Magmatism Associated with Slab Foundering and Asthenosphere Upwelling Beneath Central Anatolia

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Magmatism in Central Anatola, Turkey, expanded in a southwesterly direction after Arabia-Eurasia collision, likely as a result of slab rollback [1]. $^{40}Ar/^{39}Ar$ dates of volcanism within the Eastern Tauride-Kırşehir (ETK) blocks, at the northeastern end of the ~400 km SW-NE oriented volcanic belt, range in age from 14 to 20 Ma. This volcanism represents renewed magmatic activity after an ~20 Myr magmatic lull in Central and Eastern Anatolia. Mantle equilibration depths of mafic ETK lavas could reflect a tapered lithospheric base from ~50 km deep in the southeast to ~80 km deep in the northwest [2]. Correspondingly, lavas in the southeastern ETK are transitional to subalkaline, and exhibit greater subduction-influenced trace element signatures. Lavas in the northwestern ETK are alkaline to basanitic and, except for the basanites, exhibit more OIB-like trace element signatures.

High precision analyses of Fo_{80} to Fo_{85} olivine from ETK lavas provide new insights into melting conditions. Ni-thermometry generally gives T>1250°C, whereas temperatures obtained from Mg-thermometry average 39±41°C lower. This difference is permissive of olivine crystallization at high P (≥1 GPa) from relatively dry (<1 wt% water) melts [3]. In contrast, water contents estimated by Ca-in-olivine hygrometry [4] are higher, averaging ~2±1 wt.% water. Extrapolating T_{Ni} to values expected for primary melts in equilibrium with $Fo_{\geq 88.5}$ gives minimum estimates for $T_{melting}$ of mostly >1330°C. Combined P-T estimates for melt equilibration lie above the dry solidus.

We infer that ETK volcanism represents the initial stages of slab tearing in the once continuous subducting Neotethyan lithosphere. Asthenosphere ascending by return flow melted as the slab retreated and became torn, with melt compositions determined by the extent of mantle upwelling beneath the relatively thin lithospheric lid.

[1] Schleiffarth et al., 2018. *Geosphere*. [2] Reid et al., 2019. *EGU*; [3] Pu et al., 2017. *Am. Min.*; [4] Gavrilenko et al., 2016. *J. Pet.*