GROUND-MOTION SIMULATIONS FOR FINITE-FAULT EARTHQUAKE SCENARIOS ON THE HÚSAVÍK-FLATEY FAULT, NORTH ICELAND

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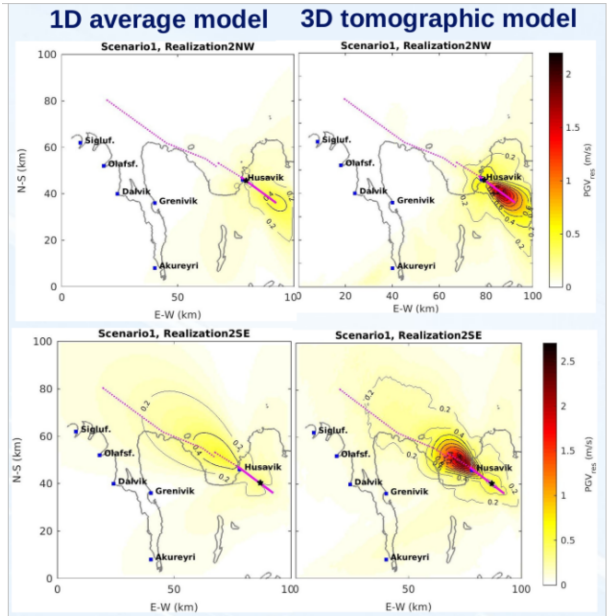
The Tjörnes Fracture Zone (TFZ) is the largest transform zone in Iceland that connects two spreading centers of the Mid-Atlantic Ridge: the Northern Volcanic Zone and the Kolbeinsey Ridge. Destructive historical earthquakes that occurred in Northern Iceland (the 1755 Ms 7.0 and the 1872 doublet Ms 6.5) have been associated with the Húsavík-Flatey Fault (HFF), which is the central largest linear strike-slip fault in the TFZ. We simulate kinematic fault rupture models for several potential earthquake scenarios at the HFF, and we estimate the ground motion of those scenarios at the main towns in Northern Iceland. Ground-motion predictions at Húsavík town are particularly interesting because of its location atop the HFF. The town is the largest in the area and is subject to the highest seismic hazard in the country. To simulate fault rupture scenarios, we apply the high-order accurate derivative discontinuous Galerkin (ADER-DG) method with SeisSol, and incorporate high-resolution topo-bathymetry and viscoelastic attenuation. Slip distributions are computed using a von Karman autocorrelation function whose parameters are calibrated with slip distributions of Icelandic $M>5.0$ recorded earthquakes. Synthetic ground motion and time histories at low frequencies (<2Hz) are estimated for the main towns, and ground-shaking maps are generated for the entire region [$\sim$100 km $\times$ 100 km]. Intensity values estimated from the simulation results are compared with those from the dynamic simulations by Li et al. (2022) and the GMPEs calibrated to Icelandic earthquakes. Directivity effects towards Húsavík town are studied. Our results are expected to complement the available information on seismic hazard in Northern Iceland towards non-ergodic physics-based seismic hazard assessment.

Note: Figure is on the next page.



$$PGV_{res} = max\{\sqrt{V_x(t)^2 + V_y(t)^2}\}$$

Shake maps generated with SORD code showing the resultant PGV of a simulated scenario of an Mw=6.4 earthquake with two different hypocenters, where we implemented a 1D velocity model (left panels) and the tomographic 3D model by Abril et al. (2021) (right panels).