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Isotopic implications for the origin and the geodynamic nature of the Miocene granitic rocks in the northwest Anatolia (Turkey): comparison with the central Aegean magmatism

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Central Aegean magmatic belt including the northwestern Anatolia is interpreted in the literature as formed along magmatic arc which has migrated southwardly to its present position. During and after the closure of the Neo-Tethyan Ocean and progressive collision of the Tauride-Anatolide Platform with the Sakarya Continent, widespread magmatism occurred in NW Anatolia. These magmatic associations form a NW trending belt. In NW Anatolia, mostly Miocene I-type, shallow seated Egrigöz, Koyunoba, Alacam plutons expose along the suture zone called İzmir-Ankara Zone. These granitoid rocks intruded into the basement rocks of the region which are from bottom to top consist of Menderes Massif, Afyon Zone and Bornova Flysch Zone. Due to the complex geodynamic evolution, the exact emplacement mode of the Miocene granitoids is still a subject for debate. New results give rise to re-consider the general mode of the Miocene magmatic activity and address the question if the magmatism was triggered by compression or extensional tectonic processes. The new data are also compared to those of the central Aegean granitoids.

Initial isotopic signatures of these shallow seated granitoids of NW Anatolian are 87Sr/86Sr(I) = 0.70800-0.70975, ENd(I) = –4.9 to –7.3, 18O = 9.4-10.6, 206Pb/204Pb = 18.85-18.918. These characteristics indicate an assimilation-dominated crystallization and most probably origin of a metaluminous older meta-sedimentary protolith which is also common in most of the central Aegean magmatic suites. However, the geodynamic scenario for the mode of emplacement of the Miocene granitoids along the NW Anatolia implies remarkable differences when comparing to the central Aegean granitoid suites. These differences can be summarized as: an extension related granitoid emplacement in the central Aegean occurred between 15 Ma to 10 Ma. However, in NW Anatolia, the granitoids emplaced after Eocene collision and continue till 20-22 Ma. Isotopic patterns with suggested mixing/mingling models imply a mantle derived source in the central Aegean granitoids. However, the granitoids in NW Anatolia are most likely affected from the lower crustal material rather than a mantle component. A post-collisional extensional emplacement model as suggested for the central Aegean granitic magmatism is not compatible with the petrogenetic and age implications of the NW Anatolian Miocene granites. According to their geological and new isotopic data, a collision-related progressive emplacement mode is more likely compatible in NW Anatolia.