

The HARP polarimeter family and application to aerosol and cloud characterizations

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The Hyper-Angular Rainbow Polarimeter (HARP) instruments are designed at the University of Maryland Baltimore County to make multi-angular multispectral polarimetric measurements needed to characterize microphysical properties for aerosols and clouds (<https://laco.umbc.edu>) [1]. Currently, there are three polarimeters based on the HARP concept: AirHARP, HARP CubeSat, and HARP-2. AirHARP is an airborne prototype instrument, which has been deployed in the NASA Lake Michigan Ozone Study (LMOS) and Aerosol Characterization from Polarimeter and Lidar (ACEPOL) campaigns during 2017. HARP CubeSat is a NASA funded 3U-size satellite to be launched in 2019 and is planned for a one-year mission lifetime. HARP-2 is an improved copy of the HARP CubeSat polarimeter payload and will be equipped on the NASA Plankton, Aerosol, Cloud, Ocean Ecosystems (PACE) mission satellite [2]. Specifically, the HARP polarimeter family measures radiance and polarization at 60 scan angles in the 670-nm wavelength and at 20 (10 for HARP-2) scan angles in each of other three spectral bands (440, 550, and 870 nm). These instruments also feature a 94° cross-track field of view, allowing a wide spatial coverage. In this presentation, we will demonstrate the HARP observation concept with the AirHARP observations collected during the LMOS and ACEPOL campaigns. We will also present preliminary applications of the AirHARP Level-1 products for characterizing cloud droplet size and aerosol microphysical properties.

References

- [1] Dubovik, O., Z. Li, M. I. Mishchenko, *et al.*, 2019: Polarimetric remote sensing of atmospheric aerosols: Instruments, methodologies, results, and perspectives. *J. Quant. Spectrosc. Radiat. Transfer* **224**, 474–511.
- [2] Remer L. A., K. Knobelspiesse, P. Zhai, *et al.*, 2019. Retrieving aerosol characteristics from the PACE mission. Part 2: Multi-angle and polarimetry. *Front. Earth Sci.* (submitted).

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