Geophysical Research Abstracts
Vol. 16, EGU2014-3892, 2014
EGU General Assembly 2014

Aerosol-cloud interaction using AATSR

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Aerosols and clouds play an important role in terrestrial atmospheric dynamics, thermodynamics, chemistry, and radiative transfer and are key elements of the water and energy cycles. The interactions between aerosol particles and cloud drops is critical to identifying how much they reflect solar radiation. Accurate evaluation of the effects of aerosols and clouds on climate requires global information on aerosol properties. Such global information can only be provided using satellite remote sensing. Among the satellite instruments used for aerosol and cloud retrieval is the Advanced Along-Track Scanning Radiometer (AATSR) on board the European Space Agency (ESA) satellite ENVISAT.

Many instruments and retrieval techniques have been developed and applied to satellite data to derive cloud data products (Kokhanonsky et al., 2009). However, many problems still remain to be solved. They are mostly related to the usage of homogeneous, single-layered cloud model. Further issues exist for studies of thin clouds, where both cloud inhomogeniety, cloud fraction and the underlying surface bi-directional reflectance must be accounted for in the retrieval process.

The aerosol retrieval algorithm (dual-view over land and single-view over ocean) was constructed for ATSR-2 data (e.g. Veefkind et al. 1998). The most recent version of ADV (AATSR Dual View) is described in Kolmenen et al. (2013). The ATSR dual-view allows retrieval without prior information about land surface reflectance.

A semi-analytical cloud retrieval algorithm using backscattered radiation in 0.4–2.4 μm spectral region has been implemented to ADV for the determination of the optical thickness, the liquid water path, and the effective size of droplets from spectral measurements of the intensity of light reflected from water clouds with large optical thickness. In AacDV (AATSR aerosol and cloud Dual View) aerosol and cloud retrievals are combined. Cloud retrieval starts when cloud tests for aerosol retrieval show the presence of clouds. The algorithm was early introduced in Kokhanovsky et al. (2003). It works well for thick clouds. ACDV was successfully tested over Scandinavia and Baltic Sea.

Combined aerosols-clouds retrieval gives an opportunity to investigate the cloud properties with respect to aerosol optical depth is surrounding cloud-free areas.

Kokhanovsky, A. A., V. V. Rozanov, E. P. Zege, H. Bovensmann, and J. P. Burrows (2003), A semianalytical cloud retrieval algorithm using backscattered radiation in 0.4–2.4 μm spectral region, J. Geophys. Res., 108, 4008, doi:10.1029/2001JD001543.

Kokhanovsky, A. and de Leeuw, G. (2009). Satellite aerosol remote sensing over land. Berlin: Springer

Kolmonen, P., Sundström, A.-M., Sogacheva, L., Rodriguez, E., Virtanen, T. and de Leeuw, G. (2013). The uncertainty characterization of AOD for the AATSR ADV/ASV retrieval algorithm -Towards the assimilation of the satellite retrieved aerosol properties. Submitted to Atmos. Meas. Tech.

Veefkind J.P., de Leeuw G., and Durkee P.A. (1998). Retrieval of aerosol optical depth over land using two-angle view satellite radiometry during TARFOX, Geophys. Res. Lett., 25, 3135-3138.