# A Model of the Morphotectonic Development of the Ústecká Brázda Furrow

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The recent morphology of the Ústecká brázda Furrow (UF) is controled particularly by tectonics, as it has been stated by earlier authors (Neubauer, 1953; Frejková-Litzmanová, 1957). Therefore, some authors consider it a "normal graben" (Žůrek, 1962). Nevertheless, the UF is still called a syncline (Herčík et al., 1999). The new detailed geological mapping and morphostructural analysis resulted in the morphostructural reinterpretation of the UF (Čech et al., 2002).

The UF is delimited by the ridges of Hřebečov and Kozlov, both of them considered to be anticlinal ridges (Litice and Potštejn anticlines). As a matter of fact, the eastern Hřebečov ridge is a monoclinal cuesta or a relict of a horst limb with less pronounced contours, the western Kozlov ridge presents a ridge modified by reverse flexural faulting. The UF is accordingly assumed to be a half-graben or a graben modified by reverse faulting. The general course of the UF is, moreover, disturbed by some diagonal faults causing rhomboidal block segmentation (Fig. 1).

The drainage along the eastern rim of the furrow as well as the position of the main European watershed present noteworthy morphological peculiarities.

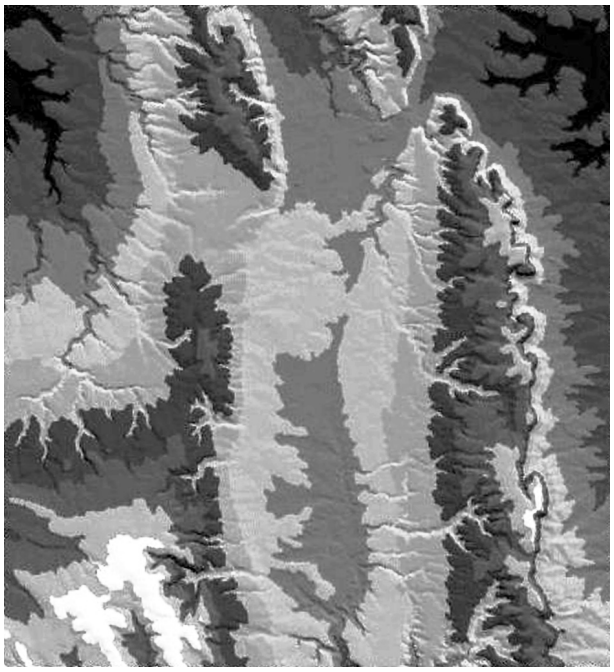

**Fig. 1.** Clear fault manifestation in the surroundings of Svitavy.

Both the reverse faulting and block segmentation development, together with other morphological and geological features were employed for the construction of a model of local morphostructural evolution:

a) The initial warping of the area seems to be due to E–W compression. Fold axes were trending approximately meridionally (Coubal, 1989).
b) Further progressive E–W compression resulted in the rupture of eastern limbs of the anticlines and the Semanín Fault development. This led to the development of a half-graben structure.
c) Segmentation of the Hřebečov and Kozlov ridges as well as the UF floor itself can be attributed to the subsequent tectonic phase with dominant S–N compression. The segmentation seems to be supported by the bending of the UF. This is due to the ongoing S–N compression and the diagonal course of the UF relative to the Lugicum. The western ridge is segmented by two dextral shear zones into rhomboidal blocks of the Kozlov and Javorník ridges. The eastern Hřebečov ridge is split by the Třebovice Saddle (transverse graben). The later is located on the sinistral Damníkov–Svitavy Shear Zone (possibly tensional) striking SW–NE. The jagged course of the Třebovka River follows this zone. The watershed near Svitavy may have been formed during this stage on the southern apex of the rhomboidal segment of the Kozlov ridge. In the northern part of the UF, a stronger E–W compression resulted in the tapering of the UF and in an expressive, sharp linear manifestation of the Semanín Fault with vertical displacement of approximately 260 m.
d) Horizontal "wedging" along the sinistral Damníkov–Svitavy Shear Zone perhaps caused the more recent subsidence along normal faults and relaxation along the eastern rim of the UF SE of Svitavy, which attracted the main drainage. Conversely, the subsidence rate of block segments is higher on the western rim of the UF, i.e., next to the Semanín Fault (consequence of phase B). Following the fault, the Svitava River has a completely straight course between Svitavy and Hradec nad Svitavou. Groundwater losses are known in this part of the UF. Several parallel strike-slip faults are present on the western slope of the Hřebečov ridge. The upper reach of the Třebovka River displays geometry of a relaxed discontinuity system. The northern part of the UF experienced no relaxation.

Transverse rivers of Tichá and Divoká Orlice seem to be antecedent in the northern part of the UF. This would support the idea

of an active uplift of the hangingwall blocks on the reverse fault. Incised meanders of the Třebovka, Tichá and Divoká Orlice rivers indicate partial superposition on the actively asymmetrically rising ridges modified by reverse faulting.

There exist clues for the sedimentary, tectonic and erosional chronosequence modelling, like the absence of Tertiary deposits south of the main European watershed and their presence in the Třebovice Saddle and in the vicinity of Česká Třebová (Fencl and Schütznerová-Havelková, 1971). Traces of a former drainage system are widely scattered, making the paleopotamological and paleogeomorphological reconstructions difficult.

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# Relationship of Emplacement of the Jihlava Pluton to the Structural Evolution and Tectonics of the Eastern Part of the Moldanubian Zone (Bohemian Massif)

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We consider structural evolution and tectonics around the major intra-Moldabnubian tectonic contact between Monotonous and Gföhl units and its relationship to the emplacement of the Jihlava syenite pluton. The study area extends from the eastern margin of the Moldanubian batholith to the western margin of the Třebíč durbachite pluton and is built by grt-crd-kfs gneisses, migmatites and amphibolites of the Gföhl unit and by bt-grt-sill paragneisses, metagreywackes and quartzites of the Monotonous units, respectively. These rocks are intruded by high-K mela-syenitoid magmas of the Jihlava pluton and associated sheets of melagranitoids.

Three deformation phases were recognized in the area. The earliest $D_1$ phase is mainly preserved in the Gföhl gneisses and migmatites in the SE part of the study area, being characterized by metamorphic gneissosity and migmatitic layering shallowly dipping towards S and SE. To the NW and in the Montonous unit, this fabric is represented by metamorphic schistosity steepened by close to isoclinal NW–SE-trending $F_2$ folds with subvertical axial planes. This folding, to a lesser extent, also affects the western margin of the Gföhl unit. In the northeast, minor melagranitic sheets were emplaced both along the subvertical and moderately dipping planes of $S_2$ foliation in the area of complete transposition of S1 fabrics. Last tectonic event, the $D_3$ phase, is marked by the development of brittle-ductile to brittle anastomosing network of right-lateral SSE–NNW-orientated zones (Přibyslav Mylonite Zone) bearing E- to S-plunging lineations marked by growth of chlorite and muscovite.

Fabric pattern of the Jihlava pluton is characterized by steep, S- to SE-dipping magmatic foliations overprinted by localized sub-solidus to ultramylonitic shear zones, dipping at moderate to steep angles to the ESE and NNW and bearing subhorizontal SSE lineation. AMS study revealed that the magnetic fabric pattern is consistent with magmatic and sub-solidus fabrics in the pluton and is characterized by generally low degree of anisotropy and dominant plane strain to oblate shapes of magnetic fabric ellipsoid. Paramagnetic minerals were the dominant carriers of the magnetic fabric, as indicated by measurements of bulk susceptibility variations with temperature.

Based on structural mapping and AMS analysis, we arrived at the following conclusions: (i) Fabrics of the Gföhl unit most