

EXPANSION TECTONICS OF THE HELLENIC REGION

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Summary

The uprising of magma in the north Aegean that forms a weak Benioff zone, the gravitational compression due to spreading, mainly, in the Atlantic and Indian Oceans, and the Tethyan sinistral megashear, are responsible for the morphology and the geophysical properties of the Hellenic region and for the underthrusting of the African continental lithosphere in the south Aegean.

Résumé

La morphologie et les propriétés géophysiques de la région des Hellénides ainsi que la subduction de la lithosphère continentale africaine en Egée du Sud sont dues à la montée du magma en Egée du Nord qui forme une zone Benioff restreinte à la compression gravitationnelle résultant, de l'expansion dans les océans Atlantique et Indien notamment, et à la mégafaille sénestre de la Téthys.

Although certain of the characteristics of the Hellenic arc comply with a plate tectonics model, the continental character of the African lithosphere imposes a major problem to the mechanism of its subduction under the Aegean (Tassos, in press). The hypothesis of earth expansion by accepting that the lithosphere is carried down by the asthenosphere and the rest of the mantle, due to the lack of substantial decoupling between them, and that underthrusting is a result of tilting around a center of rotation close to the core-mantle boundary,

solves that problem.

Expansion is assymetrical, both in time and space (Carey, 1976), and because of that we have the development of local compressional fields, despite global tension, and the existence of a sinistral shear zone around the Tethyan belt. The Hellenic region is influenced by the spreading that takes place mainly in the Atlantic and Indian Oceans and to a smaller degree in the Pacific, and due to gravity and to the assymetry of mantle uprising is under compression. The south Benioff zone dipping from the Mediterranean to the Aegean is a product of the underthrusting of the African continental lithosphere under the European plate, that most likely took place in late Miocene. Phase changes resulting from stress heating can explain the importance of gravity and the direction of the fault planes which is almost parallel to the dip of the zone (Papazachos, 1977).

Other parameters that control the morphology and the geophysical properties of the Hellenic arc are the Tethyan sinistral megashear and the subsequent anticlockwise rotation, and the plasticity fo the Aegean region which is a result of the uprising of mantle under the area. The weak Benioff zone in the north Aegean with vertical fault plane solutions, as well as the high heat flow, gravity and magnetic values in the same area, could be a manifestation of the uprising.

References

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