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Active fault and finite element geodynamic models for PSHA

Vanja Kastelic, Michele M.C. Carafa, and Francesco Visini
Istituto Nazionale di Geofisica e Vulcanologia, L'Aquila, Italy

We developed a probabilistic seismic hazard model that is based exclusively on active fault and geodynamic deformation models and applied it to the External Dinarides, a slow-deforming fold-and-thrust belt in the Central Mediterranean. Our seismic hazard analysis is based on two deformation models: the GEO deformation model for which all deformation is set to be released along the active faults depends on the position, geometry and kinematic data of the recognized active faults. In the FEM model the deformation is, besides along the active faults, released also in volumetric continuum elements and this model is based on active fault and geodynamical data. . From both models we calculated activity rates, earthquake rates and expected peak ground accelerations. We investigated both the source model and the earthquake model uncertainties by varying the main active fault and earthquake rate calculation parameters through constructing corresponding branches of a seismic hazard logic tree. Hazard curves and uniform hazard spectra have been produced for horizontal ground motion on bedrock conditions, thereby not considering local site amplification effects. The seismic hazard was computed over a 0.2° spaced grid considering 648 branches of the logic tree. We show results in terms of mean hazard curves and maps with 10% probability of exceedance in 50 years. Seismic hazard corresponding to the 5th and 95th percentiles were also evaluated to investigate the model limits. We conducted a sensitivity analysis to control which of the input parameters influence the final hazard results in which measure. We show that the application of a particular deformation model has a comparable impact on the seismic hazard as the selection of a particular ground motion prediction equation. In conclusion we suggest that PSHA models based exclusively on active faults and geodynamic inputs, thus not dependent on past earthquake occurrences, provide a valid method for seismic hazard calculation.