Seismic Hazard in Babolrud and Talar Basins based on Morphometric Indices

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1. Introduction

Tectonic geomorphology is a knowledge that can determine the effect of active tectonic using the geomorphic indices as a quantitative description of the rivers form. Accordingly, quantitative measurements provide conditions that allow them to identify the status of active tectonics areas. Active tectonic processes can affect the shape and performance of rivers. The extraction of geomorphic indices using digital elevation map (DEM) in the GIS in the past two decades has been a fast and accurate method for drainage basin analysis so that these indices are used for quick evaluation of recent tectonic activities in a particular region. Base on a natural theory, rivers are the first environmental forms that show a relatively rapid response to changes in the bedding or changes in the outflow of the bed. Regarding the proved reactions of rivers to the occurrence of normal changes, it is possible to analyze them by using geomorphic indices as the result of the effects of tectonic on the river's route. Geomorphic indices are especially used for active tectonic studies. With the study of topographic landforms and the model of drainage systems using geomorphic indices and the geological structure of each area, it is possible to evaluate the active tectonic performance and to determine the absence of active tectonic movements. The quantitative measurements provide conditions that allow them to identify the status of active tectonics areas. Along with the advancement of tectonic science of geomorphology, scientists have found that active tectonic processes can affect the shape and function of rivers being one of the most important observations that occur rapidly. Consistently in respond to deformation caused by active tectonics at the surface reflecting minor changes in topography, thus examining drainage pattern and river diversion provides important information on structural expansion and evolution of the area. The study area is classified into four categories of very high, high, medium and low tectonic activities. Alborz mountain range is the result of two orogenic movements. One of them is Precambrian ores (Acinitic), the course of which is essentially a metamorphism that leads to the interconnection and hardening of the paving stones in the Precambrian, The second one is the Alpine orogeny movements that happens in Mesozoic and Cenozoic periods. This mountain range is approximately 600 kilometers long and 100 kilometers wide along the south side of the Caspian Sea.

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The northern margin of the Alborz line is usually sloping. General trend of study area is NE-SW.

2. Materials and Methods

In this research, with using the Arc GIS software and 1:100000 Geological maps, at first, rivers and basins shapes of the area were extracted using STRAHLER method using 30 m accuracy digital elevation model in Arc GIS software. Then the necessary modifications to the wells and extraction basins were carried out using topographic maps and satellite images and finally a part of central Alborz at Talar and BabolRud area was divided into 19 catchments. 5 morphotectonic indices such as hierarchical anomalies (Δa), Bifurcation (R), Form factor (Ff), drainage density (Dd) and Relative relief (Bh) were calculated in drainage basins. Using the Relative Active Tectonic (IAT) index, the study area was classified into 4 categories. Category 1 indicates a very high tectonic activity. Category 2 is the high tectonic activity. Category 3 shows the average geological activity and category 4 activities are low relative construction. A tectonic activity zoning map was prepared for each indicator in the study area and the results of the indices were analyzed

3. Results and Discussion

Based on studies of hierarchical anomaly indices in sub-basins associated with North Alborz and Khatirkuh faults, this index increases and shows very high and high rates. Intersection between these faults and the sub-basins waterway has caused anomalies in the connection of low-grade waterways to several degrees higher. In sub-basins 11, 12, 13 and 14 which are dominated by the above-mentioned faults, the bifurcation index and the elevation changes are due to the activity of these faults are high.

4. Conclusion

Studies in this section of the Alborz mountain range using morphometric indices such as hierarchical anomalies (Δa), Bifurcation (R), Form factor (Ff), drainage density (Dd) and Relative relief (Bh) and using the IAT Index in this area, shows that recent tectonic activity is generally due to the faults activity in the region such as North Alborz and Khatirkuh faults are in a high and very high categories. Based on these studies, it was found that some other minor faults formed due to high tectonic activity and caused by major faults such as North Alborz, Khatirkuh and other major faults in the area affect the indices numbers. Tectonic impacts show that about 33.3% of the sub-basins associated with the major and minor faults of the study area have very high and high tectonic activity.

Keywords: Alborz, Catchment, Fault, Morphotectonic, River, Earthquake

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