The spreading ridge systems of the Tethys Ocean during the Jurassic and Cretaceous: constraints on the mechanisms of subduction initiation

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Conclusions

One of the cornerstones of plate tectonics, the well-known Wilson Cycle, predicts that repeated cycles of separation and re-amalgamation of major plates shapes our planet, forming ocean basins and orogenic belts. A fundamental step in the Wilson Cycle is the closure of ocean basins, which may eventually lead to orogenesis. This process is accommodated by lithosphere consumption at subduction zones. Although our understanding of subduction dynamics has substantially increased in the last decades, the process of subduction initiation is still poorly defined. A key step to further our understanding of subduction initiation is to characterize the pre-existing lithospheric structures within ocean basins where new subduction zones form. Existing models show that weakness zones such as transform faults, fracture zones, or oceanic detachment faults are needed to nucleate a new subduction zone.

One of the most dramatic events of the Mesozoic was the closure of the vast Tethys Ocean and the subsequent collision of Eurasia and Africa plates. Here we reconstruct the geometry of the mid-ocean spreading ridge system (spreading axis and transform faults) within the Tethys during the Middle Jurassic (~170 Ma) and Late Cretaceous (~95 Ma) using paleomagnetic constraints from the ophiolitic complexes of the Balkan Peninsula (Serbia, Albania, and Greece) and Turkey. Based on the known Europe-Africa convergence directions and rates we discuss the possible scenarios and mechanisms that favored subduction initiation within the Tethys Ocean.

The Tethyan Ophiolites

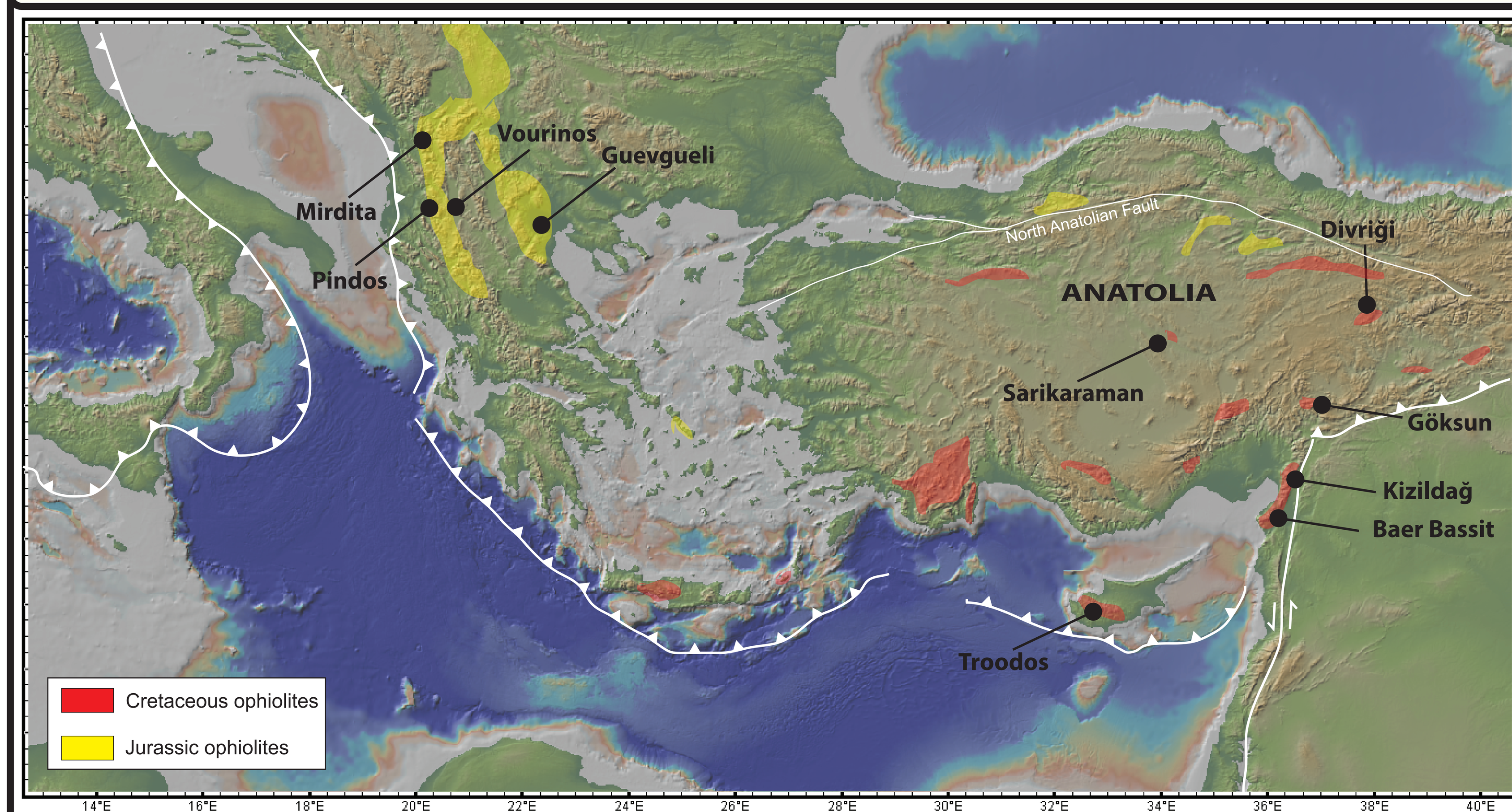

Figure 1. Regional geological map showing the present-day distribution of the peri-Mediterranean ophiolites and the sampled ophiolitic bodies.

Results From the Paleomagntism: Initial Dyke Orientations

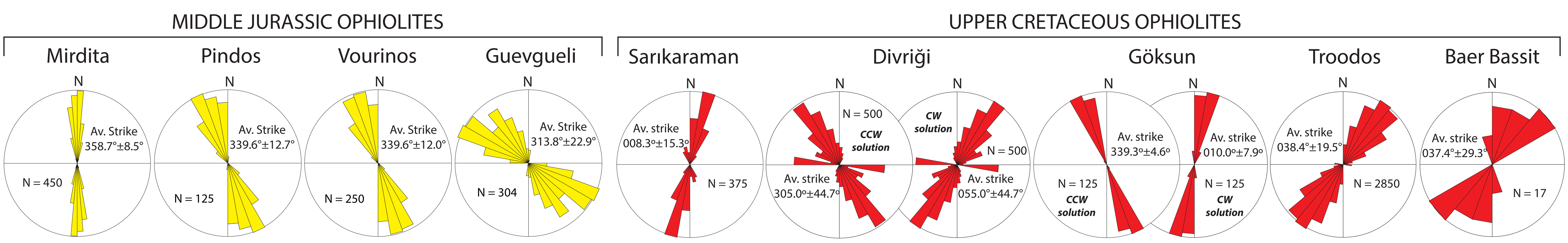

Figure 2. Stereographic projections showing the distribution of the initial dyke orientations of the studied localities visualized using rose diagrams.

Paleogeographic Reconstructions of the Neo-Tethys Spreading Ridge

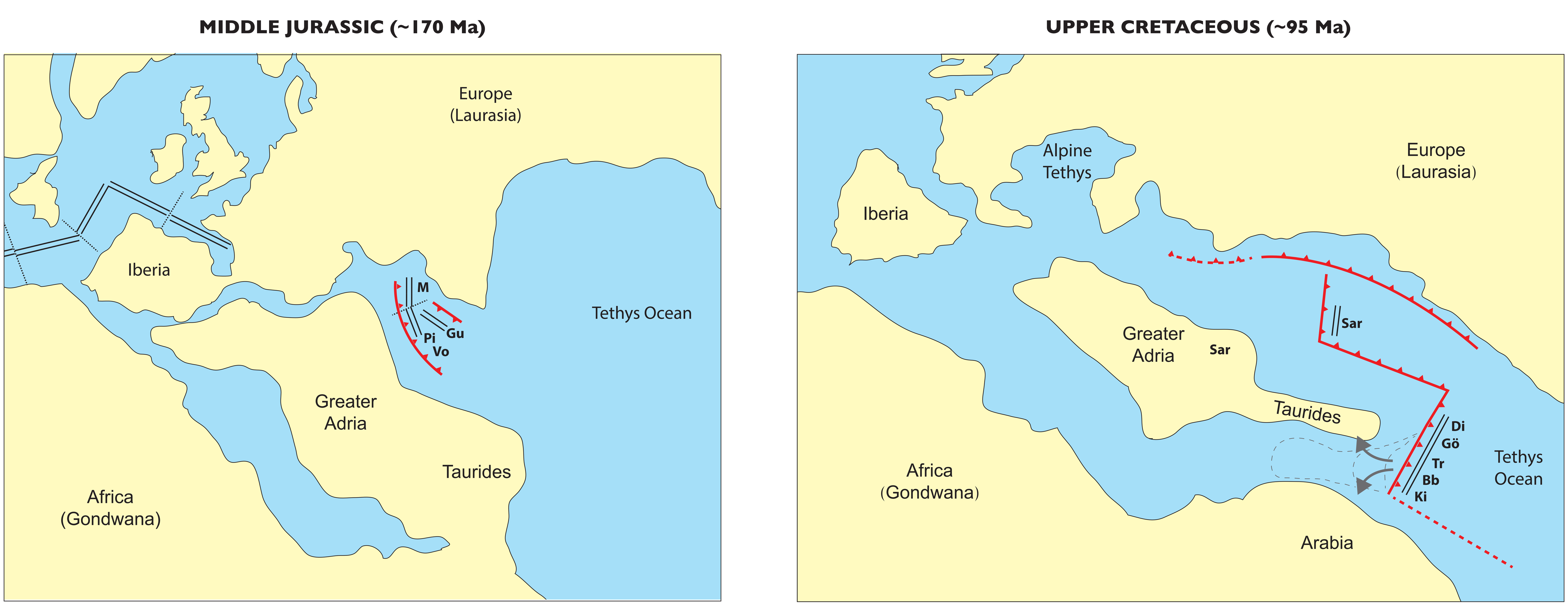

Figure 3. Paleogeographic reconstruction of the spreading ridge system of the Neo-Tethys and intra-oceanic subduction zones during (a) the Middle Jurassic and (b) Upper Cretaceous.

Acknowledgments

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