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ON THE 3-D VELOCITY STRUCTURE OF W. GREECE

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Western Greece is characterized by the highest seismicity rates of the Hellenic peninsula and is a source of interest since it is related to complexities mainly related to distributed continental deformation. The ~SW-NE convergence between the African and the Aegean plates results in intense deformation of the crust and the release of stored elastic energy by seismic slip along large faults. Deformation across the area is mainly accommodated within the accretionary sediments of the External Carbonate Platform of the Hellenides (H1) escarped from the subducted Ionian plate and collided against Pindos (e.g. Royden and Papanikolaou, 2011). This region has been frequently activated during the last decade, providing a large amount of enhanced quality recordings from the Hellenic Unified Seismological Network (HUSN), the Corinth Rift Laboratory Network (CRLN) and the Mediterranean Very Broadband Seismographic Network (MedNet), which were exploited for the purposes of this work.

The first step was the development of a local 1D velocity model capable of yielding optimized hypocentral solutions with reduced residuals. This was obtained by the mean travel-time residuals and location uncertainties minimization method (Kissling et al., 1994). Tomographic inversion was performed by applying the Local TOmography Scheme (Koulakov, 2009). A dataset consisting of more than 170,000 P- and S-wave manual picks corresponding to 6,880 events was employed. The checkerboard method was applied as an indicator of the tolerance range of the solutions due to the available data configuration. Several checkerboard tests were performed in order to obtain the optimum cell size representing the horizontal and vertical dimensions of the velocity structures that could be resolved with confidence for both amplitude and shape. This procedure showed that an initial 40x40x40 kmÂ^{3} synthetic checkerboard was the most suitable since this pattern was sufficiently reconstructed by employing the dataset of real raypaths and imposing an amount of traveltime noise. The dataset enabled good horizontal resolution between 10 and 40 km depth. Deeper than 40 km, the resolution is reduced, whereas for depths greater than 80 km, the results are found not to be reliable.

Inversion of real data was performed considering the above grid configuration and the hypocentral locations resulted from the optimized 1D regional velocity model. The tomography outcome in terms of % longitudinal (VP) and shear (VS) velocity perturbations with respect to the 1D velocity model indicates gross structures, with the following characteristics:

â€¢ The shape and amplitude pattern (15%) of the retrieved velocity anomalies is found quite similar down to 40 km depth.

â€¢ Anomalies are found to be arranged in a NE-SW and NNW-SSE direction at the shallow and the deeper part of the crust, respectively.

â€¢ The Ionian slab is highlighted by a strong velocity contrast (8%).

â€¢ Segmentation of CTF between Cephalonia and Lefkas is inferred by contrast velocity perturbations.

â€¢ A predominant NE-SW oriented low velocity zone observed in central Peloponnesus, related with dextral strike-slip faulting, marks a 90Â° rotation of the extensional stress direction that is found to occur at both sides.

â€¢ The resolved velocity anomalies support the scenario of a rigid microplate that includes the regions of

Cephalonia, Lefkas, Aitoloakarnania and NW Peloponnese, consistently with seismological (Kassaras et al., 2016) and geodetic observations (Chousianitis et al., 2015).

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