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Geodynamic Mechanisms of plateau uplift and strain distribution in Eastern Anatolia

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The Eastern Anatolia region (with an average $\sim$2 km elevation) is dominated by N-S shortening and it represents one of the best examples for active/young continental collision between the Arabian and Eurasian plates. Studies suggest that the entire plateau began to rise since the plate collision (about 13 Ma) along the Bitlis-Zagros suture zone and this collision follows the accretion of the units of the Neotethyan ocean where oceanic lithosphere fragments (e.g., ophiolites) underlies the younger units across most of the plateau at present. Seismic imaging of the deep lithosphere in the region suggests that most of the plateau is underlain by 65 km thick total lithosphere and 45 km thick crust. Corroborating the seismological work, petrological interpretations of younger volcanic rocks from the central part of the plateau (e.g., Erzurum-Kars plateau) suggest an asthenospheric source, therefore the mantle lithosphere most likely have been removed form beneath the plateau in the last 10-13 Myr. Proposed geodynamic models that accounts for the observed tectonic anomalies and inferred lithospheric removal in the east Anatolia include: (1) slab steepening/ and break off under the subduction-accretion complex in the south; and (2) mantle lithosphere delamination in the north. A series of numerical geodynamic experiments are carried out to explain the near-surface characteristics (crustal thickness, surface strain rate and heat flow) of the each hypothesis, including combined styles of break-off and delamination. We investigate the role of various controlling parameters in these experiments (e.g., plate convergence velocity, mantle lithosphere density, and crustal density) and relate the model predictions against observed geological, geophysical, and petrological anomalies for Eastern Anatolia. Model results are also considered in the context of the last 30 Myrs geodynamic evolution of the Tibetan plateau (with an elevation average of 5 km), where both Eastern Anatolia and Tibet share several common geologic histories. Our preliminary results suggest the large-scale mantle lithosphere removal under the plateaus can drive significant thermal and topographic perturpations which may be due to the delamination type rather than the localized break-off tectonics.