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Application of Synthetic Transfer Functions to Earthquake Motion Scenario Study in the Grenoble Valley, French Alps

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In this contribution we present results of the kinematic finite-extent source modeling of strong ground motions inside and outside of the 3D model of Grenoble Valley, French Alps. The source is hypothetical M6 right-lateral strike-slip event on the Eastern Part of the Belledonne Border Fault. A parallel Fortran95 computer code 3DFD_VS_MPI (ver. 1.0) developed by Kristek & Moczo is used for modeling seismic wave propagation. The code utilizes the 3D finite-difference (FD) method in heterogeneous viscoelastic media. The staggered-grid FD displacement-velocity-stress scheme is the 4th-order in space and 2nd-order in time (Moczo et al., 2002). Rheology of the Generalized Maxwell Body is applied to incorporate realistic attenuation and a formulation with material-independent anelastic functions (memory variables) and coarse spatial distribution of the anelastic functions is used (Kristek and Moczo, 2003). We compare synthetics obtained by the use of various rupture scenarios (various positions of the nucleation point, homogeneous vs. heterogeneous k-squared slip distributions, Gallovic and Brokesova, 2007). Further, we test the use of so-called Synthetic Transfer Functions obtained from point- and finite-source simulations to include basin effects into simple bedrock calculations. We have found that the Synthetic Transfer Functions involving the finite-fault effects do much better job than those obtained from point source simulations. In the particular model considered, the results warn that the use of empirical transfer functions obtained from the recordings of small earthquakes might significantly bias the modeling. The concept of Synthetic Transfer Functions offers a simple way for quick scenario simulations (regarding a large number of earthquake scenarios) to include the (synthetic) basin effects without multiple runs of any

time-consuming 3D wave-propagation code. The contribution has been inspired by the "Numerical Benchmark of 3D Ground Motion Simulation In the Valley of Grenoble, French Alps", particularly the strong motion case S1.