

EGU2020-19199

<https://doi.org/10.5194/egusphere-egu2020-19199>

EGU General Assembly 2020

© Author(s) 2020. This work is distributed under the Creative Commons Attribution 4.0 License.



The role of basaltic magma in the petrogenesis of the Late Pleistocene Ciomadul dacite, Romania

Szabolcs Harangi^{1,2}, Maurizio Petrelli³, Balázs Kiss¹, Olivier Bachmann⁴, Ioan Seghedi⁵, Theodoros Ntaflos⁶, Éva Jankovics¹, and Réka Lukács¹

¹MTA TKI, Budapest, Hungary (szabolcs.harangi@geology.elte.hu)

²Department of Petrology and Geochemistry, Eötvös Loránd University, Budapest, Hungary

³University of Perugia, Perugia, Italy (maurizio.petrelli@unipg.it)

⁴ETH Zürich, Zürich, Switzerland (olivier.bachmann@erdw.ethz.ch)

⁵Institute of Geodynamics, Romanian Academy, Bucharest, Romania (seghedi@geodin.ro)

⁶Department of Lithospheric Research, University of Vienna, Vienna, Austria (theodoros.ntaflos@univie.ac.at)

The Ciomadul in eastern-central Europe is a high-K dacitic volcanic complex characterized by long quiescence (several 10's of kyr) periods between eruptions and a long-standing (over several 100's of kyr) magmatic plumbing system. Following intermittent lava dome extrusions from 1 Ma to 360 ka, a more intense eruption stage occurred between 160 ka and 30 ka with initial lava dome building period followed by dominantly explosive eruptions. The volcano has been again in a long quiescence stage since 30 ka, although results of geophysical studies suggest presence of a subvolcanic magma body with significant melt fraction. In order to constrain better the rejuvenation mechanism of such long-dormant volcanic complex, a more thorough understanding of the nature and dynamics of the magmatic plumbing system and the reason of eruption triggers is required. In spite of the homogeneous dacitic bulk rock composition and similar mineral assemblage, each eruption product shows subtle differences in mineral-scale features. Here, we present examples showing how basaltic magma played a role in the genesis of dacite as well as triggered eruption in a timescale of days to weeks.

The Ciomadul dacites are crystal rich and contain plagioclase, amphibole and biotite as main phenocrysts in addition to accessory phases of apatite, titanite and zircon. Several dacitic lava dome rocks formed between 90 and 160 ka in Ciomadul contain also high-Mg minerals such as olivine, clinopyroxene and orthopyroxene. Cr-spinel inclusions occur in olivine, orthopyroxene and also in high-Al amphiboles. Textures and the high Mg-numbers (0.85-0.91) of these mineral phases suggest that they can be considered as antecrysts with magmatic origin having crystallised from primitive mafic magmas, which were involved in the evolution of the subvolcanic magma storage system. Zoning pattern and trace element content of plagioclases and amphiboles clearly show interaction between dacitic and basaltic magmas. In addition, these high-Mg minerals allow us to have an insight into the origin of the primary magmas as well as the dynamics of the mafic magma body stalled at the crust-mantle boundary.

The compositions of the Cr-spinel inclusions significantly differ from those of the spinels in the 600-1200 ka alkaline basalts of the nearby Perşani Volcanic Field and their high Cr-numbers

indicate a depleted mantle source for the parental magma. Such Cr-rich spinels are common in high-K magmas originated in metasomatized lithospheric mantle with depleted, harzburgitic lithology. Compositional zoning of clinopyroxenes indicates several recharge events by high-Mg and high-Cr basaltic magmas. Mafic magma batches repeatedly ascended and emplaced below the upper crustal felsic crystal mush and formed a dynamic interface between these two magmas. The mafic components remained in plastic state allowing thorough mixing of the mafic and felsic mineral cargos during turbulent convective magma stirring, whereas farther from this interface, remelting of the crystal mush occurred due to reheating and volatile transfer into the interstitial melt. The series of mafic magma injections increased the eruptible magma volume and occasionally led to eruptions.

This research was financed by the Hungarian National Research, Development and Innovation Fund (NKFIH) within K116528 project.