

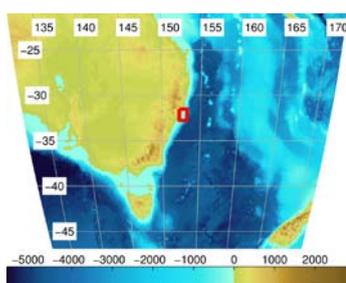
# IMPROVING RESILIENCE TO STORM SURGE HAZARDS: ASSESSING RISK THROUGH WAVE SIMULATIONS, SHORELINE MODELLING AND FIELD OBSERVATIONS



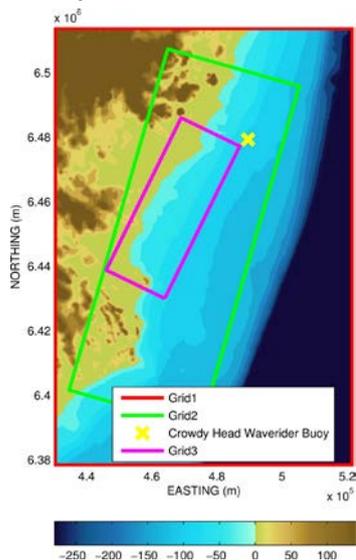
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**THIS PROJECT WILL PRODUCE PROBABILISTIC ASSESSMENTS OF COASTAL EROSION AND INUNDATION RISKS ASSOCIATED WITH STORM SURGE, PARTICULARLY FOR EVENTS THAT ARE CLUSTERED IN TIME. A CRITICAL COMPONENT OF THIS RESEARCH IS TRANSITIONING MODELLED STORM WAVES AT AN OFFSHORE WAYERIDER BUOY INTO A HYBRID SEDIMENT TRANSPORT MODEL AT THE SHORELINE. DETAILS OF WAVE TRANSFORMATION PROCESSES USING MODEL SIMULATIONS ARE PRESENTED FOR A STUDY SITE AT OLD BAR ON THE NSW MID-NORTH COAST, WHERE EROSION IS AN ONGOING MANAGEMENT ISSUE.**



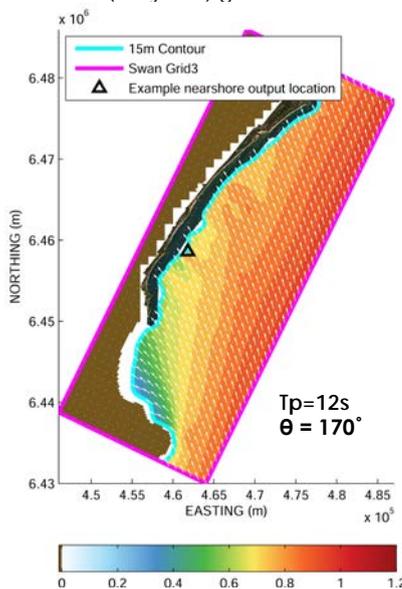
Regional bathymetry for eastern Australia (Geoscience Australia 250 m dataset). Location of Old Bar Beach (NSW) study site also indicated (red box).



Nested bathymetry grids used for SWAN wave modelling and location of Crowdy Head waverider buoy.

## STORM EVENT MODELLING

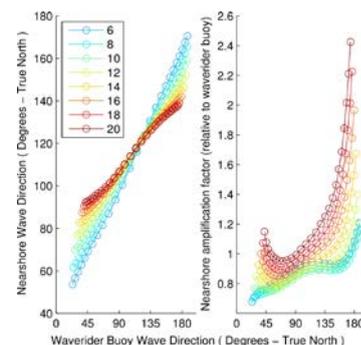
- ▶ Multivariate statistical approach within a probabilistic framework.
- ▶ Modelled the magnitude and frequency of storm events to give event exceedance probabilities and to construct synthetic storm events.
- ▶ Long-term synthetic time-series of storm events (10<sup>6</sup> years) generated.



Example SWAN wave simulation for Grid 3 at Old Bar, showing direction (arrows) and ratio of nearshore wave height to height at waverider buoy. 15 m depth contour (blue) defines seaward boundary of sediment transport model.

## SWAN# WAVE MODELLING

- ▶ Series of nested nearshore simulations designed to build wave transformation look up tables.
- ▶ Accounts for shoaling and refraction of synthetic wave series to 15 m depth contour at 250m intervals along shoreline.
- ▶ Method developed for two study sites to represent open coasts (Old Bar, NSW) & semi-enclosed bays (Adelaide, SA)
- ▶ Results integrated into sediment transport model to simulate beach morphology.



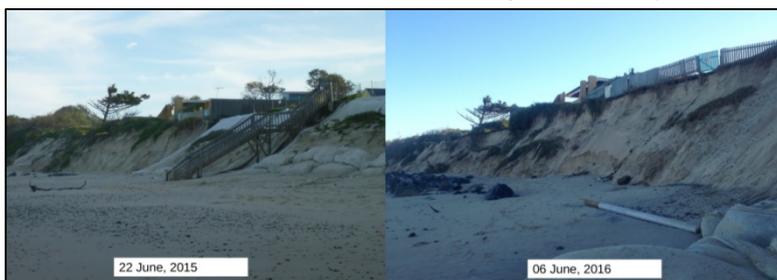
Summary of all SWAN wave model simulations for example nearshore location at Old Bar (see map to left) showing change in wave direction (left) and height (right) due to shoaling and refraction for wave periods ranging from 6-20 seconds. (# SWAN - Simulating WAVes Nearshore) <http://swanmodel.sourceforge.net/>

## NEXT STEPS

- ▶ Undertake simulations of beach response to modelled storms using a hybrid model accounting for cross-shore and longshore sediment transport processes.
- ▶ Produce probabilistic assessments of the coastal erosion and inundation risks associated with storm surge.

## END USER STATEMENT

*"At the end of its second year...this project has capitalised on the early productive engagement with end-users...to translate the research to the coastal management framework at the state level"* (M. Woolf, lead end user)



Dune erosion at Old Bar Beach (NSW) showing further retreat and damage resulting from a storm surge on 5 May 2016 (Photo credit: M. Griffiths, MidCoast Council, NSW)

