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Evaluation of Operationally Derived Aerosol Optical Depth from MSG-SEVIRI over Central Europe

C. Popp (1,2), M. Riffler (1), E. Emili (1,2), M. Petitta (2), and S. Wunderle (1)

(1) Institute of Geography, University of Bern, Bern, Switzerland (popp@giub.unibe.ch) , (2) Institute for Applied Remote Sensing, European Academy, Bolzano, Italy

Aerosol parameters derived from geostationary remote sensing instruments can complement those obtained from polar orbiting sensors (e.g. MODIS, MERIS, or AVHRR). The high scanning frequency of the Spinning Enhanced Visible and InfraRed Imager (SEVIRI) on-board the Meteosat Second Generation (MSG) satellites of 15 minutes significantly broadens the potential diurnal coverage over Europe and Africa. Therefore, these data allow to better account for the occasionally high spatial and temporal variabilities of atmospheric aerosols, for instance in cases such as desert dust outbreaks, forest fires, or the evolution of high particulate matter concentrations during stable weather conditions.

The aim of this study is to evaluate operationally derived aerosol optical depth maps based on imagery acquired by MSG-SEVIRI between December 2007 and November 2008. A one-channel multi-temporal approach is used in order to daily estimate aerosol optical depth for each slot between 6:12 and 18:12 UTC. The resulting SEVIRI AOD values are related to Sun photometer measurements from the Aerosol Robotic Network (AERONET). 22 AERONET sites within the study area of central Europe provide cloud-screened level1.5 data for the investigation period. Overall, nearly ten thousand instantaneous SEVIRI and Sun photometer AOD values are compared and a correlation of 0.75 as well as a root-mean-square-error of 0.07 is found. Further, about 75% of all SEVIRI AOD values fall within the MODIS expected error over land of +/-(0.05+0.15*AOD). Finally, the computed statistical parameters for each individual season do not vary strongly.

Taken together, the performance of the operational SEVIRI AOD estimation is comparable to the ones based on data from sensors on-board polar orbiting satellites. Therefore, these aerosol information of high temporal frequency can be of great interest e.g. for tracking pollutant transport, for comparisons with aerosol modelling results, or for synergistic use with additional remote sensing data.