



To what extent does the spatial dependence affect the regional flood risk estimation?

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Effective flood risk management may reduce the destructive impacts of floods where flood risk assessment is an essential element. In general, flood risk assessment requires damage estimation from flood events and their associated exceedance probabilities (or return periods) for a given catchment. On many occasions, flood risk assessments are based on scenarios with homogeneous return periods throughout the catchment. However, this does not represent real flood situations, especially for large-scale catchments. The return periods are spatially heterogeneous among different locations, within one flood event. The objective of this study is therefore to perceive the effect of spatial dependency in flood risk estimation by comparing three assumptions on spatial dependence of return period scenarios: (i) spatially dependent homogeneous (complete dependence), (ii) spatially dependent heterogeneous (modelled dependence) and (iii) spatially independent heterogeneous (complete independence). In this study, we use a complete flood risk chain model, RFM (Regional Flood Model for Germany), which takes into account all processes from the climate forcing through the catchment and river system to damage mechanisms. It allows us to estimate flood risk considering spatially heterogeneous patterns in all processes. We applied this framework to the Elbe catchment (Germany) and the results indicate that, while these three assumptions give similar damage estimations for small-scale subcatchments, the assumptions of complete dependence and independence result in large overestimation and underestimation of the large-scale risk, respectively.