Contrasting Copper and Gold Mineralization Styles along the Contact between the Coast Plutonic Complex and the Southeast Coast Belt, Taseko Lakes Region (NTS 092O/04), Southwestern British Columbia

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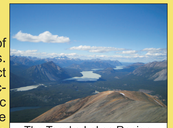
Background

Introduction

The Taseko Lakes region is located in southwestern British Columbia, approximately 215 km north of Vancouver, and straddles the boundary of the southeast and southwest Coast geomorphologic belts. Several mineral occurrences in the region are located within the southeast Coast Belt proximal to its contact with the Coast Plutonic Complex. The mineral occurrences include vein deposits and magmatic-hydrothermal systems, and are integral to the regional evolution of the eastern margin of the Coast Plutonic Complex. Numerous mineralized zones are present in the district, including the Bralorne Mines (Minfile 092JNE001) and Prosperity (Minfile 092O041) deposits. Additional deposits, which are the subjects of this contribution, include the Pellaire, Empress and Taylor–Windfall mineral occurrences.



The Taseko Lakes Region, facing northwest from Mount McLure.

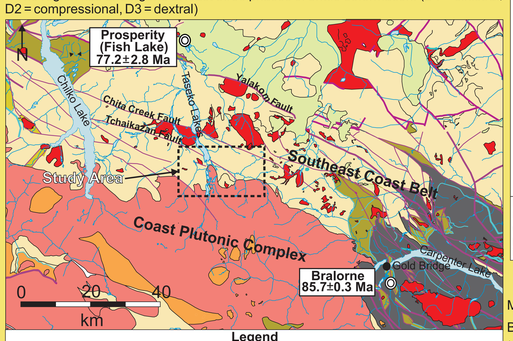
Purpose of Study

The purpose of this study is to:

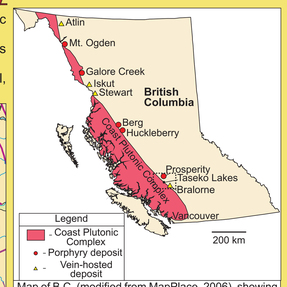
1. Characterize the alteration and mineralization of three separate mineral deposits in the Taseko Lakes Area (Pellaire, Taylor-Windfall and Empress).
2. Identify approximate P-T conditions of formation for observed alteration and mineralization.
3. Determine approximate geochronological ages for the observed mineralization in the region.
4. Identify potential fluid sources for hydrothermal alteration.
5. Provide accurate genetic classifications for the three deposits studied.
6. Assess potential genetic relationships between the deposits studied.
7. Place the deposits into a regional context.

Regional Geology

- The southeast Coast Belt consists mainly of late Paleozoic to Mesozoic volcanic arc rocks and clastic basinal lithotectonic assemblages.
- The southwest Coast Belt is dominated by Middle Jurassic to Late Cretaceous plutonic rocks of the Coast Plutonic Complex.
- The region has undergone at least three phases of brittle deformation: (D1 = sinistral, D2 = compressional, D3 = dextral)



Geologic map (modified from MapPlace, 2006) of the Taseko Lakes area, showing the Coast Plutonic Complex and southeast Coast Belt as well as the approximate ages and locations of the Bralorne and Prosperity Deposits (MINFILE, 2006).



Map of B.C. (modified from MapPlace, 2006), showing the location of Vancouver, Taseko Lakes, approximate extent of the Coast Plutonic Complex, and selected porphyry and vein-hosted deposits that occur immediately east of the Coast Plutonic Complex.

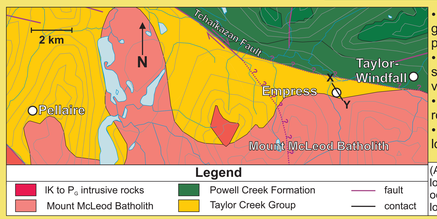
Regional Mineralization

Major Cu/Au deposits in the region include:

Bralorne area Au deposits:
- vein hosted mesothermal Au deposits
- B.C's largest historical gold producer (> 4 Moz)

Prosperity Cu deposit:
- formerly known as the Fish Lake deposit
- advanced Porphyry Cu deposit
- reserve of 1.08 billion tonnes of ore at 0.23% Cu and 0.41 g/t Au (Heinrich, 1991)

Local Geology



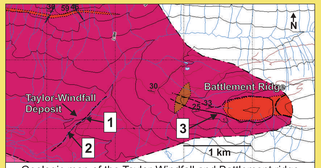
- Mount McLeod Batholith: Mainly coarse-grained hornblende granodiorite, but also consists of less areally extensive porphyritic phases.
- The Powell Creek Formation: Late Cretaceous, sub-arial to sub-marine coherent andesitic units and associated volcaniclastic rocks
- The Taylor Creek Group: Albian clastic marine sedimentary rocks and dacitic to andesitic coherent and volcaniclastic units
- The Tchaikazan Fault is the largest fault in the area. Its location poorly constrained and it is rarely visible in outcrop

(Above left): Geologic map (modified from MapPlace, 2006) showing the locations of the Mount McLeod batholith, Tchaikazan fault and mineral occurrences in the southern Taseko Lakes area. Line XY denotes the location of the cross-section shown for the Empress Deposit.

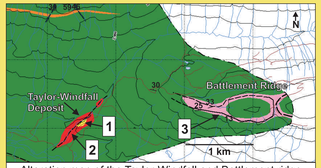
Deposits Studied

The Taylor-Windfall Deposit

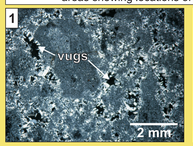
- The Taylor–Windfall deposit is a past-producing, vein-hosted Au deposit
- Au is hosted two veins: one tourmaline-dominated and one sulphide-dominated vein (Price, 1986)
- Deposit appears to be dominantly structurally controlled, with alteration restricted to the area surrounding an inferred fault/fracture zone in the Battlement Creek gulley
- A central core of vuggy silica surrounded by advanced argillic alteration and abundant pyrite are characteristics indicative of a high-sulphidation epithermal system (Reyes, 1990)
- Fault/fracture controlled quartz-alunite alteration on Battlement Ridge is interpreted to be a lithocap associated with Taylor-Windfall

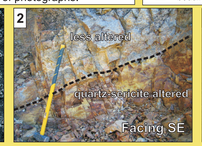


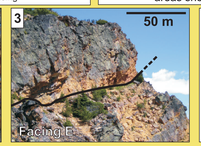
Geologic map of the Taylor-Windfall and Battlement ridge areas showing locations of photographs.



Alteration map of the Taylor-Windfall and Battlement ridge areas showing locations of photographs.







Photographs (left)

1. Cross-polarized light photomicrograph of vuggy quartz alteration
2. Fracture-controlled quartz-illite alteration
3. Fault zone hosting intense quartz-alunite alteration

Genetic Model

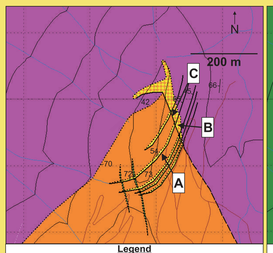
Hydrothermal fluids infiltrate along pre-existing faults and fractures, (fluid flow direction indicated by arrows)

Genetic Model

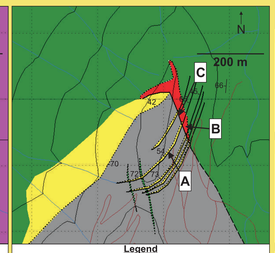
Hydrothermal fluids produce mineralized veins, vuggy quartz, quartz-sericite and quartz-alunite alteration zones surrounding faults and fractures

The Pellaire Deposit

- Pellaire is a past-producing vein-hosted gold-silver deposit
- Contractional deformation produced low angle faults cutting both the Mount McLeod granodiorite and Falls River Succession
- Quartz veins were emplaced into these low-angle faults within the granodiorite
- Quartz-sericite-jarosite cemented breccia separating the granodiorite from the Falls River Succession (part of the Taylor Creek Group) formed synchronously with the emplacement of the quartz veins
- Final phase of deformation produced the faulted contact between the granodiorite and the hydrothermal breccia

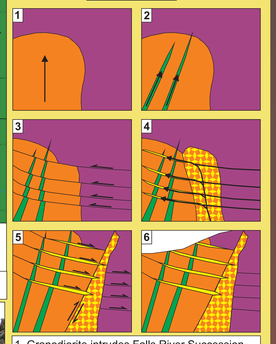


Geologic map of the Pellaire deposit showing locations of photographs



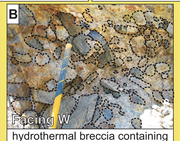
Alteration map of the Pellaire deposit showing locations of photographs

Genetic Model

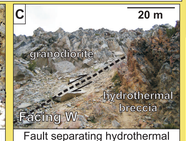


1. Granodiorite intrudes Falls River Succession
2. Basalt dikes intrude country rock
3. Compressional deformation produces low-angle faults
4. Influx of hydrothermal fluids produce hydrothermal breccia and gold-bearing veins
5. Second phase of deformation produces high-angle faults and reactivates old faults
6. Present day erosion

Au-bearing quartz vein hosted in granodiorite

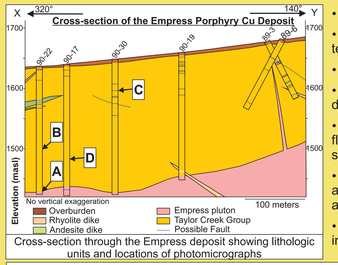


hydrothermal breccia containing granodiorite and andesite clasts



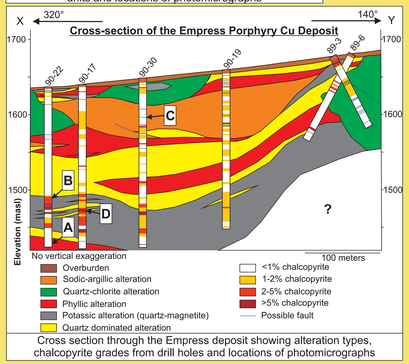
Fault separating hydrothermal breccia and granodiorite

The Empress Deposit

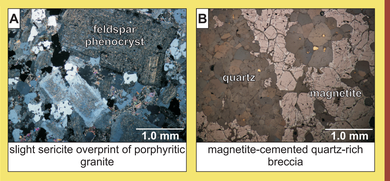


Cross-section through the Empress deposit showing lithologic units and locations of photomicrographs

- The Empress deposit is classified as a copper porphyry
- Alteration in the host rock of the deposit has obliterated all primary textures and made original lithologies indiscernible
- The deposit is underlain by a less altered, porphyritic granite
- Initial magmatic dominated hydrothermal fluids produced quartz-dominated, potassic and phyllic alteration zones
- Second alteration event arose from the heating and mixing of meteoric fluids with magmatic fluids resulting in the formation of quartz-chlorite and sodic-argillic alteration
- Majority of Cu-mineralization occurs within the potassic quartz-magnetite alteration zone and along the boundary between the potassic and phyllic alteration zones
- Horizontal layering of alteration zones suggest that permeability controls in the system (bedding?) caused lateral fluid migration



Cross section through the Empress deposit showing alteration types, chalcopyrite grades from drill holes and locations of photomicrographs



slight sericite overprint of porphyritic granite

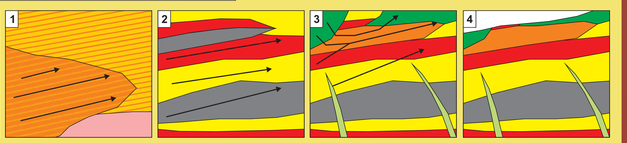
magnetite-cemented quartz-rich breccia

clay overprinting quartz-dominated alteration

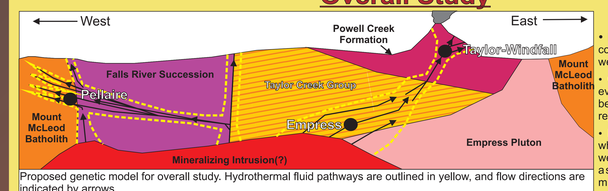
high-grade disseminated chalcopyrite

Genetic Model

1. Controlled migration of magmatic hydrothermal fluids through Empress pluton and country rock
2. Magmatic fluid phase produces quartz-dominated, potassic and phyllic alteration zones
3. Mixing of magmatic and meteoric fluids produces overprinting quartz-chlorite and sodic-argillic alteration
4. Present erosional level



Overall Study



Proposed genetic model for overall study. Hydrothermal fluid pathways are outlined in yellow, and flow directions are indicated by arrows.

Further Work

- Data from stable isotopic samples corroborates that hydrothermal fluids were predominantly magmatic in origin
- Geochronological results will provide evidence for potential genetic links between these deposits and others in the region
- Fluid inclusion data will indicate whether fluids at the different deposits were similar or unique in nature, as well as place P-T-X constrains on mineralizing fluids

Acknowledgments

The authors would like to thank Galore Resources Inc. and Geoscience BC for their support in funding the project. We are grateful to Great Quest Metals Ltd. for permitting access to the Empress property and drill core. The help of M. Cruickshanks and E. Looby during the 2007 field season was greatly appreciated.

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