Geophysical Research Abstracts, Vol. 7, 05721, 2005
SRef-ID: 1607-7962/gra/EGU05-A-05721

Ice cloud property profiling using lidar and radar.

D.P. Donovan, G-J. van Zadelhoff, E. van Meijgaard, R. Boers, H. Klien- Baltink
Royal Netherlands Meteorological Institute (KNMI)

Atmospheric Research Division, PO Box 201, 3730 AE, De Bilt, The Netherlands

(Donovan@knmi.nl / Fax: +31 30 221 04 07 / Phone +31 30 220 64 65)

The importance of ice clouds on the Earth's radiation budget is well recognized. However due to uncertainties in their properties (e.g. local extinction, particle effective size [R_{eff}]), they are not well treated in climate and forecasting models. Parameterizations of R_{eff} are generally related to temperature using a single function globally [McFarquhar et al., 2003]. Using combined lidar and radar measurements ice cloud effective particle size profiles can be estimated [Donovan and Van Lammeren, 2001]. In this work, results from combined lidar and radar ground-based observations made at three sites (the Cabauw (Netherlands), Chilbolton (UK) and the ARM-SGP (USA) site) are presented. The European sites used in this work are part of the EU-5 CLOUDNET program [http://www.met.rdg.ac.uk/radar/cloudnet/]. Profiles of ice cloud effective particle size, extinction and ice water content (IWC) for a long time series at each site have been derived. The relationship between the derived parameters and temperature, radar reflectivity, and relative depth into the cloud from cloud-top have been examined [Van Zadelhof et al, 2004]. It was found that it is not possible to construct a single R_{eff} (T,IWC) parameterization valid for all three sites and is therefore such a relationship is unlikely to be correct for global models. However, when R_{eff} is correlated to relative depth into cloud from cloud-top for different classes of total cloud thickness (H) one can define a single parameterization valid at the three sites implying that this result may hold on a global scale. The findings have formed a basis for a new ice cloud effective particle size parameterization. This parameterization is currently being tested in a regional climate model at KNMI.

References

Donovan D.P., and van Lammeren, 2001, J. Geophys. Res., 106, 27425

Mc Farquhar, G.M., et al., 2003, J. of Climate ., 16, 1643
van Zadelhoff, G.-J., et al., 2004, J. Geophys. Res., 109, D24214,