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HARP: A 3U CUBESAT FOR AEROSOL AND CLOUD OBSERVATIONS

**Abstract**

HARP (Hyper-Angular Rainbow Polarimeter) is a 3U CubeSat developed at the Earth and Space Institute at the University of Maryland Baltimore County for advanced measurements of cloud and aerosol properties from space. The HARP instrument has the hyper-angular imaging capability of 60 viewing angles at 670 nm, 10 viewing angles at 870 nm, and 9 viewing angles at other wavelengths 440 nm, 550 nm across a wide  $114^\circ$  ( $94^\circ$ ) along-track (cross-track) field-of-view. With these specs, HARP can measure the multi-angular radiance and polarized radiance profile of Earth targets and expands the amount of new information available in atmospheric, land, and ocean property retrievals. HARP CubeSat was deployed into the ISS orbit in February 2020 and has since then captured over 60 observations of aerosols and cloud scenes of interest. We present the results from on-orbit vicarious radiometric and polarimetric calibration using collocated observations from the NASA and NOAA satellite remote sensing instruments MODIS, VIIRS, and ABI. Also, preliminary retrievals of aerosol properties using GRASP and HARP CubeSat observations are discussed. This work builds on prior demonstrations of the HARP concept in the field (Puthukkudy et al. 2020, McBride et al. 2020) and an updated version of the HARP CubeSat instrument, called HARP2, will be on-board NASA's future Earth-observing mission PACE (Phytoplankton, Aerosol, Cloud and ocean Ecosystem).