Geophysical Research Abstracts, Vol. 7, 05499, 2005
SRef-ID: 1607-7962/gra/EGU05-A-05499

Cloud-clear air interfacial mixing: impact on cloud microphysics

M. Andrejczuk (1), **W. W. Grabowski** (2), S. P. Malinowski (1) and P. K. Smolarkiewicz (2)

(1) Institute of Geophysics, Warsaw University, Warsaw, Poland, (2) NCAR, Boulder, Colorado, USA

The effect of turbulent mixing between cloudy and clear air on cloud droplet spectra is an outstanding issue of cloud physics. Although characteristics of the air volumes before mixing dictate the bulk properties of the homogenized volume such as temperature and liquid water content, the size of cloud droplets after the homogenization remains unknown. The asymptotic limits of the microphysical changes during mixing are the homogeneous and extremely inhomogeneous mixing scenarios, where, respectively, either the number of cloud droplets or the cloud droplet size remain constant. The mean cloud droplet size of the homogenized volume is often argued to fall between the two limits, but the applicable theory does not exist. To investigate the evolution of microphysical properties due to turbulent mixing and homogenization, we performed a series of direct numerical simulations of the microscale cloud-clear air interfacial mixing. The simulations were set forth in the idealized scenario of decaying moist turbulence with variable input of the turbulent kinetic energy (TKE). Our results suggest that the evolution of the mean cloud droplet size during mixing follows a universal path determined by the TKE input. This implies that a simple parameterization of the cloud droplet evolution resulting from cloud entrainment can be developed and used in cloud models that apply lower spatial resolutions.