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Peralkaline volcanism in a continental collisional setting: Mount Nemrut volcano, Eastern Anatolia

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Quaternary Mount Nemrut is an active volcano in the Eastern Anatolia which culminates at 2948 m and having an elliptic summit caldera with 8.5 x 7 km diameter. The volcano is situated on the east of the deformed and dissected remnant of the Muş-Van ramp basin located at the northern foot of the Bitlis-Zagros suture zone. The suture zone is the southern margin of the continental collision between Arabian and Anatolian plates. The continental collision along the Bitlis-Zagros suture zone commenced in the Middle Miocene following the closure of the southern segment of Neo-Tethys ocean and the subduction of northern margin of Arabian plate beneath Anatolian plate. Upon the collision and the uplift of the region, widespread volcanism, which exhibits varying eruption styles and geochemical characteristics, affected most of the Eastern Anatolia. The intracontinental convergence and N - S directed compressional - contractional tectonic regime remained till the end of Late Miocene. However, compressional - extensional regime became dominant in the Early-Late Pliocene. Following the slab break off, asthenosphere beneath the Arabian Foreland probably have migrated towards the slab window, which was opened during the detachment, and invaded the mantle wedge beneath East Anatolian Collision zone. Volcanism is still active in the region, represented by major Quaternary volcanic centers.

The magmatic characteristics of Nemrut volcano is appealingly distinct compared to the other Quaternary volcanic centers in the region. The overall geochemical and mineralogical affinity of Nemrut volcanism exhibits strong similarities with the well-known sites of continental intra-plate extension. The volcano has distinguishing features of a typical silica oversaturated peralkaline (molecular ratio (Na + K / Al)>1) suite: (a) The volcanic products vary from transitional olivine basalt to peralkaline rhyolite (abundant comendite and scarce pantellerite) (b) Predominance by erupted volume of peralkaline acidic volcanic rocks with respect to basic varieties with evident scarcity of intermediate compositions between 53% and 59% SiO_2 (Daly Gap), which are partly filled by benmoreitic enclaves in peralkaline rhyolites (c) Characteristic peralkaline accessory mineral assemblages composed of aenigmatite, alkali amphibole (arfvedsonite, riebeckite, ferrorichterite), aegirine, fayalite and REE-Ti silicate chevkinite (d) Existence of a small (diameter < 10 km) collapsed caldera indicator of a shallow magma chamber, in which crystallization thought to occur at 1-3 kbar pressures. The predominance of comenditic products and the regional tectonic settings, Nemrut volcano exhibits imprints of intracontinental pre-rifting. We suggest that following the slab break-off and the emplacement of asthenosphere contributed partial melts in the lower crust, both pre-existing shears and developing extensional features in Muş basin eased the formation of high level reservoirs, resulting in peralkaline magmatism in Nemrut volcano.