Geophysical Research Abstracts
Vol. 12, EGU2010-9740, 2010
EGU General Assembly 2010

Aerosol-cloud interactions studied using ATHAM

Paul Griffiths and Michael Herzog

Environmental Processes Group, Geography Dept, University of Cambridge, Cambridge, CB23EN. United Kingdom (ptg21@cam.ac.uk)

Aerosol-cloud interactions are important to both the radiative properties of clouds and their lifetime. The description of mixed-phase clouds within numerical models remains a challenge, due to to the difficulty in incorporating them accurately within numerical models and to a lack of knowledge of the relative importance of the various processes involved.

Work within our group is underway to develop a new comprehensive aerosol-cloud microphysical module that describes as far as possible the relevant dynamical and microphysical processes from first principles. The module will combine an existing aerosol microphysical module that simulates particle size distributions with a synthesis of several existing cloud-microphysical schemes that predict mass and number of various hydrometeor classes, including the formation of precipitation. It involves an numerical integrator with user-defined accuracy and adaptive time-stepping enabling accurate treatment of the short timescale processes involved.

The module is used within the Active Tracer High Resolution Atmospheric Model (ATHAM) to simulate cloud formation in both warm and mixed-phase clouds. We will present initial results describing warm-rain formation using a new two-moment (mass and number) approach and a complementary single-moment mixed phase scheme. The results will be compared with an existing Euler-forward numerical integration scheme. The model will be initialized using data from the Aerosol Intensive Operation Period (AIOP) at the Atmospheric Radiation Measurement (ARM) Program Southern Great Plains site collected during 2003 which have been used for a similar study by Guo et al., and provide measurements of cloud liquid water path and effective radius.