of fabric acquisition of magnetite with respect to feldspar fabric pattern.

In conclusion the fabric pattern indicate that the trachyte is nearly symmetrical body and the distribution of magnetic foliation, lineation and degree of magnetic anisotropy is similar to fabrics of salt extrusions (e.g. Hormoz in Iran) rising as diapirs. High density of the interstitial crystals indicates the weak proportion of the magmatic liquid and consequently the regime of the visco-plastic deformation with significantly higher viscosity that predicted for viscous fluid (fibre slip model is suggested as the main deformation mechanisms during intrusion).

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Application of Gamma-Ray Spectrometry in Outcrop to Subsurface Correlation of Shallow-Marine Sandstones: Jizera Formation (Turonian) of the Bohemian Cretaceous Basin

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Field gamma-ray spectrometry (GRS) has the potential to objectively register small lithological changes and significant stratigraphic boundaries, which in outcrop may be difficult to recognize by standard sedimentological logging. This method is also suitable for correlation between outcrops and well logs.

In the Hradčanské stěny outcrop area near Česká Lípa (Bohemian Cretaceous Basin, North Bohemia), the Jizera Fm. is exposed in a series of outcrops of coarse-grained sandstone bodies. The degree of exposure is locally good, but the small size of most sections (between 15–20 m on average), post-sedimentary faulting, similar character of facies in different units and poor lateral correlation of sequence-stratigraphic boundaries in outcrop make it difficult to unambiguously correlate individual sequences over the area and further into the subsurface using conventional sedimentological methods. Therefore we use the field GRS to register and correlate regional stratigraphic events, in our case marine flooding events

Combination of lithological and GRS logging was used to describe individual sandstone bodies and bounding surfaces which separate them. These surfaces are characterized by abrupt decrease in grain size; however, immediately above the surfaces accumulations of gravel material (clasts size up to 10 cm) occur. These gravel layers represent a marked grain-size contrast compared to both the underlying and overlying facies. Extensive bioturbation, local cementation and high gamma-ray values characterize the bounding surfaces, interpreted as transgressive surfaces. Gravel accumulations are interpreted to have formed by wave reworking of earlier deposits during relative sea-level rise. An increase of energy in the depositional environment, coupled with a decrease in sediment supply, provided suitable conditions for passively filtering organisms and, consequently, more abundant bioturbation. Cementation at this surfaces is interpreted as of early diagenetic origin.

Individual sandstone bodies, locally less than 1 m thick in outcrop, represent building blocks, or systems tracts, of lowest-order genetic sequences (sensu Galloway). These are grouped into higher order, composite sequences which normally occur at a larger than outcrop scale and have to be delineated by regional well-log correlation. The sandstone bodies exposed in the study area comprise the following lithofacies:

(1) medium- to coarse-grained sandstones of massive appearance, with trough cross-stratification, no well-defined ichnofabric and no recognizable large-scale stratification. This facies is interpreted as strongly current-reworked deposits of shoreface environment, probably without direct sediment supply by a fluvial system.

(2) coarsening-upward successions which contain a continuum of facies ranging from fine-grained, bioturbated sandstones without recognizable stratification at the bottom, to coarse-grained to gravelly sandstones, commonly with well-defined clinoforms (foresets) of up to 10 degree slopes. These are interpreted as deposits of a deltaic system, ranging from fine-grained, pro-delta deposits to the coarse-grained foresets of Gilbert-type delta front.

The occurrence, thickness, and degree of variation of the above lithofacies define the shapes of the gamma-ray curves in both outcrop and well log, which can be divided into several electrofacies. In our correlation, the electrofacies are defined based on typical shape and overall intensity of total gamma-ray signal over a vertical interval of more than c. 5m. Typically, intervals of particular electrofacies comprise a number of individual sandstone bodies. The electrofacies, however, are dependent on local facies changes and can represent varying numbers of sequences. Therefore, individual electrofacies, as defined here, are a product of the degree of lithological variability caused by the combination of relative sea-level change and sediment supply.

For detailed correlation, the electrofacies are only a rough guide; precise local and regional correlation requires the use of individual flooding surfaces.

Elecrofacies A is characterized by stacked bodies of lithofacies 1, with low-amplitude changes in the total gamma-ray curve and low absolute values of gamma activity (c. 300–400 imp./min). Elecrofacies B and C contain various stacking patterns of sandstone bodies of lithofacies 2, with the coarser and finer end-members prevailing in B and C, respectively. The gamma-ray curves show higher frequency and higher amplitude variations compared to electrofacies A, and differ in the overall absolute values of gamma-ray counts: average 500–600 imp./min. in electrofacies B versus c. 700–1000 imp./min. in electrofacies C. (absolute values from field measurements).

Correlation at both local and regional scales enabled us to reconstruct the spatial distribution of genetic sequences at several temporal scales, and, although unequivocal interpretation of controls on sequence evolution is difficult, brought new data for the interpretation of the relative roles of relative sea-level change and sediment supply in stratigraphic architecture of this part of the Bohemian Cretaceous Basin.

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Hercynite- vs. Kyanite- Bearing Granulites of the Strá•ek Moldanubicum: Metamorphic and Structural Relationships

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The presence of high-pressure (HP) granulites in the Moldanubian domain of the Bohemian Massif is believed to reflect the peak temperature conditions attained during maximum thickening of the orogenic root during the Variscan orogenesis. During exhumation of deep parts of the Moldanubian root, the early granulitic fabric was partially or completely reworked under high-temperature (HT) and low-pressure (LP) conditions. We have studied the relationship between mineral assemblages and fabric development in acid granulites and granulitic gneisses associated with the migmatitized Gföhl gneisses, amphibolites, ultramafic rocks and durbachitic intrusions of the Strá•ek Moldanubicum (SM). The SM represents a lower-crustal unit, which has been thrust over the mid-crustal metasediments, orthogneisses and migmatites of the mid-crustal Svratka Crystalline Complex (SCC). The structural study of the granulite body has demonstrated the presence of an early vertical fabric (S1) sub-parallel to the root boundary. This fabric is reworked by flat shear zones (S2) still under HT conditions. Intrusion of durbachites is associated with the development of D2 fabric and thus coeval with thrusting of the whole sequence over the SCC.

We have focused on acid granulites and surrounding gneisses from two distinct localities – the Loucka – Bobruvka river valley (LBR) and the Libochovka river valley (LR). In the LBR, typical acid granulites occur with mineral assemblage Grt-Ky-Sill-Bt-Hc-Plg-Kf-Qtz. Observed succession of stable mineral assemblages can be described as follows: Several samples from outcrops with preserved subvertical fabric (interpreted as S1) bear stable mineral assemblage (1) Grt-Ky-Bt-Plg-Kf-Qtz, typical of HP granulites in the Moldanubian domain of the Bohemian Massif. More often, granulitic samples show extensive conversion of kyanite to sillimanite suggesting stabilization of the assemblage (2) Grt-Sill-Bt-Plg-Kf-Qtz. This conversion is most likely associated with transition from subvertical S1 into subhorizontal S2 fabrics and decompression. In several samples we have observed crystallization of Hc at the expense of Grt and Sill, suggesting stabilization of the assemblage (3) Grt-Sill-Hc-Bt-Plg-Kf-Qtz. In samples, which were taken from the S2 fabric we have observed complete retrogression of Grt--bearing mineral assemblages and the resulting mineralogy is only (4) Bt-Plg-Kf-Qtz. No Crd was found in the above-described samples. Acid granulites are accompanied by Crd- and pearl-gneisses with mineral paragenesis Crd-Sill-Bt-Plg-Kf-Qtz. Metastable relics of Grt are rarely found in these samples suggesting Grt-bearing mineral assemblage being stable in earlier stages of the metamorphic history. In the LR valley, acid granulites seem to have similar chemical composition as those in the LBR valley, but their mineral assemblages (Grt-Sill-Hc or completely retrogressed association without Grt) record dominantly LP conditions. However, rare relics of Ky only partly converted to Sill suggest early HP/HT conditions, too.

The succession of mineral assemblages shows decompressional evolution of the whole sequence at still high temperature. Using the GASP barometer combined with garnet-biotite thermometry we obtain unrealistic low temperatures of about 660 °C at pressures of 13–14 kbar for the HP/HT mineral assemblage. At present we can only provide the lower stability limit for the LP/HT assemblages Grt-Sill-Hc and Bt-Sill-Crd. The P-T conditions of the low-pressure equilibration were calculated by the VERTEX software (Connolly, 1990) using the thermodynamic dataset by Holland and Powell (1990). The results of calculation suggest temperatures exceeding 750 °C at minimum pressures of ca 4 kbar.

It is assumed that the steep S1 foliation reflects the deep root history, whereas the flat S2 structures are connected with lateral extrusion and vertical collapse of the root material. The lack of HP/HT assemblages in many parts of the studied rocks is considered to be a result of pervasive deformation and associated fluid influx during exhumation, combined with overall migmatitization. The observed mineral assemblages of Crd-gneisses and juxtaposed acid granulites indicate common metamorphic conditions at the LP/HT stage and the difference in stable mineral assemblages may well be a result of different whole-rock chemistry. However, any indication of a common HP/HT metamorphic history of Crd-gneisses and acid granulites is still missing.