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Aerosol retrievals in cloud-contaminated scenes

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Small amounts of cloud-contamination can cause large errors and/or biases in the retrieval of micro-physical and optical aerosol parameters from satellite observations. Therefore, it is common practice to only perform aerosol retrievals for scenes that are strictly screened for clouds. This, unfortunately, removes many near-cloud scenes from data-sets, while exactly those scenes are interesting for analyses of the aerosol cloud interactions. Observations and retrieval methods that can deal with cloud-contamination are required. Instruments that do multi-angle observations of intensity and especially polarization are most capable to separate between aerosols and cloud-contamination, since scattering by cloud droplets produces a distinctive feature in the degree of linear polarization at a scattering angle of about 140 degrees. The only instrument that currently performs those observations is POLDER3 on board the PARASOL satellite. Hasekamp et.al. [J. Geophys. Res., 116, D14204, 2011] have developed an algorithm that makes full use of the information in POLDER3 measurements for clear sky scenes. Our aim is to extend the retrieval scheme to also retrieve aerosol properties in cloud contaminated scenes. As a first step, the effects of residual cloud cover/cloud-contamination on the aerosol retrieval algorithm are analyzed. In order to do so cloud properties obtained from the MODIS Cloud Product have been co-located with the POLDER3 observations and the retrieved micro-physical and optical aerosol parameters are compared with independent ground based measurements from AERONET for different amounts and types of cloud contamination. The validity and limitations of the retrievals in cloud-contaminated scenes are discussed and the latest results of retrievals with an algorithm that simultaneous retrieves the cloud properties are presented.