

THE SUDETIC MARGINAL FAULT BETWEEN BÍLÁ VODA AND LIPOVÁ LÁZNĚ

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ABSTRACT

The Sudetic Marginal Fault is near the northern border of the Bohemian Massif in the length about 250 km. But misses the character of the markedly visible line in the southeastern part (in the Jeseník area). The geological mapping between Bílá Voda and Lipová Lázně (Czech Republic) has shown the Sudetic Marginal Fault to be a zone of parallel en echelon faults 4 km in width (in the NW–SE direction). The velocity of the vertical movement was not continuous for the separate faulted-block. Individual authors have variously interpreted the different denudation levels. The disposition of the Sudetic Marginal Fault System probably predates the early Variscan. More intense movements along the main faults signaled the end of the main Variscan orogenic event in the Silesian region, as this fault system was an unstable zone that responded to changes in field force. Faults with directions from NNW–SSE to N–S between Bílá Voda and Lipová Lázně area seem to be younger than the Sudetic Marginal Fault System.

KEYWORDS: Sudetic Marginal Fault, Rychleby Mts., vertical and horizontal movements

1. INTRODUCTION

The Sudetic Marginal Fault follows near the northern border of the Bohemian Massif for about 250 km. The northwestern part (150 km in length) is markedly visible within the terrain morphology. Geological mapping in the foothills of the Rychleby Mountains (between the Bílá Voda, Javorník ve Slezsku, Vápenná, and Dolní Lipová villages) has shown the Sudetic Marginal Fault to be a zone of parallel en echelon faults 4 km in width. Besides the main faults, which are evident in the geomorphology, there are also many inferior faults; these are collectively described as the Sudetic Marginal Fault System. The Sudetic marginal fault loses its marginal character to the SE (towards the Silesian crystalline core). The main Sudetic marginal fault ends near Ludvíkov, at the contact between the crystalline basement and the Nízký Jeseník Culm (Lower Carboniferous age), where it meets the parallel Bělá fault in the Silesicum. The Bělá fault is coming from Kladsko (Poland), from which it heads southeast to Horní Lipová and the Bělá river valley; it then runs over the Vidly saddle and continues to Karlova Studánka and the Nízký Jeseník Mountains. Its continuation is often broke by numerous faults.

The different denudation levels occurring in crystalline and Paleozoic basement along the fault system is a conspicuous geological feature. To the northeast the Fore-Sudetic block is down-faulted and deeply weathered. To the southwest, the core of the Orlice-Sniežnik complex (2 in Fig. 1), and the Velké Vrbno (6) and Keprník units (9) are less-denuded. Middle Sudeten basin filled with early Paleozoic sediments exists in the Polish region of this complex (Don et al., 2003).

2. TECTONIC MOVEMENTS

The Fore-Sudetic block was initially comprised of considerably higher mountains, from which weathering products were brought down to the Lower Carboniferous basins. The southwestern block began to be uplifted during the Permian age, though the velocity of its vertical movement was not continuous. These conclusions concerning the variable vertical movements along the Sudetic Marginal Fault System were arrived by H. Cloos (1922). Individual authors have variously interpreted the different denudation levels. J. Oberc (1968) estimated a difference of about 2.5 km for the Polish part. J. Skácel (1989) established that 10–12 km of cover is missing from the down-faulted block at Vidnava dome. J. Cháb (1987) arrived at the same value by considering index minerals from the metamorphic rocks of the eastern part of the Vidnava anticlinal dome. A further 6 km of mantle-derived rocks are also missing. Grocholski (1977) estimated the amplitude of down thrust to be about 900–1000 m for the upper Oligocene to Pliocene in the Swiebodzice area. In the opinion of Oberc and Dyjor (1969) the amplitude of downthrust oscillates around 200 m, while only in the Sowie Góry foreland does it exceed 300 m. Down thrust of over 300 m has been documented from boreholes in the Javorník area (Skácel, 1989). According the geological pattern of the Rychlebské Mountains foreland, it seems that the block was not dropped as a single body, but rather as a system of separate mobile depressions and horsts. It is for this reason that the amplitude of down thrust can be different for each individual block.

The degree of horizontal shift along the Sudetic Marginal Faults System has been overestimated in the past. It was previously supposed that the Fore-Sudetic

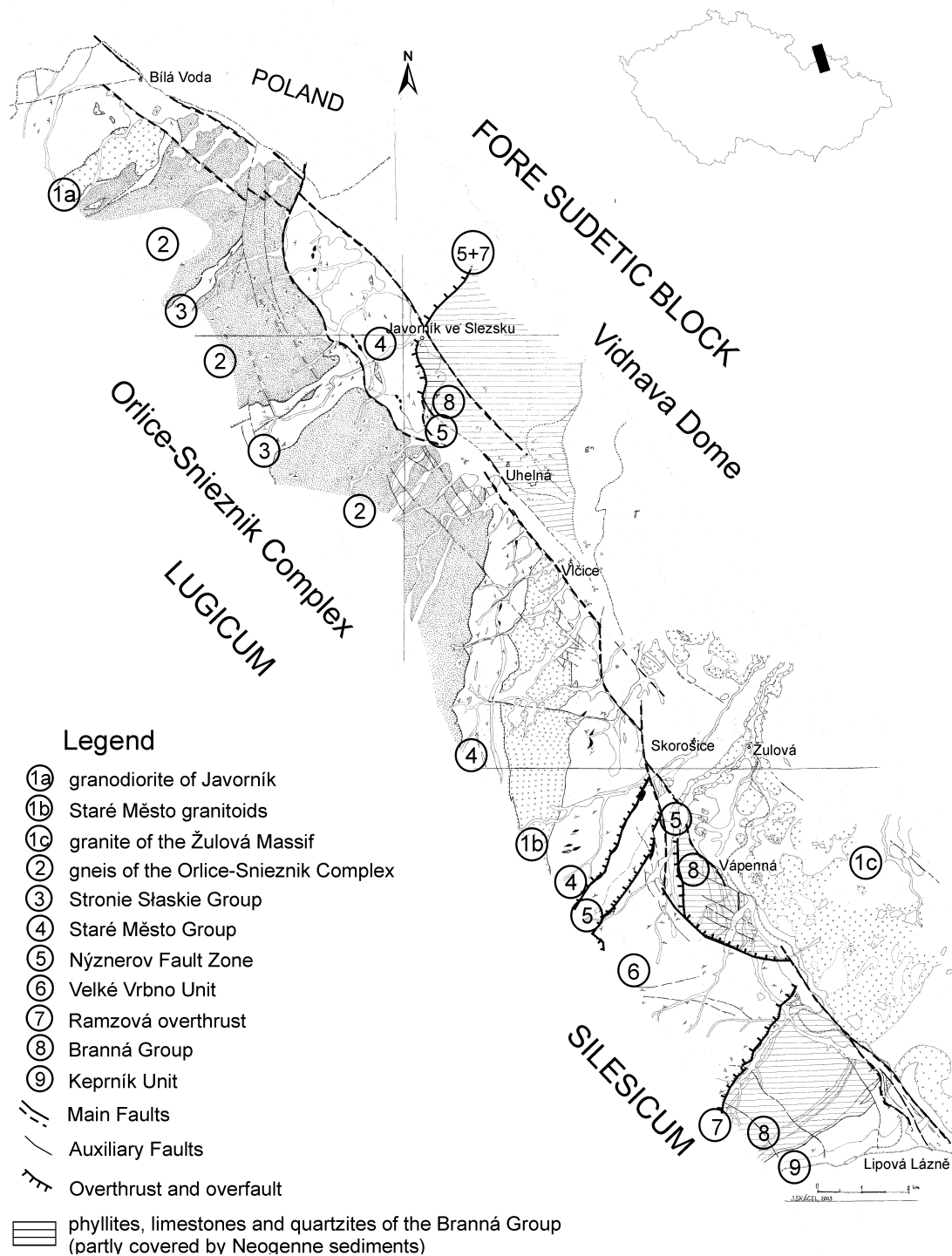


Fig. 1 Sudetic Marginal Fault System (between Bílá Voda and Lipová Lázně area)

down-faulted block had been displaced to the NW, because rock of identical stratigraphy and structure is situated in the down-faulted block to the NW, many kilometers from its origin. F.E. Suess (1912) and E. Bederke (1934) believed that the Ramzová overthrust (7) continued into the Niemcza zone 35 km away. J. Oberc (1968) placed the Ramzová overthrust from Javorník through Paczkow and Przeworno, which are

16 km to the west. More recently, J. Skácel (1989) has placed the north part of the Ramzová overthrust (which is connected to the Nýznerov fault zone – 5) to Javorník, Paczkow, the Niedzwiedz-2 borehole, and Ziębice. Significant horizontal shift is visible neither in the Sowia Góry nor in the Vidnava anticlinal dome and the Desná unit. Nonetheless, local horizontal shifts have occurred in some cases. The existence of

such a shift has been established between the villages of Skorošice and Vápenná, where the northern part of the Nýznerov fault zone (5) was horizontally displaced between two parallel faults of the Sudetic Marginal Fault System. This displacement occurred not to the NW, but to the south. These two parallel faults comprise the western part of the tectonic block between Nýznerov and Vápenná-Polka village.

The Vidnava anticlinal dome, as defined by K. Zapletal (1946, 1950), is a northern continuation of the Keprník unit (9) from the Sudetic marginal fault system. By this point of view the core of this arch has been filled by the variscan granite intrusion of the Žulová massif (1c). The mantle of this anticline is composed of mica schists, schists, and gneisses in the lower part. The metamorphic rocks with the same structure as the Branná Group (8) rocks (quartzites, phyllites, and crystalline limestones of Devonian age) composed the upper part of the anticline. While the complete profile of the eastern anticlinal limb has been preserved despite being affected by contact metamorphism (cordierite occurs to the west of Česká Ves village as first Staňková, 1975), the southern anticlinal limb has been preserved only as separate blocks consisting of xenolith-bearing granite and tectonic blocks (at Vápenná and Skorošice). The western anticlinal limb is continuous and lies within the basement rocks of the Neogene basin at Uhelná and Javorník. Its current position is the result of intensive denudation and subsequent downthrusting onto the base of south- and west-dipping mantle-derived rocks. The horizontal shift is not necessary to interpret.

The disposition of the Sudetic Marginal Fault System probably predates the early Variscan. More intense movements along the main faults signaled the end of the main Variscan orogenic event in the Silesian region, as this fault system was an unstable zone that responded to changes in field force. The Saxony orogenic event saw a brief revival of these movements, evidence of which can still be observed. The movement's intensity changed again following the recession of continental glaciers during the Pleistocene.

3. CONCLUSION

Where many parallel faults co-exist it is difficult to determine which ones were more recently active. Faults with directions from NNW–SSE to N–S seem to be younger than the Sudetic Marginal Fault System in this area. Reverse horizontal shifts were detected in these faults, for example in the Stříbrný potok valley at Skorošice, in quarries near the Vápenná railway station, at Lesní Čtvrť, and on the Pomezí saddle where the faults are filled with aplite, pegmatite, and quartzite dikes. These faults must therefore have already existed during the final phase of the Žulová massif intrusive event. Another fault has graphitic or mylonitic filling, and may still be active.

The present geological view suggests that the intrusion of the Žulová massif did not spread behind the Sudetic Marginal Fault System (to the SW, into the Rychleby Mountains) except near Skorošice, Vápenná, and the Pomezí saddle. The rocks filling the faults are all late differentiates associated with hydrothermal activity, the upward migration of which utilized the existence of faults and crushed zones with sheer dips in ENE direction.

The area around the Sudetic Marginal Fault System must have been more seismically active during the Variscan and Saxony orogenic events. So far, no recent earthquakes have been registered along the Sudetic Marginal fault system in the area from Bílá Voda to Lipová Lázně.

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