Geophysical Research Abstracts
Vol. 14, EGU2012-3094, 2012
EGU General Assembly 2012

The Fully Online Integrated Model System COSMO-ART to Simulate Direct and Indirect Effects of Aerosols

B. Vogel (1), E. Athanasopoulou (1), M. Bangert (1), A. Ferrone (1), K. Lundgren (1), H. Vogel (1), Ch. Knote (2,3), D. Brunner (2,3)

(1) Karlsruhe Institute of Technology, Institut für Meteorologie und Klimaforschung, Eggenstein-Leopoldshafen, Germany (bernhard.vogel@kit.edu, +49-(0)7247-824742), (2) Laboratory for Air Pollution / Env. Technology, Empa, Duebendorf, 8600, Switzerland, (3) Center for Climate Systems Modeling C2SM, ETH, Zurich, 8092, Switzerland

The interplay between air quality and regional climate has become a focal point in recent atmospheric research. The treatment of the interaction of the involved processes requires a new class of air quality models. The fully online integrated model system COSMO-ART was developed (Vogel et al., 2009, Bangert et al., 2010) to quantify the feedback processes between aerosols and the state of the atmosphere on the continental to the regional scale with two-way interactions between different atmospheric processes.
The meteorological driver is the operational weather forecast model of the Deutscher Wetterdienst (German Weather Service, DWD). The model system treats secondary aerosols as well as directly emitted components like soot, mineral dust, sea salt, volcanic ash and biological material. Secondary aerosol particles are formed from the gas phase. Therefore, a complete gas phase mechanism (RADMKA) is included in COSMO-ART. Modules for the emissions of biogenic precursors of aerosols, mineral dust, sea salt, biomass burning aerosol and pollen grains are included. For the treatment of secondary organic aerosol (SOA) chemistry the volatility basis set (VBS) was included. Wet scavenging and in-cloud chemistry are taken into account (Knote, 2012). To simulate the impact of the various aerosol particles on the cloud microphysics and precipitation COSMO-ART was coupled with the two-moment cloud microphysics scheme of Seifert and Beheng (2006) by using comprehensive parameterisations for aerosol activation and ice nucleation. The model system was applied for a different model domains and meteorological situations to quantify the direct and the indirect of the various aerosol particles. Studies over a few days as well as over longer time periods were carried out. Results of the simulations of the heat wave of 2003 taken into account all included particles will be shown as well as results of simulations of May 2008 focusing on the contribution of specific aerosol particles, e.g. SOA and soot, on the state of the atmosphere and comparison with measurements.