

The German radar composite RX: qualitative performance analysis for a precipitation climatology

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The German radar reflectivity composite RX combines data from 16 radar sites and offers high resolution information on precipitation for Germany. But how robust is this product in terms of quality, especially regarding the metrology of radar systems? Are there any spatial systematical deviations within this data and, if so, how can these effects be corrected?

For the investigation we used long time-series of composite RX data. The RX product has a resolution of 8 bit, 1x1 km every 5 minutes and has continuously been archived since 2004/2005. A statistical evaluation based on such data offers information about the quality of the radar measurements in addition to the areal precipitation climatology. Even weak systematical meteorological and metrological deviations from the mean become apparent.

Here, composite data from 2005 to 2009 is analyzed. Areal patterns of frequencies of occurrence of radar reflectivities and of precipitation are examined and possible causes are discussed. On average, an almost linear decrease of frequencies of occurrence of radar reflectivities with range-bin height can be observed for all radar sites. But the additional dependence of these frequencies of occurrence on reflectivity level is unequally pronounced for various radar sites. Compared to single radar images, the composite data include additional inhomogeneities caused by the compositing algorithm. Systematic variations, or biases, between data originating from different radar sites as well as the comparability of data from overlapping areas of two or more radar sites and the areas covered by only one radar have been investigated. E.g., overlapping areas tend to show higher rain amounts than adjacent single radar areas due to the compositing criteria. Based on these findings a mean statistical correction is developed on an annual basis. The algorithm comprises corrections for clutter and shading effects as well as for systematic differences in frequencies of occurrence of radar reflectivities between the near and the far ranges of individual radar sites, including an adjustment to rain gauges.