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Investigations of the Ligurian Basin using refraction seismic data and the ambient noise technique

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The Ligurian Basin is situated at the transition from the western Alpine orogeny to the Apennine system, an area where a change in subduction polarity (‘Ligurian Knot’) is observed. The Back-arc basin was generated by the southeast trench retreat of the Apennines-Calabrian subduction zone. The opening took place from late Oligocene to Miocene. While the extension led to continental thinning and subsidence, oceanic spreading with unroofing of mantle material was proposed for the late period of opening 21-16 Ma.
To shed light on the present day crustal and lithospheric architecture of the Ligurian Basin, active and passive seismic data have been recorded on ocean bottom seismometers. A seismic long-term network comprising of 29 broad band stations was installed from June 2017 to February 2018 in the framework of SPP2017 4D-MB, the German component of AlpArray. Refraction seismic profiles were shot to serve two aspects: (1) Determine the orientation of the horizontal components of the long-term ocean bottom seismometers and (2) estimate the velocity distribution of the upper lithosphere, to provide a better earth velocity model for the analysis of the passive seismic data. The ambient noise technique is applied to compute surface wave phase velocity maps of Rayleigh waves for the Ligurian Basin.
Good quality data have been recorded, regional and teleseismic events could be detected by stations of the network. Active shots have been recorded by all stations on the seafloor during shooting. The majority of the refraction seismic data show mantle phases at offsets up to 70 km. The crust mantle boundary in the central basin is observed at $\sim$9 km depth below seafloor. The mantle shows rather high velocities $>$ 7.8 km/s.