



Diachronous eclogite and granulite exhumation within the West Sudetes (Bohemia), Poland & Czech Republic

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Complementary $^{40}\text{Ar}/^{39}\text{Ar}$ thermochronometry and ion microprobe Th-Pb geochronometry conducted on two UHP / UHT terranes in the northeastern Bohemian massif reveals a probable two-stage exhumation mechanism diachronously occurring across the Sudete Mountains. Separated by less than 60 km, the Orlica-Snieżnik Dome (OSD) and the purportedly allochthonous Góry Sowie Block (GSB) are two fault-bounded high-grade terranes within the Sudetic complex that contain cm-dm scale eclogitic and granulitic assemblages. Geochronometric investigations of these two terranes detail similar, but discrete, metamorphism-to-exhumation histories beginning with a well-documented initial descent phase to depths of 75-100 km (Bröcker & Klemd, 1996; O'Brien et al., 1997). Within the western GSB, granulite-facies conditions are dated at 400 Ma (O'Brien et al., 1997), preceding peak eclogite-facies conditions in the OSD by 30 m.y (Bröcker et al., 1997). In both massifs, a stronger and more pervasive Barrovian overprint occurred during the ascent phase that was responsible for the observed structural fabric and predominant amphibolite-facies assemblages. Isothermal decompression caused widespread mid-crustal anatexis, resulting in migmatitic gneisses enveloping ultrahigh-grade blocks; partial melting also lowered rock viscosity and facilitated exhumation. Gneissic matrix from the GSB preserve ascent conditions of 0.65 GPa / 600-650 °C and record Th-Pb monazite ages of ca. 385-375 Ma; $^{40}\text{Ar}/^{39}\text{Ar}$ analyses from the same region yield hornblende cooling ages of 382 Ma and mica cooling ages of 373 Ma, signaling the rapid nature of this event. Consistent with the 30 m.y. disparity, metamorphic monazite ages from the migmatites of the OSD constrain midcrustal ascent (0.45 GPa / 550-600 °C) to 345-330 Ma coeval with rapid cooling as indicated by regional

$^{40}\text{Ar}/^{39}\text{Ar}$ white mica and biotite ages of 342-334 Ma. Notably, the GSB east of the massif-bisecting Sudetic Margin fault preserves a 337 Ma exhumation age more similar to that of the neighboring OSD to the south than of the adjoining western GSB (ca. 380 Ma). Preliminary monazite analyses conducted on the crustal-scale Niemcza shear zone, adjacent to the GSB, yields a range of Th-Pb dates from 380 ± 8 Ma to 283 ± 2 Ma, illustrating the protracted nature of this high strain zone. Moreover, the common ca. 380 Ma date between all three regions suggests the GSB allochthon was most likely emplaced at that time during final closure of the Rheic ocean. Final exhumation of the OSD was likely the result of vertical extrusion along the Stare Mesto belt during lateral Variscan shortening coupled with rapid erosional denudation.

References

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