Aspects of Geochemistry of the Zawidów Granodiorite and the Izera Granite - Arc to Rift Transition?

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Two generations of pre-Variscan granitic rocks can be distinguished in the Lugicum, a NE margin of the Bohemian Massif: - the Lusatian granodiorites, displaying ages around 540-585 Ma and the West Sudetes orthogneisses with ages of c. 450-500 Ma (Izera granites and gneisses, Rumburk Granite, Kowary Granite, Śnieżnik and Gierałtów metagranites).

Rocks of the Lusatian Granodiorite Complex (LGC) with mean $^{207}Pb/^{206}Pb$ ages of 540-587 Ma for idiomorphic zircons (Kröner et al. 1994), correspond to Cadomian phase of granitoid magmatism. Nd and Sr isotopic data support the interpretation of melting of Archean to early Proterozoic crust modified by mantle magmas for the origin of the Lusatian granodiorites (Kröner et al. 1994). The tectonic setting of the magmatic activity in the LGC is presently unclear. Kröner et al. (1994) regarded the LGC as igneous rock suites generated within active continental margin or continental intraplate settings. Late and post-collision settings were deduced for the LGC rocks by Żelaźniewicz (1997). The Zawidów Granodiorite (East Lusatian) and granodiorite gneisses, the so-called dark gneisses from Leśna, are easternmost constituents of the LGC. Major-element geochemistry of the Zawidów Granodiorite and granodiorite gneisses indicates a uniform peraluminous, calc-alkaline composition. ORG-normalised trace element geochemical patterns show enrichment in LIL elements with depletion of HFS elements typical of both volcanic-arc and post-collision settings (Pearce et al. 1984). Volcanic arc and post-collision calc-alkaline granites are distinguishable only by the high Ta/Hf and Ta/Zr ratios of the latter. A Zr-Hf-Ta triangular discrimination diagram (Harris et al. 1986) shows that the Zawidów Granodiorite and granodiorite gneisses have those ratios typical of active continental margin intrusions. It is noteworthy that Upper Brioverian greywackes intruded by the granodiorites have geochemical characteristic typical of continental island arc (Kemnitz 1994). A question arises to what extent inherited components of at least partly resorbed greywacke-pelite succession influence the position of the granodiorites in the diagram.

In the east the Zawidów Granodiorite and granodiorite gneisses combine with the Izera-Karkonosze Block (IKB). The character of the boundary between the LGC and the IKB is not yet ascertained. The Izera Granite, a western part of the IKB, intruded and partially replaced rocks of the LGC (Oliver et al. 1993, Żelaźniewicz 1997). Rb-Sr whole-rock isochrone provide age estimates of c. 450-500 Ma (Borkowska et al. 1980). Existing geochemical and isotopic data has led to conflicting interpretations regarding the geotectonic setting of the Izera Granites. According to Borkowska et al. (1980) and Kryza and Pin (1997) gneisses derived from anorogenic granites allied to a continental riftogenesis around 450-500 Ma ago. Oliver et al. (1993) claim that Izera Granite is an arc related batholith intruded into a continental shelf sedimentary sequence. The trace-element characteristic of the Izera gneisses resemble those of "crust-dominated" within-plate origin as well as the volcanic-arc granites of Pearce et al. (1984). According to the classification scheme of Maniar and Piccoli (1990). The Izera gneisses are typical of post-orogenic suites. Such rocks, not associated with only a single setting could be classified as post-collisional because they have the greatest range of sources.

It is difficult to establish the connection between the Zawidów Granodiorite and the Izera Granite because their structural, temporal, and geochemical relationships are obscured by deformation events and poor exposure. However, the existing geochemical data suggests changing tectonic environments during the Cadomian/Lower Palaeozoic magmatism and transition from active continental margin to post-collision settings is not excluded.

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