Geophysical Research Abstracts
Vol. 19, EGU2017-15246, 2017
EGU General Assembly 2017

Magma emplacement and metasomatic processes at the margins of an alkaline intrusion: new insights from the Ilímaussaq intrusion, South Greenland

Craig Martin, Adrian A Finch, William Hutchison, Andrew J Whyte, Jordan Lynch, and Max Meakins
Department of Earth and Environmental Sciences, University of St Andrews, United Kingdom (crm7@st-andrews.ac.uk)

The Ilímaussaq alkaline complex in south Greenland is one of the largest multiple element resources of REE and U in the world. It is the type locality for agpaitic nepheline syenites (peralkaline rocks, with molar (Na+K)/Al > 1.2, rich in Na-Ca- (Ti, Zr) silicates such as eudialyte group minerals) and an exceptionally well preserved example of extremely evolved alkaline magmatism. Most of the mineral exploration at Ilímaussaq has focused on the upper levels and roof zone of the intrusion (e.g. Kvanfeld, U-mine) where volatiles and highly evolved melts concentrate. However, significant mineralization is also reported around the edge of the intrusion.
Here we present new geological and geochemical observations from the eastern contact of the intrusion to evaluate the mechanisms of dyke emplacement and the processes of metasomatism/mineralization at the border of an alkaline igneous intrusion.
New geological mapping has allowed us to address the nature of interaction between the agpaitic melts and the adjacent Eriksfjord country rocks, emplacement mechamisms of lujavrites (laminated - arfvedsonite or aegirine - eudialyte nepheline microsyenites) and how they have been emplaced adjacent to the walls of the chamber, in contact the interbedded clastic sediments and lavas of the Eriksfjord formation.
Our new detailed geological map, reveals cross-cutting relationships within the complex, between aegirine lujavrite and arfvedsonite lujavrite, that are consistent with multiple stages of magma injection in the emplacement of the agpaitic rocks. Structural and petrological observations show the dimensions and composition of peralkaline dykes that extend up to 300 m from the edges of the intrusion. Mineralisation, interpreted to be caused by late-stage fluids, along a fault that extends over 3 km from the intrusion is used to assess the efficiency of faults and fractures as conduits for fluids to propagate away from the Ilímaussaq complex.
Our findings will put one of the world's most important multi rare-element deposits for REE and U exploration in context with its envelope and allow the emplacement mechanisms of the remarkable rocks of the Ilímaussaq alkaline complex to be understood with respect to the metasomatism and mineralization at its margins.