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Merging of rain gauge and radar data for various temporal resolutions and network density scenarios

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In many cases there are only few data from a sparse rain gauge network available, that might not be sufficient for the modeling of hydrologic processes. Recently, the use of radar data became more common, although there is often a high bias compared to rain gauge data. Inaccuracies in radar sensing of precipitation are, for instance, related to spatial and temporal variations in the relationship between reflected energy of the radar beam and corresponding rainfall intensity. This work focuses on the best combination of radar and rain gauge data using geostatistical approaches. Three different merging techniques, i.e. kriging with an external drift, indicator kriging with an external drift and conditional merging have been evaluated by cross validation for the data of 90 rain gauges and a radar device, while ordinary kriging is used as the reference. The study area is located in Lower Saxony, Germany, and covers the measuring range of the radar station Hanover. The data used in this study comprise continuous time series over the time period from 2008 until 2010. Different temporal data resolutions and rain gauge network density scenarios have been investigated in order to obtain more general results. In addition, the effect of radar data quality on the interpolation result is analysed. First results show that the performance of all the merging techniques depends on the quality of radar data and in general smoothing of the gridded radar data is improving the interpolation. The merging quality varies highly from time step to time step, but is usually much better than the use of point information only (ordinary kriging). So far, a single best approach has not been identified. The benefit of the analysed merging methods in comparison to only using rain gauge data depends on temporal resolution, error in radar data, network density and other factors.