Assessment and conformance of geomorphologic and seismologic evidence of active tectonic in Central Zagros area

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Extended Abstract

1- Introduction

Active faults are located in those parts of earth crust with tectonic movements in the post-Quaternary period and especially in Holocene epoch and are expected to have hazardous occurrences in future. The previous studies performed using geomorphologic indices on the other global parts, revealed the efficacy of them in identification of active faults. There are a variety of discussions regarding selecting and using active tectonic geomorphologic indices, their relationships and analysis procedures of the obtained results. In the present work, Central Zagros area was selected and assessed that included head branches of Dez River, Zayandehroud River, and Karoon River and is located in both sides of Main Zagros Fault, Sanandaj-Sirjan zone and high Zagros zone.

2- Methodology

For assessing the mentioned-above indices, a digital elevation model (DEM) related to SRTM topographic data at the accuracy of 90 m was provided for the whole studied area. Then, the measurements of drainage map drawing, sub-basin divisions, and indices were obtained by using ARCMAP, ARC VIEW, and GLOBALMAPER Softwares and the obtained results were displayed. To determine the relative tectonic activity index (Iat), an integrated index should be selected as a representative for each of the mentioned features. Therefore, a correlation was assessed among different indices and an index with the highest correlation with other indices involved in assessing a special feature was selected to be applied integrating with other indices for measuring Iat.
Thus, the considered index (Iat) was calculated and zone-flattening was done accordingly. Then, the obtained map was compared to the historical seismic maps and instrumental recorded seismograms in related to the zone. Finally, the obtained results were analyzed.

3-Discussion

In this study, seven geomorphologic features were assessed as their indices including index of earth uplift and relief, index of Drainage Basin Shape, Basin Transverse Symmetric Index, index of River Gradient, index of River Sinuosity, index of mountain front sinuosity, index of valley shape. The analyses showed that indices for basin transverse symmetric feature were not efficient in the studied zone because of the intensity of morpho tectonic and low degree of freedom in rivers. Also, among the other indices, there are better correlations among Index of Hypsometric Integral (Hi), Index of Basin elongation ratio (Re), Index of River Gradient (SL), Index of River Sinuosity (S), Index of Mountain Front Sinuosity (Smf), and Index of valley floor width to valley height (Vf). Through integrating these indices, relative tectonic activity index (Iat) was calculated. This index shows an increase of tectonic activity from Sanandaj-Sirjan Zone toward High Zagros Zone. And this finding is concurrent with the obtained results from the historical seismic maps and instrumental recorded seismograms showing that Main Zagros Recent Fault (MZRT), Main Zagros Fault (MZRF), and High Zagros Fault (HZF) had more tectonic activity in compared to Rokh and Daran Faults.

In the southern west side of whole Zagros Fault and high Zagros fault zone, there is a remarkable increase in the number and intensity of the occurred seism from northern west side to southern east side. In the furthermost of southern east zone, the seism occurred as 5.4 and 5 Richter on 6 April 1977 and 20 Oct 2005 in Naghan and Sarkhun, respectively. Both events caused huge life and financial losses. But, on the other hand, there is as reverse trend for zone-flattening based on Iat, and Iat decreases remarkably from northern west (Dez Basin) towards southern east (Karoon Basin). Two interpretations can be provided for this finding. First, fault movements in southern west occur as still creep; therefore, there is no chance for great earthquake. Second, in future there will be a probability for occurrence of great earthquake in this zone. This can be hazardous for Rudbar Dam.

4-Conclusion

Through the performed studies, indices for Hi, Re, SL, S, Smf, and Vf showed better correlations in compared to other indices. Through integrating these found indices, relative tectonic activity index (Iat) was defined and tectonic zone-flattening was performed accordingly. The obtained results showed an increase of tectonic activity from Sanandaj-Sirjan Zone toward high Zagros zone that this finding is in concurrent with the obtained seismic results. But in high Zagros zone, there is a remarkable increase in number and intensity of the occurred earthquakes from northern west toward southern east that this finding is not in concurrent with the obtained results from Iat and shows a reverse trend. It is a sign for movements of faults as still creep in northern west zone or it is...
a warning for a probable great earthquake in this zone.

Key words: tectonic activity, geomorphologic indices, Central Zagros area, Dez Basin, Rudbar Dam.

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