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Estimating the Evolution of Flood Risk to Coastal Populations

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The long term evolution of flood risk in a coastal area due to (a) Sea level rise and (b) Population rise is assessed. Historic maps and population data are used to estimate the spatial distribution of the coastal population through time, and extrapolated sea levels are used as a boundary condition in a hydrodynamic flood model to estimate the historic flood extent. The population exposed to flooding is then estimated for each time step. Uncertainty is addressed by comparing results for different population spreading techniques and rates of sea level change. The evolution of flood risk over a period of over 200 years (1801 to 2011) is assessed.

This work identifies a fundamental gap in (1) the assessment of exposure of coastal populations to flooding, and (2) the assessment of how this exposure can develop over time. This has implications for the current assessment of coastal flood events, and also for future planning decisions.

The technique developed is applied to a case study of Portsmouth on the UK's south coast. Flood risk in the case study area is seen to have increased dramatically over the last 200 years, mostly as a result of population rise. Climatic changes have also increased exposure, with significantly less population exposed to coastal flooding when changes in sea level are accounted for. This result shows that for long term (100+ year) studies even modest changes in sea level can have significant impacts on the extent of the coastal floodplain.