Reinterpretation of the Intra-Sudetic Fault Zone

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The Intra-Sudetic Fault was recently interpreted as a deep, long-living fracture separating Caledonian and Early Hercynian segments (Don, 1990) or even as a suture zone between Baltica and Gondwana (Olivier et al. 1993). Aleksandrowski (1994) and Aleksandrowski et al. (1997, more references therein) proposed an interpretation of this NW-trending fault zone as a strike-slip generated by sinistral then dextral ductile shearing with more then 300 km offset.

The new results of structural and metamorphic investigations from a northern part of the Izera-Karkonosze Block (further referred to as the Izera block) and an adjacent part of the Lusatia offer some new information on the Intra-Sudetic Fault Zone. This refers to: (1) dynamic regimes of polyphase origin of this structure, (2) geometrical evolution during D_1-D_3 stages of ductile deformation, and (3) metamorphic path recorded by polyphase mylonites. The origin of the Intra-Sudetic Fault Zone can be explained in terms of a crustal interplay of the Izera block, adjoining Lusatia and Palaeozoic Kaczawa succession.

The oldest D_1 stage was connected with the beginning of uplift of the Izera and Lusatia region at Cambrian/Early Ordovician times, during or just after the ca. 500 Ma Izera granite intrusion took place (Korytowski et al. 1993). Intensive extension in the NE-SW direction developed a set of step-like ductile normal faults which are dipping to the NNE and NE at moderate to high angles. Such faults are recognisable all over the Izera block and are interpreted here as the structural evidence of a passive continental margin separating the crystalline basement from rift-related Lower Palaeozoic metavolcano-sedimentary rocks of the Kaczawa succession. More numerous mafic dikes cutting the extended Izera granites in the eastern part of the Izera block and the presence therein of high-pressure gneisses (Achramowicz, unpublished data) allow to conclude that it was uplifted higher then the western part. The disappearance of the Mirsk-Kamień and Zlotniki Schist Zones to the east confirms this conclusion. Moreover, the discovery of the high-pressure gneisses tectonically included into a greenschist facies mylonites of the Intra-Sudetic Fault supplies a geological argument that (1) Izera crystalline rocks underlay the Kaczawa Unit, (2) most of D_1 faults were tectonically rejuvenated, but only one of them, which has been placed at the lithological border of the Izera mylonite and Kaczawa metasediments, is now visible as a special tectonic line termed the Intra-Sudetic Fault.

Due to a progressive and asymmetric uplift of the Izera block, the younger ductile (D_2) stage of regional deformation polarised the reactivating motion in an oblique slip regime along the D_1 faults. To the east of Lubomierz two phases of reactivation on NW-trending faults were recognised. The older one is recorded by intense dextral oblique-slip faulting to the SE under upper amphibolite facies conditions. The younger one developed as the sinistral overprint under medium conditions of this facies. To the west of Lubomierz the D_2 sinistral oblique-normal shearing in the NW direction became more intense and rotated to the W and SW until a few NE-trending zones of oblique-normal-slip faults developed. They are located within the Lusatia granodiorite (e.g. Grabieszyce), Izera granite and cut their irregular magmatic contact. The biggest of these zones (c. 2 km wide) have been documented along Stankowice-Świecie-Nove Město line (Achramowicz, unpublished data) and is recognised here as a reason of disappearance of the all Izera schist zones (see the map). The NE-SW faults are thought to be a horsetail splay at the end (SW wall) of the Intra-Sudetic Fault, connected with sinistral shearing phase. The conclusion is that this structure does not have any NW continuation and a long distance transport along it proposed by Aleksandrowski (1994) and Aleksandrowski et al. (1997) is improbable.

The youngest D_3 stage of the regional ductile deformation was not a continuation of the dynamic processes which have produced D_1 and D_2 structures. Between the D_2 and D_3 stages P-T conditions decreased from medium amphibolite facies to medium/lower greenschist facies. The D_3 deformation (D_2 in Aleksandrowski's sequence) changed from a transpressional regime in the NNW-SSE to a N-S convergence due to the south-growing Late Variscan orogen (Wajsprych 1997). Structural records of this transpressional regime within the Intra-Sudetic Fault Zone are identifiable as the dextral oblique-reverse-slip faulting to the E and SE, zonally passing into thrusts to the S or SSW, accompanied by sheath folds and set of SW-asymmetric folds affecting both the Kaczawa metasediments and Izera gneisses across their boundary. The D_3 mylonites include mixed metasedimentary rocks and Izera granite on meso- and microscale. The D_3 structural expression of the Intra-Sudetic Fault was here recognised as the oblique dextral duplex structure, Late Visean or younger in age. Its western end is located in the area of the Lusatia granodiorite thrusts to the SSE over the Izera block and have continuation along the Kaczawa nappes obliquely stacked to the SSW. According to the structural data obtained, the eastern continuation of the Intra-Sudetic Fault Zone is debatable. It seems that this structure ends as a set of S-vergent thrusts forming a horsetail splay within the Kaczawa succession east of the Siedlęcin area.

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