



Early Variscan arc magmatism in NW Turkey: Evidence of geochemistry and U-Pb zircon ages

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Massive, fine-grained metavolcanic rocks of the Çamlıca metamorphic unit exposed in the Biga Peninsula, north-west Turkey, have provided new Carboniferous ages and arc-related calc-alkaline volcanics indicating that the Biga Peninsula was possibly involved in the Variscan orogeny. The metavolcanic rocks are mainly composed of metalava- metatuff intercalation and have an andesitic composition. Chondrite-normalized REE patterns within these rocks are fractionated ($LaN/YbN \sim 2.2$ to 8.9), Europium anomalies are slightly variable ($Eu/Eu^* 0.6$ to 0.7) and generally negative (average $Eu/Eu^* 0.68$). The metavolcanic rocks have a distinct negative Nb anomaly and negative Sr, Hf, Ba and Zr anomalies. These large negative anomalies indicate crustal involvement in their derivation. The crustal influence may be related to either partial melting at the base of continental crust or contamination of mafic magma with crustal material. Tectonic discrimination diagrams show that all metavolcanic rocks were formed within a volcanic arc setting. Zircon ages (LA-ICPMS) of two samples yield 333.5 ± 2.7 Ma and 334.0 ± 4.8 Ma. These ages are interpreted to be the time of protolith crystallization. This volcanic episode in the Biga Peninsula can be correlated with the Central European Variscides. Carboniferous calc-alkaline magmatism in the Sakarya Zone can be ascribed to arc-magmatism as a result of northward subduction of the Palaeo-Tethys under the southern margin of Laurasia. Geochemical and U-Pb zircon data indicate that the Sakarya Zone is strikingly similar to that of the Armorican terranes in central Europe. The Biga Peninsula can provide a link between the Sakarya Zone and the Armorican terranes.