from the Bulletins of the ISC for teleseismic distances (these data in the theory of inversion that we use are similar to those of deep foci earthquakes or deep reflections). The employment of the data of points (a) and (b) enables detailing of the structure of lithosphere and asthenosphere and those of points (c) and (d) ensure specify the depth and the character of 410 and 670 km discontinuities. The new method provides common inversion of the main data (from Bulletins of ISC) and data of points (a)-(d) even in cases when crust and mantle contain low-velocity zones. The obtained 3-D P-velocity model of the mantle beneath Europe is considered.

Paleomagnetic constraints for paleogeographic position of Tatricum and Fatricum (Central West Carpathians) in the Late Mesozoic

Jacek Grabowski

Polish Geological Institute, Warsaw, Poland

During last 10 years paleomagnetic data were obtained from the Mesozoic (Lower Jurassic - Lower Cretaceous) rocks in the Central West Carpathians of Poland and Slovakia (Kadzialko-Hofmokl and Kruczyk, 1987, Kruczyk et al., 1992, Grabowski, 1995). The samples were taken from the KriŸna unit (Fatricum) of the Tatra Mts., NiŸne Tatry, Choæ Mts., Spiœka Magura and Mala Fatra and from the Cover unit (Tatricum) of the Tatra Mts. All characteristic directions are of normal polarity, they reveal predominantly clockwise rotated declinations (except the directions from the Mala Fatra) and inclinations corresponding to the expected values for the European Platform. It is very likely that these directions represent a remagnetization of Early Cretaceous age. These data differ significantly from the Middle Jurassic - Early Cretaceous paleomagnetic directions from the Apulian realm (Marton & Marton, 1983, Channel, 1992). Comparison of declinations and inclinations from the Central West Carpathians and Apulia suggest that an oceanic separation between them existed at least in the early Cretaceous. Similarly as the Northern Calcareous Alps, the Central West Carpathians did not participate in the counter-clockwise rotation of Apulia.

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Thermal effects of the exhumation of metamorphic core complex on syn-rift sediments - an example from the Rechnitz Window (Austria)

Bernhard Grasemann[1] and István Dunkl[2]

[1] Department of Geology, University Vienna, Austria
[2] Geological Institute, University of Tuebingen, Germany

The Rechnitz Window is situated at the Alpine/Pannonian borderand represents the easternmost Penninc window of the Alps. During the Miocene the window was exhumed by tectonic denudation. The Austroalpine crystalline cover was removed by top-to-ENE normal faulting. This extension produced the Pannonian basin system where the earliest sediments of the this depositional cycle were formed in Middle Miocene. The sediments of the syn-rift stage are mainly conglomerates, fanglomerates and sandstones with thin coal bands. A high level of the organic maturation (Sachsenhofer, 1991) indicates that the bottom of the sedimentary sequence suffered a post-depositional thermal overprint. Heating was able to anneal the fission tracks (FT) in the detrital apatite grains of the sediments. The 13.6 million years average of the FT ages expresses the termination of the period of an increased heat flow. The aim of the presented two-dimensional numerical thermal model is a quantitative qualification of possible thermal surface heat flow within the hanging wall during the exhumation of the Rechnitz Window along normal faults.

As the chosen initial conditions as well as the boundary conditions clearly influence the results of such a mathematical model only such parameter configurations were used, where the program records of the cooling history fit the actual thermochronological measured data of the footwall of the Rechnitz Window (Dunkl and Demény, in press). During the model calculations a chosen sample within the footwall was exhumed with various faulting velocities (2.5 - 11.5 mm/a) along normal faults with various dip angles (10° - 50°). After each time step the temperature and the location of the sample were recorded resulting in a calculated cooling curve of the footwall. All model calculations reveal a typical convex-concave cooling curve and suggest an Early Miocene rapid exhumation of 2mm/a of the footwall followed by slow exhumation of 0.25mm/a. After this period of rapid faulting the near surface geothermal gradient is increased dramatically (>50°C/km). In order to investigate the theoretically possible surface heat flux a parameter map was calculated showing the surface heat flux in the hanging wall at a distance of 0-90km to the fault trace. This plot shows that within 10km to the fault trace the surface heat flux is increased distinclty for all faulting angles and faulting velocities. For high angled normal faults the lateral cooling effect considered in the two-dimensional model is too large and the surface heat flux near the fault trace is about 0.050W/m² less. An interesting feature is that low angled faults influence the surface heat flux in the hanging wall >100km distance to the fault trace, whereas the influence on the near surface thermal structure during high angled normal faulting is considerably reduced (<50km).

The presented model shows that rapid relative displacement during normal faulting produces a warming of the adjacent hanging wall and consequently an increased surface heat flow. This effect can easily provide the heat necessary for the resetting of the FT ages in the hanging wall of the Rechnitz Window without the assumption of a hidden volcanic body.

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Gondwana origin of the Tisza-Dacia Unit? Arguments from paleomagnetism

Ulrich Hambach[1], Cristian Panaiotu[2] and Cristina E. Panaiotu[3]

[1] Department of Geology, University of Cologne, Germany
[2] Faculty of Physics, Bucharest University, Romania
[3] Faculty of Geology and Geophysics, Bucharest University, Romania

The origin of the crustal units today forming the Intra-Carpathian area is still under debate (CSONTOS 1995). The so called Tisza -Dacia unit is built up by the Apuseni Mts., the South and the East Carpathians and is characterized by a common Tertiary tectonic evolution. The pre-Tertiary tectonic history of these blocks is hardly known. Middle Jurassic to Lower Cretaceous sediments from Piatra Craiului and Bucegi Mts. (SE Carpathians, Romania) were sampled for a paleomagnetic study. The sites are situated in the massifs of Piatra Craiului and Bucegi and in the strongly faulted area between them.

The Jurassic sediments lie on pre-alpine polymetamorphic crystalline basement of the Leaota massif which is part of the alpine Bukovinian nappe system. Facies development (fining up) and synsedimentary tectonics (normal faults) point to a scenario of extension tectonics presumably lasting from Middle Jurassic to Early Cretaceous.

At present we are able to isolate a common component for all sites with identical inclinations (≈ 62°) and declinations ranging from 20° to 160°. The scatter of the mean declinations are interpreted as the result of differential clockwise rotations.

In the Bucegi massif the common component (D 122°/I 62°) is better grouped in geographic than in stratigraphic co-ordinates pointing to a post-tectonic remagnetization. The steep inclination (actual geomagnetic field inclination ≈ 64°) indicates a remagnetization event which took place just before the Early Miocene large scale rotations.

Jurassic limestones reveal shallow reverse inclinations (≈ -30°) at high demagnetization temperatures additionally.

Clockwise rotations of the Apuseni Mts. and the South and East Carpathians (Tisza-Dacia unit) were already described by BAZHENOV et al. (1993) and PATRASCU et al. (1990,1994). Their investigations of Middle to Upper Cretaceous and Tertiary sedimentary and volcanic rocks reveal rotations of more than 80° and a timing of this movements prior to the Middle Miocene. PATRASCU et al. (1990) were able to give a well defined Upper Cretaceous (70-80 Ma) paleolatitude for the Apuseni Mts. of 21° N. The shallow reverse inclination from the Jurassic limestones corresponds to a paleolatitude of about 16°. Both the Cretaceous and the Jurassic paleolatitude are a convincing argument for the Gondwana origin of the Tisza-Dacia unit.

The ongoing project focuses on the detection of primary magnetic remanences of Middle Jurassic to Early Cretaceous age in the SE-Carpathians. The reconstruction of the plate tectonic puzzle in the Carpathian realm will greatly benefit from further paleomagnetic research.

Neogene magmatism at the Alpine-Pannonian transition zone

Szabolcs Harangi

Department of Petrology and Geochemistry, Eötvös University, Hungary

Neogene alkaline volcanism developed in two main stages and formed two volcanic fields (Styrian Volcanic Field, SVF and Little Hungarian Plain Volcanic Field, LHPVF) at the Alpine-Pannonian transition zone. In the SVF, a Karpatian/Early Badenian trachyandesitic-latitic volcanism was followed by a Late Pliocene alkaline basaltic one, whereas in the LHPVF a Sarmatian/Early Pannonian bimodal