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METAMORPHIC RECORDS IN THE METASEDIMENTS FROM THE BYSTRZYCKIE MTS, WEST SUDETES

The Orlica-Śnieżnik dome is situated in the easternmost part of the West Sudetes. The western part of the dome, called the Bystrzyckie Mts, comprises a large orthogneiss body (the Śnieżnik orthogneiss) mantled by rocks of the Stronie formation. The latter mainly includes mica schists, paragneisses, basic and acid metavolcanics and marbles. The orthogneiss represents deformed and metamorphosed granitic body dated, using single zircon evaporation and SHRIMP method, at 495-515 Ma (Kröner et al. 2001). The Stronie formation, originally forming metasedimentary cover of the orthogneiss protolith is believed to be of the Late Proterozoic or Early Paleozoic age on the basis of micropaleontological findings (Gunia & Wierzchołowski 1979).

In the Bystrzyckie Mts, rocks of the Stronie formation form four separate outcrops described by Dumicz (1964) as individual tectonic units. From the NE to SW and from bottom to top of the structural sequence they are: Równia Łomnicka, Mostowice-Jagodna, Gniewoszów-Kamieńczyk and Niemojów-Czerwony Strumień units. The Stronie formation recorded a sequence of five deformation events (Szczepański 2001). The oldest D_1 structures are represented by the S_1 foliation preserved as inclusion trails mainly within plagioclase blasts. Subsequently, the S_1 foliation was deformed by F_2 isoclinal folds. The new S_2 foliation developed parallel to axial planes of these folds. Results of the first two events are best preserved in the rocks of the Równia Łomnicka Unit. The following the D_3 deformation phase was associated with reactivation of the older S_2 foliation. The newly formed complex $S_{2=3}$ foliation, the main planar structure visible in the rocks of the southern part of the Bystrzyckie Mts, dips steeply to W or SW. On the $S_{2=3}$ planes the N-S trending L_3 mineral lineation is developed. Evident and abundant kinematic indicators show top-to-the-NNE asymmetry. They document noncoaxial shear being the main component of the D_3 event. Thus, the D_3 episode was connected to the dextral non-coaxial shearing. Effects of the D_3 event are exclusively recorded in the Gniewoszów-Kamieńczyk and Niemojów Czerwony Strumień Units. The following D_4 deformation involved a regional scale folding which produced east-vergent F_4 folds. Finally, east-west trending F_5 kink-folds were formed by a brittle-ductile deformation at a shallow crustal level. Every tectonic episode except of the D_5 was connected with growth of new mineral assemblages. Consequently, it is suggested that

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investigated metasediments recorded four metamorphic events M_1 - M_4 related to four tectonic events D_1 - D_4 .

The present study is based on the petrological investigation of 80 thin sections. In order to establish PT conditions of metamorphism, mineral chemistry data (ca. 600 microprobe analyses) from selected 11 thin sections were used. The study samples were collected within the Równia Łomnicka (samples s3, s5, s16 and s25) and Gniewosów-Kamieńczyk (samples s22, s45, s63, s68, s78 and s82) and Niemojów-Czerwony Strumień (sample s54) units. These units represent the largest outcrops of the Stronie formation rocks in the studied area. Obtained chemical data were employed for P-T estimations by means of the garnet-biotite (Holdaway 2000), garnet-muscovite (Green and Hellman 1982, Chun-Ming et al. 2002) and plagioclase-muscovite (Green and Usdansky 1986) thermometers plus GPMB barometer (Powell & Holland 1988) and also phengite barometer (Massonne & Schreyer 1987).

Metasediments comprised in the structurally lowermost Równia Łomnicka unit underwent greenschist facies metamorphism. Peak temperatures calculated for these rocks, using the garnet-biotite, garnet-muscovite and plagioclase-muscovite geothermometers, vary in the range of 518 - 590 °C. The maximum pressures estimated with Grt-Pl-Ms-Bt geobarometer reach values of 8.3 - 9.9 kbar. These peak metamorphic conditions were probably achieved during the D_2 deformation event. In the Gniewosów-Kamieńczyk unit, overlying the Równia Łomnicka unit, peak mineral assemblages are related to the D_3 episode and form a typical Barrowian type sequence with biotite, garnet and staurolite zones. The garnet-biotite, garnet-muscovite and plagioclase-muscovite geothermometers produced values of 435 - 490 °C for biotite zone, 580 - 588 °C for garnet zone and 615 °C for staurolite zone. The phengite geobarometer yielded pressure of 4.9 - 6.4 kbar. Finally, metasediments comprised in the structurally uppermost Niemojów-Czerwony Strumień unit experienced amphibolite facies metamorphism. Peak temperatures calculated for mineral assemblages defining the D_3 structures in these rocks using garnet-biotite and garnet-muscovite geothermometers are scattered in the range of 615 - 650 °C. Pressures of 6.8 kbar were calculated using the fengite geobarometer for the same rocks.

Summing up, the tectonic units comprised in the Bystrzyckie Mts recorded different metamorphic conditions related to different tectonic events. Metamorphic record (M_2) comprised in the Równia Łomnicka unit, related to the D_2 event, was relatively HP/LT. In contrast, peak metamorphic conditions (M_3) recorded by rocks of the Gniewosów-Kamieńczyk and Niemojów-Czerwony Strumień units, related to the D_3 tectonic event, were relatively MP/MT. As yet no traces of the M_2 metamorphism were found in the Gniewosów-Kamieńczyk and Niemojów-Czerwony Strumień units. Consequently, it is still unclear whether those units underwent the same or different P-T path. The M_3 metamorphism in the southern part of the Bystrzyckie Mts developed the Barrowian type sequence probably under the D_3 transpressive regime. It was possibly associated with the postulated by Aleksandrowski et al., (2003) dextral strike-slip displacement along the contact of the Teplá-Barrandian and Moldanubian terranes.

Acknowledgements: The study was supported from a research grant of the Polish Research Committee 3 P04D 003 22.

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