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Using sequential Gaussian simulation to quantify uncertainties in interpolated gauge based precipitation

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Precipitation is a key input to hydrological models. Spatially distributed rainfall used in hydrological modelling is commonly based on the interpolation of gauge rainfall using conventional geostatistical techniques such as kriging, e.g. Salamon and Feyen [2009], Stisen et al. [2011]. While being effective point interpolators [Moulin et al., 2009], these techniques are unable to reproduce the spatial variability inherent in the rainfall process at unsampled locations. Stochastic simulation approaches provide the means to better capture this variability and hence to quantify the associated spatial uncertainty [McMillan et al., 2011].

The objective of this study is to quantify uncertainties in interpolated gauge based rainfall by employing sequential Gaussian simulation (SGS) coupled with ordinary kriging (OK) to generate realizations of daily precipitation at a 2x2 km2 grid. The rainfall gauge data was collected in a 1055 km2 subcatchment within the HOBE catchment (Jutland, Denmark) [Jensen and Illangasekare, 2011]. The following uncertainties are considered: i) interpolation uncertainty ii) uncertainty on the point measurement iii) location uncertainty. Results from using different numbers of SGS realizations and different lengths of the simulated period as well as different assumptions on the underlying uncertainties will be presented and discussed with regard to mean annual catchment rainfall.

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