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Assessment of geomorphic response and landform evolution due to active tectonics in the Zagros Fold and Thrust Belt, Iran

Ali Faghih
Department of Earth Sciences, College of Sciences, Shiraz University, Shiraz, Iran (afaghih@shirazu.ac.ir)

The study of landforms developed or modified by tectonic processes can provide relevant information about the activity of the related tectonic structures. Most active processes on the surface imply that tectonics and geomorphology converge in a way that landscape change may be used as a tectonic signal, given that erosion and weathering have been taken into account. In this research, tectonic activity is evaluated through the application of a general morphometric analysis over fault-generated mountain fronts around the Maharlou lake basin in the Zagros Fold and Thrust Belt of Iran. The lake is located in a tectonically active area and this characteristic of the region is reflected in the surrounding morphology of the lake. The Maharlou Lake is a NW-SE-trending structure which was formed in an active ramp valley tectonic setting. This work is largely based on the Smf/Vf regression analysis of the studied fronts. Mountain front sinuosity index (Smf) reflects the balance between uplift that tends to maintain a relatively straight front and erosion that tends to produce irregular or sinuous fronts. This index is a reconnaissance tool to identify area of tectonic activity. Valley floor width/valley height index (Vf) reflects the difference between V-shaped valleys actively downcutting in response to active uplift (low Vf values: < 1.0) and broad-floored valleys (U-shaped) with major lateral erosion in response to relative base-level stability or tectonic quiescence (high Vf values: >1.0). This index helps in identifying the area of tectonic quiescence and area that have been recently uplifted. This study indicates that variations of mountain front geomorphology can be detected by morphometric analysis. Study of geomorphic indices show a relatively high degree of tectonic activity along the Ghareh mountain front in the southwest, in contrast with a low degree of tectonic activity along the Ahmadi mountain front northeast of the lake which is consistent with field evidence and seismic data for the study area.