOTE SENSING SATELLITE WITH SCAN SENSOR. DESCRIPTION OF THE SCANSI PROGRAM [BEOBACHTUNGSRASTER EINES VORGEGEBENEN ORTES DURCH EINEN ERDERKUNDIGUNGSSATELLITEN MIT SCAN - SENSOR. BESCHREIBUNG DES PROGRAMMS SCANSI]
E F. Jochim and A. Pietrass 11 Nov. 1976 26 p ref In GERMAN
(DLR-IB-552-76/14) Avail: NTIS HC A03/MF A01

The SCANSI computer program was developed to investigate the observation raster of a given location attained by a remote sensing satellite with sensor scanning perpendicular to the orbital plane. The satellite motion is modeled according to Kepler with superposed secular perturbations The output consists of diagrams showing when and how far a given location on the earth's surface falls within the scan range of the satellite. Examples of the output are given for the planned POMS meteorological satellite The ALGOL procedures are detailed. ESA

RS77-1-337

N77-20553# European Space Agency, Paris (France).
EARTH OBSERVATION FROM SPACE: EUROPE'S INTEREST AND FUTURE PLANS [OBSERVATION DE LA TERRE A PARTIR DE L'ESPACE: INTERET DE L'EUROPE - SES PLANS D'AVENIR]
J. Plevin 1976 19 p refs In FRENCH Presented at the Journees Postuniv. des Ingr. Com., Liege, 27 Mar. 1976
Avail. NTIS HC A02/MF A01

The techniques of remote sensing are surveyed, and the utilization of ecographical satellites is discussed. Details of the European interest in development and utilization of satellite-borne remote sensing techniques are given The advantages as well as the cost of an ecographical space program are outlined. ESA

RS77-1-338

N77-22581*# Environmental and Regional Research Associates, Inc., Jonnson City, Tenn.
PHOTOMORPHIC ANALYSIS TECHNIQUES: AN INTERIM SPATIAL ANALYSIS USING SATELLITE REMOTE SENSOR IMAGERY AND HISTORICAL DATA Final Report
Harold R Keuper, Robert W. Peplies, and Robert P. Gillooly Jan. 1977 268 p refs
(Contract NAS5-31329)
(NASA-CR-150227: ERRA-74-17(R)-Y) Avail: NTIS HC A12/MF A01 CSCL 05B

The use of machine scanning and/or computer-based techniques to provide greater objectivity in the photomorphic approach was investigated. Photomorphic analysis and its application in regional planning are discussed. Topics included delineation of photomorphic regions; inadequacies of existing classification systems, tonal and textural characteristics and signature analysis techniques; pattern recognition and Fourier transform analysis; and optical experiments. A bibliography is included Author

RS77-1-339

N77-18555# Army Engineer Waterways Experiment Station, Vicksburg Miss
PROCEDURES FOR THE SYSTEMATIC EVALUATION OF REMOTE SENSOR PERFORMANCE AND QUANTITATIVE MISSION PLANNING Ph.D. Thesis Final Report
Lewis E Link, Jr. Aug. 1976 292 p refs
(DA Proj. 4A1-62121-A-896)
(AD-A030728: WES-TR-M-76-8) Avail. NTIS HC A13/MF A01 CSCL 17/5

Effective application of remote sensing techniques to civil engineering and environmental problems requires the selection of the sensor systems that will best provide the information desired Because of the many phenomena involved and the lack of a simple means to consider them collectively, planning remote sensing missions has been done subjectively, quantitatively on a piecemeal basis, or solely on the experience of the investigator. None of these offers a systematic means to optimize the mission for acquisition of specific information types as a function of the many variables involved The purpose of this study was to (a) quantitatively examine the natural phenomena that influence the information content of remote sensing imagery obtained in the visible and infrared (IR) portions of the electromagnetic spectrum, and (b) from the knowledge gained through these examinations develop analytical tools for planning remote sensing missions and provide guidance for application of photographic and thermal IR sensor systems to civil engineering and environmental problems This study consisted of (a) the development of analytical models that allow systematic control of the major variables that influence the character of imagery produced by photographic and thermal IR scanning sensor systems, and (b) formulation from the models of simple, but comprehensive, tools for planning photographic and thermal IR remote sensing missions. GRA

RS77-1-340

N77-18538*# Joint Publications Research Service, Arlington, Va
STUDY OF THE EARTH FROM ORBIT
A Koval and L Desinov Washington NASA Mar. 1977 8 p Transl into ENGLISH from Aviat. Kosmonavt. (USSR), no 12, 1976 p 36-37
(NASA Order W-13183)
(NASA-TT-F-17519) Avail NTIS HC A02/MF A01 CSCL 08F

A new step in studying the natural resources of Earth from space is discussed -- multizonal photography -- simultaneous photography of the terrain in different narrow sections of the spectrum of electromagnetic radiation. Author

RS77-1-341

N77-18543# Oak Ridge National Lab., Tenn
APPLICATION OF THE ORRMIS GEOGRAPHICAL DIGITIZING AND INFORMATION SYSTEM USING DATA FROM THE CARETS PROJECT
Charles R. Meyers, Jr., Donald L. Wilson, and Richard C Durfee Apr. 1976 109 p refs Sponsored in part by NSF
(Contract W-7405-eng-26)
(ORNL-RUS-12) Avail. NTIS HC A06/MF A01

Spatial land-use and census-tract data are utilized to illustrate the Regional Environmental Systems Analysis (RESA) program s data digitization, information processing, and display techniques, for the Oak Ridge Regional Modeling Information System (ORRMIS) geographical data system A standard display format is used that satisfies the requirements of the International Geographical Union (IGU) spatial encoding experiment. This format consists of spatial data display at the original source map scale and tabular compilation of area measurements of land use by census tract The ORRMIS scanning-digitizing system is described including data preparation, mechanical scanning, editing, and hierarchical cell assignment techniques, and the description is illustrated with computer-generated line printer and mechanical plotter displays The system also has CRT plotter capability. ERA

RS77-1-342

N77-19692*# Drexel Univ., Philadelphia, Pa. Dept. of Physics and Atmospheric Science
TECHNIQUES FOR OBTAINING REGIONAL RADIATION BUDGETS FROM SATELLITE RADIOMETER OBSERVATIONS. PHASE 4 AND PHASE 5 Ph.D. Thesis. Final Report
Jose F Pina and Frederick House Dec 1976 218 p refs
(Contract NAS1-11871)
(NASA-CR-145129) Avail NTIS HC A01/MF A01 CSCL 04A

A scheme was developed which divides the earth-atmosphere system into 2060 elemental areas The regions previously described are defined in terms of these elemental areas which are fixed in size and position as the satellite moves One method, termed the instantaneous technique, yields values of the radiant emittance (We) and the radiant reflectance (Wr) which the regions have during the time interval of a single satellite pass The number of observations matches the number of regions under study and a unique solution is obtained using matrix inversion The other method (termed the best fit technique), yields time averages of We and Wr for large time intervals (e g, months, seasons). The number of observations in this technique is much greater than the number of regions considered, and an approximate solution is obtained by the method of least squares. Author

RS77-1-343

N77-21413# Netherlands Interdepartmental Working Group on the Application of Remote Sensing, Delft.
APPLICATION OF ELECTRONIC IMAGING TECHNIQUES Three-Year Report, Dec. 1970 - Dec. 1973 [TOEPASSING ELEKTRONISCHE BEELDTECHNIEKEN. VERSLAG OVER DE PERIODE DECEMBER 1970 - DECEMBER 1973]
P. J. F. Geerders, J. Polstra, and A. H M Weerdesteyn Oct. 1974 79 p refs In DUTCH; ENGLISH summary
(NIWARS-Publ-19) Avail. NTIS HC A05/MF A01

The application of black and white to color image transformation as an aid to remote sensing photo interpretation was studied. The human visual system is dealt with and some image transformation techniques such as photographic, optical, and electronic image transformation are described. The realized system, consisting of a TV-camera, a video recorder, a density corrector, a contour adder, a pseudo relief apparatus, a black and white to color transformer, and three monitors, is described and some test results are discussed. ESA

RS77-1-344

N77-21504*# Zurich Univ (Switzerland) Dept of Geography.
SNOW MAPPING AND LAND USE STUDIES IN SWITZERLAND Final Report
Harold Haefner, Principal Investigator Jan 1977 53 p refs Sponsored by NASA Original contains color imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(E77-10137, NASA-CR-152631) Avail: NTIS HC A04/MF A01 CSCL 08L

The author has identified the following significant results. A system was developed for operational snow and land use mapping, based on a supervised classification method using various classification algorithms and representation of the results in maplike form on color film with a photomation system. Land use mapping; under European conditions, was achieved with a stepwise linear discriminant analysis by using additional ratio variables On fall images, signatures of built-up areas were often not separable from wetlands Two different methods were tested to correlate the size of settlements and the population with an accuracy for the densely populated Swiss Plateau between +2 or -12%

RS77-1-345

N77-20548*# National Aeronautics and Space Administration Lyndon B Johnson Space Center, Houston, Tex
PROCEDURE FOR DETECTION AND MEASUREMENT OF INTERFACES IN REMOTELY ACQUIRED DATA USING A DIGITAL COMPUTER
K. H Faller Jan. 1976 46 p refs Original contains color illustrations
(NASA-TM-X-74636, ERL-158) Avail NTIS HC A03/MF A01 CSCL 05B

A technique for the detection and measurement of surface feature interfaces in remotely acquired data was developed and evaluated A computer implementation of this technique was effected to automatically process classified data derived from various sources such as the LANDSAT multispectral scanner and other scanning sensors The basic elements of the operational theory of the technique are described, followed by the details of the procedure. An example of an application of the technique to the analysis of tidal shoreline length is given with a breakdown of manpower requirements. Author

RS77-1-346

N77-17548*# Washington Univ, St Louis, Mo. Center for Development Technology
PROGRAM ON EARTH OBSERVATION DATA MANAGEMENT SYSTEMS (EODMS) Final Report, 1 Jun. - 31 Dec. 1976
Lester F. Eastwood, Jr., John Kenneth Gohagan, Christopher T Hill, Robert P Morgan, Timothy R. Hays, Richard J Ballard, Gregory R Crnkovick, and Mark A. Schaeffer 31 Dec 1976 268 p refs
(Contract NAS5-20680)
(NASA-CR-144845) Avail NTIS HC A12/MF A01 CSCL 05B

An assessment was made of the needs of a group of potential users of satellite remotely sensed data (state, regional, and local agencies) involved in natural resources management in five states, and alternative data management systems to satisfy these needs are outlined. Tasks described include. (1) a comprehensive data needs analysis of state and local users; (2) the design of remote sensing-derivable information products that serve priority state and local data needs; (3) a cost and performance analysis of alternative processing centers for producing these products, (4) an assessment of the impacts of policy, regulation and government structure on implementing large-scale use of remote sensing technology in this community of users; and (5) the elaboration of alternative institutional arrangements for operational Earth Observation Data Management Systems (EODMS). It is concluded that an operational EODMS will be of most use to state, regional, and local agencies if it provides a full range of information services -- from raw data acquisition to interpretation and dissemination of final information products. Author

RS77-1-347

N77-19562*# Massachusetts Inst of Tech., Cambridge. Center for Policy Alternatives
POLICY ISSUES AND DATA COMMUNICATIONS FOR NASA EARTH OBSERVATION MISSIONS UNTIL 1985
Arthur B. Corte and Colin J. Warren Nov. 1975 97 p Sponsored by NASA
(NASA-CR-149803) Avail. NTIS HC A05/MF A01 CSCL 05B

The series of LANDSAT sensors with the highest potential data rates of the missions were examined An examination of LANDSAT imagery uses shows that relatively few require transmission of the full resolution data on a repetitive quasi real time basis Accuracy of global crop size forecasting can possibly be improved through information derived from LANDSAT imagery. A current forecasting experiment uses the imagery for crop area estimation only, yield being derived from other data sources Author

RS77-1-348

N77-17757*# Purdue Univ., Lafayette, Ind School of Electrical Engineering.
DATA COMPRESSION FOR SATELLITE IMAGES Final Report
Po Hsiin Chen and Paul A. Wintz Dec. 1976 148 p refs
(Grant NsG-5010; Contract F30602-75-C-0150)
(NASA-CR-149655, TR-EE-77-9) Avail: NTIS HC A07/MF A01 CSCL 05B

An efficient data compression system is presented for satellite pictures and two grey level pictures derived from satellite pictures. The compression techniques take advantages of the correlation between adjacent picture elements. Several source coding methods are investigated. Double delta coding is presented and shown to be the most efficient Both predictive differential quantizing technique and double delta coding can be significantly improved by applying a background skipping technique. An extension code is constructed This code requires very little storage space and operates efficiently. Simulation results are presented for various coding schemes and source codes. Author

RS77-1-349

N77-18546# General Electric Co., Daytona Beach, Fla.
PERSPECTIVE DISPLAY SIMULATION OF TERRAIN Final Report, Apr. - Dec. 1975
W Marvin Bunker and Robert A Heartz Brooks AFB, Texas AFHRL Jun. 1976 177 p refs
(Contract F33615-75-C-5243, AF Proj. 1958)
(AD-A030405 AFHRL-TR-76-39) Avail NTIS HC A09/MF A01 CSCL 09/5

The ever-expanding utilization of electro-optical viewing systems (EVS) requires display simulation which validly depicts the contour or relief characteristics of terrain, rather than merely man-made objects on a flat surface Such simulation will also be of great value in visual scene simulation The data preparation techniques and computational algorithms of existing visual scene simulation systems using computer image generation (CIG) have been developed and optimized for man-made objects - hangars, houses, aircraft, carriers etc Earlier EVS simulation effort has used these techniques and algorithms They are not optimum for terrain display. The effort covered in this report included preparation of simulation data bases from the digitized data prepared by the Defense Mapping AGency Scenes were generated using several techniques for data compression The General Electric CIG algorithm was modified to eliminate the constraint that faces be formed into convex objects - a highly artifical constraint for terrain faces Scenes were generated using both visual and EVS processing. A radar display simulation system was modified to produce perspective displays, and scenes were generated from the DMA derived data bases A comparative analysis of the radar approach versus the CIG approach was prepared, with a detailed definition of the constraints associated with the radar approach Some of the simulated scenes were correlated with scenes from a movie made during a flight over the test area Finally, an analysis concluded that scenes such as those generated can be produced in real-time by currently available CIG hardware Author (GRA)

RS77-1-350

N77-22576# National Oceanic and Atmospheric Administration, Boulder, Colo Environmental Research Labs
COLLECTED REPRINTS: 1974 - 1975, WAVE PROPAGATION LABORATORY Technical Report, 1 Jan. 1974 - 31 Dec. 1975
Jul 1976 613 p refs
(PB-262132/4; NOAA-76111050) Avail NTIS HC A99/MF A01 CSCL 04A

The reprints in this volume are compiled under the following subjects acoustic and gravity wave propagation wave propagation at optical frequencies; remote sensing concepts, geophysical studies; and development of instruments and techniques GRA

RS77-1-351

N77-17428*# Eastman Kodak Co., Rochester, N Y. Apparatus Div
PHOTOGRAPHIC CONSULTING SERVICES TO THE EARTH RESOURCES PROGRAM Final Report
17 Jul. 1976 278 p
(Contract NASw-2317)
(NASA-CR-149587) Avail NTIS HC A13/MF A01 CSCL 14E

The recommendations, procedures and techniques are summarized which provided by the Kodak Apparatus Division to the Ames Research Center to support the Earth Resources Aircraft Program at that facility Recommendations, procedures, and calibration data are included for sensitometry, densitometry, laboratory cleanliness, and determination of camera exposure. Additional comments are made regarding process control procedures and general laboratory operations. Author

RS77-1-352

N77-20402*# National Aeronautics and Space Administration, Washington, D C
SPACE PHOTOGRAPHY 1977 INDEX
[1976] 199 p
(NASA-TM-X-74628) Avail NTIS HC A09/MF A01 CSCL 14E

An index is provided to representative photographs and transparencies available from NASA Subjects include spacecraft, astronauts, lunar surface, planets and outer space phenomena, earth observations, and aviation. High altitude aircraft infrared photographs are included along with artists conceptions of pace shuttle and space colonies A.H

RS77-1-353

N77-18542*# Transemantics, Inc., Washington, D.C
THE EARTH'S RAINBOW
V. Beletskaya, Ya L Ziman, and Yu. M Chesnokov Washington NASA Feb 1977 15 p Transl. into ENGLISH from Ogonek (Moscow), v 3, Jan 1977 p 16-17
(Contract NASw-2792)
(NASA-TT-F-17525) Avail: NTIS HC A02/MF A01 CSCL 14E

Color photographs from the Soviet Soyuz-22 Spacecraft are published for the first time in this edition The photography was carried out by means of a multispectral band camera jointly developed by specialists of the Soviet Union and the German Democratic Republic. Various methods of photographing the earth, including microwave and radiothermal photography, and the various types of data which can be obtained by studying such photographs and the application of such data to economic benefit are discussed The Raduga experiment shows that a study of the Earth from space is a complex technical problem for whose solution the coordination of specialists in the most diverse branches of science and technology is required. Author

RS77-1-354

N77-19568# Army Engineer Topographic Labs., Fort Belvoir, Va
IMAGE CORRELATION ON A PARALLEL PROCESSOR
David L. Ackerman Michael A. Crombie, and Mary L. Powers Jul 1976 28 p refs
(AD-A030636, ETL-0061) Avail NTIS HC A03/MF A01 CSCL 08/2

Digital photogrammetry requires that conjugate imagery be located by image correlation Image correlation involves many computations and can be the most time consuming part of the digital photogrammetry process This report, in line and area correlations investigates the feasibility of performing the image correlation calculations on a parallel processor. Line correlation involves searching along epipolar lines using a one-dimensional window of gray shades. Area correlation pertains to using a two-dimensional window of gray shades to search for a match point either over an area or along a specific epipolar line. Functions include the linear correlation coefficient the covariance, and the sums of absolute differences The computer programs in this report were written for the GAC STARAN at ETL. The parallel processor may not reach the speeds of a special-purpose, hard-wired correlator, but it has the advantage of being readily reprogrammed The parallel processor will be used in the interactive digital image processing facility at ETL Author (GRA)

RS77-1-355

N77-21525*# General Electric Co., Philadelphia, Pa. Space Div.
LANDSAT D: APPLICATIONS DEVELOPMENT LABORATORY STUDY Final Report
L. Alexander, D. Dietrich, R. Fries, V. J. Kharkanis, N. Portner, and D. Smith. 15 Apr. 1977. 85 p.
(Contract NAS5-23412)
(NASA-CR-152484, Doc-77SDS4224) Avail: NTIS HC A05/MF A01 CSCL 02C

As the Earth Resources Program has matured through the LANDSAT spacecraft it has begun the transition from an experimental research activity to a sound demonstration of proven utility. This important transition will be complete with the LANDSAT D system which incorporates several key improvements over the current system. These improvements, based on experience with the existing LANDSATs, will provide new capabilities in the spacecraft, the sensor, the ground system, and the overall system design. Author

RS77-1-356

N77-20140# Dornier-System G.m.b.H., Friedrichshafen (West Germany)
STUDY ON GEOSYNCHRONOUS MULTIDISCIPLINARY EARTH OBSERVATION SATELLITES (MEOS). VOLUME 1: EXECUTIVE SUMMARY Final Report
Nov. 1976. 78 p. Prepared jointly with BAC, Bristol, Engl. and Soc. d'Etudes Tecn. et Entreprises Gen. Buc, France
(Contract ESA-SC/127/76-HQ)
(ESA-CR(P)-897) Avail: NTIS HC A05/MF A01

Requirements for a multidisciplinary earth observation satellite system in geosynchronous orbit were analyzed. A methodology for selection of candidate missions is presented taking into account the particular characteristics of geosynchronous orbits for observation of transient phenomena on the earth and ocean surface and in the atmosphere. The conceptual design of the payload and the spacecraft features modularity and flexibility. It includes a preliminary design of a one meter Ritchey-Chretien optical telescope as main instrument on a satellite which could be launched by Ariane into a geostationary orbit. The preferred concept allows exchange of focal plane elements to permit the performance of different kinds of measurement from high resolution imaging to vertical sounding. The preferred satellite concept is based on a three axis stabilized spacecraft. Particular attention was given to investigation of the attitude measurement and control subsystem necessary to achieve the extreme performance requirements compatible with high resolution imaging of the earth from geostationary orbit. Author (ESA)

RS77-1-357

A77-27711 * Significance of operator variation and the angle of illumination in lineament analysis on synoptic images. S. S. Siegal and N. M. Short (California Institute of Technology, Jet Propulsion Laboratory, Pasadena, Calif.). *Modern Geology*, vol. 6, no. 2, 1977, p. 75-85. 33 refs. Contract No. NAS7-100.

The significance of operator variation and the angle of illumination in acquired imagery is analyzed for lineament analysis. Five operators analyzed a LANDSAT image and four photographs of a plastic relief map illuminated at a low angle from varying directions of the Prescott, Arizona region. Significant differences were found in both number and length of the lineaments recognized by the different investigators for the images. The actual coincidence of lineaments recognized by the investigators for the same image is exceptionally low. Even the directional data on lineament orientation is significantly different from operator to operator and from image to image. Cluster analysis of the orientation data displays a clustering by operators rather than by images. It is recommended that extreme caution be taken before attempting to compare different investigators' results in lineament analysis. (Author)

RS77-1-358

A77-27106 Earth scientific aircraft measurement program - A contribution to the support of remote sensing (Erdwissenschaftliches Flugzeugmessprogramm - Ein Beitrag zur Forderung der Fernerkundung). M. Schroeder and M. Wahl. *Bildmessung und Luftbildwesen*, vol. 45, Mar. 1, 1977, p. 34-43. 6 refs. In German. Research sponsored by the Bundesministerium fur Forschung und Technologie.

The considered German program is concerned with the testing and the development of remote sensing methods in preparation for future international satellite and Spacelab programs. The program constitutes a combination of methodical investigations and directed applications of remote sensing procedures. The applications envisaged are related to forestry and agriculture, geology and hydrology, urban and region planning, and oceanography. G.R.

RS77-1-359

A77-31559 National programmes for remote sensing - A personal viewpoint with special reference to the United Kingdom. E. A. Stephens (Institute of Geological Sciences, London, England). In: Environmental remote sensing 2. Practices and problems (A77-31556 13-43). London, Edward Arnold (Publishers), Ltd., 1977, p. 41-47.

The need for national programs in remote sensing is discussed, taking into account the need for an appropriate administrative organization in the United Kingdom. European experimental programs in the remote sensing of earth resources are listed in a table. Attention is given to the ESRO program, the United Kingdom program, and a proposed program for the United Kingdom. The list of proposed programs includes a microwave program, a largely uncoordinated program of research for application from airborne platforms, and a cooperative program through European agencies based on sensors in the visible part of the spectrum. G.R.

RS77-1-360

A77-33132 Geometrical referencing of Landsat images by affine transformation and overlaying of map data. D. Steiner (Eidgenossische Technische Hochschule, Zurich, Switzerland) and M. E. Kirby (INTERA Environmental Consultants, Ltd., Ottawa, Canada). *Photogrammetria*, vol. 33, Apr. 1977, p. 41-75. 23 refs. National Research Council of Canada Grant No. A-7501.

This paper presents a solution to the problem of referencing Landsat images to a geometrical base by using overlays of UTM map data matched by a simple affine transformation. The adequacy of such a transformation is first examined theoretically by considering systematic imaging errors along scan lines, as well as earth rotation and map projection effects, the latter in the form of an approximation. A more rigorous test is carried out by transforming points on hypothetical ideal Landsat images forwards to the map base by means of the projection equations and backwards again to the images by affine transformation. An experiment is then conducted in which digitized map data are matched to two selected actual Landsat images (Lake Erie region and Manitoba). In this context, the authors discuss problems of selecting and measuring control points and an iterative affine transformation procedure based on the gradual rejection of outliers. Finally, overlays of map grids and other linear features are produced. The residual standard errors range from 83 to 185 m at ground scale. (Author)

RS77-1-361

A77-27879 Soyuz 22 with six eyes in space (Sojoez 22 met zes ogen in de ruimte). J. Terwey. *Spaceview*, vol. 7, Nov.-Dec 1976, p. 29/201-33/205. In Dutch.

An overview is presented of the Soyuz 22 mission. The launch, mission preparations, personnel, the MKF-6 multispectral camera, flight, and touchdown of the Soyuz 22 are described. R.D.V.

RS77-1-362

A77-27829 # Pacific Northwest Land Resources Inventory Demonstration Project - An overview. G. A. Thorley and D. R. Hood (U.S. Geological Survey, Land Information and Analysis Office, Reston, Va.). In: American Society of Photogrammetry, Annual Meeting, 43rd, Washington, D.C., February 27-March 5, 1977, Proceedings. (A77-27826 11-43) Falls Church, Va., American Society of Photogrammetry, 1977, p. 29-42. 5 refs. Research sponsored by the Pacific Northwest Regional Commission. (ASP 77-106)

The paper reviews the objectives and some results of the five-phase Pacific Northwest Land Resources Inventory Demonstration Project pertaining to the determination of the usefulness of Landsat and supporting aircraft data for regional resource inventory. The project is tailored to the needs and specific problems of the various users and participants. Key elements contributing to the success of the two phases thus far completed are identified and discussed. S.D.

RS77-1-363

A77-27827 * # A computer software system for integration and analysis of grid-based remote sensing data with other natural resource data. S. E. Tilmann, W. R. Enslin, and R. Hill-Rowley (Michigan State University, East Lansing, Mich.). In: American Society of Photogrammetry, Annual Meeting, 43rd, Washington, D.C., February 27-March 5, 1977, Proceedings. (A77-27826 11-43) Falls Church, Va., American Society of Photogrammetry, 1977, p. 3-14. Grant No. NGL-23-004-083. (ASP 77-103)

This report describes a computer-based information system designed to assist in the integration of commonly available spatial data for regional planning and resource analysis. The Resource Analysis Program (RAP) provides a variety of analytical and mapping phases for single factor or multi-factor analyses. The unique analytical and graphic capabilities of RAP are demonstrated with a study conducted in Windsor Township, Eaton County, Michigan. For this study, soil, land cover/use, topographic and geological maps were used as a data base to develop an eleven map portfolio. The major themes of the portfolio are land cover/use, nonpoint water pollution, waste disposal, and ground water recharge. (Author)

RS77-1-364

A77-29276 * Photographic film and the Skylab environment. L. P. Oldham (Martin Marietta Aerospace, Denver, Colo.) and H. L. Atkins (NASA, Marshall Space Flight Center, Space Sciences Laboratory, Huntsville, Ala.). *Applied Optics*, vol. 16, Apr. 1977, p. 1002-1008. 10 refs.

An overview is presented of an investigation which was conducted to determine the actual effects of the Skylab environment on flight films. Examples of the flight film performance data are provided. Attention is given to the Skylab film, the environmental parameters, a major events profile of the Skylab mission, and a film environmental effects analysis. Representative Skylab film environmental response data are shown in a graph. G.R.

RS77-1-365

A77-28714 A comparison of some methods of slope measurement from large-scale air photos. H. Turner (McGill University, Montreal, Canada). *Photogrammetria*, vol. 32, Feb. 1977, p. 209-237. 23 refs. Defence Research Board of Canada Contract No. CD-900006/709-0020/30

This study investigates slope-measurement procedures that can be applied to large-scale unrectified air photos to determine their accuracy when compared with conventional field methods. The population of slopes was stratified, and an optimum stratified sample of 45 slopes was chosen. Ten methods of slope measurement from air photos are described, and each method is applied to the slope sample. The same slopes were measured in the field with a theodolite for an 'absolute' control and also with an Abney level. Statistical analysis was performed on the data to determine the accuracy of the individual methods, their performance over a particular slope range, their limitations of orientation, and their distribution of true errors. The results show that the Delft Estimator, the Hand Templet, and the Slope Comparator are acceptable slope-measuring procedures, comparable to the Abney level, with an accuracy within 1.1 deg. (Author)

RS77-1-366

A77-31568 Ground information for the earth-resources Skylark. J. R. G. Townshend (Reading, University, Reading, Berks., England). In: Environmental remote sensing 2: Practices and problems. (A77-31556 13-43) London, Edward Arnold (Publishers), Ltd., 1977, p. 216-245. 14 refs. Ministry of Defence of England Contracts No. AT/2035/015/SP; No. AT/2035/025/ASA.

The collection of ground information in Argentina is considered, taking into account a case in which a scheme of ground information collection had to be devised for an area of 300,000 sq km, within which considerable regional variations in environmental conditions and crop combination are to be found. Difficulties in the collection of ground information are examined and an assessment is conducted of the usefulness of ground information characteristics collected in Argentina. Attention is given to the relations between ground properties and the properties of rocket photographs, problems of crop-type prediction, ground information for terrain surveys, and implications for future ground-information surveys. G.R.

RS77-1-367

A77-27845 # Determination of photo coordinates of planimetric features by interactive image processing. J. Y. C. Wang (U.S. Army, Engineer Topographic Laboratories, Ft. Belvoir, Va.). In: American Society of Photogrammetry, Annual Meeting, 43rd, Washington, D.C., February 27-March 5, 1977, Proceedings. (A77-27826 11-43) Falls Church, Va., American Society of Photogrammetry, 1977, p. 402-411. (ASP 77-148)

Automated cartographic instruments can presently produce a variety of maps, but cannot compile line maps completely automatically. Feature extraction from digital imagery is a complicated problem. The computer is often unable to accomplish this task alone. It appears reasonable to combine the superior pattern recognition abilities of the human being with the computational power of the digital computer to form an interactive system. The present paper is concerned with the extraction of features by the interactive digital image system in order to generate photo-coordinates automatically. Attention is given to the basic algorithms for edge detection and line detection, along with associated procedures. The capability for extraction of cartographic detail from digital aerial photographic data is demonstrated. S.D.

RS77-1-368

A77-29072 * The Shuttle era - A challenge to the earth scientist. W. R. Muehlberger (Texas, University, Austin, Tex.) and V. R. Wilmarth (NASA, Johnson Space Center, Science Payloads Div., Houston, Tex.). *American Scientist*, vol. 65, Mar.-Apr. 1977, p. 152-158. 5 refs.

Satellite observations of large-scale earth features and phenomena, with either instruments or astronauts, are discussed on the basis of earlier experience (mainly Skylab). Off-nadir views and photographs by astronauts have provided valuable supplements to instrument nadir views, providing cross-checks through remote sensing at different angles, different altitudes, and in different seasons. New information on plate tectonics, global cooling/drying trends, global oceanographic data (changing positions of major ocean current patterns, evolution of warm and cold eddies and their relation to sea temperatures and concentrations of marine fauna, location of internal sea waves, interactions between ocean currents and atmosphere, plankton blooms), storm development, snow cover patterns, lake and sea ice growth, sand-dune patterns, desert storms blown out to sea, effects of grazing and swidden agriculture, and other earth features and phenomena are surveyed. R.D.V.

RS77-1-369

A77-28784 # Beyond what the eye can see /2nd revised and enlarged edition/ (Za predelami zrimogo /2nd revised and enlarged edition/). A. P. Merkulov. Moscow, Izdatel'stvo Mashinostroenie, 1976. 264 p. In Russian.

Imagery and perception of imagery is surveyed in a popular science approach. The nature of light, electromagnetic spectrum, the eye and vision, and the features and uses of portions of the spectrum are discussed. Electronic imaging and TV, microscopy, spectroscopy, introscopy, IR introscopy and thermal imaging, microwave and millimeter-wavelength imaging, acoustic imaging, and radiography using X-rays, gamma-rays, ionizing radiation, and strobointroscopy and stereoscopy are covered. Separate chapters deal with magnetic imaging and with holography/lasers. Automated processes utilizing imagery and pattern recognition are also dealt with. Use of an artificial 'toad-eye' radar in ATC is explained. R.D.V.

RS77-1-370

A77-29448 Terrain classification using color imagery. K. R. Piech, D. W. Gaucher, J. R. Schott (Calspan Corp., Buffalo, N.Y.), and P. G. Smith (USAF, Rome Air Development Center, Griffiss AFB, N.Y.). *Photogrammetric Engineering and Remote Sensing*, vol. 43, Apr. 1977, p. 507-513. 13 refs. USAF-supported research.

Algorithms have been developed to permit classification of metal, soil, pavement, cultivated fields, and vegetation elements from standard color film imagery. The analyses are significant because the algorithms are independent of sensor and atmospheric conditions. The algorithms thus remove the necessity for a new training data set for each data collection mission. Terrain classification from the algorithms was accomplished to 97 per cent accuracy using imagery at scales as small as 1:100,000 taken from altitudes in excess of 50,000 ft. (Author)

RS77-1-371

A77-29944 International Law Association /ILA/, 57. Conference, Madrid, 29. August-4. September 1976 - A summary of the discussions on space law. D. Goedhuis. *Zeitschrift für Luft- und Weltraumrecht*, vol. 26, Mar. 1977, p. 32-36.

Questions of a substantive and procedural nature relating to the space law aspects of remote sensing satellites are discussed. Attention is also given to space law aspects of direct broadcasting satellites.

RS77-1-372

A77-26584 Remote sensing and state sovereignty. D. M. Polter (Bundesministerium fur Forschung und Technologie, Bonn, West Germany). *Journal of Space Law*, vol. 4, Fall 1976, p. 99-115. 55 refs.

After outlining the technical and organizational aspects of remote sensing, the paper presents a legal discussion of the concept of state sovereignty with respect to sensing. The relationship of resources to their remote sensing data and the situation of the individual with respect to these data are discussed together with the concept of sovereign national will. The contradictory role of information in preconceived and open systems of values is found to be the reason for the differing concept of state sovereignty. A.Y.

RS77-1-373

A77-31560 Remote sensing from Spacelab - A case for international cooperation. J. Plevin (ESA, Neuilly-sur-Seine, Hauts-de-Seine, France). In: Environmental remote sensing 2. Practices and problems. (A77-31556 13-43) London, Edward Arnold (Publishers), Ltd., 1977, p. 48-71. 7 refs.

It appears today that remote sensing techniques will very probably provide the information upon which decisions regarding the utilization of material resources will be based. The development of suitable information-gathering remote sensing systems requires an extensive preparatory phase. The use of Spacelab during this experimental spaceborne phase is considered. Attention is given to the Spacelab program, the operational objectives, the experimental role, experimental programs, European experiment proposals, payloads, and questions of international cooperation regarding the Spacelab project. G.R.

RS77-1-374

A77-27839 # Densitometry on color and color IR imagery. F. L. Scarpace (Wisconsin, University, Madison, Wis.). In: American Society of Photogrammetry, Annual Meeting, 43rd, Washington, D.C., February 27-March 5, 1977, Proceedings. (A77-27826 11-43) Falls Church, Va., American Society of Photogrammetry, 1977, p. 301-318. 22 refs. (ASP 77-136)

Basic concepts of color densitometry and film calibration procedures are reviewed with special emphasis on the specific application to the Remote Sensing investigator. The differences between, and the instrumentation to measure the spectral, broad band, specular, diffuse, integral and analytical densities are discussed. An explanation of equivalent neutral density and methods of determining this type of density are presented. Methodologies of using analytical densities for the Remote Sensing community are detailed. The use of analytical densities in the construction of characteristic curves are discussed. Comments are made on reasons for the use of analytical densities in the analysis of film imagery and on proper application of the exposure values derived from the characteristic curves. (Author)

RS77-1-375

A77-28443 Aerial photograph reseau mensuration with sensing arrays. W. W. Seemuller (U.S. Army, Engineer Topographic Laboratories, Fort Belvoir, Va.). *IEEE Transactions on Instrumentation and Measurement*, vol. IM-26, Mar. 1977, p. 29-32.

A solid-state area array useful for taking automatic measurements of the distance separating reseau points on aerial photographs is described. The array detects the center of reseau cross images by determining points where the spatial derivative of the image vanishes. Accuracy to within a few microns on the image is reported. R.D.V.

RS77-1-376

A77-26976 Some recent developments in remote sensing. P. Schagen (Mullard, Ltd., Mullard Research Laboratories, Redhill, Surrey, England). *Nature*, vol. 266, Mar. 17, 1977, p. 223-228. 54 refs.

After a discussion of perception at very low light levels, technological developments in image intensification and thermal image conversion are outlined. Two types of image intensifier tubes, namely, cascade tubes and channel electron multiplier tubes, are described for modern night viewing equipment to achieve high brightness gains. As for thermal imaging, it is achieved either by using a linear array of photoconductive or photovoltaic cells, and mechanically scanning the thermal image across this array or by another technique which translates the thermal image into a pattern of electrical charges on a two-dimensional target and reads these out with a scanning electron beam. Instead of using photoconductive material, it is also possible to make use of the pyroelectric effect of some materials. Some applications of remote sensing by thermal imaging include geological surveys to map water resources, indicate potential oil and mineral deposits, and agricultural inspections to monitor crop development and crop failures. A.Y.

RS77-1-377

A77-27850 # Spectral differences between VHRR and VISSR data and their impact on environmental studies. S. R. Schneider and D. F. McGinnis, Jr. (NOAA, National Environmental Satellite Service, Washington, D.C.). In: American Society of Photogrammetry, Annual Meeting, 43rd, Washington, D.C., February 27-March 5, 1977, Proceedings. (A77-27826 11-43) Falls Church, Va., American Society of Photogrammetry, 1977, p. 470-480. 9 refs. (ASP 77-156)

A comparison is made between visible channel data from sensors on two different satellites, the VISSR on board SMS/GOES and the VHRR on board NOAA-4. The VISSR responds to a larger portion of the spectrum (0.55-0.75 micron) than the VHRR (0.6-0.7 micron). Manifestations of this spectral difference were found on imagery from the two sensors. Comparisons with respect to vegetation brightness, metamorphosed snow, water penetration, land-water interface and definition of snow cover on bare rock show that, in all five cases, the VISSR imagery exhibits known characteristics of near infrared imagery. (Author)

RS77-1-378

A77-32440 Space: A resource for earth - An AIAA review. Edited by J. Grey (American Institute of Aeronautics and Astronautics, Inc., New York, N.Y.), P. Downey (Boeing Aerospace Co., Seattle, Wash.), and B. Davis (Battelle Columbus Laboratories, Columbus, Ohio). New York, American Institute of Aeronautics and Astronautics, Inc., 1977. 73 p. $8.50.

The present review identifies and documents the many applications of space systems that have improved the quality of human life on earth. It provides a sourcebook of information on the technical elements, histories, uses, and impacts of communication satellite systems, navigation satellite systems, land-observation systems, satellites designed for sea and maritime observations, meteorological and other atmospheric-observation satellites, as well as on the future potential of space processing, life-science programs in space, and space-based solar power. Specific satellites and space systems discussed include Echo I, Syncom, ATS, Intelsat/Comsat, the Defense Satellite Communication Systems, Aerosat, Marisat, Transit I, the Navstar/GPS system, the Defense Meteorological Satellite Program, Skylab, the Landsat system, GEOS-3, Seasat, Tiros, Nimbus, ITOS, SMS, GOES, the space shuttle, and Spacelab. Detailed attention is given to the utilization and benefits of each system, Landsat results, meteorological observations, various space-processing experiments, and proposed designs for space-based solar power plants. F.G.M.

RS77-1-379

A77-31558 Commercial considerations in remote sensing engineering. G. Lewis (British Aircraft Corp., Space Systems Group, Bristol, England). In: Environmental remote sensing 2: Practices and problems. (A77-31556 13-43) London, Edward Arnold (Publishers), Ltd., 1977, p. 25-40.

The industrial process is considered, taking into account the research phase, design considerations, the development process, and aspects of manufacture and quality control. Problems connected with the conduction of external relations with organizations and committees representing the user of the equipment are considered along with difficulties related to changes in the specification of a piece of equipment. Attention is also given to questions of cost and details regarding the characteristics of the contract. G.R.

RS77-1-380

A77-31561 Thoughts on the legal aspects of remote sensing of the earth by satellites. H. Kaltenecker and G. Lafferranderie (ESA, Neuilly-sur-Seine, Hauts-de-Seine, France). In: Environmental remote sensing 2: Practices and problems. (A77-31556 13-43) London, Edward Arnold (Publishers), Ltd., 1977, p. 72-80. 11 refs.

Methods, objectives, and features of remote sensing are considered, taking into account the nature of remote sensing, the value of the information, the territorial origin of the information, requirements and programs, and the organization of the space segment and the ground segment. A description of the legal framework is presented and the establishment of regulations is discussed. Attention is given to public international law, the Treaty on Outer Space, natural resources, national security, prior consent problems, the objectives of a series of regulations, and projects before the United Nations G.R.

RS77-1-381

A77-27836 # A texture-tone analysis for automated landuse mapping with panchromatic images. S.-Y. Hsu (New York, State University, Binghamton, N.Y.). In: American Society of Photogrammetry, Annual Meeting, 43rd, Washington, D.C., February 27-March 5, 1977, Proceedings. (A77-27826 11-43) Falls Church, Va., American Society of Photogrammetry, 1977, p. 203-215. 5 refs. Contract No. F30602-76-C-0211. (ASP 77-128)

Texture in digital data processing means the spatial distribution of tones of the pixels. A new texture analysis is presented based on extracting both spatial-tone and wave-form parameters from 3x3 and 5x5 pixels, referred to as Model I and Model II, for classifying individual pixels into one of the training sets or a reject category. The classifier used is the linear discriminant functions obtained from the inverse of the dispersion matrix of the texture-tone variables. A hit-rate of over 90% is obtained for the classification of general land-use types with panchromatic images. S.D.

RS77-1-382

A77-31557 Current systems and services for remote sensing in relation to common user requirements. L. P. White (General Technology Systems, Ltd., Hounslow, Middx., England). In: Environmental remote sensing 2. Practices and problems. (A77-31556 13-43) London, Edward Arnold (Publishers), Ltd., 1977, p. 12-24.

Wavebands and systems for environmental remote sensing are considered, taking into account the ultraviolet to near infrared region, the thermal infrared region, the microwave region, photographic cameras, vidicon cameras, and multispectral line-scanners. Airborne equipment and related services are discussed along with satellite systems and related services, data-treatment services, and user requirements. Attention is given to practical considerations, aerial photography, infrared imagery, side-looking radar imagery, and satellite imagery. G.R.

RS77-1-383

A77-29446 Least squares prediction. R. L. Hardy. *Photogrammetric Engineering and Remote Sensing*, vol. 43, Apr. 1977, p. 475-492. 21 refs. NSF Grant No. GK 40287.

Least squares prediction in photogrammetry with multiquadric functions and covariance functions is analyzed, with special emphasis on similarities and dissimilarities of both techniques. Based on strictly theoretical definitions applied to covariance theory, it is shown that some multiquadric functions cannot possibly be covariance functions. Superior interpolation or computational characteristics for multiquadric functions over covariance functions in applications involving topography and gravity anomalies are highlighted. A possible reason for this is that variations of topography and gravity are not necessarily stationary random functions. Results are presented for an experiment in image analysis using multiquadric functions. S.D.

RS77-1-384

A77-27847 # High altitude photography - Aspects and results. D. Gut and J. Höhle. In: American Society of Photogrammetry, Annual Meeting, 43rd, Washington, D.C., February 27-March 5, 1977, Proceedings. (A77-27826 11-43) Falls Church, Va., American Society of Photogrammetry, 1977, p. 422-442. (ASP 77-150)

The paper outlines the particularities of jet photography and determines the potential for map production with modern instruments on the basis of the results obtained from test field photographs. General aspects of high-altitude photography are examined relative to photographic aircraft used, installation of the camera systems, and high-altitude photographic problems. Results are discussed in terms of geometric accuracy, image quality, and inflight camera inclination. Application of high-altitude photography in topographic mapping is described with respect to aerotriangulation, medium and small scale line maps, and orthophoto mapping. S.D.

RS77-1-385

A77-26585 Ecospace and some of its legal implications. E. R. Finch, Jr. (Finch and Shaefler Co., New York, N.Y.) and A. L. Moore. *Journal of Space Law*, vol. 4, Fall 1976, p. 117-133. 102 refs.

Ecospace (the economics of outer space), and its legal implications are discussed together with the diverse applications of space research as an economic and technological justification to space probes. The Soviets calculate their agricultural, geologic, geographic, and oceanographic benefits from earth surveying by the Landsat satellites to be in the range of 5 billion rubles annually, and the American report shows an annual gross profit of $1.4 billion from remote sensing information. The commercial profitability of communications and weather satellites is pointed out, and the application of space technology to industrial, medical, and social problems is outlined. The necessity of the rule of law in space is emphasized and the future moon treaty proposed by the Outer Space Committee of the United Nations is discussed. Future challenges, which include the building of space transportation systems, solar power satellites, the controlling of space contamination and pollution and space colonies are mentioned. A.Y.

RS77-1-386

A77-31896 Data acquisition and control in large-scale numerical photogrammetry (Acquisition et contrôle des données par photogrammétrie numérique à grande échelle). J. Denègre (Institut Géographique National, St. Mandé, Val-de-Marne, France). *Photogrammetria*, vol. 33, Mar. 1977, p. 19-40. 16 refs. In French.

The article reviews digital data acquisition techniques in large-scale photogrammetry, and covers measuring, recording, checking, and editing of data. A classification of methods used in data acquisition and editing is presented. Advances in automation of altimetric data (digitized directly from the model, with automatic orthophotography), in direct digitization of planimetric features involving interactive CRT display systems, two-dimensional digitization from line-maps and orthophotographs, and use of stereo-orthophotographs are discussed, along with automatic interpretation (pattern recognition) and automatic revision. R.D.V.

RS77-1-387

A77-27833 * = Ground truth management system to support multispectral scanner /MSS/ digital analysis. J. C. Coiner (Columbia University, New York, N.Y.) and S. G. Ungar (NASA, Goddard Institute for Space Studies, New York, N.Y.). In: American Society of Photogrammetry, Annual Meeting, 43rd, Washington, D.C., February 27-March 5, 1977, Proceedings. (A77-27826 11-43) Falls Church, Va., American Society of Photogrammetry, 1977, p. 130-137. (ASP 77-121)

A computerized geographic information system for management of ground truth has been designed and implemented to relate MSS classification results to in situ observations. The ground truth system transforms, generalizes and rectifies ground observations to conform to the pixel size and shape of high resolution MSS aircraft data. These observations can then be aggregated for comparison to lower resolution sensor data. Construction of a digital ground truth array allows direct pixel by pixel comparison between classification results of MSS data and ground truth. By making comparisons, analysts can identify spatial distribution of error within the MSS data as well as usual figures of merit for the classifications. Use of the ground truth system permits investigators to compare a variety of environmental or anthropogenic data, such as soil color or tillage patterns, with classification results and allows direct inclusion of such data into classification operations. To illustrate the system, examples from classification of simulated Thematic Mapper data for agricultural test sites in North Dakota and Kansas are provided. (Author)

RS77-1-388

A77-26938 Developments in space law - An impressive record for the Hall of Fame. S. Gorove (Mississippi, University, University, Miss.). In: The Eagle has returned; Proceedings of the Dedication Conference of the International Space Hall of Fame, Alamogordo, N. Mex., October 5-9, 1976. (A77-26926 11-12) San Diego, Calif., American Astronautical Society; Univelt, Inc., 1976, p. 203-208; Discussion, p. 213, 214, p. 215-244; 12 refs.

Space law is reviewed in the context of the Outer Space Treaty, whose basic principles include the cardinal freedoms of exploration and use of outer space. Attention is given to subject matters under consideration by the Legal Subcommittee of the United Nations Committee on the Peaceful Uses of Outer Space, including remote sensing, direct satellite broadcasting, the moon, and the delineation of airspace from outer space. B.J.

RS77-1-389

A77-29494 A method of smoothing digital thematic maps. W. A. Davis and F. G. Peet (Environment Canada, Forest Management Institute, Ottawa, Canada). *Remote Sensing of Environment*, vol. 6, no. 1, 1977, p. 45-49. 7 refs. National Research Council of Canada Grant No. A-7634

The paper discusses smoothing and gross feature extraction process as accomplished by minimal area recognition and reclassification of digital thematic maps derived from Landsat data. A method is proposed which involves scanning a classified picture and identifying all the connected regions in the picture. It is shown how one can choose minimal areas for the different classes on a digital thematic map, apply the described algorithm, and obtain a picture in which every region has an area greater than or equal to the chosen minimum. Illustrative pictures are included. S.D.

RS77-1-390

A77-24881 Side-looking radar. K. G. Corless (Royal Radar Establishment, Malvern, Worcs., England). In: Atmospheric effects on radar target identification and imaging; Proceedings of the Advanced Study Institute, Goslar, West Germany, September 22-October 3, 1975. (A77-24876 10-32) Dordrecht, D. Reidel Publishing Co., 1976, p. 157-178.

Early types of airborne ground-mapping radar are briefly examined. Certain limitations concerning these early systems could be overcome with the aid of developments related to changes in the antenna position and the introduction of a photographic display involving rapid chemical development. The changes in the antenna position produced an antenna beam which was directed sideways. The system advantages of the side-looking radar are discussed and a description of the synthetic aperture radar (SAR) is provided. The effect of Doppler phase errors on SAR is investigated. G.R.

RS77-1-391

A77-32579 # Thermal emission from inhomogeneous laminar media (O teplovom izluchenii sluchaino neodnorodnykh sloistykh sred). V. L. Brekhovskikh and V. I. Tatarskii (Akademiia Nauk SSSR, Institut Fiziki Atmosfery, Moscow, USSR). *Akademiia Nauk SSSR, Izvestiia, Fizika Atmosfery i Okeana*, vol. 13, Feb. 1977, p. 144-152. 8 refs. In Russian.

Thermal radio emission from such laminar structures as Antarctic ice exhibits certain characteristic features associated with multiple reflections by discontinuities. In the present paper, the coefficients of electromagnetic wave reflection from a weakly absorbing laminar randomly inhomogeneous medium are calculated for both horizontally and vertically polarized emission, on the basis of equations for the probability distribution of the coefficients. Angular dependences of the brightness temperature are obtained for each polarization type. V.P.

RS77-1-392

A77-27832 * # Picture processing of SAR L-band imagery. M. L. Bryan, W. D. Stromberg, and T. Farr (California Institute of Technology, Jet Propulsion Laboratory, Pasadena, Calif.). In: American Society of Photogrammetry, Annual Meeting, 43rd; Washington, D.C., February 27-March 5, 1977, Proceedings. (A77-27826 11-43) Falls Church, Va., American Society of Photogrammetry, 1977, p. 107-127. 18 refs. Contract No. NAS7-100. (ASP 77-119)

Data digitization and thresholding are applied to two scenes - sea ice and fresh-water lakes - to define the possible uses of automatic picture processing of uncalibrated SAR L-band imagery. It is shown that certain types of features, those which have constant returns which are also very high or very low in intensity can be effectively studied using simple automatic picture processing techniques applied to uncalibrated radar data. In areas which are generally inaccessible or in which monitoring of the changes of some types of earth surfaces are required, the uncalibrated SAR data can provide valuable inputs for modeling and mapping purposes. S.D.

RS77-1-393

A77-27107 Photogrammetric research at the Institut fur Angewandte Geodäsie (Photogrammetrische Forschung im Institut fur Angewandte Geodäsie). H. Belzner (Institut fur Angewandte Geodäsie, Frankfurt am Main, West Germany). *Bildmessung und Luftbildwesen*, vol. 45, Mar. 1, 1977, p. 44-50. 20 refs. In German.

Photogrammetric studies at the Institut für Angewandte Geodasie in Frankfurt, West Germany began in 1953. Research and test work carried out in the 1950s and during the first years of the 1960s were related to coordinate measurements, aerotriangulation, and the conduction of the corresponding computations. In the following years particular attention was given to the project 'orthophoto technology'. A comprehensive research program was conducted, taking into account functional and accuracy studies, developments in the areas of device and procedure technology, and test work concerning the employment and the design of orthophoto maps. Investigations related to digital image processing are also discussed along with the studies conducted by various commissions. G.R.

RS77-1-394

A77-25823 Introduction to environmental remote sensing. E. C. Barrett and L. F. Curtis (Bristol, University, Bristol, England). London, Chapman and Hall, Ltd., New York, Halsted Press, 1976. 346 p. 205 refs. $27.50.

Basic aspects regarding the monitoring of the environment are examined and the physical bases of remote sensing are considered, taking into account the geographical uses of remote sensing, natural remote sensing, technologically-assisted remote sensing, electromagnetic energy, the radiation at source, radiation in propagation, and radiation at its target. Attention is given to the radiation characteristics of natural phenomena, sensors for environmental monitoring, sensor platforms and sensor packages, approaches for collecting in situ data for remote sensing data interpretation, manual data interpretation and data preprocessing, numerical processing and analysis, weather analysis and forecasting, global climatology, water in the environment, soils and landforms, rock and mineral resources, crops and land use, forestry and ecological studies, and urban studies. G.R.

RS77-1-395

A77-31556 Environmental remote sensing 2: Practices and problems. Edited by E C Barrett and L. F. Curtis (Bristol, University, Bristol, England). London, Edward Arnold (Publishers), Ltd., 1977. 319 p. $34.50. (For individual items see A77-31557 to A77-31571)

Questions of policy-making for remote sensing are examined, taking into account current systems and services for remote sensing in relation to common user requirements, commercial considerations in remote sensing engineering, national programs for remote sensing, and remote sensing from Spacelab The processing and presentation of remote sensing data is considered along with aspects of in situ observation and the interpretation of remote sensing data. Attention is given to the use of remote sensing data in cartography, densitometric methods of processing remote sensing data, optical processing as an aid in analyzing remote sensing imagery, an image-processing system applied to earth-resource imagery, an objective generalization of Landsat images, and problems in analyzing and interpreting data from meteorological satellites. G.R.

RS77-1-396

A77-31564 Optical processing as an aid in analysing remote sensing imagery. M. E Barnett and P. R. Harnett (Imperial College of Science and Technology, London, England). In: Environmental remote sensing 2: Practices and problems. (A77-31556 13-43) London, Edward Arnold (Publishers), Ltd., 1977, p. 125-142. 14 refs.

Image processing is normally undertaken in order to improve either the speed or the effectiveness of photointerpretation. Digital processing entails either high costs of operation or high initial capital cost. More economical alternatives are offered by analog methods. Optical processing exploits chiefly the analytical capabilities of the optical diffraction process. The term optical processing is generally taken to refer to image processing using coherent light as is obtained from a laser. Incoherent optical processing using white light has also some applications. Aspects of coherent optical processing are discussed, taking into account the azimuthal structure, the radial structure, spatial filtering, and questions of mathematical formulation. Attention is also given to optical hardware, diffraction pattern sampling, and directional filtering. G.R.

RS77-1-397

A77-31566 Objective generalization of Landsat images. A. C. Armstrong and K. M. Clayton (East Anglia, University, Norwich, England). In: Environmental remote sensing 2 Practices and problems. (A77-31556 13-43) London, Edward Arnold (Publishers), Ltd, 1977, p. 163-189. 18 refs. Research supported by the Department of Industry and Natural Environmental Research Council.

The characteristics of Landsat data are discussed along with the classification procedures in remote sensing. A description of selection procedures is presented, taking into account aspects of field selection and feature selection. The choice of clustering algorithms is considered, giving attention to the selection problem, the classical cluster analysis, the iterative clustering method, the chain clustering method, and visual analysis. A description is given of the results of a study of ERTS-1 test data. G R.

RS77-1-398

A77-27826 American Society of Photogrammetry, Annual Meeting, 43rd, Washington, D.C., February 27-March 5, 1977, Proceedings. Falls Church, Va., American Society of Photogrammetry, 1977. 543 p Members, $2.50; nonmembers, $5.00. (For individual items see A77-27827 to A77-27853)

The present collection of papers deals with recent advances in the theory and applications of photogrammetry as related to land classification and mapping by means of remote sensing techniques and aerial survey data Computer software and hardware systems for integration and analysis of pertinent data are highlighted. Featured topics include variability of wetland reflectance and its effect on automatic categorization of satellite imagery, discrimination of rock and soil types by digital analysis of Landsat data, an advanced multiphoto block adjustment program, and remote sensing in engineering and environmental geology. S.D.

RS77-1-399

A77-24886 Atmospheric effects - Some theoretical relations and sample measurements. A. T. Waterman, Jr. (Stanford University, Stanford, Calif.). In: Atmospheric effects on radar target identification and imaging, Proceedings of the Advanced Study Institute, Goslar, West Germany, September 22-October 3, 1975. (A77-24876 10-32) Dordrecht, D. Reidel Publishing Co , 1976, p. 257-273.

The interaction between radar and the gaseous constituents of the atmosphere is considered. The relations concerning the characteristics of systematic refraction are explored and questions of random scattering are investigated, taking into account weak forward scattering concepts, strong forward (saturation) scattering, and backscatter. A geometrical interpretation of weak scattering is provided and measured values of signal fluctuations are discussed. Attention is given to the amplitude covariance functions for different spectra with experimental data. G.R.

RS77-1-400

PATENT-3 984 671 Not available NTIS
National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
Optical Process for Producing Classification Maps from Multispectral Data.
Patent.
R. E. Haskell. Patented 5 Oct 76, 12p N77-10594/9, PAT-APPL-502 138
Misc-Filed 30 Aug. 1974 Supersedes N74-32780 (12 - 22, p 2680). Subm-Sponsored by NASA.
This Government-owned invention available for U.S. licensing and, possibly, for foreign licensing. Copy of Patent available Commissioner of Patents, Washington, D.C.

Descriptors: *Holography, *Maps, *Multispectral band scanners, *Multispectral photography, Binary data, Optical data processing, *Patents, Photographic film, Spectral signatures.
Identifiers: PAT-CL-235-181.

A method of producing single-class and multi-class composite classification maps from multispectral data is provided. The multispectral data is transformed into a binary matrix format which is then encoded on an optical medium such as photographic film. The encoded data is holographically correlated with coded patterns representing selected spectral signatures to produce signal-class classification maps. Several single-class maps are optically superimposed to produce multi-class composite classification maps.

RS77-1-401

THE USE OF REMOTE SENSING FOR COASTAL ZONE MONITORING,
Texas A and M Univ., College Station. Remote Sensing Center.
A. R. Benton, Jr.
In The Present and Future of Coasts, Proceedings of the First Annual Conference of the Coastal Society, held at Arlington, VA, November 1975. p. 157-170, 11 ref.

Descriptors: *Remote sensing, *Monitoring, Water, resources, *Water pollution sources, *Resources development, *Baseline studies, Aerial photography, Satellites(Artificial).
Identifiers: Coastal zone management.

The cartographic portrayal, on a satisfactory base map, of an accumulation of related parametric data of reasonable accuracy, acquired over not too long a period of time, is called a 'baseline map' The baseline map becomes the standard against which any subsequent changes in those parameters are to be measured. Monitoring, in this sense, is the periodic gathering of new data for purposes of comparison with the baseline information in order that changes and trends may be documented. Every effort should be made to continually update baseline maps thus maintaining their relevance. A camera, used with appropriate film and filter combinations, will provide mapping or monitoring data on most of the parameters of interest to the coastal zone manager. The sensors discussed in this paper are those which can be taken aboard an aircraft. Satellite-borne systems are an alternate monitoring methodology. With respect to coastal zone monitoring use, the appropriate satellite is LANDSAT-1 with its multispectral scanner. Satellite monitoring should be considered first because it is less expensive for the user than aerial photography. Within the framework of satellite monitoring, the only viable system options would seem to be film positives and tape manipulation The tape manipulation option adds a capability which increases the likelihood of image identification and differentiation. (See also W77-04462) (Sinha-OEIS)
W77-04475

RS77-1-402

NTIS/PS-77/0081/8GA PC N01/MF N01
National Technical Information Service, Springfield, Va.
Instrumentation and Data Processing Used in the Earth Resources Technology Satellite (ERTS) (A Bibliography with Abstracts).
Rept. for 1973-Jan 77,
Audrey S. Hundemann. Feb 77, 237p*
Supersedes NTIS/PS-76/0055 and NTIS/PS-75/105.

Descriptors: *Bibliographies, *Remote sensing, Spacecraft instruments, Data processing, Pattern recognition, Spectrum analysis, Image intensifiers, Photointerpretation, Spaceborne photography, Mapping, Digital techniques, Unmanned spacecraft.
Identifiers: ERTS satellites.

Abstracts are cited dealing with new or improved remote sensing techniques. Topic areas cover pattern recognition, spectrum analysis, image enhancement, photointerpretation, multispectral photography, and mapping (This updated bibliography contains 232 abstracts, 75 of which are new entries to the previous edition)

RS77-1-403

AD-A034 497/8GA PC A16/MF A01
Air Force Flight Test Center Edwards AFB Calif
Photography in Scientific Research - Selected Bibliography and Reference Materials.
Final rept.,
Louis Harris Cohen. Jul 76, 356p Rept no. AFFTC-TIH-76-4

Descriptors: *Bibliographies, *Scientific research, *Photography, *Aerial photography, *Underwater photography, Cinematography, Holography, Interferometry, High speed photography, Cameras, Optics, Photographic processing, Infrared photography, Astronomical cameras, Photomicrography, Biology, Medicine, Abstracts.
Identifiers: Laser interferometry, Kirlian photography, Design

Contents: Aerial and underwater photography; High-speed photography--applications, equipment, principles and processes; Holography and lasers--principles and applications; Optics--basic principles, design, instrumentation problems, plastic optics and fiber optics; Reference materials--dictionaries, handbooks, guidebooks, encyclopedias, glossary's and selected collections; Science and technology--astronomy, close-up photography, infrared photography, photomicrography, photomacrography, scientific research, symposiums, techniques in biology and medicine, and television; High-voltage photography (Kirlian photography), Abstracts, indexes, bibliographical sources; Brochures, dissertations, speeches, masters' theses, reports, translations and technical notes; Kinesiology--selected materials; Journals and periodicals--selected articles; Selected list of journals and periodicals for use as reference materials; Photographic reference materials; Index

RS77-1-404

AD-A035 154/4GA PC A04/MF A01
Army Engineer Topographic Labs Fort Belvoir Va
Holographic Terrain Displays,
Michael M. McDonnell. Oct 76, 52p Rept no. ETL-0083

Descriptors: *Photogrammetry, *Stereoscopic display systems, *Aerial photography, *Mapping, Holography, Photointerpretation, Terrain, Multiplexing, Topographic maps, Photographic images, Image processing, Remote systems, Fourier transformation, Fresnel lenses.
Identifiers: Remote sensing.

The suitability of holography as a method for recording and reproducing visual displays of terrain is examined in a tutorial, non-mathematical manner. The paper is based chiefly on a literature search combined with some original work by the author. A brief introduction to the terminology of holography is followed by an exposition of a scheme of classifying hologram types which is used in the rest of the paper. Consideration of requirements for 3-D displays in general and the particular problem of making holograms of terrain is followed by a detailed discussion of the different types of hologram and how they may be used to make terrain displays with different characteristics. Emphasis is on the 2-photograph stereoscopic hologram which is called a 'holographic stereomodel'. Techniques to enhance certain characteristics of holographic displays such as color rendition and efficient use of illumination are examined and possible uses of holography in tasks related to map making are suggested.

RS77-1-405

AD-A033 631/3GA PC A05/MF A01
Prc Information Sciences Co Mclean Va
User's Manual for the Reference Scene Software (RSS).
Contract rept.,
Steven H. Moritz. 15 Oct 76, 77p PRC-R-1938, ETL-0066
Contract DAAK02-75-C-0098

Descriptors: *Mapping, *Computer programming, *Radar mapping, Computerized simulation, FORTRAN, Flow charting.
Identifiers: Reference scene software, CDC-6400 computers.

The Reference Scene Software (RSS) is a set of eleven CDC 6400 computer programs used in-house at the U.S. Army Engineer Topographic Laboratories (USAETL), Ft. Belvoir, Virginia, to produce simulated Plan Position Indicator (PPI) radar scenes. The two inputs required by RSS are a matrix array (raster format) of digital terrain elevations and a corresponding vector digitized list of planimetry features (roads, lakes, railroads, cities, rivers, etc.). The output of RSS is a raster format magnetic tape image of the circular PPI scene, which is later formatted onto 35mm film and machine compared to the actual scene of the area to determine the 'goodness' of correlation. These programs were originally developed by the Naval Training Equipment Center (NTEC), Orlando, Florida, for visual flight simulation. They were converted to run on the ETL CDC 6400 computer, new input and output routines were developed, and the radar modeling algorithm was changed to produce a better machine readable rather than better human readable scene. RSS is being used to determine the data base input requirements and the radar modeling algorithm parameters necessary for producing 'correlatable' reference scenes.

RS77-1-406

AD-A035 139/5GA PC A11/MF A01
Army Engineer Topographic Labs Fort Belvoir Va
Capabilities of Remote Sensors to Determine Environmental Information for Combat.
Technical rept.,
Jack N. Rinker, Judy Ehlen, Alan E. Krusinger, Thomas R. Currin, and Ambrose O. Poulin. Nov 76, 245p Rept no. ETL-0081

Descriptors: *Remote detectors, *Aerial reconnaissance, *Image processing, *Manuals, Infrared reconnaissance, Radar mapping, Information processing, Aerial photography, Scientific satellites, Weather, Climate, Vegetation, Hydrology, Topography, Geology, Transportation, Telecommunication, Agriculture, Pollution, Construction, Military planning, Army planning, Environments.
Identifiers: *Remote sensing, Spaceborne photography, LANDSAT satellites, ERTS satellites, Remote sensors.

U.S. Army Field and Technical Manuals were used to develop a list of 313 environmental information needs, or factors, required by the Army to accomplish its various tasks. Each factor was evaluated against a list of remote sensing systems to determine the extent to which each system could provide the needed information. Interpretation procedures were restricted to evaluation of imagery by conventional interpretation techniques and equipment. The systems evaluated are LANDSAT (ERTS), radar, thermal infrared, low-level oblique photography, standard photo index sheets, stereo 1:100,000 scale vertical aerial photography, and stereo 1:20,000 scale vertical aerial photography.

RS77-1-407

AD-A035 977/8GA PC A05/MF A01
Army Engineer Waterways Experiment Station Vicksburg Miss
Remote-Sensing Practice and Potential.
Final rept.,
Albert N. Williamson, William K. Dornbusch, and W. E. Grabau. May 74, 97p Rept no. WES-MP-M-74-2

Descriptors: *Remote detectors, Data acquisition, Data processing, Infrared scanning, Infrared photography, Side looking radar, Remote systems, Image processing, Reviews.
Identifiers: *Remote sensing.

Six essential processes that must be accomplished if use of a remote-sensing system is to result in useful information are defined as problem specification, ground control data acquisition, remote-sensor information acquisition, data manipulation, information extraction, and information presentation. Several fairly common and not so common sensor types are introduced, and some devices and information extraction and presentation techniques found to be useful in remote-sensing projects are described. An overview of the current state-of-the-art of remote sensing is presented.

RS77-1-408

AD-A033 727/9GA PC A04/MF A01
Stanford Research Inst Menlo Park Calif
Interactive Aids for Cartography and Photo Interpretation.
Semiannual technical rept. 12 May-12 Nov 76,
Harry G. Barrow. Nov 76, 52p
Contract DAAG29-76-C-0057, ARPA Order-2894

Descriptors: *Photointerpretation, *Aerial photography, *Mapping, Aerial photographs, Reconnaissance, Photointerpretation keys, Images, Photographic images, Transformations(Mathematics), Algorithms, Computerized simulation, Data processing, Railroad cars, Railroad tracks, Railroads, Roads, Bridges, Rural areas, Urban areas, Networks.

This report describes the work performed during the first six months of our project on Image Understanding. The central scientific goal of the research program is to investigate and develop ways in which diverse sources of knowledge may be brought to bear on the problem of interpreting images. The research is focused on the specific problems entailed in interpreting aerial photographs for cartographic or intelligence purposes, with a view to the eventual development of a collaborative aid to the cartographer or photo interpreter. A key concept is the use of a generalized digital map to guide the process of image interpretation. (Author)

RS77-1-409

PB-261 911/2GA PC A03/MF A01
Federal Highway Administration, Arlington, Va. Demonstration Projects Div.
Demonstration Project No. 1 Aerial Analytical Triangulation Texas Project.
State rept.,
David Wolf. Aug 76, 39p FHWA-DP-1-7

Descriptors: *Analytical photogrammetry, *Triangulation, Aerial photography, Texas.

This report presents the study and comparison of the different methods which the Texas State Department of Highways and Public Transportation and Region 15, FHWA, conduct aerial triangulation of strips of large-scale aerial photography. The comparison included different methods of ground control and use of different computer programs. Aerial triangulation accuracy resulting from the different methods is presented. In addition, aerial triangulation of a 189-photo rectangular block of large-scale aerial photography was performed. Different computer programs were used to process the data which contains over 4100 measurements of 1137 points. Accuracy resulting from the different processing programs is presented.

RS77-1-410

PB-261 775/1GA PC A03/MF A01
Federal Highway Administration, Arlington, Va. Demonstration Projects Div.
Demonstration Project No. 1, Analytical Aerial Triangulation--Kentucky Project.
State rept.,
David Wolf. Nov 76, 31p FHWA-DP-1-8

Descriptors: *Photogrammetry, *Triangulation, Analytical photogrammetry, Aerial photography, Kentucky.
Identifiers: Kentucky project.

This report presents a study of various methods of performing aerial triangulation while using two different film emulsions. Analytical aerial triangulation of three flight lines was performed, using both a stereocomparator and monocomparator. Panchromatic and color film were used. Independent model aerial triangulation was also performed using the color coverage of one flight line. The accuracy resulting from the various methods and emulsions is reported.

RS77-1-411

PB-262 847/7GA PC A13/MF A01
Berne Univ. (Switzerland). Inst. of Applied Physics.
Proceedings of the URSI Commission II Specialist Meeting on Microwave Scattering and Emission from the Earth Held at Berne (Switzerland) on September 23-26, 1974,
E. Schanda. 1974, 300p
Errata sheet inserted.

Descriptors: *Radar detection, *Remote sensing, *Meetings, Microwave equipment, Aerial reconnaissance, Ocean waves, Microwave spectra, Oil pollution, Monitors, Radiometers, Sea ice, Snow, Land ice, Soil properties, Vegetation, Geology, Sea water, Wind(Meteorology).
Identifiers: Oceanographic equipment, Oil pollution detection.

Contents: Scattering and Emission from water surfaces; Sea-ice, land-ice and snow; Soil, vegetation and geological features; Theoretical studies on scatter and emission; Considerations on systems and techniques.

RS77-1-412

PB-262 889/9GA PC A13/MF A01
Giddings (L. E.), Jr., Houston, Tex.
Bolivia From Space. Images and Other Information from Satellites, With Catalogs.
Final rept. 1963-76,
L. E. Giddings, Jr. Jan 77, 279p GIDDINGS-77-01

Descriptors: *Bolivia, *Remote sensing, *Spaceborne photography, Indexes(Documentation), Photographs, Data acquisition, Scientific satellites, Meteorological satellites.
Identifiers: LANDSAT satellites, ITOS satellites, NOAA satellites, SMS-GOES satellites, Apollo project, Gemini project, Skylab project.

A summary of the wealth of information about Bolivia available from manned and unmanned satellites is presented. A comprehensive catalog of photographs taken from the Gemini, Apollo, and Skylab manned missions is included. The report describes various kinds of information available from unmanned satellites, including the LANDSAT earth resources technology satellites, the ITOS/NOAA polar orbiting meteorological satellites, and the SMS/GOES geosynchronous operational meteorological satellites. Ways of obtaining space data are clearly specified in the text. Text and tables are complete to March of 1976.

RS77-1-413

PB-263 124/0GA PC A02/MF A01
National Bureau of Standards, Boulder, Colo. Electromagnetics Div.
Electromagnetic Remote Sensing of Inhomogeneous Media,
Wolfgang A. Bereuter, and David C. Chang. Jan 77, 21p NBSIR-76-851
Prepared by Colorado Univ., Boulder.

Descriptors: *Microwaves; *Remote sensing, Dielectric properties, Wave equations, Hypergeometric functions, Mathematical models, Boundary value problems.
Identifiers: Inverse scattering, Inverse problems.

This report deals with the electromagnetic response of inhomogeneous dielectrics, i.e., media whose permittivity is a function of depth. The resulting boundary value problem is solved for a large number of permittivity functions which can model almost any medium of interest. Since those permittivity profiles are characterized by only a few parameters, they are particularly useful for the inverse problem; i.e., the retrieval of profiles from the measured electromagnetic response. It is shown how the non-uniformity of the permittivity changes the response and how the change is related to the profile characteristics.

RS77-1-414

E77-10017 PC A04/MF A01
Geological Survey, Reston, Va.
CARETS: A Prototype Regional Environmental Information System. Volume 6. Cost, Accuracy and Consistency Comparisons of Land Use Maps Made for High-Altitude Aircraft Photography and ERTS Imagery.
Final rept.,
Robert H. Alexander, and Katherine A. Fitzpatrick. Sep 76, 68p NASA-CR-148987
NASA Order S-70243-AG
(PC A04/MF A01)

Descriptors: Central Atlantic regional ecol test site, *Land use, Cost analysis, Earth Resources Program, Maps, Information systems, Sampling, Accuracy.

The author has identified the following significant results. Level 2 land use maps produced at three scales (1:24,000, 1:100,000, and 1:250,000) from high altitude photography were compared with each other and with point data obtained in the field. The same procedures were employed to determine the accuracy of the Level 1 land use maps produced at 1:250,000 from high altitude photography and color composite ERTS imagery. Accuracy of the Level 2 maps was 84.9 percent at 1:24,000, 77.4 percent at 1:100,000, and 73 0 percent at 1:250,000. Accuracy of the Level 1 1:250,000 maps was 76.5 percent for aerial photographs and 69.5 percent for ERTS imagery. The cost of Level 2 land use mapping at 1:24,000 was found to be high ($11.93 per sq km). The cost of mapping at 1:100,000 ($1.75) was about two times as expensive as mapping at 1:250,000 ($.88), and the accuracy increased by only 4 4 percent.

RS77-1-415

E77-10051 PC A12/MF A01
Stanford Univ., Calif. School of Earth Sciences.
Evaluation of ERTS Multispectral Signatures in Relation to Ground Control Signatures Using Nested-Sampling Approach.
Final rept.,
Ronald J. P. Lyon. Apr 75, 275p NASA-CR-149258
Contract NAS5-21884
Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Ave., Sioux Falls, S.D. 57198.

Descriptors: Spectral signatures, *California, *Nevada, Mining(Excavations), Grasslands, Earth resources program, Multispectral band scanners, Radiometers.
Identifiers: *Mapping.

The author has identified the following significant results. Ground measured spectral signatures of wavelength bands matching ERTS MSS were collected using a radiometer at several California and Nevada sites, and directly compared with similar data from ERTS CCTs. The comparison was tested at the highest possible spatial resolution for ERTS, using deconvoluted MSS data, and contrasted with that of ground measured spectra, originally from 1 meter squares. In the mobile traverses of the grassland sites, these one meter fields of view were integrated into eighty meter transects along the five km track across four major rock/soil types. Suitable software was developed to read the MSS CCT tapes, to shadeprint individual bands with user-determined greyscale stretching. Four new algorithms for unsupervised and supervised, normalized and unnormalized clustering were developed, into a program termed STANSORT. Parallel software allowed the field data to be calibrated, and by using concurrently continuously collected, upward- and downward-viewing, 4 band radiometers, bidirectional reflectances could be calculated.

RS77-1-416

E77-10019 PC A04/MF A01
Geological Survey, Reston, Va.
CARETS: A Prototype Regional Environmental Information System Volume 9. Shore-Zone Land Use and Land Cover; Central Atlantic Regional Ecological Test Site.
Final rept ,
Robert H. Alexander, R. Dolan, B. P. Hayden, and C. L. Vincent. Sep 75, 55p NASA-CR-148989
NASA Order S-70243-AG
(PC A04/MF A01)

Descriptors: *Land use, Shorelines, Central Atlantic regional ecol test site, *Coasts, Barriers(Landforms), Islands, Earth resources program, Ecosystems, Data bases, Information systems.

The author has identified the following significant results. Analysis of the land use and land cover maps provides a stratification of the CARETS shore area into regions which have a similar environmental organization. Different elements of the landscape are altered less frequently moving inland. Near the beach, higher frequency of monitoring is needed than is needed in the inland areas, including the marsh and estuarine areas.

RS77-1-417

E77-10022 PC A09/MF A01
Geological Survey, Reston, Va.
CARETS: A Prototype Regional Environmental Information System. Volume 12. User Evaluation of Experimental Land Use Maps and Related Products from the Central Atlantic Test Site.
Final rept ,
Robert H. Alexander, and Herbert K. McGinty, III. Sep 76, 181p NASA-CR-148992
NASA Order S-70243-AG
(PC A09/MF A01)

Descriptors: Central Atlantic regional ecol test site, *Land use, Maps, Earth resources program, *Information systems, Management planning.
Identifiers: *Data processing.

The author has identified the following significant results. Recommendations resulting from the CARETS evaluation reflect the need establish a flexible and reliable system for providing more detailed raw and processed land resource information as well as the need to improve the methods of making information available to users.

RS77-1-418

E77-10029 PC A02/MF A01
Atomic Energy Commission, Dacca (Bangladesh).
Investigations Using Data from LANDSAT-2.
Quarterly rept. Jul-Sep 76,
Anwar Hossain. Oct 76, 3p NASA-CR-149132

Descriptors: *Bangladesh, Ground truth, Islands, *Land use, Drainage patterns, Earth resources program, Maps, Topography, Forecasting.

The author has identified the following significant results. Preliminary land use maps of Sunamgonj, Baniachong, and Srimongal areas in the Sylhet districts were prepared Indication of new land in the southern Patuakhali district and Hatiya Island were found, and erosion in northern Hatiya Island is also indicated.

RS77-1-419

E77-10025 PC A02/MF A01
Science Univ. of Tokyo (Japan).
Investigation of Environmental Change Pattern in Japan.
Quarterly rept. Jul-Sep 76,
Takakazu Maruyasu, Hiroaki Ochiai, Yasuhiro Sugimori, Diataro Shaji, and Nakano Takiwao.
29 Oct 76, 18p NASA-CR-149128
Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Ave., Sioux Falls, S.D. 57198.

Descriptors: *Japan, *Ocean currents, *Volcanoes, Pattern recognition, Earth resources program, Multispectral band scanners, Environmental monitoring.

The author has identified the following significant results. A detailed land use classification for a large urban area of Tokyo was made using MSS digital data. It was found that residential, commercial, industrial, and wooded areas and grasslands can be successfully classified. A mesoscale vortex associated with large ocean current, Kuroshio, which is a rare phenomenon was recognized visually through the analysis of MSS data. It was found that this vortex affects the effluent patterns of rivers. Lava flowing from Sakurajima Volcano was clearly classified for three major eruptions (1779, 1914, and 1946) using MSS data.

RS77-1-420

E77-10100 PC A03/MF A01
Lockheed Electronics Co., Inc., Houston, Tex. Houston Aerospace Systems Div.
Detection and Mapping (DAM) Package. Volume 1. General Procedure.
Final rept. Jan-Jun 76,
Edward H. Schlosser, and M. L. Brown. Jun 76, 28p LEC-8663-Vol-1, NASA-CR-147873, , JSC-11376-Vol-1
Contract NAS9-12220
See also E77-10101.

Descriptors: *Computer programs, *Land use, *Surface water, Thematic mapping, Skylab program, EREP, Computer graphics, Multispectral band scanners.

The author has identified the following significant results. The DAM package is an integrated set of manual procedures, computer programs, and graphic devices designed for efficient production of precisely registered and formatted maps from digital LANDSAT multispectral scanner data. The software can be readily implemented on any Univac 1100 series computer with standard peripheral equipment. This version of the software includes predefined spectral limits for use in classifying and mapping surface water.

RS77-1-421

14645 **Albertz, J.; and Kreiling, W.** Photogrammetrisches Taschenbuch [Photogrammetric handbook]: 214 p. (incl. Spanish sum.), illus. (incl. tables), H. Wichmann Verlag, Karlsruhe, Germany, Federal Republic of, 1972.

RS77-1-422

18669 **Tingey, D. L.; and Woodcock, G. R.** Mission design for advanced land resources remote sensing satellites: *in* Remote sensing of Earth resources; Volume III (Shahrokhi, F., editor), p. 609-651, illus. (incl. tables, sketch maps), Univ. Tenn., Space Inst., Tullahoma, Tenn., United States, 1974.

RS77-1-423

18633 **Shahrokhi, F. (editor).** Remote sensing of Earth resources; Volume III: 813 p., illus. (incl. tables, sketch maps), Univ. Tenn., Space Inst., Tullahoma, Tenn., United States, 1974. *Conference on Earth resources observation and information analysis system. Individual papers within scope of this Bibliography are cited under the separate authors.*

RS77-1-424

14834 **Sinnock, S.; and Melhorn, W. N.** Reflections concerning machine-aided analysis of ERTS-1 MSS data; common fallacies and misconceptions: *in* Remote sensing of Earth resources; Volume IV (Shahrokhi, F., editor), p. 713-733, illus. (incl. tables, sketch maps), Univ. Tenn. Space Inst., Tullahoma, Tenn., United States, 1975.

RS77-1-425

17969 **Thompson, M. M.; and Mikhail, E. M.** Automation in photogrammetry; recent developments and applications (1972-1976): Photogrammetria, Vol. 32, No. 4, p. 111-145, 1976.

RS77-1-426

18665 **Thomas, J.; Salis, Ch.; and Waksman, G.** Computer processing for enhancement and interpretation of Landsat imagery [abstr.]: Soc. Explor. Geophys., Annu. Int. Meet., Abstr., No. 46, p. 92-93, 1976.

RS77-1-427

18623 **Sawatzky, D. L.; and Lee, K.** New uses of shadow enhancement: *in* Remote sensing of Earth resources; Volume III (Shahrokhi, F., editor), p. 1-18, illus., Univ. Tenn., Space Inst., Tullahoma, Tenn., United States, 1974.

RS77-1-428

13984 **Pilonero, J. T.** Satellite image maps of the State of Arizona and of Phoenix: U. S. Geol. Surv., Prof. Pap., No. 929 *(ERTS-1, a new window on our planet)*, p. 29-31, illus., 1976.

RS77-1-429

14796 Murai, S. Digital correction of ERTS MSS bulk data for high resolution image data base: *in* Remote sensing of Earth resources; Volume IV (Shahrokhi, F., editor), p. 735-742, illus. (incl. sketch maps), Univ. Tenn. Space Inst., Tullahoma, Tenn., United States, 1975.

RS77-1-430

14797 Murine, G. E. The effects of varying training set size on multispectral scanner data classification: *in* Remote sensing of Earth resources; Volume IV (Shahrokhi, F., editor), p. 743-758, illus. (incl. tables), Univ. Tenn. Space Inst., Tullahoma, Tenn., United States, 1975.

RS77-1-431

14830 Shahrokhi, F. (editor). Remote sensing of Earth resources; Volume IV: 806 p., illus., Univ. Tenn. Space Inst., Tullahoma, Tenn., United States, 1975. *Individual papers within the scope of this Bibliography are cited under the separate authors.*

RS77-1-432

14801 Nichols, J. D. The future of human computer processed ERTS MSS data in resource inventory, mapping and assessment: *in* Remote sensing of Earth resources; Volume IV (Shahrokhi, F., editor), p. 69-76, tables, Univ. Tenn. Space Inst., Tullahoma, Tenn., United States, 1975.

RS77-1-433

14791 Miller, W. F.; Whisler, F. D.; Robinette, H. R.; *et al.* The use of hand-held 35mm color infrared imagery for estimates of suspended solids; a progress report: *in* Remote sensing of Earth resources; Volume IV (Shahrokhi, F., editor), p. 469-480, illus. (incl. table), Univ. Tenn. Space Inst., Tullahoma, Tenn., United States, 1975.

RS77-1-434

15503 Lyons, T. R.; Ebert, J. I.; and Hitchcock, R. K. Archaeological analysis of imagery of Chaco Canyon region, New Mexico: U. S. Geol. Surv., Prof. Pap., No. 929 *(ERTS-1, a new window on our planet)*, p. 304-306, illus. (incl. sketch map), 1976. (Natl. Park Serv., Univ. N.M., Chaco Cent.; Contrib. No. 9).

RS77-1-435

14808 Otterman, J.; Lowman, P. D.; and Salomonson, V. V. Surveying Earth resources by remote sensing from satellites: Geophys. Surv., Vol. 2, No. 4, p. 431-467, illus. (incl. sketch maps), 1976.

RS77-1-436

14757 Krumpe, P. F. (compiler). The world remote sensing bibliographic index; a comprehensive geographic index bibliography to remote sensing site investigations of natural and agricultural resources throughout the world: 600 p., Tensor Industries, Inc., Fairfax, Va., United States, 1976.

RS77-1-437

14782 Maxwell, E. L. Information theory applied to remote sensing: *in* Remote sensing of Earth resources; Volume IV (Shahrokhi, F., editor), p. 43-67, illus. (incl. tables), Univ. Tenn. Space Inst., Tullahoma, Tenn., United States, 1975.

RS77-1-438

18550 Kover, A. N. Remote sensing: Geotimes, Vol. 21, No. 1 *(Special issue on earth science: the view from '76)*, p. 35-36, illus., 1976.

RS77-1-439

14760 Kuhlow, W. W. SYNOP; a versatile tool in comparing differences of ERTS, RB-57 and ground-based data banks: *in* Remote sensing of Earth resources; Volume IV (Shahrokhi, F., editor), p. 691-711, illus. (incl. sketch map), Univ. Tenn. Space Inst., Tullahoma, Tenn., United States, 1975.

RS77-1-440

15084 DeNoyer, J. M. Introduction: U. S. Geol. Surv., Prof. Pap., No. 929 *(ERTS-1, a new window on our planet)*, p. 1-2, 1976.

RS77-1-441

14750 Kiefer, R. W.; Johnson, S. D.; and Voss, A. W. A computer-based remote sensing literature cataloging system: *in* Remote sensing of Earth resources; Volume IV (Shahrokhi, F., editor), p. 675-690, tables, Univ. Tenn. Space Inst., Tullahoma, Tenn., United States, 1975.

RS77-1-442

15058 Carter, W. D. Environmental assessment of remote areas of Colombia, South America: U. S. Geol. Surv., Prof. Pap., No. 929 *(ERTS-1, a new window on our planet)*, p. 290-292, illus. (incl. sketch map), 1976.

RS77-1-443

13952 Bogomolov, L. A. Deshifrirovaniye aerosnimkov [Interpreting aerial photography]: 145 p., illus. (incl. tables), Izd. Nedra, Moscow, Union of Soviet Socialist Republics, 1976.

RS77-1-444

14685 Caron, R. H. Evaluation of full-scene registered ERTS MSS imagery using a multitemporal/multispectral Bayes supervised classifier: *in* Remote sensing of Earth resources; Volume IV (Shahrokhi, F., editor), p. 783-806, illus. (incl. tables), Univ. Tenn. Space Inst., Tullahoma, Tenn., United States, 1975.

RS77-1-445

15278 Withington, C. F.; and Breckenridge, R. M. Oil-well fire on ERTS-1 images: U. S. Geol. Surv., Prof. Pap., No. 929 *(ERTS-1, a new window on our planet)*, p. 258-260, illus., 1976.

RS77-1-446

14862 Withington, C. F. ERTS-1 MSS false-color composites: U. S. Geol. Surv., Prof. Pap., No. 929 *(ERTS-1, a new window on our planet)*, p. 3-11, illus. (incl. sketch maps), 1976.

RS77-1-447

15274 Williams, R. S., Jr. Cape Cod and the Cape Cod National Seashore of Massachusetts: U. S. Geol. Surv., Prof. Pap., No. 929 *(ERTS-1, a new window on our planet)*, p. 307-309, illus. (incl. sketch map), 1976.

RS77-1-448

15275 Williams, R. S., Jr.; and Carter, W. D. (editors). ERTS-1, a new window on our planet: U. S. Geol. Surv., Prof. Pap., No. 929, 362 p., illus. (incl. sketch maps), 1976. *Imagery applications; compilation of 85 reports, those within scope are individually cited in this Bibliography under the separate authors.*

RS77-1-449

ID NO.- EI770534277 734277
PROCEEDINGS OF THE AMERICAN SOCIETY OF PHOTOGRAMMETRY, FALL CONVENTION, 1976.
Anon
Am Soc of Photogramm, Falls Church, Va
Proc of the Am Soc of Photogramm, Fall Conv, Jt Meet with Am Congr on Surv and Mapp, Seattle, Wash, Sep 28-Oct 1 1976 Publ by Am Soc of Photogramm, Falls Church, Va, 1976 562 p
DESCRIPTORS: *PHOTOGRAMMETRY, DATA PROCESSING, (RADAR, Meteorological),
CARD ALERT: 405, 443, 716, 723, 742

Proceedings include 45 papers that contribute to land use information systems; close range photogrammetry; forest and agriculture applications; control and simulation systems; cadastral surveys; space applications; interrelation of remote sensing and photogrammetry; water and environmental engineering; and orthophoto systems and automation. Some papers are included in abstract form only. Selected papers are indexed separately.

RS77-1-450

ID NO.- EI770536230 736230
PROCEEDINGS OF THE AMERICAN CONGRESS ON SURVEYING AND MAPPING, FALL CONVENTION, 1976.
Anon
Am Congr on Surv and Mapp, Falls Church, Va
Proc Am Congr Surv Mapp Fall Conv, Jt Meet with Am Soc of Photogramm, Seattle, Wash, Sep 28-Oct 1 1976 463 p CODEN: ACSM09
DESCRIPTORS: *SURVEYING, MAPS AND MAPPING, PHOTOGRAMMETRY, GEOLOGICAL SURVEYS,
IDENTIFIERS: CARTOGRAPHY
CARD ALERT: 405, 481, 742
Proceedings include 38 papers that deal with land surveys, control surveys, interpretation, cargography, marine surveying and mapping, and aerial surveys. Some papers are included in abstract form only. Selected papers are indexed separately.

RS77-1-451

ID NO.- EI770534940 734940
IMPROVED RESOURCE USE DECISIONS AND ACTIONS THROUGH REMOTE SENSING.
Boylan, Myles; Enslin, William R.; Hill-Rowley, Richard; Vlasin, Raymond D.
Mich State Univ, East Lansing
Proc of the Int Symp on Remote Sensing of Environ, 10th, Ann Arbor, Mich, Oct 6-10 1975 Publ by Environ Res Inst of Mich, Cent for Remote Sensing Inf and Anal, Ann Arbor, 1975 v 2 p 793-802
DESCRIPTORS: (*REMOTE SENSING, *Applications),
IDENTIFIERS: RESOURCE INVENTORIES, RESOURCE MANAGEMENT
CARD ALERT: 403, 444, 405, 406, 821
From the applications completed during 1974-75, eight case studies are described briefly with some important distinctions highlighted. These selections consist of: (1) land value reappraisal for tax assessment purposes; (2) optimizing agri-business processing plant locations; (3) locating abandoned vehicles for removal and recycling; (4) mapping of surface water bodies for rural fire-fighting units; (5) timber management and utilization; (6) highway corridor selection in terms of land cover and special environments; (7-a) inventory of land use/cover for a major river basin; (7-b) land use inventory of Michigan's largest urban region.

RS77-1-452

ID NO.- EI770534930 734930
INTERNATIONAL APPROACHES TO REMOTE SENSING.
Chipman, Ralph
UN, Outer Space Affairs Div, New York, NY
Proc of the Int Symp on Remote Sensing of Environ, 10th, Ann Arbor, Mich, Oct 6-10 1975 Publ by Environ Res Inst of Mich, Cent for Remote Sensing Inf and Anal, Ann Arbor, 1975 v 2 p 901-905
DESCRIPTORS: *REMOTE SENSING, (REGIONAL PLANNING, Land Use),
IDENTIFIERS: LANDSAT, DEVELOPMENT PLANNING
CARD ALERT: 901
The UN has establisned the Space Applications Programme to promote the transfer of technology to developing countries, and the United Nations Development Programme, the WORLD BANK, and the Food and Agriculture Organization are incorporating remote sensing technology into their development projects. The programmes are based mainly on the Landsat system for which three countries now have ground systems, two more are under construction and one is in the design stage. Additional ground stations can be expected and other countries will be launching remote sensing satellites. This growing international effort must be coordinated, and the training programmes will be required to ensure that all countries benefit.

RS77-1-453

ID NO.- EI770534928 734928
SOLAR AND ATMOSPHERIC EFFECTS ON SATELLITE IMAGERY DERIVED FROM AIRCRAFT REFLECTANCE MEASUREMENTS.
Dana, Robert W.
USDA, Pac Southwest For & Range Exp Stn, Berkeley, Calif
DESCRIPTORS- *REMOTE SENSING, ATMOSPHERIC RADIATION, SOLAR RADIATION, SATELLITES,
IDENTIFIERS- SATELLITE IMAGERY, SKYLAB, ERTS-1, SPECTRAL SIGNATURES, REFLECTANCE MEASUREMENTS
CARD ALERT- 716, 741, 641, 657, 655
SOURCE- Proc of the Int Symp on Remote Sensing of Environ, 10th, Ann Arbor, Mich, Oct 6-10 1975 Publ by Environ Res Inst of Mich, Cent for Remote Sensing Inf and Anal, Ann Arbor, 1975 v 2 p 683-694
The effects were investigated by measuring terrain reflectance from low-flying aircraft. Radiometric data were recorded over three test sites in California, Georgia, and South Dakota. Radiance from Skylab (EREP) S190A and ERTS-1 (LANDSAT-1) sensors was linearly correlated with wide-band terrain reflectance. The results support the proposition that the coefficients of the regression equation are the path radiance and a quantity representing the product of total irradiance and beam transmittance at the time of satellite overflight. These coefficients should be useful as linear conversion coefficients for extending spectral signatures in computer-aided classification work on satellite imagery. 12 refs.

RS77-1-454

ID NO.- EI770534959 734959
APPLICATION OF AIRCRAFT AND $left double quote$ ERTS $right double quote$ DATA TO ENVIRONMENTAL PROBLEMS.
Eliason, Jay R.; Foote, Harlan P.; Sandness, Gerry A.
Battelle Pac Northwest Lab, Richland, Wash
Proc of the Conf on Comput Support of Environ Sci and Anal, Albuquerque, NM, Jul 9-11 1975 Prep by Univ of Calif, Lawrence Livermore Lab, at the request of US ERDA, Div of Manage Inf and Telecommun Syst (CONF-750706), Oak Ridge, Tenn, 1975 p 279-309
DESCRIPTORS: (*REMOTE SENSING, *Environmental Applications), IMAGING TECHNIQUES, ENVIRONMENTAL PROTECTION,
CARD ALERT: 901, 723, 741
Battelle's remote sensing systems utilize the ultraviolet, visible, near infrared and far infrared (thermal infrared) portions of the electromagnetic spectrum. Data are collected by optical mechanical imaging systems and recorded on magnetic tape. These primary records are then converted to digital format and analyzed by computer. Specific applications have included surface temperature mapping of water bodies, mapping of tracer dye concentrations in surface water bodies, mapping of specific types of surface material, geothermal exploration, and others.

RS77-1-455

ID NO.- EI770533108 733108
CANADIAN MAPPING USE OF LANDSAT IMAGERY.
Fleming, E. A.
Dep of Energy, Mines & Resour, Topogr Surv, Ottawa, Ont
Proc of the Int Symp on Remote Sensing of Environ, 10th, Ann Arbor, Mich, Oct 6-10 1975 Publ by Environ Res Inst of Mich, Cent for Remote Sensing Inf and Anal, Ann Arbor, 1975 v 2 p 1451-1456
DESCRIPTORS: *MAPS AND MAPPING, (REMOTE SENSING, Applications), PHOTOGRAMMETRY,
IDENTIFIERS: LANDSAT IMAGERY
CARD ALERT: 405, 716, 742
Landsat imagery has been found to be a useful source of map revision information in the wilderness areas. Maps in these areas require revision when new roads, reservoirs or hydroelectric transmission lines are built. The location and extent of these features can be determined with sufficient accuracy for interim revision of 1:250,000 and 1:50,000 maps from the Landsat imagery. In addition the imagery has proved useful for detecting small Arctic Islands, relief shading and photomapping at small scale.

RS77-1-456

ID NO.- EI770643475 743475
SHORT COURSE ON REMOTE SENSING.
Lube, Bruce M.; Russell, James D.
Purdue Univ, West Lafayette, Indiana
Photogramm Eng Remote Sensing v 43 n 3 Mar 1977 p 299-301
CODEN: PERSDV
DESCRIPTORS: *REMOTE SENSING,
CARD ALERT: 405, 742
Analysis techniques and applications of remotely sensed data are rapidly expanding. The result is a wealth of information being produced by individuals in widely separated fields including engineering, agriculture, forestry, geology, and many others. The Laboratory for the Applications of Remote Sensing (LARS) at Purdue brings subject matter specialists and technical staff together in a unique team effort to solve remote sensing problems. The individualized training program gives each participant a background in remote sensing, then provides actual practical applications tailored to his individual needs.

RS77-1-457

ID NO.- EI770534941 734941
WORLDWIDE DISASTER WARNING AND ASSESSMENT WITH EARTH RESOURCES TECHNOLOGY SATELLITES.
Robinove, Charles J.
US Geol Surv, Reston, Va
Proc of the Int Symp on Remote Sensing of Environ, 10th, Ann Arbor, Mich, Oct 6-10 1975 Publ by Environ Res Inst of Mich. Cent for Remote Sensing Inf and Anal, Ann Arbor, 1975 v 2 p 811-820
DESCRIPTORS: (*REMOTE SENSING, *Applications), ENVIRONMENTAL PROTECTION,
IDENTIFIERS: ERTS-1, DISASTER WARNING
CARD ALERT: 901, 742
Images of the Earth collected by ERTS-1 and later experimental and operational satellites can be used for the warning and assessment of disasters throughout the world. Floods, fire, glacier movement, and drought are the disasters most amenable to satellite sensing and analysis. Other disasters to which applications are promising but not yet completely feasible are earthquakes, volcanic eruptions, crop failures, and water pollution. Practical application of satellite images to disaster assessment requires the continued and reliable operation of satellites and data reception stations, rapid distribution of data to interpretive teams and to affected countries, and the rapid analysis and dissemination of maps and other results. Refs.

RS77-1-458

ID NO.- EI770534956 734956
LOOK AT ALASKAN RESOURCES WITH LANDSAT DATA.
Miller, J. M.; Belon, A. E.; Gedney, L. D.; Shapiro, L. H.
Univ of Alaska, Geophys Inst, Fairbanks
Proc of the Int Symp on Remote Sensing of Environ, 10th, Ann Arbor, Mich, Oct 6-10 1975 Publ by Environ Res Inst of Mich. Cent for Remote Sensing Inf and Anal, Ann Arbor, 1975 v 2 p 879-892
DESCRIPTORS: (*REMOTE SENSING, *Environmental Applications), ENVIRONMENTAL PROTECTION, MAPS AND MAPPING, (REGIONAL PLANNING , Land Use),
IDENTIFIERS: RESOURCE MANAGEMENT, LANDSAT DATA
CARD ALERT: 716, 901, 405, 403
Utilization of these data by many agencies in Alaska trends toward the solution to operational problems in a wide spectrum of disciplinary applications. Four examples of current applications are reviewed briefly: mapping of coastal sediment plumes, mapping of coastal zone ecosystems, mapping of landform and ground cover for proposed national parks and forests, and evaluation of seismic risks for a proposed hydroelectric project.

RS77-1-459

ID NO.- EI770745573 745573
OBLIQUE AIRPHOTOS FOR MAPPING, EDUCATING USERS, AND ENHANCING PUBLIC PARTICIPATION IN ENVIRONMENTAL PLANNING.
Smedes, Harry W.; Turner, A. Keith; Reed, John C. Jr.
US Geol Surv, Denver, Colo
Transp Res Board Transp Res Rec n 594 1976 p 1-5 CODEN: TRREDM
DESCRIPTORS: *AERIAL PHOTOGRAPHY, PHOTOGRAMMETRY, (REGIONAL PLANNING, Land Reclamation), MAPPING,
IDENTIFIERS: ENVIRONMENTAL PLANNING
CARD ALERT: 403, 405, 742, 901
Low-altitude oblique color airphotographs were used in a case study of land use planning in Jefferson County, Colorado. The photographs were used in studies that included siting of open space, landfills, septic tanks, and housing developments; Making excavation easier; extracting resources; selecting corrodors; and determining optimum sequential patterns of development. In these studies, the photographs helped explain the meaning of technical terms, illustrated the difference and significance of various classes of land use and land cover, and aided in compiling maps and in teaching users how to interpret the maps and establish criteria and guidelines that define suitable lands for different uses. 14 refs.

RS77-1-460

ID NO.- EI770534955 734955
SURVEY OF RECENT RESOURCE APPLICATIONS IN MICHIGAN.
Taylor, W. C.; Enslin, W. R.; Olson, C. E. Jr.; Sattinger, I. J.
Mich State Univ, East Lansing
Proc of the Int Symp on Remote Sensing of Environ, 10th, Ann Arbor, Mich, Oct 6-10 1975 Publ by Environ Res Inst of Mich, Cent for Remote Sensing Inf and Anal, Ann Arbor, 1975 v 2 p 857-865
DESCRIPTORS: (*REMOTE SENSING, *Environmental Applications), (REGIONAL PLANNING, Land Use), ENVIRONMENTAL PROTECTION,
IDENTIFIERS: RESOURCE INVENTORIES, RESOURCE MANAGEMENT
CARD ALERT: 742, 741, 403
Remote sensing is making a direct contribution to the implementation of emerging land-use programs and legislation by state and local public agencies. It is being extensively used in the preparation of statewide inventories of Michigan's land resources, based on a four-level classification system. Specific applications have been directed toward implementing a number of Michigan and Federal laws, including the Farmland and Open Space Preservation Act, the Soil Erosion and Sedimentation Control Act, the Shorelands Protection and Management Act, and the U. S. Coastal Zone Management Act. Through programs to encourage technology transfer, universities and other organizations are assisting Michigan-based government agencies and private organizations to make increasing use of remote sensing data for land-use regulation and management, shoreline protection and many other resource management and protection functions. 12 refs.

RS77-1-461

ID NO.- EI770534943 734943
POSSIBLE AREAS OF APPLICATION OF REMOTE SENSING TECHNOLOGY IN SIERRA LEONE SEM DASHS SOME PRELIMINARY WORK AND IMMEDIATE APPLICATION.
Kamara, C. S.; Gabisi, A. H.
Njala Univ Coll, Sierra Leone, W Afr
Proc of the Int Symp on Remote Sensing of Environ, 10th, Ann Arbor, Mich, Oct 6-10 1975 Publ by Environ Res Inst of Mich, Cent for Remote Sensing Inf and Anal, Ann Arbor, 1975 v 2 p 925-929
DESCRIPTORS: (*REMOTE SENSING, *Applications), MINERAL EXPLORATION, (REGIONAL PLANNING, Land Use),
IDENTIFIERS: RESOURCE INVENTORIES
CARD ALERT: 742, 501
While detection of minerals using aerial photos would be laborious and time consuming, remote sensing techniques provide quantitative aspects of the earth's resources in addition to location and type. The paper highlights the need for using remote sensing technology in Sierra Leone and other developing countries by outlining the areas where immediate application is possible, and where preliminary work as to be done. It also suggests the mechanism of operation and the likely financial sources. Refs.

RS77-1-462

ID NO.- EI770534160 734160
INTERNATIONAL JOINT CONFERENCE ON PATTERN RECOGNITION, 3RD, PROCEEDINGS, 1976.
Anon
IEEE Comput Soc, New York, NY
Int Jt Conf on Pattern Recognition, 3rd, Proc, Coronado, Calif, Nov 8-11 1976 Publ by IEEE (Cat n 76CH1140-3C), New York, NY, 1976 884 p
DESCRIPTORS: *PATTERN RECOGNITION SYSTEMS, CHARACTER RECOGNITION, OPTICAL, IMAGE PROCESSING, AUTOMATA THEORY, STATISTICAL METHODS, (BIOMEDICAL ENGINEERING, Computer Applications),
CARD ALERT: 723, 741
One hundred and fifty-six papers were presented at the Third International Joint Conference on Pattern Recognition. The individual sessions covered the following topics: Industrial Applications; Feature Extraction and Primitive Selection; Syntactic Methods in Pattern Analysis; Optical Character Recognition; Learning Algorithms and Sample Size; Line Drawing and Waveform Processing; Interactive Pattern Analysis; Statistical Pattern Recognition Theory; Perceptual Modeling; Pattern Recognition Competition; General Applications; Clustering; Linguistic Applications and Natural Language Processing; Theoretical Problems; Segmentation and Shape Encoding; Medical Image Processing and Pattern Analysis; Picture Description and Scene Analysis; Speech Recognition and Data Compression; Remote Sensing; Parallel Processing and Two-Dimensional Digital Filtering; Edge, Line and Object Recognition; Applications of Pattern Recognition Technique; Image Analysis and Texture; Data Base Computer Systems. 9 refs.

RS77-1-463

ID NO.- EI770532433 732433
MAPPING ARCHAEOLOGICAL SITES FROM HISTORICAL PHOTOGRAPHY.
Tinney, Larry R.; Jensen, John R.; Estes, John E.
Univ of Calif, Santa Barbara
Photogramm Eng Remote Sensing v 43 n 1 Jan 1977 p 35-44
CODEN: PERSDV
DESCRIPTORS: *IMAGE PROCESSING, AERIAL PHOTOGRAPHY,
CARD ALERT: 405, 741, 742
A discussion is presented of the application of image processing of historical photographs as an aid to archaeological excavations at two California mission sites. The first application involves research at Mission Vieja de la Purissima to map the Old Mission complex, destroyed by an earthquake and mudslide in 1812. A second project involved the digital transformation of an historical photograph of Mission San Buenaventura from its oblique perspective into a $left double quote$ pseudo-vertical $right double quote$ format. Information obtained in these studies is being used by archaeological researchers and has been found accurate and extremely useful. 6 refs.

RS77-1-464

ID NO.- EI770534937 734937
PROCEEDINGS OF THE INTERNATIONAL SYMPOSIUM ON REMOTE SENSING OF ENVIRONMENT, 10TH, VOLUME 1 AND VOLUME 2, 1975.
Anon
Environ Res Inst of Mich, Cent for Remote Sensing Inf and Anal, Ann
Proc of the Int Symp on Remote Sensing of Environ, 10th, Ann Arbor, Mich, Oct 6-10 1975 Publ by Environ Res Inst of Mich, Cent for Remote Sensing Inf and Anal, Ann Arbor, 1975 2 vol, 1458 p
DESCRIPTORS: (*REMOTE SENSING, *Applications), (RADAR, Measurement Application), PHOTOGRAMMETRY, INFRARED IMAGING, SATELLITES, IMAGE PROCESSING,
IDENTIFIERS: SYNTHETIC APERTURE RADAR, SIDE-LOOKING AIRBORNE RADAR, MULTISPECTRAL SCANNERS, SPECTRAL SIGNATURES, RESOURCE INVENTORIES
CARD ALERT: 716, 742, 741, 655, 723, 405
The Proceedings contain 158 papers presented at the Symposium. Numerous different aspects of the field are covered in the reports on work planned, in progress or completed. Presentations include those concerned with the utilization of this technology in national and international programs as well as in numerous applications for monitoring and managing the earth's resources and the global environment. Ground-based, airborne and spaceborne sensor systems, and both manual and machine-assisted data analysis and interpretation, are included. Among the specific applications reported are those in crop inventories, hydrology, forestry, meteorology, land use, oceanography, resource inventories, environmental protection, mapping and others. Selected papers are indexed separately.

RS77-1-465

ID NO.- EI770534957 734957
SATELLITE AND AIRPLANE REMOTE SENSING OF NATURAL RESOURCES IN THE STATE OF WASHINGTON.
Scott, Robert B.; Harding, Roger A.
Wash State Dep of Nat Resour, Olympia
Proc of the Int Symp on Remote Sensing of Environ, 10th, Ann Arbor, Mich, Oct 6-10 1975 Publ by Environ Res Inst of Mich, Cent for Remote Sensing Inf and Anal, Ann Arbor, 1975 v 2 p 893-900
DESCRIPTORS: (*REMOTE SENSING, *Environmental Applications), (REGIONAL PLANNING, Land Use), AERIAL PHOTOGRAPHY,
IDENTIFIERS: NATURAL RESOURCE INVENTORIES
CARD ALERT: 742, 403
The State's Department of Natural Resources (DNR) has multi-disciplinary statewide governmental and proprietary responsibilities. The DNR obtains and indexes state-wide aerial photography (black and white, color and FCIR) which is used for many purposes including inventory. Under contract the DNR has developed potential applications for Landsat data, and is a key participant in the joint USDI-EROS, NASA-AMES and Pacific Northwest Regional Commission Land Resource Inventory Demonstration Project.

RS77-1-466

ID NO.- EI770534963 734963
SIGNATURE VARIATIONS DUE TO ATMOSPHERIC EFFECTS.
Turner, Robert E.
Environ Res Inst of Mich, Ann Arbor
Proc of the Int Symp on Remote Sensing of Environ, 10th, Ann Arbor, Mich, Oct 6-10 1975 Publ by Environ Res Inst of Mich, Cent for Remote Sensing Inf and Anal, Ann Arbor, 1975 v 2 p 671-682
DESCRIPTORS: (*REMOTE SENSING, *Mathematical Models), ATMOSPHERIC OPTICS,
IDENTIFIERS: MULTISPECTRAL SCANNER DATA, SPECTRAL SIGNATURES
CARD ALERT: 921, 443, 741
In the analysis of multispectral remote sensing data it has been noticed that there is an influence of background on target as a result of scattering by the atmosphere. If this effect is strong, then the spectral signature of a class of materials will depend upon the surface spatial pattern, the reflectances of the materials composing the background, the atmospheric state, and the geometric conditions such as sun angle and view angle. To solve the problem, a single-scattering solution of the radiative-transfer equation for a point source and the solution integrated solution over a surface spatial pattern characteristic of natural agricultural materials. The results of the calculations show the change in signal level for specific targets using LANDSAT channels with a variety of background materials. The change depencs upon visibility conditions, solar zenith angles, and the type of spatial distribution of background materials.

RS77-1-467

PETERSEN, G.W./MCMURTRY, G.J.

1972

INTERDISCIPLINARY APPLICATIONS AND INTERPRETATIONS OF REMOTELY SENSED DATA. IN J.V. BUTTKAMER AND T.J. MCCULLOUGH, EDS., SPACE FOR MANKIND'S BENEFIT, P. 181-186.

SPACE CONGRESS, HUNTSVILLE, ALABAMA, NOVEMBER 15-19, PROCEEDINGS. 477 P. AVAILABLE GPO AS NATIONAL AERONAUTICS AND SPACE ADMINISTRATION PUBLICATION NASA SP-313. PAPER COPY 4.50.

REMOTE SENSING/POLLUTION SOURCES/MINE WASTES/MONITORING/LAND USE/RECREATION/ GROUNDWATER

Section 2

GEOLOGY AND HYDROLOGY

Mineral and Petroleum Resources, Geomorphology,
Geological Exploration, Polar Studies,
River-basin Hydrology, Mapping

RS77-2-423

N77-20543*# Geological Survey, Malaysia
GEOLOGICAL AND HYDROGEOLOGICAL INVESTIGATION IN WEST MALAYSIA Quarterly Report
Jaafar Bin Ahmad, Principal Investigator Dec 1976 10 p Sponsored by NASA ERTS
(E77-10135, NASA-CR-149882, QR-2) Avail NTIS HC A02/MF A01 CSCL 08G

The author has identified the following significant results The broad synoptic view of the images allowed easy identification of circular features and major fault traces in low lying areas. Sedimentary units were delineated in accordance with the prevailing rock types and where applicable the folding characteristics Igneous units could easily be differentiated by tone, degree of fracturing, texture, and drainage pattern. The larger fold structures, anticlinoriums and synclinoriums, of the younger sediments on the eastern edge of the central belt could also be easily delineated

RS77-2-424

N77-18667# Wyoming Univ., Laramie
EVALUATION OF WIND-ENERGY SITES FROM AEOLIAN GEOMORPHOLOGIC FEATURES MAPPED FROM LANDSAT IMAGERY. FIRST RESULTS
K Kolm, R Marrs J. Marwitz and J. Fletcher 1 Dec 1975 39 p refs Sponsored in part by ERDA
(Grant NSF AER-75-00598)
(ERDA/NSF/00598-75/T1) Avail NTIS HC A03/MF A01

Aeolian geomorphologic features interpreted from satellite imagery are related to areas of high-wind-energy potential. Preliminary results gathered during spring and summer months, were evaluated statistically to determine the critical interrelationships for the Killpecker test area. These tests indicate that the morphology of individual dunes is not a unique indicator of wind velocity or persistance, but the morphology of the dune field is an indicator that can be used to predict areas of high wind-energy potential These results will be used as a guide to prediction of other areas of high wind-energy potential Field measurements will then be used to test these predictions Similar evaluations are being made in the Big Hollow Area where aeolian erosional phenomena dominate the geomorphologic development ERA

RS77-2-425

N77-18523*# Colorado Univ., Boulder. Inst. of Arctic and Alpine Research
MULTIPLE RESOURCE EVALUATION OF REGION 2 US FOREST SERVICE LANDS UTILIZING LANDSAT MSS DATA
Final Report, 20 Feb. 1975 - 20 Jul. 1976
Paula V Krebs and Roger M Hoffer, Principal Investigators (Purdue Univ) Jul 1976 342 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center 10th and Dakota Avenue Sioux Falls, S. D. 57198 ERTS
(Contract NAS5-20946)
(E77-10108, NASA-CR-149595) Avail NTIS HC A15/MF A01 CSCL 02F

The author has identified the following significant results. LANDSAT MSS imagery provided an excellent overview which put a geomorphic study into a regional perspective, using scale 1:250,000 or smaller It was used for deriving a data base for land use planning for southern San Juan Mountains Stereo pairing of adjacent images was the best method for all geomorphic mapping Combining this with snow enhancement, seasonal enhancement, and reversal aided in interpretation of geomorphic features Drainage patterns were mapped in much greater detail from LANDSAT than from a two deg quadrangle base

RS77-2-426

N77-20534*# Colorado School of Mines, Golden Dept of Geology.
APPLICATION OF REMOTE SENSOR DATA TO GEOLOGIC ANALYSIS OF THE BONANZA TEST SITE, COLORADO Final Report
Keenan Lee, Principal Investigator Dec 1976 42 p refs ERTS
(Grant NGL-06-001-015)
(E77-10126, NASA-CR-149873, Rept-76-4) Avail NTIS HC A03/MF A01 CSCL 08G

The author has identified the following significant results The Hayden Pass (Orient mine area) includes 60 sq miles of the northern Sangre de Cristo Mountains and San Luis Valley in south-central Colorado. Based on interpretation of the remote sensor data, a geologic map was prepared and compared with a second geologic map, prepared from interpretation of both remote sensor data and field data Comparison of the two maps gives an indication of the usefulness and reliability of the remote sensor data The relative utility of color and color infrared photography was tested. The photography was used successfully to locate 75% of all faults in a portion of the geologically complex Bonanza volcanic center and to map and correctly identify 93% of all quaternary deposits and 62% of all areas of tertiary volcanic outcrop Using a filter wheel photometer, more than 8,600 measurements of band reflectance of several sedimentary rocks were performed The following conclusions were drawn: (1) the typical spectral reflectance curve shows a gradual increase with increasing wavelength, (2) the average band reflectance is about 0.20, and (3) within a formation, the minimum natural variation is about 0.04, or about 20% of the mean band reflectance

RS77-2-427

N77-22742*# Jet Propulsion Lab., Calif Inst. of Tech., Pasadena.
APPLICATIONS OF AEROSPACE TECHNOLOGY TO PETROLEUM EXPLORATION. VOLUME 2: APPENDICES
Leonard D Jaffe 30 Sep. 1976 296 p refs 2 Vol.
(Contract NAS7-100)
(NASA-CR-152693, JPL-Doc-5040-32-Vol-2) Avail: NTIS HC A13/MF A01 CSCL 08G

Participants in the investigation of problem areas in oil exploration are listed and the data acquisition methods used to determine categories to be studied are described. Specific aerospace techniques applicable to the tasks identified are explained and their costs evaluated. A.R.H

RS77-2-428

N77-18536*# Los Alamos Scientific Lab N.Mex.
CATALOGUE OF SATELLITE PHOTOGRAPHY OF THE ACTIVE VOLCANOES OF THE WORLD
Grant Heiken Mar 1976 29 p Sponsored by NASA
(Contract W-7405-eng-36)
(NASA-CR-149618, LA-6297-MS) Avail: NTIS HC A03/MF A01 CSCL 08K

A catalogue is presented of active volcanoes as viewed from Earth-orbiting satellites The listing was prepared of photographs, which have been screened for quality, selected from the earth resources technology satellite (ERTS) and Skylab, Apollo and Gemini spacecraft There is photography of nearly every active volcano in the world, the photographs are particularly useful for regional studies of volcanic fields ERA

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RS77-2-429

N77-19563*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md
SELECTING RECONNAISSANCE STRATEGIES FOR FLOODPLAIN SURVEYS
S. C Sollers, A. Rango, and D L. Henninger Jan. 1977 45 p refs Submitted for publication
(NASA-TM-X-71273; X-913-77-4) Avail: NTIS HC A03/MF A01 CSCL 08H

Multispectral aircraft and satellite data over the West Branch of the Susquehanna River were analyzed to evaluate potential contributions of remote sensing to flood-plain surveys Multispectral digital classifications of land cover features indicative of floodplain areas were used by interpreters to locate various floodprone area boundaries The digital approach permitted LANDSAT results to be displayed at 1:24,000 scale and aircraft results at even larger scales. Results indicate that remote sensing techniques can delineate floodprone areas more easily in agricultural and limited development areas as opposed to areas covered by a heavy forest canopy. At this time it appears that the remote sensing data would be best used as a form of preliminary planning information or as an internal check on previous or ongoing floodplain studies In addition, the remote sensing techniques can assist in effectively monitoring floodplain activities after a community enters into the National Flood Insurance Program. Author

RS77-2-430

N77-21526*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md
REMOTE SENSING: SNOW MONITORING TOOL FOR TODAY AND TOMORROW
Albert Rango Mar 1977 12 p refs Presented at Western Snow Conf., Albuquerque, N. Mex., 18-21 Apr. 1977
(NASA-TM-X-71287; X-913-77-57) Avail NTIS HC A02/MF A01 CSCL 08L

Various types of remote sensing are now available or will be in the future for snowpack monitoring. Aircraft reconnaissance is now used in a conventional manner by various water resources agencies to obtain information on snowlines, depth, and melting of the snowpack for forecasting purposes. The use of earth resources satellites for mapping snowcovered area, snowlines, and changes in snowcover during the spring has increased during the last five years Gamma ray aircraft flights, although confined to an extremely low altitude, provide a means for obtaining valuable information on snow water equivalent The most recently developed remote sensing technology for snow, namely, microwave monitoring, has provided initial results that may eventually allow us to infer snow water equivalent or depth, snow wetness, and the hydrologic condition of the underlying soil. Author

RS77-2-431

N77-22741*# Jet Propulsion Lab., Calif. Inst of Tech., Pasadena.
APPLICATIONS OF AEROSPACE TECHNOLOGY TO PETROLEUM EXPLORATION. VOLUME 1: EFFORTS AND RESULTS
Leonard D. Jaffe 30 Sep. 1976 145 p refs 2 Vol.
(Contract NAS7-100)
(NASA-CR-152694; JPL-Doc-5040-32-Vol-1) Avail. NTIS HC A07/MF A01 CSCL 08G

The feasibility of applying aerospace techniques to help solve significant problems in petroleum exploration is studied. Through contacts with petroleum industry and petroleum service industry, important petroleum exploration problems were identified. For each problem, areas of aerospace technology that might aid in its solution were also identified where possible Topics selected for investigation include: seismic reflection systems; down-hole acoustic techniques; identification of geological analogies; drilling methods; remote geological sensing; and sea floor imaging and mapping Specific areas of aerospace technology are applied to 21 concepts formulated from the topics of concern. Author

RS77-2-432

N77-19567*# Army Cold Regions Research and Engineering Lab., Hanover, N H.
SKYLAB IMAGERY: APPLICATION RESERVOIR MANAGEMENT IN NEW ENGLAND Final Report, Apr. 1973 - Sep. 1975
H. L. McKim, L. W Gatto, C. J. Merry, and R. K Haugen Sep 1976 58 p refs
(NASA Order T-4646-B)
(NASA-CR-149794, AD-A030329, CRREL-SR-76-7) Avail: NTIS HC A04/MF A01 CSCL 08/8

The purpose of this investigation was to determine the utility of Skylab S190A and B photography for providing reservoir management information in New England. LANDSAT, Skylab S190A and S190B and RB75/RC8 images were reduced to a common scale of 1 63,360 for a mapping base to demonstrate the extent to which the imagery could be utilized in the preparation of reconnaissance land use maps These types of maps are required in the baseline evaluation of areas for reservoir management planning and for future environmental planning activities, i.e. permit evaluation and impact statements Visual intepretations were accomplished on orginal NASA color infrared S190A/B and RB57/RC8 transparencies and a LANDSAT false color print made in-house. Ancillary data were not used during the mapping exercise to eliminate bias in the comparisons and to ensure the results were derived strictly from interpretations of tones and textures on the photography. Significant findings of this investigation were as follows: (1) S190B imagery is superior to the LANDSAT MSS imagery for land use mapping and is as useful for category I and II land use mapping as the high altitude RC8 imagery. Detailed land use mapping at levels III and finer from satellite imagery requires better resolution However, the larger areal coverage available from the S190B imagery is a great advantage. Thus the S190B imagery was found to be nearly ideal for detailed, regional land use mapping (2) For evaluating volume runoff potentials the S190B imagery was found to be as useful as the RB-57/RC8 imagery GRA

RS77-2-433

N77-17551*# Maryland Univ., College Park Dept of Civil Engineering
A COMPARISON BETWEEN CONVENTIONAL AND LANDSAT BASED HYDROLOGIC MODELING: THE FOUR MILE RUN CASE STUDY Final Report, Jul. 1975 - Sep. 1976
Robert M. Ragan, Thomas J Jackson, William N Fitch (Water Resources Engineers, Inc., Springfield, Va.), and Robert P. Shubinski (Water Resources Engineers, Inc., Springfield, Va.) Oct. 1976 130 p refs
(Grant NsG-5017)
(NASA-CR-149450) Avail. NTIS HC A07/MF A01 CSCL 08H

Models designed to support the hydrologic studies associated with urban water resources planning require input parameters that are defined in terms of land cover Estimating the land cover is a difficult and expensive task when drainage areas larger than a few sq. km are involved. Conventional and LANDSAT based methods for estimating the land cover based input parameters required by hydrologic planning models were compared in a case study of the 50 5 sq. km (19 5 sq. mi) Four Mile Run Watershed in Virginia. Results of the study indicate that the LANDSAT based approach is highly cost effective for planning model studies The conventional approach to define inputs was based on 1:3600 aerial photos, required 110 man-days and a total cost of $14,000 The LANDSAT based approach required 6 9 man-days and cost $2,350 The conventional and LANDSAT based models gave similar results relative to discharges and estimated annual damages expected from no flood control, channelization, and detention storage alternatives Author

RS77-2-434

N77-22588# Texas A&M Univ., College Station Water Resources Inst

ENVIRONMENTAL EVALUATION OF WATER RESOURCES DEVELOPMENT

Wesley P. James, Calvin E. Woods, and Robert E Blanz Sep. 1976 231 p refs

(Contracts DI-14-31-0001-5044; DI-14-31-0001-6045)

(PB-262011/0, TR-76; W77-02828, OWRT-A-028-TEX(1)) Avail: NTIS HC A11/MF A01 CSCL 13B

Methodology for the utilization of LANDSAT-1 imagery and aerial photography on the environmental evaluation of water resources development is presented Environmental impact statements for water resource projects were collected and reviewed for the various regions of Texas. The environmental effects of channelization and surface impoundments are discussed for twelve physiographic regions of the state as delineated on black and white satellite (LANDSAT-1) mosaic of band 7. With the aid of LANDSAT-1 imagery, representative or typical transects were chosen within each region. Profiles of each site were constructed from topographic maps, and environmental data were accumulated for each site and related to low altitude aerial photography and enlarged LANDSAT-1 false color composites GRA

RS77-2-435

N77-21529*# National Aeronautics and Space Administration, Goddard Space Flight Center, Greenbelt, Md

DISCRIMINATION OF ROCK AND SOIL TYPES BY DIGITAL ANALYSIS OF LANDSAT DATA

Melvin H. Podwysocki, Fred J. Gunther (Computer Sci. Corp., Silver Spring, Md.), and Herbert W Blodget Jan 1977 44 p refs Submitted for publication

(NASA-TM-X-71290; X-923-77-17) Avail: NTIS CSCL 08G

Principal component analysis, followed by contrast enhancement of the transformed data, provided good separation of the various lithologies of tested terranes. Canonical analysis, using training area statistics developed on the four LANDSAT MSS bands, provided black and white images and color composites with greater spectral separation for some rock units but not for others All techniques allowed the production of a geologic map with more detail than some reconnaissance maps Canonical analysis produced a more detailed picture than the more general principal components, band rationing or contrast enhancement procedures but involved much more work. Exact results appear to be scene-dependent Author

RS77-2-436

N77-17558# Army Engineer Topographic Labs., Fort Belvoir, Va.

THE POTENTIAL OF THERMAL INFRARED IMAGERY FOR SUPPLEMENTAL MAP INFORMATION IN SNOW-COVERED AREAS

Ambrose O Poulin Jan 1976 27 p refs

(AD-A028384, ETL-0059) Avail NTIS HC A03/MF A01 CSCL 08/2

A map showing the snow-covered conditions of an area is needed because of the changes in appearance and physical condition of the terrain induced by freezing, partial freezing and the snow cover itself These changes create proolems regarding land navigation, mobility, evaluation of movement corridors and water supply that are significantly different from similar problems under snow-free conditions The purpose of this report is to explain the rationale for the map, its format and its intended use and to provide background information for one unfamiliar with thermal infrared imagery and its use in cold regions Color illustrations reproduced in black and white GRA

RS77-2-437

N77-17546*# Arkansas Univ., Fayetteville Dept of Geology.

LAND USE CHANGE DETECTION WITH LANDSAT-2 DATA FOR MONITORING AND PREDICTING REGIONAL WATER QUALITY DEGRADATION Final Report, 27 Jan. 1975 - 26 Jul. 1976

H MacDonald, K. Steele, Principal Investigators, W Waite, R. Rice, M. Shinn, T. Dillard, and C Petersen Jan. 1977 222 p refs Original contains imagery Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS

(Contract NAS5-20810)

(E77-10098, NASA-CR-149581) Avail: NTIS HC A10/MF A01 CSCL 08H

The author has identified the following significant results. Comparison between LANDSAT 1 and 2 imagery of Arkansas provided evidence of significant land use changes during the 1972-75 time period Analysis of Arkansas historical water quality information has shown conclusively that whereas point source pollution generally can be detected by use of water quality data collected by state and federal agencies, sampling methodologies for nonpoint source contamination attributable to surface runoff are totally inadequate The expensive undertaking of monitoring all nonpoint sources for numerous watersheds can be lessened by implementing LANDSAT change detection analyses.

RS77-2-438

N77-22578*# Colorado School of Mines, Golden

GROUND WATER RECHARGE TO THE AQUIFERS OF NORTHERN SAN LUIS VALLEY, COLORADO: A REMOTE SENSING INVESTIGATION

Keenan Lee, Principal Investigator and David Huntley Dec. 1976 313 p refs Original contains imagery Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D 57198 ERTS

(Grant NGL-06-001-015)

(E77-10149; NASA-CR-152649; Rept-76-3) Avail: NTIS HC A14/MF A01 CSCL 08H

The author has identified the following significant results. Ground water recharge to the aquifers of San Luis Valley west of San Luis Creek was primarily from ground water flow in the volcanic aquifers of the San Juan Mountains. The high permeability and anisotropic nature of the volcanic rocks resulted in very little contrast in flow conditions between the San Juan Mountains and San Luis Valley Ground water recharge to aquifers of eastern San Luis Valley was primarily from stream seepage into the upper reaches of the alluvial fans at the base of the Sangre de Cristo Mountains. The use of photography and thermal infrared imagery resulted in a savings of time and increase in accuracy in regional hydrogeologic studies. Volcanic rocks exhibited the same spectral reflectance curve as sedimentary rocks, with only the absolute magnitude of reflectance varying. Both saline soils and vegetation were used to estimate general ground water depths.

RS77-2-439

N77-21522*# Ecosystems International, Inc., Gambrills, Md

THE APPLICATION OF REMOTE SENSING TO THE DEVELOPMENT AND FORMULATION OF HYDROLOGIC PLANNING MODELS: EXECUTIVE SUMMARY

Peter A Castruccio, Harry L. Loats, Jr., and Thomas R Fowler 28 Feb. 1977 20 p

(Contract NAS8-30539)

(NASA-CR-150235; ECO-77-C-2-1, ECO-77-Exec; C-2-1-Exec) Avail NTIS HC A02/MF A01 CSCL 08H

Methods for the reduction of remotely sensed data and its application in hydrologic land use assessment, surface water inventory, and soil property studies are presented LANDSAT data is used to provide quantitative parameters and coefficients to construct watershed transfer functions for a hydrologic planning model aimed at estimating peak outflow from rainfall inputs. A.R H

RS77-2-440

N77-22711# Polytechnic Inst of New York, Brooklyn.
CORRELATION OF MATHEMATICAL MODELS FOR WATER TEMPERATURE WITH AERIAL INFRARED WATER TEMPERATURE SURVEYS
J C. Cataldo, R. R. Zavesky, and A S. Goodman Dec. 1976 70 p refs Sponsored by New York State Energy Res and Develop Authority
(PB-261579/7, NYSERDA-75/19) Avail: NTIS HC A04/MF A01 CSCL 13B

A phenomenological model based on field measurements of heated surface discharges into Lake Michigan and Ontario and an analytic dispersion-type far field model were investigated. A predictive model was developed for phenomenological relationships for surface areas within isotherms A series of exponential equations relating the surface area to the subsurface area was formulated which can predict subsurface temperatures within 1 C to at least ten feet below the surface. A far field hydrothermal analytic model considering longitudinal advection and dispersion in the transverse and vertical direction was also developed. GRA

RS77-2-441

N77-21523*# Ecosystems International, Inc., Gambrills, Md.
THE APPLICATION OF REMOTE SENSING TO THE DEVELOPMENT AND FORMULATION OF HYDROLOGIC PLANNING MODELS Final Report
Thomas R Fowler, Peter A. Castruccio, and Harry L. Loats, Jr. 28 Feb 1977 107 p refs
(Contract NAS8-30539)
(NASA-CR-150236, ECO-77; C-2-1) Avail NTIS HC A06/MF A01 CSCL 08H

The development of a remote sensing model and its efficiency in determining parameters of hydrologic models are reviewed. Procedures for extracting hydrologic data from LANDSAT imagery, and the visual analysis of composite imagery are presented. A hydrologic planning model is developed and applied to determine seasonal variations in watershed conditions The transfer of this technology to a user community and contract arrangements are discussed. A.R.H.

RS77-2-442

N77-19561*# Virginia Univ., Charlottesville. Dept. of Environmental Sciences
LANDSAT APPLICATION OF REMOTE SENSING TO SHORELINE-FORM ANALYSIS Quarterly Report, 1 Jan. - 1 Mar. 1977
Robert Dolan, Bruce Hayden, and Jeffrey Heywood, Principal Investigators 16 Mar 1977 12 p refs ERTS
(Contract NAS5-20999)
(E77-10112, NASA-CR-149561) Avail: NTIS HC A02/MF A01 CSCL 08C

The author has identified the following significant results. Correlations for 55 segments were quite low, showing few values greater than 6. Most of the correlations substantially increased when they were run for the breakdown of Assateague into eight coastal segments Some of these correlations reflect strong and important relationships The correlations between coastal orientation and the standard deviation of rate of shoreline erosion is 93 at the 01 level of significance. Other significant relationships were orientation and swash slope (.84); standard deviation of erosion and subaerial beach slope a(-.79), foredune height and subaerial beach width (- 89); foredune height and mean plus standard deviation of erosion (- 81); and rate of erosion over time and subaerial beach width (72). Low correlation was found between sand grain size and erosion and between sand grain size and orientation.

RS77-2-443

N77-22584*# National Aeronautics and Space Administration, Goddard Space Flight Center, Greenbelt Md
GEOLOGICAL APPLICATIONS OF NIMBUS RADIATION DATA IN THE MIDDLE EAST
Lewis J Allison Washington Apr 1977 81 p refs
(NASA-TN-D-8469; G7702-F6) Avail: NTIS HC A05/MF A01 CSCL 08G

Large plateaus of Eocene limestone and exposed limestone escarpments, in Egypt and Saudi Arabia, respectively, were indicated by cool brightness temperatures recorded by the Nimbus-5 electrically scanning microwave radiometer (ESMR), over a 2-year period Nubian sandstone, desert eolian sand, and igneous-metamorphic rock of the Pliocene, Miocene, Oligocene, and Cretaceous periods were differentiated from these limestone areas by warm T suo B values. These brightness temperature differences are a result of seasonal in-situ ground temperatures and differential emissivity of limestone and sand, sandstone and granite, whose dielectric constants are 6 to 8 9 and 2.9 and 4 2 to 5.3, respectively, at 19.35 GHz. Author

RS77-2-444

N77-21541# National Oceanic and Atmospheric Administration, Ann Arbor, Mich. Great Lakes Environmental Research Lab
AN ANALYSIS OF GREAT LAKES ICE COVER FROM SATELLITE IMAGERY
Brenda Blanton Hagman Apr. 1976 17 p refs
(PB-261835/3; NOAA-TM-ERL-GLERL-9, NOAA-76101302)
Avail: NTIS HC A02/MF A01 CSCL 04B

Remotely sensed satellite data present a synoptic view of the distribution and extent of the Great Lakes ice cover. The major reason for extracting ice cover information from satellite imagery is the desire to extend the navigation season on the Great Lakes. One method of obtaining this type of information is to measure satellite transparency density and then correlate calculated surface reflectance with ice cover concentration But the use of transparencies presents several difficulties, such as the problem of variable film densities Because of the variability inherent in satellite transparencies and inaccurate ground verification data, it is desirable to find a better method of extracting ice cover information. GRA

RS77-2-445

A77-27851 * # Quantitative mapping of chlorophyll a distributions in coastal zones by remote sensing. R. W. Johnson (NASA, Langley Research Center, Marine Environments Branch, Hampton, Va.). In: American Society of Photogrammetry, Annual Meeting, 43rd, Washington, D.C., February 27-March 5, 1977, Proceedings (A77-27826 11-43) Falls Church, Va., American Society of Photogrammetry, 1977, p. 485-502. 11 refs. (ASP 77-160)

Results of experiments conducted in the James River, Virginia and the New York Bight indicate that concurrently collected sea-truth measurements may be used to calibrate remotely sensed multispectral scanner data collected over each of these environmentally different scenes. Statistical stepwise regression analysis was used in both experiments to incorporate significant bands of MSS data into regression equations that quantitatively relate remotely sensed data to water quality parameters, such as chlorophyll a and suspended sediment. These regression equations are used to map synoptic distributions of chlorophyll a in the remotely sensed scenes. B.J.

RS77-2-446

A77-31562 The use of remote sensing data in cartography. H Chismon (Hunting Surveys and Consultants, Ltd., Boreham Wood, England) In: Environmental remote sensing 2: Practices and problems. (A77-31556 13-43) London, Edward Arnold (Publishers), Ltd., 1977, p 82-100. 7 refs.

Aspects of cartography and remote sensing are examined and the sources of remote sensing data for use in cartography are considered, taking into account the cartographer's requirements for remote sensing data, questions of aerial photography, side-looking airborne radar, high-altitude aerial photography, Gemini and Apollo photography, Landsat imagery, and investigations conducted with the aid of Skylab Attention is given to standards of accuracy, questions of scale, and repetitive imagery. G.R.

RS77-2-447

A77-29495 Identifying flood water movement. D. T Currey (State Rivers and Water Supply Commission, Victoria, Australia) *Remote Sensing of Environment*, vol. 6, no. 1, 1977, p. 51-61.

Aerial photography and satellite imagery were used to trace the flood water flow paths back to their point of entry into the area of Corop Lakes, Australia, which was flooded at least three times during 1973. Color photographs and satellite color enhanced images recorded the waters containing different colored sediments with a view toward tracing the origin of the water and water movement through the lake basin The contribution of channel water to flooded areas is found to be minimal. Landsat imagery provides an obvious visible record of the course of flood waters as a valuable tool in legal proceedings. S.D.

RS77-2-448

A77-30901 * A simple thermal model of the earth's surface for geologic mapping by remote sensing. A B Kahle (California Institute of Technology, Jet Propulsion Laboratory, Pasadena, Calif.) *Journal of Geophysical Research*, vol. 82, Apr 10, 1977, p. 1673-1680. 31 refs. Contract No. NAS7-100.

Thermal inertia of the earth's surface can be used in geologic mapping as a complement to surface reflectance data as provided by Landsat Thermal inertia cannot be determined directly but must be inferred from radiation temperature measurements (by thermal IR sensors) made at various times in the diurnal cycle, combined with a model of the surface heating processes. A model is developed which differs from those created previously for this purpose, because it includes sensible and latent heating. Tests of this model using field data indicate that it accurately determines the surface heating. When the model is used with field measurements of metecrological variables and is combined with remotely sensed temperature data, a thermal inertia image can be produced. (Author)

RS77-2-449

A77-29447 Low sun-angle photography. P. M. Walker and D. T. Trexler (Nevada Bureau of Mines and Geology, Reno, Nev.). *Photogrammetric Engineering and Remote Sensing*, vol 43, Apr. 1977, p. 493-505 14 refs

The use of low sun-angle photography for the enhancement of topographic features has been known for many years. The analyses of low sun-angle photography in separate test sites in a midlatitude region are used to describe interpretation technique and to compare the effectiveness different scales of low sun-angle photography. The critical question of when to fly a low sun-angle photographic mission based on the terrain, trends of topographic features, and the effects of sun azimuth and altitude (angle) are considered. It appears that strict adherence to the extended formula need not be applied as shown by enhancement of subtle topographic features (Author)

RS77-2-450

A77-27841 # Application of remote sensing for evaluating ground stability in mining operations. R. K. Rinkenberger (Mining Enforcement and Safety Administration, Denver, Colo.). In American Society of Photogrammetry, Annual Meeting, 43rd, Washington, D.C., February 27-March 5, 1977, Proceedings. (A77-27826 11-43) Falls Church, Va., American Society of Photogrammetry, 1977, p. 335-346 12 refs. (ASP 77-139)

The objectives of the Mining Enforcement and Safety Administration (MESA) as related to identification of hazardous ground areas by remote sensing techniques in advance of mining are discussed. Observations made on features associated with ground instability in previous related work are reviewed. Particular attention is given to imagery used for evaluations, analysis of imagery, and some observations made through image analysis for general and specific mines The techniques being developed by MESA are so directed that they can be readily applied in the analysis of many mining areas, using remote sensing techniques to recognize ground discontinuities prior to the mining activity and to monitor them during the mining activity. S.D.

RS77-2-451

A77-31569 An assessment of ERTS-1 imagery as a base-map for natural-resource surveys in developing countries. M A. Keech (National College of Agricultural Engineering, Silsoe, Bedford, England). In: Environmental remote sensing 2. Practices and problems. (A77-31556 13-43) London, Edward Arnold (Publishers), Ltd., 1977, p. 246-258. 9 refs.

The requirements of field surveyors and the place of Landsat data in development planning are outlined. Examples are then given of studies in Rhodesia and Sierra Leone using Landsat data from the MSS sensor. The objective has been to see what value Landsat imagery has for the field worker engaged in resource identification without the aid of extensive technological assistance. The scalar accuracy and locational value of Landsat imagery are assessed. Subsequently the identification of geological, mining, geomorphological, soils, vegetation and land-use features are commented upon. It is concluded that Landsat imagery is a valuable complementary source of information to the resource surveyor, particularly when techniques of color-enhancement are employed. (Author)

RS77-2-452

A77-27835 # Satellite remote sensing of snowcover in the Adirondack Mountains. D. E. Meisner, T. M Lillesand, and A R Eschner (New York, State University, Syracuse, N Y.). In: American Society of Photogrammetry, Annual Meeting, 43rd, Washington, D C., February 27-March 5, 1977, Proceedings (A77-27826 11-43) Falls Church, Va., American Society of Photogrammetry, 1977, p. 159-180. 16 refs. Grant No. NOAA-04-5-158 43. (ASP 77-124)

Because of its highly temporal nature, snow cover is particularly amenable to satellite surveillance In an effort to assess this potential, digital data from NOAA-4 satellite imagery were analyzed over 20 snow survey sites across the Adirondack Mountains. Low correlations were found between intensity, measurements of snow depth, and descriptions of site characteristics. This appears to be caused by poor signal to noise ratios due to the low sensor gain setting. Following the application of a simple averaging operation to smooth the data, a snow/no snow threshold was obtained for two late spring images This permitted the generation of digital snow maps. (Author)

RS77-2-453

A77-27842 # Remote sensing in engineering and environmental geology - Overview, summary and future. W. J Prosser, Jr. (Woodward-Clyde Consultants, St. Louis, Mo.). In: American Society of Photogrammetry, Annual Meeting, 43rd, Washington, D.C., February 27-March 5, 1977, Proceedings. (A77-27826 11-43) Falls Church, Va., American Society of Photogrammetry, 1977, p 347-353. (ASP 77-142)

Remote sensing tools and effective types of image processing in photogeology are reviewed. The type of the project determines the sensor to be used: analog or video, and digital. Problems encountered in evaluating and monitoring certain phenomena by remote sensing are identified and discussed in terms of geologic hazards, environmental impact monitoring, land use, and hydrology. Future orbital high-resolution perspective or in-context view will vastly improve the geologist's ability to observe and report. The overall result will be the improved self-monitoring of man's culture and activities. S D

RS77-2-454

HYDROGEOLOGICAL INVESTIGATIONS IN THE PAMPA OF ARGENTINA,
Bundesanstalt fuer Bodenforschung, Hanover (West Germany).
D. Bannert.
Type III Report, SR-No. 330, November 1974. 13 p, 7 fig, 2 ref.

Descriptors: *Remote sensing, *Hydrogeology, *Groundwater, *South America, Satellites(Artificial), Soil water, Land use, Foreign countries, Water quality, Salinity, Foreign research, Salts, Vegetation, Data processing, Analytical techniques, Hydrology.
Identifiers: *ERTS, *Argentina(Pampa).

Increasing demand for potable groundwater, in addition to stock watering, led to a larger-scale hydrogeological investigation of about 50,000 sq kms of the Argentine Pampa. The area is situated between the Sierra de Cordoba in the West and the Rio Parana in the East. A team of hydrogeologists and technicians from the Federal Geological Survey of Germany conducted hydrogeological investigations in cooperation with Argentinian Organizations during the years 1969-1973. The multispectral investigation of ERT-1 imagery had added detailed knowledge to the results of groundwater investigations achieved by conventional ground survey in the Argentine Pampa. A number of natural features and units of the earth's surface have been identified and delineated on the imagery. These features are closely related to conditions in the near surface groundwater bodies. Satellite imagery in combination with ground investigations allows the identification and delineation of difference in the conditions of the near surface groundwater (depth to groundwater, salinity) The degree of precision achieved is greater than that obtainable by conventional ground survey methods alone. (Sims-ISWS)
W77-05813

RS77-2-455

MORPHOMETRY AND FLOODS IN SMALL DRAINAGE BASINS SUBJECT TO DIVERSE HYDROGEOMORPHIC CONTROLS,
Texas Univ., Austin. Dept. of Geological Sciences
P. C. Patton, and V. R. Baker.
Water Resources Research, Vol. 12, No. 5, p 941-952, October 1976. 7 fig, 12 tab, 46 ref. NWS A-35460, NASA NAS 9-13312.

Descriptors: *Texas, *Watersheds(Basins), *Geomorphology, *Floods, Drainage area, Geologic control, Drainage density, Drainage patterns(Geologic), Drainage systems, Hydrology, Flood peak.
Identifiers: *Morphometry, Small drainage basin, Flood response.

Morphometric parameters, such as drainage density, stream magnitude, and relief ratio, are practical measures of flood potential in small (less than 100 sq mi) drainage basins. Stereoscopic interpretation of low-altitude aerial photographs provides the most accurate maps of basins for generating these parameters. Field surveys of a high-density limestone basin in central Texas showed that 1:24,000 scale topographic maps accurately portray the efficient stream channel system but fail to reveal numerous small gullies that may form portions of hillslope hydrologic systems. Flood potential in drainage basins can be defined by a regional index computed as the standard deviations of the logarithms of the annual maximum streamflows. High potential basins tend toward greater relief, greater drainage density, and, thus, greater ruggedness numbers than low-flash flood potential watersheds. For a given number of first-order channels (basin magnitude), flash flood regions have greater ruggedness numbers, indicating higher drainage densities combined with steep hillslopes and stream channel gradients. Transient controls on flood response, such as differences between local rainstorm intensities, appear to be the major influences on hydrographs in areas of moderate dissection and relief. Morphometric parameters for low-potential flash flood regions (Indiana and the Appalachian Plateau) are better estimators of frequent low-magnitude runoff events (mean annual flood), while the same parameters correlate better with the maximum flood of record in high-flood potential regions (central Texas, southern California, and north central Utah). (Lee-ISWS)
W77-04265

RS77-2-456

RIVER BASIN SNOW MAPPING AT THE NATIONAL ENVIRONMENTAL SATELLITE SERVICE,
National Environmental Satellite Service, Washington, D.C.
S. R. Schneider, D. R. Wiesnet, and M. C. McMillan
NOAA Technical Memorandum NESS 83, November 1976 23 p, 10 fig, 1 tab, 17 ref.

Descriptors: *River basins, *Snow surveys, *Mapping, *Satellites(Artificial), United States, Snow cover, Sensors, Watersheds(Basins), Photography, Data collections
Identifiers: Photo-interpretative techniques

The development of the operational river basin snow mapping program at NESS is described Satellite derived areal snow cover measurements are now being provided for over 20 river basins to Federal and State agencies around the United States. The snow maps are made, and results are disseminated within 24 hours of a satellite pass over a study basin. The satellite sensors used in snow mapping, the methodology, possible sources of error, and quality control techniques are also described. (NOAA)
W77-04199

RS77-2-457

GREAT LAKES ALL-WEATHER ICE INFORMATION SYSTEM,
National Aeronautics and Space Administration, Cleveland, Ohio. Lewis Research Center.
R. J. Schertler, R. A. Mueller, R. J. Jirberg, D. W. Cooper, and J E. Heighway.
Available from the National Technical Information Service, Springfield, VA 22161 as N75-33481, Price codes: A03 in paper copy, A01 in microfiche. Technical Memorandum X-71815, 1975. 29 p, 15 fig, 1 tab, 10 ref.

Descriptors: *Lake ice, *Great Lakes, *Remote sensing, *Warning systems, Aircraft, Radar, Instrumentation. Data transmission, Ice cover, Ice, Satellites(Artificial), Navigation, Ships, Winter, Surveys.
Identifiers: *Side looking airborne radar, Ice thickness.

An all-weather ice information system developed by the NASA Lewis Research Center was described. This system utilizes and X-band Side-Looking-Airborne-Radar (SLAR)for determing type, location, and aerial distributio . of the ice cover in the Great Lakes and an airborne, S-band, short radar for obtaining ice thickness. The SLAR system is currently mounted aboard a Coast Guard C-130B aircraft Digitized SLAR data are relayed in real time via the NGAS-GOES-1 satellite in geosynchronous orbit to the Coast Guard Ice Center in Cleveland, Ohio SLAR images, along with handdrawn interpretative ice charts for various winter shipping areas in the Great Lakes, are broadcast to facsimile recorders aboard Great Lakes vessels via the MARAD marine VHF-FM radio network to assist such vessels in navigating both through and around the ice. The operational aspects of this Ice Information System are being demonstrated by NASA, Coast Guard, and NOAA/National Weather Service. Result from the 1974-75 winter season demonstrated the ability of this system to provide all-weather ice information to shippers in a timely manner. (Sims-ISWS)
W77-06528

RS77-2-458

CLIMATOLOGICAL AND PHOTOGRAMMETRIC SPECULATIONS ON MASS-BALANCE CHANGES OF MCCALL GLACIER, BROOKS RANGE, ALASKA.
New Brunswick Univ., Fredericton. Dept. of Surveying Engineering
E. Dorrer, and G. Wendler.
Journal of Glaciology, Vol. 17, No 77, p 479-490, 1976 8 fig, 2 tab, 40 ref. NSF GA-37306, DES 75-06184

Descriptors: *Glaciers, *Ice, *Alaska, *Surveys, Analytical techniques, *Climatology, Data processing, Evaluation, *Photogrammetry, Analysis, Measurement. On-site investigations, Movement, Aerial photography, Terrain analysis.
Identifiers: *McCall Glacier(Alaska), *Mass balance changes.

The mean mass balance of the McCall Glacier, Brooks Range, Alaska, was estimated for the period 1958-1971. The three methods used, photogrammetry, mean height of the equilibrium line, and correlation with the height of the synoptic 500 mbar pressure level, gave negative values, but the amount depended on the method used. This trend of glacier recession is in agreement with most observations of glaciers in the Brooks Range as well as with the majority of the glaciers in the Northern Hemisphere. (Humphreys-ISWS)
W77-05426

RS77-2-459

INLAND LAKES WATER QUALITY AND WATERSHED PLANNING: REMOTE SENSING TECHNOLOGY APPLICATIONS,
Michigan Environmental Research Inst., Ann Arbor.
T. Borton, C. T. Wezernak, and R. K. Raney.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-245 620, Price codes: A09 in paper copy, A01 in microfiche. Prepared for the National Science Foundation, Report NSF-RA-E-75-036, June 1975 188 p, 48 fig, 24 tab, 21 ref, 6 append. GI-34809X1.

Descriptors: *Remote sensing, *Spectroscopy, *Infrared radiation, Photography, *Decision making, *Information exchange, Water resources, *Eutrophication, Lakes, *Michigan, Mapping, Measurement, Watersheds(Basins), Planning, *Watershed management, Water quality
Identifiers: Fenton Township(MI), Genesee County(MI), Opinion leaders, Inland lakes.

Three lakes in Fenton Townships, located in Genesee County (MI), were the subject of a case study to test the utility and impact of remote sensing information on local decision making. The study sought to analyze the present sources and flow of information within and between agencies and assess the influence of the introduction of remote sensing information Salience, credibility and continuity were elements of a program designed to develop a transfer and dissemination process for technologically derived information. Recommendations for a local information dissemination program include: (1) remote sensing should be oriented to solve current, visible problems; (2) a network of opinion leaders and organizations should be used for communicating remote sensing information: (3) currently operating agencies and interest groups should coordinate remote sensing information with local decision makers Remote sensing techniques tend to stimulate interest among local residents and provide continuous information, thus encoraging public comment. Some problems with the technique are an inability to maintain scale uniformity of mapping, dependence on good weather conditions, and limited availability of processing facilities. A remote sensing eutrophication index is proposed for lake classification and change detection. As the number and size of lakes to be monitored for environmental quality increase and as the shoreline and watershed are important factors, remote sensing more adequately provides a data base for water resource management and environment planning. (Gentry-NC)
W77-05297

RS77-2-460

NTIS/PS-77/0071/9GA PC N01/MF N01
National Technical Information Service, Springfield, Va.
Permafrost. Part 1. General Studies (Citations from the NTIS Data Base).
Rept. for 1964-Jan 77,
Robena J. Brown. Feb 77, 136p*
Supersedes NTIS/PS-76/0069 and NTIS/PS-75/197. See also NTIS/PS-77/0073.

Descriptors: *Permafrost, *Bibliographies, Vegetation, Reviews, Hydrology, Frost heave, Remote sensing, Geological surveys, Soils, Ecology, Frozen soils, Pipelines, Tundra, Muskeg, Pollution, Drainage, Arctic regions, Abstracts.
The bibliography of Federally-funded research covers permafrost studies not related to structural engineering or construction. Vegetation, hydrology, frost heave, remote sensing, geological surveys, and erosion control measures are cited. (This updated bibliography contains 131 abstracts, 18 of which are new entries to the previous edition.)

RS77-2-461

A STUDY OF GLACIER-DAMMED LAKES OVER 75 YEARS, BRIMKJELEN, SOUTHERN NORWAY,
Portsmouth Polytechnic (England). Dept. of Geography.
D N Mottershead, and R. L. Collin.
Journal of Glaciology, Vol. 17, No. 77, p 491-505, 1976. 8 fig, 4 tab, 15 ref

Descriptors: *Glaciers, *Lake morphology, *Lakes, *Drainage, Ice, Shape, Dams, Foreign countries, On-site investigations, Surveys, Evaluation, Analysis, Terrain analysis, Floods, Fluctuations, Aerial photography.
Identifiers: *Norway, Glacier dammed lakes.

Evidence was brought together concerning the deglaciation of a small valley and the subsequent development of it of periodic glacier-dammed lakes The respective volumes and drainage dates of the lakes were evaluated, and an attempt was made to relate these to the down-wastage of the impounding glacier. The general pattern of lakes throughout the years, as far as it is possible to deduce the pattern from available evidence, is as follows Conditions conducive to the collection of water first occurred in 1896, and during the subsequent decade at least, this water was ponded up by Tunsbergdalsbreen subglacially beneath the Brimkjel glacier. As the glacier receded, an open lake formed. It appears that it was during this phase that the greatest lakes formed, as evidenced by the data for 1926 and 1937. Subsequently, as the ice dam of Tunsbergdalsbreen has receded and lowered, the lakes have been of much lower magnitude; although, in all cases except the brief August 1973 lake, they were larger than Rekstad's estimate for 1900 At least two of the open lakes extended up on to the surface of the impounding Tunsbergdalsbre. Calculation of the depth of water impounded in the lakes of 1937, 1957, 1962, 1966, and 1973 (spring) showed that the head of water has been remarkably constant over the years This suggests that once a given pressure is attained at the foot, then a breach in the ice dam is formed and the lake begins to drain There is evidence for flotation of the Tunsbergdalsbre ice to allow subglacial seepage, and (in other years) there is also evidence of tunnel formation. The actual mechanism of breaching may differ, therefore, from year to year. (Humphreys-ISWS)
W77-05427

RS77-2-462

ICINGS ALONG THE TRANS-ALASKA PIPELINE ROUTE,
Geological Survey, Anchorage, Alaska. Water Resources Div.
C. E. Sloan, C. Zenone, and L. R. Mayo.
Available from the Branch of Distribution, USGS, 1200 S. Eads St., Arlington, VA. 22202, price $1.05. Proffessional Paper 979, 1976. 31 p, 32 fig, 9 ref.
Descriptors: *Ice, *Pipelines, *Alaska, *Oil industry, *Flood plains, Seepage, Groundwater, Melt water, Erosion, Aerial photography, Mapping, Evaluation.
Identifiers: *Trans-Alaska Pipeline, *Pipeline icing effects.

The location and extent of icings observed during six winters, 1969 to 1974, along the trans-Alaska pipeline route are shown on a series of maps and photographs. Large flood-plain icings occur in the braided river channels of the Sagavanirktok, Atigun, Dietrich, and Delta Rivers Numerous lesser stream and hillside icings also occur along the pipeline route. Construction of the pipeline, roads, pumping stations, and training structures will displace some existing icings and will create new icings. Icings may cause problems such as flooding and erosion when they form on or near the pipeline, roads, and other pipeline facilities. (Woodard-USGS)
W77-05741

RS77-2-463

USE OF SIDE-LOOKING AIRBORNE RADAR TO DETERMINE LAKE DEPTH ON THE ALASKAN NORTH SLOPE,
Cold Regions Research and Engineering Lab., Hanover, N. H. Experimental Engineering Div.
P. V. Sellmann, W. F. Weeks, and W. J. Campbell.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-011 249, Price codes: A02 in paper copy, A01 in microfiche. Special Report 230, May 1975. 10 p, 3 fig, 7 ref.

Descriptors: *Remote sensing, *Radar, *Lakes, *Depth, *Alaska, Cold regions, Ice, Ice-water interfaces, Lake ice, Aircraft, Satellite(Artificial), Instrumentation, Coasts, Thawing.
Identifiers: *Side-looking radar, *North Slope(Alaska), Frozen lakes, Radar backscatter, ERTS, Lake depth.

Side-looking airborne radar (SLAR) imagery obtained in April-May 1974 from the North Slope of Alaska beteween Barrow and Harrison Bay indicated that tundra lakes can be separated into two classes based on the strength of the radar returns. Correlations among the areal patterns of the returns, limited ground observations on lake depths, and information obtained from ERTS imagery strongly suggest that freshwater lakes giving weak returns are frozen completely to the bottom, while lakes giving strong returns are not. Brackish lakes give weak returns even when they are not completely frozen. This is presumably the result of the brine present in the lower portion of the ice cover which limits the penetration of the X-band radiation into the ice. Although the physical cause of the differences in radar backscatter has not been identified, several possibilities were discussed. The ability to rapidly and easily separate the tundra lakes into these two classes via SLAR should be useful in a wide variety of different problems. (Sims-ISWS)
W77-06526

RS77-2-464

BIOMASS AND REMOTE SENSING OF AQUATIC MACROPHYTES IN THE PAMLICO RIVER ESTUARY,
East Carolina Univ., Greenville. Dept. of Biology.
T. M. Vicars, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-263 705, Price codes: A06 in paper copy, A01 in microfiche. M. A. Thesis, June 1976. 108 p, 22 tab, 13 fig, 41 ref. OWRT A-077-NC(9). 14-31-0001-5053.

Descriptors: *Aquatic plants, *Aerial photography, *Remote sensing, *Submerged aquatic plants, Turbidity, Wind, Currents, Water level fluctuations, Field investigations, *North Carolina, Estuaries, Estuarine environment, *Biomass, Ecosystems, Water pollution effects.
Identifiers: *Pamlico River estuary(NC), *Macrophytes(Aquatic).

The purpose was to determine what ecosystem functions are served by submersed aquatic plants (macrophytes) in the Pamlico River estuary of North Carolina. Aerial photography was used successfully to map submersed plant beds. Coverage of macrophytes varied considerably during the growing season but maximum coverage was relatively stable between 1974 and 1975, especially in upstream areas. Field studies in 1974 showed that the biomass of macrophytes ranged from 2.3 - 50 g/m2 organic dry weight (ODW), and total biomass in August 1975 was 22 - 100 g/m2 ODW, with highest values upstream and in deep water beds. Through the combined use of aerial photography and field studies total biomass estimates were made. These estimates were 104 MT (metric tons) ODW in August 1974 and 198 Mt ODW in August 1975. High biomass was related to physiography of the littoral, stable salinity and reduced wind and wave stress. Studies of plant bed distribution patterns revealed that turbidity, fluctuating water levels and currents were important factors affecting colonization. (Stewart-No Carolina State)
W77-04325

RS77-2-465

AN OPERATIONAL ALL-WEATHER GREAT LAKES ICE INFORMATION SYSTEM.
National Aeronautics and Space Administration, Cleveland, Ohio. Lewis Research Center.
R. T. Gedney, R. J. Schertler, R. A. Mueller, R. J. Jirberg, and H. Mark.
Available from the National Technical Information Service, Springfield, VA 22161 as N76-10605, Price codes: A03 in paper copy, A01 in microfiche.
Technical Memorandum X-71812, 1975. 11 p, 6 fig, 6 ref.

Descriptors: *Lake ice, *Great Lakes, *Remote sensing, *Warning systems, Aircraft, Radar, Instrumentation, Data transmission, Ice cover, Ice, Satellites(Artificial), Navigation, Ships, Winter, Surveys.
Identifiers: *Side looking airborne radar, Ice thickness.

An all-weather ice information system was developed by the NASA Lewis Research Center The system utilizes and X-band Side-Looking-Airborne-Radar (SLAR) for determining type, location, and areal distribution of the ice cover in the Great Lakes and an airborne, S-band, down-looking short pulse radar for obtaining ice thickness. The SLAR system is currently mounted aboard a Coast Guard C-130B aircraft Digitized SLAR data is relayed in real time via the NOAA-GOES satellite in geosynchronous orbit to the Coast Guard Ice Center in Cleveland, Ohio. SLAR images, along with hand-drawn interpretative ice charts from various winter shipping areas in the Great Lakes, are broadcast to facsimile recorders aboard Great Lakes vessels via the MARAD marine VHF-FM radio network to assist such vessels in navigating both through and around thelce. The results from the 1974-1975 season demonstrated that the system is capable of providing near real time all-weather ice information which vessels can use to reduce costly delys and hazards associated with winter navigation. (Sims-ISWS)
W77-06527

RS77-2-466

SNOW AND ICE SURFACES MEASURED BY THE NIMBUS 5 MICROWAVE SPECTROMETER,
Massachusetts Inst. of Tech., Cambridge. Research Lab. of Electronics.
K. F. Kunzi, A. D. Fisher, D. H. Staelin, and J. W. Waters.
Journal of Geophysical Research, Vol. 81, No. 27, p 4965-4980, September 20, 1976. 10 fig, 3 tab, 20 ref. NASA NAS7-100, NAS5-21980.

Descriptors: *Remote sensing, *Snow cover, *Ice cover, *Polar regions, *Arctic, *Antarctica, Satellites(Artificial), Cold regions, Ice, Sea ice, Snow, Electrical properties, Microwaves, Model studies, Mathematical models, Mapping, Surveys.
Identifiers: *Microwave spectrometers, *Greenland.

The 22.2- and 31.4-GHz channels of the microwave spectrometer on board the Nimbus 5 earth observatory satellite provide information about the global distribution and character of various types of snow and ice. Observations for the winter and summer of 1973 for both polar regions were presented in this paper. Well-defined spectral signatures were found for snow, sea ice, and land ice in Greenland and Antarctica A simple model with subsurface temperature gradients in a lossy, homogeneous dielectric does not account for the observations; internal scattering effects appear to play a dominant role. (Sims-ISWS)
W77-04270

RS77-2-467

AD-A033 330/2GA PC A02/MF A01
Army Engineer Topographic Labs Fort Belvoir Va
Joint Analysis in Glen Canyon National Recreation Area.
Research note,
Judy Ehlen, Oct 76, 23p Rept no. ETL-0073

Descriptors: *Aerial photography, *Utah, Geology, Joints, Faults(Geology), Rock mechanics, Drainage, Petrology, Structural geology, Stereophotography, Photogrammetry.
Identifiers: San Juan River, *Glen Canyon National Recreation Area, Remote sensing.

This report attempts to determine what information can be derived from joint patterns developed from air photo analysis of flat-lying sedimentary rocks. The area selected is in the Glen Canyon National Recreation Area along the San Juan River in southeastern Utah. Two types of analysis were undertaken on joint patterns; (1) an analysis of joint orientation depicted on rosette diagrams to determine stress patterns within the various rock units and to determine whether or not they change through time, and (2) an analysis of joint density in which joints were analyzed with a grid and then contoured in order to determine whether or not individual rock units have characteristic joint densities. The results indicated that rock units do have characteristic joint densities and orientations and that they can be differentiated on these bases.

RS77-2-468

AD-A035 260/7GA PC A04/MF A01
Pennsylvania State Univ University Park Office for Remote Sensing of Earth Resources
Floodplain Delineation Using Landsat-1 Data. Technical rept.,
D. L. Henninger, M. L. Stauffer, G. W. Petersen, and G. J. McMurtry, Dec 75, 64p Rept no. ORSER-SSEL-TR-20-75
Contract DACW73-74-C-0036
See also ORSER-SSEL-TR-1-75, AD-A035 279.

Descriptors: *Flood plains, *Rivers, Scientific satellites, Remote detectors, Agriculture, Forests, Computer applications, Multispectral, Scanning, Pennsylvania.
Identifiers: Landsat 1 satellite, Susquehanna River, Remote sensing, Multiband spectral reconnaissance.

A continuous floodplain boundary was drawn on the basis of interpretation of the computer classification of selected Landsat-1 digital MSS data. Within the agricultural and developed portion of the study area, this floodplain correlated quite favorably with the USACE 100-year return period floodplain, which is based on the conventional engineering parameters of streamflow and basin configuration. Within the forested portion of the study area, correlation of the floodplain limits was not as satisfactory. Since the floodplain limit established by remote sensing in the forested area consistently overestimated the USACE 100-year return period floodplain, there is an indication that it could represent the limit of a flood with a return period of more than 100 years. The success realized in this investigation indicates that computer analysis of remotely sensed digital MSS data has the potential of playing a prominent role in the identification and mapping of floodplains. This method could be used to update and verify existing maps or to produce maps in watersheds where none exist and the need for floodplain information to regulate land use is great. The use of remotely sensed digital MSS data would most likely have its greatest application as a tool to complement more conventional floodplain mapping techniques.

RS77-2-469

AD-A035 481/1GA PC A04/MF A01
Army Engineer Topographic Labs Fort Belvoir Va
Photo Analysis of a Desert Area.
Technical rept.,
Judy Ehlen. Apr 76, 72p Rept no. ETL

Descriptors: *Deserts, *Photographic analysis, Aerial photography, Photointerpretation, Arizona, Geology, Climate, Landforms, Drainage, Vegetation, Erosion, Environments, Engineering, Topography, Geomorphology, Arid land.
Identifiers: Physiography.

Information derived from 1:9,600 scale stereoscopic aerial photography of a desert area near Yuma, Arizona, is presented. Physiography, geology, climate, landform, drainage, erosional aspects, vegetation, and cultural features are considered in the context of local and regional environmental, engineering, and military considerations. The second part of this report presents a field verification of the general geology, geomorphology, and vegetation in the study area with a list of selected references. (Author)

RS77-2-470

AD-A036 246/7GA PC A05/MF A01
Aberdeen Univ (Scotland) Dept of Geography
Glacial Erosion by the Laurentide Ice Sheet and Its Relationship to Ice, Topographic and Bedrock Conditions.
Final technical rept. Sep 75-Sep 76,
D. E. Sugden. Sep 76, 98p
Contract DA-ERO-76-G-001

Descriptors: *Glacial geology, *Geomorphology, *Erosion, North America, Ice, Terrain, Canada, Arctic regions, Thermal properties, Undernce, Mathematical prediction, Terrain models, Glaciers, Earth models, Aerial photographs, Maps, Geographical distribution, Land ice, Area coverage.
Identifiers: Ice sheets, Laurentide ice sheet, Topography, Pleistocene, Epoch, Remote sensing, Multiband spectral reconnaissance, LANDSAT satellites, Great Britain.

The aim of this project was to map and analyse landscapes of glacial erosion associated with the Laurentide ice sheet and to relate them to the main variables affecting glacial erosion: basal thermal regime of the ice sheet, the topography and geology of the bed. A reconstruction of the basal thermal regime of the Laurentide ice sheet was carried out using and adapting a model developed for existing ice sheets. Using Landsat imagery, maps of landscapes of glacial erosion were compiled for the whole of the Laurentide ice sheet area with more detailed maps for the eastern Canadian Arctic. A conceptual model is developed. (Author)

RS77-2-471

AD-A035 279/9GA PC A06/MF A01
Pennsylvania State Univ University Park Office for Remote Sensing of Earth Resources
Floodplain Delineation Using Aircraft Data.
Technical rept.,
D. L. Henninger, M. L. Stauffer, H. A. Weeden, and G. W. Petersen. May 75, 117p Rept no. ORSER-SSEL-TR-1-75
Contract DACW73-74-C-0036

Descriptors: *Flood plains, Aerial photography, Pennsylvania, Rivers, Computer applications, Infrared photography, Soils, Vegetation, Moisture, Surface truth, Photointerpretation, Multispectral, Scanning.
Identifiers: Susquehanna River, Multiband spectral reconnaissance, *Remote sensing.

A continuous floodplain line could not be delineated on the basis of computer analysis of the aircraft collected MSS data. However, the computer analysis did indicate a break between floodplain and non-floodplain within small areas which correlated with one or more floodplain limits established by other methods (i.e., interpretation by the U.S. Army Corps of Engineers, photo interpretation of color infrared aerial photographs, and soils maps generated by the USDA Soil Conservation Service). Although the results of this investigation were somewhat less positive than desired, they do not necessarily indicate that computer analysis of aircraft collected multispectral scanner data could not be useful in the delineation of floodplains. The test area involved in this study has a very complex topography and many land cover types. The slopes range from nearly level to over 35 percent, with greatly varying aspects. The land cover types include urban and residential areas, small agricultural fields, and complex forest stands. Results in a less complex area would most likely be considerably more successful.

RS77-2-472

AD-A035 761/6GA PC A02/MF A01
Cold Regions Research and Engineering Lab Hanover N H
Selected Examples of Radiohm Resistivity Surveys for Geotechnical Exploration.
Special rept.,
P. Hoekstra, P. V. Sellmann, and A. J. Delaney. Jan 77, 21p Rept no. CRREL-SR-77-1

Descriptors: *Geophysical prospecting, Electrical resistivity, Ground waves(Electromagnetic), Radio waves, Aerial reconnaissance, Ground level, Geological survey, Subsurface, Permafrost, Gravel, Very low frequency.
Identifiers: Radiohm method.

Measurements of ground resistivity using radio wave techniques have been made in support of several geotechnical projects. Examples of surveys conducted for locating and evaluating gravel deposits, for delineating permafrost, and for extrapolating subsurface information between drill holes are used to illustrate some advantages of ground and airborne surveys using this method. (Author)

RS77-2-473

PB-264 742/8GA PC A05/MF A01
East Carolina Univ., Greenville, N.C. Dept. of Biology.
The Use of Remote Sensing in a Study of Submerged Aquatic Macrophytes of the Pamlico River Estuary, N.C.
Master's thesis,
Joseph E. Harwood. Aug 75, 87p W77-05487,, OWRT-A-077-NC(5)
Contract DI-14-31-0001-5033

Descriptors: *Aquatic plants, *Biomass, *Remote sensing, *Pamlico River Estuary, Aerial photography, Infrared mapping, Vegetation, Spectra, Ground photographs, Color photography, Density(Mass/volume), Turbidity, Depth, Colors, Theses, Pollution, Identifying, North Carolina.
Identifiers: *Vallisneria americana, *Potamogeton perfoliatus, *Macrophytes.

The feasibility of using aerial photography from fixed winged aircraft to differentiate species of aquatic macrophytes and estimate their biomass was investigated. A Spectral Data Model 10 multispectral camera with Kodak Infrared Aerographic 2424 film and a hand-held 35 mm canera with panchromatic, color, and color-IR film were used during four flights along the shallow margins of the Pamlico River estuary during the summer and fall, 1973. Remote sensing flights were made in conjunction with the acquisition of ground truth data from 27 transects randomly located in the upper one-half of the river. Ground truth consisted of species density, water depth, perpendicular distance from shore, and turbidity. Two species, Vallisneria americana and Potamogeton perfoliatus, were differentiated using color patterns due in part to differences in plant density and growth form.

RS77-2-474

PB-264 229/6GA PC A02/MF A01
Colorado State Univ., Fort Collins. Environmental Resources Center.
Determination of Snow Depth and Water Equivalent by Remote Sensing.
Completion rept.,
Harold W. Steinhoff, and Albert H. Barnes. Jun 76, 21p Completion-76, W77-05104,, OWRT-A-019-COLO(2)
Contracts DI-14-31-0001-3806, DI-14-31-0001-4006

Descriptors: *Snowmelt, *Moisture content, *Remote sensing, Aerial photography, Snow cover, Regression analysis, Missionary Ridge, Colorado.
Identifiers: *Snow depth, Durango(Colorado).

This exploratory study was designed to investigate the possibilities of using inexpensive aerial remote sensing methods to measure the snowpack and its water content. The relation of snow depth and elevation on the same aspect (north or south) was definitely linear but the slopes of the regression lines varied between months and between years. By measuring the melt date and environmental variables, one could predict snow depth and water equivalent, once these equations were established for a given area. Melt date can be measured by observation from two aerial flights at three-day intervals in early spring. It is concluded that determination of snow depth and water equivalent by remote sensing from aircraft is possible.

RS77-2-475

E77-10112 PC A02/MF A01
Virginia Univ., Charlottesville. Dept. of Environmental Sciences.
LANDSAT Application of Remote Sensing to Shoreline-Form Analysis.
Quarterly rept. 1 Jan-1 Mar 77.
Robert Dolan, Bruce Hayden, and Jeffrey Heywood 16 Mar 77, 13p NASA-CR-149561
Contract NAS5-20999

Descriptors: *Shorelines, Beaches, Assateague Island(MD-VA), Coasts, Erosion, Sands, Dunes, Earth resources program, Standard deviation, Long term effects.
Identifiers: *Coasts.

The author has identified the following significant results. Correlations for 55 segments were quite low, showing few values greater than .6. Most of the correlations substantially increased when they were run for the breakdown of Assateague into eight coastal segments. Some of these correlations reflect strong and important relationships. The correlations between coastal orientation and the standard deviation of rate of shoreline erosion is .93 at the .01 level of significance. Other significant relationships were orientation and swash slope (.84); standard deviation of erosion and subaerial beach slope (-.79); foredune height and subaerial beach width (-.89); foredune height and mean plus standard deviation of erosion (-.81); and rate of erosion over time and subaerial beach width (.72). Low correlation was found between sand grain size and erosion and between sand grain size and orientation.

RS77-2-476

E77-10013 PC A03/MF A01
Virginia Univ., Charlottesville. Dept. of Environmental Sciences.
LANDSAT Application of Remote Sensing to Shoreline-Form Analysis.
Quarterly rept. 2 Jun-1 Sep 76,
Robert Dolan, Bruce Hayden, Jeffrey Heywood, Clark Hewitt, and Jeffrey Michel. 28 Sep 76, 33p NASA-CR-148983
Contract NAS5-20999
(PC A03/MF A01)
Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Ave., Sioux Falls, S D. 57198.

Descriptors: Shorelines, *Assateague Island(Md-Va), North Carolina, Capes(Landforms), Atlantic Ocean, Earth resources program, Sands, Tides.
Identifiers: *Coastal topographic features, Coasts.

The author has identified the following significant results LANDSAT imagery of the southern end of Assateague Island, Virginia, was enlarged to 1 80,000 and compared with high altitude (1:130,000) and low altitude (1:24,000) aerial photography in an attempt to quantify change in land area over a nine month period. Change in area and configuration was found with LANDSAT and low altitude photography. Change in configuration, but no change in area was found with high altitude photography. Due to tidal differences at time of image obtention and lack of baseline data, the accuracy of the LANDSAT measurements could not be determined. They were consistent with the measurements from the low altitude photography.

RS77-2-477

E77-10078 PC A03/MF A01
Alaska Univ., College. Geophysical Inst.
Tectonic Structure of Alaska as Evidenced by ERTS Imagery and Ongoing Seismicity.
Final rept. no. 4, Jan 74-Oct 75,
Larry D. Gedney. 15 Oct 76, 44p NASA-CR-149444
Contract NAS5-20803
Original contains color imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Ave., Sioux Falls, S.D. 57198.

Descriptors: *Tectonics, *Alaska, Seismology, Geological faults, Earthquakes, Rivers, Earth Resources program, Mapping, Structural properties(Geology), Cost effectiveness.

The author has identified the following significant results. At least three seismically active faults were identified which had not been previously mapped. One of these passes was near the proposed site of a hydroelectric project on the Susitna River. Evidence of the state's past deformational history was obtained, indicating that right lateral offset has occurred sequentially from the northern part of the state to the southern. An apparent fault passes near Fairbanks, and is presumably the source of much seismic activity in the area.

RS77-2-478

E77-10027 PC A06/MF A01
Helsinki Univ. (Finland). Dept. of Geology.
Use of Satellite Pictures for Determining Major Shield Fractures Relevant for Ore Prospecting, Northern Finland,
Heikki V. Touminen, and Jussi Aarnisalo. Sep 76, 101p NASA-CR-149130
Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Ave., Sioux Falls, S.D. 57198.

Descriptors: *Finland, *Earth crust, *Geological faults, Baltic shield(Europe), Bedrock, Earth resources program, Multispectral band scanners.
Identifiers: *Fracture zones, Fracturing, Rock mechanics.

The author has identified the following significant results. A combined analysis of LANDSAT 1 imagery, aeromagnetic and other maps, and aerial photos has revealed a dense network of bedrock fractures in northern Finland. They form several fracturing zones, which obviously represent surficial manifestations of major fractures The fractures follow, in general, the eight main trends of crustal shear characteristics of the Baltic Shield, but show distinct deviations from them in detail. The major fracture zones divide the bedrock into a mosaic of polygonal blocks, which in many cases coincide with the main rock units of the area and are characterized by different patterns of internal fracturing. Known mineralizations show a tendency to concentrate along the fracture zones. Optical filtering of original LANDSAT images might provide a rapid tool for the analysis of major structural trends in extensive areas such as shields or entire continents.

RS77-2-479

E77-10088 PC A02/MF A01
Pennsylvania State Univ., University Park Office for Remote Sensing of Earth Resources.
Reconnaissance Mapping from Aerial Photographs,
H. A. Weeden, and N B Bolling. Aug 75, 21p
ORSER-SSEL-TR-17-75, NASA-CR-149571
Contracts NAS5-23133, NAS9-13406

Descriptors: *Aerial reconnaissance, Mapping, Soils, Geology, Erosion, Drainage patterns, Vegetation, Pennsylvania.
Identifiers: Land use, Image processing.

The author has identified the following significant results. Engineering soil and geology maps were successfully made from Pennsylvania aerial photographs taken at scales from 1:4800 to 1:60,000. The procedure involved a detailed study of a stereoscopic model while evaluating landform, drainage, erosion, color or gray tones, tone and texture patterns, vegetation, and cultural or land use patterns.

RS77-2-480

E77-10052 PC A05/MF A01
Montana Univ., Missoula. Dept. of Geology.
Applicability of ERTS-1 to Montana Geology.
Final rept.,
R. M. Weidman, D. D. Alt, R. Berg, W. Johns, and R. Flood. 8 Dec 76, 92p NASA-CR-149259
Contract NAS5-21826
Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Ave., Sioux Falls, S.D. 57198.

Descriptors: *Montana, *Geology, Geological faults, Tectonics, Granite, Erosion, Conifers, Grasslands, Bentonite, Earth resources program, Seasons, Mapping, Photointerpretations.

The author has identified the following significant results. Late autumn imagery provides the advantages of topographic shadow enhancement and low cloud cover. Mapping of rock units was done locally with good results for alluvium, basin fill, volcanics, inclined Paleozoic and Mesozoic beds, and host strata of bentonite beds. Folds, intrusive domes, and even dip directions were mapped where differential erosion was significant. However, mapping was not possible for belt strata, was difficult for granite, and was hindered by conifers compared to grass cover. Expansion of local mapping required geologic control and encountered significant areas unmappable from ERTS imagery. Annotation of lineaments provided much new geologic data. By extrapolating test site comparisons, it is inferred that 27 percent of some 1200 lineaments mapped for western Montana represent unknown faults. The remainder appear to be localized mainly by undiscovered faults and sets of minor faults or joints.

RS77-2-481

E77-10046 PC A02/MF A01
Department of Industry, London (England).
The Use of ERTS/LANDSAT Imagery in Relation to Airborne Remote Sensing for Terrain Analysis in Western Queensland, Australia.
Quarterly rept.,
Monica Cole, and Stewart Owen-Jones. 15 Nov 76, 10p NASA-CR-149252

Descriptors: *Australia, *Terrain analysis, Spectral signatures, Bedrock, Rivers, Earth resource program, Zinc, Mines(Excavations), Copper.
Identifiers: *Remote sensing, *Mineral deposits.

The author has identified the following significant results. Distinctive spectral signatures were found associated with areas of near surface bedrock with covered ground east of Dugald River and along the Thorntonia River valley west of Lady Annie. Linears identified in the Dugald River area on LANDSAT 2 imagery taken in March and July 1975 over the Cloncurry-Dobbyn area, displayed preferred orientation. A linear group with NE-SW orientation was identified in the Lady Annie area. In this area, the copper mineralization in Mt. Kelly area occurs along a well marked linear with NNW/SSE direction apparent on images for March, September, and November 1975. Geobotanical anomalies provided surface expression of the copper deposits in Mt. Kelley.

RS77-2-482

E77-10056 PC A08/MF A01
MacKay School of Mines, Reno, Nev.
Geologic Investigations in the Basin and Range of Nevada Using Skylab/EREP Data.
Final rept.,
Jack G. Quade, and Dennis T. Trexler. Jun 75, 170p NASA-CR-144497
Contract NAS9-13274
Original contains color imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Ave., Sioux Falls, S.D. 57198.

Descriptors: Geology, *Nevada, *Geomorphology, Geological faults, Tectonics, Vegetation, Earthquakes, Land use, Drainage patterns, Skylab program, EREP, Mapping, Mines(Excavations).

The author has identified the following significant results. Working from the S190A photography at a scale of 1:702,000 and comparing the results with existing geologic maps has suggested that the larger scale structural features can be mapped and related to regional trends which provide an overall view not available at lower altitudes. All S190B in-house coverage was in stereo. The stereo capability was helpful in resolving problems relating to elevations and attitude of bedding, etc, but the greatest single contribution was the resolution capability. (Portions of this document are not fully legible.)

RS77-2-483

14863 **Witte, W. G.** Evaluation of the dual differential radiometer for remote sensing of sediment and chlorophyll in turbid waters: *in* Remote sensing of Earth resources; Volume IV (Shahrokhi, F., editor), p. 577-589, illus. (incl. tables, sketch map), Univ. Tenn. Space Inst., Tullahoma, Tenn., United States, 1975.

RS77-2-484

13993 **Torbert, G.** Cadastral boundaries on ERTS images: U. S. Geol. Surv., Prof. Pap., No. 929 *(ERTS-I, a new window on our planet)*, p. 44-47, illus. (incl. sketch maps), 1976.

RS77-2-485

14993 **Stoertz, G. E.; and Carter, W. D.** Hydrogeology of closed basins and deserts of South America: U. S. Geol. Surv., Prof. Pap., No. 929 *(ERTS-I, a new window on our planet)*, p. 76-80, illus. (incl. sketch maps), 1976.

RS77-2-486

19171 **Speight, J. G.** Landform pattern description from aerial photographs: Photogrammetria, Vol. 32, No. 5, p. 161-182, illus. (incl. tables), 1977.

RS77-2-487

18417 **Afonichev, N. A.; Borovikov, L. I.; Dolivo-Dobrovol'skiy, A. V.; *et al.*** Significance of the interpretation of satellite photographs: Geotectonics, Vol. 10, No. 1, p. 19-26, sketch maps, 1976. *Examples of structural interpretation are cited for the Karatau and Tarbagatay ranges, western and northeastern Balkhash region, Kazakhstan.*

RS77-2-488

15245 **Strong, A. E.** Algal blooms in Utah lake: U. S. Geol. Surv., Prof. Pap., No. 929 *(ERTS-I, a new window on our planet)*, p. 270-272, 1976.

RS77-2-489

14995 **Sydor, M.** Turbidity in Lake Superior: U. S. Geol. Surv., Prof. Pap., No. 929 *(ERTS-I, a new window on our planet)*, p. 153-156, illus. (incl. sketch maps), 1976.

RS77-2-490

14846 **Strong, A. E.; and Eadie, B. J.** Satellite observations of calcium carbonate precipitations in the Great Lakes [abstr.]: Eos (Am. Geophys. Union, Trans.), Vol. 57, No. 10 *(Second Midwest regional meeting of the AGU)*, p. 755, 1976.

RS77-2-491

15244 **Strong, A. E.** A Lake Michigan "whiting": U. S. Geol. Surv., Prof. Pap., No. 929 *(ERTS-I, a new window on our planet)*, p. 266-269, illus., 1976.

RS77-2-492

19373 Allan, R. J.; and Richardson, K. A. Uranium and potassium distribution by lake-sediment geochemistry and airborne gamma-ray spectrometry; a comparison of reconnaissance techniques: Can. Min. Metall. Bull., Vol. 67, No. 746, p. 109-120, illus. (incl. sketch maps), 1974.

RS77-2-493

18415 Abdel-Gawad, M.; and Tubbesing, L. ERTS study of ancient river gravels of Sierra Nevada: *in* Remote sensing of Earth resources; Volume III (Shahrokni, F., editor), p. 93-106, illus. (incl. sects, sketch maps), Univ. Tenn., Space Inst., Tullahoma, Tenn., United States, 1974.

RS77-2-494

15249 Sydor, M. Western Lake Superior ice: U. S. Geol. Surv., Prof. Pap., No. 929 *(ERTS-1, a new window on our planet)*, p. 169-172, illus., 1976.

RS77-2-495

18653 Stohr, C. J.; and West, T. R. Delineation of sinkholes using thermal infrared imagery: *in* Remote sensing of Earth resources; Volume III (Shahrokhi, F., editor), p. 193-205, illus. (incl. sketch maps), Univ. Tenn., Space Inst., Tullahoma, Tenn., United States, 1974.

RS77-2-496

13951 Ayeni, O. O. Considerations for automated digital terrain models with applications in differential photo mapping [abstr.]: 208 p., Doctoral, 1976, Ohio State: Columbus. (Diss. Abstr. Int., Vol. 37, No. 5, p. 2120B, 1976).

RS77-2-497

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RS77-2-498

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RS77-2-499

18438 Bhattacharyya, B. K.; and Leu, L.-K. Spectral analysis of gravity and magnetic anomalies due to rectangular prismatic bodies: Geophysics, Vol. 42, No. 1, p. 41-50, illus. (incl. tables), 1977.

RS77-2-500

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RS77-2-501

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RS77-2-502

18445 Brosse, J.-M. La teledetection en geologie structurale; deux examples, le massif granitique de Villefranche-de-Rouergue (Aveyron) et le systeme filonien de Vialas (Lozere) (Massif Central, France) [Remote sensing in structural geology; two examples, the granitic massif of Villefranche-de-Rouergue, Aveyron, and the vein system of Vialas, Lozere, Central Massif, France]: Fr., Bur. Rech. Geol. Minieres, Bull. (Ser. 2), Sect. 2, No. 6, p. 473-523 (incl. English sum.), illus., 1975.

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RS77-2-506

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RS77-2-507

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RS77-2-508

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RS77-2-509

14228 Moore, G. K.; and Hollyday, E. F. Discovery and significance of the Beech Grove Lineament of Tennessee: U. S. Geol. Surv., Prof. Pap., No. 929 *(ERTS-1, a new window on our planet)*, p. 164-168, illus. (incl. sketch map), 1976.

RS77-2-510

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RS77-2-512

18477 Enslin, W. R.; Richason, B., III; and Bennett, M. J. Resource inventory for multi-agency watershed planning: *in* Remote sensing of Earth resources; Volume III (Shahrokhi, F., editor), p. 653-670, tables, sketch maps, Univ. Tenn., Space Inst., Tullahoma, Tenn., United States, 1974.

RS77-2-513

14029 Fisher, J. J. Teaching geologic/earth science remote sensing at the collegiate and the secondary school level: J. Geol. Educ., Vol. 25, No. 1, p. 2-13, illus., 1977.

RS77-2-514

18446 Buznikov, A. A.; Klimuk, P. I.; Kondrat'yev, K. Ya.; *et al.* Spektrofotometrirovaniye Zemli s pilotiruemogo kosmicheskogo korablya "Soyuz-13" [Spectrophotometry of the Earth from the manned orbital ship "Soyuz-13"]: Akad. Nauk SSSR, Dokl., Vol. 221, No. 6, p. 1310-1313, illus., 1975.

RS77-2-515

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RS77-2-516

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RS77-2-517

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RS77-2-518

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RS77-2-519

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RS77-2-520

14969 Paulson, R. W. Water resources in the Delaware River basin: U. S. Geol. Surv., Prof. Pap., No. 929 *(ERTS-1, a new window on our planet)*, p. 132-133, 1976.

RS77-2-521

15320 Frater, J. B. Geomorphic interpretation of Skylab photography collected over the Nevada portion of the Great Basin: Master's, 1975, Purdue.

RS77-2-522

14258 Ross, D. C. Geologic analysis of the Santa Lucia Range, California: U. S. Geol. Surv., Prof. Pap., No. 929 *(ERTS-1, a new window on our planet)*, p. 50-52, illus. (incl. sketch maps), 1976.

RS77-2-523

18599 Perry, W. J.; and Crick, I. H. Aerial thermal infrared survey, Rabaul area, Papua New Guinea, 1973. *in* Volcanism in Australasia (Johnson, R. W., editor), p. 211-219, illus. (incl. sketch maps), Elsevier Sci. Publ Co., New York, N.Y., United States, 1976.

RS77-2-524

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RS77-2-525

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RS77-2-526

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RS77-2-527

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RS77-2-528

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RS77-2-529

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RS77-2-530

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RS77-2-532

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RS77-2-533

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RS77-2-534

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RS77-2-535

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RS77-2-538

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RS77-2-539

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RS77-2-540

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RS77-2-542

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RS77-2-546

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RS77-2-547

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RS77-2-552

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RS77-2-553

18607 Raines, G. L.; and Lee, K. An evaluation of multiband photography for rock discrimination: *in* Remote sensing of Earth resources; Volume III (Shahrokhi, F., editor), p. 361-396, illus. (incl. tables, sketch maps). Univ. Tenn., Space Inst., Tullahoma, Tenn., United States, 1974.

RS77-2-554

14156 Elston, D. P. Geological evaluation of North-central Arizona: U. S. Geol. Surv., Prof. Pap., No. 929 *(ERTS-1, a new window on our planet)*, p. 59-66, illus. (incl. geol. sketch map), 1976.

RS77-2-555

14932 Hollyday, E. F.; and Plahowski, E. J. Improving estimates of streamflow characteristics: U. S. Geol. Surv., Prof. Pap., No. 929 *(ERTS-1, a new window on our planet)*, p. 136-138, illus., 1976.

RS77-2-556

15361 Morrison, R. B. Enhancement of topographic features by snow cover: U. S. Geol. Surv., Prof. Pap., No. 929 *(ERTS-1, a new window on our planet)*, p. 72-75, illus. (incl. sketch map), 1976.

RS77-2-557

18498 Gregory, A. F.; and Moore, H. D. The role of remote sensing in mineral exploration with special reference to ERTS-1: Can. Min. Metall. Bull., Vol. 68, No. 757, p. 67-72, illus. (incl. table), 1975.

RS77-2-558

13973 Henriksen, N. Investigation of satellite images: Groenlands Geol. Unders., Rapp., No. 75 *(Report of activities, 1974)*, p. 13, 1975.

RS77-2-559

15837 Kirton, M.; and Lyus, D. Calibration of an airborne gamma ray spectrometer over Mary Kathleen uranium mine: Aust. Soc. Explor. Geophys., Bull., Vol. 7, No. 2, p. 69-74, illus. (incl. sketch map), 1976.

RS77-2-560

14744 Johnson, R. W. Quantitative sediment mapping from remotely sensed multispectral data: *in* Remote sensing of Earth resources; Volume IV (Shahrokhi, F., editor), p. 565-576, illus. (incl. tables, sketch maps), Univ. Tenn. Space Inst., Tullahoma, Tenn., United States, 1975.

RS77-2-561

13990 Sibert, W.; and Clark, F. T. Orthoimage mosaic of New Jersey: U. S. Geol. Surv., Prof. Pap., No. 929 *(ERTS-1, a new window on our planet)*, p. 26-28, illus., 1976.

RS77-2-562

15355 Meier, M. F. Monitoring the motion of surging glaciers in the Mount McKinley Massif, Alaska: U. S. Geol. Surv., Prof. Pap., No. 929 *(ERTS-1, a new window on our planet)*, p. 185-187, illus., 1976.

RS77-2-563

14216 Machej, W. Uwagi o tektonice utworow gornokredowych okolic Brzegow nad Nida; fotointerpretacja zdjec lotniczych [Tectonics of upper Cretaceous formations from the Brzegi-on-Nida area; interpretation of aerial photography]: Tech. Poszukiwan, No. 1/61, p. 38-42 (incl. Russian, English sum.), geol. sketch maps, 1976.

RS77-2-564

14783 McCauley, J. R.; and Yarger, H. L. Kansas water quality using ERTS-1: *in* Remote sensing of Earth resources; Volume IV (Shahrokhi, F., editor), p. 521-541, illus. (incl. sketch map), Univ. Tenn. Space Inst., Tullahoma, Tenn., United States, 1975.

RS77-2-565

13962 Colvocoresses, A. P. Applications to cartography; introduction: U. S. Geol. Surv., Prof. Pap., No. 929 *(ERTS-1, a new window on our planet)*, p. 12-22, illus. (incl. sketch maps), 1976.

RS77-2-566

14816 Rich, E. I. Satellite look at regional geology of northern California [abstr.]: Am. Assoc. Pet. Geol., Bull., Vol. 60, No. 12 *(AAPG-SEPM-SEG Pacific section meeting)*, p. 2188, 1976.

RS77-2-567

26174 Aerophotographic solution (C.V.C.M.) of underground structures in Otake and Kirishima geothermal areas. Todoki, N. pp 635-642 of In Proceedings of the second United Nations symposium on the development and use of geothermal resources. Vol. 1. Berkeley, CA; Univ. of California (1976).

From 2. United Nations symposium on the development and use of geothermal resources; San Francisco, California, USA (20 May 1975).

See CONF-750525—P1.

In the development of geothermal reservoirs, the systematic collection is required of large numbers of field observations, which have often involved photointerpretation; and often, in addition, the "Character Vectors Construction Method" (C.V.C.M.) has been used. The C.V.C.M. has been built up from experience of the lengths of time and costs of various stages of its processes. Nevertheless, the C.V.C.M. processing costs are very small compared with the costs of carrying out the field work of geological surveys in this case. The C.V.C.M. provides analytical data rapidly for computer graphics, for analyses of facies profiles, and for hot dry rock fracturing techniques in the tectonic stress field, and so on. Utilizing the above-mentioned techniques, the shapes of fractures, that is, the locations and sizes of cracks as passages for steam and gases, along which the migration of geothermal activity is also seen will be classified systematically. The directions are from southwest to northeast in both the Otake and Kirishima areas. Furthermore, in both areas, it is evident from the approximately parallel arrangements of character vectors that many ring-like blocks are distributed in and along, or nearly parallel to, the structural lines of northeastward direction. Surrounding the above-mentioned blocks many hot springs, fumaroles, and altered zones are well developed, and are predominant in the Kirishima area. Consequently, migration of geothermal activity is also seen along the conjugate fracture zones of northwestward direction.

RS77-2-568

29264 Advanced airborne infrared method for evaluating geothermal resources. Kerr Del Grande, N. (Univ. of California, Livermore). pp 947-953 of In Proceedings of the second United Nations symposium on the development and use of geothermal resources. Vol. 2. Berkeley, CA; Univ. of California (1976).

From 2. United Nations symposium on the development and use of geothermal resources; San Francisco, California, USA (20 May 1975).

See CONF-750525—P2.

A new geophysical assessment method, which (1) identifies most geothermal resources with few ground measurements; (2) quantifies weak heat flows, five or more times the global average; and (3) pinpoints areas for deep exploratory drilling is described. This capability does not currently exist. Aerial thermal surveys have duplicated results of shallow thermal gradient surveys for measuring heat flows greater than 3 W/m^2, enhancing the surface temperature more than 0.5 K above the ambient value. The Geothermal Energy Multiband (GEM) system, which would have 10 times better sensitivity, is described. Such a system is needed to reduce the time and cost of detailed thermal surveys (typically 1-1/2 yr and $2 to $3 million) prior to deep exploratory drilling of promising geothermal sites. Near-surface heat flow measurements require 125,000 man-hours per 100 km^2. Aerial thermal surveys require only 5 man-hours to scan 100 km^2 four separate times and cost less than $100,000. The GEM system would resolve 0.05 to 0.5 K temperature enhancements for areas more than 1 km^2 by ratioing narrow infrared (ir) bands at 2.2, 3.5, 3.9, 4.8 and 13.2 μm. These signal ratios have major advantages, namely (1) they are insensitive to the surface emissivity for natural terrains; (2) they vary as a high power of the absolute surface temperature (typically $50/\lambda_1$ to $50/\lambda_2$ near 288 K for ir wavelengths at λ_1 and λ_2 μm); and (3) they avoid the 6- to 13-μm region (subject to interpretative uncertainties from 0.5 to 5 K for surfaces composed of silicates, carbonates, and sulfates). Four predawn surveys taken under varied climatic conditions are needed to provide redundant data for distinguishing geothermal effects from climatic thermal noise.

RS77-2-569

29279 Evaluation of NOAA satellite data for geothermal reconnaissance studies. Marsh, S.E. (Stanford Univ., CA); Lyon, R.J.P.; Honey, F. pp 1135-1141 of In Proceedings of the second United Nations symposium on the development and use of geothermal resources. Vol. 2. Berkeley, CA; Univ. of California (1976).

From 2. United Nations symposium on the development and use of geothermal resources; San Francisco, California, USA (20 May 1975).

See CONF-750525—P2.

Research concerning the applicability of the U.S. National Oceanographic and Atmospheric Administration (NOAA) Very High Resolution Radiometer (VHRR) to geothermal studies is in progress. The VHRR senses energy in the visible spectrum at 0.6 to 0.7 μm and in the thermal infrared at 10.5 to 12.5 μm, with twice-daily coverage of the continental United States (at approximately 0900 and 2100 local time), and with a ground spatial resolution of approximately 1 km. The NOAA satellite contains a blackbody reference source, thereby permitting the calculation of calibrated "surface" temperatures. A reading and analysis program for digitized nine-track tape records from the NOAA satellite was written at the Stanford Remote Sensing Laboratory for the PDP-10 computer. The approximate scale of the computer output is 1:200,000, resulting in improved evaluation capabilities from the normal VHRR image scale of approximately 1:7,500,000. The interactive program can produce raw satellite data (numerics), histograms of the data, and shadeprints in which appropriate intervals (gray-scale steps) may be stretched or enhanced in order to optimize the result for a particular application. The geothermal areas of Yellowstone National Park, Wyoming, are under study, because the areal size of a number of the geothermal areas provides compatible resolution with the VHRR sensor. A preliminary analysis of the computer-derived images of the park indicated delineation of some geothermal areas is possible. This initial research indicates that the NOAA thermal sensor system can already provide a data source for some geothermal reconnaissance studies.

RS77-2-570

29266 Thermal microwave detection of near-surface thermal anomalies. England, A.W.; Johnson, G.R. (Geological Survey, Denver). pp 971-977 of In Proceedings of the second United Nations symposium on the development and use of geothermal resources. Vol. 2. Berkeley, CA; Univ. of California (1976).

From 2. United Nations symposium on the development and use of geothermal resources; San Francisco, California, USA (20 May 1975).

See CONF-750525—P2.

The radiobrightness of soil is determined predominantly by the amount of soil moisture and its state and not by thermal temperature. Therefore, radiobrightness maps of geothermal areas delineate moisture anomalies rather than near-surface thermal anomalies. An exception to this occurs where the thermal anomaly affects the depth of seasonal frost. Because frozen ground appears radiometrically dry, the interface between moist and frozen ground, or the frost line, becomes a boundary between dielectrically contrasting materials. This dielectric constrast influences deeper penetrating, longer wavelengths more than it does shorter wavelengths. The resultant spectral variation of radiobrightness is diagnostic of the depth to the frost line. That is, the radiobrightness should reveal a geothermally induced thinning or absence of seasonal frost. Preliminary tests of this theory in the Raft River geothermal area and near Kindred, North Dakota, support application of this technique in sandy soils. The problem in clay soils appears to be related to the greater variability of the dielectric properties of clays and to the gradational change of dielectric properties from moist to frozen soils. Clays freeze over a temperature range, so that the frost line becomes blurred and may not act as the necessary reflector to microwaves.

RS77-2-571

29258 **Relationships as shown in ERTS satellite images between main fractures and geothermal manifestations in Italy.** Barbier, E.; Lanelli, M. (Istituto Internazionale per le Ricerche Geothermiche del CNR, Pisa, Italy). pp 883-888 of In Proceedings of the second United Nations symposium on the development and use of geothermal resources. Vol. 2. Berkeley, CA; Univ. of California (1976).

From 2. United Nations symposium on the development and use of geothermal resources; San Francisco, California, USA (20 May 1975).

See CONF-750525—P2.

The images provided by the American ERTS-A satellite in the spectral band 0.8 to 1.1 μm (near infrared) have been utilized to verify any eventual relationship between long lineations (over 100 km long) on Italian territory, as seen on these same images, and geothermal manifestations (hot springs and geothermal fields). The images, in that they provide a global view of Italy, have for the first time made possible a study of this type. A very definite relationship has been proven between geothermal manifestations and these lineations (fractures). In fact, about 80% of the hot springs lie on one or more lineations. Furthermore, this study has shown that there are "hot lineations" on which the number of springs is particularly high and on two of which lie the geothermal fields of Larderello and Travale.

RS77-2-572

27584 **(E—76-10322) EREP geothermal. Final report.** Johnson, E.W.; Dunklee, A.L.; Wychgram, D.C. (Martin Marietta Corp., Denver, Colo. (USA)). 9 Aug 1974. Contract NAS8-24000. 72p. NTIS $4.50.

The author has identified the following significant results. A reasonably good agreement was found for the radiometric temperatures calculated from the ground truth data and the radiometric temperatures measured by the S192 scanner. This study showed that the S192 scanner data could be used to create good thermal images, particularly with the X-5 detector array. (GRA)

RS77-2-573

ID NO.- EI770534927 734927

ADDRESSING THE REMOTE SENSING $left double quote$ DATA-INFORMATION GAP. $right double quote$: OVERHEAD MONITORING IN NEW YORK'S ST. LAWRENCE RIVER-EASTERN LAKE ONTARIO COASTAL ZONE.

Littlesand, T. M.; Tyson, W. E.

State Univ of NY, Coll of Environ Sci & For, Syracuse.

Proc of the Int Symp on Remote Sensing of Environ, 10th, Ann Arbor, Mich, Oct 6-10 1975 Publ by Environ Res Inst of Mich, Cent for Remote Sensing Inf and Anal, Ann Arbor, 1975 v 1 p 189-201

DESCRIPTORS: *REMOTE SENSING, ENVIRONMENTAL PROTECTION, (DATA PROCESSING, Data Handling), (INFORMATION SCIENCE, Information Use), (WATER RESOURCES, Management).

CARD ALERT: 901, 723, 444

Despite substantive gains in remote sensing technology, a gap between the generation of data and conversion of same to information persists in $left double quote$ the real world $right double quote$ of coastal zone management. Included are results and conclusions drawn from applying remote sensing as an environmental monitoring tool. A gamut of applications were demonstrated and the innate differences in roles of $left double quote$ remote sensing researchers $right double quote$ and $left double quote$ users $right double quote$ were crystallized. Several suggestions are made for bridging this data-information gap. Refs.

RS77-2-574

ID NO.- EI770536798 736798
USE OF REMOTE SENSING FOR WATER RESOURCE MANAGEMENT IN MICHIGAN.
Christensen, R. J.; Wezernak, C. T.
Mich Dep of Nat Resour, Water Resour Comm, Lansing
Proc of the Int Symp on Remote Sensing of Environ, 10th, Ann Arbor, Mich, Oct 6-10 1975 Publ by Environ Res Inst of Mich, Cent for Remote Sensing Inf and Anal, Ann Arbor, 1975 v 1 p 485-494
DESCRIPTORS: (*WATER RESOURCES, *Management), (REMOTE SENSING, Environmental Applications), WATER POLLUTION, ENVIRONMENTAL PROTECTION,
IDENTIFIERS: ENVIRONMENTAL MONITORING
CARD ALERT: 444, 453
The applications considered included power plant discharges and industrial discharges. Applications are examined in terms of using spectral bands in the thermal IR, visible, and ultraviolet. The results indicate that remote sensing can serve as an important addition to techniques available to a regulatory agency for environmental monitoring.

RS77-2-575

ID NO.- EI770534046 734046
MAJOR LINEAMENT IN THE ARABIAN SHIELD AND ITS RELATIONSHIP TO MINERALIZATION.
Moore, J. McMahon
Imp Coll of Sci & Technol, London, Engl
Miner Deposita v 11 n 3 1976 p 323-328 CODEN: MIDEBE
DESCRIPTORS: (*ORE DEPOSITS, *Saudi Arabia), (GEOCHEMISTRY, Volcanic Rocks), (GEOLOGY, Sedimentology),
CARD ALERT: 504, 481
The Al Amar Fault lies in a belt of Proterozoic, metamorphosed volcanic and sedimentary rocks, bounded by granitic batholiths. A string of metalliferous and industrial mineral deposits form a $left double quote$ mineral belt $right double quote$ which coincides with the volcano-sedimentary belt. Orebodies of basic and ultra-basic association are directly related to the fault through its influence on intrusive activity. Cu-Zn-Au bearing veins of meta-volcanic affiliation are spatially related to the fault. A group of Pb-Ag bearing veins is associated with the granitic batholith which forms the western boundary of the volcano-sedimentary belt. Associations between ore minerals and particular igneous rocks indicate that granitic, basic and metamorphosed volcanic rocks were sources of Pb-Ag-W-Mo, Fe-Cr-Cu-Ni and Fe-Cu-Zn-Au-Ba, respectively. Hydrothermal activity in the fault zone promoted ore formation, and faulting provided sites for deposition. Al Amar Fault is a $left double quote$ copper-lead line $right double quote$ dividing a Pb-Ag sub-province (of sialic derivation?) from a Cu-Zn-Au sub-province (of plate-margin/island arc derivation?). The fault is a useful empirical guide in exploration for ores of basic or ultra-basic plutonic and meta-volcanic affiliation and can be identified and traced, as a lineament, using ERTS satellite images and aeromagnetic maps. 12 refs.

RS77-2-576

ID NO.- EI770748943 748943
MINERALIZED CRUSTAL FAILURES SHOWN ON SATELLITE IMAGERY OF NIGERIA.
Chukwu-Ike, I. M.; Norman, J. W.
R Sch of Mines, London, Engl
Trans Inst Min Metall Sect B v 86 Feb 1977 p B55-B57
CODEN: TIAEA7
DESCRIPTORS: (*GEOLOGY, *Nigeria), (MINERAL EXPLORATION, Nigeria), (SATELLITES, Photography), (AERIAL PHOTOGRAPHY, Nigeria), (ORE DEPOSITS, Nigeria),
CARD ALERT: 481, 501, 655, 742, 504
The extensive current studies of imagery from LANDSAT (formerly named Earth Resources Technology Satellite) are proving their value for the detection of long fractures in shield areas. The scale and resolution of the imagery limits practical detection to a minimum length of the order of 1 km; but with several bands and $left double quote$ scenes $right double quote$ from different seasons, a profusion of faults of greater length can often be detected. Concealed in this apparently chaotic random pattern may be important block faults or $left double quote$ disjunctive zones $right double quote$, which coincide with zones of mineralization, areas of intrusives and extrusives, and major geophysical anomalies. One useful approach is to search for systems of parallel fractures of long and medium lengths, regularly spaced at intervals of the order of 25-75 km, exemplified by those seen in central Nigeria. 3 refs.

RS77-2-577

ID NO.- EI770534944 734944
GEOLOGIC INTERPRETATION OF LANDSAT-1 IMAGERY OF THE GREATER PART OF THE MICHIGAN BASIN.
Drake, Ben; Vincent, Robert K.
Environ Res Inst of Mich, Ann Arbor
Proc of the Int Symp on Remote Sensing of Environ, 10th, Ann Arbor, Mich, Oct 6-10 1975 Publ by Environ Res Inst of Mich, Cent for Remote Sensing Inf and Anal, Ann Arbor, 1975 v 2 p 933-948
DESCRIPTORS: (*REMOTE SENSING, *Applications), GEOLOGY, MAPS AND MAPPING,
IDENTIFIERS: LANDSAT-1 IMAGERY
CARD ALERT: 481, 742, 405
A mosaic consisting of spring, 1973 color composites was studied with the unaided eye using photogeologic interpretation techniques. Mainly Wisconsin glacial deposits can be discriminated on the mosaic, and there is a strong correlation between the land use, or at least the land cover, in the Southern Peninsula and the types of geologic features discriminated on the mosaic. The glacial deposits and features that can be locally discriminated on the mosaic are end and lateral moraines, ground moraines and outwash plains, ice-contact stratified drift, a delta, lake beds, glacial lake shorelines and beaches, and glacial drainage channels. The use of the LANDSAT-1 mosaic along with glacial and topographic maps will allow many of the glacial deposits and features and the extent and boundaries of them to be revised and mapped better. Refs.

RS77-2-578

ID NO.- EI770748882 748882
HYDROLOGY OF GAS STORAGE SITES BY REMOTE SENSING.
Fisher, Wilson Jr.
Am Gas Assoc Oper Sect Proc 1976, Transm Conf, Pap, Las Vegas, Nev, May 3-5 1976 Pap 76-T-65, 3 p CODEN: POAGAB
DESCRIPTORS: (*GAS STORAGE, *Underground), (HYDROLOGY, Remote Sensing),
IDENTIFIERS: HYDROGEOLOGY
CARD ALERT: 522, 444, 471, 732
Development of expansion planning of gas storage sites should consider the hydrologic implications of well siting. Failure to address the hydrogeologic factors (fracture traces and the water bearing character of the strata) can lead to water resource quality and quantity problems, as well as others. Site assessments by hydrogeologists using remote sensing tools and techniques can minimize these potential problems by delineating areas of concern. 15 refs.

RS77-2-579

ID NO.- EI770534276 734276
ZUR BEURTEILUNG DER BELAENDEDARSTELLUNG IN TOPOGRAPHISCHEN KARTEN. $left bracket$ Interpretation of Land Features in Topographic Maps $right bracket$.
Finsterwalder, R.
Bull Soc Fr Photogramm n 57 Jan 1975 p 9-16 CODEN: BFPGA5
DESCRIPTORS: *PHOTOGRAMMETRY,
CARD ALERT: 405, 742
The author proposes a standardized method of calculating the error of position and the error of form of countour lines. The checking method is demonstrated with contour lines plotted directly and contour lines derived from profiles of the same terrain. An important supplementation of the numerical standard error gives visual checking of contour lines by a qualified topographer, who knows the terrain from autopsy or from stereomodel. 8 refs. In German with English abstract.

RS77-2-580

ID NO.- EI770535584 735584
SHORELANDS MANAGEMENT USING REMOTE SENSING TECHNIQUES.
Dooley, James P.; Clinton, Fredrick A.; Jannereth, Martin R.
Mich Dep of Nat Resour, Lansing
Proc of the Int Symp on Remote Sensing of Environ, 10th, Ann Arbor, Mich, Oct 6-10 1975 Publ by Environ Res Inst of Mich, Cent for Remote Sensing Inf and Anal, Ann Arbor, 1975 v 2 p 1447-1450
DESCRIPTORS: (*SHORE PROTECTION, *Erosion), AERIAL PHOTOGRAPHY, (WATER RESOURCES, Management), (REMOTE SENSING, Applications),
CARD ALERT: 407, 742, 444
The Michigan Shorelands Protection and Management Act was presented as the impetus for surveying the Great Lakes shoreline to identify areas having significant erosion problems. Setback distances from the bluffline are required on all undeveloped, unplatted high risk erosion shoreline for the protection of permanent structures. Aerial photographic coverage of the shoreline, both historic and modern are discussed as the most cost effective way of determining actual recession of the bluffline. This information is then used to calculate the setback distances for each area. Unique problems arising in the use of aerial photography in measuring changes in the shoreline environment as well as photogrammetric problems common to all areas are discussed.

RS77-2-581

ID NO.- EI770748988 748988
UTILISATION DE LA PHOTOGRAMMETRIE AERIENNE POUR LES RELEVES TRADITIONNELS DE FLUCTUATIONS DES LANGUES GLACIAIRES. $left bracket$ Use of Aerial Photogrammetry for Routine Surveys of Glacier Snout Variations $right bracket$.
Mura, R.; Memier, M.
Cent Tech du Genie Rural des Eaux et Forets
Houille Blanche v 31 n 6-7 1976 p 461-466 CODEN: HOBLAB
DESCRIPTORS: (*GLACIERS, *Mapping), PHOTOGRAMMETRY, SURVEYING,
IDENTIFIERS: AERIAL PHOTOGRAMMETRY
CARD ALERT: 405, 443, 444, 481, 742
The survey methods and results of the two programs carried out are described, quoting the $left double quote$ Glacier Blanc $right double quote$ in the Oisans range of the French Alps as an example. A number of points to either side of the flight paths are plotted on a Lambert coordinate system. In French with English abstract.

RS77-2-582

ID NO.- EI770536789 736789
SOME OPERATIONAL USES OF SATELLITE RETRANSMISSION IN CANADA.
Halliday, R. A.; Reid, I. A.
Water Resour Branch Environ Can, Ottawa, Ont
Proc of the Int Symp on Remote Sensing of Environ, 10th, Ann Arbor, Mich, Oct 6-10 1975 Publ by Environ Res Inst of Mich, Cent for Remote Sensing Inf and Anal, Ann Arbor, 1975 v 2 p 1361-1366
DESCRIPTORS: (*WATER RESOURCES, *Canada), TELECOMMUNICATION SYSTEMS, SATELLITE RELAY, REMOTE SENSING,
CARD ALERT: 444, 655, 716
It is now possible through use of the data collection systems carried by satellites such as Landsat and GOES to obtain near real time water resources data from any location in Canada. These data have been used for flow and flood forecasting and to assist in the conduct of hydrometric surveys. Present programs will be continued and, likely, expanded, depending on the availability of suitable satellite systems.

RS77-2-583

ID NO.- EI770533107 733107
REGIONAL MAPPING PROGRAM AND MINERAL RESOURCES SURVEY BASED ON REMOTE SENSING DATA.
Correa, Aderbal Caetano
Inst de Pesquisas Espaciais, Sao Paulo, Braz
Proc of the Int Symp on Remote Sensing of Environ, 10th, Ann Arbor, Mich, Oct 6-10 1975 Publ by Environ Res Inst of Mich, Cent for Remote Sensing Inf and Anal, Ann Arbor, 1975 v 2 p 1057-1065
DESCRIPTORS: *MAPS AND MAPPING, (REMOTE SENSING, Applications), GEOLOGICAL SURVEYS, MINERAL EXPLORATION,
IDENTIFIERS: MINERAL RESOURCE INVENTORIES, ERTS-1 DATA
CARD ALERT: 405, 716, 481, 742
The Earth Resources Technology Satellite-1 multiband imagery has been used as the basis for structural mapping of the middle Sao Francisco River area, eastern Brazil. The synoptic view available from orbital imagery provided the means to detect geological structures already mapped in some areas and to revise small scale geological maps. Data from other remote sensors, mainly side looking airborne radar imagery and aerial photography were analyzed when available. The identification of new crustal fractures, and particularly the intersection of sets of linear features, which control to a great extent the formation of some types of ore deposits, are some of the data which were considered when defining areas with potential mineralization. Refs.

RS77-2-584

ID NO.- EI770532042 732042
GEOTHERMAL SURVEY USING THERMAL INFRARED REMOTE SENSING IN JAPAN.
Hase, Hirokazu; Matsuno, Kyuya; Nishimura, Kashiro.
Geol Surv of Jpn, Kawasaki-shi
Proc of the Int Symp on Remote Sensing of Environ, 10th, Ann Arbor, Mich, Oct 6-10 1975 Publ by Environ Res Inst of Mich, Cent for Remote Sensing Inf and Anal, Ann Arbor, 1975 v 2 p 995-1005
DESCRIPTORS: (*GEOPHYSICS, *Geothermal), INFRARED IMAGING, (REMOTE SENSING, Applications),
CARD ALERT: 481, 741
In the national survey of geothermal resources, aerial thermal infrared remote sensing has been applied and five areas were selected as the survey area. The merits of the survey are rapid mapping of thermally anomalous spots and visual effect. Particularly an alignment of thermally anomalous spots characterized by fumaroles is closely related to fracture pattern, thus this method is useful in understanding shallow underground geothermal phenomena.

RS77-2-585

ID NO.- EI770645041 745041
URANIUM EXPLORATION METHODS DEVELOPMENT.
Grutt, Eugene W. Jr.
ERDA, Grand Junction, Colo
AMC (Am Min Congr) Min Conv, set n 6: Explor, Denver, Colo, Sep 26-29 1976 Publ by AMC, Washington, DC, 1976 36 p
DESCRIPTORS: (*URANIUM DEPOSITS, *Exploration), (GEOPHYSICS, Exploratory), REMOTE SENSING,
CARD ALERT: 504, 481, 622, 732
This paper reviews new and improved technology that is being developed to support uranium exploration by industry and the on-going Uranium Resource Assessment Program of the Energy Research and Development Administration (ERDA). These developments range from modest improvements on established and relatively simple methods, such as gross gamma counting with portable instruments, through application of advanced state-of-the-art techniques, such as high sensitivity gamma-ray spectrometry, to research and development of new sophisticated measuring systems, such as direct uranium logging using neutron interrogation. The new methods span a broad range of earth sciences including geophysics, remote sensing, geochemistry, and drilling. 17 refs.

RS77-2-586

ID NO.- EI770645067 745067
VALUE OF LANDSAT IN URBAN WATER RESOURCE PLANNING
Jackson, Thomas J.; Ragan, Robert M.
Univ of Ky, Lexington
J Water Resour Plann Manage Div ASCE v 103 n 1 May 1977 p 33-46 CODEN: JWRDDC
DESCRIPTORS: (*URBAN PLANNING, *Water Supply), (WATER RESOURCES, Management), WATERSHEDS, MATHEMATICAL MODELS,
IDENTIFIERS: LANDSAT DATA
CARD ALERT: 403, 444, 446, 723, 921
Bayesian decision theory was used to study the economic value of Landsat data in urban water resources planning. The investigation focused upon a case study of the Fourmile Run watershed. Land cover data were required to aid in the selection of an optimal level of onsite detention storage to mitigate flood damages. An estimate of the percentage of impervious area was needed to determine the parameters of the hydrologic simulation model utilized in generating flood frequency information. Preposterior Bayesian analysis indicated that computer-aided analysis of Landsat data was a highly cost-effective method for determining the percentage of impervious area. 20 refs.

RS77-2-587

ID NO.- EI770645068 745068
TEST OF LANDSAT-BASED URBAN HYDROLOGIC MODELING
Jackson, Thomas J.; Ragan, Robert M.; Fitch, William N.
Univ of Ky, Lexington
J Water Resour Plann Manage Div ASCE v 103-n 1 May 1977 p 141-158 CODEN: JWRODC
DESCRIPTORS: (*URBAN PLANNING, *Water Supply), (HYDROGRAPHIC SURVEYING, Computer Applications), AERIAL PHOTOGRAPHY, WATERSHEDS,
IDENTIFIERS: COMPUTER MODELS
CARD ALERT: 403, 444, 446, 471, 723, 742
Many of the models designed to support the hydrologic studies associated with urban water resources planning require input parameters that are defined in terms of land cover. Estimating the land cover is a difficult and expensive task and any innovation that can reduce these problems should be of significant value to the water resources planning community. The purpose of the reported investigation was to compare conventional and Landsat-based methods for determining the land cover inputs of hydrologic planning and design models. Comparisons were based on a case study of the Fourmile Run Watershed in Virginia. Results of the study indicated that for planning model studies the Landsat-based approach is highly cost-effective. However, in the design model investigations the errors encountered when the Landsat date are used were unacceptable. 18 refs.

RS77-2-588

ID NO.- EI770752973 752973
ELECTRONIC METHODS OF RIVER GAUGING.
Newman, J. D.
Plessey Radar, Cowes, Isle of Wight, Engl
Syst Technol n 25 Dec 1976 p 24-31 CODEN: SYTEAX
DESCRIPTORS: *STREAM FLOW, RIVERS, ELECTRONIC EQUIPMENT,
CARD ALERT: 407, 444, 442, 631; 715
In river/stream management, one of the most important variables to be considered is volumetric flow. This article describes two electronic techniques which have been developed to overcome some of the limitations of traditional methods of continuous flow measurement. 1 ref.

RS77-2-589

ID NO.- EI770535647 735647
MEASUREMENTS OF SNOW COVER OVER LAND WITH THE NIMBUS-5 MICROWAVE SPECTROMETER.
Kuenzi, Klaus F.; Staelin, David H.
Univ of Berne, Switz
Proc of the Int Symp on Remote Sensing of Environ, 10th, Ann Arbor, Mich, Oct 6-10 1975 Publ by Environ Res Inst of Mich, Cent for Remote Sensing Inf and Anal, Ann Arbor, 1975 v 2 p 1245-1253
DESCRIPTORS: (*SNOW AND SNOWFALL, *Measurements), (SPECTROMETERS, MICROWAVE, Applications), REMOTE SENSING,
IDENTIFIERS: MICROWAVE SIGNATURES, NIMBUS-5
CARD ALERT: 443, 715
From data obtained by the microwave spectrometer NEMS microwave signatures of snow covered land have been derived. The emissivity at 31. 4 GHz is lower by about 10% than at 22. 2 GHz, while the emissivities for uncovered land are about 0. 95 at both frequencies. Maps for snow cover over land are generated for the northern hemisphere and compared with data obtained by visible light imagery.

RS77-2-590

ID NO.- EI770532006 732006
STUDY OF LAND FORMATION IN BANGLADESH WITH LANDSAT-I IMAGERIES.
Hossain, Anwar; Chaudhury, M. U.
Bangladesh Natl LANDSAT Prog, India
Proc of the Int Symp on Remote Sensing of Environ, 10th, Ann Arbor, Mich, Oct 6-10 1975 Publ by Environ Res Inst of Mich, Cent for Remote Sensing Inf and Anal, Ann Arbor, 1975 v 2 p 1023-1027
DESCRIPTORS: (*GEOLOGY, *Bangladesh), (REMOTE SENSING, Applications),
IDENTIFIERS: LANDSAT-I IMAGERY
CARD ALERT: 481, 741, 742
The study was concentrated in one of the test site areas of Bangladesh National Landsat Programme. A black and white print of the area in band-6 blown to a scale of 1:250,000 was used for detailed study. Aerial photographic mosaics of the area taken 4, 5 & 7 of the same area at a scale of visits to the area in water crafts and also through visual observations and from the oblique photographs taken during low-altitude helicopter reconnaissance flights over the area. The findings revealed information on huge land formation in the Bay of Bengal which is increasing the land area of Bangladesh.

RS77-2-591

ID NO.- EI770534273 734273
UNE METHODE PHOTOGRAMMETRIQUE ANALYTIQUE DE CONTROLE DES CARTES TOPOGRAPHIQUES EXISTANTES. $left bracket$ Analytical Photogrammetric Method of Checking Existing Topographic Maps $right bracket$.
Lacomme-Lahourguette, A.; Denegre, J.
Inst Geogr Natl, Paris, Fr
Bull Soc Fr Photogramm n 57 Jan 1975 p 17-22 CODEN: BFPGAS
DESCRIPTORS: *PHOTOGRAMMETRY,
CARD ALERT: 405, 742
If new air-photos give a general way to check old stereo-plottings, it is not necessary for this purpose to plot again: a method, first described by Rome Air Development Center (USA) and recently experimented at I. G. N. , is based on computing from single air-photos the new coordinates of some check points, by space resection and intersection with the digital terrain model taken from the old stereo-plotting. Thus it is possible, with a procedure which looks like the orthoprojection from single air-photo and digital terrain model, to check the homogeneity of existing maps. In French with English abstract.

RS77-2-592

ID NO.- EI770536787 736787
REMOTE SENSING TECHNIQUES APPLIED TO THE STUDY OF FRESH WATER SPRINGS IN COASTAL AREAS.
Guglielminetti, M.; Boltri, R.; Marino, C. M.
IDROTECNECO, Italy
Proc of the Int Symp on Remote Sensing of Environ, 10th, Ann Arbor, Mich, Oct 6-10 1975 Publ by Environ Res Inst of Mich, Cent for Remote Sensing Inf and Anal, Ann Arbor, 1975 v 2 p 1297-1309
DESCRIPTORS: *WATER RESOURCES, (REMOTE SENSING, Applications), INFRARED IMAGING,
IDENTIFIERS: MULTISPECTRAL SCANNER DATA
CARD ALERT: 444, 741
The work involved more than 600 miles of flights utilizing both thermal infrared (I. R.) and multispectral techniques. A dual channel I. R. thermal scanner and a cluster of four EL/70 Hasselblad were employed to detect both thermal contrast at sea surface and difference in light penetration in sea water due to fresh water upwelling. False colour I. R. was also used to have a more detailed and complete knowledge of the land use along the coastal area. Particular techniques, such as density slicing, ratio, difference of thermal signals were used during the play-back operation. Data were interpreted for separating the fresh water effects from other similar ones, and are utilized for field analysis.

RS77-2-593

ID NO.- EI770752118 752118
NEW METHODS IN SNOWMELT-RUNOFF STUDIES IN REPRESENTATIVE BASINS.
Martinec, Jaroslav
Fed Inst for Snow & Avalanche Res, Weissfluhjoch/Davos, Switz
Int Symp on Hydrol Charact of River Basins and the Eff on these Charact of Better Water Manage, Proc, Tokyo, Jpn, Dec 1-8 1975 Jointly Publ by Sci Counc of Jpn, Tokyo and Int Assoc of Hydrol Sci (IAHS-AISH Publ n 117), Paris, Fr, 1975 p 99-107
DESCRIPTORS: *RUNOFF, SNOW AND SNOWFALL, REMOTE SENSING,
IDENTIFIERS: SNOWMELT
CARD ALERT: 442, 444, 443
A snowmelt-runoff model has been developed taking into account the variable conditions in different parts of a representative alpine basin and the changing proportion of the immediate and delayed runoff. A new concept of the subsurface runoff mechanism revealed by an environmental isotope method is incorporated. Air photography as a first step to the multispectral remote sensing is used for monitoring the changing areal extent of the snow cover. An automatic meteorological station provides data from a remote part of the basin for determining the meltwater production and the rainfall contribution. The daily discharge values have been simulated for the entire snowmelt season of 3 months. A good agreement with direct discharge measurements was obtained by introducing parameters determined beforehand without optimization.

RS77-2-594

ID NO.- EI770532769 732769
REMOTE SENSING INVESTIGATION ON LAKE BIWA.
Sakata, Toshibumi; Shimoda, Haruhisa; Tanaka, Kunikazu; Suzuki, Toru
Tokai Univ, Jpn
Proc of the Int Symp on Remote Sensing of Environ, 10th, Ann Arbor, Mich, Oct 6-10 1975 Publ by Environ Res Inst of Mich, Cent for Remote Sensing Inf and Anal, Ann Arbor, 1975 v 1 p 401-410
DESCRIPTORS: (*LAKES, *Remote Sensing), AERIAL PHOTOGRAPHY, (WATER RESOURCES, Management),
CARD ALERT: 444, 742
Multi band photographs of Lake Biwa in Japan were taken from a helicopter with 4 Hasselblad cameras while field observation and sampling of lake water were made from a boat. The multi band images were analysed with an analog processor TIAS-I. Plumes of river discharges and several kinds of coastal plants were enhanced with this analysis.

RS77-2-595

ID NO.- EI770536788 736788
CORPS OF ENGINEERS APPLICATIONS OF LANDSAT DIGITAL DATA.
Williamson, A. N.
US Army Eng Waterw Exp Stn, Vicksburg, Miss
Proc of the Int Symp on Remote Sensing of Environ, 10th, Ann Arbor, Mich, Oct 6-10 1975 Publ by Environ Res Inst of Mich, Cent for Remote Sensing Inf and Anal, Ann Arbor, 1975 v 2 p 1353-1360
DESCRIPTORS: *WATER RESOURCES, (REMOTE SENSING, Computer Applications), WATER POLLUTION,
IDENTIFIERS: LANDSAT-1 DATA, COMPUTER COMPATIBLE TAPES
CARD ALERT: 444, 723, 741
The Waterways Experiment Station has been studying data from Landsat-1 to determine the feasibility of detecting flow patterns, flushing actions of estuaries, and sediment and pollution dispersion. Techniques were developed to process Landsat computer-compatible-tape data, extract useful information, and present the information in several easily used forms. The automated processing techniques and concepts have broad applicability. The paper discusses how they have been applied to three studies.

RS77-2-596

ID NO.- EI770532395 732395
COST-EFFECTIVENESS COMPARISON OF EXISTING AND LANDSAT-AIDED SNOW WATER CONTENT ESTIMATION SYSTEMS.
Sharp, James M.; Thomas, Randall W.
Univ of Calif, Berkeley
Proc of the Int Symp on Remote Sensing of Environ, 10th, Ann Arbor, Mich, Oct 6-10 1975 Publ by Environ Res Inst of Mich, Cent for Remote Sensing Inf and Anal, Ann Arbor, 1975 v 2 p 1255-1262
DESCRIPTORS: *HYDROLOGY, (REMOTE SENSING, Environmental Applications), SNOW AND SNOWFALL,
IDENTIFIERS: LANDSAT IMAGERY
CARD ALERT: 444, 471, 443
The paper describes how LANDSAT imagery can be cost-effectively employed to augment an operational hydrologic model. Attention is directed toward the estimation of snow water content, a major predictor variable in the volumetric runoff forecasting model used by the California Department of Water Resources. A stratified double sampling scheme is supplemented with qualitative and quantitative analyses of existing operations to develop a comparison between the existing and satellite-aided approaches to snow water content estimation. Refs.

RS77-2-597

ID NO.- EI770536763 736763
APPLICATION OF LANDSAT TO THE SURVEILLANCE AND CONTROL OF EUTROPHICATION IN SAGINAW BAY.
Rogers, R. H.; Shah, N. J.; McKeon, J. B.; Wilson, C.; Reed, L.; Smith, V. Elliott; Thomas, Nelson A.
Bendix Aerosp Syst Div, Ann Arbor, Mich
Proc of the Int Symp on Remote Sensing of Environ, 10th, Ann Arbor, Mich, Oct 6-10 1975 Publ by Environ Res Inst of Mich, Cent for Remote Sensing Inf and Anal, Ann Arbor, 1975 v 1 p 437-446
DESCRIPTORS: (*WATER POLLUTION, *Control), (REMOTE SENSING, Computer Applications), ENVIRONMENTAL PROTECTION,
IDENTIFIERS: LANDSAT DATA, EUTROPHICATION, WATER QUALITY
CARD ALERT: 453, 723
Computer techniques developed for mapping water quality parameters from LANDSAT data are demonstrated. Chemical and biological parameters were collected at 27 bay stations in concert with LANDSAT overflights. Application of stepwise linear regression to 12 of these parameters and corresponding LANDSAT measurements resulted in relationships that can be applied to map any one of the 12 water quality parameters over the entire bay. The regression correlation coefficients varied from 0. 99 for total phosphorus to 0. 72 for chlorophyll a corrected. Five of the water quality parameters are best correlated with LANDSAT Band 6 alone. One parameter, temperature, relates to Band 5 alone and only two bands are justified for mapping the remaining six parameters.

RS77-2-598

ID NO.- EI770532781 732781
FACTORS AFFECTING DISTRIBUTION OF LANDSLIDES ALONG RIVERS IN SOUTHERN ALBERTA.
Thomson, S.; Morgenstern, N. R.
Can Geotech Conf, 29th, Vancouver, BC, Oct 13-16 1976 Sponsored by Can Geotech Soc, Montreal, Que, 1976 Sess IV p 73-95
DESCRIPTORS: (*LANDSLIDES, *Alberta), (GEOPHYSICS, Rock Properties), AERIAL PHOTOGRAPHY,
CARD ALERT: 481, 483, 484, 742
A regional study of the distribution and characteristics of landslides along four major rivers in southern Alberta was undertaken to relate landslide activity to geologic and physiographic factors such as bedrock outcrop, ground water, river sinuosity and the aspect of valley slope. This provides greater insight into the factors controlling slides in the study region, particularly in the Cretaceous bedrock. The study was based on an analysis of air photos augmented by surficial and bedrock geologic maps and hydrogeologic and bedrock topographic maps. 17 refs.

RS77-2-599

ID NO.- EI770643505 743505
TRANSVERSE MIXING IN THE MOBILE RIVER, ALABAMA.
Meyer, William
J Res US Geol Surv v 5 n 1 Jan-Feb 1977 p 11-16 CODEN: JRGSAW
DESCRIPTORS: (*RIVERS, *Measurements), FLUOROMETERS, AERIAL PHOTOGRAPHY,
CARD ALERT: 407, 444, 941, 742
Transverse dispersion in the Mobile River is measured by (1) ground-base techniques using water samples and a fluorometer and (2) by aerial photography. Magnitude of the transverse mixing coefficient obtained by the two methods is 6. 2 feet squared per second (0. 58 meter squared per second) and 5. 0 feet squared per second (0. 46 meter squared per second), respectively. The value of the numerical coefficient k, which relates the transverse mixing coefficient E//z to shear velocity U* and average depth of flow, d, by the relationship k $equals$ E//z/U*d, is 7. 2. 5 refs.

RS77-2-600

ID NO.- EI770533485 733485
USGS DENVER R&D GROUP SEEKS PRACTICAL USES FOR EMERGING PROSPECTING TECHNOLOGY.

Sissleman, Robert
Eng Min J v 178 n 1 Jan 1977 p 76-79 CODEN: ENMJAK
DESCRIPTORS: (*MINERAL EXPLORATION, *United States), (ORE DEPOSITS, United States), (GEOCHEMISTRY, Exploratory), (SATELLITES, Photography),
CARD ALERT: 501, 504, 481, 655
Changing priorities within the Department of the Interior in the last few years are causing the department's US Geological Survey to shift from a research orientation to an emphasis on applications of technology. An example of that metamorphosis is the USGS Denver, Colo. , Exploration Research Branch, where scientists are redirecting their efforts from research in ore-finding methods to application of available technology for rapid evaluation of mineral resources on Federal lands. Nevertheless, USGS scientists still manage to pursue a wide array of research activities. Some of the studies under way, from Maine to Alaska, are highlighted here: soil gas, including mercury and the halogens, to detect concealed mineralization; geochemical dispersion patterns, to extend known lead-silver resources and to identify potential resources in the Coeur d'Alene mining district of Idaho; plants growing in stream channels, to sample ground water inexpensively; satellite and fixed-wing aircraft surveys over vegetated terrain, to target geochemically stressed plants.

RS77-2-601

ID NO.- EI770532014 732014
LINEAMENTS AND TECTONISM IN THE NORTHERN PART OF THE MISSISSIPPI EMBAYMENT.

O'Leary, Dennis; Simpson, Shirley
US Geol Surv, Denver, Colo
Proc of the Int Symp on Remote Sensing of Environ, 10th, Ann Arbor, Mich, Oct 6-10 1975 Publ by Environ Res Inst of Mich, Cent for Remote Sensing Inf and Anal, Ann Arbor, 1975 v 2 p 965-973
DESCRIPTORS: (*GEOLOGY, *Geomorphology), (REMOTE SENSING, Applications),
IDENTIFIERS: LANDSAT IMAGERY, SIDE-LOOKING AIRBORNE RADAR, SKYLAB
CARD ALERT: 481, 716, 742
A study of LANDSAT images, SLAR image strips, and Skylab photographs reveals a tectonically significant landscape pattern at the northern end of the Mississippi embayment. Of chief geologic significance in the area are various structurally controlled, straight linear features. These features have a bearing on the alluvial part of the embayment, where structure is not observable at the surface. The lineament pattern indicates that this part of the embayment is dominated by block-faulted structures which have been surrounded and partly buried by Pleistocene sediments. Major lineaments intersect at the north end of the embayment, where a complex pattern of faulting is present.

RS77-2-602

ID NO.- EI770638902 738902
USE OF INFRARED IMAGERY IN BANK-STORAGE STUDIES.
Thompson, T. H.
J Res US Geol Surv v 5 n 1 jan-Feb 1977 p 1-10 CODEN: JRGSAW
DESCRIPTORS: (*DAMS, *Seepage), INFRARED IMAGING, (LAKES, Bank Protection),
CARD ALERT: 441, 741, 407, 444, 442
The use of thermal infrared imagery as a reconnaissance tool to identify bank seepage was investigated at Franklin D. Roosevelt Lake in northeastern Washington. The existence of a significant amount of bank storage was suspected. An airborne scanner having a spectral coverage of 8.5 to 11 micrometers and continuous filmstrip output was used in two test flights of March 27 and April 24, 1973. These flights were made during the reservoir drawdown when ground water flow was from the banks to the reservoir and the ground water was warmer than the lake. The imagery shows temperatures in the lake ranging from 5 $degree$ to 13 $degree$ C. the lighter tones of the imagery show lake circulation patterns and extensive areas of bank seepage, spring discharge, stream inflow, and subsurface discharge which are all distinguishable from the darker tones of the colder lake surface. Bank seepage and ground water discharge generally are evident where unconsolidated glacial sediment rather than bedrock is present. 16 refs.

RS77-2-603

ID NO.- EI770750352 750352
ANALYSIS OF FRACTURES AND FISSURE VEIN MINERALIZATION TRENDS IN THE DRAKE VOLCANICS, NEW SOUTH WALES, AUSTRALIA.
Shephe $minus$ x
Trans Inst Min Metall Sect B v 86 Feb 1977 p B9-B16 CODEN: TIAEA7
DESCRIPTORS: (*MINERAL EXPLORATION, *Australia), (GEOLOGY, Australia), (SATELLITES, Photography), (ORE DEPOSITS, Australia), (GEOCHEMISTRY, Volcanic Rocks), AERIAL PHOTOGRAPHY
CARD ALERT: 501, 481, 655, 504, 742
Product moment and Spearman's rank correlation coefficients are used to measure the correlation of trends between mineralized fractures observed in the field and lineaments observed from aerial photography and Landsat-1 imagery. At one highly mineralized locality (Mount Carrington), field observations show that an agglomerate neck bounded by early arcuate fractures is crossed by later fractures and intersections are loci for mineralization. The later fractures in the volcanics are observed as one of several drainage alignments on aerial photographs and Landsat-1 imagery, and also occur in the granites of the adjacent New England batholith. The results indicate that copper-zinc-gold fissure veins in the Drake volcanics may be detected from aerial photographs and to a lesser extent from Landsat-1 imagery. 41 refs.

RS77-2-604

ID NO.- EI770533106 733106
MAPPING IN THE CRATERS OF THE MOON VOLCANIC FIELD, IDAHO WITH LANDSAT (ERTS) IMAGERY.
Lefebvre, Richard H.
US Geol Surv, EROS Program Off, Reston, Va
Proc of the Int Symp on Remote Sensing of Environ, 10th, Ann Arbor, Mich, Oct 6-10 1975 Publ by Environ Res Inst of Mich, Cent for Remote Sensing Inf and Anal, Ann Arbor, 1975 v 2 p 951-963
DESCRIPTORS: *MAPS AND MAPPING, REMOTE SENSING, GEOLOGICAL SURVEYS, IMAGE PROCESSING,
IDENTIFIERS: LANDSAT DATA
CARD ALERT: 405, 481, 741
Lava flows in the area show significant radiance variation on the imagery. The radiance surface roughness, surface chemistry and mineralogy, and surface cover. Preliminary mapping has been conducted using digital LANDSAT imagery in conjunction with analysis of aerial photographs and field observations. Digital processing of these radiance variations provides investigators with a broad regional and multispectral perspective for geologic mapping of Holocene flows. The lack of accessibility and the predominance of miner features, such as flow units, make the Craters of the Moon (COM) area and others like it difficult areas to study. The paper describes the various kinds of geological information and maps that have been obtained. Refs.

RS77-2-605

ID NO.- EI770532008 732008
ENHANCEMENT OF GEOLOGIC FEATURES NEAR MOJAVE, CALIFORNIA BY SPECTRAL BAND RATIONING OF LANDSAT MSS DATA.
Merifield, P. M.; Lamar, D. L.; Lamar, J. V.
Calif Earth Sci Corp, Santa Monica
Proc of the Int Symp on Remote Sensing of Environ, 10th, Ann Arbor, Mich, Oct 6-10 1975 Publ by Environ Res Inst of Mich, Cent for Remote Sensing Inf and Anal, Ann Arbor, 1975 v 2 p 1067-1075
DESCRIPTORS: (*GEOLOGY, *California), IMAGE PROCESSING, (REMOTE SENSING, Applications),
IDENTIFIERS: MULTISPECTRAL SCANNER DATA, LANDSAT DATA
CARD ALERT: 481, 741, 723
A number of geologic features are enhanced in spectral ratio images which include Band 4 of Landsat MSS data. Alluvial fans of different ages, which are indistinguishable in single spectral band images, are readily differentiated. Subtle differences in soil color, apparently due to variations in hydrous iron oxide content, are enhanced on the ratio images. Differences in the density and type of vegetation may also be reflected on the images. Other geologic features enhanced relative to their surroundings include an iron oxide gossan and a marble quarry. Calcareous and alkaline soils of low fertility are easily distinguished.

RS77-2-606

ID NO.- EI770532396 732396
HYDROLOGIC STUDIES IN ALASKA USING NOAA VHRR IMAGERY.
Seifert, R. D.; Kane, D. L.; Carlson, R. F.
Proc of the Int Symp on Remote Sensing of Environ, 10th, Ann Arbor, Mich, Oct 6-10 1975 Publ by Environ Res Inst of Mich. Cent for Remote Sensing Inf and Anal, Ann Arbor, 1975 v 2 p 1263-1272
DESCRIPTORS: *HYDROLOGY, RADIOMETERS, SNOW, REMOTE SENSING. INFRARED IMAGING,
IDENTIFIERS: SNOWMELT, VERY HIGH RESOLUTION RADIOMETER
CARD ALERT: 444, 471, 741
The National Oceanic and Atmospheric Administration (NOAA) satellites, operational for Alaska since February 28, 1974, have provided the opportunity to study synoptically the spring snowmelt period for both the 1974 and 1975 seasons. The on-board sensor of major interest for this study was the Very High Resolution Radiomater (VHRR). This sensor has a medium-range resolution of 0.9 km at nadir, and has a dual channel scanning radiometer which senses in both the visible and the thermal infrared. The imagery produced is nearly identical in coverage for both channels.

RS77-2-607

ID NO.- EI770536786 736786
WATER QUALITY INDICATORS OBTAINABLE FROM AIRCRAFT AND LANDSAT IMAGES AND THEIR USE IN CLASSIFYING LAKES.
Scherz, James P.; Van Domelen, John F.
Univ of Wis, Madison
Proc of the Int Symp on Remote Sensing of Environ, 10th, Ann Arbor, Mich, Oct 6-10 1975 Publ by Environ Res Inst of Mich, Cent for Remote Sensing Inf and Anal, Ann Arbor, 1975 v 1 p 447-460
DESCRIPTORS: *WATER RESOURCES, (REMOTE SENSING, Environmental Applications),
IDENTIFIERS: WATER QUALITY, LANDSAT IMAGERY
CARD ALERT: 444, 716, 742
For remote sensing of water quality when distilled water and a very clear, deep lake approaching distilled water are used as laboratory and field reflectance standards, it is possible to eliminate surface reflection and atmospheric effects. For other target lakes, the resulting residual radiance is due only to the material added to the pure water of these lakes. This material is what impairs water quality. The relative strength of the residual radiance at different wavelengths can be used to determine the type of material. The absolute strength of the radiance can be used to determine its concentration.

RS77-2-608

ID NO.- EI770534275 734275
AUTOMATISCHE HERTELLUNG EINER FEFAELLSTUFENKARTE. $left bracket$ Automatic Production of Terrain-slope Maps $right bracket$.
Stanger, W.
Univ Stuttgart, Ger
Bull Soc Fr Photogramm n 57 Jan 1975 p 34-41 CODEN: BFPGA5
DESCRIPTORS: *PHOTOGRAMMETRY,
CARD ALERT: 405, 742
A computer program for the automatic production of a terrain-slope map is presented. The program starts from the given height data of a regular grid (digital height model) and computes the slope values at the grid points, forming the digital slope model. A separate program interpolates lines of constant slope values (hypsoclines) from the digital slope model. The data for these lines are prepared for automatic plotting, together with the necessary cartographic symbols. 5 refs. In German with English abstract.

RS77-2-609

ID NO.- EI770532397 732397
INFRARED IMAGERY ANALYSIS OF THE SURFACE AND NEAR-SURFACE HYDROLOGY OF A GAS STORAGE FIELD IN GARRETT COUNTY, MARYLAND.
Fisher, Wilson Jr.
HRB-Singer, Inc, State College, Pa
Proc of the Int Symp on Remote Sensing of Environ, 10th, Ann Arbor, Mich, Oct 6-10 1975 Publ by Environ Res Inst of Mich, Cent for Remote Sensing Inf and Anal, Ann Arbor, 1975 v 2 p 1415-1426
DESCRIPTORS: *HYDROLOGY, INFRARED IMAGING, (GAS STORAGE, Underground), (REMOTE SENSING, Applications),
CARD ALERT: 444, 471, 741
The paper describes a study to identify, locate, and report the fracture traces, the surface, and the near-surface water over gas storage field thereby delineating those areas where drilling would not be advisable. This was accomplished by the utilization of airborne thermal infrared remote sensing and existing hydrogeologic information. The combination of this information led to the development of three basic maps to be used to guide the location of drillholes. The second map was a hydrologic feature map including springs, seeps, ponds, and streams. The third map was a ground water contour map developed from reported water well levels and data from the hydrologic feature. 12 refs.

RS77-2-610

ID NO.- EI770532568 732568
$left double quote$ HEAT CAPACITY MAPPING $right double quote$, IS IT FEASIBLE?
Rosema, Andries
NIWARS, Delft, Neth
Proc of the Int Symp on Remote Sensing of Environ, 10th, Ann Arbor, Mich, Oct 6-10 1975 Publ by Environ Res Inst of Mich, Cent for Remote Sensing Inf and Anal, Ann Arbor, 1975 v 1 p 571-582
DESCRIPTORS: (*INFRARED IMAGING, *Mathematical Models), (SOILS, Thermal Effects), GEOLOGICAL SURVEYS, REMOTE SENSING,
IDENTIFIERS: HEAT CAPACITY MAPPING, THERMAL INERTIA MAPPING, THERMAL MODELING
CARD ALERT: 741, 921, 483
The term $left double quote$ heat capacity mapping $right double quote$ has been borrowed from heat flow physics. It is better to speak of $left double quote$ thermal inertia mapping $right double quote$. Both terms refer to obtaining quantitative information on rock and soil properties by means of infrared line scanning, based on study of the transport processes involved, which study is frequently called $left double quote$ thermal modeling $right double quote$. The paper treats several stages of thermal modeling in an attempt to discover its essential components, to assay the present conception of thermal inertia mapping, and to suggest a possible approach to some of the questions raised. 10 refs.

RS77-2-611

ID NO.- EI770534043 734043
PHOTOGEOLOGICAL FRACTURE TRACE ANALYSIS AS A SUBSURFACE EXPLORATION TECHNIQUE.
Norman, J. W.
Imp Coll of Sci & Technol, London, Engl
Trans Inst Min Metall Sect B v 85 Feb 1976 p B52-B62
CODEN: TIAEA7
DESCRIPTORS: (*ORE DEPOSITS, *Exploration), (GEOLOGY, Photography), (PETROLEUM PROSPECTING, Photography), AERIAL PHOTOGRAPHY,
CARD ALERT: 504, 481, 742, 512
Existing information indicates that in some situations it is possible to detect geological structures concealed under transported superficial deposits or younger unconformable rocks from the distribution and patterns of surface traces of rock fractures on air photographs, even though the faulting and folding in the lower rocks appears to have ceased before the deposition of the covering materials. Some of the methods used to collect and analyse the data are briefly reviewed. The technique of fracture trace analysis can be used to detect the presence of concealed intrusive rocks (e. g. granites, carbonatites, salt plugs) sufficiently near the surface to impose their own stress pattern, as well as drape folds and buckle folds. Information obtained may also lead to an earlier understanding of the structural controls of some types of ore deposits. 39 refs.

RS77-2-612

ID NO.- EI770536800 736800
APPLIED REMOTE SENSING OF THE LOWER ATCHAFALAYA BASIN FLOODWAY.
Lewis, Anthony J.; Kim, Soon T.; Wilson, Robert T.; Monte, Judith A.; McDonald, Roy C.
La State Univ, Baton Rouge
Proc of the Int Symp on Remote Sensing of Environ, 10th, Ann Arbor, Mich, Oct 6-10 1975 Publ by Environ Res Inst of Mich, Cent for Remote Sensing Inf and Anal, Ann Arbor, 1975 v 2 p 1319-1328
DESCRIPTORS: (*WATER RESOURCES, *Management), AERIAL PHOTOGRAPHY, (REMOTE SENSING, Applications), (REGIONAL PLANNING, Land Use),
IDENTIFIERS: RESOURCE INVENTORIES
CARD ALERT: 444, 742, 741, 403
The paper discusses a resource inventory for the area to provide some of the data necessary for rational decision making. Remote sensing data (color, color infrared, and black and white infrared aerial film) were the primary data sources. Of the three types of aerial photographs, color infrared was judged the best for interpreting the various facets of the resource inventory. The results are presented in the form of five 1/62,500 scale maps covering vegetation, soils, water quality, canals and aquatics, and land use and a sequence of accretion maps from 1917 to 1972.

RS77-2-613

ID NO.- EI770532004 732004
CORRELATION BETWEEN GROUND METAL ANALYSIS, VEGETATION REFLECTANCE, AND ERTS BRIGHTNESS OVER A MOLYBDENUM SKARN DEPOSIT, PINE NUT MOUNTAINS, WESTERN NEVADA.
Lyon, R. J. P.
Stanford Remote Sensing Lab, Calif
Proc of the Int Symp on Remote Sensing of Environ, 10th, Ann Arbor, Mich, Oct 6-10 1975 Publ by Environ Res Inst of Mich. Cent for Remote Sensing Inf and Anal, Ann Arbor, 1975 v 2 p 1031-1044
DESCRIPTORS: *GEOLOGY, (REMOTE SENSING, Applications), MINERAL EXPLORATION.
IDENTIFIERS: VEGETATION REFLECTANCE, ERTS DATA
CARD ALERT: 481, 741, 501, 821
The paper reports on a study through which it has been possible to detect a 2. 0 by 1 mile anomaly on ERTS data directly, in the pine- and juniper-covered mountains of western Nevada. This anomalous area is about 3-5 times larger than that of the known geobotanical anomaly which lies centrally within the area. The site has been studied on the ground and bi-directional reflectances obtained for 40 trees, using both in-vivo techniques and field determinations of cut branches. Refs.

RS77-2-614

ID NO.- EI770752160 752160
HYDROGEOLOGICAL APPLICATIONS OF EARTH RESOURCES TECHNOLOGY SATELLITE LANDSAT I IMAGERY.
Charron, J. E.
Can Inland Waters Branch Sci Ser n 62 1976 21 p CODEN: CIWSA6
DESCRIPTORS: (*SATELLITES, *Imaging Techniques), HYDROLOGY,
IDENTIFIERS: HYDROGEOLOGY
CARD ALERT: 655, 444, 471
A correlation of LANDSAT I imagery with various hydrogeological and surficial geology features in the Winnipeg area, Manitoba, and the Ottawa (Ontario) SEM DASH$ Montreal (Quebec) area of Canada is presented. The study includes the identification of groundwater recharge and discharge areas and artesian zones; areas of freshwater discharge into surface-water bodies; and the identification of mapping of various types of surficial deposits. 10 refs.

Section 3

AGRICULTURE AND FORESTRY

Soils Studies, Crop-disease Detection, Range Resources, Forest-fire Monitoring, Wildlife Studies

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RS77-3-154

N77-18535*# Clemson Univ., S C Dept of Horticulture.
CROP STATUS EVALUATIONS AND YIELD PREDICTIONS Final Report, 1 Apr. 1974 - 1 Oct. 1976
J R Haun 27 Sep 1976 76 p refs
(Contract NAS9-14006)
(NASA-CR-151180) Avail NTIS HC A05/MF A01 CSCL 02C

One phase of the large area crop inventory project is presented Wheat yield models based on the input of environmental variables potentially obtainable through the use of space remote sensing were developed and demonstrated By the use of a unique method for visually qualifying daily plant development and subsequent multifactor computer analyses, it was possible to develop practical models for predicting crop development and yield Development of wheat yield prediction models was based on the discovery that morphological changes in plants are detected and quantified on a daily basis, and that this change during a portion of the season was proportional to yield. Author

RS77-3-155

N77-21517*# California Univ., Berkeley. Space Sciences Lab
FORESTRY APPLICATIONS PROJECT/TIMBER RESOURCE. SAM HOUSTON NATIONAL FOREST INVENTORY AND DEVELOPMENT OF A SURVEY PLANNING MODEL Final Report, 15 Nov. 1974 - 31 Jul. 1976
Robert N Colwell 14 Jul. 1976 142 p refs
(Contract NAS9-14452)
(NASA-CR-151243, SSL-Ser-17-Issue-55) Avail. NTIS HC A07/MF A01 CSCL 02F

The Forestry Applications Project has been directed towards solving the problem of meeting informational needs of the resource managers utilizing remote sensing data sources including satellite data, conventional aerial photography, and direct measurement on the ground in such combinations as needed to best achieve these goals It is recognized that sampling plays an important role in generating relevant information for managing large geographic populations The central problem, therefore, is to define the kind and amount of sampling and the place of remote sensing data sources in that sampling system to do the best possible job of meeting the manager's informational needs. Author

RS77-3-156

N77-19557*# Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing
THE APPLICATION OF REMOTE SENSING TECHNOLOGY TO THE SOLUTION OF PROBLEMS IN THE MANAGEMENT OF RESOURCES IN INDIANA Semiannual Report, 1 Jun. - 30 Nov. 1976
R A Weismiller, Principal Investigator and R P. Mroczynski 1977 71 p refs Original contains imagery Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S D 57198 ERTS
(Grant NGL-15-005-186)
(E77-10124; NASA-CR-149867) Avail: NTIS HC A04/MF A01 CSCL 05A

The author has identified the following significant results The Lydich quadrangle area was successfully classified into seven cover types: (1) trees, (2) poorly drained soil and water, (3) pasture land, (4) well drained brown soil, (5) moderately well drained dark brown soil, (6) moderately drained soil, and (7) medium to poorly drained soil Measurements of the percent of mapping unit represented by a named soil series range from 44 to 55 percent. If the class identified as vegetation is combined with the named unit, the range increases from 54 to 64 percent The Xenia mapping unit was the only unit represented by less than 50 percent of the named unit Results from the intensive tent moth study in Owensburg and Williams were interpreted from 70 mm color infrared and visually transferred to maps A correction factor was necessary, because the date the sample photography was taken was a month later than the intensive site data (CF x acres defoliated in each level = expanded defoliated acres).

RS77-3-157

N77-21514*# Army Cold Regions Research and Engineering Lab., Hanover, N. H.
LAND USE AND POLLUTION PATTERNS ON THE GREAT LAKES Final Report, Apr. 1972 - Mar. 1975
R. K. Haugen, Principal Investigator, H. L. McKim, and T. L. Marlar Mar 1975 258 p refs Sponsored by NASA Original contains imagery Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S D. 57198 ERTS
(E77-10148; NASA-CR-152641) Avail NTIS HC A12/MF A01 CSCL 08B

The author has identified the following significant results. The final mapping of the large watersheds of the Manitowoc and the Oconto was done using the 25% sampling approach Comparisons were made with earlier strip mapping efforts of the Oconto and Manitowoc watersheds. Regional differences were noted. Strip mapping of the Oconto resulted in overestimation of the amount of agricultural land compared to the random sampling method For the Manitowoc, the strip mapping approach produced a slight underestimate of agricultural land, and an overestimate of the forest category.

RS77-3-158

N77-21537# Netherlands Interdepartmental Working Group on the Application of Remote Sensing, Delft.
REFLECTION SPECTRA OF SOME SOIL SAMPLES IN THE NETHERLANDS, DETERMINED WITH THE NIWARS FIELD SPECTROMETER [REFLECTIESPECTRA VAN ENIGE NEDERLANDSE BODEMMONSTERS BEPAALD MET DE NIWARS - VELDSPECTROMETER]
A R. P. Janse and N. J. J Bunnik Jul. 1974 32 p refs In DUTCH
(NIWARS-Publ-18) Avail: NTIS HC A03/MF A01

Spectral reflection of different soil samples was investigated using the NIWARS visible light and infrared fieldspectrometer. The effect of the aggregate size was not significant for samples with a fine texture The influence of moisture content was appreciable both in visible light and in the infrared. The reflection spectrum method was found to be useful for the determination of soil characteristics. ESA

RS77-3-159

N77-20544*# National Aeronautics and Space Administration Lyndon B. Johnson Space Center, Houston Tex
LARGE AREA CROP INVENTORY EXPERIMENT (LACIE). RESULTS OF LACIE INTEGRATED DROUGHT ANALYSIS (SOUTHERN U.S. GREAT PLAINS DROUGHT 1975-76)
David R Thompson Jul 1976 76 p
(NASA-TM-X-74640, LACIE-00424, JSC-11336) Avail NTIS HC A05/MF A01 CSCL 04A

The development and intensification of the drought in the United States southern Great Plains was monitored during the initial growing period of the 1975-76 winter wheat crop Because of the severity of the drought conditions, a drought analysis plan was developed and implemented beginning on March 8, 1976. Sample segments and full-frame imagery were used at 9-day intervals to identify the drought area and quantify the effects on the wheat acreage Yield model simulations were run to extrapolate the effects of the drought on yield estimates at harvest assuming 10 and 90 percent of normal rainfall for subsequent months and 30-day forecast A survey of LANDSAT data for improvement of distribution of rainfall patterns in the drought area was done for April and yield models run for drought affected crop reporting districts Special aggregations were performed by the Crop Assessment Subsystem on the drought area to evaluate the utility of remote sensing to monitor the effect of the drought on wheat area, yield, and production GRA

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RS77-3-160

N77-22579*# Bureau of Land Management, Denver, Colo
A LANDSAT STUDY OF EPHEMERAL AND PERENNIAL RANGELAND VEGETATION AND SOILS Final Report, 1 Mar. 1975 - 1 Dec. 1976
R. Gordon Bentley, Jr., Principal Investigator, Bette C. Salmon-Drexler, William J Bonner, and Robert K. Vincent 1 Dec. 1976 244 p refs Original contains color imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S D. 57198 ERTS
(NASA Order S-53966-A)
(E77-10150; NASA-CR-152650, YA-300-1700-1012) Avail. NTIS HC A11/MF A01 CSCL 08F

The author has identified the following significant results. Several methods of computer processing were applied to LANDSAT data for mapping vegetation characteristics of perennial rangeland in Montana and ephemeral rangeland in Arizona The choice of optimal processing technique was dependent on prescribed mapping and site condition Single channel level slicing and ratioing of channels were used for simple enhancement. Predictive models for mapping percent vegetation cover based on data from field spectra and LANDSAT data were generated by multiple linear regression of six unique LANDSAT spectral ratios. Ratio gating logic and maximum likelihood classification were applied successfully to recognize plant communities in Montana. Maximum likelihood classification did little to improve recognition of terrain features when compared to a single channel density slice in sparsely vegetated Arizona. LANDSAT was found to be more sensitive to differences between plant communities based on percentages of vigorous vegetation than to actual physical or spectral differences among plant species.

RS77-3-161

N77-17549*# Texas A&M Univ, College Station. Remote Sensing Center.
REMOTE SENSING OF ST. AUGUSTINE DECLINE (SAD) DISEASE
William Claude Odle Aug. 1976 177 p refs
(Grant NGL-44-001-001)
(NASA-CR-149586, TR-RSC-77) Avail NTIS HC A09/MF A01 CSCL 02C

Laboratory and field spectral reflectance measurements of healthy and infected St. Augustine grass were made using several different instruments Spectral differences between healthy and infected grass occured in the visible and near infrared regions. Multiband and color infrared photographs were taken of healthy and diseased turf from ground-based platforms and low altitude aircraft. Qualitative (density slicing) and quantitative (transmission densitometry) analyses revealed distinct tonal differences between healthy and St Augustine disease (SAD) infected grass Similar experiments are described for determining if healthy and diseased grass can be distinguished from waterstressed grass and grass deficient in either nitrogen or iron. Author

RS77-3-162

N77-22574*# Jet Propulsion Lab, Calif. Inst. of Tech, Pasadena.
JPL FIELD MEASUREMENTS AT THE FINNEY COUNTY, KANSAS, TEST SITE, OCTOBER 1976: METEOROLOGICAL VARIABLES, SURFACE REFLECTIVITY, SURFACE AND SUBSURFACE TEMPERATURES
Anne B Kahle, John Schneidge, and Helen N. Paley 1 Feb. 1977 62 p refs
(Contract NAS7-100)
(NASA-CR-152675; JPL-Publ-77-1) Avail: NTIS HC A04/MF A01 CSCL 08F

Data collected at the Finney County, Kansas test site as part of the Joint Soil Moisture Experiment (JSME) are presented here, prior to analysis, to provide all JSME investigators with an immediate source of primary information The ground-truth measurements were taken to verify and complement soil moisture data taken by microwave and infrared sensors during aircraft overflights Measurements were made of meteorological variables (air speed, temperature, relative humidity, and rainfall), surface reflectivity, and temperatures at and below the surface. Author

RS77-3-163

N77-21505*# Delaware Univ., Newark. Center for Remote Sensing
VARIABILITY OF WETLAND REFLECTANCE AND ITS EFFECT ON AUTOMATIC CATEGORIZATION OF SATELLITE IMAGERY
V. Klemas, Principal Investigator and D. Bartlett 10 Jan. 1977 2 p ERTS
(Contract NAS5-20983)
(E77-10139; NASA-CR-152633) Avail: NTIS HC A02/MF A01 CSCL 05B

The author has identified the following significant results Land cover categorization of data from the same overpass in four test wetland areas was carried out using a four category classification system. The tests indicate that training data based on in situ reflectance measurements and atmospheric correction of LANDSAT data can produce comparable accuracy of categorization to that achieved using more than four wetlands cover categories (salt marsh cordgrass, salt hay, unvegetated, and water tidal flat) These data produced overall classification accuracies of 85% by conventional and relative radiance training and 81% by use of in situ measurements. Overall mapping accuracies were 76% and 72% respectively

RS77-3-164

N77-21528*# National Aeronautics and Space Administration Goddard Space Flight Center, Greenbelt, Md
AN ESTIMATE OF FIELD SIZE DISTRIBUTIONS FOR SELECTED SITES IN THE MAJOR GRAIN PRODUCING COUNTRIES
Melvin H. Podwysocki Apr. 1977 39 p
(NASA-TM-X-71288, X-923-76-93) Avail. NTIS HC A03/MF A01 CSCL 02C

The field size distributions for the major grain producing countries of the World were estimated LANDSAT-1 and 2 images were evaluated for two areas each in the United States, People s Republic of China, and the USSR One scene each was evaluated for France, Canada, and India Grid sampling was done for representative sub-samples of each image, measuring the long and short axes of each field; area was then calculated Each of the resulting data sets was computer analyzed for their frequency distributions Nearly all frequency distributions were highly peaked and skewed (shifted) towards small values, approaching that of either a Poisson or log-normal distribution The data were normalized by a log transformation, creating a Gaussian distribution which has moments readily interpretable and useful for estimating the total population of fields. Resultant predictors of the field size estimates are discussed. Author

RS77-3-165

N77-18528*# Lockheed Electronics Co, Houston, Tex Aerospace Systems Div
A NEW IMAGE ENHANCEMENT ALGORITHM WITH APPLICATIONS TO FORESTRY STAND MAPPING
Edwin P. F. Kan, Principal Investigator and Jinn-Kai Lo Jun. 1975 48 p refs Original contains imagery Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S D. 57198 EREP
(Contract NAS9-12200)
(E77-10115, NASA-CR-150915; LEC-6178; JSC-09695) Avail NTIS HC A03/MF A01 CSCL 02F

The author has identified the following significant results. Results show that the new algorithm produced cleaner classification maps in which holes of small predesignated sizes were eliminated and significant boundary information was preserved These cleaner post-processed maps better resemble true life timber stand maps and are thus more usable products than the pre-post-processing ones Compared to an accepted neighbor-checking post-processing technique, the new algorithm is more appropriate for timber stand mapping

RS77-3-166

N77-18531*# Lockheed Electronics Co., Houston, Tex Aerospace Systems Div
TRI-COUNTY PILOT STUDY
C A. Reeves, Principal Investigator, T W. Austin, and A. G Kerber Jul 1976 90 p refs Original contains color imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D 57198 EREP
(Contract NAS9-12200)
(E77-10118; NASA-CR-147887; LEC-8657; JSC-11473) Avail: NTIS HC A05/MF A01 CSCL 08F

The author has identified the following significant results An area inventory was performed for three southeast Texas counties (Montgomery, Walker, and San Jacinto) totaling 0.65 million hectares The inventory was performed using a two level hierarchy. Level 1 was divided into forestland, rangeland, and other land Forestland was separated into Level 2 categories: pine, hardwood, and mixed, rangeland was not separated further. Results consisted of area statistics for each county and for the entire study site for pine, hardwood, mixed, rangeland, and other land Color coded county classification maps were produced for the May data set, and procedures were developed and tested.

RS77-3-167

N77-19564*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md
SOIL MOISTURE SENSING WITH AIRCRAFT OBSERVATIONS OF THE DIURNAL RANGE OF SURFACE TEMPERATURE
T Schmugge, B. Blanchard (Tex A&M Univ.), A. Anderson, and V Wang (Lockheed Elec Co., Inc., Houston) Jan 1977 23 p refs
(NASA-TM-X-71274, X-913-77-13) Avail: NTIS HC A02/MF A01 CSCL 08H

Aircraft observations of the surface temperature were made by measurements of the thermal emission in the 8-14 micrometers band over agricultural fields around Phoenix, Arizona The diurnal range of these surface temperature measurements were well correlated with the ground measurement of soil moisture in the 0-2 cm layer The surface temperature observations for vegetated fields were found to be within 1 or 2 C of the ambient air temperature indicating no moisture stress These results indicate that for clear atmospheric conditions remotely sensed surface temperatures are a reliable indicator of soil moisture conditions and crop status Author

RS77-3-168

N77-17544*# Purdue Univ., Lafayette, Ind. Lab for Applications of Remote Sensing.
CROP IDENTIFICATION AND AREA ESTIMATION OVER LARGE GEOGRAPHIC AREAS USING LANDSAT MSS DATA Final Report, 25 Mar. 1975 - 24 Sep. 1976
Marvin E Bauer, Principal Investigator Jan. 1977 174 p refs Original contains color imagery Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S D. 57198 ERTS
(Contract NAS5-20793)
(E77-10094; NASA-CR-149577; LARS-TR-012477) Avail: NTIS HC A08/MF A01 CSCL 02C

The author has identified the following significant results LANDSAT MSS data was adequate to accurately identify wheat in Kansas; corn and soybean estimates in Indiana were less accurate. Computer-aided analysis techniques were effectively used to extract crop identification information from LANDSAT data. Systematic sampling of entire counties made possible by computer classification methods resulted in very precise area estimates at county, district, and state levels Training statistics were successfully extended from one county to other counties having similar crops and soils if the training areas sampled the total variation of the area to be classified

RS77-3-169

N77-18521*# Alaska Univ., Fairbanks, Inst. of Arctic Biology
ON VEGETATION MAPPING IN ALASKA USING LANDSAT IMAGERY WITH PRIMARY CONCERNS FOR METHOD AND PURPOSE IN SATELLITE IMAGE-BASED VEGETATION AND LAND-USE MAPPING AND THE VISUAL INTERPRETATION OF IMAGERY IN PHOTOGRAPHIC FORMAT Final Report, 1 Aug. 1972 - 30 Apr. 1975
J. H Anderson, Principal Investigator Oct 1976 195 p refs Original contains imagery Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S D. 57198 ERTS
(Contract NAS5-21833)
(E77-10105; NASA-CR-149591) Avail, NTIS HC A09/MF A01 CSCL 08F

The author has identified the following significant results. A simulated color infrared LANDSAT image covering the western Seward Peninsula was used for identifying and mapping vegetation by direct visual examination The 1:1,083 400 scale print used was prepared by a color additive process using positive transparencies from MSS bands 4, 5, and 7. Seven color classes were recognized A vegetation map of 3200 sq km area just west of Fairbanks, Alaska was made Five colors were recognized on the image and identified to vegetation types roughly equivalent to formations in the UNESCO classification: orange - broadleaf deciduous forest; gray - needleleaf evergreen forest; light violet - subarctic alpine tundra vegetation, violet - broadleaf deciduous shrub thicket, and dull violet - bog vegetation

RS77-3-170

N77-19558*# Alabama Univ., University Dept of Geology and Geography.
USE OF REMOTE SENSING TECHNIQUES FOR GEOLOGICAL HAZARD SURVEYS IN VEGETATED URBAN REGIONS Final Report, 1 Jul. 1973 - 30 Jun. 1976
Stephen H Stow, Rex C. Price, Fred Hoehner, and Charles Wielchowsky Jun 1976 170 p refs
(Contract NAS8-29937)
(NASA-CR-150196) Avail: NTIS HC A08/MF A01 CSCL 08G

The feasibility of using aerial photography for lithologic differentiation in a heavily vegetated region is investigated using multispectral imagery obtained from LANDSAT satellite and aircraft-borne photography. Delineating and mapping of localized vegetal zones can be accomplisned by the use of remote sensing because a difference in morphology and physiology results in different natural reflectances or signatures An investigation was made to show that these local plant zones are affected by altitude, topography, weathering, and gullying; but are controlled by lithology Therefore, maps outlining local plant zones were used as a basis for lithologic map construction Author

RS77-3-171

N77-18540*# Scientific Translation Service, Santa Barbara, Calif.
RESULTS OF INVESTIGATIONS OF THE MOISTURE OF SOILS BY THE SUPERHIGH FREQUENCY RADIOMETRIC METHOD (A PROJECT REPORT OF THE SOVIET-AMERICAN WORKING GROUP)
A Ye Basharinov and A M. Shutko Washington NASA Feb 1977 12 p refs Transl into ENGLISH of "Itogi issledovaniy vlazhnosti gruntov SVCh radiometricheskim metodom (Proyekt otcheta sovetsko-amerikanskoy rabochey gruppy)" (unpublished work) Moscow, Acad. of Sciences USSR, Inst of Radio Engineering and Electronics, 1976 p 1-11
(Contract NASw-2791)
(NASA-TT-F-17522) Avail NTIS HC A02/MF A01 CSCL 08M

Research in the U S A. and the U S S R has established important properties of the superhigh frequency radiometric method of determining the moisture in soils The theoretical, laboratory, field, and aircraft investigations are described Author

RS77-3-172

N77-19553*# Kansas Univ. Center for Research, Inc., Lawrence. Remote Sensing Lab
SEASONAL VARIATIONS OF THE MICROWAVE SCATTERING PROPERTIES OF DECIDUOUS TREES AS MEASURED IN THE 1-18 GHz SPECTRAL RANGE
Fawwaz T. Ulaby, Principal Investigator, T. Bush, T. Metzler, and H. Stiles Jun. 1976 47 p refs EREP
(Contract NAS9-10261)
(E77-10120; NASA-CR-151174, RSL-TR-177-60) Avail. NTIS HC A03/MF A01 CSCL 20N

The author has identified the following significant results. Employing two FM-CW radar spectrometers, scattering data were acquired from stands of deciduous trees during the spring and autumn. The data suggest that the trees act as a volume scatter target particularly in the 7-18 GHz region. A comparison of data collected in spring and autumn indicates that the radar scattering coefficient, sigma deg, as measured in spring can be substantially larger (as much as 10 dB) than sigma deg as measured in the autumn.

RS77-3-173

N77-17541*# Pennsylvania State Univ., University Park. Office for Remote Sensing of Earth Resources.
RECONNAISSANCE MAPPING FROM AERIAL PHOTOGRAPHS
H. A. Weeden and N. B. Bolling, Principal Investigators Aug. 1975 21 p refs ERTS
(Contracts NAS5-23133, NAS9-13406)
(E77-10088; NASA-CR-149571, ORSER-SSEL-TR-17-75) Avail: NTIS HC A02/MF A01 CSCL 08B

The author has identified the following significant results. Engineering soil and geology maps were successfully made from Pennsylvania aerial photographs taken at scales from 1:4,800 to 1:60,000. The procedure involved a detailed study of a stereoscopic model while evaluating landform, drainage, erosion, color or gray tones, tone and texture patterns, vegetation, and cultural or land use patterns.

RS77-3-174

N77-18533*# A & M Associates, Lanham, Md
ON THE REMOTE MEASUREMENT OF EVAPORATION RATES FROM BARE WET SOIL UNDER VARIABLE CLOUD COVER Final Report, Nov. 1975 - Nov. 1976
Siegfried Auer [Nov. 1976] 41 p refs
(Contract NAS5-22815)
(NASA-CR-152429) Avail. NTIS HC A03/MF A01 CSCL 08M

Evaporation rates from a natural wet soil surface are calculated from an energy balance equation at 0.1-hour intervals. A procedure is developed for calculating the heat flux through the soil surface from a harmonic analysis of the surface temperature curve. The evaporation integrated over an entire 24-hour period is compared with daily evaporation rates obtained from published models.
Author

RS77-3-175

N77-22577*# Atomic Energy Commission, Dacca (Bangladesh).
INVESTIGATIONS USING DATA FROM LANDSAT-2 Quarterly Report, Oct. - Dec. 1976
Anwar Hossain, Principal Investigator Feb 1977 4 p refs Sponsored by NASA ERTS
(E77-10138; NASA-CR-152632) Avail: NTIS HC A02/MF A01 CSCL 05B

The author has identified the following significant results. New lands for forestation were set aside in the coastal area of Bangladesh, based on LANDSAT mosaics (Chittagong - 195,000 acres, Noakhali - 450,000 acres, Barisal - 350,000 acres, and Patuakhali - 225,000 acres). LANDSAT imageries were used for identification of drainage patterns in both the old and and new Comilla district.

RS77-3-176

A77-31209 Asymptotic nature of grass canopy spectral reflectance. C. J. Tucker. *Applied Optics*, vol. 16, May 1977, p. 1151-1156. 15 refs. NSF Grants No. GB-31862X2; No. GB-41233X; No. BMS-73-02027A02, No. DEB-73-02027A03

The asymptotic nature of grass canopy spectral reflectance has been evaluated from field experimental data collected over the wavelength region of 0.500-1.000 micron at 0.005-micron intervals. The spectral reflectance of green vegetation against a soil background decreases in regions of absorption and increases in regions of minimal or no absorption as the vegetational density increases until a stable or unchanging spectral reflectance, called the asymptotic spectral reflectance, is reached. Results indicated that spectral reflectance asymptotes occurred at significantly lower levels of total wet biomass, total dry biomass, dry green biomass, chlorophyll content, and leaf water content in regions of strong pigment absorption (low detectability threshold) than in the photographic IR region where absorption was at a minimum (high detectability threshold). These findings suggested that photographic IR sensors were more suited to remote sensing of moderate to high biomass levels or vegetational density in a grass canopy than were sensors operating in regions of the spectrum where strong absorption occurred. (Author)

RS77-3-177

A77-25240 * Leaf optical system modeled as a stochastic process. C. J. Tucker (NASA, Goddard Space Flight Center, Earth Resources Branch, Greenbelt, Md.) and M. W. Garratt (U.S. Bureau of Land Management, Office of Scientific Systems Development, Denver, Colo.). *Applied Optics*, vol. 16, Mar. 1977, p. 635-642. 26 refs. NSF Grant No. BMS-73-02027A02.

A stochastic leaf radiation model based upon physical and physiological properties of dicot leaves has been developed. The model accurately predicts the absorbed, reflected, and transmitted radiation of normal incidence as a function of wavelength resulting from the leaf-irradiance interaction over the spectral interval of 0.40-2.50 micron. The leaf optical system has been represented as Markov process with a unique transition matrix at each 0.01-micron increment between 0.40 micron and 2.50 micron. Probabilities are calculated at every wavelength interval from leaf thickness, structure, pigment composition, and water content. Simulation results indicate that this approach gives accurate estimations of actual measured values for dicot leaf absorption, reflection, and transmission as a function of wavelength. (Author)

RS77-3-178

A77-29492 Spectral estimation of grass canopy variables. C. J. Tucker. *Remote Sensing of Environment*, vol. 6, no. 1, 1977, p. 11-26. 20 refs. NSF Grants No. GB-31862X2; No. GB-41233X, No. BMS-73-02027A02, No. DEB-73-02027A03

Regression analysis of in-situ spectral reflectance of a blue grama grass canopy sampled with approximately equal amounts of standing live and standing dead vegetation has identified spectral regions between 0.35 and 0.80 micron where the total wet biomass, total dry biomass, and leaf water content can be spectrally estimated. The amount of total wet or dry biomass was best estimated in the 0.35-0.44 micron region of the spectrum. This resulted from a combination of a relatively greater carotenoid than chlorophyll retention in the recent standing dead vegetation and of carotenoid and chlorophyll pigments present in the photosynthetically active or live vegetation. The leaf water content, highly related to the amount of photosynthetically active vegetation present, was best estimated in the 0.46-0.50, 0.63-0.69, and 0.74-0.80 micron regions. This resulted from strong chlorophyll absorption in the 0.46-0.50 and 0.63-0.69 micron region and the high reflectance of living vegetation in the 0.74-0.80 micron region. (Author)

RS77-3-179

A77-31563 Densitometric methods of processing remote sensing data, with special reference to crop-type and terrain studies. E. S Owen-Jones (Bedford College, London, England) In: Environmental remote sensing 2: Practices and problems. (A77-31556 13-43) London, Edward Arnold (Publishers), Ltd , 1977, p. 101-124. 8 refs. Research supported by the Department of Industry and Ministry of Defence (Procurement Executive).

Quantitative measurements of the tonal values in the film are required for the identification of the surface cover of a scene with the aid of computer processing The densitometers for conducting these measurements include the rotating drum scanner, the flying-spot scanner, and the flat-bed machine. Film properties and requirements are discussed and the principles of densitometry are examined The application of classification techniques to agricultural and natural terrain areas is considered, giving attention to a crop-type analysis and the classification of natural terrain. G.R.

RS77-3-180

A77-27849 * # A field evaluation of small-scale forest resource aerial photography. J. Marshall and J Meyer (Minnesota, University, St. Paul, Minn.). In: American Society of Photogrammetry, Annual Meeting, 43rd, Washington, D.C., February 27-March 5, 1977, Proceedings. (A77-27826 11-43) Falls Church, Va., American Society of Photogrammetry, 1977, p. 460-469. Research supported by the McIntire-Stennis Cooperative Forestry Research Program, University of Minnesota and NASA. (ASP 77-155)

An earlier study under somewhat clinical laboratory conditions has suggested the possibility of using smaller scales of forest photography without serious information loss The present paper subjects this idea to a rigorous field test by a number of experienced user cooperators. Various combinations of summer black-and-white infrared and color infrared aerial photography at scales of 1:15,840, 1:24,000, 1:31,680, and 1:80,000 were taken over forested portions of Minnesota. Major conclusions are that 1 15,840 is the preferred working photo scale, and that instead of 1:15,840 a scale of 1:20,000 is considered an acceptable substitute. S.D.

RS77-3-181

A77-27852 * # Airphoto assessment of changes in aquatic vegetation. B. L. Markham, W. R. Philipson, and A. E. Russel (Cornell University, Ithaca, N.Y.). In: American Society of Photogrammetry, Annual Meeting, 43rd, Washington, D.C , February 27-March 5, 1977, Proceedings. (A77-27826 11-43) Falls Church, Va., American Society of Photogrammetry, 1977, p. 504-516. 8 refs. Research supported by the U S. Department of the Interior; Grant No. NGL-33-010-171. (ASP 77-162)

Large scale, multiyear, color and color infrared aerial photographs were used to evaluate changes in aquatic vegetation that have accompanied a reduction in phosphorus inputs to a phosphorus-limited, eutrophic lake in New York State. The study showed that the distribution of emergent, floating and submersed vegetation could be determined with little or no concurrent ground data; that various emergent and floating types could be separated and, with limited field checks, identified; and that different submersed types are generally not separable. Major vegetative types are characterized by spectral and nonspectral features, and a classification is developed for compiling time-sequential vegetation maps. (Author)

RS77-3-182

A77-27853 * # An information system design for watershed-wide modeling of water loss to the atmosphere using remote sensing techniques. S, Khorram (California, University, Berkeley, Calif.). In: American Society of Photogrammetry, Annual Meeting, 43rd, Washington, D.C., February 27-March 5, 1977, Proceedings. (A77-27826 11-43) Falls Church, Va., American Society of Photogrammetry, 1977, p. 517-537. 21 refs. Grant No. NGL-05-003-404. (ASP 77-163)

Results are presented of a study intended to develop a general location-specific remote-sensing procedure for watershed-wide estimation of water loss to the atmosphere by evaporation and transpiration. The general approach involves a stepwise sequence of required information definition (input data), appropriate sample design, mathematical modeling, and evaluation of results. More specifically, the remote sensing-aided system developed to evaluate evapotranspiration employs a basic two-stage two-phase sample of three information resolution levels. Based on the discussed design, documentation, and feasibility analysis to yield timely, relatively accurate, and cost-effective evapotranspiration estimates on a watershed or subwatershed basis, work is now proceeding to implement this remote sensing-aided system. S.D.

RS77-3-183

A77-27055 Remote-sensing of crop yields. S. B. Idso, R. D. Jackson, and R. J. Reginato (U.S. Water Conservation Laboratory, Phoenix, Ariz.). *Science*, vol. 196, Apr. 1, 1977, p. 19-25. 15 refs.

A concept of stress degree day (SDD) is developed on the basis of emitted thermal radiation as parameter, and a sounder agronomic basis and greater pertinence to remote sensing are claimed for the approach. The concept, used in combination with acreage estimates as encountered in the Large Area Crop Inventory Experiment (LACIE) program, could support remote surveillance of crop production. Ground truth is derived from an experiment with durum wheat, described in detail. Crop yield estimates can be made from remotely sensed canopy temperatures and air temperature measurements during the period from the onset of head growth to its termination. Vegetative canopy albedo and interference from soil albedo are discussed, predictions of crop yields are considered, and nomograms for scheduling irrigations are mentioned. R.D.V.

RS77-3-184

A77-27830 # Variability of wetland reflectance and its effect on automatic categorization of satellite imagery. D. S Bartlett, V. Klemas (Delaware, University, Newark, Del.), R H. Rogers, and N. J. Shah (Bendix Corp., Aerospace Systems Div , Ann Arbor, Mich.). In: American Society of Photogrammetry, Annual Meeting, 43rd, Washington, D.C., February 27-March 5, 1977, Proceedings. (A77-27826 11-43) Falls Church, Va., American Society of Photogrammetry, 1977, p. 70-89. 8 refs (ASP 77-113)

The paper describes a technique for obtaining Landsat/MSS-equivalent spectral radiances in situ and the transformation of these and actual MSS data to atmospherically corrected reflectance values. The use of this information in training automated analysis of Landsat data over Delaware's tidal wetlands is discussed along with an evaluation of environmental sources of variation in visible/near IR reflectance properties of wetlands cover types. It is shown that training data based on in-situ reflectance measurements and atmospheric correction of Landsat data can produce categorization accuracy comparable to that achieved using more conventional relative radiance training. S.D.

RS77-3-185

A77-27844 # Wetlands mapping in New Jersey and New York. W. W. Brown (Earth Satellite Corp., Washington, D.C.). In: American Society of Photogrammetry, Annual Meeting, 43rd, Washington, D.C., February 27-March 5, 1977, Proceedings. (A77-27826 11-43) Falls Church, Va., American Society of Photogrammetry, 1977, p. 381-395. (ASP 77-145)

The wetlands of New Jersey and New York were recently mapped using 1:12,000 scale color and/or color infrared aerial photographs. In support of tidal wetlands legislation, a physical parameter, tidal frequency and extent was determined by using a biological entity - plant species. In New Jersey dominant plant species were identified on each map. In New York a broader classification system was used based on plant species categories such as coastal fresh marsh, high marsh, etc. (Author)

RS77-3-186

A77-25226 Likely effects of solar elevation on the quantification of changes in vegetation with maturity using sequential Landsat imagery. M. J. Duggin (Commonwealth Scientific and Industrial Research Organization, Div. of Mineral Physics, North Ryde, Australia). *Applied Optics*, vol. 16, Mar. 1977, p. 521-523. 11 refs.

Effects of solar elevation on reflectance factors of various species of vegetation are studied in satellite imagery and ground truth. Optical effects dominated by the geometry of the vegetative canopy can be ascribed to crop type, health, and maturity. Seasonal changes in vegetative cover reflectance are studied (including changes brought about by direct human interference - agricultural activities). Reflectance vs. solar elevation is studied in several separated passbands. Diurnal variation in reflectance is also given consideration. R.D.V.

RS77-3-187

AD-A037 821/6GA PC A21/MF A01
Rome Air Development Center Griffiss AFB N Y
Agricultural Crop Yield Prediction Utilizing Narrowband Multispectral, Temporally-Registered Imagery (A Feasibility Study's Technical Report and Recommendations).
Rept. for Jun 74-Jun 76,
Gregory B. Pavlin. Dec 76, 487p Rept no. RADC-TR-76-380
Original contains color plates: All DDC reproductions will be in black and white.

Descriptors: *Corn, *Pattern recognition, *Multispectral, *Plant growth, *Remote detectors, Photographic images, Narrowband, Yield, Agriculture, Plant pathology, Radiometry, Cameras, Photographic filters, Identification systems.
Identifiers: *Multispectral photography, Remote sensing, Pennsylvania.

Selected narrowband multispectral photography, dedicated to detecting levels of stress within corn, was collected regularly at low and high altitudes over eight large agricultural test sites in Central Pennsylvania during the period of April thru October of 1974. A spectroradiometry survey was conducted at the test sites during three intervals of the 1974 corn growth cycle to verify the selection of the multispectral camera system's filters. Superlative ground and image truth were collected regularly to supplement the multispectral photography of the test sites. After analyzing the multispectral photography with additive color analysis techniques, selected multispectral photography of three test sites, spanning the entire growth cycle, was digitized and registered, both spectrally and temporally, using the image processing resources of the Rome Air Development Center's Image Processing Facility. By analyzing the digital, temporally-registered, multispectral image data with weather and ground truth data, utilizing the techniques of multivariate and regression analysis, the feasibility of agricultural crop yield prediction was investigated.

RS77-3-188

PB-264 531/5GA PC A03/MF A01
Technicolor Graphic Services, Inc., Sioux Falls, S. Dak.
A Selected Bibliography: Remote Sensing Applications in Agriculture.
Final rept.,
William C. Draeger, and David T. McClelland.
1977, 36p* USGS-LI-77/004
Contract DI-14-08-0001-16439
See also PB-264 532.

Descriptors: *Bibliographies, *Remote sensing, *Agriculture, Spaceborne photography, Farm crops, Agronomy.

The bibliography contains nearly 300 citations of selected publications and technical reports dealing with the application of remote-sensing techniques to the collection and analysis of agricultural information. Most of the citations were published between January 1968 and December 1975, although some earlier works of continuing interest are included.

RS77-3-189

PB-264 532/3GA PC A03/MF A01
Technicolor Graphic Services, Inc., Sioux Falls, S. Dak.
A Selected Bibliography: Remote-Sensing Techniques Applied to the Collection and Analysis of Soils Information.
Final rept.,
William C. Draeger, and David T. McClelland. 16 Feb 77, 24p* USGS-LI-77/005
Contract DI-14-08-0001-16439
See also PB-264 531.

Descriptors: *Bibliographies, *Remote sensing, *Soil surveys, Soil science, Spaceborne photography, Soils.

The bibliography contains nearly 200 citations of selected publications and technical reports dealing with the application of remote-sensing techniques to the collection and analysis of soils information. Most of the citations were published between January 1968 and December 1975, although some earlier works of continuing interest are included.

RS77-3-190

E77-10076 PC A05/MF A01
Cornell Univ., Ithaca, N.Y. School of Civil and Environmental Engineering.
Engineering Analysis of LANDSAT 1 Data for Southeast Asian Agriculture.
Final rept.,
Arthur J. McNair, Howard L. Heydt, Ta Laing, and Gilbert Levine Nov 76, 83p NASA-CR-149442
Contract NAS5-21844
Original contains color imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Ave., Sioux Falls, S.D. 57198.

Descriptors: *Southeast Asia, Agriculture, Ground truth, *Rice, Irrigation, Philippines, Earth Resources program, Spectral signatures, Radiometers, Multispectral band scanners.
Identifiers: *Farm crops.

The author has identified the following significant results. LANDSAT spatial resolution was estimated to be adequate, but barely so, for the purpose of detailed assessment of rice or site status. This was due to the spatially fine grain, heterogenous nature of most rice areas. Use of two spectral bands of digital data (MSS 5 and MSS 6 or 7) appeared to be adequate for site recognition and gross site status assessment. Spectral/temporal signatures were found to be more powerful than spectral signatures alone and virtually essential for most analyses of rice growth and rice sites in the Philippine environment. Two band, two date signatures were estimated to be adequate for most purposes, although good results were achieved using one band and two- or four-date signatures. A radiometric resolution of 64 levels in each band was found adequate for the analyses of LANDSAT digital data for site recognition and gross site or rice growth assessment.

RS77-3-191

E77-10060 PC A05/MF A01
Environmental Research Inst. of Michigan, Ann Arbor. Infrared and Optics Div
Evaluation of Algorithms for Estimating Wheat Acreage from Multispectral Scanner Data.
Final rept. 15 May 75-14 May 76,
Richard F. Nalepka, Wyman Richardson, and Alex P. Pentland. May 76, 104p ERIM-109600-69-F, NASA-CR-151000
Contract NAS9-14123

Descriptors: *Wheat, Agriculture, Algorithms, Multispectral band scanners, Large area crop inventory experiment, Ground truth, Kansas, Texas, EREP, Skylab program, Spectral signatures, Maximum likelihood estimates, Data bases.
Identifiers: *Farm crops.

The author has identified the following significant results. Fourteen different classification algorithms were tested for their ability to estimate the proportion of wheat in an area. For some algorithms, accuracy of classification in field centers was observed. The data base consisted of ground truth and LANDSAT data from 55 sections (1 x 1 mile) from five LACIE intensive test sites in Kansas and Texas. Signatures obtained from training fields selected at random from the ground truth were generally representative of the data distribution patterns. LIMMIX, an algorithm that chooses a pure signature when the data point is close enough to a signature mean and otherwise chooses the best mixture of a pair of signatures, reduced the average absolute error to 6.1% and the bias to 1.0% QRULE run with a null test achieved a similar reduction.

RS77-3-192

E77-10057 PC A11/MF A01
Environmental Research Inst. of Michigan, Ann Arbor. Infrared and Optics Div.
Investigation of LANDSAT Follow-On Thematic Mapper Spatial, Radiometric and Spectral Resolution.
Final rept. Nov 75-Apr 76,
Richard F. Nalepka, James P. Morgenstern, Edward R. Kent, and Jon D. Erickson. Apr 76, 230p ERIM-119300-10-F, NASA-CR-150943
Contract NAS9-14819

Descriptors: *Thematic mapping, Agriculture, *Crop growth, Radiometers, Blight, EREP, Skylab program, Resolution, Sensitivity, Multispectral band scanners.
Identifiers: *Farm crops.

The author has identified the following significant results. Fine resolution M7 multispectral scanner data collected during the Corn Blight Watch Experiment in 1971 served as the basis for this study. Different locations and times of year were studied. Definite improvement using 30-40 meter spatial resolution over present LANDSAT 1 resolution and over 50-60 meter resolution was observed, using crop area mensuration as the measure. Simulation studies carried out to extrapolate the empirical results to a range of field size distributions confirmed this effect, showing the improvement to be most pronounced for field sizes of 1-4 hectares. Radiometric sensitivity study showed significant degradation of crop classification accuracy immediately upon relaxation from the nominally specified values of 0.5% noise equivalent reflectance. This was especially the case for data which were spectrally similar such as that collected early in the growing season and also when attempting to accomplish crop stress detection.

RS77-3-193

E77-10058 PC A07/MF A01
Environmental Research Inst. of Michigan, Ann Arbor Infrared and Optics Div.
Forest Classification Accuracy as Influenced by Multispectral Scanner Spatial Resolution.
Final rept 15 May 75-14 May 76,
Richard F. Nalepka, F. Sadowski, and J. Sarno.
May 76, 132p ERIM-109600-71-F, NASA-CR-150998
Contract NAS9-14123
Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Ave , Sioux Falls, D.C. 57198.

Descriptors: *Forests, *Timber identification, Multispectral band scanners, Timber inventory, Vegetation, Texas, Skylab program, EREP, Data processing, Accuracy, Spatial filtering.

The author has identified the following significant results A supervised classification within two separate ground areas of the Sam Houston National Forest was carried out for two sq meters spatial resolution MSS data Data were progressively coarsened to simulate five additional cases of spatial resolution ranging up to 64 sq meters. Similar processing and analysis of all spatial resolutions enabled evaluations of the effect of spatial resolution on classification accuracy for various levels of detail and the effects on area proportion estimation for very general forest features. For very coarse resolutions, a subset of spectral channels which simulated the proposed thematic mapper channels was used to study classification accuracy.

RS77-3-194

E77-10108 PC A15/MF A01
Colorado Univ., Boulder. Inst. of Arctic and Alpine Research.
Multiple-Resource Evaluation of Region 2 US Forest Service Lands Utilizing LANDSAT MSS Data.
Final rept. 20 Feb 75-20 Jul 76,
Paula V. Krebs, and Roger M. Hoffer. Jul 76, 342p NASA-CR-149595
Contract NAS5-20948
Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Ave., Sioux Falls, S D. 57198.

Descriptors: *Forests, *Vegetation, *Land use, *San Juan Mountains(CO), Topography, Geomorphology, Earth Resources program, Multispectral band scanners, Mapping, Landslides, Glaciers.

The author has identified the following significant results. LANDSAT MSS imagery provided an excellent overview which put a geomorphic study into a regional perspective, using scale 1:250,000 or smaller. It was used for deriving a data base for land use planning for southern San Juan Mountains. Stereo pairing of adjacent images was the best method for all geomorphic mapping. Combining this with snow enhancement, seasonal enhancement, and reversal, aided in interpretation of geomorphic features. Drainage patterns were mapped in much greater detail from LANDSAT than from a two deg quadrangle base.

RS77-3-195

E77-10062 PC A05/MF A01
Environmental Research Inst. of Michigan, Ann Arbor. Infrared and Optics Div.
System for Analysis of LANDSAT Agricultural Data: Automatic Computer-Assisted Proportion Estimation of Local Areas.
Final rept. 15 May 75-14 May 76,
Richard F. Nalepka, R. J. Kauth, and G. S. Thomas. May 76, 88p ERIM-109600-67-F, NASA-CR-151002
Contract NAS9-14123
Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Ave., Sioux Falls, S.D. 57198.

Descriptors: Agriculture, *Pattern recognition, *Crop identification, Ground truth, Large area, Crop inventory experiment, Skylab program, EREP, Photointerpretation, Brightness, Man machine systems.
Identifiers: Farm crops.

The author has identified the following significant results. A conceptual man machine system framework was created for a large scale agricultural remote sensing system. The system is based on and can grow out of the local recognition mode of LACIE, through a gradual transition wherein computer support functions supplement and replace A1 functions. Local proportion estimation functions are broken into two broad classes: (1) organization of the data within the sample segment; and (2) identification of the fields or groups of fields in the sample segment.

RS77-3-196

E77-10010 PC A07/MF A01
Michigan State Univ., East Lansing.
Economic Evaluation of Crop Acreage Estimation by Multispectral Remote Sensing,
Lester V. Manderscheid, R. Nalepka, Wayne Myers, Gene Safir, and Douglas Hardt. 1976, 138p NASA M-CR-150976
Contract NAS9-13332
Prepared in cooperation with Environmental Research Inst. of Michigan, Ann Arbor.(PC A07/MF A01)
Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Ave., Sioux Falls, S.D. 57198.

Descriptors: Multispectral photography, *Farm corps, Agriculture, Economics, Michigan, Corn, EREP, Skylab program, Multispectral band scanners, Photointerpretation.

The author has identified the following significant results. Photointerpretation of S190A and S190B imagery showed significantly better resolution with the S190B system. A small tendency to underestimate acreage was observed. This averaged 6 percent and varied with field size. The S190B system had adequate resolution for acreage measurement but the color film did not provide adequate contrast to allow detailed classification of ground cover from imagery of a single date. In total, 78 percent of the fields were correctly classified but with 56 percent correct for the major crop, corn.

RS77-3-197

N76-78636/7GA PC A11/MF A01
Lockheed Electronics Co., Inc., Houston, Tex. Houston Aerospace Systems Div.
Photointerpretation Guide for Forest Resource Inventories.
Technical memo.,
R. L. Smelser, Jr., and Andrew W. Patteson. Oct 75, 250p LEC-4302, NASA-TM-X-58195
Contract NAS9-12200

Descriptors: *Forestry, *Photointerpretation, *Natural resources, *Photogrammetry, Manuals, Inventories, Color photography, Infrared,mapping, Aerial photography, Land use, Infrared film, Covering, Statistical analysis, Landforms, Forest trees, Structural timber, Erosion, Classifications, Stereophotography.
Identifiers: High altitude, Mensuration.

The guide explains the use of small-scale photography for inventorying and assessing resources. The manual introduces high-altitude, color infrared photography to investigators familiar with conventional photointerpretation techniques. Although other film types and scales may be better suited for specific tasks in forest resource inventories, this guide emphasizes the use of 1.60,000-scale color infrared film because of the advantages for forestry investigations. A loose-leaf binder-format permits updating the guide as more techniques become available. In the guide, a brief review of aerial photography and photointerpretation precedes sections on evaluation and applications. The review sections cover the resource requirements, photographic preparation, and mensuration tehcniques needed to apply the methodology described in the applications sections. The statistical evaluation of aerial mapping is covered to provide the user with a methodology for evaluating accuracy, establishing confidence limits, and determining the required sample size. Applications covered in the guide include land use classification and mapping, landform analysis, timber stand mapping, and erosion detection.

RS77-3-198

REMOTE SENSING OF SOIL MOISTURE WITH MICROWAVE RADIOMETERS-II,
National Aeronautics and Space Administration, Greenbelt, Md Goddard Space Flight Center.
T. Schmugge, T Wilheit, W. Webster, Jr., and P. Gloersen.
Report NASA TN D-8321, September 1976. 34 p, 20 fig, 7 tab, 25 ref.

Descriptors: *Remote sensing, *Soil moisture, *Microwaves, *Aircraft, Moisture content, Soil moisture meters, Soils, Soil properties, Soil texture, Surveys, Soil surveys, Vegetation, Vegetation effects, Radiation, Radio waves.
Identifiers: *Microwave radiometers.

Results were presented which were derived from measurements made by microwave radiometers during the March 1972 and February 1973 flights of National Aeronautics and Space Administration (NASA) Convair-990 aircraft over agricultural test sites in the southwestern part of United States The purpose of the missions was to study the use of microwave radiometers for the remote sensing of soil moisture. The microwave radiometers covered the 0.8- to 21-cm wavelength range The results showed a good linear correlation between the observed microwave brightness temperature and moisture content of the 0- to 1-cm layer of the soil. The results at the largest wavelength (21 cm) showed the greatest sensitivity to soil moisture variations and indicated the possibility of sensing these variations through a vegetative canopy The effect of soil texture on the emission from the soil was also studied, and it was found that this effect can be compensated for by expressing soil moistures as a percent of field capacity for the soil. The results were compared with calculations based on a radiative transfer model for layered dielectrics, and the agreement is very good at the longer wavelengths. At the shorter wavelengths, surface roughness effects are larger, and the agreement becomes poorer. (Sims-ISWS)
W77-06530

RS77-3-199

15595 Iyer, H. S. Use of additive color viewer for interpretation of ERTS imagery for soil mapping with respect to a part of north western India: *in* Remote sensing of Earth resources; Volume IV (Shahrokhi, F., editor), p. 293-300, sketch map, Univ. Tenn. Space Inst., Tullahoma, Tenn., United States, 1975.

RS77-3-200

15254 Torbert, G. Applications to agriculture, forestry, and rangeland management; introduction: U. S. Geol. Surv., Prof. Pap., No. 929 *(ERTS-1, a new window on our planet)*, p. 243, 1976.

RS77-3-201

13960 Carter, V. Computer mapping of coastal wetlands: U. S. Geol. Surv., Prof. Pap., No. 929 *(ERTS-1, a new window on our planet)*, p. 280-282, illus. (incl. sketch map), 1976.

RS77-3-202

15057 Carter, V.; McGinness, J. W., Jr.; and Anderson, R. R. Wetland mapping in a large tidal brackish-water marsh in Chesapeake Bay: U. S. Geol. Surv., Prof. Pap., No. 929 *(ERTS-1, a new window on our planet)*, p. 286-289, illus. (incl. sketch map), 1976.

RS77-3-203

14788 Messmore, J.; Copeland, G. E.; and Levy, G. F. Mapping forest vegetation with ERTS-1 MSS data and automatic data processing techniques: *in* Remote sensing of Earth resources; Volume IV (Shahrokhi, F., editor), p. 327-344, illus. (incl. tables, sketch map), Univ. Tenn. Space Inst., Tullahoma, Tenn., United States, 1975.

RS77-3-204

15259 Turner, R. M. Detection of short-term changes in vegetation of southern Arizona: U. S. Geol. Surv., Prof. Pap., No. 929 *(ERTS-1, a new window on our planet)*, p. 246-248, illus., 1976.

RS77-3-205

15255 Torbert, G. Monitoring forest-fire burn areas in Alaska: U. S. Geol. Surv., Prof. Pap., No. 929 *(ERTS-1, a new window on our planet)*, p. 244-245, illus., 1976.

RS77-3-206

14998 Thompson, T. H. Use of infrared imagery in bank-storage studies: J. Res. U. S. Geol. Surv., Vol. 5, No. 1, p. 1-10, illus. (incl. sketch maps), 1977.

RS77-3-207

14715 Frazier, B. E.; Kiefer, R. W.; and Krauskopf, T. M. Statewide wet land mapping using Landsat imagery: *in* Remote sensing of Earth resources; Volume IV (Shahrokhi, F., editor), p. 267-280, illus. (incl. table, sketch map), Univ. Tenn. Space Inst., Tullahoma, Tenn., United States, 1975.

RS77-3-208

13981 North, G. W.; and Lineback, N. G. Thematic mapping of forested and cultivated land in Alabama: U. S. Geol. Surv., Prof. Pap., No. 929 *(ERTS-1, a new window on our planet)*, p. 228-229, illus., 1976.

RS77-3-209

14703 Duggin, M. J.; Curtain, C. C.; Anderson, N.; *et al.* Factors controlling the application in agriculture of multichannel remote sensing surveys; with particular reference to the ERTS bandpasses: *in* Remote sensing of Earth resources; Volume IV (Shahrokhi, F., editor), p. 301-316, illus. (incl. tables), Univ. Tenn. Space Inst., Tullahoma, Tenn., United States, 1975.

RS77-3-210

15573 Brack, E. V. An investigation into the use of multispectral photography for soil surveying in upland Britain: *in* Remote sensing of Earth resources; Volume IV (Shahrokhi, F., editor), p. 255-265, illus. (incl. sketch map), Univ. Tenn. Space Inst., Tullahoma, Tenn., United States, 1975.

RS77-3-211

18673 Tucker, C. J.; and Miller, L. D. Extraction of the underlying soil spectra from canopy spectroreflectance measurements of the shortgrass prairie: *in* Remote sensing of Earth resources; Volume III (Shahrokhi, F., editor), p. 73-83, illus. (incl. tables), Univ. Tenn., Space Inst., Tullahoma, Tenn., United States, 1974.

RS77-3-212

15221 Seevers, P. M.; Peterson, R. M.; Mahoney, D. J.; *et al.* A wetlands inventory of the state of Nebraska using ERTS-1 imagery: *in* Remote sensing of Earth resources; Volume IV (Shahrokhi, F., editor), p. 281-292, illus., Univ. Tenn. Space Inst., Tullahoma, Tenn., United States, 1975.

RS77-3-213

15054 Carter, V.; and Anderson, R. R. Coastal wetland mapping in the central Atlantic region: U. S. Geol. Surv., Prof. Pap., No. 929 *(ERTS-1, a new window on our planet)*, p. 277-279, illus. (incl. sketch map), 1976.

RS77-3-214

15056 Carter, V.; Anderson, R. R.; and McGinness, J. W., Jr. Wetland classification and mapping along the South Atlantic Coast: U. S. Geol. Surv., Prof. Pap., No. 929 *(ERTS-1, a new window on our planet)*, p. 273-276, illus. (incl. sketch map), 1976.

RS77-3-215

14829 Seidel, K.; Gfeller, R.; and Binzegger, R. Snow and vegetation classification by means of digital Landsat-MSS-data: *in* Remote sensing of Earth resources; Volume IV (Shahrokhi, F., editor), p. 317-326, illus. (incl. tables), Univ. Tenn. Space Inst., Tullahoma, Tenn, United States, 1975.

RS77-3-216

ID NO.- EI770745618 745618
SEPARABILITY OF AGRICULTURAL COVER TYPES BY REMOTE SENSING IN THE VISIBLE AND INFRARED WAVELENGTH REGIONS.
Kumar, R.; Silva, L. F.
Purdue Univ, W. Lafayette, Indiana
IEEE Trans Geosci Electron v GE-15 n 1 Jan 1977 p 42-49
CODEN: IEGEAO
DESCRIPTORS: (*AGRICULTURAL ENGINEERING, *Remote Sensing),
IDENTIFIERS: AGRICULTURAL COVER TYPES
CARD ALERT: 821, 921, 732
The purpose of this study was to determine the statistical separability of multispectral measurements from agricultural cover types: corn, soybeans, green forage (hay and pasture), and forest, in one to 12 spectral channels. Multispectral scanner data in 12 spectral channels in the wavelength range 0.4-11.7 SmuS m, acquired on July 16, 1971 for three flight lines, were analyzed by applying automatic pattern recognition techniques. The same analysis was performed for data acquired on August 12, 1971 over the same three flignt lines to investigate the effect of time on the statistical separability of agriculture cover types. In subsets of one to six spectral cnannels, the combination of wavelength regions (where V, N, M, and T denote the visible, near-infrared, middle-infrared, and thermal-infrared wavelength regions, respectively): V, V M, V N M, V N M T, V V N M T, V V N M M T, respectively, were found to be the best choices for getting good overall statistical separability of the agricultural cover types for the data acquired on July 16 as well as August 12. An effort was made to explain these results on the basis of the spectral properties of agricultural cover types. The overall statistical separability of the agricultural cover types was found to be greater for the data of August 12 than the data of July 16. 18 refs.

RS77-3-217

ID NO.- EI770534786 734786
INFLUENCE OF SOIL MOISTURE ON THE MICROWAVE RESPONSE FROM TERRAIN AS SEEN FROM ORBIT.
Moore, R. K.; Ulaby, F. T.; Sobti, A.
Univ of Kans Cent for Res Inc, Lawrence
Proc of the Int Symp on Remote Sensing of Environ, 10th, Ann Arbor, Mich, Oct 6-10 1975 Publ by Environ Res Inst of Mich, Cent for Remote Sensing Inf and Anal, Ann Arbor, 1975 v 2 p 1141-1147
DESCRIPTORS: (*RADAR, *Measurement Application), (SOILS, Moisture), (REMOTE SENSING, Applications), (RADIOMETERS, Applications),
IDENTIFIERS: SKYLAB DATA
CARD ALERT: 716, 483
The space operation of the S-193 Radiometer/Scatterometer on board Skylab provided data that was used to determine the response. The target cell for the radiometer was roughly one and a half times as large as that for the scatterometer. Data were obtained for various combinations of polarization and incidence angle. Upon examination of these data, it was discovered, as anticipated, that soil moisture was an important variable that influenced the radiometer and scatterometer response. This led to an evaluation of the influence of the soil moisture on the microwave response. Results from this evaluation are provided. Precipitation histories obtained from weather reporting station summaries were used to compute an estimate for the soil moisture. Influence of the moisture estimate was sought by computing a correlation between the radar and radiometer response and the soil moisture.

RS77-3-218

ID NO.- EI770534958 734958
ANALYSIS OF THE ACCURACY AND COST-EFFECTIVENESS OF A CROPLAND INVENTORY UTILIZING REMOTE SENSING TECHNIQUES.
Jensen, John R.; Tinney, Larry R.; Estes, John E.
Univ of Calif, Santa Barbara
Proc of the Int Symp on Remote Sensing of Environ, 10th, Ann Arbor, Mich, Oct 6-10 1975 Publ by Environ Res Inst of Mich, Cent for Remote Sensing Inf and Anal, Ann Arbor, 1975 v 2 p 1149-1158
DESCRIPTORS: (*REMOTE SENSING, *Environmental Applications), AGRICULTURAL ENGINEERING, INFRARED IMAGING,
IDENTIFIERS: CROPLAND INVENTORIES, LANDSAT IMAGERY
CARD ALERT: 741, 821
Cropland inventories utilizing high altitude and LANDSAT imagery were conducted in Kern County, California. In terms of the overall mean relative and absolute inventory accuracies, a LANDSAT multidate analysis yielded the most optimum results, (98 percent accuracy). The 1:125,000 color infrared high altitude inventory is a serious alternative which can be very accurate (up to 97 percent) if imagery is available for a specific study area. The operational remote sensing cropland inventories documented in this study are considered cost-effective.

RS77-3-219

ID NO.- EI770534933 734933
AUTOMATIC SOIL IDENTIFICATION FROM REMOTE SENSING DATA.
Wong, Kam W.; Thornburn, T. H.; Khoury, M. A.
Univ of Ill, Urbana-Champaign
Photogramm Eng Remote Sensing v 43 n 1 Jan 1977 p 73-80
CODEN: PERSDV
DESCRIPTORS: *REMOTE SENSING, SOILS,
CARD ALERT: 405, 483, 742
A reliable method of automatic soil identification can be developed by the combined application of remote sensing and digital terrain data. Research results have demonstrated that small differences in soil types can be distinguished by the use of quantitative terrain factors which are computed from digital terrain data. Continuing research effort is directed towards the improvement of the terrain factors, the development of statistical prediction techniques, and testing the effectiveness of these factors in the identification of soils. 22 refs.

RS77-3-220

ID NO.- EI770534285 734285
CANOPY-RELATED STRATIFICATION OF A SOUTHERN PINE FOREST USING LANDSAT DIGITAL DATA.
Williams, Darrel L.
NASA/Goddard Space Flight Cent, Greenbelt, Md
Proc of the Am Soc of Photogramm, Fall Conv, Jt Meet with Am Congr on Surv and Mapp, Seattle, Wash, Sep 28-Oct 1 1976 Publ by Am Soc of Photogramm, Falls Church, Va, 1976 p 231-239
DESCRIPTORS: (*PHOTOGRAMMETRY, *Forestry Applications), FORESTRY,
CARD ALERT: 405, 742, 821
An investigation was undertaken to determine if a consistent stratification of a Southern pine forest could be obtained by using Landsat multispectral scanner data to assess crown closure. Winter and summer Landsat scenes of the North Carolina coastal region were analyzed individually and then registered and merged to take advantge of temporal changes in the forest canopy. Three levels of pine crown closure were accurately delineated. The applicability of this stratification as supplemental input to a forest inventory system is also discussed. 5 refs.

RS77-3-221

ID NO.- EI770643614 743614

LARGE AREA CROP INVENTORY EXPERIMENT (LACIE) $EM DASH$ AN APPLICATION OF REMOTE SENSING BY MULTISPECTRAL SCANNERS.

Erb, R. Bryan

NASA Lyndon B. Johnson Space Cent, Houston, Tex

Adv Instrum v 31 1976, Proc of 31st Annu ISA Conf anc Exhib, Houston, Tex, Oct 10-14 1976 pt 2 Pap 663, 8 p CODEN: AVINBP

DESCRIPTORS: (*SATELLITES, *Computer Applications), (REMOTE SENSING, Multispectral Scanners), (AGRICULTURAL ENGINEERING, Remote Sensing),

CARD ALERT: 655, 732, 821

Primary data sources for LACIE are (1) multispectral radiance measurements acquired by the Landsat satellite; (2) meteorological data from both ground weather stations reportec through the World Meteorological Organization (WMO) network and from meteorological satellites and (3) certain historic information. These data are computer vprocessed to estimate wheat area from the Landsat data, yield from meteorological data and production, the product of area and yield. Experimental reports are produced on wheat area, yield anc production on a periodic basis for selected wheat-procuction on a periodic basis for selected wheat-producing regions. LACIE is being conducted jointly by the NASA, NOAA, and USDA to prove out an economically important application of remote sensing from space. The experiment has completed its first phase of activity in estimating wheat area, yield anc production for a $left double quote$ yardstick $right double quote$ area in the U. S. Great Plains. The technical approach to LACIE, the activity already completed and the tentative results of the first phase of the activity. 4 refs.

RS77-3-222

ID NO.- EI770534945 734945

REFLECTANCE PROPERTIES OF GRAZING PASTURES AS DETERMINED IN THE LANDSAT SATELLITE BANDPASSES AND FROM OBLIQUE COLOUR-INFRARED AERIAL PHOTOGRAPHY.

Duggin, M. J.; Roberts, R. J.; George, J. M.

CSIRO Div of Miner Phys, Sydney, Aust

Proc of the Int Symp on Remote Sensing of Environ, 10th, Ann Arbor, Mich, Oct 6-10 1975 Publ by Environ Res Inst of Mich, Cent for Remote Sensing Inf and Anal, Ann Arbor, 1975 v 2 p 1101-1109

DESCRIPTORS: (*REMOTE SENSING, *Applications), AGRICULTURAL ENGINEERING, AERIAL PHOTOGRAPHY,

IDENTIFIERS: LANDSAT IMAGERY, CANOPY REFLECTANCE

CARD ALERT: 742, 821, 741

An experiment is reported in which ground-based vertical radiometric mesurements of the canopy reflectance properties of a grazing treatment were used to evaluate the potential of vertical aerial or satellite imagery to distinguish differences between pastures. Analyses of variance showed that, for each bandpass, there were significant differences between the reflectance factors viewed from the vertical for pastures grazed by different sheep breeds, which lambed at different times and were stocked at different rates. In order to find whether oblique imagery could yield quantitative information which could be related to imagery obtained from the vertical, the study determined the significance of the relationships between radiance detected by the oblique imagery and vertical measurements of the reflectance factors at ground level. Refs.

RS77-3-223

ID NO.- EI770532432 732432
ACCURACY OF FOREST MAPPING FROM LANDSAT COMPUTER COMPATIBLE TAPES.
Kalensky, Z.; Scherk, L. R.
For Manage Inst, Can For Serv & Comput Devices Co, Ottawa, Ont
Proc of the Int Symp on Remote Sensing of Environ, 10th, Ann Arbor, Mich, Oct 6-10 1975 Publ by Environ Res Inst of Mich, Cent for Remote Sensing Inf and Anal, Ann Arbor, 1975 v 2 p 1159-1167
DESCRIPTORS: *IMAGE PROCESSING, (PHOTOGRAMMETRY, Forestry Applications), (REMOTE SENSING, Applications), MAPS AND MAPPING,
IDENTIFIERS: LANDSAT DATA, MULTISPECTRAL SCANNER DATA, COMPUTER COMPATIBLE TAPES
CARD ALERT: 723, 741, 821, 405
The study examined the applicability of Landsat multispectral images recorded on computer compatible tapes (CCT) to forest mapping. A supervised classification was based on the Gaussian Maximum-Likelihood Decision Rule. The input imagery consisted of CCTs of Landsat scenes and their multidate combinations. Reported are accuracies and consistencies of computerized delineation and identification of the coniferous forest, deciduous forest and nonforest land as a function of the date of Landsat scene and their multidate combinations.

RS77-3-224

ID NO.- EI770534282 734282
AIRPHOTO ANALYSIS IN THE TROPICS: CROP IDENTIFICATION.
Philipson, W. R.; Liang, T.
Cornell Univ, Ithaca, NY
Proc of the Int Symp on Remote Sensing of Environ, 10th, Ann Arbor, Mich, Oct 6-10 1975 Publ by Environ Res Inst of Mich, Cent for Remote Sensing Inf and Anal, Ann Arbor, 1975 v 2 p 1079-1092
DESCRIPTORS: (*PHOTOGRAMMETRY, *Agricultural Applications), (AERIAL PHOTOGRAPHY, Applications),
IDENTIFIERS: CROP IDENTIFICATION
CARD ALERT: 405, 742, 821
Keys for identifying major crops of the tropics on medium scale, panchromatic aerial photographs are developed, based on directly and indirectly observable field, management and crop features. Crops considered include sugar cane, lowland rice, maize, tobacco, pineapple, banana, rubber, coconut, coffee and cacao. 14 refs.

RS77-3-225

ID NO.- EI770531813 731813
USE OF A REMOTE REFLECTOMETER AND DIGITAL DATA ANALYSIS TO STUDY PHOSPHATE DEFICIENCY IN SPRUCE TREES.
Drewett, R. J.
Plessey Radar Res Cent, Havant, Hamps, Engl
Proc of the Int Symp on Remote Sensing of Environ, 10th, Ann Arbor, Mich, Oct 6-10 1975 Publ by Environ Res Inst of Mich, Cent for Remote Sensing Inf and Anal, Ann Arbor, 1975 v 2 p 1123-1131
DESCRIPTORS: *FORESTRY, (REMOTE SENSING, Environmental Applications), REFLECTOMETERS,
CARD ALERT: 821, 741
The paper describes a series of measurements to determine the spectral characteristics of Sitka spruce trees subjected to phosphate deficiency, in order to determine the feasibility of detecting this form of stress by multiband photographic methods.

RS77-3-226

ID NO.- EI770534948 734948
RESULTS FROM THE CROP IDENTIFICATION TECHNOLOGY ASSESSMENT FOR REMOTE SENSING (CITARS) PROJECT.
Bizzell, R. M.; Hall, F. G.; Feiveson, A. H.; Bauer, M. E.; Davis, B. J.; Malila, W. A.; Rice, D. P.
NASA, Johnson Space Cent, Houston, Tex
Proc of the Int Symp on Remote Sensing of Environ, 10th, Ann Arbor, Mich, Oct 6-10 1975 Publ by Environ Res Inst of Mich. Cent for Remote Sensing Inf and Anal, Ann Arbor, 1975 v 2 p 1189-1198
DESCRIPTORS: (*REMOTE SENSING, *Applications), AGRICULTURAL ENGINEERING, INFRARED IMAGING,
IDENTIFIERS: CROP IDENTIFICATION
CARD ALERT: 821, 741, 723
The CITARS task design and objectives are reviewed and final results presented, together with conclusions and recommendations. It was found that several factors had a significant effect on crop identification performance: crop maturity and site characteristics; which of several different single-date automatic data processing procedures was used for local recognition; nonlocal recognition, both with and without preprocessing for the extension of recognition signatures; and use of multidate (multitemporal) data. Among other conclusions is that classification accuracy for field center pixels was not a reliable indicator or proportion estimation performance for whole areas. Refs.

RS77-3-227

ID NO.- EI770751986 751986
ESTIMATION OF PROPORTIONS OF GIVEN POPULATIONS WHEN OBSERVABLE UNITS CONTAIN SEVERAL POPULATIONS.
Basu, J. P.; Basu, Rekha
Lockheed Electr Co, Houston, Tex
IEEE Trans Syst Man Cybern v SMC-6 n 11 Nov 1976 p 775-777
CODEN: ISYMAW
DESCRIPTORS: (*REMOTE SENSING, *Multispectral Scanners), STATISTICAL METHODS,
CARD ALERT: 922
Remotely sensed multispectral scanner data from earth scenes are being used for estimating the proportions of different tree species in a forest canopy or crops in a large agricultural area. The picture elements often contain several tree species/crops and bare soil, each having different spectral characteristics. Thus the observation on each picture element is obtained as an average of the observations on the characteristics of several heterogeneous populations. This peculiarity of the data makes the usual proportion estimation techniques inapplicable. A proportion estimation based on a linear model with random coefficients is therefore proposed. 7 refs.

RS77-3-228

ID NO.- EI770643327 743327
MEASUREMENT OF CERTAIN ELECTROPHYSICAL CHARACTERISTICS IN RADAR PROBING OF FROZEN SOILS.
Glushnev, V. G.; Slutsker, B. D.; Finkel'shtein, M. I.
Riga Inst of Civ Aviat Eng, Latv SSR
Radiophys Quantum Electron v 19 n 1 Jan 1976 p 40-43
CODEN: RPQEAC
DESCRIPTORS: (*RADAR, *Measurement Applications), REMOTE SENSING, (SOILS, Frozen),
CARD ALERT: 483, 716, 732
Results are reported for radar probing of frozen soils and bogs from a helicopter using nanosecond pulses at 440 MHz; they indicate that remote measurement of the characteristics of frozen soils by active-radar methods is a practical possibility. 10 refs.

RS77-3-229

ID NO.- EI770534947 734947
MEASURING $left double quote$ FORAGE PRODUCTION $right double quote$ OF GRAZING UNITS FROM LANDSAT MSS DATA.
Deering, D. W.; Rouse, J. W. Jr.; Haas, R. H.; Schell, J. A.
Tex A&M Univ, College Station
Proc of the Int Symp on Remote Sensing of Environ, 10th, Ann Arbor, Mich, Oct 6-10 1975 Publ by Environ Res Inst of Mich, Cent for Remote Sensing Inf and Anal, Ann Arbor, 1975 v 2 p 1169-1178
DESCRIPTORS: (*REMOTE SENSING, *Applications), AGRICULTURAL ENGINEERING, INFRARED IMAGING,
IDENTIFIERS: RANGELAND MANAGEMENT, LANDSAT DATA, MULTISPECTRAL SCANNER DATA, RESOURCE INVENTORIES, SPECTRAL REFLECTANCE
CARD ALERT: 821, 741
The study emphasized the development of techniques for quantitative analysis of the spectral reflectance data as quantitative indicators of the amount and seasonal condition of rangeland vegetation. Coincident satellite and ground truth data were collected during the growing seasons at ten test sites throughout the Great Plains. The correlations between the MSS digital data, corrected for sun angle, and various ground parameters were determined. The theoretically derived normalized difference between the red and infrared bands was found to be useful for the quantitative measurement of herbaceous green biomass of natural vegetation systems. This led to the development of the Transformed Vegetation Index.

RS77-3-230

ID NO.- EI770534949 734949
ESTIMATION OF MOISTURE CONTENT OF FOREST FUELS OVER THE SOUTHEASTERN U. S. USING SATELLITE DATA.
Waters, Marshall III
NOAA, Natl Environ Satell Serv, Suitland, Md
Proc of the Int Symp on Remote Sensing of Environ, 10th, Ann Arbor, Mich, Oct 6-10 1975 Publ by Environ Res Inst of Mich, Cent for Remote Sensing Inf and Anal, Ann Arbor, 1975 v 2 p 1199-1208
DESCRIPTORS: (*REMOTE SENSING, *Applications), (FORESTRY, Fire Protection), (RADIOMETERS, Applications), (SATELLITES, Weather),
CARD ALERT: 821, 741
Synchronous meteorological satellite visual and infrared spin scan radiometer data were analyzed quantitatively for cloud cover and surface temperature for an area in the southeastern United States for 5 days in January 1975. Surface measures of air temperature and humidity at stations within the study area augmented the satellite data. The 1-hour timelag fuel moisture component of fuel model D in the National Fire Danger Rating System was estimated by: using the satellite visual information for cloud cover, air temperature blended with surface equivalent black body temperatures, and an estimate of humidity made from ground stations. Differences between estimated and measured fields of fuel moisture were analyzed.

RS77-3-231

ID NO.- EI770534950 734950
LANDSAT APPLICATIONS IN CANADIAN FORESTRY.
Sayn-Wittgenstein, L.; Wightman, J. M.
For Manage Inst, Ottawa, Ont
Proc of the Int Symp on Remote Sensing of Environ, 10th, Ann Arbor, Mich, Oct 6-10 1975 Publ by Environ Res Inst of Mich, Cent for Remote Sensing Inf and Anal, Ann Arbor, 1975 v 2 p 1209-1218
DESCRIPTORS: (*REMOTE SENSING, *Applications), (PHOTOGRAMMETRY, Forestry Applications),
IDENTIFIERS: LANDSAT
CARD ALERT: 716, 742, 821
The most significant operational applications of Landsat data have been in the mapping of broad forest cover types and recent forest fires. Experiments dealing with the charting of high water levels and tornado damage were also successful and satellite data would find practical application if the need should arise. Experimental successes in mapping cutover areas do not seem to have been translated into practice, perhaps because there is insufficient evidence that results obtained in one area are valid elsewhere. The operational value of ERTS in assessing forest insect damage may well be soon clarified. Generally, operational projects favour interpretation of digital data, others employ the principles of conventional photo interpretation. Refs.

RS77-3-232

ID NO.- EI770534931 734931
COMPARISON OF AERIAL PASSIVE GAMMA AND PASSIVE MICROWAVE TECHNIQUES FOR MEASUREMENT OF SOIL MOISTURE.
Peck, Eugene L.; Larson, Lee W.; Farnsworth, Richard K.; Dietrich, Thomas L.
Natl Weather Serv, NOAA, Silver Spring, Md
Proc of the Int Symp on Remote Sensing of Environ, 10th, Ann Arbor, Mich, Oct 6-10 1975 Publ by Environ Res Inst of Mich, Cent for Remote Sensing Inf and Anal, Ann Arbor, 1975 v 2 p 1235-1243
DESCRIPTORS: *REMOTE SENSING, (SOILS, Moisture), (GAMMA RAYS, Detection), MICROWAVES,
CARD ALERT: 483, 622, 944, 711
The paper presents a comparison of concurrent measurements of estimates of soil moisture from ground sampling and from measurements of passive microwave and passive gamma radiation made by aircraft. Simultaneous flights of microwave and gamma radiation sensors over a special survey line near Luverne, Minn., were made in June 1972. Microwave measurements were made at 4.99 and 13.4 GHz (with vertical and horizontal polarization). Gamma measurements were made over the range 0.05 Mev to 3.0 Mev. Extensive measurements of soil moisture and data on ground cover were also obtained.

RS77-3-233

ID NO.- EI770531812 731812
TOTAL TIMBER RESOURCE INVENTORY BASED UPON MANUAL AND AUTOMATED ANALYSIS OF LANDSAT-I AND SUPPORTING AIRCRAFT DATA USING STRATIFIED MULTISTAGE SAMPLING TECHNIQUES.
Titus, S.; Gialdini, M.; Nichols, J.
Univ of Calif., Berkeley
Proc of the Int Symp on Remote Sensing of Environ, 10th, Ann Arbor, Mich, Oct 6-10 1975 Publ by Environ Res Inst of Mich, Cent for Remote Sensing Inf and Anal, Ann Arbor, 1975 v 2 p 1093-1099
DESCRIPTORS: *FORESTRY, (REMOTE SENSING, Environmental Applications), IMAGE PROCESSING,
IDENTIFIERS: TIMBER RESOURCE INVENTORIES, LANDSAT-1 DATA
CARD ALERT: 821, 723, 741
Results of a timber resource inventory for the Plumas National Forest in California are reported. The survey was based upon manual and automated analysis of LANDSAT-I and supporting aircraft and ground data using stratified multistage sampling techniques. The survey was completed in six months time and estimated a number of parameters. Cubic meter volume was estimated to be 167 m**3 per hectare with a sampling error of 7. 8 percent.

RS77-3-234

ID NO.- EI770534946 734946
REMOTE SENSING APPLICATIONS FOR AGRICULTURAL FIELDS IN JAPAN.
Shimoda, H.; Sakata, T.; Nakamura, K.
Tokai Univ, Hiratsuka City, Jpn
Proc of the Int Symp on Remote Sensing of Environ, 10th, Ann Arbor, Mich, Oct 6-10 1975 Publ by Environ Res Inst of Mich, Cent for Remote Sensing Inf and Anal, Ann Arbor, 1975 v 2 p 1133-1140
DESCRIPTORS: (*REMOTE SENSING, *Applications), AGRICULTURAL ENGINEERING, AERIAL PHOTOGRAPHY,
IDENTIFIERS: CROP IDENTIFICATION
CARD ALERT: 405, 742, 821
The operational evaluation of crop identification by remote sensing techniques was studied from view points of classification accuracy and cost effectiveness. From experiments, results on necessary ground classification accuracies and cost evaluation were obtained. A multi-band camera was used as the sensor, with flight altitude at 750 m. Image interpretation was done with an analog image analysis system.

RS77-3-235

ID NO.- EI770536799 736799
REMOTE SENSING OF WETLANDS IN VIRGINIA.
Penney, Michael E.; Gordon, Hayden H.
Va Inst of Mar Sci, Gloucester Point
Proc of the Int Symp on Remote Sensing of Environ, 10th, Ann Arbor, Mich, Oct 6-10 1975 Publ by Environ Res Inst of Mich, Cent for Remote Sensing Inf and Anal, Ann Arbor, 1975 v 1 p 495-503
DESCRIPTORS: (*WATER RESOURCES, *Management), (REMOTE SENSING, Environmental Applications), ENVIRONMENTAL PROTECTION
CARD ALERT: 444, 901, 742, 716
The paper discusses environmental management details of wetlands, and reports some technical details involving the use of ERTS data with LARS analysis for inventoring wetlands and low altitude film imagery analysis for determining plant community parameters. In particular, it concentrates on why technologically oriented remote sensing data analysis has been a failure, to date, in terms of assisting wetland management. Refs.

RS77-3-236

ID NO.- EI770749446 749446
INTERACTIVE COMPUTER ANALYSIS OF AERIAL COLOR INFRARED PHOTOGRAPHS.
Underwood, S. A.; Aggarwal, J. K.
Univ of Tex, Austin
Comput Graphics Image Process , v 6 n 1 Feb 1977 p 1-24 CODEN: CGIPBG
DESCRIPTORS: (*INSECT CONTROL, *Computer Applications), (AERIAL PHOTOGRAPHY, Infrared Radiation), (IMAGE PROCESSING, Computer Applications), (AGRICULTURAL ENGINEERING, Computer Applications),
CARD ALERT: 821, 741, 723, 742
Aerial photography using color infrared film has proved to be successful for the detection of insect infestations in citrus orchards by human interpretation. The chlorophyll in vegetation reflects in the infrared region of the spectrum, and produces a red image on the film. The paper describes an interactive digital computer system that uses a three-color film digitizer to measure the color of individual trees to detect the presence of insect infestation. The input to the computer is an aerial color infrared photograph. The computer locates the outine of each individual tree and measures the color characteristics of each spatial point within the tree outline. Each tree within the photograph is analyzed interactively on the computer, and the output shows the degree of infestation present. 13 refs.

RS77-3-237

ID NO.- EI770643465 743465
REMOTE SENSING APPLICATIONS IN COASTAL ZONE MANAGEMENT.
Tilton, Edward Lee III
NASA, Earth Resour Lab, Slidell, La
Adv Instrum v 31 1976, Proc of 31st Annu ISA Conf and Exhib, Houston, Tex, Oct 10-14 1976 pt 3 Pap 756, 12 p CODEN: AVINBP
DESCRIPTORS: (*REGIONAL PLANNING, *Remote Sensing), SHORE PROTECTION,
CARD ALERT: 403, 901, 407
New applications for remote sensing in the coastal zones are demonstrated. Many complex and critical information needs today can be met, or supplemented, in a timely and cost-effective manner from data acquired by aircraft and satellites and suitably processed and formatted to meet a variety of monitoring and management functions. Use of remotely sensed data in the classification of particular species of vegetation for monitoring of erosion, deterioration, salinity, and marine resource productivity, is considered. 17 refs.

RS77-3-238

ID NO.- EI770529192 729192
MEASUREMENTS OF VEGETATION STRESS BY A MULTISPECTRAL SCANNER AS A BASIS FOR AIR QUALITY MAPS.
Marschalek, Heinz
SPACETEC, Vienna, Austria
Proc of the Int Symp on Remote Sensing of Environ, 10th, Ann Arbor, Mich, Oct 6-10 1975 Publ by Environ Res Inst of Mich, Cent for Remote Sensing Inf and Anal, Ann Arbor, 1975 v 1 p 283-291
DESCRIPTORS: (*AIR POLLUTION, *Air Quality), (REMOTE SENSING, Multispectral Scanners),
CARD ALERT: 451, 716, 741
The method uses trees as indicators. The measured degree of the damage (due to air pollution) for different tree sorts was standardized in such a way that it was possible to make conclusions about the air quality. A practical example as well as a general concept are described.

RS77-3-239

ID NO.- EI770532567 732567
INVESTIGATIONS ON THE THERMAL BEHAVIOUR OF PLANTS AFFECTED BY VIRUS AND FUNGUS DISEASES (TOBACCO MOSAIC VIRUS IN NICOTIANA TABACUM L. CV. XANTHI NC. , AND UROMYCES APPENDICULATUS (PERS.) LINK IN PHASEOLUS VULGARIS L.).
De Carolis, C.; Conti, G. G.; Lechi, G. M.
Univ di Milano, Italy
Proc of the Int Symp on Remote Sensing of Environ, 10th, Ann Arbor, Mich, Oct 6-10 1975 Publ by Environ Res Inst of Mich. Cent for Remote Sensing Inf and Anal, Ann Arbor, 1975 v 2 p 1219-1229
DESCRIPTORS: (*INFRARED IMAGING, *Applications), AGRICULTURAL ENGINEERING, (REMOTE SENSING, Applications).
IDENTIFIERS: PLANT PATHOLOGY
CARD ALERT: 741, 821
The paper reports on studies carried out in 2-5. 6 and 9-11 micron bands, from aircraft at the ground level. Variations in leaf radiances are detected by remote sensing techniques and could contribute to the knowledge of the energetic behaviour of diseased plants. Results of radiometric measurements are presented concerning plants experimentally infected. An AGA-Thermovision Thermocamera was employed, with a black-body reference. Refs.

RS77-3-240

ID NO.- EI770534785 734785
ON THE FEASIBILITY OF MONITORING CROPLANDS WITH RADAR.
Bush, T. F.; Ulaby, F. T.
Univ of Kans Cent for Res Inc, Lawrence
Proc of the Int Symp on Remote Sensing of Environ, 10th, Ann Arbor, Mich, Oct 6-10 1975 Publ by Environ Res Inst of Mich, Cent for Remote Sensing Inf and Anal, Ann Arbor, 1975 v 2 p 1111-1121
DESCRIPTORS: (*RADAR, *Measurement Application), AGRICULTURAL ENGINEERING, (REMOTE SENSING, Applications),
IDENTIFIERS: CROPLAND MONITORING, RADAR BACKSCATTER COEFFICIENT
CARD ALERT: 716, 821
An experiment was performed to determine the dependence of the scattering coefficients of wheat, corn and alfalfa on the measurable properties of these crops. It was determined that for wheat and alfalfa the greatest sensitivity of radar backscatter coefficient to plant development occurred at nadir while for corn, angles of incidence in the 50 $degree$ through 70 $degree$ region were optimum. Furthermore, for all three crops it was possible to functionally relate backscatter coefficient to the measurable crop properties at selected angular ranges.

RS77-3-241

ID NO.- EI770534954 734954
LARGE AREA CROP INVENTORY EXPERIMENT (LACIE) SEM DASHS AN ASSESSMENT AFTER ONE YEAR OF OPERATION.
MacDonald, R. B.; Hall, F. G.; Erb, R. B.
NASA Lyndon B. Johnson Space Cent, Houston, Tex
Proc of the Int Symp on Remote Sensing of Environ, 10th, Ann Arbor, Mich, Oct 6-10 1975 Publ by Environ Res Inst of Mich, Cent for Remote Sensing Inf and Anal, Ann Arbor, 1975 v 1 p 17-37
DESCRIPTORS: (*REMOTE SENSING, *Environmental Applications), (PHOTOGRAMMETRY, Agricultural Applications), SATELLITES,
IDENTIFIERS: CROP INVENTORIES
CARD ALERT: 821, 405, 742, 655
The experiment was undertaken to prove out an economically important application of remote sensing from space. The first phase of the experiment, which focused upon determinations of wheat area in the U. S. Great Plains and upon the development and testing of yield models, is now nearing completion. The system implemented to handle and analyze the Landsat and meteorological data has generally worked well and met operational goals. A very preliminary assessment of results to date indicates that the accuracy goals of the experiment can be met.

RS77-3-242

ID NO.- EI770535683 735683
CORRELATION OF ERTS SPECTRA WITH ROCK/SOIL TYPES IN CALIFORNIAN GRASSLAND AREAS.
Levine, Saul
Stanford Univ, Calif
Proc of the Int Symp on Remote Sensing of Environ, 10th, Ann Arbor, Mich, Oct 6-10 1975 Publ by Environ Res Inst of Mich, Cent for Remote Sensing Inf and Anal, Ann Arbor, 1975 v 2 p 975-984
DESCRIPTORS: (*SOILS, *Classification), (REMOTE SENSING, Computer Applications),
IDENTIFIERS: SPECTRAL SIGNATURES, ERTS DATA
CARD ALERT: 483, 723, 741
A seasonal study of ERTS data, accomplished by means of four band spectra plots of normalized reflectance, indicates that in the San Francisco Bay and adjacent Coast Range grassland areas, soils mapping or classification by computer techniques is possible at the end of the dry or grass dieback season. Excellent correlation is shown between ground reflectance measurements and data at three test sites and two different soil types: serpentine and sedimentary. The uniqueness of their spectra is then demonstrated by the successful application of STANSORT, a computerized classification technique.

Section 4

MARINE SCIENCES

Sea-surface, Estuarine and Nearshore Studies

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RS77-4-161

N77-20549*# National Aeronautics and Space Administration Lyndon B Johnson Space Center, Houston, Tex.
REMOTE SENSING OF CHLOROPHYLL CONCENTRATION: STATE-OF-THE-ART, 1975
B. H Atwell Jan 1976 35 p refs
(NASA-TM-X-74635, Rept-156) Avail: NTIS HC A02/MF A01 CSCL 06C

Remote measurement of chlorophyll concentration of the world's oceans from satellite observations could potentially be extremely useful for assessments of productivity in large areas for which measurements by other means would be impractical. The basis of these measurements rests with the physics of the interaction of light with material dissolved and suspended in the water. It is theoretically possible to predict the nature of light upwelled from the ocean surface from a solution to the radiative transfer equation. Practically, however, this is difficult. Monte-Carlo methods presently are thought to be the most viable method to treat the general theoretical problem. With restrictive assumptions of the nature of scattering, it is possible to construct simpler models Algorithms developed to relate chlorophyll concentration (or some other parameter, i e., seechi depth) to the upwelled light spectrum are discussed. Author

RS77-4-162

N77-21527# Instituto de Pesquisas Espaciais, Sao Paulo (Brazil).
STUDY OF THE WESTERN LIMIT OF THE SUBTROPICAL CONVERGENCE IN THE SOUTH ATLANTIC OCEAN USING SATELLITE-NIMBUS V, AND OCEANOGRAPHIC DATA FOR THE PERIOD OF 1972 TO 1973
Tseng Yun Chi Sep 1976 100 p refs In PORTUGUESE; ENGLISH summary
Avail. NTIS HC A05/MF A01

The thermal discontinuity of the ocean was studied, utilizing the Temperature Humidity Infrared Radiometer (THIR) of NIMBUS V and historical oceanographic data Seventy five THIR images were visually interpreted and some of them with the Image-100. The main study was done by superposition of the detected fronts, on surface temperature and salinity charts These results showed the great potentiality of satellite data to study surface thermal structures, surface currents, and oceanic fisheries Author

RS77-4-163

N77-21788*# National Aeronautics and Space Administration, Lewis Research Center, Cleveland Ohio.
ALL-WEATHER ICE INFORMATION SYSTEM FOR ALASKAN ARCTIC COASTAL SHIPPING
R. T. Gedney, R J. Jirberg, R. J. Schertler, R A Mueller, T L. Chase, I Kramarchuk L A Nagy, R. A Hanlon and H. Mark 1977 14 p refs Presented at 9th Ann. Offshore Technology Conf., Houston, Tex., 2-5 May 1977
(NASA-TM-X-73619, E-9108) Avail. NTIS HC A02/MF A01 CSCL 04B

A near real-time ice information system designed to aid arctic coast shipping along the Alaskan North Slope is described The system utilizes a X-band Side Looking Airborne Radar (SLAR) mounted aboard a U S Coast Guard HC-130B aircraft. Radar mapping procedures showing the type, areal distribution and concentration of ice cover were developed In order to guide vessel operational movements, near real-time SLAR image data were transmitted directly from the SLAR aircraft to Barrow, Alaska and the U.S Coast Guard icebreaker Glacier. In addition, SLAR image data were transmitted in real time to Cleveland Ohio via the NOAA-GOES Satellite Radar images developed in Cleveland were subsequently facsimile transmitted to the U S Navy's Fleet Weather Facility in Suitland, Maryland for use in ice forecasting and also as a demonstration back to Barrow via the Communications Technology Satellite Author

RS77-4-164

N77-21530*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt Md.
MEAN SEA LEVEL DETERMINATION FROM SATELLITE ALTIMETRY
W D. Kahn, B. B. Agrawal (Computer Sci Corp.), and R. D Brown (Computer Sci Corp) Mar 1977 28 p refs Submitted for publication
(NASA-TM-X-71298: X-921-77-41) Avail: NTIS HC A03/MF A01 CSCL 05B

The primary experiment on the Geodynamics Experimental Ocean Satellite-3 (GEOS-3) is the radar altimeter. This experiment's major objective is to demonstrate the utility of measuring the geometry of the ocean surface, i e. the geoid Results obtained from this experiment so far indicate that the planned objectives of measuring the topography of the ocean surface with an absolute accuracy of + or - 5 meters can be met and perhaps exceeded. The GEOS-3 satellite altimeter measurements have an instrument precision in the range of + or - 25 cm to + or - 50 cm when the altimeter is operating in the short pulse mode. Author

RS77-4-165

N77-22788# National Oceanic and Atmospheric Administration, Miami, Fla Atlantic Oceanographic and Meteorological Labs
A COMPARISON OF SATELLITE-OBSERVED SEA-SURFACE TEMPERATURES WITH GROUND TRUTH IN THE INDIAN OCEAN
Ants Leetmaa and Matthew Cestari Aug 1976 17 p refs
(PB-262414/6; NOAA-TR-ERL-376; AOML-22;
NOAA-76112404) Avail NTIS HC A02/MF A01 CSCL 08J

Daily worldwide sea-surface temperature maps are produced by the National Environmental Satellite Service For the first half of 1975, sea-surface temperatures recorded on these maps were compared with concurrent ship observations in the Indian Ocean Additional comparisons were made with historical data. These show systematic differences between the satellite and sea-surface observations. The satellite-derived temperatures appear to be too low along the equator and along the East African coast in the vicinity of the equator. GRA

RS77-4-166

N77-17534*# Science Univ. of Tokyo (Japan).
INVESTIGATION OF ENVIRONMENTAL CHANGE PATTERN IN JAPAN. INVESTIGATION OF VARIATIONS IN THE PROMINENT OCEANIC CURRENT, KUROSHIO
Takakazu Maruyasu and Daitaro Shoji, Principal Investigators Jan 1977 5 p Sponsored by NASA Original contains color imagery Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D 57198 ERTS
(E77-10081, NASA-CR-149564) Avail: NTIS HC A02/MF A01 CSCL 08C

The author has identified the following significant results Conspicuous results of composed color images were realized in the ground patterns, such as the fine meander of the Tenryu River. No significant difference was found between single band color image and multiband composed color image in the sea area It was found that MSS was more advantageous for land than for sea; only band 4 shows dominant features in the sea

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RS77-4-167

N77-21818*# National Aeronautics and Space Administration Goddard Space Flight Center, Greenbelt, Md
A REVIEW OF APPLICATIONS OF MICROWAVE RADIOMETRY TO OCEANOGRAPHY
Thomas T. Wilheit, Jr. Feb 1977 22 p refs Submitted for publication
(NASA-TM-X-71296; X-953-77-27) Avail: NTIS HC A02/MF A01 CSCL 08C

The emissivity of sea ice and atmospheric precipitation was investigated Using the above physics, the data from the Electrically Scanning Microwave Radiometers (ESMR's) on the Nimbus-5 and Nimbus-6 satellites operating at wavelengths of 1 55 cm and 3mm respectively, can be interpreted in terms of rain rate, ice coverage, and first year versus multi-year ice determination. The rain rate data is being used to establish a climatology of rainfall over the oceans Both ice and rain data sets have been generated for the Global Atmospheric Research Project Data Systems Test. Author

RS77-4-168

N77-21510*# Delaware Univ., Newark Center for Remote Sensing
DISTRIBUTION AND CONCENTRATION OF SUSPENDED MATTER IN DELAWARE BAY
V Klemas, Principal Investigator and W Philpot 10 Apr 1977 2 p ERTS
(Contract NAS5-20983)
(E77-10144, NASA-CR-152637) Avail: NTIS HC A02/MF A01 CSCL 08J

The author has identified the following significant results The problem of remote sensing of suspended matter in water was analyzed in terms of the single-scattering albedo, and a semiempirical relationship between satellite radiance measurements and the concentration of suspended matter in the water was developed. The relationship was tested using data from the 7 July 1973 LANDSAT overpass of Delaware Bay with good results Suspended sediment concentration maps for the entire Delaware Bay were prepared using radiance values extracted from LANDSAT MSS imagery and correlating them with ground truth samples collected from boats and helicopter.

RS77-4-169

N77-17128*# Naval Research Lab., Washington, D.C.
ANALYSIS OF MICROWAVE RADIOMETRIC MEASUREMENTS FROM SKYLAB Final Report
Robert M Lerner and James P Hollinger Apr. 1976 97 p refs Sponsored in part by NASA
(NRL Proj A01-48)
(NASA-CR-149659, AD-A028076; NRL-MR-3306) Avail: NTIS HC A05/MF A01 CSCL 08/10

The results from the 1 4-GHz, S-194, phased array passive radiometer located on the SKYLAB satellite are presented. The objective of the investigation is to establish the degree to which quantitative measurements of sea-surface conditions and related wind fields can be made using the S-194 radiometer. To interpret the radiometric measurements in terms of environmental parameters, the microwave intensity is calculated using theoretical models for the atmosphere and for the ocean surface; the total radiation is then convolved with the detailed antenna pattern of the S-194 to obtain the antenna temperature. This antenna temperature is then compared with the measured value, the environmental parameters adjusted, and the calculations iterated until agreement is obtained to within the measurement error. GRA

RS77-4-170

N77-17554# Environmental Research Inst of Michigan, Ann Arbor
BASIC REMOTE SENSING INVESTIGATION FOR BEACH RECONNAISSANCE Interim Report, 1 Jun. - 31 Dec. 1975
F Thompson, R. Shuchman, C Wezernak, D. Lyzenga, and D Leu Jul. 1976 127 p refs
(Contract N00014-74-C-0273)
(AD-A029041, ERIM-108900-5-P) Avail: NTIS HC A07/MF A01 CSCL 15/4

Progress is reported on three tasks designed to develop remote sensing beach reconnaissance techniques applicable to the benthic, beach intertidal, and beach upland zones Task 1 is designed to develop remote sensing indicators of important beach composition and physical parameters which will ultimately prove useful in models to predict beach conditions. Task 2 is designed to develop remote sensing techniques for survey of bottom features in the benthic zone. Task 3 is designed to develop radar processing techniques to delineate important beach intertidal and upland parameters and to better understand the potential of radar-derived information when used with optical sensor data. Author (GRA)

RS77-4-171

N77-18512*# Division of National Mapping, Canberra (Australia)
MAPPING ISLANDS, REEFS AND SHOALS IN THE OCEANS SURROUNDING AUSTRALIA Final Report, 8 Aug. 1975 - 8 Aug. 1976
Leonard G. Turner, Principal Investigator 8 Nov 1976 14 p ref Sponsored by NASA ERTS
(E77-10091, NASA-CR-149574) Avail NTIS HC A02/MF A01 CSCL 08B

The author has identified the following significant results Contours of residual errors were depicted in east and north directions Contours were constructed from residuals which were determined at 22 ground control points. Residuals at two control points were rejected from contour determination, as their magnitudes were not in keeping with surrounding values Results obtained so far from depth measurement tests are only tentative Both sucessful and unsuccessful correlations were depicted between the imagery intensities and bathymetric data Using the results from nine profile comparisons abstracted from a scene over Torres Strait, where water was generally very clear, an empirical relationship between image intensity (I) and water depth (d) was derived I = 30 - 0 75 d

RS77-4-172

N77-12484# Bochum Observatory (West Germany). Inst. fuer Weltraumforschung.
REMOTE SENSING OF VARIATIONS OF SEA-ICE-SURFACES IN THE BARENTS-SEA FROM 1966 - 1975 BY MEANS OF SATELLITE DATA, AMONG OTHERS NOAA-VHRR
Heinz Kaminski 1976 32 p refs In GERMAN Presented at the 10th Intern. Polar Meeting, Zurich, 6-8 Apr. 1976
Avail: NTIS HC A03/MF A01

The sea ice dynamics were investigated from ESSA 2, 4, 6, 8, ITOS 1, NOAA 1, 3, 4 satellite infrared sensor measurements in April of the years 1966 to 1975 The free water surface was established and correlated with the average air and water temperature measured at the Vardoe, Kanin, Bjoernoya, Spitzbergen, and Ostrov Heisja weather stations. The free water surface is shown to have increased in the reference period, and the annual variations of the free water surface show a good correlation with the average water temperature of the Gulf North Cape stream and with the average April air temperature. ESA

RS77-4-173

N77-22792# Environmental Research Inst of Michigan, Ann Arbor

PRELIMINARY ENGINEERING MEASUREMENTS FROM L-BAND DATA COLLECTED AT MARINELAND

J. S Zelenka, R Shuchman, and A. Klooster 27 Aug 1976 21 p Revised

(PB-262500/2; ERIM-123000-6-T-Rev) Avail. NTIS HC A02/MF A01 CSCL 08C

Some preliminary measurements obtained from the L-Band, H-H polarization data collected with the ERIM multichannel radar are reported. A portion of the L-Band data collected near the Gulf Stream was scanned in the image plane of an optical processor. The resulting measurement enabled investigators to obtain an estimate of the modulation depth associated with this particular example of wave imagery, and the results should be representative of the prevailing seastate. GRA

RS77-4-174

N77-22791# Environmental Research Inst. of Michigan, Ann Arbor.

WAVE VELOCITY EFFECTS ON SAR IMAGERY AS OBSERVED IN THE OPTICAL PROCESSOR

R A Shuchman and J S Zelenka 20 Aug 1976 17 p ref (Grant NOAA-04-6-158-44078)

(PB-262439/3; ERIM-123000-5-T; NOAA-76112908) Avail: NTIS HC A02/MF A01 CSCL 08C

ERIM X-L data collected at Marineland on December 15, 1975 was selected for the experimental study. Using data that covered shallow, deep, and Gulf Stream conditions, wave velocity and direction was transferred into velocities that correspond to positive or negative motion parallel to the aircraft direction (i e, traveling essentially in the azimuth direction) GRA

RS77-4-175

N77-17537*# Science Univ. of Tokyo (Japan)

INVESTIGATION OF ENVIRONMENTAL CHANGE PATTERN IN JAPAN. CLASSIFICATION OF SHORELINES Quarterly Report

Takakazu Maruyasu and Daitaro Shoji, Principal Investigators Jan. 1977 11 p Sponsored by NASA ERTS

(E77-10084 NASA-CR-149567) Avail: NTIS HC A02/MF A01 CSCL 08B

The author has identified the following significant results. The sand beach was separated from sea water in each of four bands. If the beach had a width of 100 m or more. Density ranges of the sea for CCT counts were determined as 0-3 for band 7, 0-16 for band 6, 0-25 for band 5, and 0-27 for band 4

RS77-4-176

A77-29493 * Sea-truth and environmental characterization studies of Mobile Bay, Alabama, utilizing ERTS-1, data collection platforms. W. W. Schroeder (Alabama, University, Dauphin Island, Ala.). *Remote Sensing of Environment*, vol. 6, no. 1, 1977, p. 27-43. 26 refs Contract No NAS5-21876.

The paper reports on the scientific results obtained during a feasibility study that evaluated the potential of using ERTS data collection platforms (DCPs) in the coastal environment of Mobile Bay, Alabama. The utility of instrumented buoys operated in a coastal marine environment as ERTS DCPs is demonstrated It is shown that these platforms are capable of providing both sea-truth data for ERTS imagery studies and time-series data for event monitoring and/or environmental characterization studies. S.D.

RS77-4-177

A77-24874 West Antarctic ice streams. T Hughes (Maine, University, Orono, Me., National Center for Atmospheric Research, Boulder, Colo.). *Reviews of Geophysics and Space Physics*, vol 15, Feb. 1977, p. 1-46. 75 refs

Dynamic processes at work in ice streams that impart a degree of independent behavior to the ice sheets are studied, with a focus on consequences of viscoplastic instability of anisotropic polycrystalline solids (such as glacial ice). Viscoplastic instability and subglacial topography responsible for ice stream formation near ice sheet margins grounded below sea level, the eroding action of calving bays migrating up surging ice streams, and the contribution made by ice sheets to climatic change are examined Tidal flexure along floating ice stream margins, stress and velocity fields in ice streams, and ice stream boundary conditions are studied in the interpretation of ERTS-1 photomosaics taken of West Antarctica, with characteristic ice sheet crevasse patterns scrutinized in order to monitor ice stream surges and to study calving bay dynamics. R.D.V.

RS77-4-178

A77-30004 * Satellite, aircraft, and drogue studies of coastal currents and pollutants. V. Klemas, G. Davis, J. Lackie (Delaware, University, Newark, Del.), W. Whelan, and G. Tomatore (ITT, Avionics Div., Columbia, Md.). *IEEE Transactions on Geoscience Electronics*, vol. GE-15, Apr. 1977, p. 97-108. 17 refs. Research supported by the Du Pont de Nemours and Co., Contract No. NAS5 21937.

The mounting interest in extracting oil and other resources from the continental shelf and continuing use of shelf and estuarine waters for waste disposal is creating a need for synoptic means of determining currents and monitoring pollutants in this area. A satellite aircraft-drogue approach is described which employs remotely tracked expendable drogues together with satellite and aircraft observations of waste plumes and current tracers such as dyes or suspended sediment. Tests conducted on the continental shelf and in Delaware Bay indicate that the approach provides a cost-effective means of studying current circulation, oil-slick movement, and ocean waste dispersion under a wide range of environmental conditions. (Author)

RS77-4-179

A77-31913 Remote sensing of coastal wetland vegetation and estuarine water properties. V. Klemas (Delaware, University, Newark, Del.). In: Estuarine processes Volume 2 - Circulation, sediments, and transfer of material in the estuary. New York, Academic Press, Inc., 1977, p. 381-403. 53 refs.

The advantages and limitations of remote sensing techniques for collecting synoptic data over large coastal and estuarine areas are reviewed with emphasis on the need for a proper balance between remotely sensed data and 'ground truth'. Specific applications include mapping wetland vegetation and coastal land use; monitoring natural and man-induced changes in the coastal zone; charting current circulation, including the movement and dispersion of known water pollutants; and determining the type and concentration of suspended matter in coastal waters. The photo-interpretation of aircraft and satellite imagery with the aid of 'ground truth' is illustrated, employing both direct visual and automated computer techniques. For some applications, it is shown that an integrated boat-aircraft-satellite approach can produce better results or cost less, than the deployment of large numbers of boats or field teams without remote sensor support. (Author)

RS77-4-180

A77-31726 * On the observed annual cycle in the ocean-atmosphere heat balance over the Northern Hemisphere. A. H Oort (NOAA, Geophysical Fluid Dynamics Laboratory, Princeton, N.J.) and T. H. Vonder Haar (Colorado State University, Fort Collins, Colo.). *Journal of Physical Oceanography*, vol. 6, Nov. 1975, p. 781-800. 32 refs. Grant No. NGR-06-002-102.

Based on the best presently available satellite radiation, atmospheric and oceanic data sets, the long-term mean heat balance of the earth and its normal seasonal variation are investigated over the Northern Hemisphere. Quantitative estimates for the various flux and storage terms in the atmospheric and terrestrial branches of the heat balance are given for 10-deg-wide latitude belts and for each calendar month. The results are presented in both graphical and tabular form. As was known before, the storage of heat in the oceans is found to dominate the energy storage in the combined atmosphere-ocean-land-cryosphere system. In the tropics, large changes in oceanic heat storage are found in the 10 N-20 N belt with a maximum in spring and a minimum in late summer. The main new finding of this study is that the inferred oceanic heat transports appear to undergo very large seasonal variations especially in the tropics. (Author)

RS77-4-181

A77-30002 Radar scatterometer discrimination of sea-ice types. S. K. Parashar (Canada Centre for Remote Sensing, Ottawa, Canada), R. M. Haralick, R. K. Moore, and A. W. Biggs (Kansas, University, Lawrence, Kan.). *IEEE Transactions on Geoscience Electronics*, vol. GE-15, Apr. 1977, p. 83-87. 10 refs.

Distinct types of sea ice can be discriminated with the 400 MHz and 13.3 GHz radar scatterometers described. Categories range from open water through young ice of various thicknesses to first-year ice and multiyear ice of various thickness ranges. The 13.3 GHz scatterometer can be used to achieve 92% correct identification accuracy in distinguishing these categories, using a Bayes decision rule with a multivariate density function. This performance is superior to that attainable with the 400 MHz scatterometer, and superior to that attainable employing other automatic classifying techniques. R.D.V.

RS77-4-182

A77-27069 Ice movements in the Beaufort Sea 1973-1975 - Determination by ERTS imagery. L. W Sobczak (Department of Energy, Mines and Resources, Gravity and Geodynamics Div., Ottawa, Canada) *Journal of Geophysical Research*, vol. 82, Mar. 20, 1977, p. 1413-1418. 7 refs.

Remote sensing (ERTS) imagery has been used to map the distribution of leads in the sea ice over the Beaufort Sea during late February through early April in 1973, 1974, and 1975. A comparison of the bearings and speeds of ice movements obtained from ERTS-based maps with those of geostrophic winds calculated from average daily and weekly atmospheric pressure charts indicates that the ice drifts at about 1/100 of the speed of the geostrophic winds in a direction about 20 degrees to the left of them. During early March 1973, before excessive ice breakup, the sea ice moved slowly, about 0 3 km/d, but during periods of rapid ice fracturing (March and April 1975) the sea ice moved at rates as high as 18.2 km/d. (Author)

RS77-4-183

EUSTATIC SEA VARIATION IN THE LAST 2000 YEARS IN THE MEDITERRANEAN,
Bologna Univ. (Italy) Instituto di Fisica.
M Caputo, and L. Pieri.
Journal of Geophysical Research, Vol 81, No 33, p 5787-5790, November 20, 1976. 4 fig, 1 tab, 2 ref.

Descriptors: *Sea level, *Archaeology, *History, Harbors, Docks, Shores, Aerial photography, Coastal structures, Foreign countries, Mathematical studies.
Identifiers: *Sea variation, *Mediterranean Sea, *Italy, Archeological ruins, Fish ponds, Harbor wharves, Tide gages, Ancient shorelines.

The rise in the sea level of the Mediterranean Sea in the period ranging from 600 B.C to 100 A.D was studied by using archeological ruins chosen in order to give assurance with respect to the date and the height. Among the archeological structures visible and in contact with the sea at that time, Roman fish ponds, harbor wharves, and docks were the most important. A plot of measured depth versus date showed that from 600 B C. to 100 A.D. the Mediterranean Sea rose from -1.7 to -0 4 m with respect to mean sea level in 1884. Two least squares regression lines with 95% confidence region were drawn. The first, which included all 22 data sets, showed a rise of the mean sea level of 1.7 mm/year in the time span from 600 B.C. to 100 A.D.; one, containing only 20 data sets, showed a rise of the mean sea level of 1.4 mm/year in the same time period. This rise of the sea may have ended around the year 350 A.D. A rise of 1.4 mm/year agreed with the rise of the Mediterranean Sea as recorded in the last century by tide gage. The altimetric data for buried ruins were obtained by means of traditional geometric leveling; for underwater ruins, in situ measurements were taken with reference to the present sea level, while the values with respect to the mean sea level were calculated on site by means of harmonic forecast of tidal movements. (Roberts-ISWS)
W77-04271

RS77-4-184

ANTISYMMETRIC STRESS FOR SEA ICE,
Geological Survey, Tacoma, Wash. Water Resources Div.
C. H Ling, and W. J Campbell
AIDJEX Bulletin No 33, University of Washington, Seattle, Division of Marine Resources, p 77-84, September 1976. 1 fig, 14 ref.

Descriptors: *Sea ice, *Oceans, *Volume, *Equations, Methodology, *Stress, Movement, Arctic Ocean, Antarctic Ocean, Aerial photography, Aircraft, Satellites(Artificial).

Equations are described for studying the dynamics of floating ice Starting with a control volume, the momentum equation and the equation for the angular momentum are derived. The control volume, which comprises several floes, consists of four control surfaces plus the top and bottom control surfaces that coincide with the top and bottom of the floes. The stress has the unit of force per unit length. The important point to consider is that for the Arctic Ocean and parts of the Antarctic ocean, continuum ice can be large. Recent aircraft and satellite data (Campbell et al., 1974, 1975) show that the Beaufort Sea has a significant variation of floe size, with many large floes, up to 60 km in diameter, in the eastern part and much smaller ones in the western part. During recent aircraft flights between Greenland and the North Pole, many large aggregates composed of numerous small and large floes were observed which had dimensions on the order of 100 km. Markò and Thomson (1975) have noted the presence of large-scale, spatially rectilinear leads separated by distances of approximately 100 km through satellite imagery of the ice-covered Canada Basin in the Arctic Ocean. This is further evidence that the sea ice as a continuum has a very large scale. (Woodard-USGS)
W77-04240

RS77-4-185

OBSERVATIONS OF THE MOTION FIELD OF THE CONNECTICUT RIVER PLUME,
Connecticut Univ., Groton. Marine Science Inst., and Connecticut Univ., Groton. Dept. of Geology and Geophysics.
R. W. Garvine.
Journal of Geophysical Research, Vol. 82, No. 3, p 441-454, January 20, 1977. 18 fig, 1 tab, 14 ref, 1 append

Descriptors: *Rivers, *Estuaries, *Water circulation, *Connecticut River, Tide waters, Tides, Buoys, Flow, Coasts, Dye releases, Aerial photography, Aircraft, Tracking techniques, Tracers, Freshwater-saline water interfaces, Salinity, Mapping.
Identifiers: *Drogues, *Long Island Sound, *Drifters, Fronts(Water), *Plumes(Rivers).

Observations of the motion field associated with the plume formed by the outflow of the Connecticut River into the coastal seawater of Long Island Sound were presented. Approximately 35 drogues and drifters were tracked for each of three experiments using an airborne camera. The trajectories and the Eulerian velocity field deduced from them was presented. The offshore boundary of the plume as formed by a front where there was a strong discontinuity at the surface in both the velocity and density fields. In addition to a vigorous outflow of plume surface water away from the river mouth and parallel to the plume axis, the observations showed a pronounced surface flow toward the front and normal to the axis, which was consistent with frontal convergence. The speed of plume water was found to be highly supercritical. The motion of nearby ambient seawater appeared to be little affected by the plume. (Sims-ISWS)
W77-05808

RS77-4-186

A COST-EFFECTIVE SATELLITE-AIRCRAFT-DROGUE APPROACH FOR STUDYING ESTUARINE CIRCULATION AND SHELF WASTE DISPERSION,
Delaware Univ., Newark. Coll of Marine Studies.
V. Klemas, G. Davis, H. Wang, W. Whelan, and G. Tornatore.
Available from the National Technical Information Service, Springfield, VA 22161 as N76-16528, Price codes: A02 in paper copy, A01 in microfiche. Reprint from Ocean '75, MTS and IEEE Combined Conference, p 751-760, 1975. Also as Delaware University College of Marine Studies Report No. CMS-NASA-5-75. 11 fig, 11 ref.

Descriptors: *Continental Shelf, *Remote sensing, *Waste disposal, *Water pollution sources, *Oil pollution, Dispersion, Ocean currents, Ocean circulation, Cost benefit analysis, Resources development, Environmental effects, Delaware Bay, Atlantic Ocean.
Identifiers: *Outer Continental Shelf, *Estuarine circulation, U.S. East Coast.

The mounting economic pressure to extract oil and other resources from the Continental Shelf and to continue using it for waste disposal is creating a need for cost-effective, synoptic means of determining currents in this area. An integrated satellite-aircraft-drogue approach has been developed which employs remotely tracked expendable drogues together with satellite observations of waste plumes, and natural tracers, such as suspended sediment. Tests conducted on the Continental Shelf and in Delaware Bay indicate that the system provides a cost-effective means of monitoring current circulation and ocean waste dispersion even under severe environmental conditions (Sinha-OEIS)
W77-04492

RS77-4-187

DELINEATION OF THERMAL EFFLUENTS DISCHARGED INTO TROPICAL WATERS AROUND PUERTO RICO BY AERIAL INFRARED SCANNING,
Puerto Rico Nuclear Center, Mayaguez.
E. D. Wood.
Presented to the American Society of Limnology and Oceanography 38th Annual Meeting, Halifax, Nova Scotia, June 23-26, 1975. 28 p, 14 fig, 5 ref.

Descriptors: *Remote sensing, *Thermal pollution, *Infrared radiation, *Puerto Rico, Aircraft, Aerial photography, Data processing, Powerplants, Nuclear powerplants, Cooling water, Bays, Estuaries, Instrumentation, Model studies, Mathematical models, Pollution, Effluents, Pollutants, *Path of pollutants, Tropical regions
Identifiers: *Infrared scanners.

Aerial infrared scanning offers a versatile tool with which to monitor thermal discharges and a rapid method of detecting extraneous discharges whose temperatures differ from the ambient waters. Knowledge of the extent and distribution of thermal effluents is necessary to assist in determining the effects of the added heat upon biota of the region. An AGA Model 680 Thermovision infrared scanner with a 45 deg lens was mounted in a Cessna 182 and flown at altitudes of 600-2000 m during night and twilight hours. The detector was InSB, cooled with liquid nitrogen and sensitive to the range 2-5.6 micrometers. The picture was originally displayed on a color monitor which assigned ten arbitrary colors to shades of gray on the control unit. Isotherms have been assigned using coincidental surface measurements made with a thermometer, read to the nearest 0.1C. The data were then recorded on film. Ranges were set at 2C and 5C, and common sensitivities were 0.2C and 0.5C, respectively. More recently, the data have been recorded on magnetic tapes with a Sabre III instrumentation tape recorder. Observed data were compared to predictions made using the Pritchard Plume Model. Anomalies can be explained by boundary, wind, and tidal effects. (Sims-ISWS)
W77-05814

RS77-4-188

PAT-APPL-743 372/GA PC A02/MF A01
Department of the Navy Washington D C
Dual-Frequency, Remote, Ocean Wave Spectrometer.
Patent Application,
John W. Wright, William J. Plant, and Dale L. Schuler. Filed 19 Nov 76, 24p AD-D003 468/6
This Government-owned invention available for U.S. licensing and, possibly, for foreign licensing. Copy of application available NTIS.

Descriptors: *Oceanographic equipment, *Patent applications, Gravity waves, Ocean waves, Coherent radar, Spectrometers, Dual channel, Surface waves, Ocean surfaces, Remote detectors
Identifiers: PAT-CL-343-200, Surface gravity waves, Remote sensing.

The patent application describes a coherent, dual-frequency, ocean wave spectrometer radar system for measuring the characteristics of ocean surface gravity waves which includes a transmitter for transmitting a pair of closely spaced, coherently related, microwave frequencies; a receiver for receiving and separating the radar-return signals of the dual-frequency channels, a frequency shifter for offsetting the doppler spectrum of each radar return signal, and a multiplier for multiplying the radar-return signals of the dual-frequency channels to obtain a Bragg resonance condition indicating the presence of a particular gravity wave frequency on the ocean surface.

RS77-4-189

ON THE OCEAN TEMPERATURE DISTRIBUTION IN THE GULF OF ALASKA, 1974-1975,
Alaska Univ., College. Inst. of Marine Science
T. C. Royer, and R. D. Muench.
Journal of Physical Oceanography, Vol. 7, No. 1, p 92-99, January 1977. 5 fig, 1 tab, 14 ref. NOAA 03-5-022-56, NESS 5-35190, NSF IDE74-13969 A02.

Descriptors: *Remote sensing, *Water temperature, *Gulfs, *Alaska, Satellites(Artificial), Infrared radiation, Circulation, Water circulation, Density, Salinity, Temperature, Continental shelf, Currents(Water), Ocean currents, Estuaries, Oceanography.
Identifiers: *Gulf of Alaska.

Infrared data gathered by the NOAA 3 and 4 satellites have made it possible to construct a detailed synoptic view of sea surface temperatures in the northern Gulf of Alaska. These satellite data were compared with simultaneous oceanographic data to yield information on vertical subsurface features. Generally, tow surface temperature regimes characterize the northern gulf throughout the year. Relatively warm surface water occurs over the continental shelf, while colder water is found farther offshore, beyond the shelf break. A narrow (5-10 km) Coastal band, with relatively low temperatures which apparently are due to terrestrial runoff, was not always present. Wave or eddy-like features were observed along the boundary between the warm and cold surface water regimes. Lateral advection and vertical mixing both contribute to maintenance of these two major surface temperature regimes. Offshelf lateral advection and/or upwelling brought colder water into the northern gulf between July 1974 and February 1975 and led to an offshelf temperature decrease of nearly 2C at 200 m depth. Such temperature decreases at depth were not evident in the shelf waters. The upper layer (less than 100 m) vertical stability was greater in the offshelf region and confined the sea-air heat loss there to a relatively shallow layer. Since the water density is controlled primarily by salinity at the temperatures and salinities found in the Gulf of Alaska, sea surface temperature changes reflect both heat loss and vertical density (salinity) structure. (Sims-ISWS)
W77-06320

RS77-4-190

AD-A032 606/6GA PC A02/MF A01
Texas A and M Univ College Station Dept of Oceanography
Gulf Stream Kinematics Inferred from a Satellite-Tracked Drifter,
A. D. Kirwan, Jr., G. McNally, and J. Coehlo. 27 Feb 76, 7p Rept no. Contrib-652
Contract N00014-75-C-0537
Availability: Pub. in Jnl. of Physical Oceanography, v6 n5 p750-755 Sep 76.

Descriptors: *Gulf Stream, Drift, Buoys, Paths, Remote detectors, Spaceborne, Tracking, Ocean surface, Kinematics, Meteorological satellites, Reprints.
Identifiers. Nimbus 6 satellite, Drogued buoys.

A drifter was deployed in the Gulf Stream and Tracked for 5 months by the Nimbus 6 satellite. From this experiment we have assessed the technical capability of the satellite fixing system for measuring ocean currents, the drifter trajectory as it relates to the Gulf Stream position as determined by other independent means, and the kinematics and accelerations following the Stream axis. It is shown that the trajectory agrees quite well with the other data on the location of the Gulf Stream. The velocities, accelerations and kinetic energies derived from the trajectory are compared with previous studies. A comparison is made of the kinetic energy of the Gulf Stream as inferred from the drifter with some recent calculations made from ship drift. (Author)

RS77-4-191

AD-A033 745/1GA PC A03/MF A01
Louisiana State Univ Baton Rouge Coastal Studies Inst
Detection of Oceanic Thermal Fronts off Korea with the Defense Meteorological Satellites.
Technical rept.,
Oscar Karl Huh. 9 Jun 76, 26p Rept no. TR-226
Contract N00014-75-C-0192
Availability. Pub. in Remote Sensing of Environment, v5 p191-213 1976.

Descriptors: *Infrared images, *Infrared scanning, *Radiometers, Ocean surface, Surface temperature, Coastal regions, Korea, Ocean currents, Temperature gradients, Resolution, Meteorological satellites, Military satellites, Remote detectors, Spaceborne, Infrared detectors, Reprints.
Identifiers: Tsushima Current, Fronts(Oceanographic), Defense meteorological satellite program, *Ocean temperature, DMSP satellites.

Scanning radiometers of the Defense Meteorological Satellite Program have provided useful thermal infrared (8-13 micrometer imagery of the oceanic regions near the Korean Peninsula. The near real-time thermal infrared data (at 3.7 km spatial resolution) provided temperatures some 2-10 C cooler than the actual surface measurements. The thermal gradients were faithfully reproduced, however, and relative temperature differences to less than 0.1 C were successfully estimated from the imagery. A combination of methods was used to avoid possible confusion with atmospheric temperature and humidity gradients. The oceanic thermal front between the Tsushima Current and the Korean coastal waters was routinely detected and displayed on the electro-optically contoured thermal imagery. The contour intervals are 1.6 C, and noise-induced effects give a thermal resolution of 0.8 C. Temperature differences across the front of 3.29 C were measured by seven ship crossings, and temperature differences of 3.3 C were estimated from five satellite overpasses Thermal patterns of a one-sided divergence and a cyclonic eddy were detected in the coastal waters at the flow separation where the western edge of the Tsushima Current curves away from the coast into the Sea of Japan. A critique of the oceanographic capabilities and limitations of the system is provided.

RS77-4-192

AD-A032 447/5GA PC A02/MF A01
Environmental Research Inst of Michigan Ann Arbor
Basic Investigations for Remote Sensing of Coastal Areas.
Quarterly rept. 16 Jul-15 Oct 76,
R. A. Shuchman, D. R. Lyzenga, and F. J. Thomson. 1976, 6p Rept no. ERIM-108900-8-L

Descriptors: *Coastal regions, Remote detectors, Optical detectors, Near infrared radiation, Beaches, Minerals, Air water interactions, Atmosphere models, Ocean models, Reflectance, Ocean surface, Ocean environments, Refractive index, Optical properties, Absorption(Physical).
Identifiers: *Remote sensing, Coasts, Multiband spectral reconnaissance.

During the quarterly period 16 July - 15 October 1976, three principle activities took place. The second year interim report was printed and distributed. Work was completed on obtaining critical optical properties of beach minerals to be used as inputs into the Beach and Environment Models. In the water modeling area, the water-atmosphere model was tested and used in a study for the Naval Coastal Systems Lab., and analysis of model results in the context of MRA development has begun. In connection with this task, a letter was sent to the Editor of Applied Optics on the reflectance of a flat ocean in the limit of zero water depth.

RS77-4-193

AD-A031 306/4GA PC A03/MF A01
Geophysical Survey Systems Inc Burlington Mass
Airborne Sea Ice Thickness Profiling Using an Impulse Radar.
Final rept.,
Rexford M. Morey. Jun 75, 32p USCG-D-178-75, CGR/DC-28/75
Contract DOT-CG-81-75-1373

Descriptors: *Radar mapping, *Sea ice, Helicopters, Radar pulses, Airborne, Thickness, Aircraft antennas, Radar antennas, Icebreakers, Navigation, Northwest Territories, Flight testing.
Identifiers: Ice profiling, Electromagnetic subsurface profiling, Remote sensing.

The remote measurement of sea ice thickness from a mobile platform has been a goal of researchers and organizations, such as the U.S. Coast Guard, for many years. Ice thickness data is needed over large areas for icebreakers operation and navigation. The objective of this contract is to evaluate a successful ground-based sea ice profiling radar when adapted to a helicopter platform. The electronic and recording equipment were mounted in a small helicopter and the radar antenna was slung on a rope 14 m. below the helicopter. The thickness of fresh water ice and sea ice was successfully measured in the Canadian Arctic near Inuvik, N.W.T. Over 50 km of first-year sea ice were continuously profiled. The ice thickness varied from 0.5 m. to 2 m. and the wind-swept snow cover varied from zero to 0.3 m. In the traverse mode, sea ice thickness was continuously measured at an altitude of 40 m. and a speed of 65 km/hr. Theoretical considerations and experimental results are given. (Author)

RS77-4-194

AD-A035 032/2GA PC A08/MF A01
Motorola Inc Scottsdale Ariz Government Electronics Div
Performance of Coherent-on-Receive Synthetic Aperture Side Looking Airborne Radar.
Final rept. Apr-Jul 76,
D. E. Fraser, and G. V. Morris. Oct 76, 165p
GED-2213, USCG-D-109-76
Contract F42600-75-A-1861

Descriptors: *Side looking radar, *Synthetic aperture radar, *Oil spills, *Water pollution, *Coherent radar, Airborne, Performance, Coast Guard, Signal processing, Aircraft antennas, Wind, High gain.
Identifiers: *Oil slicks, Oil pollution detection, Remote sensing, Ocean waves, Ocean surface.

The Coast Guard's Oil Slick Detection Side Looking Airborne Radar was modified to add a synthetic aperture mode. The modification used the technologies of real time digital synthetic aperture processing and making the existing magnetron transmitter/receiver unit coherent-on-receive. Improvement in resolution by a factor of ten and imaging of the ocean surface and moving vessels were demonstrated. Synthetic oil slicks, generated using Oleyl alcohol, were detected by the synthetic aperture radar at a range of 25 km under 10 knot wind conditions and at 9 km under 4 knot wind. Comparison imagery was taken by a standard AN/APS-94D. The OSDR provided greater detection ranges of oil, due primarily to the higher sea return of the 8-foot vertically polarized antenna of the OSDR. The AN/APS-94D, with the higher gain 16-foot horizontally polarized antenna, detected vessels at longer ranges. (Author)

RS77-4-195

AD-A037 300/1GA PC A03/MF A01
Naval Oceanographic Office Washington D C
Aerial Ice Reconnaissance and Satellite Ice Information Microfilm File,
Peter A. Mitchell. Aug 76, 37p Rept no. NOO-RP-17

Descriptors: *Sea ice, Arctic regions, Antarctic regions, Microfilm, Area coverage, Aerial photographs, Aerial reconnaissance, Scientific satellites, Files(Records).
Identifiers: Polar regions, Remote sensing, Forecasting.

Interest in the polar regions has increased manyfold in recent years principally due to the newly developing economic incentives and revived military significance of the Arctic and the continuing scientific research in the Antarctic. Improvement and further development of operational sea ice forecasting techniques that allow our naval forces to operate safely in these areas depend heavily upon the maintenance of historical ice data files. The Aerial Ice Reconnaissance and Satellite Ice Information Microfilm File effectively substitutes for the terminated Oceanographic Office annual reports of the arctic and antarctic ice observing and forecasting programs. This publication provides the researcher with listings of available microfilm in one of the Navy's more extensive ice data files and describes the procedures to follow to obtain copies of the original chart analyses of aerial ice reconnaissance and satellite ice data. (Author)

RS77-4-196

AD-A035 011/6GA PC A03/MF A01
Naval Oceanographic Office Washington D C Marine Sciences Dept
Airborne Radiation Thermometer Survey Tongue of the Ocean, 5 Through 9 February 1963.
Informal Manuscript rept.,
J. Wilkerson, R. Peloquin, and I. Perlroth. 28 Feb 63, 45p Rept no. NOO-IM-O-20-63

Descriptors. *Oceanographic data, Thermometers, *Tongue of the Ocean, Acoustic properties, Temperature gradients, Antisubmarine aircraft, Airborne, Shallow water, Deep water, Bahama Islands, Surface temperature, Ocean surface.
Identifiers: Most project-2, Radiation thermometers, Exuma Sound.

Three flights were conducted over the Tongue of the Ocean (TOTO) and Exuma Sound to obtain sea surface temperature measurements with the Barnes Model 14-320 Airborne Radiation Thermometer (ART). The TOTO and Exuma Sound are deep basins (600 to 1,100 fathoms) with steep, sloping sides and are surrounded by shoals (1 to 6 fathoms). A shallow area about 38 miles in width divides the basins along their longest axis. The flight tracks over the survey area are shown. Sea surface temperatures were recorded with the ART from an altitude of 1,500 feet at speeds of 200 to 220 knots. Navigation was performed by LORAN and visual means. Accuracy to the nearest one-half mile was achieved along the grid pattern flown.

RS77-4-197

AD-A031 352/8GA PC A03/MF A01
Cold Regions Research and Engineering Lab Hanover N H
Grounded Ice in the Fast Ice Zone along the Beaufort Seacoast of Alaska,
Austin Kovacs. Sep 76, 29p Rept no. CRREL-76-32
Grant NOAA-01-5-022-1651

Descriptors: *Ice, *Ice islands, *Ice reporting, *Sea ice, *Beaufort Sea, Ice formation, Surface roughness, Salinity, Temperature, Sonar, Density, Coastal regions, Core sampling, Brines, Side looking radar, Meteorological radar, Pack ice, Thickness, Alaska.
Identifiers: *Harrison Bay, Prudhoe Bay.

Four large grounded multi-year shear ridge formations were found in the grounded ice subzone of the fast ice zone near the Harrison Bay/Prudhoe Bay area of Alaska. A 166-m-long cross section of one of these formations was obtained by leveling and sonar measurements. These measurements revealed that the maximum ridge height was 12.6 m and that the formation was grounded in 17-18 m of water. The salinity, temperature, brine volume and density of the ice were determined on samples obtained by coring. The physical characteristics of the formations as observed in satellite, SLAR and aerial imagery indicate that these formations have not moved between the time of their formation in the fall of 1974 and August of 1976. Evidence of significant aeolian debris discoloring the ice is discussed.

RS77-4-198

PB-261 413/9GA PC A20/MF A01
National Oceanic and Atmospheric Administration, Boulder, Colo. Environmental Research Labs.
Environmental Assessment of the Alaskan Continental Shelf. Volume 14. Ice.
Annual rept.
Apr 76, 452p NOAA-76100501-14
See also PB-261 400. Prepared in cooperation with Bureau of Land Management, Washington, D.C.

Descriptors: *Natural resources, *Oil pollution, *Sea ice, *Continental shelves, *Alaska, Assessments, Ecology, Remote sensing, Ice, Creep rate, Shear stress, Land ice, Failure, Crude oil, Geomorphology, Beaufort Sea, Coasts, Bering Sea, Chukchi Sea.
Identifiers: *Outer Continental shelves, Baseline studies.

This is the fourteenth volume of a set of fourteen which presents baseline studies of the natural resources of the Alaska Continental Shelf as well as studies of the environmental effects of the development of the resources in that area with particular emphasis on oil pollution. This volume contains the following studies: The interaction of oil with sea ice in the Arctic Ocean; Dynamics of near-shore ice (near-shore radar transponder and fast ice studies); Dynamics of near-shore sea ice in shear zone (data buoys); Study of climatic effects on fast ice extent and its seasonal decay along the Beaufort Sea coast; Mechanics of origin of pressure ridges, shear ridges and hummock fields in landfast ice; Morphology of Bering near-shore ice conditions by means of satellite and aerial remote sensing; Morphology of Beaufort near-shore ice conditions by means of satellite and aerial remote sensing; Experimental measurements of sea ice failure stresses near grounded structures; Beaufort Sea, Chukchi Sea, Bering Strait historical baseline ice study; Development of hardware and procedures for in-situ measurement of creep in sea ice and operation of an Alaskan facility for applications of remote-sensing data to Outer Continental Shelf studies.

RS77-4-199

PB-264 249/4GA PC A99/MF A01
National Oceanic and Atmospheric Administration, Miami, Fla. Atlantic Oceanographic and Meteorological Labs.
Collected Reprints - 1974. Atlantic Oceanographic and Meteorological Laboratories. Volume I.
Annual rept. no. 9.
Sep 76, 805p NOAA-77012402
See also report dated Jul 74, COM-75-50164 and Volume 2, PB-264 250.

Descriptors: *Oceanography, *Atlantic Ocean, *Marine meteorology, *Air water interactions, Ocean currents, Ocean temperature, Salinity, Turbidity, Water pollution, Internal waves, Sediments, Remote sensing, New York Bight, Scientific satellites, Stratigraphy.
Identifiers: SEASAT-A satellite, ERTS satellites, Virginia Key Vessel, Bellows vessel.

This report brings together the published research results of the NOAA Atlantic Oceanographic and Meteorological Laboratories (AOML). It provides a single source for articles which appeared in various scientific journals, and those which appeared as internal scientific and technical publications, during 1974. The Atlantic Oceanographic and Meteorological Laboratories conduct research programs to study the physical, chemical, and geological characteristics and processes of the ocean waters, the sea floor, and the atmosphere above the ocean. (Portions of this document are not fully legible.)

RS77-4-200

PB-264 250/2GA PC A25/MF A01
National Oceanic and Atmospheric Administration, Miami, Fla. Atlantic Oceanographic and Meteorological Labs.
Collected Reprints - 1974. Atlantic Oceanographic and Meteorological Laboratories. Volume II.
Annual rept. no. 9.
Sep 76, 597p NOAA-77012403
See also Volume 1, PB-264 249.

Descriptors: *Oceanography, *Atlantic Ocean, *Marine meteorology, *Air water interactions, Ocean currents, Marine geology, Marine geophysics, Sediments, Magnetic anomalies, Continental drift, Paleomagnetism, Continental shelves, Wind(Meteorology), Abyssal zone, Scientific satellites, Remote sensing.
Identifiers: ERTS satellites, SKYLAB-4 satellite.

This report brings together the published research results of the NOAA Atlantic Oceanographic and Meteorological Laboratories (AOML). It provides a single source for articles which appeared in various scientific journals, and those which appeared as internal scientific and technical publications, during 1974. The Atlantic Oceanographic and Meteorological Laboratories conduct research programs to study the physical, chemical, and geological characteristics and processes of the ocean waters, the sea floor, and the atmosphere above the ocean. (Portions of this document are not fully legible.)

RS77-4-201

PB-262 132/4GA PC A99/MF A01
National Oceanic and Atmospheric Administration, Boulder, Colo. Environmental Research Labs.
Collected Reprints: 1974-1975, Wave Propagation Laboratory.
Report for 1 Jan 74-31 Dec 75.
Jul 76, 613p NOAA-76111050
See also report dated Aug 74, COM-75-10471.

Descriptors: *Remote sensing, *Wave propagation, Elastic waves, Radio waves, Gravity waves, Coherent radiation, Acoustic scattering, Underwater acoustics, Optical detection, Atmospheric sounding, Echo sounding.
Identifiers: Reprints, Acoustic gravity waves, Atmospheric boundary layer.

This fourth volume of Collected Reprints comprises work published by WPL authors between 1 January 1974 and 31 December 1975. The papers included in this volume have been selected to minimize duplication or extraneous material; for this reason, only abstracts, rather than the full text, of WPL/NOAA Technical and Memorandum Reports are included. The reprints in this volume are compiled under the following subjects: acoustic and gravity wave propagation; wave propagation at optical frequencies; remote sensing concepts; geophysical studies; and development of instruments and techniques.

RS77-4-202

PB-262 500/2GA PC A02/MF A01
Environmental Research Inst. of Michigan, Ann Arbor.
Preliminary Engineering Measurements from L-Band Data Collected at Marineland.
Memorandum rept.,
J. Zelenka, R. Shuchman, and A. Klooster. 27 Aug 76, 21p ERIM-123000-6-T, NOAA-76112909
Revision of report dated Jan 76.

Descriptors: *Gravity waves, *Radar images, Ocean waves, Oceanographic data, Data acquisition, Sea states, L band, Data processing.
Identifiers: Gulf Stream.

A major engineering objective of the Marineland Experiment is to help determine the sensitivity required of the SEASAT SAR for imaging gravity waves. Some preliminary measurements obtained from the L-Band, H-H polarization data collected with the ERIM multichannel radar are reported. All results pertain to data collected on December 15, 1975. The most spectacular gravity waves obtained at Marineland with the ERIM multichannel radar were obtained near the Gulf Stream on December 14 and 15, 1975. A portion of the L-Band data collected on December 15 near the Gulf Stream was scanned in the image plane of an optical processor. The resulting measurement enabled investigators to obtain an estimate of the modulation depth associated with this particular example of wave imagery, and the results should be representative of the prevailing seastate.

RS77-4-203

PB-265 414/3GA PC A05/MF A01
National Environmental Satellite Service, Washington, D C
NOAA Program Development Plan for SEASAT-A Research and Applications.
Mar 77, 97p NOAA-77030210

Descriptors: *Oceanography, *Remote sensing, Platforms, Project planning, Project management, Unmanned spacecraft, Scientific satellites.
Identifiers: SEASAT-A satellite, *SEASAT-A project.

A program development plan considers the marine applications of NASA's SEASAT-A spacecraft, designed for launch in 1978. SEASAT-A is the first space research platform dedicated to ocean science and application. Specific objectives are: (1) explore, map, and chart the global ocean and its living resources; (2) manage, use, and conserve those resources; (3) describe, monitor, and predict conditions in the atmosphere, ocean, sun, and space environment; (4) issue warnings against impending destructive natural events; (5) develop beneficial methods of environmental modification; and (6) assess the consequences of inadvertent environmental modification over a period of time.

RS77-4-204

PB-262 420/3GA PC A05/MF A01
National Oceanic and Atmospheric Administration, Miami, Fla. Atlantic Oceanographic and Meteorological Labs.
An Experiment to Evaluate SKYLAB Earth Resources Sensors for Detection of the Gulf Stream.
Technical rept.,
George A. Maul, Howard R. Gordon, Stephen R. Baig, Michael McCaslin, and Roger DeVivo.
Aug 76, 77p NOAA-TR-ERL-378-AOML-23, NOAA-76112405
Descriptors: *Remote sensing, *Ocean currents, *Gulf Stream, Spaceborne photography, Spectroradiometers, Scanners, Scanning, Instrumentation, Florida Straits.
Identifiers: Remote sensors, SKYLAB project, Multispectral scanners.

An experiment to evaluate the SKYLAB Earth Resources Package for observing ocean currents was performed in the Straits of Florida in January 1974. Data from the S-190 photographic facility, S-191 spectroradiometer, and the S-192 multispectral scanner were compared with surface observations made simultaneously by the R/V VIRGINIA KEY and the NASA C-130 aircraft.

RS77-4-205

PB-259 932/2GA PC A14/MF A01
California Univ., Santa Barbara. Marine Science Inst.
Oil Spill and Oil Pollution Reports, February 1976 - April 1976.
Quarterly rept.,
Penelope Melvin, Robin M. Ross, and Helmut Ehrenspeck. Aug 76, 320p* EPA/600/2-76/215
Grant EPA-R-803992
See also report dated Jul 76, PB-257 886 (PC A14/MF A01)

Descriptors: *Oil spills, *Oil pollution, *Bibliographies, *Water pollution, Detection, Monitoring, Remote sensing, Sampling, Evaluation, Water pollution control, Patents, Regulations, Prevention, Research projects, Abstracts.

The February 1976 - April 1976 Oil Spill and Oil Pollution Reports is the seventh quarterly compilation of oil spill events and oil pollution report summaries. Presented in the report are: (a) summaries of oil spill events; (b) summaries and bibliographic literature citations; (c) summaries of current research projects; and (d) patent summaries. This report is submitted in partial fulfillment of EPA Grant No. R-803992 by the Marine Science Institute, University of California, Santa Barbara, under the sponsorship of the Environmental Protection Agency.

RS77-4-206

PB-258 745/9GA PC A14/MF A01
California Univ., Santa Barbara. Marine Science Inst.
Oil Spill and Oil Pollution Reports August 1975 - October 1975.
Quarterly rept.,
Penelope Melvin, and Robin M. Ross. Jul 76, 312p EPA/600/2-76/113
Grant EPA-R-803063
See also report dated Jul 76, PB-257 886.

Descriptors: *Oil pollution, *Bibliographies, Removal, Reviews, Documents, Research projects, Patents, Water pollution abatement, Detectors, Monitoring, Petroleum products, Environmental impacts, Boats, Abstracts, Marine biology, Hydrocarbons, Fisheries, Wildlife, Shellfish, Remote sensing, Legislation.
Identifiers: *Oil spills.

The August 1975 - October 1975 Oil Spill and Oil Pollution Reports is the fifth quarterly compilation of oil spill events and oil pollution report summaries. Presented in the report are: (a) Summaries of oil spill events; (b) summaries and bibliographic literature citations; (c) summaries of current research projects; and (d) patent summaries.

RS77-4-207

E77-10043 PC A06/MF A01
Geological Survey, Menlo Park, Calif.
Studies of the Inner Shelf and Coastal Sedimentation Environment of the Beaufort Sea from ERTS-A.
Final rept. 15 Jun 72-15 Oct 73,
Erk Reimnitz, Peter W. Barnes, Larry J. Toimil, and Deborah Harden. 15 Aug 76, 105p NASA-CR-149172
NASA Order S-70243-AG
Original contains color imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Ave., Sioux Falls, S.D. 57198

Descriptors: *Coasts, Sediments, Alaska, Rivers, *Beaufort Sea(North America), Continental shelves, Sea ice, Earth resources program, Arctic regions, Ocean bottom.
Identifiers: Pack ice, Ice reporting, Shores.

The author has identified the following significant results. Shearing periodically occurs between the westward moving pack ice (3 to 10 km/d) within the Pacific Gyre and the fast ice along the coast, forming major grounded shear and pressure ridges between the 10 to 40 m isobaths. Ridges occur in patterns conforming to known shoals. The zone of grounded ridges, called stamukhi zone, protects the inner shelf and coast from marine energy and pack ice forces. Relatively undeformed fast ice grows inshore of the stamukhi zone. The boundary is explained in terms of pack ice drift and major promontories and shoals. Intense ice gaging, highly disrupted sediments, and landward migration of shoals suggest that much of the available marine energy is expended on the sea floor within the stamukhi zone. Naleds (products of river icings) on the North Slope are more abundant east than west of the Colville River. Their location, growth, and decay were studied from LANDSAT imagery.

RS77-4-208

E77-10053 PC A02/MF A01
Norsk Polarinstitutt, Oslo.
Sea Ice Studies in the Spitsbergen-Greenland Area.
Quarterly rept. no 5,
Torgny E. Vinje. Nov 76, 15p NASA-CR-149261
Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Ave., Sioux Falls, S.D. 57198.

Descriptors: *Sea ice, *Greenland, Geology, Glaciers, Arctic Ocean, Snow, Ocean currents, Earth resources program, Multispectral band scanners.
Identifiers: Snow line

The author has identified the following significant results Detailed information on the outflow through the Fram Strait of ice from the Polar Ocean over shorter periods were obtained. It is found that the speed of the outflow may vary about 100 percent over periods of a few days. The core of the East Greenland Current is found between 2 deg E and 4 deg W The speed of the surface water at 81 deg N is for a calm period estimated to be about 10 cm/s A new surging glacier was discovered and new fronts of several glaciers were determined. The variation of the snow line with respect to distance from the coast was for the first time determined for the southern part of Spitsbergen. Great variations were observed, from 200 m in the east to 550 m in the central area of the island

RS77-4-209

14675 Bryan, M. L. Application of ERTS-1 and multiplexed SLAR imagery for the study of flooded shorelines: *in* Remote sensing of Earth resources; Volume IV (Shahrokhi, F., editor), p. 601-619, tables, sketch maps, Univ. Tenn. Space Inst., Tullahoma, Tenn., United States, 1975.

RS77-4-210

18901 Bogorodskiy, V. V.; Kropotkin, M. A.; and Sheveleva, T. Yu. Study of the effect of waves on remote sensing of oil pollution by the active method; Oceanology, Vol. 15, No. 6, p. 714-716, illus., 1976.

RS77-4-211

14752 Kirkham, R. G.; and Stevenson, M. R. A preliminary analysis of ERTS-1 imagery over the Gulf of California [abstr.]: Eos (Am. Geophys. Union, Trans.), Vol. 56, No. 12 *(Fall annual meeting)*, p. 1003, 1975.

RS77-4-212

14792 Moore, B. R.; and Wachs, T. C. Use of infra red imagery in the selection of a port facility, Western Australia: *in* Remote sensing of Earth resources; Volume IV (Shahrokhi, F., editor), p. 99-104, sketch maps, Univ. Tenn. Space Inst., Tullahoma, Tenn., United States, 1975.

RS77-4-213

15055 Carter, V.; and Anderson, R. R. Tidal effects in coastal wetlands: U. S. Geol. Surv., Prof. Pap., No. 929 *(ERTS-1, a new window on our planet)*, p. 283-285, illus., 1976.

RS77-4-214

18908 Buznikov, A. A.; Ivanyan, G. A.; Kondrat'yev, K. Ya.; *et al.* Primeneniye effekta polyarizatsii dlya tseley distantsionnogo obnaruzheniya plenok nefti na poverkhnosti morya [Application of the polarization effect for the purposes of remote sensing of oil slicks on the sea surface] Akad. Nauk SSSR, Dokl., Vol. 221, No. 5, p. 1082-1085, 1975.

RS77-4-215

13261 Campbell, W. J. Applications to oceanography; introduction: U. S. Geol. Surv., Prof. Pap., No. 929 *(ERTS-1, a new window on our planet)*, p. 326-327, 1976.

RS77-4-216

ID NO.- EI770532405 732405
TECHNIQUES FOR STUDYING SEA ICE DRIFT AND DEFORMATION AT SITES FAR FROM LAND USING LANDSAT IMAGERY.
Hibler, W. D. III; Tucker, W. B.; Weeks, W. F.
US Army Cold Reg Res & Eng Lab, Hanover, NH
Proc of the Int Symp on Remote Sensing of Environ, 10th, Ann Arbor, Mich, Oct 6-10 1975 Publ by Environ Res Inst of Mich, Cent for Remote Sensing Inf and Anal, Ann Arbor, 1975 v 1 p 595-609
DESCRIPTORS: *ICE, OCEANOGRAPHY, (REMOTE SENSING, Environmental Applications),
IDENTIFIERS: LANDSAT IMAGERY, SEA ICE DRIFT, SEA ICE DEFORMATION
CARD ALERT: 443, 931, 471
A semi-automatic procedure for rapidly and accurately transferring ice coordinates from one LANDSAT image to another and for simultaneously estimating all linear measures of the ice deformation is described. The procedure takes into account the non-parallel nature of th elongitude lines and the finite curvature of the latitude lines, factors which are particularly critical in the polar regions. Necessary inputs are the location coordinates (latitude and longitude) of the center of each image and the location of two arbitrary points on a line of longitude on the image. The accuracies of the various elements of the procedure are examined using imagery over land and are found to be dominated by deviations (as large as 8 km) of the actual position of the center of the image from its stated position. Refs.

RS77-4-217

ID NO.- EI770533837 733837
CURRENT STATUS AND QUALITY OF GLOBAL OPERATIONAL SEA SURFACE TEMPERATURES FROM SATELLITE INFRARED DATA.
Brower, Robert L.; Pichel, William G.; Walton, Charles C.; Signore, T. L.
NOAA, Natl Environ Satell Serv, Suitland, Md
Proc of the Int Symp on Remote Sensing of Environ, 10th, Ann Arbor, Mich, Oct 6-10 1975 Publ by Environ Res Inst of Mich, Cent for Remote Sensing Inf and Anal, Ann Arbor, 1975 v 2 p 1405-1414
DESCRIPTORS: (*OCEANOGRAPHY, *Temperature Measurement), (RADIOMETERS, Infrared), (REMOTE SENSING, Computer Applications),
CARD ALERT: 471, 941, 944
The paper describes a program that provides daily global surveillance of the ocean's surface temperature structure. Sea surface temperature values are derived from scanning radiometer infrared data from the NOAA series of polar orbiting satellites. The techniques used to obtain these temperatures is the fully automated computer procedure GOSSTCOMP (Global Operational Sea Surface Temperature Computation). Surface temperature retrievals are derived by statistical analysis and quality control techniques applied to instrument measurements within roughly 100 km square areas. Retrieval temperatures are corrected for the effects of atmospheric attenuation. The basic product obtained from the model is a daily set of 5,000 to 7,000 observations of sea surface temperature over the oceans of both hemispheres.

RS77-4-218

ID NO.- EI770750807 750807
PHASE AND DOPPLER ERRORS IN A SPACEBORNE SYNTHETIC APERTURE RADAR IMAGING THE OCEAN SURFACE.
Tomiyasu, Kiyo
GE, Valley Forge Space Cent, Philadelphia, Pa
IEEE J Oceanic Eng v OE-2 n 1 Jan 1977 p 68-71 CODEN: IJOEDY
DESCRIPTORS: *OCEANOGRAPHY, RADAR EQUIPMENT, (OCEAN ENGINEERING, Communication Systems),
IDENTIFIERS: SPACEBORNE RADAR
CARD ALERT: 471, 472, 716
Data processing in a spaceborne synthetic aperture radar (SAR) imaging the ocean surface is affected by earth rotation, orbit eccentricity, and wave motion. Without compensation these sources will cause the images to shift in range and in-track positions and also cause defocusing. Ionospheric granularities may degrade image quality. Calculations of the magnitudes of these effects are presented.

RS77-4-219

ID NO.- EI770534287 734287
INTERPRETATION KEY FOR SAR (L-BAND) IMAGERY OF SEA ICE.
Bryan, M. Leonard
Calif Inst of Technol, JPL, Pasadena
Proc of the Am Soc of Photogramm, Fall Conv, Jt Meet with Am Congr on Surv and Mapo, Seattle, Wash, Sep 28-Oct 1 1976 Publ by Am Soc of Photogramm, Falls Church, Va, 1976 p 406-435
DESCRIPTORS: (*PHOTOGRAMMETRY, *Interpretation), ICE, (RADAR, Meteorological),
IDENTIFIERS: SEA ICE
CARD ALERT: 405, 443, 716, 742
This paper presents a key developed for L-band (25 cm) radar imagery collected over the Arctic Ocean by the Jet Propulsion Laboratory. Data from several seasons (April, August, October) are considered. Open water situations (polynas, leads, flaws), examples of unconsolidated ice (frazil, slush, brash), thin ice (nilas) and annual ice (first year, multi-year ice) situations are also considered. 34 refs.

RS77-4-220

ID NO.- EI770532406 732406
SPATIAL VARIABILITY OF ICE THICKNESS DISTRIBUTION AS DETERMINED FROM LANDSAT-A.
Hall, R. T.
AIDJEX, Seattle, Wash
Proc of the Int Symp on Remote Sensing of Environ, 10th, Ann Arbor, Mich, Oct 6-10 1975 Publ by Environ Res Inst of Mich, Cent for Remote Sensing Inf and Anal, Ann Arbor, 1975 v 1 p 611-619
DESCRIPTORS: *ICE, (REMOTE SENSING, Environmental Applications),
IDENTIFIERS: LANDSAT IMAGERY, ARCTIC ICE DYNAMICS JOINT EXPERIMENT, ICE THICKNESS DISTRIBUTION
CARD ALERT: 931, 742
Landsat images of the Arctic pack ice have been used to measure a point on the ice thickness distribution, and examine its variability on scales considered by the AIDJEX model. The variation of thickness distribution as a function of sample size and distance is shown for three Landsat strips located in the Beaufort Sea for March and April 1973. In all cases there were spatial variations of thickness distribution on a scale of 800 km, with shorter scale variations superimposed. Although the amplitude of the shorter scale variations sometimes equal the amplitude of the larger trends the preliminary conclusion is that the measurements support using a 100 km continuum element to characterize the ice thickness distribution.

RS77-4-221

ID NO.- EI770531436 731436
SATELLITE GLOBAL MONITORING OF ENVIRONMENTAL QUALITY.
Schiffer, R. A.
NASA, Washington, DC
Proc of the Int Symp on Remote Sensing of Environ, 10th, Ann Arbor, Mich, Oct 6-10 1975 Publ by Environ Res Inst of Mich, Cent for Remote Sensing Inf and Anal, Ann Arbor, 1975 v 1 p 255-263
DESCRIPTORS: *ENVIRONMENTAL PROTECTION, (SATELLITES, Detection), AIR POLLUTION, OCEANOGRAPHY, (REMOTE SENSING, Environmental Applications),
IDENTIFIERS: NIMBUS G, SAGE
CARD ALERT: 901, 655
Nimbus G, the Air Pollution and Oceanographic Observing Satellite, scheduled for launch in 1978, is NASA's first research and development satellite dedicated to environmental quality measurements. Atmospheric experiments on Nimbus-G will determine the feasibility of space-borne detection and mapping of important minor stratospheric constituents, and will provide a measurement of the Earth's radiation budget. Oceanographic experiments on Nimbus-G will focus on monitoring ocean color in coastal zones and will provide the first all-weather capability for measurement of sea surface temperature. A second satellite mission planned for the same general time frame is SAGE, the Stratospheric Aerosol and Gas Experiment. This satellite will provide data on stratospheric aerosol distributions and concentrations at latitudes beyond those accessible to the solar occultation aerosol sensor on Nimbus-G.

RS77-4-222

ID NO.- EI770533105 733105
THEMATIC MAPPING OF CORAL REEFS USING LANDSAT DATA.
Smith, V. Elliott; Rogers, Robert H.; Reed, Larry E.
Cranbrook Inst of Sci, Bloomfield Hills, Mich
Proc of the Int Symp on Remote Sensing of Environ, 10th, Ann Arbor, Mich, Oct 6-10 1975 Publ by Environ Res Inst of Mich, Cent for Remote Sensing Inf and Anal, Ann Arbor, 1975 v 1 p 585-594
DESCRIPTORS: *MAPS AND MAPPING, OCEANOGRAPHY, (REMOTE SENSING, Environmental Applications), AERIAL PHOTOGRAPHY, DATA PROCESSING,
IDENTIFIERS: LANDSAT DATA, CORAL REEFS, COASTAL ZONES
CARD ALERT: 471, 941, 742, 405, 723
Recent progress is reported in a continuing study of coral reef monitoring by satellite. Physiographic zones of the Australian Great Barrier Reef (Cape Melville area) were categorized and mapped by automated processing of LANDSAT (ERTS) tapes. Data products included color-coded, geometrically-correct images (1:250,000 scale) and quantitative inventories of zonal area on selected reefs. Categorized images were evaluated with reference to aerial photography. These results further demonstrate the potential of LANDSAT data for use in coral reef surveillance, mapping and inventories.

RS77-4-223

ID NO.- EI770535124 735124
INSTRUMENT FOR REMOTE MONITORING OF SEDIMENT MOVEMENT AND ASSOCIATED HYDRAULIC CONDITIONS ON THE CONTINENTAL SHELF.
Heath, R. A.; Carter, L.; Barnes, E. J.; Hunt, B. J.
NZ Oceanogr Inst, Dep of Sci & Ind Res
NZ Eng v 31 n 10 Oct 15 1976 p 242-243 CODEN: NZENA5
DESCRIPTORS: (*SEDIMENTATION, *Measurements), (REMOTE SENSING, Environmental Applications), (INSTRUMENTS, Remote Reading), (OCEANOGRAPHY, Currents),
IDENTIFIERS: SEDIMENT MOVEMENT
CARD ALERT: 471, 732, 931, 944
An instrument package, designed to monitor both the hydraulic and sediment movement conditions, has been constructed at the New Zealand Oceanographic Institute. Current velocity is measured with a commercially available Geodyne current meter which records on 8 mm film. The pressure fluctuations near the sea floor are measured with a dual port pressure transducer and recorded on magnetic tape. 3 refs.

RS77-4-224

ID NO.- EI770536797 736797
SKYLAB MSS VS. PHOTOGRAPHY FOR ESTUARINE WATER COLOR CLASSIFICATION.
Gordon, Hayden H.; Nichols, Maynard M.
Va Inst of Mar Sci, Gloucester Point
Proc of the Int Symp on Remote Sensing of Environ, 10th, Ann Arbor, Mich, Oct 6-10 1975 Publ by Environ Res Inst of Mich, Cent for Remote Sensing Inf and Anal, Ann Arbor, 1975 v 1 p 421-435
DESCRIPTORS: (*WATER RESOURCES, *Management), (REMOTE SENSING, Multispectral Scanners), AERIAL PHOTOGRAPHY, DATA PROCESSING,
IDENTIFIERS: SKYLAB, EARTH TERRAIN CAMERA
CARD ALERT: 444, 742, 941, 723
A computer classification was performed on data from the Skylab multispectral scanner and Earth Terrain Camera for the Rappahannock Estuary in the Chesapeake Bay. A comparison of results indicates a similar water class structure from color film and MSS tapes, but a much better two-dimensional chart derived from the MSS. Refs.

RS77-4-225

ID NO.- EI770533825 733825
BIOLOGICAL AND PHYSICAL OCEANOGRAPHIC REMOTE SENSING STUDY ABOARD THE CALYPSO.
Harlan, J. C.; Hill, J. M.; El-Reheim, H. A.; Bohn, C.
Tex A&M Univ, Remote Sensing Cent, College Station
Proc of the Int Symp on Remote Sensing of Environ, 10th, Ann Arbor, Mich, Oct 6-10 1975 Publ by Environ Res Inst of Mich, Cent for Remote Sensing Inf and Anal, Ann Arbor, 1975 v 1 p 661-670
DESCRIPTORS: *OCEANOGRAPHY, REMOTE SENSING,
CARD ALERT: 471, 716, 742
A multi-agency oceanographic remote sensing program was conducted in the Gulf of Mexico and the Caribbean Sea between November 1974 and February 1975. Remote sensors on satellites and on aircraft were used as operations and experimental planning tools as well as for scientific data acquisition. The experiments were designed to provide basic information for correlating ocean measurements with remotely sensed observations. The cruise was conducted in three legs, using U-2 aircraft with a 10-channel prototype ocean color scanner: ERTS data, and satellite imagery. Refs.

RS77-4-226

ID NO.- EI770532407 732407
PASSIVE RADIOWAVE SENSING OF THE THICKNESS AND OTHER CHARACTERISTICS OF SEA ICE.
Tiuri, Martti; Laaperi, Antti; Jokela, Kari
Helsinki Univ of Technol, Otaniemi, Finl
Proc of the Int Symp on Remote Sensing of Environ, 10th, Ann Arbor, Mich, Oct 6-10 1975 Publ by Environ Res Inst of Mich, Cent for Remote Sensing Inf and Anal, Ann Arbor, 1975 v 1 p 633-636
DESCRIPTORS: *ICE, RADIOMETERS, REMOTE SENSING.
IDENTIFIERS: SEA ICE THICKNESS
CARD ALERT: 931, 941, 716
During the spring of 1975 an extensive experiment to determine the characteristics of sea ice in the Baltic Sea by passive and active remote sensing methods was performed in cooperation with Finnish, Swedish and Dutch research groups. In this report the preliminary results of UHF and microwave radiometer measurements are described. The results indicate that 600 MHz and 5 GHz radiometers can be used to determine the ice thickness in the case of relative low salinity ice. Some information is also obtained about ice ridges.

RS77-4-227

ID NO.- EI770533836 733836
AUTOMATED MEASUREMENT OF SEA SURFACE TEMPERATURE FROM A GEOSTATIONARY ENVIRONMENTAL SATELLITE.
Tarpley, J. D.; Raymond, B. A.
Natl Oceanic & Atmos Adm, Suitland, Md
Proc of the Int Symp on Remote Sensing of Environ, 10th, Ann Arbor, Mich, Oct 6-10 1975 Publ by Environ Res Inst of Mich, Cent for Remote Sensing Inf and Anal, Ann Arbor, 1975 v 1 p 139-148
DESCRIPTORS: (*OCEANOGRAPHY, *Temperature Measurement), (REMOTE SENSING, Environmental Applications), SATELLITES, INFRARED RADIATION,
CARD ALERT: 471, 741, 655
An automatic technique has been developed to measure sea surface temperature using 10 mu m infrared data from a geostationary operational environmental satellite. Temperature derivatives are used to discriminate between cloudy and cloud free areas. Sea surface temperatures are retrieved at a resolution of 25 km and checked against a first guess field that is maintained and updated daily.

RS77-4-228

ID NO.- EI770532561 732561
DETECTION AND ANALYSIS FOR WATER SURFACE COVERED WITH OIL FILM.
Matsui, M.; Tsutsumi, S.; Takagi, T.
Kyoto Inst of Technol, Matsugasaki, Jpn
Proc of the Int Symp on Remote Sensing of Environ, 10th, Ann Arbor, Mich, Oct 6-10 1975 Publ by Environ Res Inst of Mich, Cent for Remote Sensing Inf and Anal, Ann Arbor, 1975 v 1 p 223-230
DESCRIPTORS: *INFRARED IMAGING, (WATER POLLUTION, Oil Spills), INFRARED RADIATION, REMOTE SENSING.
IDENTIFIERS: SCANNING ANGLE DEPENDENCE
CARD ALERT: 741, 453
The additive background radiation from all materials other than the targets to be detected presents a serious problem to passive infrared sensors. The paper describes both the scanning angle dependence of the spatial radiance distribution over the sea surface and the relationship of the sea surface radiance versus the thickness of oil film by which the sea surface is covered uniformly, operating in the spectral region of 10 to 13 mu m.

RS77-4-229

ID NO.- EI770536796 736796
INVESTIGATION OF THE WATERS IN THE LOWER CHESAPEAKE BAY AREA.
Bowker, D. E.; Witte, W. G.; Fleischer, P.; Gosink, T. A.; Hanna, W. J.; Ludwick, J. C.
NASA, Langley Res Cent, Hampton, Va
Proc of the Int Symp on Remote Sensing of Environ, 10th, Ann Arbor, Mich, Oct 6-10 1975 Publ by Environ Res Inst of Mich, Cent for Remote Sensing Inf and Anal, Ann Arbor, 1975 v 1 p 411-420
DESCRIPTORS: (*WATER RESOURCES, *Management), (REMOTE SENSING, Multispectral Scanners),
IDENTIFIERS: LANDSAT-1, WATER QUALITY
CARD ALERT: 444, 941
During the first year an intensive effort was made to collect water data at the time of LANDSAT-1 overpasses. Bands (5-6) of the multispectral scanner (MSS) were shown to be useful for monitoring total particles, although a daily calibration was required. Band 5 had a high correlation with sediment and under some conditions an internal correction for atmospheric interference was possible. The relation of sediment to particles was established by using the MSS radiance values, since the two parameters were not monitored at the same stations.

RS77-4-230

ID NO.- EI770533822 733822
OCEANS '76.
Anon
IEEE Counc on Oceanic Eng, New York, NY
Oceans '76: Mar Technol Soc and IEEE Counc on Oceanic Eng Annu Comb Conf, 2nd, Washington, DC, Sep 13-15 1976 Publ by IEEE (Cat n 76 CH 1118-9 OEC), New York, NY, 1976 var pagings
DESCRIPTORS: *OCEAN ENGINEERING, OCEANOGRAPHY, ELECTRIC CABLES, SUBMERSIBLES, MINES AND MINING, SATELLITES,
CARD ALERT: 471, 472, 706, 502, 655, 751
Proceedings includes 129 papers, of which 9 are presented in the form of abstracts or summaries. In addition 8 papers are indicated only by title. The material is divided into 25 sections dealing with legal aspects of the sea, marine mining, undersea cables, information transfer, navigation, economic aspects, deep water mapping, the SEASAT-A satellite, marine education, pollution control, fisheries, marine biology, buoys, remote sensing, acoustics, undersea vehicles, offshore facilities, diving, outer continental shelf study, oceanographic instrumentation, salvage, and coastal zone management.

Section 5

URBAN LAND USE

Geography, Environmental and Population Studies,
Lower Tropospheric Meteorology and Land-Use Studies

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RS77-5-134

N77-18556*# Army Cold Regions Research and Engineering Lab Hanover, N.H
REMOTE SENSING OF LAND USE AND WATER QUALITY RELATIONSHIPS - WISCONSIN SHORE, LAKE MICHIGAN
R K Haugen and T. L Marlar Aug 1976 55 p refs Sponsored in part by NASA
(NASA-CR-149449, AD-A030746; CRREL-76-30) Avail. NTIS HC A04/MF A01 CSCL 14/5

This investigation assessed the utility of remote sensing techniques in the study of land use-water quality relationships in an east central Wisconsin test area. The following types of aerial imagery were evaluated high altitude (60 000 ft) color, color infrared, multispectral black and white, and thermal, low altitude (less than 5000 ft) color infrared, multispectral black and white, thermal, and passive microwave A non-imaging hand-held four-band radiometer was evaluated for utility in providing data on suspended sediment concentrations Land use analysis includes the development of mapping and quantification methods to obtain baseline data for comparison to water quality variables. Suspended sediment loads in streams, determined from water samples, were related to land use differences and soil types in three major watersheds A multiple correlation coefficient R of 0 85 was obtained for the relationship between the 0 6-0 7 micrometer incident and reflected radiation data from the hand-held radiometer and concurrent ground measurements of suspended solids in streams Applications of the methods and baseline data developed in this investigation include. mapping and quantification of land use, input to watershed runoff models, estimation of effects of land use changes on stream sedimentation, and remote sensing of suspended sediment content of streams High altitude color infrared imagery was found to be the most acceptable remote sensing technique for the mapping and measurement of land use types. GRA

RS77-5-135

N77-19556*# Geological Survey Reston Va.
APPLICATIONS OF SKYLAB DATA TO LAND USE AND CLIMATOLOGICAL ANALYSIS Final Report
Robert H Alexander, Principal Investigator, Jonn E Lewis, Jr., Harry F. Lins, Jr., Carol B. Jenner, Sam I Outcalt, and Robert W. Pease Feb 1976 237 p refs Original contains color imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D 57198 EREP
(NASA Order T-5290-B)
(E77-10123; NASA-CR-151196) Avail NTIS HC A11/MF A01 CSCL 05B

The author has identified the following significant results. Skylab study in Central Atlantic Regional Ecological Test Site encompassed two separate but related tasks (1) evaluation of photographic sensors S190A and B as sources of land use data for planning and managing land resources in major metropolitan regions, and (2) evaluation of the multispectral scanner S192 used in conjunction with associated data and analytical techniques as a data source on urban climates and the surface energy balance. Photographs from the Skylab S190B earth terrain camera were of greatest interest in the land use analysis task; they were of sufficiently high resolution to identify and map many level 2 and 3 land use categories. After being corrected to allow for atmosphere effects, output from thermal and visible bands of the S192 was employed in constructing computer map plots of albedo and surface temperature

RS77-5-136

N77-17550*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
A PROCEDURE USED FOR A GROUND TRUTH STUDY OF A LAND USE MAP OF NORTH ALABAMA GENERATED FROM LANDSAT DATA
Sanford W. Downs, Jr., G. C. Sharma, and Colin Bagwell Washington Feb. 1977 62 p refs
(NASA-TN-D-8420; M-209) Avail: NTIS HC A04/MF A01 CSCL 08B

A land use map of a five county area in North Alabama was generated from LANDSAT data using a supervised classification algorithm There was good overall agreement between the land use designated and known conditions, but there were also obvious discrepancies. In ground checking the map, two types of errors were encountered - shift and misclassification - and a method was developed to eliminate or greatly reduce the errors Randomly selected study areas containing 2,525 pixels were analyzed. Overall, 76 3 percent of the pixels were correctly classified A contingency coefficient of correlation was calculated to be 0.7 which is significant at the alpha = 0 01 level. The land use maps generated by computers from LANDSAT data are useful for overall land use by regional agencies However, care must be used when making detailed analysis of small areas The procedure used for conducting the ground truth study together with data from representative study areas is presented
Author

RS77-5-137

N77-20625# Utah Univ., Salt Lake City.
AIRBORNE AIR POLLUTION MONITORING EXPERIMENT IN AN AREA OF MOUNTAIN-VALLEY TERRAIN
S. K. Kao and G. H Taylor Jan 1976 69 p refs Presentsd at Symp on Atmospheric Turbulence, Diffusion, and Air Quality, Raleigh, N. C 19 Oct 1976
(Contract ET(11-1)-2455)
(COO-2455-7, Conf-761003-4) Avail: NTIS HC A04/MF A01

Using a conductivity-type analyzer, sulfur dioxide concentrations were measured at various locations downwind of a large copper smelter A series of cross wind passes were flown, at incremental altitudes, to determine the concentration distribution of sulfur dioxide Measured concentrations in the mountain-valley terrains were, in general, much lower than those predicted by the flat-surface diffusion model It was felt that, since the smelter lies in an area of high relief, models intended for use over a flat surface would not be applicable for predicting plume concentrations in mountain-valley terrain; mechanical turbulence induced by mountain terrain near the source was thought to be the major cause of discrepancies between flat surface predictions and measured centerline concentrations An analytic equation based on wind tunnel experiments was developed for use during

RS77-5-138

N77-19559*# Alabama Univ., University. Dept of Geology and Geography
DELINEATION OF GEOLOGICAL PROBLEMS FOR USE IN URBAN PLANNING Final Report, 1 Jul. 1973 - 30 Jun. 1976
Travis H. Hughes, Pamela Bloss, Robert Fambrough, Stephen H. Stow, W Gary Hooks, Douglas Freehafer, and David Sutley Jun. 1976 104 p refs
(Contract NAS8-29937)
(NASA-CR-150197) Avail: NTIS HC A06/MF A01 CSCL 08G

Activities of the University of Alabama in support of state and local planning commissions are reported Demonstrations were given of the various types of remotely sensed images available from U-2, Skylab, and LANDSAT; and their uses and limitations were discussed Techniques to be used in determining flood prone areas were provided for environmental studies A rapid inexpensive method for study was developed by which imagery is copied on 35 mm film and projected on existing topographic maps for measuring delta volume and growth
Author

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RS77-5-139

N77-18539*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va
REMOTE SENSING OPERATIONS (MULTISPECTRAL SCANNER AND PHOTOGRAPHIC) IN THE NEW YORK BIGHT, 22 SEPTEMBER 1975
Robert W Johnson and John B. Hall Jr Feb 1977 14 p ref
(NASA-TM-X-73993) Avail: NTIS HC A02/MF A01 CSCL 14E

Ocean dumping of waste materials is a significant environmental concern in the New York Bight One of these waste materials, sewage sludge, was monitored in an experiment conducted in the New York Bight on September 22 1975 Remote sensing over controlled sewage sludge dumping included an 11-band multispectral scanner, fiver multispectral cameras and one mapping camera Concurrent in situ water samples were taken and acoustical measurements were made of the sewage sludge plumes. Data were obtained for sewage sludge plumes resulting from line (moving barge) and spot (stationary barge) dumps Multiple aircraft overpasses were made to evaluate temporal effects on the plume signature. Author

RS77-5-140

N77-20657# Science Applications, Inc., La Jolla, Calif.
APPLICATION OF REMOTE TECHNIQUES IN STATIONARY SOURCE AIR EMISSION MONITORING
C. B. Ludwig and M. Griggs Jun. 1976 166 p refs
(Contract EPA-68-03-2137)
(PB-258853/1: SAI-76-687-LJ· EPA-340/1-76-005) Avail. NTIS HC A08/MF A01 CSCL 07D

The usefulness of remote sensing techniques for monitoring the gaseous and particulate emissions from stationary sources was analyzed The status active and passive remote monitoring instruments were evaluated Results confirmed that the technique of differential absorption has the best sensitivity for the single-ended measurement of gaseous and particulate poliutants In general, data interpretation problems of the passive techniques make them less accurate than the active methods GRA

RS77-5-141

N77-19560*# TRW Defense and Space Systems Group, Redondo Beach, Calif.
MONITORING AIR POLLUTION FROM SATELLITES (MAPS). VOLUME 1: TECHNICAL REPORT Final Report, Dec. 1974 - May 1976
1 Mar 1977 309 p refs 2 Vol
(Contract NAS1-13635)
(NASA-CR-145137, TRW-25435-6001-RU-00-Vol-1) Avail. NTIS HC A14/MF A01 CSCL 14B

Performance tests on an electro-optical model of an infrared sensor for remote measurements of trace atmospheric gases are detailed, the instrument utilized a sample of the gas to be measured as spectral filter. Also reported is the development of radiometric calibration equipment that determines responses to simulated pollution effects Results show excellent agreement with theoretical performance predictions with the exception of nonuniform radiance responses Balance stability to an accuracy better than the rms noise level was demonstrated for the EOM in both the NH3 and CO modes for a period of two days under laboratory conditions Flight test results show that the temperature range of the absorption cell is restricted to 255 K or higher.
G G

RS77-5-142

N77-17612# Energy Research and Development Administration, Pittsburgh, Pa. Energy Research Center
DETECTION OF POINT SOURCES OF AIR POLLUTION USING ERTS-1 DATA
F. R Brown, F S Kam, and R. A. Friedel Mar. 1976 19 p refs
(PERC/RI-76/1) Avail NTIS HC A02/MF A01

Earth Resources Technology Satellite (ERTS-1) imagery was used for the detection of specific sources of industrial air pollution Particulate plumes and condensed water vapor plumes were detected when they were of sufficient size and when they were adequately contrasted with background features Vegetation damage due to air pollution was not detected, but surface mining and coal storage could be identified. Industrial complexes that both produced and did not produce sighted plumes were located. ERA

RS77-5-143

N77-20555# Rhode Island Univ., Kingston. Dept. of Chemistry.
REMOTE DETECTION OF WATER POLLUTANTS BY COMPUTERIZED LASER-RAMAN SPECTROSCOPY Completion Report, 1 Jul. 1974 - 30 Jun. 1976
Chris W Brown 30 Jun 1976 31 p refs Sponsored by Dept of the Interior
(PB-258777/2; W77-00154; OWRT-A-054-RI(1)) Avail. NTIS HC A03/MF A01 CSCL 07D

Hazardous chemicals in water were analyzed remotely and by conventional instrumentation using a digitized Raman spectrometer Several data processing methods were explored in order to lower the level of detectability. Furthermore, the feasibility of using the resonance Raman effect to lower the level of detectability was investigated. It is possible to detect many hazardous chemicals in the 1-10 ppm range using either data processing or the resonance Raman effect. GRA

RS77-5-144

N77-21518*# National Aeronautics and Space Administration Lewis Research Center, Cleveland, Ohio
APPLICATION OF REMOTE THERMAL SCANNING TO THE NASA ENERGY CONSERVATION PROGRAM
Robert L Bowman and John R Jack Jan. 1977 25 p refs Original contains color illustrations
(NASA-TM-X-73570, E-9017) Avail NTIS HC A02/MF A01 CSCL 08B

Airborne thermal scans of all NASA centers were made during 1975 and 1976 The remotely sensed data were used to identify a variety of heat losses, including those from building roofs and central heating system distribution lines Thermal imagery from several NASA centers is presented to demonstrate the capability of detecting these heat losses remotely Many heat loss areas located by the scan data were verified by ground surveys At this point, at least for such energy-intensive areas, thermal scanning is an excellent means of detecting many possible energy losses Author

RS77-5-145

N77-17614# Battelle Pacific Northwest Labs., Richland, Wash.
GROWTH OF AEROSOL IN AN URBAN PLUME
A. J. Alkezweeny 1976 19 p refs Presented at the 12th Intern Symp on Atmospheric Pollution, Paris, 5 May 1976 Sponsored by ERDA
(BNWL-SA-5537; Conf-760519-1) Avail: NTIS HC A02/MF A01

Time changes of aerosol particle size distribution in the range of 0.01 micrometer diameter, concentration of O3, NO, NO2, SO2, several hydrocarbons, and sulfate were measured in an urban plume. The investigation was conducted in a Lagrangian frame of reference using instrumented aircraft The air parcel trajectory was identified by the movement of a tetroon launched from the ground to an altitude within the plume This study was carried out in metropolitan St Louis, Missouri, U S A The results of the measurement of trace gases and the aerosol particles and their chemical analyses are presented and discussed. ERA

RS77-5-146

A77-27828 # A comparison of cell and synoptic techniques for land use analysis with radar imagery. F. M. Henderson (New York, State University, Albany, N.Y.). In American Society of Photogrammetry, Annual Meeting, 43rd, Washington, D.C., February 27-March 5, 1977, Proceedings. (A77-27826 11-43) Falls Church, Va., American Society of Photogrammetry, 1977, p. 15-25. 8 refs. (ASP 77-104)

A strip of K-band radar imagery covering an area of about 12 miles wide and 1500 miles long stretching from eastern Minnesota to northern Utah is used as a study base to develop two small-scale land use maps by two different approaches The first one is referred to as a traditional approach in which a qualitative interpretation key consisting of five physical and cultural characteristics of the environment observed on radar imagery is used to create land use regions. The second approach involves the creation of a land use map of the same extensive area using gridded cell overlays with a recognized land use classification system, compatible to information system requirements of rapid data retrieval, updating, and storage. Attention is directed on determining how such a map and classification compare with traditional, subjective mapping and regionalization results. S.D.

RS77-5-147

A77-27848 * # A procedure for merging land cover/use data from Landsat, aerial photography, and map sources - Compatibility, accuracy and cost. W. R. Enslin, S. E. Tilmann, R. Hill-Rowley (Michigan State University, East Lansing, Mich.), and R. H. Rogers (Bendix Corp., Aerospace Systems Div., Ann Arbor, Mich.). In: American Society of Photogrammetry, Annual Meeting, 43rd, Washington, D.C., February 27-March 5, 1977, Proceedings (A77-27826 11-43) Falls Church, Va., American Society of Photogrammetry, 1977, p. 449-458. Grant No. NGL-23-004-083. (ASP 77-153)

A method is developed to merge land cover/use data from Landsat, aerial photography and map sources into a grid-based geographic information system. The method basically involves computer-assisted categorization of Landsat data to provide certain user-specified land cover categories; manual interpretation of aerial photography to identify other selected land cover/use categories that cannot be obtained from Landsat data; identification of special features from aerial photography or map sources; merging of the interpreted data from all the sources into a computer compatible file under a standardized coding structure, and the production of land cover/use maps, thematic maps, and tabular data. The specific tasks accomplished in producing the merged land cover/use data file and subsequent output products are identified and discussed. It is shown that effective implementation of the merging method is critically dependent on selecting the 'best' data source for each user-specified category in terms of accuracy and time/cost tradeoffs. S.D.

RS77-5-148

A77-33277 Aerial investigation of the ozone plume phenomenon. G. T. Wolff, P. J. Lioy (Interstate Sanitation Commission, New York, N.Y.), G. D. Wight (Connecticut Department of Environmental Protection, Hartford, Conn.), and R. E. Pasceri (New Jersey Department of Environmental Protection, Trenton, N.J.). *Air Pollution Control Association, Journal*, vol. 27, May 1977, p. 460-463. 17 refs.

Aerial ozone measurements were obtained during the summer of 1975 in the Northeastern United States. This paper reports on the results of a series of tests conducted upwind and downwind of several major metropolitan and industrial complexes, which include Philadelphia-Camden-Wilmington and New York City-Northeastern New Jersey-Southeastern Connecticut. Flight pattern consisted of upwind and downwind transverses perpendicular to the urban plume and vertical profiles. The results indicate significant O3 generation occurs in the urban plumes, but at no time was the difference between the upwind and downwind O3 concentrations greater than 0.08 ppm (maximum 0.078 ppm) However, in several cases when the upwind values were added to the O3 produced by the urban area, this was sufficient to result in violations of the NAAQS downwind. The paper also discusses the results of flights over refineries and petrochemical facilities which yielded a positive contribution to downwind O3 values. (Author)

RS77-5-149

A77-26288 * Space photography - A valuable tool for surface mine planning. F. R. Brumbaugh (Lockheed Electronics Co., Inc., Aerospace Systems Div., Houston, Tex.). *Coal Mining and Processing*, vol. 14, Mar. 1977, p. 78-80, 82. 5 refs. Contract No. NAS9-12200.

Some plausible advantages of remote sensing from orbit in inventorying of strip-mined land areas are noted, but heavy emphasis is placed on the limitations of such information at the present state of the art, in this application, and on the different types of information extracted from high-resolution imagery by experts of differing backgrounds. Skylab multispectral sensors are described and land use categories encountered in strip mining are catalogued. While oversell of remote sensing applied to strip mining land use inventory is deprecated, planning ahead for effective use of Space Shuttle in this area in the coming years is encouraged. R.D.V.

RS77-5-150

A77-28446 Monitoring the quality of ambient air. G. B. Morgan (U S Environmental Protection Agency, Las Vegas, Nev.). *Environmental Science and Technology*, vol. 11, Apr. 1977, p. 352-357.

The application of airborne remote-sensing techniques to air-monitoring is discussed together with the necessary characteristics of an effective air-monitoring network. In accomplishing the proper ambient air quality assessment in such networks, the need for a pollutant-specific systematic approach is pointed out. The national air-monitoring program is an integrated effort involving local, regional, state and federal agencies. The primary goal of state and local programs is to show compliance with national ambient air quality standards for particulate matter, SO2, CO, NO2, and photochemical oxidants. Air-monitoring activities are divided into permanent-fixed-site (trend) monitoring, exposure monitoring, ambient-source-linked monitoring, and biological monitoring The particulate matter composition is measured by an airborne LIDAR radar system, and the ozone composition will be measured by a dual wavelength laser absorption system, now in the testing phase. A.Y.

RS77-5-151

A77-28999 Atmospheric remote sensing. M. Griggs (Science Applications, Inc., La Jolla, Calif.). In: Methods for atmospheric radiometry; Proceedings of the Seminar, San Diego, Calif., August 26, 27, 1976. (A77-28990 12-35) Palos Verdes Estates, Calif., Society of Photo-Optical Instrumentation Engineers, 1976, p. 94, 95.

The paper discusses UV, IR, and visible systems for the remote monitoring of air pollution. Attention is given to such active systems as lidar, differential absorption, and Raman, and such passive systems as interferometer spectrometers, gas filter correlation, matched filter correlation, and vidicons. B.J.

RS77-5-152

A77-29449 Land-use mapping by machine processing of Landsat-1 data. V. A. O. Odenyo and D. E. Pettry (Virginia Polytechnic Institute and State University, Blacksburg, Va.). *Photogrammetric Engineering and Remote Sensing*, vol. 43, Apr. 1977, p. 515-524. 26 refs.

The paper discusses machine-processes land-use map generation of a portion of the City of Virginia Beach, Virginia, by means of the LARSYS software system applied to Landsat-1 MSS remote sensing data. The objectives were to test the applicability of the LARSYS pattern recognition software for land-use mapping in the cited rapidly changing and complex environment and to determine the feasibility of producing an operational land-use map by using the machine analysis approach. Six tentative land-use test classes are selected: urban, agricultural, wooded, water, wetland, and bare land. The LARSYS software system is shown to be applicable in areas with complex land uses. The machine analysis approach reduces bias in classification, and the inherent digitizing of the data facilitates data storage and various forms of retrieval. Comparison with the USGS's proposed land-use classification system is included. S.D.

RS77-5-153

A77-29003 * Imaging air pollutants in the near ultraviolet. D. Norris, J. Conley, and S. Seng (California Institute of Technology, Jet Propulsion Laboratory, Space Instruments and Photography Section, Pasadena, Calif.). In: Methods for atmospheric radiometry, Proceedings of the Seminar, San Diego, Calif., August 26, 27, 1976 (A77-28990 12-35) Palos Verdes Estates, Calif., Society of Photo-Optical Instrumentation Engineers, 1976, p. 116-122. 10 refs. Contract No. NAS7-100.

This paper discusses a program for remote sensing of air pollutants called Multispectral Observation of Pollutants System (MOPS). The broad objective of the program is to photograph 'invisible' gaseous pollutants by combining ultraviolet imaging in several spectral bands with portable data processing equipment. Electronic cameras using solid state imaging arrays of large dynamic range will permit very low contrast images to be electronically ratioed and contrast enhanced, thus bringing out pollutant images which are below the contrast threshold of film. Such photographs will allow synoptic coverage of geographic areas providing source, sink, and flow data on pollutants, and will provide reconnaissance and pointing information for other remote sensors. The principle gases to be mapped by MOPS will be ozone, sulfur dioxide, and nitrogen dioxide. (Author)

RS77-5-154

A77-29084 Isokinetic sampler for continuous airborne aerosol measurements. J. A. Pena, J. M. Norman, and D. W. Thomson (Pennsylvania State University, University Park, Pa.). *Air Pollution Control Association, Journal*, vol. 27, Apr. 1977, p. 337-341. 8 refs. U.S. Environmental Protection Agency Contract No. R-800397.

The paper describes the design and performance capabilities of an isokinetic-decelerator aerosol sampler with a common sampling chamber for use on most instrumented light aircraft or helicopters. The sampler requires no electrical power, mounts entirely outside the aircraft on a single support, and has sampling characteristics virtually independent of aircraft angle of attack. Air enters the sampler through a carefully designed 2.03 cm diam circular intake and is reduced in speed through a 7 deg conical expansion that terminates in a cylindrical sampling chamber in which the air speed is reduced by a factor of 16.6 from the aircraft speed. In this cylindrical chamber, less than 10% of the total air flow is removed by the aerosol measuring instruments. Behind the sampling chamber the air is accelerated along a second section to the exhaust port. Critical features in the design of this isokinetic sampler are discussed in terms of the intake size and shape, the expansion angle, and the exhaust port size. S.D.

RS77-5-155

SEASONAL AND WAVELENGTH DEPENDENCE OF URBAN/RURAL RADIANCE IN IOWA,
Iowa State Univ., Ames. Dept. of Aerospace Engineering; and Brooks, Borg and Skiles, Des Moines, Iowa.
B. K. Lunde.
Journal of Applied Meteorology, Vol. 16, No. 1, p 103-105, January 1977. 2 fig, 1 tab, 7 ref.

Descriptors: *Remote sensing, *Radiation, *Cities, *Rural areas, *Iowa, Satellites(Artificial), Albedo, Wavelengths, Heat budget, Snow cover, Seasonal, Energy, Energy budget.
Identifiers: *LANDSAT, Radiance variation.

LANDSAT measurements show that the radiance of urban areas is higher in the summer than that of rural areas and lower in the winter, aiding the heat budget of cities and tending to save energy. The radiance of both urban and rural areas increases with snow cover in winter, but cities have less radiance than the country. In the early summer the country has low radiance in the near infrared, and in the late summer it has low radiance in the visible region of the spectrum. The radiance of urban areas follows the mentioned trends in a very limited way. (Sims-ISWS)
W77-06514

RS77-5-156

PB-262 202/5GA PC A07/MF A01
Meteorology Research, Inc , Altadena, Calif.
Midwest Interstate Sulfur Transformation and Transport Project: Aerial Measurements of Urban and Power Plant Plumes, Summer 1974.
Final rept. Jul 74-Jun 76,
W. H. White, J. A. Anderson, W. R. Knuth, D. L. Blumenthal, and R. B. Husar. Nov 76, 138p
EPA/600/3-76/110
Contract EPA-68-02-1919
Prepared in cooperation with Washington Univ., St. Louis, Mo.

Descriptors: *Sulfur dioxide, *Sulfates, *Plumes, *Atmospheric chemistry, Ozone, Aerosols, Combustion products, Industrial wastes, Electrical power plants, Sensors, Sampling, Monitors, Urban area, Chemical reactions, Oxidants, Concentration(Composition), Regression analysis, Numerical analysis, Aerial surveys, Mathematical models.
Identifiers: *Air pollution sampling, Saint Louis(Missouri), Coal-fire power plants, MISTT project.

A portion of the research activities of the Midwest Interstate Sulfur Transformation and Transport Project (Project MISTT) during the summer of 1974 is documented. Using a light plane equipped with instruments for measuring air pollutants and meteorological parameters, investigators mapped the three-dimensional distribution of aerosols and pollutant gases originating in the St. Louis area. Each day's flight plan was designed to characterize a large pollutant plume at discrete distances downwind from its source. The plume from the coal-fired power plant at Labadie, Missouri was followed out to 45 km. Secondary aerosol production within the plume was documented. The estimated average conversion rate for sulfur dioxide to sulfate was about three percent/hour at the distances sampled. The overall removal rate of SO2 was too small to detect, and no net production of ozone was observed. Large pollutant plumes were also identified downwind of central St. Louis and the Wood River refineries. These urban-industrial plumes were followed out to 60-70 km, where they were characterized by elevated concentrations of ozone and light-scattering aerosols.

RS77-5-157

PB-261 579/7GA PC A04/MF A01
Polytechnic Inst. of New York, Brooklyn.
Correlation of Mathematical Models for Water Temperature with Aerial Infrared Water Temperature Surveys,
J. C. Cataldo, R. R. Zavesky, and A. S. Goodman. Dec 76, 70p NYSERDA-75/19

Descriptors: *Thermal pollution, *Monitors, *Remote sensing, *Infrared detection, Mathematical prediction, Temperature measurement, Mathematical models, Lake Michigan, Lake Ontario.
Identifiers: Water pollution detection.

A feasibility study to predict subsurface temperatures from given surface temperatures obtained by remote sensing of a thermal plume was performed. A phenomenological model based on field measurements of heated surface discharges into Lake Michigan and Ontario and an analytic dispersion-type far field model were investigated. A predictive model was developed for phenomenological relationships for surface areas within isotherms. A series of exponential equations relating the surface area to the subsurface area was formulated which can predict subsurface temperatures within 1 degree C to at least ten feet below the surface. A far field hydrothermal analytic model considering longitudinal advection and dispersion in the transverse and vertical direction was also developed.

RS77-5-158

PB-262 011/0GA PC A11/MF A01
Texas A and M Univ., College Station. Water Resources Inst.
Environmental Evaluation of Water Resources Development.
Technical rept ,
Wesley P James, Calvin E. Woods, and Robert E. Blanz. Sep 76, 231p TR-76, W77-02828, ,
OWRT-A-028-TEX(1)
Contracts DI-14-31-0001-5044, DI-14-31-0001-6045

Descriptors: *Reservoirs, *Environmental impacts, *Remote sensing, *Water resources, Aerial photography, Inventories, Research projects, Channel improvements, Vegetation, Ecology, Topographic maps, Profiles, Sites, Evaluation, Scientific satellites, Texas.
Identifiers: LANDSAT-1 satellite.

Methodology for the utilization of LANDSAT-1 imagery and aerial photography on the environmental evaluation of water resources development is presented. Environmental impact statements for water resource projects were collected and reviewed for the various regions of Texas. The environmental effects of channelization and surface impoundments are discussed for twelve physiographic regions of the state as delineated on black and white satellite (LANDSAT-1) mosaic of band 7. With the aid of LANDSAT-1 imagery, representative or typical transects were chosen within each region. Profiles of each site were constructed from topographic maps and environmental data were accumulated for each site and related to low altitude aerial photography and enlarged LANDSAT-1 false color composites. Each diagrammatic transect, with accompanying data and photographs, provides significant information for input of environmental amenities on a local and regional scale into preliminary water resources development studies. Remote sensing techniques are readily adapted to water resources planning.

RS77-5-159

PB-259 975/1GA PC A04/MF A01
Stanford Research Inst., Menlo Park, Calif.
Remote Measurement of Air Pollutants.
Rept. no 3 (Annual) 1 Jan 75-31 Dec 75,
E. R. Murray, and R. L. Byer. Feb 76, 56p
NSF/RANN/IT/AEN73-10596-A01/PR/75/4, NSF/RA-760253
Grant NSF-AEN73-10596-A01

Descriptors: *Remote sensing, *Optical radar, Air pollution, Infrared spectroscopy, Monitoring, Water vapor, Gas lasers, Test chambers, Experimental design, Aerosols, Backscattering, Spectroscopic analysis.
Identifiers: *Air pollution detection, Differential absorption lidar.

This report is the third annual progress report on research into methods for remote measurement of air pollutants. The major thrust was toward establishing differential-absorption lidar (DIAL) capabilities in the infrared. The first infrared DIAL system was constructed and successfully operated using water vapor as the target species. Line overlaps between high-energy, discretely tunable lasers and air pollutants have been investigated and several dozen pollutants appear to be readily monitored using this infrared DIAL system. Variations in atmospheric scintillation and aerosol scattering are measured and found to be small for the experimental conditions. Heterodyne receivers have been studied and found to be capable of significantly increasing system range and sensitivity. The major effort is toward the completion of the high-energy tunable source for remote monitoring of air pollutants The receiving telescope is being installed at the end of the year, and the processing electronics are almost completed in preparation for air-pollution sensing experiments.

RS77-5-160

PB-264 183/5GA PC A99/MF A01
Environmental Protection Agency, Washington, D.C. Office of Monitoring Systems.
Proceedings of Conference on Environmental Quality Sensors (2nd) Held at National Environmental Research Center, Las Vegas, Nevada on October 10-11, 1973.
Dec 76, 779p EPA/600/9-76/031

Descriptors: *Remote sensing, Forecasting, Fluorescence, Chemical analysis, Water analysis, Air pollution, Water pollution, Environmental impacts, Assessments, Monitoring, Oil pollution, Performance evaluation, Dissolved oxygen, Gas analysis, Microwave equipment, Radiometry, Hazardous materials, Infrared detection, Optical radar, Aerial surveys, Scientific satellites, Zeeman effect, Polarimeters, Turbidity, Plumes, Data analysis, Atomic spectroscopy, Optical measurement, Electrodes, Water quality, Sensor mapping, Design criteria, Concentration(Composition), Sewers.
Identifiers: *Air pollution detection, *Water pollution detection, Air quality, Ion selective electrodes, Long path optical measurements, Procedures.

This report contains the papers presented at the Second Conference on Environmental Quality Sensors, held at the U.S. Environmental Protection Agency's National Environmental Research Center, Las Vegas, Nevada, on October 10 and 11, 1973. The papers covered such topics as: aircraft-, satellite-, and land-based remote sensing systems for monitoring and/or identifying pollutants in the air, in water, and on land; in situ monitoring systems, remote sensing techniques for land use mapping, environmental impact assessment, water surface temperature determinations, oil and hazardous material spills identification; also addressed are present environmental monitoring requirements of the EPA regions.

RS77-5-161

PB-262 906/1GA PC A04/MF A01
Herkimer-Oneida Counties Comprehensive Planning Program, Utica, N.Y.
Land Use Inventory Update and Projection Utica-Rome Air Quality Maintenance Area (AQMA).
Final rept.,
Stephen S. Olney. Jan 77, 52p EPA/902/4-77/001
Contract EPA-68-02-2305

Descriptors: *Air pollution abatement, *Land use, *Urban areas, Inventories, Aerial photography, Statistical data, Industrial relations, Mathematical prediction, Correlations, Requirements.
Identifiers: *Air quality maintenance, Air quality maintenance areas, Herkimer County(New York), Oneida County(New York), Residential areas, Commercial areas, Needs.

The Utica-Rome AQMA consists of 14 Mohawk Valley towns and cities in Herkimer and Oneida Counties, New York. Land uses in the area were inventoried in 1968 as part of the Statewide Land Use Natural Resource Inventory (LUNR). The present report updates the 1968 inventory to 1975 based upon aerial photo measurements of a sample of kilometer squares. Urban land uses are projected to 1980, 1985, 1990 and 2000. This information will be used by the New York State Department of Environmental Conservation to project future air quality.

RS77-5-162

PB-264 650/3GA CP T02
Geological Survey, Reston, Va. Geography Program.
Digital Land Cover Classification of the Washington Urban Area Derived from LANDSAT Data, 1972 and 1973.
Data file,
Leonard Gaydos, James R. Wray, and Stephen C. Guptill. 9 Apr 73, mag tape DOI/DF-77/003
Source tape is in BINARY character set. Character set restricts preparation to 9 track one-half inch tape only. Identify recording mode by specifying density only. Call NTIS Computer Products, if you have questions.

Descriptors: *Data file, *Mapping, Urban areas, District of Columbia, Virginia, Maryland, Metropolitan areas, Remote sensing, Magnetic tapes.
Identifiers: Landsat-1 satellite.

This digital tape named 'WED 029' contains precision geometrically corrected land cover classification of the Washington urban area, D.C., MD, and VA. Prepared by USGS Land Information and Analysis Office in cooperation with National Aeronautics and Space Administration and U.S. Department of the Interior Earth Resources Observation Systems (EROS) Program. The classification is derived by machine-processing of digital multispectral scanner data for two contrasting Landsat scenes, October 11, 1972 (frame E-1080-15192), and April 9, 1973 (frame E-1260-15201), combined. The window defined by N=230, W=434, S=1018, and E=1418 corresponds to an area 60km by 60km as defined on maps published in USGS folio I-858. Each data point (pixel) is about 76m north-south and 61m west-east, and covers 0.464 hectare (1.14 acre). Each 8 bit byte represents a binary integer from 1-26 and 64. Numbers 1-26 represent the land cover classes listed below. Number 64 describes the background surrounding the precision geometrically corrected area.

RS77-5-163

E77-10104 PC A05/MF A01
South Dakota State Univ., Brookings. Remote Sensing Inst.
Application of Remote Sensing Technology to Land Evaluation, Planning Utilization of Land Resources, and Assessment of Wetland Habitat in Eastern South Dakota. Parts 1 and 2.
Annual progress rept. 1 Jul 75-30 Jun 76,
Victor I. Myers, T. L. Cox, and R. G. Best. 30 Jun 76, 84p SDSU-RSI-76-07-Pt-1/2, NASA-CR-149590
Grant NGL-42-003-007
Original contains color imagery. Original photography may be purchases from the EROS Data Center, 10th and Dakota Ave., Sioux Falls, S.D. 57198.

Descriptors: *Wetlands, *South Dakota, *Land use, Soils, Earth Resources program, Mapping, Highways, Data processing, Photointerpretation.

The author has identified the following significant results. LANDSAT fulfilled the requirements for general soils and land use information. RB-57 imagery was required to provide the information and detail needed for mapping soils for land evaluation. Soils maps for land evaluation were provided on clear mylar at the scale of the county highway map to aid users in locating mapping units. Resulting mapped data were computer processed to provide a series of interpretive maps (land value, limitations to development, etc.) and area summaries for the users.

RS77-5-164

E77-10014 PC A21/MF A01
Geological Survey, Reston, Va.
CARETS: A Prototype Regional Environmental Information System. Volume 2. Parts A and B. Norfolk and Environs; a Land Use Perspective.
Final rept.,
Robert H. Alexander, Peter J. Buzzaneli, Katherine A. Fitzpatrick, Harry F. Lins, Jr., and Herbert K. McGinty, III. Sep 75, 487p NASA-CR-148984
NASA Order S-70243-AG
(PC A21/MF A01)
Original contains color imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Ave , Sioux Falls, S D. 57198.

Descriptors: Central Atlantic regional ecol test site, *Virginia, Land use, Environmental monitoring, Urban development, Transportation, Earth resources program, Statistical analysis, Cost effectiveness, Industries.

The author has identified the following significant results. The Norfolk-Portsmouth metropolitan statistical area in southeastern Virginia was the site of intensive testing of a number of land resources assessment methods. Land use and land cover data at three levels of detail were derived by manual image interpretation from both aircraft and satellite sources and used to characterized the 1,766 sq km (682 sq mi) area from the perspective of its various resource-related activities and problems. Measurements at level 1 from 1:100,000 scale maps revealed 42 percent of the test area (excluding bays and estuaries) to be forest, 28 percent agriculture, 23 percent urban and built-up, 4 percent nonforested wetlands, and 2 percent water. At the same scale and level of detail, 10 percent of the area underwent change from one land use category to another in the period 1959-70, 62 percent of which involved the relatively irreversible change from forest or agriculture to urban uses.

RS77-5-165

E77-10016 PC A06/MF A01
Geological Survey, Reston, Va.
CARETS: A Prototype Regional Environmental Information System. Volume 5. Interpretation Compilation and Field Verification Procedures in the CARETS Project.
Final rept.,
Robert H. Alexander, Peter W. DeForth, Katherine A. Fitzpatrick, Harry F Lins, Jr., and Herbert K. McGinty, III Sep 76, 120p NASA-CR-148986
NASA Order S-70243-AG
(PC A06/MF A01)
Original contains color imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Ave., Sioux Falls, S.D. 57198.

Descriptors: Central Atlantic regional ecol test site, *Information systems, *Land use, Earth Resources Program, Photointerpretation, Mapping, Data bases, Spectral signatures.

The author has identified the following significant results. Level 2 land use mapping from high altitude aircraft photography at a scale of 1:100,000 required production of a photomosaic mapping base for each of the 48, 50x50 km sheets, and the interpretation and coding of land use polygons on drafting film overlays. To enhance the value of the land use sheets, a series of overlays were compiled, showing cultural features, county boundaries and census tracts, surface geology, and drainage basins. In producing level 1 land use maps from LANDSAT imagery, at a scale of 1.250,000 drafting film was directly overlaid on LANDSAT color composite transparencies. Numerous areas of change were identified, but extensive areas of false change were also noted.

RS77-5-166

E77-10098 PC A10/MF A01
Arkansas Univ., Fayetteville. Dept. of Geology.
Land Use Change Detection with LANDSAT-2 Data for Monitoring and Predicting Regional Water Quality Degradation.
Final rept. 27 Jan 75-26 Jul 76,
H. MacDonald, K. Steele, W. Waite, R. Shinn, and R. Rice. Jan 77, 223p NASA-CR-149581
Contract NAS5-20810
Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Ave., Sioux Falls, S.D. 57198.

Descriptors: *Land use, *Water quality, Arkansas, Storms(Meteorology), Watersheds, Earth resources program, Pollution monitoring, Sampling, Water pollution.

The author has identified the following significant results. Comparison between LANDSAT 1 and 2 imagery of Arkansas provided evidence of significant land use changes during the 1972-75 time period. Analysis of Arkansas historical water quality information has shown conclusively that whereas point source pollution generally can be detected by use of water quality data collected by state and federal agencies, sampling methodologies for nonpoint source contamination attributable to surface runoff are totally inadequate. The expensive undertaking of monitoring all nonpoint sources for numerous watersheds can be lessened by implementing LANDSAT change detection analyses.

RS77-5-167

15219 **Schwarz, D. E.; and Gaydos, L.** Regional interpretability variations of land use using satellite data in digital and visual form: *in* Remote sensing of Earth resources; Volume IV (Shahrokhi, F., editor), p. 243-253, Univ. Tenn. Space Inst., Tullahoma, Tenn., United States, 1975.

RS77-5-168

15277 **Withington, C. F.** Applications to environmental monitoring; introduction: U. S. Geol. Surv., Prof. Pap., No. 929 *(ERTS-1, a new window on our planet)*, p. 253, 1976.

RS77-5-169

15134 **Johnson, G. E.; and Johannsen, C. J.** Land use discrimination employing remote multispectral sensing techniques: *in* Remote sensing of Earth resources; Volume IV (Shahrokhi, F., editor), p. 233-242, tables, Univ. Tenn. Space Inst., Tullahoma, Tenn., United States, 1975.

RS77-5-170

15127 **Hiser, H. W.; Lee, S. S.; Veziroglu, T. N.; *et al*** Application of remote sensing to thermal pollution analysis: *in* Remote sensing of Earth resources; Volume IV (Shahrokhi, F., editor), p. 481-497, illus. (incl. tables, sketch maps), Univ. Tenn. Space Inst., Tullahoma, Tenn., United States, 1975.

RS77-5-171

18502 Guernsey, J. L.; Mausel, P. W.; and Gilbert, R. H. Machine processing ERTS-1 data in analyzing land use conflicts in the Indianapolis metropolitan area: *in* Remote sensing of Earth resources; Volume III (Shahrokhi, F., editor), p. 527-543, illus. (incl. table, sketch maps), Univ. Tenn., Space Inst., Tullahoma, Tenn., United States, 1974.

RS77-5-172

14733 Hallock, H. B. The use of land resource satellite sensors for air and water pollution measurement: *in* Remote sensing of Earth resources; Volume IV (Shahrokhi, F., editor), p. 431-467, illus. (incl. tables), Univ. Tenn. Space Inst., Tullahoma, Tenn., United States, 1975.

RS77-5-173

15091 Drackett, K.; Gregg, T. W. D.; and Bale, J. Practical applications of low, medium, and high altitude aircraft remote sensing data to land use planning: *in* Remote sensing of Earth resources; Volume IV (Shahrokhi, F., editor), p. 203-231, illus. (incl. tables, sketch maps), Univ. Tenn. Space Inst., Tullahoma, Tenn., United States, 1975.

RS77-5-174

15108 Gerdin, R. B. Application of remote sensing to managing the Earth's environment [abstr.]: 335 p., Doctoral, 1976, UCLA. (Diss. Abstr. Int., Vol. 37, No. 5, p. 2139B-2140B, 1976).

RS77-5-175

13965 Ellefsen, R.; Gaydos, L.; and Wray, J. R. Computer-aided mapping of land use: U. S. Geol. Surv., Prof. Pap., No. 929 *(ERTS-1, a new window on our planet)*, p. 234-241, illus. (incl. sketch maps), 1976.

RS77-5-176

18618 Rogers, R. H.; Reed, L. E.; and Smith, V. E. ERTS-1; automated land-use mapping in lake watersheds: *in* Remote sensing of Earth resources; Volume III (Shahrokhi, F., editor), p. 463-485, tables, sketch maps, Univ. Tenn., Space Inst., Tullahoma, Tenn., United States, 1974.

RS77-5-177

15080 Curnow, R. D. Applications to conservation; introduction: U. S. Geol. Surv., Prof. Pap., No. 929 *(ERTS-1, a new window on our planet)*, p. 303, 1976.

RS77-5-178

14751 Kiefer, R. W.; Kuhlow, W. W.; and Wynn, S. L. A statistical analysis of data extraction for land cover information from high-altitude and satellite images: *in* Remote sensing of Earth resources; Volume IV (Shahrokhi, F., editor), p. 759-781, illus. (incl. tables, sketch maps), Univ. Tenn. Space Inst., Tullahoma, Tenn., United States, 1975.

RS77-5-179

15060 Cast, L. D. Land use in Northeast Colorado: U. S. Geol. Surv., Prof. Pap., No. 929 *(ERTS-1, a new window on our Planet)*, p. 225-227, illus., 1976.

RS77-5-180

15017 Anderson, J. R. Applications to land-use mapping and planning; introduction: U. S. Geol. Surv., Prof. Pap., No. 929 *(ERTS-1, a new window on our planet)*, p. 223-224, 1976.

RS77-5-181

18613 Rehder, J. B. The uses of ERTS-1 imagery in the analysis of landscape change: *in* Remote sensing of Earth resources; Volume III (Shahrokhi, F., editor), p. 573-586, illus. (incl. sketch maps), Univ. Tenn., Space Inst., Tullahoma, Tenn., United States, 1974.

RS77-5-182

15183 Paludan, C. T. Land use surveys based on remote sensing from high altitudes: Geogr. Helv., Vol. 31, No. 2, p. 17-24, 1976.

RS77-5-183

18643 Sinnock, S.; Melhorn, W. N.; and Montgomery, O. L. Machine-aided analysis of land use landform relations from ERTS-1 MSS imagery, Sand Hills region, Nebraska: *in* Remote sensing of Earth resources; Volume III (Shahrokhi, F., editor), p. 503-526, illus. (incl. sketch maps), Univ. Tenn., Space Inst., Tullahoma, Tenn., United States, 1974.

RS77-5-184

15198 Rehder, J. B. Changes in landscape due to strip mining: U. S. Geol. Surv., Prof. Pap., No. 929 *(ERTS-1, a new window on our planet)*, p. 254-257, illus., 1976.

RS77-5-185

15187 Place, J. L. Monitoring change in land use over large regions: U. S. Geol. Surv., Prof. Pap., No. 929 *(ERTS-1, a new window on our planet)*, p. 230-233, illus., 1976.

RS77-5-186

30729 (CONF-750706—, pp 279-309) **Application of aircraft and "ERTS" data to environmental problems.** Eliason, J.R.; Foote, H.P.; Sandness, G.A. (Battelle Pacific Northwest Labs., Richland, WA). 1975.

From ERDA-wide conference on computer support on environmental science and analysis; Albuquerque, New Mexico, USA (9 Jul 1975).

In Conference on computer support of environmental science and analysis.

A presentation is given of optical mechanical imaging systems which are designed to collect or transmit and collect electromagnetic energy at wavelengths from ultraviolet to the far infrared. Data are collected by optical mechanical imaging systems and recorded on magnetic tape. These primary records are then converted to digital format and analyzed by computer.

RS77-5-187

27348 (EPA—600/7-76-002, pp 61-68) **EPA/NASA cooperation to develop remote sensing and in situ sensors and techniques for pollution monitoring.** Morrison, J.R.; Mugler, J.; Tilton, E.L. III. (National Aeronautic and Space Administration, Washington, DC). 1976.

From EPA-OEMI symposium; Washington, District of Columbia, United States of America (USA) (9 Feb 1976).

In Proceedings of national conference on health, environmental effects, and control technology of energy use.

Two projects of the EPA and NASA are described which relate to developing remote and in situ sensors and techniques for measurement and characterization of power plant and other source effluents, and to obtaining baseline data with which to monitor the rehabilitation of surface mining areas. Five tasks of remote and in situ instrument development are described: (1) Raman Lidar, (2) Plume dispersion studies, (3) IR Dial, (4) Laser heterodyne detector, and (5) HCl monitor.

RS77-5-188

ID NO.- EI770534939 734939
EVALUATION OF LAND USE AND ITS COLOR REPRESENTATION IN TOKYO DISTRICTS WITH LANDSAT DIGITAL DATA.
Murai, Shunji
Univ of Tokyo, Minatoku, Jpn
Proc of the Int Symp on Remote Sensing of Environ, 10th, Ann Arbor, Mich, Oct 6-10 1975 Publ by Environ Res Inst of Mich, Cent for Remote Sensing Inf and Anal, Ann Arbor, 1975 v 1 p 345-350
DESCRIPTORS: (*REMOTE SENSING, *Applications), (REGIONAL PLANNING, Land Use), MAPS AND MAPPING,
IDENTIFIERS: LANDSAT DATA, LAND USE INVENTORY
CARD ALERT: 403, 901, 405
Remotely sensed data should be classified into categories which represent the real status of land use or land cover at the time of flight. As it is now appropriate to assign a pixel of unresolved remotely sensed data to a name of land use, a new criterion for classification of real status of land use must be established. In this study, land use is assumed to be composed of a mixture of three primary components, water, vegetation and nonorganic matter (bare soil, rock, sand, concrete, asphalt and so on). Three components can be evaluated by the remotely sensed data because of their unique spectral characteristics. Three primary components, water, vegetation and nonorganic matter are corresponded to three primary colors, blue, green and red respectively. Real status of land use or land cover with a mixture of water, vegetation and nonorganic matter will be represented in a mixture of three primary colors which are related to land use.

RS77-5-189

ID NO.- EI770529198 729198
DEGRADATION OF THE VEGETATION COVER WITH URBANIZATION AND ITS INFLUENCE ON THE FLOW OF POLLUTED AIR.
Nakajima, Iwao
Minist of Agric & For, Gov For Exp Stn, Tokyo, Jpn
Proc of the Int Symp on Remote Sensing of Environ, 10th, Ann Arbor, Mich, Oct 6-10 1975 Publ by Environ Res Inst of Mich, Cent for Remote Sensing Inf and Anal, Ann Arbor, 1975 v 1 p 275-282
DESCRIPTORS: (*AIR POLLUTION, *Analysis), (URBAN PLANNING, Land Use), ENVIRONMENTAL PROTECTION, REMOTE SENSING,
IDENTIFIERS: LANDSAT-1
CARD ALERT: 451, 403, 901
The reflection light value ratio taken over the Kanto area by LANDSAT-1 was recorded and classified under six stages. A survey was also made over each 2 km**2 area to determine the extent of land-usage as well as that of preserved land. The survey classified land surface under the following seven categories: forest, farmland, grassland, bare-land, residential areas, densi-urban, and water surfaces. This data was used to subsequently determine the degree of environmental destruction resulting from urbanization, and the effect of this environmental destruction in terms of air pollution. The paper discusses how polluted air comes to be concentrated as a result of hot air masses rising over densely populated areas with little vegetation cover $EM DASH$ a phenomenon caused by radiation heat waves. It was also seen that the ratio of radiation heat waves is closely related with the type of land surface.

RS77-5-190

ID NO.- EI770531436 731436
SATELLITE GLOBAL MONITORING OF ENVIRONMENTAL QUALITY.
Schiffer, R. A.
NASA, Washington, DC
DESCRIPTORS- *ENVIRONMENTAL PROTECTION, (SATELLITES, Detection), AIR POLLUTION, OCEANOGRAPHY, (REMOTE SENSING, Environmental Applications),
IDENTIFIERS- NIMBUS G, SAGE
CARD ALERT- 901, 655
SOURCE- Proc of the Int Symp on Remote Sensing of Environ, 10th, Ann Arbor, Mich, Oct 6-10 1975 Publ by Environ Res Inst of Mich, Cent for Remote Sensing Inf and Anal, Ann Arbor, 1975 v 1 p 255-263
Nimbus G, the Air Pollution and Oceanographic Observing Satellite, scheduled for launch in 1978, is NASA's first research and development satellite dedicated to environmental quality measurements. Atmospheric experiments on Nimbus-G will determine the feasibility of space-borne detection and mapping of important minor stratospheric constituents, and will provide a measurement of the Earth's radiation budget. Oceanographic experiments on Nimbus-G will focus on monitoring ocean color in coastal zones and will provide the first all-weather capability for measurement of sea surface temperature. A second satellite mission planned for the same general time frame is SAGE, the Stratospheric Aerosol and Gas Experiment. This satellite will provide data on stratospheric aerosol distributions and concentrations at latitudes beyond those accessible to the solar occultation aerosol sensor on Nimbus-G.

RS77-5-191

ID NO.- EI770745960 745960
METHODS FOR ATMOSPHERIC RADIOMETRY.
McNutt, Douglas P. (Ed.)
Nav Res Lab, Space Sci Div, Washington, DC
SPIE Semin Proc v 91 1976, for Meet, San Diego, Calif, Aug 26-27 1976 124 p CODEN: SPIECJ
DESCRIPTORS: (*ATMOSPHERIC RADIATION, *Measurements), RADIOMETERS, ATMOSPHERIC OPTICS, REMOTE SENSING, (AIR POLLUTION, Analysis), SPECTROSCOPY,
CARD ALERT: 443, 622, 941, 944, 741, 451
Proceedings include 15 papers on radiometric instrumentation and techniques used in remote sensing atmospheric transmission studies, studies of airglow and auroral, and in the monitoring of air pollution from aircraft. Among the topics discussed are passive microwave sensing of atmospheric parameters, spectral radiometric measurement of atmospheric constituents, a transmissometer for night vision experiments, atmospheric transmission measurements using infrared lasers and Fourier spectroscopy, instrumentation for studying the visible spectrum of the aurora and airglow, measurement of the aurora and airglow with rocket-borne cryogenic spectrometers, a high-reliability radiometer for infrared emission measurements, the performance of high-rejection optical baffling systems, radiometry and spectroscopy of the upper atmosphere from aircraft, an IR system for measuring distributions of radiating sources, observations of spatial variations of night sky brightness, and the imaging of air pollutants in the near ultraviolet.

RS77-5-192

ID NO.- EI770531437 731437
GREAT LAKES ENVIRONMENTAL LAND USE MAPPING.
Risley, Clifford Jr.
US EPA, Chicago, Ill
Proc of the Int Symp on Remote Sensing of Environ, 10th, Ann Arbor, Mich, Oct 6-10 1975 Publ by Environ Res Inst of Mich, Cent for Remote Sensing Inf and Anal, Ann Arbor, 1975 v 1 p 337-343
DESCRIPTORS: *ENVIRONMENTAL PROTECTION, (MAPS AND MAPPING, Computer Applications), (REGIONAL PLANNING, Land Use), REMOTE SENSING, WATER POLLUTION,
IDENTIFIERS: ERTS, LAND USE INVENTORY
CARD ALERT: 901, 405, 403, 453, 723
The project uses earth research technology satellite (ERTS) imagery and advanced sophisticated computer technology. The Laboratory for Applications of Remote Sensing (LARS), Purdue University, has produced the desired inventory using computer analysis of multispectral scanner data obtained by ERTS. Land use classes were spectrally separated by the analysis into 17 classes including four primary classifications: Urban-Commercial-Industrial, Agricultural, Forest, and Water and secondary level classification in further detail such as density of urban use and types of agricultural use such as row crops, pasture and meadows.

RS77-5-193

ID NO.- EI770534938 734938
REVIEW OF THE FEDERAL HIGHWAY ADMINISTRATION PROGRAM.
Perchalski, Frank R.
Fed Highw Adm, Washington, DC
Proc of the Int Symp on Remote Sensing of Environ, 10th, Ann Arbor, Mich, Oct 6-10 1975 Publ by Environ Res Inst of Mich, Cent for Remote Sensing Inf and Anal, Ann Arbor, 1975 v 1 p 47-52
DESCRIPTORS: (*REMOTE SENSING, *Applications), HIGHWAY ENGINEERING, PHOTOGRAMMETRY,
CARD ALERT: 406, 405, 432
Increased use of remote sensing techniques has been promoted for 30 years. Early emphasis was on photointerpretation for engineering soils mapping and construction materials exploration. For the past 10 years, however, investigations of engineering applications of a wide range of sensing techniques have been undertaken as a cooperative State/Federal/Contract effort. This approach to operational engineering applications has been formalized into the current Federally Coordinated Program of Research and Development. The flexibility of cooperative efforts and continued interest in remote sensing developments will allow the Federal Highway Administration to provide practicing transportation engineers with more effective approaches to many current and anticipated problem areas. 23 refs.

RS77-5-194

ID NO.- EI770534920 734920
LANDSAT IMAGERY AS A TOOL IN REGIONAL PLANNING.
Warne, D. K.; Leech, P. R.; Macleod, I. D. G.
Aust Surv v 28 n 3 Sep 1976 p 128-138 CODEN: AUSUAK
DESCRIPTORS: (*REGIONAL PLANNING, *Land Use), SURVEYING, (SATELLITES, Geodetic),
CARD ALERT: 403, 405, 655, 901
The paper considers the potential role of LANDSAT satellite imagery in the field of regional planning. Described also is work currently in progress at the Department of Engineering Physics, Australian National University, on the formation of a system for the analysis of the data. 7 refs.

RS77-5-195

ID NO.- EI770536774 736774
NEW CONCEPT FOR THE REMOTE MEASUREMENT OF OIL FLUORESCENCE CONVERSION EFFICIENCY.
Kung, R. T. V.; Itzkan, I.
Avco Everett Res Lab Inc, Mass
Proc of the Int Symp on Remote Sensing of Environ, 10th, Ann Arbor, Mich, Oct 6-10 1975 Publ by Environ Res Inst of Mich, Cent for Remote Sensing Inf and Anal, Ann Arbor, 1975 v 1 p 231-241
DESCRIPTORS: (*WATER POLLUTION, *Oil Spills), LASERS, REMOTE SENSING,
CARD ALERT: 453, 744
It is well known that the $left double quote$ thick $right double quote$ film oil conversion efficiencies is a good identifier of oil types since it spans over three orders of magnitude from heavy residual to light oils. Thus for some spectrally similar oils, the differences in absolute version efficiencies may distinguish among oil types. Spectral measurements alone would not allow this differentiation since the intensities are strongly dependent on the oil thicknesses. The paper discusses an approach that measures conversion efficiency remotely without prior knowledge of the oil film thickness, by using integrated water Raman return as a reference. The latter is calibrated by the measurement of the temporal Raman decay constant.

RS77-5-196

ID NO.- EI770534935 734935
LAND-USE INTERPRETATION WITH RADAR IMAGERY.
Henderson, Floyd M.
State Univ of NY, Albany
Photogramm Eng Remote Sensing v 43 n 1 Jan 1977 p 95-99 CODEN: PERSDV
DESCRIPTORS: *REMOTE SENSING, (REGIONAL PLANNING, Land Use),
CARD ALERT: 403, 405, 742, 901
The potential of radar imagery as a data base for small-scale thematic land-use mapping is explored. Nine interpreters were provided with a simple qualitative interpretation key and asked to create land-use regions over a 1500 mile area of the United States. Most interpretation discrepancies occurred in semi-arid portions of the study area but several borders were agreed upon, particularly where land-use change corresponded to topographic change. In written descriptions of the regions, respondents agreed upon composition of land uses but not on location of changes. An inability to maintain similar hierarchical land-use levels within and between maps was also evident. 11 refs.

RS77-5-197

ID NO.- EI770534961 734961
TRACKING POLLUTANTS FROM A DISTANCE.
Melfi, S. H.; Koutsandreas, John D.; Moran, John
US EPA, Las Vegas, Nev
Environ Sci Technol v 11 n 1 Jan 1977 p 36-38 CODEN: ESTHAG
DESCRIPTORS: (*REMOTE SENSING, *Environmental Applications), (AIR POLLUTION, Monitoring),
CARD ALERT: 901, 451, 902
New remote sensing methods, used to gather legally defensible data, are but one valuable set of tools EPA can use to meet its monitoring responsibilities. An obvious advantage of remote sensing is its perspective; it allows the observation of the whole picture all at once. Remote sensing also offers another important advantage over more conventional monitoring techniques: it is cost-effective. This is an especially important consideration because it is unlikely that EPA will ever have the resources necessary to perform all the monitoring that is required.

RS77-5-198

ID NO.- EI770534960 734960
USE OF REMOTE SENSING IMAGERY FOR ENVIRONMENTAL LAND USE AND FLOOD HAZARD MAPPING.
Mouat, David A.; Miller, David A.; Foster, Kennith E.
Univ of Ariz, Tucson
J Environ Sci v 19 n 3 May-Jun 1976 p 19-26 CODEN: JEVSAG
DESCRIPTORS: (*REMOTE SENSING, *Environmental Applications), MAPS AND MAPPING, FLOODS, (REGIONAL PLANNING, Land Use),
CARD ALERT: 723, 741, 405, 442, 403, 901
Local governmental planning agencies have traditionally regulated the design of new subdivisions by adoption of local regulations which sometimes require (among other considerations) minimum drainage design criteria. Due to passage of the mandatory flood-plain regulations at the state level, local planning agencies are now faced with the task of the delineation of floodplains. Remote sensing systems offer a dynamic resource inventory system which can be used to complement traditional detailed studies or serve as an important source of information in regions where detailed studies are not available. In Graham, Yuma, and Yavapai Counties remote sensing techniques have provided hydrologic information in areas where planning had been hampered by the lack of suitable hydrologic data. The County Planning Departments can now, with only limited funds and manpower, guide development more wisely away from flood prone areas. 11 refs.

RS77-5-199

ID NO.- EI770748491 748491
FLOOD FREQUENCY STUDIES ON UNGAGED URBAN WATERSHEDS USING REMOTELY SENSED DATA.
Jackson, Thomas J.; Ragan, Robert M.; Subinski, Robert P.
Univ of Ky, Lexington
Ky Univ Off Res Eng Serv Bull n 111 Dec 1976, Natl Symp on Urban Hydrol, Hydraul, and Sediment Control, Proc, Univ of Ky, Lexington, Jul 27-29 1976 p 31-39 CODEN: KUOBAJ
DESCRIPTORS: (*FLOODS, *Remote Sensing), (URBAN PLANNING, Hydrology), WATERSHEDS, (STREAM FLOW, Mathematical Models),
IDENTIFIERS: FLOOD FREQUENCY STUDIES
CARD ALERT: 442, 403, 444
One approach to determining flood frequency data is to use a continuous streamflow generation model. If the model is to be useful in ungaged watersheds, its parameters must be related to measurable watershed characteristics. The paper reports on an investigation to develop a technique for estimating parameter values for the STORM model using satellite multispectral remote sensing (Landsat) of watershed characteristics. One of the most attractive features of STORM is that it has only two calibration parameters and those can be given physical interpretations in flood analysis. Regional relationships are presented for predicting the STORM parameters, a runoff coefficient and a depression storage coefficient, from the percent of impervious area. 18 refs.

RS77-5-200

ID NO.- EI770534962 734962
MANAGERIAL APPLICATIONS OF A 4-YEAR REGIONAL PROGRAM IN REMOTE SENSING.
Fuller, Dale B.; Harman, Dan M.; Fuller, Kent B.
Univ of Md, Frostburg
Coastal Zone Manage J v 3 n-2 1977 p 183-196 CODEN: CZMJBF
DESCRIPTORS: (*REMOTE SENSING, *Environmental Applications), (ENVIRONMENTAL ENGINEERING, Management), ECOLOGY,
CARD ALERT: 901, 912, 742, 472
A study was conducted to determine the degree of regional utilization of remote sensing data from the NASA Wallops four-year old Chesapeake Bay Ecological Program. Forty-three managerial agencies utilized the data in more than 80 projects related to regional management. User and project emphases were categorized on a primary and secondary basis. The results of the study indicate that remote sensing is being practically applied to the accomplishment of a diverse variety of managerial objectives by a significant proportion of the public agencies of the middle-Atlantic states. 7 refs.

RS77-5-201

ID NO.- EI770529199 729199
CORRELATION INTERFEROMETER: A NEW INSTRUMENT SPECIFICALLY DESIGNED FOR REMOTE MEASUREMENT OF ATMOSPHERIC TRACE SPECIES.
Dick, R.; Barringer, A. R.; Levy, G. M.; Zwick, H.; Goldstein, H. W.; Grenda, R. N.; Bortner, M. H.; LeBel, P. J.
Barringer Res Ltd, Toronto, Ont
Proc of the Int Symp on Remote Sensing of Environ, 10th, Ann Arbor, Mich, Oct 6-10 1975 Publ by Environ Res Inst of Mich, Cent for Remote Sensing Inf and Anal, Ann Arbor, 1975 v 1 p 293-304
DESCRIPTORS: (*AIR POLLUTION, *Analysis), INTERFEROMETERS, REMOTE SENSING,
IDENTIFIERS: CORRELATION INTERFEROMETERS
CARD ALERT: 451, 941
By making full use of the known properties of the possible variety of measurement situations, the data rate of a remote sensor may be minimized and its selectivity maximized. An example is given of a specialized instrument designed in this manner for remote sensing of carbon monoxide and other trace species. Some test results are included.

RS77-5-202

ID NO.- EI770533103 733103
APPLICATION OF REMOTE SENSING DATA TO GEOGRAPHIC-BASED INFORMATION MANAGEMENT SYSTEMS.
Halpern, Jack A.; Alexander, Lawrence D.; O'Regan, Dennis M.
Dames & Moore, Cranford, NJ
Proc of the Int Symp on Remote Sensing of Environ, 10th, Ann Arbor, Mich, Oct 6-10 1975 Publ by Environ Res Inst of Mich, Cent for Remote Sensing Inf and Anal, Ann Arbor, 1975 v 1 p 351-358
DESCRIPTORS: *MAPS AND MAPPING, (POWER PLANTS, Site Selection), (REMOTE SENSING, Applications),
IDENTIFIERS: LAND USE INVENTORY
CARD ALERT: 405, 402, 614
Remote sensing has been shown to be able to provide much of the data necessary for rapidly obtaining data about large parcels of land, but there has been a lag in the application of such data to studies of these types. One reason for this lack of use of remote sensing data has been the inadequacy of data management programs that accept the data and transform it into something needed and readily usable. The paper describes the application of remote sensing data to one such data management system for a preliminary power plant siting investigation.

RS77-5-203

ID NO.- EI770534942 734942
USE OF REMOTE SENSING IMAGERY AND THE IPOS SYSTEM IN LAND USE STUDIES AT THE SOUTHERN CALIFORNIA EDISON COMPANY.
Crouch, R. G.; Dangermond, J. P.
Urban/Reg Plan at SCE, Rosemead, Calif
Proc of the Int Symp on Remote Sensing of Environ, 10th, Ann Arbor, Mich, Oct 6-10 1975 Publ by Environ Res Inst of Mich, Cent for Remote Sensing Inf and Anal, Ann Arbor, 1975 v 2 p 835-844
DESCRIPTORS: (*REMOTE SENSING, *Applications), ELECTRIC UTILITIES, (REGIONAL PLANNING, Land Use),
IDENTIFIERS: LAND USE INVENTORIES
CARD ALERT: 742, 706, 403
Over the past three years the Southern California Edison Company (SCE) has developed and implemented an ongoing land use study program to assist in forecasting future electrical load growth and general facility planning. The technical elements of this program involve collection of land use data from high altitude imagery, automating this data using the PIOS system, conducting various area overlay and mapping studies, and encorporating this data into a generalized methodology for forecasting land use. In addition to a successful technical program, SCE has worked closely with three country agencies in definition of a mutually usable data inventory and in establishing a joint sponsorship program.

RS77-5-204

ID NO.- EI770534286 734286
TESTING LOW COST INTERPRETATION SYSTEMS FOR UPDATING LAND USE INVENTORIES.
Hardy, Ernest E.; Hunt, Linda E.
Cornell Univ, Resour Inf Lab, Ithaca, NY
Proc of the Int Symp on Remote Sensing of Environ, 10th, Ann Arbor, Mich, Oct 6-10 1975 Publ by Environ Res Inst of Mich, Cent for Remote Sensing Inf and Anal, Ann Arbor, 1975 v 1 p 393-400
DESCRIPTORS: (*PHOTOGRAMMETRY, *Interpretation), (REGIONAL PLANNING, Land Use), MAPS AND MAPPING, REMOTE SENSING,
IDENTIFIERS: LAND USE INVENTORIES
CARD ALERT: 405, 742, 403
The paper discusses a study designed to test the feasibility of approaches to developing the re-survey techniques for the New York State Land Use and Natural Resource Inventory. Processes tested included: use of the zoom stereoscope, use of orthophoto base maps, use of high altitude imagery, color photography, and regular black and white photography. Microfiche readers also have been adapted to this work. The most efficient systems are reported, with current results showing the microfiche reader, using high altitude monoptical coverage, as the most efficient and most accurate techniques for interpretation. Cost evaluation is considered in detail, to determine the cost effectiveness of the selected methods.

RS77-5-205

ID NO.- EI770533104 733104
NATIONAL LAND USE SURVEY OF THE DEVELOPED AREAS OF ENGLAND AND WALES BY REMOTE SENSING.
Van Genderen, J. L.; Smith, T. F.
Fairey Surv Ltd, Maidenhead, Berkshire, Engl
Proc of the Int Symp on Remote Sensing of Environ, 10th, Ann Arbor, Mich, Oct 6-10 1975 Publ by Environ Res Inst of Mich, Cent for Remote Sensing Inf and Anal, Ann Arbor, 1975 v 1 p 383-392
DESCRIPTORS: *MAPS AND MAPPING, (URBAN PLANNING, Land Use), AERIAL PHOTOGRAPHY,
IDENTIFIERS: LAND USE SURVEY
CARD ALERT: 405, 403, 742
This national land use survey of developed land is being carried out at a scale of 1:50,000 on transparent map overlays using the latest Ordnance Survey Sheets at the same scale, and with constant reference to Royal Air Force panchromatic small scale aerial photography flown in 1969. The survey will result in the compilation of a series of over 120 land use maps to cover the whole of England and Wales. The Department of the Environment intend then to computerize the handling of the mapped information, especially for measurement purposes and in order to relate it to Census information. 16 refs.

RS77-5-206

ID NO.- EI770536779 736779
REMOTE SENSING OF LUMINESCING ENVIRONMENTAL POLLUTANTS USING A FRAUNHOFER LINE DISCRIMINATOR (FLD).
Watson, Robert D.; Hemphill, William R.; Bigelow, Robert C.
US Geol Surv, Flagstaff, Ariz
Proc of the Int Symp on Remote Sensing of Environ, 10th, Ann Arbor, Mich, Oct 6-10 1975 Publ by Environ Res Inst of Mich, Cent for Remote Sensing Inf and Anal, Ann Arbor, 1975 v 1 p 203-222
DESCRIPTORS: (*WATER POLLUTION, *Remote Sensing), OPTICAL INSTRUMENTS,
IDENTIFIERS: FRAUNHOFER LINE DISCRIMINATORS
CARD ALERT: 453, 741, 941
A redesigned FLD, tested in both ground-based and airborne experiments for 18 months to determine its ability to detect luminescing pollutants, has demonstrated the capability of operating at selected Fraunhofer wavelengths throughout the visible spectrum, with a sensitivity sufficient to detect 0.25 parts per billion rhodamine WT dye in 0.5 m depth of water at 20 $degreeS C. The instrument has been used to detect and monitor several sources of pollution including oil spills and seeps, sewage effluent, phosphate processing effluent, and paper mill effluent. Selected luminescent dyes that could be used as tracers in pollutant transport studies were monitored in real time from helicopter platform. Refs.

RS77-5-207

ID NO.- EI770531438 731438
UTILIZATION OF HIGH ALTITUDE PHOTOGRAPHY AND LANDSAT-1 DATA FOR CHANGE DETECTION AND SENSITIVE AREA ANALYSIS.
De Gloria, S. D.; Daus, S. J.; Tosta, N.; Bonner, K.
Univ of Calif, Berkeley
Proc of the Int Symp on Remote Sensing of Environ, 10th, Ann Arbor, Mich, Oct 6-10 1975 Publ by Environ Res Inst of Mich, Cent for Remote Sensing Inf and Anal, Ann Arbor, 1975 v 1 p 359-368
DESCRIPTORS: *ENVIRONMENTAL PROTECTION, MAPS AND MAPPING, AERIAL PHOTOGRAPHY, REMOTE SENSING,
IDENTIFIERS: LANDSAT-1 DATA, NATURAL RESOURCE INVENTORIES
CARD ALERT: 901, 405, 742
A multi-disciplinary and multi-purpose remote sensing study was conducted in the northern desert shrub environment to evaluate the applicability of remotely-sensed data as an input to the Bureau of Land Management (BLM) Planning System, and to provide map products and data summaries to be utilized by District-level land managers. The experimental design, procedures, and results of the environmental monitoring tasks of that study are reported. Sensitive areas were mapped and monitored within and between two seasons utilizing both manual and automatic analyses of high-altitude photography and LANDSAT-1 data.

RS77-5-208

ID NO.- EI770534919 734919
LOUISIANA COMPREHENSIVE PLANNING INFORMATION SYSTEM: COMPILATION AND UTILIZATION OF THE DATA BASE.
Schwertz, Eddie L. Jr.
La State Univ, Baton Rouge
Proc of the Int Symp on Remote Sensing of Environ, 10th, Ann Arbor, Mich, Oct 6-10 1975 Publ by Environ Res Inst of Mich, Cent for Remote Sensing Inf and Anal, Ann Arbor, 1975 v 2 p 873-877
DESCRIPTORS: (*REGIONAL PLANNING, *Computer Applications), REMOTE SENSING,
IDENTIFIERS: LANDSAT IMAGERY
CARD ALERT: 403, 901, 723
A brief description of the types of sociodemographic data stored in CPIS is covered. Considerable detail is devoted to the Land Use and Data Analysis (LUDA) Program of the U. S. Geological Survey (USGS) as it pertains to a cooperative agreement between the Louisiana State Planning Office and the Geography Program of USGS. Also reported is an account of the successful use made of the computerized land use data when merged with flood delineations obtained from LANDSAT satellite imagery to provide flood maps and tabulations. Computerization of soils association data for storage in CPIS and the potential for producing thematic soils limitation/suitability maps is presented.

RS77-5-209

ID NO.- EI770536775 736775
RADAR OBSERVATIONS OF CONTROLLED OILSPILLS.
van Kuilenburg, J.
NIWARS, Holland, Neth
Proc of the Int Symp on Remote Sensing of Environ, 10th, Ann Arbor, Mich, Oct 6-10 1975 Publ by Environ Res Inst of Mich, Cent for Remote Sensing Inf and Anal, Ann Arbor, 1975 v 1 p 243-250
DESCRIPTORS: (*WATER POLLUTION, *Oil Spills), (RADAR, Measurement Application), REMOTE SENSING,
IDENTIFIERS: SIDE-LOOKING AIRBORNE RADAR
CARD ALERT: 453, 716
From scatterometer observations of oilslicks in a wavetank it is concluded that oil is always detectable, but also that oil-type and thickness have little influence on the radarecho. The radar observation of the damping of water waves which travel into the polluted area is proposed as an indicator of the physical oil properties. A radar operating in the VV-polarization mode is shown to be optimal because of the strength of the radarecho, the observed contrast and the low noise. However, experiments using a SLAR operating in the HH-mode, showed this polarization combination to perform well enough for the purpose of oil detection. Refs.

RS77-5-210

BAUER, H.J.

1973

ECOLOGICAL AERIAL PHOTO INTERPRETATION FOR REVEGETATION IN THE COLOGNE LIGNITE DISTRICT. IN R.J. HUTNIK AND G. DAVIS, EDS., ECOLOGY AND RECLAMATION OF DEVASTATED LANDS, P. 469-476.

NORTH ATLANTIC TREATY ORGANIZATION ADVANCED STUDY, PENNSYLVANIA STATE UNIVERSITY, UNIVERSITY PARK, AUGUST 3-16, 1969, PROCEEDINGS, VOLUME II. 495 P.

SURFACE MINED AREAS/AERIAL PHOTOGRAPHY/ECOSYSTEMS/REVEGETATION/LIGNITE/EUROPE

RS77-5-211

ALEXANDER, S.S./DEIN, D./GOLD, P.

1973

THE USE OF ERTS-1 FOR MAPPING STRIP MINES AND ACID MINE DRAINAGE IN PENNSYLVANIA. IN SYMPOSIUM ON SIGNIFICANT RESULTS OBTAINED FROM THE EARTH RESOURCES TECHNOLOGY SATELLITE-1, NEW CARROLLTON, MARYLAND, MARCH 5-9, PROCEEDINGS, 1:569-575.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION REPORT NASA SP-327. 874 P. AVAILABLE GPO AS NAS 1.21 (SP 327). PAPER COPY 13.65.

SURFACE MINING/ENVIRONMENTAL EFFECTS/ACID MINE WASTES/ACID MINE DRAINAGE/MAPS/ MONITORING/REMOTE SENSING/PENNSYLVANIA

RS77-5-212

BROOKS, R.L./PARRA, C.G.

1975

APPLICABILITY OF SATELLITE REMOTE SENSING FOR DETECTION AND MONITORING OF COAL STRIP MINING ACTIVITIES.

WOLF RESEARCH AND DEVELOPMENT CORPORATION, POCOMOKE, MARYLAND. 88 P. AVAILABLE NTIS AS E76-10038. PAPER COPY 5.00/MICROFICHE 2.25.

SURFACE MINING/COAL/LAND USE/MONITORING/REMOTE SENSING/AGRICULTURE

RS77-5-213

GAROFALO, D./WOBBER, F.J.

1974

AN AERIAL-PHOTOGRAPHIC ANALYSIS OF THE ENVIRONMENTAL IMPACT OF CLAY MINING IN NEW JERSEY.

PHOTOGRAMMETRIA 30(1):1-19.

SURFACE MINED AREAS/ENVIRONMENTAL EFFECTS/REMOTE SENSING/AERIAL PHOTOGRAPHY/ MONITORING

RS77-5-214

BUSCH, R.A./BACKER, R.R./ATKINS, L.A.

1974

PHYSICAL PROPERTY DATA ON COAL WASTE EMBANKMENT MATERIALS.

U.S. BUREAU OF MINES, SPOKANE, WASHINGTON, SPOKANE MINING RESEARCH CENTER, REPORT OF INVESTIGATIONS JANUARY-JUNE 1973. 149 P. AVAILABLE NTIS AS PB-240 022/4ST. PAPER COPY 5.75/MICROFICHE 2.25.

COAL MINING/MINE SPOILS/TAILINGS/WASTE DISPOSAL/SOIL PROPERTIES/EMBANKMENTS/ DAMS/AERIAL PHOTOGRAPHY

Section 6

INSTRUMENTATION

Data Systems and Methods of Remote Sensing

RS77-6-160

N77-18553# Harris Corp., Melbourne, Fla
IMAGE MATCHED FILTER CORRELATOR EXPERIMENTS
Final Technical Report, Jul. 1975 - Jun. 1976
F. B. Rotz Jul 1976 113 p
(Contract F30602-75-C-0305, AF Proj. 5569)
(AD-A030025, RADC-TR-76-219) Avail NTIS HC A06/MF A01 CSCL 08/2

The work described in this report is the continuation of the development of an automatic stereo compilation system based on coherent optical techniques. A breadboard coherent optical mapping system was modified to improve its accuracy and overall performance while at the same time simplifying the basic optics involved. Methods for preprocessing imagery to enhance correlation performance were studied and phase-type spatial filters were used to increase optical efficiency. The problem of data readout was investigated with particular attention to the use of an optical heterodyne technique. Computer and interface requirements for a fully automatic breadboard system were established and the use of real time filters was considered. Results indicate that this coherent optical system has considerable promise in the area of parallax measurement and, with slight modification, may be a useful tool for feature extraction from aerial photographs. GRA

RS77-6-161

N77-18534*# Bendix Corp., Ann Arbor, Mich. Aerospace systems Div.
SIMULATION OF THEMATIC MAPPER PERFORMANCE AS A FUNCTION OF SENSOR SCANNING PARAMETERS Final Report
Robert H. Johnson, Navinchandra J. Shah, and Norman F. Schmidt 1 Oct 1975 57 p
(Contract NAS5-20821)
(NASA-CR-152436; BSR-4202) Avail NTIS HC A04/MF A01 CSCL 08B

The investigation and results of the Thematic Mapper Instrument Performance Study are described. The Thematic Mapper is the advanced multispectral scanner initially planned for the Earth Observation Satellite and now planned for LANDSAT D. The use of existing digital airborne scanner data obtained with the Modular Multispectral Scanner (M2S) at Bendix provided an opportunity to simulate the effects of variation of design parameters of the Thematic Mapper Analysis and processing of this data on the Bendix Multispectral Data Analysis System were used to empirically determine categorization performance on data generated with variations of the sampling period and scan overlap parameters of the Thematic Mapper. The Bendix M2S data, with a 2.5 milliradian instantaneous field of view and a spatial resolution (pixel size) of 10-m from 13,000 ft altitude, allowed a direct simulation of Thematic Mapper data with a 30-m resolution. The flight data chosen were obtained on 30 June 1973 over agricultural test sites in Indiana. Author

RS77-6-162

N77-21539# Royal Aircraft Establishment, Farnborough (England)
REMOTE-SENSING EXPERIMENTS FROM SKYLARK SOUNDING ROCKETS
R. J. Jude Sep 1976 55 p refs
(RAE-TR-76122, BR55389) Avail NTIS HC A04/MF A01

The development and performance of photographic payloads carried on three Skylark rockets, one fired from Woomera, South Australia and two from Mercedes, San Luis Province, Argentina are described. The methods used for prediction of the performance of the photographic systems and the estimation of the required camera exposures are given. For each rocket firing the choice of photographic emulsions and filters is detailed, and examples are given of the imagery obtained. Measurements made on the imagery have validated the methods used for the prediction of the performance of the photographic systems. Author (ESA)

RS77-6-163

N77-18424# Grumman Aerospace Corp., Bethpage, N.Y. Research Dept.
OPTICAL MATCHED FILTERING TECHNIQUES FOR AUTOMATIC INTERROGATION OF AERIAL RECONNAISSANCE FILM Final Report
Kenneth G. Leib, Robert A. Bondurant, and Stephen Hsiao Sep 1976 134 p refs
(Contract DAAG53-75-C-0199)
(AD-A030574; RE-524) Avail: NTIS HC A07/MF A01. CSCL 15/4

The continuing requirement for aerial reconnaissance imagery has created a need for systems to rapidly screen and interpret this film to complement the human photointerpreters handling the current work load. The Grumman developed Optical Matched Filter Image Correlation System (OMFIC) processes such imagery through holographic lens-matched filter optical memories at high speed, conservatively estimated at 180 sq cm per second for 70 mm aerial reconnaissance film. To establish such a system, analyses of matched filter output sensitivities with variation in image parameters are made. The (-3 db) sensitivities determined for the M-60 target are: scale, + or - 19 percent in area about 100 percent image; contrast, imagery can have optical density range of 1 to 5 OD, resolution equal or greater than 5 cycles per target width, and orientation, + or - 8 degrees. These sensitivities were arrived at by independently varying each parameter. Such information is utilized in the memory requirement determination for the target of interest (M-60 tank). The data show the requirement for 23 filter positions of memory to cover a 360 degree target orientation. Interrelated parametric variations will require additional memory positions. GRA

RS77-6-164

N77-21535# Oak Ridge National Lab., Tenn.
DIGITAL GEOGRAPHIC DATA WITH GRIDOT: A GENERALIZED PROGRAM FOR DRAWING OVERLAY GRIDS IN VARIOUS MAP PROJECTIONS
R. G. Edwards and R. C. Durfee Sep 1976 127 p refs Sponsored in part by NSF
(Contract W-7405-eng-26)
(ORNL/RUS-17) Avail: NTIS HC A07/MF A01

The GRIDOT computer program draws overlay grids on a Calcomp plotter for use in digitizing information from maps, rectified aerial photographs, and other sources of spatially distributed data related to regional environmental problems. The options of the program facilitate use of the overlays with standard maps and map projections of the continental United States. The overlay grid is defined as a latitude-longitude grid (geodetic grid) a universal transverse mercator grid, or one of the standard state plane coordinate system grids. ERA

RS77-6-165

N77-17142*# General Electric Co., Philadelphia, Pa. Space Div.
EARTH VIEWING APPLICATIONS LABORATORY (EVAL). INSTRUMENT CATALOG
25 May 1976 29 p
(Contract NAS5-24022)
(NASA-CR-152435) Avail: NTIS HC A03/MF A01 CSCL 14B

There were 87 instruments described that are used in earth observation, with an additional 51 instruments containing references to programs and their major functions. These instruments were selected from such sources as: (1) earth observation flight program, (2) operational satellite improvement programs, (3) advanced application flight experiment program, (4) shuttle experiment definition program, and (5) earth observation aircraft program. Author

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RS77-6-166

N77-18516*# Lockheed Electronics Co., Houston, Tex. Aerospace Systems Div.
DETECTION AND MAPPING (DAM) PACKAGE. VOLUME 1: GENERAL PROCEDURE Final Report, Jan. - Jun. 1976
Edward H. Schlosser, Principal Investigator and M. L. Brown Jun 1976 28 p EREP
(Contract NAS9-12200)
(E77-10100, NASA-CR-147873, LEC-8663-Vol-1; JSC-11376-Vol-1) Avail: NTIS HC A03/MF A01 CSCL 08H

The author has identified the following significant results. The DAM package is an integrated set of manual procedures, computer programs, and graphic devices designed for efficient production of precisely registered and formatted maps from digital LANDSAT multispectral scanner data. The software can be readily implemented on any Univac 1100 series computer with standard peripheral equipment. This version of the software includes predefined spectral limits for use in classifying and mapping surface water.

RS77-6-167

N77-21519*# Environmental Research Inst. of Michigan, Ann Arbor. Infrared and Optics Div.
MIDAS PROTOTYPE MULTISPECTRAL INTERACTIVE DIGITAL ANALYSIS SYSTEM FOR LARGE AREA EARTH RESOURCES SURVEYS. VOLUME 2: CHARGE COUPLED DEVICE INVESTIGATION Final Report, Oct. 1975 - Jan. 1976
F. Kriegler, R. Marshall, and S. Sternberg Aug. 1976 48 p refs 2 Vol
(Contract NAS1-13128)
(NASA-CR-145166; ERIM-108800-54-F) Avail: NTIS HC A03/MF A01 CSCL 05B

MIDAS is a third-generation, fast, low cost, multispectral recognition system able to keep pace with the large quantity and high rates of data acquisition from large regions with present and projected sensors. MIDAS, for example, can process a complete ERTS frame in forty seconds and provide a color map of sixteen constituent categories in a few minutes. A principal objective of the MIDAS Program is to provide a system well interfaced with the human operator and thus to obtain large overall reductions in turn-around time and significant gains in throughput. The need for advanced onboard spacecraft processing of remotely sensed data is stated and approaches to this problem are described which are feasible through the use of charge coupled devices. Tentative mechanizations for the required processing operations are given in large block form. These initial designs can serve as a guide to circuit/system designers. Author

RS77-6-168

A77-26346 **Digital scan converters in airborne display systems.** G. K. Slocum (Hughes Aircraft Co., Culver City, Calif.) and J. O. Mysing (USAF, Avionics Laboratory, Wright Patterson AFB, Ohio). *(NATO, AGARD, Symposium, Edinburgh, Scotland, Aor. 1975.) SID, Proceedings*, vol. 17, 3rd Quarter, 1976, p. 147-158.

Recent developments in digital scan converters (DSC) provide high quality image storage for avionics sensor displays and can simplify the pilot's tasks in radar target acquisition. Typical digital scan converter concepts and their system design implications are described for an air-to-air radar, a multimode radar and a high resolution reconnaissance sensor. Studies of operator performance in using stored digital imagery with various encoded gray levels show eight shades of grey are adequate for radar imagery but at least 16 are needed for electro-optical imagery. Tradeoffs in memory selection and digital image enhancement techniques are presented. The cost of ownership analysis shows that the high reliability, low maintenance adjustments and short repair time of digital scan converters can result in significant life cycle cost savings over analog scan converter display systems. The performance, new display modes and cost of ownership advantages of digital scan converters indicate their wide applications not only in new avionics systems, but also for retrofit of existing systems. (Author)

RS77-6-169

A77-28749 **The pyroelectric vidicon - A new technique in thermography and thermal imaging.** R. Watton, D. Burgess, and B. Harper (Royal Signals and Radar Establishment, Malvern, Worcs., England). *Journal of Applied Science and Engineering, Section A - Electrical Power and Information Systems*, vol. 2, Mar. 1977, p. 47-63. 12 refs.

A description of the pyroelectric vidicon and its basic properties is presented. Modes of operation employing a chopper or panning the camera are analysed. It is shown that the camera panning mode is suitable for qualitative assessment of the thermal scene, when temperature differences of 0.2 C may be observed. For quantitative measurements the chopping method is necessary and a simple chopping camera is described which uses a long persistence display to remove flicker. The accuracy of measurements directly on the video waveform is plus or minus 1 C. (Author)

RS77-6-170

A77-29270 * **Skylab S191 visible-infrared spectrometer.** T. L. Barnett and R. D. Juday (NASA, Johnson Space Center, Houston, Tex.). *Applied Optics*, vol. 16, Apr. 1977, p. 967-972.

The paper describes the S191 visible-infrared spectrometer of the Skylab Earth Resources Experiment Package - a manually pointed two-channel instrument operating in the reflective (0.4-2.5 micron) and thermal emissive (6-15 micron) regions. A sensor description is provided and attention is given to data quality in the short wavelength and thermal infrared regions. B.J.

RS77-6-171

A77-25235 **Field-averaging spectrograph camera for remote sensing applications and its characteristics.** H. Genda and H. Okayama (Chiba University, Chiba, Japan). *Applied Optics*, vol. 16, Mar. 1977, p. 601-606. Research supported by the Ministry of Education.

A field-averaging spectrograph camera (FASC) and a beam split camera (BSC) are used together and separately in tests of systems for remote sensing. The FASC utilizes a continuous interference filter and a step tablet; color patches are used for comparisons with results obtained with a spectroradiometer and a self-spectrophotometer. Color positives are reproduced (cyan, red; and false color from IR and green bands using the BSC), and wavelength dependences of relative reflectance for various color patches are displayed. Higher spectral reflectance (probably due to flare) is noted in the FASC results. The combination of FASC and BSC is recommended as an effective and readily portable system for remote sensing work.
R.D.V.

RS77-6-172

A77-29758 # **Topomat - A new all-automatic photogrammetric restitution system of VEB Carl Zeiss JENA.** K. Szangolies and W. Kunze. *Jena Review*, vol. 22, no. 2, 1977, p. 55-63. 5 refs.

Automated restitution of aerial images and terrestrial photographs has been accelerated by the development of an electronic image correlator called Oromat which automatically performs model profiling. The combined system termed Topomat produces orthophotos, digital profile recordings, and graphical drop-line representations. The design of the Topomat instrument system and the Oromat correlator (scanning systems, circuitry, adaptability, applicability) are described in detail. Topomat can be used for differential rectification as well as for graphical and digital relief representation; provides restitution of aerial photographs at medium and small scales and also at higher scales 1.500-1:5000 if certain requirements are met (as is the case for terrestrial photogrammetry); and processes normal, wide, and superwide angle photographs. M.L.

RS77-6-173

A77-24813 Mathematical modelling of an earth sensor. C. A. Markland (ESA, European Space Research and Technology Centre, Noordwijk, Netherlands). In: Symposium on Automatic Control in Space, 7th, Rottach-Egern, West Germany, May 17-21, 1976, Preprints. Volume 2. (A77-24777 10-12) Düsseldorf, VDI/VDE-Gesellschaft Mess- und Regelungstechnik, 1976, p. 412-427.

The purpose and nature of mathematical modeling of attitude control system components is considered with particular attention to sensors. The requirements of the system designer are discussed, and the practical value of a mathematical model to the component designer is demonstrated. As an example, a model of a two-axis infra-red earth sensor is presented. This sensor is being developed for high accuracy earth pointing of geostationary satellites. The physical operation of the sensor is described, and the basic input-output equations are derived. Then the impact of quantization of the internal measurements is analyzed. It is shown that the resulting quantization of the output signals is not regular and that a cross-coupling between the pitch and roll axes occurs. The amplitude and frequency characteristics of the sensor output noise are examined, and the effectiveness of a first-order filter is demonstrated. (Author)

RS77-6-174

A77-24883 Synthetic aperture radar. S. Marder (Michigan, Environmental Research Institute, Arlington, Va.). In: Atmospheric effects on radar target identification and imaging; Proceedings of the Advanced Study Institute, Goslar, West Germany, September 22-October 3, 1975 (A77-24876 10-32) Dordrecht, D. Reidel Publishing Co., 1976, p. 193-217. 11 refs.

Disadvantages of radar with respect to aerial photography are briefly examined. Penetration of the atmosphere requires the use of long wavelengths which limit the attainable resolution. The use of both coherent illumination and long wavelengths entail target scattering effects. The implications of these effects for target imaging are investigated and an approach is considered for avoiding or alleviating the resulting target-imaging problems. The approach involves an application of synthetic aperture radar (SAR) devices. A description of synthetic aperture radar applications is presented and the effect of the atmosphere upon SAR images is studied. G.R.

RS77-6-175

A77-24882 Azimuth compression processing of real SLAR data. S. R. Brooks (GEC-Marconi Electronics, Ltd., Marconi Research Laboratories, Chelmsford, Essex, England). In: Atmospheric effects on radar target identification and imaging; Proceedings of the Advanced Study Institute, Goslar, West Germany, September 22-October 3, 1975 (A77-24876 10-32) Dordrecht, D. Reidel Publishing Co., 1976, p. 179-191. Research supported by the Ministry of Defence (Procurement Executive)

A description is presented of a real data processing study which is based on earlier theoretical investigations in the area of digital signal processing. The operational principles of synthetic aperture radar are briefly examined, taking into account the disadvantage of the standard optical technique and an improved approach. The new approach is based on the use of a digital processor. Attention is given to aspects of quantization, the employed computing facilities, the data processing software, questions of real data recording, details of computer processing, and problems of image interpretation. G.R.

RS77-6-176

A77-31565 * An image-processing system applied to earth-resource imagery. P. Carter and W. E. Gardner (Atomic Energy Research Establishment, Harwell, England). In: Environmental remote sensing 2: Practices and problems. (A77-31556 13-43) London, Edward Arnold (Publishers), Ltd., 1977, p. 143-162. 18 refs. Contract No. NAS7-100.

The Harwell Image Processing System (HIPS) has been adapted for processing earth-resource imagery in either film or tape format. Data from film are obtained using a computer-controlled flying-spot scanner. Local rapid interactive processing is based on a PDP 11/20 minicomputer which has suitable display facilities for immediate visual appraisal of results and also a fast data link to an IBM 370/168 computer complex. An extensive subroutine library is being assembled for data preprocessing and feature extraction. This chapter includes a discussion of the basic principles of image analysis, a description of the HIPS system, and finally, for illustrative purposes, a description of several simple software routines. (Author)

RS77-6-177

AD-A033 714/7GA PC A04/MF A01
Technology Service Corp Santa Monica Calif
Digital Simulation of High Resolution Radar Imagery.
Final technical rept. Jun 75-Jun 76,
Jeffrey W. Bell. Oct 76, 71p TSC-PD-B486-2, RADC-TR-76-290
Contract F30602-75-C-0303

Descriptors: *Synthetic aperture radar, *Radar images, Digital simulation, High resolution, Radar mapping, Comparison, Aerial photography, Topographic maps, Targets, Mathematical models, Computerized simulation, Computer programs, Algorithms.

This study was an exploratory development program with the purpose of establishing the fundamental capability of simulating SAR imagery of future systems for use in exercising change detection processors. To this end the objectives of program were twofold: (1) to develop algorithms and techniques for simulating high resolution imagery for future SAR systems using aerial photography, topographical maps, and SAR imagery from present systems as source data, and (2) to generate a set of simulated imagery under a variety of conditions to demonstrate the methods. (Author)

RS77-6-178

AD-A033 567/9GA PC A04/MF A01
Army Engineer Topographic Labs Fort Belvoir Va
Stereo Analysis of a Specific Digital Model Sampled from Aerial Imagery.
Research note,
Michael A. Crombie. Sep 76, 64p Rept no. ETL-0072

Descriptors: *Image processing, *Stereophotography, Aerial photography, Computer programming, FORTRAN, Mathematical models
Identifiers: CDC-6400 computers.

Approximately 160,000 points were matched over a digitized stereo model using correlation algorithms coded in FORTRAN for the CDC 6400. Each of the digitized stereo pair was represented by over 4 million pixels, which were measured on a microdensitometer and stored on disc in the Image Processing Center at ETL. The matched point coordinates and the associated local coordinates were also stored on disc. The derived digital model will be used in the Interactive Image Processing Center to evaluate a variety of problems in digital image processing of stereo photography.

RS77-6-179

30451 Aerial reconnaissance systems: pods/aircraft. Volume 79. Shea, E. (ed.). Palos Verdes Estates, CA, Society of Photo-Optical Instrumentation Engineers (1976). 234p. (CONF-760306—P5)
From SPIE/SPSE technical symposium; Reston, Virginia, United States of America (USA) (22 Mar 1976).

In the past two decades, the dedicated, internally configured aircraft has emerged as the standard tactical air reconnaissance vehicle. But recently military planners have looked toward externally mounted sensor pods to satisfy various data collection needs, accommodate special purpose sensors, augment dedicated reconnaissance assets, and provide an interim reconnaissance capability during a major tactical aircraft change. Design considerations for both types of systems are presented. Twenty-nine papers were presented at the seminar.

RS77-6-180

ID NO.- EI770532041 732041
THERMAL INERTIA MAPPING.
Kahle, Anne B.; Gillespie, Alan R.; Goetz, Alexander F. H.; Addington, John D.
JPL, Calif Inst of Technol, Pasadena
Proc of the Int Symp on Remote Sensing of Environ, 10th, Ann Arbor, Mich, Oct 6-10 1975 Publ by Environ Res Inst of Mich, Cent for Remote Sensing Inf and Anal, Ann Arbor, 1975 v 2 p 985-994
DESCRIPTORS: (*GEOPHYSICS, *Geothermal), (THERMAL EFFECTS, Mathematical Models), INFRARED IMAGING, (REMOTE SENSING, Applications),
IDENTIFIERS: THERMAL INERTIA MAPPING
CARD ALERT: 481, 741, 921
A thermal model of the Earth's surface has been developed and used to determine the thermal inertia of a test site in the Mojave Desert, California. The model, which includes meteorological heating terms as well as radiation and conduction heating terms, is used with remotely sensed surface temperature data to determine thermal inertia of materials. The thermal inertia is displayed in image form, and can aid in the differentiation of the various lithologic materials in the test site. Refs.

RS77-6-181

ID NO.- EI770532430 732430
NEW IMAGE ENHANCEMENT ALGORITHM, WITH APPLICATIONS TO FORESTRY STAND MAPPING.
Kan, E. P.; Lo. J. K.; Smelser, R. L.
Lockheed Electron Co, Houston, Tex
Proc of the Int Symp on Remote Sensing of Environ, 10th, Ann Arbor, Mich, Oct 6-10 1975 Publ by Environ Res Inst of Mich, Cent for Remote Sensing Inf and Anal, Ann Arbor, 1975 v 2 p 745-755
DESCRIPTORS: *IMAGE PROCESSING, MAPS AND MAPPING, FORESTRY, REMOTE SENSING,
IDENTIFIERS: MULTISPECTRAL SCANNER DATA
CARD ALERT: 723, 741, 405, 821
The theory and applications are presented of a new image enhancement algorithm which refines computer classification maps of multispectral data. The refinement eliminates connected sets smaller than a prespecified size and merges them to the surrounding area. Conventional practices in forestry timber stand mapping require small geographic areas to be absorbed by surrounding large areas to form homogeneous stands. This homogeneity is often incompatible with the statistical formulation of homogeneity. The new algorithm is designed to postprocess classification maps to result in more usable timber stand maps. 15 refs.

RS77-6-182

ID NO.- EI770751816 751816
VARIABILITY IN THE MEASUREMENT OF RADAR BACKSCATTER.
Nush, Thomas F.; Ulaby, Fawwaz
Univ of Kans Cent for Res, Inc, Lawrence
IEEE Trans Antennas Propag v AP-24 n 6 Nov 1976 p 896-898
CODEN: IETPAK
DESCRIPTORS: (*RADAR, *Testing), (RADIO TRANSMISSION, Backscattering),
CARD ALERT: 716
A variety of systems and platforms is used over the past three decades to acquire radar backscatter data of terrain. The variability in the reported data is evaluated for agricultural crops under $left double quote$ similar $right double quote$ phenological conditions and for approximately the same sensor parameters (frequency, polarization, and angle of incidence). The evaluation reveals wide variations in the magnitude of the scattering coefficient among different measurement programs. While it is difficult to determine the exact causes of these variations it is quite evident that extreme care must be employed in 1) monitoring the measurement system transfer function, 2) calibrating the system on an absolute basis, and 3) acquiring and reporting detailed target parameter information. 12 refs.

RS77-6-183

ID NO.- EI770532431 732431
CHANGE DETECTION IN MULTI-SENSOR IMAGES.
Price, K.; Reddy, R.
Carnegie-Mellon Univ, Pittsburgh, Pa
Proc of the Int Symp on Remote Sensing of Environ, 10th, Ann Arbor, Mich, Oct 6-10 1975 Publ by Environ Res Inst of Mich. Cent for Remote Sensing Inf and Anal, Ann Arbor, 1975 v 2 p 769-776
DESCRIPTORS: *IMAGE PROCESSING, REMOTE SENSING,
IDENTIFIERS: MULTISPECTRAL SCANNER IMAGERY
CARD ALERT: 723, 741
A continuous multi-spectral image can be segmented into discrete regions having similar properties and this provides the basic symbolic representation needed for change detection. A picture segmentation method based on multi-dimensional histogram thresholding, feature extraction, and matching of the regions in two images to determine changes, if any. The method is illustrated in detection of changes in snow cover and the analysis of aircraft imagery of crop land. The results compare favorably to other known results. Refs.

RS77-6-184

ID NO.- EI770751985 751985
EXPERIMENTAL DETERMINATION OF THE RADIO EMISSION OF THE UNDERLYING SURFACE ON $lambda$ $equals$ 2. 1 cm.
Gordon, Z. I.; Frolov, A. V.
Sov Hydrol n 4 1975 p 256-260 CODEN: SHSPBB
DESCRIPTORS: (*REMOTE SENSING, *Environmental Applications), (RADIOMETERS, Temperature Measurement), ELECTROMAGNETIC WAVES,
IDENTIFIERS: RADIO EMISSION, RADIO LUMINANCE TEMPERATURES
CARD ALERT: 941, 944, 443
The radio emission of underlying surfaces must be taken into account in the interpretation of meteorological satellite or aircraft information and, furthermore, it can be used to determine the temperature of the surface of the earth and the state of this surface. The paper reports on an experimental study to determine the radio emission of various underlying surface areas under natural conditions using a very stable radiometer operating on a wavelength of 2. 1 cm. Instrumentation is described, along with the surfaces studied, including various types of vegetation and crops, soils, and soil moisture content.

RS77-6-185

ID NO.- EI770534158 734158
AUTOMATIC CLASSIFICATION OF AIRCRAFT AND SATELLITE MULTISPECTRAL IMAGES USING MIXED INTEGER PROGRAMMING.
Rebollo, M.; Escudero, L. F.
Univ Auton of Madrid, Spain
Proc of the Int Symp on Remote Sensing of Environ, 10th, Ann Arbor, Mich, Oct 6-10 1975 Publ by Environ Res Inst of Mich, Cent for Remote Sensing Inf and Anal, Ann Arbor, 1975. v 2 p 731-744
DESCRIPTORS: *PATTERN RECOGNITION SYSTEMS, REMOTE SENSING, IMAGE PROCESSING, MATHEMATICAL PROGRAMMING.
IDENTIFIERS: MULTISPECTRAL SCANNER IMAGES, MIXED INTEGER PROGRAMMING, LAND USE CLASSIFICATION
CARD ALERT: 723, 741, 921
Mixed integer programming is applied to the problem of finding discriminant surfaces. A discriminant mixed integer programming model (DISMIP) is described which achieves either linear or non-linear separation. The input data of the DISMIP model is in the form of labelled samples. If the training sets are disjoint, a strictly separating surface is generated that maximizes a $left double quote$ dead zone $right double quote$ between the sets. If the sets intersect, a surface is generated that minimizes a specified misclassification error. The DISMIP classifier has been tested for accuracy and efficiency in three practical applications: (a) simulated images, (b) classification of an agricultural area, using an aircraft multispectral image (MSS 12 channels), and (c) classification of a LANDSAT I image of Northeastern Spain in several land-use categories. 18 refs.

RS77-6-186

ID NO.- EI770751104 751104
MIXED INTEGER PROGRAMMING APPROACH TO MULTI-SPECTRAL IMAGE CLASSIFICATION.
Rebollo, M.; Escudero, L. F.
Autonomous Univ of Madrid, Spain
Pattern Recogn v 9 n 1 Jan 1977 p 47-57 CODEN: PTNRA8
DESCRIPTORS: *PATTERN RECOGNITION SYSTEMS, (REMOTE SENSING, Multispectral Scanners),
CARD ALERT: 723, 732
A supervised discriminant mixed integer programming algorithm (DISMIP) is described which achieves either linear or non-linear separation, without assuming any specific probability distribution. This system offers greater flexibility in dealing with problems of multi-spectral classification. If the training sets are disjoint, a strictly separating surface is generated that maximizes a $left double quote$ dead zone $right double quote$ between the sets. If the sets intersect, a surface is generated that minimized a specified misclassification error. The final sections of this paper describe the utilization of the DISMIP classifier for the recognition of patterns corresponding to aircraft and LANDSAT I multispectral images. A comparative analysis is made of the results given by this classifier. This system is also used for the automatic classification of patterns corresponding to meteorological maps, to predict meteorological situations in air pollution problems. 19 refs.

RS77-6-187

ID NO.- EI770749349 749349
EXPERIMENTS IN ITERATIVE ENHANCEMENT OF LINEAR FEATURES.
VanderBrug, Gordon J.
Univ of Md, College Park
Comput Graphics Image Process v 6 n 1 Feb 1977 p 25-42
CODEN: CGIPBG
DESCRIPTORS: (*IMAGE PROCESSING, *Computer Applications), (PATTERN RECOGNITION SYSTEMS, Computer Applications), (SATELLITES, Imaging Techniques),
CARD ALERT: 723, 655
Lines and curves in an image are detected locally by a template-matching process which determines the $left double quote$ line-ness $right double quote$ value of the image at each point, in a set of orientations. The output of the detection process is the strongest of these values at each point, and the orientation that gave rise to this value. The results of this approach tend to be noisy, but their noisiness can be reduced by examining, for each point, the values at nearby points, in the direction defined by the preferred orientation, and increasing the point's value if the nearby points have high values and similar orientations. Experimental results using these and other methods are obtained for a portion of a LANDSAT image containing many linear features. 4 refs.

RS77-6-188

ID NO.- EI770536806 736806
COMPLETELY AIRBORNE CALIBRATION OF AERIAL INFRARED-WATER-TEMPERATURE MEASUREMENTS.
Schott, John R.; Tourin, Richard H.
Calspan Corp, Buffalo, NY
Proc of the Int Symp on Remote Sensing of Environ, 10th, Ann Arbor, Mich, Oct 6-10 1975 Publ by Environ Res Inst of Mich, Cent for Remote Sensing Inf and Anal, Ann Arbor, 1975 v 1 p 477-484
DESCRIPTORS: (*WATER RESOURCES, *Temperature Measurement), INFRARED IMAGING, REMOTE SENSING, (RADIOMETERS, Calibration),
CARD ALERT: 444, 741, 941, 944
The technique utilizes infrared radiometer data collected on a series of passes at different altitudes over a target area to calibrate the radiometer for absolute temperature at zero altitude, without the need for ground-based measurements. The radiometer data are, in turn, used to calibrate an aerial infrared thermal mapper, which scans the water surface viewed in a series of line scans over a 120 $degree$ view angle perpendicular to the direction of airplane travel. The airborne calibration method was applied to 75 infrared images of 31 power plant discharges in New York State.

Section 7

AUTHOR/KEYWORD INDEX

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Section 8

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October 2-4, 1977	Global Growth Alternatives Houston, TX	Jon Conlon Mitchell Energy and Development Corp. 3900 One Shell Plaza Houston, TX 77002
October 17-20, 1977	Instrument Society of America Niagra Falls, NY	Niagra Falls/77 Instr. Soc. of America 400 Stanwix Street Pittsburgh, PA 15222
October 18-21, 1977	American Soc. of Photography/American Congress of Surveying and Mapping Fall Convention Little Rock, AR	J.T. Long 823 North Bryan Little Rock, AR 72205
October 30-November 2, 1977	Pecora III Symposium Application of Satellite Data to Petroleum and Mineral Exploration, AAPG Sioux Falls, SD	Michael T. Halbouty Consulting Geologist & Petroleum Engineer The Halbouty Center 5100 Westheimer Rd. Houston, TX 77056
November 7-9, 1977	Geological Society of America (Includes symposium to be held on Nov. 8 on "Geological Applications of Remote Sensing"). Annual Meeting Seattle, WA	GSA Headquarters 3300 Penrose Place Boulder, CO 80301
February 26-March 3, 1978	American Society of Photogrammetry Annual Meeting Washington, DC	William J. Kosco U.S. Geological Survey Mail Stop 510 Reston, VA 22092

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