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Contribution of the geodetic observations (GPS and levelling) to study the tectonic deformation and seismic hazard on the Central Alborz, Iran

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Iran is situated within a north-south collision zone of 20-25 mm/yr between the Arabia and Eurasia plates and belongs to the Alpine-Himalayan seismic belt. In northern Iran, the Alborz is a major geological structure accommodating a part of the total shortening. The Tehran metropolis is located on the southern side of the Central Alborz. Numerous historical and recent earthquakes in this area motivate the geodetic and tectonic studies presented there.

In this work, a geodetic approach is developed to better understand the tectonic deformation and seismic hazard. Several GPS campaigns were carried out on a dense network between 2000 and 2003 and provided the horizontal velocity field in the study area. The vertical tectonic movement was estimated by the comparison of the height differences measured during 3 campaigns of levelling between 1981 and 2003.

The GPS rates analysis allowed to quantify shortening and left-lateral slip accommodating the oblique convergence in Alborz. The shortening is mainly located on the northern side while left-lateral movement is concentrated on the major faults of Mosha and Taleqan on the southern part of the Alborz. The comparison of the height differences from levelling indicate an uplift for the Central Alborz larger than the shortening observed by GPS.