Petrogenesis of Eocene volcanic rocks from north-central Iran: Implications for the Tethyan subduction system

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The Eocene volcanic rocks in north-central Iran are confined in a narrow zone trending parallel to the suture around the central Iran tectonic block, along which a short-lived branch of the Neotethys opened and closed in the Cretaceous. These volcanic rocks, similar to those from east Pontide (NE) and north Anatolia (N-central), Turkey, were mainly produced during the Eocene flare-up associated with the Arabia-Eurasia convergence. The rock suite includes basalt, trachyandesite/andesite and trachydacite/rhyolite lavas and pyroclastic deposits and evolved compositionally from calc-alkalic to shoshonitic. Their normalized trace element concentration patterns show a moderately enriched light/heavy REE ratio and depletions in Nb and Ta, as well as Ti in the more felsic rocks. They have moderate ranges of Pb isotopic ($^{206}Pb/^{204}Pb$ =18.55–18.93, $^{207}Pb/^{204}Pb$ = 15.55–15.65, and $^{208}Pb/^{204}Pb$ = 38.49–38.01) and a narrow range of $^{143}Nd/^{144}Nd$ (0.51267-0.51272) ratios. The new analyses indicate that the parental magmas of the volcanic rocks were derived from a common mantle source that had been enriched by fluids released from subducted oceanic slab. The fluids introduced significant amounts of LILE, but neglible HFSE to the source. The parental magmas underwent fractional crystallization to produce the range of volcanic rocks, and assimilation of upper crustal materials as indicated by the high $^{87}Sr/^{86}Sr$ ratios (up to 0.7079) of differentiated lavas. Integration of new analyses with regional data suggests that the Eocene volcanic rocks from north-central Iran, together with the ~coeval volcanic rocks in east Pontide and north Anatolia were most probably derived from an enriched source that involved both lithospheric and asthenospheric mantle before the Arabia-Eurasia collision.