Geophysical Research Abstracts
Vol. 21, EGU2019-285, 2019
EGU General Assembly 2019

From magmatic stoping to hybridization: snapshots of granite emplacement processes and interactions in a shallow crustal magma chamber

Zorica Petrinec, Iva Olić, and Dražen Balen

University of Zagreb, Division of Mineralogy and Petrology, Department of Geology, Faculty of Science, Zagreb, Croatia (zoricap@geol.pmf.hr)

Granite intrusions often bear geochemical and/or textural signature of multiple magma injections accompanied by mingling and/or mixing of different magma batches, together with features characteristic for the interaction of magma with the country rocks en route to surface or at the emplacement level of the intrusion.
In this contribution, we present the new data collected from a rare exposure of mafic enclave swarms in the abandoned quarry and unique hybrid rock varieties from the central parts of Moslavačka Gora (MG) crystalline (Croatia). Complex Cretaceous S-type granitoid pluton makes 2/3 of this small (180 sq km) crystalline exposure. Geochemistry of granitoids (predominantly two-mica granites and leucogranites) comprising the pluton corresponds to an active continental marginal setting which is related to the Mesozoic suture zone between Adria microplate and Europe-derived units and all available P-T data points to a regionally enigmatic Cretaceous HT-LP signature.
The swarms of meter- to decameter-sized mafic xenoliths in the Pleterac quarry are surrounded by typical MG two-mica granite and crosscut by leucogranite dykes (up to few meters wide) and veins (cm- to dm-wide). Xenoliths comprise different textural varieties of mafic gneisses (amphibolites). Mineral assemblages from all studied mafic xenoliths point to migmatisation through the reaction Pl + Hbl + Qtz = Di $\pm$ Grt + trondhjemitic melt. Although corresponding biotite-dehydration reactions and their HT-LP nature (2-5 kbar, 720-790°C) have been described previously on rare occurences of large metapelitic xenoliths, the nature of the contacts and interaction with the granite host have always been masked, making the mafic xenolithes of Pleterac crucial for the interpretation of mechanisms of xenolith emplacement. Regardless the textural type, mafic xenoliths show uniform textural features throughout the blocks and sharp angular contacts toward the host granite. Only seldom, on the xenolith faces perpendicular to the foliation in the blocks, localized leucocratic zones of trondhjemitic composition interpreted as pods of melt drained from the still partly ductile xenoliths were found. All of the features point to magmatic stoping near the wall or roof parts of the MG magma reservoir and incorporation of ductile-brittle and/or brittle blocks of country rocks in the intruding magma. This also supports the idea that dehydration-driven melting reactions found in various lithological types of MG xenoliths are actually snapshots of melt production mechanisms in deeper structural levels of the MG plumbing system.
The granite occurrences from the Pleterac quarry also corroborate previous research regarding the geochemistry and emplacement modes of various granite types from northern parts of the pluton, confirming the existence of at least two different batches and/or pulses of the granitoid magma throughout the pluton. Additionally, several hybrid types of rocks collected from the rock store during the working time of the quarry contain unique microstructural information of at least one hybridization episode through the interaction of granite magma with a more mafic end member at a shallow emplacement level (0.4-1.7 kbar, 610-670°C). The quest for the possible mafic end member and in situ occurrences of similar hybrid rocks throughout the pluton continues.