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Preliminary Geochemical Data for the Diabase Dykes from the Izmir-Ankara-Erzincan Suture Belt, Central Anatolia

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The Izmir-Ankara-Erzincan Suture Belt preserves oceanic and continental fragments originated from the closure of the northern branch of Neotethys. In the Bogazkale area (Central Anatolia), the pieces of the Neotethyan oceanic lithosphere exist in a chaotic manner, forming an ophiolitic mélange. Within the mélange, diabase dykes occur, which are found to cut various types of oceanic lithospheric rocks, including pillow basalts, gabbros and serpentinized ultramafics. We here present the preliminary geochemical results obtained from the diabase dykes and put some constraints on their petrogenesis.

The investigated diabase dykes are chiefly composed of plagioclase and a mafic phase, which is clinopyroxene and/or hornblende. A detailed examination reveals two petrographic types on the basis of predominating mafic mineral phase, namely clinopyroxene-dominated Type 1, and hornblende-dominated Type 2. Ophitic to sub-ophitic textures, where lath-shaped plagioclase crystals are enclosed by clinopyroxene, can be observed in almost all Type 1 dykes. In Type 2 samples, altered mafic phases can be seen enclosed within plagioclase crystals, forming poikilitic texture. Polysynthetic twinning is common in plagioclase. Hornblende occasionally displays simple twinning. Both types appear to have been variably affected by low-grade hydrothermal alteration as reflected by the presence of secondary mineral phases, such as chlorite, epidote, prehnite, and actinolite.

The whole-rock geochemistry appear to be consistent with the petrographical grouping, revealing distinct immobile trace element systematics for the two types. Both types have basaltic composition with sub-alkaline characteristics (Nb/Y=0.2-0.3 for Type 1; Nb/Y=0.02-0.08 for Type 2). The relatively low MgO contents of the dykes suggest that they do not represent primary magmas, but evolved through fractionation of mafic phases. In the N-MORB normalized diagrams, Type 2 diabases exhibit marked negative Nb anomalies, with HFSE abundances around or slightly more enriched than N-MORB. Type 1 diabases, on the other hand, do not possess any negative Nb anomalies and display enrichment in highly incompatible elements. In the chondrite-normalized diagrams, Type 1 diabases display slight LREE enrichment relative to HREE, whereas Type 2 diabases show flat to slightly LREE-depleted patterns.

The N-MORB-like Nb contents of Type 2 dykes suggest that they have been derived from depleted asthenopheric mantle source. The marked enrichment of Th and La over Nb indicates that their source has been metasomatized by slab-derived fluids/melts. However, the enrichment in highly incompatible elements in Type 1 dykes implies their derivation from a relatively enriched source region and/or small degrees of partial melting. Trace element systematics suggest that Type 2 diabases may have formed in an oceanic back-arc basin environment, whereas Type 1 diabases have been generated in a mid-ocean ridge or alternatively in an oceanic back-arc basin.