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HAZARDSCRC

DEVELOP BETTER PREDICTIONS AND FORECASTS FOR EXTREME WATER LEVELS AROUND AUSTRALIA

Charitha Pattiaratchi

School of Civil, Environmental and Mining Engineering
The University of Western Australia, WA



An Australian Government Initiative



THE UNIVERSITY OF
WESTERN AUSTRALIA

PROJECT TEAM

Researchers

- Sarath Wijeratne (UWA)
- Ivan Haigh (University of Southampton, UK)
- Mathew Eliot (UWA, DamaraWA).
- 2 Positions to be advertised

Endusers

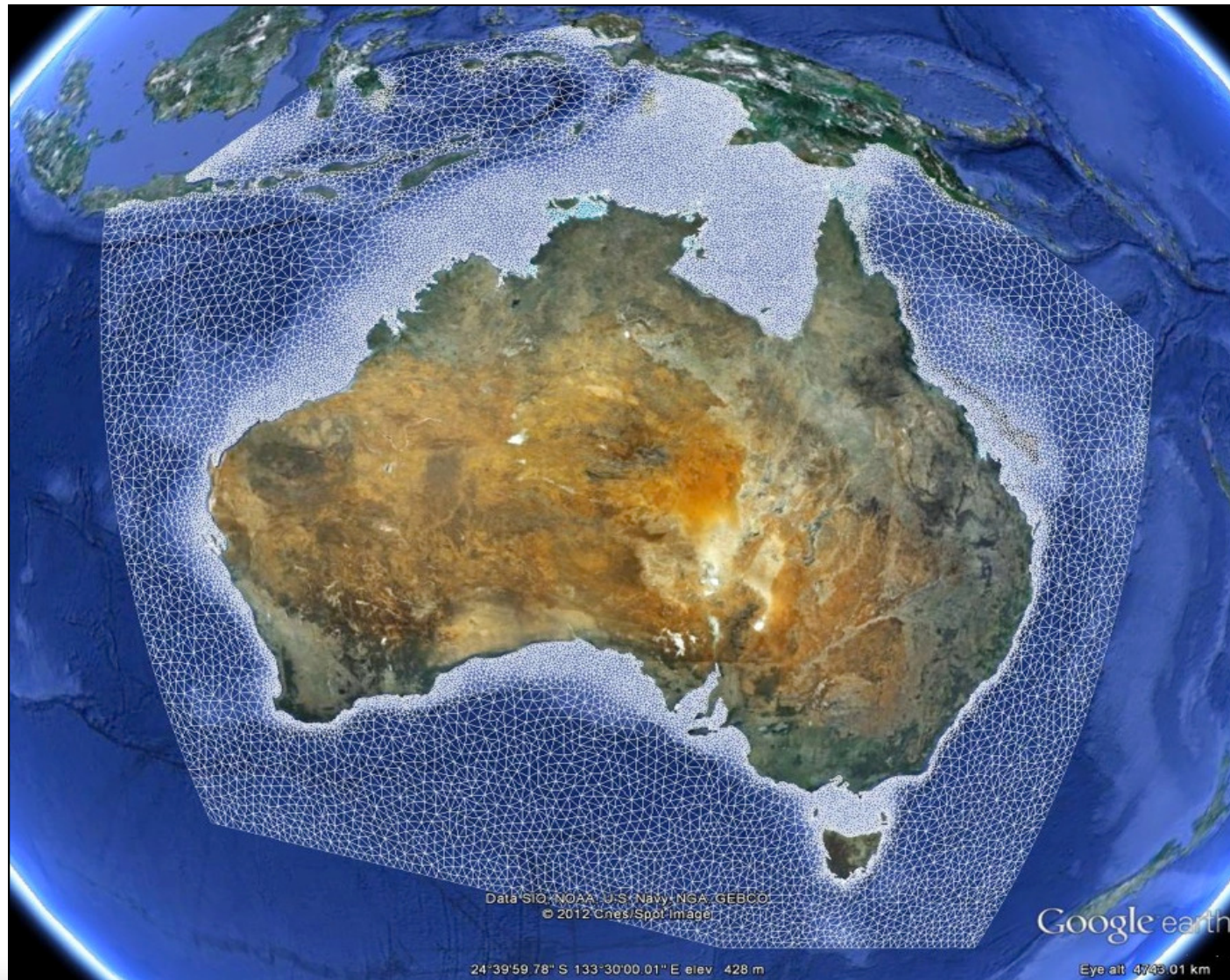
- R. Schwartz (Queensland)
- Doug Fotheringham (SA)
- Heather Stuart & David Hanslow (NSW)
- Shona Prior (Tasmania)

PROBLEM STATEMENT

- Potential impacts and hazards of extreme water level events along our coasts are significantly increasing.
- The occurrence of extreme water levels along low-lying, highly populated and/or developed coastlines can lead to loss of life and of damage to coastal infrastructure
- To better prepare, coastal engineers, emergency managers and planners require accurate estimates of extreme water levels.

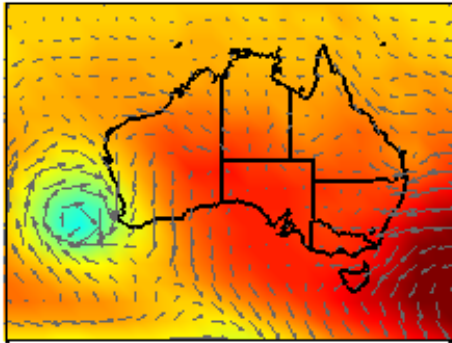


Tide/surge Numerical model: Australia

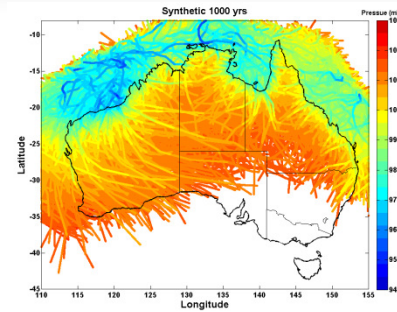
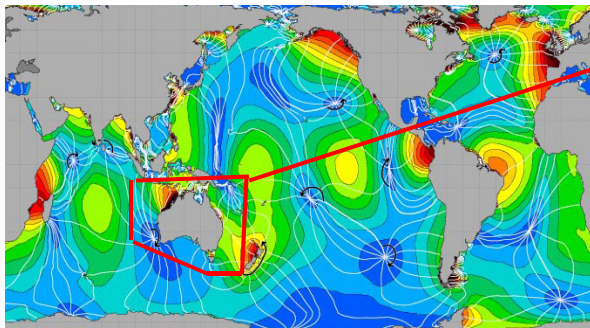


Sea level hindcasts

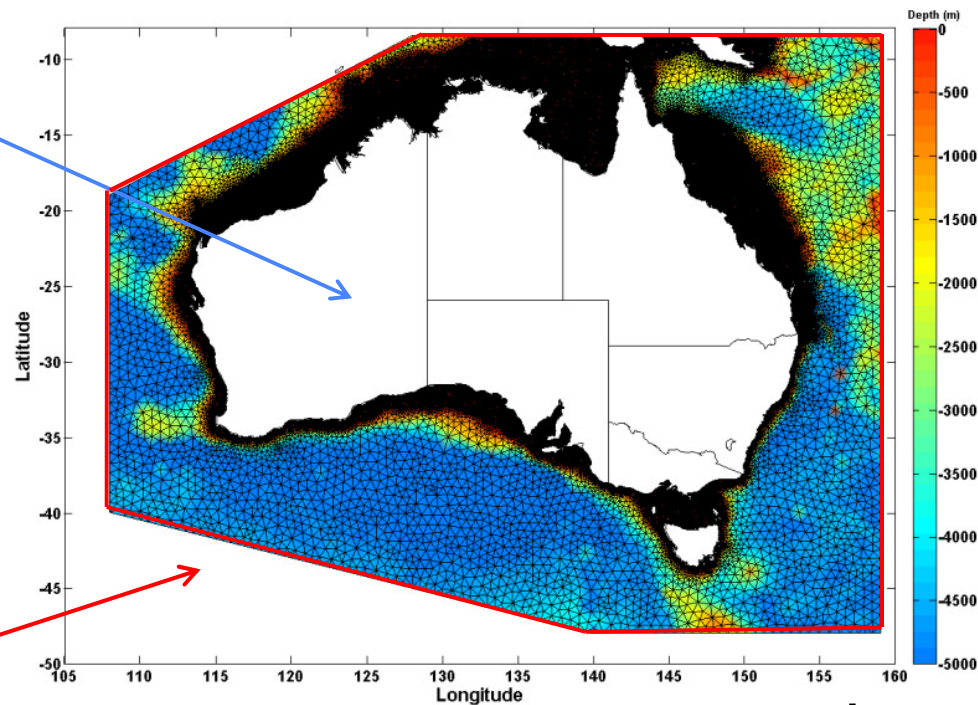
NCEP: 1949-2014



Global tidal model



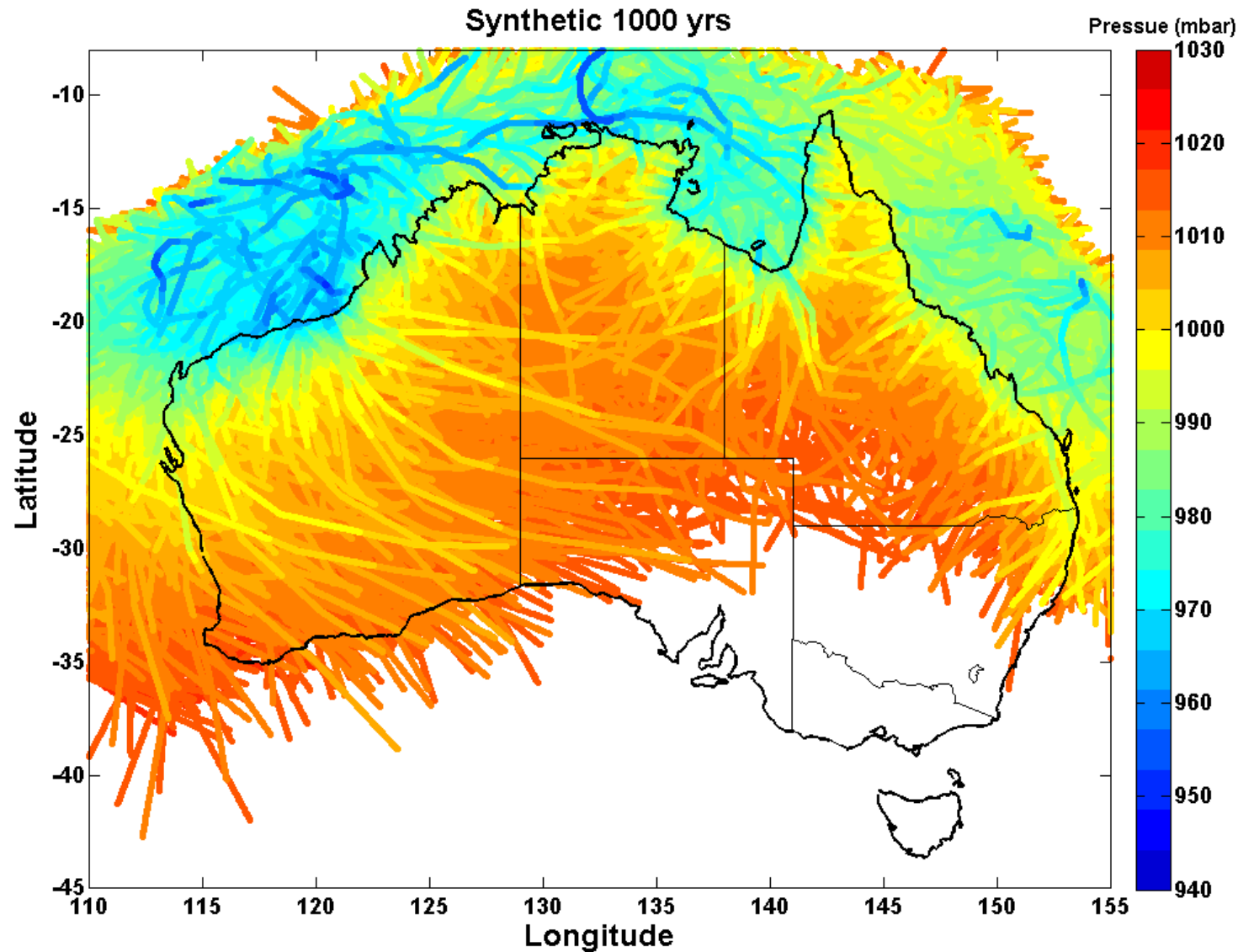
Tropical
Cyclones



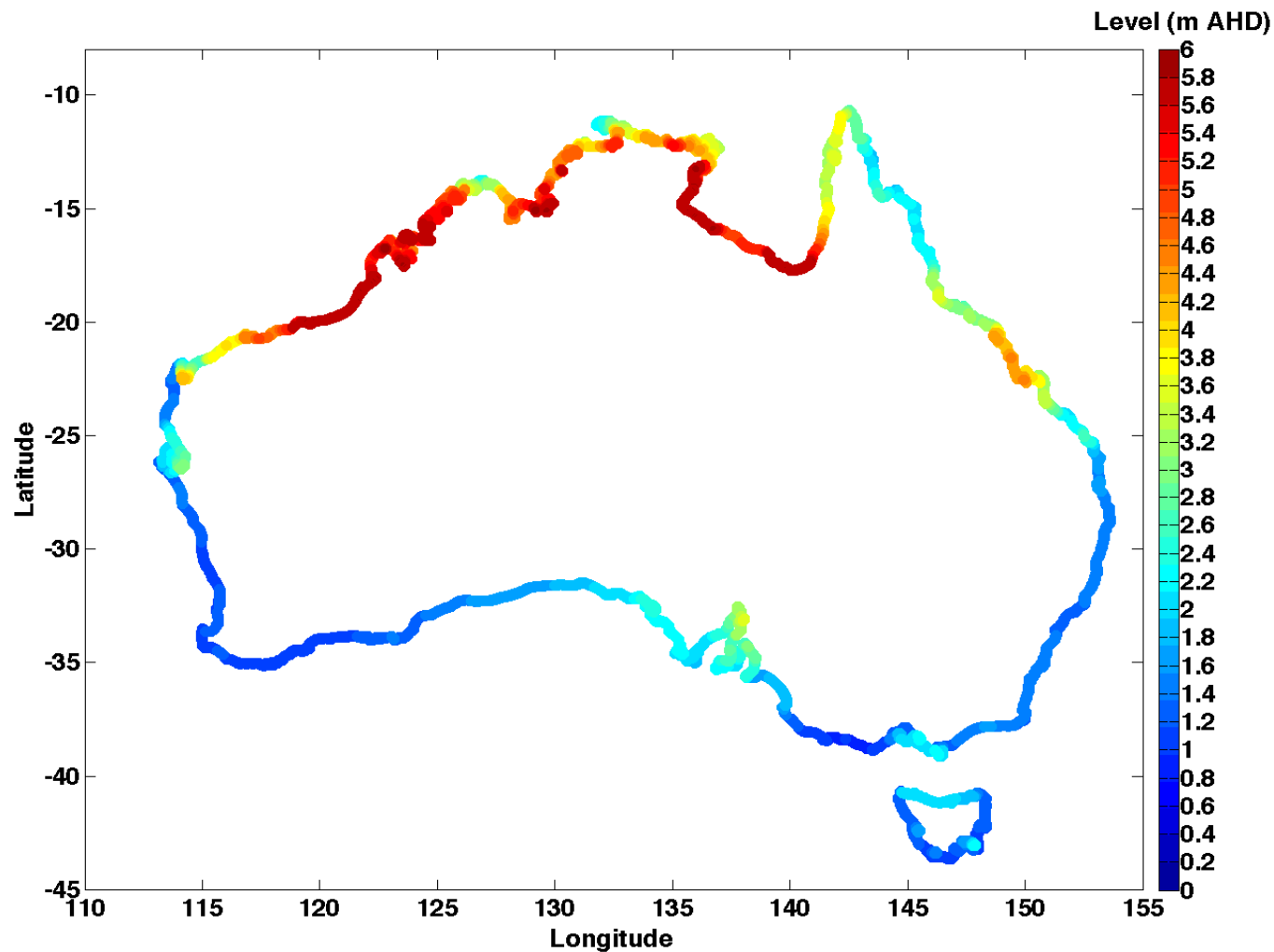
~75,000 simulations
equivalent to 10,000 years

Total Sea level
(~60 year time
series)

Tropical storms – 10,000 year climatology



1:1000ARI: total water level (tropical + extra-tropical)



OBJECTIVES

Develop better predictions and forecasts for extreme water levels arising from:

Tides

Storm surges

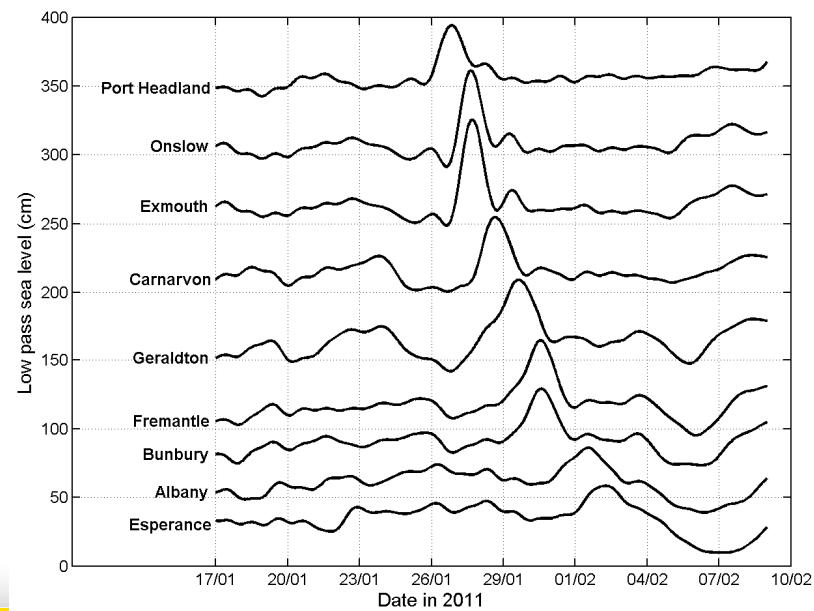
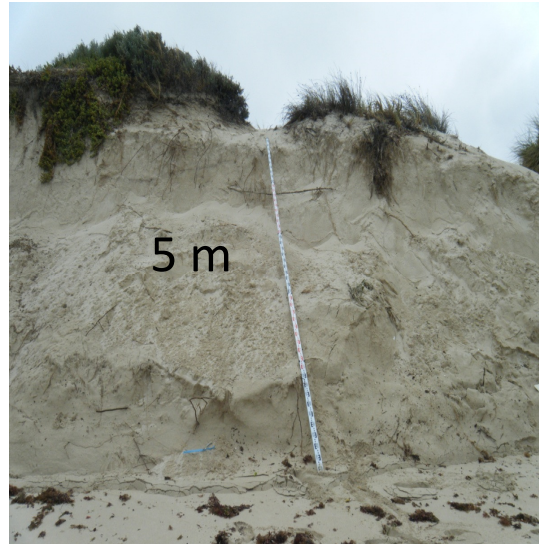
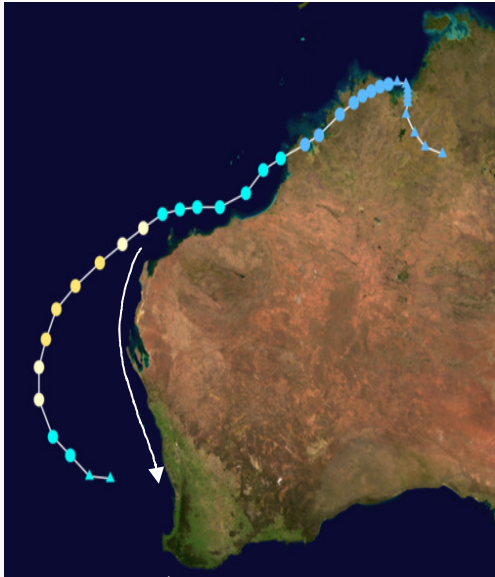
Surface gravity waves

Continental shelf waves

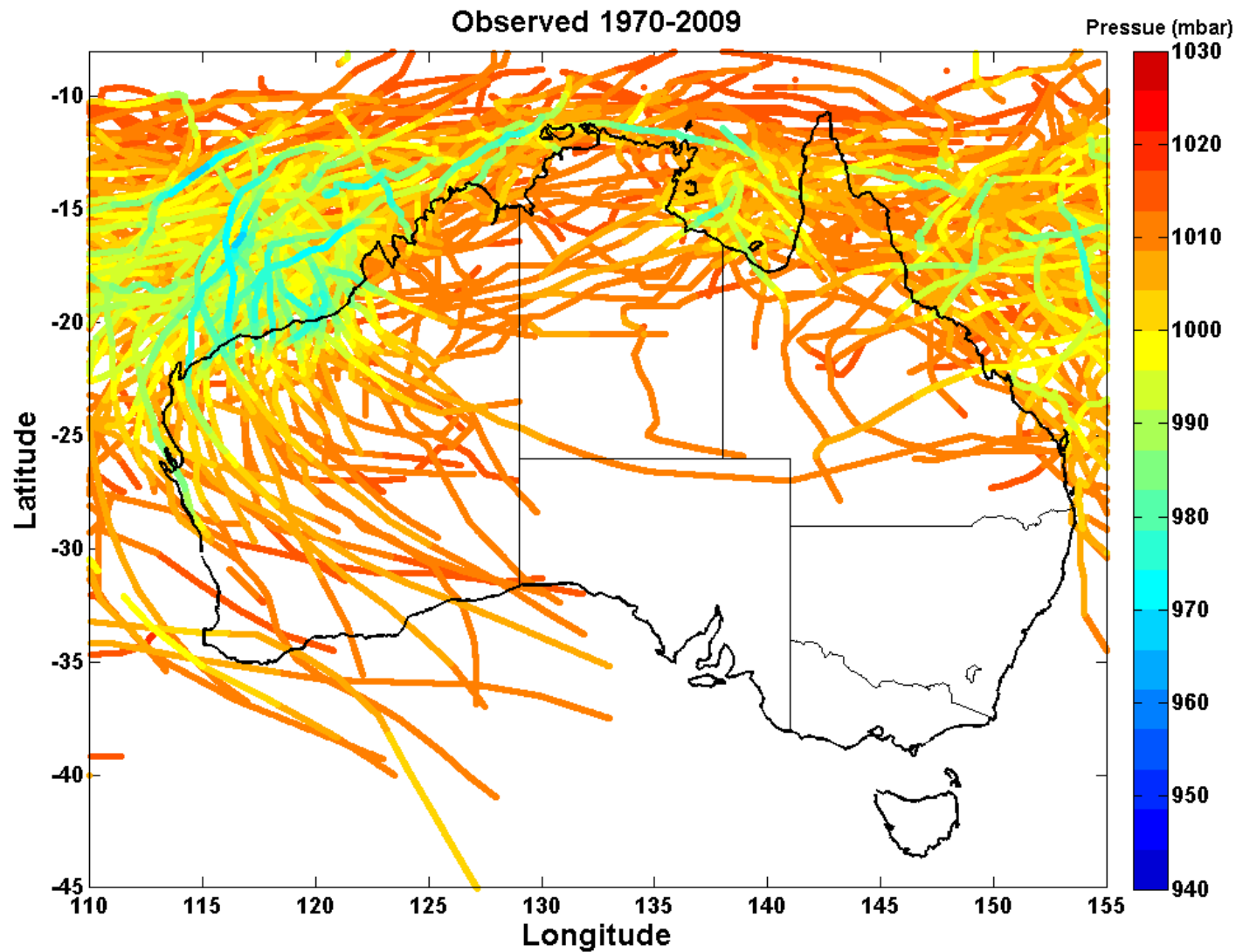
Tsunamis (meteorological)



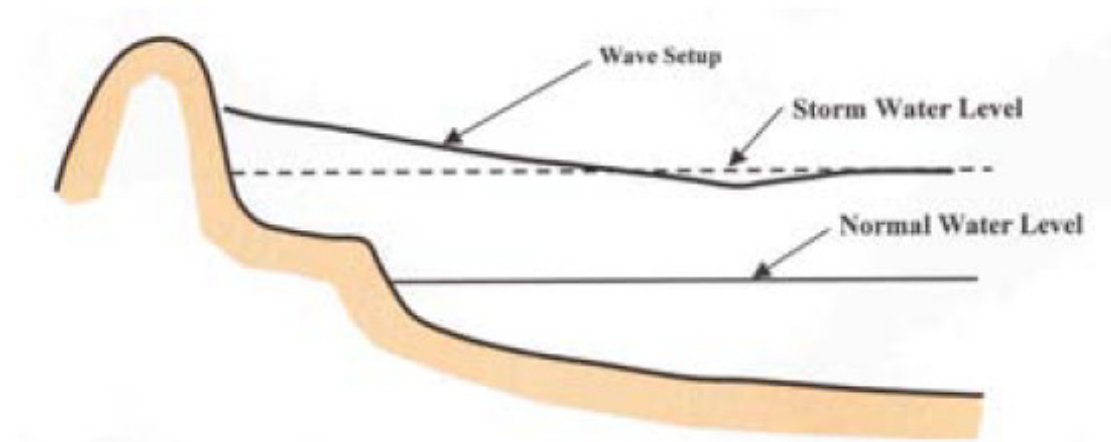
Continental shelf waves



Tropical to extra-tropical cyclone transition



Effects of surface gravity waves

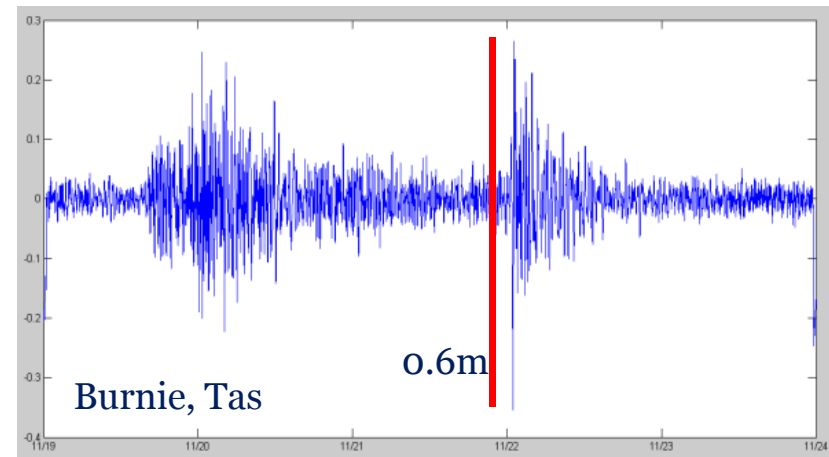
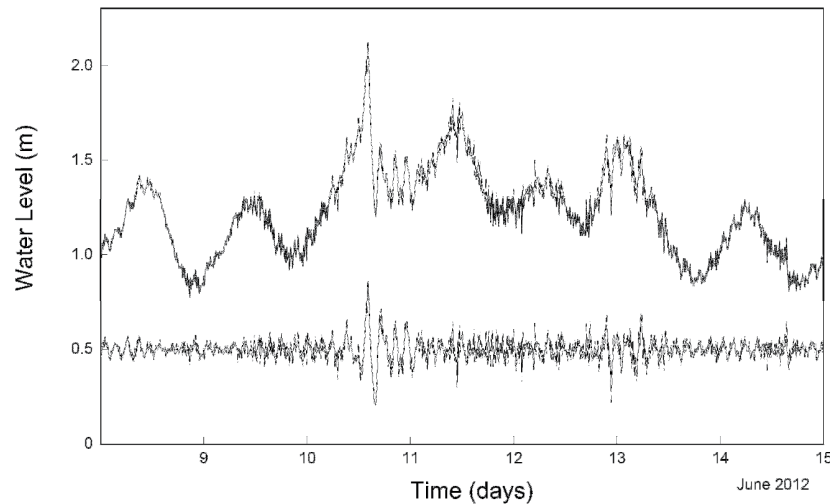
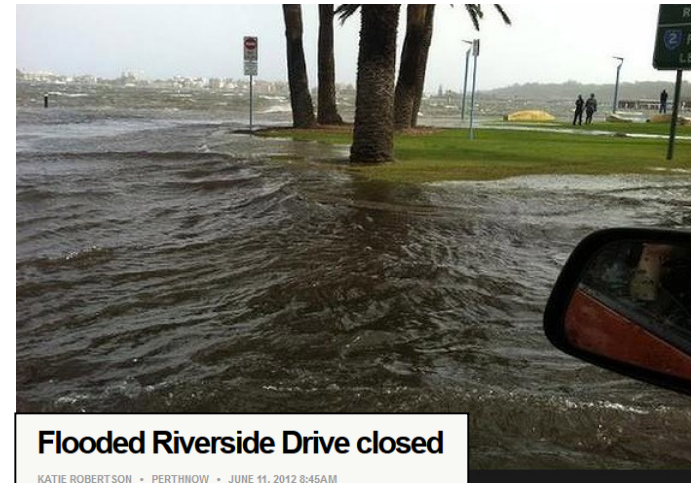
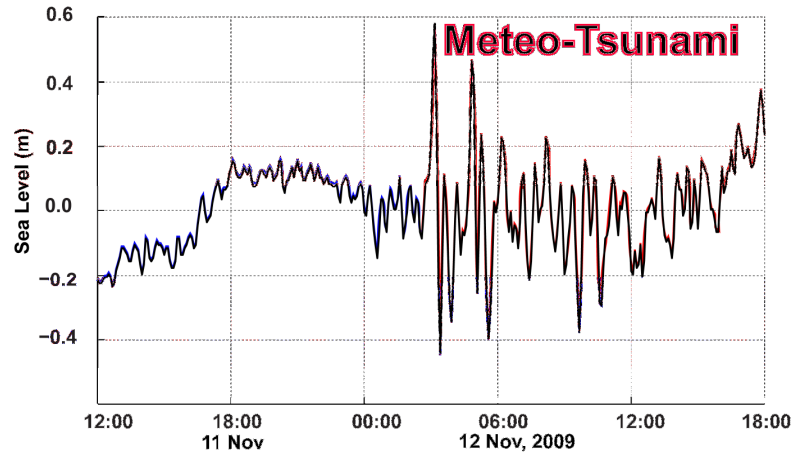


Which regions of Australia are susceptible for wave set-up ?

What coastal types are important ?

Meteo-tsunamis

large amplitude short period sea level oscillations forced by meteorological disturbances

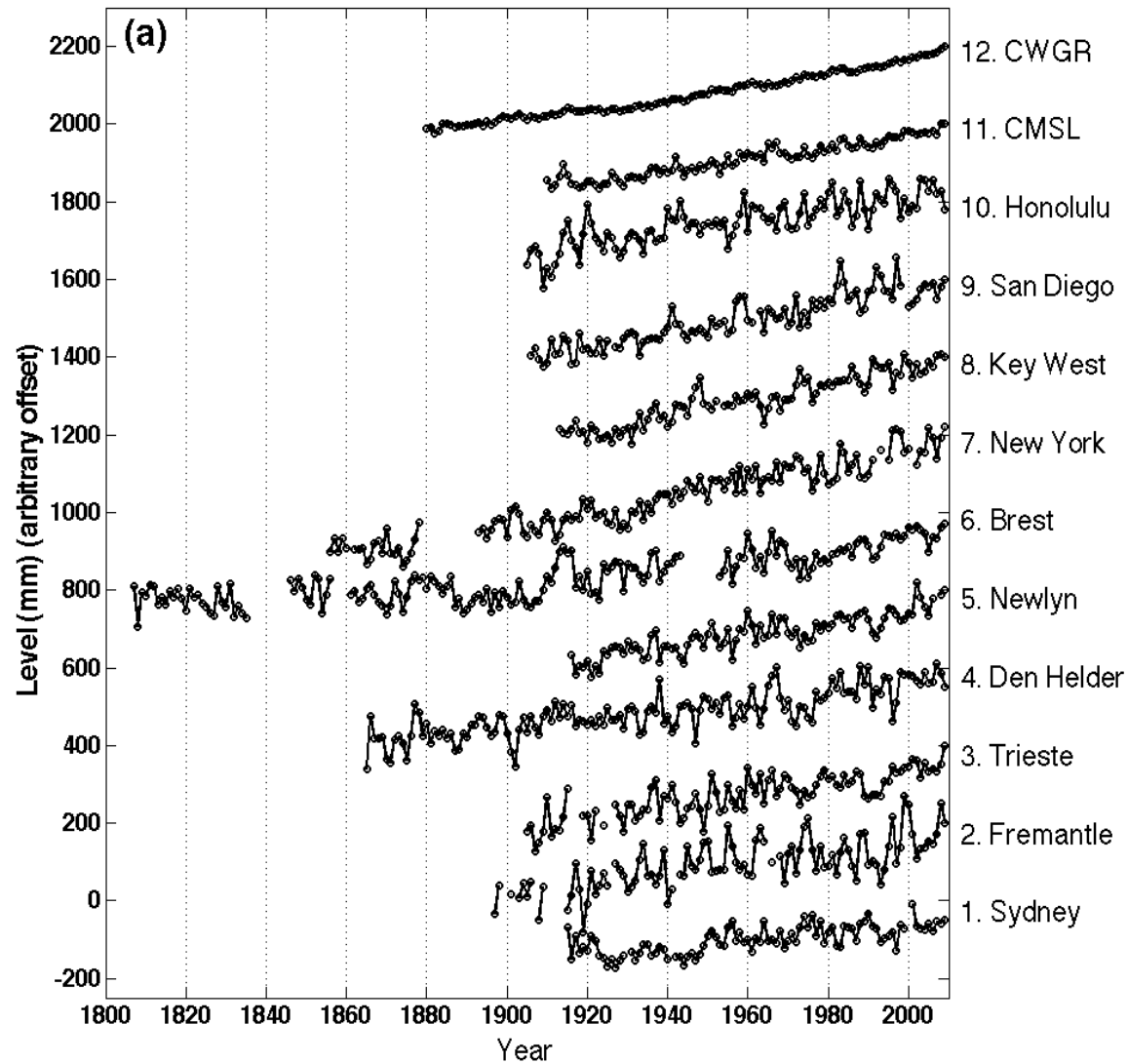


Highest water level recorded in 115 years

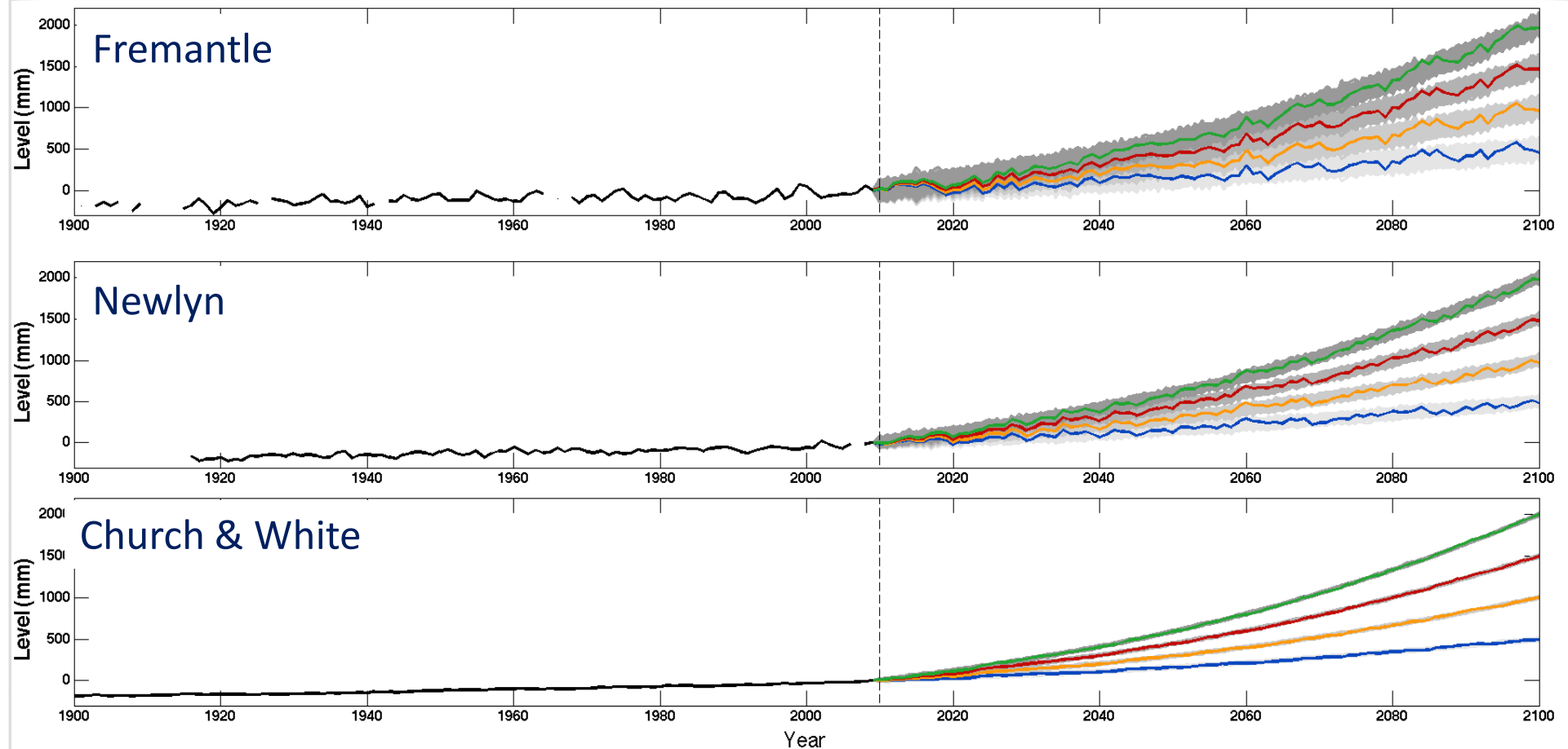
MAJOR OUTCOMES EXPECTED

- Estimates of the extreme water levels around Australia at 2.5 km (model resolution) intervals around the coastline of Australia, to include the effects of: storm surges due to extra-tropical, tropical cyclones and continental shelf waves
- Identify regions where set-up due to surface gravity waves are important
- An assessment of the occurrence of meteorological tsunamis around Australia from existing tide gauge and meteorological records
- The model output generated by the project to be available via web interfaces such as www.sealevelrise.info and/or through the Australian Ocean Data Network (AODN)

Global Mean Sea Level



Global Mean Sea Level – acceleration ?



Global Mean Sea Level – acceleration

- There is a sustained increase in global mean sea level over the 20th Century and early 21st Century.
- The magnitude of the rate of rise currently being observed is consistent with the latest Sea Level budgets.
- It will be several decades before a discernable sea level rise acceleration in individual TG records are detected mainly due to inter-annual to multi-decadal variability
- Accelerations significantly different current values are unlikely to be detected in individual TG records until later this decade or early next decade