



Crust and upper mantle structure of the Ligurian Sea revealed by ambient noise tomography using ocean bottom seismometer data

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The Liguro-Provencal-basin was formed as a back-arc basin of the retreating Calabrian-Apennines subduction zone during the Oligocene and Miocene. The resulting rotation of the Corsica-Sardinia block at roughly 32–24 Ma is associated with rifting, shaping the Ligurian Sea. It is highly debated though, whether oceanic or atypical oceanic crust was formed or if the crust is continental and experienced extreme thinning during the opening of the basin.

To investigate the velocity structure of the Ligurian Sea a network (LOBSTER) of 29 broadband Ocean Bottom Seismometer (OBS) was installed jointly by GEOMAR (Germany) and ISTerre (France). The LOBSTER array measured continuously for eight months between June 2017 and February 2018 and is part of the AlpArray seismic network. AlpArray is a European initiative to further reveal the geophysical and geological properties of the greater Alpine area.

We contribute to the debate by surveying the type of crust and lithosphere flooring the Ligurian Sea.

Because of additional noise sources in the ocean, causing instrument tilt or seafloor compliance, OBS data are rarely used for ambient noise studies. However, we extensively pre-process the data to improve the signal-to-noise ratio. Then, we calculate daily cross-correlation functions for the LOBSTER array and surrounding land stations. Additionally, we correlate short time windows that include strong events. The cross-correlations of these are dominated by earthquake signals and allow us to derive surface wave group velocities for longer periods than using ambient noise only. Finally, phase velocity maps are obtained by inverting Green's functions derived from cross-correlation of ambient noise and teleseismic events, respectively. The phase velocity maps show strong heterogeneities for short periods (5-15 s, corresponding to shallow depths). Causes for these include varying sediment thickness, fault zones and magmatism. For longer periods (20-80 s) the velocity structure smoothens and reveals mantle velocities north-northwest of the basin centre. This might hint on an asymmetric opening of the basin. We do not see strong indications

for an oceanic spreading centre in the Ligurian basin.

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