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Vernaricum – regional distribution, lithostratigraphy, tectonics and paleogeography

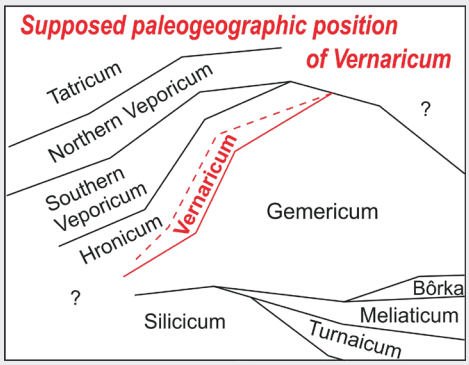
JOZEF HÓK[1] and MÁRIO OLŠAVSKÝ[2]

[1]Department of Geology and Palaeontology, Faculty of Natural Sciences, Comenius University in Bratislava, Mlynská dolina, Ilkovičova 6, 842 15 Bratislava, Slovak Republic; jozef.hok@uniba.sk
[2]State Geological Institute of Dionýz Štúr, Zelená 5, 974 04 Banská Bystrica, Slovak Republic; mario.olsavsky@geology.sk

Abstract: The Vernaricum is the highest partial unit belonging to the Hronic nappe system of the Internal Western Carpathians. The stratigraphic range of the Vernaricum sediments is from the Lower Triassic to the Lower Jurassic. The Permian rhyolites and volcaniclastics are tectonically incorporated into the Lower Triassic sediments. The Vernaricum overlies tectonic units of the Northern Veporicum, Fatricum, lower partial nappes of Hronicum and Southern Veporicum. The Gemeric, Meliatic and Silicic rock complexes are located in the tectonic overburden. The paleogeographic position of the Vernaricum is interpreted between the Veporic and Gemeric zones.

Key words: Internal Western Carpathians, Vernaricum, Hronicum, Veporicum, Gemericum

Graphical abstract



Highlights

- New described lithotectonic unit of Internal Western Carpathians – the Vernaricum – as the highest positioned partial nappe of the Hronic nappe system includes rock sequences of former Vernár nappe, Drienok nappe and lower Muráň nappe with characteristic occurrences of rhyolites and their volcaniclastic material from the pre-Cenozoic basement of the Central Slovakian Neogene volcanites;
- Paleogeographic position of the Vernaricum is assumed between the Hronicum and Gemericum tectonic units.

Introduction

The Vernaricum as a new lithotectonic unit of Internal Western Carpathians was mentioned in work by Hók et al. (2004), but its main attributes including its lithostratigraphy were not defined.

This unit is named after the Vernár village and Vernár nappe (Maheľ, 1986). In the past, the Vernár nappe was interpreted as a part of the Hronicum, as well as Gemericum *ergo* Silicicum. The evolution of opinions on tectonic affiliation of the Vernár nappe and the most complete lithostratigraphic description was consistently presented by Havrila (in Mello et al., 2000b) from the Slovenský raj (Slovak Paradise) area, where the Vernár nappe was supposed to represent a part of Silicicum s.l. Havrila (1997) identifies the Vernár nappe with the Lower Muráň nappe and Drienok nappe, being distinguished by Bystrický (1964) as "*the Drienok series*" and compared with "*facial development of Gemerides in the Muráň plain area*". Most recently, the Drienok nappe, the lower Muráň nappe and the Vernár nappe were considered to be partial nappes of extended Hronicum nappe (Havrila, M. & Havrila, J., 2022; Fig. 2), while the Drienok nappe was understood as a partial nappe of the extensive Považie nappe. The Vernár nappe together with Lower Muráň nappe are presented as partial nappes of Vernaricum in the frame of Hronic nappe system.

Rock complexes, lithostratigraphically corresponding to Middle Triassic dolomites, Szin and Bódvaszilas beds, containing anhydrites and rhyolitic volcaniclastics, resp. "volcaniclastic material of acid origin", were described as a part of pre-Cenozoic basement bedrock in boreholes KOV-33, 39, 40, 41, 42, VŠ-5 and GK-10 (Fig. 1), located in the area of Central Slovakian Neogene volcanites (Vozár in Burian et al., 1968; Vozár, 1969, 1973; Biela, 1978). This rock complex was considered by Vozár (1973) "*to be characteristic of Gemerides as it was described in the Drienok Unit, on the Muránska planina Plain and in the southern part of the Spiš-Gemer Ore Mts*.", i.e. as a part of the Silicic Unit s.l.

Based on above assumptions, it can be concluded that the Vernár nappe, the lower Muráň nappe, the Drienok nappe and the rock complexes in the basement of Central Slovak volcanites represent a part of the same allochthonous tectonic unit, for which we propose the name "Vernaricum". In the following text we define its lithostratigraphy, tectonic location and discuss the paleogeographic position.

Telgárt was assigned to the Lower Triassic of the Vernár nappe (Havrila in Mello et al., 2000b). However, this volcano-sedimentary rock sequence was petrographically, by age and tectonically defined as Permian rhyolite complex (263 ± 3.5 Ma), composed of a cover of rhyolite ignimbrites and central rhyolite extrusions tectonically separated from its surroundings (Demko & Hraško, 2013; Fig. 1), including the Lower Triassic sediments (Bód-

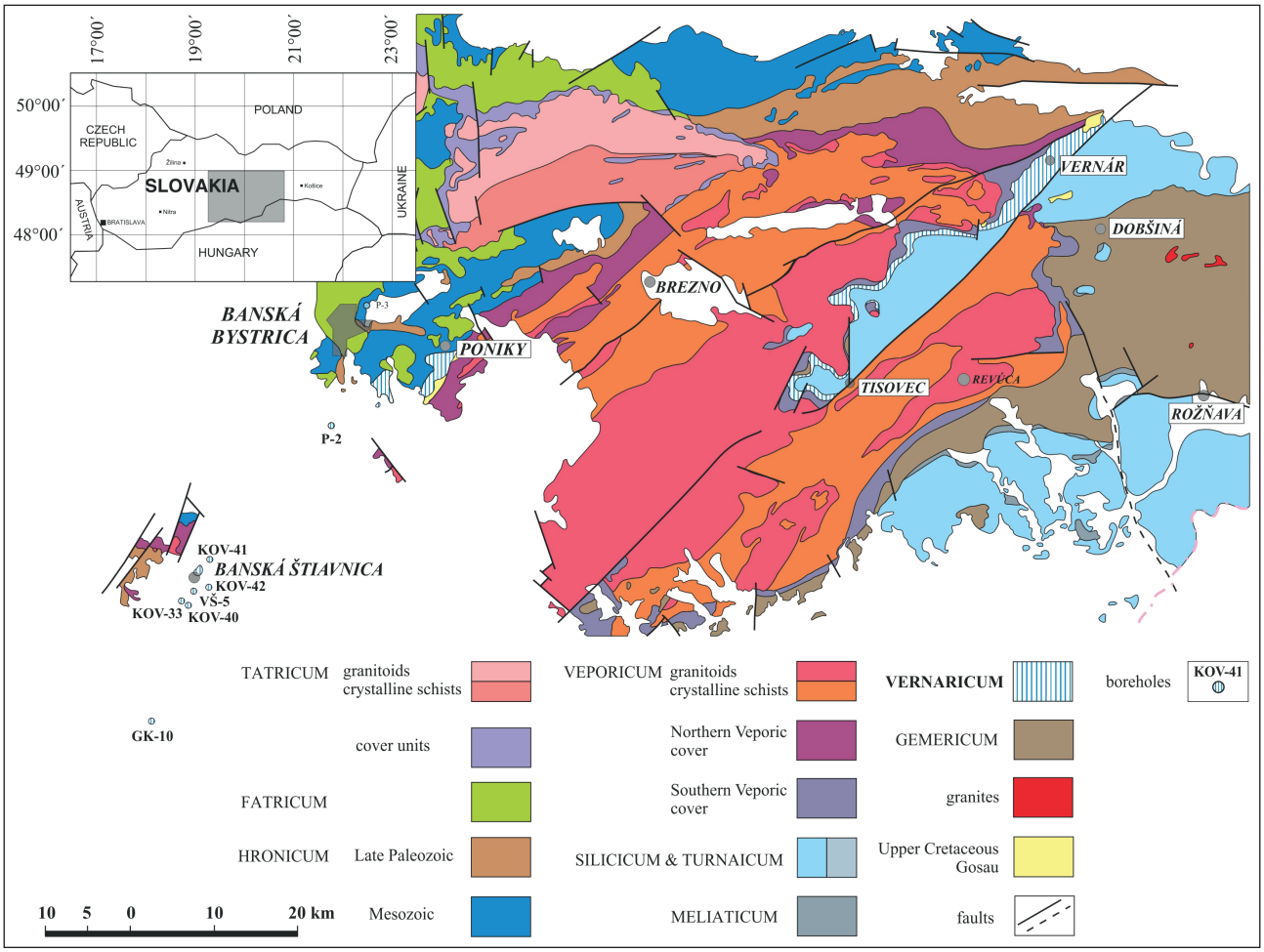


Fig. 1. Simplified tectonic map with occurrences of Vernaricum. Geological map is compiled after maps by Fusán et al. (1987), Biely et al. (1995), Mello et al. (2000a), Polák et al. (2003a).

Lithostratigraphy of Vernaricum

The most extensive and until the most complete sequence of Vernaricum was described from the area of occurrence of the Vernár nappe in the Slovenský raj area (Havrila in Mello et al., 2000b). The rhyolites and rhyolitic volcaniclastics associated with Lower and Middle Triassic sediments were considered as the stratigraphically lowest lithological / lithostratigraphic member. The occurrence of rhyolites and rhyolitic volcaniclastics in the wider vicinity of the Gregová elevation (1168 m a.s.l.) northeast of

vaszilas Beds) and Middle Triassic carbonates (Gutenstein dolomites and limestones). The Permian age of the mentioned rhyolite complex was assumed already by Plašienka (1981). Ondrejka et al. (2018) specified the petrographic classification (A-type rhyolites) and age (263.3 ± 1.9 to 269.5 ± 1.8 Ma) at the localities of occurrence of the so-called lower Murán nappe (*sensu* Havrila, 1997). Dating of monazites from rhyolite at Veľká Stožka (Muránska planina plain) was carried out by R. Demko and reports an age of 281 ± 4.5 Ma (R. Demko, personal communication – November 18, 2019). Rhyolites from the Drienok

area (606 m a.s.l.) west of Poniky locality have the same Permian age (271.0 ± 1.5 and 267.5 ± 1.6 Ma) and are interpreted as tectonically separated bodies in the Drienok nappe (Ondrejka et al., 2022). Despite tectonic position of the rhyolite volcanics and volcaniclastics in relation to the Triassic sediments, these should be considered as an integral part of the Vernaricum (Drienok, Vernár and lower Muráň nappes), because they form a typical lithotectonic horizon and probably represented the substrate on which the Lower Triassic clastics have sedimented.

On the basis of the lithofacies and lithostratigraphic analysis of the Lower Triassic assemblages of the Hronic tectonic unit on the southern slopes of the Low Tatra Mts. and Vernaricum (Drienok, Lower Muráň and Vernár nappes) it is possible to correlate the Lower Triassic sediments in these units with each other (Olšavský, 2004, 2019; Olšavský et al., 2010). For the Lower Triassic lithostratigraphic members of the Vernaricum, it was suggested to use the names Benkov and Šuňava formations, instead of Bódvaszilas and Szin members (Ondrejka et al., 2022). In addition to the mentioned formations, the Hronsek Member was defined (Olšavský et al., 2010) as a separate unit of the uppermost part of the Benkovo Formation and at the same time a correlation horizon between the Franková nappe (Hronicum) and the Drienok nappe (Silicicum s.l.). The Benkovo and Šuňava formations, including the Hronsek Beds, Member represent a unique lithostratigraphic horizon, pointing to the proximality of Vernaricum and Hronicum sedimentary areas in the Lower Triassic period (Figs. 2 and 3).

The Middle Triassic formations of the Drienok nappe in the Poniky area are regularly separated from the Lower Triassic formations by tectonic breccias with a thickness of 30–50 m (Slavkay et al., 1968). As a part of the Middle Triassic assemblages, the Ráztoka Limestones and the Jasenie Limestones (Havrila et al., 2016; Havrila, M. & Havrila, J., 2022), described in the Hronic tectonic unit (Kochanová & Michalík, 1986), are also present in the Drienok nappe. Other Middle Triassic lithostratigraphic members are common both in the Drienok and Vernár nappes (Fig. 3), while it cannot be excluded that the Raming Limestones originally described in Vernár nappe (Havrila in Mello et al., 2000b) could represent Ráztoka Limestones.

The Upper Triassic sediments are known only from the area of occurrence of the Vernár nappe (Mello et al., 2006a, b). The Lunz Formation (Carnian) of dark clayey shales and sandstones represents an important lithostratigraphic member. The Lunz Formation occurs in the tectonic units of the Tatricum, Fatricum, Northern Veporicum, Hronicum and Vernár nappe (Kohút et al., 2018; Havrila et al., 2019). We consider the occurrence of the Lunz Formation and the Reifling Limestones in the southern zone of Veporicum (Aubrecht et al., 2017; Fig. 1) to be unfounded (cf. Havrila et al., 2019; Mello et al., 2000). Grey-black shales, black limestones with cherts and sandstones (Reingraben Shales, "Mürztal" Beds, Julian) are present in the sub-units of Červený Štros and the Gerava unit of the Stratená nappe of Silicicum (or Stratená Group sensu Mello et al., 2000b). Lithostratigraphically similar sediments occur also in the

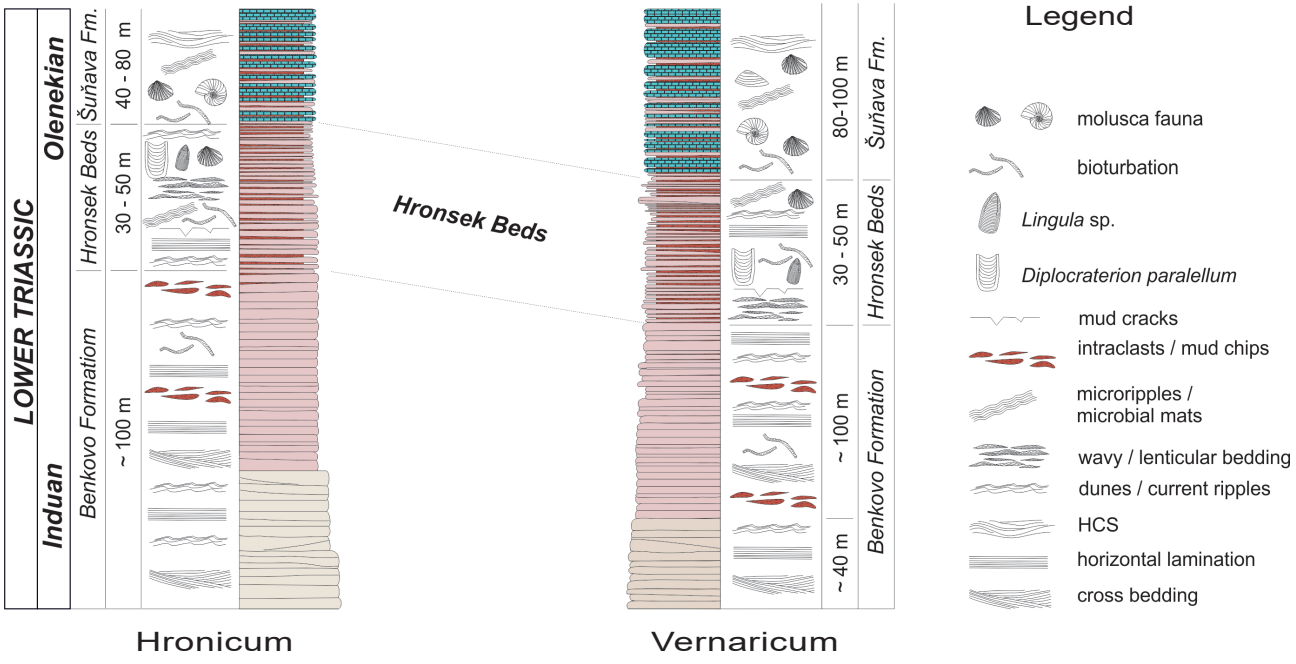


Fig. 2. Correlation of Lower Triassic sediments of the Hronicum and Vernaricum tectonic units.

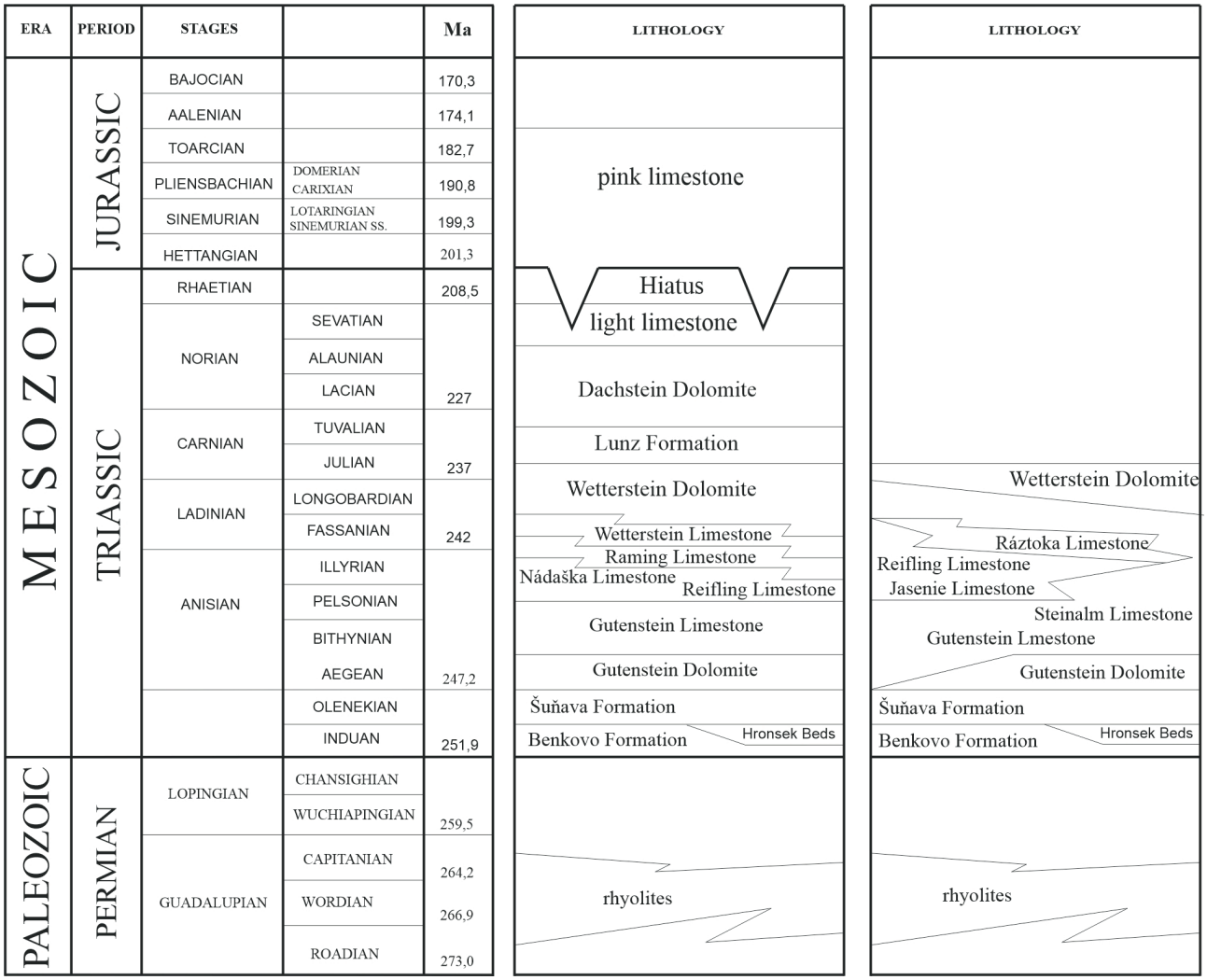


Fig. 3. Lithostratigraphic column of the Vernaricum in the areas of the Vernár nappe (left) and Drienok nappe (right). Permian volcanic bodies are incorporated to Vernaricum tectonically. Compiled according to Havrila (in Mello et al., 2000b), Mello, Vozárová and Polák (in Polák et al., 2003b, modified and supplemented).

Muráň nappe of Silicicum (upper Muráň nappe sensu Havrila, 1997) in the northeastern part of the Muránska planina Plain (Bystrický in Fusán et al., 1963; Geological map of Slovak Republic – https://apl.geology.sk/akt50js/). From the listed lithofacies members of Carnian age, it is possible to unreservedly compare the Lunz Formation from the Vernár nappe (dark shales and sandstones) with the sediments of the Lunz Formation described from the tectonic units of Hronicum, Veporicum, Fatricum and Tatricum. Other lithofacies members (Reingraben Schists, "Mürztal" Beds) are, on the contrary, well correlated with occurrences in Silicicum (Mello et al., 1997a, b). In the area of the Vernár nappe in the Slovenský raj territory, the Dachstein dolomites with light grey and pink limestones (Norian) were described (Havrila in Mello et al., 2000b) in the overlier of the Lunz Formation. In the environment of the latter described limestones the neptunic dikes filled with pink microcrystalline limestones occur (?Liassic). It should be noted that in the Vernár nappe, in contrast to the Stratená Group of Silicicum (sensu Mello et al., 2000b), occurrences of Upper Triassic Aflenz, Hallstatt and Pötschen limestones are absent.

The Lower Triassic lithostratigraphic members (with the exception of tectonically incorporated acid volcanics of the Permian age), the Ráztoky Limestones, Jasenie Limestones and Lunz Formation occurring in the Drienok and Vernár nappes can be parallelized with the tectonic unit of Hronicum.

Tectonic position of the Vernaricum

In the area of Zvolenská kotlina Basin (wider area of Poniky locality; Fig. 1), the Drienok nappe rests on different lithostratigraphic members and at the same time on partial structures / nappes of the Hronicum as well as

the northern Veporicum / Fatricum (Polák et al., 2003a; Olšavský, 2004; Geological map of Slovak Republic https://apl.geology.sk/gm50js/).

At the hypothetical northeastern continuation of the Drienok nappe into the Brusno – Predajná – Bystrá area, three imbricated structures of the Hronicum are present. For these structures, local names of sub-nappes in superposition hierarchization – Bystrá, Svíbová and Okosená nappes – were proposed (Biely, 1963, 1984; Biely et al., 1997). The lithofacial content of partial nappes corresponds to the Biely Váh basin sequence of the Hronicum, similar to the Vernaricum (Biely, 1984; Biely et al., 1997; Havrila, M. & Havrila, J., 2022). In the body of the Svíbová partial nappe, rhyolite ignimbrites of probably Permian age are present between the Malužiná and Benkovo formations (Olšavský & Demko, 2007; Olšavský, 2020). The Stupka Beds were described as the youngest member of the Malužiná Formation in the Svíbová nappe. Their significant component is represented by centimeter- to decimeter-sized rhyolite clasts (Olšavský & Demko, 2007; Olšavský, 2020). In both cases, it is possible to establish a partial lithofacies (Biely Váh Sequence) as well as lithostratigraphic (rhyolite volcanics and rhyolite clastics) affinity with the Drienok nappe, respectively with the Vernaricum. The direct correlation is contradicted by the presence of rock complexes of the Ipoltica Group, and at least by the presence of the Stupka Beds as an integral member of the Malužiná Formation. Another important argument is the tectonic superposition of partial nappes and their lithostratigraphic filling. The Drienok nappe south of Hron river (Zvolenská kotlina Basin *sensu* Mazúr & Lukniš, 1978) clearly appears as the highest structural element tectonically overlying the Marková as well as the Franková partial nappes of the Hronicum (Polák et al., 2003a, b). Structurally, the highest partial nappe north of Hron river (Bystrianske podhorie area sensu Mazúr & Lukniš, 1978) is the Okosená nappe, whose stratigraphic range is Lower to Upper Triassic without the presence of rock complexes typical for Vernaricum or Drienok nappe. A similar situation is also repeated in the superpositionally lowest Bystrany partial nappe of the Hronicum. The Svíbová nappe with the tectonic slice of rhyolites and the Stupka Beds thus occur between two structures where it is not possible to determine their lithostratigraphic relationship with the Vernaricum or Drienok nappe. The lithostratigraphic content of the Svíbová nappe thus indicates only a paleogeographical, but not a tectonic affinity with the Drienok nappe resp. Vernaricum.

The youngest lithostratigraphic member of the Northern Veporicum, which is tectonically overlain by Vernaric sediments, is the Mraznica Formation (Valanginian – Hauterivian). Polymict breccias (Poniky Breccias *sensu* Slavkay & Rohalová, 1993) were described from the area of extension of the Drienok nappe. The Poniky Breccias are stratigraphically, but without biostratigraphic evidences, considered to be Upper Cretaceous–Paleogene sediments (Slavkay & Rohalová, l.c.). They contain Permian to Lower Cretaceous clastics and discordantly overlie the structures of the Northern Veporicum / Fatricum, Hronicum and Drienok nappe (Slavkay et al., 1968; Slavkay & Rohalová, 1993). At the same time, they are tectonically covered by generally south-vergent displaced parts of these tectonic units. According to Slavkay and Rohalová (1993), the most striking thrusting of the Drienok nappe towards the southeast occurs in the area between the elevations of Farbište and Repište in the valley of Suchá Driekyňa and to the W of the road connecting Poniky and Ponická Lehôtka localities, where relics of the Drienok nappe occur from Ľuptákov vrch hill (local name) up to the surroundings of the Žiar elevation point (659 m a.s.l.). The exclusively tectonic character of the breccias is assumed by Polák et al. (2003b). This assumption cannot be accepted when considering the thickness of the breccias, which reaches up to 320 meters (Polák et al., Fig. 13). We assume that the structural reworking of a part of the breccias is a consequence of backthrust displacements (Slavkay et al., 1968; Slavkay, 1971; Olšavský, 2004).

In the pre-Cenozoic bedrock of Central Slovakian Neogene volcanites (Fig. 1), the sediments of Vernaricum were revealed by drilling survey. The Triassic sediments and volcaniclastics are superimposed on the sediments of tectonic units of Southern Veporicum and Hronicum (Vozár, 1973; Hók & Vojko, 2011). In the area of Štiavnica stratovolcano (*sensu* Vass et al., 1988), the occurrence of Lower Triassic sediments near Šobov (Jergištôlňa) was included into the Silicicum s.l. (Konečný et al., 1998). In view of the North Veporic affiliation of the pre-Cenozoic bedrock in the wider area of the Sklené Teplice horst (Konečný et al., 1998; Hók & Vojko, 2011; Hók et al., 2013) and the geometry of the spatial spread of tectonic units in the boreholes as well as in the geological map (Fig. 1) it is more likely that the Lower Triassic assemblage belongs rather to the Drienok nappe or to Vernaricum.

The Lower Carboniferous sediments with carbonates (Ochtiná Formation) as well as sediments that are lithologically close to Hámor Formation and occur in the overburden of the Ochtiná Formation (Plašienka & Soták, 2001) were identified in the footwall of the Muráň nappe in the Furmanec valley (NW of Tisovec town, Fig. 1). This sedimentary complex, named as Furmanec unit (Furmanec sub-unit *sensu* Plašienka and Soták, 2001), occurs in the overlier of Southern Veporic sediments. According to other authors (Demko & Olšavský, 2005), the Upper Carboniferous (non-carbonate) members in the Slávča valley (approx. 5 km to northeast of the Furmanec unit occurrence) as well as in the Furmanec valley, correspond – together with vein bodies of sub-ophytic basalts of the Permian age – to the lithology of the Nižná

Boca Formation. In this case, the volcano-sedimentary complex of the Nižná Boca Hronic assemblage would emerge in the tectonic overburden of the rock complexes of the Southern Veporicum, which would also be located in the tectonic footwall of the Furmanec unit (Demko & Olšavský, 2005). Due to the fact that the lower Muráň unit of Gemericum (Demko and Olšavský, 2005) should be located in the footwall of the Silicic nappe (upper Muráň nappe). The arrangement of tectonic units in the southern part of the Muránska planina plain (Tisovec area) is then as follows: Southern Veporicum → Hronicum → Vernaricum → Gemericum → Meliaticum → Silicicum (Fig. 4).

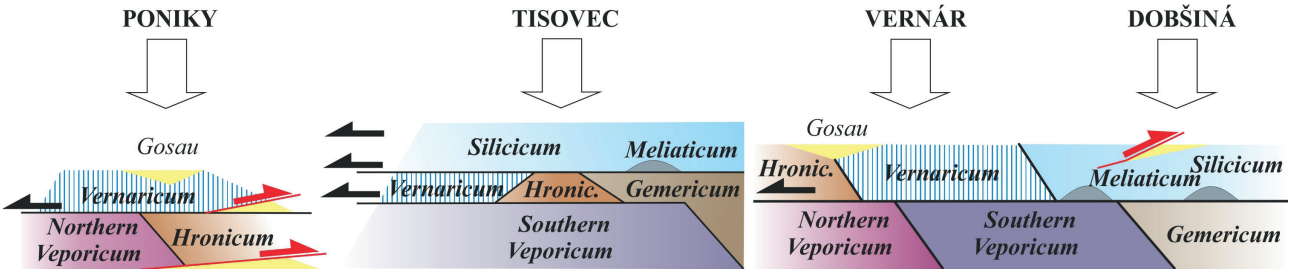


Fig. 4. Simplified situation of the tectonic position of the Vernaricum in individual areas of its occurrence (see Fig. 1). Black arrows indicate north-vergent displacements of tectonic units, red arrows indicate south-vergent displacements of tectonic units.

nappe occurs in the immediate tectonic underlier of the upper Muráň nappe included in Silicicum s.s. (Havrila, 1997) and in northeast direction from the Furmanec and the Slávča valleys immediately tectonically overlies the rocks of the Southern Veporicum, the Lower Muráň nappe (Vernaricum) is found in a structural superposition above the sediments and volcanics of the Nižná Boca Formation (Fig. 4).

From a nearby area (elevation point Magnet, 964 m a.s.l.), Bacsó and Valko (1969 ex Vojtko, 2000) described in the borehole TV-10 a set of metamorphosed black graphitic and siliceous phyllites with evaporites, situated in the underlier of Triassic silicic limestones (of upper Muráň nappe sensu Havrila, 1997). The metamorphosed rock complex is considered to be a part of the tectonic unit of Meliaticum (Vojtko, 2000). At the same time, a Lower Triassic rock sequence (Bodvaszilas and Szin beds) with rhyolite pyroclastics in the basal part of the Bodvaszilas Formation as well as the complex of Middle and Upper Triassic limestones in the stratigraphic range Aegean to Cordevolian conditionally correlated with the Turnaicum tectonic unit or the Drienok nappe, were described in this area (Vojtko, 2000). From the point of view of the present body of knowledge, the Triassic rock complex with rhyolite pyroclastics can be assigned to the Lower Muráň nappe or Vernaricum (Havrila, 1997). In the area of the Furmanec valley and elevation Magnet (964 m a.s.l.), the rock complexes of the southern Veporicum, Gemericum (Furmanec partial unit sensu Plašienka & Soták, 2001), the lower Muráň nappe (Havrila, 1997), Meliaticum (Vojtko, 2000) and Silicicum (upper Muráň nappe sensu Havrila, 1997) occur in tectonic superposition. In the Slávča and Furmanec valleys, the sediments and volcanics of the Nižná Boca Formation of Hronicum and the Furmanec

In the Slovenský raj area (Vernár area; Fig. 1) the situation is more complicated. The Vernár nappe here should rest on the sediments of the Southern Veporicum and Hronicum, but at the same time in the tectonic footwall of Silicicum (Mello et al., 2000a; Geological map of Slovak Republic – https://apl.geology.sk/gm50js/). The results of reambulatory geological mapping (Madarás and Ivanička, 2001) show that the slice of Carboniferous sediments located between the Southern Veporicum (https://apl.geology.sk/gm50js/) and Vernaricum belongs to the Slatviná Formation (Southern Veporicum) and not to the Hronicum tectonic unit as was primarily assumed (Mello et al., 2000a). The principal argument for such decision was primarily the structural record. Kováčik (2012), however, assumes that the entire complex of Carboniferous sediments with volcanics belongs to the tectonic unit of the Hronicum, displaced on the sediments of the Southern Veporicum, protruding from under the rock complexes of the Hronicum in tectonic windows, while the author (l.c.) considers the structural record in both units to be comparable. From the point of view of the tectonic location of the Vernár nappe, the tectonic arrangement of the rock zone between the Vernár nappe and the rocks of Southern Veporicum (Madarás & Ivanička, 2001; Kováčik, 2012) is irrelevant, because the Vernár nappe tectonically overlies the rock complexes of the Hronicum and the Southern Veporicum and, due to its tectonic position, it is in a situation similar to the one in the area of Tisovec. the Vernaricum (Vernár nappe) tectonically covers the Southern Veporikum as well as the Hronicum, and the Vernaricum itself is overlain by Meliaticum and Silicicum (Fig. 4; Geological map of Slovak Republic – https://apl.geology.sk/gm50js/).

Southwest of Betlanovce village, the ?Upper Cretaceous to ?Paleocene sediments (in each case sediments younger than the Campanian and older than the Lower Eocene) cover the tectonic contact of the Hronicum and the Vernár nappe (l.c.; Figs. 1 and 4). These sediments contain clasts derived from tectonic units of Veporicum, Gemericum, Hronicum, as well as Meliaticum and Silicicum (Havrila, Filo, Mello in Mello et al., 2000a, b). The Upper Cretaceous sediments of the Gosau Group, situated under the south-vergent back-thrust displacements, are present in the area north of Dobšiná. Similarly, the geological setting of Upper Cretaceous to Paleogene sediments is complicated by south-vergent displacements in the Poniky area (Slavkay et al., 1968; Slavkay, 1971; Slavkay & Rohalová, 1993). The south-vergent displacements are probably related to the exhumation of the Tatric crystalline basement of the Nízke Tatry Mts. during the Upper Eocene (Králiková et al., 2016).

In the area of the Zvolenská kotlina Basin, the Drienok nappe covers the Northern Veporicum / Fatricum and Hronicum and represents the highest tectonic unit in this area of its occurrence (Fig. 4). The Vernár nappe (Vernaricum) in the Slovenský raj area rests in a tectonic position on the Betlanovce partial nappe / the slice of Hronicum (Mello et al., 2000a, b). From the Gľac partial nappe and the Červený Štros Group of the Stratená nappe, the Vernáricum is separated along the entire contact by the Muráň fault, but southwest of Hrabušice village (the Píla area) the Stratená nappe (the Červený Štros Group) is displaced on Vernár nappe (Vernaricum).

Paleogeographic position of Vernaricum

The present spatial arrangement of tectonic units in individual areas of the Vernaricum occurrence is expressed in Fig. 4. The immediate tectonic contact of the Vernaricum with the tectonic unit of the Northern Veporicum and Hronicum is observable in the area of Poniky (Zvolenská kotlina Basin), where the Vernaricum (Drienok nappe) represents the highest tectonic unit. In the area of Central Slovakian Neogene volcanites, occurrences of Vernaricum were recorded mostly in boreholes and overlap the tectonic contact of the Northern and Southern Veporicum (Hók & Vojtko, 2011). In the Slovenský raj area, the direct tectonic underlier of Vernaricum (Vernár nappe) is the Southern Veporicum and Hronicum. The direct tectonic overlier of Vernaricum is represented by Silicicum. In the area of the Muránska planina Plain (the Lower Muráň nappe) the tectonic underlier of Vernaricum is formed of units of Southern Veporicum and Hronicum. The Vernaric tectonic overlier is formed again by Silicicum (Upper Muráň nappe).

Silicicum in the entire range of its occurrence has Vernaricum in its tectonic underlier only in areas of Slovenský raj and the Muránska planina Plain. As a separate tectonic unit, Silicicum was displaced onto already structured basement of Veporicum, Hronicum, Vernaricum and Gemericum in the Upper Cretaceous period (Plašienka, 2018). Of the last mentioned tectonic units, Gemericum is found in the highest structural position under Silicicum. Taking into account the movement of tectonic units generally from the southeast to the northwest (in today's geographical coordinates, cf. Plašienka, 1999, 2018; Csontos & Vörös, 2004; Hók et al., 1995), the paleogeographical position of the Vernaricum lies between the Hronicum and Gemericum, while Vernaricum represents the structurally highest element of the Hronic system of nappes (Havrila, M. & Havrila, J., 2022).

Permian volcanism in the Hronicum is represented by tholeiitic basalts, andesites and their volcaniclastics, originating in the extensional tectonic regime, which conditioned the riftogenesis of the continental margin or forearc resp. backarc basin formation within the continental crust (Vozár et al., 2015). The presence of a continental type of crust is indicated by the occurrence of crystalline rocks (crystalline schists and granitoids) at the base of the Nižná Boca assemblage of the Ipoltica Group of Hronicum on the northern slopes of the Nízke Tatry (Low Tatra) Mts. (Andrusov, 1936; Vozárová & Vozár, 1979). The same is true on the northern side of the Nízke Tatry Mts. in the area of Okrúhly vrch (Olšavský, unpublished data) as well as on the southern slopes of the Nízke Tatry Mts. (Olšavský & Demko, 2007; Olšavský, 2020), however, acidic varieties of volcanics (rhyolites and rhyolite ignimbrites and Stupka Beds) have also been detected in the structure of the Hronicum, indicating the lithological affinity of the Permian acidic volcanics of Hronicum and Vernaricum (Olšavský, 2020).

Another aspect in deciphering the paleogeographic position of the Vernaricum is represented by lithostratigraphic members that are part of Vernaricum but also occur in other tectonic units. These include the Benkovo and Šuňava formations together with the Hronsek Beds (Lower Triassic; Olšavský et al., 2010; Olšavský, 2019), Ráztoky and Jasenovo Limestones (Havrila et al., 2016; Havrila, M. & Havrila, J., 2022), but also other lithofacies of Triassic limestones (see Fig. 2) and the Lunz Formation (Upper Triassic; Havrila in Mello., 2000b), which are lithostratigraphically identical to the occurrences in the tectonic unit of Hronicum and in the given lithological, facies and stratigraphic configuration they do not occur elsewhere. Vernaricum can be considered as a part of the Hronicum tectonic unit (cf. Havrila, M. & Havrila, J., l.c.). Presently, it crops out in the highest structural position within the partial nappes of the Hronicum. Vernaricum belongs to internal zone of the Hronicum paleogeographic area, which stretched between Veporicum and Gemericum.

Conclusion

Vernaricum is defined as the structurally highest unit or partial nappe of Hronicum in the stratigraphic range of Lower Triassic to Lower Jurassic. A typical lithotype accompanying Vernaricum is represented by rhyolites and rhyolitic volcaniclastic, being tectonically incorporated to Lower Triassic sediments. These probably formed the substrate of the Triassic lithostratigraphy of Vernaricum (Fig. 3). The Vernaricum includes the tectonic units, in the past referred to the Vernár nappe (Maheľ, 1986), the Drienok Series (Bystrický, 1964) or the Drienok nappe (Polák et al., 2003), as well as the Lower Muráň nappe (Havrila, 1997). The structurally individualized occurrences, referred as the Vernár nappe, the Lower Muráň nappe, the Drienok nappe and occurrences in the footwall of the Central Slovakian Neogene volcanites (Fig. 1), were in the past considered to be a part of the Gemericum s.l. (*e.g.* Bystrický, 1964; Vozár, 1973), Silicicum (e.g. Andrusov & Samuel, 1983; Mello et al., 2000) or Hronicum (e.g. Kettner, 1937; Havrila, M. & Havrila, J., 2022). The Vernaricum tectonically overlies the units of the Northern Veporicum / Fatricum, Southern Veporicum and Hronicum, and at the same time it is situated in the tectonic underlier of Gemericum, Meliaticum and Silicicum (Figs. 1 and 4). The tectonic individualization of the Vernaricum can be dated to the Lower Cretaceous period. The presumed paleogeographic position of Vernaricum (in today's geographical coordinates) was located on the internal / southern edge of the Hronic sedimentary basin.

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Vernárikum – rozšírenie, litostratigrafia, tektonika a paleogeografia

Vernárikum je definované ako štruktúrne najvrchnejšia jednotka alebo čiastkový príkrov príkrovového systému hronika. Tektonické jednotky zaradené do vernárika sa označovali ako séria Drienka (Bystrický, 1964), vernársky príkrov (Maheľ, 1986) a spodný muránsky príkrov (Havrila, 1997), pričom Havrila (l. c.) koreloval spodný muránsky príkrov s drienockým príkrovom, resp. sériou Drienka (*sensu* Bystrický, 1964). Zároveň boli drienocký príkrov, vernársky príkrov a spodný muránsky príkrov považované za súčasť tektonických jednotiek gemerika (napr. Bystrický, 1964; Vozár, 1973), silicika (napr. Andrusov a Samuel, 1983; Mello et al., 2000) alebo hronika (Kettner, 1937).

Stratigrafický rozsah vernárika je spodný trias až spodná jura (obr. 3). Typickými asociujúcimi litotypmi sú permské ryolity a ryolitové vulkanoklastiká, tektonicky začlenené do sedimentov spodného triasu (Demko a Hraško, 2013; Ondrejka et al., 2018, 2022). Príkrovové premiestnenie vernárika možno datovať do obdobia spodnej kriedy. Vernárikum prikrýva tektonické jednotky severného veporika/fatrika, hronika a južného veporika. V jeho štruktúrnom nadloží sa nachádza gemerikum, meliatikum a silicikum (obr. 1 a 4). Predpokladaná paleogeografická pozícia vernárika sa nachádzala v priestore medzi veporikom a gemerikom.

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