Geological evolution of the rhyolite extrusive body of Borsuk – central part – based on documentation of the workings in the wine cellar at the village of Viničky (Zemplínske vrchy Mts., Eastern Slovakia)

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Abstract

Article presents newly excavated underground spaces in the Neogene rhyolite extrusive body of Borsuk in the Zemplínske vrchy Mts., mined for the wine cellars. Numerous volcanological phenomena are shown in photodocumentation with their precise location inside the extrusive body, applying the 3D visualization of underground spaces.

Key words: rhyolite extrusive body, pyroclastic surges, phreatomagmatic pyroclastic flows, autoclastic breccia, lapilli, Neogene, Viničky area, Zemplínske vrchy Mts.

The rhyolite extrusive body Borsuk (altitude point 267 m a.s.l.) is located in the south-eastern part of the Zemplín horst (Fig. 1), north of the Viničky village (Fig. 2). The workings (wine cellars) were dug out for the Tokaj Company Viničky in the basal parts of this extrusive body, built of the horizon of volcaniclastic rocks deposited on their pre-Tertiary basement.

Exploited galleries, regarding their relation to deposit conditions of the volcaniclastic rocks, can be characterized as cross-cuts, directional galleries, inclined galleries, exploitation shaft and “domes” (Fig. 3).

Domes represent atypical workings of the cylindrical shape with a diameter up to 3.5 m, height up to 3 m and approximately hemispherical ceiling. The total length of mined workings located in four horizons is 805.49 m, and, concerning the documentation, also 116.0 m^2 of excavation faces in a total number 17 must be added to this number. The length of the exploitation shaft is 28.5 m (Tab. 1A, B, C, D).

Workings have penetrated the volcaniclastic and extrusive--intrusive rhyolite bodies. A substantial part of the workings was mined in volcaniclastic rocks. Three principal eruption activities, derived from various, distant centres, with relatively numerous particuliar eruption phases were identified, being represented prevailingly by the formation of fallen and flow pyroclastic deposits. They are divided by the hiatus, forming the erosive paleorelief and partial flooding of the former surface. They represent a time boundary between the distinguished 2nd and 3rd stages of volcanic activity.

Among the volcaniclastic rocks the pyroclastic rock types are distinctly dominating. They are represented by the sequences of pyroclastic pumice fluxes in a typical development (Fig. 4). Their total thickness is preliminarily estimated to 15 m. In the stratigraphic underlier of these volcanic surges mainly the thick beds of mainly ashy tuffs occur with thin interbeds of pumice lapilli tuffs (Fig. 5).

In the ash tuffs of the second eruption activity (Fig. 6), the accretionary-enveloped (Figs. 7a, c) as well as armored (Figs. 7b, d) lapilli were identified.

This finding documents the phreatomagmatic type of eruption and deposition in the proximal to distal positions in relation to the eruption centre.

The time hiatus among individual volcanic phases in terrestrial environment (with local occurrence of fluvial environment), are documented by the erosion surface of older volcaniclastic sediments and the occurrence of flora casts in fine-grained tuffitic micaceous sandstones (Fig. 8).

The phreatomagmatic volcaniclastics were deposited on the sand (Fig. 9), consisting of pyroclastic flows and surges – ashy--pumice, debris-flows as well as gravitation flows – avalanches. The dip of the slope of initial conus was 25° to 30°. Characteristic is the presence of polymict fragments, rarely even boulders of underlying Permian sediments (Fig. 10). We suppose that the complex of volcanic and pyroclastic rocks probable belonged to a smaller separate volcano, being later distinctly eroded and covered after the final penetration of the extrusive dome, as well as having probable transition into the lava flow in the direction from the E (NE) to the W (SW).

In the mining spaces, the syngenetic decomposition of the marginal parts of the extrusive dome and its autoclastic breccia has occurred with their subsequent gravitation collapse (Figs. 11 and 12). During these processes, the underlying parts of older pyroclastic sediments were often incorporated in the form of fragments boulders and blocs. Their margins manifest the thermic effects of the surrounding flaming gravitation flow. The origin of perlites in individual fragments and blocks indicates the subaquatic environment during the evolution of the extrusive body.

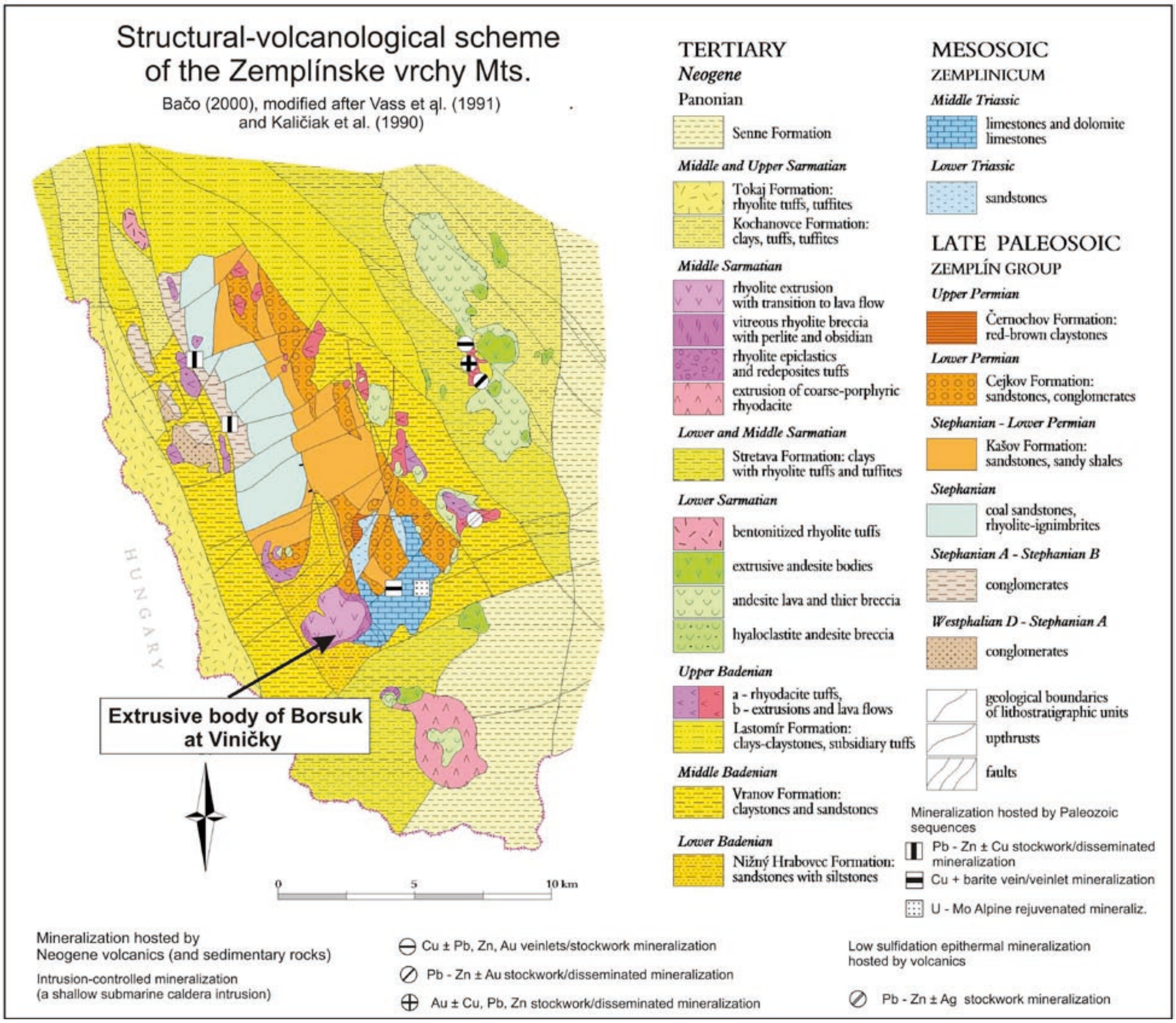


Fig. 1. Position of the extrusive body of Borsuk at the village of Viničky visualized on structural-volcanological scheme of the Zemplínske vrchy Mts. (Bačo, 2000, modified after Vass et al., 1991, and Kaličiak et al., 1990).

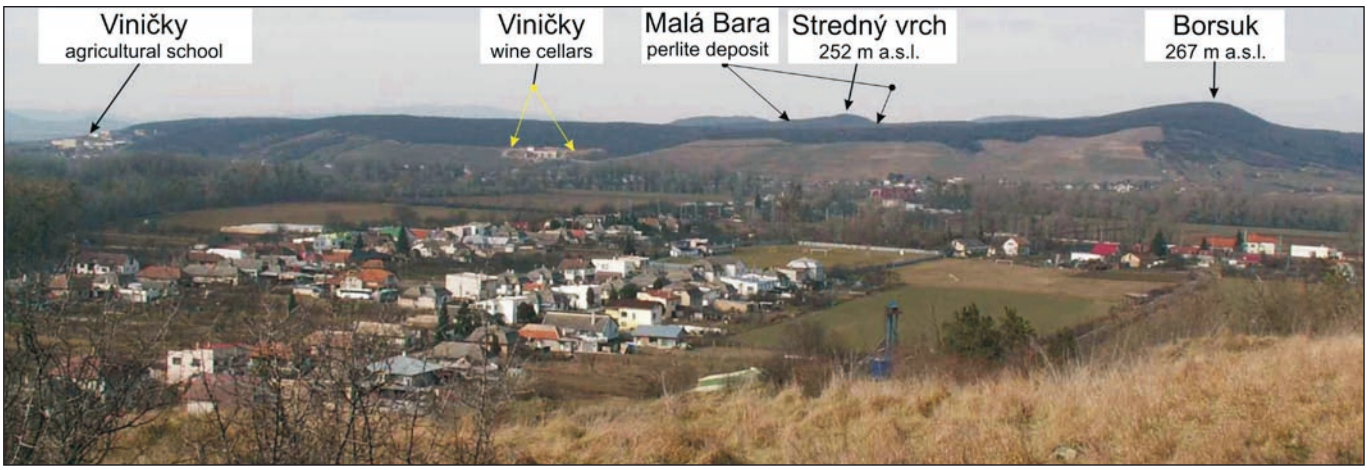


Fig. 2. Sceneric view on extrusive body Borsuk from the south northward. The village of Streda nad Bodrogom is located in the foreground, the village Viničky in the background. Photo P. Bačo.

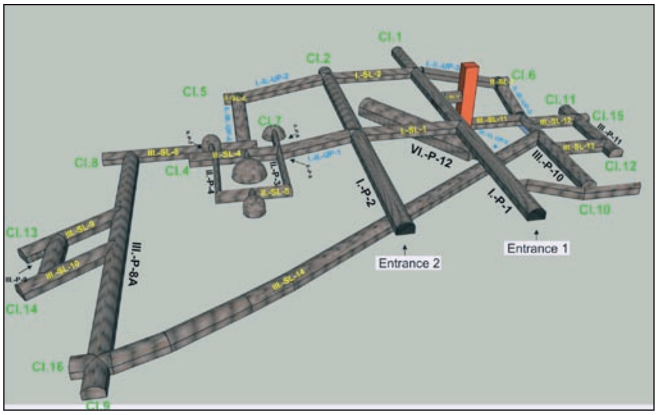


Fig. 3. Viničky – wine cellars. Designation and the space distribution of workings in 3D visualization.

Fig. 4. Sequence of pyroclastic surges. The pyroclastic surge contains a bed of fallen ash with a base surge. Location – Viničky, cellar, III.-SL-14B, left side, 24 m. Photo P. Bačo.

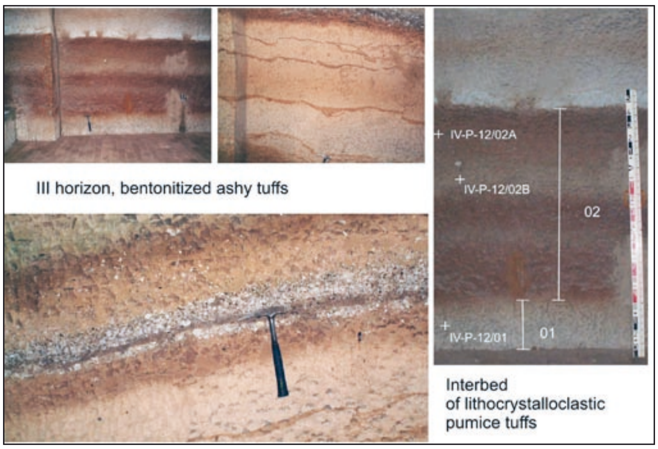
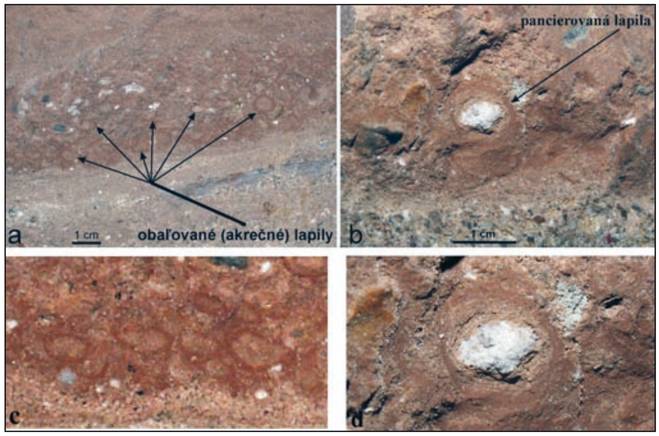


Fig. 5. Bentonitized ashy and pumice-ashy tuffs with distinguished eruption phases. Individual phases are highlighted by the solidification paleosurface. Photo P. Bačo.

Fig. 6. Succession of ashy and pumice–ashy pyroclastic deposits with the presence of accretionary lapilli. Location – Viničky, cellar, III.-SL-8 – Cl8. Photo P. Bačo.



Figs. 7a, b, c, d. Various types of lapilli in the ashy horizon. Location – Viničky, cellar, III.-SL-8 – Cl8. Photo P. Bačo.

Fig. 8. Erosion surface of the underlying ashy rhyolite tuffs. In the tight overlier the tuffitic micaceous sands with the flora casts occur. Location – Viničky, cellar, III.-P-8A3, right side, 10.5 m. Photo P. Bačo.

Fig. 9. Phreatomagmatic pyroclastic flows, surges and dry gravitation flows – avalanches. Dip of the cone slope was 25°. Location – Viničky, cellar, III.-P-8 – Cl9. Photo P. Bačo.

Fig. 10. Polymict fragments and boulders in the slope sediments of the primary cone developed on eroded underlier of the older, mainly ashy, rhyolite tuffs. Location – Viničky, cellar, III.-SL-9B. Photo P. Bačo.

Fig. 11. The gravitation flow of the original autoclastic breccia dragged away the block of the former pyroclastic sediments with the distinct thermic effect of the blazing surrounding environment. Location – Viničky, cellar, I.-P-2 – Cl-2. Photo P. Bačo.

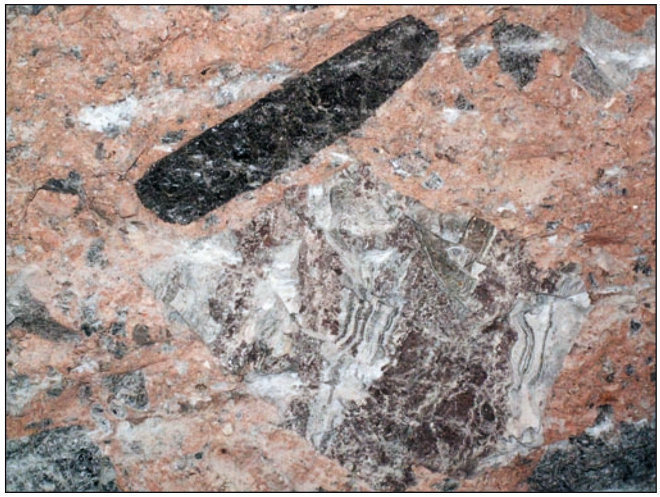


Fig. 12. Detail of the autoclastic breccia with angular shape of fragments to boulders from the various levels of individual bodies, manifesting the gravitation displacement. Location – Viničky, cellar, I.-P-1B, right side, B, 6.4 m. Photo P. Bačo.