

THE RELATIONSHIP BETWEEN INTRUSION-HOSTED Cu-Mo MINERALIZATION AND
THE VMS DEPOSITS OF THE ARCHEAN STURGEON LAKE MINING CAMP, NORTHWESTERN
ONTARIO

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Abstract

Volcanogenic massive sulfide (VMS) deposits of the Archean Sturgeon Lake district are underlain by the 2734 Ma Beidelman Bay composite tonalite-trondhjemite synvolcanic intrusion. This 20- by 2-km sill complex is comagmatic with the VMS-hosting felsic volcanoclastic strata dated at 2735 Ma. The top of the Beidelman Bay intrusion is host to weak Cu-Mo porphyry-type sulfide mineralization associated with igneous and hydrothermal breccia zones and a plagioclase-quartz and quartz-plagioclase porphyry dike swarm. It was earlier postulated that the presence of intrusion-hosted base metal mineralization indicates that the Beidelman Bay intrusion not only initiated and sustained the subsea-floor convective system responsible for the formation of the cauldron-hosted VMS deposits but may also have supplied metals to the fluid system.

New U/Pb zircon analyses of a plagioclase-quartz porphyry dike overprinted by the Cu-Mo mineralization resulted in a date of $2720.5^{+3.5}_{-3.0}$ Ma, approximately 14 m.y. younger than the host biotite trondhjemite phase of the Beidelman Bay intrusion. Rare earth and trace element concentrations differ greatly between the porphyry dike and the tonalite and trondhjemite phases of the Beidelman Bay intrusion but are similar in composition to a $2717.9^{+2.9}_{-1.5}$ Ma postcauldron rhyolite tuff unit. This demonstrates that the porphyry-type mineralization hosted within the Beidelman Bay synvolcanic intrusion is unrelated to the VMS hydrothermal system and is most likely related to later, more evolved oceanic arc magmatism.