Fluid inclusion and stable isotope study of gold formation in the Lavoie-Maisie Gold District, northwestern New Brunswick, Canada

GLEN HODGE[1]*, JACOB HANLEY[1], AND JIM WALKER[2]

1. Department of Geology, Saint Mary's University, Halifax, Nova Scotia, B3H 3C3 ¶ 2. Geological Surveys Branch, Energy and Mines, Bathurst, New Brunswick, E2A 3Z1

Hosted in the late Ordovician sediments of the Grog Brook Group, the Menneval gold occurrence in the Lavoie-Maisie Gold district is a gold-bearing quartz vein striking northeast with a strike length of ~600 m (with gold grades ranging from trace to >10g/t). The first discovery at Maisie was in 2011 by M. Taylor, which led to more detailed exploration in the region to further understand the conditions of formation of the gold occurrences, as well as the full expanse of the gold occurrence. Minimum conditions of entrapment and fluid isochores for the system are being determined through fluid inclusion studies of two phase quartz-hosted fluid inclusions (L+V). The average minimum trapping temperatures resulting from these measurements is 177.58 ± 31.10°C for 55 single inclusions measured, with the average salinity being 2.77 ± 0.03 wt% NaCl. Additional constraints on vein formation temperature are being constrained by the chemistry of quartz (Ti-in-quartz thermometry) and rutile (Zr-inrutile thermometry) in the mineralized veins by means of LA-ICPMS (University of New Brunswick). The timing of rutile formation is unclear at present but initial data suggest that the hydrothermal system locally reached much higher temperatures than suggested by regional metamorphic assemblages. Trace element chemistry of the rutiles in the veins, wall-rocks and associated Ti-bearing oxides in the porphyry intrusion are being compared in order to determine whether the rutile in the veins are wall-rock derived, or crystallized from the same fluids that sourced the gold (possibly from the intrusion). Cathodo-luminescence has been used to examine growth textures and brittle structures in the vein quartz in order to determine whether different generations of fluids can be linked to specific growth periods in the veins. SIMS oxygen isotope results (University of Manitoba) showed very little variation in isotope ratios suggesting that either the quartz vein underwent a number of opening-closing cycles which would restore the initial isotope values of the parental fluid reservoir (i.e., open system), or that there was mixing of fluids, with sources being close in isotope values. The more likely of the two scenarios with the data thus far would be mixing of fluids, involving hydrothermal and metamorphic sources similar salinities and temperatures. Further data are being collected to better constrain the temperatures of the quartz veining, which will then allow fluid sources to be clarified. [Poster]

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