DYNAMIC SOURCE INVERSION FOR PHYSICAL PARAMETERS CONTROLLING THE MW 6.3 2017 LESVOS EARTHQUAKE

Filip KOSTKA [1], ***Efthimios SOKOS*** [2], ***Jiri ZAHRADNIK*** [1], ***Frantisek GALLOVIC*** [1]

[1] Department of Geophysics, Faculty of Mathematics and Physics, Charles University, Prague, Czech Republic

[2] Department of Geology, University of Patras, Patras, Greece

We perform a Bayesian dynamic finite-extent source inversion to constrain the physical parameters and stress conditions that governed the Mw 6.3 2017 Lesvos earthquake. The mainshock occurred on 12 June, offshore the south-eastern coast of the Greek island of Lesvos in the north Aegean Sea. It caused 1 fatality, 10 injuries and extensive damage to the southeastern part of the island. The earthquake likely ruptured the eastern segment of the Lesvos Basin fault dipping to the south-west at 43^{circ} with normal faulting mechanism (Kiratzi, 2018). We start with centroid moment tensor inversion, obtaining the south-west dipping nodal plane compatible with the hypocentre location. Considering this plane as the fault plane, we perform the dynamic finite extent source inversion based on an elliptical model of rupture (Twardzik & Madariaga, 2014). The forward problem (dynamic rupture simulation) is solved by a 3D finite difference method assuming linear slip-weakening friction law on a planar fault (Madariaga et al., 1998). Coupling the obtained rupture evolution with Green's functions precalculated by the discrete wavenumber method (AXITRA) allows us to evaluate the misfit between synthetic and observed waveforms at 19 stations with fault distances of up to 100 km. The inverse problem is solved using the Parallel Tempering Monte Carlo algorithm (Sambridge, 2013), which samples the posterior probability density function of model parameters that determine frictional and stress conditions on the fault. This way we obtain not only the model that provides the best fit with the observed seismograms, but we also examine the uncertainty, stability and correlations of the inverted dynamic and kinematic source parameters.