Geophysical Research Abstracts, Vol. 8, 03727, 2006
SRef-ID: 1607-7962/gra/EGU06-A-03727

The Alps-Dinarides-Carpathians connection: evolution of lithosphere- and crustal-scale structures in space and time

Kamil Ustaszewski(1), Stefan M. Schmid(1), Bernhard Fügenschuh(2), Matthias Tischler(1), Wim Spakman(3)

1) Institute for Geology & Palaeontology, Universität Basel, Basel, Switzerland, 2) Institute for Geology & Palaeontology, Universität Innsbruck, Innsbruck, Austria, 3) Faculty of Geosciences, Utrecht University, Utrecht, Netherlands

In an attempt to understand the evolution of the Alps-Dinarides-Carpathian connection in time and space, a new tectonic map of the entire system was compiled. This map was arrived at by integrating existing geological maps as well as subsurface information taken from the literature for those areas that are covered by significantly thick Mio-Pliocene (Pannonian basin) or Mid-Cretaceous to Pliocene deposits (Transylvanian basin). This map serves as a base for a 2D (map-view) retro-deformation of the various tectonic units of the system.

The retro-deformation of Mio-Pliocene rotations and translations in the Alps-Dinarides-Carpathian system was sketched for the first time by Balla (1987). Subsequent reconstructions, showing Early Tertiary and/or Mesozoic configurations (e.g. Csontos & Vörös 2004), were restricted to the Pannonian-Carpathian part of the system and disregarded the Eastern and Southern Alps. We attempt to overcome this shortcoming by considering the interrelated motions in the entire system in the Mio- to Pliocene. The most important of these comprise

(a) the invasion of the Austroalpine-Carpathian-Pannonian ("ALCAPA") and Tisza "blocks" into the Carpathian embayment, accompanied by significant counterclockwise and clockwise internal rotations, respectively, and driven primarily by slab-pull and roll-back of the European lithospheric slab in the Carpathians,

(b) the indentation and counterclockwise rotation of the Adriatic indenter (comprising

Southern Alps and Dinarides), triggering shortening in the Southern Alps, exhumation of the Tauern Window and lateral extrusion of the ALCAPA block towards E,

(c) up to 200 km of extension of both the ALCAPA and Tisza blocks concomitant with their invasion into the Carpathian embayment, leading to the formation of the Pannonian basin.

Our goal is to reconstruct the pre-Mid-Miocene geometry, i.e. before the onset of rifting in the Pannonian basin. We rely on existing reconstructions for the Eastern Alps (Frisch et al. 1998) and the Southern Carpathians (Fügenschuh & Schmid 2005) and on shortening and extension amounts derived from geological cross-sections. Moreover, kinematic data from fault-slip analysis, palaeomagnetic data and a crustal stretching factor map for the Pannonian basin (Cloetingh et al. in press), are taken into account. So far, the restoration yielded some surprising features: (a) Eastern Alps and W-Carpathians fit into a relatively small area W of present-day Budapest, (b) the Periadriatic-Balaton Line is straightened out, strikes WNW-ESE and implies components of strike-perpendicular shortening as well as strike-parallel extension, (c) Tisza was at least partly emplaced into the Carpathian embayment before the onset of lateral extrusion of ALCAPA located north of the Periadriatic-Mid-Hungarian Line.

References:

Balla, Z, 1987. Tertiary paleomagnetic data for the Carpatho-Pannonian region in the light of Miocene rotation kinematics. Tectonophysics 13, 67-98.

Cloetingh S, Bada G, Matenco L, Lankreijer A, Horvath F, Dinu C (in press) Thermomechanical modelling of the Pannonian-Carpathian system: modes of tectonic deformation, lithospheric strength and vertical motions. In: Gee DG, Stephenson R (eds) European Lithosphere dynamics. Geological society, London

Csontos L & Vörös A, 2004. Mesozoic plate tectonic reconstruction of the Carpathian region. Paleogeography, Paleoclimatology, Paleoecology 210, 1-56.

Frisch W, Kuhlemann J, Dunkl I, Brügel A, Palinspastic reconstruction and topographic evolution of the Eastern Alps during late Tertiary tectonic extrusion, Tectonophysics 297, 1-15, 1998.

Fügenschuh B, Schmid SM (2005) Age and significance of core complex formation in a very curved orogen: Evidence from fission track studies in the South Carpathians (Romania). Tectonophysics 404(1-2):33-53.