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Approach to the complex 3D upper-crustal seismic structure by artificial sources tomography on a grid of OBS in the Sea of Marmara

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The 3D upper-crustal P-wave velocity model of Marmara Sea is derived by inverting 13733 first arrival times of artificial sources with offsets ranging from 0 to 140 km. The data have been collected in the frame of the multi-method SEISMARMARA survey which has been carried out after the 1999 Izmit and Duzce earthquakes. During this survey a network of 37 Japanese OBS placed on a 2D grid have recorded the 2000 km of MCS profiles in the North Marmara Trough (NMT). The image resolution at the rims of NMT has been obtained by including the shots recorded at 5 land stations. As in the classical approach the data has been inverted using several 1D a priori velocity models in a grid of 5 km and 1 km node spacing in horizontal directions and depth respectively. The distribution of the classical quality estimators and spread function is analyzed. Several kinds of synthetic test have been performed in order to check the adequacy of chosen a priori parameters and threshold values of quality estimators. As another verification, the forward problem have been solved using different ray tracing algorithm. The choice of the better 1D starting model is possible thanks to the possible comparison with the results of the wide angle reflection, refraction modeling. This is the one which allows to recover the same basement topography beneath deep basins and highs of the Marmara Sea.
The comparison with the 2D MCS reflection profiles and 2D modeling of refraction

shows that the inversion gives a consistent 3D image. The same main features are found by shifting the nodes of the grid by the half of their distance (2,5 km). Most of the small wave-length structure is constrained only either by using the initial grid or the shifted one. With a 5x5 km grid, we thus do not resolve the complete information that the data contain. One possibility is to perform a step by step inversion with a grid getting finner at each step, with offsets selection of the inverted phases getting larger and with a 3D starting model.