than the sedimentation ages. This rather narrow range (with a mean of 20.1 ± 0.9 Ma) can be considered as cooling age after the Neogene metamorphic event, which caused the total resetting of the zircon FT ages. The similarity of the white mica K/Ar ages and the range of zircon FT ages indicates a rapid cooling period in the Early Miocene. The Neogene syn-rift sediments from above the metamorphic basement suffered no significant post-depositional overprint and their zircon FT ages can be interpreted as typical cooling ages of the source regions, but not the IKU .

The East Slovak core complex occurs in the area of strike-parallel wrench zone. Therefore, the exumation of the IKU could be initiated by buoyancy and ductility of underplate rocks, updomed within the wrench zone. Since the Early Miocene, the main controlling factor of the exhumation was extensional unroofing. The extensional formation of the core complex structure is evidenced by the cataclasites developed on detachment faults. Youngest extensional detachment with cataclasites overprinted the contact of basement core complex with the Neogene sediments (cataclastic breccias were misinterpreted sometimes as basal clastic sediments). Therefore, the Neogene sediments appear to be detached during the core complex exhumation. This assumption is also supported by FT results, which provide a different type of zircon grains in Neogene syn-rift sediments having no young FT annealing typical for the core complex associations. In the seismic profiles, this detachment is expressed as a basin/basement reflector, which responds to the low-angle normal fault with roll-over growth of elevations in the Ptrukša Zone and Zemplín Unit. In this case, the East Slovak Basin was formed above extensional detachment (master fault), which gave rise as a consequence of core complex updoming accomplished by hangingwall normal faulting and subsidence.

Stratigraphic evidence and geochronological data on the IKU allow to interpret the time–temperature path. The cored rocks of the IKU were brought from the metamorphic depth (ca. 15 km) to shallow crustal level, or even to the near-surface position (their material was recycled to the Merník conglomerates). Thus, the complexes of the IKU appear to have been cooled and exhumed rapidly. The vertical displacement of the core complex started in the Upper Oligocene, with a high uplift rate and approached the zircon FT blocking temperature during the Early Miocene (~20 Ma). If the time of 30–20 Ma is assumed for the exhumation, the core complex reached the uplift rate of about 1.5 km/Ma. Such uplift rate is high, but obvious in the core complexes exhumed in the continent–continent collisional orogens.

The cooling age of the IKU is most consistent with zircon FT ages of the Rechnitz window. From this Penninic window, Dunkl and Demény (1991) reported the zircon FT data ranging from 15.1 to 18.5 Ma. Although that window is situated at the western margin of the Pannonian Basin System, the formation of both core complex structures was related to the same Early Miocene extensional period (Royden et al. 1983). The minor difference between the means of zircon FT ages in these windows could indicate some temporal shift of the main extension.

References

DUNKL I. and DEMÉNY A., 1991. Preliminary zircon fission track results in the Köszeg Penninic Unit, W. Hungary. Acta Mineralogica–Petrographica, Szeged, XXXII: 43-47.

ROYDEN L.H., HORVÁTH F. and RUMPLER J., 1983. Evolution of the Pannonian basin system: 1. Tectonics. Tectonics, 2: 63-90.

Sequence Architecture of the Central-Carpathian Paleogene Basin Inherited from Climatic, Eustatic and Tectonic Events

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The Central Carpathian Paleogene Basin (CCPB) has undergone a two 3rd-order cycles of initial transgression (TA 3.5–3.6 cycles sensu Haq et al. 1988), being successively filled up during a two 2nd-order cycles of deposition (TA4 and TB1 supercycles sensu Haq et al. 1988). The initial transgression was preceded by deposition of alluvial-fan and delta-fan sediments. Later on, the fluvial and deltaic sediments of the CCPB were flooded to coastal zone and than overlain by shoreface sands and carbonate platform deposits. Upper Lutetian transgression in the CCPB (Andrusov and Köhler 1963) led to shallow-marine deposition of nummulitic banks developed in two 3rd-order cycles (Bartholdy 1997). The nummulitic cycles of the CCPB disappeared due to inverse of the Late Eocene warm climate (introduction of TA4 supercycle). Climatic changes tend to the "Terminal Eocene Event", which corresponds to global cooling and glacio-eustatic regression (Van Couvering et al. 1981). Consequently, the extensive carbonate deposition on broad, warm shallow shelves was replaced by terrigenous sedimentation on bypassed shelf areas. The sediments from above the nummulitic limestones are depleted in $CaCO_3$ and enriched in organic matter. They contain abundance of cool-water coccoliths (e.g., *Isthmolithus recurvus, Zigrablithus bijugatus*), diatom oozes (Menilites) and Globigerina-rich fauna (Globigerina Marls). A small-scale intercalation of non-calcareous black shales and Menilites with Globigerina Marls reveals a short pulse of high carbonate productivity in the period of the terminal Eocene fertility crisis (precessional cycles).

Climatic control of depositional changes in the CCPB became less significant in time of forced regression. Nevertheless, the influx of cool water into the CCPB led to carbonate depletion and anoxicity in the Šambron "Beds". The appearance of Globigerina Marls in the deep-water siliciclastic deposits (Šambron "Beds") indicates the CCD drop described from about the Eocene/Oligocene boundary (Thunell and Corliss

1986). The falling stage of relative sea level is recorded by a Type-1 sequence boundary on shelves (between carbonate platform deposits and overlying formation), which were eroded by fluvial channels entering the basin through marginal delta-fed fans. During forced regression, the basinal slopes were actively tilted and incised by submarine valleys, which fed the basin-floor and slope fans. The Šambron fan (alike Tokáreň, Szaflary and Pucov fans, etc.) represents a lowstand systems tract consisting of channel-fill, spill-over and mass-failure deposits. The later stage of regression is evidenced by a progradational stacking of the Šambron "Beds" and by amalgamated sandstone unit (Bachledova Sandstone) representing a sandy toeset deposits of shelf-margin deltas (shingled turbidites).

The TA4 supercycle tends to gradual rise of relative sea level during the Lower Oligocene. Successive formation of the CCPB (Huty Fm.) respods to transgressive and highstand systems tracts. The transgression is marked by ravinement surfaces detected between Eocene Nummulitic banks and Middle Rupelian sediments of NP 23 Biozone (South Orava region) and locally as unconformity between growth-fault systems tract (Šambron "Beds") and overlying sequence of mud-rich fans. The basal sediments of the transgressive formation still revealed a cool-water influence and semi-isolation (wetzeliellacean dinoflagellates, reticulofenestrid species of NP 22–NP 23 Biozones, imprints of diatoms, etc.). The relative sea-level rising during the Lower Oligocene restored the Paratethyan circulation (Baldi 1984). Consequently, the CCPB became reoxygenated with increasing carbonate precipitation, productivity, fertility, etc. (calcareous claystones, abundance of cyclicargoliths, oxygen-related ichnocoenosis, etc.). Maximum flooding of this sequence falls into the condensed of manganese layers (the highest sea level occurred at 32 Ma – Haq et al. 1988). Late highstand of this formation is evidenced by small-scale progradational events and megaturbidite beds (Orava region). The Late Rupelian highstand sedimentation in the CCPB fits well with relative sea-level rise in the Outer Carpathian Basin marked by nanno-chalk horizons (cf. Krhovský and Djurasinovič 1993).

The TB1 supercycle was introduced by the Intra-Oligocene regression (distinctive drop in sea level at about 30 Ma – the beginning of the Antarctic glaciation and cooling of the Northern Hemisphere). The falling stage of the Late Oligocene regression in the CCPB is expressed by an offlap break of prior highstand sediments, which were eroded and reworked into conglomerate-slope accumulations of submarine fans (e.g., blocks of Mn carbonatic ores). Erosional truncation of the upper fan zones becomes less obvious towards the basin, inffered as correlative conformity between sand-poor turbidite system (Huty Fm.) to sand-rich turbidite system (Zuberec and Biely Potok Fm.). The sand-rich deposition of the CCPB lasted till the Early Miocene, as has been already indicated by some nannoplankton and foraminiferal species (e.g., *Helicosphaera scissura, H. kamptneri, H. cf. ampliaperta, Triquetrorhabdulus cf. carinatus?)*. The regression in the CCPB (as in the Paratethyan basins) reached the maximum lowstand at the base of the NN2 zone, when brackish fauna appeared (shallow-water brackish species of dinoflagellates – Hudáčková 1998, small gastropods, etc.). By this, the deposition of the Biely Potok Fm. should be terminated till the Early Eggenburgian, i.e. to the lowstand phase at the beginning of the NN2 zone, which preceded the next transgressive cycle of TB 1.5, occurred at the base of the Prešov Fm. The time-equivalent sedimentation in the Outer Flysch Carpathians also took place in lowstand setting, recorded by the Krosno Facies (Krhovský and Djurasinovič 1993).

References

ANDRUSOV D. and KÖHLER E., 1963. Nummulites, facies et dévelopment prétectonique des Karpates Occidentales Centrales au Paleogene. Geol. zborn. SAV, 14, 1: 175-192.

BÁLDI T., 1984. The terminal Eocene and Early Oligocene events in the Hungary and the separation of an anoxic, cold Paratethys. Eclogae geol. Helv., 77, 1: 1-27.

BARTHOLDY J., 1997. Mikrofazies und integrierte Bio- und Sequenzstratigraphie mitteleozäner mariner Ablagerungen am Nordrand des Tatra-Gebirges, Polen. Unpubl. Diploma Thesis FUB, Berlin, 80 p.

HAQ B. U., HARDENBOL J. and VAIL P. R., 1988. Mesozoic and Cenozoic chronostratigraphy and cycles of sea-level change. In: Wilgus, C.K. et al. (Eds.), Sea-level changes – an integral approach: SEPM Spec.Publ., 42, pp. 71-108.

HUDÁČKOVÁ N., 1998. Tertiary foraminifers and dinocysts from the Western Carpathians with special attention to the Vienna Basin. Thesis, Comenius University Bratislava.

KRHOVSKÝ J. and DJURASINOVIČ M., 1993. The nannofossil chalk layers in the Early Oligocene Štibořice Member in Velké Němčice (the Menilitic Formation, Ždánice Unit, South Moravia): orbitally forced changes in paleoproductivity: *Knihovnička ZPN*, 15: 33-53.

THUNELL R.C. and CORLISS B.H., 1986. Late Eocene – Early Oligocene carbonate sedimentation in the deep sea. *Developments in Paleontol. And Stratigr.*, 9: 363-380.

VAN COUVERING J.A., AUBRY M-P., BERGGREN W.A., BUJAK J.P., NAESER C.W. and WIESER T., 1981. The Terminal Eocene Event and the Polish connection. *Palaeogeogr., Palaeoclimatol., Palaeoecol.*, 36: 321-362.

Calcite Mylonites of SW Brunovistulicum

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Calcite mylonites, which can be used for the study of the final stages of Variscan collision, are developed between the basement and the allochtonous units of the Variscan Orogeny in Moravia. A profile across the frontal part of the orogen in SW Moravia is analysed for the assessment of trends in fabric evolution of the mylonitized limestones. The profile comprises the footwall of the Moravian nappes (the Závist–Květnice Unit of the Svratka Dome) and their close foreland (sedimentary cover of the western part of the Brno massif).

Strain magnitudes and geometries, palaeotemperatures, microstructures and lattice preferred orientation (LPO) are measured and correlated in many samples of the profile studied.