

TECTONIC DEVELOPMENT OF WESTERN CARPATHIANS AND DIVISION OF TECTONIC MAP: an overview

Tectonic structure of Western Carpathians contains fragments of several orogens and young superimposed sedimentary and volcanic formations. The tectonic setting of Western Carpathians is a product of two main orogeneses -Hercynian and Alpine. Each of them had several own geotectonically differing phases. The oldest constituents of tectonic setting of Slovakia are built by the fragments of Hercynian tectonic units, forming crystalline basement. They are also the main building elements of recent crust of Western Carpathians. To some extent the Western Carpathians are from NW and N underlied by sub-merged European platform (mainly Cadomian crystalline basement of Brunia), may be also the fragments of Oravic basement beneath Tatricum. Southward there are also interpreted the supposed fragments of Cadomian basement of unknown affiliation in the underlier of Hercynian units. Hercynian tectonic units originated during long-lasting evolution in Paleozoic in the space between former continents Gondwana and Laurasia. The existence of additional smaller continental blocks and oceanic domains is also supposed in this space.

The Hercynian units represent the middle crustal nappes formed during Hercynian collisional processes. They are composed of complexes of metamorphic rocks differing in metamorphic degree and lithology. At the end of their evolution they were intruded by granitoid bodies at various time periods. The Hercynian tectonic setting was later disintegrated. The fragments of former Hercynian units were incorporated into new Alpine units and structurally reworked. This disintegration of Hercynian continental crust started already during the Upper Paleozoic riftogenesis and continued in Mesozoic when the new oceanic basins and microcontinents have formed.

Alpine orogenesis consists of several Mesozoic and Tertiary phases. These are conventionally divided on Paleo-, Meso- and Neoalpine phases using the principle of closing of the oceanic domains in the space between European and African plate (e. g. Suk et al., 1996). We suppose the existence of three oceanic basins with differing development in Mesozoic and Tertiary. Depending on their closure the principal Alpine tectonic units of Western Carpathians originated in differing time and space. During the youngest Neoalpine phase of the Western Carpathian arc development these units were gradually located to the recent space and position.

The Paleoalpine phase started with the closure of Meliata ocean in Jurassic and terminated with collision before Upper Cretaceous. Mesoalpine phase is related with the closure of South Penninic-Vahic ocean and following compressional events at the end of Cretaceous and beginning of Paleogene. In Neoalpine phase the North-Penninic - flysch basin was closed at the end of Paleogene and Neogene and following oblique collision as well as transpressional and transtensional movements between European platform and Carpathian block occurred.

In known northern polarity of Alpine orogen the Meliata basin represented the oceanic space being closed as the first. The fragments of oceanic crust in several nappe outliers are the only proofs of its existence. The origin of the main crustal Paleoalpine units of the Western Carpathians as well as the near-superficial nappes we relate with the Meliata basin closure and following collision. The long-lasting Paleoalpine tectonic phase terminated in Middle Cretaceous when the Carpathian continental block originated. In Mesoalpine phase (roughly at the end of Cretaceous and beginning of Paleogene) this continental block, probable after the closure of supposed oceanic basin of South-Penninic type, collided with the next continental block rifted-away from European platform (hypothetic Oravicum and its basement). Tectonic units of this phase were in next development structurally reworked and became a part of Neoalpine setting at the boundary of recent Inner and Outer Carpathians. This is the reason, why we interpret the Mesoalpine development only from indirect indications and using the analogy with the development of neighbouring segments, mainly in the Alps.

After Mesoalpine collision the Carpathian block gradually obliquely collided with European platform and the outer flysch oceanic basin was synchronously closed. The accretion prism of flysch nappes (Outer Western Carpathians) was formed. The Carpathian block (Inner Carpathians) was disintegrated mainly by strike-slips. The simultaneous extension caused the origin of sedimentary basins and volcanism.

The tectonic division of Western Carpathians is based on tectonic evolution. In Explanations to Tectonic map we have distinguished two principal groups of tectonic units and formations: Neoalpine tectonic structures of Inner and Outer Western Carpathians and Paleoalpine tectonic units of Inner Western Carpathians. The principal division of the map is derived from the youngest Neoalpine tectonic processes, during which the flysch prism of Outer Western Carpathians originated owing to the interaction of the block of Inner Western Carpathians with European platform. Block of the Inner Western Carpathians contains fragments of all previous development phases from different time and space as well as superimposed Neoalpine structures and formations. The main principal units of this block are the Paleoalpine crustal units and detached near-superficial nappes. The remnants of Mesoalpine units outcrop only at the boundary zone between Outer and Inner Carpathians and are prevailingly structurally reworked by Neoalpine phase. The sedimentary basins with Upper Cretaceous to Quaternary filling and neovolcanic complexes represent the Neoalpine formations superimposed on Paleoalpine nappe system.