



## **Petrogenesis of mafic magmatism in Arabia-Eurasia collision zone: valley filling flows in Armenia**

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The Turkish- Armenian-Iranian orogenic plateau grew after the Middle Miocene following the initial Paleogene Arabia- Eurasia collision. It is widely accepted, that uplift of the plateau is related to break-off of the southern Neo-Tethys slab beneath the Bitlis-Zagros Suture at  $\sim 15$ -10 Ma, coupled with continued plate convergence and regional crustal shortening. Since this time there has also been a widespread mantle-derived collision magmatism over large parts of NW Iran, Eastern Anatolia and the Lesser Caucasus, potentially hundreds of kilometres from the site of southern Neo-Tethys slab break-off,  $>10$  Myr after the proposed break-off event. Detailed whole rock geochemistry and Sr-Nd-Pb-Hf isotope data are presented for  $\sim 2.5$  Ma trachy-basalt to trachy-basaltic andesite lavas erupted in Armenia in the South Caucasus.

These thick (up to 400 m) mafic flows generated several plateaux within the Lesser Caucasus: the Javakheti Plateau (S Georgia and NW Armenia), and the Lori and Kotayk Plateaux (Armenia). These basalts sequences also extend to the NE Kars-Erzurum Plateau in eastern Turkey.

It is demonstrated that studied series formed by  $<5\%$  melting of fertile subduction-modified spinel-facies lithospheric mantle, and very few display elemental or isotopic evidence for contamination by the 45-km thick Mesozoic-Paleogene arc crust or South Armenian Block continental crust. Recent magmatic activity in Armenia may not a direct consequence of southern Neo-Tethys slab break-off 300-450 km to the south of the country. It is possible that Late Miocene break-off of a second (northern Neo-Tethys) slab beneath the Pontide Arc allowed asthenospheric upwelling over a much wider area than was affected by southern Neo-Tethyan break-off.

Whole-scale delamination of mantle lithosphere can be ruled out due to the modest degrees of partial melting, a lack of asthenospheric components and limited crustal interaction of the Armenian magmas. Small-scale sub-lithospheric convection may be complementary to break-off, causing localised removal of lithospheric mantle and aiding the occurrence of volcanism for a significant time interval after the break-off event(s). Finally, collision magmas such as those in Armenia represent an under-appreciated juvenile addition to continental crust, with extreme enrichment in incompatible elements. However such magmas, especially on the Turkish-Iranian Plateau, have Th/La ratios  $\leq 0.2$ , much lower than the value of  $\sim 0.3$  for continental crust, so infra-crustal recycling and/or lower crustal delamination are certainly required to produce andesitic high-Th/La bulk continental crust.