

Wednesday, 2nd December 2015

Sea level and coastal extremes

McInnes, K.L., White, C.J., Haigh, I.D., Hemer, M.A., Hoeke, R.K., Holbrook, N.J., Kiem, A.S., Oliver, E.C.J., Ranasinghe, R., Walsh, K.J.E., Westra, S. & Cox, R.



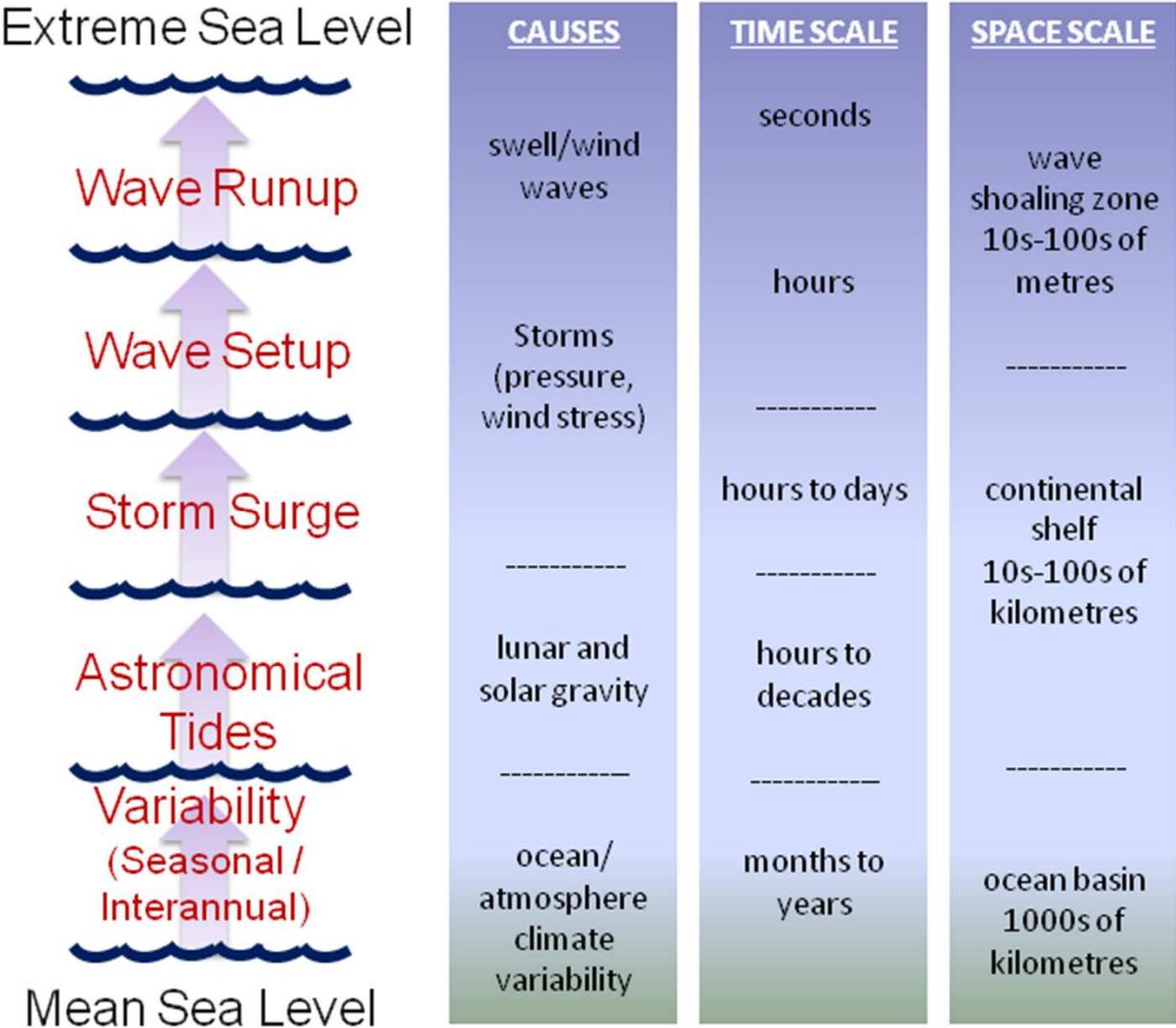
THE UNIVERSITY
of ADELAIDE



The coastal zone and coastal extremes

- Defined as “the region of low-elevation coastal land and adjacent estuarine and marine ecosystems”
- Region extends from the continental shelf offshore (where oceanic processes responsible for extreme sea levels occur), through to low-lying coastal land (where physical processes are felt)
- Coastal extremes generally arise from a combination of phenomena, including mean ocean level, astronomical tides, storm surges, wave setup and (in estuarine regions) fluvial processes

Sea level and coastal extremes can arise from multiple phenomena at a range of space/time scales

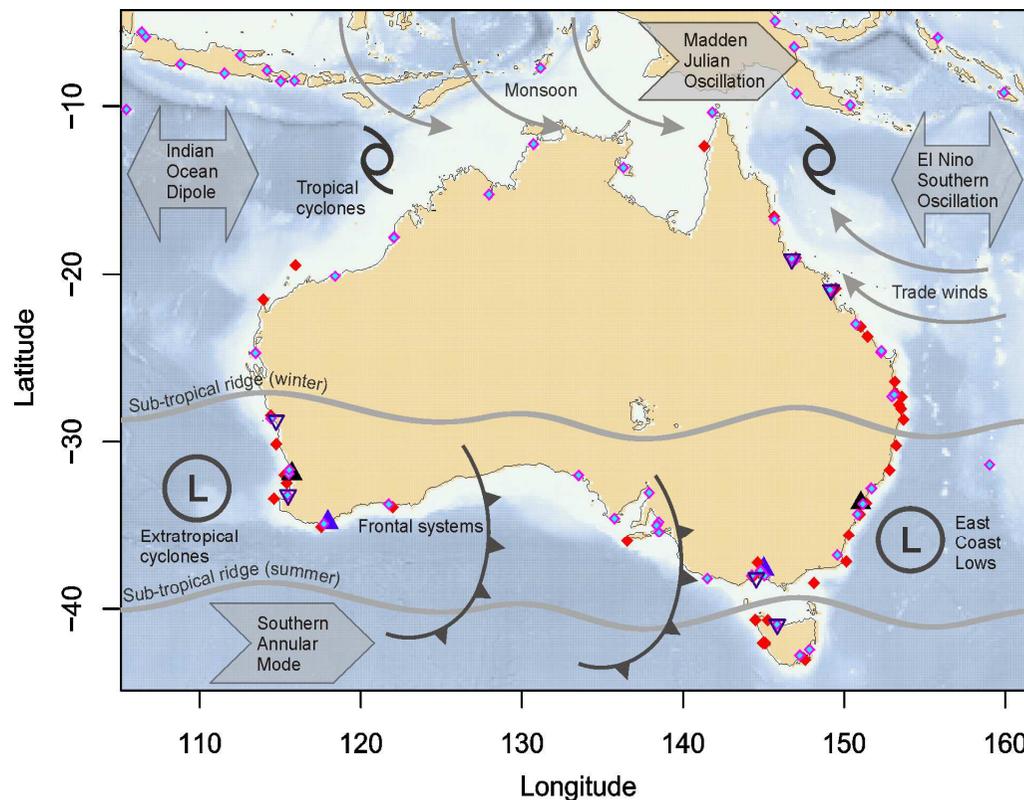


Structure of the paper

1. Introduction
2. **Understanding sea level and coastal extremes in Australia**
 - a. Causes of sea level and coastal extremes (inc tides, storm surges, coastally trapped waves, wind-waves...)
 - b. Weather and climate drivers (tropical cyclones, extra-tropical cyclones and fronts, east coast lows, various modes of climate variability)
 - c. Terrestrial factors (vertical land movement, geomorphology, fluvial contributions, anthropogenic modifications to the coastal landscape)
3. **Historical changes and their causes**
 - a. Extreme sea levels (trends in mean sea level, extreme sea level, extreme waves)
 - b. Causes of change in coastal extremes and physical impacts
4. **Future projections**
 - a. Regional sea level rise and extremes
 - b. Wave climate and storm surge
 - c. Coastal impacts (including coastal inundation and erosion)
5. Conclusions, knowledge gaps and recommendations

Research priorities

- Improved data:
 - Digitisation of sea level records
 - Improved coverage of wave climate, particularly along the south coast of Australia
 - Extended paleo-climate reconstructions for sea level and wave extremes, to put instrumental record in context



Large solid blue triangles: locations where digitization could extend the hourly records to the late 19th century

Open blue triangles: locations where digitization could extend the hourly record back at least to 1950

Research priorities

- Improved representation of key processes, particularly at finer space/time scales
 - Higher-resolution horizontal eddy-resolving models (~10km) to resolve shelf dynamics in projecting regional sea level rise
 - Resolution of the processes that cause storm surge extremes and wave extremes (note: projections from these are assigned 'low confidence' by the 2013 IPCC report)
 - Better understanding of the combination of fluvial and coastal processes in estuarine regions
 - Better understanding of the likely response of the coastline to extremes (i.e. erosion and deposition), particularly at longer timescales