Highlights of Spanish Astrophysics VIII, Proceedings of the XI Scientific Meeting of the Spanish Astronomical Society held on September 8–12, 2014, in Teruel, Spain. A. J. Cenarro, F. Figueras, C. Hernández-Monteagudo, J. Trujillo Bueno, and L. Valdivielso (eds.)

Optical linear polarimetric observations of Solar System bodies using a Wedged Double Wollaston.

J. Gorosabel[1,2,3], A. García Muñoz[4], A. Sánchez-Lavega[2,5], R. Hueso[2,5], and S. Pérez Hoyos[2,5]

[1] Instituto de Astrofísica de Andalucía (IAA-CSIC), Glorieta de la Astronomía s/n, E-18008, Granada, Spain.
[2] Unidad Asociada Grupo Ciencia Planetarias UPV/EHU-IAA/CSIC, Departamento de Física Aplicada I, E.T.S. Ingeniería, Universidad del País Vasco UPV/EHU, Alameda de Urquijo s/n, E-48013 Bilbao, Spain.
[3] Ikerbasque, Basque Foundation for Science, Alameda de Urquijo 36-5, E-48008 Bilbao, Spain.
[4] ESA Fellow, ESA/RSSD, ESTEC, 2200 AG Noordwijk, The Netherlands.
[5] Grupo de Ciencias Planetarias, Departamento de Física Aplicada I, E.T.S. Ingeniería, Universidad del País Vasco UPV/EHU, Alameda de Urquijo s/n, E-48013 Bilbao, Spain.

Abstract

The gases and aerosols contained in a planetary atmosphere leave characteristic signatures on the reflected radiation. Hence we could use the polarization state of emergent radiation to investigate the atmospheric optical properties of the planet. We report on the first polarimetric tests of Jupiter and Saturn recently carried out with a Wedged Double Wollaston (WeDoWo) prism attached to the ALFOSC instrument mounted at NOT.
A WeDoWo is composed of a suitable combination of two glass wedges and two Wollaston prisms in the parallel beam ALFOSC. The edges split the beam and feed the Wollaston prims with axes rotated by 45 deg. Thus, the relative intensities of the output light provides the angle and degree of the input photons. The four images are taken simultaneously and hence at identical planet rotation and atmospheric conditions. In order avoid overlap of the 4 images in the CCD, a 10 wide slit is placed on the telescope focal plane.
Polarimetry complements the extended technique of photometry by probing different atmospheric altitudes, characterizing the particles in suspension in the atmosphere. In observations with spatial resolution of the planet disk, polarimetry may be sensitive to the phenomenon of limb polarization and to the occurrence of polar hazes (as for Jupiter).
We plan to complement the observational work with modelling. For that purpose, we are using a novel Pre-conditioned Backward Monte Carlo (PBMC) algorithm that computes the full Stokes vector for multiple scattering. We are also developing a new calibration code in order to systematize the data reduction. Despite the potentialities of the technique, there has been no systematic survey of the Solar System planets in polarimetric mode. In the medium term we plan to extend the the WeDoWo use to other objects of the Solar System.