

Cenozoic magmatism in Iran; evidences for existence of juvenile mantle beneath central to the northeast of Iran

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Cenozoic magmatic activities in Iran are manifested by widespread volcanic and plutonic rocks. Although widespread across Iran but the Cenozoic magmatic rocks are especially focused in two magmatic zones; The Urumieh-Dokhtar magmatic arc (UDMA) which stretches from northwest to southeast of Iran, and the Sabzevar magmatic zone in NE Iran. The relationship between magmatic activities in the Urumieh-Dokhtar magmatic assemblage and the Sabzevar zone has been a controversial issue for decades. Comparison of ages and Sr-Nd isotopic compositions between Cenozoic magmatic rocks along these collisional zones provides a better understanding of the Cenozoic magmatic activities in Iran. Taking into consideration two proposed mechanisms to generation of the magmatic rock of UDMA (i.e. slab rollback and slab break off), it seem that plutonic rocks of UDMA (more specifically in the central part of UDMA) show wide interaction between mantle and crust. Accordingly, Eocene and Miocene granitoids from the central UDMA (Kuh-e-Dom and Niyasar, respectively) characterized by a high contribution of Cadomian lower crust (assimilation more than 60%). Whereas, Eocene Khalkhab-Neshveh granitoids, Late Oligocene- Early Miocene south Ardestan granitoids, and their volcanic counterparts, Early Miocene Natanz granitoids, Miocene Kajan subvolcanic, as well as, toward southeastern UDMA have similar isotopic signatures which imply that the juvenile mantle-dominant melts with negligible contribution of Cadomian crust (assimilation between 6-10%) played a significant role in the petrogenesis of Cenozoic magmatic rocks in the central UDMA. Taking into consideration voluminous post-collisional magmatism along Cenozoic active continental margin in NE Iran, it is plausible that following clauser of the Sabzevar ocean in Late Cretaceous and consequently subduction of the Neotethyan slab beneath central Iran, influx of deeper and juvenile mantle-derived magma into Cadomian crust during Cenozoic led to generation of widespread mantle-dominant magmatism in NE Iran (i.e. Eocene Kashmar and Arghash granitoids, Eocene SE Biarjmand to SW Sabzevar volcanics, Oligo-Miocene Neyshabour volcanics). As a result, based on age and isotopic signatures of Cenozoic magmatic rocks in Iran, we proposed a similar juvenile mantle for the Cenozoic UDMA and NE Iran magmatism which was stretched from a compressional (UDMA) to an extensional (NE Iran) setting. This extensional setting magmatism may represent the back-arc basin of the UDMA which developed as a result of the subduction of the Neotethyan oceanic crust beneath the central Iran.