Magmatic Evolution of the Greater Ararat Strato-Volcano, Eastern Anatolian Collision Zone, Turkey

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Greater Ararat is the largest (~40 km diameter with a footprint area of ~1250 km^2) and tallest (5165 m) stratovolcano in Anatolia, still preserving its typical conical shape. It is made up of the Quaternary lavas intercalated with pumice fall and flow units. Lavas of the Greater Ararat volcano are calcalkaline in character, varying in a wide compositional range from trachybasalt to rhyolite. Porphyiritic andesite is the most abundant lithology. Lavas of the Ararat volcano plot into the sub-alkaline fields on the classification diagrams. MORB-normalized multi element patterns of these lavas display a clear subduction signature. Result of our melting models suggest derivation of the primitive lavas from a metasomatized, spinel-rich sub-lithospheric mantle source.

Chondrite-normalized REE patterns show downward concave patterns with enrichment in LREEs and a notable depletion in MREEs relative to LREEs and HREEs, implying crystallization of amphibole and plagioclase from evolved magmas. Results of our petrographical studies and fractionation models show a polybaric crystallization in two interconnected magma chambers, located at two different crustal depths beneath the Greater Ararat volcano. These results also demonstrate that these chambers must have been periodically replenished by primitive basaltic magmas. We argue that the Ararat lavas owe their intermediate composition and sub-parallel fractionation trends on the Harker diagrams to the aforementioned magma mixing, replenishment and homogenization processes. Our AFC models imply that the degree of crustal assimilation was variable in these lavas (i.e. *r* values reaching up to 0.7) but mostly display moderate to low values. The fact that the data points are clustered in a very narrow *F* range (*F*: the melt remaining) on the modelled AFC curves can be explained by the replenishment of the evolving magma body with basic primitive magmas throughout the fractionation history. It appears that the dominance of the magma replenishment was the main reason for lower degrees of crustal assimilation and homogeneous intermediate character of the lavas.