Crustal structure and evolution of the Niuafo‘ou Microplate in the northeastern Lau Basin, southwestern Pacific

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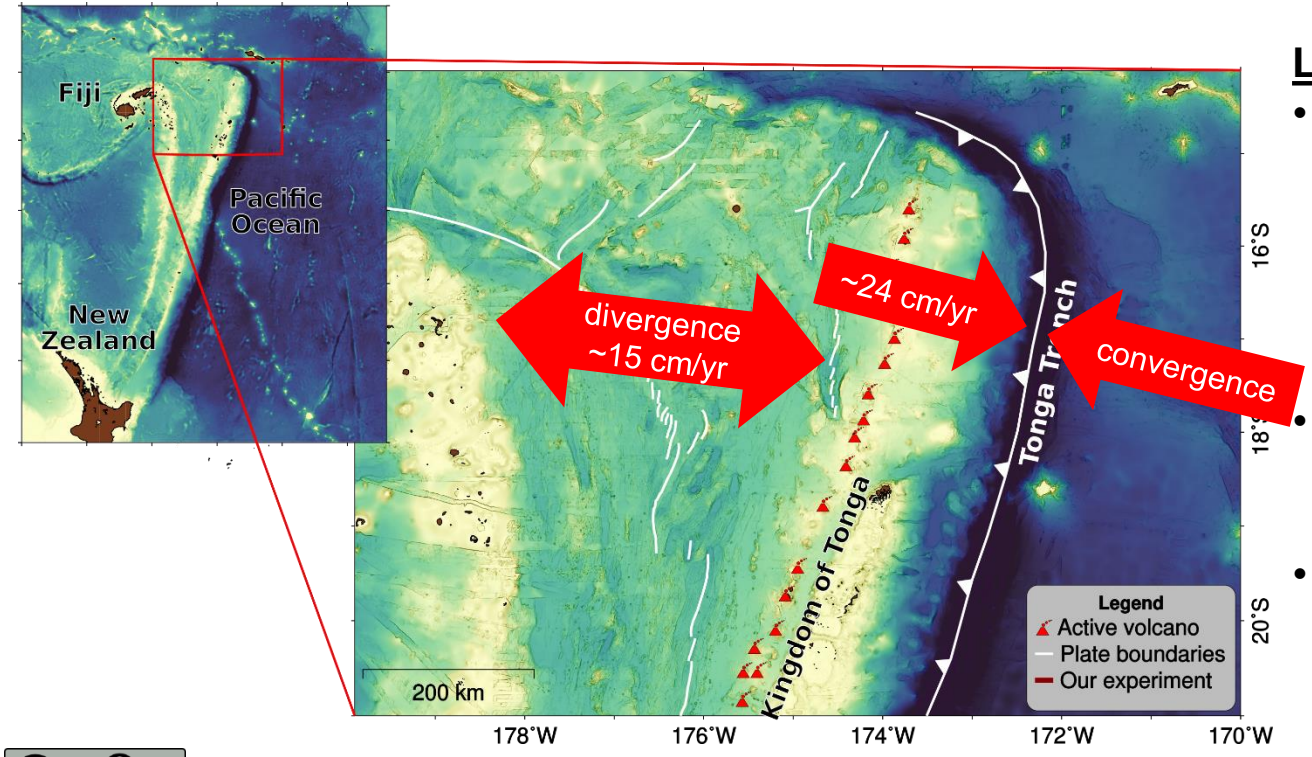
Overview of the Lau Basin tectonic structure



Lau Basin is a unique place:

- No where else do processes of destruction and creation of new crust in such proximity happen as fast as here.
- Convergence at Tonga trench, approx. 24 cm/yr
- Opening of Lau Basin, approx. 15 cm/yr

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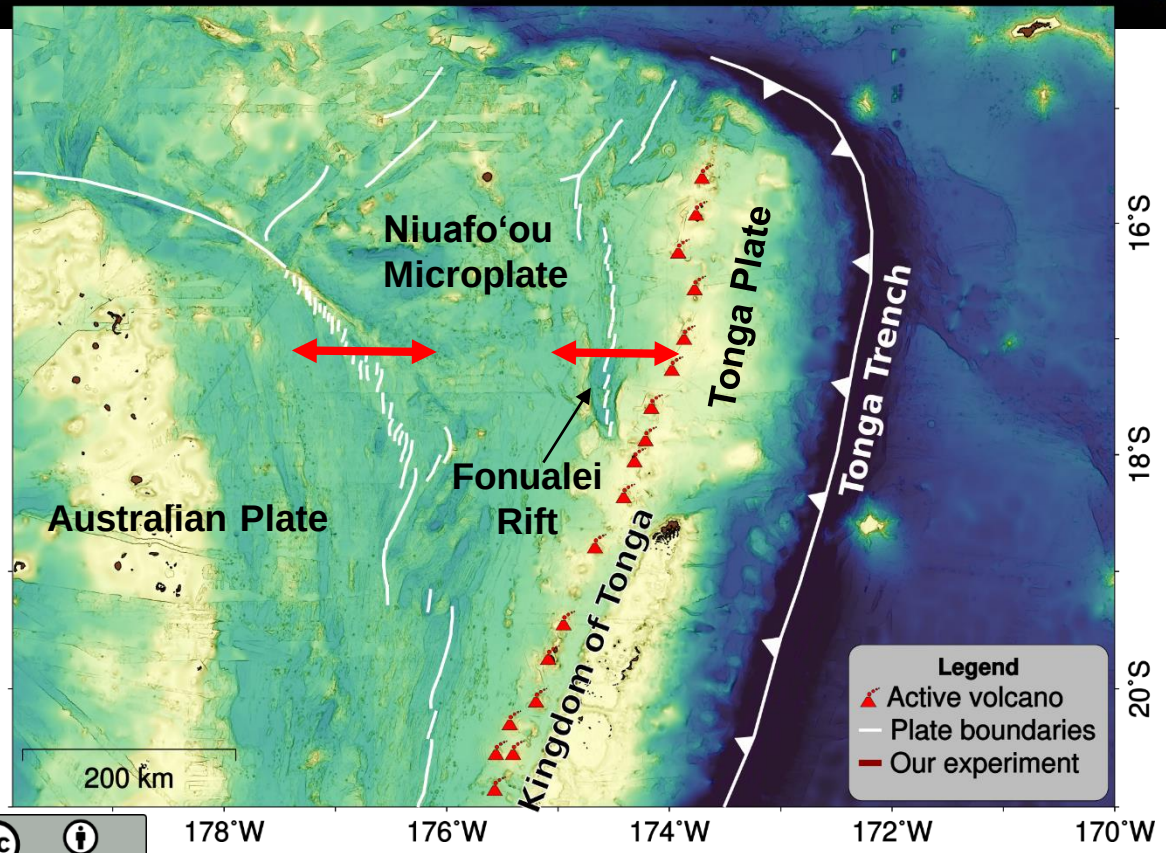
Why did we go there?



Lau Basin tectonic structure:

- A complex mosaic of microplates.
- Around 17°S there are even two extension centers, indicated by red arrows.

Main science questions:

1. What processes formed the crust in the north Lau Basin?
2. Is there seafloor spreading at the Fonualei Rift?

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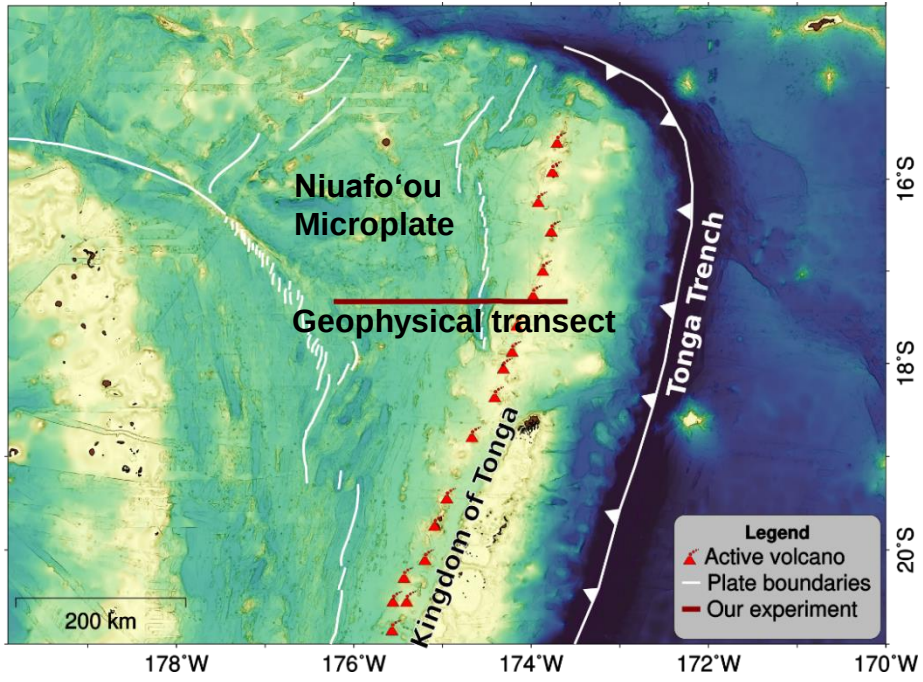
Our geophysical experiment at 17°20‘S



300 km long geophysical transect to investigate crustal structure, acquired in December 2018, during expedition SO-267 of RV Sonne

Acquired datasets include:

- Refraction seismics
- Reflection seismics
- Magnetics
- Gravity

Photo: P. Brandl

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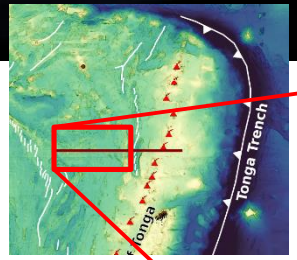
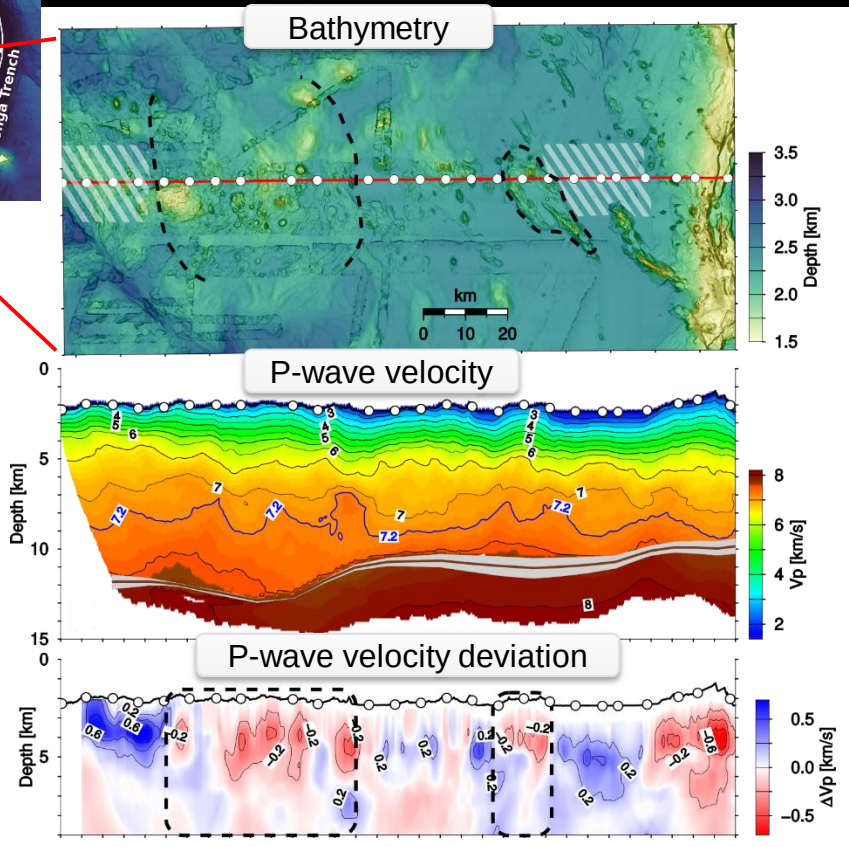
Results from the Niuafo‘ou Microplate





Crust of Niuafo‘ou Micrplate resembles a jigsaw of crustal blocks:

- Some blocks are similar to typical ocean crust, see the hatched areas in left map.
- Some blocks are similar to volcanic arc crust, see the perimeters indicated by dashed black lines in left map.

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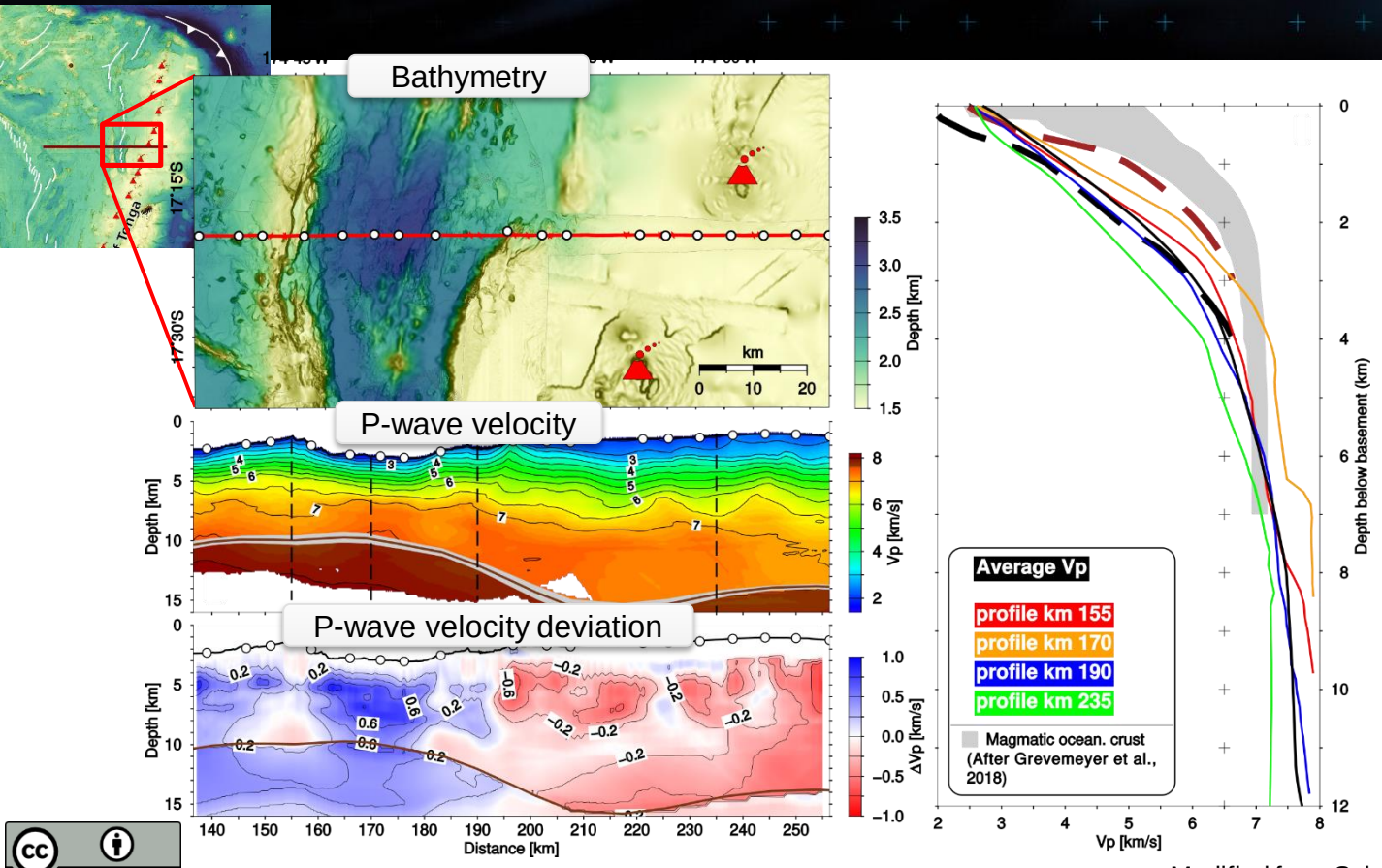
Results from the Fonualei Rift



Vp-depth distribution in Fonualei Rift differs from typical oceanic crust but also from rift shoulders on both sides.

We propose that crustal accretion is accomodated by a combination of rifting and magmatism

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