The Ligurian Basin is located north-west of Corsica at the transition from the western Alpine orogen to the Apennine system. The Back-arc basin was generated by the southeast retreat of the Apennines-Calabrian subduction zone. The opening took place from late Oligocene to Miocene. While the extension led to extreme continental thinning little is known about the style of back-arc rifting. Today, seismicity indicates the closure of this back-arc basin. In the basin, earthquake clusters occur in the lower crust and uppermost mantle and are related to re-activated, inverted, normal faults created during rifting.

To shed light on the present day crustal and lithospheric architecture of the Ligurian Basin, active seismic data have been recorded on short period ocean bottom seismometers in the framework of SPP2017 4D-MB, the German component of AlpArray. An amphibious refraction seismic profile was shot across the Ligurian Basin in an E-W direction from the Gulf of Lion to Corsica. The profile comprises 35 OBS and three land stations at Corsica to give a complete image of the continental thinning including the necking zone.

The majority of the refraction seismic data show mantle phases with offsets up to 70 km. The arrivals of seismic phases were picked and used to generate a 2-D P-wave velocity model. The results show a crust-mantle boundary in the central basin at ~12 km depth below sea surface. The P-wave velocities in the crust reach 6.6 km/s at the base. The uppermost mantle shows velocities >7.8 km/s. The crust-mantle boundary becomes shallower from ~18 km to ~12 km depth within 30 km from Corsica towards the basin centre. The velocity model does not reveal an axial valley as expected for oceanic spreading. Further, it is difficult to interpret the seismic data whether the continental lithosphere was thinned until the mantle was exposed to the seafloor. However, an extremely thinned continental crust indicates a long lasting rifting process that possibly did not initiate oceanic spreading before the opening of the Ligurian Basin stopped. The distribution of earthquakes and their fault plane solutions, projected along our seismic velocity model, is in-line with the counter-clockwise opening of the Ligurian Basin.