SH11D-3380

Center-to-Limb Variation of the polarization of Mg II h & k lines as measured by CLASP2

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Measurements confirm recent **predictions** of Mg II *h* & *k* **polarization** in the **chromosphere**.

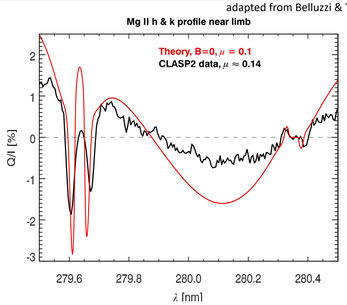
INTRO:

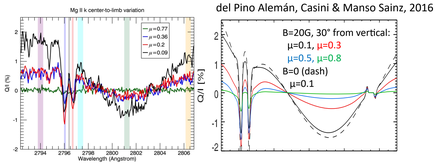
- **Who cares?** Magnetograms in the upper chromosphere are needed for accurate magnetic coronal extrapolations. The CLASP2 sounding rocket took spatially resolved spectropolarimetric data of Mg II h & k in the upper chromosphere, that can be used as a pathfinder to routine magnetograms.
- **This work:** Preliminary results of the center-to-limb variation (CLV) of the linear polarization in the quiet sun. We compare the signals to recent theoretical calculations of the expected polarization which include PRD, J-state interference, and magneto-optical effects.

RESULTS

- Observed Q/I **qualitatively matches** theory

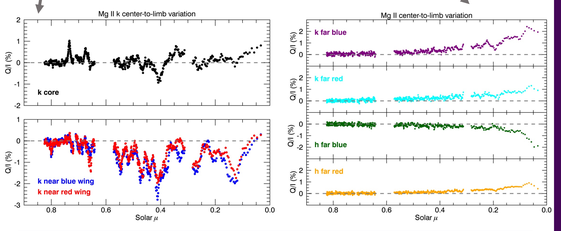
adapted from Belluzzi & Trujillo Bueno, 2012.





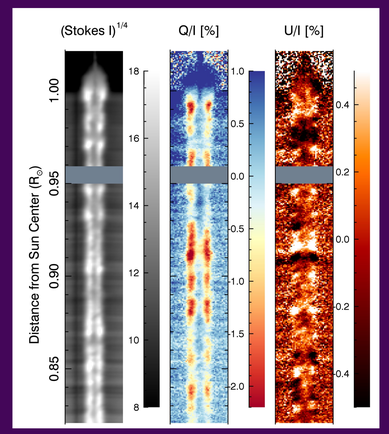
del Pino Alemán, Casini & Manso Sainz, 2016

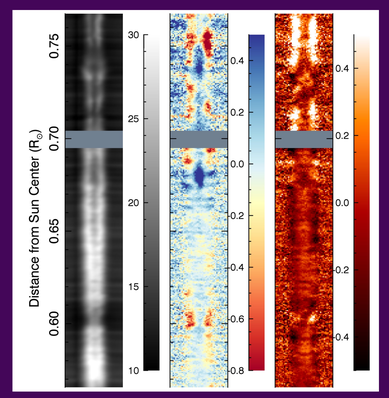
- Q/I CLV in Mg II k emission line is **not clear**
- Q/I CLV outside of emission lines (due to PRD & J-state interference) **is clear**.

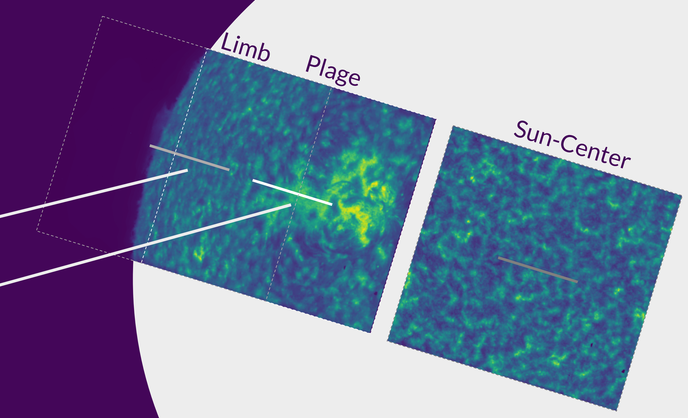


- U/I signal is dominated by spatial variations.
- **Partial frequency redistribution, J-state interference,** and the presence of a **magnetic field,** are needed in models to match observations.

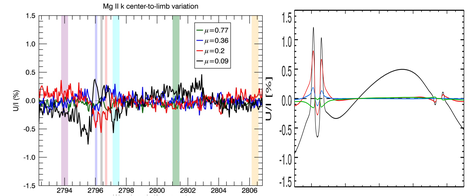
CLASP2 Mg II *k* Polarization

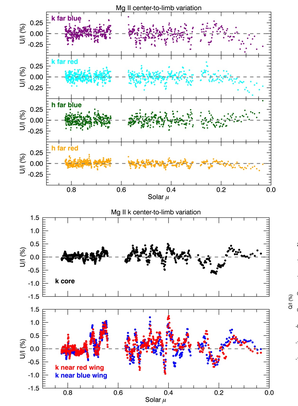




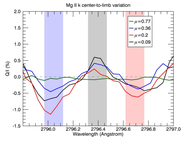


CLASP2 Observations
11 April 2019





B=20G, 30° from vertical:
μ=0.1, μ=0.3
μ=0.5, μ=0.8
B=0 (dash)
μ=0.1



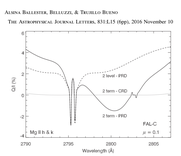


Figure 1. Scattering polarization Q/I patterns of the Mg II *h* & *k* lines calculated in the semi-empirical model C of Fontenla et al. (1993, hereafter FAL-C) assuming CRD (dotted curve) and taking into account PRD effects (solid curve), in both cases including the effects of *J*-state interference. The dashed curve indicates the two-level atom PRD solution for the Mg II *k* line; note that it is a reasonable approximation for modeling the positive line-center peak and the two negative peaks located in the near wings of the Q/I profile. The reference direction for positive Stokes Q is the parallel to the nearest limb.

- PRD – partial frequency redistribution
- CRD – complete frequency redistribution
- J-state interference: Quantum interference between the upper j-levels of the h & k lines.
- 2-level atom radiative transfer code taking into account collisional and radiative transitions and the joint action of scattering processes and the Hanle and Zeeman effects produced by B.
- 2-step process: first assumes CRD and solve non-LTE for zero-B and include only inelastic collisions. Second the converged CRD solution is used to initialize the iteration for the PRD problem with B and adding elastic collisions.

Related talk here at AGU

SH44A-06 *The Chromospheric Layer Spectro-Polarimeter (CLASP2) Sounding Rocket Mission: First Results,* David E. McKenzie et al.

Thursday 17:15 - 17:30 Moscone South - 208, L2

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