Well-log – based Correlation of Turonian – Lower Coniacian Depositional Systems in the Western Part of the Bohemian Cretaceous Basin: New Basis for Reconstructing the Basin History

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Well-log correlation has long been used in petroleum geology as an important stratigraphic tool; its usefulness and precision significantly increased with the onset of sequence stratigraphic methodology. In the Bohemian Cretaceous Basin, despite of an existing extensive well-log data base, this method has not been systematically used in stratigraphic practice or in research and/or industrial applications. The presented cross-sections represent a part of an ongoing, long-term research effort based on integrating geophysical and sedimentological data and focused on constructing a high-resolution, 3-D stratigraphic model of the infill of the Bohemian Cretaceous Basin.

The Turonian and Early Coniacian times represent the "mature" stage of evolution of the Bohemian Cretaceous Basin, characterized by siliciclastic wedges of deltaic systems that prograded from the fault-bounded basin margins and pinched out into distal, offshore through hemipelagic, facies. The next generation of cross-sections, to be finished in 2002, will include also data on the Cenomanian, as well as the Coniacian--Santonian stages of basin evolution.

In correlating the stratigraphically significant units and bounding surfaces we followed the basic sequence-stratigraphic techniques and principles, with the aim to define essentially chronostratigraphic units. However, because sequence boundaries of the "Exxon" type are difficult to precisely localize and correlate in the coarse-grained deltaic facies, we chose an allostratigraphic division of the stratigraphic record, similar to the Galloway "genetic stratigraphy" – that is, our division is based on regionally correlatable flooding /maximum flooding surfaces rather than subaerial erosion surfaces and their correlative conformities.

The recently presented network of stratigraphic cross-sections has a number of applications. The most straightforward use is as a basis for detailed, physical stratigraphy of the basin, which in near future will be combined with existing biostratigraphy. Within this multistratigraphic framework, depositional geometries of sedimentary bodies are used, for example, to interpret the basinwide relative sea-level history, improve our understanding of behaviour of nearshore through hemipelagic depositional systems in time and space, or to reconstruct the detailed timing and magnitude of movement on individual, syndepositionally active fault blocks. An important area of recent application is a test data set used for constraining 2-D and 3-D numerical forward models of stratigraphic evolution.

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Kinematics and Succession of the Neoalpine Fault Structures of the Tisovec Karst and its Surroundings

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Overthrusting of the Muráň nappe is not sufficiently resolved, because the tectonic structure is complex and the latest research of the Murañ nappe points to problems of its internal duplex structure (Havrila 1997; Vojtko 1999; Vojtko 2000). Tectonic units building up the Tisovec Karst area are derived from the Meliata-Hallstatt ocean during the Late Jurassic collision and these units have been overthrust northwesternly at the present coordinates (Hók et al. 1995; Plašienka 1993).

The Late Cretaceous to Early Eocene tectonics is characterized by the north-south compression and under these conditions, synform and probably also antiform structures in the Muráň nappe have been formed. Evolution of these structures lasted from the Maastrichtian till Paleocene, as synform structures, Santonian to Campanian sediments are also incorporated but Priabonian sediments have colmated them (Marko 1993a). The brittle fault zone, named Muráň line, which cut off the synforms was established during this tectonic event. Fold plane dips of synforms are generally northward and their b-axes are east-west oriented (Vojtko 1999). Continuous north-south compression induced sinistral transpressional regime at the Muráň line along which carbonate lenticular bodies within the Scythian shales, with klippen tectonic style, have been formed. The fan--fault structures of the first generation were likely generated by sinistral movements along the Muráň line. These all tectonic structures were cut by the NNE-SSW Suché Doly fault at the end of compressional stage (Vojtko 1999).

During the Eocene and Oligocene, compression changed into an extensional regime. This tectonic regime induced a dextral transtension along the Tisovec fault and simultaneously the SW block subsided. The tectonic event is recorded in sedimentary filling of the Brezno depression by block sedimentation during the Priabonian.

Along this extension, the Lower Miocene compression followed, which induced destruction of the Paleogene basin as well as uplift of the surrounding mountains. This compression stage is not sufficiently documented, because of lack of exact data from the tectonic slickensides on the fault planes (Marko 1993b, Vojtko 1999).

The Miocene extensional tectonics is characterized by evolution of the Vepor volcano-plutonic complex, in which five eruption phases with various products of this volcanism were identified. The Miocene extension was E -W directed and it generated a normal fault system, which shaped the Tisovec Karst to asymmetrical graben structure (Vojtko 1999). These normal fault discontinuous zone served as way for migration of groundwaters northerly from the Suché Doly valley shallow holes to the Teplica karst spring in the Furmanec valley (Wiesengangerová 2000).

A very young tectonic activity was identified at the brittle Tisovec fault, which cut all the normal faults together with the Muráň line probably during the Plio-Pleistocene.The neotectonic activity of the Tisovec Karst area is very difficult to be identified, because the rocks younger than the Badenian are not known there. Quaternary alluvial sediments are of small thickness up to 2.5 m, locally, south of Tisovec, to 3.5 m. There are circumstantial evidences in the studied area which point to a neotectonic activity. The most important evidence are "seismites", documented by limestone block debris near the Tisovec fault. These blocks fell down from fault scarp of the fault zone. In the area of this tectonic zone morphological features are present, which proved neotectonic activity. The neotectonic movements influenced the course of the Rimava river and Strieborný potok stream and caused also geomorphological anomalies between Tisovec town and the Zbojská saddle (Vojtko 1999).

References

HAVRILA M., 1997. Vzťah hronika a silicika. Manuskript, archív GS SR, Bratislava.

HÓK J., KOVÁČ P. and RAKÚS M., 1995. Výsledky a interpretácia štruktúrneho výskumu Vnútorných Západných Karpát. *Miner. Slov.*, 27 (4): 231-235.

MARKO F., 1993a. Kimenatics of Muráň fault between Hrabušice and Tuhár village. In: M. RAKÚS and J. VOZÁR (Editors): Geodynamický model a hlbinná stavba Západných Karpát. Konf. Symp. Sem., GÚDŠ, Bratislava, pp. 253-261.

MARKO F., 1993b. Štruktúrne geologická analýza mýtňansko-tisoveckého zlomu medzi Breznom a Tisovcom. Manuskript, Kat. geológie a paleont, PriF UK, Bratislava.

PLAŠIENKA D., 1993. Structural pattern and partitioning of deformation in the Veporic Foederata cover unit (Central Western Carpathians). In M. RAKÚS and J. VOZÁR (Editors): Geodynamický model a hlbinná stavba Západných Karpát. Knf. Symp. Sem., GÚDŠ, Bratislava, pp. 269-277.

VOJTKO R., 1999. Geológa a tektonika Tisovského krasu a okolia. Dipl. práca, Kat. geológie a paleont., PriF UK, Bratislava.

VOJTKO R., 2000. Are there tectonic units derived from the Meliata-Hallstatt trough incorporated into the tectonic structure of the Tisovec Karst ? (Muráň karstic plateau, Slovakia). *Slov. Geol. Mag.*, 6 (4), in press.

WIESENGANGEROVÁ S., 2000. Hydrogeologické pomery Tisovského krasu. Dipl. práca, Kat. hydrogeológie, PriF UK, Bratislava.

Remarks to Main Tectonic Fenomena along the Northern Part of the Seismic Transect 2T

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The contribution is focused on regional tectonic problems based on re-interpretation of the seismic transect 2T, one of the dominant in the territory of the Slovak Republic presented in the Atlas of deep reflection seismic profiles of the Western Carpathians and their interpretation (Vozár et al. 1998,1999)

The already traditional question concerning the Tatricum unit basement is the Penninicum problem (Leško and Varga 1980) or the problem of unit representing function of the Penninicum here (Vahicum sensu Maheľ, 1981). The Penninicum represents a hypothethic unit in the Western Carpathians. None of the units belonging to the Flysch zone, which according to some ideas might represent Penninicum in the Western Carpathians, does not overlap the lineament of the Klippen Belt. Based on the deep seismic profiles (3T, 8HR, 6HR, 2T, G) it is not possible to interpret continuation of units belonging to the flysch zone toward the inner part of the Pieniny Klippen Belt.

The contact between the Tatricum and Veporicum, which are dominant units in the Inner Western Carpathians, is interpeted as a north-verged overthrust of metamorphic rocks belonging to the northern Veporicum on the prevailingly granitoid basement of the Tatricum in the southern part of the Ďumbier Lower Tatras (e.g., Koutek 1931). The originally defined Čertovica Line (Zoubek 1953 in Maheľ et al. 1964) as a tectonic contact of the Veporicum and Tatricum, was at the same time interpreted as a scar after reduced depositional area of the Krížna Nappe extended above the Veporicum basement (Biely and Fusán 1967).