Constraints on the timing and duration of magma residence for the youngest phase of the Mid-Miocene ignimbrite flare-up in the Pannonian Basin, eastern-central Europe

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The prolonged and periodically active Miocene silicic ignimbrite flare-up episode in the Pannonian basin provides an excellent opportunity to study timescales for magma reservoirs during intensive lithosphere thinning. Beyond the obtained TIMS data on single crystals, the individual in-situ zircon ages determined by LA-ICP-MS technique helped to identify the pre-eruption residence time of the silicic magma reservoirs. The youngest age populations isolated from the spot ages coincide well with the zircon (U-Th)/He data and could record the age of eruption. Magnetic polarity data support and bracket the interpreted eruption ages obtained from the LA-ICP-MS data set.

Based on our new geochronological data, we recognized waxing and waning phases of magmatic evolution during the younger stage (14-16 Ma) of the ignimbrite flare-up period. Among these, at least two large volume eruptions (>10 km^3) occurred at 14.8±0.3 Ma and 14.1±0.3 Ma. The in-situ U-Pb zircon dating suggest that the individual silicic magma reservoirs could exist mostly in a high crystallinity mushy state over 300-700 kyr, where antecryst recycling occurred.

Small, but significant differences in zircon, bulk rock and glass shard composition among units suggest the presence of several spatially separated reservoirs, sometimes existing contemporaneously. Trace element composition of zircons implies pre- and co-crystallization of plagioclase, amphibole, apatite and allanite, although in different degrees. Evolved melts assembled into a common melt-dominated lens, presumably just before the eruption, and resulted in evacuation of crystal-poor magmas, but with a zircon crystal cargo preserving the heterogeneous, long-lived compositional character of the magma storage.