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Structures of stratiform clouds as measured by a scanning 35.5GHz cloud radar

J. Grenzhäuser, J. Handwerker, and K.D. Beheng

Institut für Meteorologie und Klimaforschung, Universität Karlsruhe / Forschungszentrum Karlsruhe, Karlsruhe, Germany (jens.grenzhaeuser@imk.fzk.de)

Most cloud radars worldwide operate at vertical incidence delivering only height-time-cross-sections. Consequently the interpretation of time-dependent structures obtained by such instruments in terms of spatial characteristics assumes inherently that the structures move with a speed independent of time and space (ergodic hypothesis). However, this supposition may be a crude one since structures in clouds change continuously in space and time. To reveal such properties a cloud radar (MIRA36-S) – having a scanning capability – is applied to situations of stratiform clouds.

MIRA36-S measures at 35.5 GHz ($\lambda = 8.5$ mm). It is a coherent and polarimetric cloud radar and has two symmetrical receivers for simultaneously receiving co- and cross-polarized signals. The cassegrain antenna can perform RHI- and PPI-Scans with azimuths ranging from 0-360 degrees and elevations ranging from 0-45 degrees relative to zenith. RHI-Scans are usually accomplished in direction of mean wind velocity. The wind direction is determined by applying an improved VAD-algorithm (Tabary et al., 2001) on a previous PPI-scan. The resolution of the raw data from RHI-scans is 1.23° in elevation and 30 m in range. Each profile is the average of four 256-points-FFTs (PRF=5 kHz). The raw data of these measurements are interpolated to Cartesian coordinates and smoothed with a Gaussian filter to reduce small scale fluctuations. Using the image-processing-algorithm of Canny (1986) edges of structures of reflectivity are detected. Measurements of the linear depolarisation ratio and the radial velocity are taken into account to improve the structure detection. The structures are then tracked on the basis of an adapted version of the tracking algorithm TREC (Rinehart and Garvey, 1978).

The presentation comprises first results with regard to the detection of structures within stratiform clouds, the velocity and direction of their movement and their change in size and intensity. These investigations concentrate here on evaluations of (2D) RHI-data. Analyses of (3D) volume data are in preparation.