Engelhardia) and in the lower part of the profile changes in low sporomorphs concentration (Pinaceae) are recorded opposite to higher percentages of halophytes (Chenopodiaceae) and dinoflagellates. Ostracods, benthic foraminifera, molluscs, charophytes, fish remains and pollen have been recovered. Palaeomagnetic sampling was also performed and all samples display a normal polarity. The ostracod assemblage is characterised by the alternate dominance of *Cyprideis* sp. and *Ilyocypris* spp., with *Leucocythere* sp., *Zonocypris membranae quadricellae*, *Heterocypris salina* and *Candonidae* as accompanying species. The benthic foraminifera appear suddenly in the *Cyprideis* dominated samples and disappear as much abruptly. *Quinqueloculina*, *Miliolina Trisegmentina* and *Varidentella*, tolerating hyperhaline conditions, dominate the foraminiferal assemblage. Species rapidly increase in size with aberrant coiling up to top of profile. In the lowermost part of the profile, abundant exemplars of *Perfocalcinella fusiformis* and Palaeogene and Cretaceous redeposited calcareous nannofossils were recovered. Foraminifera and calcareous nannoplancton presence in the lower part of the profile provide two hypotheses about this sequence origin.

Seismic anisotropy and deformation patterns in upper mantle xenoliths from the central Carpathian-Pannonian region: indications for a collision driven asthenospheric flow?

Kovács I.[1], Falus Gy.[1], Hidas K.[2], Szabó Cs.[2], Hegedűs E.[1], Posgay K.[1] and Zilahi-Sebess L.[1]

[1]Eötvös Loránd Geophysical Institute of Hungary, H-1145, Columbus u. 17-23, Hungary, kovacsij@elgi.hu, falus@elgi.hu
[2]Lithosphere Fluid Research Laboratory, Department of Petrology and Geochemistry, Eötvös University, Budapest, H-1117, Pázmány Péter sétány 1/C, Hungary, cszabo@elte.hu, karoly.hidas@gmail.com

The Cenozoic geodynamic evolution, including basin formation, volcanism in the Carpathian-Pannonian region (Central Europe, CPR for short), has been interpreted in many different ways. A review is presented on deformation patterns in mantle xenoliths from the central part of the Carpathian-Pannonian region and seismic anisotropy data which appear to support the existence of an E-W directed asthenospheric flow underneath the study area. The E-W oriented asthenospheric flow and accompanying horizontal extrusion of lithospheric blocks from the Alpine orogen, as well as extension was the result of the collision between the European and Adriatic units in the Eocene. The eastward directed asthenospheric flow may be an additional driving force to the previously proposed slab-rollback and gravitational instability models for the formation and deformation of the Carpathian-Pannonian region. The existence of such a flow beneath the CPR may also generally confirm that the asthenosphere does not only have a passive role in tectonically active zones (i.e., orogen belts) but can be an important driving-force for the formation of marginal basins.

Late Neogene red clay in the Carpathian basin and its paleoclimatological implications

Kovács J.[1], Újvári G.[2] and Varga G.[1]

[1]Department of Geology, Faculty of Sciences, University of Pécs, H-7624 Pécs, Ifjúság u. 6, Hungary, jones@gamma.ttk.pte.hu, gyoker@gamma.ttk.pte.hu
[2]Geodetic and Geophysical Research Institute of the Hungarian Academy of Sciences, H-9400 Sopron, Csatkai E. u. 6–8, Hungary, ujvari@ggki.hu

The red clays in Hungary (Tengelic Red Clay Formation: TRCF; Kerecsend Red Clay Formation: KRCF) is overlain by loess paleosol sequences. The thickness of the red clay (in general) ranges from 4 to 90 m. The red clay sediments in the Carpathian basin are known from both exposures and boreholes. The age of these formations is ~3.5–1.0 Ma. Elemental oxide analyses of red clays were determined by x-ray florescence (XRF), and x-ray powder diffraction (XRD) was used for mineral identification. The degree of chemical weathering in soils by hydrolysis increases with available precipitation and temperature. Both water and

warmth serve to accelerate the depletion of alkali and alkaline earth elements (Ca, Mg, Na, K) at the expense of refractory elements such as aluminum (Al). These relationships within soils have been used to derive transfer functions for estimating paleoclimatic variables from paleosols of comparable parent material composition and degree of development. This study extends these techniques to paleosols formed during the Late Pliocene–Early Pleistocene in the Carpathian basin. The chemical index of alteration without potassium (CIA = $100\times mAl_2O_3/(mAl_2O_3+ mCaO+Na_2O)$ in mol) increases with mean annual precipitation in modern soils. Paleotemperature of paleosols can be derived from alkali content (C = $(mK_2O+mNa_2O)/mAl_2O_3$, in mol) which decreases in modern soils with mean annual temperature. The equation for mean annual temperature is: MAT (°C) = 46.94C + 3.99 (R^2 = 0.72, standard error ±182 mm); for mean annual precipitation is: MAP (mm) = 14.265(CIA-K)-37.632 (R^2 = 0.96, standard error ±0.6°C). The older type (Beremend Member, age ~3.5–2.0 Ma) of the TRCF is red kaolinitic clay containing typically disordered kaolinite, mixed-layer smectite/kaolinite, smectite and little gibbsite. It was formed in the local subaerial weathering crust in warm, humid, subtropical or monsoon climate (MAT: 13–15°C; MAP: 1200–1400 mm). The younger member (age ~2.0–1.0 Ma) of the TRCF contains red (or "reddish") clay beds. It contains relatively fresh material (illite, chlorite), the weathering products are predominantly smectite and goethite formed under warm and drier climate in environmental conditions of savannah and steppe or forest steppe (MAT: 10–13°C; MAP: 1100–1300 mm). The basal red clay layers of the Paks Loess Fm. and KRCF (age ~1.0–0.5 Ma) contain similar material as the underlying red clays belonging to the younger member of the TRCF. The slightly but significantly lesser degree of weathering (more illite and chlorite, less smectite) indicates cooling of the climate (MAT: 8–10°C; MAP: 900–1000 mm). It appears from the sedimentological data that the main part of the red clay is of wind-blown origins, other is weathering crust of the underlying material. The Neogene red clay accumulated under persistent weak winds and a rather steady warm–arid climate. This material later was modified by post-depositional weathering under warm–humid climate.

Acknowledgements: This contribution was made possible through financial support for J. K. by the Hungarian Academy of Sciences, Bolyai János Research Grant.

Time and space distribution of the Neogene intrusive magmatism from Oaş-Gutâi Mts., Eastern Carpathians, Romania

Kovacs M.[1], Pécskay Z.[2], Fülöp A.[1], Jurje M.[3] and Edelstein O.[4]

[1]*Faculty of Mineral Resources and Environment, North University of Baia Mare, Baia Mare, Romania, marinelkovacs@yahoo.com*
[2]*Institute of Nuclear Research, Hungarian Academy of Science, Debrecen, Hungary*
[3]*Mineralogy Museum, Baia Mare, Romania*
[4]*Edelstein Klara AF, Baia Mare, Romania*

The Oaş-Gutâi Mts. (OG) belongs to the Eastern Carpathians Neogene-Quaternary volcanic chain. Two types of calc-alkaline volcanism took place during the Middle-Miocene (15.4-7.0 Ma): a felsic explosive extensional type and an intermediate arc type of extrusive and intrusive origin, respectively. Gold-silver and base metal epithermal ore deposits are associated with the intermediate type of volcanism.

Subvolcanic and shallow–level intravolcanic intrusive rocks of irregular shapes and various sizes (from tens of metres up to 6 km long) developed on more of 3000 m vertical extent (based on drill core data). They suggest morphologies of dykes, sills and apophysis of microlaccolites crosscutting the Paleogene flysch-type basement, the Neogene sedimentary deposits, as well as the volcanic suite; hundreds of intrusions outcrop mostly in the south-eastern part of Gutâi Mts. Despite the relationships of the intrusions with different volcanic complexes, they can be hardly attributed to some individual volcanic structures. Among the various compositions and textures of rock types (from gabbros to microgranodiorites), the andesites and the porphyritic microdiorites, quartz diorites and quartz monzodiorites are the most abundant. Hornfelses and sometimes skarns formed at the contact of the intrusions with the sedimentary deposits.