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Probabilistic Seismic Hazard Assesment for Bulgaria as a Basis for a new National Building Code

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The territory of Bulgaria represents a typical example of high seismic risk area in the eastern part of the Balkan Peninsula. Bulgaria contains important industrial areas that face considerable earthquake risk. Moreover, the seismicity of the neighboring countries, like Greece, Turkey, former Yugoslavia and Romania (especially Vrancea-Romania intermediate earthquakes involving the non-crustal lithosphere), influences the seismic hazard in Bulgaria.
Seismic hazard maps proposed as part of a new building code for Bulgaria based on the recommendations in EUROCODE 8 are presented in the study. The probabilistic seismic hazard analysis (PSHA) carries out integration over the total expected seismicity during a given exposure period to provide the estimate of a strong-motion parameter of interest with a specified confidence level. The basic approach used for the creation of ground motion maps combines via GIS, source-geometry, earthquake occurrence model, the strength of the earthquake sources, and the appropriate attenuation relations. In the study seismic hazard maps for Bulgaria are presented in terms of Peak Ground Acceleration (PGA) in agreement with EC8. As recommended in EC8, the maps are calculated for a 475 years return period (probability of exceedance of 10% in 50 years) for the design earthquake and for a 95 years return period (probability of exceedance of 10% in 10 years) for weaker earthquakes with higher frequency of occurrence. The PSHA was performed, using the Bulgarian version of computer code EQRISK.
For the sensitivity analysis on the characterization of the seismicity in the seismic sources a PSHA for 500 randomly chosen models was run. The results suggested that uncertainties in seismic characteristics have relatively small effect on the final seismic hazard.
A procedure called disaggregation has been applied to examine the spatial and magnitude dependence of PSHA results. The aim is to determine the magnitudes and distances that contribute to the calculated exceedance frequencies at a given return period and at a structural period of engineering interest. The hazard for 27 cities on the territory of Bulgaria for a 475 years return period and at PGA is partitioned into selected magnitude-distance bins.