



Palaeogeography of southern Adria: Hints on the evolution of the Hellenides

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Adria is a N-S-elongated continental domain which is fringed on its eastern, northern and western flanks by Alpine s.l. fold-and-thrust belts, but opens southward into the oceanic Ionian Sea which is of early Mesozoic age. Basinal and shallow water carbonate sediments characterize the Mesozoic successions of Adria, that represents the only undeformed remnant of the southern Tethyan margin. This portion of margin has been likely preserved because of its continental substrate, that has limited the Alpine deformation. The distribution of Mesozoic basins and platforms strongly affected the subsequent evolution of the outer Hellenides. Fold-and-thrust belts with a relatively higher topography are observed where the carbonate platform successions have been accreted, as in southern Albania and western Greece, whereas thick Cenozoic foredeep sediments were deposited on the undeformed NW tip of the Ionian basinal domain. Deformed sediments of the Ionian zone are cropping out in southern Albania and western Greece. Several lines of evidence, from shortening estimates to palaeomagnetic rotations, indicate that the Ionian basin was wider south-eastward. A similar spatial geometry of the original basin can be inferred for the Pindos basin, following an eastward widening pattern that characterizes the whole Tethyan realm. Further east these basins may have been floored by oceanic crust that branched from a single, wider ocean located further to the east. In the long-running debate about the origin of the ophiolite slabs of the internal Hellenides, one-ocean-one-slab tectonic models are often contrasted to two-oceans-two-slabs models. An alternative hypothesis for the Hellenide evolution is here proposed, given that the fate of most oceanic crust is to be subducted, often without leaving much direct evidence of its presence, and that the origin of the ophiolite belts of Greece and Albania can be more satisfactorily explained by obduction from a single ocean located to the NW of the Pelagonian domain. In this reconstruction the early Mesozoic palaeogeography of the Hellenide region was characterized by at least three oceanic domains, Ionian, Pindos and Vardar, separated by continental ribbons of variable width. The ophiolite slabs of Albania and Greece were emplaced following an intra-oceanic subduction that occurred in the Vardar ocean; whereas the oceanic crust of the Pindos and Ionian basin was entirely subducted, leaving only the deep water sediments as remnants. The large amount of post Jurassic subduction required by large-scale plate reconstructions can hardly be reconciled with subduction of wide portions of continental crust (although thinned), as implied in some tectonic models that assume the Pelagonian domain as the edge of continental Adria. In this view, the major lateral discontinuities of the Hellenide fold-and-thrust-belt, such as the Scutari-Pec and the Kefalonia lines, can be seen as inherited palaeogeographic boundaries. The subductive evolution of the Pindos and Ionian oceanic domains is similar to that of the Lagonegro basin in the Italian southern Apennines, where deep water sediments have been scraped off from their substrate and accreted to the fold-and-thrust belt. No direct evidence of the basement is present, but considering the regional-scale reconstructions, an oceanic crust is the most likely substrate, unless one assumes that the slab subducted at 400 km depth underneath Calabria is not oceanic.