

Polarimetric remote sensing of atmospheric aerosols using SPEXone/PACE: Instrument, retrieval, and data use.

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The NASA Phytoplankton Aerosol Cloud & ocean Ecosystems (PACE) mission is expected to provide a significant advancement in aerosol and cloud observation capabilities from space. PACE will carry 3 instruments: 1) the Ocean Color Instrument (OCI) that provides *hyperspectral* measurements from the UV to the NIR (320-870 nm) + 6 SWIR bands. 2) The SPEXone instrument, that provides *hyperspectral radiance and polarization measurements* at high accuracy in the spectral range 385-770 nm observing each ground pixel under 5 viewing angles. SPEXone has been developed, built, and calibrated in the Netherlands. 3) The Hyper-Angular Rainbow Polarimeter-2 (HARP-2) that provides hyper-angular radiance and polarization measurements at 4 wavelengths (440, 550, 670, 865 nm) observing a ground pixel under up to 60 viewing angles, enabling to resolve the cloud bow in polarization. This presentation will focus on the SPEXone instrument, the corresponding retrieval algorithm development, and the data exploitation of SPEXone aerosol products, in synergy with other data products from PACE. We will discuss latest advancements in development of the Remote Sensing of Trace gas and Aerosol Products (RemoTAP) algorithm, to be used for operational processing of SPEXone data. Also, we discuss the capability of SPEXone to quantify aerosol emissions using data assimilation, the capability to derive aerosol chemical composition and to quantify radiative forcing due to aerosol-radiation and aerosol-cloud interactions. We will show results from synthetic studies as well as from studies with real polarimetric observations of PARASOL and airborne observations.

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