Josiah Ensing

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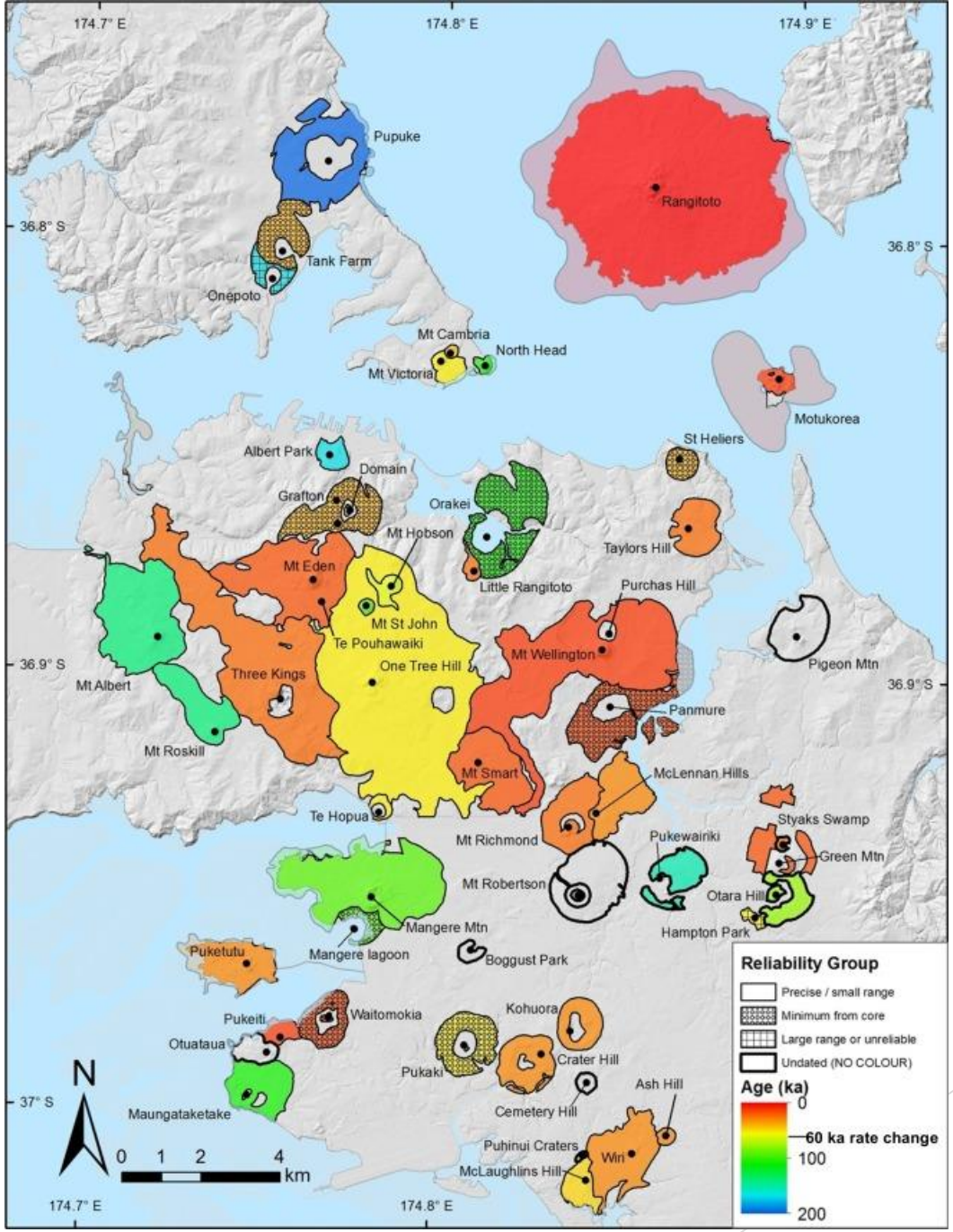
Co-Supervisor: Bernhard Sporli

A 3D shear speed model of the AVF crust

The Auckland Volcanic Field

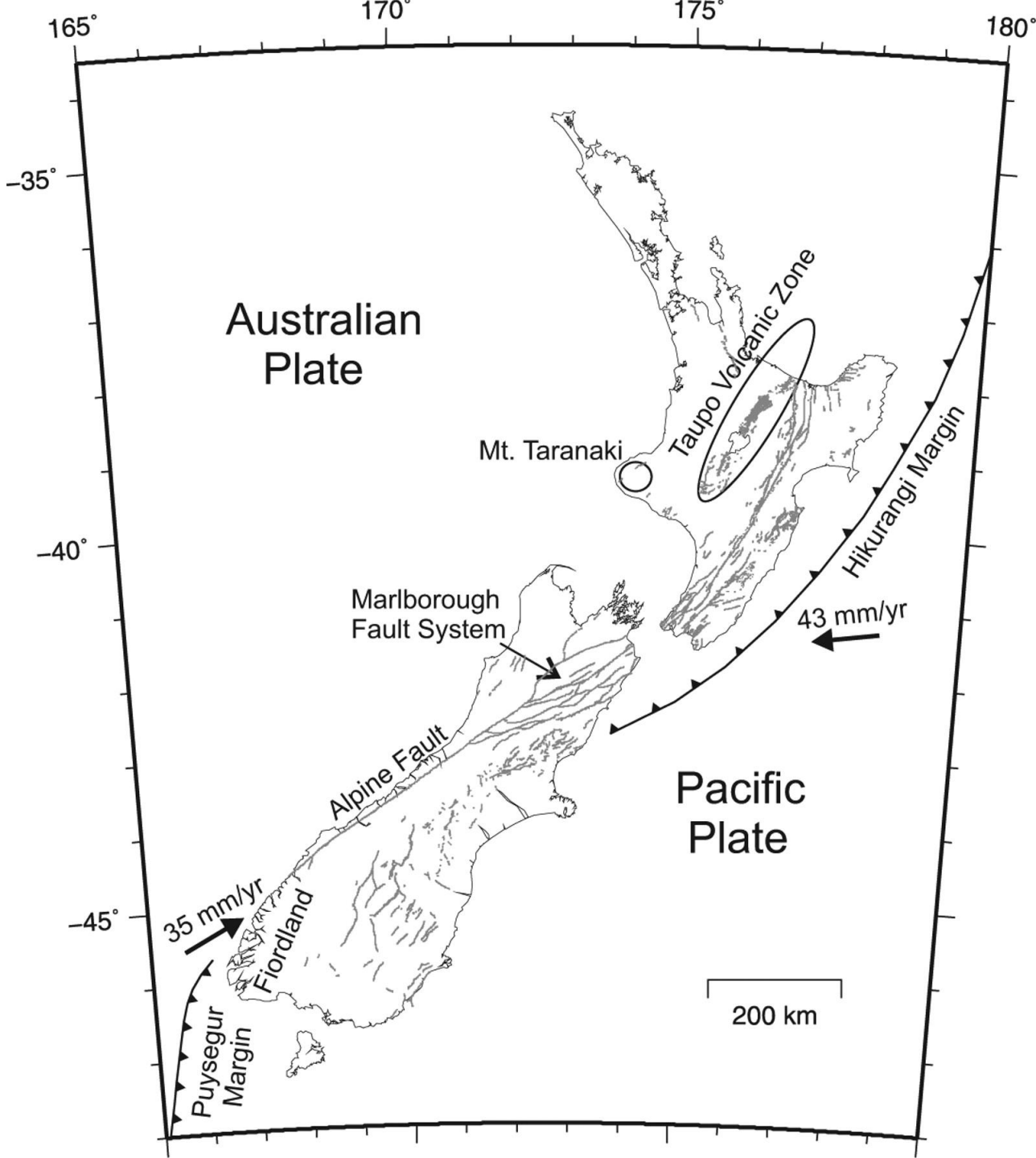
- Basaltic intraplate volcanic field
- Active
- High Population



Map taken from Graham et al. (2017)

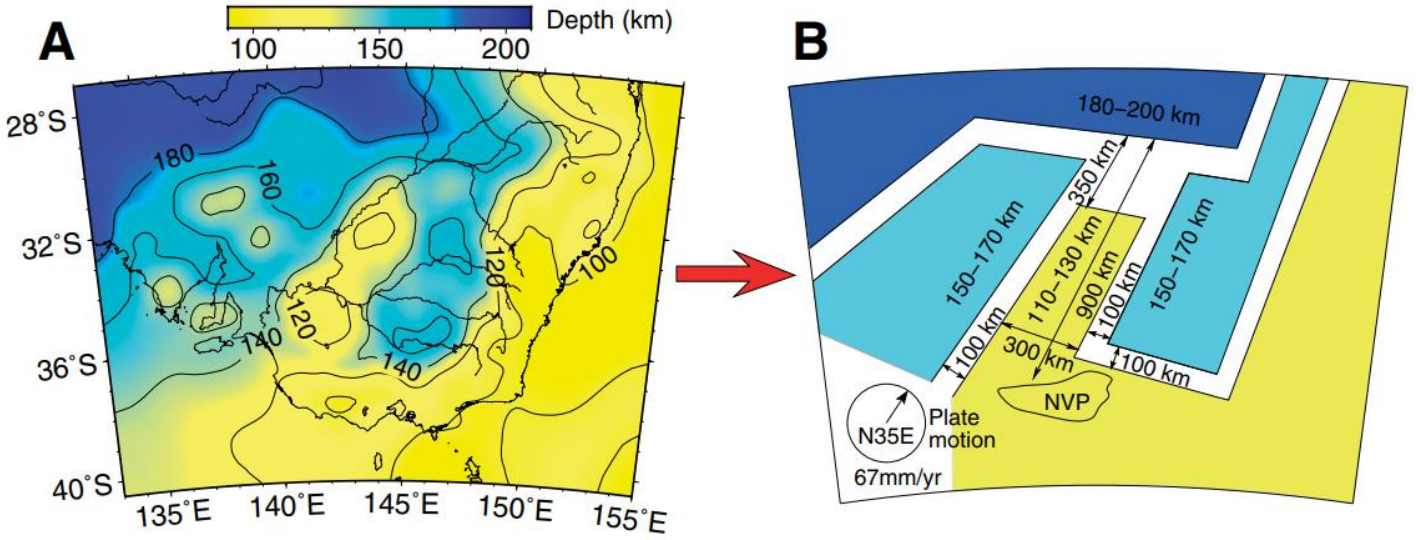
What drives volcanism in Auckland?

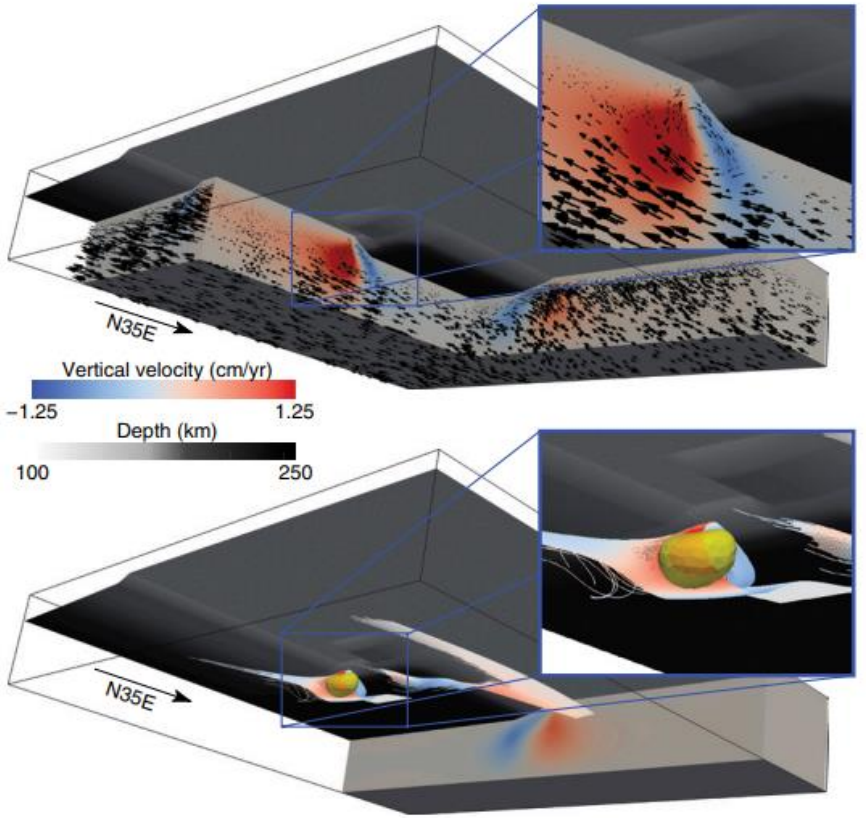
- No known connection to tectonic plate boundary.
- No mantle plume or rift system.
- There are a broad range of other possible mechanisms.



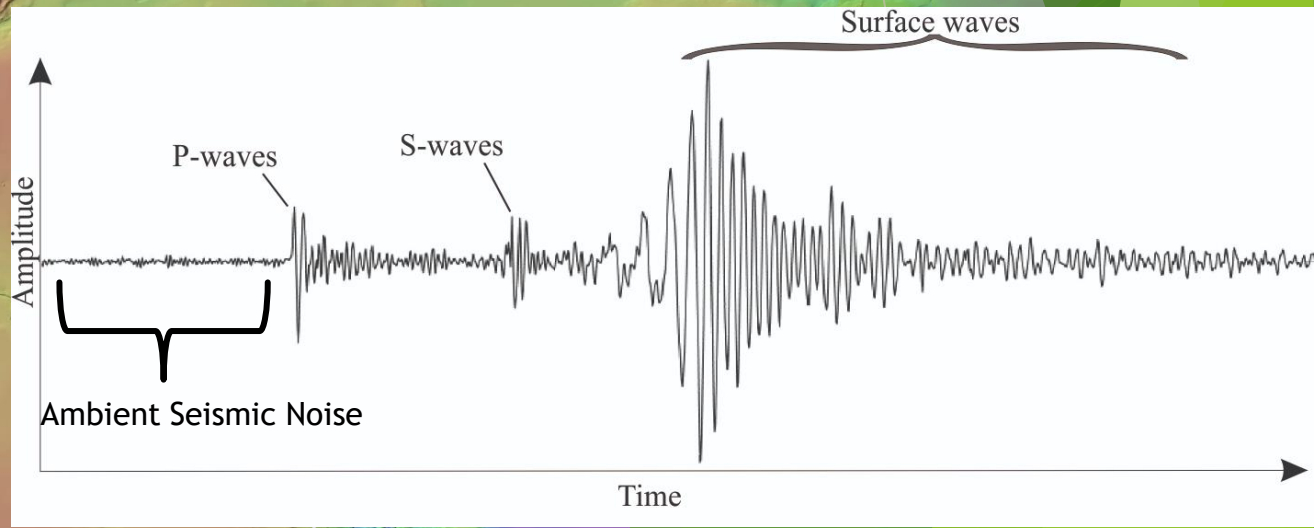
Geodynamical modelling

- Geodynamics deals with dynamics of the Earth.
- It applies physics, chemistry and mathematics to the understanding of tectonic and geologic phenomena.
- Davies et al. (2015) highlight a correlation between lithospheric thickness, volcanic outcrop and magma composition.
- Davies & Rawlinson (2014) finds that lithospheric steps are a key prerequisite for generating some intraplate volcanism, and their orientation is of equal importance.



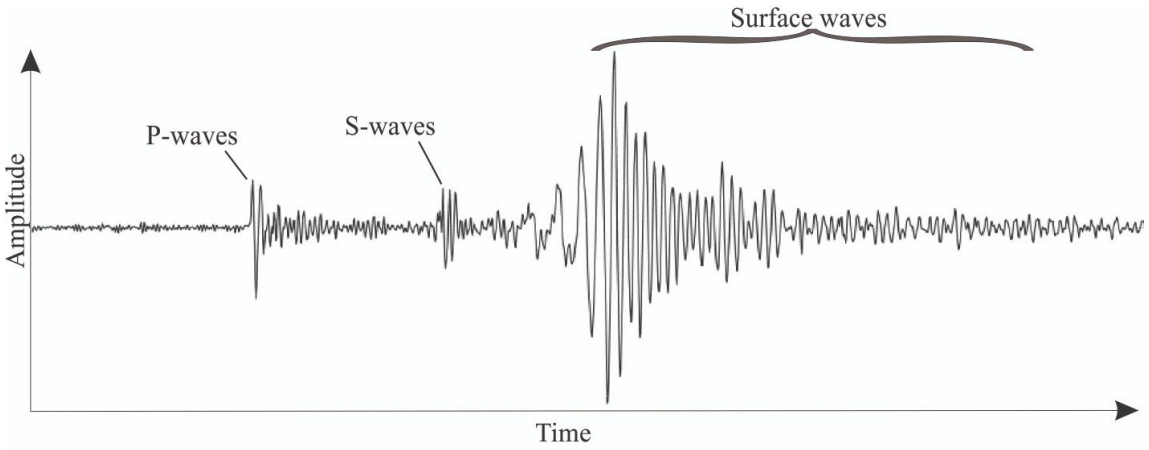


Ambient Seismic Noise

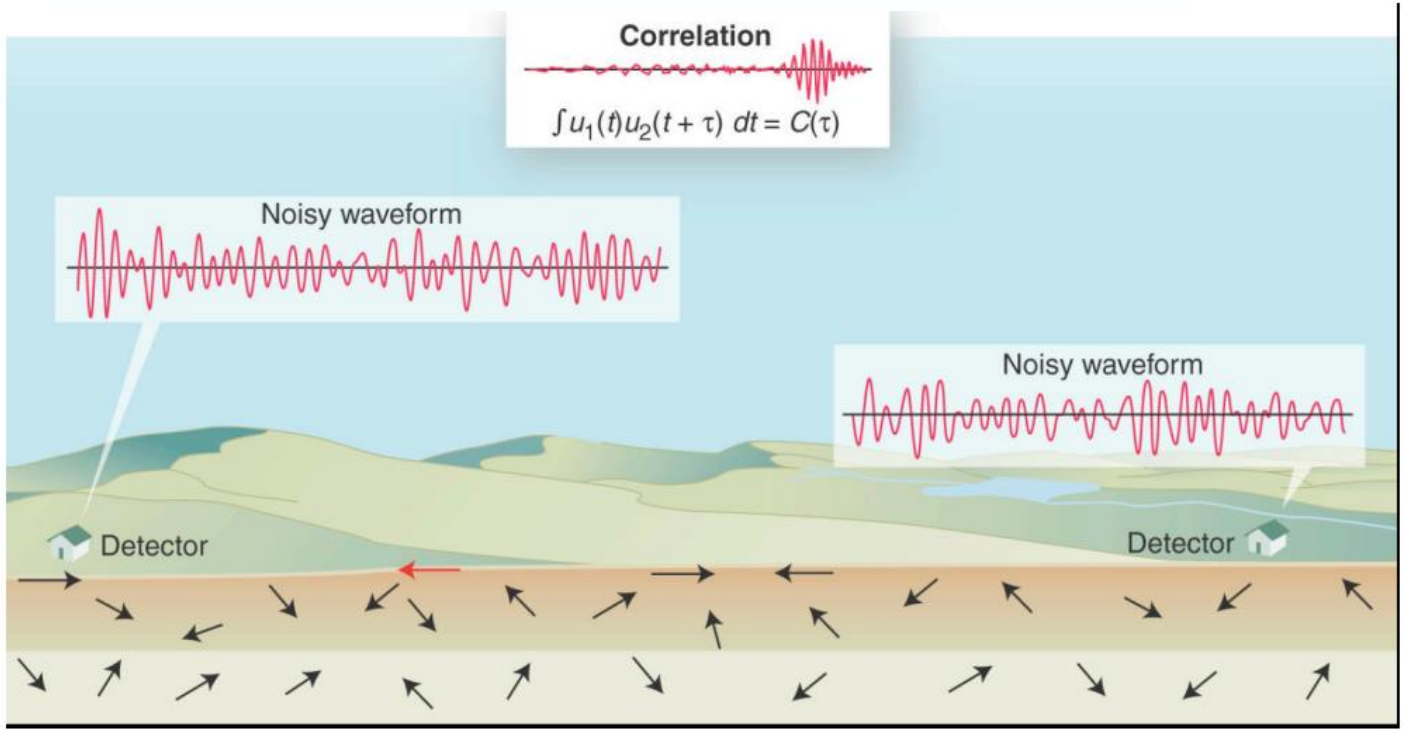


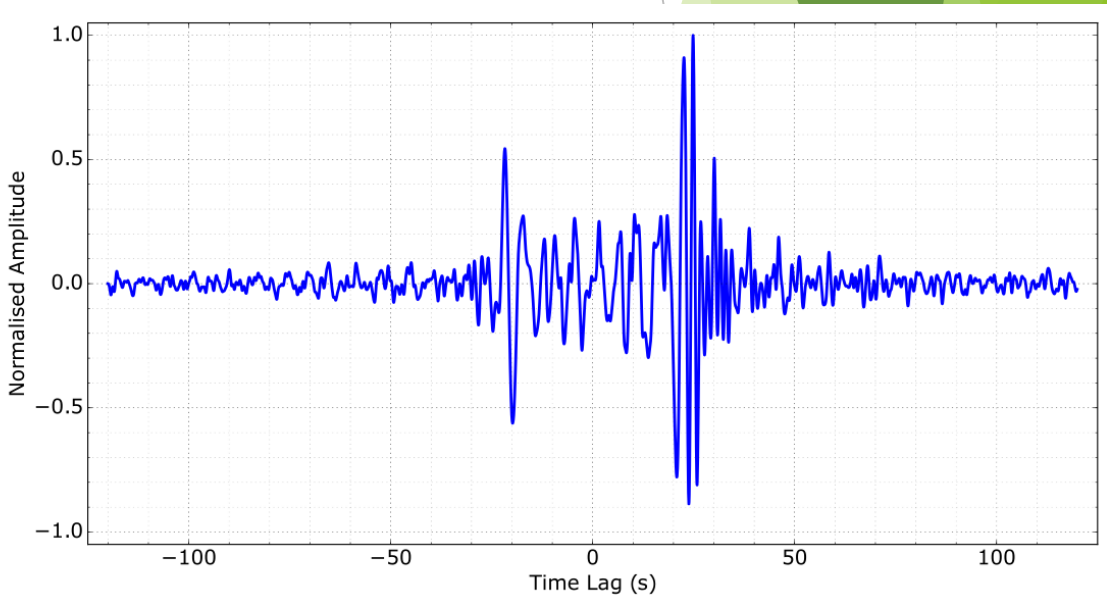
A bathymetric image compiled from the NZ 250m gridded bathymetric data set, CANZ (2008) and The Centenary Edition of the GEBCO Digital Atlas, 2003.

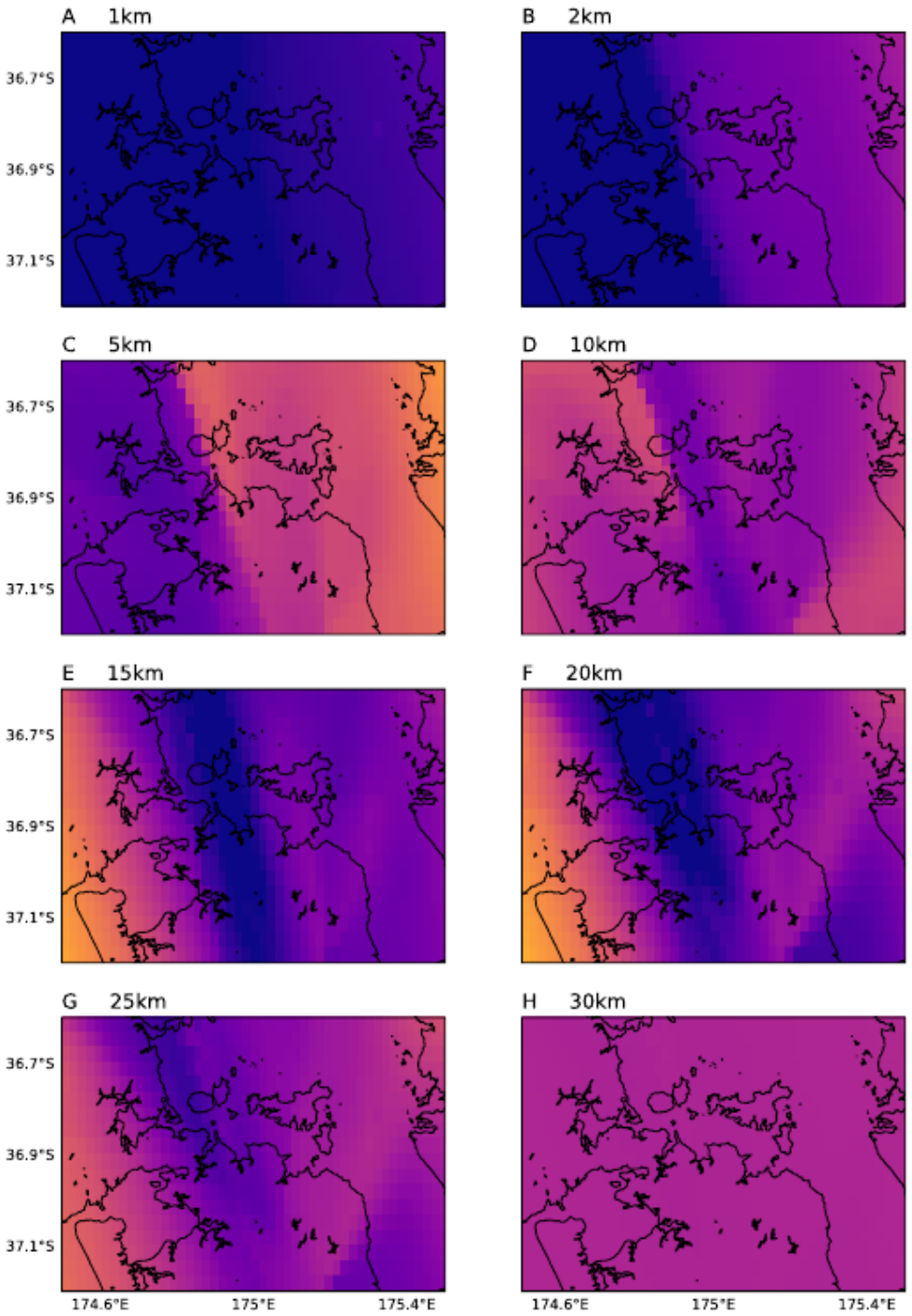
Cross-Correlating Ambient Seismic Noise

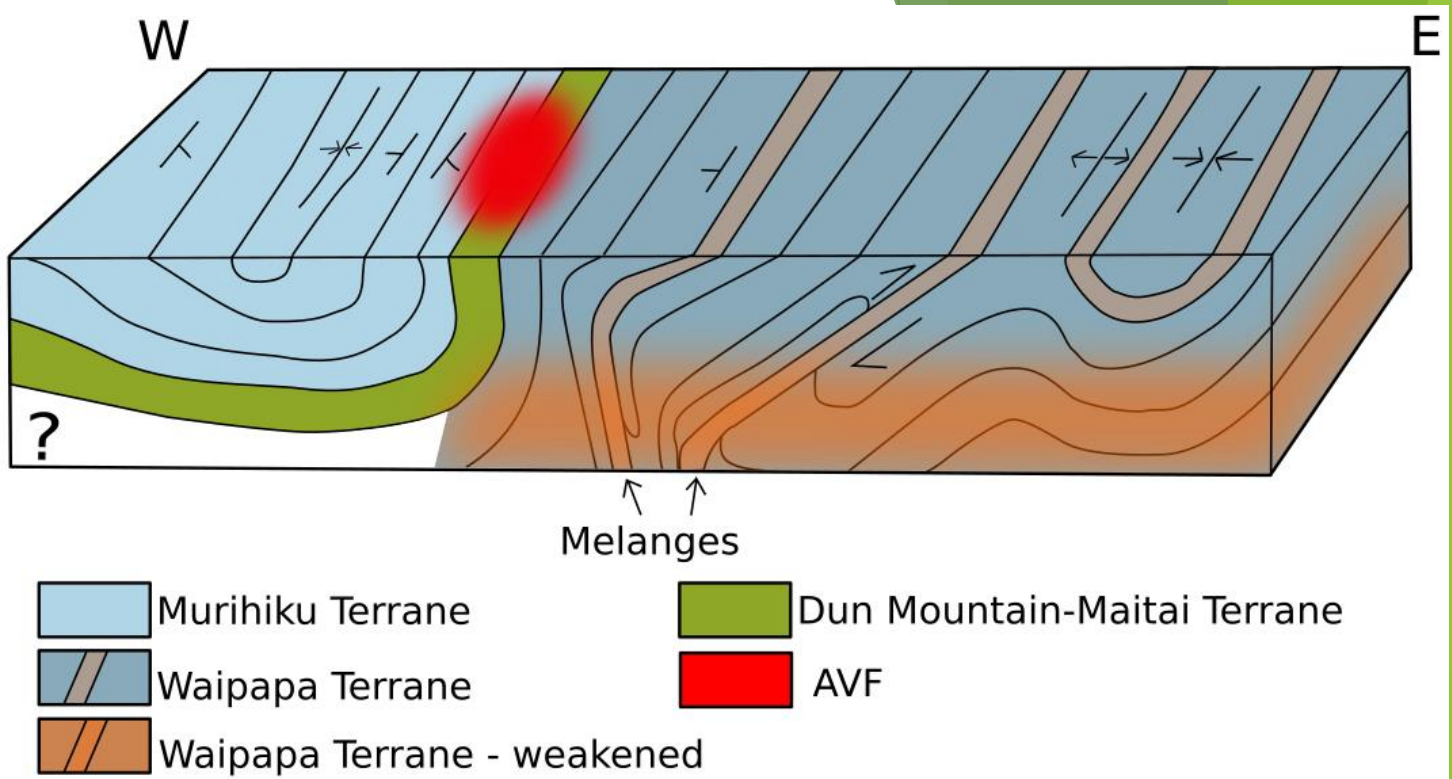


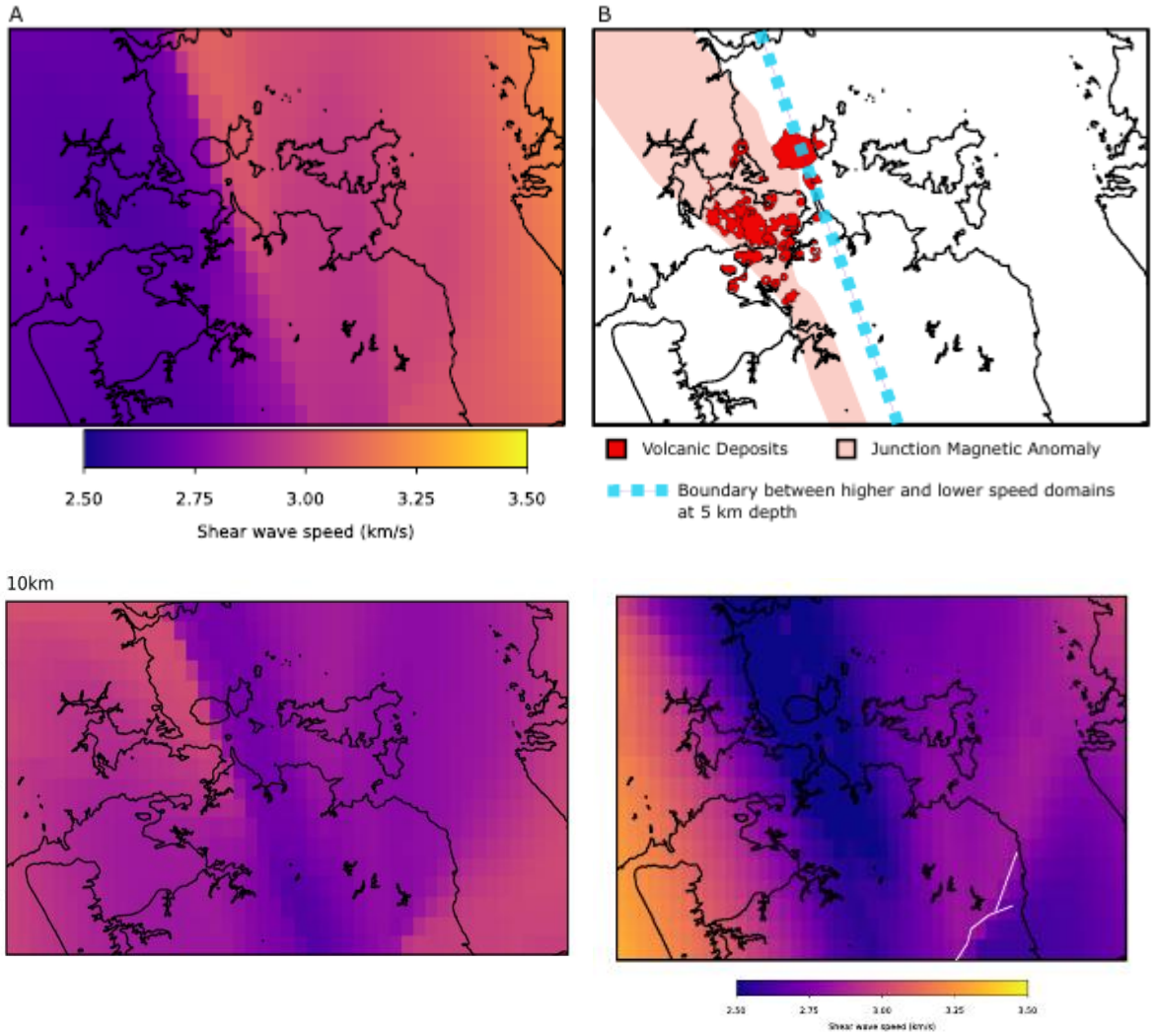
- Our new shear speed model is
  - 3D
  - Higher resolution
  - More robust

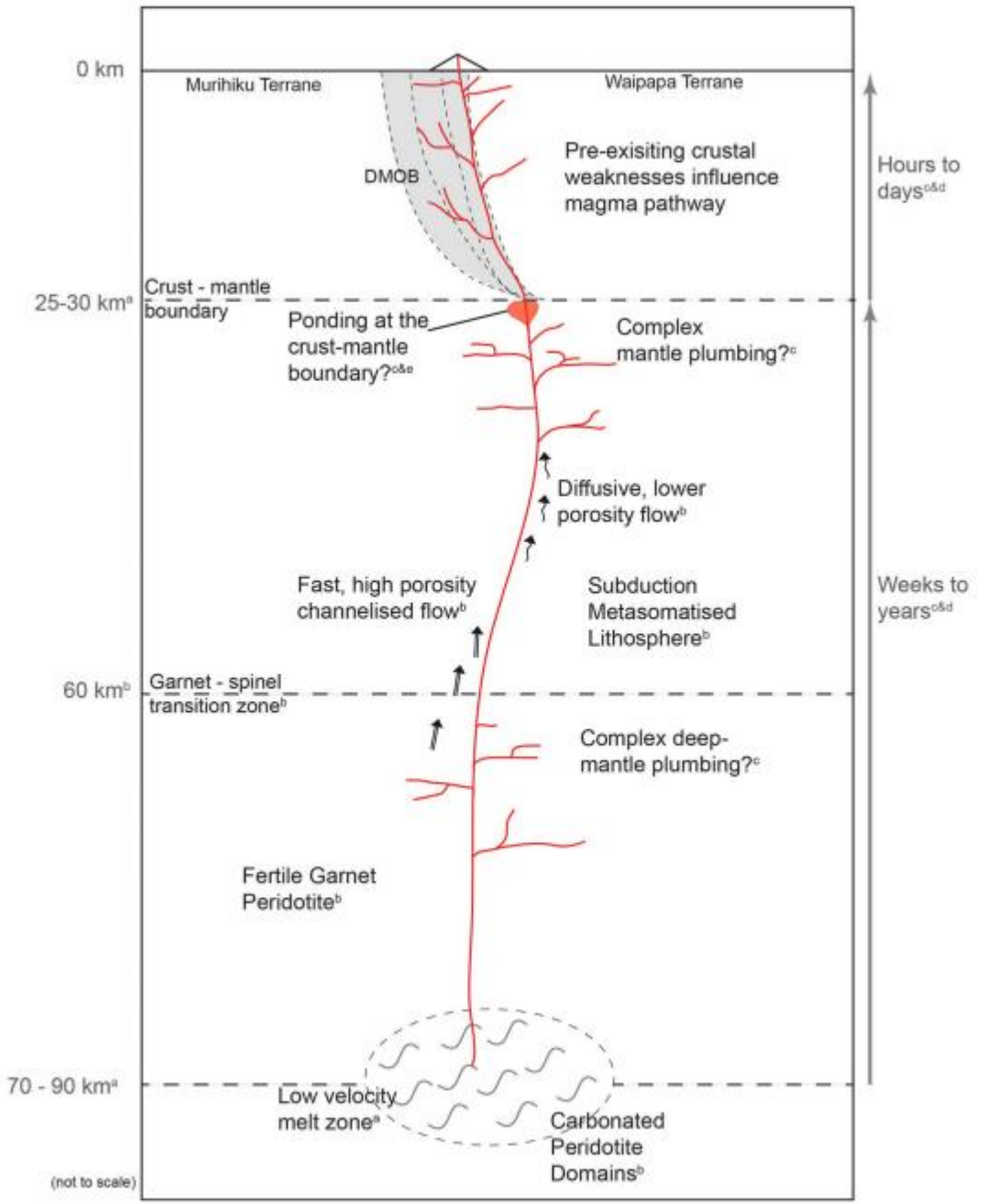




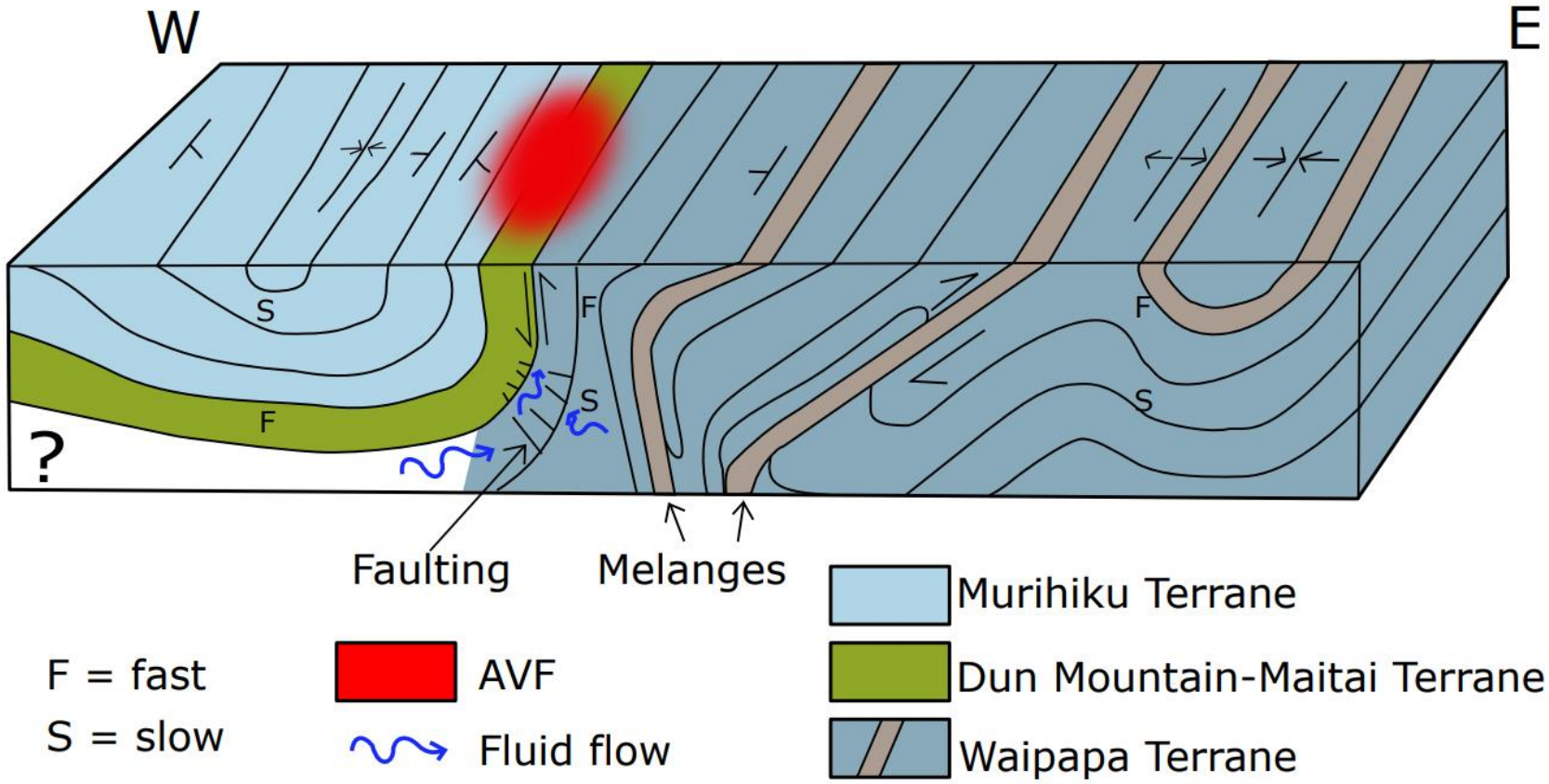

A 1km
B 2km
C 5km
D 10km
E 15km
F 20km
G 25km
H 30km
36.7°S
36.9°S
37.1°S
174.6°E
175°E
175.4°E
3.50
3.25
3.00
2.75
2.50
Shear wave speed (km/s)

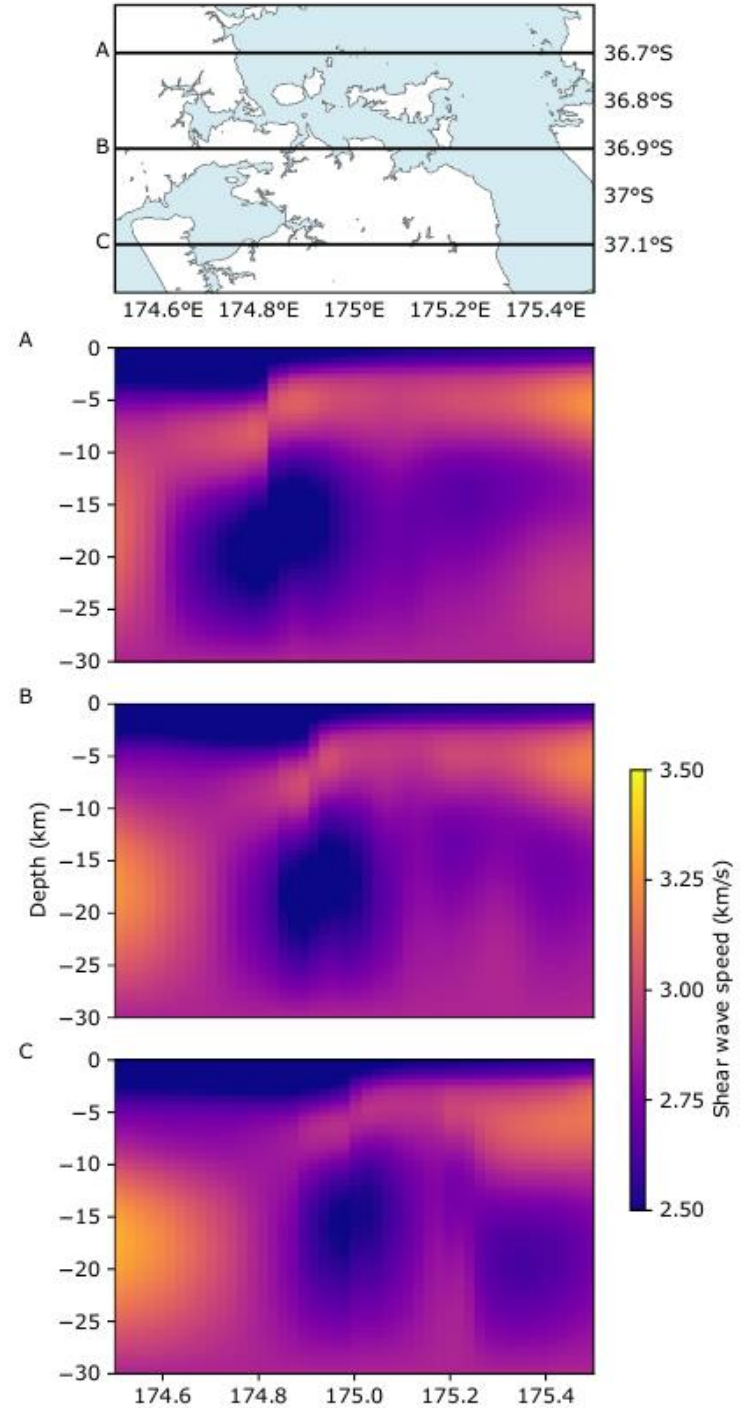

W
E
?
Melanges
Murihiku Terrane
Waipapa Terrane
Waipapa Terrane - weakened
Dun Mountain-Maitai Terrane
AVF





Hopkins et al. 2020


W
E
S
F
F
S
F
S
?
Faulting
Melanges
F = fast
S = slow
AVF
Fluid flow
Murihiku Terrane
Dun Mountain-Maitai Terrane
Waipapa Terrane


A
B
C
36.7°S
36.8°S
36.9°S
37°S
37.1°S
174.6°E
174.8°E
175°E
175.2°E
175.4°E
Depth (km)
0
−5
−10
−15
−20
−25
−30
174.6
174.8
175.0
175.2
175.4
Shear wave speed (km/s)
3.50
3.25
3.00
2.75
2.50

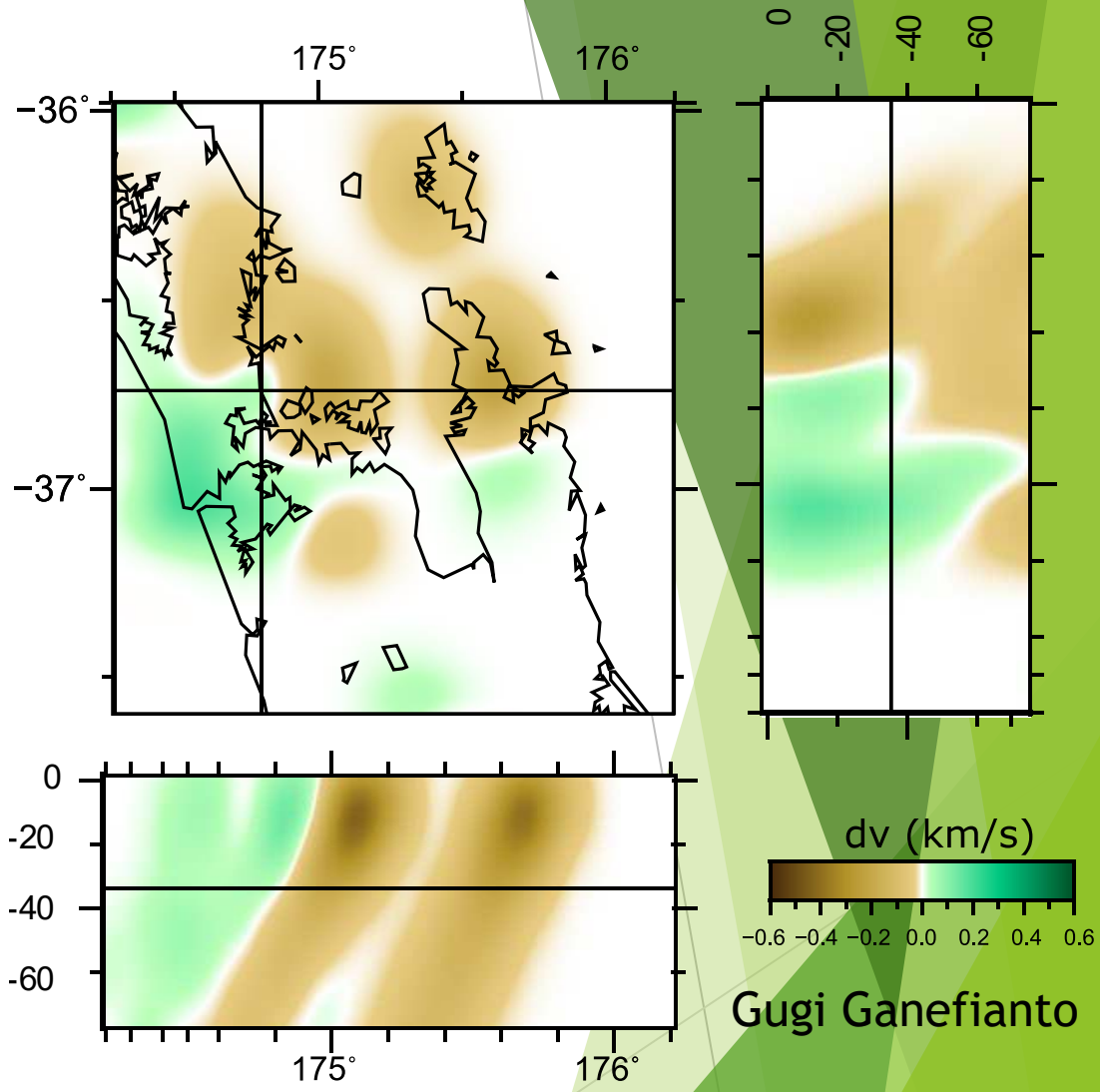
Take home

Our 3D model

- reveals the structure of the crust (upper lithosphere)
- hint's towards a step in lithospheric thickness
- should help improve larger scale tomography

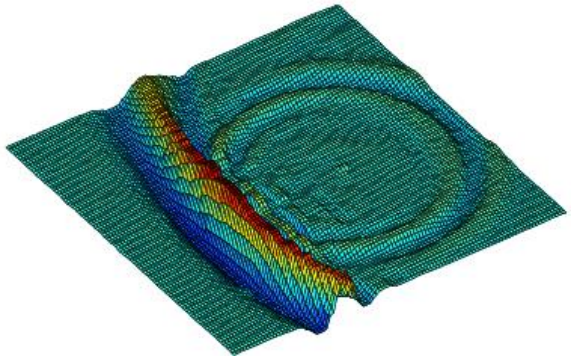
Moving forward

- Map the Moho
- Map the lithosphere thickness
- Image the magma source



Gugi Ganefianto

DEVORA



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