

crops out along the northern margin of Klippen belt. It is a thick-bedded flysch formation in which mostly the greywacke sandstones. The sandstones are predominantly fine- to medium-grained, of greywacke type, with quartz and carbonate clasts. The formation contains as much as 10 m thick bodies of slump sandstones and conglomerates. We infer the total thickness of Strihovce Formation of 900 m. Its age predates the Middle Eocene. The *Inovce Formation* [Middle (?)–Late Eocene] is pelitic, made up of red-violet, yellow- white and green-blue-grey "variegated" claystones. It crops out at the southern end of Inovce village.

NEOGENE

Neogene molasse

Eggenburgian

The relics of sediments are preserved NE of the Klippen belt, mainly south-east and east of the village Modra n. Cirochou. The sediments are pelitic, shallow-water, composed of weathered grey to greenish-grey claystones and contain siltstone. Besides claystones and siltstones there also occur fine-grained sandstones and scarce sandstones with conglomerate intercalations.

Karpatian

The Otrngian hiatus was followed by the Karpatian transgression. The Basal Teriakovce Formation is characterized by a deep water, pelitic development. The transgressive character has the upper part of Karpatian stage - the *Kladzany Formation*, observed at the junction with Paleogene rocks as a varied, lagoonal development. The formation is composed of brown-violet claystones with scarce sandstone and siltstone intercalations. Also present are gypsum veinlets and efflorescences. The sediments of this formation scarcely occur south-east of the Oreské village.

Badenian

The sedimentation during Badenian stage shows again the transgressive features. Thus, the *Nížný Hrabovec Formation* (Lower Badenian), as well as the overlying *Vranov Formation* (Middle Badenian) indicate a detritic-pelitic development. The *Nížný Hrabovec* sediments are made up of medium-fine-grained yellowish to rusty-brown sandstones and grey to yellow-brown patchy claystones. They are so much weathered as to form clays. The *Vranov Formation* is characterized by the sediments composed of grey to blue-grey clays with fine-medium grained yellowish to moderately rusty sandstone intercalations. The sediments of both formations crop out south-east of the Oreské village.

Neogene volcanic rocks

Badenian

The Lower Badenian areal type of dacite to rhyodacite volcanism is represented by the fine-grained, predominantly aleuritic-pelitic, light-grey to greenish, *Hrabovec rhyodacitic tuffs*. In the lower part there occur medium- to coarse-grained tuffs with pumice fragments and with biotite and feldspar crystalclasts. The garnet grains occur scarcely. The bentonitization and zeolitization processes obliterated the primary character of tuffs. They crop out mainly west of the Vihorlat Mts., near Oreské and north-east of Sobrance.

Sarmatian - Pannonian

Another type of volcanism is represented by the basalt-andesite to andesite of the volcanic arc type. This activity continued during the Middle and Upper Sarmatian stages in a form of rhyodacite bodies that intrude the Paleogene sediments. One such body occurs north-east of Beňatina. The *Beňatinska voda rhyodacite body* is made up of pale, autometamor-phosed rhyodacite with accessory garnet. The body is wrapped in a breccia that contains the fragments of glassy rhyodacite in a clayey-sandy matrix. The beginning of Middle Sarmatian times was marked by the volcanic activity whose products crop out as morphologically distinct, extrusive bodies of the *Vinné Complex*. This complex includes the extrusive bodies of amphibole-hypersthene andesites, hypersthene andesites with accessory augite and amphibole, augitic-hypersthene andesites and associating transitions to the extrusive breccias.

Most of the Upper Sarmatian to Lower Pannonian times was dominated by the development of andesitic stratovolcanoes. Two distinctive chains of andesite stratovolcanoes developed during the mentioned explosive-effusive activity.

The north-west striking eastern chain includes the morphologically isolated stratovolcanoes. The *Popriečny Stratovolcano* is composed of the lower *Popriečny Formation* and of the upper *Petrovce Formation*. Most of the *Popriečny Formation* is represented by pyroclastic breccias and autochthonous agglomerates, alternating with lava flows of aphanitic to medium-porphyrific pyroxenic andesite, but also by redeposited pyroclastics and epiclastics. The upper, *Petrovce Formation* is mainly a product of effusive activity, of which the individual lava flows of medium- to coarse-porphyrific pyroxenic and leucocratic andesites make up the south-west running fill of an eroded away paleovalley. The *Diel Stratovolcano* is composed of the *Bystrá, Vavrová* and *Diel Formations* and the Complex of *central zone*. The *Bystrá Formation* is made up of medium-porphyrific pyroxenic andesite lava flows and directly overlies the pre-Neogene basement. In the south most of the formation is composed of redeposited pyroclastic and epiclastic rocks. The *Vavrová Formation*, composed mainly of coarse-porphyrific pyroxenic andesite with large augite phenocrysts and sporadic leu-

cocratic and basaltic andesite lava flows, overlies the denuded surface of the *Bystrá Formation*. The *Diel Formation*, represented by the youngest products of volcanic activity of the stratovolcano, is composed of the relics of amphibole-pyroxene andesite lava flows and the dykes and necks of pyroxene-amphibole andesites. The Complex of central zone is represented by propylitized pyroxenic andesites that are intruded by the diorite porphyry and the dykes of pyroxenic andesites. The *Morské oko Stratovolcano* is composed of the *Hámre* and *Sninský kameň Formations* and the *Complex of central zone*. The base of stratovolcano is made up of the *Hámre Formation*, characterized by medium-porphyrific pyroxenic lava flows and of a discontinuous bed of redeposited tuffs. The *Sninský kameň Formation* disconformably overlies the moderately to strongly denuded surface of the *Hámre Formation*. The base of formation is made up predominantly of coarse-porphyrific pyroxenic andesite lava flows and the upper part is made up of medium- fine-porphyrific pyroxenic andesites, grading to basaltic andesites. The Complex of central zone comprises an unspecified propylitized/chloritized sequence of andesitic porphyries and andesites, the intrusions of diorite porphyries, the dykes of andesite and andesite porphyry, the bodies of secondary quartzites and the silicification and argillitization zones.

The western, south-west-north-east running chain is represented by morphologically merge stratovolcanoes. The *Vihorlat Stratovolcano* is characterized by a pericentral arrangement of the lava flows around a central protrusion (a ?tholoid), located in the area of Vihorlat summit triangulation point (1075.4 m). The lava flows are composed of pyroxenic andesites. The asymmetrical structure of *Sokolský potok Stratovolcano* strikes north-west, and, together with the *Kyjov Stratovolcano*, they make up a volcanic structure with greater representation of the explosive products in its lower part, and with the lava flows gradually predominating in its higher levels. The pyroxenic andesites predominate over the pyroxenic basaltic andesites. The *Kamienska Volcano* is characterized by the deposits of autochthonous pyroclastic breccias. They are intersected by a number of dykes and necks of pyroxenic andesite.

In contrast to the stratovolcanoes of the eastern branch, the western branch stratovolcanoes almost totally lack the differentiated rocks, the spatial similarity and are less extensive. It seems that the mentioned features were due to the development of volcanic structures beyond the main, graben-like, volcano-tectonic zone. The bases of most of the mentioned stratovolcanoes both, in the eastern, and the western branch, are characterized by the products of explosive activity that sedimented in a fluvial-limnic environment and were later overlain by the products of effusive activity (deposited predominantly in a terrestrial environment).

QUATERNARY

The Quaternary cover reflects the geological structure of pre- Quaternary basement. The Quaternary sediments occur in mountainous parts of the Vihorlatské vrchy Mts., where most of them are made up of Pleistocene and Holocene loamy-stony sediments. The Pleistocene, deluvial-fluvial sediments, the fluvial, the eolian-deluvial and the proluvial sediments are widespread in the sub-mountainous part of the Vihorlatské and Humenské vrchy Mts. In their mountainous parts there occur also the solifluction and gravitational sediments.

TECTONICS

The heterogeneity of geological structure is largely a result of its position at the junction of important tectonic units, which influenced its formation.

It is probable that the Miocene thrusting was responsible for the elimination of all traces of the Late Cretaceous north-wergent thrusts and for the development of thrust-sliced structure of the Humenné Mesozoic, with south-vergent, steeply north-east dipping thrust planes. It was during this stage that the Humenné Unit split to form four west-north-west striking thrust-slices. During a later tectonic stage there formed west-north-west and west striking faults, and the youngest, transversal, north, or north-north-east striking and steeply westwards and eastwards dipping, fault system of the Humenné Mesozoic, which segments the thrust-slice structure of the Mesozoic rocks into relatively independent blocks. The Klippen belt is a complicated megaboudinage structure, a narrow tectonic zone that formed during several stages of Alpine folding. However, its typical klippen style developed as a result of neo-Alpine folding. The lateral sinistral slip faults also played an important role in its formation. The outer, rootless flysch nappes were transported north-eastwards. The oldest and the most important Neogene structure is the along-strike running fault system, also referred to as a longitudinal system (north-west striking), which represents a tectonic junction between the Inner Carpathian Paleogene and the Neogene sediments, is the place where the Lower and Middle Miocene formations contact. Of the younger, transversal (north-east striking) faults, only the fault south of Oreské and the fault running along the Laborec valley, both dipping south-east, play an important role. The youngest, north striking fault system in this area, makes up a continuation of the distinct fault system from the Humenské vrchy Mts. Mesozoic. The development stages of volcanic structures are mostly bound to the north-west-south-east and north-east-south-west striking fault systems. Some of the Neogene tectonic features continued to the Quaternary times.



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