EVIDENCE OF VARISCAN GRANITES AND THE EVOLUTION OF THE VARISCAN CRUST ALONG THE DEKORP MVE-90 PROFILE (ERZGEBIRGE)

H.J. BEHR, W. CONRAD & R. TRZEBSKI

Institut für Geologie und Dynamik der Lithosphäre, Universität Göttingen, Goldschmidtstr. 3, 37077 Göttingen, F.R.G.

Late- to post-Hercynian granites occur widely, but sparsely throughout the Variscan Belt of Central Europe and are historically well known for their important mineral deposits. A reconstruction of the tectonic setting and the interpretation of the seismic dataset in the surroundings of the KTB drilling site (Oberpfalz) and along the DEKORP MVE-90 line (Erzgebirge) is inconceivable without the involvement of granitic magmatism. Even though various detailed petrological, geochronological and geochemical studies on the Variscan granites along the northern and northwestern margin of the Bohemian Massif have been accumulated during the recent years, the knowledge of emplacement, growth, shape and dimensions of the granitic intrusions still remains very poor.

Assessment of geophysical datasets along the DEKORP MVE-90 seismic section reveals that the significant gravity minimum of the Erzgebirge and adjacent areas is caused by large volumes of granitic material. Using gravity data for a determination of the amount of granites in the crust, it seems that up to 30 vol.% of the present-day crust (ca. 30 km) is occupied by granitic intrusions. In the Erzgebirge volumes of granitic material of nearly 54,000 km^3 have been estimated with thicknesses from 8-15 km, e.g. Eibenstock/Karlovy Vary Granite. Consequently, considerations for a reconstruction of the granitization processes, magma ascent and emplacement have been made. Thus, by assuming the calculated volume of the granites in the Erzgebirge, the required nature and origin of the protolith and the remaining residuals were derived, from which the pre-granitic Variscan crustal thickness was estimated to be >60 km. Two dimensional modelling yielded that the integrated thicknesses of the granitic intrusions were originally 12-20 km. Considering a granodioritic composition of the protolith and partial melting temperatures of 700-800 °C, melting rates of <20 vol.% will result. Magmas with such a melting rate cannot ascend due to viscosity. Therefore theoretical rates of 20-30 vol.% were derived for the melting of the granitic magma in the West-Erzgebirge.

The emplacement of the Oberpfalz Granites occurred for 325-310 Ma. Considering the cooling period (max. 10 Ma), the ascent (max. 10 Ma) and the melt formation up to ascent fertility (15-25 Ma), the position of the intrusions in the Variscan space-time evolution reveals their late- to post-orogenic history. The seismic data of the MVE-90 profile yield crustal thicknesses of 27-33 km in the Erzgebirge. Hence, attempts have been made to explain the processes which were responsible for the reduction of the pre-granitic Variscan crust from > 60 km to the present-day thickness. It seems reasonable that only post-variscan extensional tectonics could lead to this considerable thinning of the overthickened Variscan crust through collapse, exhumation and subcrustal as well as superficial erosion.

Extensional reflection patterns in the MVE-90 seismic sections, thinned crust, large volumes of late to post-orogenic granites, are merely some arguments for a significant post-Variscan structural evolution of the crust in the Erzgebirge.

HEAT AND MOTION DURING LATE VARISCAN MOUNTAIN BUILDING IN THE MOLDANUBIAN OF BAVARIA

J.H. BEHRMANN[1], P. O'BRIEN[2], D.C. TANNER[1], J. SCHUSTER[2]

[1] *IGL, Universität Giessen, Senckenber str. 3, 35390 Giessen, Germany*

[2] *Bayerisches Geoinstitut, Universität Bayreuth, Universitätsstr. 30, 95440 Bayreuth, Germany*

The Moldanubian gneisses of eastern Bavaria have recorded high-temperature metamorphism at low confining pressures during Carboniferous time. This type of metamorphic evolution is a widespread phenomenon in the Variscan belt of Europe, and is rare or absent in most other collisional orogens. Low-pressure, high-temperature regional metamorphism cannot be easily reconciled with conventional tectono-thermal models for convergent mountain belts with a cycle of burial by crustal or lithospheric thickening, followed by heating due to relaxation of isotherms, uplift and erosion.