

# Seismicity cluster below the Moho indicates thrust faulting in the central Ligurian Basin

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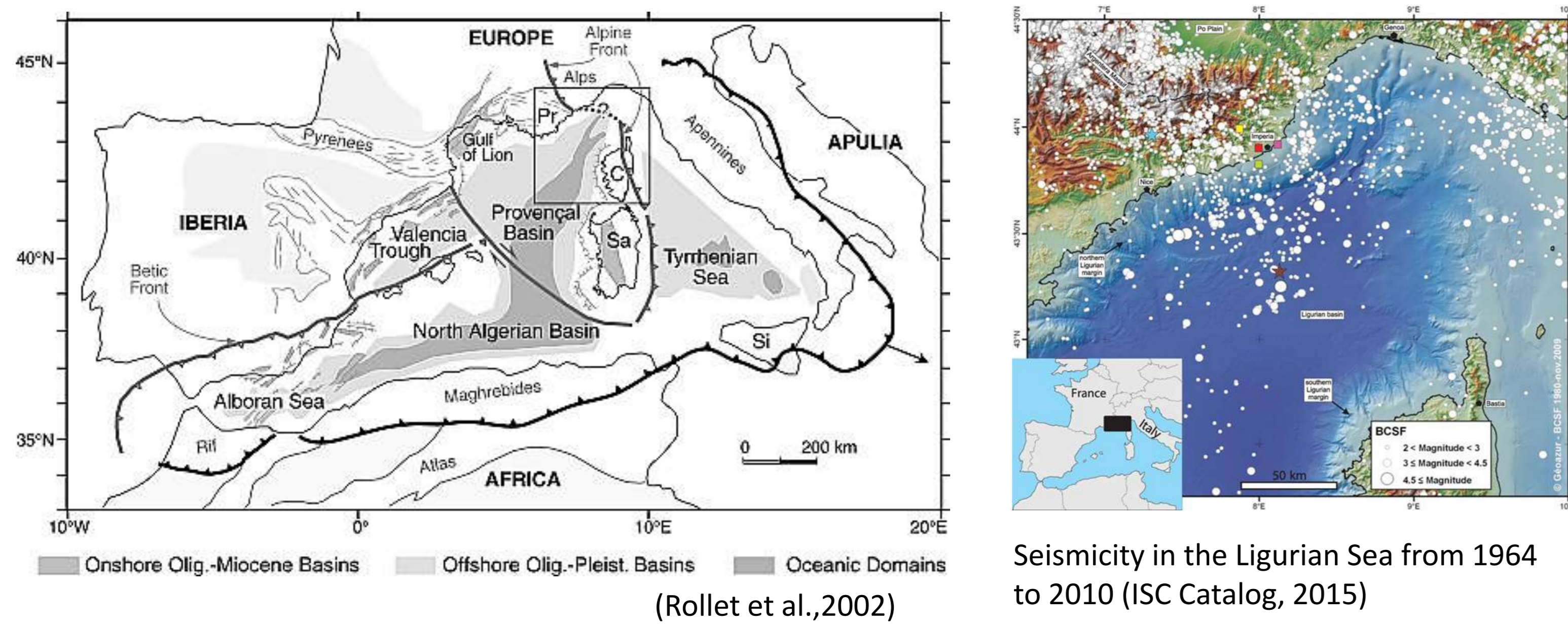
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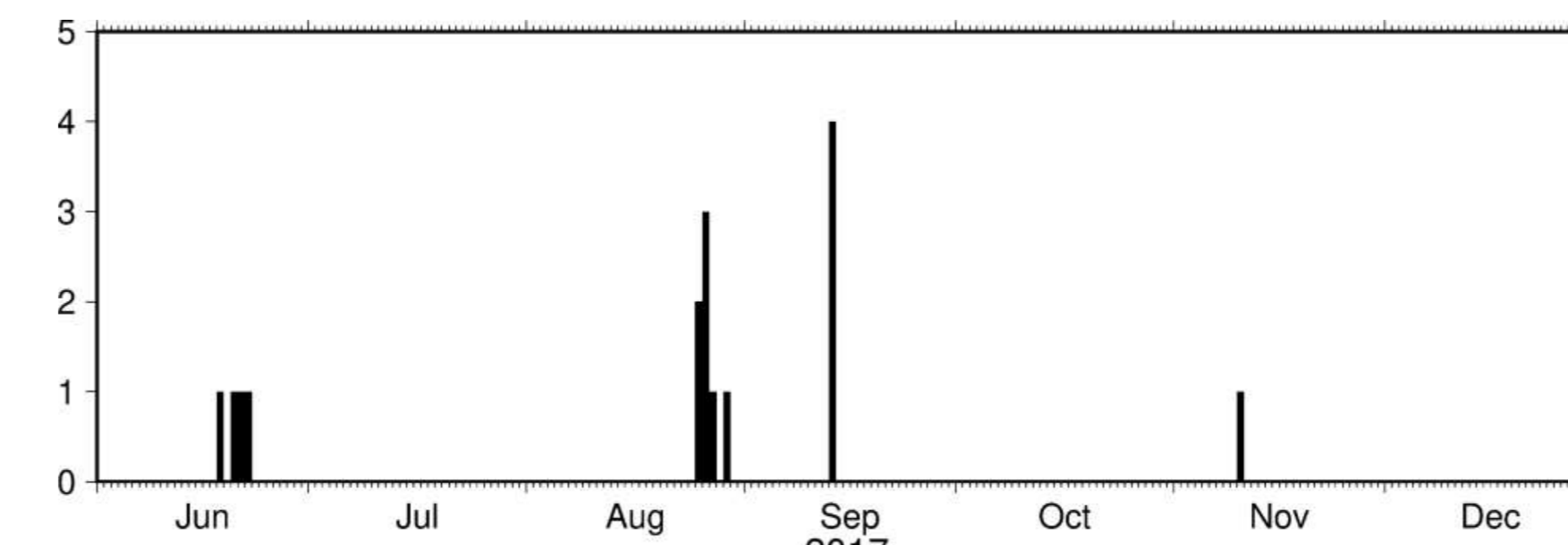
## The Ligurian Basin

- The Ligurian basin is in the transition between the Alpine and the Apennines orogen. (left)
- During the extension 30 Ma – 16 Ma ago, Corsica and Sardinia was pulled eastwards to its present position by the retreat of the Apennines-Calabrian Subduction zone. Back-arc extension led to rifting and formed the basin. No relative motion is observed nowadays in GPS measurements between Corsica and continental Europe.
- Seismicity is therefore low within the basin, but high close to the origins in the Northwest of the basin. (right)

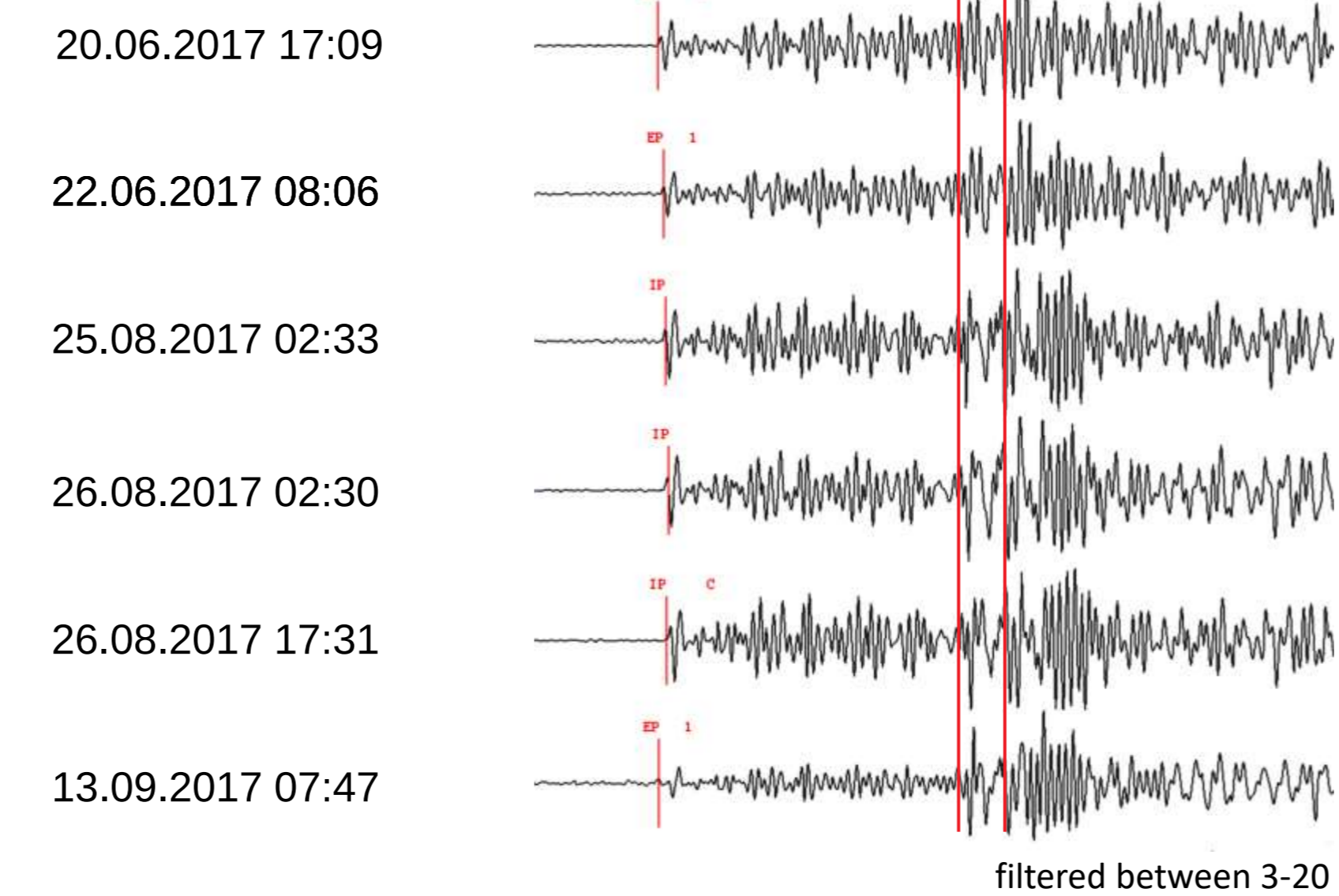


## Earthquake cluster close to A423A

15 earthquake with magnitudes < 2.5 occurred close to OBS A423A. This cluster was active in June (4 events), August (7 events), September (4 events) and in November (1 event).



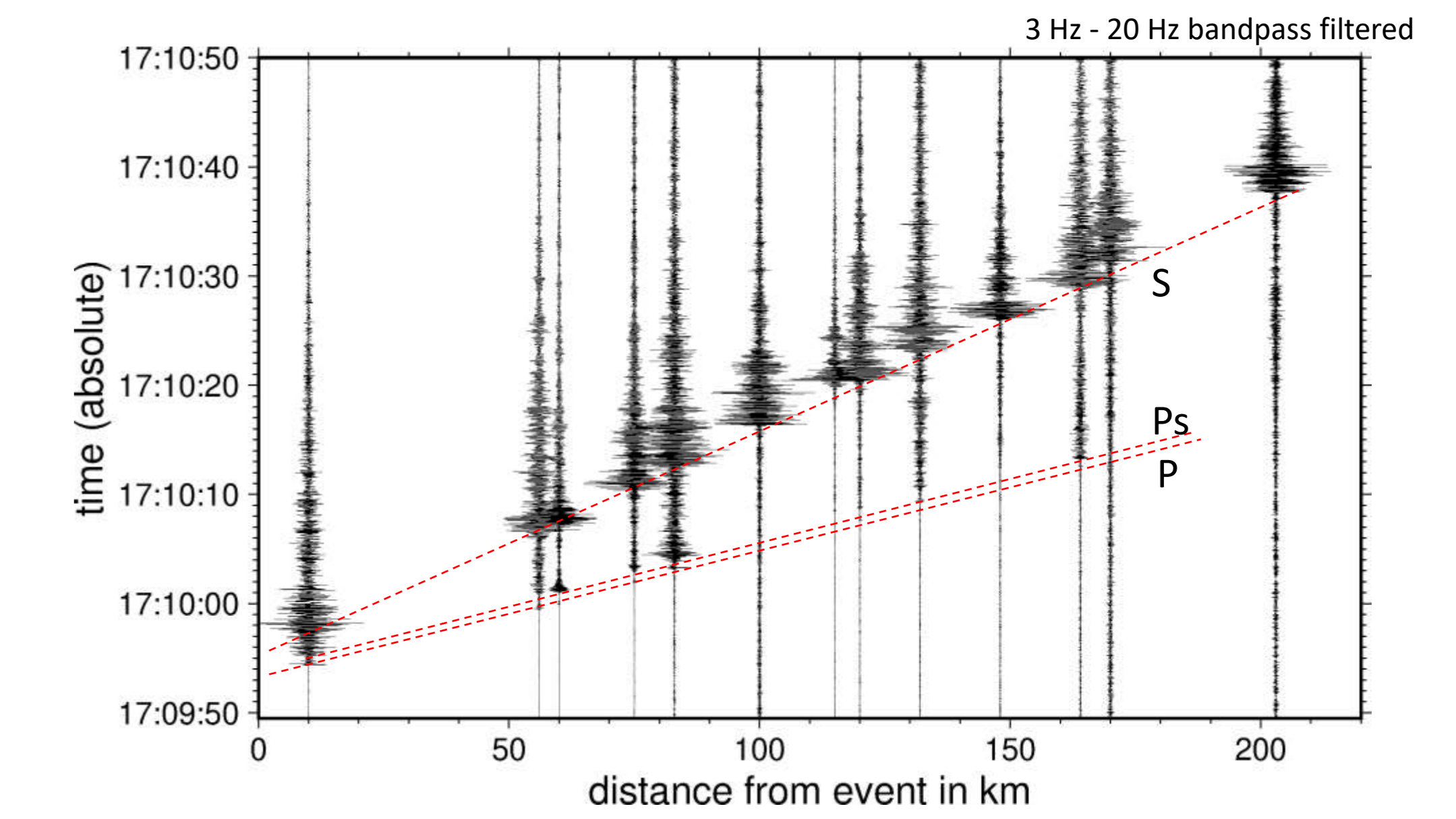
The earthquakes has highly coherent waveforms as it is shown for the vertical component of station A423A.



filtered between 3-20 Hz

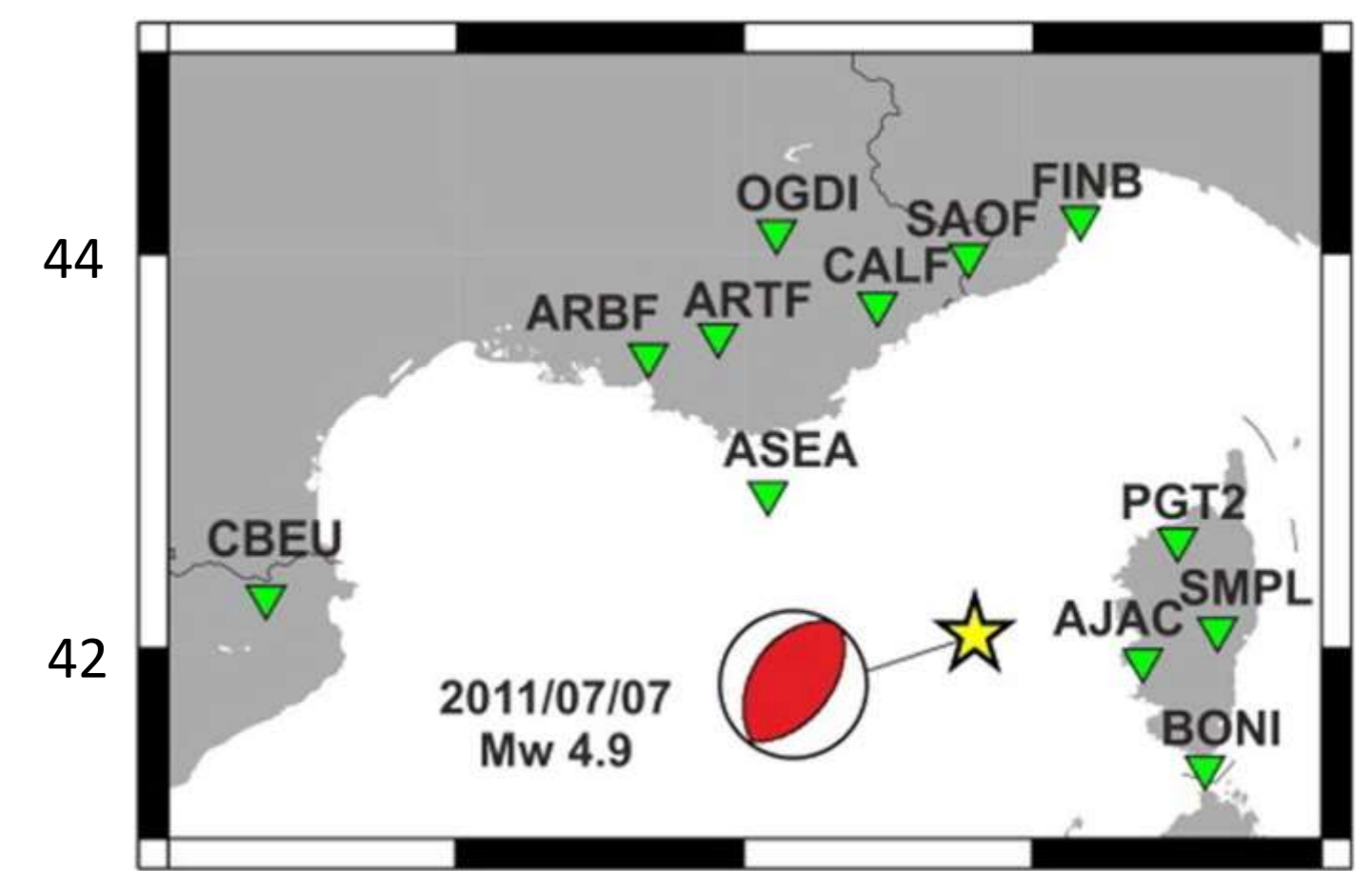
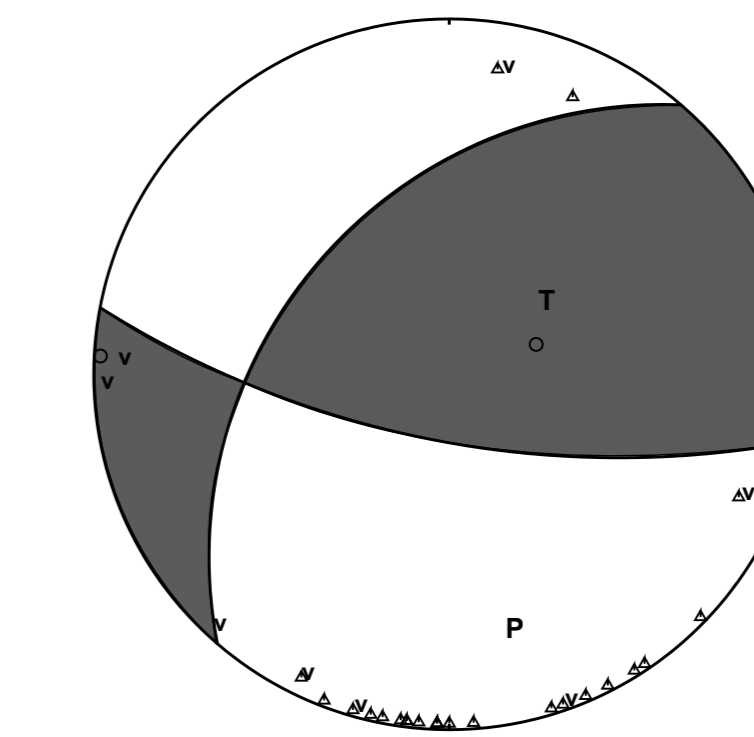
## Earthquake ML=2.5 on 20.06.2017

The earthquake on 20.06.2017 was the strongest event within the cluster. 3 prominent onsets are observed: P-wave, a converted Ps-wave and the S-wave. The weak P- and the stronger converted Ps wave have a apparent velocity of about 8 km/s. The time difference between both is between 1 s and 1.5 s. The S-wave has a apparent velocity of about 4.6 km/s.



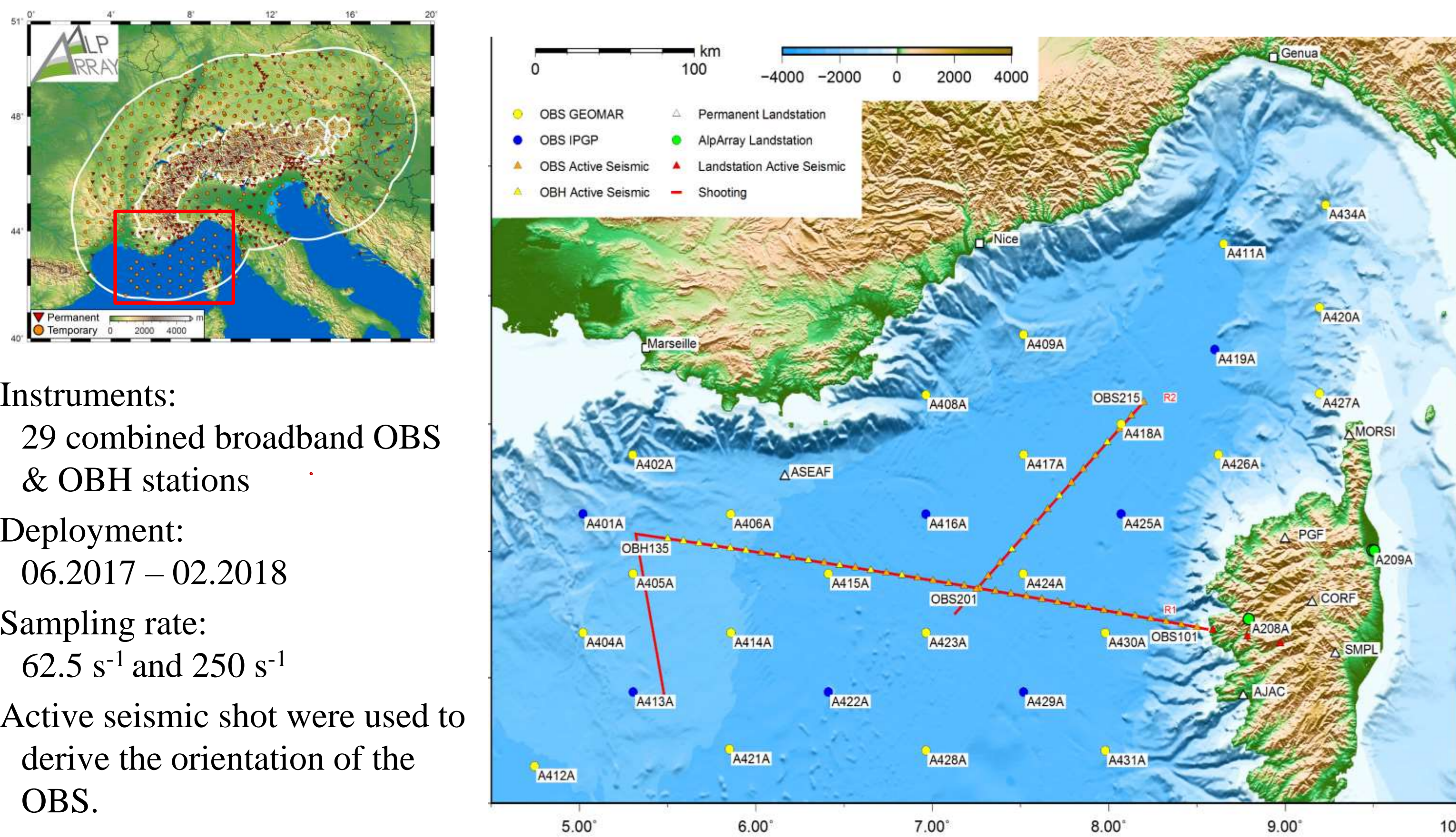
First motion direction of the P-wave and amplitude ratios of P- and S-wave on the vertical component were used to derive the fault plane solution of the event (left). The thrust faulting should be also the mechanism for all events within the cluster.

The focal mechanism is similar to the one observed for the Mw=4.9 earthquake on 07.07.2011, which occurred about 50 km to the east (right).



(Larroque et al., 2016)

## Lobster Location Map



Instruments:  
29 combined broadband OBS & OBH stations

Deployment:  
06.2017 – 02.2018

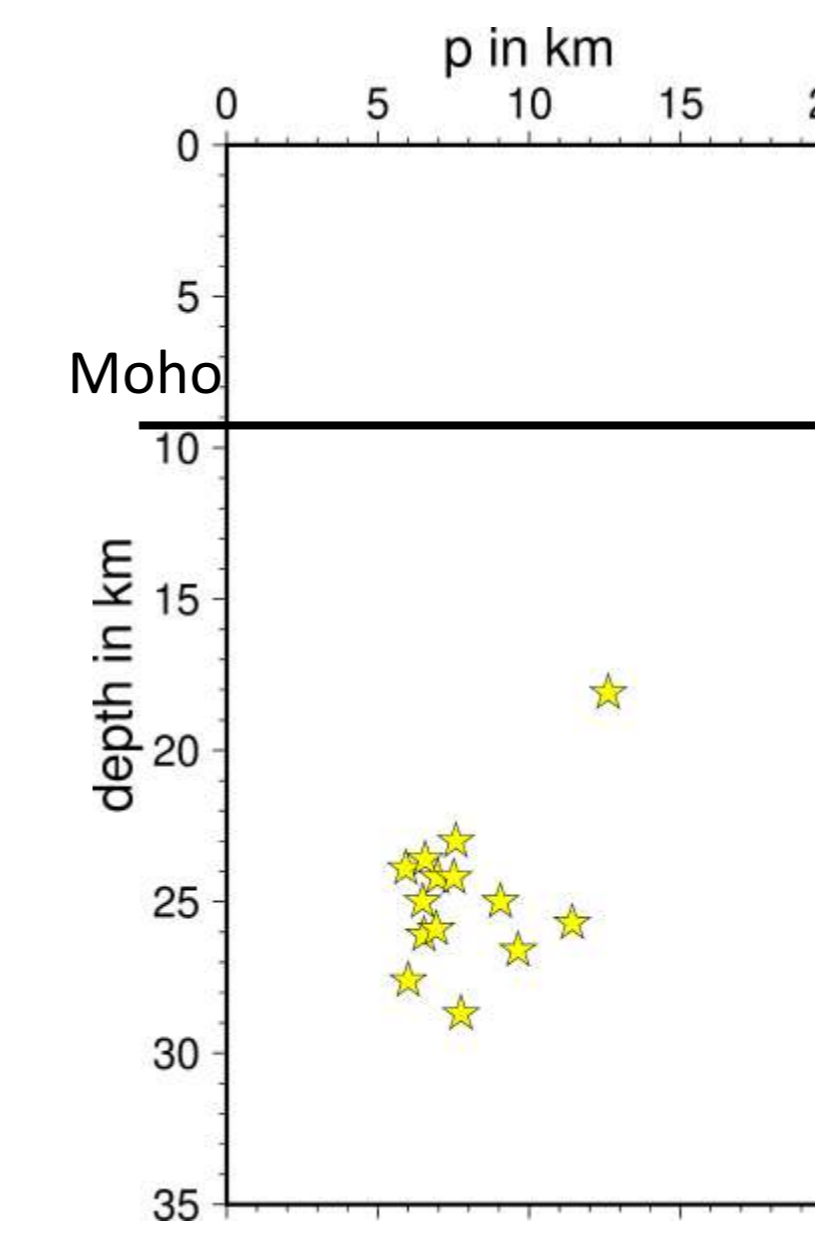
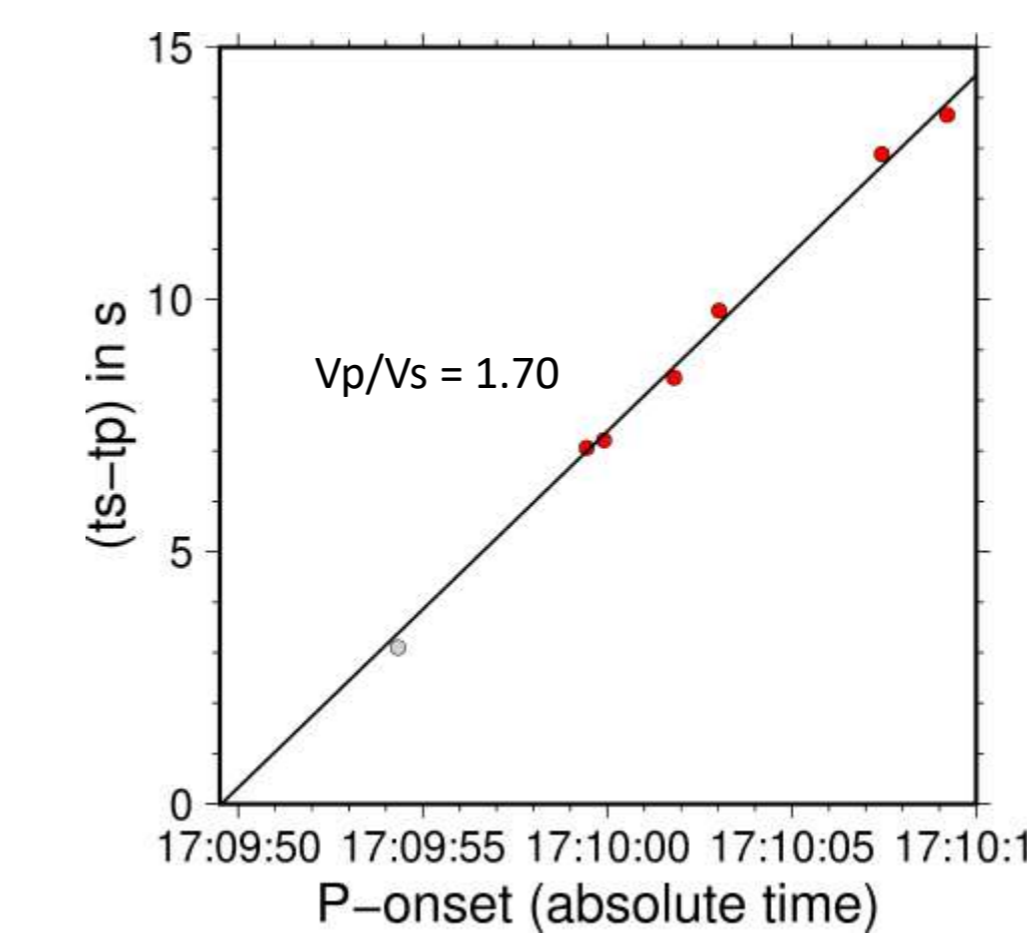
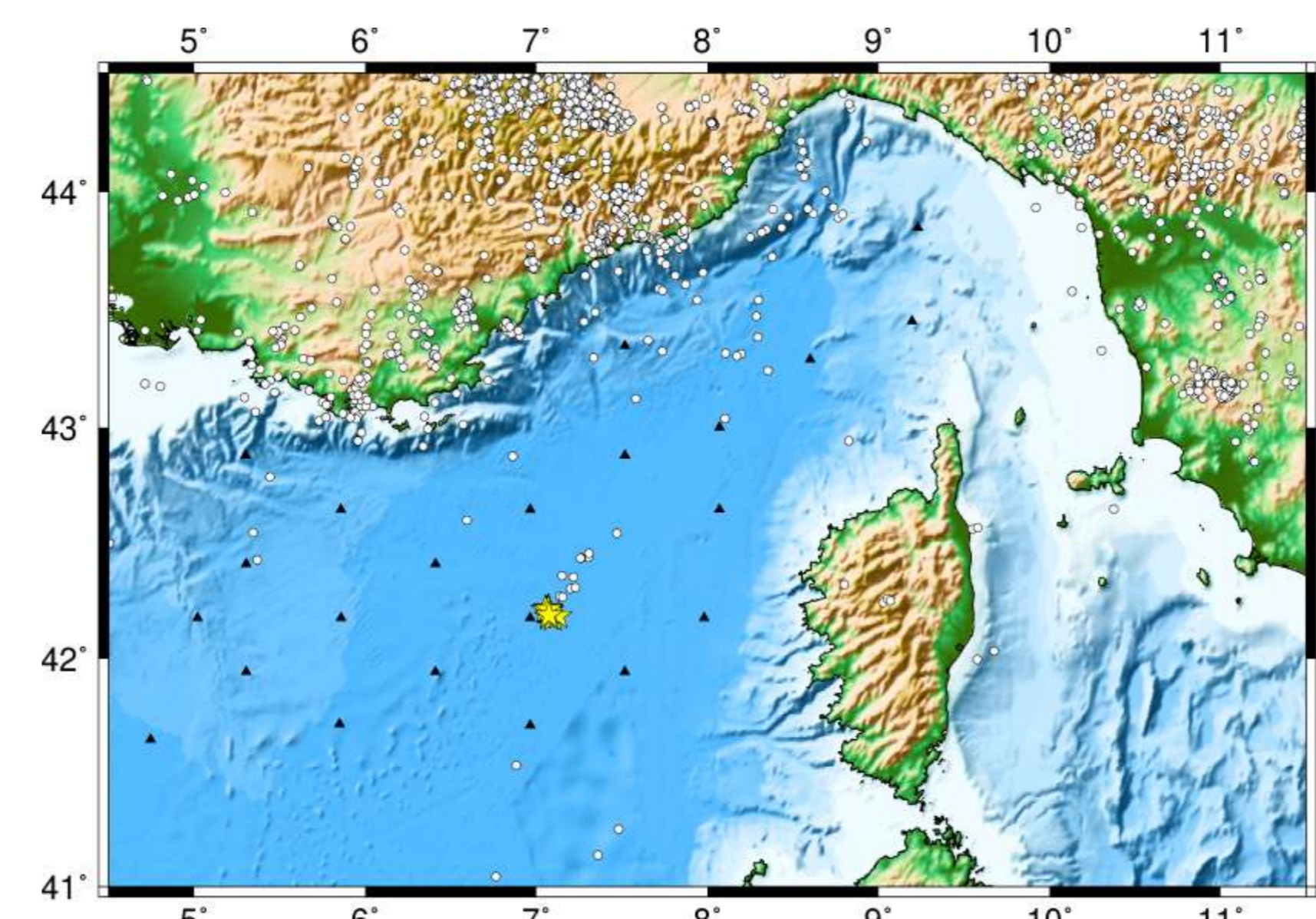
Sampling rate:  
62.5 s<sup>-1</sup> and 250 s<sup>-1</sup>

Active seismic shot were used to derive the orientation of the OBS.

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The earthquakes (yellow stars) were located using a P-wave-velocity model derived by an active refraction seismic profile (Dannowski et al., 2020). An average Vp/Vs ratio of 1.7 was used as it is found in the Wadati-diagram (right)

The cluster has a lateral extend of max. 7 km. (bottom left) The depth range is between 18 km and 30 km below the seafloor (bottom right). The cluster lies about 15 km below the Moho found in the active seismic profile (Dannowski at al., 2020).



## Summary

- A cluster of 15 earthquakes occurred in the center of the Ligurian Basin.
- The earthquakes are located below the Moho.
- The fault plane solution indicate thrust faulting.

## References

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