Mining environments in a changing climate

P. HUNTSMAN[1*], A. CLEAVER[2], H.E JAMIESON[2], K. VOLCHEK[1], T. DI FEO[1], N. REYNIER[1], R. GAGNE-TURCOTTE[1], S. LANGLEY[1], J.S. CLEMENTE[1,3], A. ASEMANINEJAD[1], H.P. WHITE[4], C. RICKWOOD[1]

[1]CanmetMINING, Natural Resources Canada, Ottawa, Canada (philippa.huntsman@canada.ca)

[2]Dept. of Geological Sciences and Geological Engineering, Queen's University, Kingston, Ontario

[3]Department of Earth Sciences, University of Oxford, Oxford, U.K.

[4]Canada Centre for Mapping and Earth Observation, Natural Resources Canada, Ottawa, Canada

Canada's climate is warming, driving changes in precipitation patterns and watershed dynamics across the country. The seasonal availability of freshwater is changing, with an increased risk of excess water in winter and water supply shortages in summer [1]. This is altering environmental systems and creating new challenges for the mining industry. Natural Resources Canada is conducting research on the assessment and mitigation of mine waste and water management risks, as well as the potential downstream ecosystem effects in a changing climate.

This presentation will highlight results from three projects: 1) Water management: Assessment of water treatment technologies (reverse osmosis and nanofiltration) at a nickel-copper concentrator that will minimize freshwater demands and volumes of water discharged to the environment while maintaining the efficiency of the metallurgical process. 2) Mine waste management: On-going evaluation of both organic and saturated covers on acid-generating tailings under varying precipitation regimes and changing frequencies of freeze-thaw cycles in the Sudbury basin and Elliot Lake, respectively. Using laboratory scale columns the impact of climate change on the oxidation kinetics is being assessed using techniques such as pore water biogeochemistry and oxygen diffusion as performance indicators. 3) Environmental effects: Abandoned mine sites were investigated to assess the transport and fate of metal-bearing mine dust into surface water. Through geochemical and mineralogical analysis, in addition to the application of remote sensing, this study is investigating a contamination pathway which has not been previously evaluated in detail.

This project aims to support the development of adaptation-related knowledge, best practices, and innovative tools for use in the mining sector across Canada.

[1] ECCC (2019) Canada's Changing Climate Report.