Goldschmidt 2023 Abstract
https://doi.org/10.7185/gold2023.17989

# Emplacement and differentiation in granitic systems: The case study of the Beauvoir rare metal granite

**MR. NICOLAS ESTEVES**[1], DR. LYDÉRIC FRANCE[1,2], PIERRE BOUILHOL[1] AND MICHEL CUNEY[3]

[1]Université de Lorraine, CNRS, CRPG
[2]Institut Universitaire de France (IUF)
[3]Université de Lorraine, CNRS, Géoressouces

Presenting Author: nicolas.esteves@univ-lorraine.fr

Constraining the assembly and evolution of granitic intrusions and the kinematics associated with their magmatic differentiation remain a major objective in igneous petrology. To progress on those issues, we took advantage of a 1km long drilled core of the Echassières-Beauvoir granite, a rare metal granite intrusion from the French Massif Central, allowing a high resolution sampling of a fully recovered plutonic body. Based on structural data, and high-resolution major and trace element composition of the mineral phases (in-situ measurements and chemical map) associated with cathodoluminescence imaging, we provide constraints on the differentiation processes and its dynamics during the construction of the intrusion. Mostly based on lepidolite compositions and morphologies, we show that the granite formed via the stacking, from bottom to top, of decametric crystal-poor sills, corresponding to the different sub-units of the Beauvoir granite. Once intruded these magmas crystallize an assemblage of quartz-mica-feldspar and topaz, displaying a differentiation record from the bottom to the top of each sub-units. Differentiation leads to the formation of a crystal-rich mush and associated interstitial residual melts enriched in incompatible elements (e.g., Li, F). Textural and mineralogical evidences suggest efficient extraction of these residual melts from the crystal-rich mush. Both quartz-rich cumulative assemblages and veins relates to the collection and extraction of the evolved melts. Locally, these veins are found as intrusive in overlying subsequently intruded sill, thus representing (less evolved-) magmas injected residual melts. They can also be seen as fragmented and dismembered mm to cm Pl-rich domains, representing mixing features between the two magmas. Ultimately, the enriched residual liquids are then collected at the top of the plutonic body, forming the upper unit of the Beauvoir granite (≈ 100m). This process of evolved interstitial melt extraction leading to an accumulation of non-viscous evolved melt in the upper-part of magmatic reservoir, could then be mobilized and eventually erupted silica-rich magma, which record can be seen as rhyolitic dykes intruding the surrounding host-rocks. This study eventually provides fundamental constraints on the processes leading to the construction and enrichment in rare metal (e.g., Li) granite bodies.