Strain parameters were obtained from deformed bioclasts and pressure fringes along quartz clasts. Illite crystallinity, vitrinite reflectance and conodont colour alteration index were used for the estimation of maximum paleotemperatures. The computer image analysis of the photomicrographs obtained in optical microscope and TEM were used for measuring size and shape parameters. X-ray diffraction texture analyses (reflection geometry) were applied to the measurement of the LPO of fine-grained matrix. Orientations of coarse grains were measured in thin sections in U-stage and thus "semidomainal" c-axes distribution analysis was carried out.

The results of microfabric analysis allow to distinguish several basic groups of (proto-)mylonites with similar features:

A) Types with clasts/matrix composition. In spite of substantial strains, matrix carries no traces of microfabric changes. Clasts are usually twinned and/or slightly undulose. The distribution of the c-axes of the clasts is random to strong with single maximum near the S-pole. Bulk X-ray LPO is much weaker, increasing with the higher volume of the clasts. Fabric development of this type is explained by strain partitioning due to grain-size inhomogeneity, with preferential strain localization into matrix. The interpreted dominant mechanisms of the deformation are grain-boundary sliding (GBS) + diffusion transport at the grain boundaries (mainly fluid transfer) for the matrix and brittle fracturing + twinning + intracrystalline slip for the clasts.

B) Protomylonites with mantled porphyroclasts/matrix structure. The core-and-mantle structures develop along the clasts. In the matrix grain growth indicates grain boundary migration (GBM). No traces of subgrain formation were observed in most of the recrystallized samples and thus all the dynamically recrystallized grains are interpreted as the products of GBM. The LPO of these types of protomylonites has similar features as that in type A: strong single maximum of the c-axes near the S-pole, which is weakened in the LPO of whole sample. The activity of GBS is likely to persist both in the matrix and in the domains of recrystallized grains.

C) Mylonites with relict porphyroclasts and relatively coarse-grained matrix (20–30 μm). All the grains are strain-free, with higher grain aspect ratios, grain boundaries are straight to slightly curved. LPO is similar for both the matrix and the porphyroclasts, showing single c-axes maximum near the S-pole. GBM has the dominant effect in this microstructure, nevertheless, substantial simultaneous role of twinning and ICS is likely as well, as indicated e.g. by high aspect ratios and the distribution of c-axes.

D) Coarse-grained marbles with no porphyroclasts. Homogeneous domains are developed with uniform grain size, which depends on the volume of dispersed sheet silicates and dolomite. In domains with small amount of secondary phases the grain size is usually 110–140 μm. All the grains are strain-free, having almost straight boundaries. Domains with equant coarse grains and grain boundaries meeting at 100–140° triple junctions can be occasionally observed. Generally strong LPO is weaker in the domains with equant grains. These types of fabric indicate very low to zero differential stress during final formation and can be viewed as the products of static recrystallization.

E) Further low-temperature deformation of the marbles of type D generated strong twinning, undulosity and grain-size reduction at grain boundaries.

The absence of subgrains in the porphyroclasts of all the types described indicates that the given conditions of deformation (low temperature?) did not probably allow the activity of recovery process in calcite. Consequently, each increment of continued deformation increased the internal strain of the grains and thus raised the velocity of GBM. The high content of water, indicated by frequent markers of solution transfer, could have also accelerated GBM process (cf. Tullis and Yund 1982, a.o.).

Palaeotemperatures measured in the limestones covering the western part of the Brno massif show no substantial correlation with microfabric and are similar to those from the Závist–Květnice Unit of the Svratka Dome (max. 300 °C; e.g., Bosák 1983; S. Ulrich, pers. comm.). In contrast, finite strain values increase significantly from A to D types. Continuous evolution of the mylonites from A, B and C types in similar temperature conditions is suggested with stepwise freezing-in of the microfabric. The protomylonites of the Závist–Květnice Unit with the weakest strain fabric are concentrated mainly in the internal (tectonically lowest) part of the dome and show strong affinity to the sheared limestones of the western Brno massif. Types A–C and markedly contrasting type D are unlikely to have been produced together in a normal deformational gradient and could be better explained by their juxtaposition in late tectonic phases.

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Tectonosedimentary Evolution of the Cheb Basin (Cenozoic, Western Bohemia)

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The Cheb Basin is located at the intersection of the Ohře Graben structural domain, dominated by NE-trending graben systems in present-day geology, and the NW-trending Cheb–Domažlice Graben. Our study, based on the revision of borehole data, geological maps, newly constructed isopach maps, and DTM (digital terrain model) data, brings new insights into the interplay between tectonics and sedimentation in the Cheb Basin area between the Late Oligocene and Late Pliocene times.

The sedimentary fill of the Cheb Basin was affected by two main depositional episodes during this time interval. The first significant episode (c. 26–21.2 Ma) coincides with the deposition of Late Oligocene–Early Miocene clastics in the whole extensional system of the Ohře Rift. During this period, the evolution of the whole Ohře Graben was driven by approximately N–S, or NNE–SSW extension, which caused development of a system of c. E–W-striking normal faults, arranged in an en-echelon pattern throughout the whole graben. This pattern, typical of oblique rifting (e.g., McClay and White 1995) led to formation of a number of E–W-elongated depocentres within the whole Ohře Graben, as well as within the Cheb Basin proper. However, the most prominent structural feature of the Cheb Basin area at that time was a palaeohigh caused by a NW-trending, transfer/accommodation zone (the Dřenice Ridge), separating several minor depocentres. The NNW-striking Eastern Border Fault Zone (EBFZ), northern limb of the Mariánské Lázně Fault Zone, was inactive at that time. The interpreted palaeostress direction is in partial agreement with Adamovič and Coubal (1999) who inferred a N–S extension for the northern part of the Ohře Graben. Similar palaeostress orientation was interpreted by Peterek et al. (1997) from the area of the Franconian Fault Zone.

Preservation of the Early–Middle Miocene Cypris Formation, deposited between c. 21 and 16.8 Ma after a basinwide flooding event (possibly an increase in subsidence rate), is strongly affected by Late Miocene/Early Pliocene uplift and erosion, between c. 16 and 5 Ma. Isopachs of the Cypris Fm. do not reflect the actual geometry of the depocentres at time of deposition. Instead, preservation of most of the thickness of the Cypris Fm. is due to post-Cypris faulting, showing the same style as the Pliocene syn-depositional deformation, and probably immediately preceding the onset of the Pliocene deposition.

The second major depositional episode, of Late Pliocene age, occurred under a very different kinematic regime than the Oligo–Miocene phase of rift basin evolution. During the deposition of the Vildštejn Fm. (c. 4.5–1.5 Ma), the Cheb Basin adopted its present-day structural characteristics, as a NNW-elongated depression, characterized by a pronounced depocentre along the Eastern Border Fault Zone. We interpret the present-day structure of the Cheb Basin and the Cheb–Domažlice Graben as a consequence of sinistral displacement on the Mariánské Lázně Fault Zone (MLFZ). Reactivation of this strike-slip fault zone led to the formation of a terminal horsetail splay of oblique-extensional faults at the northern termination of the MLFZ, which contained the present-day Cheb Basin. The Cheb–Domažlice Graben formed during the same time along the MLFZ, as indicated by a number of left-stepping oversteps, as well as by a major left-stepping bend west of Mariánské Lázně, interpreted as a hard link of a former overstep of the MLFZ. A number of NW-striking faults, which show a degree of curvature towards the W, are interpreted as synthetic shears to the MLFZ. We interpret the palaeostress field that controlled the Late Pliocene strike-slip regime as dominated by NE- to NNE-oriented extension.

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Gravity Maps of the NW Bohemia

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The area of NW Bohemia is almost completely covered by gravity survey 1:25,000 – with areal density of 4 gravity stations per sq km. This fact allows to construct relatively datailed gravity images in order to reveal information about geological structure of the study area..

Absolute gravity system S-Gr-95, altitude system Balt and geodetic system WGS84 were used when calculating Bouguer gravity anomalies. Subsequently, the presented gravity images were generated from 250 m regular digital grid. Gridding of randomly distributed gravity stations, as well as the final map layout of the images, were made by Geosoft software package using map projection UTM (System S-42).

The relief of gravity anomaly field reflects density distribution within the upper part of the Earth's crust up to 10 or even 15 km. Density contrasts, connected with the changes in rock composition, are reflected by distinct gravity anomalies. Negative anomalies are caused by granitic massifs and/or by sedimentary fill of basins. Positive gravity anomalies are generally linked with crystalline complexes lacking granitic bodies and migmatitization, but most of all they indicate the existence of basic massifs and separate basic and ultrabasic bodies of amphibolites, peridotites, skarns etc. Combining gravity images and geological maps, the anomalies in gravity field can help us to extrapolate the extent and subsurface continuation of thee main geological units in the study area.

The presented gravity maps were constructed for the Czech Geological Survey in the period of 1997–1998, when solving research project related to the evolution of the Earth's crust in West Bohemia during the Proterozoic and Paleozoic (Šrámek et al. 1999).

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