Comparison of measured drop size distribution and retrieved Z/R relations with the distribution of reflectivity patterns in the 2D-radar image

Malte Neuper
Institute of Water Resources and River Basin Management - Section Hydrology, Karlsruhe Institute of Technology KIT, Karlsruhe, Germany
Ehret, Uwe (Institute of Water Resources and River Basin Management - Section Hydrology, Karlsruhe Institute of Technology KIT, Karlsruhe)

E-mail: malte.neuper@kit.edu

The relation between the measured radar reflectivity factor Z and surface rainfall intensity R – the Z/R relation – is highly variable in space and time and depends on the actual drop size distribution. The actual drop size distribution in turn depends on the different microphysical precipitation formation processes which took place during the drop growth. Opposing to he operational practice of using a fixed Z/R relation for a specific season, radar processing algorithms should ideally account for an altered Z/R relation in a case sensitve manner, depending on the type of rainfall resp.

Altought a lot of efforts have already been performed at this topic over the course of the radar meteorology history and retrieving clear results can in the nature of things not often achieved, we took a further apporach to this topic:

As part of the interdisciplinary DFG research project CAOS (Catchment as Organized Systems) a comparison between the distribution of the reflectivity values in the radar image, changes in the drop size distribution and the rain rate was carried out. The main goal of one part of the project is to improve the actual Z/ R relations and thus the quantitative precipitation estimation, which serves as an input parameter in the hydrological modeling.

For this purpose the research area (the Attert catchment in Luxembourg) was equipped with six laser-optic disdrometers and two vertically pointing micro rain radars in order to get a hand on the actual DSDs and the actual Z/R relation, resp. Furthermore data a C-band Doppler radars covering the research area has been available, with the research area lying in the optimal measurement area of the radar (that is outside the cone of silence, but within an appropriate distance, where the resolution isn't too coarse).

With the various data sets correlation analyzes were executed. In order to get a notion on the different appearance of the reflectivity patterns in the 2D-radar image, first of all various simple distribution indices (for example the Gini-index, Rosenbluth-Index) were calculated and compared to the synoptic situation in general and the atmospheric stability in special. The indices were then related to the drop size distributions and the Z/R relation, resp. Special emphasis was laid in an objective distinction between stratiform and convective precipitation and the hereby altered droplet size distribution.