IT'S OUR FAULT
NŌ MĀTOU TE HAPA

Increasing Our Resilience
TE WHAKAPIKI MANAHAU

WELLINGTON EARTHQUAKE RESEARCH PROGRAMME

Wellington Collab meeting
16 June 2023
Nicola Litchfield (IOF Science Leader)

Toka Tū Ake EQC

CIVIL DEFENCE WELLINGTON REGION EMERGENCY MANAGEMENT GROUP

Absolutely Positively Wellington City Council
Me Heke Ki Pōneke

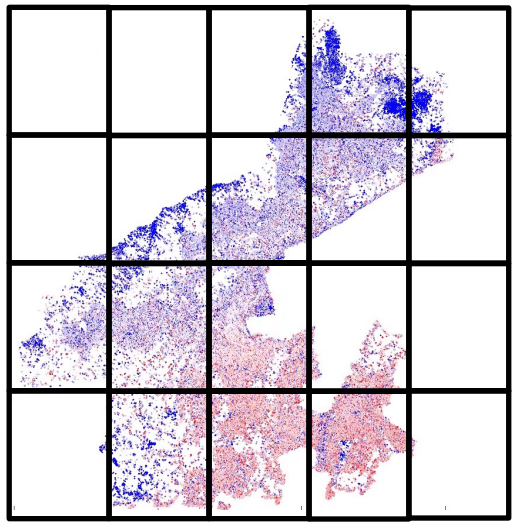
GNS SCIENCE TE PŪ AO

- **2022-23 science projects**
  - Hikurangi Subduction Zone – Howell talk
  - Active Fault Paleoseismology – Coffey talk
  - Tsunami Hazard and Vulnerability – Wang talk
  - Ground Deformation
  - Planning and Policy – Gunnell talk (part)

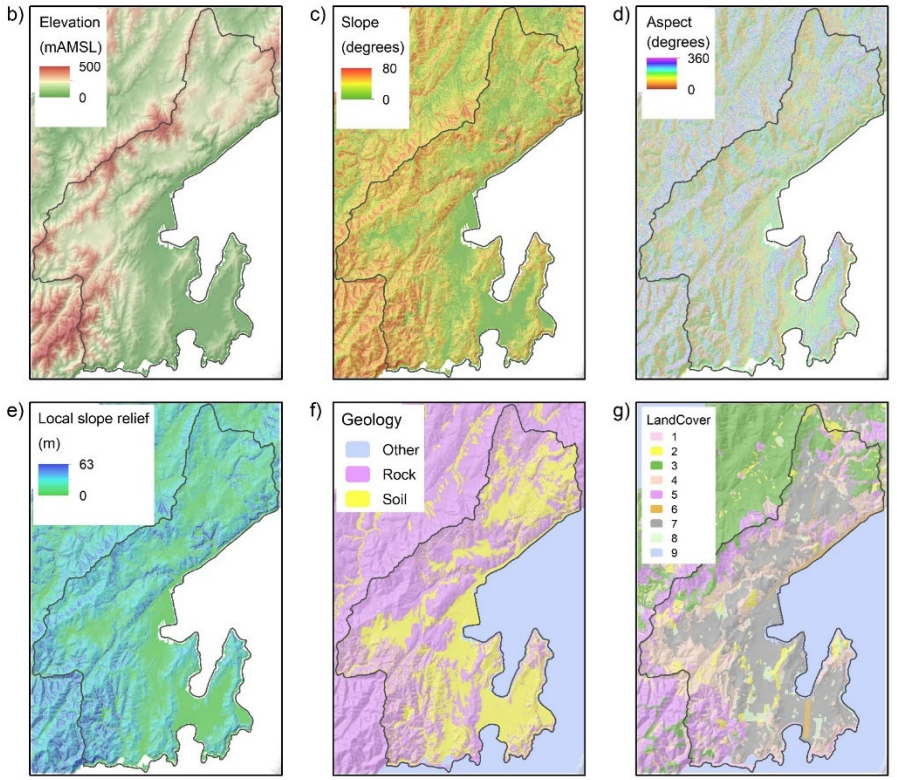
- **2023-24 science projects**
  - Hikurangi Subduction Zone
  - Tsunami (x 2)
  - Engineering/Risk
  - Planning and Policy

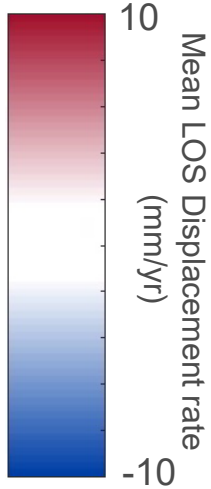
22-23: Ground Deformation

- Methodologies set up and running to process the large amounts of data (4 x 14 m pixels every 6-12 days)
- Clustered deformation identified:
  - Anthropogenic fill and reclamation subsidence
  - Construction changes
- Classifications nearing completion

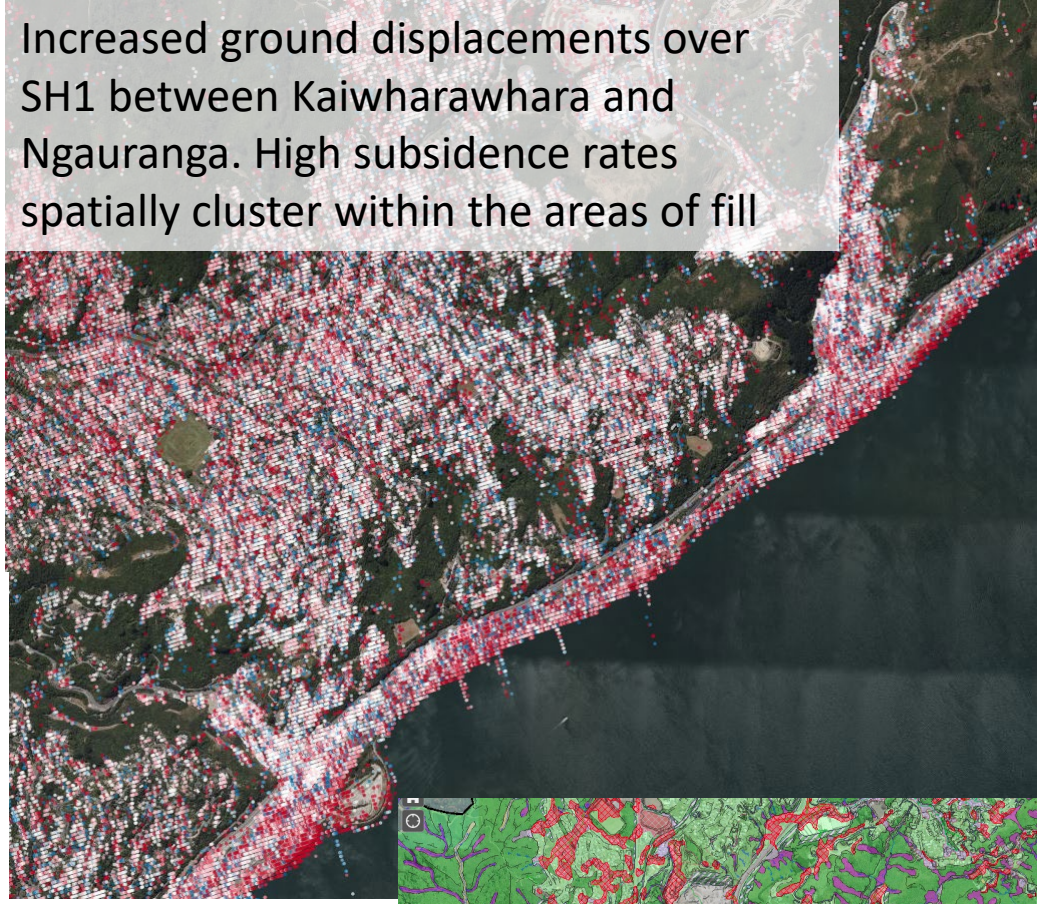


Spatial clustering: Land cover, geology, topography





Increased ground displacements over SH1 between Kaiwharawhara and Ngauranga. High subsidence rates spatially cluster within the areas of fill

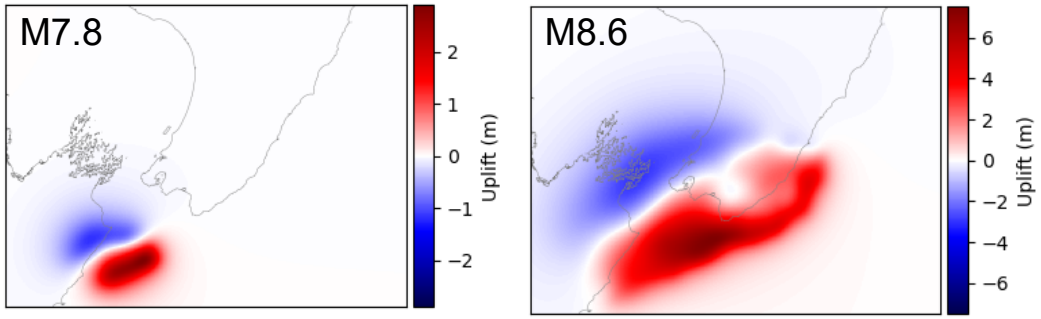


22-23: Planning and Policy

Science to Practice Workshop – Wellington City

- Workshop held 18 Nov 2022
- Attended by ~40 WCC personnel from the Resource Consent and District Plan Policy teams
- Topics chosen included Hikurangi Subduction Zone, active faults, landslides, tsunami, sea level rise

23-24: Hikurangi Subduction Zone Hazard



Models of vertical land movements in Hikurangi subduction earthquakes

Paleoearthquake records

- Detailed analysis of Mataora-Wairau lagoon cores
- Collect more cores at Mataora-Wairau lagoon OR reconnaissance boat trip to Lake Grassmere

Probabilistic model of coseismic vertical land movements for the Wellington Region

- Refine a probabilistic model of the vertical land movements caused by earthquakes (subduction and upper-plate faults)
- Will help to identify coastal areas where earthquake deformation will either ameliorate or exacerbate climate-driven sea level rise, and the likelihood of this occurring
- Particularly important for Petone, Wellington waterfront, Porirua, Kāpiti Coast

23-24: Tsunami Hazard and Vulnerability – Project 1

Photo: Margaret Low

Identification of evacuation barriers for communities on the eastern side of Wellington Harbour (Seaview to Eastbourne) in local tsunami

- Combine agent-based evacuation modelling with highly-detailed tsunami evacuation times (which will be highly variable)
- Will identify bottle necks and help to optimize evacuation routes along this thin coastal strip

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23-24: Tsunami Hazard and Vulnerability – Project 2

Photo: Lloyd Homer

Combined impact of tsunami, storm surge, and tides in Wellington Harbour

- International studies show that simultaneous occurrence leads to increased wave heights and speeds
- Storm surges could become more frequent with climate change
- Model simultaneous events and compare with current tsunami coastal impact estimates
- Propose further improvements of current practice and modelling methodology for the wider Wellington Region

23-24: Engineering / Risk

Natural hazards impacts on key Māori facilities (e.g., Marae)

- Pilot study with a Māori community to assess natural hazards impacts on a key facility and its community
- Exposure analysis to provide qualitative impact and risk to infrastructure and people
- Multi-hazard (earthquake shaking, tsunami, liquefaction, landslide etc, as applicable)
- Work with the community to use the results to support decision making, awareness raising and education
- Will likely focus on Takapūwāhia Marae (Ngāti Toa, Porirua)

23-24: Planning and Policy

Science to Practice Workshop

- Longer version (1-2 days)
- Multiple Councils

https://www.itsourfault.org.nz/