HYPER-ANGLE IMAGING POLARIMETRY FOR MICROPHYSICAL RETRIEVALS OF AEROSOL AND CLOUDS

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Current radiometric retrievals of aerosol and cloud properties are information-limited, and the many assumptions about particle shape, size, and distribution needed by these retrievals can lead to biased conclusions about the underlying atmosphere. In the past two decades, polarimetric remote sensing provided ways of deriving these assumed properties directly and independently. Polarimeters enhance radiometric retrievals, instrument validation and atmospheric correction efforts, and with multi-angle sampling, can perform comprehensive BRDF analyses, stereo cloud height, and single-pixel retrievals from space and aircraft.

The Hyper-Angular Rainbow Polarimeter (HARP) is a wide field-of-view, multi-angle imaging polarimeter instrument developed, calibrated, and operated by the University of Maryland, Baltimore County (UMBC). The HARP suite was designed for atmospheric correction and highly accurate retrievals of cloud and aerosol microphysical properties from space. The instrument is novel in its simultaneous imaging, angular sampling density, optimized optical assembly, and dynamic wavelength selection. The HARP technology was demonstrated twice in 2017 by the aircraft platform, AirHARP, during Lake Michigan Ozone Study (LMOS, on-board the NASA LaRC B200) and Aerosol Characterization from Polarimeter and LIDAR (ACEPOL, NASA ER-2) campaigns. Two future HARP deployments are anticipated: the HARP CubeSat will sample the Earth for one year from ISS orbit starting in May 2018, and HARP2, the most refined HARP instrument to date, will fly aboard the Plankton-Aerosol-Cloud-ocean Ecosystem (PACE) satellite in the early 2020s.

This poster will explore preliminary microphysical retrievals from the AirHARP instrument from LMOS and ACEPOL campaigns and discuss how the upcoming HARP CubeSat and HARP2 instruments will improve upon AirHARP in accuracy, signal-to-noise, and calibration.

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