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Geology and Tectonic Evolution of the Kazdağ Massif (NW Anatolia)

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Abstract

In the northwestern part of Anatolia along the Izmir-Ankara Suture Zone, the Kazdağ and Uludağ metamorphic massifs form an E-W trending belt between the Sakarya Continent in the north and the Menderes Massif in the south. Internal succession of these two massifs have been described as metamorphic complexes consisting of various kinds of micaschists, quartz mica schist, gneisses, amphibolites and marbles. In the Kazdağ metamorphics, metaophiolites have been described additionally (Okay et al., 1991; Yaltırak and Okay, 1994; Okay et al., 1996; Duru et al., 2004).

These metamorphic complexes were considered to form the basement of the Sakarya Continent tectonically overlain by the Early Permian (Topuz et al., 2004) to Late Triassic (Okay and Monie, 1997; Okay et al., 2002) Karakaya Complex. This old basement and the Karakaya Complex were suggested to be unconformably overlain by Liassic and younger platform limestones and detritals (Altıner et al., 1991). In the literature, it has also been suggested that the Kazdağ Massif had experienced polyphase metamorphism, first during Carboniferous time, second during Early Triassic and third during Tertiary (Bingöl, 1971; Okay et al., 1996; Okay and Satır, 2000).

In this study we mapped the Kazdağ Massif on 1/25000 scale, studied its internal stratigraphy and structures and performed some petrologic analyses and radiogenic age determinations. Stratigraphically in the lower part of the Kazdağ metamorphic sequence, there is a part of an oceanic crust represented by metaultramafic rocks and gabbroic metacumulates. Geochemistry of these banded metagabbros show a mid-oceanic affinity. This oceanic crust is overlain, along an unconformity, by a platform type marble succession. At the base of the marbles, there is a basal conglomerate, clasts of which derived from the underlying ultramafic sequence. Thick white marble sequence is overlain along a gradational boundary with a metadetrital succession consisting of quartz mica schist and mica schists that are partly converted into migmatites. There are mafic metavolcanic intervals along the lower gradational zone and within various levels of the metadetrital unit and some marble lenses. The platform sequence resembles to the Mesozoic platform of the Sakarya continent and the underlying oceanic crust might be a part of a Paleotethys Ocean.

The Kazdağ succession had been subjected to high-grade migmatitic metamorphism accompanied by syntectonic granite emplacements. Zircons of these metagranites yielded U-Pb ages of 27.6 $\pm$ 6.8 Ma and 207Pb/206 Pb evaporation ages of 30 Ma. The metadetrital sequences and migmatites show scattered 207Pb/206 Pb zircon evaporation ages ranging from 301.4 $\pm$ 2.8 Ma, 274.9 $\pm$ 3.1 Ma, 169.3 $\pm$ 3.5 Ma indicating mixed ages with strong Alpine imprints.

After metamorphism the Kazdağ metamorphic sequence was internally imbricated by southward compression and the ultramafic sequence thrust on the top of the platform sequence. During this southward thrusting two different nappes emplaced successively on top of the Kazdağ metamorphics from the north. The first nappe consists of a part of Karakaya Complex and the second one, at the top, consists of the Çetmi Melange.

Our mapping results clearly show that all these nappe packages including the internally imbricated Kazdağ metamorphics are cut by undeformed young granites of 18-24 Ma age (Okay and Satır, 2000).
Exhumation of the Kazdağ metamorphics was a result of the southerly imbrication which occurred after the emplacement of the syntectonic metagranites (29-30 Ma) and before the intrusion of the cross cutting young granites (~21 Ma) The present topographic relief of the mountain was the result of younger vertical movements dissipated among numerous E-W trending high angle normal faults observed on its southern slope facing to Edremit Bay.

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