Geophysical Research Abstracts
Vol. 14, EGU2012-6997, 2012
EGU General Assembly 2012

Quantitative evaluation of efficiency of the methods for a posteriori filtration of the slip-rate time histories

M. Kristekova (1,2), M. Galis (2,1), P. Moczo (2,1), J. Kristek (2,1)

(1) Geophysical Institute, Slovak Academy of Sciences, Bratislava, Slovakia, (2) Faculty of Mathematics, Physics and Informatics, Comenius University Bratislava, Slovakia

Simulated slip-rate time histories often are not free from spurious high-frequency oscillations. This is because the used spatial grid is not fine enough to properly discretize possibly broad-spectrum slip-rate and stress variations and the spatial breakdown zone of the propagating rupture. In order to reduce the oscillations some numerical modelers apply the artificial damping. An alternative way is the application of the adaptive smoothing algorithm (ASA, Galis et al. 2010). The other modelers, however, rely on the a posteriori filtration. If the oscillations do not affect (change) development and propagation of the rupture during simulations, it is possible to apply a posteriori filtration to reduce the oscillations. Often, however, the a posteriori filtration is a problematic trade-off between suppression of oscillations and distortion of a true slip rate.

We present quantitative comparison of efficiency of several methods. We have analyzed slip-rate time histories simulated by the FEM-TSN method. Signals containing spurious high-frequency oscillations and signals after application of a posteriori filtering have been compared to the reference signal. The reference signal was created by application of a careful iterative and adjusted denoising of the slip rate simulated using the finest (technically possible) spatial grid. We performed extensive numerical simulations in order to test efficiency of a posteriori filtration for slip rates with different level and nature of spurious oscillations. We show that the time-frequency analysis and time-frequency misfit criteria (Kristekova et al. 2006, 2009) are suitable tools for evaluation of efficiency of a posteriori filtration methods and also clear indicators of possible distortions introduced by a posteriori filtration.