



Estimation of particulate matter concentration using SEVIRI and model data

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Satellite based Monitoring Initiative for Regional Air quality (SAMIRA) is an ESA funded project that has the goal of using satellite data in combination with weather numerical models and in-situ measurements to generate air quality maps over Europe.

Estimating ground-level concentrations of fine particulate matter (PM_{2.5}) from satellite obtained total column aerosol optical depth (AOD) requires a conversion factor that accounts for their spatial and temporally varying relationship. This conversion factor is a function of aerosol size, aerosol type, relative humidity and the vertical distribution of the aerosol.

In this study a conversion procedure is implemented. Firstly, we use the Spinning Enhanced Visible and InfraRed Imager (SEVIRI) to obtain the AOD. Then using the Weather Research and Forecasting model - Chemistry enabled (WRF-Chem), we select a number of relevant aerosols that are grouped to reconstruct the aerosol components of the Global Aerosol Data Set (GDAS). Using the microphysical properties from GDAS and the T-matrix method a mass-to-extinction conversion factor can be calculated for a wide range of aerosol mixtures. These conversion factors are saved as a look-up table that can be used to estimate total column PM_{2.5} concentration. The vertical distribution and relative humidity from WRF-Chem is used to obtain a ground level concentration of PM_{2.5}.

This algorithm is used to obtain PM_{2.5} concentration maps in near real-time for regions with satellite derived AOD. The method is validated using in situ ground-based measurements of PM_{2.5}.