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Seismic Tomography of Southern Tyrrhenian by means of teleseismic data

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The topic of my work is a seismic tomography which has as object the investigation of Southern Tyrrhenian. This tomography has been obtained by means of inversion of teleseismic data to investigate subduction zones in the Southern Tyrrhenian oceanic back-arc basin. The subducting lithosphere has been mostly consumed along the Tyrrhenian-Apennine system has been consumed with the exception of the Calabrian arc sector. This kind of inversion could provide a good resolution to depth of 500-600 km, whereas previous local tomographies of Southern Tyrrhenian show results to depth of 250-300 km. The adopted database consists of 1929 teleseisms recorded in period 1990-2012 by 122 southern Italian seismic station directly connected to ISC (International Seismological Centre). The software FMTT was employed for the inversion of these arrival times. I have implemented a grid of 0-500 km in depth, 7°E-20°E in longitude and 35°-48° in latitude, with a grid spacing of 50 km in depth, 0.8 degrees in longitude and 0.4 degrees in latitude. I have made 10 horizontal sections of final model from 50 km of depth to 500 km of depth, with an interval of 50 km of depth from each other. I have made 8 vertical sections, 4 NS vertical sections at fixed longitude and 4 WE vertical sections at fixed latitude. Finally, I have made 3 transversal sections. Summarising, the horizontal sections show an evolution of the high velocity body that represents the Ionian slab. It is visible both at depth of 50 km and at depth of 100 km, beneath the Calabrian arc and extends to northern Sicily beneath the Aeolian arc with a maximum of 0.6-0.8 km/s. At depth of 250 km, the tomography evidences a sort of “transition” due to the absence of the Southern Tyrrhenian HVA and the occurrence of a low velocity region with maximum of -0.5 km/s scattered between the Aeolian Islands and Calabria. In the depth interval from 250 km to 400 km, there are two impressive high velocity areas in northern Sicily and along southern Campania with a value of 0.3 km/s, separated by a low velocity area (LVA) along the Calabrian arc and the Aeolian Islands in the range [0.4 ; 0.6] km/s. Extensions of HVAs and LVAs previously mentioned have been estimated by means of vertical and transversal sections. This evidence could be interpreted as the effect of a three-dimensional circulation of astenospheric flow provoked by slab roll-back. A new evidence from the tomography is the presence of a LVA in the [250 ; 400] km depth interval with an extension of 100-150 km that practically splits the Tyrrhenian slab into two parts, in Neapolitan region and in the southern Calabria-northern Sicily region. The presence of this “window slab” could be interpreted as a tear in which unperturbed mantle insert itself.