



Microseismicity constraints on the lithospheric structure at the ridge-transform intersection at the Romanche Transform Fault and Mid-Atlantic Ridge

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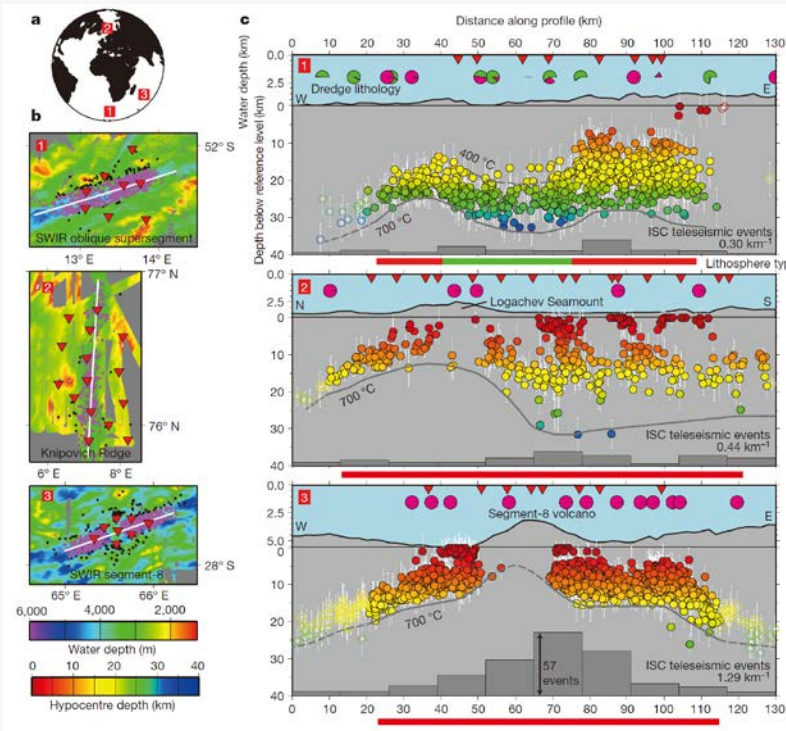
Introduction—SMARTIES cruise

- **Scientific goals:**

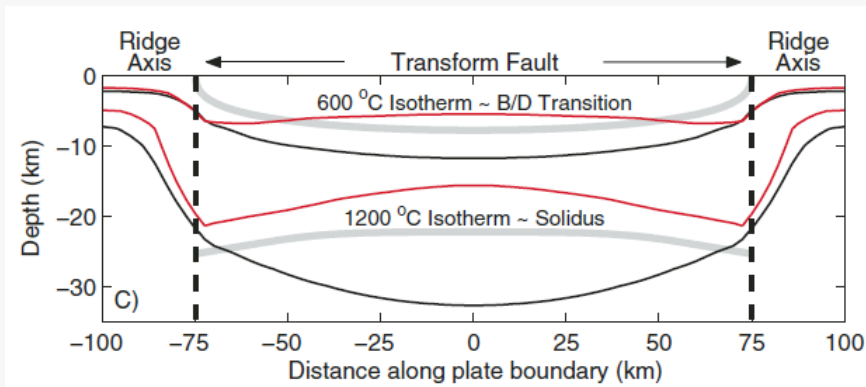
- Map local seismicity (microearthquakes) in the Eastern Romanche TF, MAR and RTI.
Derive focal mechanisms for subset of catalogue.
- Difference in seismicity between normal-spread crust and smooth-spread crust: melt migration/formation mechanisms.
- Dynamics and tectonics of RTI.
- Depth of brittle-ductile transition and thermal regime.
- Controls of earthquake slip on TFs – link to tomographic model & rock sampling.

Thermal structure

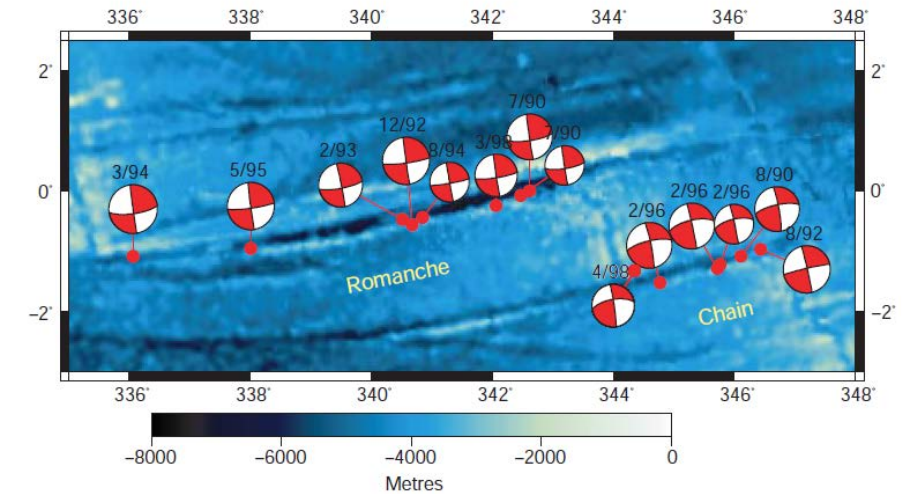
- Maximum depth of micro-earthquakes



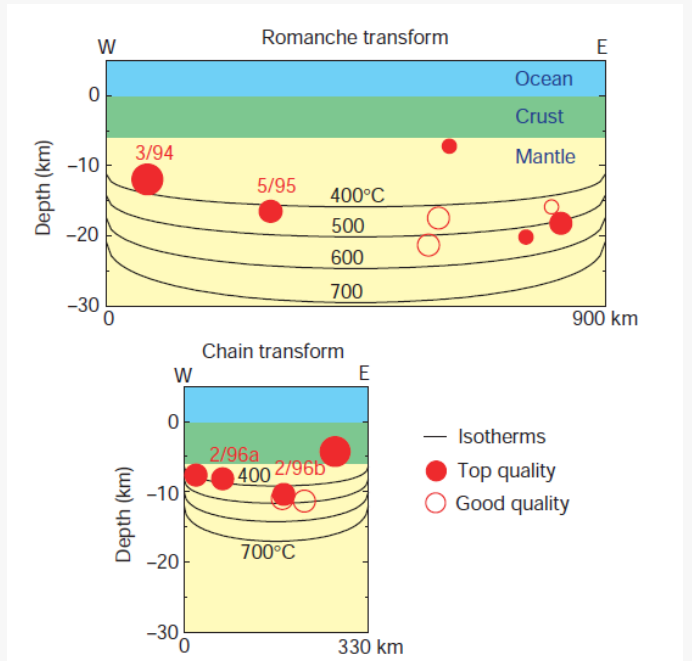
Schlindwein & Schmid (2016)



Behn et al. (2007)

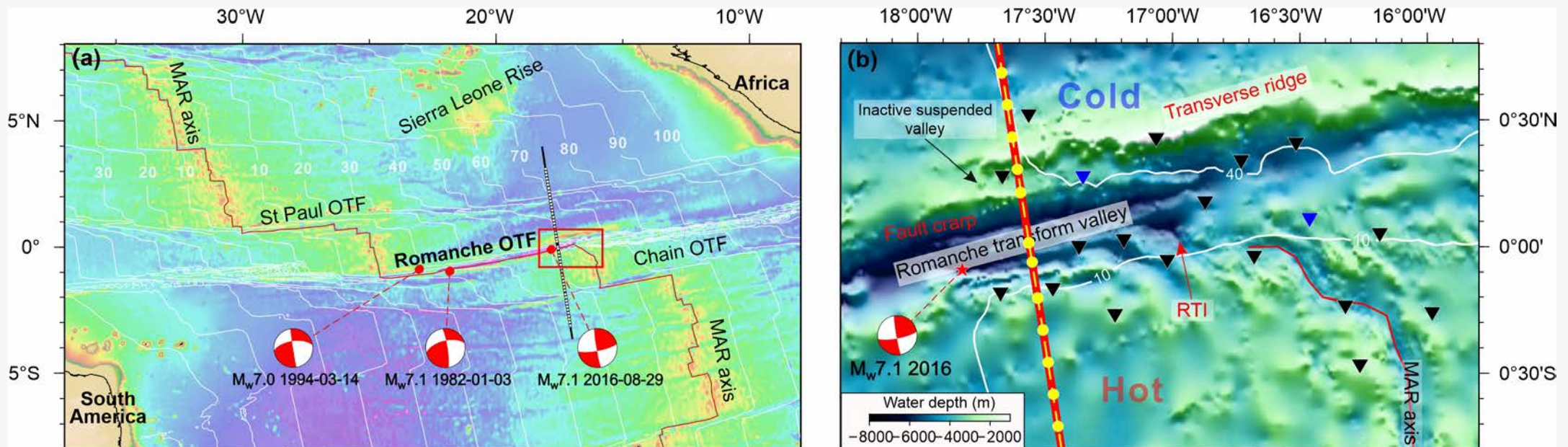


Abercrombie & Ekstrom (2001)



Introduction—SMARTIES cruise

- **Date:** 2019.7.18-2019.8.16
- **Observation:** 19 ocean-bottom seismometers (OBSs); 17 OBSs were recovered
- Average recording time: ~ 20.74 days
- The 2016 M_w 7.1 Romanche earthquake: 2016-08-29-04:29:28, Lat: -0.09; Lon: -17.83; Depth: 23 km

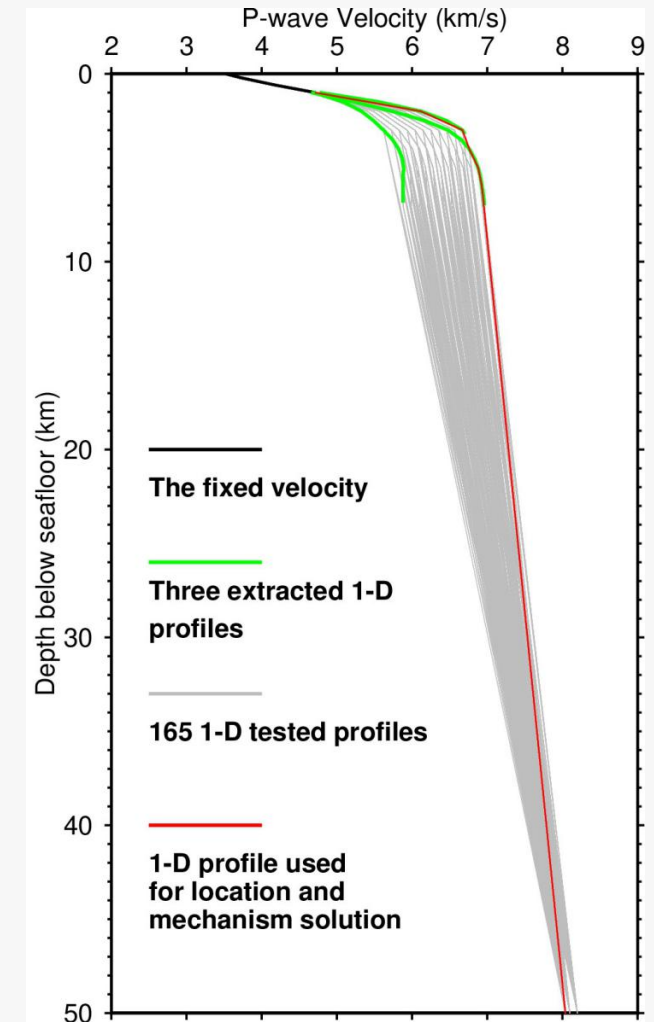


Earthquake detection

- **Automatically detecting:** Seisan program, a short-term-average to long-term-average ratio(STA/LTA) trigger algorithm
- Pspiker; a matlab program (Baillard, C., et al., 2013, BSSA)
- **Mannually checked:** Seisan and SAC programs
- **1363 events:** recorded by at least three OBS stations
- **845 events:** located by at least 5 arrivals

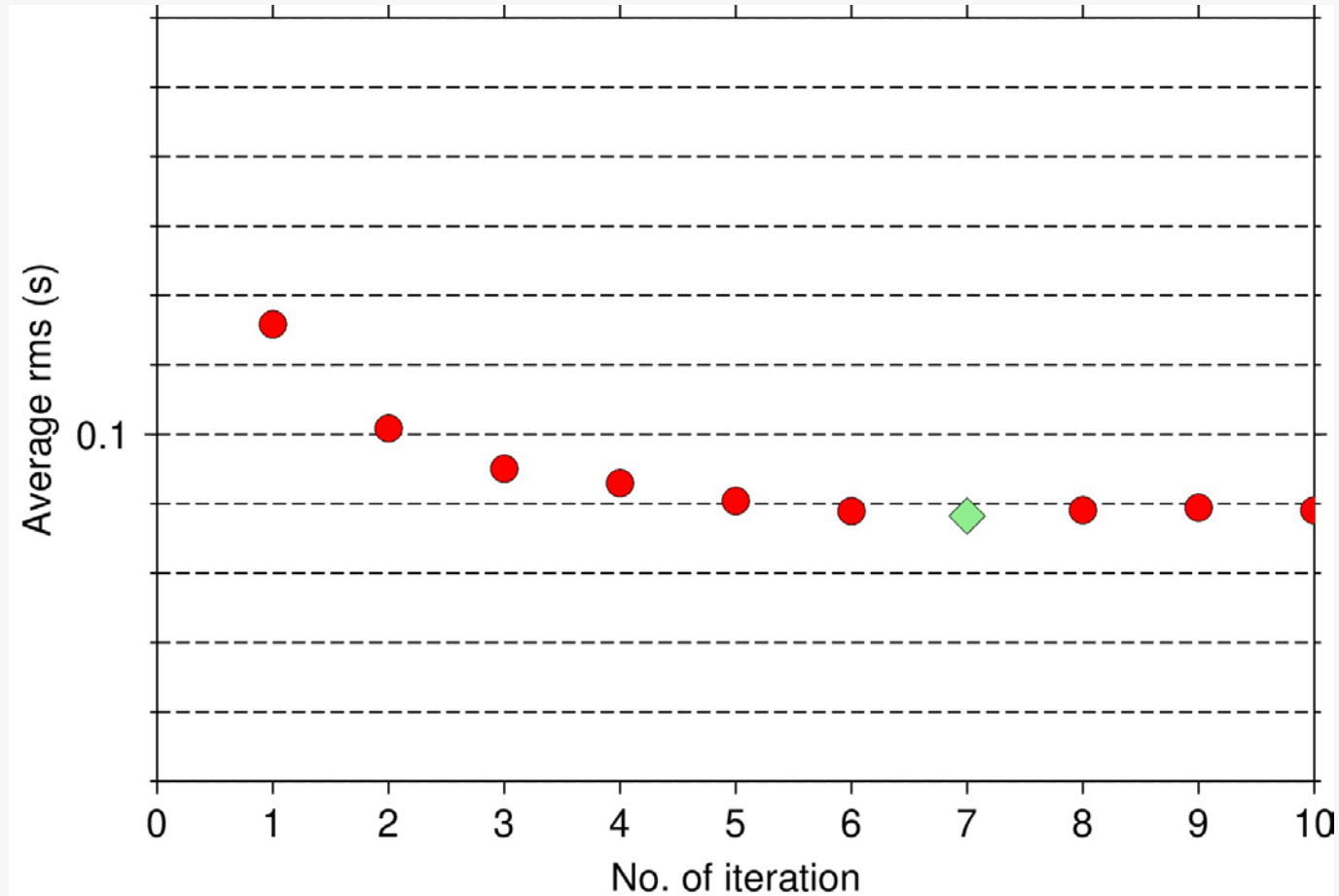
Earthquake location

- **NonLinLoc:** non-linear oct-tree search algorithm NonLinLoc program (Lomax et al., 2000)
- **Velocity model:** three 1-D profiles extracted from the velocity model using the active-source OBS data by Gregory et al. 2020 (EGU).
- **Red line:** the chosen one



Earthquake location

- **Station corrections** by update iterations: the lowest RMS value



Earthquake location

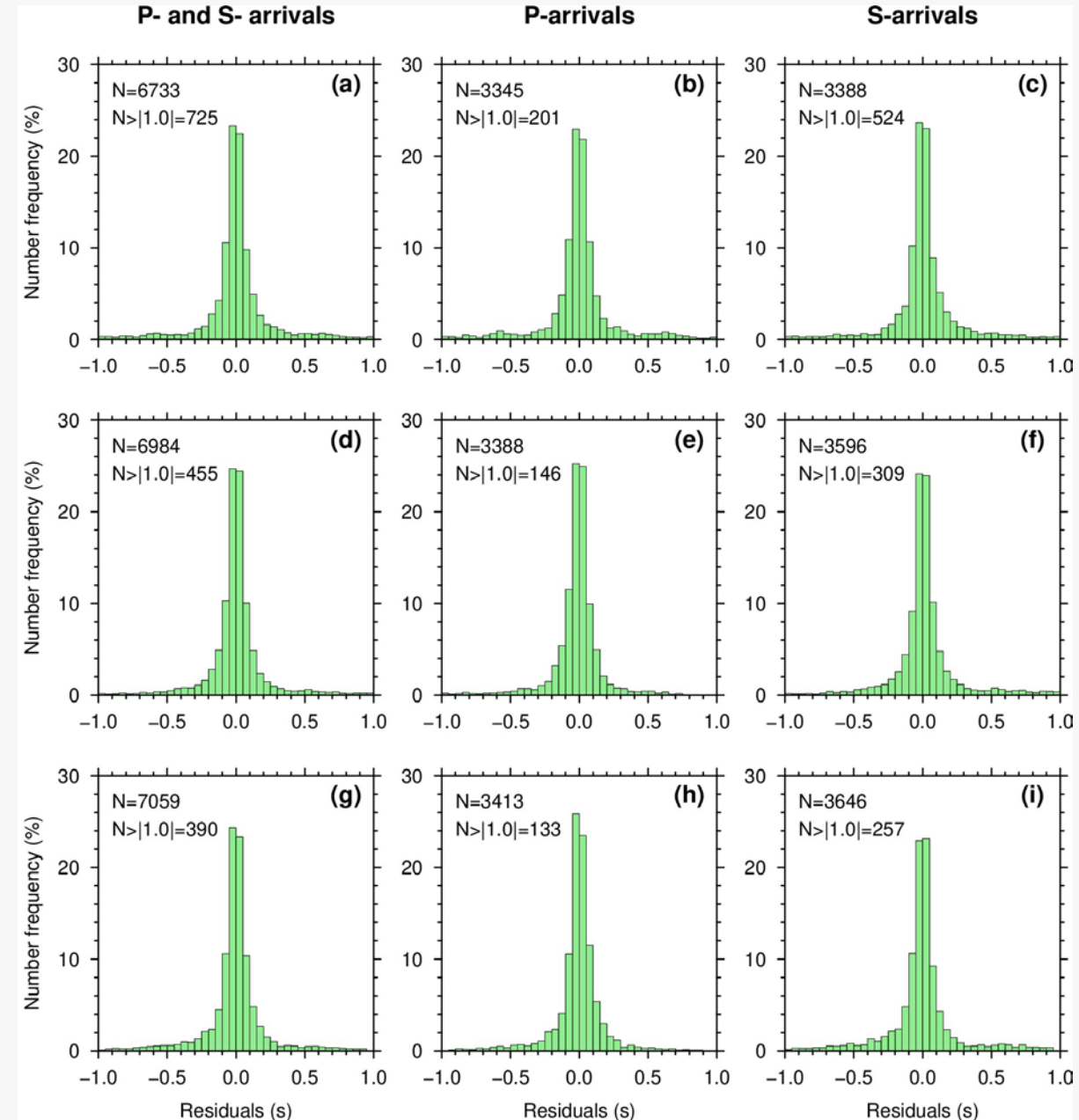
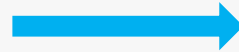
- (a-c): initial results



- (d-f): with station corrections



- (g-i): removing S-delay



Preliminary results

- A total of 414 earthquakes are well located
- Focal depth: 0-36 km
- Most events are located in the transform valley and RTI
- Events beneath the MAR can reach ~22 km
- Our microseismicity shows a very cold lithosphere along the Romanche transform fault

References

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Thank you!