Drahotěšice fault

Structure ID: DRA
Fault Section IDs: DRA_01 to DRA_07
Related terms: drahotěšický zlom (in Czech); Blanice furrow fault system (En)
Editor: Ivan Prachar

General description

Drahotěšice fault is one of the very significant "N-S" faults, which belongs to the fault system of the Blanice furrow, respectively the Kourim-Blanice-Rodl-Kaplice Large-scale Fault System. This ca. 250 km long, approximately NNE-SSW (and partly NNE-SSW) trending large-scale fault system extends from the Kouřim Furrow in the North, following the Blanice Furrow, crossing the basins of Třeboň and České Budějovice via Kaplice (CZ) and the valley of the Große Rodl to Gramastetten (A) and the basin of Eferding, where it is partly covered by Miocene sediments, but continues into the basin subsurface (see http://resource.geolba.ac.at/structure/182).

The course of the fault is best evident on its 20 km long section between Dolní Bukovsko in the north and Úsilné in the south (sections DRA_02 to DRA_05). However, it can be expected continuation of the fault to the north and south.

On a short, about 1.7 km long section near Úsilné, the Drahotěšice fault is the western limitation of the Permian Lhotice basin in the west according to the Raster geological map 1 : 50 000, Czech Geological Survey - sheet 32-22 České Budějovice. But this assumption contradicts the findings from the drill US-2 (see LÁNA, 1973). At a depth of 70.6 - 92.2 m, a layer of Permian-Carboniferous arkoses to arkose conglomerates of mostly light gray and gray-green color was found, up to "white-gray arkose boulder conglomerate" (91.6 - 92.2 m) on the base. Furthermore, weathered, migmatitized paragneiss were drilled up to 127.7 m, where the drilling was terminated. These sediments most likely belong to the basal Peklov layers (Stephanian C) – see PEŠEK ET AL. (2001). Therefore, it is not certain that the geological map 1 : 50 000 - sheet 32-22 České Budějovice shows the real marginal fault of the Lhotice Basin near Úsilné.

Further to the north, between Borek in the south and Baba hill in the north, the Drahotěšice fault is accompanied by an intrusion of Ševětín granodiorite. Limitation to Permian sediments here takes over the parallel Lhotice fault tending to NNE between Borek and Lhotice (see Raster geological map 1 : 50 000, Czech Geological Survey - sheet 22-44 Hluboká).

Between Drahotěšice in the south and Dolní Bukovsko in the north, the fault limits a block of sediments of the Klikov Formation of the Třeboň Basin, situated to the east of the fault, with an offset documented by drills around 110 - 125 m (see Raster geological map 1 : 50 000, Czech Geological Survey - sheet 22-44 Hluboká).

In the section north of the Dolní Bukovsko, Drahotěšice fault becomes more difficult to track, but the presence of a fault is assumed (see KADLECOVÁ AND BURDA ET AL., 2016). In the surroundings of Dolní Bukovsko, sediments of the Klikov Formation extend across the fault line to the west, but in a very small thickness. E.g. the thickness of the Cretaceous sediments was only 15 m in the drill V-19 (see ZÍMA, 1961). In contrast, Cretaceous sediments with a thickness of 115 m were found in the eastern side of the fault (see drill V-18. ZÍMA, 1961).

Behind the Třeboň Basin towards the north, the fault is no longer visible (see Raster geological map 1 : 50 000, Czech Geological Survey - sheet 22-42 Bechyně).

Fault structure and dip

The angle of dip of the fault plane is assumed to be very steep with direction generally to the east, but opposite dip (to the west) is not excluded, as can be deduced from the log of the ŠV-2 drill (for detail see Fevidence DRA_A). In the surroundings of Drahotěšice the course of the fault is highlighted by a quartz vein (tectonic breccia – see Fig. 1).

On the western edge of the Lhotice basin, between Borek and Lhotice, two parallel fault planes are running. Among them, the Ševětín granodiorite is pulled up into a thin, only about 150 m thick tectonic slice. The Lhotice fault separating granodiorite and Permian sediments is filled with a few meters thick grayish-black ultramylonite (see Fig. 1).

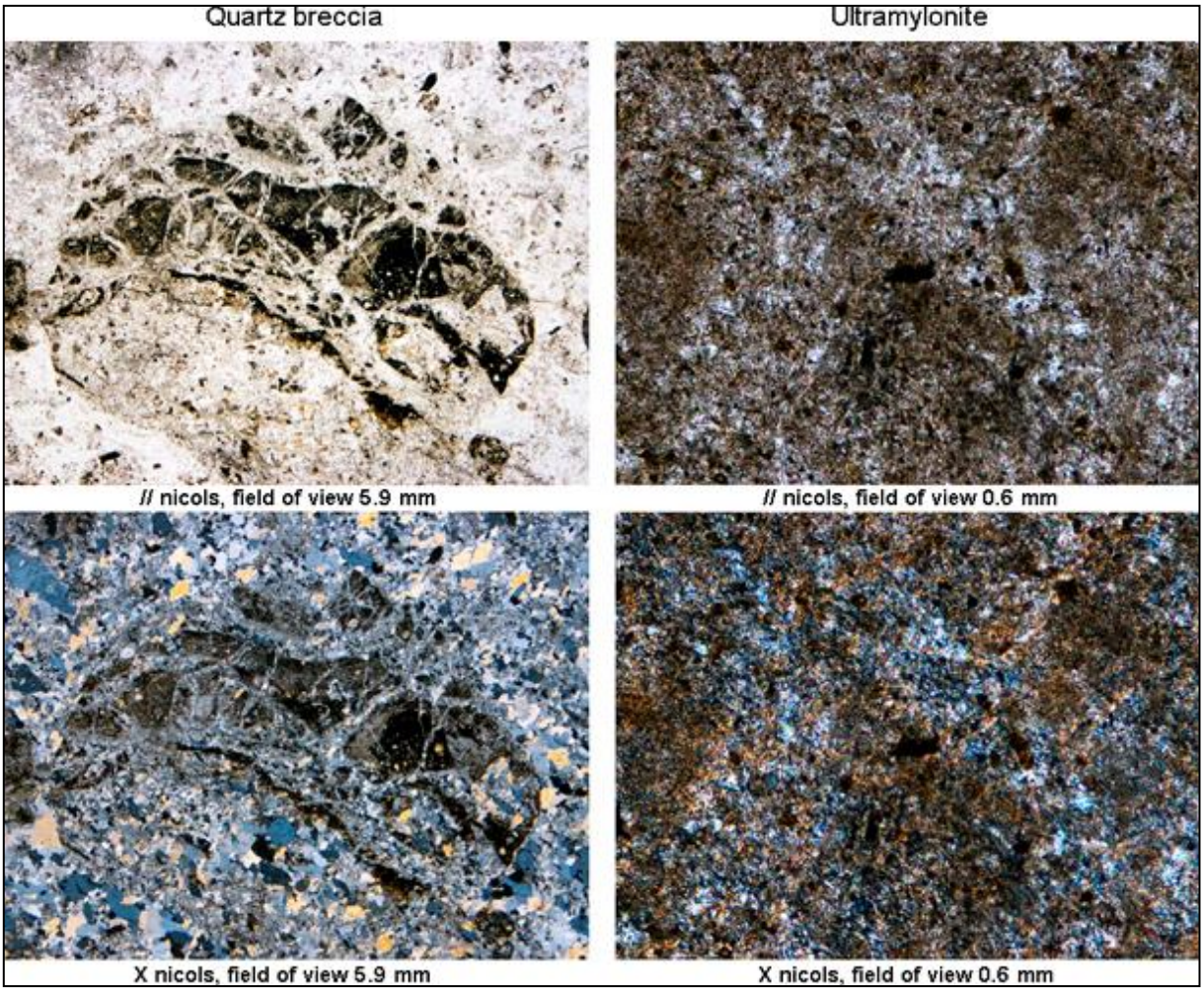

Fig. 1: Thin section of quartz breccia from the quartz vein outcrop near Drahotěšice (left). Thin section of ultramylonite from the fault core outcrop near Chyňava (right). Photo I. Prachař.

Cross structures and Segmentation

Geological maps (see e.g. Raster geological map 1 : 50 000, Czech Geological Survey – sheets 22-44 Hluboká and 32-22 České Budějovice) show two important cross structures that limits the occurrence of Permian sediments near České Budějovice.

In the south, Lhotice basin is limited by Hluboká fault towards filling of the Cretaceous Budějovice Basin. However, the drills show that the Permian sediments are spread even under the base of Cretaceous sediments, south of the Hluboká fault (see Fsection DRA_01).

Northern limitation of the Lhotice Basin forms the Dobřejovice fault of the WNW-ESE direction. According to the geological map (see e.g. Raster geological map 1 : 50 000, Czech Geological Survey – sheets 22-44 Hluboká), Dobřejovice fault interrupts the line of the Drahotěšice fault near Chotýčany.

Scarp morphology

The morphological manifestation of the Drahotěšice fault is not very pronounced. Nevertheless, it is possible to observe a slight lowering of the relief in the eastern side of the fault, in the Třeboň Basin as well as in the.

Seismicity

No earthquake epicenters were recorded in the fault zone. Except for one micro-earthquake near Veselí na Lužnicí (49.207°N, 14.606°E on October 24, 2005, which had ML = 0.

Pre-Miocene evolution

Drahotěšice fault shows a long-lasting and multiphase deformation history. The fault was reactivated many times, and inverse movements of the individual blocks of the fault occurred. According to MALECHA (1994) and VRÁNA ET AL. (1994), the dip-slip movements alternated with the reverse-slip movements, and the dip of the fault plane also changed in terms of angle and direction.

Drahotěšice fault played a very important role during opening and development of the Permian and Cretaceous basins. Paleogene movements are also likely, but convincing observations are not available.

Fault activity in late Cenozoic

Miocene activity of the fault was assumed by some authors, such as A. Malecha (SEE MALECHA, 1994). Later surveys, however, did not confirm the Malecha's concept of Miocene tectonic ditches, as e.g. nearby Pořežany ditch (see PRACHAŘ, 2012).

Post Miocene activity of this fault has not been proven.

Related local evidence

Drahotěšice: Deep drill ŠV-2

evi_ID: DRA_A
fsec_IDs: DRA_04
editor: Ivan Prachař

The nature of the fault zone can be inferred from the log of the deep drill ŠV-2 (see MALECHA, 1994) excavated by Czech geological survey northeast of Drahotěšice in 1986. The borehole was placed in close proximity to the quartz vein, to the western side of the fault. The silicified tectonic breccia was passed by drill from 6 m up to 128.4 m, then, until the final depth of 259 m, a dark gray to black clay breccia with fragments of vein quartz was drilled. At a depth

of 190.2-194.0 m, the breccia was light gray and contained a vein of pink carbonate. A similar fragment of breccia was found at a depth of 225.6 m. The fragments contained slightly clayey sandstone to conglomerates surrounded by tectonic breccia. The author (A. Malecha) assigned it to the Klikov Formation (Upper Cretaceous) and considers it to be evidence of inverse movements at the Drahotěšice fault in the post Cretaceous period.

Úsilné: Trench for waterpipe.

evi_ID: USI_D
fsec_IDs: DRA_02
editor: Ivan Prachař

The contact between the Permian and Cretaceous sediments was investigated in the R-V trench for waterpipe about 700 m long on the southern edge of Úsilné (see Fig. 2), approximately at the point where the Drahotěšice fault is drawn on the geological maps.

Fig. 2: View of the western end of the water pipe excavation south of the village of Úsilné. The contact between the Senonian sediments of the Budějovice Basin and the Permian sediments of the Lhotice Basin was uncovered by the trench. Senonian sediments and contact are covered by a layer of fluvial sands and slope sediments affected by gelifluction. Photo I. Prachař, 2009.

Permian sediments were affected by faulting, as shown the upturned beds of siltstones and claystones in the profile. The direction of bedding was in the range of 10° - 20° (NNE-SSW). The same direction had tectonic dislocations, generally also towards the NNE-SSW. The dip of the fault planes was very steep, both towards the ESE and WNW. Permian rocks were considerably cracked to crushed, with a few slickensides, oblique striations and occasionally with signs of chloritization (see Fig. 3 and Fig. 4). Towards the east, the frequency of faults decreased (see PRACHAŘ ET AL., 2012 and PRACHAŘ, 2012).

However, the contact zone was covered by Quaternary fluvial sands and partly also by slope sediments, so it was not possible to determine unambiguously the character of the contact between these units. As drilling in the surrounding area has shown, transgression of Senonian sediments over Permian is very likely. This is assumed only in the embayment of Budějovice

Basin near Borek, where the Cretaceous sediments cross the line of the Hluboká fault towards the north.

Fig. 3: Detail view of the wall of the R-V trench with exposed Permian siltstones with slickensides and oblique striations on the divisional planes. Photo I. Prachař, 2009.

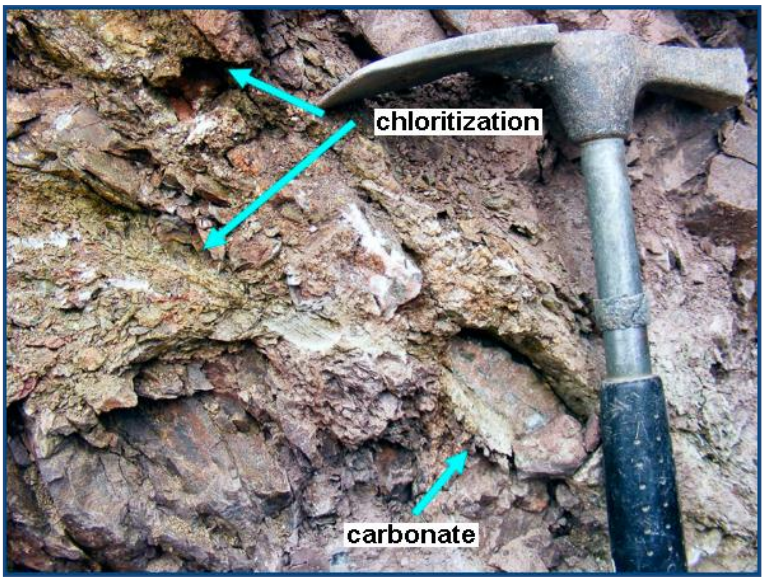

Fig. 4: Tectonically affected and altered Permian siltstones dusters in the zone of Drahotěšice fault with carbonate veins and crushed zones with chlorite. Úsilné, R-V trench. Photo I. Prachař, 2009.

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