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DETAILED IMAGE OF CRUSTAL STRUCTURE IN SICILY (SOUTH ITALY) FROM LOCAL EARTHQUAKE TOMOGRAPHY

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We present a new seismic velocity model for the crust and uppermost mantle beneath Sicily (Southern Italy) and surrounding submerged areas, obtained by local earthquake tomographic. The Sicilian region represents a portion of the Apennine–Maghrebide fold-and-thrust belt developed in an area dominated by both the convergence between the European and Nubia plates (Goes et al., 2004; Pondrelli et al., 2004; Billi et al., 2007) and the extensional processes linked to the opening of the Tyrrhenian basin (Malinverno and Ryan, 1986; Faccenna et al., 1996). The major seismogenic domains identified on the basis of seismological evidences (Presti et al., 2013) are: (I) the Southern Tyrrhenian E–W striking domain, located off-shore of northern Sicily, undergoing N–S compression; (II) the northern Sicily domain presenting extensional regimes that vary from N–S, to the west, to WNW–ESE to the east; (III) the mainland Sicily domain comprising the Etna area and showing a mainly transpressional regime; (IV) the Hyblean Foreland domain in southeastern Sicily with primarily strike-slip deformation.

To perform the tomographic inversion, we selected ca. 7100 earthquakes occurred between 1990 and 2012 in the depth range 0-100km and with a minimum of 10 observations. Data and recordings have been derived by the Italian recording networks managed by INGV (www.ingv.it). By using the LOTOS code for passive tomography inversion (Koulakov, 2009), we have computed the distribution of Vp, Vs, and the Vp/Vs ratio in the study area. LOTOS code is designed for simultaneous inversion for P and S velocity structures and source coordinates. In the inversion grid construction, nodes are distributed according to the ray density and spacing is chosen to be smaller in areas of higher ray density. However, to avoid excessive concentration of nodes, a minimum spacing is defined. In order to increase the detail of our analysis with respect to previous study carried out in the same sector (Barberi et al., 2004; Chiarabba et al., 2008 ; Orecchio et al., 2011; Calò et al., 2013), we tested several spacings for the inversion grid and we report the result obtained with the most dense and reliable one.

The obtained velocity models, jointly evaluated with results of synthetic modeling, as well as with the hypocenter distribution and geological information, give us new constraints to geodynamical and structural knowledge of the study area.

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