Probabilistic seismic hazard assessment of Egypt

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ABSTRACT

A new and updated probabilistic seismic hazard assessment has been conducted for Egypt. To carry out this appraisal, new data and models has been incorporated, as well as a new treatment of the involved uncertainties in this type of studies. An updated and unified earthquake catalogue (2200 BC - 2013) has been compiled specifically for this assessment. A new seismic source model has been developed, including 28 shallow seismic zones (h < 35 km) for the Egyptian territory and its surroundings, 53 shallow seismic sources (h < 20 km) for the Eastern Mediterranean region after Seismic Hazard Harmonization in Europe (SHARE) project, and 7 intermediate seismic sources (20 < h < 100 km) covering the intermediate-depth seismicity in the Eastern Mediterranean region. These seismic sources were defined including all available data, some of them specifically compiled for this work (seismicity and focal mechanism catalogues). After a sensitivity analysis, a logic tree design was used in order to consider the epistemic uncertainty both in the b-value and the maximum expected magnitude of the Gutenberg-Richter recurrence relationship, as well as in the ground motion attenuation model. Using the CRISIS 2014 software, seismic hazard computations for rock site conditions and different return periods were performed. Here we show some of these results, in fact, peak horizontal ground acceleration (PGA) and spectral acceleration (SA) values for spectral periods of 0.2 and 1.0 s, and for return periods of 475 and 975 years. Moreover, uniform hazard spectra (UHS) have been computed specifically for some selected cities. All these results are compared with those included in the current Egyptian regulation. Maximum hazard values are obtained at Nuweiba city, located at the Gulf of Aqaba, around the location of the November 22, 1995, Mw 7.2 Aqaba earthquake. Values of 0.74 g and 0.98 g for a spectral period of 0.1 s, are obtained for return periods of 475 and 975 years, respectively. In Cairo, computed maximum values are 0.32 g and 0.44 g for the same return periods, also obtained for a spectral period of 0.1 s.

Key words: Seismic hazard; Egypt.

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