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EARTHQUAKE LOCATION BY TRAVELTIME STACKING AND FOCAL MECHANISMS OBTAINED BY REGIONAL MOMENT TENSOR ANALYSIS AT THE ARMUTLU PENINSULA, NW TURKEY

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The Armutlu peninsula is located in the Eastern Marmara region, Turkey, which is exposed to hazards from major earthquakes on segments of the North Anatolian Fault (NAF). The seismotectonic setting is complex, due to the interaction of fault branches of the NAF, pull apart basins, and different crustal fault mechanisms. Precise locations of microearthquakes and determination of focal solutions are important to better understand the complex tectonic interaction. In our study, we apply a full waveform approach (LOKI software, Grigoli et al. 2013) to automatically locate events. The method is based on the stacking of characteristic functions, works directly on waveforms and does not require phase picking or phase association. It is therefore appealing towards automated reprocessing of large datasets. The location approach performs a 3D grid search for hypocentral locations, builds characteristic functions enhancing P and S onsets from 3 component traces, stacks Short Term Averagae/Long Term Average (STA/LTA) at each location along theoretical travel time surfaces, and finally finds the hypocentral coordinates at the location of maximal coherence. We compare 7 different 1D velocity models proposed for the Marmara region, for a selected dataset of 20 events. The velocity model evaluation is performed on the basis of three statistical measurements: (1) RMS of travel time residuals, (2) uncertainties in depth and epicentral coordinates and (3) maximum coherence values. The vertical and horizontal uncertainties of the re-located earthquakes derived from waveform stacking methods are smaller than those obtained using standard automated location methods. Although the results confirm that a best velocity model can be selected by waveform stacking methods, the results also indicate that effects from 3D heterogeneities remain strongly, and that 3D velocity models should be considered in future. Automated locations are then performed on a larger dataset including 1197 events with duration magnitude M_d among 0.4 and 4.5 for the period 01.11.2005-31.03.2008 and 01.07.2009-31.08.2010. Events are only considered if their epicenters are located inside the network (Lat 40.15°N-41.0°N, Lon 28.5°E-29.7°E), with at least 6 available stations, then 633 events were re-located. Green's functions have also been calculated for the preferred velocity model, in order to perform moment tensor inversion. Moment tensor inversion has been carried out by fitting amplitude spectra and full waveform displacements at regional distances, by means of the Kiwi tools software (Cesca and Heimann, 2013). Preliminary analysis of the focal mechanisms indicate a transtensional regime. While the northern domain of the Armutlu peninsula is dominated by normal faulting mechanisms with only minor strike-slip components, southern domain of the Armutlu peninsula is characterized stronger strike-slip components

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