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Upper Cretaceous HP-LT metamorphism along the leading edge of the Mesozoic Bolkardag platform, southern Turkey

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HP/LT metamorphism within the Anatoliodes (Tavşanlı and Afyon zonses) provides key evidence of Late Cretaceous/Paleogene subduction of N the margin of the Tauride microcontinent. HP/LT metamorphism within the Bolkar Dağ has long been suspected, but without supporting evidence until now. HP/LT rocks are exposed as disrupted stratiform bodies interbedded with pale-coloured meta-limestones (tens of metres thick in all) around the periphery of Kargöl, 20 km SE of Ulukışla. The outcrops are mapped as lying within the Bokar Dağ stratigraphy, separate from lower grade accretionary melange and unmetamorphosed ophiolitic rocks further north. The age of the meta-basic rocks is uncertain but could be either Early Mesozoic or Late Meszoic based on comparison with the Taşvanlı Zone elsewhere.

The protoliths of the HP/LT rock are mostly meta-basic extrusives igneous rocks, including massive lava and lava breccia, mostly converted to amphibolite. The protoliths fall into two groups, alkaline (Nb/Y=1.43-2.05) and tholeiitic (Nb/Y=0.04-0.58). Chondrite-normalized REE patterns, N-MORB normalized multi-element diagrams and tectonic discrimination diagrams suggest that the alkaline amphibolites were derived from the metamorphism of intra-plate basaltic rocks. The tholeiitic amphibolites form two groups, one characterized by slightly LREE-enriched (La/YbN=1,74-2,67) patterns and progressive enrichment in LIL elements; this has a similarity to enriched-mid ocean ridge basalts (E-MORB). The second group of tholeiitic amphibolites is characterized by LREE-depleted (La/YbN=0,57-0,90) rare earth element patterns. Multi-element diagram of this group exhibits strong negative Nb anomalies and flat HFS elements compared to N-MORB, suggesting a subduction influence on magmatism. Petrographic studies of the amphibolites indicate a blueschist facies overprint, represented by glaucophane. 40Ar-39Ar isotopic age determinations performed on amphibole separates yielded ages from 92.29±0.38 Ma to 94.96±0.50 Ma (Turonian), similar to the Tavşanlı zone elsewhere. The oldest rocks unconformably overlying the HP/LT rocks are Upper Paleocene to Middle Eocene sediments. However, detrital glaucophane is present in Maastrichtian sediments which unconformably overlie the accretionary melange further NE.

Taken together, the available data suggest the the meta-basic rocks and interbedded meta-carbonate rocks represent part of the northerly, leading edge of the Bolkar continental unit, which subducted at a N-dipping subduction zone during the Late Cretaceous. During the collision of the subduction trench with the passive margin, the leading edge of the Tauride microcontinent was deeply underthrust and metamorphosed under HP–LT conditions.The HP-LT rocks were exhumed by the Maastrichtian. The new evidence supports the existence of a Mesozoic basin directly north of the Bolkar continental unit, known as the Inner Tauride ocean.