SEASCAPES

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Queensland Climate Change and Coastal Vulnerability to Tropical Cyclones

Queensland Government

Bureau of Meteorology

Project Update

As reported in the last edition of *SEASCAPES*, the Bureau of Meteorology, in conjunction with a number of Queensland Government agencies and with financial support from the Queensland Greenhouse Special Treasury Initiative, commissioned SEA in association with the James Cook University Marine Modelling Unit, to assess the magnitude of the ocean threat from tropical cyclones in Queensland. The project is intended to update and extend the present understanding of the threat of storm tide inundation in Queensland on a state-wide scale including the effects of storm wave conditions in selected areas, and estimates of potential Greenhouse impacts.

Part A of the study was completed earlier this year and a comprehensive technical/scientific report has been published under the auspices of the Queensland Government.

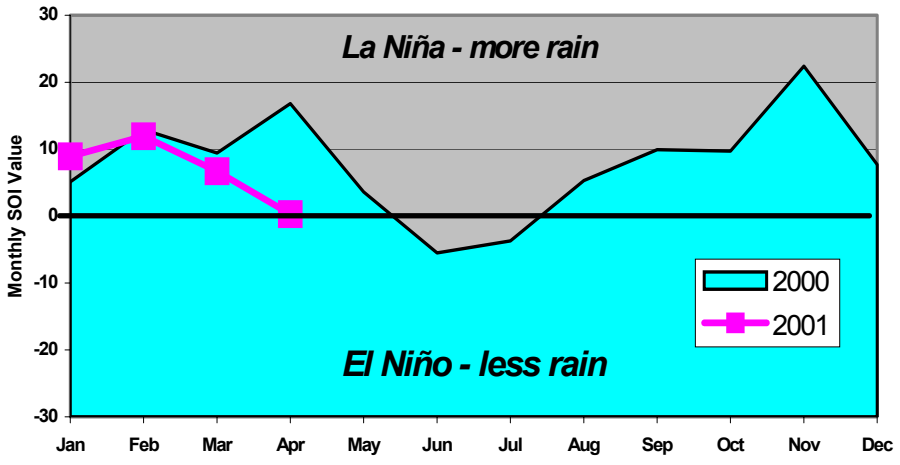
Part B of the study continues, whereby SEA is assisting the Queensland Regional Office of the Bureau of Meteorology in undertaking a series of numerical storm surge simulations. The entire coast of Queensland has been represented by a series of overlapping numerical ocean models and historical cyclone data is being assessed to provide suitable parameter ranges for the modelling.

A key feature of the modelling will be to develop a series of simplified parametric models of the storm tide response of each coastal region. It is envisaged that these models will then serve the joint role of underpinning statistical storm tide estimates for planning purposes as well as providing enhanced real-time forecast and warning capabilities.

Future stages of the project to be tendered will consider wave modelling and the effects of breaking wave setup on coastal water levels.

Near-Neutral SOI Forecast for 2001

The National Climate Centre's outlook for total winter rainfall shows that a drier than average season is the more likely outcome in southeast Queensland and northern NSW (around 60 to 65% below average). Recent Pacific observations are consistent with both a continuation of neutral conditions (the most likely) and the early stages of an El Niño. The majority of international computer models are predicting warming in the tropical Pacific Ocean during the next 6 months, with half predicting the development of an El Niño.
[Data and comments based on Bureau of Meteorology sources.]



SEASCAPES

SEASCAPES features the developing risk assessment capabilities of Systems Engineering Australia Pty Ltd (*SEA*). Our services include coastal, ocean and offshore engineering, statistical analysis of tropical cyclone data, quantitative estimation of insurance losses, cyclone wind, wave and storm surge modelling, flood risk assessment and severe thunderstorm downbursts, hail and tornadoes.

Visit us on the web:
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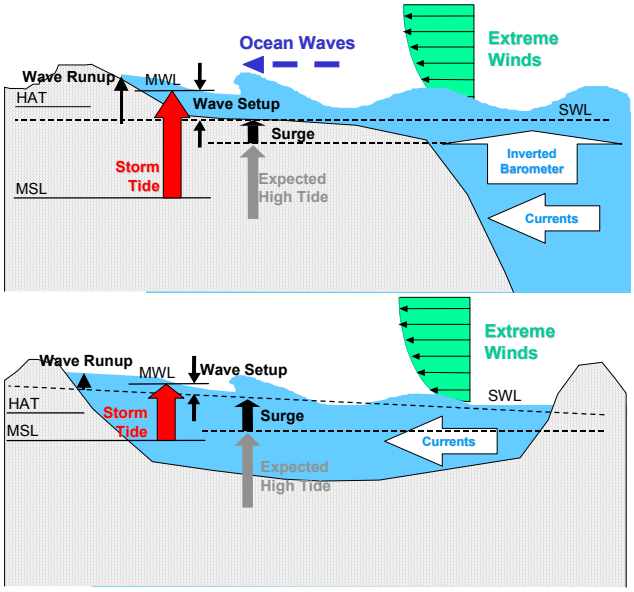
SEA

Cocos (Keeling) Islands Storm Surge Study

Systems Engineering Australia has recently completed a numerical modelling study which is designed to provide statistical estimates of the tropical cyclone storm tide threat at the Cocos (Keeling) Islands - an Australian Government Territory in the Indian Ocean (12°10'S, 96°50'E). The client was Gutteridge Haskins and Davey Pty Ltd (Perth) on behalf of the Commonwealth Department of Transport and Regional Services.

The Cocos (South Keeling) Island group is a relatively small isolated mid-oceanic atoll comprising 26 islands surrounding a shallow lagoon. The atoll is located in a region of significant tropical cyclone activity during October through to March. The lagoon is 10 km E-W and 12 km N-S and shallow (<10 m) with the principal openings to the north and north-west but with smaller openings to the south and east. The inhabited islands (pop. 600 in total) are low lying (typically + 6m MSL) and heavily vegetated with coconut palm.

The study involved the creation of a number of numerical models to simultaneously represent all of the various components which make up the combined storm tide level during the close approach of a severe tropical cyclone. Wind, surface pressure and wave models were all developed and verified where possible against data from the island.



Top Panel: Processes affecting the outer reef zones
Bottom Panel: Processes within the island lagoon.

A statistical model was then created to provide estimated probabilities of exceeding a range of critical water levels.

The models show that the effects of breaking wave setup on the outer reefs are the dominant process causing a rise in local water levels during tropical cyclones.

Cocos (South Keeling) Island atoll as seen by LANDSAT satellite.

Some of the SEA Clients Since 1996

Tropical Cyclone Risks:
- ***RACQ Insurance***
- ***CGU Insurance***
- ***Suncorp Metway Insurance***
- ***Aon Group Australia Limited***
- ***Powerlink Queensland***
- ***Australian Geological Survey***

Severe Thunderstorm Risks:
- ***Suncorp Metway Insurance***
- ***Macquarie University, Natural Hazards Research Centre***
- ***Powerlink Queensland***

Flood Risks:
- ***RACQ Insurance, Qld.***

Coastal and Ocean Hazards:
- ***Woodside Offshore Petroleum, WA.***
- ***Dept Natural Resources, Vic.***
- ***Environmental Protection Agency, Qld.***
- ***Dept Transport and Regional Services***
- ***GHD Pty Ltd***
- ***Bureau of Meteorology***
- ***Kvaerner E&C Australia***

Multi-Hazard Studies:
- ***Dept Emergency Services, Qld.***
- ***Bureau of Meteorology / AGSO***

Research:
- ***The Risk Prediction Initiative,***

AGSO Cities Project SE Qld

An earlier *SEASCAPES* reported on the role of Systems Engineering Australia acting on behalf of the Bureau of Meteorology in Queensland by providing hazard summary data for the Australian Geological Survey Organisation (AGSO) in its *Cities Project* multi-hazard assessment.

A series of reports has been completed by AGSO which now also consider community wide levels of damage caused by tropical cyclones. To achieve this, SEA was subsequently commissioned by AGSO to provide a series of hypothetical tropical cyclone wind swaths covering the region from Caboolture south to the Gold Coast. The wind swaths were representative of a range of peak wind gusts corresponding to return periods estimated from the SEA insurance risk assessment model MIRAM. AGSO applied the wind fields to its own form of damage assessment model using GIS-based terrain and topography. Reports are being prepared for each local government region. The AGSO approach is based on previously published SEA methodology.

Real risk management decision - making tools for your business.

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