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Polarimetric Remote Sensing of atmospheric aerosols: The first year of SPEXone PACE

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On February 8, 2024 the NASA Plankton, Aerosol, Cloud & ocean Ecosystem (PACE) mission has been launched with onboard the SPEXone Multi-Angle Polarimeter. SPEXone is designed to deliver unprecedented information on aerosol properties, such as size, shape, absorption (Single Scattering Albedo), and amount (Aerosol Optical Depth, number concentration), and complex refractive index. From the complex refractive index, size and shape, chemical composition can be derived in terms of volume fractions of the main aerosol components. The launch of PACE brings an end to a 10 year gap in the availability of space-based multi-angle polarimeter data, which are essential to understand and quantify the role of aerosols and clouds in climate change. In this contribution, we present the first year of aerosol data from SPEXone. As we will show, the first version of SPEXone aerosol data shows already very good agreement with ground-based AERONET observations. The presentation includes a global view on aerosol composition in terms of volume fractions of Dust, Sea Salt, Black Carbon, Organic Carbon, fine mode inorganics (Sulphate, Nitrate), and aerosol water. SPEXone shows expected patterns of high fractions of sulphates/nitrates over industrial regions and cities in Asia and (North+South) America, Black Carbon over biomass burning regions in Africa and North America, Dust over desert regions and as outflow over the ocean, and hydrated sea salt over the open ocean. Finally, we discuss the capability of SPEXone to provide a Cloud Condensation Nuclei (CCN) product from the retrieved aerosol properties (number concentration, size distribution, water content).