Correlation and tectonic significance of Mesozoic ophiolites in the Dinarides, Albanides and Hellenides

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Mesozoic ophiolites occur in two sub-parallel belts running down the spine of the Dinarides, Albanides and Hellenides. Key questions are: When did rifting occur to form the ocean basins? In what tectonic setting did the ophiolites form and how and when were they emplaced?

The outer ("external" belt) is the more simple of the two. There is extensive rift volcanism in the Early–Mid Triassic, followed by probable spreading in the Late Triassic (N Greece). Spreading in the Late Permian is unlikely in view of the absence of Permian deep-water continental margin sediments (e.g. Pindos–Olonos zone, W Greece), or Permian deep-water basic igneous rocks in melanges. Spreading at a mid-ocean ridge (MOR) setting in the early Late Jurassic is evidenced by the age of radiolarian cover sediments of the westerly ophiolites of Albania (Mirdita zone). The largest ophiolites (e.g., easterly Mirdita ophiolites; Albania) show clear lithological and geochemical evidence of formation above a subduction zone, and are also of early Late Jurassic age based on radiolarian ages. Less well dated ophiolites in N Greece (Pindos, Vourinos) also formed in an above-subduction zone setting. Early displacement (late Middle Jurassic) within the ocean basin is indicated by ubiquitous formation of sub-ophiolitic metamorphic soles (e.g., Zlatibor, Serbia; Euboea, Greece).

The inner ("internal") belt is much more heterogeneous. In N Greece there is evidence of widespread Permian bimodal rift-related volcanism (Serbo–Macedonian zone). In Serbia it was suggested that the Vardar zone is a long-lived Palaeotethyan ocean basin, but definite evidence is lacking. There is evidence of Triassic rifting and development of a passive margin in N Greece (Serbo–Macedonian Zone) with fragments of Triassic MORB and radiolarites (Almopias Zone). Also in N Greece there is excellent evidence of development of a Jurassic Andean-type continental margin arc and backarc basin(Paikon arc and Gevgueli Ophiolite). The Gevgueli Ophiolite had formed by late Middle Jurassic time based on the age of radiolaritian cover sediments. In N Greece (Vardar Zone) H/P metamorphism occured presumably related to subduction (Paikon unit) prior to Early Cretaceous time. Ophiolites were emplaced on the eastern margin of the Pelagonian Zone prior to deposition of a Late Jurassic shallow-water carbonate cover. In N Greece the Vardar Zone apparently closed by the Late Jurassic, whereas the basin still remained open further south, where there is no evidence of Late Jurassic metamorphism or collision (Argolis). In N Greece the Vardar Zone then reopened in the Early-mid Cretaceous to form a small MORB-type ophiolite, probably a strike-slip pull-apart basin. The Vardar Zone in Serbia was apparently also dominated by strike-slip during the Cretaceous.

In the Late Cretaceous additional (small?) ophiolites formed by spreading above a subduction zone in S Greece

(Argolis). The Vardar zone finally closed by westward thrusting in Early Tertiary time.

Where did the ophiolites form? Options are: 1. In a single easterly ("internal") oceanic basin, with large-scale westward thrusting towards the Adrian foreland; 2. In single oceanic basin that was "overlapped" by strike-slip (i.e. terrane displacement); 3. In two separate oceanic basins (Pindos-Mirdita and Vardar). Orientations of units should take account of Neogene rotation to form the Aegean arc. Also, interpretation of kinematic data of emplacement directions is complicated by extensive Early Tertiary re-thrusting. There is evidence of westward emplacement of Vardar ophiolites (N Greece) and also of westward thrusting of external ophiolites (Albania). There is also evidence of northeastward directed intra-oceanic thrusting in northern Greece (Vourinos), Albania (Mirdita eastern ophiolites) and Serbia (Zlatibor), and also generally eastward thrusting of continental margin units (Othris, Greece). The most likelyscenario is that ophiolites were emplaced westwards onto the Pelagonian and Drinia-Ivanjica zone (a microcontinent) from an oceanic basin in the Vardar Zone in the Late Jurassic, and also eastwards from the Pindos-Mirdita ocean in the Early Cretaceous.

A further question is where was the entire allochthonous complex ultimately rooted? Is the Olympos platform a window of the Adrian margin, or an accreted microcontinent within the Pindos-Mirdita ocean? Only deep seismic studies could finally resolve this question. However, the hypothesis that the entire allocthonous complex was thrust from a root zone to the east of the Serbo-Macedonian zone can be ruled out as there is clear field evidence that the Jurassic Gevgueli Ophiolite (NE Greece) remains magmatically welded onto continental basement rocks of the Serbo-Macedonian Zone and is not part of an overthust allochthon.