Aerosol Retrievals using GRASP from HARP instruments in Twilight Regions

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Twilight regions, characterized by particles exhibiting intermediate characteristics of clouds and aerosols, represent a challenging area of study due to their complex dynamics and the scarcity of globally distributed data. These regions undergo rapid fluctuations in physical and microphysical properties, particularly in humid cloud environments. Investigating aerosol-cloud transition regions is paramount for advancing our understanding of aerosol-cloud interactions. The advent of new-generation satellite-based Earth observing missions equipped with multi-angular, multi-spectral polarimeters promises to overcome current limitations and provide novel insights into this domain[1], [2], [3], [4]. For instance, the deployment of the Hyper Angular Rainbow Polarimeter (HARP-2) aboard NASA's Plankton Aerosol Cloud Ocean Ecosystem (PACE) Satellite in early February 2024 facilitates global measurements that can enhance aerosol retrievals in twilight regions through additional polarimetric information, utilizing algorithms such as the Generalized Retrieval of Aerosols and Surface Properties (GRASP). In this study, we analyze variations in aerosol optical depth (AOD) within twilight regions and endeavor to discern between physical enhancements near clouds and retrieval artifacts, leveraging Large Eddy Simulations (LES) and their corresponding 1D/3D radiative transfer simulations.

References

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