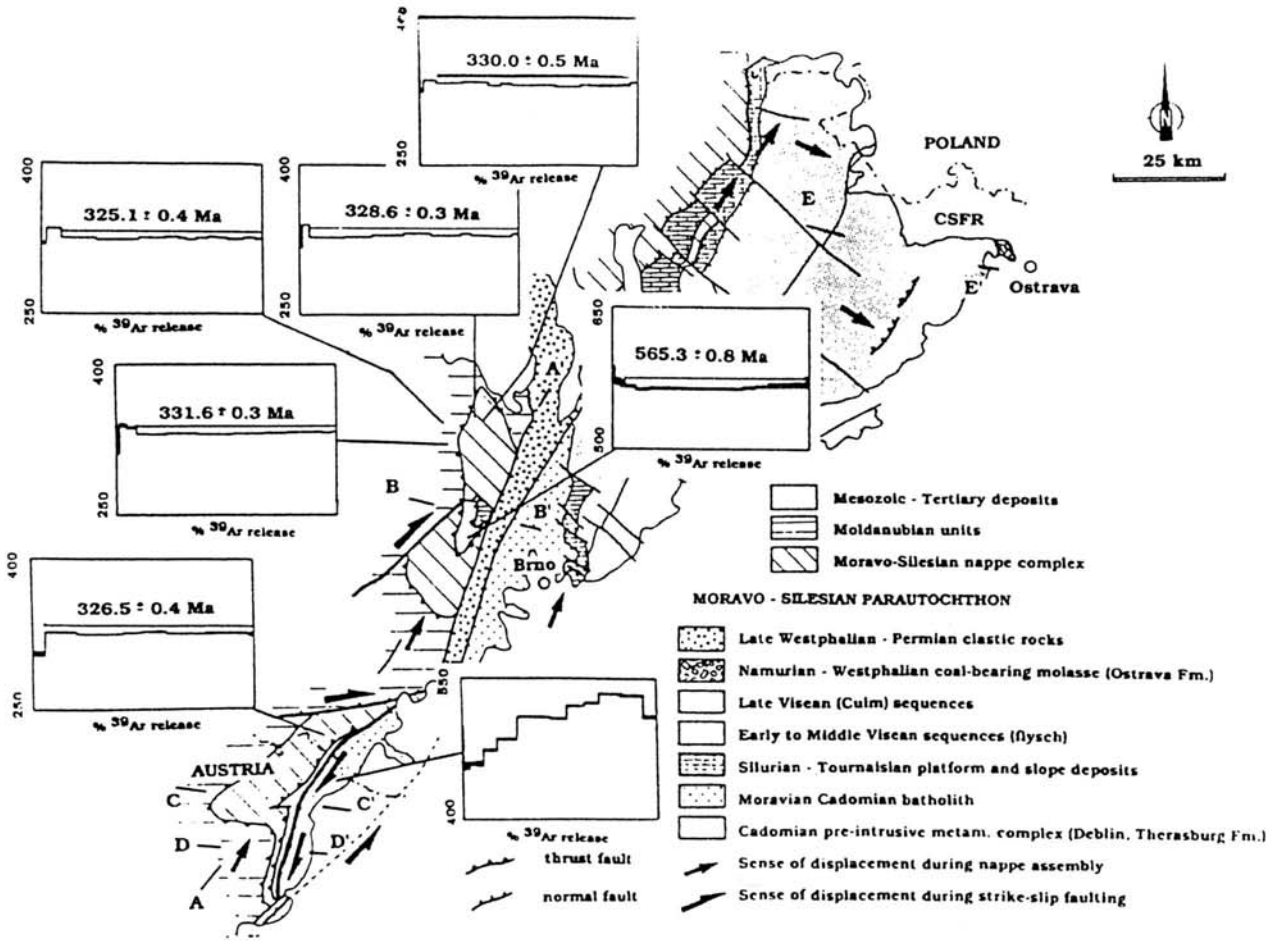

Fig.1. Simplified geological map of the southeastern Bohemian Massif with argon release spectra of muscovite concentrates.

A 1.38 Ga PROTOLITH AGE FOR THE DOBRA ORTHOGNEISS (MOLDANUBIAN ZONE OF THE SOUTHERN BOHEMIAN MASSIF, NE-AUSTRIA): EVIDENCE FROM ION-MICROPROBE (SHRIMP) DATING OF ZIRCON

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Zircons were extracted from the granodioritic, I-type Dobra orthogneiss, a main constituent of the granitoid basement of the southern Bohemian Massif. Tectonically the Dobra gneiss forms the base of the Varied Group or Drosendorf unit (Fuchs,1976). The latter belongs to the lower part of the Variscan (Carboniferous) nappe pile that developed during E-directed thrusting of the Moldanubicum over the Moravo-Silesicum.

Oscillatory zoning as detected by cathodoluminescence (CL) using a scanning electron microscope, demonstrate the magmatic origin of the zircons. Spots placed within magmatically resorbed zircon cores plot on the same discordia trajectory as spots run in the volumetrically much larger and uniformly shaped main population. Additionally, both Th/U ratios (0.21-0.59) and U-contents (ca.1000 -1500 ppm) are indistinguishable in these only existing, two magmatic zircon types. On a Concordia diagram all 'magmatic' spots plot concordantly to subconcordantly on a zero line discordia yielding an upper intercept age of 1377 Ma±10 Ma. This age is interpreted to reflect the emplacement age of the protolith of the Dobra gneiss (Gebauer and Friedl, in prep.).

Conventionally determined U/Pb multigrain analyses of specially separated, elongated zircons provide $^{207}Pb/^{206}Pb$ ages consistent with the ion–microprobe data. This supports the lack of pre–1.38 Ga old inherited zircons in the Dobra gneiss.

Analyses of the rare and very thin zircon rims being different in CL, Th/U and U–contents are interpreted to reflect Cadomian (ca. 600 Ma) and Carboniferous metamorphic overprints that are well known magmatic/metamorphic events in this region. Two monazite fractions extracted from a different sample of the Dobra gneiss yielded ages of 333±2 Ma. This Variscan age of metamorphism is identical with an age of 334±2 Ma for monazite fractions from still another sample of the Dobra gneiss (Friedl et al.,1992).

The Middle Proterozoic Dobra gneiss, possibly of volcanic origin (Frasl,1970), now represents a second occurrence of volumetrically significant pre–Cadomian basement within the European Variscides. It expands over similar areas as the Pentevrian crust of the N–Armorican Massif. However, in contrast to the Dobra gneiss recent SHRIMP data on zircons from two calc alkaline, I–type granodiorites of the Pentevrian crust (Isle of Guernsey) contain inherited cores that exceed the age of the comagmatic zircons, i. e. ca. 2040 Ma by about 100 Ma (Gebauer and D'Lemos, unpubl.). Interestingly, very similar zircon ages between 2048 Ma and 2061 Ma have recently been published for sirnilar granitic orthogneisses occumng in three small tectonic lenses within paragneisses in a distance of only about 80 km to the NW of the Dobra gneiss (Wendt et al.,1993). These three very small occurrences of orthogneisses as well as the much larger Dobra gneiss complex occur in tectonostratigraphic similar positions formed during SE–directed nappe transport that separates different lithostratigraphic units within the Moldanubian zone (Varied Group and Monotonous Group) from the tectonically underlying Moravicum.

Whereas a Gondwana derivation of both the ca 2.0 Ga – 2.1 Ga old Pentevrian crust in the N–Armorican Massif and the three equally old orthogneiss lenses approx. 80 km to the NE of the Dobra gneiss is very likely, its age of 1377 Ma rather argues for a derivation from Laurentia or Baltica. There are two lines of evidences for this: first, granitoids around 1.4 Ga are well known within N–America, i.e. Laurentia (e.g. Bickford et al.,1989, Graubard and Mattinson,1990 or Reed and Snee,1991) and in the Scandinavian Shield, i.e. Baltica (Gaal and Gorbatschev,1987 or Aberg,1989) and second: magmatic rocks around 1.4 Ga are to our knowledge not unambiguously detected in Gondwana–derived terranes. The latter is clearly supported by the age distribution of primary magmatic zircons extracted from various sediments and metasediments of the European Variscides (Fig.1) including also a paragneiss from the Regensburg Forest (Moldanubicum of NE–Bavaria). Together with the presence of many Panafrican zircons, the lack of zircons with ages around 1.4 Ga to 1.5 Ga (Fig.1) is the best evidence that most parts of the European Variscides were derived and recycled from Gondwana.

Thus, at the present stage of investigation the existence of a suture between the two supercontinents around the Moldanubian–Moravian boundary seems well possible. As rocks similar to the Dobra gneiss occur also within the adjacent Moravo–Silesian unit, the southern Bohemian Massif might well become the region with the largest detected amounts of pre–Cadomian crystalline basement within the European Variscides.

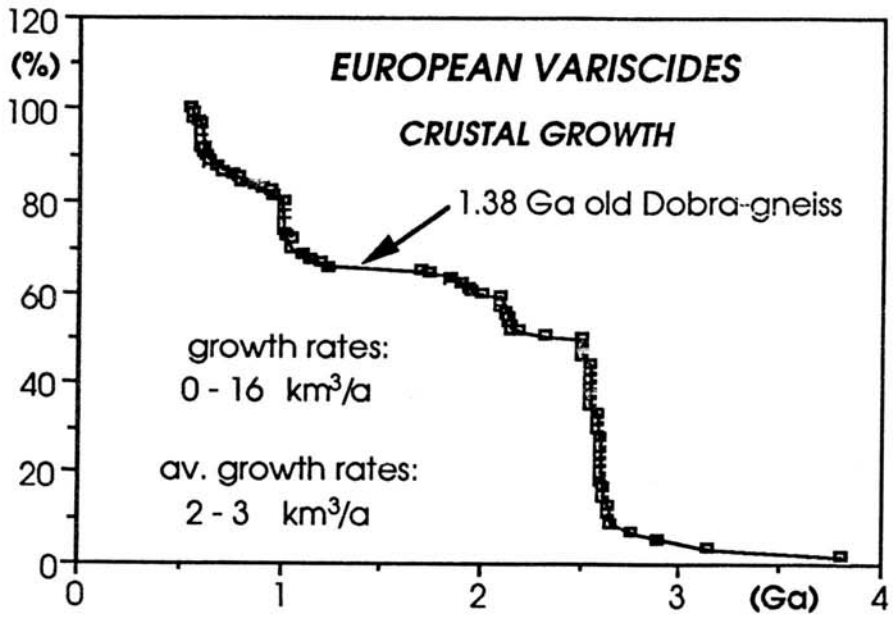

Fig. 1. Integrated crustal growth rates for the European Variscides based on primary ages of detrital zircons in Cambrian and Ordovician (meta)sediments (Gebauer et al.1989). The average age of the continental crust, based on the data above, is 1.9 Ga. The data are corrected for recycling and the much higher content of mafic crust in the Archean when compared to the post–Archean.