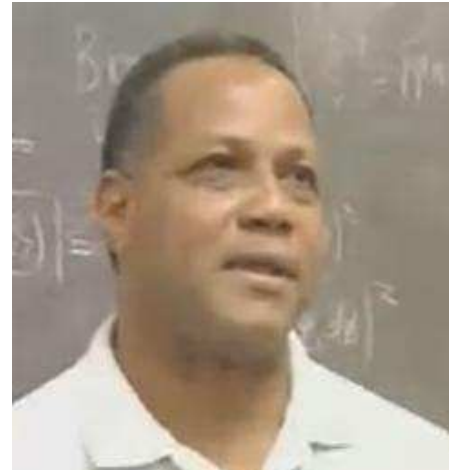


## Mosquera Cuesta, Herman J.

Position: Visitor Professor ICRANet-Brasil

Period covered: 1<sup>st</sup> November 2009 to 31<sup>st</sup> October, 2010



### I. Scientific Work

During this year I published the following set of scientific papers:

1) Title: Nonlinear Electrodynamics and CMB Polarization

Authors: Mosquera Cuesta, Herman J.; Lambiase, Gaetano

Publication: ICNAAM 2010: International Conference of Numerical Analysis and Applied Mathematics 2010. AIP Conference Proceedings, Volume 1281, pp. 864-869 (2010).

2) Title: L'energie sombre: Un mirage cosmique? Luminosity distance  $\neq$  proper distance: A cosmological dissimilitude induced by nonlinear electrodynamics

Author: Mosquera Cuesta, Herman J.

Publication: INVISIBLE UNIVERSE: Proceedings of the Conference. AIP Conference Proceedings, Volume 1241, pp. 1083-1092 (2010).

3) Title: Precession in Extragalactic Parsec-Scale Accretion Disks

Authors: Caproni, Anderson; Livio, Mario; Abraham, Zulema; Mosquera Cuesta, Herman J.

4) Title: Removing Black Hole Singularities with Nonlinear Electrodynamics Authors: Corda, Christian; Mosquera Cuesta, Herman J.

5) Title: Bursts of Gravitational Waves Emitted During Ejection of Jet Superluminal Components in Active Galactic Nuclei Dynamically Dominated by Bardeen-Petterson Effect

Authors: Mosquera Cuesta, Herman J.; Caproni, Anderson; Abraham, Zulema

6) Title: Warping and Precession in Extragalactic Maser Accretion Discs

Authors: Caproni, A.; Abraham, Z.; Livio, M.; Mosquera Cuesta, H. J.

Publication: XII Latin American IAU Regional Meeting (Eds. G. Magris, G. Bruzual, & L. Carigi) . Revista Mexicana de Astronomía y Astrofísica (Serie de Conferencias) Vol. 35, pp. 58-59 (2009)

7) Title: A spherically symmetric and stationary universe from a weak modification of general relativity

Authors: Corda, C.; Mosquera Cuesta, H. J.

Publication: Europhysics Letters, Volume 86, Issue 2, pp. 20004 (2009).

8) Title: Luminosity distance vs. proper distance: Effects of nonlinear electrodynamics in cosmology

Authors: Mosquera Cuesta, H. J.; Salim, J. M.; Novello, M.

Publication: Proceedings of Science (PoS), ISFTG (2009) 009, Trieste, Italy

The following papers are also submitted for publication:

9) Title: Nonlinear electrodynamics and CMB polarization

Authors : Herman J. Mosquera Cuesta, Gaetano Lambiase

Submitted to: Journ. Cosm. Astropart. Phys. Preprint: JCAP\_001P\_0710

10) Title: Inflation from  $R^2$  gravity: a new approach using nonlinear electrodynamics

Authors: Herman J. Mosquera Cuesta, C. Corda, R. Lorduy Gomez

Submitted to Astroparticle Physics (2010)

11) Title: The Correction to the Compton Shift from Nonlinear Electrodynamics  
Authors: Jean Paul Mbelek, Herman J. Mosquera Cuesta  
Submitted to Physics Letters B (2010)

12) Gravitational waves produced by ejection of jet superluminal components, precession and gravito-magnetic distortion of accretion disks in active galactic nuclei, micro-quasars, and T-Tauri stars dynamically driven by Bardeen-Petterson effect  
Authors: Herman J. Mosquera Cuesta, Luis Alberto Sanchez, Daniel Alfonso Pardo, Anderson Caproni, and Zulema Abraham  
Publication: The Open Astronomy and Astrophysics Journal, in press (2010)

I became referee of the scientific journals:

- a) "Astronomy and Astrophysics", published by Editions de Frontieres Science (Berlin, print).
- b) "Entropy", published by MDPI Publishing (Basel, Switzerland).
- c) I was also invited to become member of the "Board of Editors" of the journal "Positioning", published by Scientific Research Publishing, USA. It is a journal dedicated to the latest advancement of positioning, with the goal of keeping a record of the state-of-the-art research and promoting the research work in these fast moving areas.

## II. Conferences and educational activities

### II a. Conferences and Other External Scientific Works

By continuing my engagement in collaborating with Colombian Scientific Institutions and Universities, I have been participating in projecting astronomical infrastructures that will be evaluated by the Colombian "Comision Colombiana del Espacio (CCE)". This entity is an governmental organ created by the Government of Republica de Colombia, and has as main purposes to foster the development in Space and Basic Sciences in Colombia through a national plan named "Vision Colombia 2009-2019", through which is expected to achieve significant advances in development the growth of those fields of science in Colombia. Among the astronomical projects are: Creation of the Colombian Astrophysical Observatory, Participation in International Astronomical Enterprises (Big Science Projects), Creation of Undergraduate Programs in Astronomy and the Design of the Structural Academic Grids for those university programs.

Recently, I took benefit of my scientific amity with Prof. Dr. Sylvester James Gates, member of President Barack Obama Scientific Adviser Council, (an organ in charge of designing new policies for science and technology in USA for the decades to come), and suggested to Dr. Jaime Restrepo Cuartas, "Director of Colciencias" (Colombian Science Foundation), to invite Prof. Gates to visit the country in the next months having in perspective the Colombia-USA summit, next February 2011, which is seen as the first step to implement the international Agreement of Cooperation in Science and Technology Matters between both countries. Such agreement was signed last year by Mrs. Hillary Clinton (USA Secretary of State) and President Alvaro Uribe, during Mrs. Clinton visit to Bogota.

During this period, I was also engaged in the following projects:

a) Co-organizing with Dr. Christian Corda (Galileo Galilei Science Center, Prato, Italy) and Prof. Alexander Polnarev (Queen Mary College, University of London) the "Second Big Challenge Symposium: The Big Challenge of Cosmological Understanding: Gravitation, Dark Matter and Dark Energy. Towards New Scenarios". Such event was part of the "8th International Conference Of Numerical Analysis And Applied Mathematics: ICNAAM 2010", held in Rhodes, Greece, from 19-25 Sep 2010. General Editor Theodore Tsimos AIP in press

b) Participated in the international conference "VI Malian Symposium on Basic and Applied Sciences", which was held in Bamako, Mali, August 1-7, 2010, at the "Centre International de Conferences de Bamako". In this Symposium I delivered an invited lecture on " Nonlinear electrodynamics in cosmology", and was co-lecturer, with Dr. Jean Paul Mbelek (CEA/Saclay/Paris – Universite de Bamako), of the talk "The Correction to the Compton Shift from Nonlinear Electrodynamics".

As a very educational project, I was invited to become member of the International Associate Professors Project, a national initiative of the Ministry of Higher Education, Science and Technology of the Mali Government. Such program is intended to gain the support and effective participation of distinguished professors, from any country in the world, who are interested in sharing with young scholars at Malian universities their knowledge in these fields.

#### II b. Work With Students

During the months of July, August and September of this year, I continued, presentially in Pescara, my advising of the thesis work of Ph. D. student Luis Juracy Rangel Lemos, of the ICRANet IRAP-PhD Program. Such work was done in collaboration with Prof. Carlo Bianco of ICRANet from Rome. We redesigned the strategy to proceed with the work on computing the "Luminosity Function of Gamma-Ray Bursts (GRBs)", in the perspective of reproducing, in a complete fashion, the work done in a paper published in ApJ (2009) by Prof. M. Schmidt from Caltech. This astrophysical tool allows one to estimate the distance to a given GRB event without knowing its redshift. We obtained important new results, and this first task, which is one of the main subjects of Juracy's thesis project, is almost done. Nonetheless, there is still much work to be done in this respect. In particular, we need still to proceed to apply the obtained expertise in computing such luminosity function to a different sample of GRBs (such a sample was selected introducing new criteria related to observational features of GRBs), to obtain new results for that sample and to compare them with those of ones obtained by Prof. Schmidt in 2009. The discussion of such analysis must be presented in a paper to be submitted for publication in a specialized journal.

I also designed the M. Sc. Thesis Project of the student Daniel Alfonso Pardo of Universidad Nacional de Colombia, Sede Medellin, of whom I am tutoring his thesis project in collaboration with Prof. Luis Alberto Sanchez D., staff of Escuela de Fisica, Universidad Nacional/Sede Medellin. I also prepared, in collaboration with Prof. Luis Alberto Sanchez D., the research project: "Estudio de la Emision de Ondas Gravitacionales por Discos de Acrescion Dinamicamente Dominados por el Efecto Bardeen-Petterson", which is being submitted to "Fundacion para la Promocion de la Investigacion y la Tecnologia Banco de la Republica", an institution dedicated to promote the research and technology development in Colombia. The project is designed for being executed during one year, and is related to the main part of student Alfonso Pardo thesis plan.

#### II c. Diploma thesis supervision

Over this year I have been tutoring, presentially when possible, and at a distance, the IRAP-PhD student Luis Juracy Rangel Lemos in his thesis work. An important progress has been achieved, but there is still more work to be done in the perspective of helping him to arrive to conclude in the due course his Ph. D. Dissertation.

Meanwhile, I have been advising the student Daniel Alfonso Pardo, Universidad Nacional de Colombia/Medellin, in the work related to his M. Sc. Thesis which will focus on the "Emission of gravitational waves from accretion discs in active galactic nuclei driven by Bardeen- Petterson Effect".

#### II d. Work With Post-docs

I started a research project with Dr. Fabrizio di Marco (ICRANet Pescara/Italy) on the subject: Cosmic Strings in Nonlinear Electrodynamics, which is a work in progress.

During this year, I continued my scientific collaboration with Dr. Jean Paul Mbelek (Universite de Bamako, and CEA/Saclay/Paris) on studies involving the application of nonlinear electrodynamics in open problems related to fundamental physics, astrophysics and cosmology.

In the late months, I started, in collaboration with Dr. Dinesh Singh (Regina University, Canada) and Prof. Donato Bini, (Istituto per l'Applicazione del Calcolo, Rome/Italy), a study on the "Emission of gravitational waves by gravito-magnetic distortion of accretion discs dominated by Bardeen-Petterson Effect".

### III. Service activities

#### III a. Within ICRANet

In 2010, ICRA-Brasil published as a book, the innovative compilation "Programa Minimo de Cosmologia" (Minimum Program for Cosmology), JAU'A Editora/Brasil, with ISBN code 85-89410-03-8. To this special volume I contributed with a couple of chapters entitled: "Astrofisica de Ondas Gravitacionais"

(Astrophysics of Gravitational Waves), and “Astrofísica de Objetos Compactos” (Astrophysics of Compact Objects).

Starting this November, 2010, I will be engaged in the project intended to create in Fortaleza, Ceara' State, Brazil, the new filial of ICRA-Net: The “International Center for Relativistic Astrophysics – Fortaleza”, an initiative of ICRA-Brasil and coordinated by Prof. Francisco J. Amaral Vieira of ICRA-Net South-America Secretariat, in Fortaleza. I will also give support to the project SOBRAL ASTRO, to be developed in the ville of Sobral, Ceara State, Brazil. This initiative is also coordinated by Prof. Francisco J. Amaral Vieira, in collaboration with professors of the Department of Physics, Universidade do Vale do Acaraú, in Sobral.

#### III b. Outside ICRA-Net

I am also co-editor, together with Dr. Christian Corda, Dr. Oswaldo D. Miranda, and Prof. Theodore Tsimos, of the special volume on “Gravitational Waves: The Big Challenge”, to be published in 2010 by “The Open Astronomy and Astrophysics Journal” (in press).

#### IV. Other

During the first week of November, 2010, I was invited to be Lecturer in the international conference “Forum du 3<sup>e</sup> Festival Mondial des Arts Nègres”, which is being organized by Professeur Iba Der Thiam, UNESCO and Université de Dakar, and President of the Scientific Committee. The Forum will be held in Dakar, Senegal, from 10 to 22 December, 2010.