Geophysical Research Abstracts
Vol. 21, EGU2019-8741, 2019
EGU General Assembly 2019

From subduction- to strike slip-related volcanism: Miocene to Pliocene activity in Sivas-Malatya region, Central-Eastern Anatolia

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Central-Eastern Anatolia volcanic activity recorded long-term geochemical history linked to the geodynamic evolution of the region. There, abundant orogenic magmatism resulted from the convergence of the Arabian plate towards the Eurasian one, which finally collided and sutured along the Bitlis Zagros Suture Zone (late Eocene-early Miocene). After this, in several locations of the Central-Eastern Anatolia, scattered intraplate-type basaltic volcanism developed along transtensional strike-slip faults, linked with the North Anatolian, the East Anatolian and Central Anatolian Fault Zones.

In the study area, located in between the Kizilirmak and Malatya-Ovacik strike-slip faults, both calc-alkaline and alkaline rocks occur. Calc-alkaline volcanic activity developed during the early to late Miocene, with the Yamadag and Kepez Dag Volcanic Complexes (19-12 Ma), which were characterised by basaltic to rhyolitic products, with the typical geochemical and isotopic characteristics of subduction-related magmas: Large Ion Lithophile Elements enrichments, High Field Strength Elements depletions, with strong Nb-Ta negative anomalies, high $^{87}Sr/^{86}Sr_i$ (0.70400-0.70547) and low $^{143}Nd/^{144}Nd_i$ (0.51261-0.51288).

Coeval early-middle Miocene (16-13 Ma) basaltic lavas were emplaced, to form plateau-like structures along the Kizilirmak strike-slip fault. These rocks are Na-alkaline basanites and alkali-basalts, showing in spite of their alkaline character high LILE/HFSE ratios, high $^{87}Sr/^{86}Sr_i$ (0.70416-0.70554) and low $^{143}Nd/^{144}Nd_i$ (0.51262-0.51284) isotopic composition, indicating the persistence of a relict subduction-related geochemical signature.

Middle Miocene ($\sim$10 Ma) alkaline basaltic volcanic rocks from Arguvan were erupted as less small linear lava flows aligned along the Malatya-Ovacik strike slip fault. They range from alkaline basalts to mugearites, and show different geochemical and isotope characteristics with respect to the older volcanic rocks. Primordial Mantle-normalised trace element diagrams show bell-shaped patterns typical of intra-plate volcanic rocks. The low $^{87}Sr/^{86}Sr_i$ (0.70348-0.70385) and high $^{143}Nd/^{144}Nd_i$ (0.51278-0.51292) isotopic ratios suggest a contribution from a sub-lithospheric mantle. However, trace element compositions and enrichment in fluid-mobile elements display that also the Arguvan mantle source was affected by a previous subduction event.

During the Pliocene (6-4 Ma), scattered basaltic lava flows erupted within the Kangal basin. These rocks are K-alkaline, ranging from alkaline basalts to shoshonite, showing high LILE/HFSE ratios, and Nb, Ta, and Ti troughs in Primordial Mantle-normalised trace element plots. Higher $^{87}Sr/^{86}Sr_i$(0.70425-0.70522) and lower $^{143}Nd/^{144}Nd_i$ (0.51263-0.51277) ratios with respect to Arguvan basalts suggest the involvement of a crustal component in their genesis. In this case crustal contamination en-route to the surface rather than recycling in the mantle source is inferred on the basis of petrographic characteristics and numerical modelling.

In summary, a transition from calc-alkaline to Na-alkaline volcanic rocks is observed with time related to the geodynamic evolution of the region. Early-middle Miocene orogenic magmas are typical arc volcanics, whereas alkaline magmas from Sivas, Arguvan and Kangal, mark the change from compressional to strike slip tectonic regime at the beginning of the late Miocene, with the development the Kizilirmak fault and the Malatya-Ovacik fault zone that favoured local upwelling of sub-lithospheric mantle. The apparent subduction-related signature in the youngest activity of the Kangal is ascribed to crustal contamination rather than a renewal of subduction components.