EVALUATION OF ACTIVE TECTONIC OF SOHREIN FAULT USING MORPHOMETERY AND MAGNETOMETERY

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The Zandjan region (NW Iran), is situated at the junction between the southern termination of right-lateral North Tabriz Fault and the western end of the Alborz mountain range. Ongoing deformation in this region is due to the north-south convergence between Arabia and Eurasia. This convergence lead to a complex system of reverse and strike- slip faults in northwest Iran including the zanjan region. In NW Iran, signatures of late Quaternary to active deformation was reported by several authors (e.g., Solaymani et al., 2011) while, there is no evidence of instrumental and/or historical seismicity porportional to this conspicuous tectonic activity. In the absence of earthquake data, activity of geological structures becomes key to evaluate seismic hazard of the region. Low rates of deformation, however, imply that neotectonic features associated with faults have subtle geomorphic expression. In such a context, the interplay between erosion and tectonics cannot be easily determined and the interpretation of geomorphic features becomes a difficult job. This study combines to different geophysical and geomorphic tools to evaluate activity of the 75-km-long Sohrein fault (NW of Zanjan), which is inferred being one of the main seismgenic source for Zanjan city and adjucent areas. Along almost 85 percent of the lenght, the Sohrein fault was traced based on subtle geomorphic features, with unclear erosional or tectonic nature (Solaymani, et al., 2011).

We used magnetic survey to detect the trace of the fault through unconsolidated Quaternary deposits overlying the Eocene magnetic bedrock. The interplay of tectonic activity and erosion was investigated using two independent geomorphic parameters (stream gradient index - SL and valley width to height ratio - Vf). The stream-gradient index is particularly sensitive to changes in slope and thus is a valuable tool in evaluating active tectonics with a strong vertical component of deformation. However, the index is also sensitive to rock resistance. İn a simple way, values of the index are high in areas where the rocks are particularly resistant or where active tectonics has resulted in vertical deformation at the Earth’s surface. The valley width to height ratio index was originally used to distinguish V-shaped valleys from U-shaped valleys. V-shaped valleys are common in areas of active uplift and deep, linear stream incision (low Vf values, often close to 0). U-shaped valleys are representative of formerly glaciated or tectonically stable areas where stream valley bottoms tend to be wider (higher Vf values).

Magnetic method is used to investigate the subsurface layering and structure. Modern high-resolution magnetic surveys are able to detect magnetic signatures in the subsurface and trace the extension of the faults. The interpretation of the magnetic surveys of the two sites on the fault shows no conspicuous evidence of active faulting. The morphometery results also do not show systematic changes related to tectonic activity (shown in Figures 1 and 2). These two lines of evidence may suggest that the surface trace of the Sohrein Fault to be subtle expression of erosion in fluvial terraces around the Zanjan Rud River. However, other geophysical methods such as seismic reflection may improve this preliminary result.

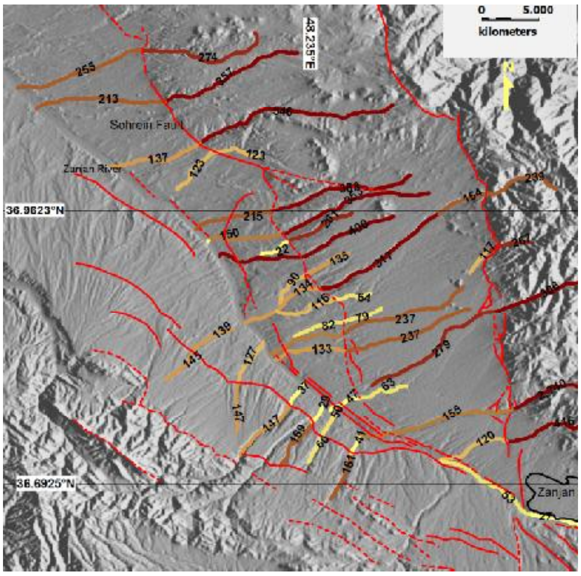

Figure 1. Topographic sun-shaded map derived from the 90 m resolution SRTM DEM (NASA). Red continuous line are active faults and red dotted line are inferred faults based on Solaymani, et al., 2011. Calculated SL values written on the streams. Purple stream show the maximum SL value and yellow stream show the minimum one

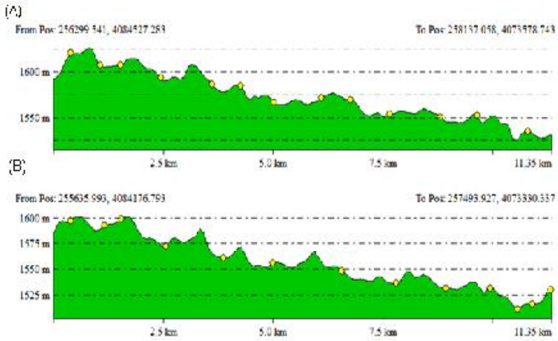

Figure 2. Topographic profile along a part of Sohrein fault. Profile (A) is on hangingwall and profile (B) is on footwall. There isn't any significant difference in valley width and height between tow profiles

REFERENCES

Solaymani Azad S et al. (2011) The Zandjan fault system: Morphological and tectonic evidences of a new active fault network in the NW of Iran, *Tectonophysics*, 506: 73-85