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A Possible Influence of Tethyan Ophiolite Emplacement on North and Central Atlantic Spreading

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Much of the interest in ophiolites has focussed on their creation, particularly those ophiolites whose compositions show the influence of a subduction zone, i.e. supra-subduction zone (SSZ) ophiolites, and the evidence for a high temperature of formation. This contribution discusses the emplacement (destruction) of the SSZ ophiolites in the western Tethys, mostly in former Yugoslavia, Albania, Greece, Turkey and Iran. It suggests that there may be a link between ophiolite destruction and ocean-floor spreading in the North and Central Atlantic.

The crystallization ages of the western Tethys SSZ ophiolites are of two distinct ages: mid-Jurassic (c. 170 Ma) in the Hellenic-Dinaric ophiolites and mid-Cretaceous (c. 94 Ma) for the ophiolites in Turkey and Iran. Tectonic emplacement was initially onto adjacent ocean-floor and then onto adjacent continental (or island arc). Emplacement of the Hellenic-Dinaric ophiolites was largely complete in Kimmeridgian time (c. 140 Ma), and for the Turkish-Iranian ophiolites generally by latest Cretaceous time. In both cases the later phases of emplacement coincide with a marked slowdown in the relative motions between western Eurasia and Afro-Arabia calculated from the spreading history of the North and Central Atlantic.

The simplest possible plate tectonic model of the relative motions between western Eurasia and Afro-Arabia in Mesozoic time is one in which three large plates are involved: N America, western Eurasia and Afro-Arabia. During ophiolite emplacement, there is a plate margin between the ophiolite and the adjacent continental (or island arc) margin. The simplest model equates this margin with the plate margin between western Eurasia and Afro-Arabia, which eventually terminates at a triple junction in the Atlantic Ocean. When ophiolite emplacement has ceased, this margin no longer exists and western Eurasia and Afro-Arabia temporarily become a single plate. Eventually another plate margin is created

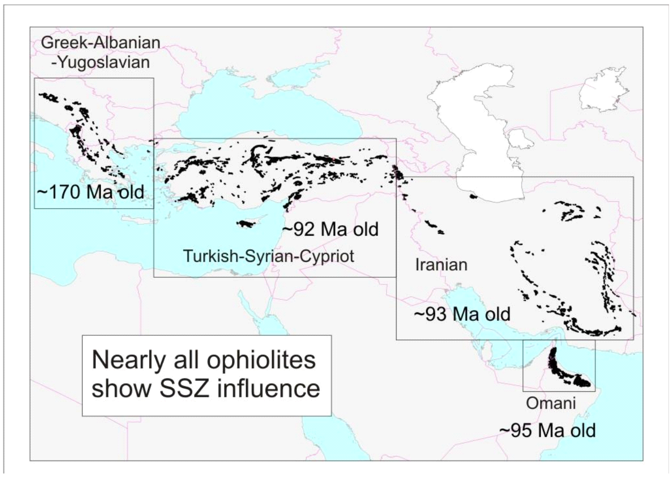

Fig. 1. Distribution and ages of the main ophiolites masses in former Yugoslavia, Albania, Greece, Cyprus, Turkey, Iran and Oman.
Most are supra-subduction (SSZ) ophiolites. Compiled from various sources. Note the separation into two distinct age provinces.

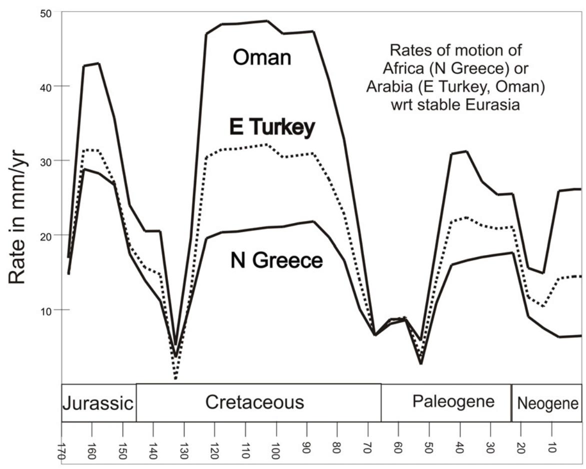

Fig. 2. Rates of motion of representative points on Afro-Arabia near the boundary between stable Afro-Arabia and stable western Eurasia, calculated from the the plate circuit Africa-N America-western Eurasia.
Rates are in millimeters per year from 170 Ma to the present day, The substantial reduction in the rates of motion in the latest Jurassic to earliest Cretaceous and in the latest Cretaceous to early Paleogene correspond respectively to the periods when the Dinaric-Hellenic and Turkish-Iranian-Omani ophiolites were emplaced onto the adjacent continents.

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between the two continents and Afro-Arabia and western Eurasia continue to approach one another. This process occurred twice in the case of the western Tethyan ophiolites and seems unlikely to recur in the future.

Most Chinese ophiolites are located along the boundaries of the tectonic fragments that make up China. Many of these are of Paleozoic age, but Jurassic and Cretaceous ophiolites make up the Banggong Lake-Nujiang ophiolite and the Yarlung Zangbo ophiolite belts in SW China and adjacent regions. it is possible that the model presented here may be applicable to their emplacement though the complexities of Jurassic and Cretaceous deformation and the Cenozoic deformation subsequent to their emplacement may make it difficult to test this conjecture.

Key words: Atlantic, ophiolites, tectonics, Tethys, emplacement

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