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Aerosol retrieval over snow using RemoTAP

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In order to conduct accurate aerosol retrieval over snow, the Remote Sensing of Trace Gases and Aerosol Products (RemoTAP) algorithm developed by SRON Netherlands Institute for Space Research is extended with a Bi-directional Reflection Distribution Function (BRDF) for snow surfaces. The capability of the extended algorithm is validated with both synthetic measurements and real satellite measurement from PARASOL. For synthetic measurements, a 6-band retrieval (443 nm, 490 nm, 565 nm, 670 nm, 875 nm, 1020 nm) is conducted with baseline RemoTAP and extended RemoTAP for comparison, showing that the extended RemoTAP maintains capability on snow-free pixels and has obvious advantage on accuracy and goodness-of-fit for retrieval over snow, especially over surfaces with snow cover > 70%. To identify snow covered pixels for real PARASOL measurements, we use the MODIS snow cover product for snow pixel selection. According to the validation with AERONET, we find that the retrieval algorithm has difficulty in fitting the PARASOL 1020 nm band, where snow reflectance is significantly lower than for the visible bands. When we perform a 4-band retrieval (490 nm, 565 nm, 670 nm, 875 nm) with extended RemoTAP, we obtain a good retrieval result (e.g., RMSE 0.133 for AOD at 550 nm). Therefore, the 4-band retrieval with extended RemoTAP is recommended for aerosol retrieval over snow considering information content and stability.

Keywords: Aerosol retrieval, Snow, RemoTAP