Eastern border of the Western Carpathian basement units; Reconstruction from lithology, metamorphism and age dating

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The Cierna Hora and Branisko Mts. are usually interpreted as part of the Vepor and/or Tatra units, but position of the Zemplin unit has been discussed in the frame of the Western or Eastern Carpathians. In order to confirm or otherwise similarities and differences among these units as well as their possible relations to the Tatra or Vepor units in the Western Carpathians, metamorphic conditions and results of geochronological dating are discussed here. Peak P-T conditions for Variscan and Alpine metamorphisms in the Čierna Hora Mts. of the Vepor unit are estimated using mineral compositions in metabasites with application of available thermobarometric methods. Temperature and pressure of 610 ± 20 °C and 9 ± 1 kbar for Variscan metamorphism were calculated form garnet amphibolites in the basement rocks. Metamorphic conditions for Alpine metamorphism were obtained for the Permian diorite of the Choč nappe. Temperature and pressure of 250 ± 25 °C and 3 ± 0.2 kbar were obtained for mineral assemblages in diorite that involves prehnite, pumpellyite, epidote, chlorite, albite and white mica.

Metamorphic conditions, appropriate to triple point between amphibolite, eclogite and granulite facies conditions are characteristic for the Branisko Mts., where garnet- pyroxene-bearing metabasites are present. The metabasites contain Ca- and Mg-rich garnet ($Grs_{20–32}$, $Py_{18–20}$) and diopside and plagioclase ($An_{10–40}$). Garnet contains inclusion of clinopyroxene, plagioclase and ilmenite and K-feldspar. P-T conditions of 750 °C and 13–14 kbar were estimated using various exchange thermometries and equilibrium reactions. Pyroxene forms symplectite with plagioclase and amphibole in the matrix. The high-grade metamorphism was followed by amphibolite facies metamorphism at 650 °C and 7–8 kbar. Textural relations in metabasites with combination of geochronologic data from other occurrences of garnet-pyroxene-bearing metabasites suggest long-termed and polyphase evolution of the Western Carpathian basement during Pre-Alpine history.

Amphibolite facies conditions of 665–700 °C/ 7.7–8.0 kbar with a retrograde P-T path to 4 kbar, 550 °C were estimated for Pre-Alpine metamorphism in the Zemplin unit (Faryad and Vozárová 1997). Monazites dating from a quartz-micaschists indicated 338 ± 22 Ma age that is interpreted to represent amphibolite facies regional metamorphism (Finger and Faryad 1999). K-Ar age data from minerals (white mica, amphibole, biotite and feldspar) in metamorphic rocks and pegmatite indicate Variscan metamorphic and magmatic events in the Zemplin Unit. The rocks hosting these minerals are amphibolite, gneiss, micaschist and pegmatite. Variscan age for amphibolite facies metamorphism was confirmed based on K-Ar measurement of amphibole from amphibolite that yielded 338 Ma. K-Ar ages of muscovite and of some amphiboles depend on the degree of mylonitization of the host micaschists and amphibolites and they range from 284.8 ± 11 Ma to 211 ± 9 Ma. Ar/Ar spectrum on a white mica of 227 Ma K-Ar age yielded a ca 300 Ma plateau-like age and indicates a younger, likely Alpine overprint. K-Ar age of 307.9 ± 12.0 Ma from muscovite in relatively fresh pegmatite is the best argument for Variscan igneous activity in this unit. Cretaceous ages of 105 ± 4.2 Ma and 126.6 ± 5.2 Ma were obtained from plagioclase and from white mica concentrate (<2 μm fraction) from strongly mylonitized amphibolite. The data support the interpretation of Variscan amphibolite facies metamorphism >338 Ma with subsequent magmatism (>307.9 Ma) followed by Alpine overprint (126–105 Ma). Besides similarities in lithology (Vozárová and Vozár, 1988), this is a further argument for a tentative correlation of the Zemplin unit with the medium- to high-grade Variscan basement of the Western Carpathians.

References

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