Geophysical Research Abstracts, Vol. 7, 08233, 2005
SRef-ID: 1607-7962/gra/EGU05-A-08233

Numerical Examination of Interactions between insoluble Particles and tropospheric mixed-phase Clouds - first Results

H. Heinrich (1), M. Simmel (1) and S. Wurzler (2)

(1) Institute for Tropospheric Research, Leipzig (harald@tropos.de), (2) North Rhine-Westphalia State Environment Agency

Mixed-phase clouds plays a crucial role in the formation of precipitation. Although many clouds reside completely or partially above freezing level, cloud droplets do not freeze instantaneously as they are exposed to negative temperatures. Ice forming mechanisms, being of primary importance for cloud evolution, are poorly understood.

The aim of our project is to determine the role of insoluble aerosol particles (AP) in ice-phase initiation. We will study the interactions of AP and clouds in the context of hail development. We assume insoluble particles provides the nuclei for ice crystal generation. Therefore, the implementation of a spectral two-dimensional microphysical model into a radially symmetric cylindrical dynamic model is proposed. The dynamic model consists of two concentric air columns, the inside column corresponding to an updraft (cloud) region and the outside concentric annullar column to the surrounding downward motion (cloudless) region.

The employed two-dimensional microphysics improves the description of drop freezing: a one-dimensional microphysics is a function of the drop size only. This implies that equal sized drops can contain only equal sized aerosol particles and, thus, show the same freezing behavior. However, in reality equal sized drops can contain different sized particles which may lead to different concentrations of soluble material in the drops and, due to that, to various freezing temperatures of the drops. The two-dimensional approach can improves the description of drop freezing. Equal sized drops are allowed to contain different sized AP which may lead to a different freezing behavior.

As a first step we will present the characteristics of the dynamic model in terms of an instability analysis of the linearized system. Also we will show first results of simulations with the model including the two-dimensional cloud microphysics. Sensitivity studies are shown for different insoluble AP.