Morphogenesis and tectonic position of Variscan granitoids in the eastern Oberpfalz and Bohemian Forest: Results of the gravity survey

R. Trzebski[1], H.J. Behr[1], W. Conrad[1] & H.J. Neugebauer[2]

1) IGDL-Göttingen
2) Geodynamik-Physik der Lithosphäre, Bonn

1. Aims of the project

Nearly 50% of the surface area in the surroundings of the KTB drill site are covered by Variscan granitic intrusions. Thus, in today's crust of approx. 40km thickness, volumes of up to 15% of granites are expected. Consequently, the tectonometamorphic, structural and related thermal features associated with the ascent and emplacement of the Variscan granites must have influenced significantly the crustal environment around the KTB.

For the assesment and modelling of magmatic processes at the NW-margin of the Bohemian Massif including volume and mass considerations implied by the emplacement of the Variscan granitic intrusions, additional geological and geophysical data are required.

Geological data are seldom reliable enough to quantify the three dimensional shape of granitic bodies in the crust. The interpretation of gravity data yields quantitative estimates of the subsurface shape of plutons as important constraints for emplacement dynamics.

2. Methods

a/ Gravity survey

To support the geological interpretation, a detailed gravity survey has been performed over an area covering the granitoids of the eastern Oberpfalz and Bohemian Forest (Fig. 1). The data set consists of 480 gravity stations recorded along 6 lines expanding over approx. 80km. The distances between the gravity stations have been usually reduced from 200m to 50m as density changes between the units have been expected according to the geological maps of the area. All stations include elevation measurments using a precision levelling altimeter.

The measurement coverage is largely appropriate to the contrast of the facies heterogenities. Densities have been determined on samples collected in the field and the results yield average densities 2.60 for the granites and 2.68 for the gneisses.

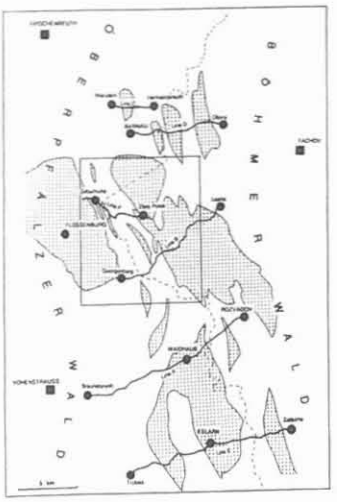

Fig. 1: Location map of the gravity lines

All stations have been connected with the gravity net of northern Bavaria (Plaumann, pers. comm.) as well as with the Czech gravity net (Mrlina, pers. assist.). After the usual gravity corrections, relative Bouguer gravity values for the 6 lines are obtained.

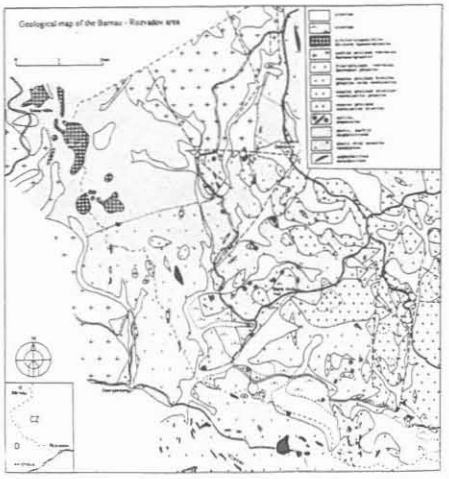

Fig. 2: Geological map of the Bärnau-Rozvadov area after Breiter (1994)

b/ Geological mapping

Beside gravity studies detailed geological mapping has been performed along the german-czech border under the conduction of Dr. K. Breiter from the Czech Geological Survey in Prague (Fig. 2). The main emphasis was to determine the contacts between the granites and the surrounding gneisses, which will be lately included as an important feature for the 3D-modelling of the gravity data. The mapping area extends partly over the granites of Flossenbürg and Bärnau in NW and covers the granites and the gneisses of the western part of the Rozvadov Massif.

3. Results

The presented gravity data set are preliminary results of the survey processed for Bouguer anomaly cross sections along the 6 recorded lines. Fig.3 shows the amplitudes of the relative Bouguer gravity curves projected over simplified geological cross sections.

The gravity data will be used for 2.5D and 3D modelling of the granitic intrusions and will be finally correlated with structures acquired the magmatic stage of pluton emplacement. The information provided by the gravity represents a valuable contribution to determinig the mode of emplacement of granitic intrusions.

According to geological mapping at least 3 generations of granitoids have been recognized within the Rozvadov Massif after preliminary geochemical and petrographic analyses. First results reveal a close geochemical and genetic similarities of the granitoids of the Rozvadov Massif with the granites of Flossenbürg.

Moreover, the intrusions show narrowly outcropping shapes, mostly elongated in N-S to NNW direction, a fact which support similar trending of the syn-granitic faults used for the ascent and emplacement of the magma. The granitic bodies are often associated and intruded by narrow pegmatitic and aplopegmatitic apophyses, which were partly used as source material for ceramic production

4. Conclusions

The measured gravity data reflect generally the negative gravity anomaly in the area between Tirschenreuth-Waidhaus-Rozvadov which is likely caused by considerable volumes of granites in the crust. The presence of granites along the lines is as well clearly characterized by gravity lows. Thus, according to the structures and shapes of granites mapped in the study area, large volumes of fault related granitoid intrusions are expected after 3D modelling of the gravity data.

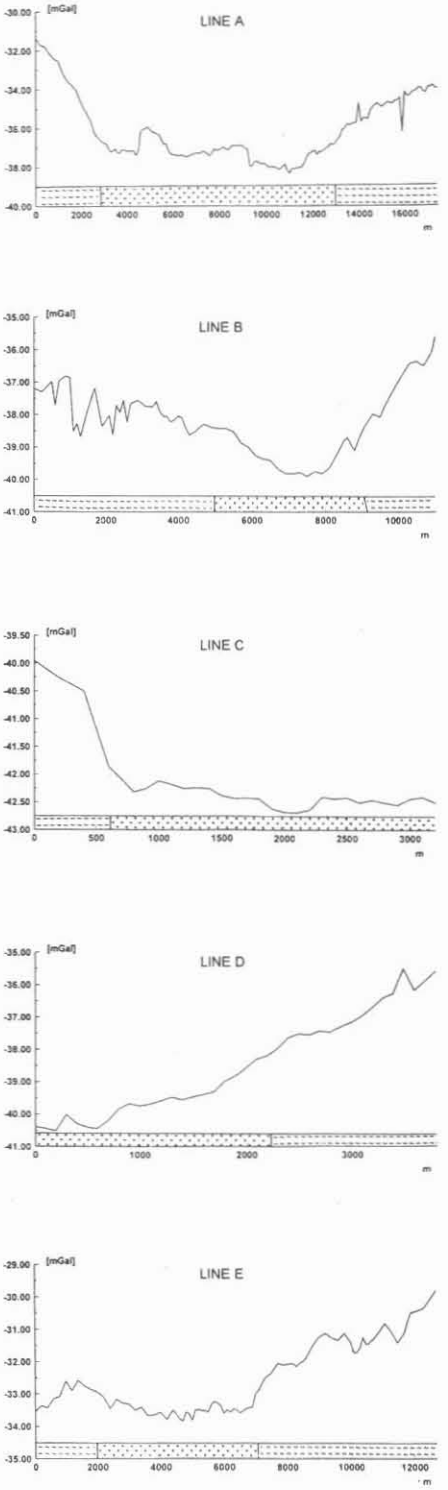

Fig. 3: 5 gravity lines as indicated in Fig. 1 (except Line F in prep.)

References:

Breiter (1994): Variscan Granitoids in Bärnau-Rozvadov area.- J.Czech Geol.Soc., 391.