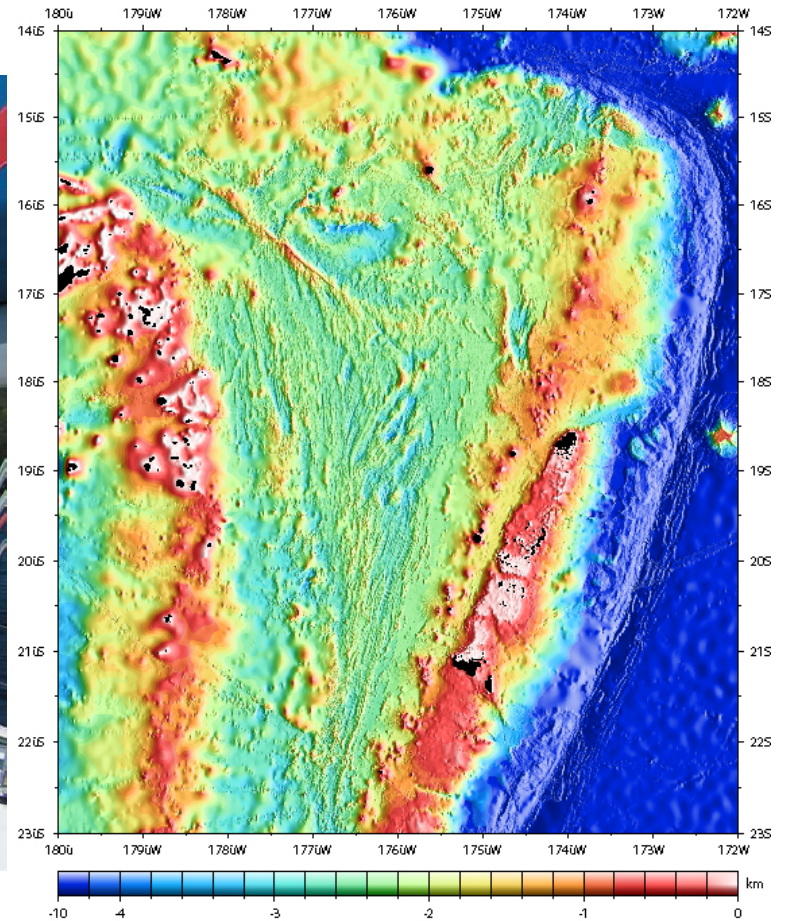


The Tonga-Kermadec- New Zealand arc - Lau back-arc: future directions

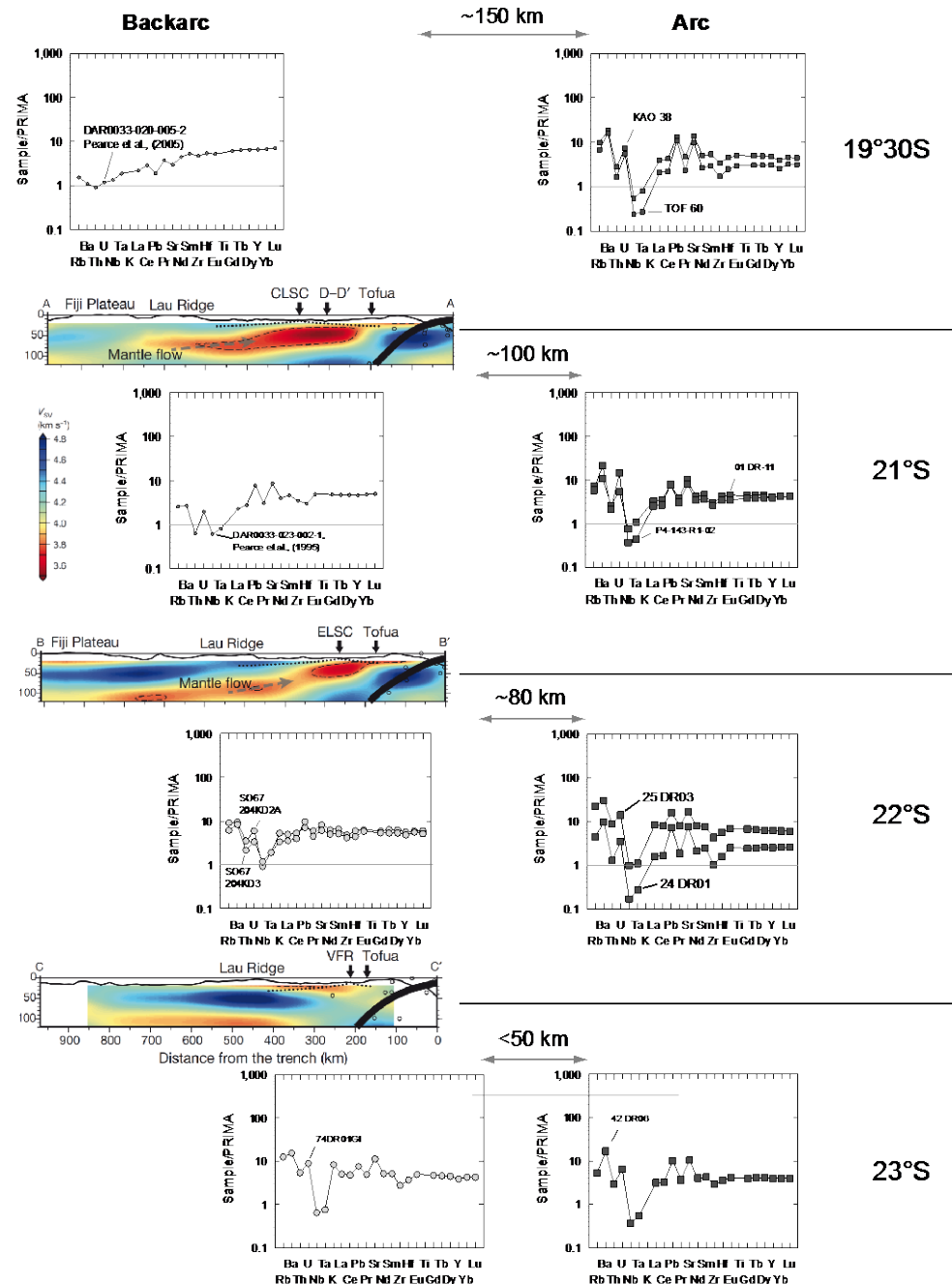
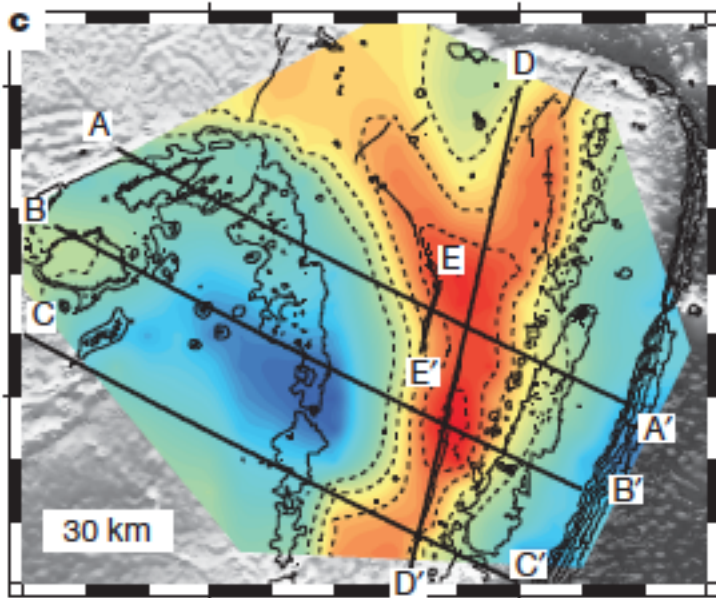
Simon Turner

Tonga-Kermadec arc - Lau back arc

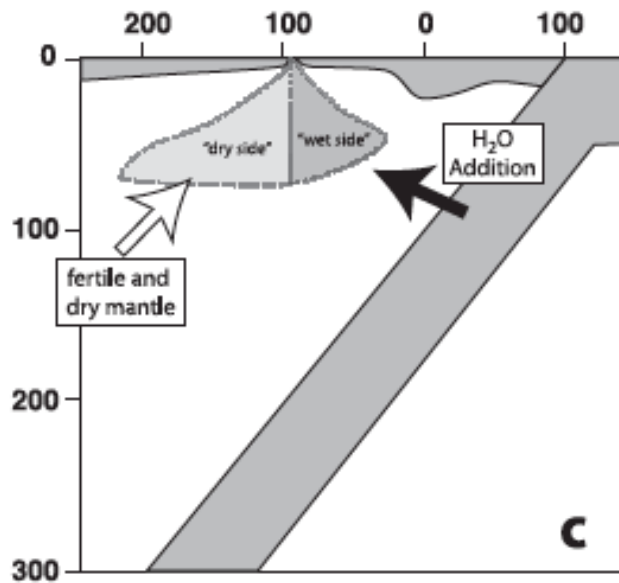


Seismic evidence of effects of water on melt transport in the Lau back-arc mantle

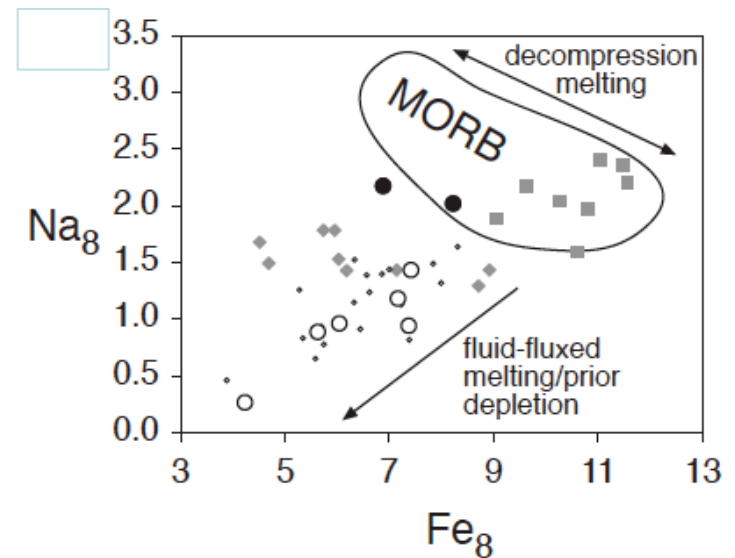
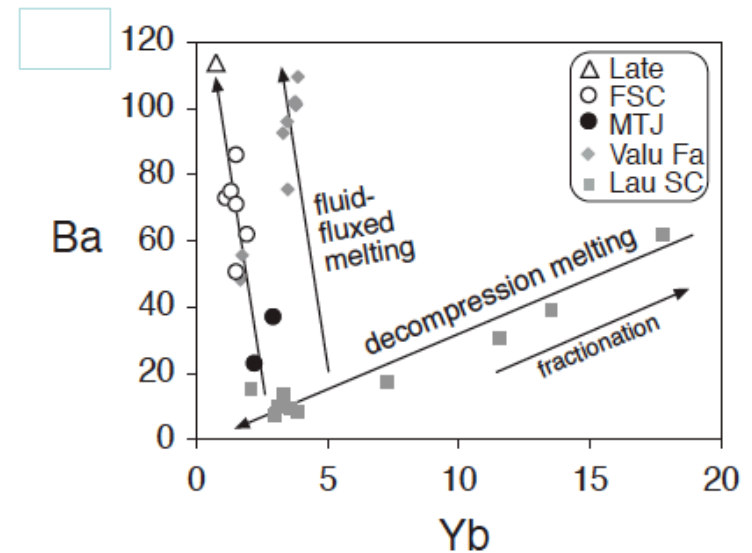
S. Shawn Wei¹, Douglas A. Wiens¹, Yang Zha², Terry Plank², Spahr C. Webb², Donna K. Blackman³, Robert A. Dunn⁴ & James A. Conder⁵



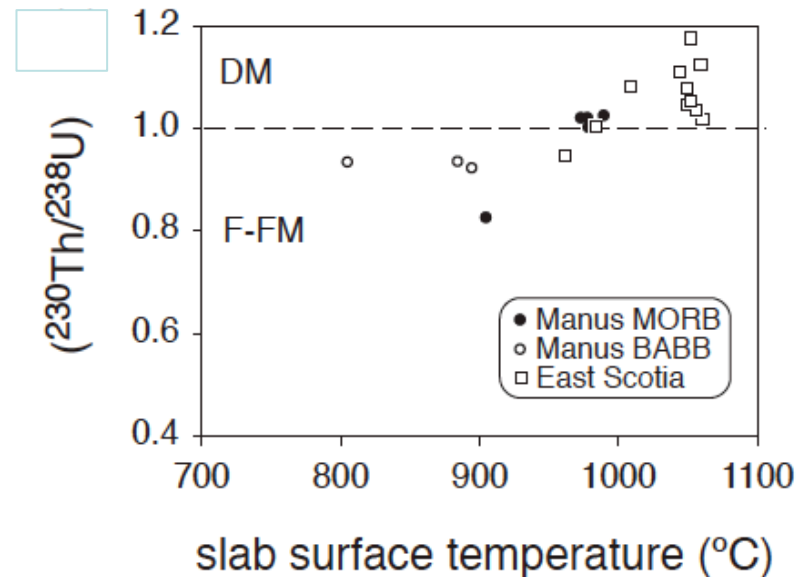
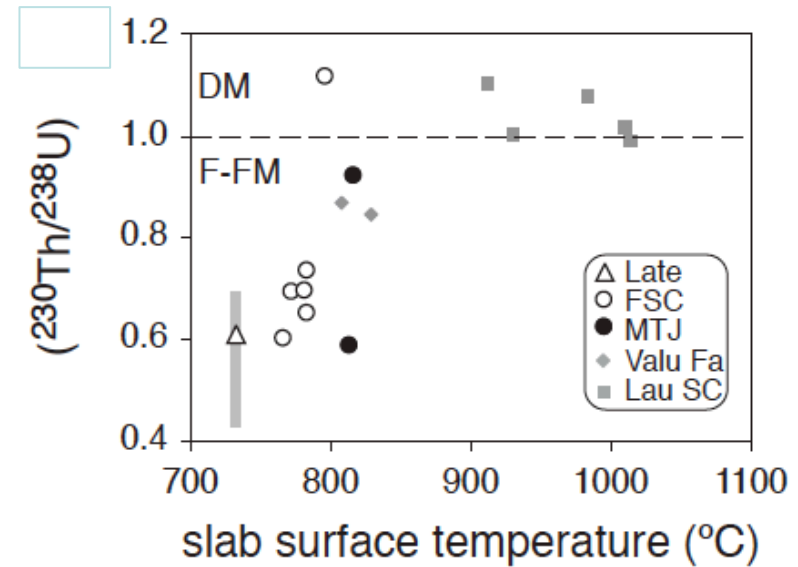
Major and trace element data suggest a change from fluid-fluxed melting to melting dominated by decompression with increasing distance from the arc front:



Langmuir et al. 2006



Is there a general shift from fluid-fluxed to decompression dominated melting when the slab surface reaches $\sim 900^{\circ}\text{C}$?



**IBM forearc
(52-44 Ma)**

Interpretation

**arc
andesites**

mature subduction
produces typical calc
alkaline volcanics

hydrothermal ore
boninites

onset of subduction and
fluid release remelts
shallow refractory
residue in asthenosphere

hydrothermal fluid -
seawater interaction
(black smokers)

**forarc
basalts**

fracturing of oceanic plate
leads to decompression
melting of asthenosphere

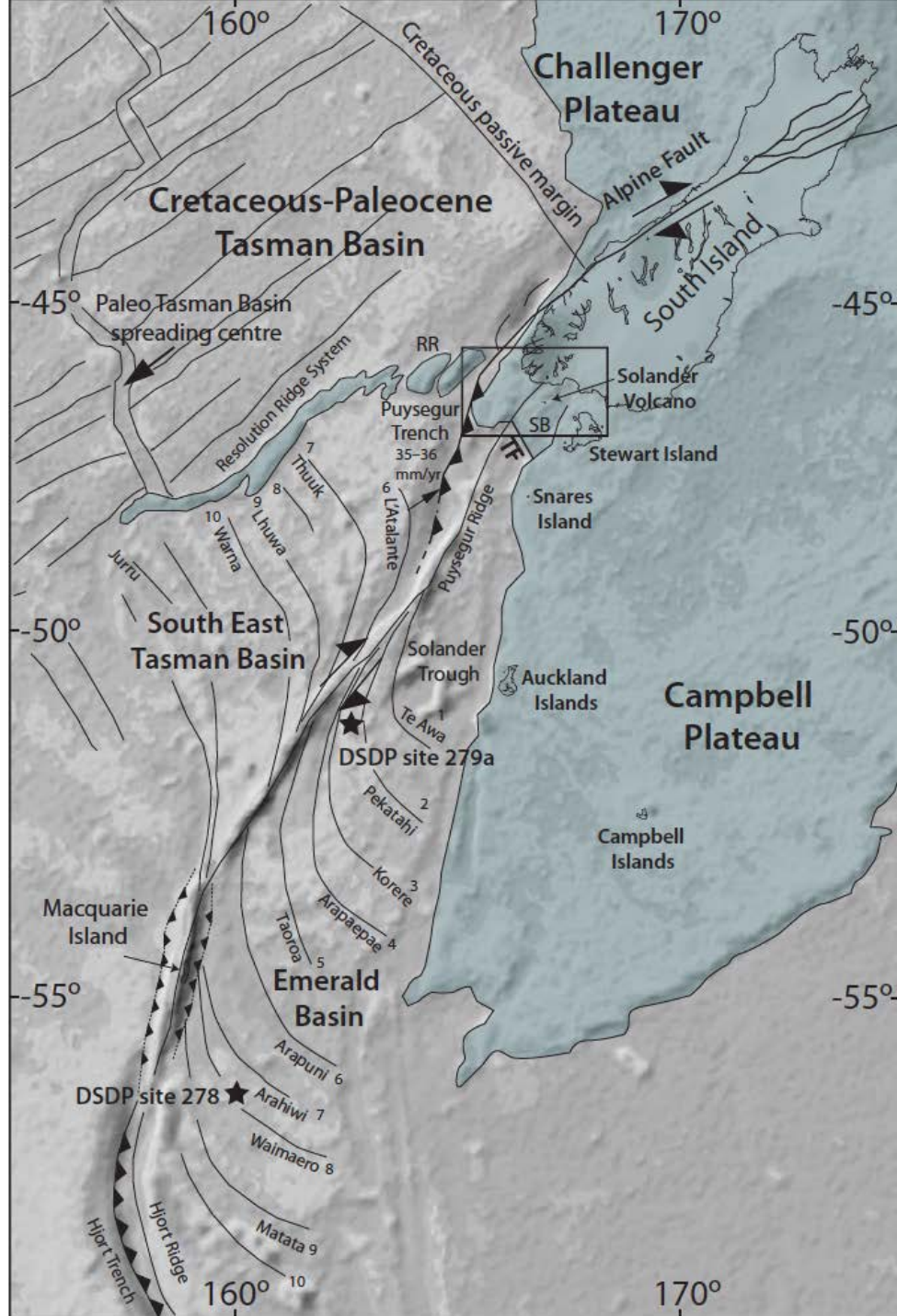


SISIE

Collaborative Research: South Island, New Zealand, Subduction Initiation Experiment

During the study, these over-arching scientific questions will be addressed:

1. During subduction initiation what controls the transition from a forced to self-sustaining state?
2. What are the mechanical properties of the oceanic plate during incipient subduction?
3. At what stage of subduction initiation are metamorphic fluids released?
4. At what stage of subduction initiation does a hot, circulating mantle wedge with melt generation form above the subducting slab?
5. *How are the thermal and mechanical state of the subducting plate and mantle wedge linked to the compositions of the volcanic rocks?*



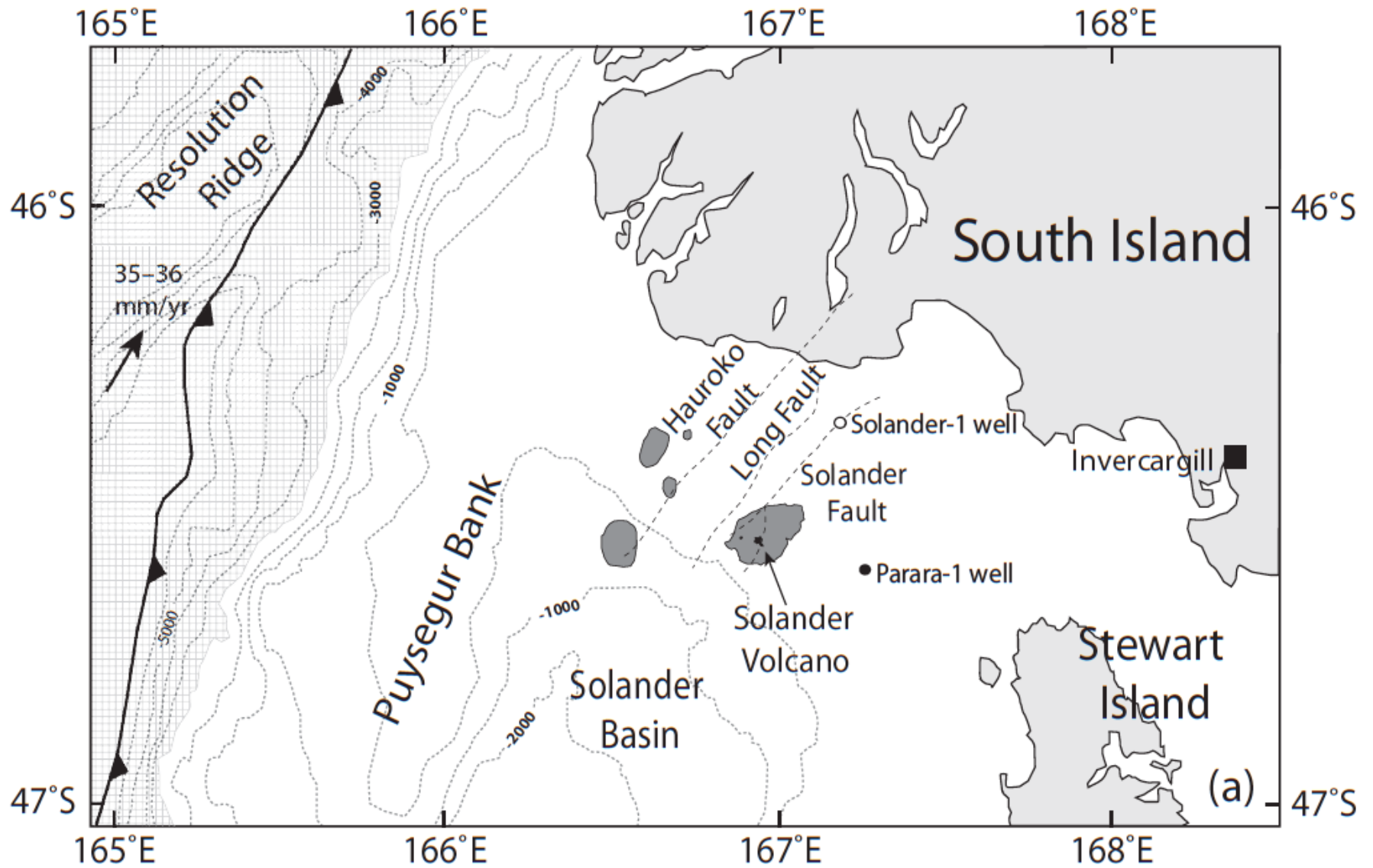
Puysegur Trench and Solander Island:

Major tectonic features of New Zealand shows the setting of Solander volcano and Puysegur Trench.

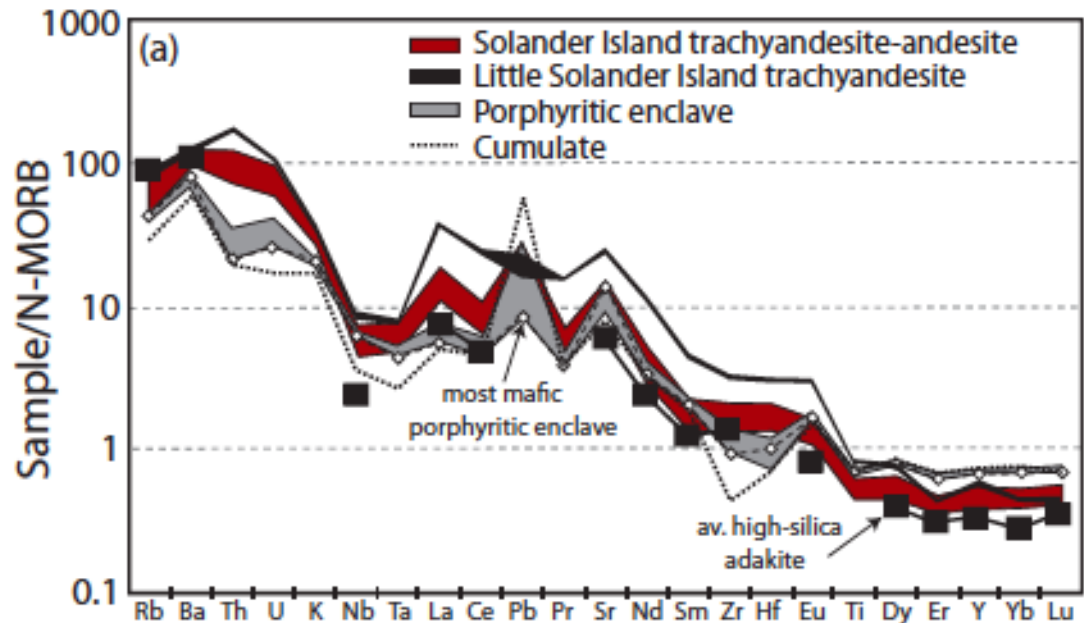
- Induced subduction developing from a strike-slip fault system.
- Pacific plate and current plate motion is 35-36 mm/yr. Very oblique
- Subduction began 10-12 million years ago. Slab melting proposed by Reay and Parkinson (1997) to explain adakitic volcanism of Solander Island

An excellent natural laboratory to study subduction initiation (GeoPrisms SCD Key Site)

** Solander volcanism was the topic of Fiona Foley's PhD thesis, Foley et al., 2013; 2014*



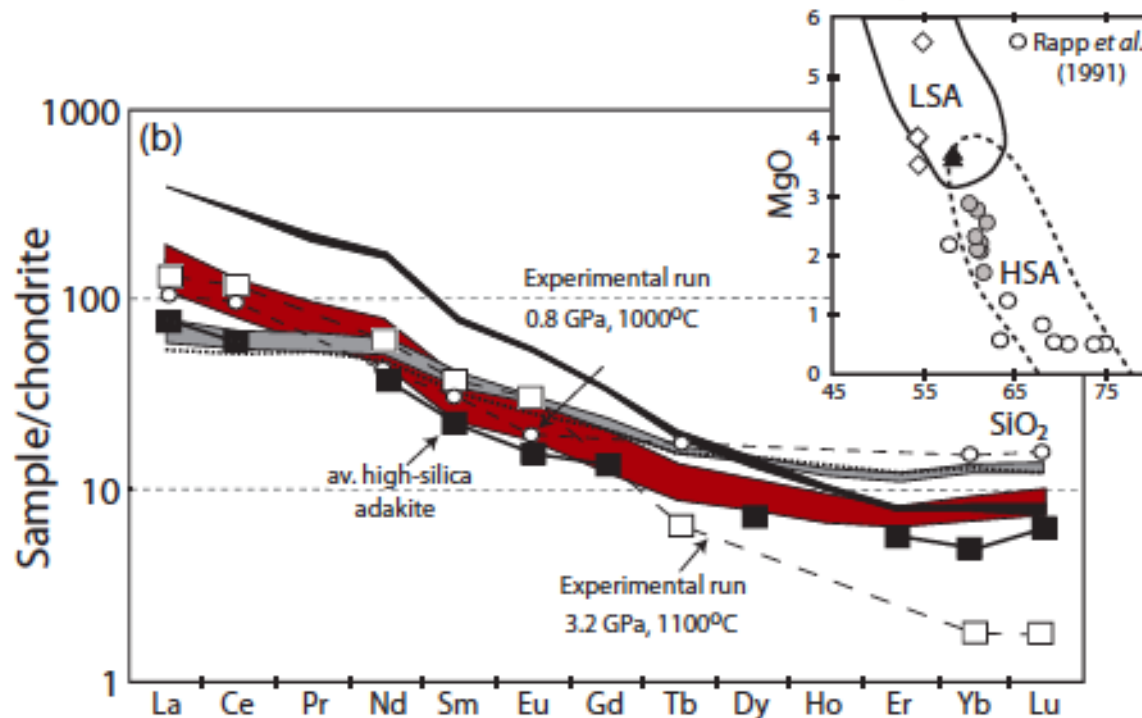




Trace element plots for the Solander sample suite:

(a) Primitive mantle-normalized (Sun & McDonough, 1989)

(b) Chondrite-normalized. (Sun & McDonough, 1989). Included are dehydration experiments on amphibolite. Note they are flatter than expected if partial melting occurred with garnet.



The average high-silica adakite from Martin et al. (2005) is shown for comparison.

Active source seismic experiment

