USING REALISTIC DISASTER SCENARIO ANALYSIS TO UNDERSTAND NATURAL HAZARD IMPACTS AND EMERGENCY MANAGEMENT REQUIREMENTS

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The study of historical occurrences of natural disasters only provides a very limited view of the full range of risk Australia is exposed to. Natural Catastrophe models have been designed as a tool to extrapolate beyond past experience and as such can help risk practitioners prepare for the types of events yet to be seen. In this project we propose to apply the same techniques at the core of catastrophe models to design realistic disaster scenarios. After a brief example of a scenario outcome using our new heatwave model, recent development to our tropical cyclone (TC) model framework are presented. These include a new rainfall component and an improved vulnerability module to better characterize wind-related damage to properties and population displacement.

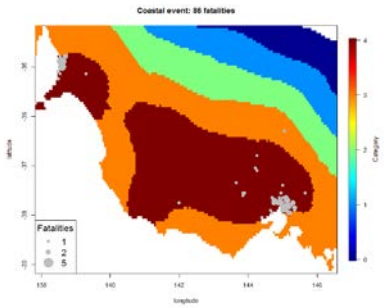
PROJECT SUMMARY

To provide a global picture of natural disaster risk in Australia a range of perils and locations are selected through the 3 years of the project.

- To date the scenarios delivered cover Tropical Cyclones, Earthquake and Heatwave perils for regions around Adelaide, Melbourne and Southeast Queensland
- In the third year of the project focus will shift towards flooding events triggered by Tropical Cyclones in Queensland and East Coast Lows in New South Wales
- These scenarios are designed to: (1) explore likely impacts from extreme disasters so that risks and capability gaps can be better understood and (2) improve risk communication tools.

HEATWAVE SCENARIO

A framework to assess heatwave risk in terms of human fatalities was introduced in Year 2. Figure 1 below illustrates the use of our new risk category scheme along with projected fatalities from one of the three scenarios modelled in the project.



TC HAZARD MODELLING

TC Marcia (2015)

The tropical cyclone (TC) hazard model framework presented in Year 1 has been updated to include estimates of TC rainfall. The rainfall model is a symmetric vortex model based on rainfall rates derived from the Tropical Rainfall Measuring Mission (TRRM) satellite (Tuleya et al. 2007). A storm surge component will be added later this year using TUFLOW-FV software provided by BMT WBM. Validation and calibration of the wind and rainfall models is currently being conducted using Bureau of Meteorology (BoM) Automatic Weather Station (AWS) wind and rainfall data (Figure 2) collected during the landfall of Tropical Cyclone Marcia (2015).

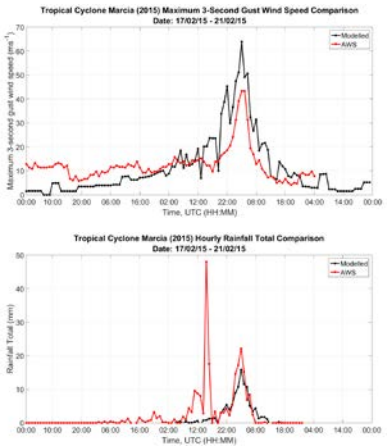


Figure 2. Comparison of modelled open exposure (z_0 = 0.02 m) and observed (non-standardized) maximum three-second gust wind speeds (top), as well as rainfall totals (bottom) over one hour time intervals at the Yeppoon The Esplanade BoM AWS.

TC VULNERABILITY MODEL

The Year 1 tropical cyclone vulnerability model framework has also been updated to simulate wind-related damage estimates to residential, commercial, and industrial structures, as well as, population displacement from residential homes within Statistical Area 1 (SA1) boundaries (Figure 3). These boundaries are determined and provided by Geoscience Australia. Impacts to lifeline infrastructure (e.g. power transmission lines, transportation, etc.) will be assessed in the next year.

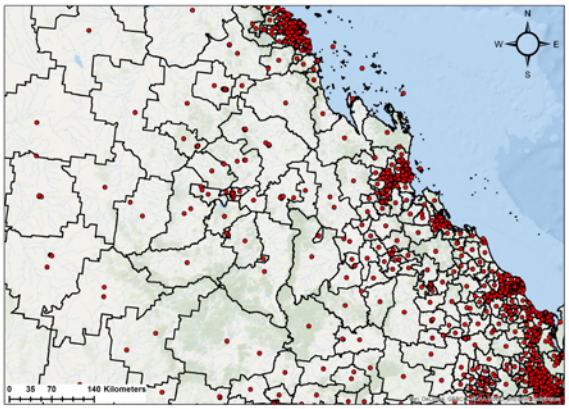


Figure 3. Map of SA1 boundaries across the Fitzroy catchment in Queensland. The red filled circles mark the centroid of each SA1 boundary.

Additional data sets including Dynamic Land Cover Data (DLCD), high-resolution (25-m spatial resolution) Light Detection and Ranging (LiDAR) topography, and Queensland Land Parcel and Property Framework data have been obtained. These data sets are being integrated together into a Geographic Information System (GIS) to evaluate TC impacts on a much finer-scale (e.g. property-level).

REEFERENCES

Tuleya, R. E., M. DeMaria, and R. J. Kuligowski, 2007: Evaluation of GFDL and simple statistical model rainfall forecasts for U.S. landfalling tropical storms. *Wea. Forecasting*, **22**, 56 – 70.