Post-collisional granitic magmatism via slab breakoff in the Eocene NW Anatolia, Turkey

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The Early Cenozoic tectonic evolution of NW Anatolia was controlled by the subduction of a Tethyan oceanic lithosphere and the subsequent collision of the Sakarya and Tauride-Anatolide continental blocks. Post-collisional magmatism in this region produced two linear belts of E-W trending Eocene plutons along and north of the Izmir-Ankara-Erzincan suture zone (IAESZ) whose geochemical features and age relations suggest a slab breakoff model for their petrogenetic evolution. The plutons in the southern belt, the Suture Zone Granitoids (SZG), have ages around 52-48 Ma, are intrusive into blueschist rocks of the IAESZ, and are composed of diorite, quartz diorite, granodiorite, and syenite. The plutons in the northern belt, the Marmara Granitoids (MG), are slightly younger (48-35 Ma), intrusive into the Paleozoic-Mesozoic crystalline basement rocks of the Sakarya Continent, and composed of monzogranite, granite, and granodiorite.

Both SZG and MG have moderately to highly evolved, medium to high-K calcalkaline compositions (respectively) and are predominantly metaluminous resembling I-type granitoids. Nd-Sr isotopic compositions and trace element patterns displayed by the SZG and MG rocks suggest a metasomatized lithospheric mantle source modified by the Late Cretaceous subduction event for their parental melts. Partial melting of this mantle lithosphere was facilitated by asthenospheric upwelling and associated thermal perturbation in response to a slab breakoff, experienced by the Tethyan oceanic lithosphere subducted beneath the Sakarya Continent. Mantle derived melts were modified by crustal contamination, assimilation, and fractional crystallization processes as they migrated through the overlying crust. More depletion of the MG rocks in Eu, Ba, Sr, and P and their higher contents of Pb, K, Ni and SiO_2 in comparison to the SZG rocks suggest greater amounts of crustal contamination during the evolution of their magmas rising through the Sakarya continental crust. The geochemistry, petrogenesis, and geochronology of the subparallel SZG and MG belts along and north of the IAESZ provide a case study of the evolution of slab breakoff magmatism in an alpine-style collision zone.