# Lardeau Group mapping update – implications for ultramafic-associated massive sulfide and critical metal exploration in southeast British Columbia

Mitch Mihalynuk and Luke Ootes, BCGS
John Drobe, Wealth Minerals Ltd., and
Corey Wall and Rich Friedman, UBC-PCIGR

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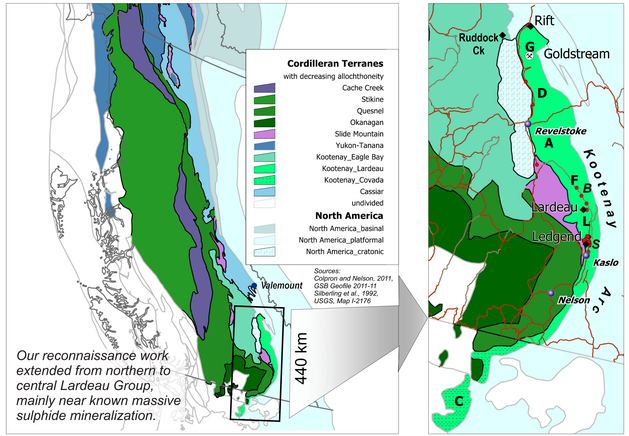
Ministry of Energy, Mines and Low Carbon Innovation

## Introduction

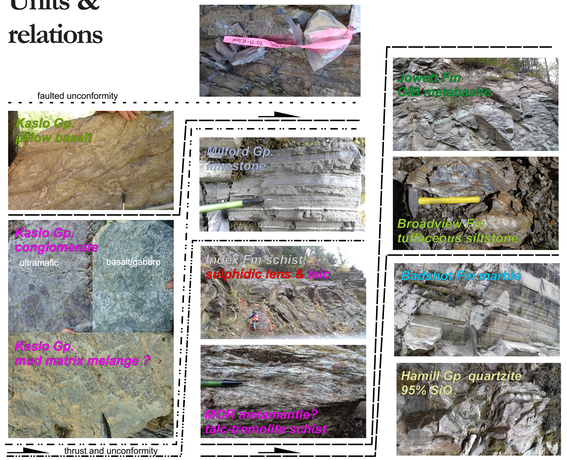
Ultramafic-associated massive sulfide deposits (UAMS ) are forming today in off-ridge settings

- massive sulfide lenses can be tens of meters thick and kilometres long, are Ni-Co-enriched, with remarkably high Cu-Zn grades of 20-40%
- unusual critical element-enriched massive sulfide mineralization (Ni-Cu-Co-Zn-Ag) was discovered near Kaslo in 1981; it may be a metamorphosed UAMS, but rich grades have not been found ...yet
- named Ledgend, this prospect occurs in the middle of a 300+ km long belt of Lardeau Gp., historically considered a passive continental margin succession
- adjacent metamorphic units include talc-tremolite-mariposite and manganiferous graphitic schists
- preliminary detrital zircon dating suggests that host rocks may be as young as Triassic
- host rocks include possible fragments of oceanic or primitive arc crust emplaced during arc-continent collision, analogous to the modern Banda-Australia collision zone

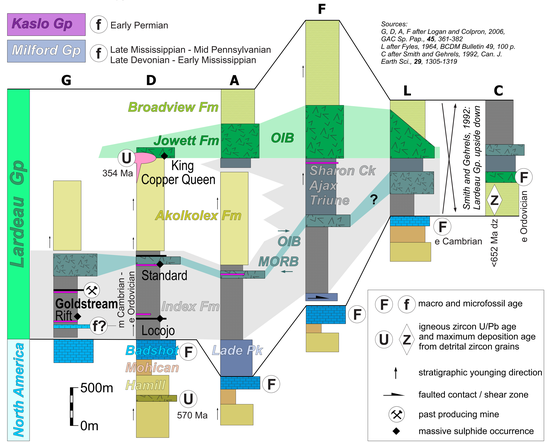
## Regional Geology



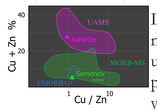

## Units & relations




## Lardeau Gp. strata & conventional correlatons

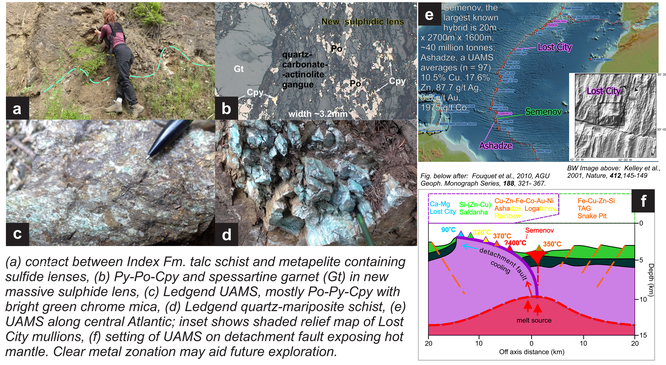



## *Why should you care?*




Lardeau Gp. is not fully understood but preliminary young ages from the Index Formation units containing meta-ultramafite and metalliferous zircon-impoverished graphitic pelite suggest that they are fragments of ocean crust with ultramafic-associated massive sulfides. Modern UAMS deposits have grades of 20-40% combined Cu+Zn and are worthy exploration targets

## Mineralization

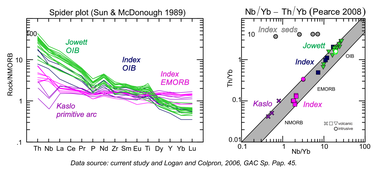


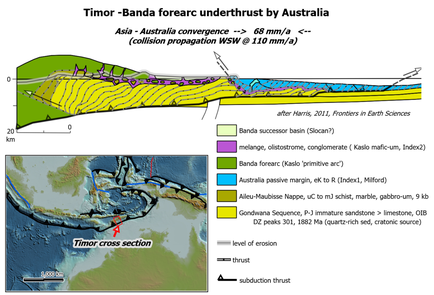

*(a) contact between Index Fm. talc schist and metapelite containing sulfide lenses, (b) Py-Po-Cpy and spessartine garnet (Gt) in new massive sulphide lens, (c) Ledgend UAMS, mostly Po-Py-Cpy with bright green chrome mica, (d) Ledgend quartz-mariposite schist, (e) UAMS along central Atlantic; inset shows shaded relief map of Lost City mullions, (f) setting of UAMS on detachment fault exposing hot mantle. Clear metal zonation may aid future exploration.*

## What is Lardeau Gp.?

Conventionally thought of as marking the rift-to-drift tansition following Neoproterozoic Rodinia breakup, many consider Lardeau Gp. "nailed to the craton". However, sparse new age dating, geochemistry and possible UAMS suggest otherwise.

Rifting logically precedes ocean basin formation; therefore, OIB/rift geochemistry and detrital zircon ages support an inverted Lardeau Gp. MORB + talc/serpentine (?mantle) suggest a structurally



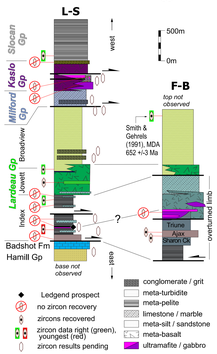



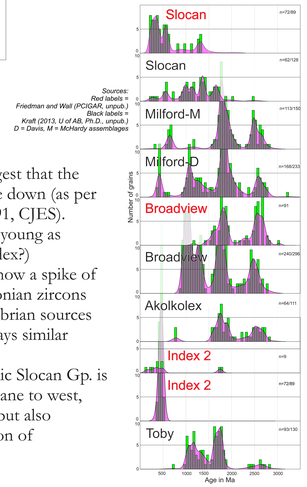

collapsed oceanic basin in which UAMS may have accumulated on exposed mantle.

Juxtaposition of all units may have occurred during arc-continent collision, much like the Banda-Australia example.

Ongoing work is aimed at testing this collisional model hypothesis, including further attempts at dating the Index Fm. and geochemical characterization of the ultramafic mantle association with tools not available to previous workers.

## U-Pb zircon age dating




- Preliminary ages suggest that the Lardeau Gp. is upside down (as per Smith & Gehrels, 1991, CJES).
- Index Fm. may be as young as Triassic (a second Index?)
- Parts of Index also show a spike of Ordovician and Devonian zircons isolated from Precambrian sources
- Milford (Davis) displays similar Ordovician peak
- Source of Late Triassic Slocan Gp. is mainly coeval arc terrane to west, probably Nicola arc, but also significant contribution of Proterozoic grains