Aerosol and CCN Distributions over Europe

L. B. Hande1, C. Engler2, C. Hoose1 and I. Tegen2

1) Introduction

• Aerosols indirectly affect the climate through the modification of clouds, therefore an accurate representation of the spatial and temporal variability of aerosols is needed in models.

• The Consortium for Small-scale Modeling (COSMO-MUSCAT) model was used to simulate the emission and transport of anthropogenic and natural aerosols to Europe.

• Table 1 shows the aerosol species and properties simulated with the COSMO-MUSCAT modeling system. Also shown, is whether the aerosol species acts as a cloud condensation nucleus (CCN) or an ice nuclei (IN).

• Particle number concentrations were calculated from the particulate masses using the assumed particle properties from Table 1, and assuming external mixing.

2) Aerosol Distributions

![Image of Aerosol Distributions]

3) Cloud Condensation Nuclei and Ice Nuclei Distributions

![Image of Cloud Condensation Nuclei and Ice Nuclei Distributions]

4) Conclusions and Outlook

• The total aerosol concentrations (organic carbon, sulfate, nitrate, ammonium) simulated with COSMO-MUSCAT were evaluated against observations from Melpitz, Germany on 28.05.2008.

• The parameterisation Abdul-Razak et al. (1998) was used to estimate the number of activated aerosol particles to form CCN for ammonium, sulfate, nitrate and sea salt aerosols, for May 2008.

• A parameterisation for deposition freezing on soot particles (Ullrich et al., 2014) was applied to estimate the deposition ice nuclei concentrations from the elemental carbon aerosol fields for May 2008.

• For deposition IN, the RH_{dep} was assumed to be a constant value of 115%, with the mean horizontal temperature field for May 2008. The parameterisation is valid within a temperature range of 195 - 235 K. Here, the surface aerosol concentrations are used, thus the IN estimate represents the potential deposition IN.

• The number concentration of CCN and IN particles near the surface are shown in Figure 3.

References