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Imaging 3D seismic velocity along the seismogenic zone of Algarve region (southern Portugal)

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The present seismic tomographic study is focused around Algarve region, in South of Portugal. To locate the seismic events and find the local velocity structure of epicentral area, the P and S arrival times at 38 stations are used. The data used in this study were obtained during the Algarve campaign which worked from January/2006 to July/2007. The preliminary estimate of origin times and hypocentral coordinates are determined by the Hypoinverse program. Linearized inversion procedure was applied to comprise the following two steps: 1) finding the minimum 1D velocity model using Velest and 2) simultaneous relocation of hypocenters and determination of local velocity structure. The velocity model we have reached is a 10 layer model which gave the lowest RMS, after several runnings of eight different velocity models that we used “a priori”. The model parameterization assumes a continuous velocity field between 4.5 km/s and 7.0 km/s until 30 km depth. The earth structure is represented in 3D by velocity at discrete points, and velocity at any intervening point is determined by linear interpolation among the surrounding eight grid points. A preliminary analysis of the resolution capabilities of the dataset, based on the Derivative Weight Sum (DWS) distribution, shows that the velocity structure is better resolved in the West part of the region between the surface to 15 km. The resulting tomographic image has a prominent low-velocity anomaly that shows a maximum decrease in P-wave velocity in the first 12 kms in the studied region. We also identified the occurrence of local seismic events of reduced magnitude not catalogued, in the neighbourhood of Almodôvar (low Alentejo). The spatial distribution of epicentres defines a NE-SW direction that coincides with the strike of the mapped geological faults of the region and issued from photo-interpretation. It is still expectable to refine the seismicity of the region of Almodôvar and establish more rigorously its role in the seismotectonic picture of the region. This work is expected to produce a more detailed knowledge of the structure of the crust over the region of Algarve, being able to identify seismogenic zones, potentially generators of significant seismic events and also the identification of zones of active faults.