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Upper mantle structure of the SW Iberian Margin and Alboran Sea: new insights from 3D teleseismic tomography integrating OBS and land stations data

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During the EC-NEAREST project a seafloor seismic network was deployed for 11 months (end of August 2007-August 2008) in the Gulf of Cadiz and off-shore Cap St. Vincent. This network comprised 24 stations (OBS/H, German DEPAS pool) plus an OBS installed on the GEOSTAR deep sea multi-parameter observatory. The OBS array provided the waveforms of 65 teleseisms recognized as direct P phases. This dataset was selected from over 200 Mw $\geq$ 5.5 events with epicentral distance between 25° and 95° which occurred during the experiment. We also added 74 teleseisms recorded in the period September 2008 – June 2009 to obtain better ray coverage. We accurately picked arrival times on waveforms recorded by the OBS and by some land stations. This data was merged with the arrival times reported on the ISC bulletin. In total, we selected 139 teleseismic events with at least 10 P-wave recordings resulting in 6,056 P-wave arrival times for the tomography inversion. The tomography was performed by inverting relative traveltime residuals with a recently developed non-linear technique.
We present the travel time residual analysis and the 3D P-velocity model computed for the upper-mantle down to 480 km depth. The main features of the tomographic images are:
A high velocity anomaly, arch shaped, extending from beneath the south of Spain to the Alboran Sea, continuous in the depth range 120-360 km.
A wide high velocity anomaly beneath central-southern Spain in the depth range 60-180 km, possibly representing thick old lithosphere.
An elongated low velocity anomaly running along the western-southwestern Iberian Margin from north of Portugal to the Strait of Gibraltar, from crustal depths down to 180 km. This anomaly could be related to the transition zones from Atlantic to Eurasian lithosphere (west) and from African to Eurasian lithosphere (south-southwest).
A high velocity anomaly is imaged under the OBS network extending from crustal depths to 120 km. This anomaly does not appear as connected with the high velocity body below the Alboran Sea.