Geophysical Research Abstracts
Vol. 12, EGU2010-12194, 2010
EGU General Assembly 2010
© Author(s) 2010

Evaluation and improvement of the statistical cloud parametrization in ECHAM using statistics of ground-based remote sensing observations

Verena Grützun (1), Johannes Quaas (1), and Felix Ament (2)
(1) Max Planck Institute for Meteorology, Hamburg, Germany, (2) University of Hamburg, Germany

Cloud feedbacks are appreciated to be one of the reasons for the large scatter of Global Climate Model (GCM) simulations (Randall et al., 2007). One way to reduce the uncertainties in the representation of clouds and their feedback to the climate is a thorough evaluation of the respective cloud process parametrizations in GCMs. While satellite observations are useful tools for a first evaluation, they lack important information such as, for example, accurate water vapor retrievals. Also, the spacial resolution of satellite data, especially the vertical one, is too coarse to gain comprehensive information about the atmospheric state, which is crucial for a model improvement on the process level. A more detailed data basis with higher vertical resolution and more information about the atmospheric constituents and properties can be retrieved from ground-based remote sensing. Especially, through measurements of lidar, radar and radiometers at certain locations for long time periods, a comprehensive data set for model evaluation can be gained: Using the Integrated Profiling Technique (IPT, Löhnert et al., 2004) to combine the different measurements it is possible to retrieve accurate vertical profiles of humidity, liquid water, temperature, and also the hydrometeor distribution within the clouds along with the corresponding uncertainties in the data.
We will make use of long-term ground-based remote sensing data by University of Hamburg and by the Richard-Aßmann-Observatory of the Deutscher Wetterdienst (DWD) to evaluate and improve the statistical cloud scheme by (Tompkins, 2002) in ECHAM6 (Roeckner et al., 2003). For the first time, the statistical representation of the total liquid water content and the respective cloud cover, which has been developed basing on cloud resolving model simulations, will be tested against detailed measurements.
To link the column data to the comparably coarse resolution of a GCM, a statistical analysis over long time periods of the measurements will be done, which can directly be compared to the statistical cloud scheme. First, the scheme will be evaluated and improved in the framework of a single column version of ECHAM6, then full 3D model runs are planned, wherein the improvements of the scheme with regard to cloud cover and precipitation will be evaluated with the help of satellite data.
We will present first results obtained from sensitivity studies from ECHAM6 run in column mode. The model is forced by ECMWF reanalysis data. The sensitivity of the scheme to changes of different cloud parameters is tested with a large set of column simulations. Depending on the availability of data retrievals at that time, first comparisons with measured quantities are included.

Randall, D.A. et al., in: Climate Change 2007: The Physical Science Basis. IPCC report, 2007.
Löhnert, U. et al., J. Appl. Meteorol., 43, 1295-1307, 2004.
Tompkins, A., J. Atmos. Sci., 59, 1917-1942, 2002.
Roeckner et al., Report No. 349, MPI-M, Hamburg, 2003.

Acknowledgement
This project is funded by the cluster of excellence “Integrated Climate System Analysis and Prediction (CliSAP, http://www.clisap.de)”.