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SEDIMENTARY BRECCIAS FROM THE CONTACT ZONE BETWEEN THE ŚWIEBODZICE DEPRESSION AND THE CIESZÓW UNIT (SUDETES)

Abstract: Breccias interpreted so far as epimetamorphic sequence occurring on the contact of the Świebodzice Depression and the Cieszów Unit were studied. Field investigations and detailed petrographic analyses showed that the breccias are of sedimentary origin. They represent sediments of submarine cohesive flows deposited not earlier than in the Late Devonian and are regarded as the basal breccias of the Świebodzice Depression sedimentary infill in the Cieszów area.

Keywords: sedimentary breccias; Cieszów Unit; Świebodzice Depression.

INTRODUCTION

The Cieszów Unit (CU; Fig. 1) is the smallest and structurally topmost tectonic unit of S part of the Kaczawa Complex (KC; Teisseyere 1968). It is built of thick epimetamorphic sequence of diabases, their tuffs and cataclasites of felsic volcanic rocks. Originally these rocks were interpreted as parts of older Palaeozoic basement of the Świebodzice Depression (SD; Berg *et al*. 1910; Dathe and Zimmermann 1912; Bederke 1924). According to the model of Teisseyre (1968), CU has been interpreted as a nappe of greenshists thrusted over from the north into SD basin and folded together with unmetamorphosed sedimentary basin infill.

CU is composed of two structural elements of lower order: Sady Górne Element (eSG) which trends W-E and borders on the north with Dobromierz Unit, and ellipsoidal Jaskulin Element (eJ) located further to SE and surrounded by sedimentary complex of SD (Teisseyre 1968; Fig. 1). Both units are separated by Sosnowica syncline (sS) built of D_3-C_1 deposits. The border zone of eJ and SD consists of peculiar lithological complex, composed of fragments of metamorphic and sedimentary rocks containing characteristic huge lenses of crystalline limestone. This complex was defined either as diabase tuffs (Berg *et al*. 1910) or chlorite schists (Teisseyre 1973) and was included into epimetamorphic members of CU. Because of common brecciation of rocks, in Teisseyre's model (1968), these rocks were interpreted as tectonic breccias which had developed under the nappes during thrusting. However, field observations in CU and detailed petrographic analyses made by the authors of this work indicate that the breccias have sedimentary – rather than tectonic – origin.

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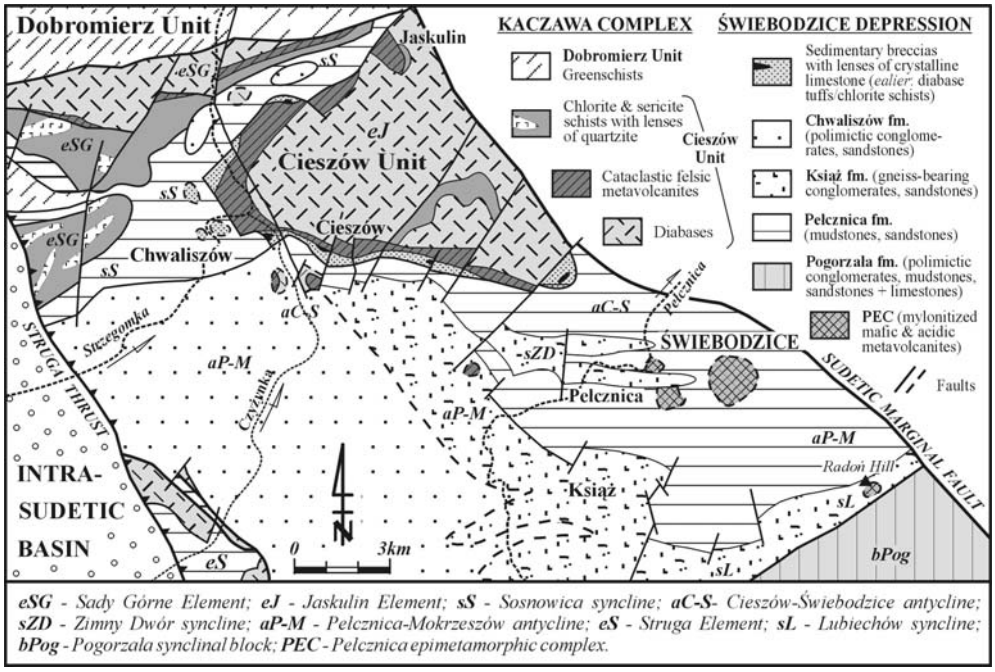

Fig. 1. Geological map of the central and northern parts of the Świebodzice Depression and the Cieszów Unit (Kaczawa Complex; modified after Berg et al. 1910; Teisseyre 1968).

PETROGRAPHY

The breccias are green in colour which derives from chlorite dispersed in matrix and from greenschist clasts. The framework constitutes 40-70 vol. % of the rock mass and is built of angular clasts, 1-7 cm in diameter (Fig. 2A). Calcareous rocks – grey, beige and reddish microsparite limestones, often with admixture of terrigeneous material (mainly quartz and feldspar, and tiny, irregular fragments of dark metavolcanics) are the dominant lithological varieties in the clasts. D_1-D_3 corals and crynoids were found in these limestones (e.g. Dathe and Zimmermann 1912; Gunia 1968). Less abundant are clasts of metamorphic rocks occurring in CU, i.e. of greenschists, felsic mylonites, and chlorite schists containing pumpellyite and stilpnomelane, as well as of rocks which recently do not occur in the vicinity of the investigated area – gneisses, mica schists with garnets, aplites, and granitic rocks. Clasts of sedimentary rocks (mudstones, greywackes) are rare.

In one of the quarries, cobbles of brecciated crystalline limestone, cemented with pale-green matrix occurred within the sedimentary breccias (Fig. 2B). The cobbles were mantled by several cm thick greenish envelope of mudstone rich in chlorite. Additionally, partly chloritized flakes of biotite were found in that rim. Within the angular pebbles of crystalline limestone, fine detritic albite, being replaced by pumpellyite, occurs. This feature is not observed in the cobble rim. RTG analyses of the rim show lack of very low grade metamorphism minerals (VLGM; e.g. pumpellyite, stilpnomelane) and zeolites (heulandite, laumontite).

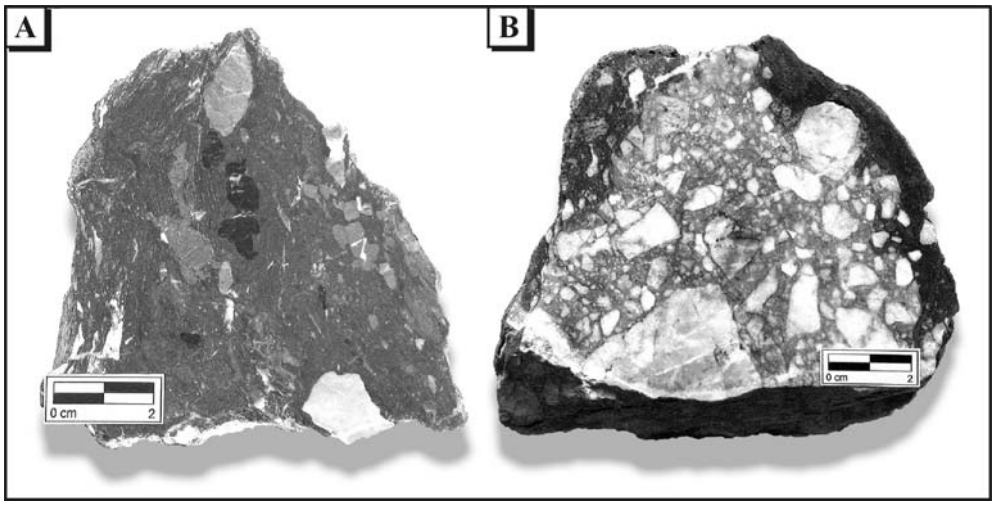

Fig. 2. A – Polimictic sedimentary breccia from the vicinity of Chwaliszów with visible fabric. Pale clasts – limestone, dark ones – greenschists. B – a cobble of crystalline limestone breccia enveloped in dark chlorite-rich mudstone from N margin of eJ.

The matrix of the breccia usually is built of fine-grained greywacke, with weakly visible lamination (Fig. 2A). It constitutes of quartz, albite, flakes of light mica, chlorite, occurring in various proportions, and additionally of garnets, rutile, biotite, sphene, and apatite. All constituents are cemented with calcite containing dispersed chlorite and locally Opq. Enrichment in chlorite is observed in the vicinity of greenschist clasts. Quartz and albite grains are strain free. There are no *in situ* recrystallized metamorphic minerals in the matrix. RTG analyses of the matrix in search of VLGM also provided negative results.

A characteristic feature of the whole breccias series is the presence of huge (20-200 m in diameter) lenses of crystalline limestone. At present, most of them do not exist at the surface due to almost complete exploitation in last two centuries. According to German papers (*op. cit.*), the limestones were medium- to fine-blastic rocks, white, grey or pinkish in colour, containing sericite-chlorite bands. Locally, quartz-feldspar-sericite assemblages impregnated the rock and the outer parts of the lenses were silicified and enveloped in a several cm thick chlorite mantle. No fauna remnants have been found in the limestone.

TECTONIC POSITION OF SEDIMENTARY BRECCIAS

So far similar sedimentary breccias were described by Dathe & Zimmermann (1912) from a crystalline limestone quarry in the central part of the village of Cieszów. The studies made by the authors of this paper indicate, that this facies is common, always occurring in the contact zone of D_3-C_1 sedimentary succession of SD and felsic cataclastic rocks belonging to CU. The whole sequence dips towards N, underneath metamorphic complex at the southern margin of eJ, and towards SE along NW margin of eJ. The dip varies between 65-80°. The thickness of the

breccias series varies between 0-200 m, and the thickest outcrops are observed at W margin of eJ, where sS has the largest width.

CONCLUSIONS

Lithological composition of rock assemblage interpreted on geological maps as diabase tuffs or chlorite schists indicates that the rocks are of sedimentary origin. It is evidenced by the presence of both sedimentary and metamorphic rocks of different ages in the framework and lack of VLGM minerals in the matrix. Additionally this is supported by the affinity of petrographical features of breccias' matrix with adjacent sedimentary rocks of SD and lack of tectonic structures typical for CU complex. The sedimentary breccias can be traced almost along the whole eJ margin, on the boundary between metamorphic rocks and D_3-C_1 sedimentary infill of SD. Rocks constituting the framework indicate that the sedimentary breccias are dominantly composed of local material which underwent relatively short sedimentary transport (angular pebbles). However, the cobbles of crystalline limestone breccias and of rocks which at present do not exist in the vicinity of eJ point also to redeposition of an older sedimentary cover. Fauna remnants documented in some limestone pebbles define the age of the breccias – to be not older than D_3. Summing up, the breccias are not of tectonic origin *sensu* Teisseyre (1968) but clearly of sedimentary genesis. Most probably these are deposits of submarine cohesive flows, and the presence of crystalline limestone olistolites within the sequence suggests that they are of olistostrome type. Because of common occurrence on the contact with metamorphic complex, the breccias are interpreted as basal breccias which document the beginning of sedimentation in SD in the Cieszów area. Thus, it should be excluded from the epimetamorphic complex of CU and, in consequence, reinterpretation of geological maps is required.

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