

# Tectono-sedimentary features of the southern margin of the Orava–Nowy Targ basin (Poland-Slovakia cross-border): Their possible relationship with the Late Cenozoic Western Carpathians evolution

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The Orava–Nowy Targ (O–NT) basin could be treated as a crucial block in the puzzle of the understanding of the Cenozoic history of the Western Carpathians area. This basin is one of few records of the tectono-sedimentary history that postdates the uplift and erosion of older structural units such as the Magura Unit, Pieniny Klippen Belt, Central Carpathian Paleogene and the Tatra block. Moreover, its sedimentological profile reflects geological events in the Podhale and Orava regions from the Middle Miocene until now.

The O–NT basin originated from the Middle Miocene as a tectonic depression overlying different Central and Outer Carpathians units. The subsidence trend is observed until present times, however tectonic inversion can also be found at the basin margins. The basin is considered as a pull-apart structure. Although some geophysical investigations have been done, the tectonic style of the basin is still not confirmed in details known.

During the sedimentary history, the O–NT basin was filled with thick series (more than 1.3 km in the central part) of diversified clastic deposits, from silts to gravels as well as with phytogenic deposits such as brown coals. The provenance of clastic deposits is considered to be mainly Magura and Podhale flysch units and less the Pieniny Klippen Belt and the Tatra Mts. The alteration grade of an autochthonic and detritic brown coal shows that the organic matter exposed now at the surface was buried at a depth of over 1 km. Moreover, the pyroclastic layers that are widespread in the basin can be used for dating and correlation.

Despite many years of basic geological, geomorphological and geophysical investigations the knowledge about the structure and evolution of the basin is still unsatisfactory. In last few years, good opportunity to expand studies on the basin infilling appeared due to strong erosion of Czarny Dunajec and Oravica rivers. In these rivers cuttings, long sections of unweathered Neogene

deposits and their contact with the O–NT basin basement have been exposed.

Recent preliminary investigations revealed some aspects of basin evolution in the southern part of the O–NT basin. Fine clastic deposits were observed in the outcrop of Oravica river near Čimhová at the basin boundary with the Central Carpathian Paleogene flysch. Such deposits indicate the lake and alluvial plain environments with general direction of material transport to S–SW. Relatively high-degree coalification of brown coal suggests thick overburden. It seems that at the time of sedimentation there were no nearby high-relief areas and the O–NT basin spread more to the south. After long time of sedimentation there was an episode of uplifting and erosion of the basin rocks, probably related with an uplifting of Skorušina foothills. Deposits at the Oravica outcrop show no evidence of tectonic activity at the time of sedimentation. Thick coarse clastic layers are exposed at the Bystry and Cichy streams and the Domański Wierch hill. The clasts lithology points to the nearby source area but not from the Tatra block. A synsedimentary tectonic activity east to this area is probable and should be distinguished from the tectonic activity related with the Domański Wierch uplift.

For future studies it is essential to acquire additional data on the structural evolution of the O–NT basin based on sedimentological and geochemical studies. Because the basin infill is mostly clastic, it shows what rocks were weathered and eroded in the region during the time of sedimentation. Size of clasts could indicate distance from source rocks as well as the intensity of weathering. Freshwater lake and river sediments show dynamics of environment thus allowing to interpret the terrain paleomorphology. Diagenesis of wide-spread brown coals and sediment compaction, supplemented by apatite fission-track method indicate depth/temperature of burial and can suggest time and conditions of uplifting of basin infill.