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GEODETIC-BASED AND GEOLOGICAL-BASED EARTHQUAKE RATES FOR IRAN

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The Iranian plateau is one of the most seismically active regions in the world (Berberian et al., 1999). Different seismic zones, including Zagros, Alborz, Azerbaijan, Kope Dagh and Central-East Iran, have been characterized and large-magnitude earthquakes are observed in all these various zones. It is shown that recurrence times of large-magnitude earthquakes are more than 2000 years (Berberian et al., 2001) in the Iranian Plateau and further investigations that had been carried out after Tabas 1978, Manjil 1990, Bam 2003 and Ahar 2012 dual large-magnitude earthquakes confirmed long quiescence period between such earthquakes. Given that large-magnitude earthquake recurrences are more than several thousand years, observed seismicity, paleoseismological investigations are either short or incomplete. Merely using one dataset cannot constrain earthquake statistics to the degree necessary for a precise hazard assessment. In other words, seismic hazard assessment using historical and instrumental can lead to underestimated results.

In recent decades, GPS networks are developed all over the world and several studies are carried out on geodetic observations and strain rates over large areas are depicted with different degrees of precision. For various regions (e.g. California (Field et al., 2015), Canada (Mazzotti et al., 2011), Japan, New Zealand (Stirling et al., 2002) and Italy (Slejko et al., 2010)), strain rates, which are derived from geodetic and geological data, are converted to seismic moment rates and earthquake statistics. In this contribution, we aim to estimate earthquake rates based on a combination of observed seismicity and geodetic strain rates for the Iranian Plateau. Using long-term deformation rates of the Iranian Plateau that are estimated by geodetic and geological data (Khodaverdian et al., 2015), deformation-based earthquake rates are obtained. The results show that catalog-based rates are really different than deformation-based rates. These outcomes will provide the possibility of comparison between traditional seismic-based and novel deformation-based hazard analysis and more acurate seismic hazard assesment. Describes some example point information for the various seismotectonic areas in the Iranian plateau.

Table 1. The seismic moment rates obtained from catalog and geodetic and geological data.

Zone	(E,N)	$\dot{M}_0^S$ (10^{17} Nm/yr)	$\dot{M}_0^C$ (10^{17} Nm/yr)	$\frac{\dot{M}_0^C}{\dot{M}_0^S}$
Alborz	(51,36)	5.40	36.30	6.72
Center	(52,33)	1.38	18.10	13.13
East	(55,33)	1.77	15.80	8.96
Kope Dagh	(59,37)	10.70	24.80	2.32
North West	(48,38)	5.30	54.20	10.23
Zagros	(49,33)	4.99	10.90	2.18

In Figure 1 the red solid line show the frequency-magnitude distributions of earthquakes from catalog with mean value of the β, and blue dash line p the frequency-magnitude distributions of earthquakes from catalog with mean value ± standard deviation of the β. The solid blue line presents the frequency-magnitude distributions.

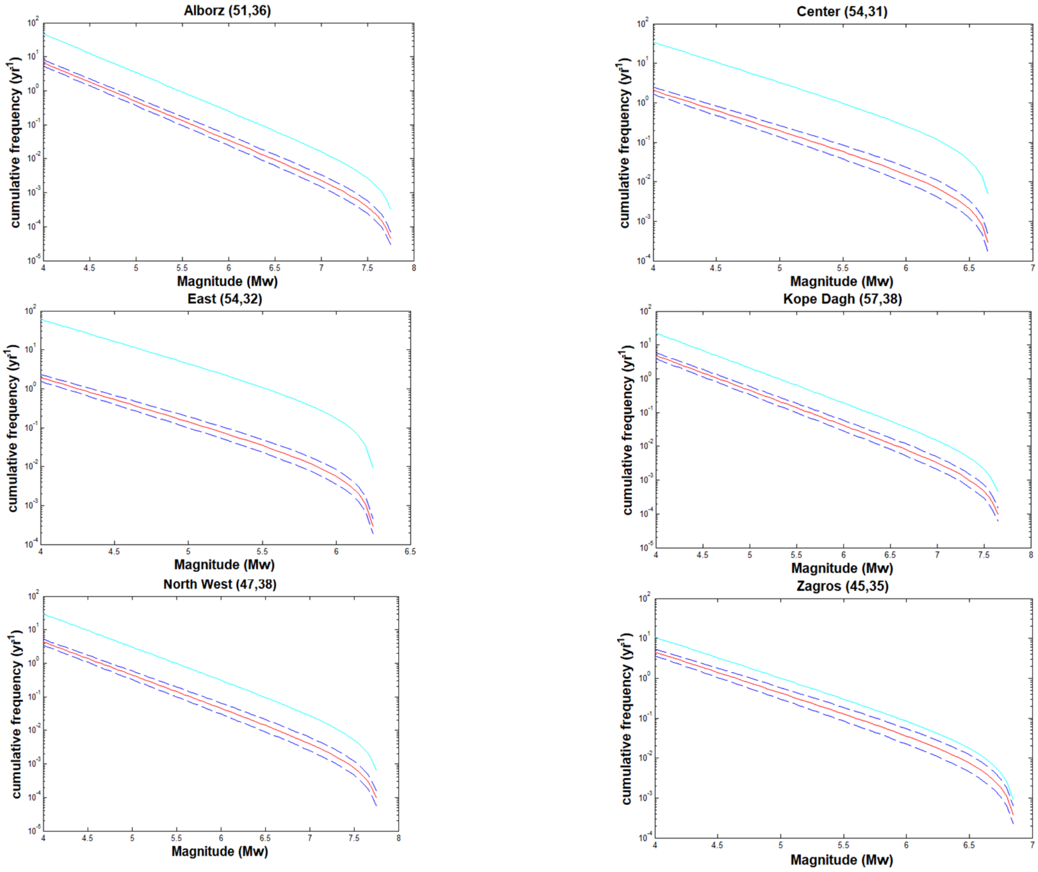

Figure 1. The frequency-magnitude distributions of earthquakes for different zones. From catalog with mean value of the β (red solid line), from catalog with mean value ± standard deviation of the β (blue dash line) and from Geodetic and geological data (solid blue line).

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