An integrated P-T-X study of fluid inclusions and SIMS δ18O on a gold-bearing quartz vein from the Caribou gold deposit, Meguma terrane, Nova Scotia, Canada

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Integrated fluid inclusion (FI) and O isotopic studies provide insight into the P-T-X conditions of ore-forming systems. Such studies, when combined with additional information such as the nature of the mineralising veins and deposit geology, can be used to better understand ore forming environments and aid in the exploration for new mineral deposits. This study focuses on analysing FIs and O isotopes of a gold mineralised quartz vein from the historical Caribou orogenic gold deposit in the Meguma terrane, Nova Scotia. In this region, bedding-concordant and -discordant veins were emplaced into Cambrian-Ordovician metaturbidite rocks during the regional Acadian deformation of Late Devonian age, during which metamorphic conditions reached greenschist-facies. One representative vein sample has been chosen for a detailed petrographic, FI, and isotopic study to constrain the P-T-X evolution of the mineralising environment. An aqueous carbonic fluid, with XCO2 = 0.03-0.15 and 3-5 wt. % eq. NaCl, has been identified as the dominant fluid and the associated FIAs (fluid inclusion assemblages, i.e., a group of FIs that represent the trapping of a single fluid at a given point in time) reflect re-equilibration to produce a variety of interpretable textures, such as decrepitates which are reflecting drastic changes in pressure. In addition, rarer CO2-rich FIAs and LH2O-VH2O-Halite FIAs are present, the origin of which remains to be resolved. Cathodoluminescence (CL) images, when used in conjunction with the petrographic study of FIAs, can provide constraints on the trapping of fluids and provide insight into the growth history of the vein material; this approach has shown that the FIs post-date vein growth in the Caribou system. Evaporate mound analysis (EMA) obtained from FI decrepitates will be used to constrain the fluid chemistry and determine the soluble species present (e.g., Na, K, Ca, Fe). The O isotope data will be generated in situ using secondary ion mass spectrometry (SIMS) with points constrained from CL. The results obtained will aim to characterise the source-fluid reservoir and fluid evolution of the Caribou gold deposit. This integrated approach is rarely undertaken in studies of orogenic gold deposits, and as such, should provide much needed insight into resolving the fluid history associated with the vein formation of the Caribou gold deposit.