



Re-evaluations of seismic hazard of Iraq

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Abstract

In recent years, Iraq has experienced an increase in seismic activity, especially, near the east boundary with Iran. Previous studies present their results in terms of PGA and for return periods of 500 years and less, and other studies not continued to include the whole PSHA process whereas some recent studies continued to include the whole PSHA process using earthquakes data till 2009 including dependent events. This study includes two main stages, the first is collecting the earthquakes records including the recent events till the end of March 2016 and applying data processing to get the net catalog to independent events. The second stage is applying the steps of PSHA method. Matlab programs have been built to execute these two stages and to convert the results of PSHA computations into contours of 5% damping PGA and spectral accelerations at 0.2 and 1.0 s for a return period of 2475 years, and for rock sites. Also, spectral acceleration against period has been presented for main cities. Also, the PGA map, for a return period of 475 years, has been plotted and then prepared together with similar maps of neighbor countries in one map for comparison. In general, this comparison indicates the similarity in behavior but, the values reveal a relative agreement and they are between Turkish and Iranian values.

Keywords Iraq · PSHA · Data processing · Independent events · PGA · Spectral accelerations · Seismic hazard

Introduction

Iraq located on the northern portion of the Arabian Plate, as shown in Fig. 1, surrounded in the northern and eastern boundaries by the Bitlis-Zagros Fold and Thrust Belt, in which the convergent tectonic boundary between the Arabian and Eurasian plates produces a strong earthquake activity. The rest of Iraq is mainly located within the Arabian Plate, away from the major plate boundaries.

The Taurus/Bitlis and Zagros continental collision zones form the northern, northeastern and eastern boundaries of Iraq. They are the result of continued convergence between the Arabian plate and the Turkish and Iranian plateaus. The

Taurus zone is diffused, but the Zagros is well defined and extends for about 1500 km in a NW-SE direction.

Figure 1 shows the northeast trending transitional motion and counterclockwise rotational motion of the plate. Most of the seismicity are occurring in the crust along the Zagros and Taurus mountain ranges and their foothills. The great majority of the earthquakes occur as a result of the continental collision between the Arabian plate and the Iranian and Turkish plateaus. Preliminary analysis of the earthquakes' spatial distribution suggests likely alignment with the faults in the region, (Ghalib and Aleqabi/JZS 2016).

Seismicity studies in Iraq can be summarized in four main studies that went a long way in PSHA. Three of them reached the final results in the form of contours of spectral acceleration and/or Peak Ground Acceleration, (PGA). These are, (Al-Sinawi and Al-Qasrani 2003; Mahmood et al. 1988; Onur et al. 2016):

The seismic design code of Iraq (1988) reported a seismicity study on Iraq region in which the Iraqi earthquakes data file has been collected and prepared for the period 859–1986 and the analysis of completeness indicated that the data were completed for $M_s \geq 4.8$. Ten area sources were identified in the report using the reported hypocenter locations of past earthquakes listed in the Iraqi earthquake data file and with the geological and tectonics information, (Mahmood et al. 1988). The activity parameters of seismic sources such as a , b and m_{max} have been

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