Predicting extreme water levels around Australia

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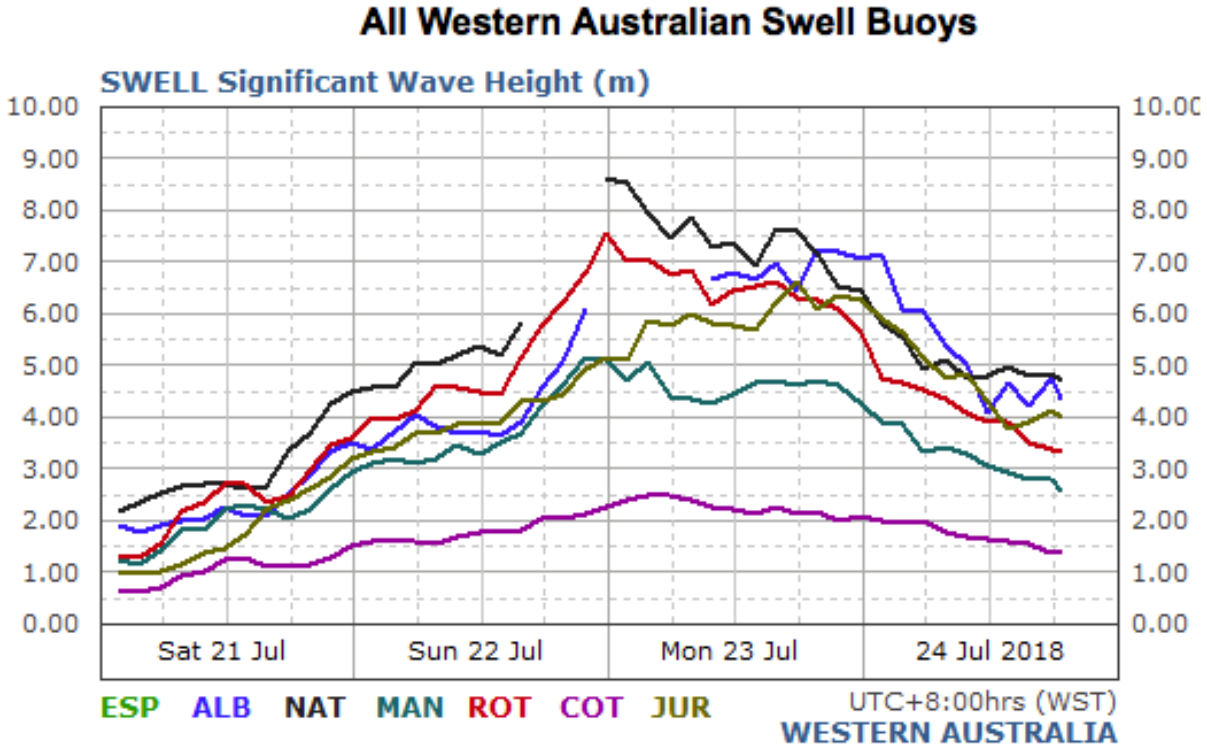
Bushfire and Natural Hazards CRC, Melbourne, Vic

2018: south-west Australia



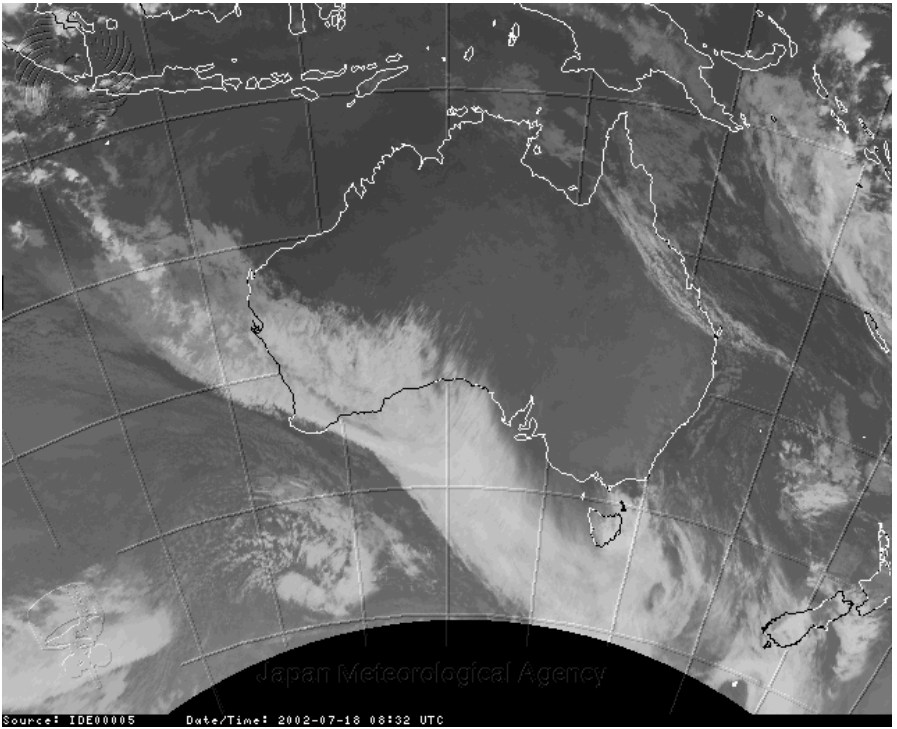
Images Courtesy: Coastal Data Centre

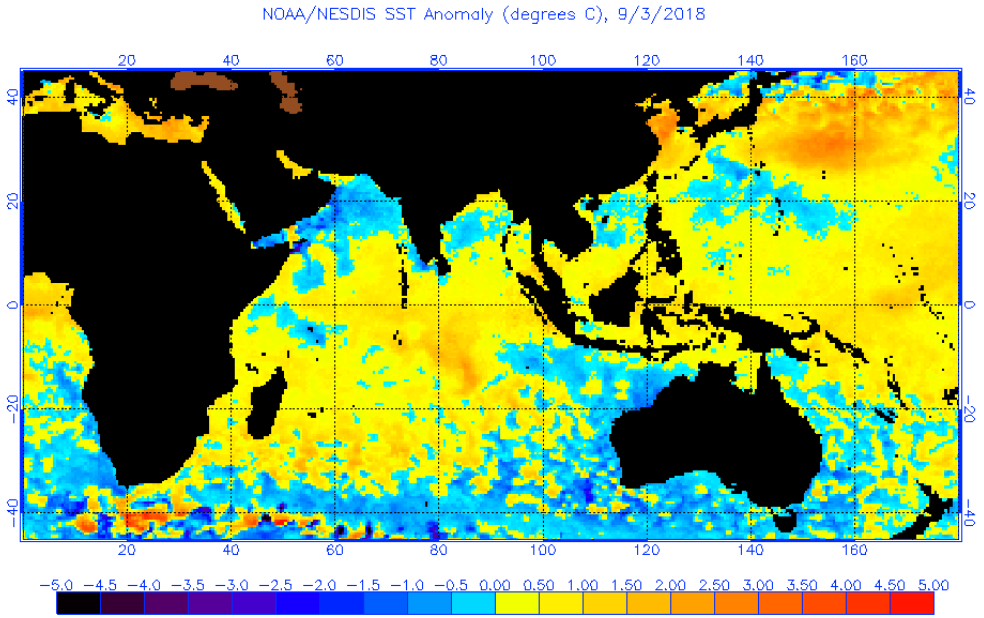
August since 1965

ms whip up massive swells in south

cer | PerthNow
2:01AM

2018: north-west cloud bands





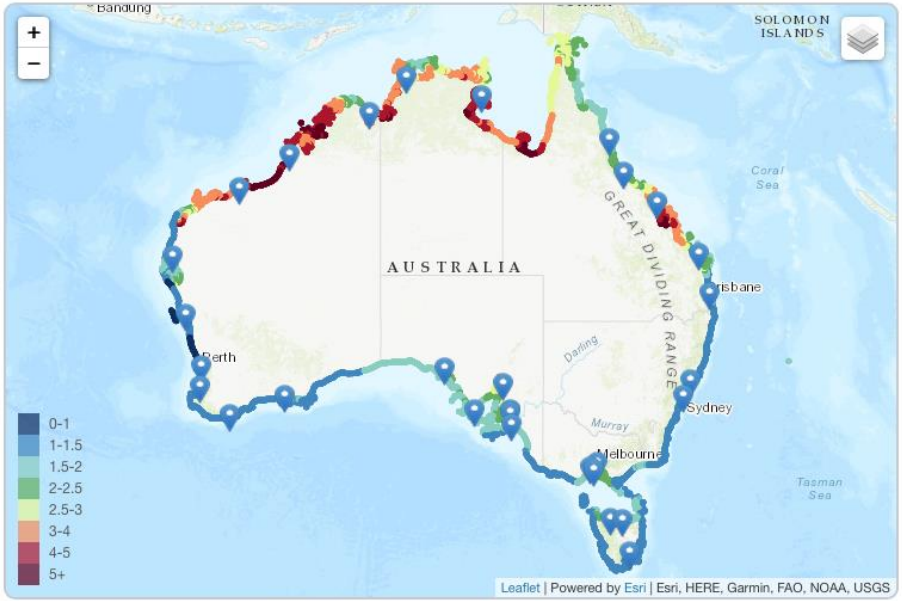
Objectives

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

Tides
Storm surges
Surface gravity waves
Continental shelf waves
Tsunamis (meteorological)

Output: 59 year time series of water levels around Australia, ARI values

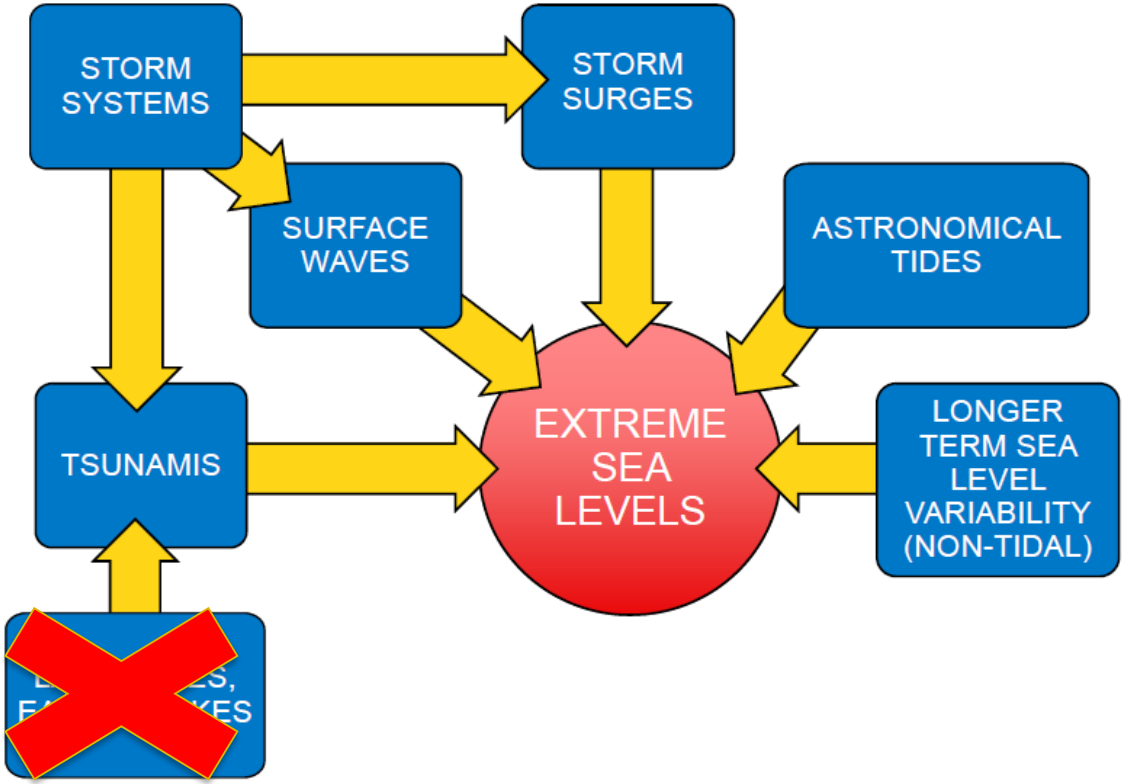
Deliverables



Colour scale: 100 year ARI in metres above Australian Height Datum (AHD)

- BNHCRC project “Developing better predictions for extreme water levels”
- 59 year hourly sea level hindcast
- Extreme Value Analysis
- Website: 100 yr ARI 2 km spacing @coast

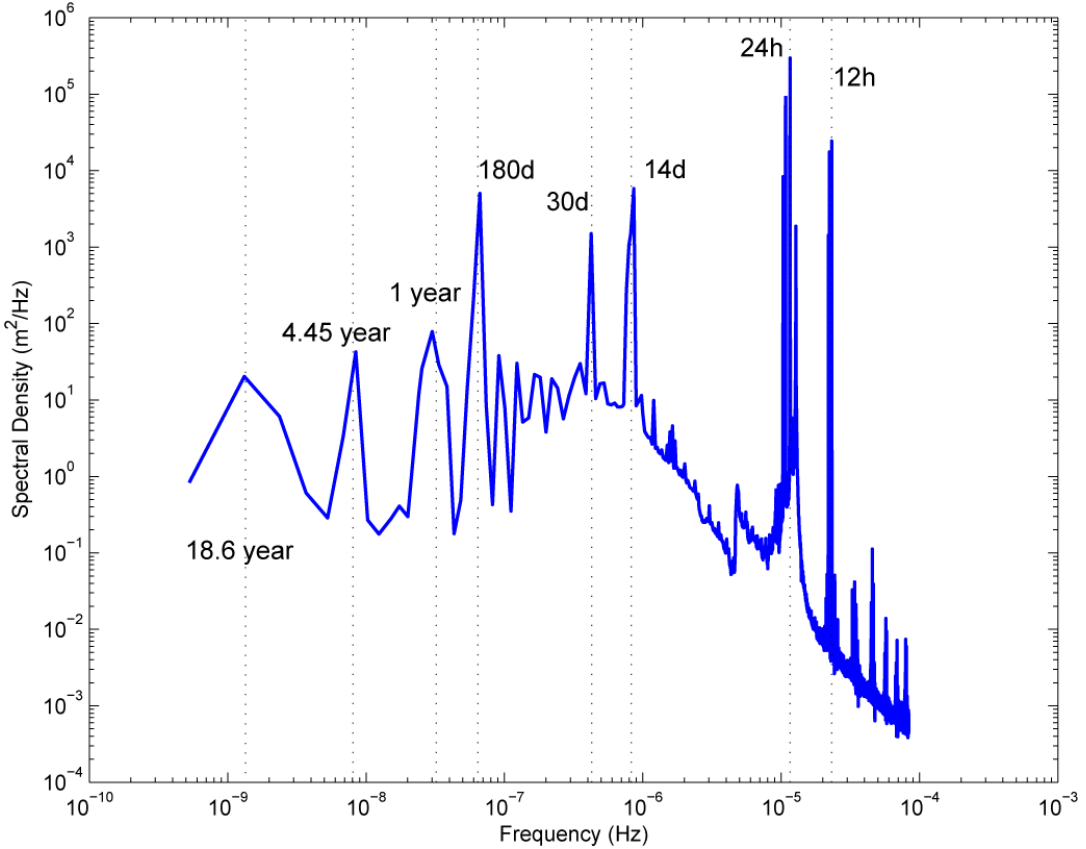
Extreme sea levels



Climate Council
@climatecouncil
Follow

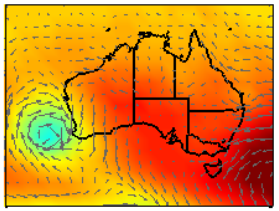
Australians Recovering From 15th 'Once In A Lifetime' Disaster bit.ly/1PCownN @SBSComedy #SydneyStorms 😂😂😂

Fremantle Tide Spectrum1950-2010

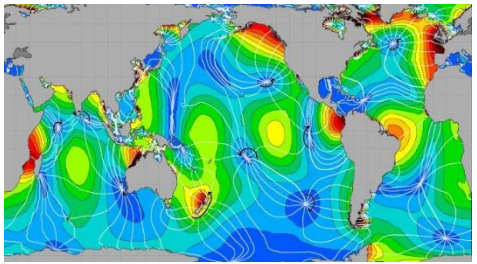


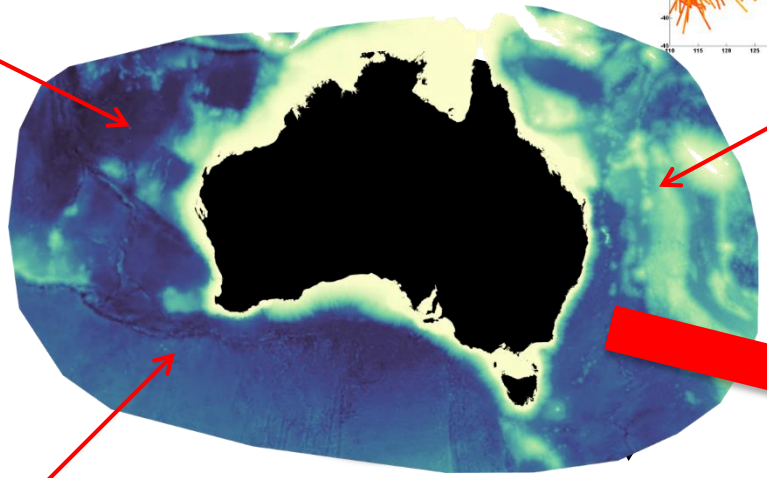
Model forcing

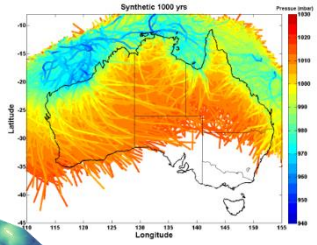
JRA55: 1958-2016



Global tidal model







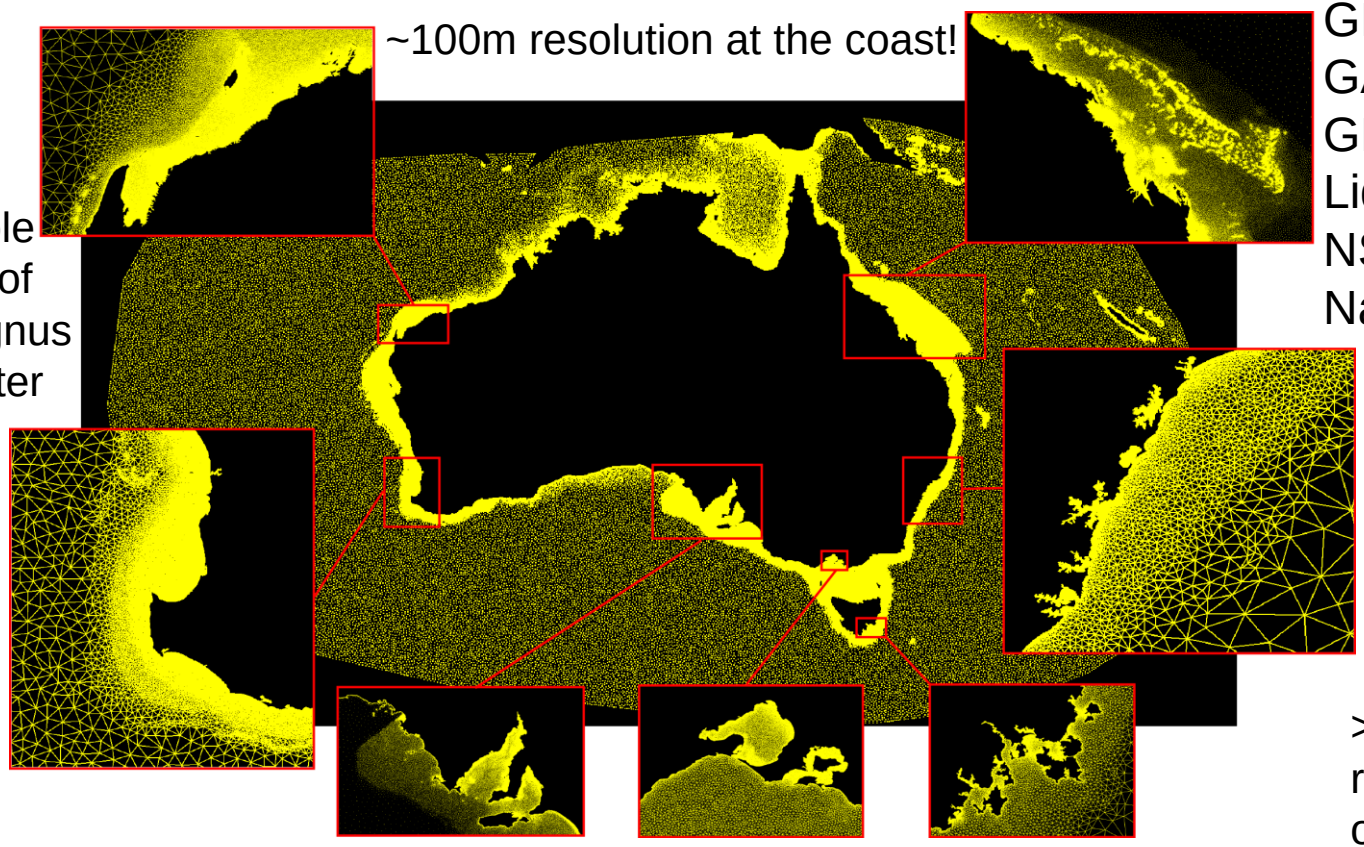
Tropical Cyclones

Total sea level

(~59 year time series)

Unstructured model - SCHISM

~100m resolution at the coast!

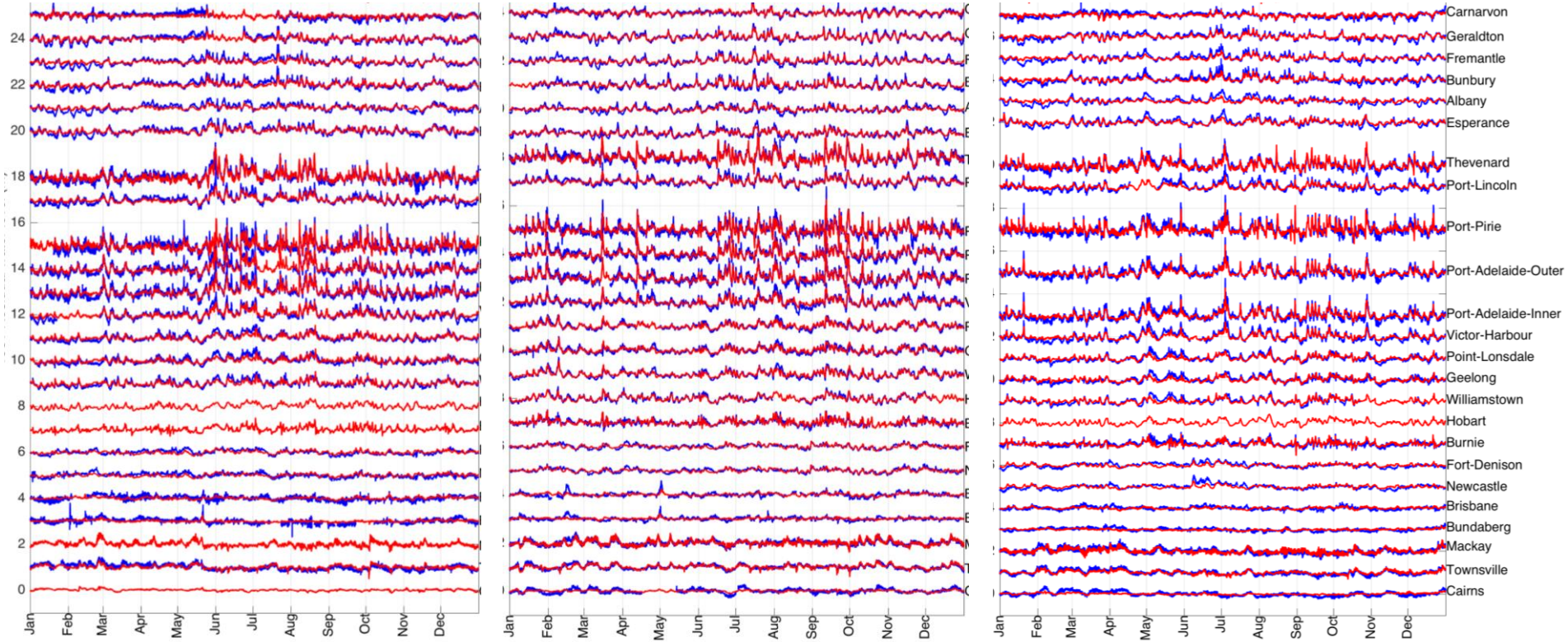


GEBCO
GA 250 m
GBR 100m
Lidar
NSW wave
Nautical charts

Made possible through use of Pawsey Magnus supercomputer

> 10km resolution offshore

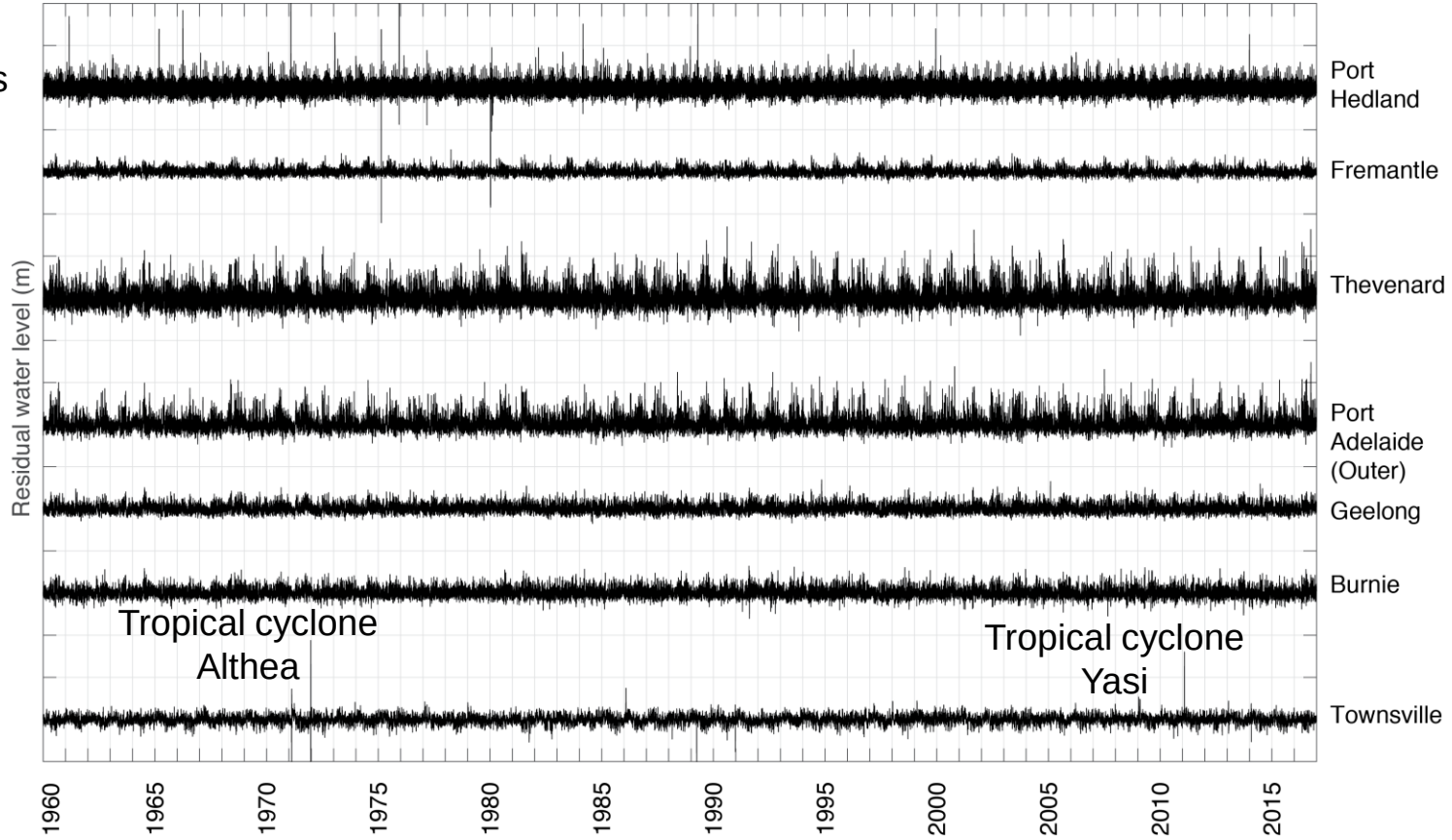
Sea levels, skill >0.9



1981 1996 2007

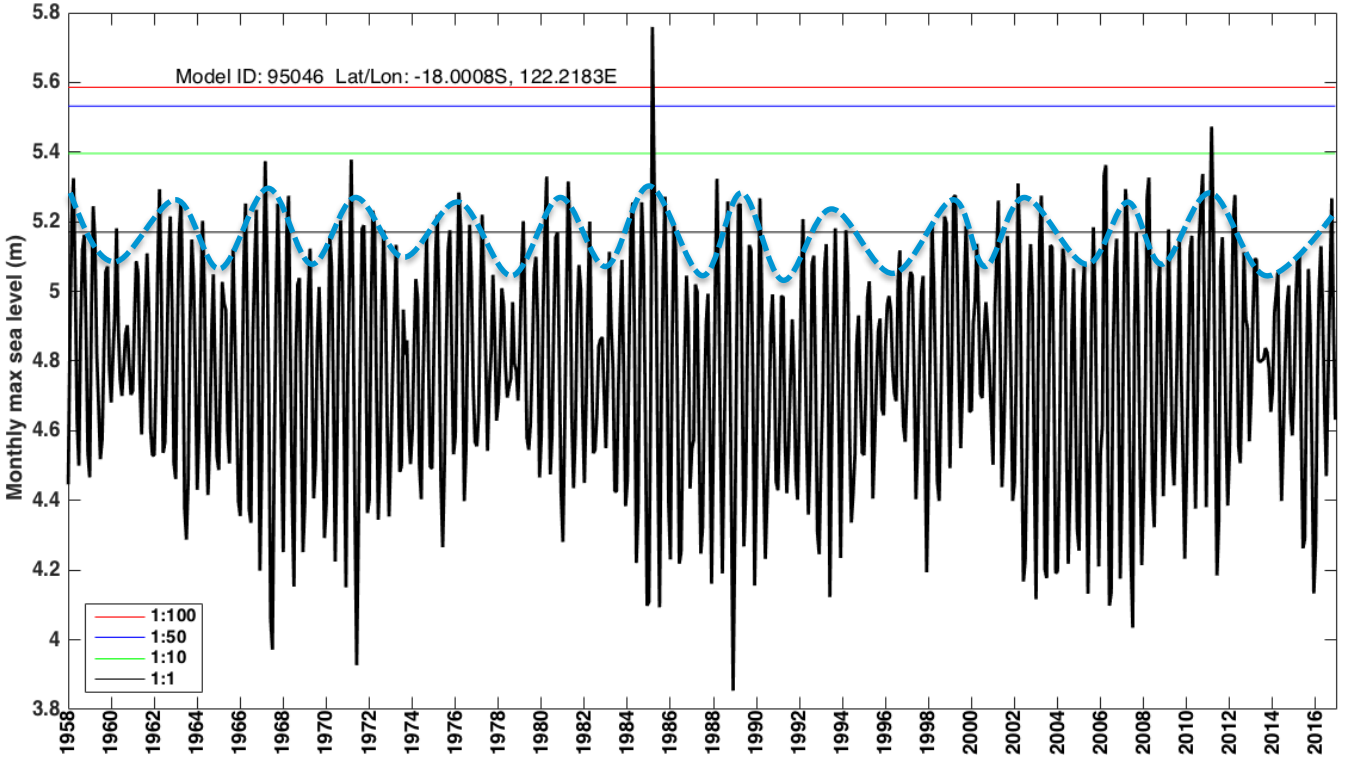
obs
pred

Results: 59 year sea level hindcast (1958-2016)



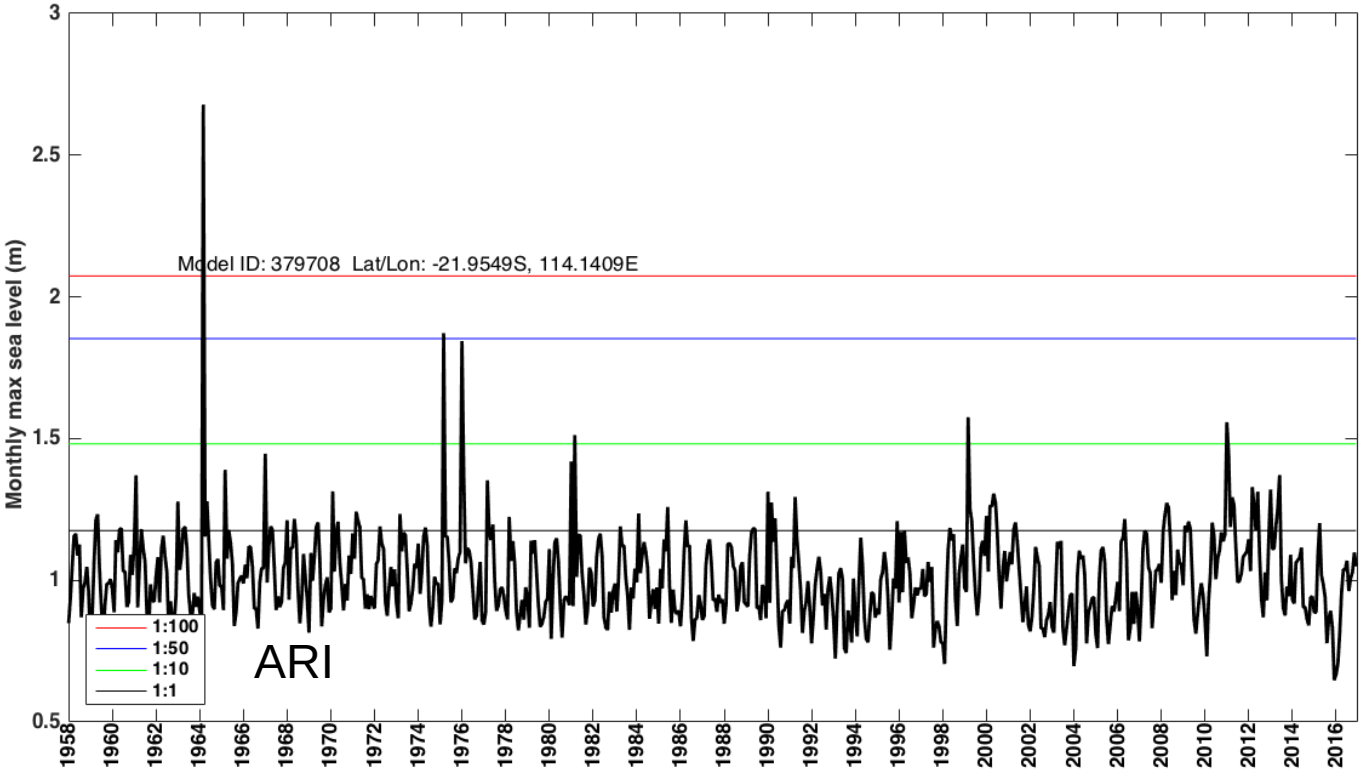
Extreme sea levels – a range of processes

4.4 yr Tidal cycle



Strong tidal influence + Tropical cyclones

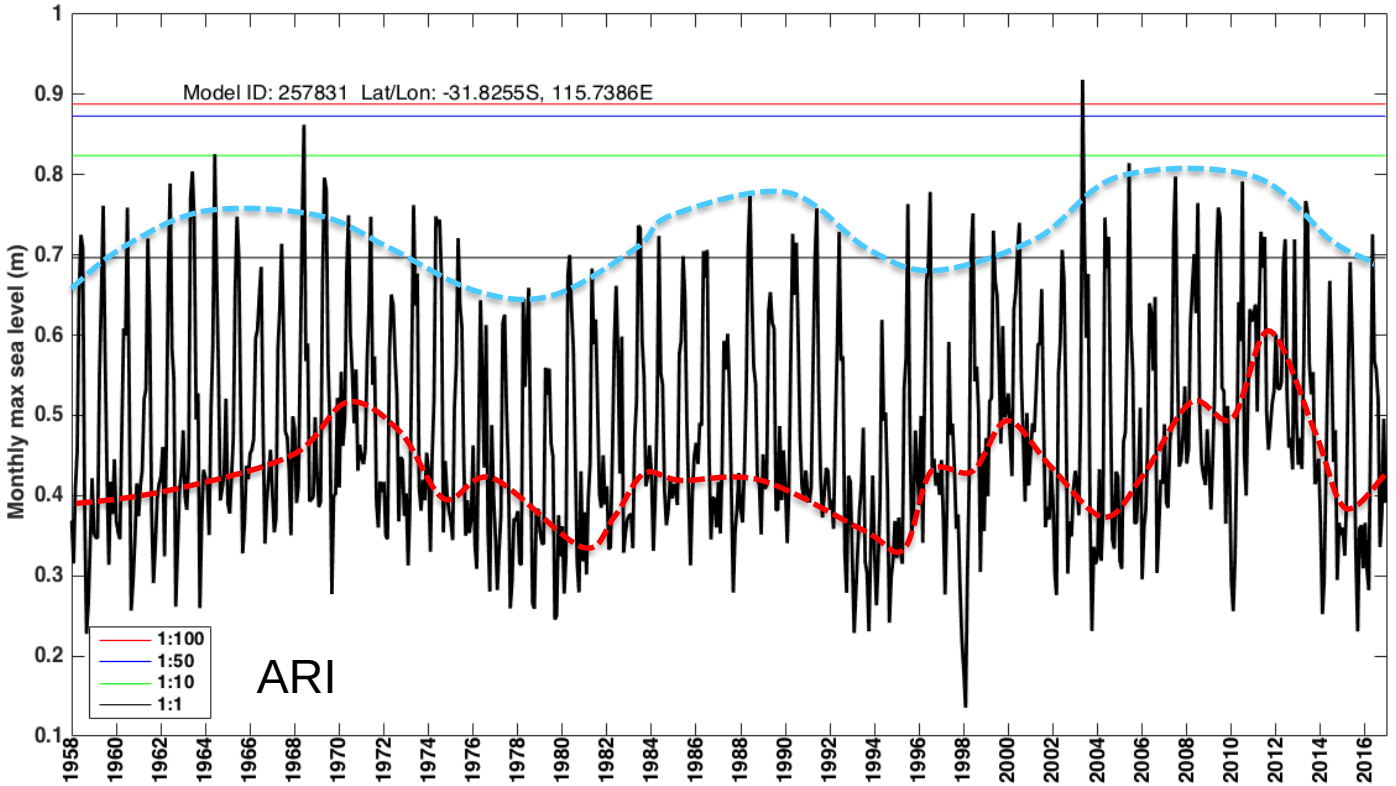
Extreme sea levels – a range of processes



Tropical Cyclones

Rare but extreme

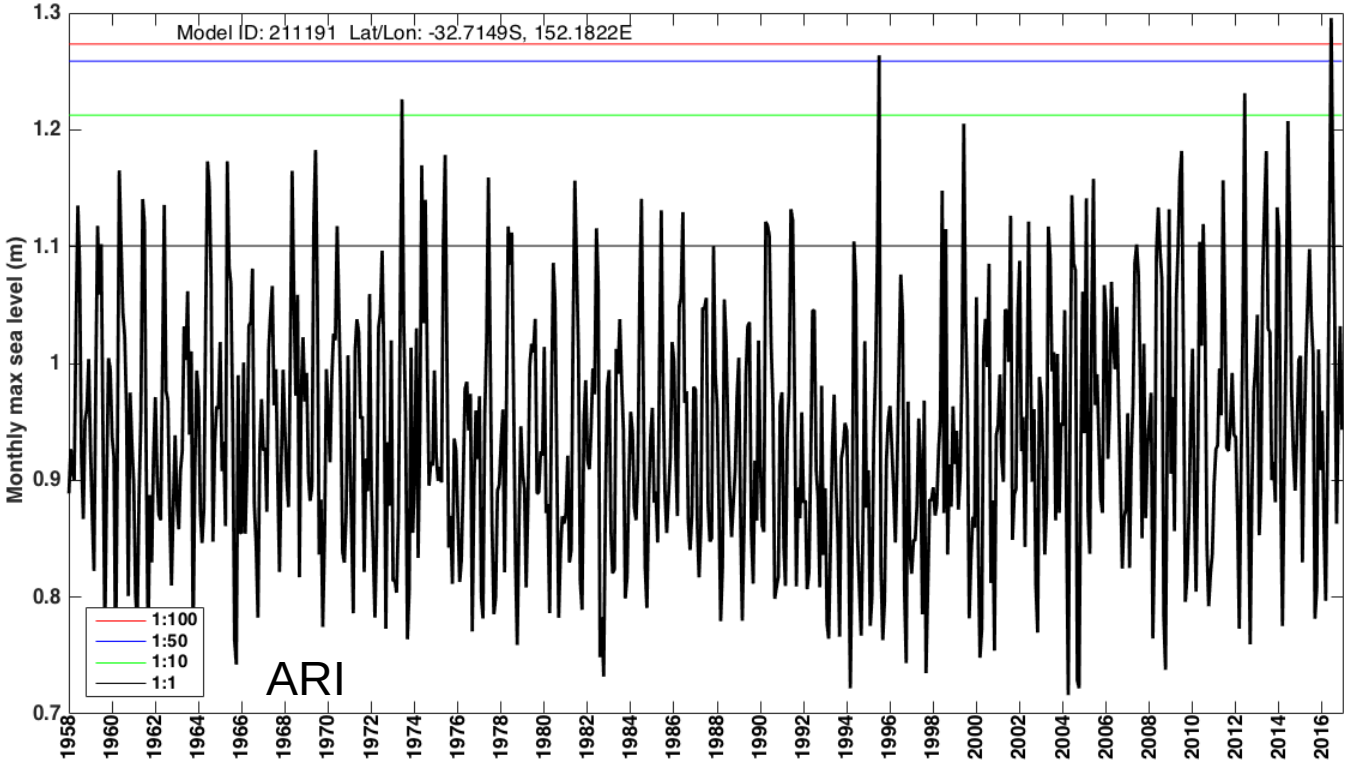
Extreme sea levels – a range of processes



18.6 yr
tidal cycle

ENSO

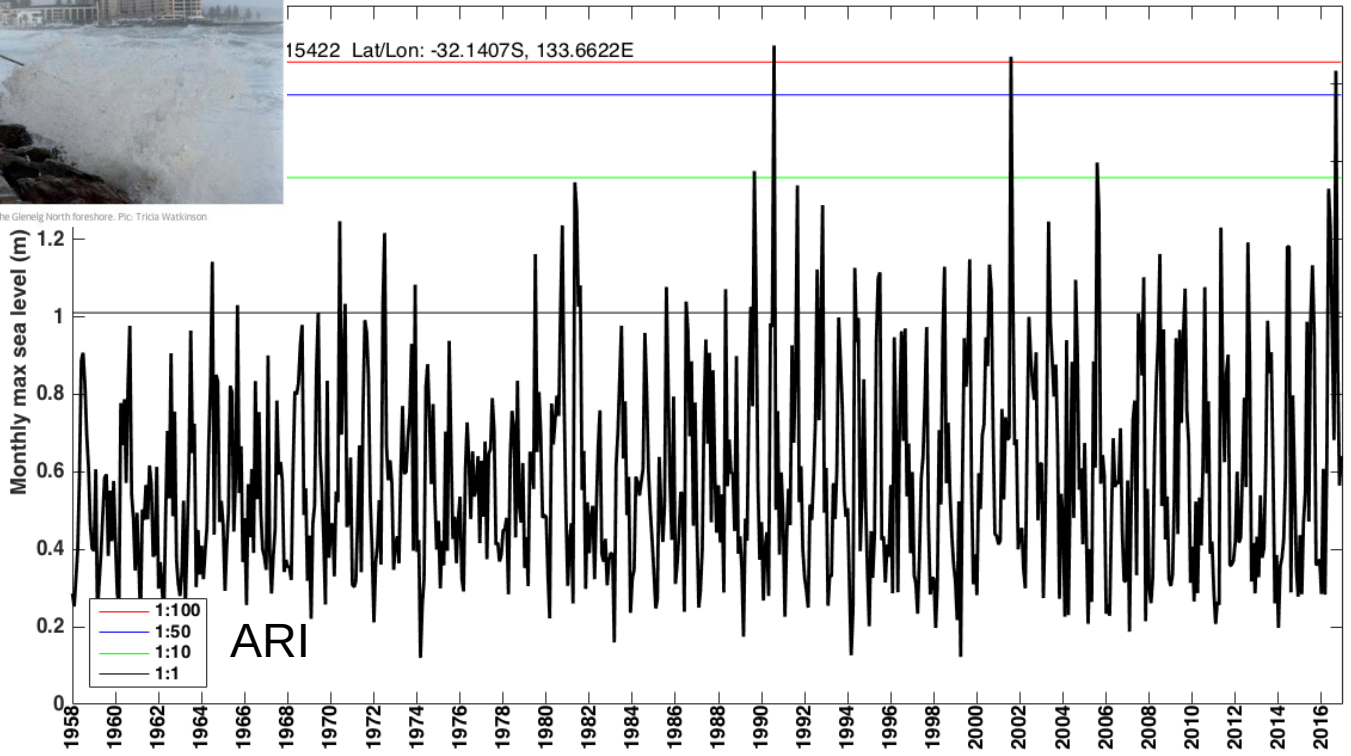
Extreme sea levels – a range of processes



East Coast Lows

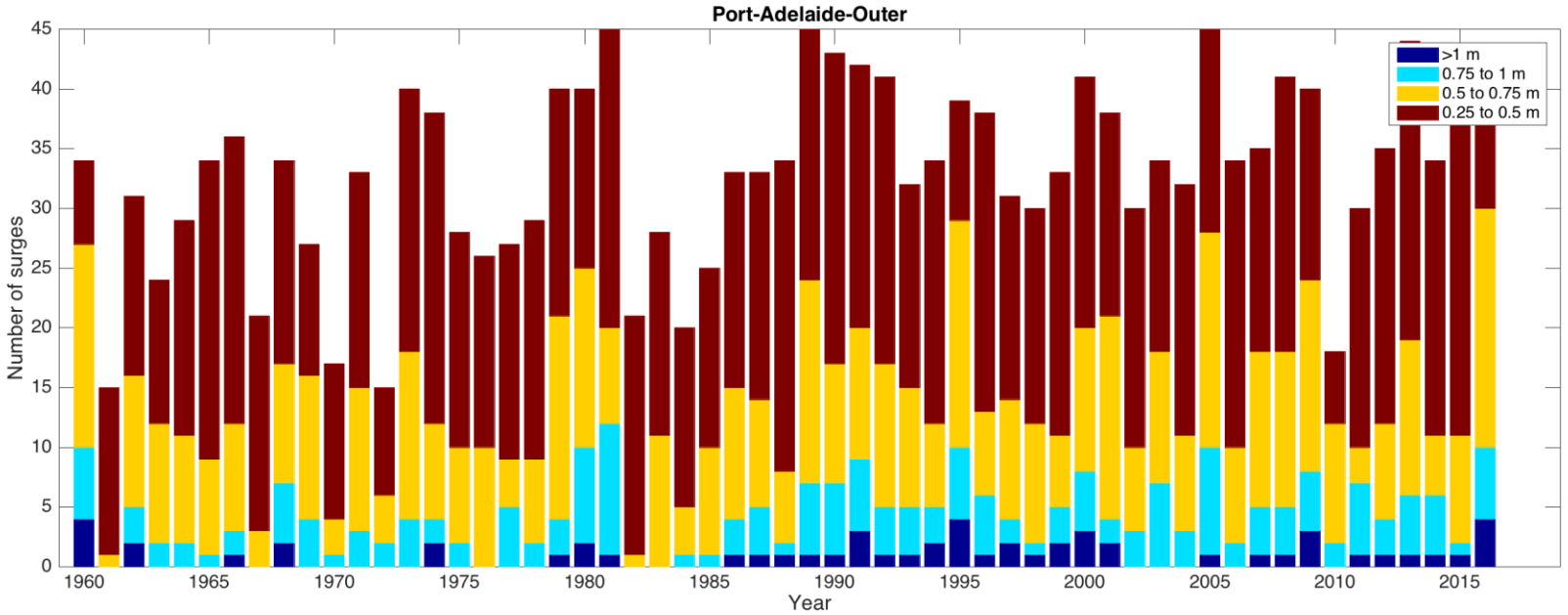
Extreme sea levels – a range of processes

Sandra Storey checks out the waves at the Glenelg North foreshore. Pic: Tricia Watkinson



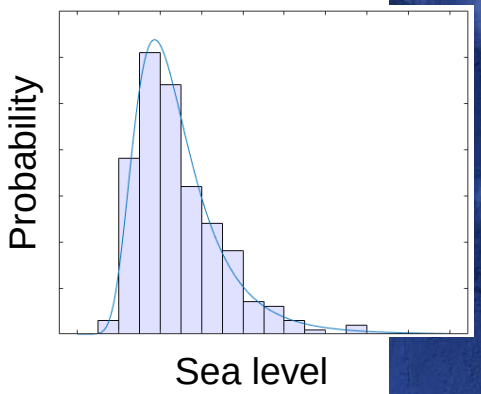
Winter
storm surge
+
Fortnightly tide

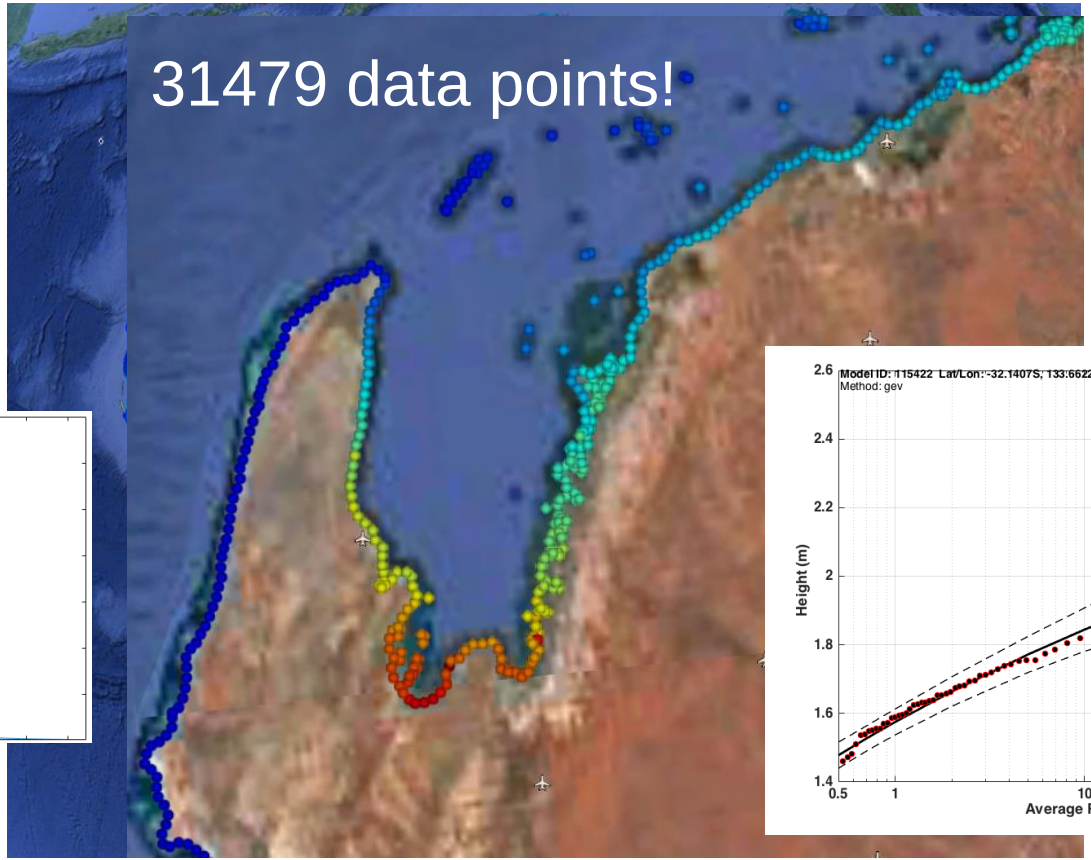
Storm surge counts



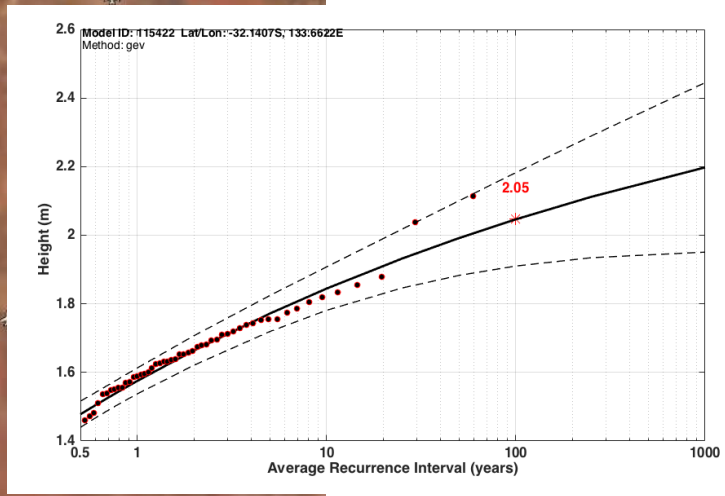
Extreme value analysis – 2km spacing

Extreme Value analysis





100 year Average Recurrence Interval (ARI)



Website: ozsealevelx.org

EXTREME SEA LEVELS IN AUSTRALIA

bushfire&natural HAZARDSCRC

THE UNIVERSITY OF WESTERN AUSTRALIA

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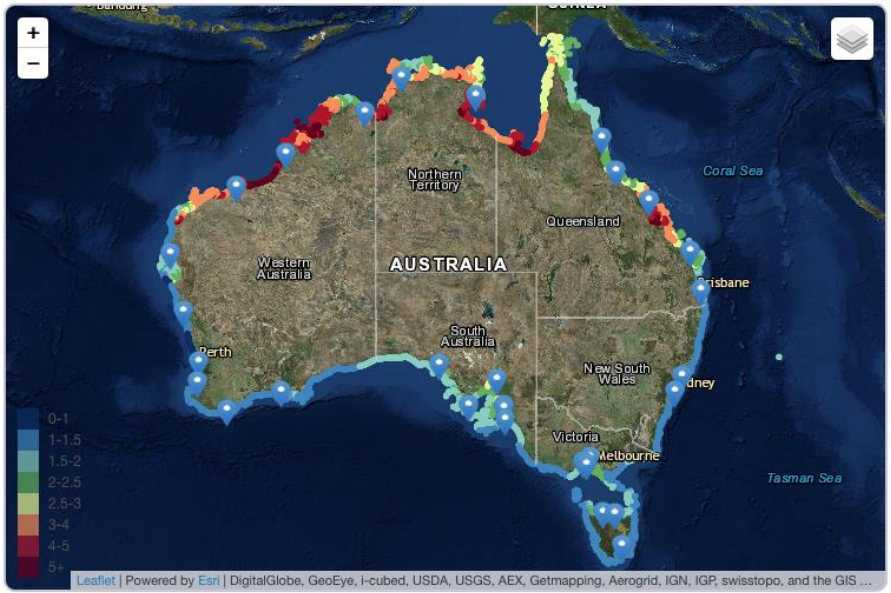
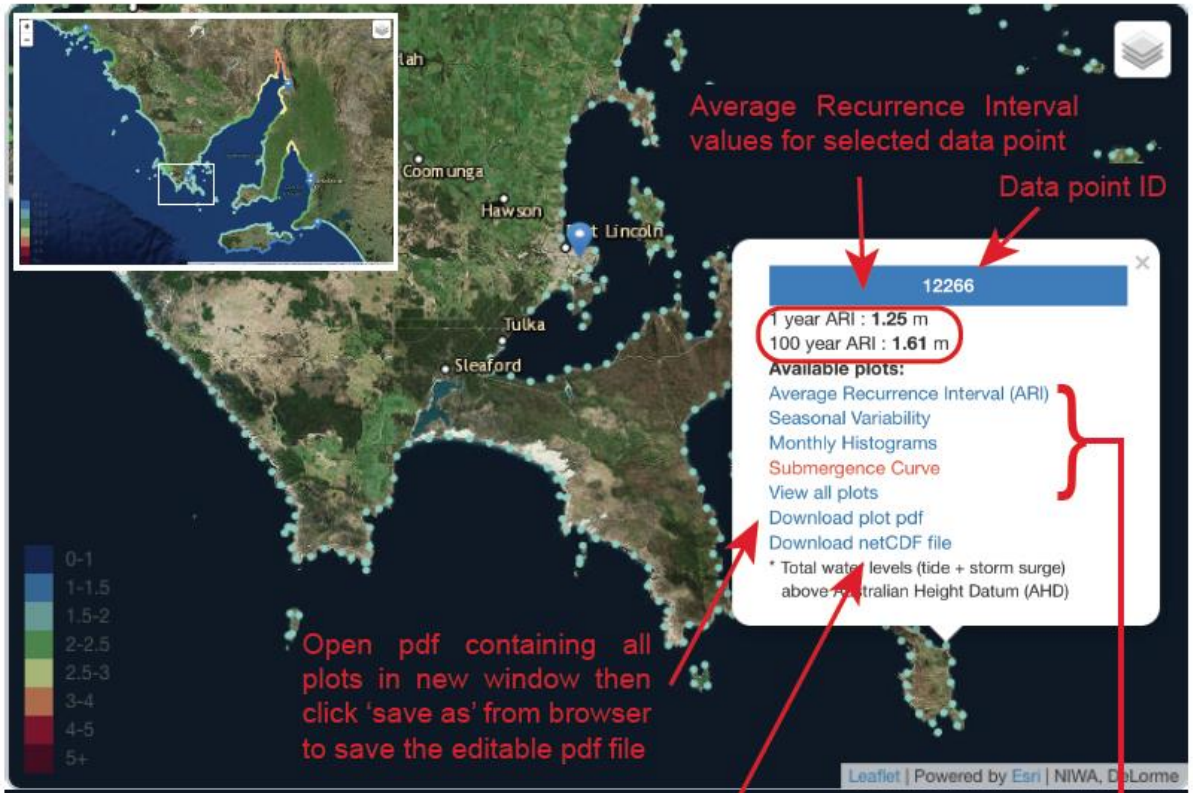


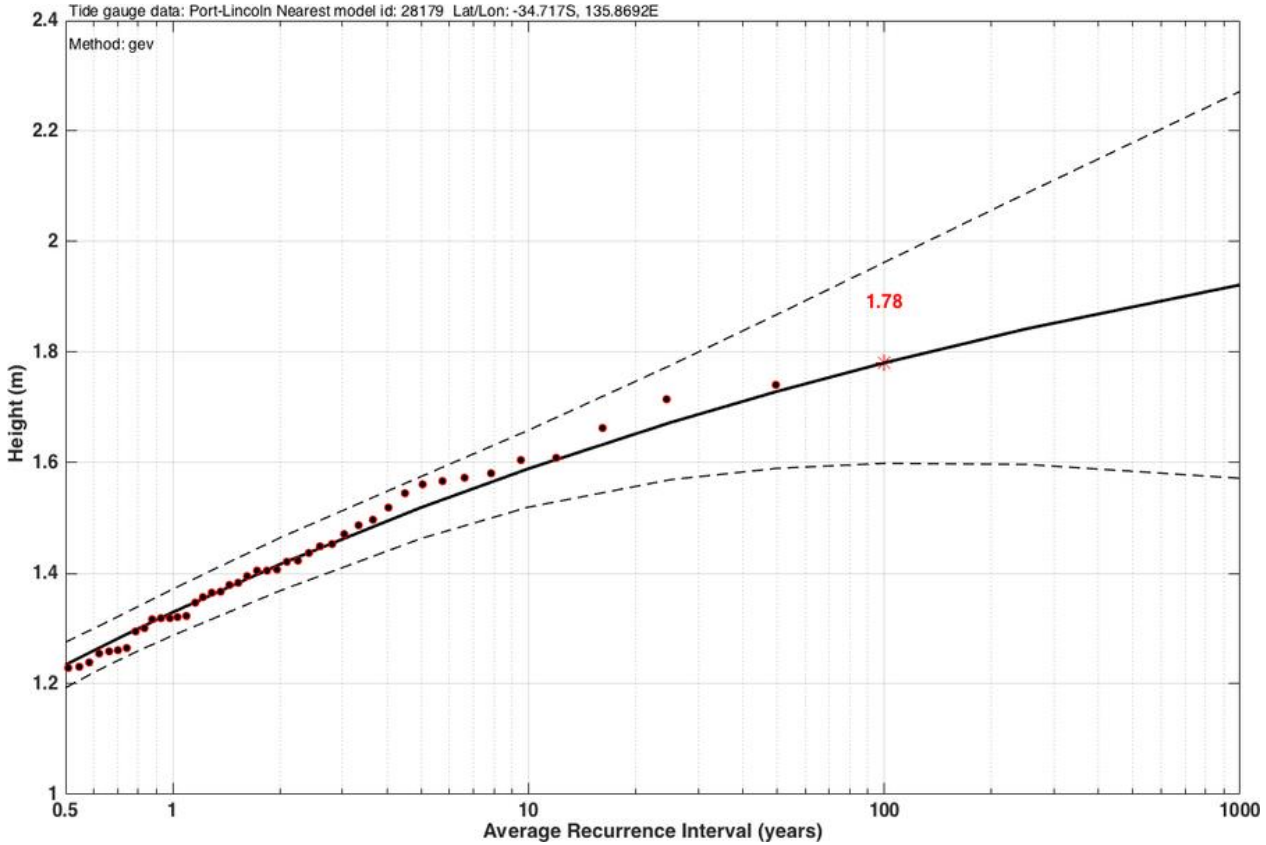
Colour scale: 100 year ARI in metres above Australian Height Datum (AHD)

Predicted extreme sea level statistics around Australia

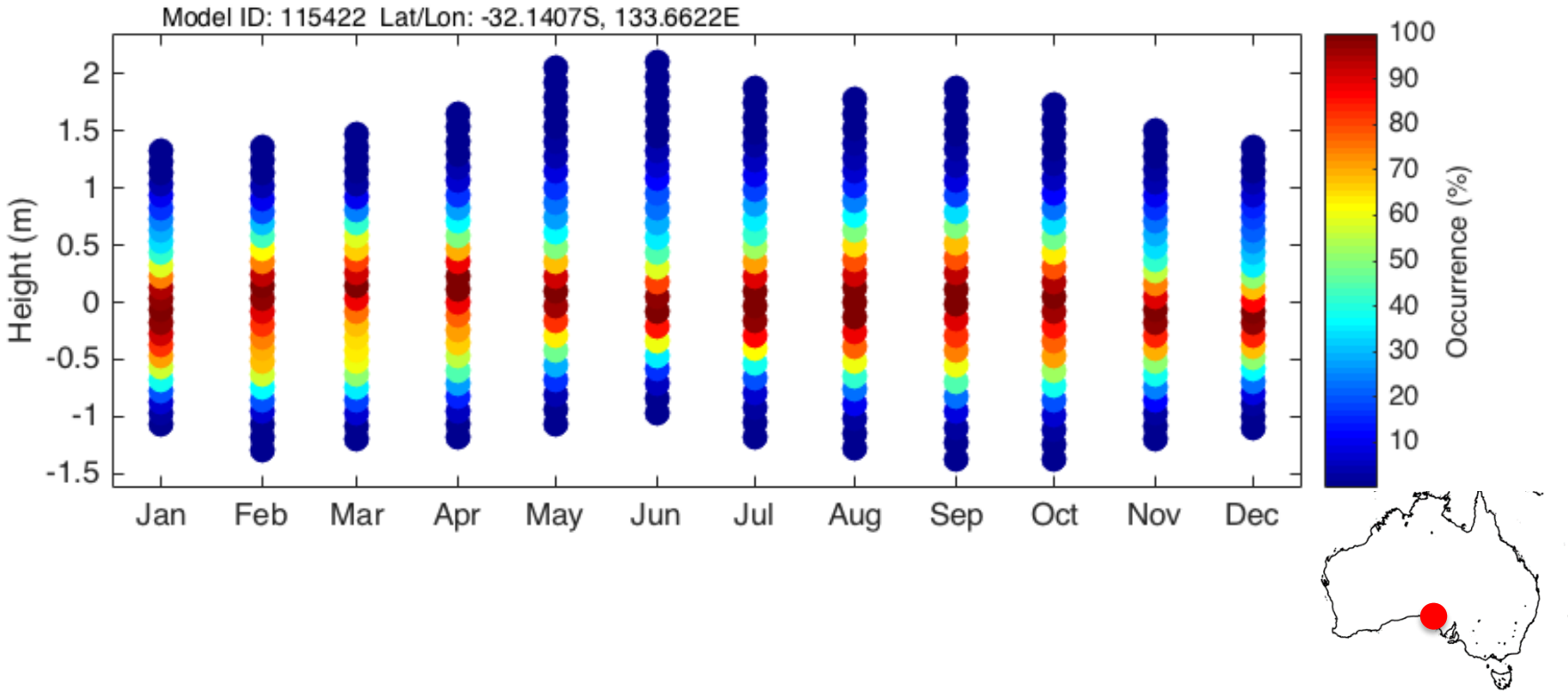
Click on coastal data points to access the statistics, including present day 100 year Average Recurrence Interval (ARI) levels, historical and seasonal variability derived from the numerical model. Blue markers contain data derived from measurements at 29 tide gauge sites.


Average Recurrence Interval values for selected data point
Data point ID
12266
1 year ARI : 1.25 m
100 year ARI : 1.61 m
Available plots:
Average Recurrence Interval (ARI)
Seasonal Variability
Monthly Histograms
Submergence Curve
View all plots
Download plot pdf
Download netCDF file
* Total water levels (tide + storm surge) above Australian Height Datum (AHD)
Coomunga
Hawson
Lincoln
Tulka
Sleaford
0-1
1-1.5
1.5-2
2-2.5
2.5-3
3-4
4-5
5+
Leaflet | Powered by Esri | NIWA, DeLorme
Open pdf containing all plots in new window then click 'save as' from browser to save the editable pdf file
Click here to download a netCDF file containing model hourly time series data used to calculated the ARIs
View individual plots for this location in popup window

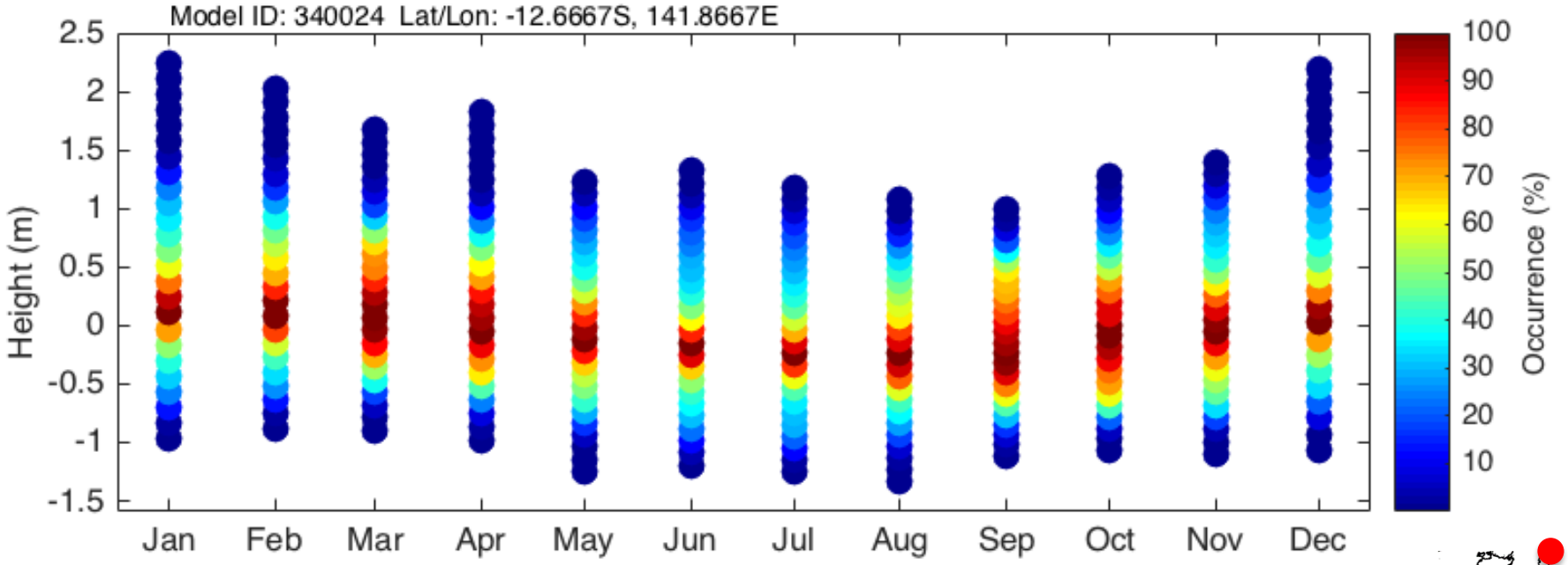
Average Recurrence Interval (ARI) curves



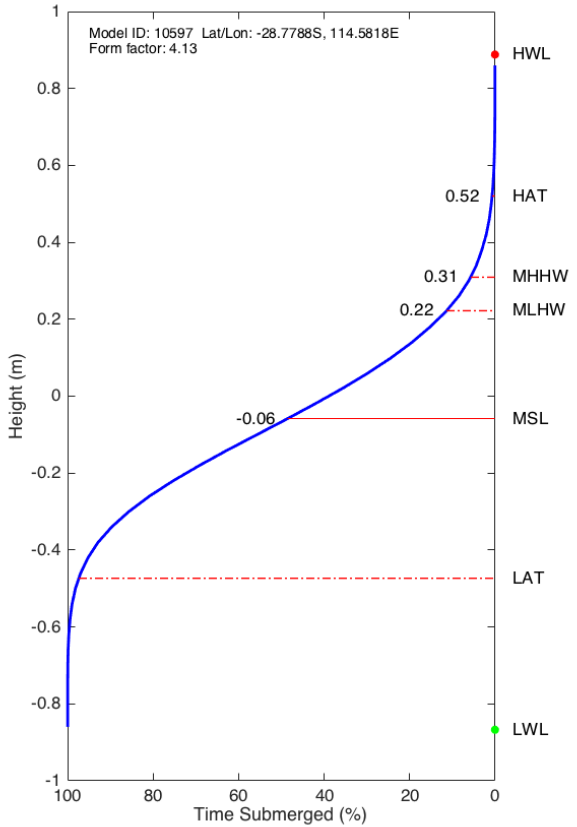
Seasonality



Seasonality



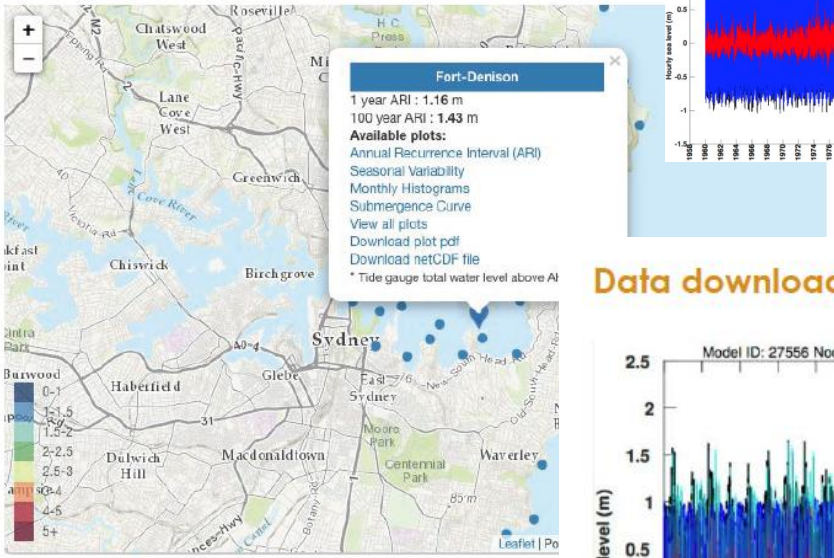
Submergence curves

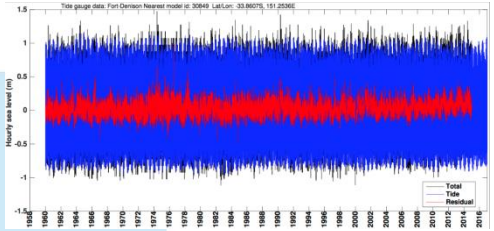


HWL	Highest total water level
HAT	Highest Astronomical Tide
LAT	Lowest Astronomical Tide
LWL	Lowest total water level
AHD	Australian Height Datum
MHHW	Mean Higher High Water
MLHW	Mean Lower High Water
MLLW	Mean Lower Low Water

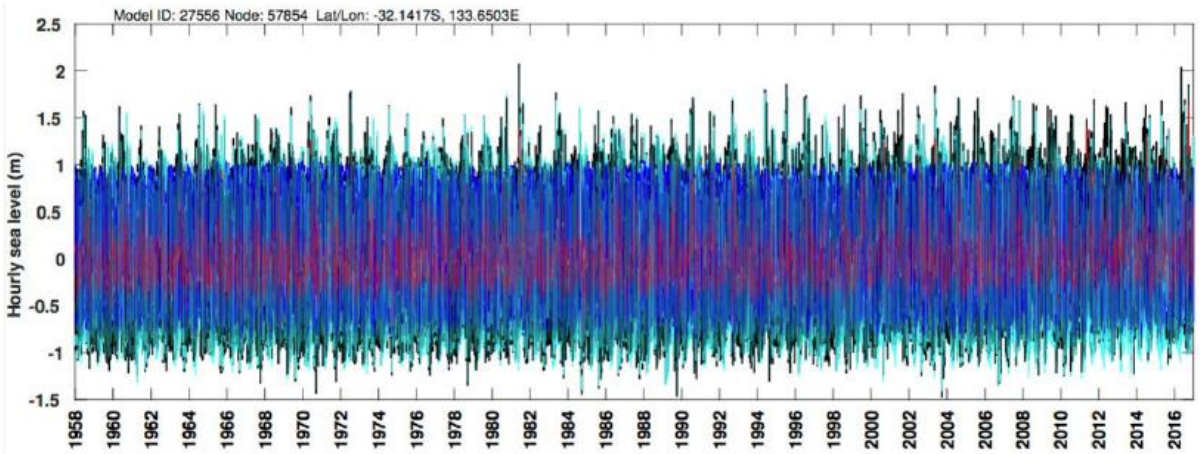
Data download (model + tide gauge)

Comparison with tide gauge data at select sites:

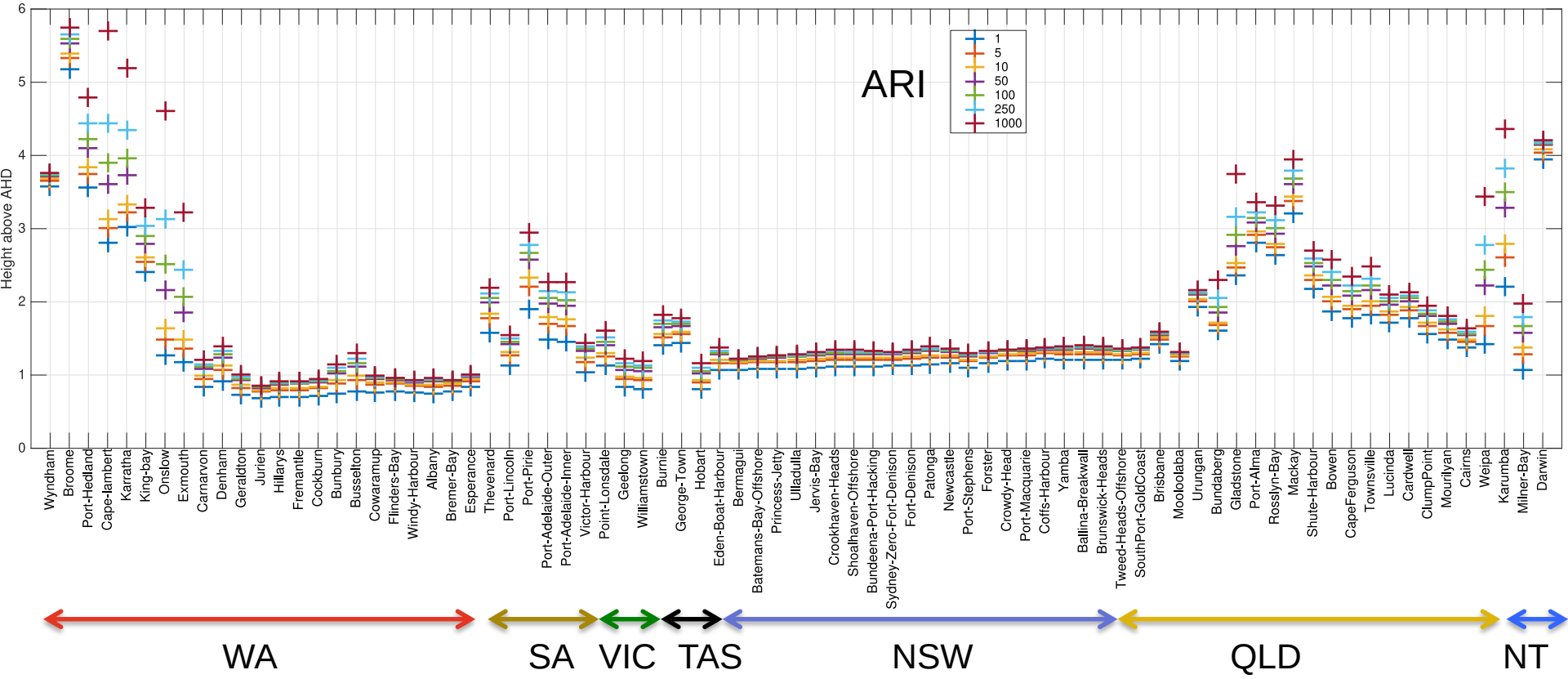




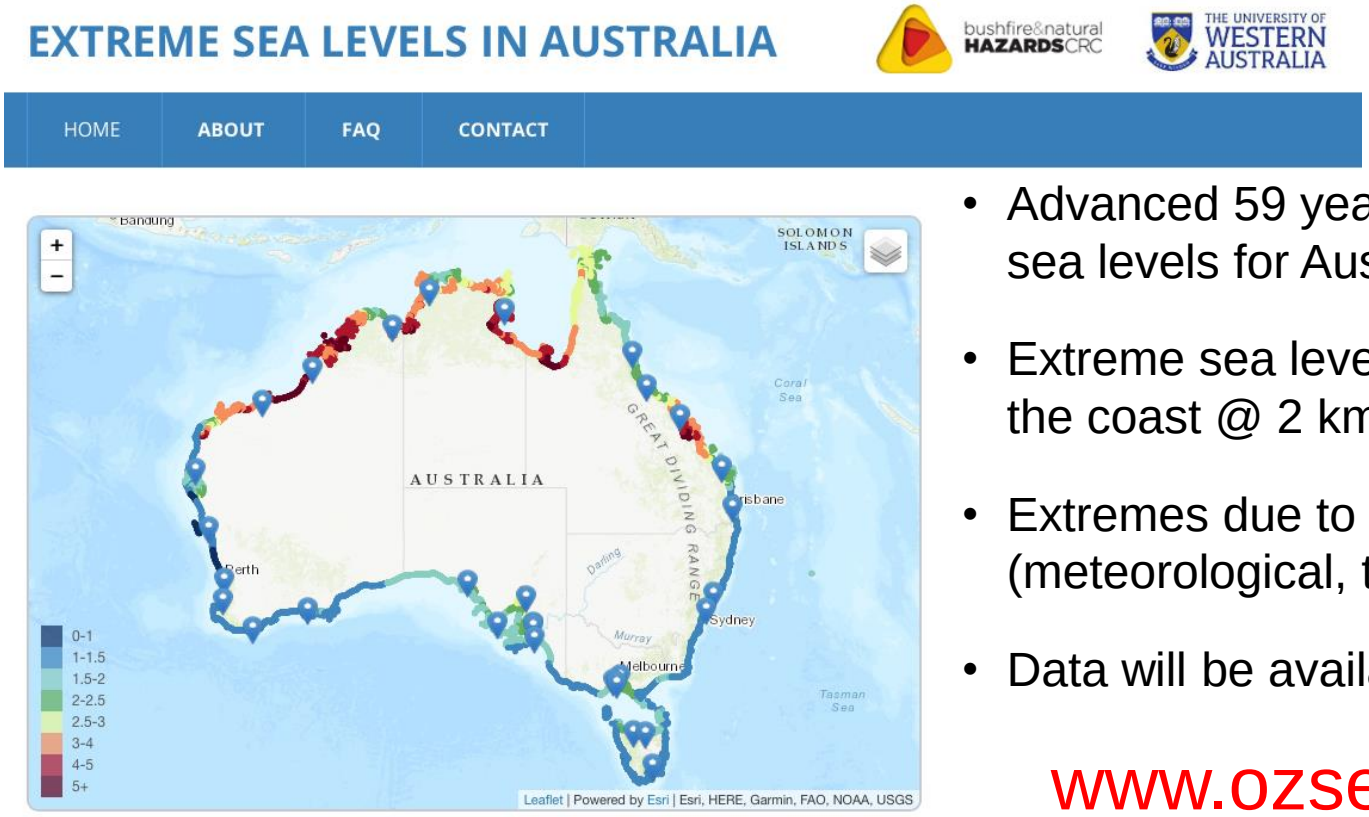
Data download option for model time series



Extremes around Australia

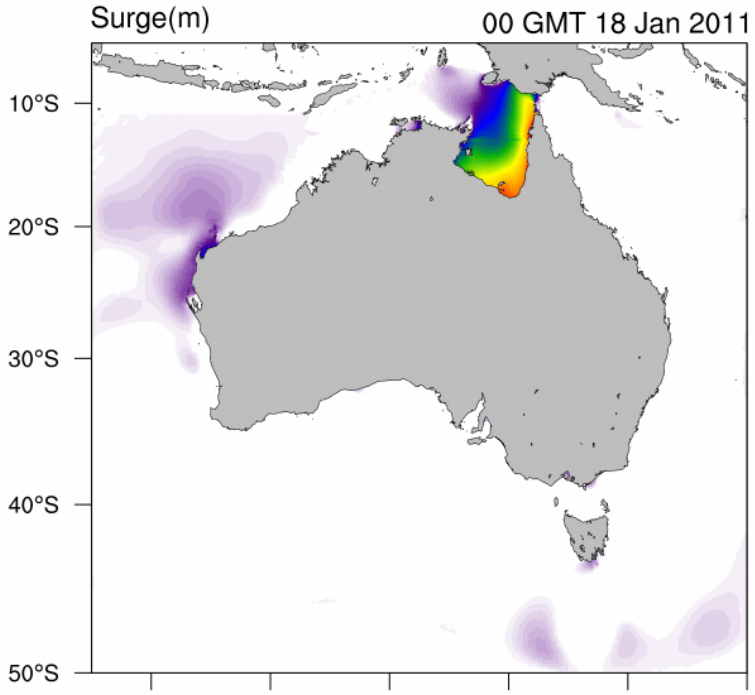


Summary



- Advanced 59 year model hindcast of sea levels for Australia
- Extreme sea level statistics all around the coast @ 2 km resolution
- Extremes due to numerous processes (meteorological, tides, mean sea level)
- Data will be available on website:

www.ozsealevelx.org


Surge(m)
00 GMT 18 Jan 2011
10°S
20°S
30°S
40°S
50°S