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Local earthquake tomography: crustal structure beneath northern morocco and southern iberian peninsula and alboran sea area.

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Abstract:

We have obtained a new P-wave velocity model structure from local earthquakes under northern Morocco and Alboran Sea and Southern Spain using an iterative simultaneous inversion method for velocity and hypocentral parameters. For this purpose, we investigate this tomographic method to 40714 P-wave arrival times from more than 2400 local seismic events recorded by a permanent and transportable seismic station networks.The P-wave travel times are calculated by the finite difference technique which allows a flexible parameterization of the velocity model. Twenty horizontal layers with a thickness of 4km for each one were proposed to obtain a three-dimensional P-wave velocity structure along and in depth of the complex Ibero-Moroccan boundary region. The hypocenter location of the global earthquake dataset has been remarkably improved by the obtained three-dimensional velocity model. At the uppermost level of the crust the results suggest that the most prominent feature is the very low velocity zone associated with flysch units north of the Strait of Gibraltar, and in northern Morocco extending from Al-Hoceima region to the Albor,n ridge. Conversely, a high velocity anomaly is observed in the area of the Ronda Peridotites, but a similar structure is not observed in the Beni-Boussera region in Morocco. The obtained velocity model shows an accurate identification in depth of the shape and the geometry of the geology structures in the area. The tomographic cross sections reveal a vertical downgoing highly velocity materials in the whole area and show a thick crust in either the western part of the Alboran sea or north-west of Morocco region and a thin crust in the middle and the east of the Alboran sea and the north-east of Morocco. We also identify in Gibraltar arc region a relatively deep slab subduction zone which is associated with a linear seismicity along this slab.

Keywords: local earthquake, P wave arrival-time, simultaneous inversion, relocation, subduction.