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Operational discrimination of raining from non-raining clouds in mid-latitudes using multispectral satellite data

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The authors propose a new operational method for the identification of precipitating clouds at mid-latitudes using multi-spectral satellite data. This approach is not only sufficient for the identification of mainly convective induced precipitation by means of the commonly used connection between infrared cloud-top temperature and rainfall probability but also enables the detection of stratiform precipitation, e. g. in connection with mid-latitude frontal systems.

The technique is based on the concept, that rainfall results from a large enough combination of the cloud effective droplet radius and the cloud optical thickness. This, in turn, is equal to a fixed threshold value of the cloud liquid water path. The cloud properties are derived by the Semi-Analytical CloUd Retrieval Algorithm SACURA (Kokhanovsky et al. 2003, Kokhanovsky & Nauss 2005). The reliability of SACURA has been shown in an evaluation study over land and sea surfaces (Nauss et al. 2005).

The rainfall area is finally identified by a pixel-based computed threshold value of the effective radius as a function of the corresponding optical thickness. The function is based on a comparison between Terra-MODIS scenes and ground based radar data during the severe summer floods in 2002 (Nauss & Kokhanovsky 2006). The new rain area delineation scheme has been validated against ground based radar data from the German weather service in a comparison study between January and August 2004 showing a good performance.

Kokhanovsky et al. 2003, J. Geophys. Res., D108, 4008, 10.1029/2001JD001543. // Kokhanovsky & Nauss 2005, J. Geophys. Res. 110/D19, D19206, 10.1029/2004JD005744 // Nauss et al. 2005, Atmos. Res. 78, 46-78. // Nauss & Kokhanovsky 2006, Atmospheric Chemistry and Physics Discussions, accepted.