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Coastal flood risk in England: Present levels and uncertainties

Jose Pinto Rascon (1), Robert Nicholls (1), Ivan Haigh (2), and Gustavo de Almeida (1)

(1) University of Southampton, Faculty of Engineering and Physical Sciences, United Kingdom (Alejandro.Pinto-Rascon@soton.ac.uk), (2) Ocean and Earth Science National Oceanography Centre, University of Southampton, United Kingdom (I.D.Haigh@soton.ac.uk)

In the UK, coastal flooding is widely recognised as a high cause of civil emergency, with potential consequences including fatalities, damage to property, interruption of essential goods and services, and environmental damage (Cabinet Office, 2015). Changes in the socioeconomics of the coastal area along with changes in the climatic conditions, particularly sea level rise, have the potential to increase the present levels of threat. The Department for Environment, Food and Rural Affairs (DEFRA) has estimated coastal flooding to produce expected annual damages of £ billion under current conditions, with significant infrastructure at risk (DEFRA, 2014). However, it has been argued that these results overpredict by fourfold the possible consequences of floods (Penning-Rowsell, 2015). Furthermore, most of the national assessments are based on a single methodology, used to develop the Risk Assessment for Strategic Planning (RASP) by Hall et al. (2003). Therefore, this work aims to provide updated estimates of coastal flood risk in England, along with precise identification of its largest uncertainties by employing a methodology that can be directly scaled to regional and local assessments allowing for direct comparison of levels of risk along the country. It does so by following the Source-Pathway-Receptor-Consequence framework and analysing each of its components. The sources are obtained with the statistical analysis of 46 tide gauge records distributed along the UK's coast, and compared with the Government's design flood boundary conditions. A national flood defence database by the Environment Agency is used to determine the pathways. Sources and pathways are coupled in a LISFLOOD-FP inundation model to determine the extent of the floodplain. Receptors are determined by coupling the 2011 England census population-weighted centroids along with a national dataset of building heights. Finally, the consequences are obtained by relating the number of people exposed to their average annual income. The preliminary results indicate the largest variabilities in our coastal flood estimates caused by the source component. In particular, the use of design curves that fail to consider skew surge double the risk estimates. However, lack of precise data on the coastal flood defences generates the biggest uncertainties at present, requiring further investigation of the defence failure mechanisms.

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