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Effect of Geostatistical Interpolation of Rainfall Using Weather Radar as Additional Information on the Simulation of Floods

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The most important input for distributed hydrological modelling of highly dynamic processes like floods are precipitation data with high resolution in space and time. In contrary to the sparse spatial resolution of hourly or shorter time step precipitation data from recording networks, radar derived precipitation provides a high spatial resolution, but often comes along with a large space-time variable bias in radar rainfall estimates. To provide optimal input for distributed hydrological modelling the best strategy is probably a combination of all available information about rainfall and applying sophisticated interpolation methods.

Objective of this research was the investigation of spatial interpolation of hourly precipitation for mesoscale hydrological modelling. The multivariate geostatistical method external drift kriging (EDK) was applied and further developed for interpolation of short time precipitation using additional information, especially radar data, but also from denser daily measurement networks and physiographic factors. To address the problem of fractional precipitation coverage a multi-step interpolation applying binary indicator kriging as first step was used.

Investigations were carried out for fifteen flood events from 2000 to 2005 caused by precipitation with different characteristics. The 125 km radius around the selected radar station, which is located northeast of the Harz Mountains in northern Germany, covers the study area including 22 recording stations. The hydrological modelling was carried out for a subcatchment of the Bode river basin in the southeastern part of the Harz Mountains with a drainage area of about 100 km^2.

For a first assessment of the interpolation performance of the multivariate methods cross validations in comparison with some univariate standard interpolation methods were carried out. Subsequently comparative hydrological simulations using the model WaSiM-ETH were applied for a more specific evaluation.