Atmospheric Chemistry and Physics
An Interactive Open Access Journal of the European Geosciences Union

Atmos. Chem. Phys., 5, 2333-2340, 2005
www.atmos-chem-phys.net/5/2333/2005/

CLABAUTAIR: a new algorithm for retrieving three-dimensional cloud structure from airborne microphysical measurements

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Abstract. A new algorithm is presented to reproduce the three-dimensional structure of clouds from airborne measurements of microphysical parameters. Data from individual flight legs are scanned for characteristic patterns, and the autocorrelation functions for several directions are used to extrapolate the observations along the flight path to a full three-dimensional distribution of the cloud field. Thereby, the mean measured profiles of microphysical parameters are imposed to the cloud field by mapping the measured probability density functions onto the model layers. The algorithm was tested by simulating flight legs through synthetic clouds (by means of Large Eddy Simulations (LES)) and applied to a stratocumulus cloud case measured during the first field experiment of the EC project INSPECTRO (INfluence of clouds on the SPECtral actinic flux in the lower TROposphere) in East Anglia, UK. The number and position of the flight tracks determine the quality of the retrieved cloud field. If they provide a representative sample of the entire field, the derived pattern closely resembles the statistical properties of the real cloud field.

Final Revised Paper (PDF, 536 KB) Discussion Paper (ACPD)

Citation: Scheirer, R. and Schmidt, S.: CLABAUTAIR: a new algorithm for retrieving three-dimensional cloud structure from airborne microphysical measurements, Atmos. Chem. Phys., 5, 2333-2340, 2005. Bibtex EndNote Reference Manager