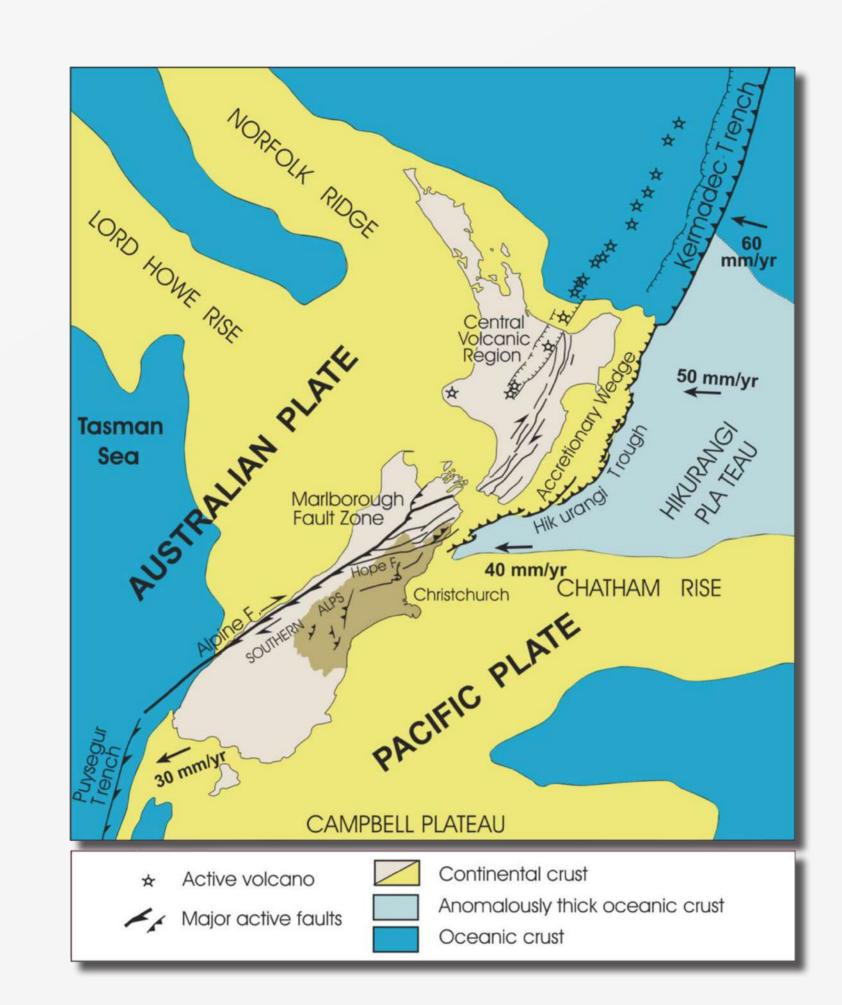
Kaikoura Earthquake: Tectonic Setting and Seismology

Map of the main tectonic features of New Zealand associated with the obliquely convergent Australia-Pacific Plate Boundary.

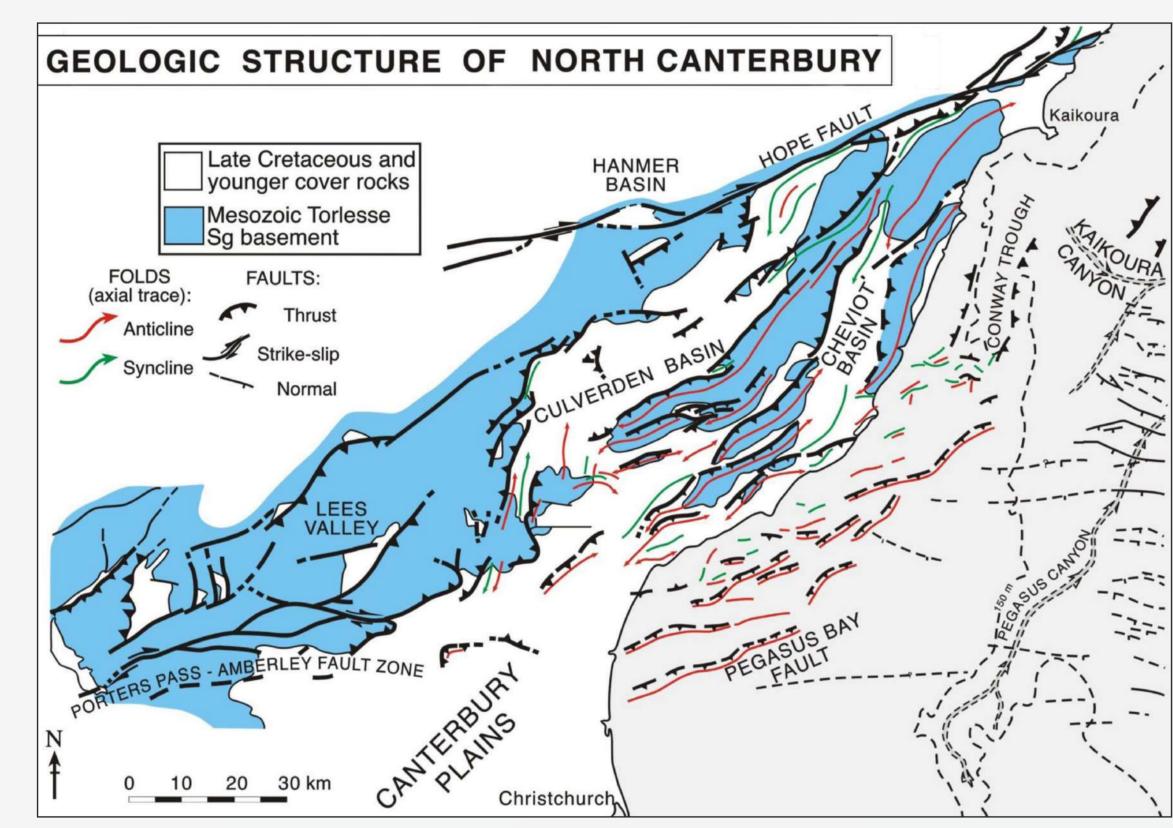
Bold arrows indicate movement rate in millimetres per year of Pacific Plate relative to Australian Plate.

Figure Source: from Pettinga et al. (1998)



Simplified geological structure of the North Canterbury Region. All faults in bold are active.

Figure Source: from J. R. Pettinga



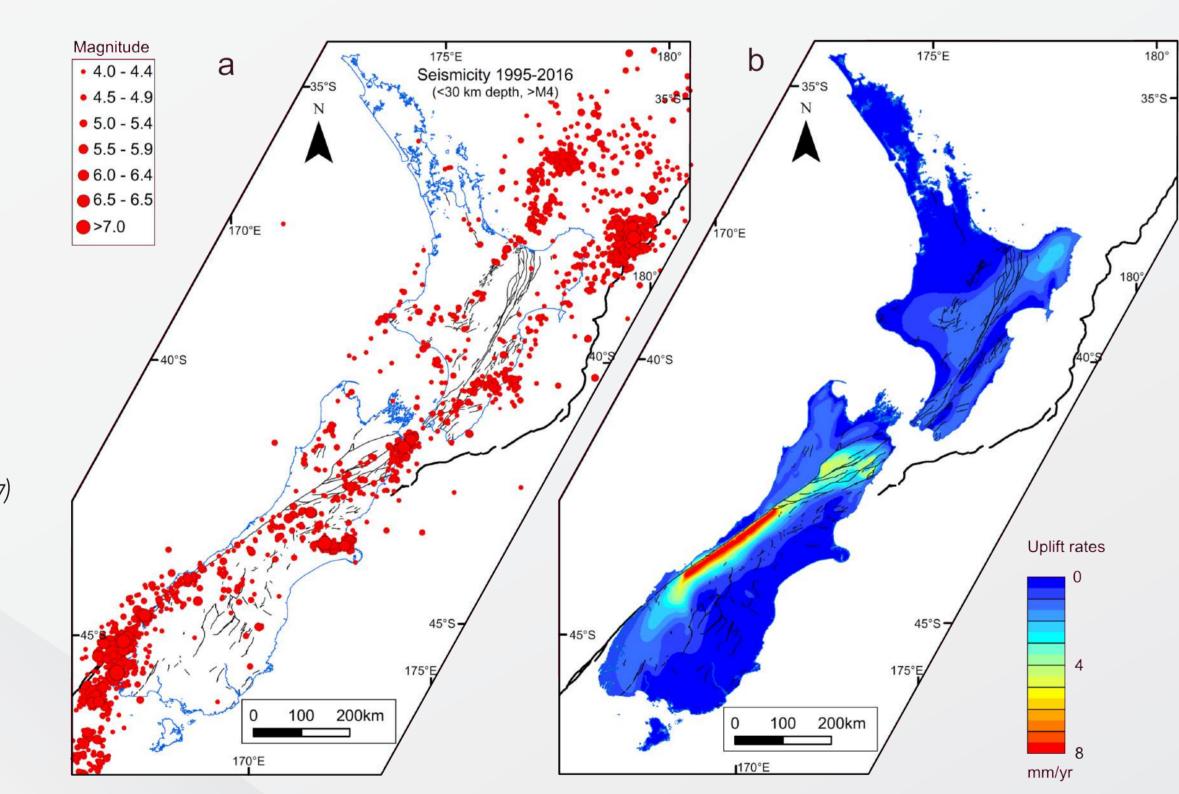
Summary maps of New Zealand:

- a) Seismicity from 1995 to 2016

 shallow depth (<30km)

 earthquakes and magnitudes >M4
- b) Uplift rate map (mm per year)

Figure source: Nicol et al. (2017)



Kaikoura Earthquake – Some Statistics

Mainshock - 14 November 2016 at 12:03 AM (local time)

Magnitude: Mw 7.8

Mainshock epicentre located ~20 km south of the Hope Fault, at a

Focal depth of ~15 km

Rupture propagated NE as complex sequence – several NE-

propagating pulses of energy release Fault rupture arrested near Cape Campbell

Strong ground motion lasted ~2 minutes
Peak Ground Accelerations ~1.3 g

Rupture speed ~1.8 km/sec (~6450 km/hr)

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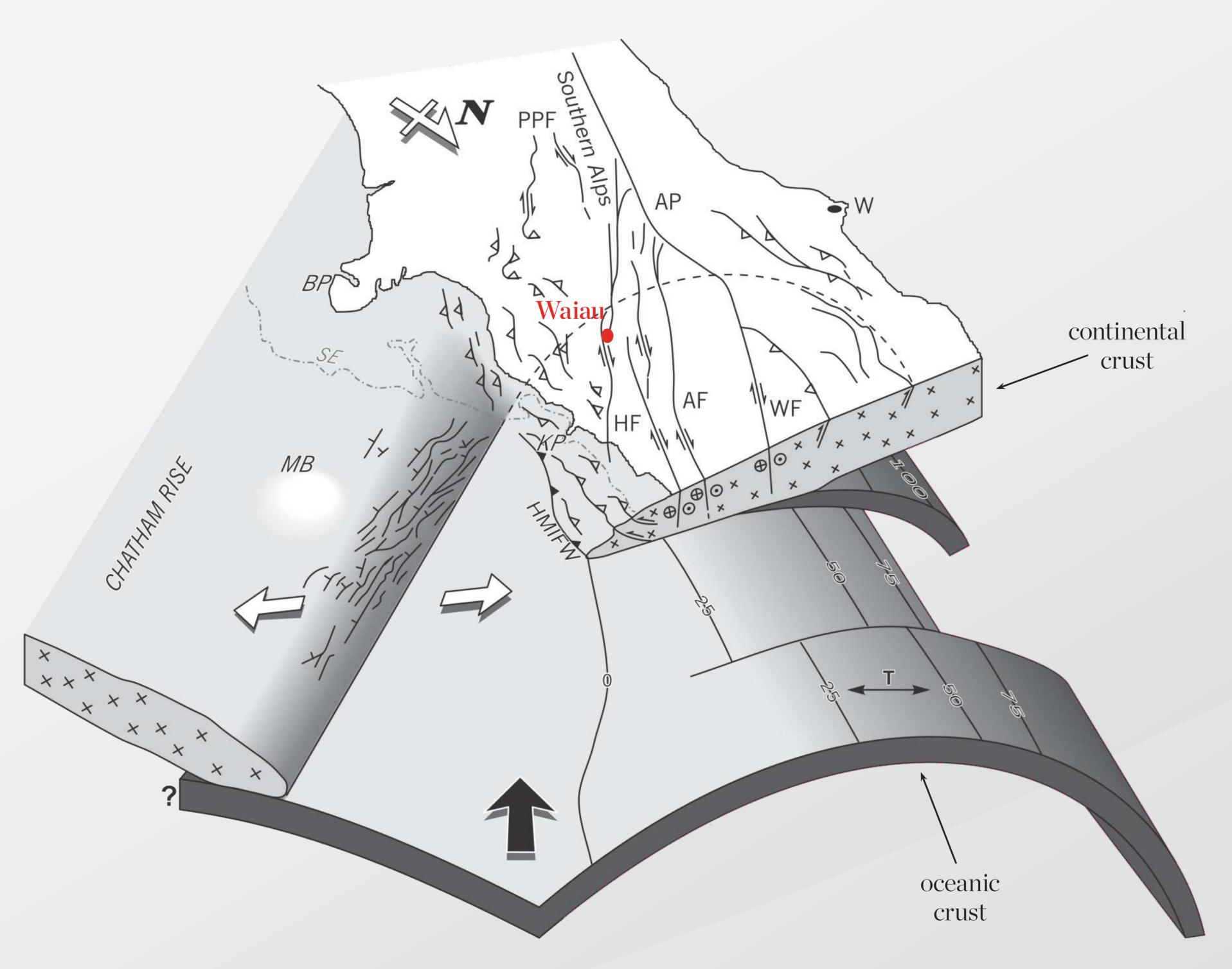
Ruptured at least 12 faults at the ground surface

Approx. 180 km-long zone of ground surface rupturing

2 deaths, 57 injured

Tens of thousands of landslides

Estimates indicate \$5-8 billion dollars damage



Abbreviations: WF: Wairau Fault; AF: Awatere Fault; HF: Hope Fault; HMIFW: Hikurangi subduction Margin Frontal Wedge; PPF: Porters Pass Fault Zone; W: Westport; BP: Banks Peninsula.

Conceptual diagram depicting the subducting slab of the Pacific Plate and associated deformation of the overriding continental crust of northern South Island.

Northern South Island is located at the transition from oblique plate subduction along the Hikurangi margin to continental collision

Marlborough Fault Zone is characterised by predominantly strike-slip (horizontal displacement) faulting

Figure source: from Barnes (1994)

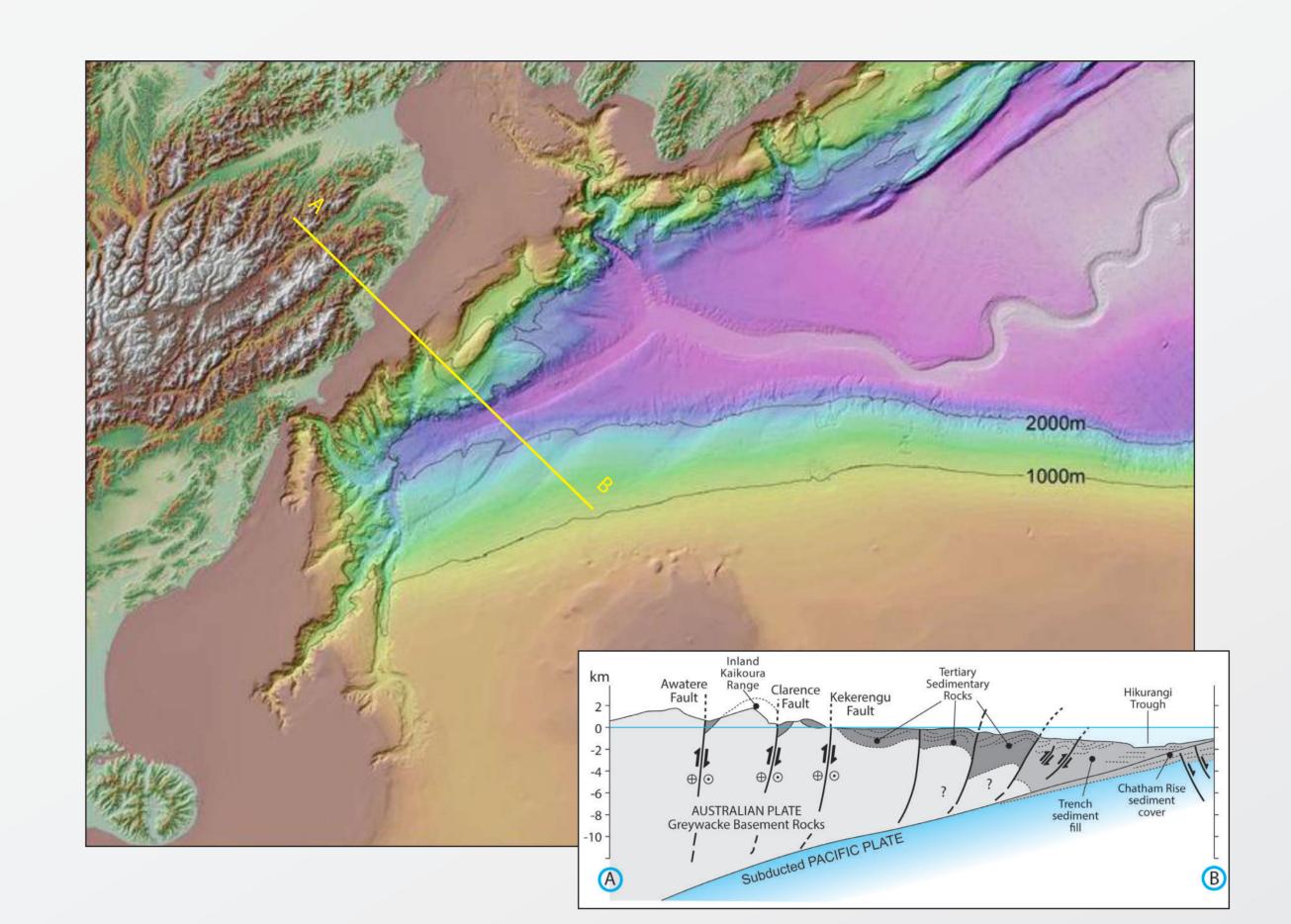
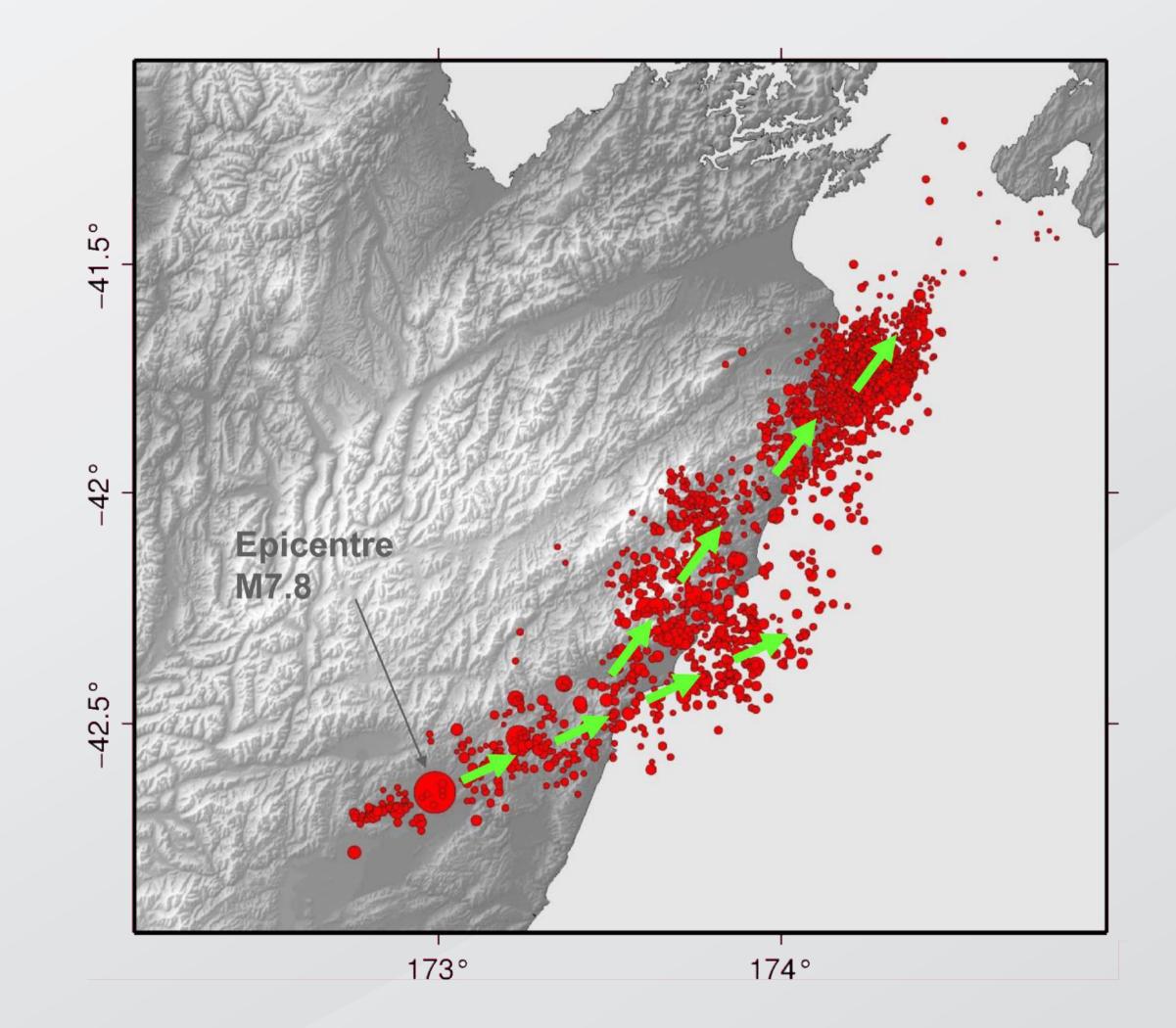


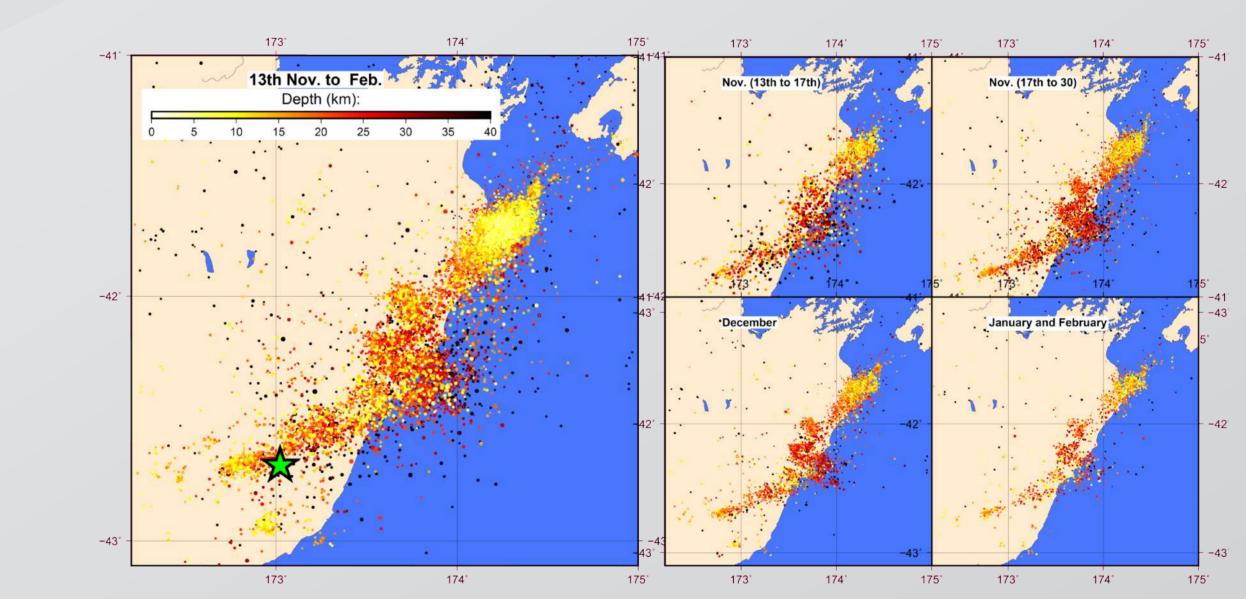
Plate boundary "architecture" in the transition zone from oblique subduction to oblique continental collision.

> Map Figure Source: NIWA Cross Section Figure source: J.R. Pettinga - unpublished



Aftershock distribution (total 690 with magnitude >1.6) for period 14-19th November, Kaikoura Earthquake. Arrows indicate direction of fault rupture propagation. Overall relatively low rate of aftershock productivity.

Data source: Geonet Figure source: Kaiser et al. in review SRL



Kaikoura Earthquake aftershock spatial and temporal distribution patterns

Figure source: Sofia Kufner – GFZ Potsdam

