PERMIAN GRANITIC MAGMATISM AND DISINTEGRATION OF THE LOWER PALAEOZOIC BASEMENT IN THE SW VEPORICUM NEAR KLENOVEC (WESTERN CARPATHIANS).

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Abstract: EMPA monazite dating provided a mid-Permian age (266±16 Ma) for a granite from the Klenovec area in the southern Veporicum (Western Carpathians). Age, geochemistry and mineralogy of this Klenovec granite as well as its geological position is close to the group of the specialized S-type Spiš-Gemer granites. This may indicate similar tectono-metamorphic conditions in the Gemericum and the southern Veporicum during the Permian. The Klenovec intrusion perhaps triggered the desintegration of the Variscan crust of the Veporicum.

Key words: West-Carpathians granites, southern Veporicum, Gemericum, Permian age

Introduction

Permian granites are more frequent in the Western Carpathians than previously presumed (Finger et al. 2002). The A-type granites are the most typical representatives of the Permian granite activity. They intruded along deep faults or strike-slip lineaments (Uher and Broska, 1996). Besides of the A-type granites the Western Carpathians contain characteristic Permian S-type granites. Such specialized S-type granites with interesting Sn-W-(Li-Nb-F) mineralization (e.g. Malachovský in Grecula, 1985; Broska and Uher, 2001) occur in the Gemeric superunit. However, Permian S-type granites have recently also been recognized in the Veporic superunit. This sheds some new light on the role of Permian magmatism in the Western Carpathians (Finger et al. 2002).

Permian granites in the southern Veporic unit

The granites and granite-porphyries of the Klenovec massif have increased K, Rb, B, Y, U, Be, Sn, W and F content and reduced Ca, Sr and Ba content. Typically is a high Fe content in biotites with F/FM=0.73-0.8. Hraško et al. (1997) supposed that the magma formed through fluid absent melting of orthogneisses. Fractional crystallisation may have later increased the H2O activity in the melt. Most geochemical attributes, including striking tourmalinisation features, remind to the S-type granites known from the Gemeric superunit. A mineralogical study of tourmaline in both granitoids suggests a genetic linkage as well (Broska et al., 2000).

Monazite has recently been dated in thin-sections of the Klenovec type granite from borehole KS-1 (Molák et al.1990) by electron microprobe. This has yielded an age of **266±16** Ma (Tab.1, Fig. 1), which corresponds to the age previously obtained for the Gemeric S-type granites (Finger and Broska 1999, Poller et al. 2000). The results thus show that specialized S-type granites of Permian age occur also outside of the Gemeric superunit.

The granite body at Klenovec is indicated by a light gravimetric anomaly (recently revised by Grand in Kubeš et al., 2001), with longer axis in ESE-NWN direction lying between Klenovec and Hnúšťa. Traces of light gravimetric anomalies are present in SW-NE direction, with the NE border lying between Klenovec and Hnúšťa and the SW border near NW of Zlatno village. The SE border of the gravimetric anomaly is coaxial with the Alpine - Sinec shear-zone with talk-magnesite deposits (Fig.2).

Molák et al. (1990) confirmed a granite intrusion in the depth of 250 m in the centre of a negative gravimetric anomaly at the SE border of Klenovec village. Granites and granite-porphyries intruded the low metamorphosed – Klenovec metasandstone complex (sensu Bezák, 1982), so called albite-biotite gneisses. In the centre of this structure two-mica peraluminous granite stocks have been revealed, on the border, small granite-porphyry bodies are present (Hraško et al.,1997).

Discussion and tectonic remarks

The granite magma of the Klenovec type probably ascended into higher horizons via deep-seated faults or shear zones. There are some geological indications, which suggest that the granite intruded a weakened zone in the Lower Palaeozoic basement. Šuf (1938) mentioned that migmatitic crystalline basement is disintegrated into a northern zone connected to big granitoid masses, and a southern zone. This southern crystalline complex consists of steeply inclined masses of ortho- and paragneisses in the Sinec massif (see recently published map 1: 50 000 of Bezák et al., 1999). The geological situation is further complicated because of the presence of an Alpine shear-zone with talk-magnesite deposits. The block of the southern migmatite zone (sense Šuf, 1938) is rotated relative to the northern migmatite zone. The core of the Sinec massif (southern migmatite zone) is composed of para- and orthogneisses with subvertical foliation in S-N direction. The same type of rocks in the northern zone have foliations in SW-NE direction with medium dip to NW. This rotation must be mainly a product of pre-Alpine tectonogenesis, because sericite lineations (mainly NE-SW, to W-E direction) in Alpine shear zones, that developed in the rotated block in the Sinec massif, are not rotated compared to other regions of the south Veporic basement. This implies pre-Alpine rotation of the southern migmatite-orthogneiss block (sensu Šuf, 1938). We suggest that the intrusion of the Permian granitic rocks is synchronous to (or younger than ?) the disintegration of the Variscan crust in the south Veporic basement. It may be that the intrusion of the Klenovec granite has triggered this disintegration.

On the other hand, the Hrončok granite occurrences in the northern Veporic unit may perhaps be younger than the Klenovec type granite in the southern Veporic unit. These Hrončok granites have A-type affinities (Uher and Broska, 1996, Petrík and Kohút, 1997) and formed along an Alpine rejuvenated Variscan strike-slip lineament zone. U-Pb zircon ages yielded a discordia line with a lower intercept age of 238.6 ± 1.4 Ma or 233±4 Ma resp., which is interpreted as the crystallization age of the Hrončok granite and its differentiates (Putiš et al.,2000 and Putiš et al.,2001). Kotov et al. (1996) interpret an upper intercept U/Pb 278±11 Ma as the age of granite (Permian) . Chemical monazite dating (Finger et al. 2002) also suggests a Permian age. The formation of the Hrončok granite may thus also be related to the disintegration of the Veporic basement.

A similar geotectonic scenario is possible for the generation of both the Klenovec granite type from the southern Veporicum and the Spiš-Gemer granites from the Gemericum, although several shear-zones e.g. Sinec zone and Lubeník line of Alpine age (Kováčik et al.,1997) separate them now.

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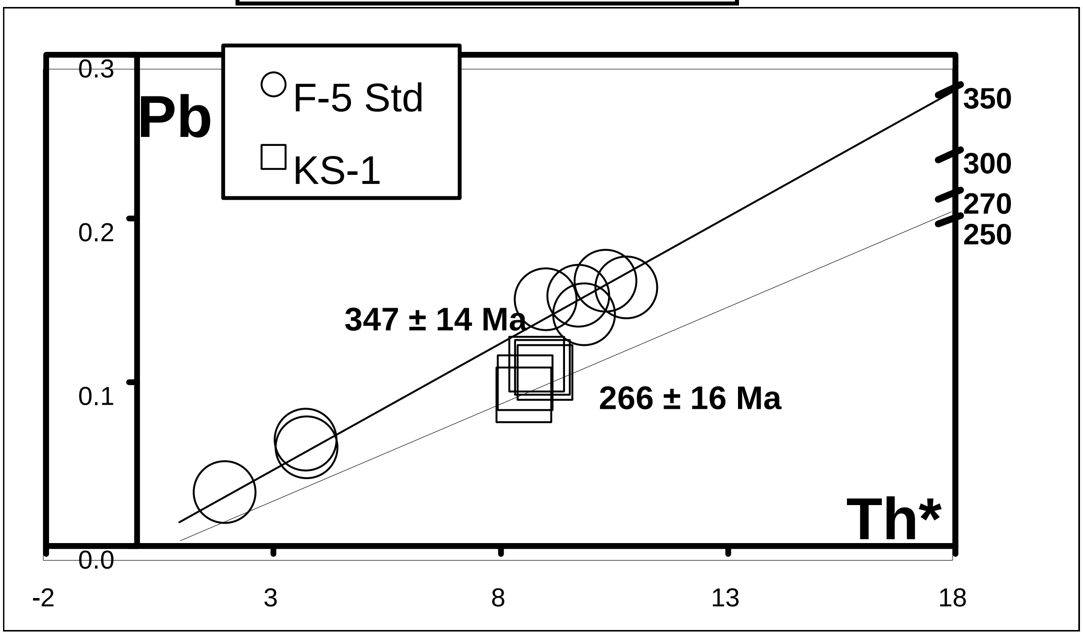
Table 1
Th, U, Pb contents (wt % elements), Th* values and model ages of the analysed monazites from samples KS-1 and standard F-5. Model ages calculated after Montel et al. 1996.

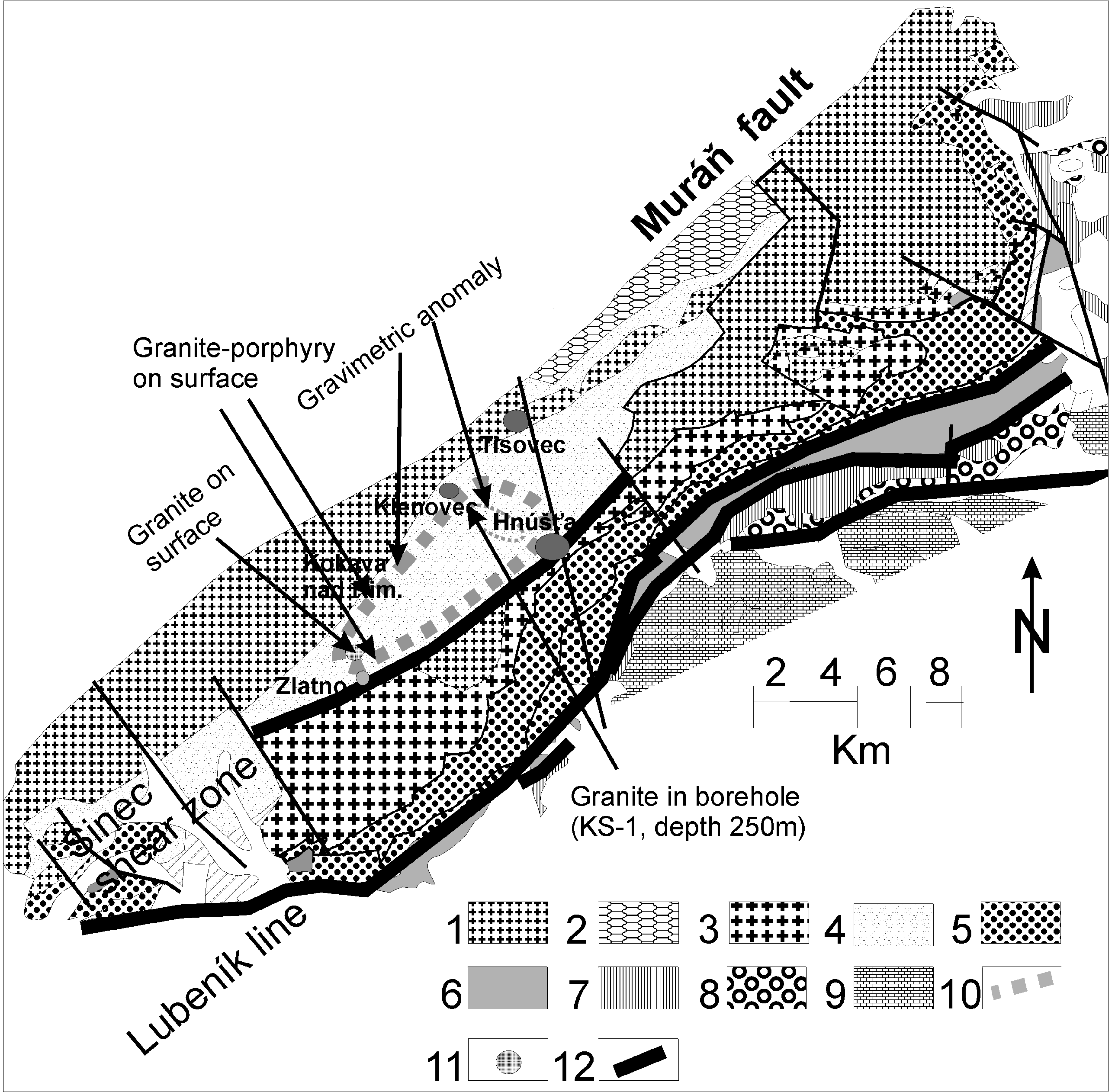
Fig. 1. Total Pb vs. Th* isochron diagram of Th(U)-Pb electron microprobe dating of monazite from Klenovec granite according Suzuki, et al. 1991). The Th* parameter includes the measured Th with a certain amount of theoretical Th, that would have produced the same amount of lead as the measured U (at the model age). KS-1 represents the Klenovec granite, F-5 is a standard sample from the Salzburg laboratory for comparison (recommended age 341 Ma).

Fig. 2. Schematic geological position of specialised S-type granites in southern Veporikum. Klenovec granite and its negative gravimetric anomaly and position of Gemeric granites.
(adapted from the map 1: 1 000 000 – Vozár (ed.) et al. 1996.
Explanations: 1-Lower Hercynian complex of migmatites (migmatitised para- and orthogneisses), gneisses, granitoids and metabasaltic rocks; 2- complex of Lower Palaeozoic "Muráň orthogneisses"; 3 - complex of the Rimavica granitoids – Lower Palaeozoic and younger granite (older Alpine or Permian); 4 - metasandstones (Klenovec complex sensu Bezák et al.,1982) and micashists; 5 – Upper Palaeozoic to Triassic metasediments; 1-5 – Veporicum ; 6 – Ochtiná group (black metapelite shists, magnesites, metabasalts, metaultrabasic rocks) – Early Carboniferous; 7 – Early Devonian metasandstones, metaconglomerates, shists; 8 – oligomict metaconglomerates, metasandstones with rhyolites – Early Permian; 9 - metamorphosed Mesozoic shists; 6 - 9 - Gemeric unit; 10 – contour of light gravimetric anomaly of Klenovec granite; 11 – Klenovec granite on surface; 12 – Alpine – faults, nappe lines and shear zones.

Standard F-5					
Grain	**Th**	**U**	**Pb**	**Th***	**Age**
1.1	1.102	0.806	0.060	3.728	**363 ± 84**
1.2	5.880	0.953	0.151	8.991	**375 ± 35**
1.3	7.113	1.122	0.158	10.761	**329 ± 29**
1.4	1.911	0.551	0.065	3.711	**392 ± 85**
1.5	6.774	1.084	0.162	10.306	**352 ± 30**
1.6	5.998	1.138	0.153	9.704	**353 ± 32**
1.8	6.251	1.103	0.142	9.835	**323 ± 32**
1.9	0.815	0.342	0.033	1.930	**382 ± 163**
Mean					**347 ± 14**

SAMPLE KS-1					
Grain	**Th**	**U**	**Pb**	**Th***	**Age**
1.1	5.612	0.898	0.092	8.514	**243 ± 37**
2.1	6.633	0.666	0.111	8.790	**283 ± 36**
2.2	6.733	0.676	0.109	8.921	**274 ± 35**
2.3	6.714	0.700	0.106	8.977	**265 ± 35**
3.1	5.990	0.787	0.100	8.537	**262 ± 37**
Mean					**266 ± 16**





Muráň fault
Gravimetric anomaly
Granite-porphyry on surface
Granite on surface
Tisovec
Klenovec
Hnúšťa
Kokava nad Rim.
Zlatno
Granite in borehole (KS-1, depth 250m)
2 4 6 8
Km
N
Sinec shear zone
Lubeník line
1
2
3
4
5
6
7
8
9
10
11
12