The origin of Tertiary high-alumina basalts in central Urumieh-Dokhtar magmatic arc, Iran: Constraints from geochemistry, U-Pb geochronology and Nd-Hf isotopes

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High-alumina basalts in the Urumieh–Dokhtar magmatic arc (UDMA) of Iran have been seldom reported to date. Tertiary volcanism in central UDMA is represented by the Eshtehard high-alumina lavas, classified as calc-alkaline basalt and basaltic andesite, and K-calc-alkaline andesites and dacites. U-Pb dating by LA-ICP-MS of zircon yielded ages of ca. 47, 43 and 41 Ma for basaltic, andesitic and dacitic samples, respectively. Major and trace element variations indicate a general increase in incompatible trace elements with differentiation, consistent with the effects of fractional crystallization. The uniform εNd (-0.8 to 1.8) and variation of $\varepsilon Hf_{(t)}$ (-6.4 to +6.5; av. +0.7) values indicate the major source component has probably been a mantle domain. Partial melting followed by fractional crystallization under hydrous conditions, determining weak negative to positive Eu anomaly and negative variation between Al_2O_3 and SiO_2, can justify the generation of such high-alumina basalts magmatic suite. Isotopic and trace elements modelling suggests mixture of less than 10% Cadomian upper crust and more than 90% of primitive mantle. This is in agreement with slightly concave up and typical straight-line trends of crystal size distribution (CSD) curves, which also suggest mixing between primitive mantle and up to 4% sediment melts. We hypothesize that a descending slab migrating backwards in the asthenospheric mantle (slab rollback) in the Eocene resulted in strong upwelling of the asthenosphere to a relatively shallow level. Continuous supply of hot mantle-derived magmas led to interaction between moderately basic melts and the overlying crust, experiencing limited AFC processes en route to the surface.