Geophysical Research Abstracts,
Vol. 11, EGU2009-1454, 2009
EGU General Assembly 2009

Impact of aerosols on the hydrologic cycle in the regional climate model CCLM

E. Zubler (1), U. Lohmann (1), D. Lüthi (1), A. Mühlbauer (2), and C. Schär (1)

(1) Institute for Atmospheric and Climate Science, ETH, Zurich (elias.zubler@env.ethz.ch), (2) Department of Atmospheric Sciences, University of Washington, Seattle

Since aerosols serve as cloud condensation and ice nuclei they influence the microphysical properties of clouds and precipitation. Increasing the aerosol number in a cloud leads to a deceleration of hydrometeor growth and may also cause significant changes in ice formation. On the regional scale, aerosols may therefore alter precipitation patterns, possibly leading to a spin-down of the hydrologic cycle. Hence, the representation of complex cloud and aerosol microphysics is crucial to narrow down current uncertainties in regional climate modelling.

In this study, the regional climate model CCLM (version 4.0) was coupled to an aerosol microphysics module and a 2-moment bulk cloud scheme. The aerosol module accounts for the life cycle (emission, chemical evolution through condensation of soluble material onto the particles and water uptake, in- and below-cloud scavenging, sedimentation and dry deposition) of major aerosol species such as sulfate, seasalt, soil dust, black and organic carbon. The 2-moment cloud microphysics scheme allows for the prognostic representation of both mass and number concentrations for 5 different types of cloud and precipitation particles.

An overview of the physical parameterizations and first results with the newly coupled version of CCLM4.0 are shown. Sensitivity studies will be conducted for a time span of 1960-2000 driven by ERA-40 reanalysis, applying aerosol boundary data from the global atmospheric circulation model ECHAM5-HAM. It is shown that the new model version produces physically consistent results. Aerosol and cloud optical properties as well as number and mass concentrations are simulated reasonably.