Thursday 29 November 2018 – 16:30 AMGC Seminar:

"Magma propagation through the Earth's crust: unraveling emplacement timing of dyklets and calcite veins in carbonate mudstones on Hovedøya Island, Oslo Fjord, Norway"

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When magma propagates through the Earth's crust, it deforms the host rocks, and eventually the Earth's surface. Because direct observations of the process are impossible, competing models of intrusion-induced deformation have been proposed. Studies of solidified and exposed intrusions help gaining insight in these intrusion processes.

This presentation will discuss observations of the geometry and associated host rock deformation induced by Triassic dyklets that intruded in Late-Ordovician carbonate mudstones on Hovedøya island in the Oslo Rift, S-Norway. First, the interaction with the local fracture network evidences that local weakness orientations in a host rock guide propagating magma. Secondly, several parts of the host rock are bent around pointy tips of dyklet segments, while others have been deformed by shear along pre-existing fracture planes ahead of blunt dyklet tips. Two host rock deformation modes thus coexisted during dyklet emplacement. To understand the geochemical and temporal relationship between the dyklet chill margins and calcite veins which occur in the host rock, we used μXRF compositional mapping, isotopic ratios of carbon and oxygen, and whole-rock major and minor element analysis. Our multi-proxy analysis shows that magma intrusion induced local contact metamorphism and the formation of an iron-rich chill margin around the dyklets and at their tips, while secondary calcite precipitation occurred from the pore water contained in the host rock after the intrusion. Our observations demonstrate that the propagation of magma is, at least at the relatively small scale of the described outcrop, a function of local stress fields, weaknesses in the host rock and hydrothermal interaction with the pore water it contains.