



Wellington Region Storm Tide Modelling

Iain Dawe

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GW Coastal Hazards Research Programme

- Seabed mapping (bathymetry)
- Historical storm tide events
- **Storm surge modelling**
- Regional sea level analysis
- Tsunami modelling

Complements KCDC coastal hazards research

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Coastal Hazards

- 2 main hazards are (often related):
 - **Erosion** (*hazard lines*)
 - **Inundation** (*this project*)
- Have a range of causes:
 - Storm surge & storm tide
 - High waves
 - King tides
 - Sea level rise & climate change
 - Tsunami

Inundation

- Mean sea level (sea level rise)
- Tides
- Storm surge
- Wave breaking and runup

Sea level fluctuations (short term)

- Daily tidal cycle (Kapiti mean high tide is 0.9 m over mean sea level)
- Storm surge; short term local elevation due to...
 - low air pressure - inverse barometer
(1 Hpa = 1 cm rise/drop around 1014 Hpa)
 - wind set-up
- Wave breaking and runup

Combined, these can cause an elevation of up to 1.0 m above local mean sea level (1936 storm ~1.2 m; Wahine storm ~1.0 m)

- Storm tides (can cause local water elevations to 2.5 m above mean sea level)

***These events will all continue
to occur on a rising sea level***

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Storm Surge – Kapiti Coast 17/10/07



Sea surface elevated by regular northwest conditions and very low air pressure

Result: Sea wall overtopped and road berm behind was scoured



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Storm Surge – Raumati 23/07/08



Sea surface elevation ~ 0.5 m above mean level due to storm surge effects

Result: Sea wall completely overtopped, heavy scouring in the backshore and damage to property and coastal infrastructure

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Wave runup



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Storm Tide Project

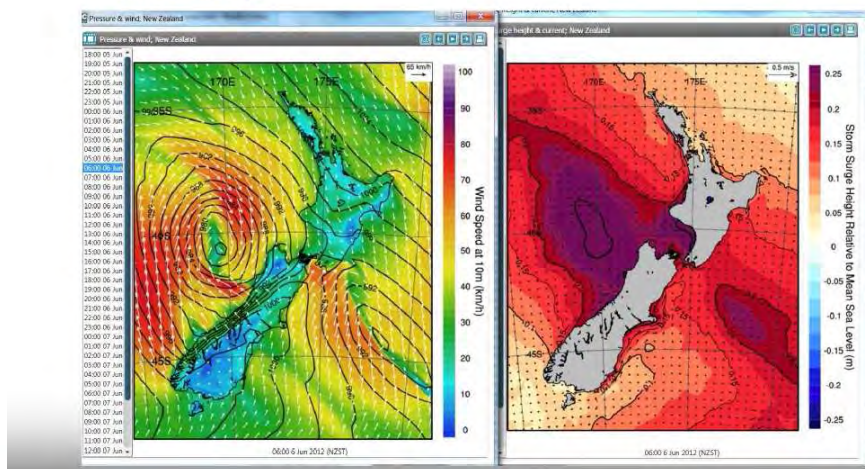
- GW commissioned, KCDC & WCC support, NIWA
- Construction of a modelling grid based on bathymetry and LiDAR
- Calculation of storm surge levels, wave heights, wave runup, previous large storm events
- Modelling combined storm-tide wave events with a 100 yr ARI storm events to derive max water levels
- Simulation of storm events with SLR scenarios and production of inundation maps
- Update and reanalysis of regional sea level variability

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Storm Surge

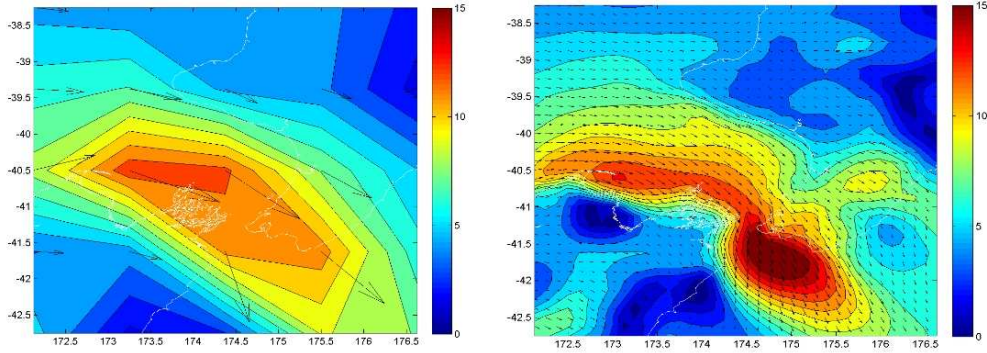
- Variations in sea level due to meteorology
 - Inverse barometer
 - Wind set-up



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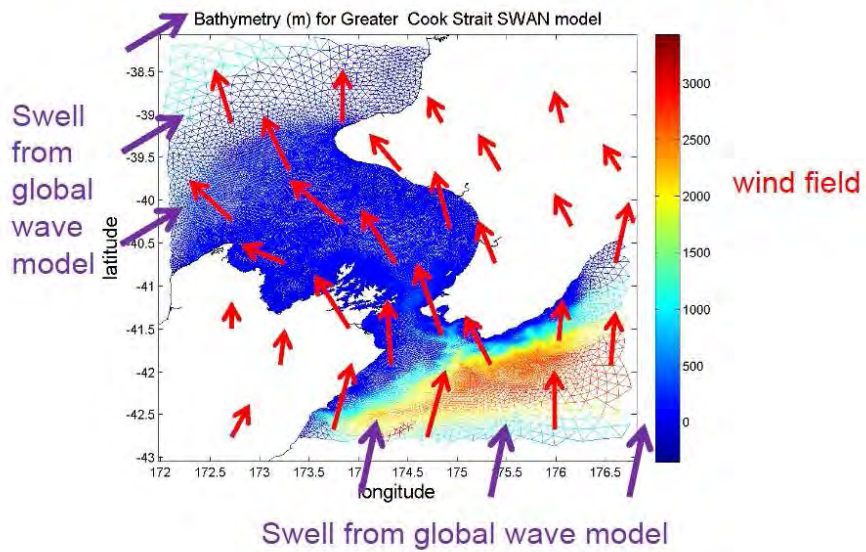
ERA-40 winds - downscaled



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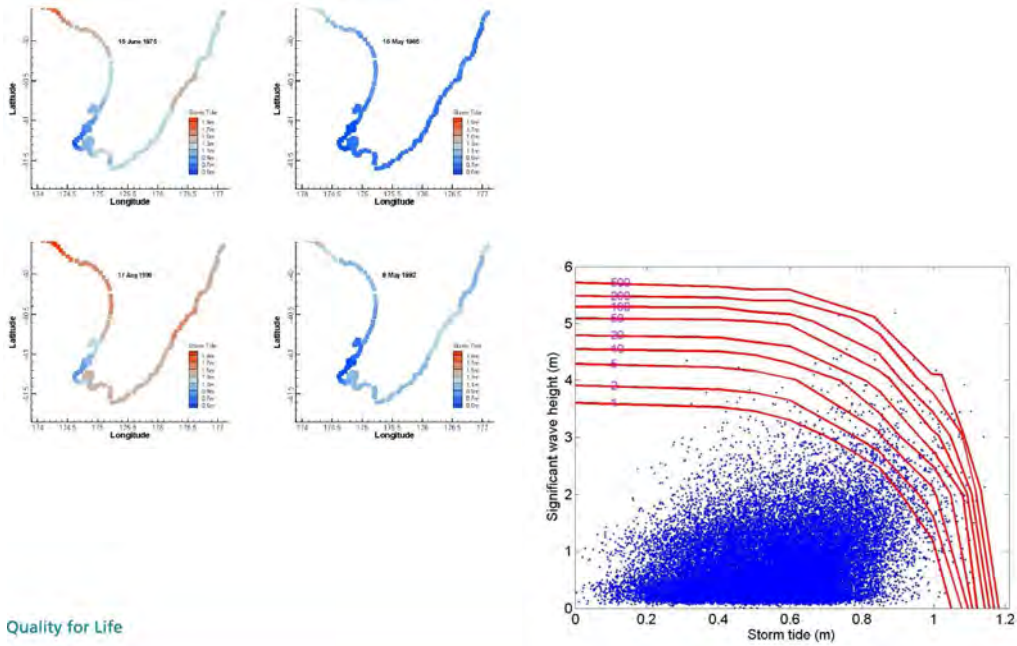
Regional wave model (SWAN)



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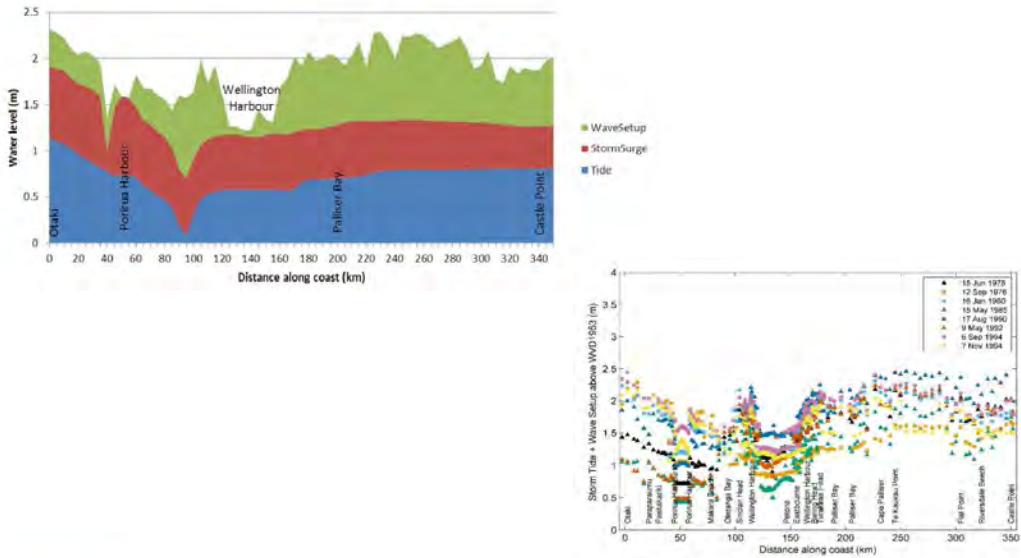
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Storm tide probability



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Storm surge heights

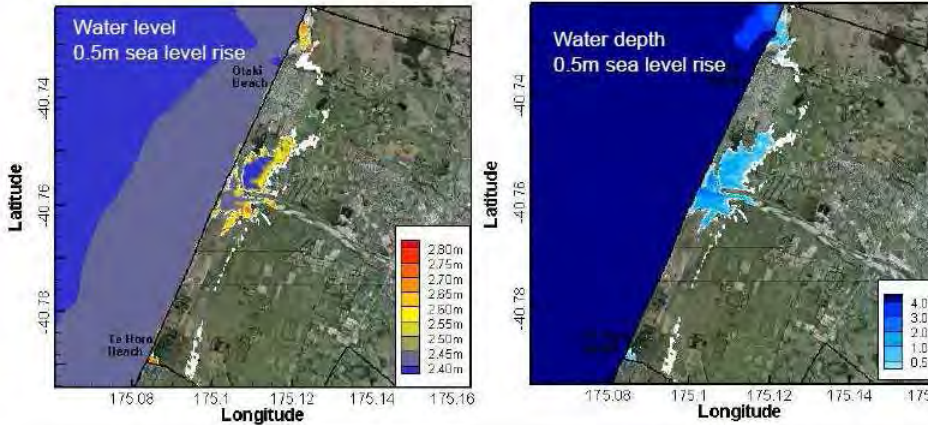


Storm tides with Wave Setup
 Largest events are still:
 6 Sep 1994 (Kapiti Coast) and
 17 Aug 1990 (Wellington Harbour and southern coast)

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Mapping inundation

Inundation: Otaki, 50 cm sea level rise



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What's it all for...

- Regional planning for sea level rise and coastal hazards – RPS, Regional Plan, Regional hazards strategy, supporting TA's (defining a regional coastal hazard management area)
- Information for decision making – consenting, hearings, env court, TAs, CDEM, flood pro, asset/infrastructure planning, LTPs, general public

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Questions...

