

Kaczawa Klippen Belt – geotouristic attraction in the Sudety Mountains, SW Poland

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ABSTRACT

In the paper authors present some geological sites from Kaczawa Unit, Sudetes, Poland, and their interpretation in a geotectonic context. All described geosites are important for understanding the evolution of so called Kaczawa Accretionary Prism as well as whole Sudetes. Presented outcrops are easily accessible, well exposed and exhibits high education value. Special attention was given to the Wojcieszów Limestones and their relationship to the surrounding rocks

Keywords: geotourism, geotectonic, Sudetes, Kaczawa Unit, olistolith.

INTRODUCTION AND OBJECTIVES

Noticeable increase of different geotouristic initiatives have been recently recognized in Poland. Few geoparks and geoeducational centers have been already established and some more are in the project phase. Numerous geological sites have been described and prepared for tourism and numerous publications and geotouristic maps are available. However, it has been noticed that not enough attention is given to processes which are responsible for rock formation. Also an information about geotectonic environment in which given rock had been formed are usually not presented in proper and understandable way. It is stipulated, that besides the ability how to recognize different rocks or minerals, it is also, or even more important, to understand the geotectonic position of a given rock. It is believed, that such a knowledge will help in understanding the whole earth as a one system.

In this paper authors would like to focus on the lower part of the Kaczawa Unit lithostratigraphic profile and present some valuable outcrops with geotectonic interpretation in the context of the plate tectonic theory and Wilson Cycle, with

special attention given to the Wojcieszów Limestones.

GEOLOGICAL SETTINGS

Geographically, the Kaczawa Unit is located in the south western part of Poland. Geologically, it belongs to the Western Sudetes and occupies most external, northeastern part of the Bohemian Massif. From the south - west the Kaczawa Unit is bordered by the Karkonosze Massif, which is considered as a eastern part of the Saxothuringian Terrane. The stratigraphic profile of the Kaczawa Unit comprises two distinct parts. The lower one of Cambrian to Lower Carboniferous age is interpreted as a accretionary prism formed during the final stage of the Variscian orogeny, while the upper part is represented by Upper Carboniferous and Lower Permian postorogenic sediments (Aleksandrowski et al., 2002).

The lower part of the Kaczawa Succession starts probably from the Gackowa Sandstone of tentative age of deposition. Based on recent investigations, both Late Proterozoic or Early Paleozoic ages are equally probable (Kryza et al., 2008a).

Those sandstones, known from several outcrops near Wojcieszów, are immature and exhibits typical shallow water structures like hummocky cross stratification. The Cambrian period is represented by pillow lavas and volcano-sedimentary succession. The Wojcieszów Limestone of Middle Cambrian age intercalated by metavolcanoclastic rocks are interpreted as a shallow water reefal limestone (Lorenc, 1983). The Radzimowice Slates exhibits characteristic features of turbiditic currents deposits. Previously they were interpreted as a trench fill (Baranowski, 1988), but recently considered as a deep water sequence deposited in the extensional settings (Kryza et al., 2008b). The Ordovician part of the litostratigraphic profile of the Kaczawa Unit consists different kind of metavolcanoclastic deposits and mixed, acidic and mafic volcanic rocks (e.g. Lubrza Trachytes) (Kryza et al., 2008a). Above them slightly metamorphosed pillow

lavas of Silurian age are present. They are covered by black Devonian siliceous shales, while Lower Carboniferous is build of melanges and flysch like sediments resembling culm facies.

GEOTURISTIC SITES

The Okole Hill is famous for Cambrian pillow lavas which can be found on the summit of the Okole Hill as well as on the northern and south-western slopes of the hill. The pillow structures sometimes are not fully preserved due to the metamorphic processes, however usually well visible.

The Wojcieszów Limestone outcrop in the narrow, west – east trending belt from Podgórkki to Mysłów. Those limestones are usually mapped as a different size bodies, ranging from kilometres to meters, which occur between slates or schists of Lower Palaeozoic age, mainly Radzimowice Slates (Fig. 1).

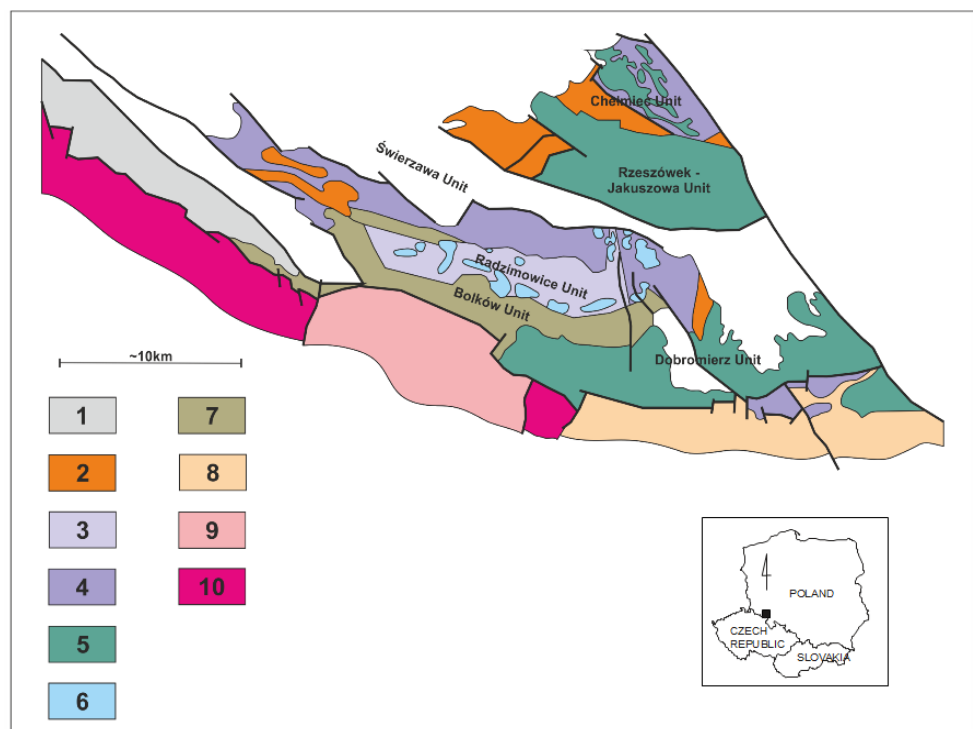


Fig. 1 Simplified geological map of the Kaczawa Unit (after Białek et al., 2007, with changes). 1 – limestones and metasedimentary rocks, 2 – chaotic complexes (melanges), 3 – Radzimowice Slates, 4 – metasedimentary and metavolcanic rocks (undivided), 5 – metabasalts, 6 – Wojcieszów Limestones, 7 - metavolcanic and metasedimentary rocks of the Bolków Unit, 8 – sedimentary rocks of the Intrasedetic Basin, 9 – Karkonosze granite, 10 – mica schists and gneisses

The most spectacular and outcrop of the

Wojcieszów Limestone is located in the

abandoned quarry in Wojcieszów in the southern slope of the Bielec Hill. In the western part of the outcrop a non-sedimentary contact between crystalline limestones and Radzimowice Slates can be directly observed. The character of the contact suggest that the body of the Wojcieszów Limestone forms a large scale olistolith between Radzimowice Slate (Fig. 2). Similar observation can be made in the western part of the Podgórk village, where smaller block of the

Wojcieszów Limestone was also excavated (Fig. 3), as well as in other outcrops near Mysłów. As a more resistant to erosion the bodies of Wojcieszów Limestone form a characteristic klippens in the landscape locally obscured by the vegetation.

The picturesque Lipa Gorge is located in Rzeszówek – Jakuszowa Unit in the northern part of the Kaczawa Unit. It is one of several gorges located in this unit. On the both sides of the gorge slightly metamorphosed Silurian - Devonian

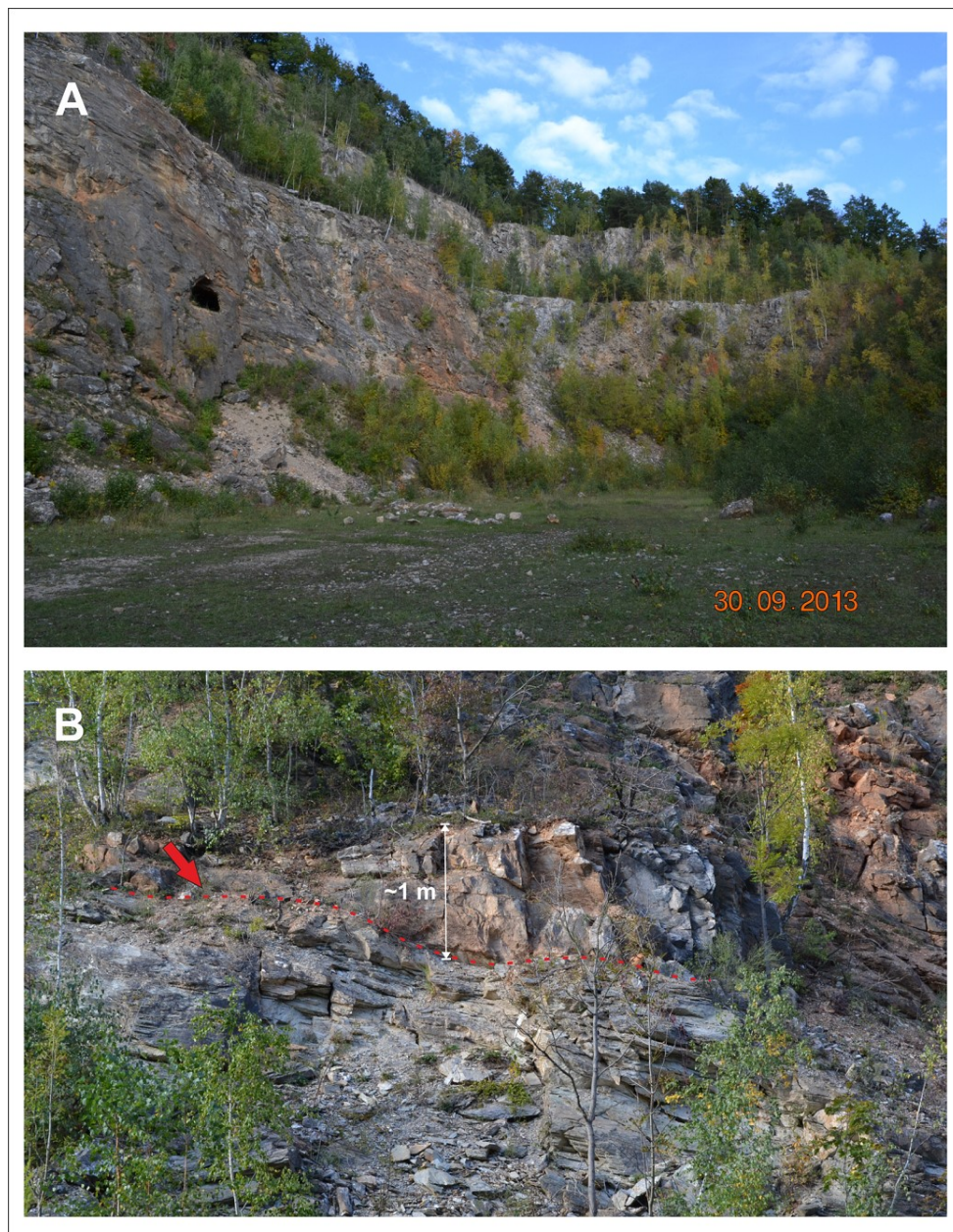


Fig. 2 The Gruszka Quarry. A – general view on the north wall of the quarry, B – nonsedimentary contact between Wojcieszów Limestone and Radzimowice Slates (marked with dashed red line)



Fig. 3 Medium sized olistolith of the Wojcieszów Limestone. Abandoned quarry in the western part of the Podgórci village.



Fig. 4 Silurian – Devonian pillow lavas of the Lipa Gorge.

MORB basalts with characteristic and well preserved pillow structures can be observed (Fig. 4).

The outcrop of Lower Carboniferous culm-like facies and chaotic complex can be found in the Rzeszówek village. In the central part of the village in the right bank of the stream a black and brown, intensively fractured shales are visible. In the upper part of the stream, in the northern part of the village, below the black shales the so called “Rzeszówek Melanges” complex is clearly visible. This complex is composed of deformed fragments of differentiated rocks (e. g. limestones, sandstones) within a shally matrix.

INTERPRETATION IN THE CONTEXT OF PLATE TECTONICS AND WILSON CYCLE

The lowermost part of the Kaczawa Unit is interpreted as a typical sequence of early rifting stage, which led to the open of the Rheic Ocean (Kryza et al., 2008a). The pillow basalts found in the Okole Hill

represents the early oceanic crust of the Rheic Ocean, while Wojcieszów Limestone and Radzimowice Slates are interpreted as a sedimentary fill of the basin. According to the published information (Lorenc, 1983) the Wojcieszów Limestones were deposited in the shallow- to very shallow water environment, however in the great distance from the coast, which may suggest a volcanic ridge settings. The Radzimowice Slates, as mentioned before, exhibits features characteristic for turbidites, thus may be interpreted as deep-water sediments. The emplacement of different size fragments of the Wojcieszów Limestone within Radzimowice Slates should be connected with submarine mass movements like slides or slumps, which are typically considered as processes responsible for olistolith formation (Fig. 5). The Ordovician bimodal volcanic sequence exhibits typical for early rift stage (Kryza et al., 2008a). The Silurian - Devonian MORB basalts of the Lipa Gorge represents remnants of the back arc ocean which had opened during closure of the Rheic Ocean and are interpreted as a equivalent of the

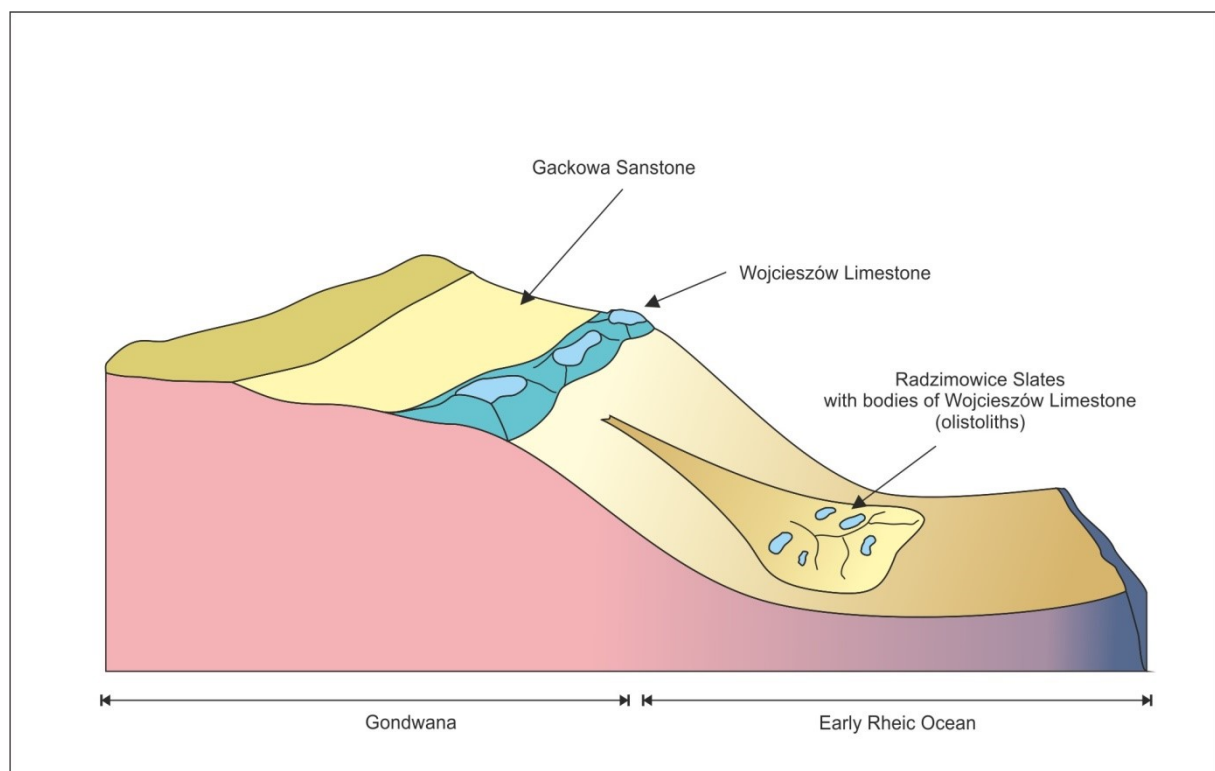


Fig. 5 Schematic model of Gackowa Sandstone, Wojcieszów Limestone and Radzimowice Slates sedimentation during Cambrian – Ordovician period.

Intrasudetic Ophiolite. The stage of Variscian accretionary prism building is represented by the “Rzeszówek Melanges”.

CONCLUSION

Because of the striking resemblance to the Pieniny Klippen Belt, especially in the context of recent advances in the interpretation of its formation (Golonka et al., 2014), it is stated that klippen formed by Wojcieszów Limestone should be named as a Kaczawa Klippen Belt. All mentioned above geoturistic sites displayed high educational values. The presented simplified interpretation covers only the geotectonic aspect. It is believed that many more geological subjects can be supported by those geosites. Authors suggest that all outcrops mentioned above should be precisely described and examined, so they can play a significant role in the education process.

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