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Miocene to Quaternary volcanism in NW Iran Azerbaijan: new geochemical and geochronological data

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The Mesozoic to Present geology of Iran has been shaped by the northward subduction of the Neo-Tethys Ocean during convergence and subsequent collision between Arabia and Eurasia, leading to the generation of magmatic arcs and seeding the conditions for the formation of the Turkish-Iranian Plateau. Over this Plateau, Miocene to Quaternary magmatic rocks cover vast areas. Processes, such as lithospheric delamination or slab break-off, which led to this widespread magmatism are still debated.

We present major and trace element analyses together with LA-ICP-MS U-Pb zircon ages of domes and lavas from NW Iran Azerbaijan, with the goal to shed light on the generation and evolution of these recent magmatic rocks and compare them with previously published information. We focused on morphologically prominent domes scattered over the region. The sampled domes, dominantly dacitic to rhyolitic in composition, and the lavas, showing a wide range from basaltic to dacitic and few alkaline compositions, have tholeiitic to calc-alkaline and shoshonitic chemical features. REE patterns are steep and flatten towards the HREE. Plots of primitive mantle normalized trace elements systematically show a negative Nb-Ta anomaly indicating a subduction-modified component in the mantle source and/or crustal contamination.

U-Pb zircon ages on one lava, two tuffs and 12 dacitic domes yield two distinct age distributions: (1) middle Miocene (ca. 10-12 Ma) and (2) latest Miocene – late Pleistocene (ca. 2-5.5 Ma). Ascribing these two age clusters to trace element compositions reveals that REE patterns became more depleted from middle Miocene to late Pleistocene. On a plot of Rb/Sr vs Ba/Rb the samples follow a low Rb/Sr trend typical for an amphibole-bearing mantle source. First Sr-Nd isotope results lie within or near the mantle array, making crustal contamination enigmatic. Coeval lavas in neighbouring regions (e.g. Ararat) show similar major/trace element and Sr-Nd isotopic compositions and the wide chemical and isotopic compositional variability points to a heterogeneous mantle metasomatized by subduction-derived fluids. This mantle is identified as a heterogeneous amphibole-bearing source becoming progressively depleted in trace elements during partial melting.

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