NOAA AVHRR derived aerosol optical depth over land

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Aerosol optical depth was retrieved from a time series of NOAA-16 AVHRR data from May 2001 through December 2002 for Central Europe (40.5°N-50.0°N, 0°E-17°E). In contrast to classical methods, no a priori knowledge of the surface reflectance is necessary but instead the surface reflectance is estimated from a time series including the previous 44 days. Additionally, the area where aerosol optical depth can be retrieved is no longer limited to certain land cover types. Only bright surface targets are excluded in the retrieval. To retrieve the aerosol optical depth, the radiative transfer code SMAC is used. Afterwards the data is averaged within a 25 x 25 pixel region to increase the retrieval precision. The resulting standard deviation of the aerosol optical depth within this region is used as a quality control parameter and suitable for a post-processing of the initial aerosol retrieval. This post-processing leads to a substantial increase in the retrieval accuracy when compared to ground-based AERONET measurements. Over 650 co-incident AVHRR retrievals and AERONET measurements were compared and a correlation coefficient of 0.70 was found. Altogether, the proposed method offers the potential to generate an aerosol climatology based on NOAA AVHRR data, which dates back to the early 1980s.