Monte-Carlo Based Probabilistic Earthquake Hazard Analysis Tool: Case Study Marmara Region

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Abstract
Seismic hazard analysis is an important step in seismic risk calculations to reduce future hazards in earthquake prone areas. Monte-Carlo based hazard assessment methods offer more practical and powerful alternatives to the widely used direct integration based seismic hazard assessment methods due to efficient handling of uncertainties. In this work, a probabilistic seismic hazard tool based on Monte-Carlo approach is developed to predict hazard at macro level. In addition to the Poisson model, a time dependent renewal model is also integrated into the seismic hazard tool to take into account temporal dependencies between seismic events. In hazard calculations, near field directivity effects are also accounted for. To verify the accuracy of the developed tool, one of the highly seismic regions of the world, Marmara region in Turkey, is selected as a case study area to perform seismic hazard analysis. The hazard analysis results obtained from the developed tool show strong correlation with the hazard maps developed in SHARE project and the latest Turkish Earthquake Design code. This demonstrates that the developed PSHA tool can be used by engineers, practitioners and decision makers to develop risk mitigation strategies prior to potential future earthquakes.