

New developments for the RemoTAP algorithm: Collaborative Neural Networks significantly improve Global Aerosol Products from Multi-Angle Polarimeters

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We present the latest RemoTAP developments for aerosol retrievals from Multi-Angle Polarimeters (MAP). Firstly, Multiple Collaborated Neural Networks (MCNN) are developed and used to perform global aerosol MAP retrievals over land and ocean. The combined use of MCNN with a full physics inversion in RemoTAP-Hybrid, significantly improves accuracy and computational speed of SPeXone aerosol retrievals. Secondly, following an analysis on AERONET data, we extend the aerosol description to a parametric 4 mode by adding a fine non-spherical mode, in addition to a fine spherical, coarse non-spherical, and coarse spherical mode. The new aerosol description extends retrieval capability for scenes dominated by non-spherical fine particles. RemoTAP-Hybrid retrievals for SPeXone, using the 4-mode aerosol description, shows improved agreement with AERONET compared to the original version of RemoTAP. RemoTAP-Hybrid also provides aerosol composition (black carbon, brown carbon, dust, fine/coarse water/non-absorbing components, fine non-spherical non-absorbing component) using the retrieved complex refractive index and aerosol volume per mode. Thirdly, we present our extended ocean body model in our joint atmosphere-ocean retrievals. With the new ocean body model in the RemoTAP-Hybrid algorithm, for the first time we demonstrate good agreement of SPeXone-retrieved global ocean color product of Remote Sensing Reflectance (Rrs) with AERONET-OC, even at 400nm, where the atmospheric contribution to the top-of-atmosphere signal is large. Finally, we present the extension of RemoTAP-Hybrid to aerosol above cloud retrievals with application to SPeXone.

References

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