STRUCTURAL MATURITY OF BLIND FAULTS IN ZAGROS FOLD AND THRUST BELT

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Structural maturity is a determinant parameter in seismic hazard assessment and is less considered. It is qualified by surface rupture conditions (segmentation, rupture length and displacement value on the rupture), earthquake recurrence pattern and the ground motions produced by earthquake (see Manighetti et al., 2007; Radiguet et al., 2009; Liu-Zeng et al., 2005). These parameters completely support each other and strong ground motion is the most reasonable and comparable parameter of them (see Sabour et al., 2011).

The Zagros Mountains of Iran are a seismically active fold-thrust belt resulting from the collision of the Arabian plate and central Iran. While surface faulting of earthquakes is extremely rare in the Zagros, most information about the active faulting is obtained from earthquakes studies. Therefore in the Zagros region, we just used strong ground motion to determine the degree of structural maturity of the faults. The ground motions produced by earthquakes on immature faults are larger than those generated by earthquake on mature faults (Radiguet et al., 2009).

We calculated the response spectra for near field horizontal motions caused by some earthquakes that occurred on Zagros faults in seismic periods of 0.1-2 sec. We compared the obtained response spectra with ones resulted from the experimental model presented by Boore et al. (1997). Increase or decrease of the response spectra from mean level (Boor line) determines maturity or immaturity of the fault.

Table 1. Maturity of the faults that studied in this research

No.	Fault Name	Earthquake Name	Date (dd/mm/yyyy)	Mw	Depth (Km)	Style of Faulting	Maturity	Reference
1	Unknown	SE Gir	02/02/1985	5.6	11	T	Mature	1
2	Kazerun		12/07/1986	5.5	7	R	Mature	2,3
3	Kazerun		11/08/1988	5.5	7	R	Mature	2
4	Kazerun		11/08/1988	5.8	9	R	Mature	2
5	Kazerun		06/12/1988	5.6	10	R	Mature	2
7	Sabz-Poushan	Mook	01/03/1994	5.9	13	S	Mature	1
8	Sabz-Poushan		20/06/1994	5.8	9	S	Mature	1
10	Karebas	Kouhmareh-Sorkhi	06/05/1999	6.1	7	S	Mature	1
11	Karebas	Kouhmareh-Sorkhi	06/05/1999	5.7			Mature	4
12	Unknown	Qeshm	27/11/2005	6	4-8	T	Mature	5
13	MRF	Chalan-Choulan	31/03/2006	6.1	6	S	Mature	6
14	Unknown	Fin	25/03/2006	5.7	8±3	T	Mature	7
15	Karebas		27/09/2010	5.6	16		Mature	8
16	Unknown	Shonbeh	09/04/2013	6.3	10	T	Mature	4
17	Unknown	Murmuri	18/08/2014	6.2	10	T	Mature	4,9

(1) Talebian and Jackson, 2004; (2) Baker et al., 1993; (3) Berberian, 1995; (4) USGS (5) Nissen et al., 2007; (6) Peyret et al., 2008; (7) Roustaei et al., 2010; (8) Nissen et al., 2011; (9) IRIS.

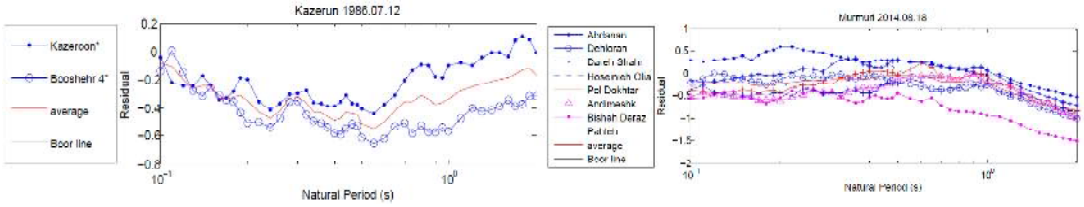

Figure 1. Ratio of response spectra for near field horizontal motions of the 1986 Kazerun and the 2014 Murmuri earthquakes that compared with ones resulted from the experimental model presented by Boore et al. (1997). The name of recording stations is showed in the legend

Our study shows that nearlly N-S trending faults, subparallel to shortening direction, are the most mature faults (e.g. the Kazerun fault) that have a long term activity and several events are recorded on them. These faults are the old faults that govern the structure. Whereas with change in direction of faults toward NW-SE, the degree of maturity is decreased (e.g. causative faults of 2014 Murmuri, 2013 Shonbeh and 2006 Chalan-Choulan earthquakes). In central Zagros, from Kazerun fault toward Sabz-Pushan fault with change in direction, the structural maturity is decreased. Hatzfeld et al., (2010) in their study on fault slip rates in western Zagros point the migration of seismic activity on the faults and suggest that it seems the motion is transfered from main recent fault to Dena and Kazerun faults, jumps to the Krebas fault and distribute slightly on the high Zagros and Sabz-Pushan faults. It seems that the motion moves from the more mature Kazerun fault toward the Karebas and Sabz-Pushan younger faults with less degree of maturity. Reverse faults (e.g. causative faults of 2006 Fin earthquake), have a least degree of maturity and they are the young faults that are govern with structure and don't have many activity background and have a more immature structure in depth.

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