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Geometric-kinematic characteristics of the main faults in the W-SW of the Lut Block (SE Iran)

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Abstract

The area to the W-SW of the Lut Block in Iran has experienced numerous historical and recent destructive earthquakes. We examined a number of faults in this area that have high potential for generating destructive earthquakes. In this study a number of faults are introduced and named for the first time. These new faults are Takdar, Dehno, Suru, Hojat Abad, North Faryab, North Kahnoj, Heydarabad, Khatun Abad and South Faryab. For a group of previously known faults, their mechanism and geological offsets are investigated for the first time. This group of faults include East Nayband, West Nayband, Sardueiyeh, Dalfard, Khordum, South Jabal-e-Barez, and North Jabal-e-Barez. The N-S fault systems of Sabzevaran, Gowk, and Nayband induce slip on the E-W, NE-SW and NW-SE fault systems. The faulting patterns appear to preserve different stages of fault development. We investigated the distribution of active faults and the role that they play in accommodating tectonic strain in the SW-Lut. In the study area, the fault systems with en-echelon arrangement create structures such as restraining and releasing stepover, fault bend and pullapart basin. The main mechanism for fault growth in the region seems to be 'segment linkage of preexisting weaknesses' and also for a limited area through 'process zone'. Estimations are made for the likely magnitudes of separate or combined failure of the fault segments. Such magnitudes are used in hazard analysis of the region.

Keywords: Active tectonics; En-echelon faults; Fault growth; Restraining zone; Releasing zone; Seismic hazard.

1. Introduction

Tectonics of Iran is especially characterized by active faulting, large destructive earthquakes and Quaternary volcanism. About 189,640 human fatalities are reported due to 130 earthquakes in Iran during the 1900-2016 period; in average 1459 persons each year. 17 of the earthquakes resulted in more than 1000 victims each, and 10 of them were larger than magnitude 7 [*National Geophysical Data Center, NOAA*, 2016]. A substantial part of the earthquake fatalities is due to tectonic activities along the eastern and western margins of the Lut Block, which is considered as a rigid block with a thin crustal structure [*Dehghani and Makris*, 1984]. The eastern limit of the