whole accretion wedge so as inside Upper Silesian Coal Basin this thrusts display statistically conjugated (bi-vergent) geometry and kinematics. Corresponding back-thrusting is primarily limited along the western domain of flysh foredeep and partially also in the western part of Upper Silesian coal basin.

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Early Palaeozoic Syntectonic Migmatization Preceded Variscan Metamorphism in the Orlica-Śnieżnik Dome, Sudetes: U-Pb SHRIMP Evidence

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The Międzygórze structure is one of informal tectonic units in the eastern part of the Orlica-Śnieżnik Dome (OSD), West Sudetes, Poland. Within coarse-grained, augen orthogneisses (~Śnieżnik type), there is a ca. 6 km long and 1.7 km wide inlier composed of fine-grained, light to dark, banded or streaky, often migmatitic gneisses (~Gierałtów type), accompanied by isolated bodies of amphibolites (mainly retrograded eclogites) and eclogites. U-Pb and Pb-Pb datings of zircons from the OSD gneisses repeatedly yielded ages between 515–480 Ma interpreted as time of intrusion of their granitic precursors (Van Breemen et al. 1982, Oliver et al. 1993, Borkowska and Dörr 1998, Turniak et al. 2000, Kröner et al. 2001). All rocks in the OSD rocks underwent synmetamorphic shearing and mylonitization during Variscan orogeny at ca. 340–320 Ma (Borkowska et al. 1990, Brueckner et al.1991, Turniak et al. 2000, Lange et al. 2002, Marheine et al. 2002), which resulted in overall secondary parallelism of almost all lithological contacts and often imparted similar outlook to originally different gneiss variants. Combined with superposed foldings and geochemical similarities, all these have caused serious confusions and misidentification of gneiss variants, and provoked still open debate on their original relationships and timing of deformation, i.e. pre-Variscan and Variscan (Don 1977, 2001, Borkowska et al. 1990, Přikryl et al. 1996, Kröner et al. 2001), or exclusively Variscan (Turniak et al. 2000, Štipska et al. 2004). Kröner et al. (2001) were able to show that in the western part of the OSD an undeformed microgranodiorite vein dated at 492±35 Ma (Pb-Pb zircon) intruded the already gneissified granite (~514 Ma protolith age). This data needs to be verified, however, an early Palaeozoic tectonothermal event in the OSD cannot be viewed upon as a merely magmatic one. Similar conclusion, based on data from the eastern OSD, has recently been reached by Lange et al. (in prep.).

Our studies revealed that although augen gneisses and migmatitic gneisses outcropped in the Międzygórze structure display little differences in geochemistry, they differ systematically in modes and mineral phase (feldspar, garnet, mica) compositions, and differ significantly in fabrics and deformational histories (Grześkowiak and Żelaźniewicz 2002, Grześkowiak 2003, 2004). From the presence of (1) the isolated enclaves of migmatitic gneisses enclosed in the once porphyrytic granite (now augen gneiss), (2) the preserved intrusive contacts of the two rocks and (3) much simpler phase composition of feldspars in the porphyrytic granite, it has been inferred that the latter developed at the expense of a migmatitic suite via partial melting of the older crust. This requires migmatization coeval with the granite formation. An alternative view which assigns granite intrusion to the Cambro-Ordovician and migmatization to the Carboniferous (Turniak et al. 2000) is not substantiated by our field and textural evidence. To solve the problem a set of 5 zircon

samples carefully selected from structurally and lithologically different gneisses in Międzygórze was collected for U-Pb analyses with the SHRIMP II in RSES, Canberra. They represent: [1] fine-grained, polyphase deformed migmatitic gneiss, [2] fine-grained, streaky "homogenous" gneiss (Borkowska et al., 1990), [3] leucosome injection crosscutting both migmatitic gneiss and amphibolitized eclogite boudin, [4] coarse-grained porphyrytic metagranite (Śnieżnik augen gneiss) with weak constrictional fabric, and [5] enclave of a polydeformed migmatitic gneiss within the latter. The zircons from the leucosome injection which are prismatic with simple internal structure and oscillatory zoning typical of magmatic origin yielded ages clustering around 500 Ma. Few xenocrysts were dated at ~600 Ma and 540-535 Ma. Samples [1] and [2] have more varied populations of zircons, with more complex internal structure. Their rims yielded ages of ca. 502 and 495 Ma, respectively, and again few analyses recorded inheritance. The zircons from samples [4] and [5] proved to be most varied. Those with most internally complex structure have U-rich metamorphic overgrowths which yielded ages between 350 and 325 Ma (av. 343, 7 Ma). Other zircons, similar to those of samples 2 and 3, yielded ages between 508 and 476 Ma, and few inherited xenocrysts were dated at 635 to 586 Ma.

Our new SHRIMP II results are consistent with the previous reports on U-Pb and Pb-Pb zircon ages of ~515–480 Ma. However, the interpretations of earlier data failed to distinguish between various processes which occurred in that time span. Our sampling procedure for geochronological studies considered our field and laboratory data, has eventually allowed us for resolving these processes and argue for:

- two tectonothermal events, pre-Variscan and Variscan, in the history of the OSD rock units;
- character and significance of a single protracted tectonothermal event between 515 and 480 Ma;
- extensive HT migmatization in this time span, which in the Międzygórze structure affected both the earlier formed gneisses (~Gierałtów type) and eclogite boudins;
- coeval formation and intrusion of the augen gneiss (~Śnieżnik type) precursor developed via partial melting of the migmatized Neoporoterozoic crust,
- later metamorphism and intense shearing at ~343 Ma (350–325 Ma) heterogeneously overprinting all the rocks, yet not to the limit disabling detection of earlier events.

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Sea Mount as Strain Indicator. Szarvaskő Area, N Hungary

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In the Szarvaskő area two tectonic units are resting over the Bükk paraautochtonious. The Szarvaskő tectonic unit is a mid Jurassic (Árva-Sós 1989) complex, composed of MORB-like basic-ultrabasic rocks (Balla and Dobretsov 1984), shales and sandstones. The Monosbél tectonic unit is a complex composed of shales, cherts, radioloarites, oolithic sandstones, forming mostly olitostromes. The age of this complex vas determined from radiolarites as upper Jurassic (Csontos 1991).

In spite of that the upper Jurassic Monosbél tectonic unit is younger than the Szarvaskő tectonic unit, field evidences show that the Monosbél tectonic unit has lower position compared with the Szarvaskő tectonic unit. It has been reconstructed the volcanic build-up of the szarvaskő area as well, developing a distorted seamount structure, which rests over Monosbél tectonic unit.

Pinch and swell structures, boudines, suggests that the first, layer-parallel shistosity has been developed by an early burial metamorphism. The second shistosity is related by dinamic metamorphism and has enhanced the asymmetry of the formerly developed structures. Shear sense indicators as asymmetrical boudins, asymmetrical folds, asymmetrical pinch and swell (extended than shortened) structures show tectonic transport direction towards SE. In this way we can consider that the two units have been thrusted over the Bükk paraautochtonious from N-NW, in accordance with Csontos (1999), between the forming of the two shistosities.

Starting from the consideration that the seamount structures are circular features it can be estimated the bidimensional bulk strain as well.

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Permian Granites in the Southern Veporicum Unit (Slovak Ore Mountains)

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A Permian age of some types of granitoid bodies have been recognised according to an intensive research and dating in the Veporic (Kotov et al. 1996) and Gemeric tectonic domains (Kovách et al. 1986, Finger and Broska 1999, Poller et al. 2000).

Two principle granitoid types are present in the Southern Veporicum Unit:

1st: **A specialized two-mica peraluminous granite** and granite–porphyries of "Klenovec" type emerges northern of "Rimavica complex" of granitoids (Lower Carboniferous). Its composition is close to specialized granitoids of Ss type in the Gemericum. The age is defined according to EMPA monazite dating at **266±16 Ma** (Finger et al. 2003). The granite is enriched on Rb, B, U, Sn, W, Y and F. The Rb/Sr ratio is usually above value 3.5. The typical feature is the presence of Fe rich biotite, as well as turmalinization. Granite is forming stock–like body. Hraško et al. (1997) presumes its generation by dehydrating melting of biotite in the deep crustal horizons, simultaneously probably with contribution of heat from subcrustal source.

2nd: **Leucocratic muscovitic granites and aplites** are partly member of the Lower Carboniferous intrusions.