Geophysical Research Abstracts,
Vol. 10, EGU2008-A-07333, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-07333
EGU General Assembly 2008


# Collision driven astenospheric flow in the Carpathian-Pannonian region: a new interpretation for the Cenozoic geodynamics???

I. Kovács (1,2), **Gy. Falus** (1,3), K. Hidas (1), Cs. Szabó (1)

(1) Lithosphere Fluid Research Laboratory, Department of Petrology and Geochemistry, Eötvös University, Budapest, H-1117, Pázmány Péter sétány 1/C, Hungary, (cszabo@elte.hu)

(2) Research School of Earth Sciences, Australian National University, Building 61 Mills Road, Canberra, ACT 0200, Australia, (istvan.kovacs@anu.edu.au)

(3) Eötvös Loránd Geophysical Institute, H-1145, Columbus u. 17-23, Hungary, (falus@elgi.hu)

New data on volcanism, xenoliths, and seismic tomography raises substantial questions with the present model for Cenozoic evolution of the Carpathian-Pannoian region. This model attributes basin formation and volcanism to the slab roll-back along the Carpathian arc, which now faces several challenges such as: 1) temporal and spatial pattern of Cenozoic volcanism (apart from the Eastern Carpathians) does not match that of the subduction; 2) there is no clear geological and seismic evidence that subduction occurred along the entire Carpathians; 3) subduction roll-back itself cannot entirely account for late Oligocene-early Miocene extrusion and mainly middle Miocene basin formation. Therefore a new geodynamic scenario is proposed in which both the lithosphere and the asthenosphere may have suffered orogen-parallel extrusion from the Alpine orogen following the collision in the Eocene.

Our model, which is similar to those proposed for eastern China and Anatolia, implies that the major geodynamic events in the CPR took place after the collision between the Adriatic intender and the stable European platform at 30 Ma. This is because further convergence started being taken up by the lithospheric and asthenospheric mantle, as well. The shortening resulted in orogen parallel escape of the less-viscous asthenospheric mantle that eventually led to the extrusion of lithospheric blocks (i.e., Alcapa) through basal drag. This is consistent with the geological record that shows late Oligocene-early Miocene extrusion of the Alcapa and strong rifting and stretching in the lithosphere over the Miocene. This later is a consequence of the eastwardly escaping asthenospheric flow that could only be accommodated by thinning significantly the overlying lithosphere, the effect of which was probably further amplified after the soft collision of lithospheric blocks (Alcapa and Tisza) with the European platform in the middle Miocene. The eastward migrating depocenters and younging volcanism matches well the concept of an eastward directed asthenospheric flow. The OIB-like nature of Plio-Pleistocene volcanic rocks can also be accounted for by the arrival of subduction-contaminated asthenospheric mantle from the Alpine realm. Mantle xenoliths show strong anisotropy and distinct deformation patterns in the lithosphere and in the asthenosphere, which may indicate decoupling during extrusion. Subduction rollback seems to be not driving but being driven by the asthenospheric flow. This flow may have been forced to dive under the stable European Platform along the Carpathians, which can be manifested by northward dipping reflectors found in the mantle beneath the Western Carpathians. Future seismic anisotropy measurements in the CPR could facilitate the development of this model.