A new proposed seismic source model for the seismic hazard assessment of Egypt

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Abstract:

A new seismic source model for the Egyptian territory and its surroundings is proposed. This model can be readily used for seismic hazard assessment and seismic forecasting studies. The definition of this model includes not only the seismicity data but incorporates all available geological and geophysical data, in an attempt to define areas which show not only a homogeneous seismicity release, but also exhibit similar seismic and seismotectonic characteristics. For this reason, an updated and unified earthquake catalogue (2200 B.C. - 2013), was compiled and employed in the current study. Data were obtained from different sources, local, regional and international (e.g., the regional catalogue of Ambraseys et al., 1994; the International Seismological Center (ISC) and the annual bulletin of the Egyptian National Seismological Network). The initial compilation spanning a region from 21° to 38°N and from 22° to 38°E, and includes all the events having an assigned magnitude of 3.0 and above for international sources and any magnitude value for local sources on any magnitude scale. Earthquake magnitudes are reported in different scales and come from a variety of sources. For establishing a common magnitude, namely an equivalent moment magnitude (MW), two new relationships correlating surface-wave (MS) and body-wave (mb) magnitudes with MW were specifically derived. All non-Poissonian (dependent) events were removed using the Gardner and Knopoff (1974) approach. A total of 16642 events represent the final Poissonian catalogue with a magnitude above or equal to MW 3.0. The proposed seismic source model comprises 28 seismic sources including the shallow seismicity (h ≤ 35 km) for the Egyptian territory and its surroundings. In addition, for the Mediterranean region, we proposed the shallow seismic source zones (h ≤ 20 km), used in the SHARE (2013) project for estimating the seismic hazard for Europe. Furthermore, to cover the intermediate-depth seismicity (20 ≤ h ≤ 100 km), 7 intermediate-depth seismic source zones have been delineated in the Eastern Mediterranean region. Following the determination of zone boundaries, a separate earthquake and focal mechanism sub-catalogue for each seismic zone was created. Several seismicity parameters (b-value, activity rate and maximum expected magnitude) have been computed for each source. In addition, the predominant focal mechanism solution was assigned in each source zone using the stress field inversion approach. This characterization of the seismic sources represents the main input for the seismic hazard assessment studies.

Keywords:

Seismotectonics, Earthquakes, Egypt

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