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Defining a new 3-D lithospheric velocity model of the Calabrian Arc region (Southern Italy) from the integration of different seismological data

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We present a new 3D P-wave velocity model of the Calabrian Arc lithosphere obtained from the integration of seismic velocity data using a method conceptually similar to the one of Waldhauser et al. (GJI, 1998 and 2002). They obtained an integrated 3D P-velocity model of the Alpine region by combining published controlled-source seismic (CSS) and local earthquake tomographic data. Their model includes first-order structures such as the Moho topography, sedimentary basins and the strong intracrustal velocity anomalies and shows the main features of the state of the crust and the processes at work (e.g. orogeny, subduction, etc.). The use of this model as starting model of a teleseismic tomography showed a meaningful improvement of the resolution. In order to apply this method in the Calabrian Arc region we collected all types of seismic velocity data available, mainly derived from active seismic surveys (Chironi et al., BSGI, 2000; Nicolich et al., Tectonoph., 2000; Cassinis et al., CROP Project, 2005, among others)and seismic and teleseismic tomographies (Barberi et al., PEPI, 2004; Chiarabba et al., EPSL, 2008; Monna & Dahm, JGR, 2009). Moreover, we also considered the Moho depth reported by the European Moho Map (Dèzes & Ziegler, 2nd EUCOR-URGENT Workshop, 2001) and Pontevivo & Panza (PAGEOPH., 2006). We had to adapt the procedure of Waldhauser et al. (GJI, 1998 and 2002) because the available information didn't furnish an homogeneous coverage in our region. All the collected velocity-depth couples of data are reported on the nodes of a grid with 40km h-spacing. We used the Moho depth obtained from WARR profiles and Pontevivo & Panza (PAGEOPH., 2006) as constraint, to detect the depth ranges characterized by marked velocity variations. Then, for each node we divided the depth range into three parts: the first covers the crust, the second identifies the Moho transition zone, the last encloses the sub-moho interval. For each of them we separately fit all the available couples of data using a second order polynomial function. The different type of data showed a good agreement with only little inconsistency in very few nodes, where we decided to attribute greater weight to the data coming from the active seismic profiles. Finally, we obtained an average P-wave velocity model of the Calabrian Arc lithosphere that, integrating all the "a-priori" information available for the region, furnishes a more complete picture of the lithospheric structure and a basic knowledge useful for further investigation. In addition, the use of this model as starting velocity model in a new P-wave tomographic inversion of shallow earthquakes (Neri et al.,submitted to GJI) led to a meaningful reduction of the Rms parameter and to better constrained results.