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Aerosol Optical Depth over Central Europe - comparison of the GEM-AQ model results with satellite and AERONET observations

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Aerosol Optical Depth (AOD) is a measure of the extinction of solar radiation due to scattering and absorption by atmospheric aerosol. AOD is calculated from satellite observations (i.e. from MODIS, MISR) of atmospheric spectral transmission and ground based observations (i.e. AERONET sun photometers). However, quality and availability of satellite data is very sensitive to cloud cover and is usually limited in terms of spatial coverage. Modelling results of meteorological and aerosol concentration fields can provide a broader context for the analysis and interpretation of measurements.

An on-line chemical weather model GEM-AQ (Kaminski et al., 2008) with an aerosol module is used to simulate the variability of aerosol concentrations over Central Europe with a resolution of 15 km. Aerosol module includes 5 size-resolved types of aerosols: sulphates, black carbon, organic carbon, sea salt and mineral dust. Aerosol mass is distributed into 12 logarithmically spaced bins (Gong et al., 2003).

We will present a distribution of AOD over Central Europe based on the GEM-AQ model results and available observations. Based on the analysis of MODIS observations cloud free periods will be selected when AOD products were available for several consecutive days. We will use the extinction cross-sections from the AODSEM (Aube, 1998) model which is based on the same aerosol module that is implemented in GEM-AQ.

Calculated AOD will be compared with fields derived from satellite observations, AERONET Belsk station and two stations from the Radiative Transfer Laboratory, a network run by the Institute of Geophysics at the University of Warsaw (Zawadzka et al., 2012). Spatial and temporal variability of model derived AOD will be analyzed and contributions of individual aerosol species will be assessed. Also, contributions of natural and anthropogenic aerosol to AOD will be discussed.