Geophysical Research Abstracts
Vol. 12, EGU2010-2202, 2010
EGU General Assembly 2010

UK coastal flood risk; understanding the uncertainty

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The sensitivity of flood risk mapping to the major sources of future climate uncertainty were investigated by propagating these uncertainties through a LISFLOOD inundation model of a significant flood event of the North Somerset coast, to the west of the UK.

The largest source of uncertainty was found to be the effect of the global Mean Sea Level rise range of 18-59cm (as reported by the Intergovernmental Panel on Climate Change), with an approximate upper limit of 1m, by 2100. Therefore, MSL rise uncertainty needs to be quantified in future flood risk predictions. However, the uncertainty of the storm tide height along the coastline (i.e. the maximum water-level at the coast excluding wave effects) was found to significantly affect our results. Our evidence suggests that the current flood mapping approach of forcing the inundation model with an extreme water-level of constant return period is incorrect. We present a new technique which is based on the spatial characteristics of real events. This provides a more reliable spatial treatment of the storm tide uncertainty.

The uncertainty of land roughness coefficients (0.018-0.09 for the study area, depending upon land use), used within the inundation model to control flood wave propagation, was found to affect inundation extents especially for larger inundation events. However, the sensitivity to roughness uncertainty was found to be much smaller than other factors, such as Mean Sea Level rise uncertainty. We present the results of propagating these uncertainties through an inundation model and develop probabilistic techniques to quantify these sources of future flood risk uncertainty.

Keywords:
future flood risk, uncertainty, inundation, LISFLOOD, sea-level rise, climate change