Genesis and differentiation of a calc-alkaline volcano in syn-collisional continental setting: the Mount Ararat (Ağrı Dağı, Eastern Anatolia)

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Mount Ararat (Ağrı Dağı) is the largest volcanic center of the Eastern Anatolia block resulting from the syn-collisional magmatism related to the Arabia–Eurasia collision zone. Ararat is a polygenetic, compound, stratovolcano, with two well-developed cones: Greater Ararat and Lesser Ararat.

In this study we present a complete geochemical and isotopic (Sr,-Nd, and Pb) characterisation on a set of samples collected from Greater Ararat, revealing clues on magma genesis and differentiation.

During field work was possibile to recognise a complex volcanic structure, made up by a basal basaltic plateau and at least two volcanic edifices (Old and Young Ararat) superimposed on top of each other. The lavas range from trachybasalts to basaltic andesites in the basaltic plateau and from high-Mg# andesite to rhyolite in Old and Young Ararat. The rocks have calc-alkaline affinity and subduction-related trace element patterns, with less marked HFSE negative anomalies in the plateau basalts. The data suggest a mantle modified by fluids or melts derived from the recycling of subducted basaltic oceanic crust in amphibolite facies, as suggested by the low Nb/Ta of the least evolved products.

The high-Mg# of the andesites can be interpreted as representative of the direct derivation of these magmas form a modified mantle source, or in alternative as due to significant fractionation of Fe-Ti oxides during the early stage of differentiation from parental basaltic magams.

Major and trace element data define two distinct differentiation trends, characterised by different contents in alkalis and key trace elements such as Y, Nb, Zr and REE, which are likely related to the fractionation of specific phases (e.g., amphibole). These two trends seem to be not strictly related to the different phases of the volcano activity.

Basalts from the underlying plateau show less radiogenic Sr and more radiogenic Nd isotope compositions than the high-Mg# andesite and the more evolved products. The latter show variable isotope composition and no systematic variation between the Old and Young Ararat or with indices of magma differentiation.