Slovak Geol. Mag., 6, 2-3(2000), 85–87

Correlation of Lower Miocene deposits in the southern part of the Carpathian Foredeep in Moravia (Czech Republic)

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Abstract. Lower Miocene sediments, first of all the Karpatian, were studied on the basis of cores from drill holes, wireline logs and seismic reflection profiles in the southern part of the Carpathian Foredeep in the Moravia. Micropaleontological data were used for stratigraphic, paleoecological and paleogeographic conclusions. Pelitic sections with some psammitic beds of highly varied thickness were predominate. Depositional systems of the Karpatian sediments were classified as predominantly shallow water.

Key words: Carpathian Foredeep, Lower Miocene, Micropaleontology, Drill Logging

Introduction

The Karpatian period played an important role for the tectonic, basinal and facies evolution of the Carpathian Foredeep, representing a peripheral foreland basin. During the Karpatian, the areal extent of the foredeep widely stretched along the flysch accretionary wedge of the Outer Carpathians from the today´s southern Moravia to Poland (Cicha et al., 1989). Karpatian deposits are characterized also by considerable thickness. At the eastern margin of the Carpathian Foredeep, close to flysch nappes, their thickness reached 1 200 m (Čtyroký, 1991), therefore, a high sedimentation rate is estimated. Completely different opinions exist about detailed Karpatian stratigraphy and paleogeography of the Neogene basins on the periphery of Western Carpathians (Cicha, 1995; Jiříček, 1995 etc.). The most complicated situation exists in the southern part of the Carpathian Foredeep. The proposed preliminary correlation of the Karpatian deposits in the southern part of the Carpathian Foredeep is based on subsurface data (cores from drill holes, wireline logs, seismic reflection profiles), because of the absence of suitable outcrops. There were studied lithology, drill logs and micropaleontological assemblages of the borehole Mikulov-1 (Mik-1), Nový Přerov-1 (NP-1), Nový Přerov-2 (NP-2), Hrušovany-1 (Hruš-1) and cores including micropaleontology of the HV-304 Hrušovany nad Jevišovkou and HV-305 Slup (Fig. 1).

Results

Well logs are very important for destination of the lithology of strata, cores are necessary for the verification of interpretation. The help of the program – gdBase practiced reinterpretation of well logs of drills in southern part of the Carpathian Foredeep. This program works with geological, geophysical, laboratory and other necessary data. Well logs were vectorized by means of the digitization (NUMONICS) with the program Intergraph Microstation 5.0. Character of logs shows, first of all, basic type of drilled rocks and their lithological character, consolidation of sediments, deformation of rocks etc. Influence of clayey admixture is very significant especially on the Gamma-Ray Logs, the Electric Resistivity Logs and the Spontaneous Potential (SP) Log (Doveton, 1994). Character of the Neogene sediments is pelitic-psammitic. Predominant mudstones include sandy and sandstones intercalations. Pelitic rocks reach values of the Ra 2-16 ohmm (maximum), values of thinly sandy rocks increase to 25 ohmm. Values of GK of calcareous or thinly sandy pelites fluctuate about 13 –33 uR/h. Anomalous high values of SP are typical for several meters thick layer of sandstones. New litological interpretations in boreholes (Mik-1), (NP-1), (NP-2) and (Hruš-1) as shown in Fig. 2, e.g. dismemberment of the logging complex, resulted in possibility to correlate some parts of the Carpathian Foredeep (see interpretation).

Assemblages of foraminifers were studied from the boreholes Mik-1, NP-1, NP-2, Hruš-1, HV-304 and HV-305. Holzknecht (1978, hand published data) considered the assemblages of the Karpatian foraminifers from the whole profiles of Mik-1, NP-1, NP-2 and Hruš-1 such as the 1st zone of the Karpatian sensu Cicha & Zapletalová (1974). Microfauna is strongly reduced. Huge number of teleostei-bone fragments, strongly pyritized foraminiferal fauna, especially genera *Globigerina*, and diatoms, indicate the reductive environment of the sedimentation. Some horizons with huge planktonic pyritised foraminifers (genera *Globigerina*) change to the very reduced and pyritised sections. A correlation horizon with agglutinated forams *Bathysiphon* sp.+*Cribrostomoides* sp. were described in NP-1 and NP-2 boreholes. The microfauna in the lower part of HV-304 is also considered to the 1st zone of the Karpatian (Petrová, 1999). The upper parts of section HV-304 and HV-305 contain relatively rich assemblages of the Karpatian and it is considered to the 2nd

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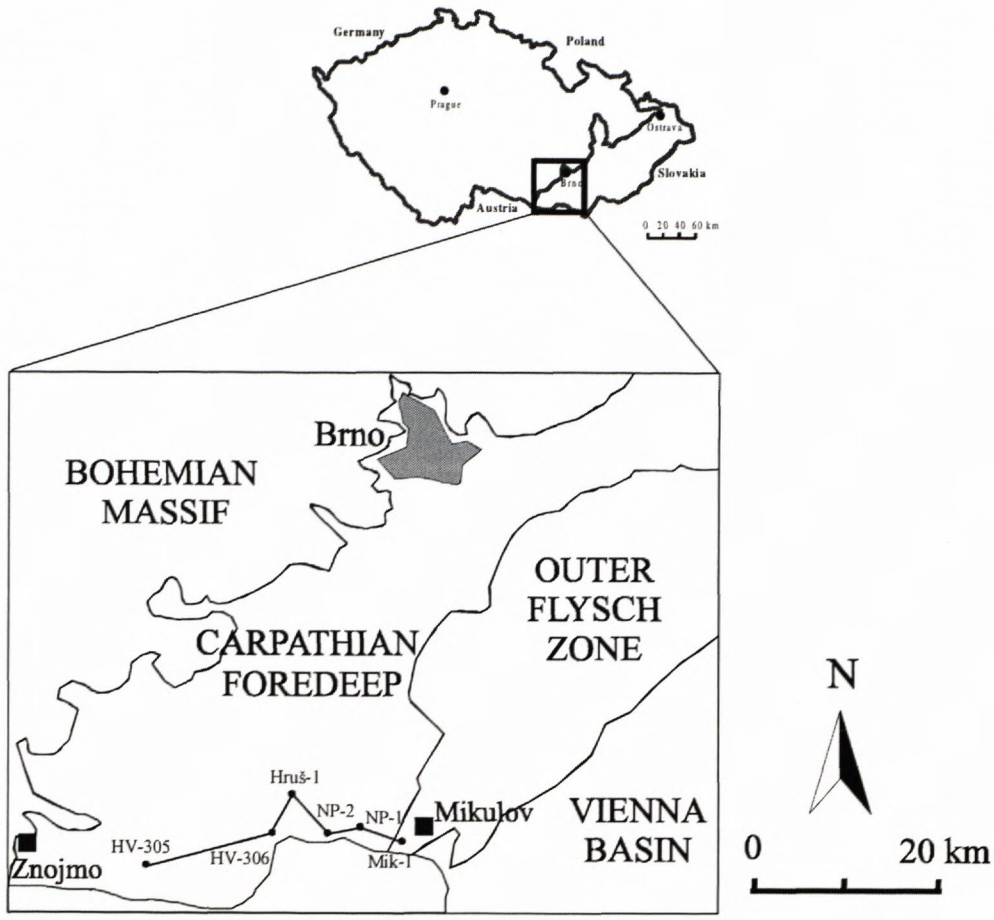

Fig. 1. Schematic map of the Carpathian Foredeep showing location of the boreholes

zone, so microfauna of HV-boreholes is conspicuously different as compared to a microfauna in Mik-1, NP-1, 2 and Hruš-1.

Typical shallow water assemblages were identified in the uppert part of HV-304 with the taxa *Heterolepa dutemplei* (d`Orb.), *Ammonia beccarii* (L.), *Valvulineria* sp., *Hansenisca soldanii* (d`Orb.), *Elphidium* div. sp. etc., plant fragments and molluscs tests. They indicate the proximity of the coast. Rather different shallow water foraminifers were described on the top of Mik-1, represented by taxa *Elphidium fichtelianum* (d`Orb), *Elphidium crispum* (L.), *Elphidum macellum* (Ficht. & Mol.), *Ammonia beccarii* (L.) etc.

Interpretation

Psammitic intercalations of the HV-boreholes is not possible to corelate with the psammits of the boreholes closed to Flysch nappes such as shallow water sediments on the top of the sequences. It is documented also by the foraminifera associations. Psammitic beds reprezented wedge-shaped deposits which were located in the eastern and western margin of the Karpatian basin. Some beds are products of storms, other sandy beds are products of shoreline deposition reflecting periods of shoreline progradation (Nehyba & Petrová, 2000). Depositional system was classified as predominantly shallow marine.

Microfauna, especially foraminifera, is in agreement with these results, too. Some psammitic sediments with shallow water fauna alternate to pelitic sediments with planktonic fauna. Some stratigraphic conclusion – this fauna represents important stratigraphic changes sensu Cicha a Zapletalová (1974) in a little area during the Karpatian. In our opinion, stratigraphic zones by Cicha and Zapletalová are not suitable for stratigraphic division of the Karpatian. These zones represent probably biofacial and paleoecological changes during the Karpatian sedimentation in the Carpathian Foredeep, not stratigraphic division.

Assemblages of the Eggenburgian and the Ottnangian are rather reduced, huge fragments of teleostei-bone predominate.

Large volumes of the Karpatian and Lower Badenian deposits, especially marginal deposits, were eroded. Karpatian deposits in the southern part of the Carpathian Foredeep were deposited in a single basin (Nehyba et al., 2000). Their complicated lithology reflects structural resemblance of the basin during this period. Multiple evidence of sharp – based sandstones is reflecting shoreline deposition in the outer (more distal) part of the basin (Nehyba & Petrová, 2000). Formation of the accommodation space, stratal geometry and facies distribution within the Carpathian Foredeep were predominantly governed by tectonic processes within the accretionary wedge. Important role was also played by sea – level changes and sediment supply.

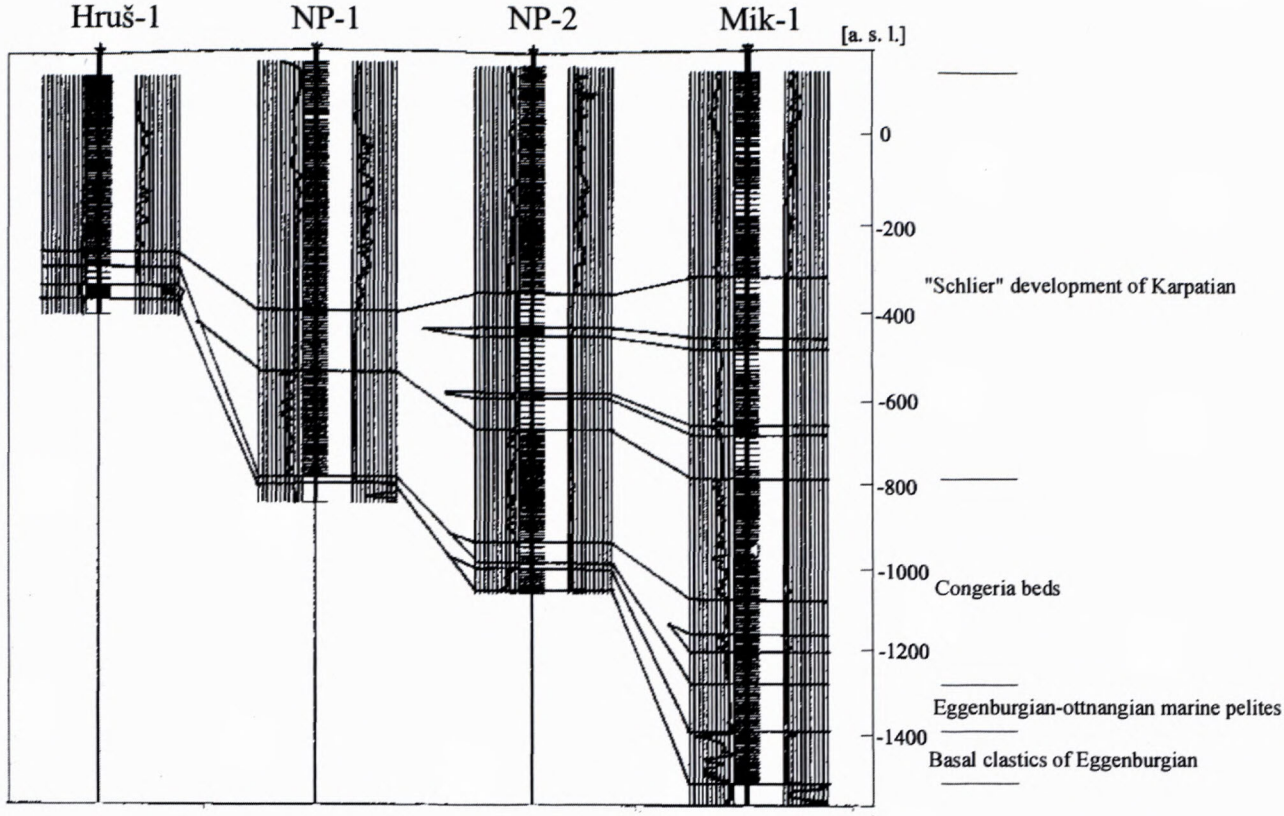

Fig. 2. Correlation of the boreholes Mik-1, NP-1, NP-2 and Hruš-1

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