bles and present-day Gemeric outcrops may be explained by the difference in the exhumation level during mid-Cretaceous and Late Cretaceous to Recent times, respectively. An alternative view assumes that the southern Western Carpathian zones experienced compressional tectonic regime during the Early Cretaceous (no sediments, deformation, 140 Ma thermal event – Vozárová et al., 2000), hence the area was likely uplifted and continuously eroded. This would be the first exhumation pulse triggered by compression, surface uplift, erosion and deposition of eroded material (including "exotic" granitoids) in an adjacent flysch basin. After that, the presently measured Upper Cretaceous zircon FT ages from Gemeric granites may have resulted from reheating during extensional unroofing of the Veporic metamorphic core complex in their footwall, i.e. they record the second exhumation pulse associated with extension and nearly no uplift and erosion.

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Re-Os Dating of Molybdenite from the Hnilec Permian Granite-Related Mineralisation – its Tectonic Significance (Gemeric Unit, Slovakia)

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Understanding tectonic and ore evolution in composite orogenic belts (COB) that comprise multistage metamorphic and magmatic processes, for example, in the Alps, Carpathians or Himalayas is often problematic. Polyorogenetic history of modern COB marked by incorporation of pre-Mesozoic crystalline basement rocks into young Alpine fabrics results in formation of composite terranes and ore deposits with multistage ore evolution and mineralisation. However, unraveling ore-forming episodes in composite ore deposits is practically impossible without precise dating. But in many cases silicate gangue and/or wall-rock alterations minerals may not be consanguineous with metal deposition phases of mineralisation, and therefore commonly used radioactive isotope systems (K-Ar, Ar-Ar, Rb-Sr, Sm-Nd, and U-Pb) cannot be applied for dating hydrothermal activity relative to intrusive magmatism and direct ore dating is needed (Stein et al. 2001). In the last decade the ^{187}Re-^{187}Os chronometer applied to molybdenite (MoS_2) and/or oxide minerals has shown that the timing of mineralisation can be exactly determined, and yields relevant information of ore fluids origin (Stein et al., 2001). Direct dating of mineralisation is helpful in placing chronologic limits especially in COB deposits where field observations are enigmatic. Here we present new Re-Os molybdenite age from the Hnilec deposit and together with host granite data discuss tectonic evolution of NW part of Gemeric unit. According to the mineralogical study the molybdenite was formed during retrograde Fe dolomite-ankerite-siderite replacement in quartz-glauconite-phengite ± carbonate schists that are directly related to tin, tungsten greisen mineralisation at the exocontact of the Hnilec granite body.

The Western Carpathians create the northernmost, E-W trending branch of the European Alpides, linked to the Eastern Alps in the west and to the Eastern Carpathians in the east. The pre-Alpine crystalline basement outcrops mainly in the Central Western Carpathians consisting of three main crustal-scale superunits – Tatricum, Veporicum and Gemericum and several cover-nappe systems: the Fatricum, Hronicum and Silicicum. The basement of the Gemericum is composed of an Early Palaeozoic, mostly low-grade flyschoid metasediments and metavolcanics, with remnants of an ophiolite complex metamorphosed at high-grade. This volcano-sedimentary sequence was intruded by small granite apophyses derived from a huge underlying postorogenic body. Generally, there exist two concepts of fabric differing in the preferred Hercynian or Alpine nappe structures and/or whole edifice (Andrusov, 1958, Grecula, 1982, Bajaník et al., 1983, Vozárová, 1998). The internal tectonic structure of the Gemericum was interpreted either as an anticline (Maheľ, 1954, Bajaník et al., 1983) composed of central – Gelnica Group (Cambrian – Lower Devonian) and upper-marginal Rakovec Group (Middle Devonian – Lower Carboniferous), or as a set of seven individual nappe units (Grecula, 1982, Grecula et al., 1990). Two working groups advocated Hercynian versus Alpine ages for Gemeric granites and related mineralisation as isotope dating (K-Ar, Rb-Sr) yielded scattered results from granite rocks, 300–220 Ma and 160–90 Ma, respectively (Kantor and Rybár, 1979, Kovach et al., 1986). New Re-Os molybdenite dating (262.2 ± 0.9 Ma), determined at the AIRIE molybdenite laboratory at Colorado State University, resolved the long-standing debate concerning age of high-temperature Mo ± Sn and W mineralisation related to the Hnilec granite-greisen body. The Re-Os result also provides a more precise age for the hosting Hnilec granite than recent U-Pb ages with large uncertainties (monazite - 276 ± 13 Ma, Finger and Broska, 1999; zircon - 245 ± 18 Ma, Poller et al., 2002).

The location of the Hnilec granite body between two important geologic units is long known, moreover, as situation between Gelnica and Rakovec Group is familiar since the times of Andrusov (1958). However, knowledge of its exact magmatic age and related mineralisation in surrounding rocks confirms their relation. Indeed, the majority of geologists intuitively preferred a Hercynian superposition (e.g. Andrusov, (l.c.), Bajaník et al., 1983 amongst others). Albeit there is no doubt that various local and regional Alpine shear zones exist within the Gemericum (Grecula et al., 1990), as a terminative fabric of the whole Western Carpathians is Alpine in age, and mostly the Paleo-Alpine (Jurassic–Cretaceous) period was responsible for deformation and tectonic fabric in Gemericum. It is obvious that this granite magmatism and its associated mineralisation (262.2 ± 0.9 Ma) are Permian in age and therefore mutual staking of the Gelnica and Rakovec Group preceded intrusion of granite apophyse from geological point of view. The tin greisen and exocontact veinlets of molybdenite mineralisation at this granite body originated because of shallow level of granite apophyse emplacement into schist environment that enabled apical granite alterations, e.g. albitization, silicification, potassic alteration and muscovitization ± tourmalization and concentration of ore fluids.

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