Geophysical Research Abstracts
Vol. 20, EGU2018-8581, 2018
EGU General Assembly 2018

Dynamic source inversion of the 2016 Mw6 Amatrice earthquake

Frantisek Gallovic (1), Alice-Agnes Gabriel (2), and Lubica Valentova (1)

(1) Department of Geophysics, Faculty of Mathematics and Physics, Charles University, Prague, Czech Republic (gallovic@karel.troja.mff.cuni.cz), (2) Department of Earth and Environmental Sciences, Ludwig-Maximilian University of Munich, Germany (gabriel@geophysik.uni-muenchen.de)

In 2016 Central Italy was struck by a sequence of three Mw∼6 earthquakes associated with normal faulting of NW-SE strike and dip towards SW, which is the prevalent style of faulting in the area. The first earthquake of the sequence, the Mw6 Amatrice event (08/24), caused building collapse and about 300 casualties. The event was recorded by a uniquely dense network of seismic stations. Here we perform dynamic source inversion to infer physical parameters and stress conditions that controlled the 2016 Amatrice earthquake rupture. In particular, we consider dynamic rupture governed by a linear slip-weakening friction law with spatially variable parameters along the fault. Finding the optimal distribution of these dynamic parameters is computationally challenging due to the strongly non-linear relation between seismograms and model parameters. Therefore, we utilize very efficient finite-difference code FD3D by Madariaga et al. (1998) to evaluate slip rates for tens of thousands of models. The inverse problem is formulated in a Bayesian approach, where we sample the posterior probability density function using Parallel Tempering Monte Carlo algorithm (Sambridge, 2013). The main advantage of such formulation is that by subsequent analysis of the inferred samples we can infer stable features of the result and their uncertainty. Our preferred model exhibits bilateral rupture propagation with two asperities in agreement with kinematic inversions (e.g., Pizzi et al., 2017). We validate the preferred distribution of dynamic source parameters by high-resolution forward modeling considering complex physics on and off-fault using the SeisSol software package (www.seissol.org).