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Slip sense inversion on the active Mosha strike-slip fault system, central Alborz, Iran

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The Alborz mountain range accommodates the overall oblique left-lateral shortening between the southern Caspian basin and central Iranian blocks within the broad Arabia–Eurasia collision zone. The WSW-ENE to NW-SE striking Mosha fault system, extending $\sim$150 km, is one of the largest strike-slip faults in the southeast of central Alborz. As a major active left-lateral strike-slip fault at the vicinity of Tehran, the Mosha fault system shows an important potential seismic source that threatens the Iranian metropolis. However, the slip sense inversion on the Mosha fault system is still largely debated. Study of earthquake focal mechanisms, displaced geomorphological features and associated fault rock structures allows us to constrain the present fault kinematics.

The geometry of the conical drag folds along with other fault-related structures indicate a reverse faulting with right-lateral strike-slip component. The S–C fabrics of fault gouge and breccia zone along with the fault striations developed in the active fault zone show a transient from reverse faulting with a right-lateral to a left-lateral strike-slip motion. The youngest fault striations present a normal with left-lateral shear sense compatible with the earthquake focal mechanisms. Similarly, the small-size Holocene drainages cutting shallowly mountain slopes and Holocene-Pleistocene terraces have been deflected left-laterally, whereas large-size streams which deeply incised into the Miocene-Pliocene deposits show no systematically left-lateral offset. Seismologically, most of the reliable fault-plane solutions present an oblique faulting either with a component of left-lateral strike-slip or normal motions on the Mosha fault system. The fault plane solutions reveal a regional NNW-SSE transtensional regime in the region. This strike-slip inversion might result from the concentration of convergence

and shortening in the less elevated regions, such as Alborz foohills due to bouancy forces arising from the thickened Iranian plateau. This multidisciplinary study has implications in terms of understanding the recent geodynamical evolution of the central Alborz region and also mountain-ranges strike-slip fault evolution.