Above Cloud Aerosol Retrieval from Multi-Angular Polarimetric Satellite Measurements using a Neural Network Ensemble Approach

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Aerosol observations for Above Cloud Aerosol (ACA) scenes are of great importance to understand the effect of aerosols on climate through direct and semi-direct effects [1]. Multi-Angle Polarimeter (MAP) measurements have the potential to provide accurate retrievals for ACA scenes. In this contribution, we present a novel algorithm for performing ACA retrievals from MAP measurements. The algorithm makes use of Neural Networks for the detection of ACA scene, the aerosol retrievals in ACA scenes, and forward model simulations to evaluate the goodness-of-fit for the retrieved aerosol properties. The use of Neural Networks (NNs) for ACA is a promising way because of their computational efficiency which is especially an added value for ACA scenes where classical retrievals rely on time-consuming radiative transfer calculations as clouds are included. Besides, NNs carry the prospect of providing more accurate retrievals due to the flexibility in the (reduced-) state vector definition and the avoidance of complex iterative schemes that have the risk of ending up in a local minimum. Our algorithm has been trained on synthetic multi-angle, multi-wavelength measurements of reflectance and polarization and has been applied to real PARASOL measurements. We validate the NN retrievals with adjacent PARASOL-RemoTAP clear sky retrieval in 2008 and the data from SEAC4RS campaign in 2013. These experiments indicate that the NN is effective in both detecting and retrieving ACA. We also show some first ACA retrievals from SPEXone observations on the NASA PACE mission.

References

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