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Geomorphological analysis of the drainage system on the active convergent system in Azerbaijan, NW Iran

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Rivers are important landforms to reconstruct recent tectonic history because they are sensitive to surface movements, especially uplift and tilting. The most important drainage basins of NW Iran are, from north to south, the Arax River, the Urmia Lake and the Ghezel Ozan River catchment. The morphology of the two adjacent catchments draining into the Caspian Sea, the Arax and Ghezel Ozan were studied to better understand the active tectonics and the effect of fault activity on morphology and erosion rate of NW Iran. We performed a quantitative analysis of channel steepness and concavity, from slope-area plots calculated from digital elevation model. This information has been combined with GPS velocity vectors and seismicity.

Both catchments developed under uniform climate conditions.

Results show that the two rivers are in morphological disequilibrium; they exhibit profiles with prominent convexities and knickpoints. The Arax River shows higher channel steepness and concavity index in downstream part of the profile. Distribution of knickpoints show scattered elevation between 700m and 3000m. GPS rates display shortening 10 ± 2 mma^{-1} and 14 ± 2 mma^{-1} in upstream and downstream, respectively. The river profiles of Ghezel Ozan River and its tributaries reveal more disequilibrium downstream where channel steepness and concavity index are higher than upstream. Most knickpoints occur between 1000m and 2000m. The amount of shortening by GPS measurement changes from upstream 13 ± 2 mma^{-1}to downstream 14 ± 2 mma^{-1}. Recorded earthquakes, such as Rudbar earthquake (Mw=7.3, 1990), are more frequent downstream.

The Urmia Lake is surrounded by many small and large catchments. Only major catchments were considered for the analysis. One of the most active faults, the north Tabriz fault, corresponds to a major knickpoints on the Talkhe rud River.

Concordance between river profile analysis, GPS and seismotectonic records suggests that the characteristics of the river profiles are related to active fault systems.