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Assessing current and future storm surge risk around Tasmania, Australia

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Storm surge hazard along the coastline of Australia's island state, Tasmania, has recently been investigated as part of the 'Climate Futures for Tasmania' (CFT) project. The CFT project was initiated to provide Tasmania with detailed information on a range of climate variables under future climate conditions. Using the Conformal Cubic Atmospheric Model (CCAM, McGregor and Dix, 2008), six of the Coupled Model Intercomparison Project (Meehl et al., 2007) simulations under two IPCC emission scenarios (A2 and B1) were dynamically downscaled to approximately 60 and 15 km resolution over Tasmania yielding six-hourly information for a large number of model variables over the period 1961-2100.

One task undertaken as part of the CFT project was an investigation of storm tide hazard. An analysis of extreme sea levels in tide gauge records around Tasmania revealed that for much of this coastline the extremes were highly correlated both with each other and with tide gauges on the southeastern mainland Australian coast. This suggested that the method of McInnes et al., (2009) in which a small number of tide gauge records were used to select extreme sea level events for modeling could be extended to Tasmania. A population of Historical storm surge events were identified from five tide gauge records from southeastern Australia and Tasmania from the late 20th century and simulated using a hydrodynamic model. Extreme value statistical analysis was applied to the model output to evaluate storm surge event probabilities and return periods for late 20th century conditions. Joint probability analysis was then used to combine the storm surge data with tide heights to obtain return periods for total sea levels. It was found that the highest storm surges (a 100 yr return level of up to 0.7 m above msl) occurred along the southeast coast of the state and the lowest (100 yr return level of up to 0.4 m above msl) occurred on the northern coast. However, the highest stormtides (100 yr return level of 1.9 m above msl) occurred on the northern coast owing to the large contribution of the astronomical tides.

The impact of climate change on the wind speeds in the CFT climate model simulations indicates an increase in wind speeds particularly on the east coast of Tasmania implying possible changes to storm surge heights in this area in the future. This paper will report on the characteristics of storm surges and tides around Tasmania and present results on the impact of climate change on storm surges by means of hydrodynamic model simulations that have been nested in the output of selected CFT model simulations.

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