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Ground Motions prediction Equations from a stochastic simulation approach for in-slab intermediate-depth earthquakes along the Hellenic subduction zone

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We have used a stochastic approach to simulate a large number of scenarios for in-slab intermediate-depth earthquakes in the southern Aegean Sea Hellenic subduction region, by applying an extended-source model using the EXSIM code. A large database of synthetic ground motion recordings for events with magnitudes in the range **M**6.0-8.5 has been compiled, covering the whole southern Aegean Benioff zone. For the stochastic simulations, we followed the approach developed in our previous works (Kkallas et al., 2018a,b), where we used the anelastic attenuation from the GMPEs modeling developed by Skarlatoudis et al. (2013) to constrain the different attenuation patterns and properties for the back-arc and fore-arc area. Simulation model parameters, such as stress parameters and attenuation parameters were also adopted from previous works, while for fault parameters we adopted the typical average focal mechanisms proposed by Papazachos et al. (2000), in agreement with the regional subduction tectonics. Estimates of expected ground motion measurements (PGA and PGV values) at different distances from different earthquakes have been employed to generate hybrid Ground-Motion Prediction Equations (GMPE). More specifically, we attempt to modify the existing Ground-Motion Prediction Equations (GMPE) from Skarlatoudis et al. (2013) for intermediate-depth earthquakes along the Hellenic Arc for large magnitude events (**M**>6.5), so that they can be efficiently used for Seismic Hazard assessment, as the original strong-motion dataset used for their development was lacking data in this magnitude range. Peak ground accelerations and velocities predicted by the EXSIM code are generally in very good agreement with the available GMPE results for magnitudes less than **M**7. However, significantly lower ground motions than those predicted by the GMPEs are predicted for large-magnitude events (**M**>7). Using the previous results, we propose a magnitude-dependent correction for the GMPE results both back-arc and along-arc ground motions. Moreover, we demonstrate how the final earthquake ground motion scenarios, as well as the modified GMPEs affect both deterministic and probabilistic seismic hazard analysis. This work has been partly supported by the HELPOS (MIS 5002697) project.