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Crustal and Lithospheric Structure in the Zagros Fold and Thrust Belt: A Geological and Geophysical Approach

The Zagros fold and thrust belt formed during the collision between the Africa/Arabia and Eurasian plates from Miocene times. The region is characterized by intermediate seismicity, a probable detached subducting slab, a deep foreland basin, and an irregularly folded sedimentary cover. Despite extensive acquisition of geophysical data major unknowns are related to i) the nature of the crustal deformation during collision and the resulting crustal structure; ii) the existence of a mantle root and the possible strain partitioning between crust and mantle lithosphere; and iii) the basement deflection caused by the building of the Zagros mountains and the associated deep geometry of the foreland basin. These items are addressed in two ways. An integrated approach, combining the use of gravity, geoid and absolute elevation allows us to infer the 3D regional crustal and lithospheric structure. A range of input parameters, e.g. the isostatic compensation depths and the elastic properties of the lithosphere, are tested to separate the regional and local field components which, in turn, allows for a more detailed 2D lithospheric modelling along selected geotransects. These geotransects contain existing and partly new data including seismic profiles, surface elevation, gravity, geoid, and magnetics. The crustal and lithospheric structure is modelled by using a numerical code that simultaneously solves the geopotential, lithostatic, and heat transport equations. Temperature distribution in the lithosphere is used to constrain the lithospheric strength and add information on the location of the transition from brittle to ductile deformation.