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The Solarya Volcano-Plutonic Complex (NW Turkey): Petrography, Petrogenesis and Tectonic Implications

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The post collisional magmatic activity produced several volcano-plutonic complexes in NW Anatolia (Turkey) during the late Oligocene- Middle Miocene. One of the major volcano-plutonic complexes, the Solarya volcano-plutonic complex is remarkable for its coeval and cogenetic plutonic (Solarya pluton), hypabysal and volcanic rocks of Early Miocene (24-21 Ma) age. Solarya pluton is an epizonal pluton which discordantly intruded into metamorphic and nonmetamorphic basement rocks of Triassic age. It is a N-S trending magmatic body covering an area of 220 km^2,approximatelly 20 km in length and 10 km in width. Based on the field and petrographic studies, three main rock groups distinguished in Solarya pluton; K-feldspar megacrystalline granodiorite, microgranite-granodiorite and haplogranite. Porphyritic and graphic-granophyric textures are common in these three rock groups. Pluton contains magmatic enclaves and syn-plutonic dykes of dioritic composition. Hypabyssal rocks are represented by porphyritic microdiorite and porphyritic quartz-diorite. They form porphyry plugs, sheet inrusions and dykes around the pluton. Porphyrites have microcrystalline-cryptocrystalline groundmass displaying micrographic and granophyric textures. Petrographically similar to the hypabyssal rocks, volcanic rocks are formed from andesitic and dasitic lavas and pyroclastic rocks. Plutonic, hypabyssal and volcanic rocks of Solarya volcano-plutonic complex show similar major-trace element and Sr-Nd-Pb isotopic compositions, indicating common magmatic evolution and multicomponent melt sources including mantle and crustal components. They are mainly metaluminous, medium to high-K calc alkaline rocks and display enrichment in LILE and depletion in Nb, Ta, P and Ti. They have initial $^{87}Sr/^{86}Sr$ values of 0.70701- 0.70818 and $^{143}Nd/^{144}Nd$ values of 0.51241-0.51250. These geochemical characteristics and isotopic signatures are considered to reflect the composition of the magmas derived from a metasomatized lithospheric mantle beneath NW Anatolia and from the overlying crust. Compositional variations in Solarya volcano-plutonic complex are interpreted as a result of AFC.

Convective removal or partial delamination of the base of mantle lithosphere and asthenospheric upwelling can be considered as possible mechanisms to provide melting of subcontinental lithospheric mantle metasomatized by earlier subduction, resulting in post collisional magmatic activity in NW Anatolia and the adjacent regions.