Goldschmidt 2026 Abstract
https://doi.org/10.46427/gold2026.37325

The timing and geochemical signature of the High Arctic Large Igneous Province on Svalbard

ANNA M. R. SARTELL[1,2], LAURI MALINEN[1], CHRISTOPH BEIER[3], KIM SENGER[2], GRACE E. SHEPHARD[4,5], ULF SÖDERLUND[6], KRZYSZTOF MICHALSKI[7], LARS EIVIND AUGLAND[4], PROF. MONIKA A. KUSIAK[7], DR. DANIEL J. DUNKLEY, PHD[7], KRZYSZTOF NEJBERT[8], SZCZEPAN BAL[7], RAFAEL K. HOROTA[2] AND TEREZA MOSOČIOVÁ[2,4]

[1]University of Helsinki
[2]University Centre in Svalbard
[3]University of Helsinki, Finland
[4]University of Oslo
[5]Australian National University
[6]Lund University
[7]Institute of Geophysics, Polish Academy of Sciences
[8]University of Warsaw

The High Arctic Large Igneous Province (HALIP) was emplaced and erupted across the circum-Arctic during the Cretaceous. Three main pulses have been identified, at 126 – 120 Ma, 94.5 – 90 Ma, and 84 – 78 Ma [1]. Geochemically, the oldest pulse is tholeiitic, the second one bimodal and the third mainly alkaline. Spatially, the oldest pulse is the most widespread, as it has been documented on Svalbard, Franz Josef Land, in the Canadian Arctic, and the Arctic Ocean. The second pulse is limited to the Canadian Arctic and the Arctic Ocean, whereas the youngest one is found in northern Greenland and in the Canadian Arctic.

On Svalbard, the HALIP is mainly expressed as sills and inclined sheets, but dikes have also been observed locally. We acquired over 300 dolerite samples from the HALIP intrusions on Svalbard, with the aim of studying the timing and magmatic source of the HALIP on Svalbard.

Several new U-Pb zircon and baddeleyite ages will be coming during spring 2026. Furthermore, whole-rock geochemical analysis of the collected samples is currently ongoing. Combining geochronology and geochemistry is important to understand the link between the timing and the geochemical signature of the igneous intrusions. In addition to hand samples, high-resolution drone images were also acquired in the field. These images were used for digital outcrop models (DOMs), which allows for the sampling locations to be visualized in three-dimensional space. DOMs are also a good tool for interpreting the geometry of igneous systems, and provide an estimate for the thickness and lateral extents of sills and dikes.

Here, we present the resulting geochronology and geochemical data from the HALIP on Svalbard, and highlight digital outcrop models of some of the intrusions studied from this region. Preliminary geochemical data indicates that the Svalbard intrusions are of tholeiitic basaltic composition, consistent with the oldest pulse of the HALIP, and have relatively high TiO_2 compared to the rest of the Arctic.

[1] Sartell, A. M. R., Söderlund, U., Senger, K., Kjøll, H. J., & Galland, O. (2025). *Geochemistry, Geophysics, Geosystems* 26, 1-23. https://doi.org/10.1029/2023GC011083