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On the Genesis of Two Meridionally Trending Lineations in Rocks of the Orlica-Śnieżnik Dome: Evidence from Marbles of the Stronie Formation

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Character and kinematics of the meridionally trending lineations in the Orlica-Śnieżnik Dome (OSD) have been widely discussed and diversely interpreted. Because this lineation is composite tectonic feature (neglection of that fact can lead to erroneous, simplified conclusions) its interpretation has to be carried out with respect to the superimposed deformational events distinguished in rocks of the OSD. The very important aspect of this investigation is the correlation of N-S trending tight recumbent folds preserved mostly in metapelites of the Stronie formation and similarly, N(NE)-S(SW) trending stretching lineation observable mostly in orthogneisses. The N-S trending lineation in the Stronie formation is considered to be associated with the N-S trending tight folds (e.g. Teisseyre 1975, Don 1982). In gneisses, the regional elongation along N-S trending rodding lineation could be the result of either coincidental strain due to N-S tectonic escape induced by the E-W shortening (Żelaźniewicz 1988) or the NE-SW strike slip in transpressional regime (Cymerman 1997). Żelaźniewicz (1988) connects development of N-S stretching lineation with the early tectonic stage of the OSD gneisses evolution, whereas Cymerman (1997) assumes that all tectonic features of the gneisses developed during one deformational event.

On the basis on structural reconstruction and geothermometric calculations carried out for marbles of the Stronie formation it can be stated that the N-S trending linear structures observed in the rocks of the Stronie formation result from two separate events characterised by different metamorphic and kinematic conditions. This explains the ascertained occurrence of two lineations: (i) intersection and (ii) stretching, where each of them becomes locally dominant. Marbles were chosen because of their rheological properties allowing for a good distinction between tectonic features developed during consecutive tectonometamorphic stages. The earliest distinguished N-S trending lineation in marbles is defined

by the intersection of a tightly folded (F2) early metamorphic fabric S1 and the axial planar foliation S2 marked by the parallel alignment of flattened carbonates and plate- and needle-shaped silicates (Phl-Ms±Tr±Czo). On the folded planes, the intersection lineation manifests as frequently arranged thin trails of this new metamorphic lamination. On the exposed axial planes of tight folds F2, the lineation occurs as differently thickened and shaded bands, depending on the thickness and colour of the folded beds. The folding is interpreted to be induced by the E-W shortening leading to the lithospheric thickening (in accordance with Dumicz 1979). Tight folds formed during orogenic uplift related to relaxation of the lithosphere (also documented by the flattening of the inclusion trails in garnets in mica schists). At the onset of this uplift temperature peak of metamorphism in the upper amphibolite facies conditions took place.

The axial planes S2 are overprinted by locally observed new meridionally trending stretching lineation. This lineation is defined by elongated carbonate clasts and linearly accumulated carbonates in pressure shadows of less ductile domains e.g. boudinaged Czo porphyroclasts. Products of this tectonic stage have been recorded by locally developed dynamically recrystallized shear zones, which are characterised by strong grain size reduction and elongation of carbonate grains. Angular relations between developed S- and C'-type planes as well as geometry of σ-clasts point to top-to-the-N shearing along the reactivated former axial grain shape fabric. Due to progressive deformation rocks were locally transformed into the L-tectonite. These processes took place during retrograde conditions, at temperatures lower by ~100 °C than those accompanied with the folding stage. The top-to-the-N shearing recognised within the OSD can be correlated with the sinistral movements in the Złoty Stok – Skrzynka Zone, as stretching lineations in these areas have the same position in the sequence of deformation. This deformational stage could be possibly linked to NNE-directed thrusting of the OSD, when OSD interacted with adjacent domains. Within the OSD, the deformation was heterogeneous and partitioned into laminae, hence parallel to the former axial planes.

In conclusion, two generally N-S trending lineations could be distinguished in rocks of the Stronie formation. The orientation of the foremost intersection lineation delineates the Y-axis of the strain ellipsoid representing the tectonic stage related to the temperature peak of metamorphism. Formation of the subsequent stretching lineation was related to uplift and retrogression. Contrary to the intersection lineation, its orientation shows the direction of the maximum strain component. These observations could partially explain controversy regarding the presence of the mineral lineation nearly parallel to the fold axis. In orthogneisses, high temperature conditions, at which the rodding lineation was formed, point to its connection with the N-S directed tectonic escape induced by E-W shortening (according to Żelaźniewicz 1988). Transition from prolate to oblate shapes of the rodding lineation (Żelaźniewicz 1991) could be related to the flattening strain responsible for folding in the Stronie formation. Later top-to-the–NE reactivation at greenschist facies conditions (Żelaźniewicz 1991) concurs with the late shearing that gave the stretching lineation in the Stronie formation.

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Application of Newly Developed ArcGIS Software Extensions for Localization of Faults and Natural Zones of Methane's Escape by Morphotectonic Analysis (Moravosilesian Region)

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The framework of Variscan coal-bearing molasses represented in the Moravosilesian region by the Czech part of the Upper Silesian Coal Basin (USCB) was reactivated and modified by a sedimentary loading of the Inner Carpathian molasses and tectonic movement of accretion wedge of the Outer Carpathian nappes during the period of Alpine orogeny. The sedimentary and tectonic loading initiated significant rejuvenation of older Variscan structures. A lot of reactivated Variscan faults of the USCB were imprinted