Estimation of Cloud Condensation Nuclei (CCN) from SPEXone on PACE

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Proper proxies for Cloud Condensation Nuclei (CCN) number concentration are vital to qunatify Aerosol-Cloud Interactions (ACI) and provide accurate constraints for climate models. An effective proxy for CCN is the column number of aerosol particles that surpasses a predetermined threshold radius (N_{CCN}). This CCN proxy has been estimated from PARASOL using level 2 aerosol microphysical and/or optical property retrievals [1]. With the launch of SPEXone on PACE, further improvements on the N_{CCN} retrievals are expected. For example, given that the ability of an aerosol particle to become a CCN is determined by its dry size than the ambient, the retrieved refractive index can be used to estimate the volume fraction of aerosol-water, and consequently the dry size distribution [2]. Also, using the retrieved Aerosol-Layer Height (ALH) from near-UV polarization measurements [3], the boundary layer contribution of the aerosol column can be derived, which is more related to CCN at cloud base, thus better suited for quantifying ACI than the total column [4].

In this contribution we investigate the retrieval of N_{CCN} from RemoTAP SPEXone level-2 retrievals and by directly retrieving N_{CCN} using a Neural Network (NN)-based polarimetric retrieval algorithm. The NN-based Remote sensing of Trace gas and Aerosol Products (RemoTAP-NN) algorithm performs level 2 aerosol and surface property retrievals from SPEXone polarimetric measurements. In our study we will extend the RemoTAP-NN algorithm to directly retrieve $N_{CCN.}$ We will showcase the retrieval results from both approaches and discuss the capabilities and limitations.

References

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