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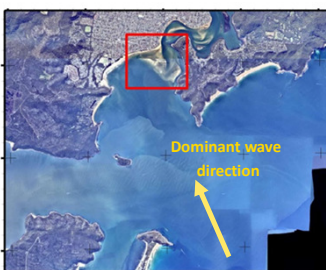
Understanding the complex ebb tide delta at Ettalong using advances in remote sensing

Chris Drummond, James Carley, Gabriela Lumiatti, Kilian Vos

UNSW Water Research Laboratory School of Civil and Environmental Engineering
 Central Coast Council
 Royal HaskoningDHV Enhancing Society Together
 NSW Office of Environment & Heritage



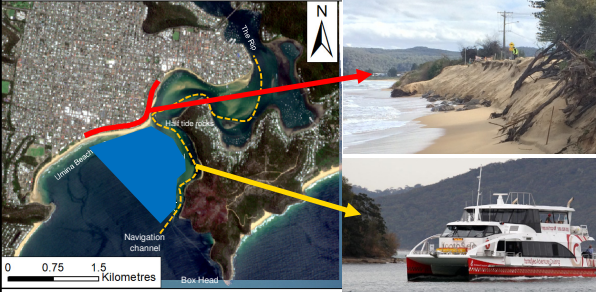
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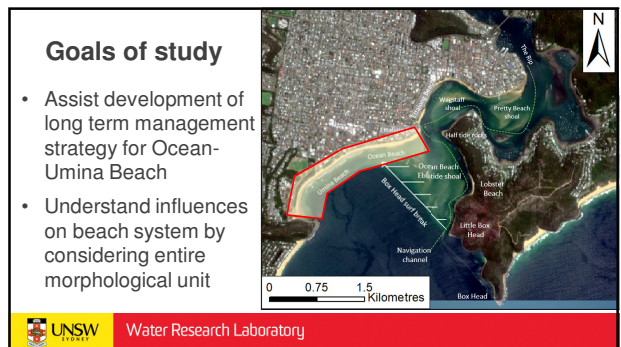
Site Location

- Ocean-Umina Beach
- 50 km north of Sydney
- Entrance to large estuary
- Semi-open coast location
- History of unpredictable cycles of erosion

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Data driven framework!

1. **Capture of a 'digital twin' of the system**
Drone survey, jetski bathymetry and sediment sampling
2. **Compile 80 year visual timeline of site:**
~200 photos from historical aeriels, satellites, Nearmaps, drone surveys
3. **Track key morphological features**
Shoreline, shoal properties, channel properties
4. **Link past changes in the system to environmental forcing**
Waves, water levels, rainfall, artificial modifications



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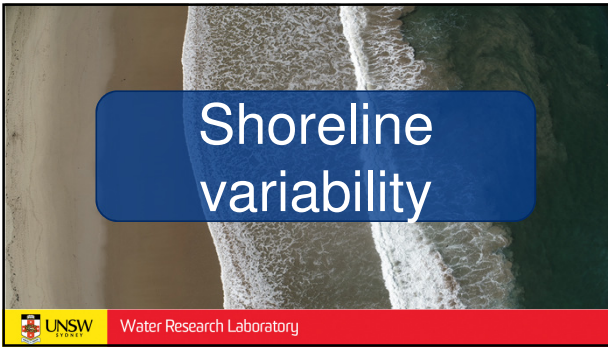
Data Collection



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Analysis







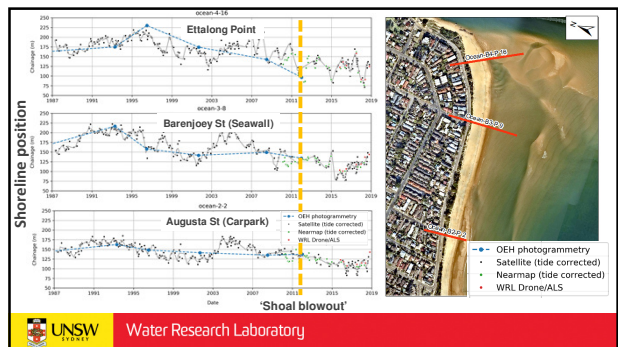
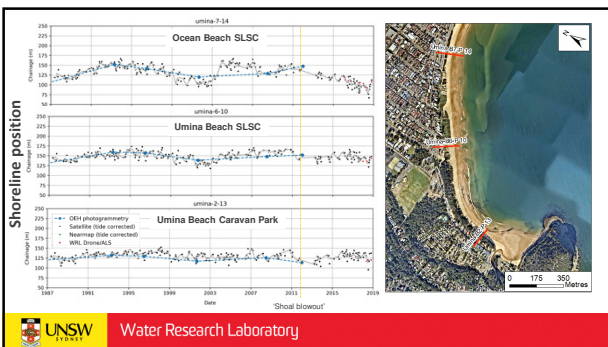
CoastSat

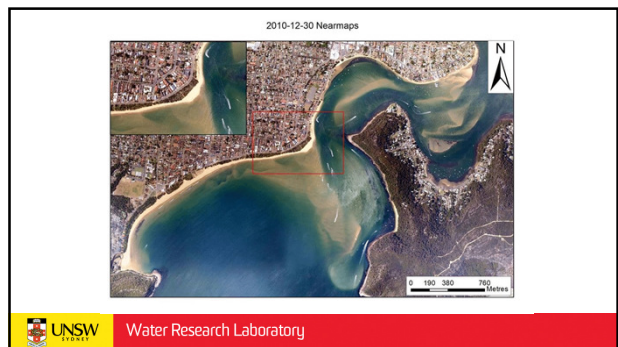
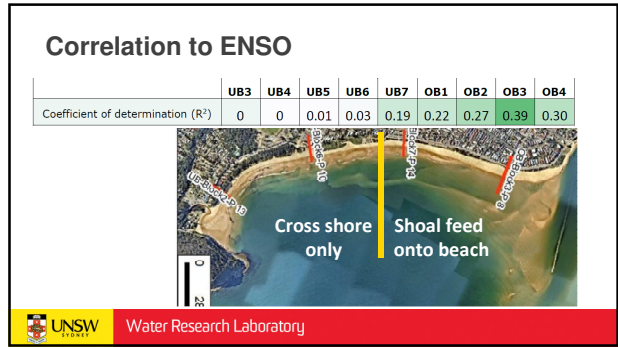
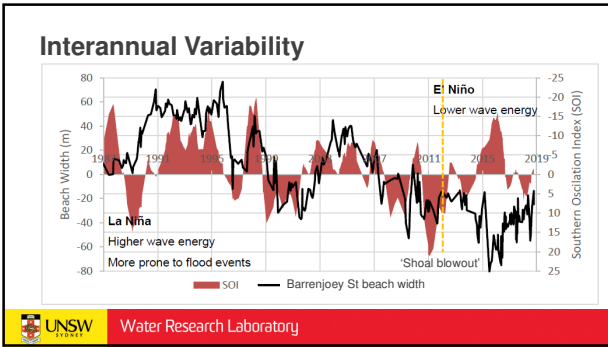
- Open source toolkit in python
- Produces timeseries of shoreline position
- 30 + years of shorelines from 1987- present
- Validated shoreline accuracy of 10 m

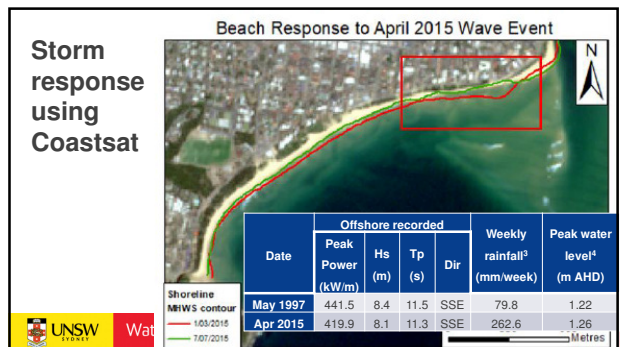
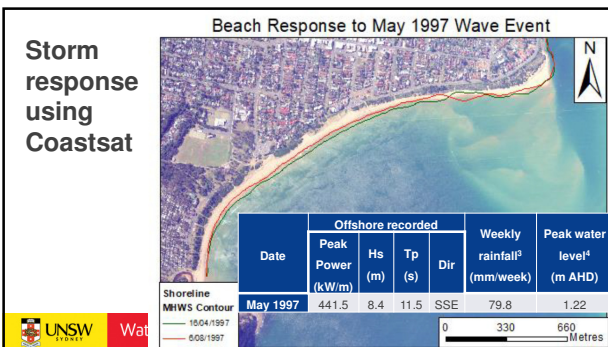
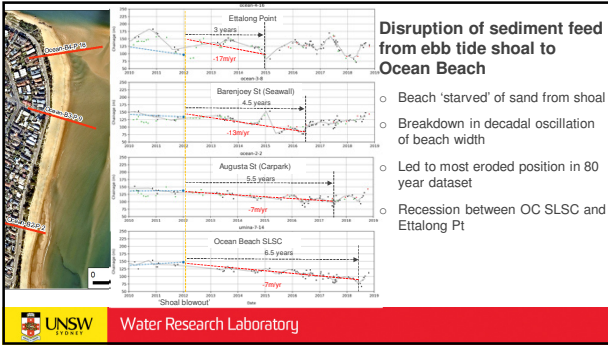



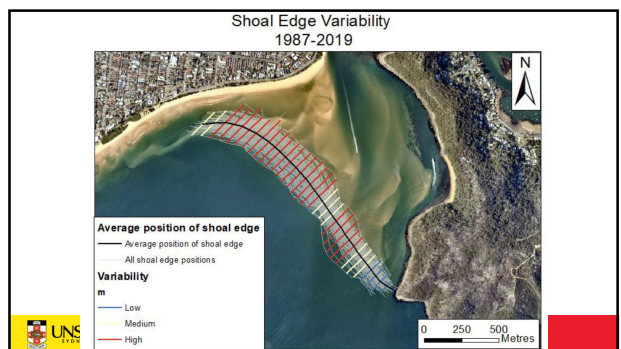
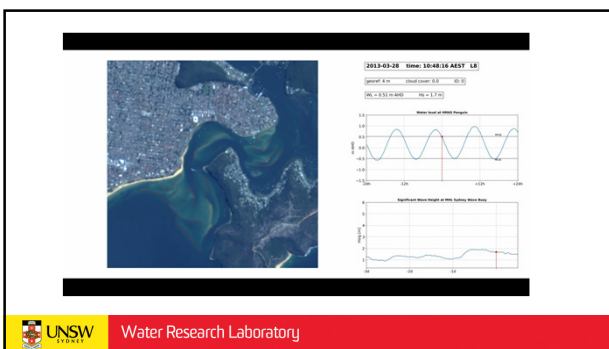
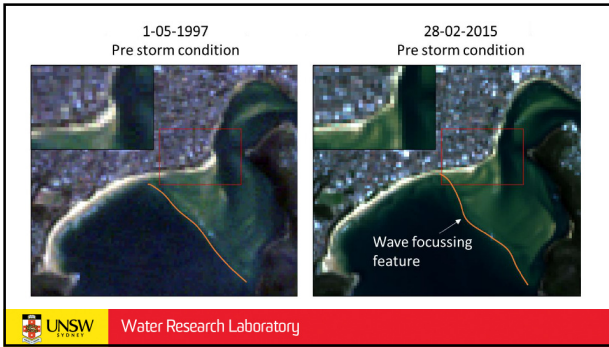



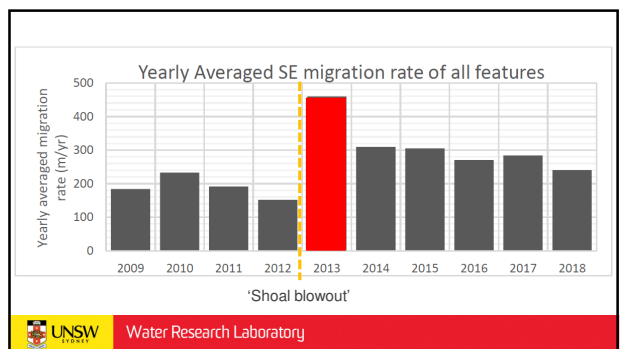
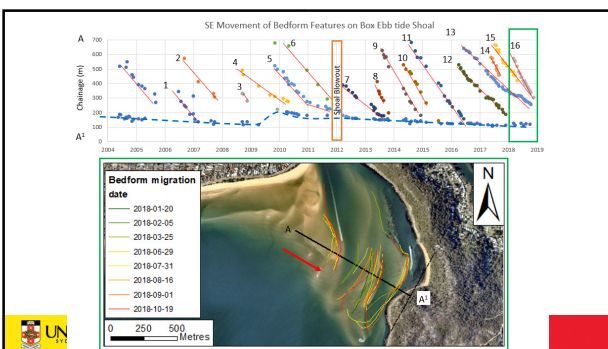
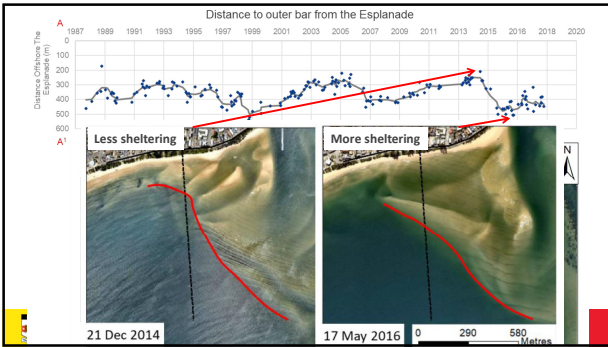
<https://github.com/kvos/CoastSat>

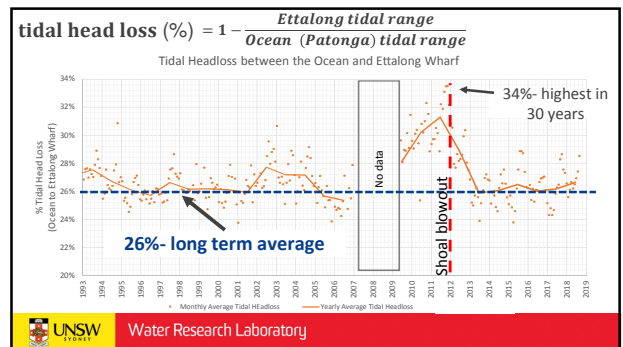
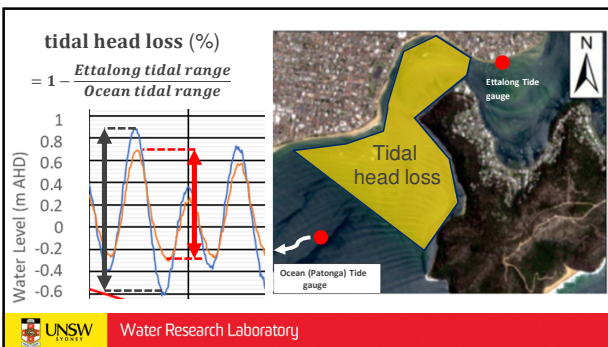
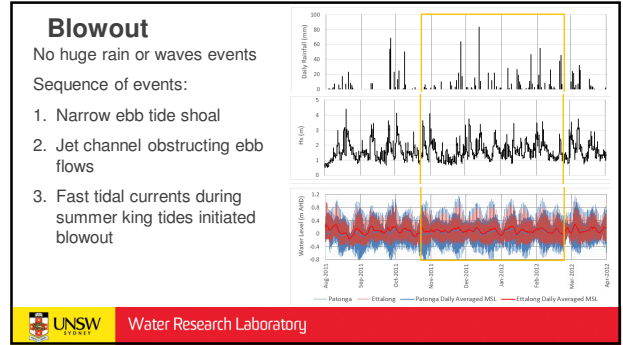
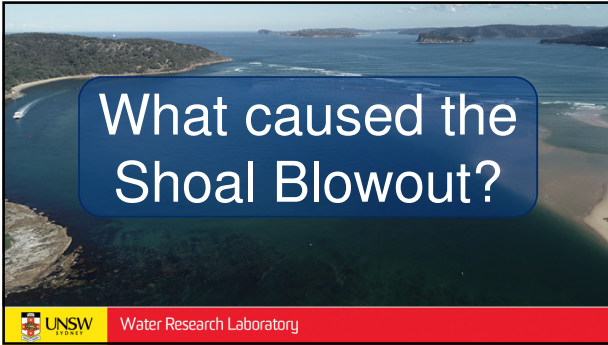


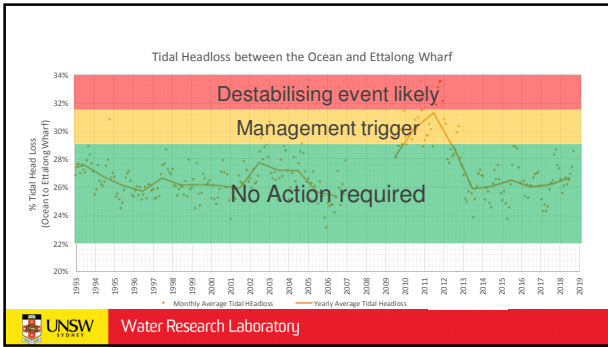













- ### Processes disrupted by blowout
1. Recession of Ocean Beach due to reduced sediment feed
 2. Increase in tidal planes upstream of ebb tide shoal
 3. Increase in SE bedform migration rate causing channel siltation
 4. Change in shape of outer shoal edge → wave focusing feature in 2015 storm
 5. Reduction in surf quality at 'The Box'
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- ### Management strategies
- Avoid blowout at all costs
 - Monitor beach width
 - Possible interventions:
 - Nav channel dredging
 - Enhance permanency of Ettalong Pt
 - Avoiding blowout is win-win for coastal management and maintaining surfing amenity
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