EGU online presentation

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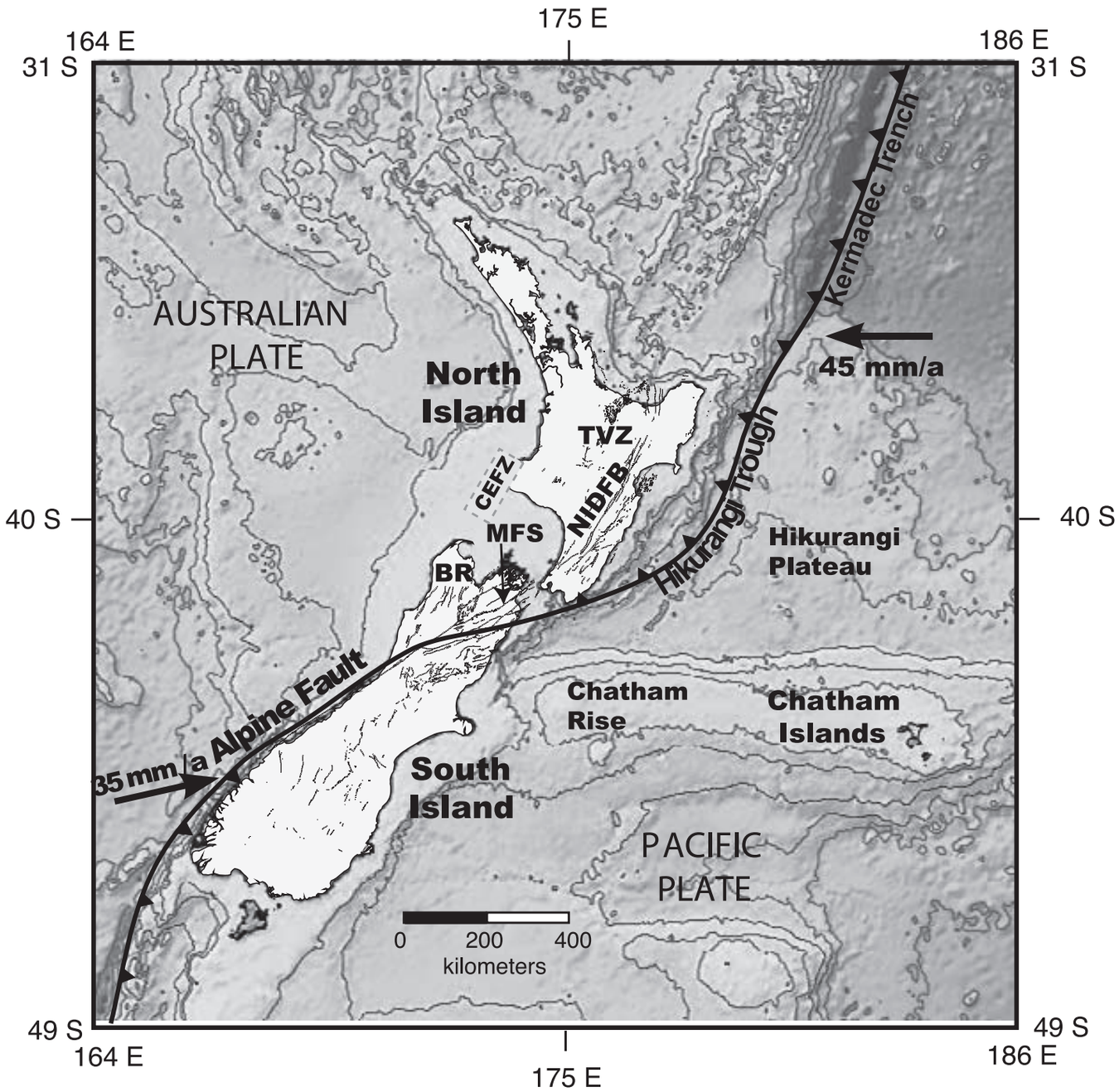
Seismo-tectonic context of New Zealand



Wallace and beavan, 2004

Boundary between Pacific and Australian plate

North Island: the Pacific plate subducts beneath the Australian plate

Southern: the Australian plate subducts beneath the Pacific plate

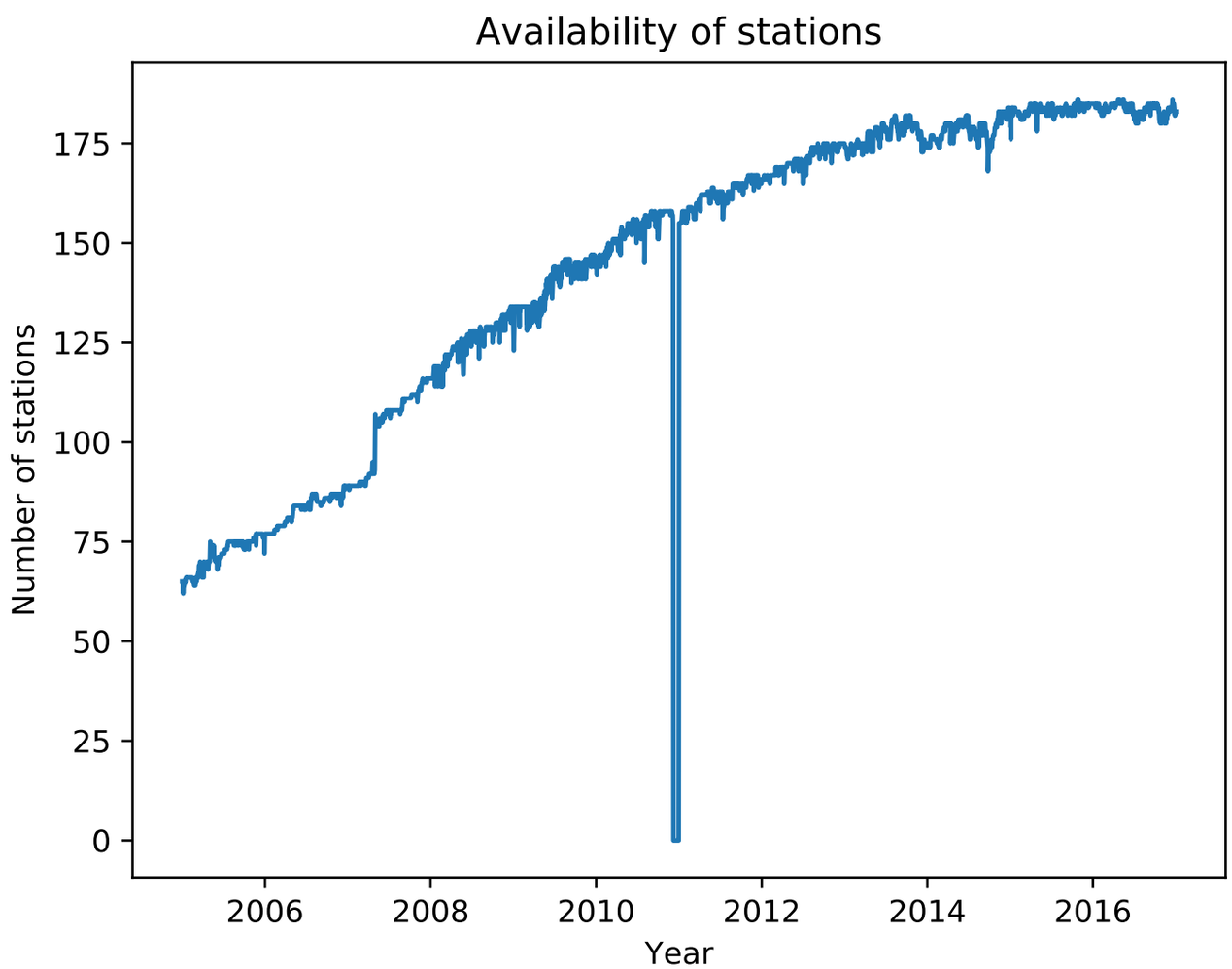
The two subductions are accommodated by Marlborough fault system and the Alpine fault

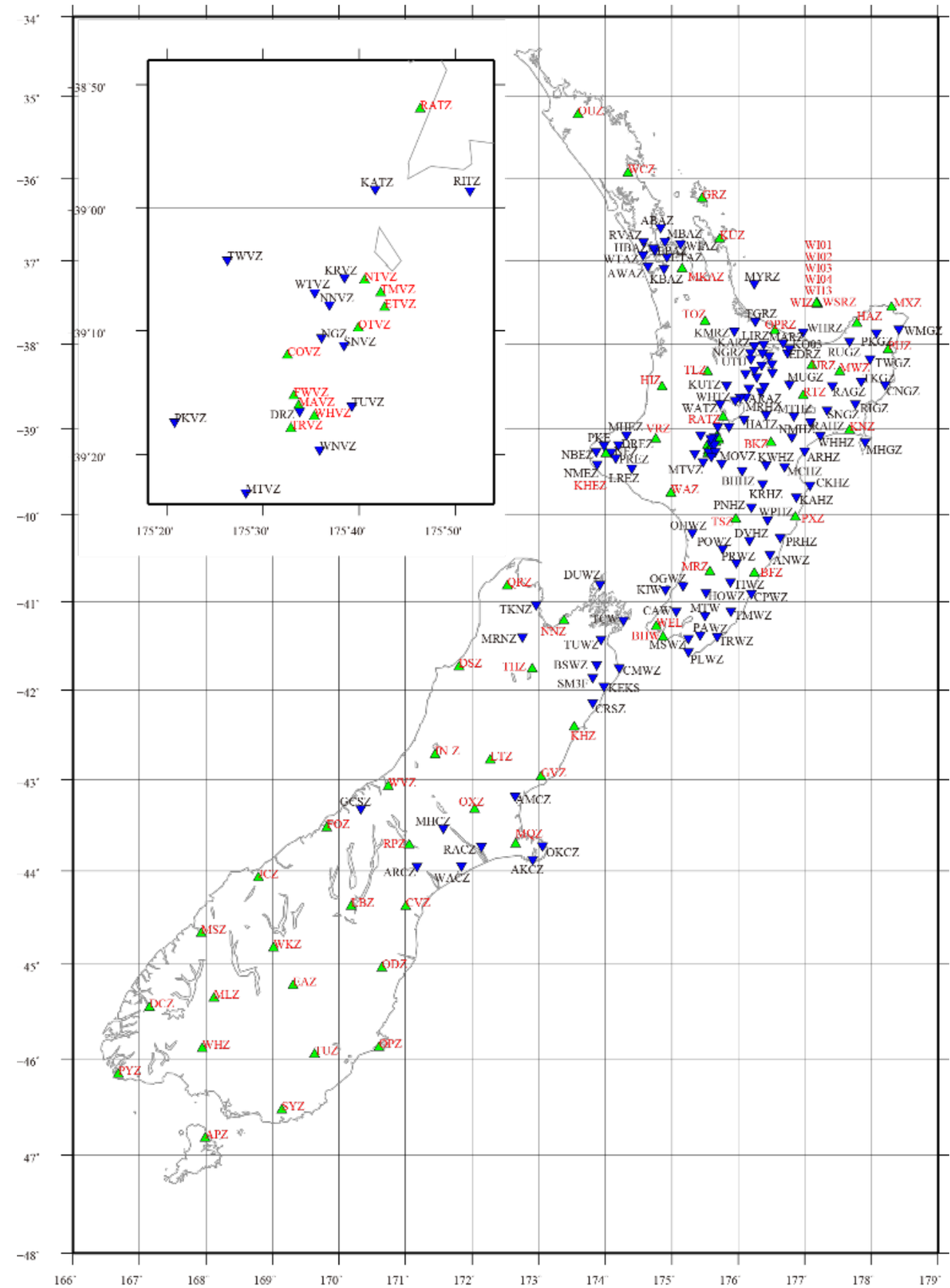
New Zealand Seismic network

Geonet network

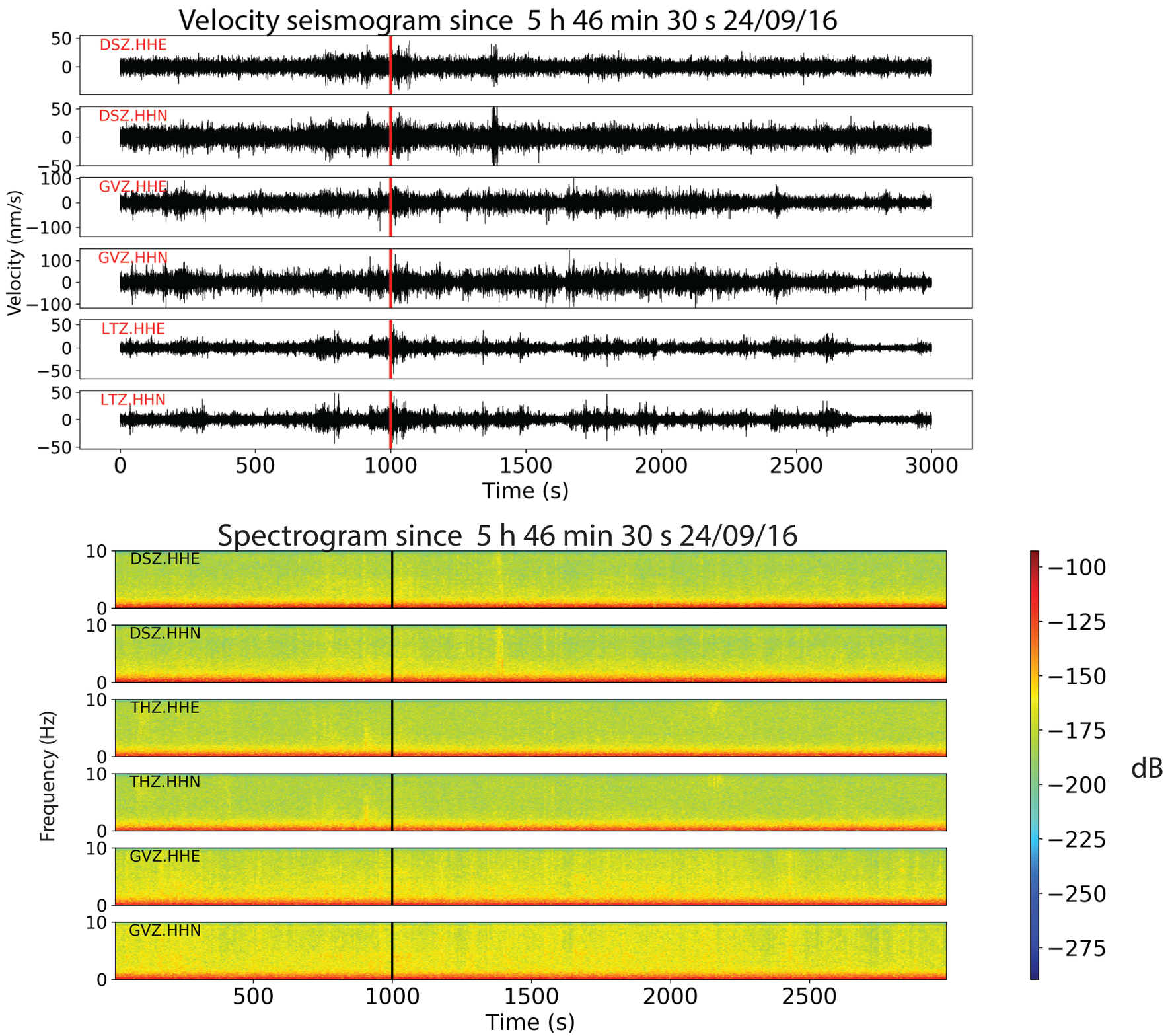
Broad-band stations

Short-period stations





Example of tremor signal



-> Tremors: mainly detected between 2-8Hz, small amplitude

Method

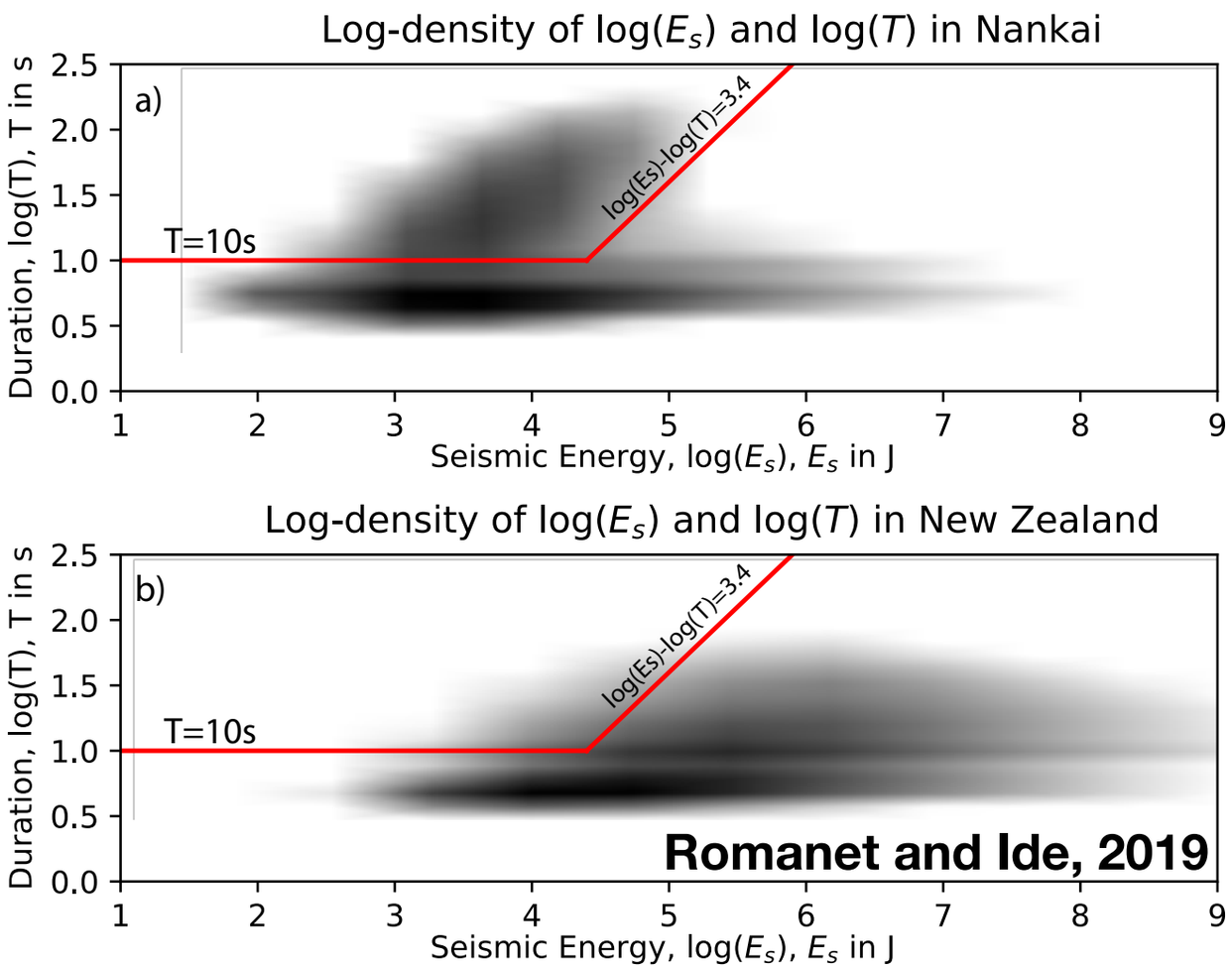
Envelope cross-correlation method
+
Scaling-based sorting
+
Handpicking

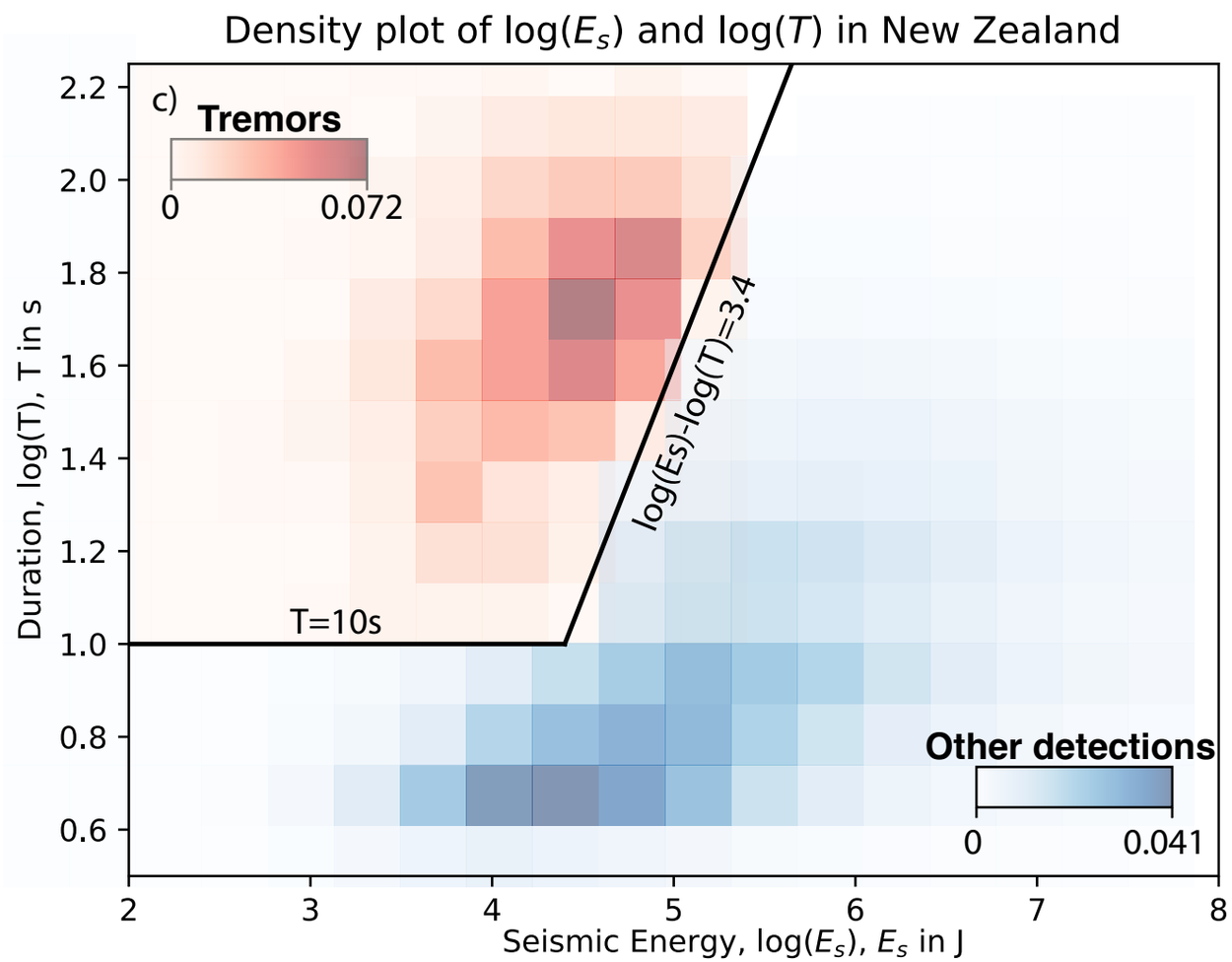
For earthquakes	$M_0 \propto T^3$
For tremors	$M_0 \propto T$

Ide et al., 2007

For earthquakes	$E_S \propto T^3$
For tremors	$E_S \propto T$

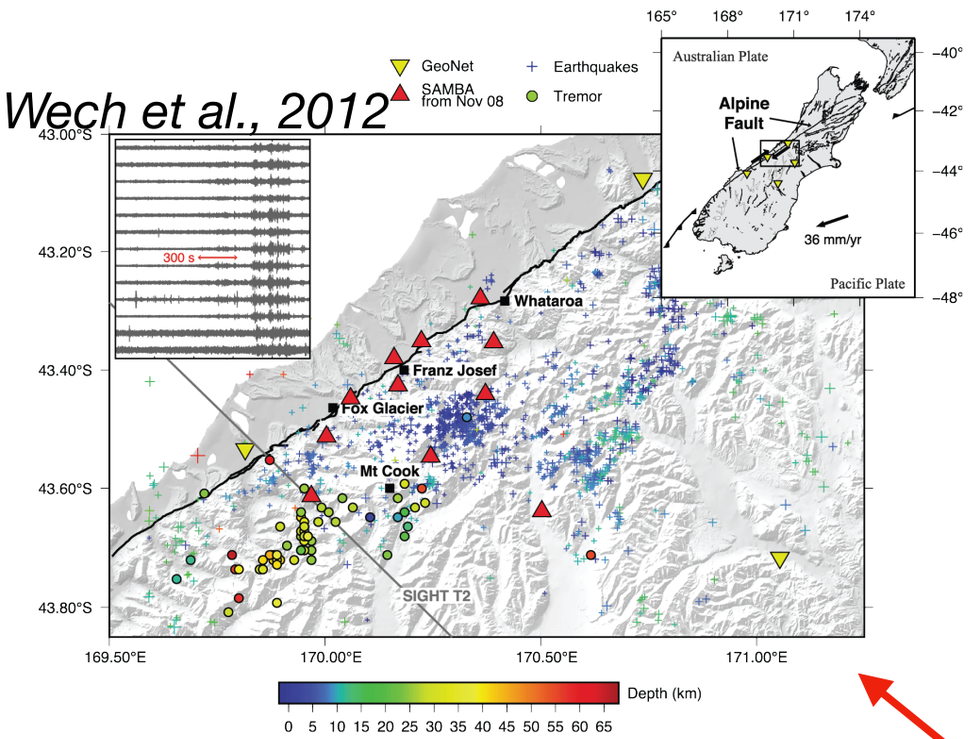
$$M_e - \log T < -1$$





Tremors in New Zealand

Wech et al., 2012



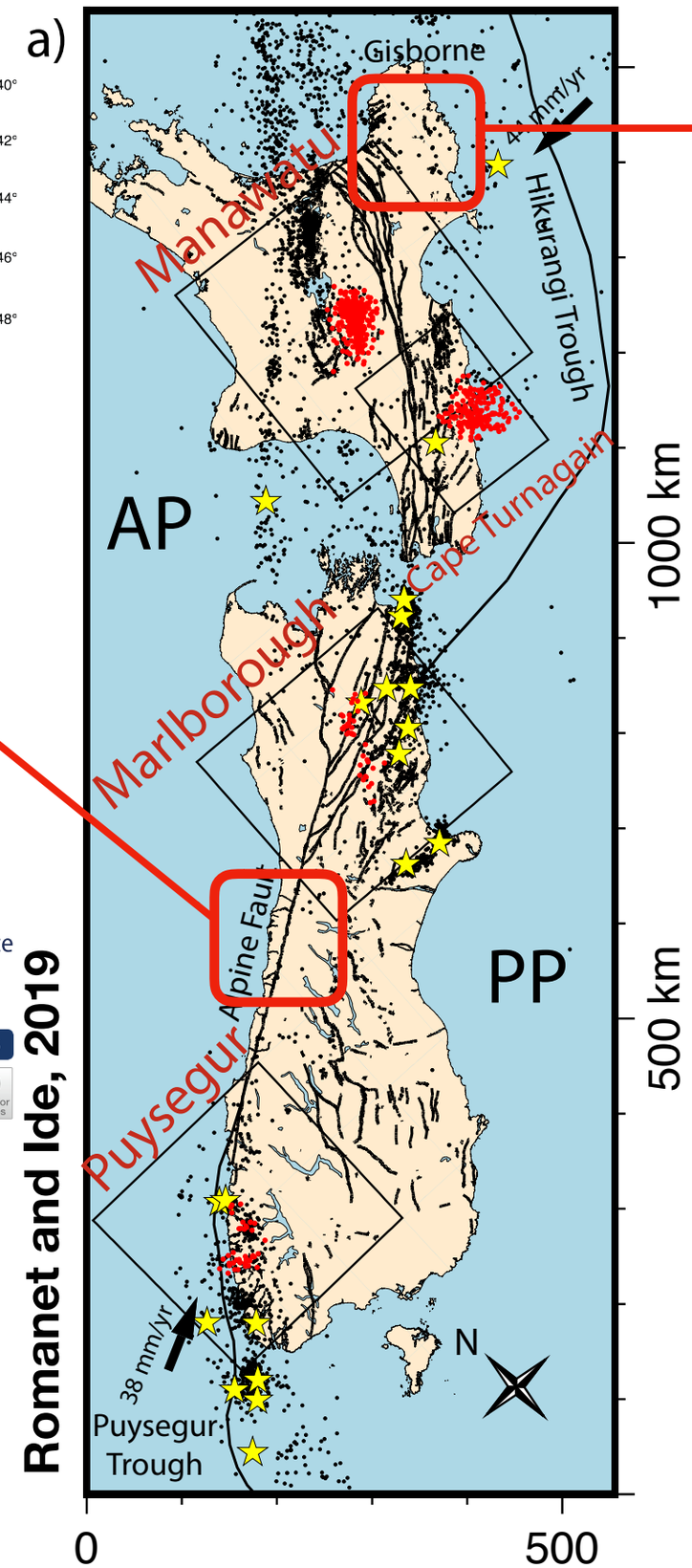
Romanet and Ide Earth, Planets and Space (2019) 71:59
https://doi.org/10.1186/s40623-019-1039-1

Earth, Planets and Space

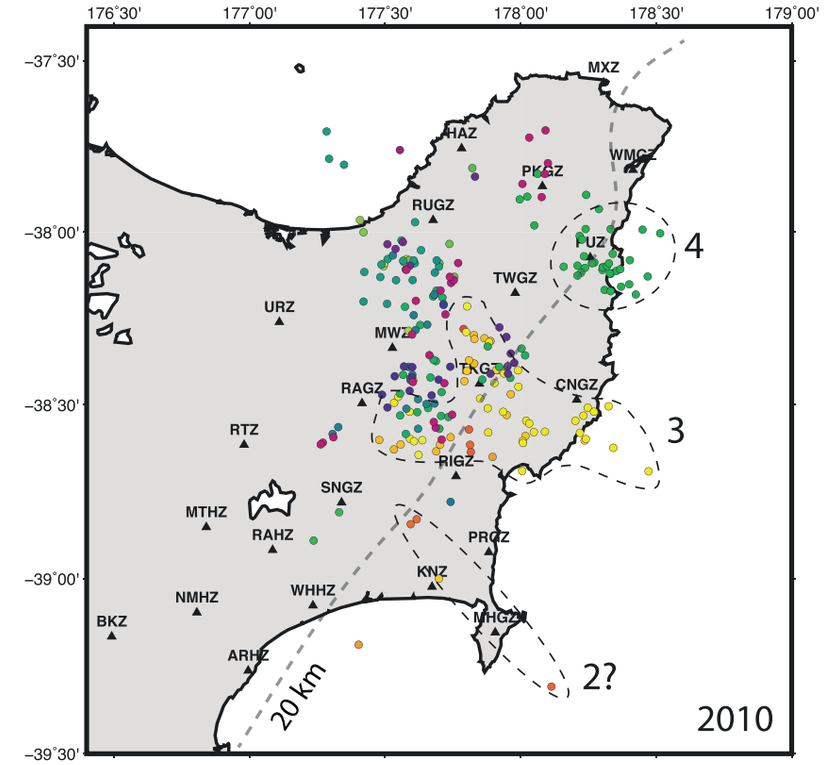
EXPRESS LETTER Open Access

Ambient tectonic tremors in Manawatu, Cape Turnagain, Marlborough, and Puysegur, New Zealand

Pierre Romanet and Satoshi Ide



Romanet and Ide, 2019

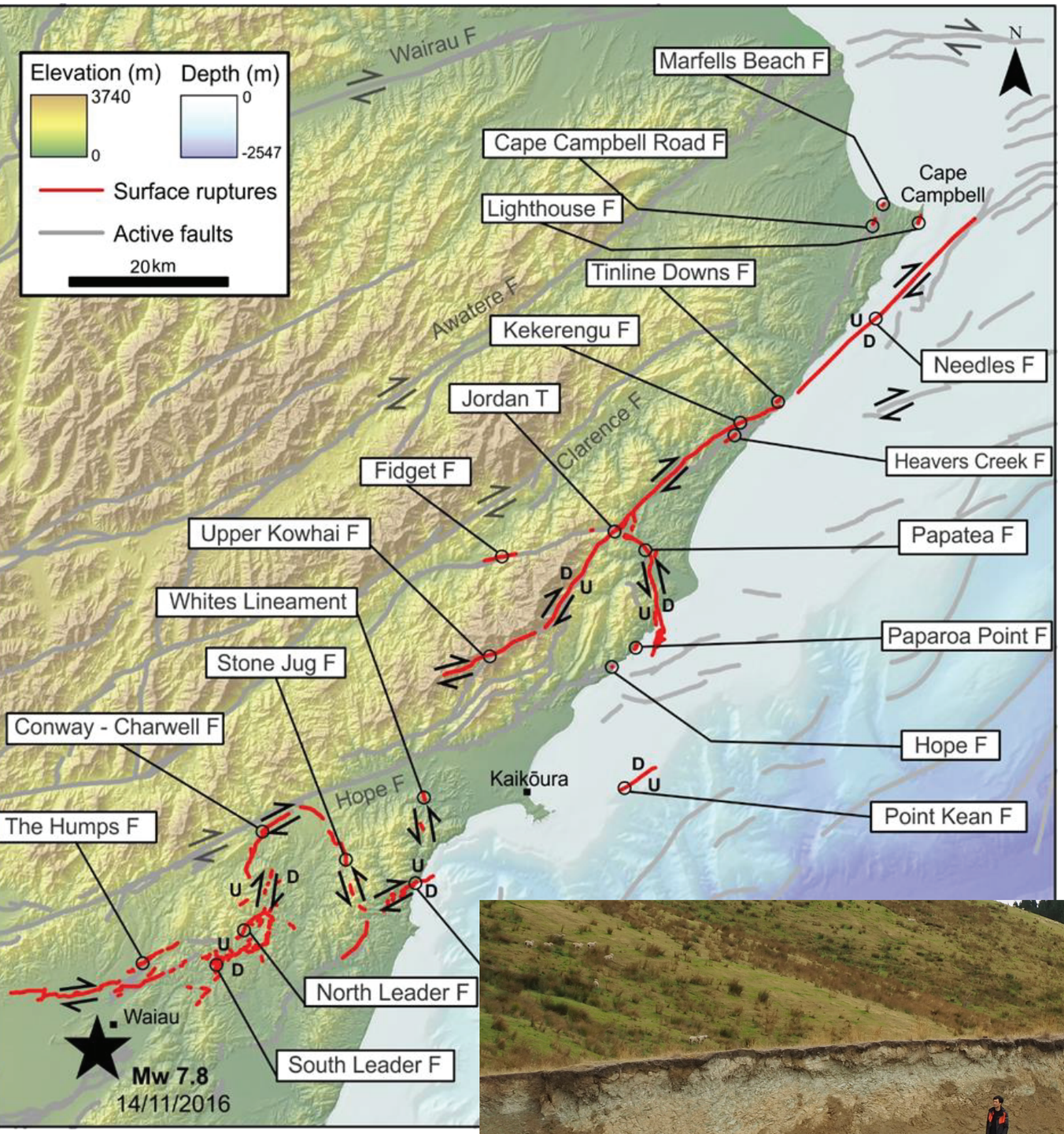


Todd and Schwartz, 2016
Todd et al., 2018

-> Tremors detected nearly everywhere in New Zealand

● Tremor ★ Earthquake (Mw>6) • Earthquake (Mw>4)

Seismic Cycle of Kaikoura?



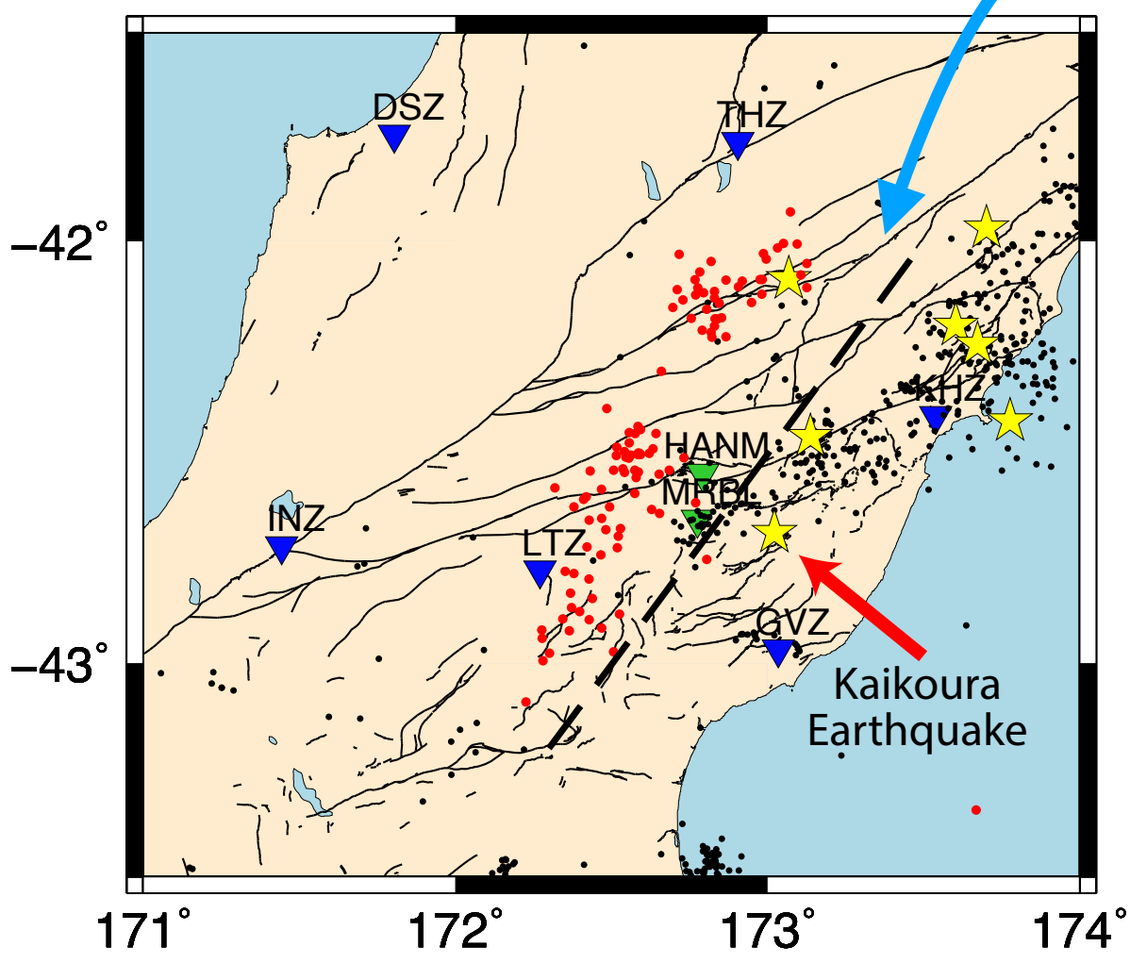
Stirling et al., 2017

Interaction with slow events?

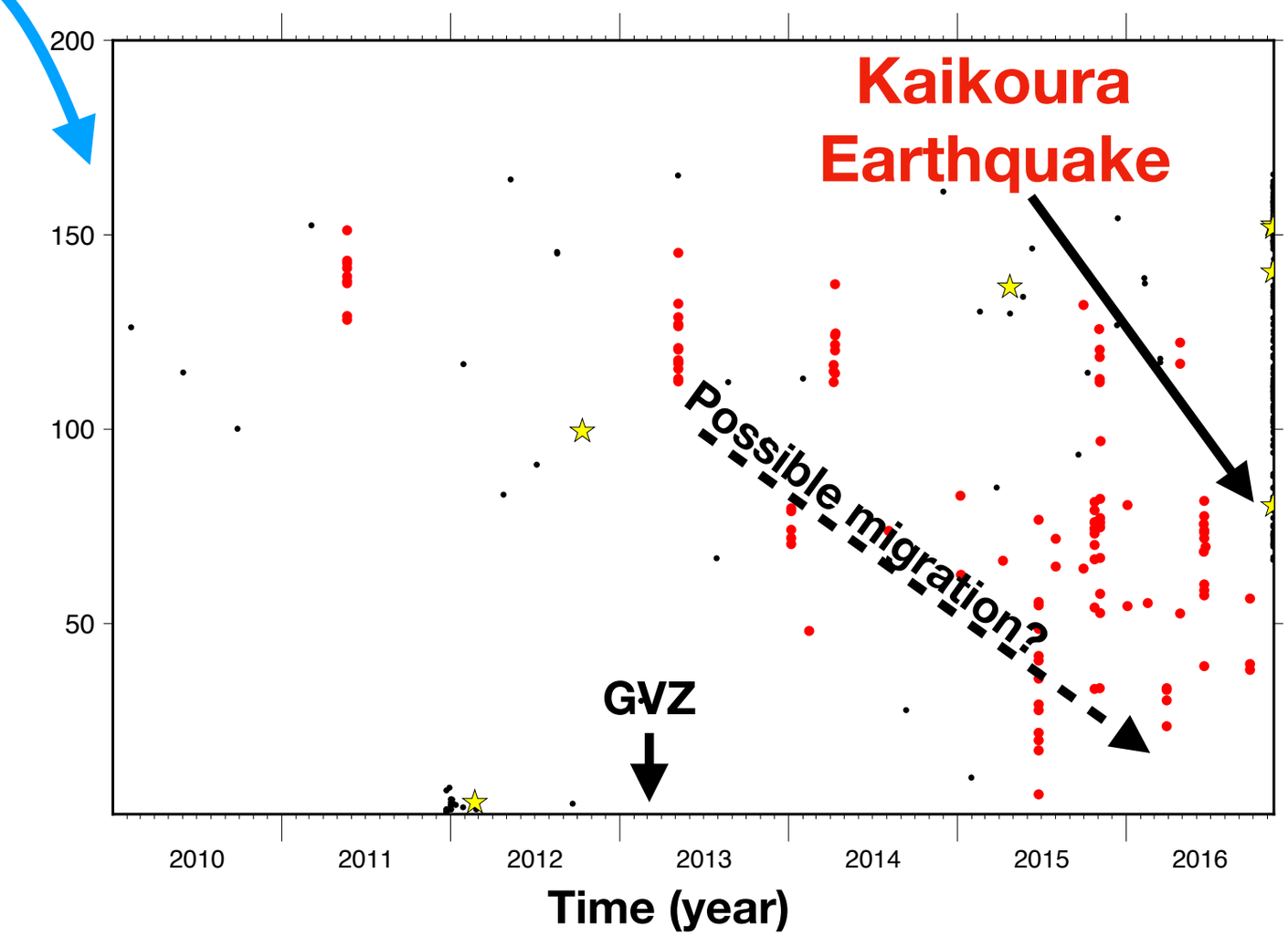
Leaders fault

What happened before Kaikoura EQ?

Projection on this line



Space-time plot

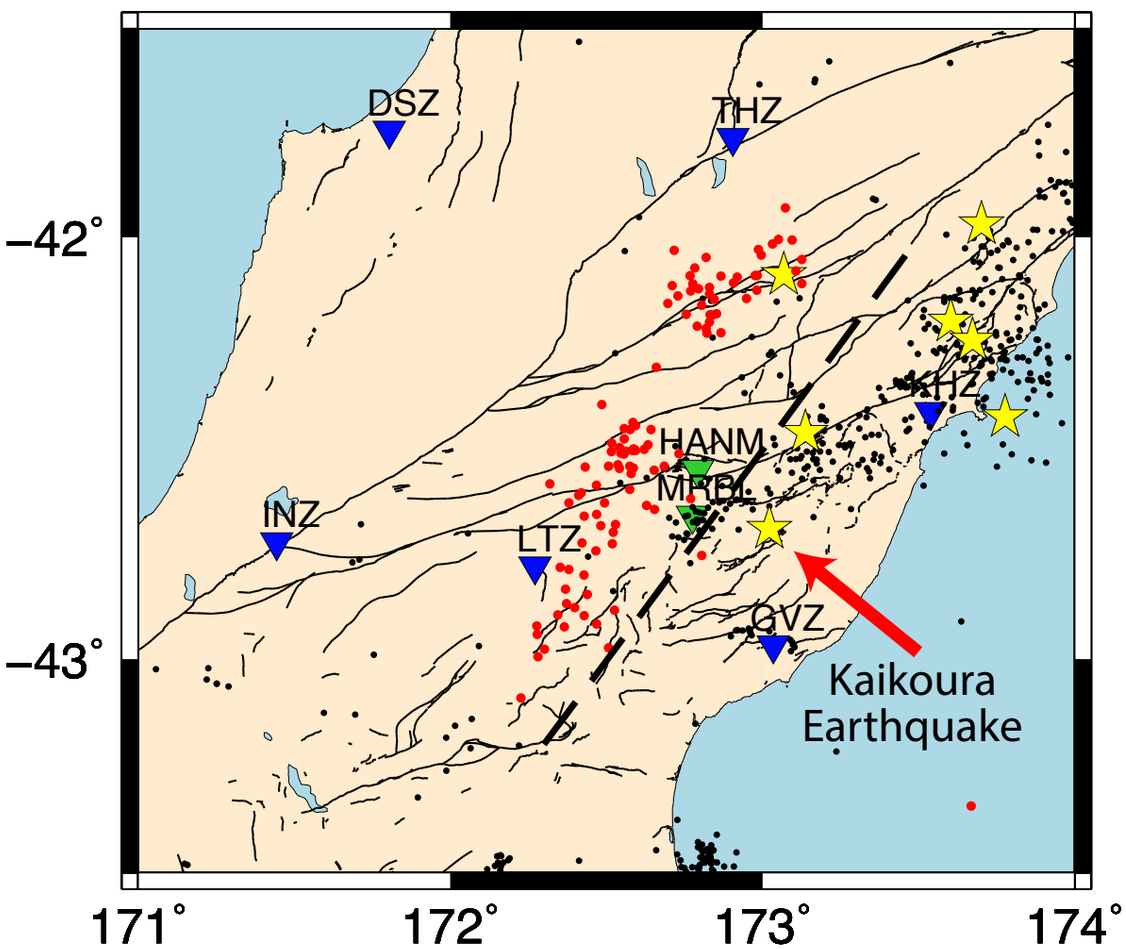


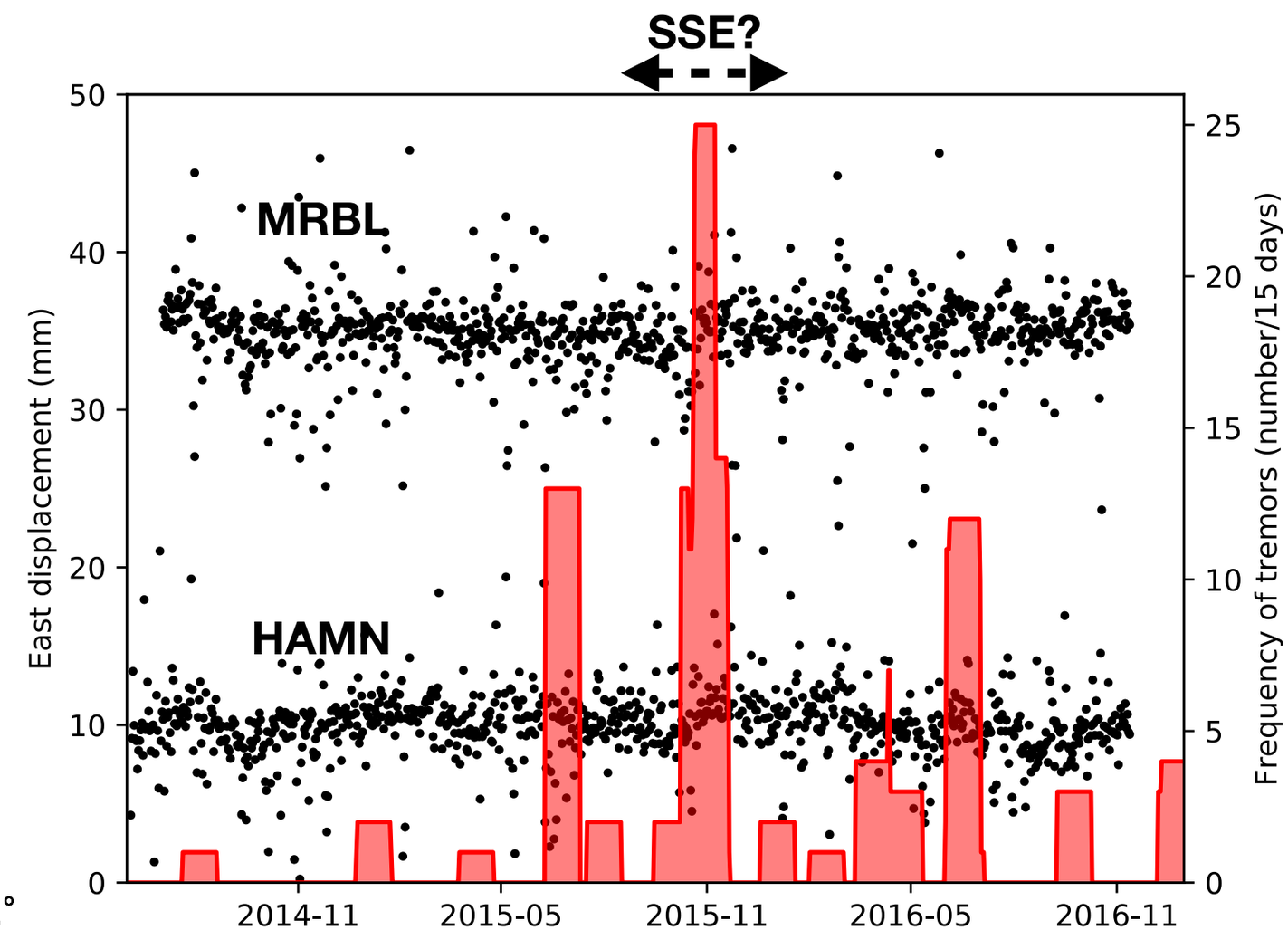
● Tremor ★ Earthquake (Mw>6) • Earthquake (Mw>4)

-> Tremors before Kaikoura EQ
-> Migration towards the epicenter?

What happened before Kaikoura EQ?

GPS signal and tremor frequency versus time

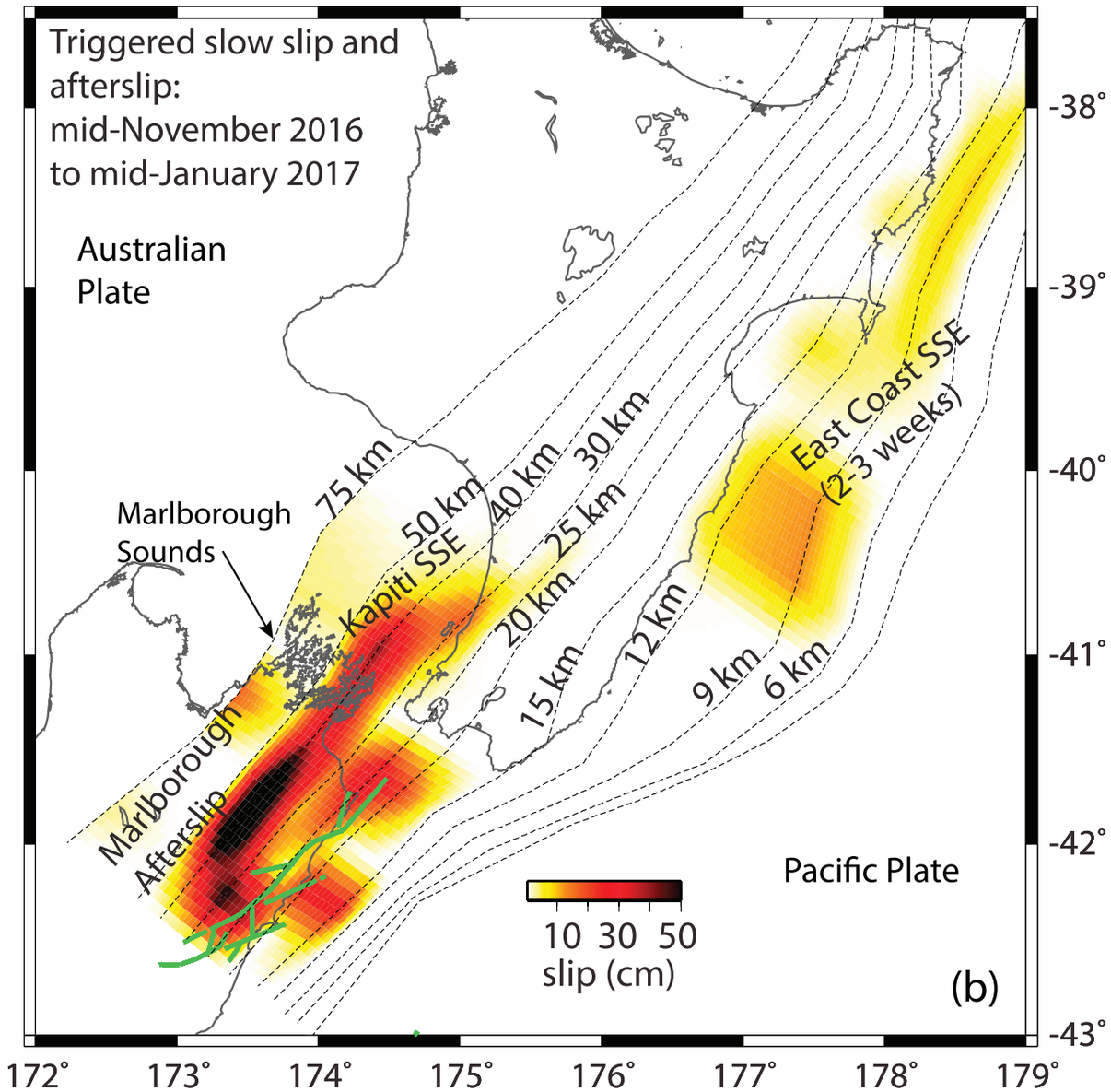


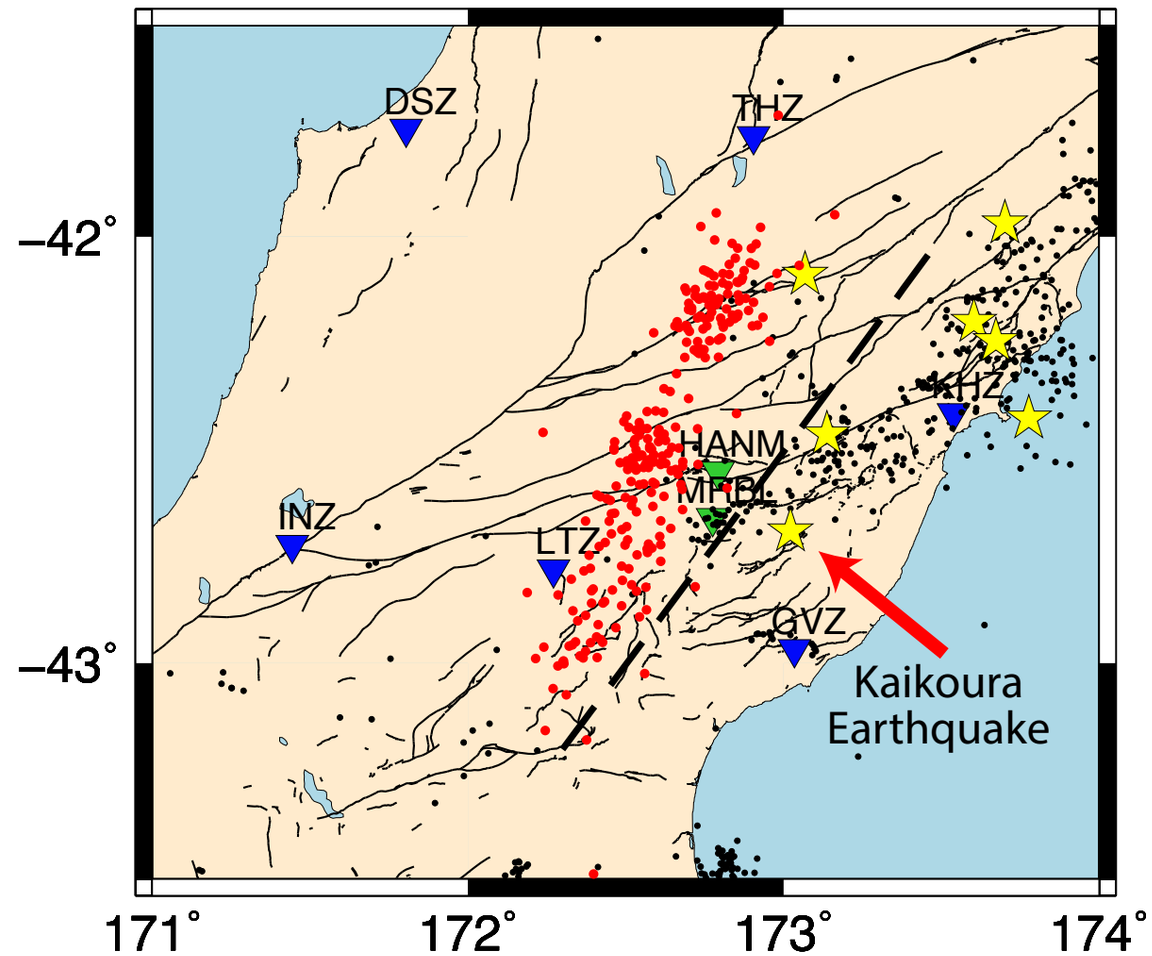


-> Relationship with possible slow events?

What happened after Kaikoura EQ?

Wallace et al., 2018

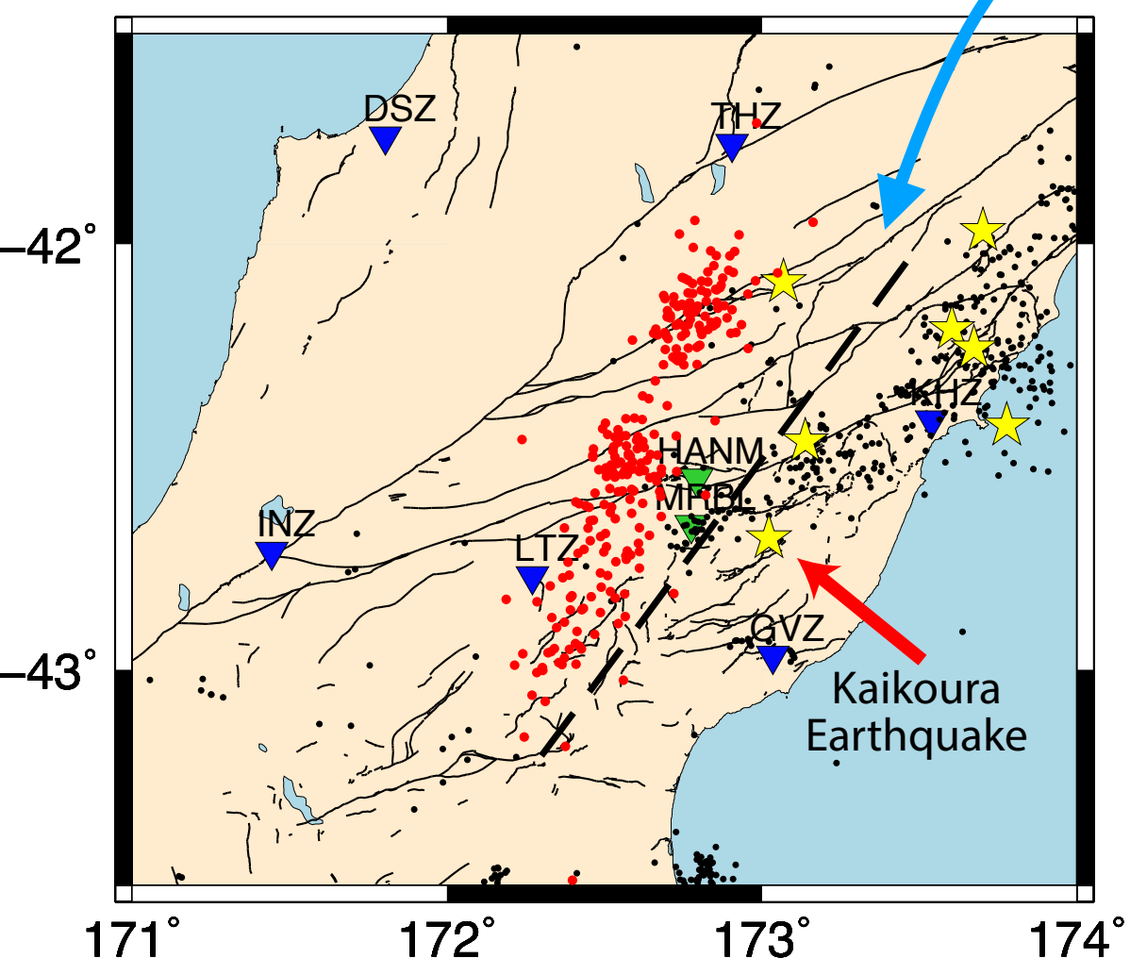




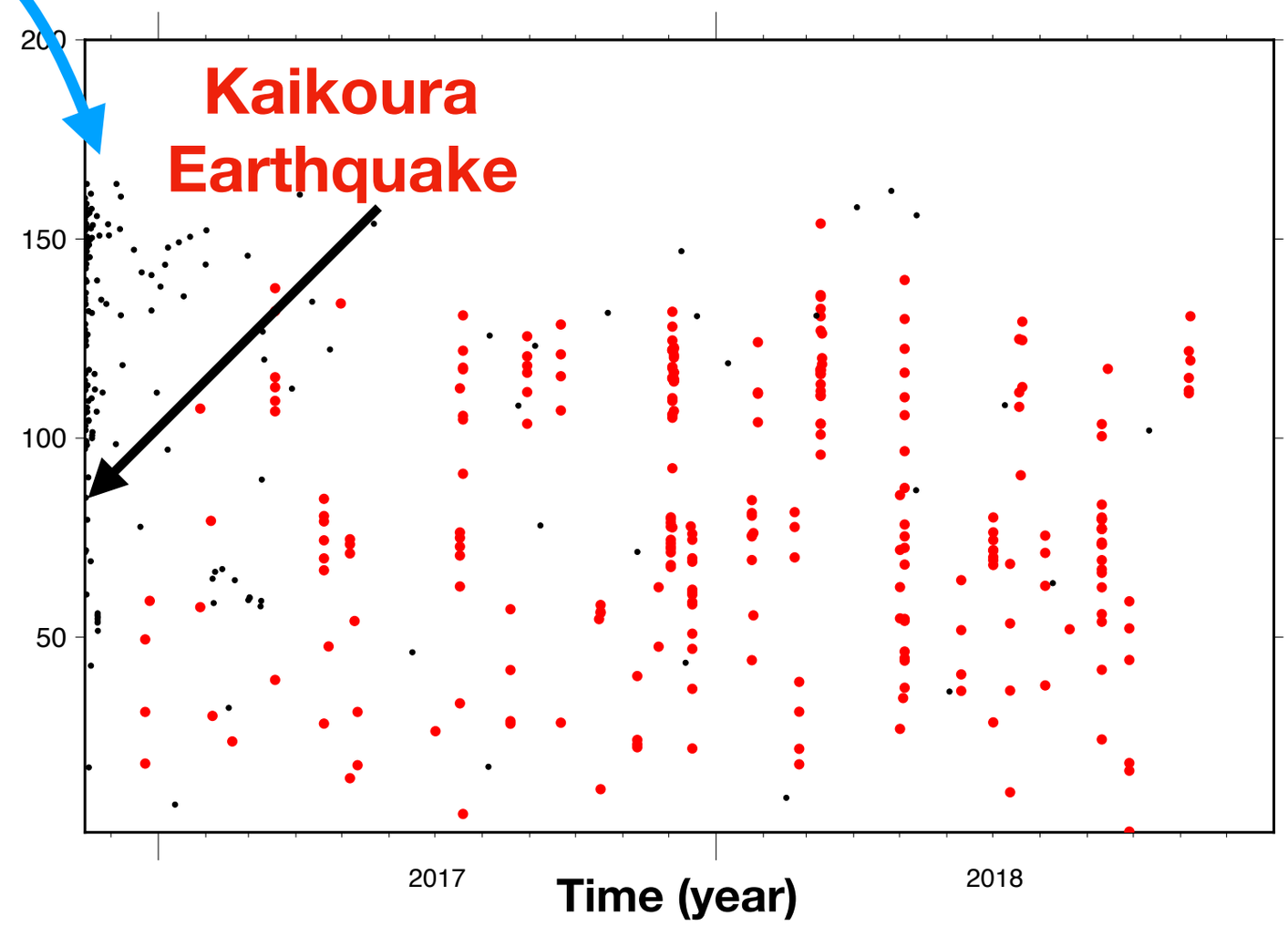
-> Triggered slow slip event
-> Increase in tremor rate

What happened after Kaikoura EQ?

Projection on this line



Space-time plot

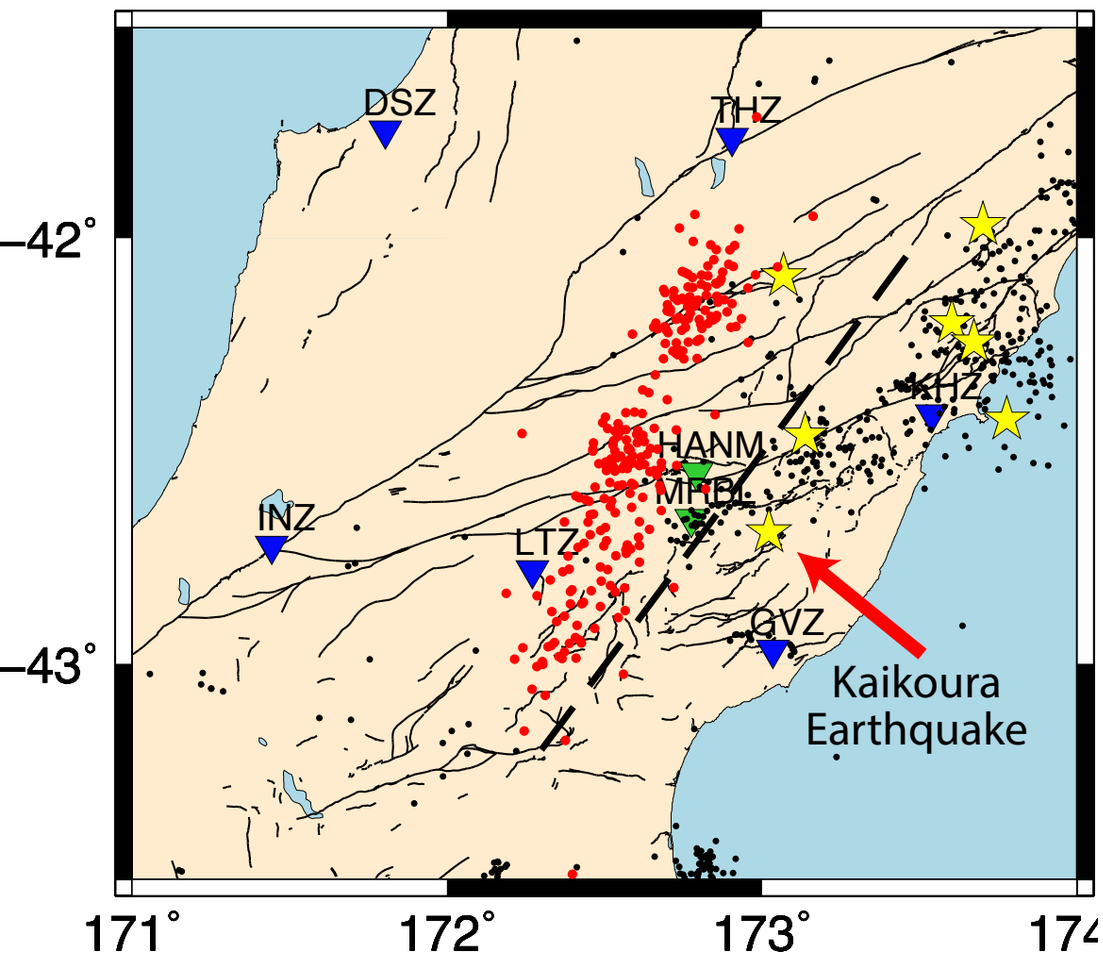


● Tremor ★ Earthquake (Mw>6) • Earthquake (Mw>4)

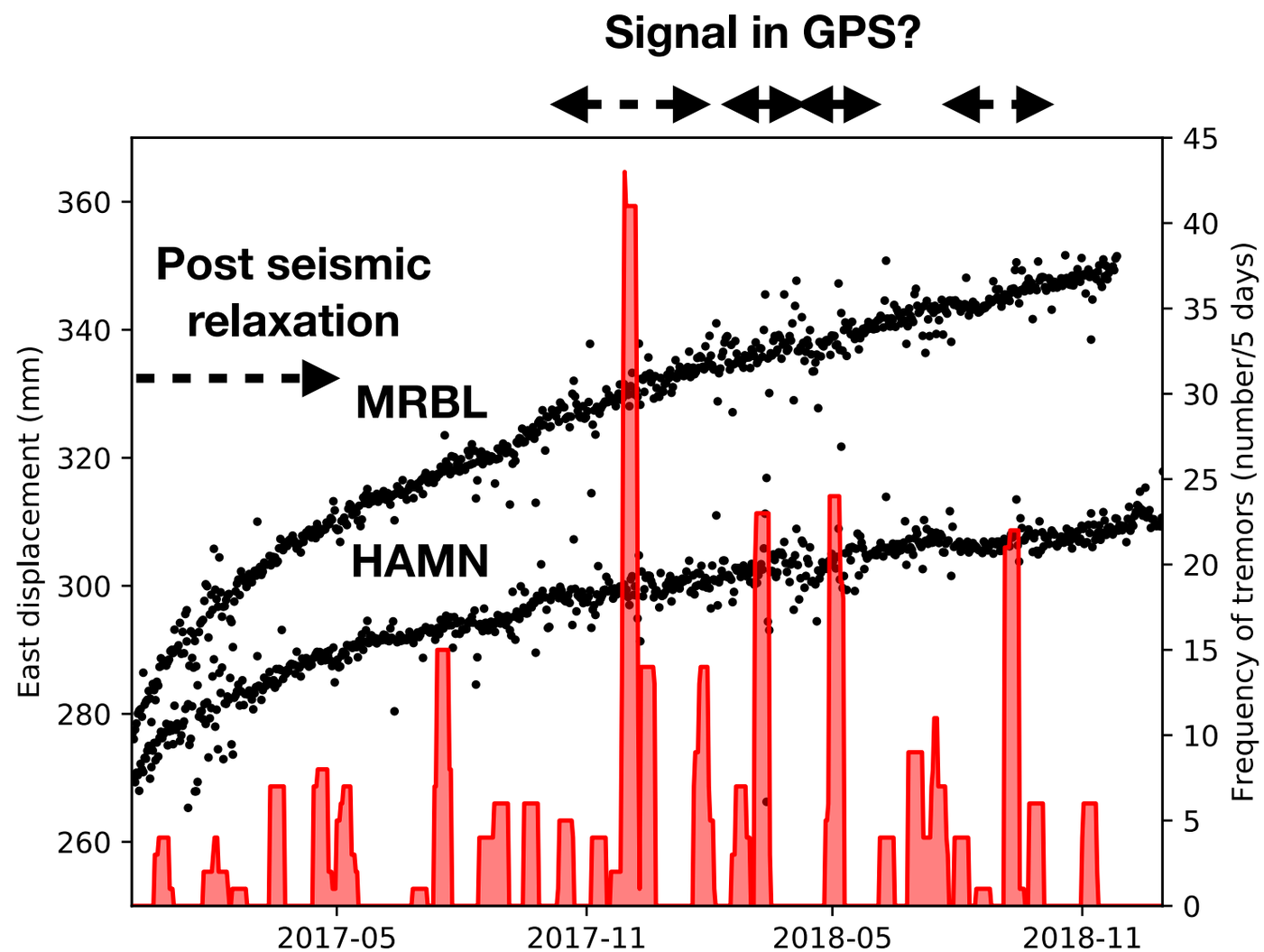
-> Two clusters

-> Increase in tremor rate

What happened after Kaikoura EQ?



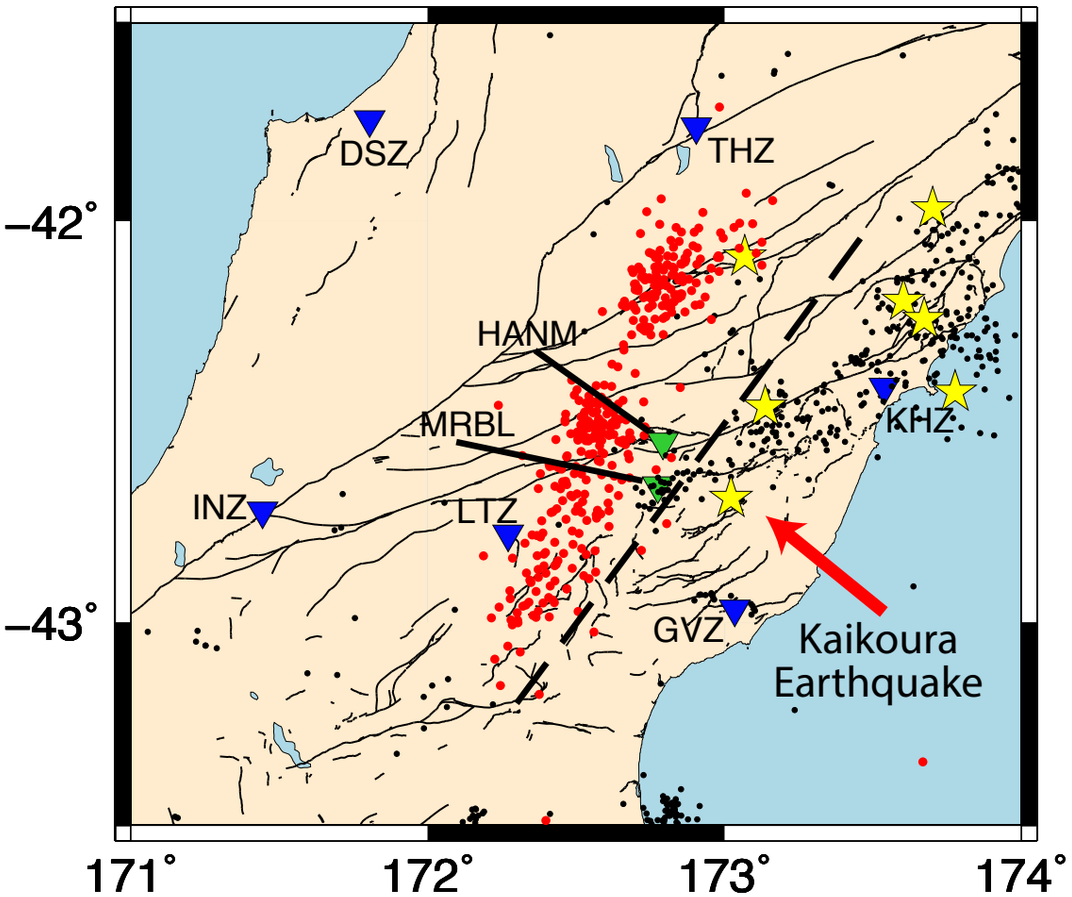
GPS signal and tremor frequency versus time

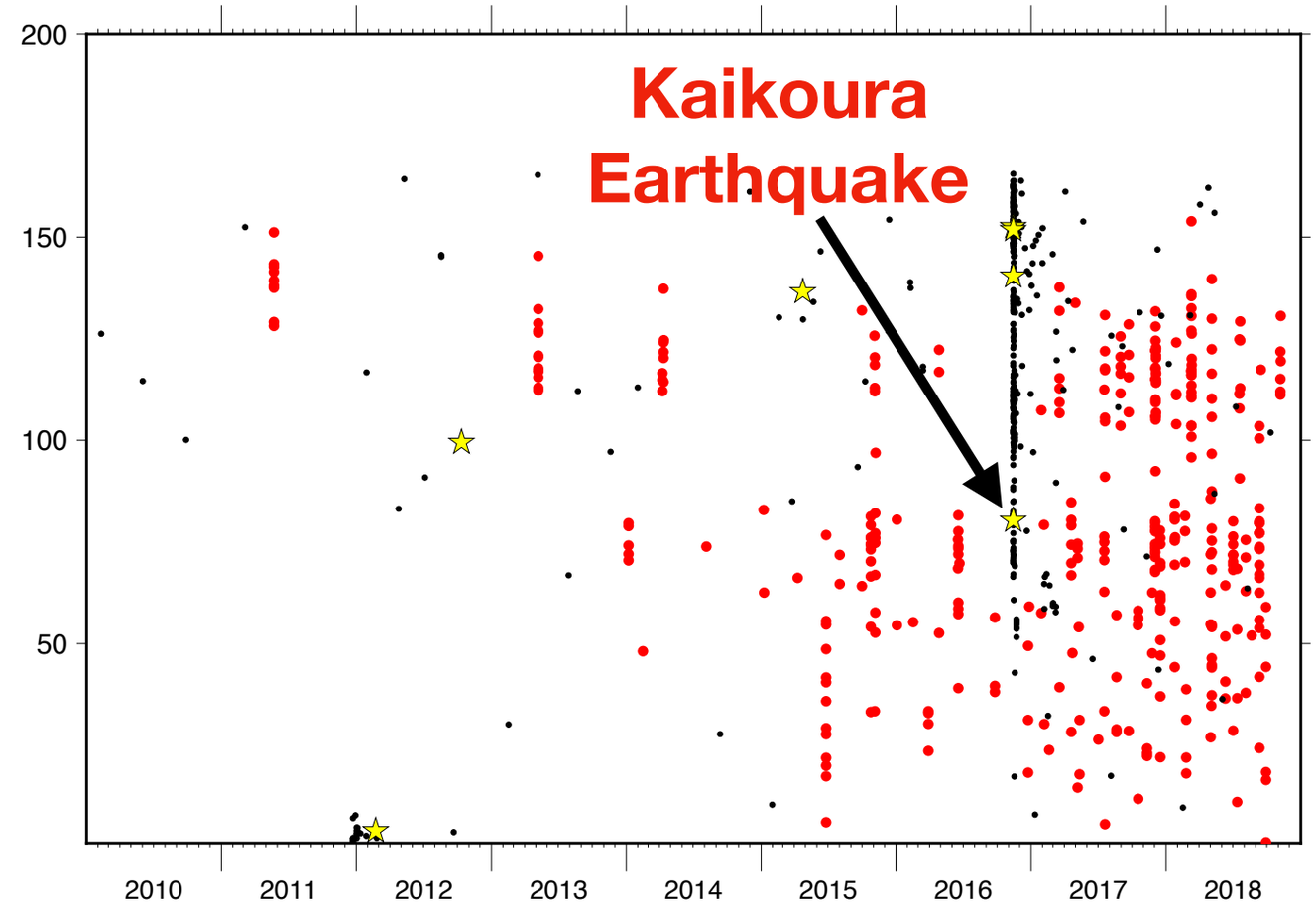


-> Possibility of a signal in GPS?

-> Increase in tremor rate

Conclusion





-> We detected some tremors in a region close to Kaikoura EQ
-> It seems that we have a migration of tremor before
-> The tremor rate increased after Kaikoura EQ