Probabilistic Seismic Hazard Analysis Consisting of PGA, PGV and Acceleration Spectra for Iran

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Iran has experienced many strong earthquakes in the history. Most of the earthquakes in Iran are generated in the crustal zone that is compressed between the Eurasian and Arabian plates. The first probabilistic seismic hazard analysis for whole Iran was done by the committee of Iranian seismic design code and up to now it has been edited three times. The third edition of this code was issued in 2007. The other probabilistic hazard analysis was done by Ashtiani and Tavakoli in 1999 using catalog of earthquakes until 1996 of Iran. They used global attenuation acceleration relation developed by Campbell and Bozorgnia (1994). Current study carried out the probabilistic seismic hazard analysis of Iran, using updated earthquake catalog. Furthermore, the special attenuation relations considering Iran's major seismic zones, which the authors developed by last earthquake catalog of Iran were used in the analysis. In the probabilistic seismic hazard analysis, all of the seismic sources in Iran like historical events and due to active faults have been considered. A total number as 741 earthquake events was used for probabilistic hazard analysis. The earthquakes were classified to the point, line and area seismic sources. Concerning seismic source recurrence relations, as there were not enough source-related earthquake events to draw recurrence relation, we obtained recurrence relation by each seismic zone. The suitable evaluation period was found under the catalog processing for each zone. Cumulative event number in reverse chronological order was draw for all seismic zones of Iran for moment magnitudes from 5.0 to 7.5. Base on the proper distribution of earthquake events, annual rate corresponding to each magnitude was calculated and by drawing the cumulative rates versus magnitude, the recurrence law coefficients of each zone were obtained. We used 20 seismic zones for Iran which was published by Tavakoli (1996) and active faults of Iran which was published by International Institute of Earthquake Engineering and Seismology of Iran (IIEES, 2009). For better estimation of hazard analysis in cities near to borders of Iran, we considered around faults in neighbor countries using geological map of the middle east of geological survey of Iran (1993). Seismic hazard in this study was evaluated for seismic sources located in 100 km radius of desired site in terms of 10% and 2% exceedance probabilities of occurrence per 50 years. Results of this analysis using probabilistic approach were put in a GIS-based system to be able to show visually site specific design spectra for each part of Iran. We made a mesh net by 0.1 in 0.1 degree in geographic longitude and latitude. GIS-based seismic hazard assessment system can predict PGA, PGV and spectral acceleration design spectra for any site of Iran. Outcomes of this study would contribute for the quick and better estimation of the seismic design of structures.