Ar-Ar dating and composition of the basanitic-basaltic volcanism in southern Turkey

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Basanitic-basaltic lavas in southern Turkey erupted from extensional fractures and volcanic cones along strike-slip fault systems in the İskenderun Basin and Hassa Graben. New Ar-Ar dating results of the lavas in the İskenderun Basin indicate that volcanic activity occurred between ~2.1 Ma and 120 ka. The volcanic products are alkali basalts and basanites, which are alkaline. Geochemical and isotopic data imply that assimilation with combined fractional crystallisation (AFC) might have been an important process to basaltic lavas, in contrast to basanitic samples were subjected to fractional crystallisation but were not affected by the crustal contamination processes. EC-RAFC model calculations using Sr and Nd isotopic ratios and trace element abundances suggest that the alkali basaltic samples which contain up to 2-5% crustal assimilation.

Incompatible trace elements contents of the basanites and alkali basalts and petrogenetic models indicate the existence of mantle metasomatism and presence of the phlogopite and/or amphibole as residual minerals in the mantle source region of the mafic alkaline volcanism in southern Turkey. The metasomatic minerals may have formed by mantle metasomatism in the base of the lithospheric mantle caused by fluid or melts derived from the ascending asthenospheric mantle due to the collision generated along the African-Anatolian plates boundary beneath southern Turkey. Based on the PM-normalized incompatible trace element compositions, petrogenesis of the alkali basalts can explain by mixing of melt fractions from phlogopite-bearing garnet peridotite source with melt fractions from spinel peridotite, in contrast to basanites could have been derived only from the phlogopite bearing garnet peridotite mantle source. It is clear that the basanitic and alkali basaltic samples in southern Turkey could be derived from partial melting in the lithosphere-asthenosphere boundary and the mixture of the melts from the lithosphere-asthenosphere boundary and the lithospheric mantle, respectively and then they have reached the surface along the strike-slip fault zones and extensional fractures through lithospheric extension occurred by collision tectonics.