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Evolution of lithospheric thickness during Eurasia-Arabia collision and uplift of the Anatolian Plateau

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A co-investigation of mantle melting conditions and seismic structure reveals an evolutionary record of mantle dynamics accompanying the transition from subduction to collision along the Africa-Eurasia margin and the ∼1.5 km uplift of the Anatolian Plateau. New $^{40}Ar/^{39}Ar$ dates of volcanic rocks along a broadly NW-SE trending transect considerably expand the known spatial extent of Miocene-aged mafic volcanism following an ∼20 Myr magmatic lull in Central and Eastern Anatolia. The chemical diversity of these basalts is consistent with a northwestward increase in melt equilibration depths. Specifically, if melts last equilibrated with an olivine and orthopyroxene-bearing (peridotite-dominated) source, mantle equilibration depths could indicate that early to middle Miocene lithospheric thickness varied from ∼50 km or less in the southeast to ∼80 km in the northwest. This tapering lithospheric base could be a vestige of the former interface between the subducted (and now detached) portion of the Arabia plate and the overriding Eurasia plate, and/or a reflection of mantle weakening associated with greater mantle hydration trenchward prior to collision. Asthenospheric upwelling driven by slab retreat and tearing along this former interface, possibly accompanied by convective removal of the lithosphere, could have led to renewed volcanic activity after 20 Ma. Seismic imaging and melt equilibration depths for late Miocene and Pliocene basalts are suggestive of attainment of a relatively invariant lithospheric thickness of 60-70 km by ∼11 Ma. Thus, no evidence was found for large-scale delamination of the lower lithosphere from the overriding plate, elsewhere proposed to account for late Miocene and younger uplift of Anatolia.