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Integration of on-site land use changes in the flood inundation modelling – concept of an analysis framework

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After the extreme flood event in 2002 the German Water Resources Act was enhanced through the paragraphs §31b and §31c, demanding a comprehensive localisation of flood risk areas throughout the country. However, there are still major research challenges that need to be addressed: the problem of scale and derivation of effective parameterizations, the provision of distributed floodplain roughness, the economic and socio-cultural values as well as the validity period. Especially urban areas require effective and differentiated approaches for the modelling of flood risk areas due to the accumulation of monetary values. The reason, the historical urbanisation with a continue propagation into the natural floodplain areas changed and intensified the vulnerability and risk as well as the recent inundation areas. To analyse the impact of spatiotemporal effects of on-site land use changes in the inundation modelling, an analysis framework is developed. The computational design is a combination of a Monte-Carlo routine to simulate the parameter inputs, a two-dimensional hydrodynamic model to compute the flood events and different performance measures to evaluate the model results. The current investigations of the parameters are limited to the spatial distributed floodplain roughness, the topography and the hydrograph. Based on this concept a coupled sensitivity and uncertainty analysis is applied to investigate the model results. The spatiotemporal distribution of the land use values are derived from historical maps as well as a computational model for urban development for future predictions. Focussing on the extreme impact during the flood 2002 and the availability of detailed data there, the city of Dresden is selected as investigation site.