

Circulation of deep groundwaters in the Canadian Shield and their relevance in ore deposit formation

MARIAH C. J. WILLIAMS AND JACOB HANLEY

Department of Geology, Saint Mary's University, Halifax, Nova Scotia B3H 3C3

There is a widely accepted concept at the Sudbury Igneous Complex, Ontario, of hydrothermal fluids derived from ancient saline groundwaters with unique compositional characteristics having been involved in the concentration of ore metals in sulfide deposits. The overall objective of this study is to determine whether there are different fluids in each area or if the same fluid flowed through both regions, and if so how did that fluid evolved compositionally. A comparison of fluid inclusion trace element compositional data from the Sudbury Igneous Complex and the nearby East Bull Lake intrusive suite, Ontario, was done in order to determine if the previously mentioned concept is true, or if all deep groundwaters in the Canadian Shield from that time period (1.85 Ga) are the same at a regional scale. Epidote-quartz pegmatite and quartz vein samples from the East Bull Lake yielded over 350 fluid inclusion analyses by optical microscopy, microthermometry, and laser ablation inductively-coupled plasma mass spectrometry (LAICPMS). The study involved two types of fluid inclusions: (i) two-phase liquid-vapour and (ii) three-phase liquidvapour-halite inclusions. Parameters compared between East Bull Lake and Sudbury were the bulk fluid salinity (in NaCl eq wt%), and a large suite of major and trace elements as elemental concentrations and ratios. In particular, trace elements that occur in elevated concentrations in both fluids are Ba, Zn, Pb, Mg, Fe, Rb, and Sr suggesting, tentatively, that the saline fluids in both settings are related to a common source. Continued data interpretation is being carried out and stable isotope work is planned to further link the two different hydrothermal fluid systems.