



Driving Mechanism of Asthenospheric Flow and Isostasy in Eastern Anatolia: Insight from Gravity Data Modeling

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Eastern Anatolia, Turkey, is part of Alpine-Himalayan collisional belt where continental crust is relatively thin for a collisional zone. The region contains part of the Zagros suture zone formed during the collision of Arabian and Anatolian plates in Miocene. It is underlain by a low-velocity zone associated with asthenospheric flow in the uppermost mantle. The mechanism of the upward asthenospheric flow and subsequent asthenospheric underplating beneath Eastern Anatolia is not well understood.

We have constructed gravity models of the crust and upper mantle structures to assess the driving mechanism of asthenospheric flow and isostatic state in Eastern Anatolia, Turkey. The density models are based on terrestrial and satellite-derived gravity data. The gravity models show significant lithospheric thickness variations across the Anatolian and Arabian plates. The lithospheric mantle in Eastern Anatolia is thinner (~62 – 74 km) than the Arabian Plate (~84 - 95 km), indicating that part of the Anatolian mantle lithosphere might have been removed by delamination. The lithospheric removal process (delamination) might have occurred following the detachment of the Arabian slab in Miocene. The widespread Holocene volcanism and high heat flow in Eastern Anatolia can be considered as evidences of lithospheric delamination and slab-break off. Thus, the upward asthenospheric flow and subsequent asthenospheric underplating beneath Eastern Anatolia might have been induced by both delamination and slab-break off. The two processes may account for the rapid uplift of the Anatolian plateau. There is a residual topography of approximately 1.7 km in Eastern Anatolia that cannot be explained by crustal roots. Thus, part of the Eastern Anatolian Plateau may be dynamically supported by asthenospheric flow in the upper mantle.