MAGMATIC EVOLUTION OF HUNGARIAN DURBACHITE-TYPE VARISCAN GRANITOID BASED ON U-Pb ZIRCON GEOCHRONOLOGY

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We analysed two hundred sixty three well-determined, carefully pre-selected (KIS *et al.*, 2019), non-metamict spots in ninety eight zircon crystals with different morphological characteristics (short, normal, long prismatic) from all rock types (felsic, hybrid, mafic) in the Mórágy pluton, Hungary using laser ablation inductively coupled plasma mass spectrometry (LA-ICP-MS).

The routinely used LA-ICP-MS can result in reliable age constraints only if the system is not overprinted by multiple geological processes that affect the isotope system of zircons. To overcome the ambiguities our zircon U-Pb age data were evaluated first using simple statistical models, then a zircon internal (primary and secondary) texture related complex approach was applied. That latter method demonstrated that the U-Pb age in our overprinted system show correlation with the local structural state of the zoned zircon crystals (Fig. 1).

Individual zircon internal texture and structural state based evaluation made possible to select the least overprinted age components of the system and identify five steps **(phases A–E)** in the evolution of the studied intrusive.

In **phase A** two magmas, a granitoid felsic and a lamprophyre-derived mafic were generated separately. In **phase B**, the thermodynamic conditions favoured the long and short prismatic type zircon growth morphology over the normal prismatic type. By cooling of the system crystallization of rock forming minerals was initiated in **phase C**. This is the first point when we can try to assign time and temperature to the system (~800–850 °C; ~355 ± 3–4 Ma). For zircon crystal morphology the normal prismatic type gains dominance over the short and long types. Already at this phase, or at the beginning of **phase D** at the latest, mingling of the two magmas went on. Zircon crystallizes continuously in normal prismatic shape. Phase D may overarch the ~ 348–338 Ma period and the 800–700 °C temperature range. **Phase E** is the eutectic crystallization of the rest magmas. The rims of these long and normal prismatic zircons are embedding Na-free K-feldspar, albite and quartz, indicating a ~650 °C closing temperature, besides show the ~334 ± 4 Ma closing age.

The post-crystallization history, denoted here technically as **phase F**, is even more complicated than the previous five phases: more, possibly separated impacting events (F1, F2, F3) can be distinguished. In **event F1** lead loss of worse structural state zircon zones results younger concordant ages. In **event F2** the secondary texture type (convolute zonation) fully overprints the zircon primary internal texture (growth zonation). These convolute zones are of good structural state and give well defined concordant zircon U-Pb ages (~300 Ma). **Event F3** resulted in overprints causing slightly discordant ages. **Event F3** could be attributed to a proven magmatic event of the area in the Cretaceous.

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Reference

KIS, A., WEISZBURG, T. G. & BUDA, GY. (2019): Földtani Közlöny, 149: 93–104.

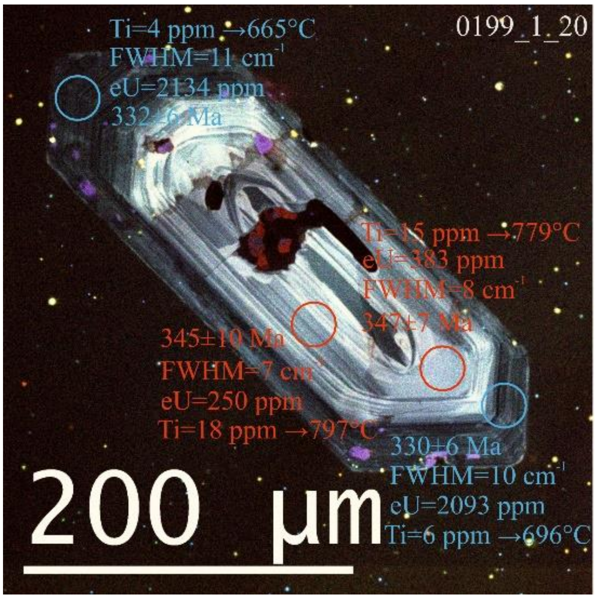

Fig. 1. Zircon crystal (grain #0199_1_20) with a large antecrystic / xenocrystic core and growth zoning texture. Notation: Circles show the U-Pb dated areas. Same colour means same internal texture part. Concordant age with error (Ma), effective U = eU(ppm) = U(ppm) + 2.4*Th(ppm), $\nu_3(SiO_4)$ FWHM (cm^{-1}), Ti-in-zircon thermometry data (5080/(6.01-log(Ti in ppm))-273) are indicated to each area analysed.