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Magmatic Evolution and Sulfide Saturation Mechanisms Forming the Ultramafic-Hosted Stormi Ni-Cu-(Co) Deposit of the Vammala Belt, SW Finland

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The Proterozoic (~1.88 Ga) Stormi Ni-Cu-(Co) deposit is hosted in the ultramafic Vammala Ni belt in SW Finland. Interpreted as arc magmas along a paleosubduction zone related to the Svecofennian Orogeny (~2.0-1.8 Ga), the orthomagmatic sulfide deposit can be compared to more recent Phanerozoic analogues, such as the Aguablanca Ni-Cu-(PGE) deposit in Spain. Assimilation of black schists is often considered as an important mechanism driving sulfide saturation in silicate melts to form large orthomagmatic ore deposits, which has also been suggested for Aguablanca. A similar hypothesis has been proposed for the Vammala Ni belt. However, few available $\delta^{34}S$ data of magmatic sulfides that range from -0.79 to +12.5‰ rather exclude that black schist assimilation induced the sulfide saturation. Here, we test whether Proterozoic arc magmas may have been more reducing than those from the Phanerozoic, causing early sulfide saturation during fractional crystallization in the absence of black schist assimilation.

Drill cores of magmatic sulfide-bearing olivine cumulates with minor clinopyroxene and chromite from the Stormi Ni-Cu-(Co) deposit were sampled at the Geological Survey of Finland. The main sulfide phases are pentlandite, pyrrhotite, and chalcopyrite with accessory Co-Ni arsenides, cubanite, and Bi-Te-Ni phases. The ultramafic cumulates were serpentinized and affected by amphibolite facies metamorphism. However, remnants of magmatic minerals are preserved. Olivine forsterite contents of ~82% suggest that the cumulates do not refer to a primitive magma source. In combination with the Ni concentration, the potential for olivine as an exploration tool for orthomagmatic sulfide deposits in arc crusts will be investigated. Additionally, trace element LA-ICP-MS data, along with new S and O isotope data, help to further constrain the magma evolution and timing of sulfide segregation.