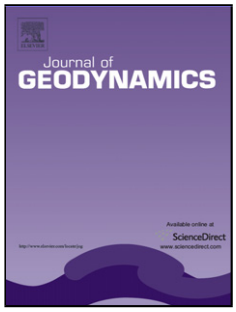

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PII: S0264-3707(18)30057-7
DOI: https://doi.org/10.1016/j.jog.2018.07.005
Reference: GEOD 1587

To appear in: *Journal of Geodynamics*

Received date: 28-2-2018
Revised date: 21-6-2018
Accepted date: 26-7-2018

Please cite this article as: Konstantinou KI, Estimation of optimum velocity model and precise earthquake locations in NE Aegean: implications for seismotectonics and seismic hazard, *Journal of Geodynamics* (2018), https://doi.org/10.1016/j.jog.2018.07.005

Estimation of optimum velocity model and precise earthquake locations in NE Aegean: implications for seismotectonics and seismic hazard

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Highlights

Estimated a minimum 1D model for P, S velocities in the area of NE Aegean

Obtained precise relative locations for 3,354 events during 2011-2017

Faults delineated by seismicity agree with the model of transtensional deformation

Seismogenic layer thickness estimated from depth distribution is 14.8-15.8 km

Magnitudes of potential earthquakes along specific faults range from 6.3 to 7.2

Abstract

This study relocates the seismicity in NE Aegean during the period 2011-2017 using data recorded by the Hellenic Unified Seismic Network (HUSN) in order to elucidate the relationship between seismicity and active faults in this area. P- and S-phase travel times of well-recorded events were first inverted in order to derive a minimum 1D velocity model with station delays using VELEST. Absolute locations of 4,450 events were obtained by use of the nonlinear probabilistic algorithm NLLOC and the newly derived velocity model. Precise relative locations with horizontal and vertical uncertainties that do not exceed 1.2 km were calculated for 3,354 events using the double-difference algorithm. The relocated seismicity delineates active faults to the south of Lesvos island, at the tip of Biga peninsula in Turkey and along the parallel strands of strike-slip faults that accommodate the westward motion of Anatolia. The comparison of the seismicity distribution with known active faults and the regional stress field shows that the strike-slip faults represent either principal shear zones, or Riedel shears oriented obliquely to the minimum stress axes. Normal faults are oriented almost perpendicular to the direction of the minimum stress axes in accordance with the transtensional deformation model. The seismogenic layer thickness derived from the depth distribution of relocated seismicity was found to be in the range of 14.8-15.8 km. By combining