



Crust and mantle flow during 50 Ma of Aegean extension

J.-P. Brun (1), D. Sokoutis (2)

(1) Géosciences Rennes, Campus de Beaulieu, 35042 Rennes cedex France, (2) Vrije Universiteit, Faculty of Earth and Life Sciences, De Boelelaan 1085, 1081 HV Amsterdam, The Netherlands

We attempt here an integrated crust-mantle approach of the Aegean extension based on the geometry and timing of crustal ductile flow patterns, directly observed in the metamorphic core complexes (MCC), and those that can be inferred for the mantle from seismology, in particular seismic anisotropy and tomography. Our analysis can be summarised according the three following lines of evidence.

1- Structural, paleomagnetic and geochronological evidence from the Rhodope MCC show that extension starts in the northern Aegean in the Eocene time -i.e. 45-50 Ma ago- 15 to 20 Ma before what was supposed up to now.

2- Twice during the extensional history, MCC develop synchronous with the exhumation of HP metamorphic rocks: i) in Eocene time, MCC in the Rhodope and blueschist exhumation in the Cyclades, ii) in Oligocene-Lower Miocene times, MCC in the Cyclades and blueschist exhumation in Crete.

3- Stretching lineations in Rhodope and Cyclades MCCs and mantle anisotropy in North Aegean, when plotted on the same map, form a coherent arcuate pattern that suggest a strong kinematical relationship between crust and mantle flow and between ductile flow and large scale dextral block rotation in the upper brittle crust.

The evolution of extension at the scale of the whole Aegean is quantitatively described by a step-by-step restoration of extensional displacements at surface that take into account the geometry of the most prominent large-scale structures, block rotation, indicated by structural contours and paleomagnetic data, and the directions of principal stretch measured in MCCs.

On the above bases, we propose a model where most of the 50 Ma of Aegean extension are controlled by the rotational retreat of the Hellenic slab toward the S-SW. The model well fits with the flow pattern recorded in crust and mantle, simultaneously. During the last 5 Ma, this simple kinematics is however modified by the westward extrusion of Anatolia.