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Paleogene autochtonous deposits at the basement of the Polish Outer Carpathians and their paleogeographical implications

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Abstract: The Paleocene through the Eocene/Oligocene autochthonous and paraautochthonous deposits from the Polish Carpathian Foredeep and those occurring below the Carpathian nappes could be correlated with autochthonous Paleogene deposits from Southern Moravia. They probably form a sedimentary infill of southeast trending paleovalleys, which supplied the northern part of the Outer Carpathian Basin at that time.

Key words: Paleogene, Western Carpathian Foredeep, paleovalleys, debris flow deposits

Introduction

Since the early sixties the autochthonous Paleogene deposits have been known from Southern Moravia on the slopes of the Bohemian massif. These deposits were pierced beneath the marginal part of the Western Outer Carpathians. They represent depositional fill of the Nesvalička and Vranovice paleovalleys (Picha, 1979), incised in the European plate during the Paleogene (Fig. 1). The Late Eocene-Oligocene sedimentary fill of those palleovalleys, up to 1500 m thick, is developed as organic-rich laminated mudstones and siltstones, and subordinatly as turbidites and debris flows (Picha & Stranik, 1999).

In the Polish Carpathian Foredeep the autochtonous Paleogene terrestrial deposits were documented by Moryc (1995) in a few boreholes located in the frontal part of the Skole Nappe near Rzeszów (Fig. 1). These deposits, up to 302 m thick, filled southwards dipping the post-laramian paleodepression (below 3200 m bsl) up to 20 km wide, cut in the Jurrasic, late Paleozoic and Precambrian platform basement. The Paleogene sequence consists of a 96-203 m thick basal, variegated coarse conglomerates, composed of clasts derived from the basement. The conglomerates are followed by the organic-rich mudstones with sandstone intercalations. According to dinoflagellata determinations the uppermost portion of this sequence probably represents the middle/late Eocene marine deposits (Moryc, 1995). The Paleogene strata in the Rzeszów area are transgressively overlapped by the Early Badenian deposits.

The remnants of the Oligocene-? Early Miocene autochthonos deposits are also known from the vicinity of Żory in Upper Silesia (Fig. 1). In that area the Menilite-like bituminous shales with fish scales were found above the Upper Carboniferous and beneath the Lower Badenian deposits (Oszczypko et al., 1989).

Results

The report of the Zawoja-1 deep borehole (Fig. 1) was published by Moryc (1989). Deposits reached at a depth of 4666.0-4825.5 m were defined as the Zawoja Fm. and assigned to the Lower Miocene age. This formation overlies the 33 thick, variegated, ?Lower Triassic deposits, underlain by the Upper Carboniferosus strata. The Zawoja Fm. is overlapped by the 259 m thick flysch olistoplaque (Sucha Fm.) composed of the Lower Cretaceous deposits (Gedl, 1997) followed by the Stryszawa Fm. (?Karpatian) with the flysch conglomerates of the Stachorówka Mb. at the base (Oszczypko, 1997).

The Zawoja Fm. is not homogenous, and according to our opinion its origin could have been connected with at least two different sedimentary environments. This formation begins with a thick layer of grey-greenish to black conglomerates (4825.5-4815.0 m). The fine to medium-grained, well rounded clasts are composed of quartz, quartzitic sandstones, slates and sporadically rusty limestones derived from the Paleozoic and Proterozoic basement rocks (Moryc, 1989, Laskowicz, 1997). The sandy-silty matrix is rich in coalified flakes. These conglomerates are followed by a 115 m thick sequence of dark coloured deposits, which display a few fininig and thinnig upwards sequences, 25-40 m thick (Fig. 2). The lower portion of these sequences are dominated by matrix-supported conglomerates. The matrix is represented by sandy, silty and clay material and contains considerable amount of organic matter and FeS_2. The clasts are composed of milky quartz, quartzitic-sandsones, fragments of slates, marbles and granites. The diameter of the clasts varies from granule up to 20 cm cobbles.

These conglomerates pass upwards into laminated mudstones with intercalations of dark-grey pebbly mudstones. At the depth interval 4779-4736 m among the

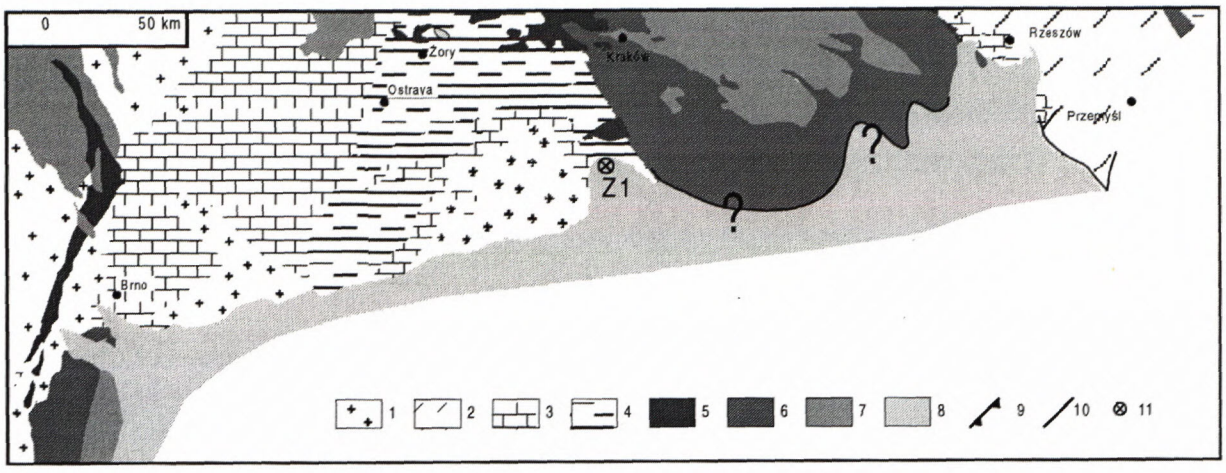

Fig. 1. Sketch map of the Pre-Neogene platform basement of the Western Carpathians (after Oszczypko et al., 1989, Moryc, 1995, and Picha, 1996, modified). 1 – Crystaline basement, 2 – Vendian-Cambrian metasediments, 3 – Devonian-Lower Carboniferous, 4 – Upper Carboniferous, 5 – Permian and Triassic undivided, 6- Jurassic, 7-Upper Cretaceous, 8 –Paleogene, 9 – Front of Western Carpathians, 10 – fault, 11-Zawoja – 1borehole.

massive pebbly mudstones a subvertically dipping (up to 80°) layers of dark laminated mudstones were observed. At a depth of 4751-4759 m the mesoscopic anticline was pierced. The core material from this interval displays parallel laminated dark mudstones with interclations of very thin-bedded (1-2 cm) and very fine-grained sandstones. The sandstones are composed of poorly-sorted, poorly rounded grains accompanied by plagioclases and biotites, indicating the short transport of these sediments. A characteristic feature of these arenites is the high content of the organic matter (cement) and clay minerals (matrix). The presence of pyrite (framboides on micas) indicates the reductive conditions of the sedimentary enviroment.

According to well logs, a low resistivity unit, 58 m thick, is visible above the conglomerate-mudstone interval (4736-4745 m) (Fig. 2). The core material from a depth of 4689-4697 m consisted of green calcareous-free siltstones with red, irregular lamination or hematite coating. At the top of this interval (4689-4691 m) the shales contained irregular, very thin layers of coarse-grained, siliceous and reddish sandstones with small clasts of green shales. According to Moryc (1989) in this interval thin veins of gypsum were present. The uppermost portion of the Zawoja Fm. (4666-4689 m) belongs to coarse-grained matrix supported polimictic conglomerates. (Fig. 2).

The Zawoja Fm. was examined for foraminiferal and dinocyst content. The dark mudstones (Z-22; Fig. 2) yielded only a few specimens of foraminifers. This fauna consisted of poorly preserved Cretaceous planktonic forms and agglutinated *Recurvoides* sp. and *Hormosina* sp. The green and variegated siltstones (Z-19) contained mixed, two-coloured specimens of the Late Cretaceous *Globotruncana* s.l. and agglutinated Early and Middle Eocene species *Saccamminoides carpathicus* Geroch and *Reticulophragmium amplectens* (Grzybowski).

Two uppermost samples (Z-18 and Z-19) were barren of dinocyst. All the other samples contained organic matter. The palynofacies were composed of variable ratios of black woody particles and plant tissue remains. Dinocysts

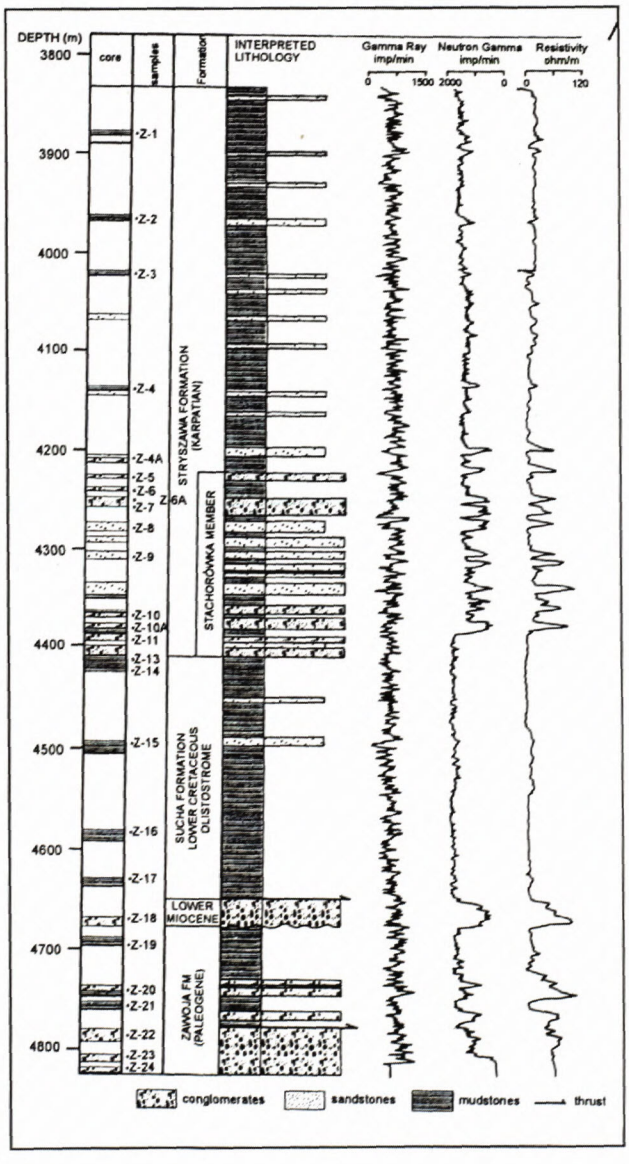

Fig. 2. Graphic summary of the Zawoja-1 borehole.

were rare. The following taxa representing Paleocene were recognized from samples Z-20 and Z-21: *Areoligera* spp., *Cerodinium diebelii*, *C. speciosum*, *Cordosphaeridium exilimurum*, *C. fibrospinosum*, *Hystrichosphaeridium tubiferum*, *Lejeunecysta* spp., *Oligosphaeridium complex*, *Operculodinium divergens*, *Phelodinium magnificum*, *Senegalinium obscurum*, *Spinidinium densispinatum*, *Spiniferites ramosus*.

Different dinocyst taxa determined as the Eocene-Oligocene were encountered from samples Z-22, Z-23 and Z-24: *Areosphaeridium?*, *Achomosphaera alcicornu*, *Cleistosphaeridium* sp., *Deflandrea phosphoritica* EISENACK, *Glaphyrocysta* sp., *Homotryblium tenuispinosum*, *H. plectilum?*, *Homotryblium* spp., *Impagidinium brevisculatum*, *Impagidinium* sp., *Lejeunecysta* spp., *Lingulodinium machaerophorum*, *Odontochitina* sp, *Operculodinium centrocarpum*, *Palaeocystodinium golzowense*, *Spiniferites mirabilis*?, *Spiniferites* spp., *Systematophora placacantha*, *Wetzeliella* spp.

Interpretation

Sedimentological features of the described sequence at the depth of 4825-4689 m suggest its marine origin related both to the cohesive and turbidite flows and to hemipelagic mudstones (green shales). The uppermost part (4666-4689 m) is represented by coarse-grained conglomerates of terrestrial origin.They resemble the Lower Miocene Stachorówka conglomerates of the Stryszawa Fm.

Thus, in the light of the above facts the Zawoja Fm. should be redefined. We propose to leave this name only for the marine-origin deposits, whereas the terrestrial conglomerates should be regarded as a different unit (Fig. 2).

Discontinuous coring and different age determinations of the same samples from the Zawoja Fm. s.s. impede its univocal interpretation.

The microfauna from the sample Z-19 documents the Lower/Middle Eocene age of the hemipelagic green shales, whereas dinocysts from samples Z-20 and Z-21 indicate the Palaeocene age of the pebbly mudstone unit. Beneath the depth of 4751 m the samples indicate the Eocene-Oligocene age of the lower portion of the Zawoja Fm. s.s. The older age of the upper part of the formation and the younger age assignment for the lower part could be explained by tectonic repetition (overthrusting). However, the sedimentary recycling of the microfauna and dinocysts from the interval 4689,5-4759 m cannot be excluded.

Assuming that there is tectonic repetition of the Zawoja Fm., it will be necessary to accept the post-Late Oligocene and prior to Late Burdigalian (Karpatian) inverse tectonics in the northern part of the Carpathian Foreland Basin. This tectonics was followed by erosion and deposition prior to the Old Styrian compression, which is manifested by the flysch olistoplaque of the Sucha Fm. (Oszczypko & Lucińska-Anczkiewicz, this issue).

In our opinion the Paleocene? to Oligocene autochthonous and paraautochthonous deposits from the Polish Carpathian Foredeep and below the Carpathian nappes could be correlated with the autochthonous Paleogene deposits from Southern Moravia (see Picha & Stranik, 1999). The deposits which were penetrated in the boreholes in the Rzeszów area and Zawoja–1 borehole probably represent sedimentary infill of the southeast trending palleovaleys. During the Paleocene through the Oligocene these paleovalleys supplied the northern part of the Carpathian Flysch Basin (Subsilesian and Skole subbasins).

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