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Analysis of Geo-Statistical Properties of Radar Errors for Ensemble Precipitation Generation

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Two and a half years of co-located hourly radar and rain-gauge data were analyzed with respect to the statistical properties and the spatial structure of several different ways to estimate the error between the two measurements. Error here is defined as the deviation of the radar estimate (R) from the gauge measurement (G). It can be calculated in several different ways, among which are the difference ($R-G$), the ratio (R/G), the dB-ratio ($10 \cdot log_{10}(R/G)$) as well as more sophisticated deviation estimates consisting of more than one error term.

In order to use these error estimates for stochastic simulations their distribution and covariance structure must be known. Ideally, if a normal or multivariate normal distribution may be assumed, simulation could then be performed easily using well established simulation methods (e.g. Turning Bands, Sequential Gaussian, Cholesky Decomposition).

For the alpine region it has been shown by other authors that the spatial correlation pattern could not be described by a variogram. The presented results, which were based on radar data of the German Weather Service station Dresden in eastern Germany and surrounding rain gauges, also show a large variation in correlation coefficients for larger distances. For distances up to approx. 20 km, however, the correlation or, respectively, the covariance structure could be modelled by a variogram functional relationship. In addition, the distributional properties of the abovementioned error estimates were analysed with respect to their usability for ensemble precipitation generators.