The Chromospheric Layer SpectroPolarimeter (CLASP2) Mission: Introduction

*David E. McKenzie[1], Ryohko Ishikawa[2], Ryouhei Kano[2], Joten Okamoto[2], Laurel Rachmeler[1], Javier Trujillo Bueno[3], Frederic Auchere[4], Ken Kobayashi[1], Donguk Song[2], Masaki Yoshida[2]

1. NASA Marshall Space Flight Center, 2. National Astronomical Observatory of Japan, 3. Instituto Astrofísica de Canarias, 4. Institut d'Astrophysique Spatiale

A major challenge for solar physics is to decipher the magnetic structure of the chromosphere, because of its vital role in the transport of energy into the corona and solar wind. Routine satellite measurements of the chromospheric magnetic field will dramatically improve our understanding of the chromosphere and its connection to the rest of the solar atmosphere. Before such a satellite can be considered for flight, we must refine the measurement techniques by exploring emission lines with a range of magnetic sensitivities. In 2015, the CLASP mission achieved the first measurement of linear polarization produced by scattering processes in a far UV resonance line (hydrogen Lyman-alpha), and the first exploration of the magnetic field (via the Hanle effect) and geometrical complexity in quiet regions of the chromosphere-corona transition region. These measurements are a first step towards routine quantitative characterization of the local thermal and magnetic conditions in this key layer of the solar atmosphere.

Nonetheless, Lyman-alpha is only one of the magnetically sensitive spectral lines in the UV spectrum. The CLASP2 mission extended the capability of UV spectropolarimetry by acquiring groundbreaking measurements in the Mg II h and k spectral lines near 280 nm, whose cores form about 100 km below the Lyman-alpha core. These lines are sensitive to a larger range of field strengths than Lyman-alpha, through both the Hanle and Zeeman effects. CLASP2, launched from White Sands Missile Range in April 2019, captured measurements of linear and circular polarization to enable the first determination of all 4 Stokes parameters in chromospheric UV radiation. Coupled with numerical modeling of the observed spectral line polarization (anisotropic radiation pumping with Hanle, Zeeman, and magneto-optical effects), CLASP and CLASP2 are pathfinders for determination of the magnetic field's strength and direction, as well as of the geometry of the plasma in the upper solar chromosphere.

In this presentation we will introduce the CLASP and CLASP2 missions. We will summarize the results of the 2015 flight of CLASP; and we will describe the modifications, performance characteristics, and observing plan for the CLASP2 flight in 2019. Initial results from the 2019 flight will be shown in the partner presentation by Okamoto.

Keywords: chromosphere, polarization, sounding rocket