Zircon crystallization Age Distribution reflecting the Lifetime of the Long-living Crystal Mush System beneath the Ciomadul Volcanic Dome Field (Eastern-Central Europe)

LUKÁCS, R.[1]*, SCHMITT, A.K[2], CARICCHI, L.[3], BACHMANN, O.[4], GUILLONG, M.[4], MOLNÁR, K.[1,5], HARANGI, SZ.[1,5]

[1]MTA-ELTE Volcanology Research Group, Budapest, Hungary; *correspondence: reka.harangi@gmail.com
[2]Ruprecht-Karls University, Heidelberg, Germany (axel.schmitt@geow.uni-heidelberg.de)
[3]Université de Genève, Genève, Switzerland (luca.caricchi@unige.ch)
[4]ETH Zürich, Zürich, Switzerland (olivier.bachmann@erdw.ethz.ch)
[5]Eötvös Loránd University, Dept. Petrol. and Geochem., Budapest, Hungary (szabolcs.harangi@geology.elte.hu)

The Ciomadul volcanic dome field covers a 120 km^2 area and was active between 1 Ma and 30 ka with 100-200 kyr and 10-40 kyr quiescence periods in the Old and Young Ciomadul eruptive periods, respectively. The cumulative volume of volcanic material (pyroclastic and lava rocks) is ~10 km^3. Although the volcano is apparently inactive, there are many lines of evidences that reactivation cannot be unambiguously excluded. The eruptive products of Ciomadul are uniform in terms of petrology and geochemistry, suggesting long-term stability in magma reservoir conditions.

We used high spatial resolution zircon geochronology (SIMS and LA-ICP-MS) and trace element analysis to reveal the lifetime and chemical evolution of this mid-upper crustal magma reservoir. Zircons do not show significant compositional variation and crystallized mainly at 720-670°C based on Zr saturation and Ti-in-zircon thermometry. Zircon crystallization initiated at ca. 1.5 Ma, well before the onset of volcanic eruptions and was apparently continuous during the two eruptive periods and even during episodes of eruptive quiescence. Zircon crystallization model calculations adapted to the Ciomadul case suggest the existence of an upper crustal crystal mush with a 500-1000 km^3 volume that was supported by a recharge flux of ~10^{-4} km^3/yr. This is consistent with a growing silicic magma body having wet calc-alkaline compositional character. Intermittent rejuvenations led to eruption of relatively low volume magma batches, i.e. still significant magma mass could reside in the subvolcanic reservoir calling attention for potential reactivation even in case of such long-dormant volcanic systems.