Biofaziesmustern, tonmineralogischen und geochemischen Analysen überein, die ein evaporitisches Milieu in der Salagou Formation anzeigen.

Körner, F. (1999): Sedimentologie und Geochemie der Perm-Klastite des Lodève Beckens (S-Frankreich): Fazies, Klima, Genese. - Diplomarbeit, 1-87, TU-Bergakademie Freiberg.

Nesbitt, H. W., Young, G. M. (1982): Early Proterozoic climates and plate motions inferred from major element chemistry of lutites. - Nature, **299**: 715-717.

Nmila, A. (1995): L'Empreinte du volcanisme dans le remplissage Permien du bassin de Lodève, Etude petrographique et geochemique implication metallogenique. - Thèse Doct. Univ. Pierre et Marie Curie Paris VI, spécialité Pétrologie - Géochimie, 202.

Odin, B. (1986): Les formations permiennes Autunien supérieur à Thuringien du „bassin" de Lodève (Hérault, France). - Thèse Doct. Univ. Marseille III, spécialité Géologie, 392.

New organic carbon and strontium isotope data for the Permian/Triassic boundary (PTB) from the Abadeh (Iran) and the Sosio Valley (Sicily, Italy) sections

Korte, C.*, Bruckschen, P.*,***, Kozur, H.**, Schwark, L.***, Hamdi, B.****, Leythaeuser, D.*** & Veizer, J.*,*****

*Institut für Geologie, Mineralogie und Geophysik, Ruhr-Universität Bochum, 44801 Bochum, Germany, **Rézsü u. 83, H-1029 Budapest, Hungary, ***Geologisches Institut der Universität zu Köln, Zülpicher Str. 49 a, 50674 Köln, Germany, ****Geological Survey of Iran, P.O. Box 13185-14494 Tehran, Iran, *****Ottawa-Carleton Geoscience Center, University of Ottawa, Ontario K1N 6N5, Canada

Isotopic composition of past seawater yields constrains on the evolution and interaction of biosphere and geosphere on geological time scales. This, in particular, is the case for $\delta^{13}C$ and $^{87}Sr/^{86}Sr$ compositions that reflect the interplay of biological and tectonic processes. The early reconnaissance studies (e.g. Peterman et al. 1970, Veizer & Hoefs 1976) were recently superseded by high resolution curves that were based on low-Mg calcitic fossils, such as brachiopods and belemnites, from stratigraphically well defined sequences (e.g. Korte 1999, Bruckschen et al. 1999, Veizer et al. 1999). For intervals with scarce low-Mg skeletons, phosphatic conodonts were utilized. The samples were screened by optical (microscope, CL, SEM) and trace element techniques (ICP-AES, PIXE, Bruhn et al. 1997) for preservation of their textures and chemical/isotopic signals. As a further advance on these studies, we measured the $\delta^{13}C$ values of sedimentary total organic carbon (TOC) and the $^{87}Sr/^{86}Sr$ ratios of conodonts from the PTB in Iran (Abadeh section) and Sicily (Sosio Valley), both well defined by conodont biozonation.

For strontium isotopes, we analyzed conodonts with a CAI (conodont alteration index) of 1 in the Sosio Valley and a CAI of 2 to 2.5 in Abadeh. The $^{87}Sr/^{86}Sr$ record is characterized by an increase from 0.7074 in the uppermost Permian to 0.7082 in the upper Lower Triassic. The $\delta^{13}C$ values of TOC from the Abadeh section vary usually between -24 and -26 ‰ (PDB) during the upper Permian, but decrease to -28.8 ‰ just below the Permian-Triassic boundary. Subsequently, within the lowermost Triassic conodont zone (*parvus* zone), they rebound to -25 ‰, oscillating afterwards between -24 and -26 ‰ (PDB). The uppermost Upper Permian sediments of the Sosio Valley section also show depleted TOC $\delta^{13}C$ values of -28.2 ‰ (PDB), followed by an increase to -26 ‰ in the lowermost Triassic conodont zone.

The negative shift in carbon isotopes coincides with the biggest mass extinction in earth history (Kozur 1998). This negative $\delta^{13}C$ shift may be due to re-oxidation of the extinct organic material. After the mass extinction in the uppermost Permian the $\delta^{13}C_{org}$ values increased by 2.5 ‰ during the lower Scythian. The Sr isotope record is generally related to tectonics and continental weathering, and the increase in $^{87}Sr/^{86}Sr$ ratios during the Upper Permian/Lower Triassic may reflect enhanced erosion and subsequent deposition of sediments rich in radiogenic strontium. This can be caused either by uplift of large continental areas or/and due to a world-wide drastic diminution of land plant cover on continents (also in wet climatic zones, world-wide Scythian coal-gap), a result of biotic crisis at the PTB.

Bruckschen, P. Oesmann, S. & Veizer, J. (1999): Isotope stratigraphy of the European Carboniferous: proxy signals for ocean chemistry, climate and tectonics. - Chem. Geol., **161**: 127-163, Amsterdam.

Bruhn, F., Korte, C., Meijer, J., Stephan, A., & Veizer, J. (1997): Trace element concentrations in conodonts measured by the Bochum proton microprobe. - Nucl. Instr. and Meth. in Phys. Res. B, **130**: 636-640, Amsterdam.

Korte, C. (1999): $^{87}Sr/^{86}Sr$-, $\delta^{18}O$- und $\delta^{13}C$-Evolution des triassischen Meerwassers: Geochemische und stratigraphische Untersuchungen an Conodonten und Brachiopoden. - Bochumer geol. u. geotechn. Arb., **52**: 1-171, Bochum.

Kozur, H. (1998): Some aspects of the Permian-Triassic boundary (PTB) and of the possible causes for the biotic crises around this boundary. - Palaeogeogr. Palaeoclim. Palaeoeco., **143**: 227-272, Amsterdam.

Peterman, Z. E. Hedge, C. E. & Tourtelot, H. A. (1970): Isotopic composition of strontium in seawater throughout the Phanerozoic time. - Geochim. Cosmochim. Acta, **34**: 105-120, Oxford.

Raup D. M. (1979): Size of the Permo-Triassic bottleneck and its evolutionary implications. - Science, **206**: 216-218, Washington.

Veizer, J. & Hoefs, J. (1976): The nature of $^{16}O/^{18}O$ and $^{13}C/^{12}C$ secular trends in sedimentary rocks. - Geochim. Cosmochim Acta, **40**: 1387-1395, Oxford.

Veizer, J., Ala, D., Azmy, K., Bruckschen, P., Buhl, D., Bruhn, F., Carden, G. A. F., Diener, A., Ebneth, S., Goddéris, Y., Jasper, T., Korte, C., Pawellek, F., Podlaha, O. G. & Strauss, H. (1999): $^{87}Sr/^{86}Sr$, $\delta^{13}C$ and $\delta^{18}O$ evolution of Phanerozoic seawater. - Chem. Geol., **161**: 59-88, Amsterdam.

Seismic interpretation and structural modelling of the Rotliegend along the northern limit of the Northeast German Basin

Kossow, D., Rieke, H., McCann, T., Ondrak, R., Strecker, M.* & Negendank, J.F.W.

GeoForschungsZentrum Potsdam, PB 3.3. "Sedimente und Beckenbildung", Telegrafenberg, 14473 Potsdam, *Universität Potsdam, Mathematisch-Naturwissenschaftliche Fakultät, Institut für Geowissenschaften, 14469 Potsdam

Following the cessation of compressive Variscan movement, Central Europe was characterized by a period of widespread basin formation accompanied by extensive magmatic activity (Ziegler 1990). In the study area, basin development is linked with activities along the TESZ, leading to a complex relationship between sedimentation and tectonics.

To study the Lower Permian basin morphologies and depositional architectures along-strike of the initial northern limit of the Northeast German Basin, an extensive database consisting of core material and a network of commercial seismic profiles have been used.

In the area several NW-SE-trending subbasins are developed. However, the internal structure of these basins and, therefore, the depositional pattern is controlled by the development of approximately N- to NE-trending half grabens reflecting E-W extension during this time. The observed structural style is interpreted as the brittle response to deep-seated ductile deformation along the NW-trending Trans-European Fault (Berthelsen 1992). Dextral crustal shearing had its near-surface expression in the development of N-trending normal faults.

Forward modelling using STRETCH (Kuznir et al. 1991) has been used to attempt to quantify the tectono-sedimentary evolution during and after the phase of extension. The program is based on the flexural cantilever model of continental lithosphere extension and is able to compute the complex interference pattern which is induced by the presence of many faults of different size, position and polarity along an investigated profile. Sediment loading, erosional unloading as well as compaction of the syn-rift sediments may be included. Furthermore, the post-rift phase which is mainly characterised by thermal subsidence can be calculated.

The analysis showed that extension by multiple faults has resulted in a complex interference pattern between the flexural footwall uplift and hangingwall collapse of each fault. In this phase of mechanical extension the basin geometry and deposition were largely controlled by the fault pattern resulting from the overall extension. Faulting led to rapid thickness variations across the tilted blocks producing a complex sedimentation pattern. The response to the subsequent post-rift stage was the gradual peneplanation of the fault-generated topography. In the study area post-rift thermal subsidence led to deepening of the basin and produced a simpler depositional pattern with a thickening towards the basin centre. The post-rift sediment package overlies the syn-faulted sediments and extends across the former basin margins.

By integrating geological and geophysical data, analysis of the depositional and structural development resulted in an improved understanding of the geodynamic evolution of the Lower Permian succession in the region.

Ziegler, P. (1990): Geological atlas of western and central Europe. - 1-239, (Elsevier) Amsterdam.

Berthelsen, A. (1992): From Precambrian To Variscan Europe. - (In: Blundell, D., Freeman, R., Mueller S. (Eds): A Continent Revealed - The European Geotraverse), 153-164, Cambridge University Press.

Kuznir, N.J., Marsden, G. & Egan, S.S. (1991): A flexural-cantilever simple-shear/pure-shear model of continental lithosphere extension: applications to the Jeanne d' Arc Basin, Grand Banks and Viking Graben, North Sea. - (In: Roberts, A.M., Yielding, G. & Freeman, B. (Eds.): The Geometry of Normal Faults London), Geological Society Special Publication, **56**: 41-60.

Neogene sequence stratigraphy of the Western Carpathian Basins

Kovác, M.*, Zlinská, A.***, Halásová, E.*, Holcová, K.** & Hudácková, N.*

*Dpt. of Geology and Paleontology, Comenius University, Bratislava, Kovacm@fns.uniba.sk, **Dpt. of Paleontology, Charles University, Prague, Holcova@prfdec.natur.cuni.cz, ***Geological survey SR, Bratislava, Zlinska@gssr.sk

Interaction of sea level changes and tectonics had an important influence on the paleogeography and paleoenvironment of the Central Western Carpathian basins. The depth and the shape of the basins were predominantly controlled by the main tectonic events. Eustatic oscillations, reflected in coastal onlaps were followed mostly by the rise of water paleodepth in offshore environment. The correlation of the constructed curves for the coastal onlap and predicted paleodepth with global reference curves (Haq 1991) shows some discrepancies, predominantly caused by tectonic events during the basin development.

In contradiction to the Burdigalian continuous relative sea level rise in the Mediterranean (TB 1.5 and TB 2.1 cycles), the paleoenvironment of the Vienna and East Slovakian Basins has been changed from deep water high-energy to shallow water low-energy due to the compressive collision tectonics in the front of orogen. The Late Egerian - Eggenburgian transgression (zone NN2) was followed by deepening of the sedimentary environment. The Ottnangian marine ingressions observed in the back arc area (Novohrad - Nógrad Basin) can be related to highstand conditions. Latter on, during the Late Ottnangian (zone NN3) a brackish paleoenvironment has been developed in the Vienna Basin. In the East Slovakian and Novohrad Nógrád Basins the uplift was associated with hiatus or deposition of terrestrial coal bearing formations.

The Karpatian transgression (zone NN4) and highstand depositional system can be correlated with transgression and global sea level rise of the TB 2.2 cycle. The intra-Karpatian sea level oscillations have a regional character and were tectonically controlled during the stadium of initial rifting in the Western Carpathian basins. In the East Slovakian Basin the local sea level drop led to salinity crisis. The following Langian sea level change of the global TB 2.3 cycle (zone NN4) is observable only in the East Slovakian and Nógrád - Novohrad Basins. In the Vienna and Danube Basins the erosion of uplifted areas or terrestrial deposition in depressions occurred between the Late Karpatian and beginning of the Early Badenian.

Pronounced Serravalian transgression followed by highstand is observed in the Vienna, Danube and East Slovakian Basins during the extensional synrift stage of development in the late Early Badenian and Middle Badenian (zone NN5). This relative sea level change can be correlated with the global TB 2.4 cycle. The falling stage and lowstand at the end of this cycle is expressed only in the East Slovakian Basin by the evaporite sedimentation. The next sea level change, which can be correlated with the global TB 2.5 cycle is proved by transgression followed by deepening of the sedimentary environment and stratification of water masses during the Late Badenian (zone NN6 - NN7 lower part) in all Western Carpathian basins.

The last well observed Serravalian global sea level change that can be correlated with the TB 2.6 cycle (sensu Haq 1991) was associated with Sarmatian transgression (zone NN7), highstand and gradual shallowing. The local sea level rises or falls were controlled by synsedimentary tectonics during the basin development.

The Late Miocene global sea level changes cannot by satisfyingly interpreted and correlated in the Western Carpathian basins due to their isolation and lack of relevant chrono- and biostratigraphical data in the Pannonian and Pontian deposits.

Haq, B.U. (1991): Sequence stratigraphy, sea-level change, and significance for the deep sea. - Spec. Publ. int. Ass. Sediment., **12**: 3-39.

Possible causes for the Permian-Triassic biotic crisis: palaeontologic and sedimentary evidences

Kozur, H.

Address: Rézsü u. 83, H-1029 Budapest, Hungary

The biotic crisis close to the Permian-Triassic boundary (PTB) is the strongest Phanerozoic biotic crisis despite the fact that it was often overestimated. The search for the causes of the biotic crisis around the Permian-Triassic boundary (PTB) requires the investigation of the exact scenario of the PTB biotic crises (extinction and recovery patterns among all major faunal and floral groups of all facies) and the exact global correlation of these patterns. It also requires consideration of accompanying geological phenomena (e.g., facies changes and their sedimentary evidences, climatic changes, age and character of volcanic activity around the PTB, changes in stable isotopes, the distribution and vertical range of the oceanic anoxia, possible evidences for cosmic causes). According to Kozur (1998a, b), the following extinction and recovery patterns can be observed:

- The (siliceous) plankton (radiolarians), and the warm-water benthos, nektobenthos and nekton were most strongly affected, whereas the cold-water faunas were not or slightly,