Přibyslav Mylonite Zone (Přibyslav crustal fault)

Structure ID: PMZ
Fault Section IDs: PMZ_01 to PMZ_12
Related terms: přibyslavský hlubinný zlom, přibyslavská mylonitová zóna (in Czech); Přibyslav Mylonite Zone, Vitis-Pribyslav Fault System (En); Vitis-Pribyslav Störungssystem (DE)
Editor: Ludmila Daňková

General description

Přibyslav crustal fault (WEISS, 1977), also known as Přibyslav Mylonite Zone (term was introduced by KOUTEK, 1935), is the northern part of Vitis-Přibyslav shear zone. This over 200 km general steeply WNW dipping and NNE-SSW striking fault system runs from the Alpine thrust front (WALLBRECHER ET AL., 1991) in Austria as Vitis fault via Amstetten, Zwetl and Vitis to Slavonice (Czech Republic), where runs as Přibyslav fault through Dačice to Jihlava and Přibyslav, where it rotates to NNW and it runs to surroundings of Chotěboř.

The protolites of mylonites of Přibyslav Mylonite Zone belongs to Moravian and Strážek Moldanubicum. Whereas the Ostrong Unit (with biotite or sillimanite-biotite gneiss or cordierite gneiss with local migmatization) dominates Moravian Moldanubicum and the Drosendorf Unit (with amfibolite, serpentinite, marble, erlan or granulite) dominates Strážek Moldanubicum.

Fault structure and dip

The angle of dip of the NNE-SSW fault plane is assumed to be very steep (almost subvertical) with direction generally to the WNW. The opposite dip to ESE (almost to E) was frequently described at field. The Přibyslav Mylonite Zone is a complex of unmetamorphosed rocks and mylonite or ultramylonite. The cataclasite as brittle reactivation was detected at Rančířov quarry. The tectonic clay which suggests Neogene reactivation was detected at the same locality.

The maximum of the Mylonite Zone thickness is 4 km, however mylonites and ultramylonites nearby Přibyslav are formed to system of lentils-like layers with a maximum thickness of 150 cm which thin out to the North, also to the South (ŠTĚPÁNEK ET AL., 2008).

Cross structures and Segmentation

The Raster geological maps 1 : 50 000 show very intensive segmentation of Přibyslav Mylonite Zone. Five NE–SW cross faults are shown south of Přibyslav (see the Raster geological maps 1 : 50 000, Czech Geological Survey – sheets 23-22 Žďár nad Sázavou and 23-24 Polná). Two verified NE–SW faults run at Česká Jablonná, others are marked as the supposed faults. The NE–SW system of supposed cross faults also locally occurs west of Prostředkovice.

The W–E system of the supposed faults is captured from north of Polná to Jamné also at the sheet 23-24 Polná. The short W–E faults accompanied with N–S fault plane system belonging to Přibylsav Mylonite Zone devide the area into the fault blocks.

The first occurrence of the NW–SE cross faults (phal fault system) is east of Jihlava – by Velký Beranov (see the Raster geological map 1 : 50 000, Czech Geological Survey – sheet 23-23 Jihlava). The occurrence of the NW–SE faults can be traced to Cizkrajov (see the Raster geological maps 1 : 50 000, Czech Geological Survey – sheet 23-41 Třešť, 23-43 Telč. The supposed NW–SE faults dominate the entire length of occurrence. Nevertheless one verified NW–SE fault is caught north of Cizkrajov.

The rare occurrence of the NNW–SSE cross faults is found between Prostředkovice and Urbanov (see the Raster Geological map 1 : 50 000, Czech Geological Survey – sheet 23-41 Třešť.

Scarp morphology

The morphological manifestation of the Přibyslav Mylonite Zone is not very pronounced. However, it is possible to observe a preferred orientation of some water cuts between Jihlava and Dačice.

Seismicity

To be revisited after completion of earthquake catalogue.

Pre-Miocene and Tertiary evolution

The Přibyslav Mylonite Zone was created as a result of an underthrusting of the eastern edge of Moldanubian Unit with the Brunia microplate at c. 341–339 Ma, which led to extrusion of the Moldanubian rocks over the top of Brunia and propagation of the microplate edge as far west as the Zone (Štípská & Schulmann, 1995). Structural data around the Jihlava pluton (collected by Schulmann et al., 2014) suggest that the overlapping was followed by dextral west-side-up shearing along the Přibyslav Mylonite zone at c. 338–335 Ma (Verner et al., 2006). The main ductile movement phase of the Přibyslav fault system is applied to the late Variscan (Büttner, 2007). A large number of reactivations accompanied by steep dip of fault plane have indicated both sinistral shear motion (Urban & Synek, 1995; Daňková, 2014), and dextral shear motion (Schulmann et al., 2014).

Brittle reactivation at the end of Variscan orogeny caused a sinking of the small tectonic block of the unmetamorphosed upper Paleozoic conglomerates nearby Stříbrné Hory village (Koutek, 1939).

Frequent Tertiary reactivations of NNE-SSW structures caused the sinking of the Anthracolithic and Tertiary sediments which led to the formation of the Boskovice furrow, Blanice furrow and hypothetical Jihlava furrow (Veselá, 1979, Holub & Tásler, 1980). It is assumed, that a brittle Miocene reactivation locally accompanied by cataclastic flow holds the sinistral motion kinematic. (Brandmayr et al., 1997; Büttner, 2007; Lehnhard et al., 2007).

Long-term evolution of the Přibyslav mylonitic zone with ductile and later brittle deformations has been described based on kinematic indicators by Kubátová (1992) near Dačice and by Daňková (2014) near Jihlava and Přibyslav.

Fault activity in late Cenozoic

More detailed study of fault activity in late Cenozoic is missing, however the fault system is considered extinct.

Related local evidence

Rančířov: The active quarry

evi_ID: PMZ_A
fsec_IDs: PMZ_06 (transverse)
editor: Ludmila Daňková

The quarry is located 1.48 km to NE from the Na Nivách hill (622 m above sea level) at migmatized sillimanite-biotite gneiss of Ostrong Unit which is intensively affected by polyphase tectonic deformation. The significant mouldered mylonite zone runs through NW edge of quarry. The oriented rock sample of mylonite was taken from subzone with fault plane D 104/40. The microstructural kinematic indicators confirmed the normal fault with dextral strike-slip motion along striation L 122/40. A gradually embrittlement of deformation mechanisms was determined which is sign for several reactivations. A dilatation of volume (MELICHAR, 2002) was found because the young sideling-opened chlorite microveins were observed.

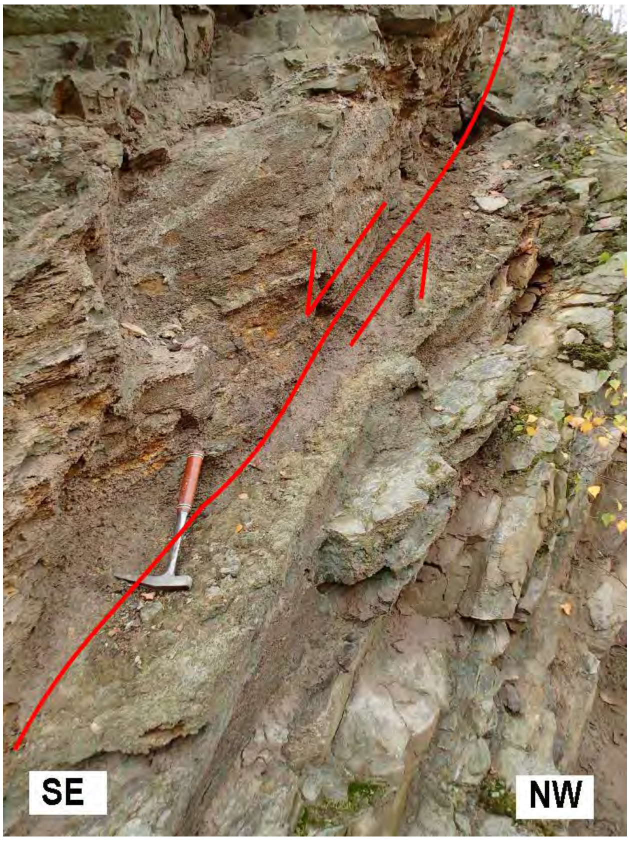

Fig. 1: View of the mylonite subzone normal fault plane D 104/40 at Rančířov quarry. Photo L. Daňková 2014.

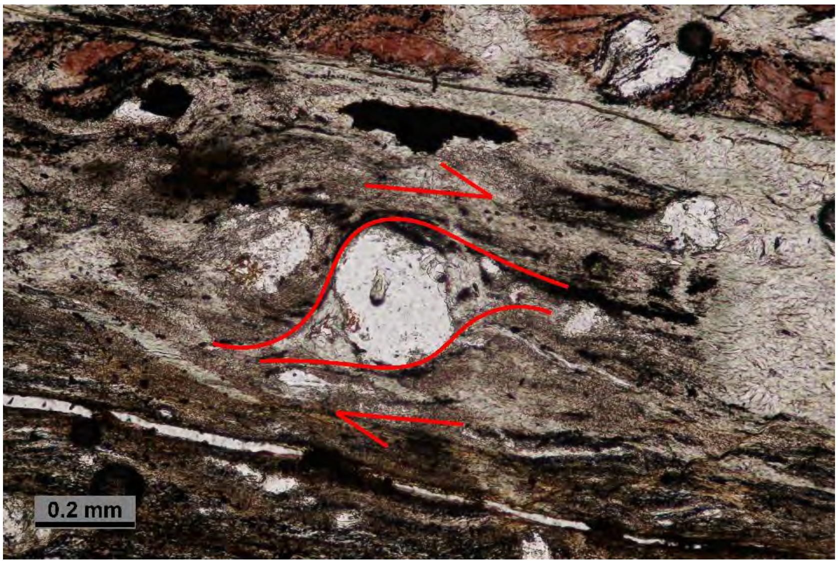

Fig. 2: The σ-porfyroclast of plagioclase as the kinematic indicator at the thin section of mylonite from Rančířov quarry. Photo L. Daňková 2014.

Přibyslav: the notch with the old quarry

evi_ID: PMZ_B
fsec_IDs: PMZ_02
editor: Ludmila Daňková

The old quarry is situated by the roadside 800 m to the west from Ronov nad Sázavou castle at migmatized sillimanite-biotite gneiss and biotite gneiss of Ostrong Unit. The movements in the Ronov slight mylonite zone with orientation D: 96/88, which was measured on the notch at the edge of the quarry, have reverse fault character with sinistral strike-slip motion to N along striaton L: 186/56.

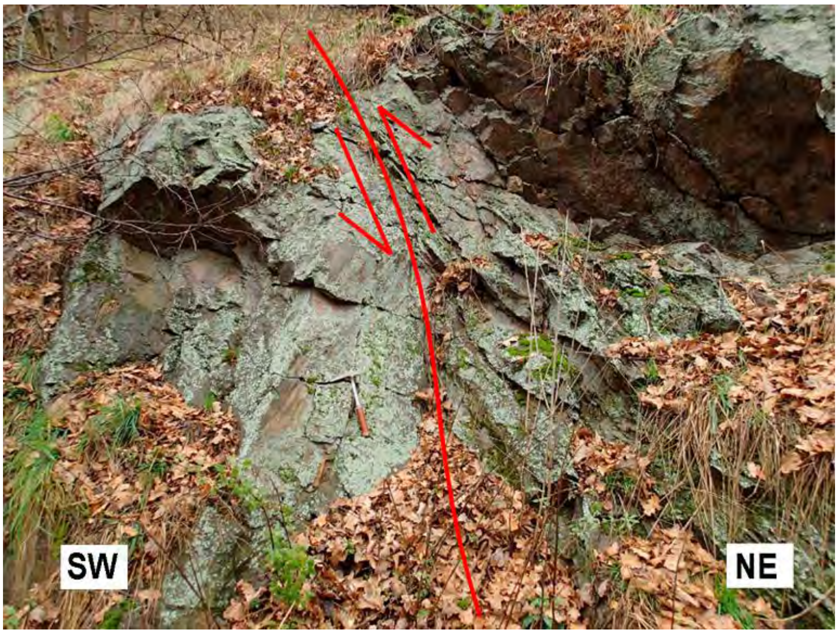

Fig. 3. View of the mylonitized reverse fault plane D 96/88 with sinistral strike-slip motion. Photo L. Daňková 2014.

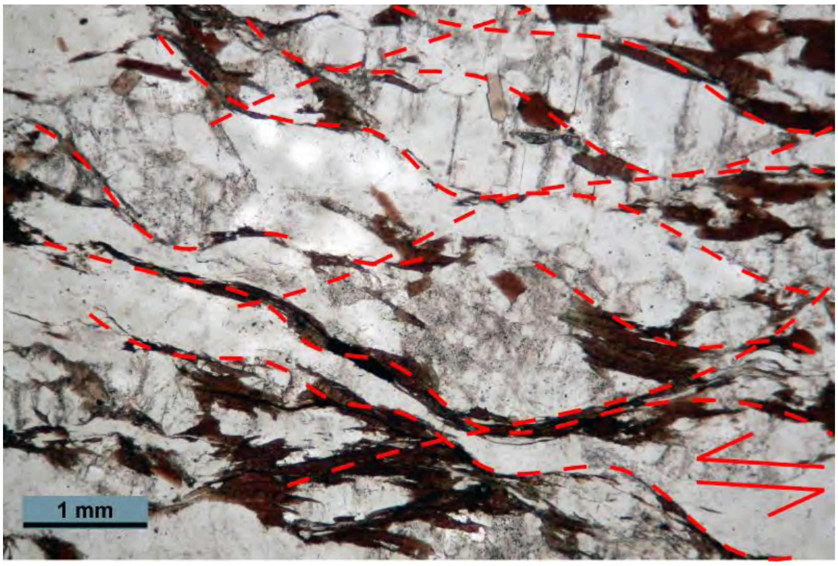

Fig. 4: Slightly developed S-C fabric as the kinematic indicator at the thin section of mylonite eastern of Přibyslav. Photo. L. Daňková 2014.

Železné Horky: The active quarry

evi_ID: PMZ_D
fsec_IDs: PMZ_04
editor: Ludmila Daňková

The old quarry is situated 1.4 m to the SSE from the Dvořákův kopec hill (548 m above sea level) at migmatized gneiss and migmatite with feldspar porphyroblasts of Drosendorf Unit. Several weathered dislocations were detected in the quarry. According to the thin section describtion the movements of the mylonite zone with fault plane's orientation D: 90/75 have reverse fault character with sinistral strike-slip motion to SSE along striation L: 164/45.

Fig. 5: View of the mylonitized reverse fault plane D 90/75 with sinitral strike-slip motion. Photo. L. Daňková 2014.

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