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Geological setting, exploration methods, and recent Geological Survey of Canada research related to porphyry and epithermal deposits in British Columbia, Canada

Dianne Mitchinson

Natural Resources Canada – Geological Survey of Canada

Erdene Resource Development Corp.
Khundii Minerals District Geosymposium,
Ulaanbaatar, September 18, 2026

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Outline

- **The Canadian Critical Minerals Strategy and NRCan Critical Minerals Geoscience and Data Initiative**
- **Copper in Canada, copper in British Columbia**
- **The “Golden Triangle” mineral district, BC**
- **Exploration context: Tools of the trade in BC**
- **Recent BC porphyry/epithermal systems projects at the Geological Survey of Canada**

Canadian Critical Minerals Strategy

The Canadian Critical Minerals Strategy

FROM EXPLORATION TO RECYCLING:
Powering the Green and Digital Economy for
Canada and the World

“Critical Minerals”

- have few or no substitutes;
- are strategic and somewhat limited commodities; or
- are increasingly concentrated in terms of extraction and, even more, in terms of processing location.



1. Supporting economic growth, competitiveness, and job creation;



2. Promoting climate action and environmental protection;



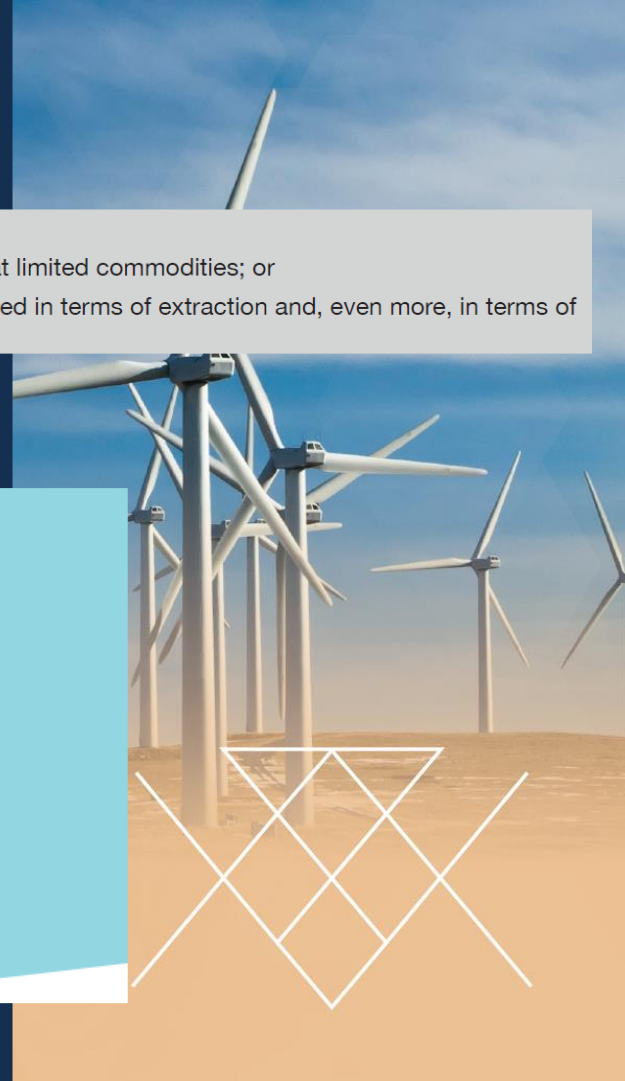
3. Advancing reconciliation with Indigenous peoples;

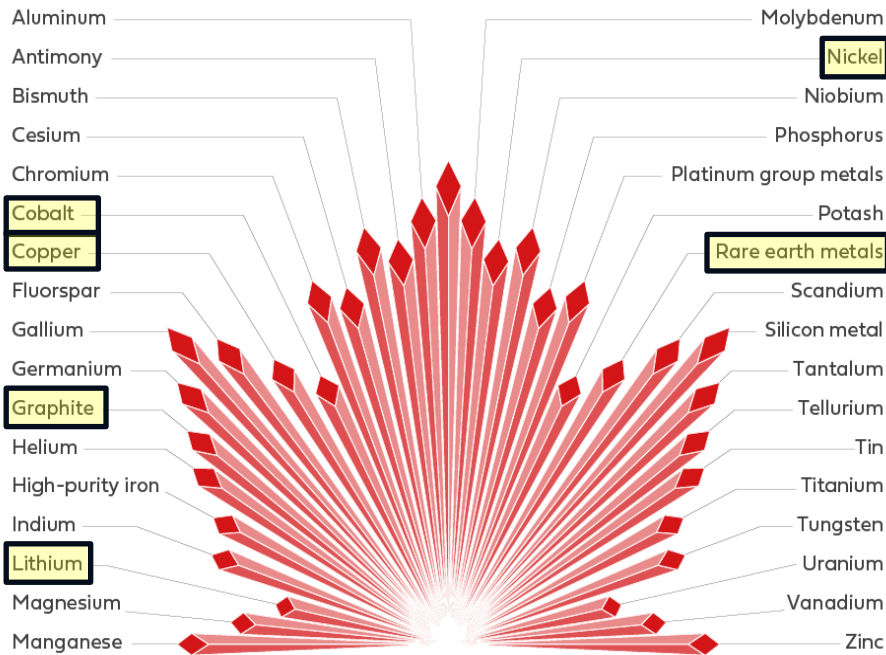


4. Fostering diverse and inclusive workforces and communities; and



5. Enhancing global security and partnerships with allies.





NRCan (2024)

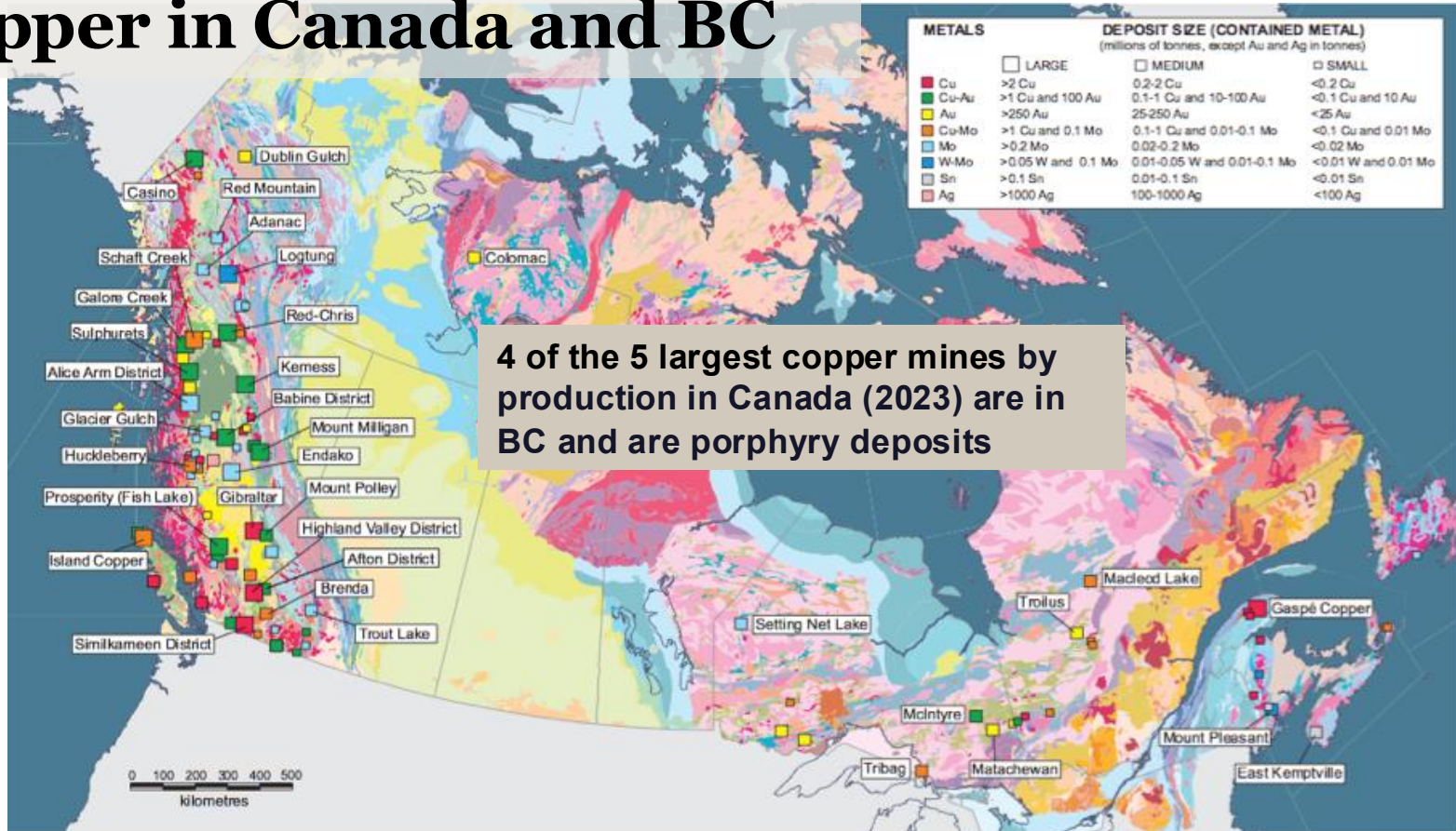
Goal: provide geoscience to accelerate development of 6 critical minerals

These minerals are vital to a range of industries including **technology, energy, defence, and infrastructure**, and are essential to produce a wide range of products, including **batteries, electronics, and infrastructure materials**



Copper in Canada, Copper in BC

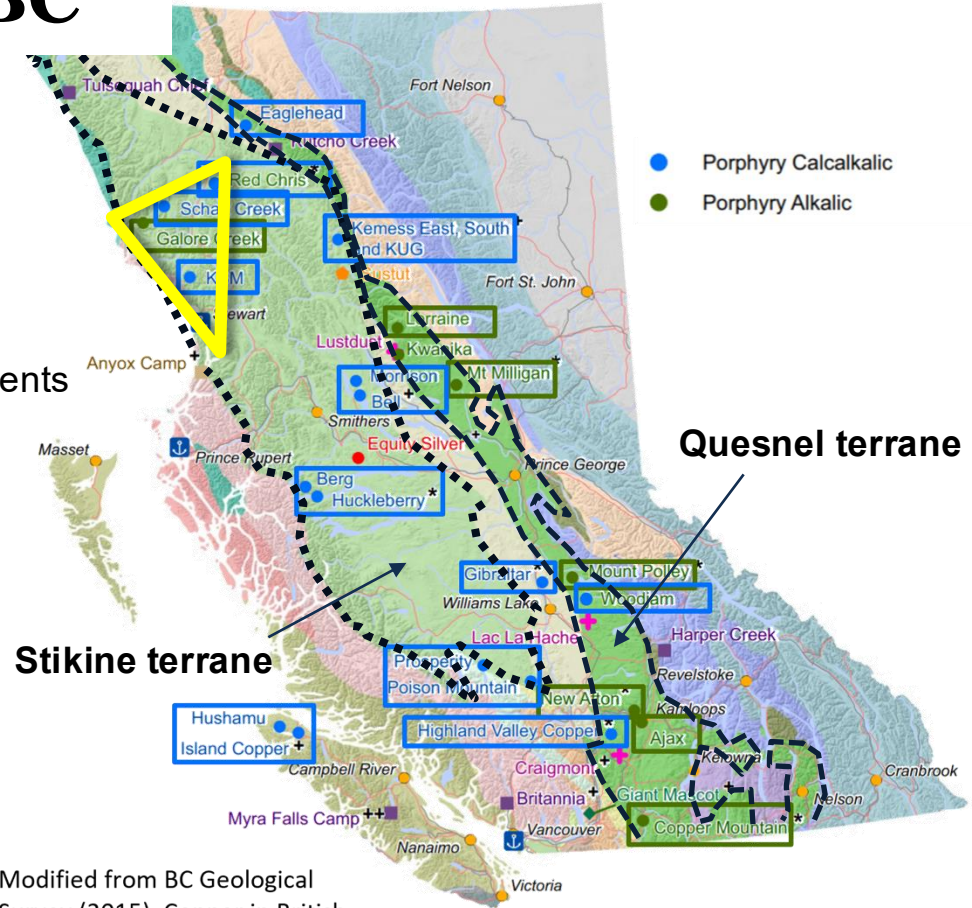
Copper in Canada and BC



Porphyry deposits in BC



BC's Stikine and Quesnel terranes:
Volcano-magmatic island arc environments



Modified from BC Geological Survey (2015), Copper in British Columbia, information circular

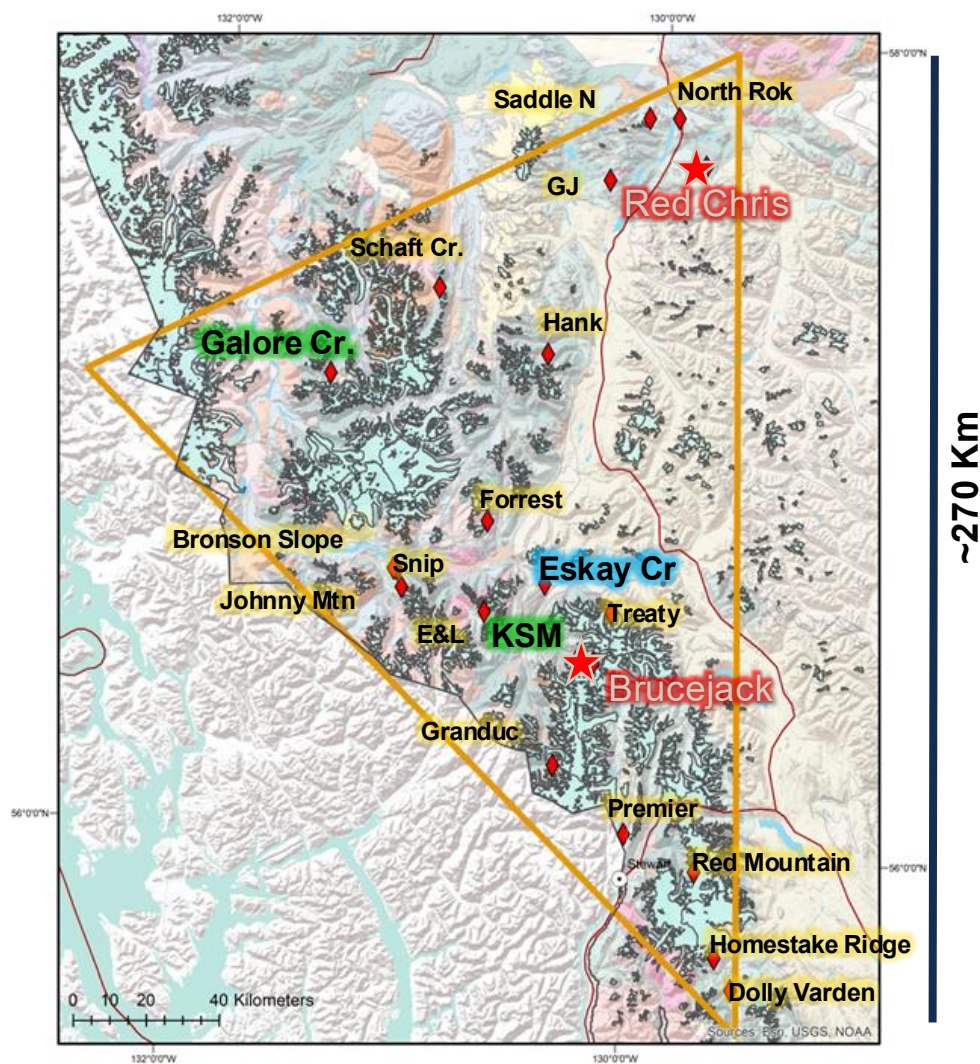
‘Golden Triangle’ – prolific BC mineral district

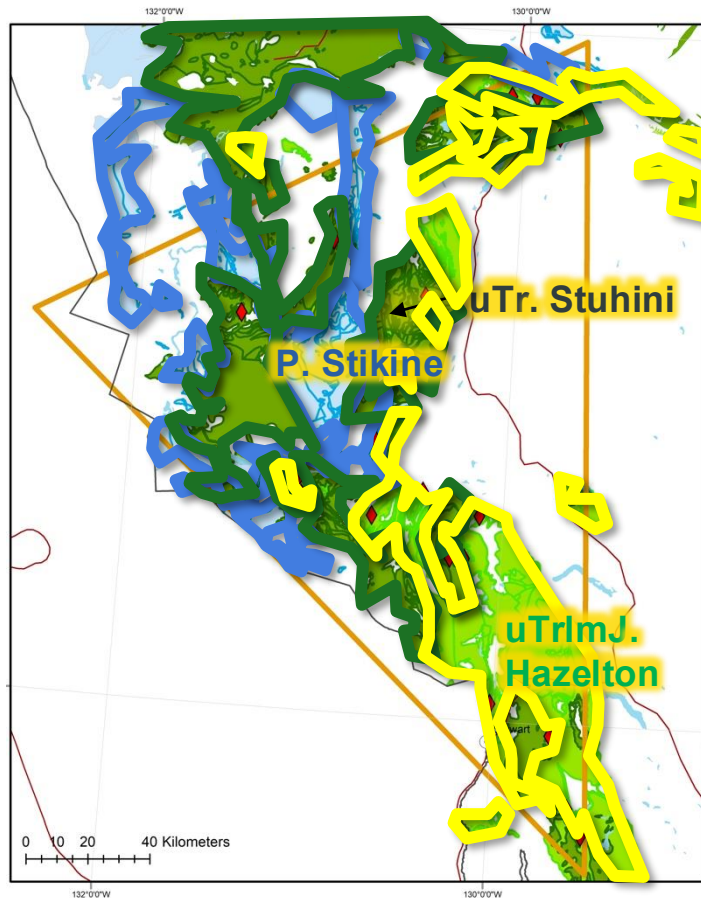
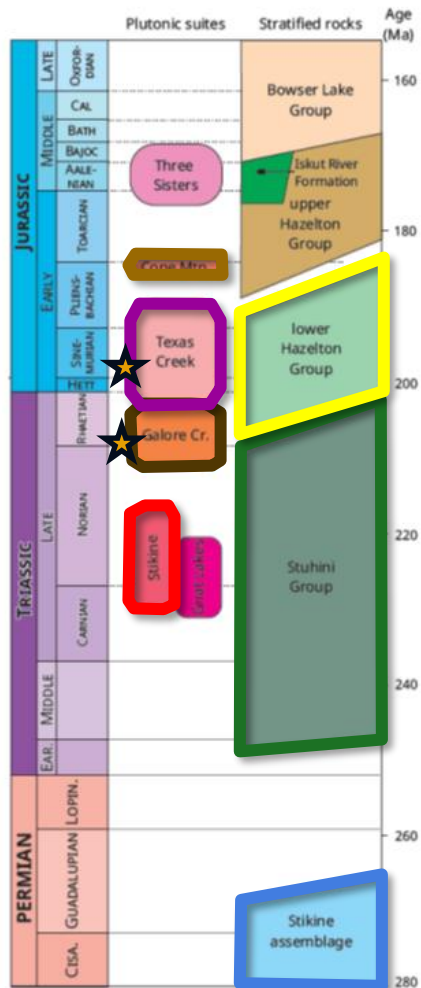
Operating Mines – Red Chris (porphyry), Brucejack (epithermal)

Galore Creek, KSM (Kerr-Sulphurets-Mitchell) -

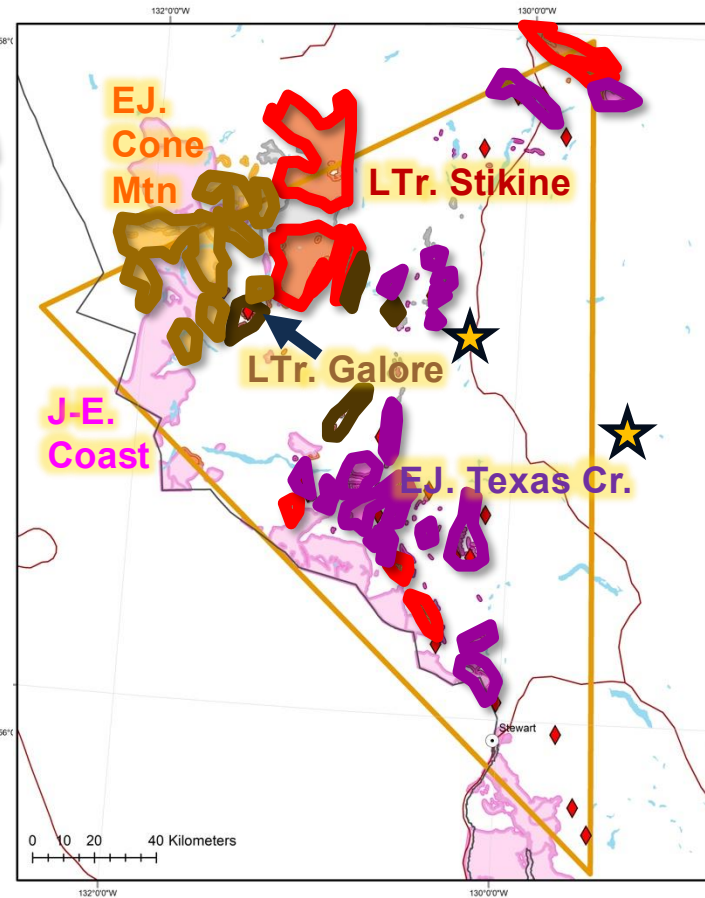
Among some of world's largest undeveloped copper and gold deposits

Eskay Creek – 1994-2008 - was one of the highest grade gold mines in the world – currently being redeveloped as an open pit mine with 12 year mine life





Volcanic/volcano-sedimentary rocks



Plutonic rocks

Exploration for Porphyry Systems - BC

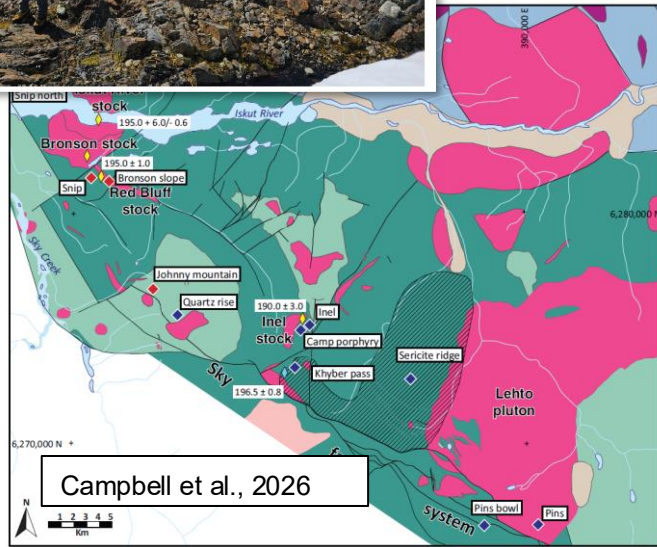
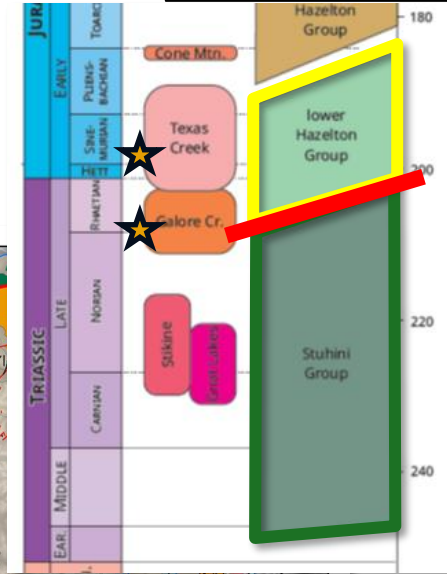
Exploration Methodologies and Research

Hickin, 2026

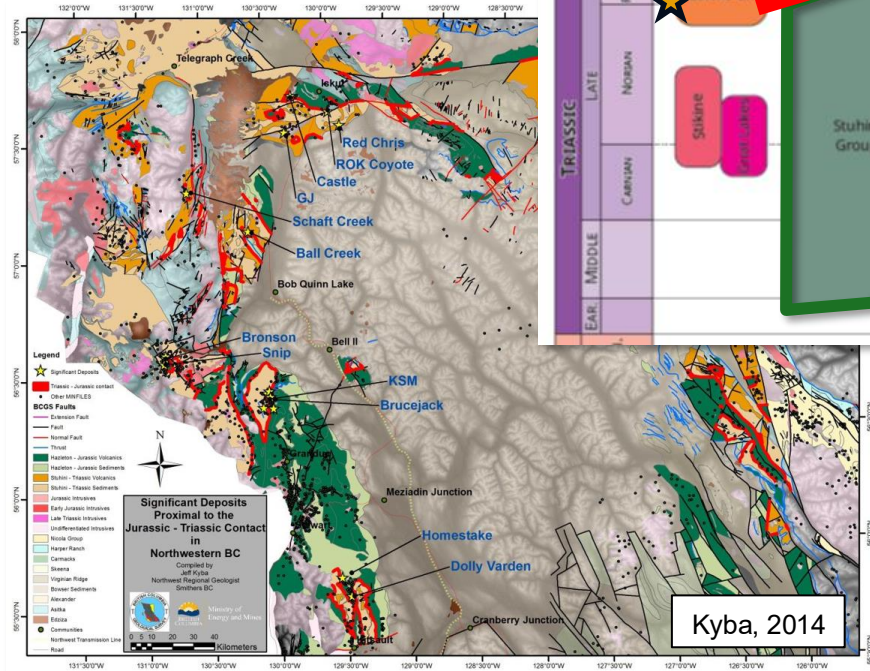


- Prospecting
- Geological mapping – geochronology (BCGS)
- Structural context – major unconformities, preservation

Campbell et al., 2025

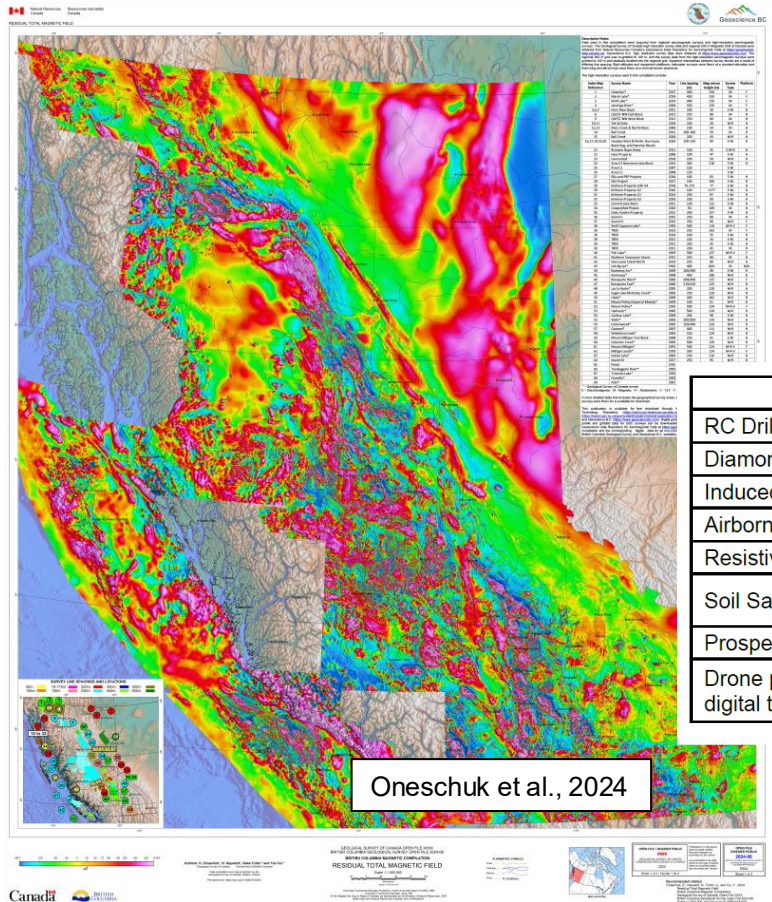


Campbell et al., 2026



Kyba, 2014

Exploration Methodologies and Research

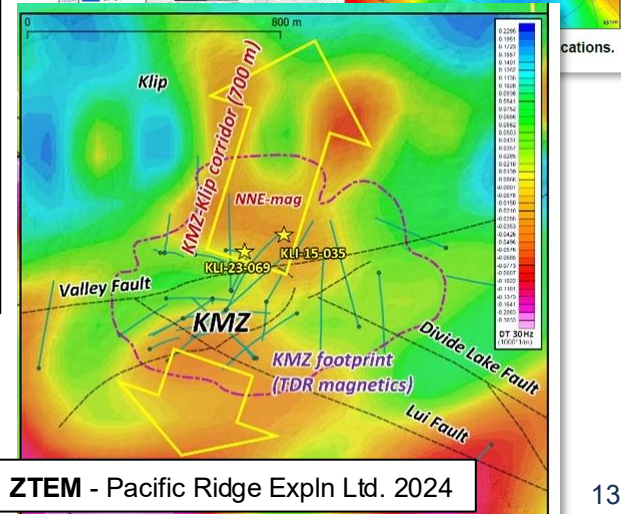
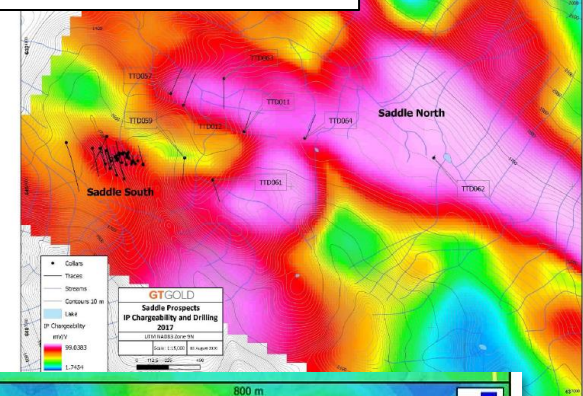


- Geophysics - magnetic, EM, IP surveys, most common at the project scale

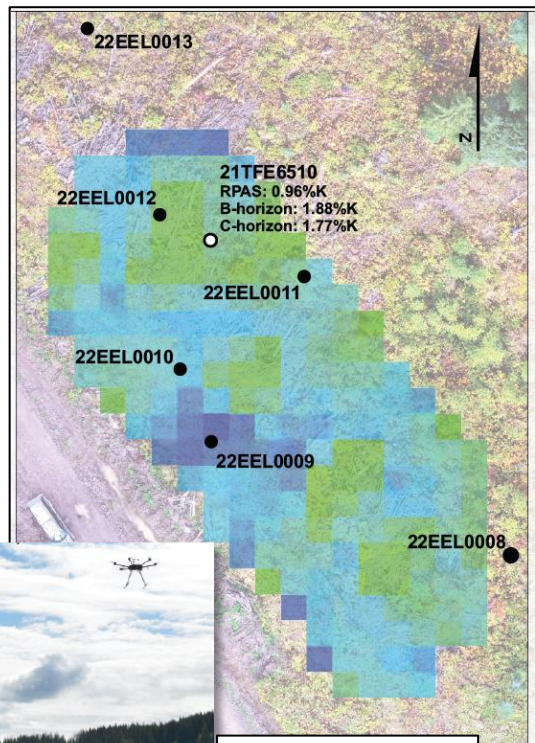
Activity	Amount of Work
RC Drilling	28 holes for 1,527 m
Diamond Drilling	64 holes for 16,180 m
Induced Polarization	30.5 line-km
Airborne Magnetic Survey	158 line-km
Resistivity Survey	2.5 line-km
Soil Sampling	46 soil samples
Prospecting	177 rock samples
Drone photography and digital topographic model	5.3 km ²

GT Gold, NI43-101, 2017

IP - GT Gold, NI43-101, 2017



Exploration Methodologies and Research

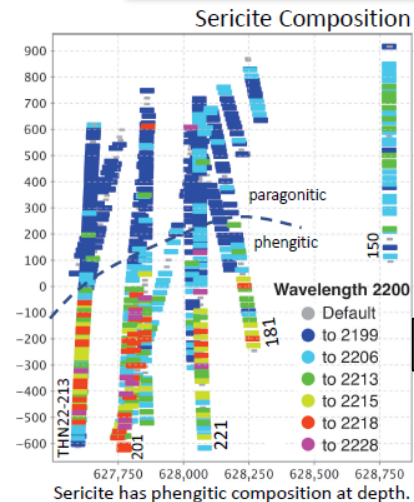
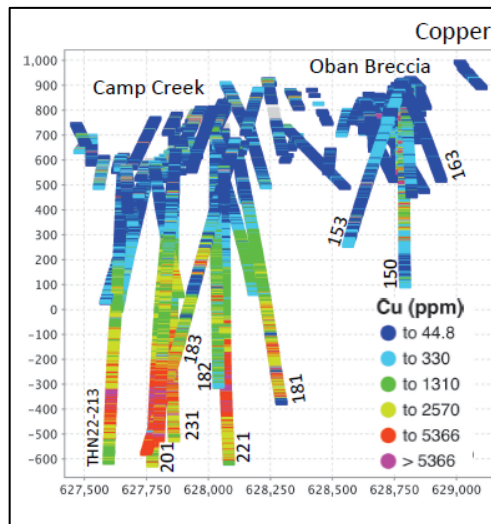
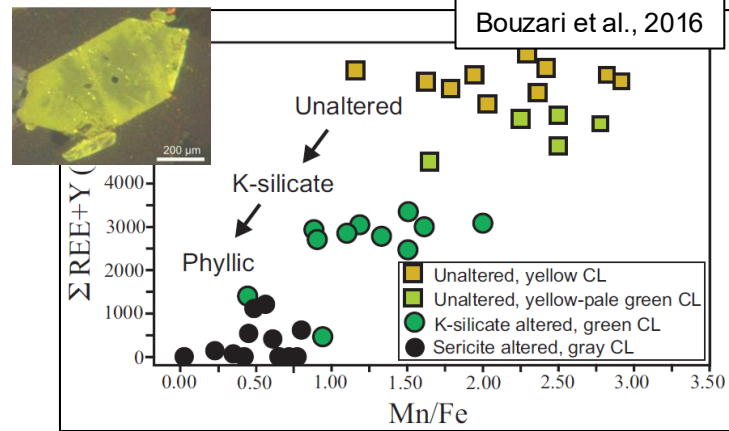


Ferbey et al., 2024

Drone radiometrics

Hickin, 2026.

- Traditional lithogeochem, soils, tills, lake/stream sediments, portable XRF, portable LIBS (laser-induced breakdown spectroscopy)
- Alteration vectors – indicator minerals, mineral chemistry, hyperspectral imaging



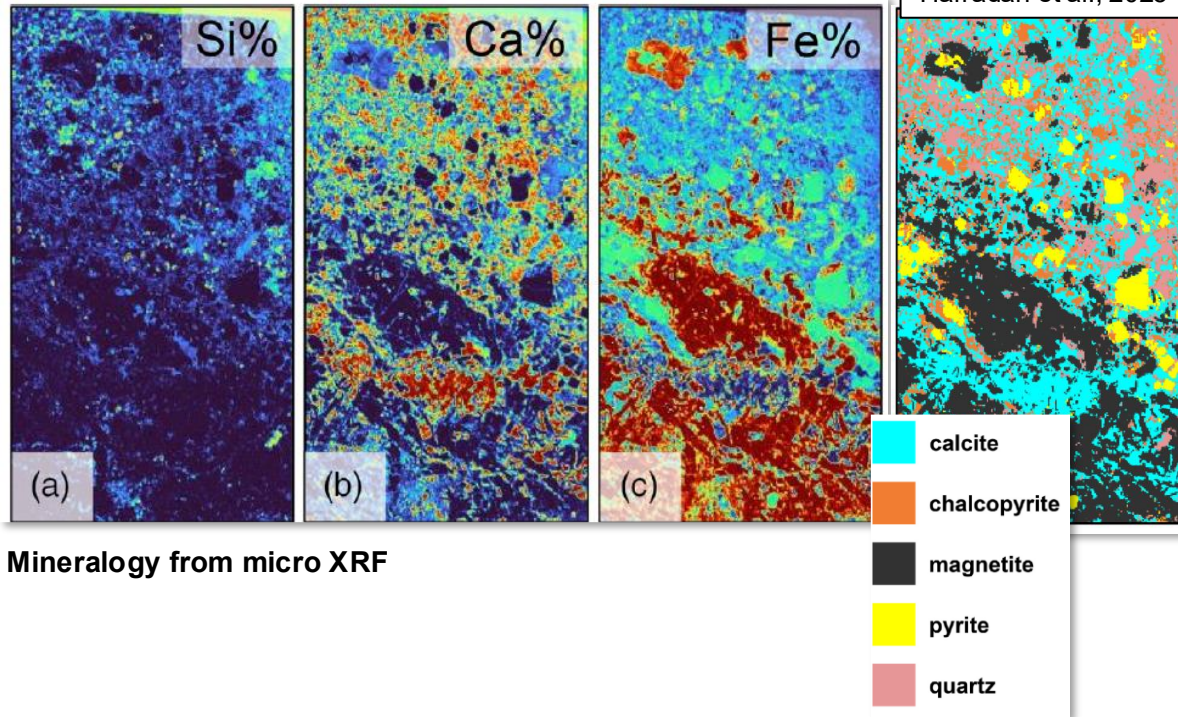
Cathodoluminescence and mineral chemistry

Bouzari and Barker 2024

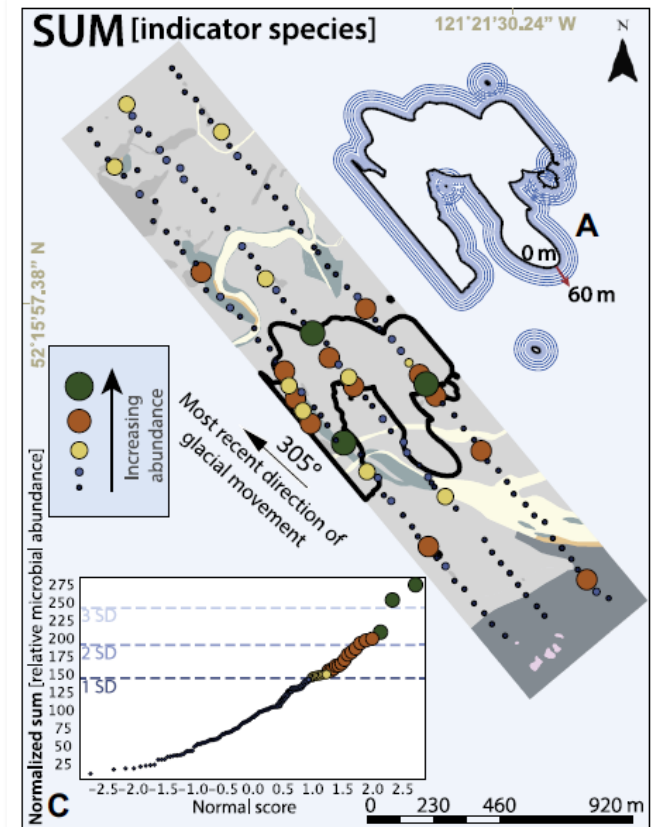
SWIR data for white mica species

Exploration Methodologies and Research

- Machine learning to analyze big data
- Genomics, microbial indicators



Microbial indicators, detection of Cu-sulfide ore

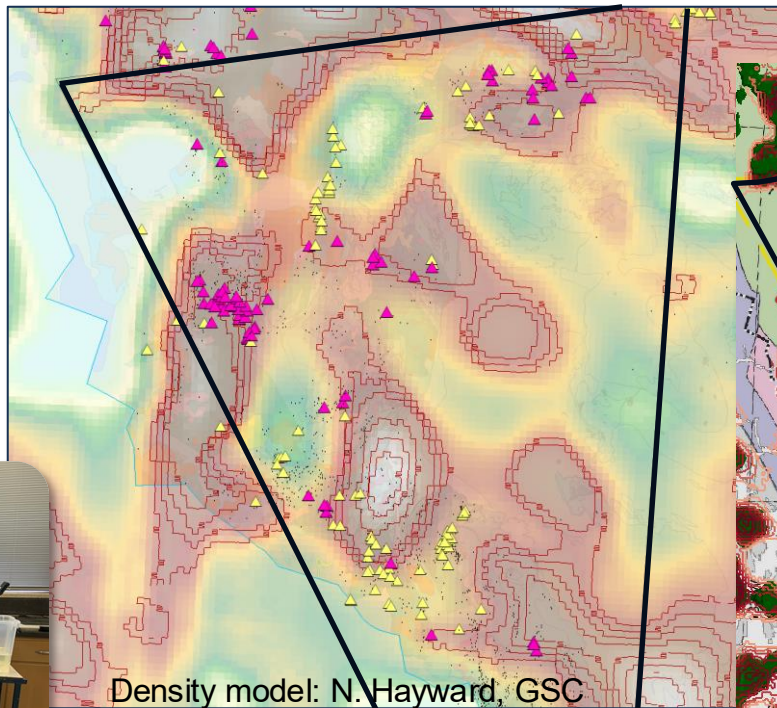


Geological Survey of Canada Projects

Regional petrophysics and geophysics, Mitchinson et al.

Regional geophysical datasets are underused but provide important information in BC

Geophysical interpretations supported by petrophysical properties and XRD mineral analysis in this study



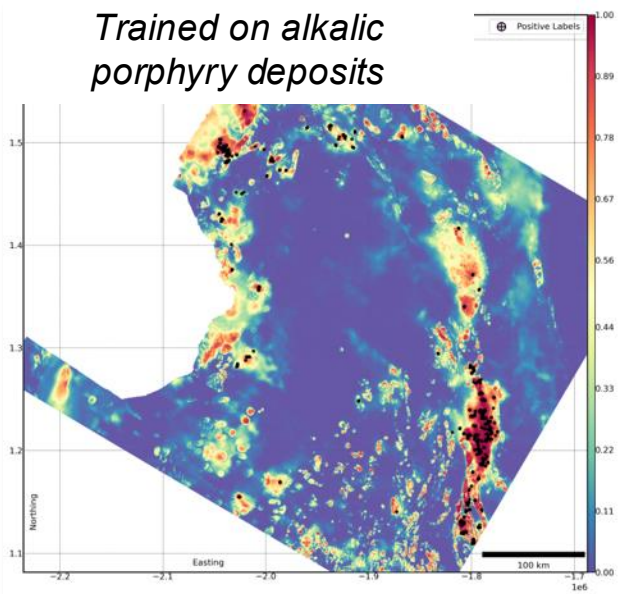
10 km horizontal slice through density model (gravity inversion)



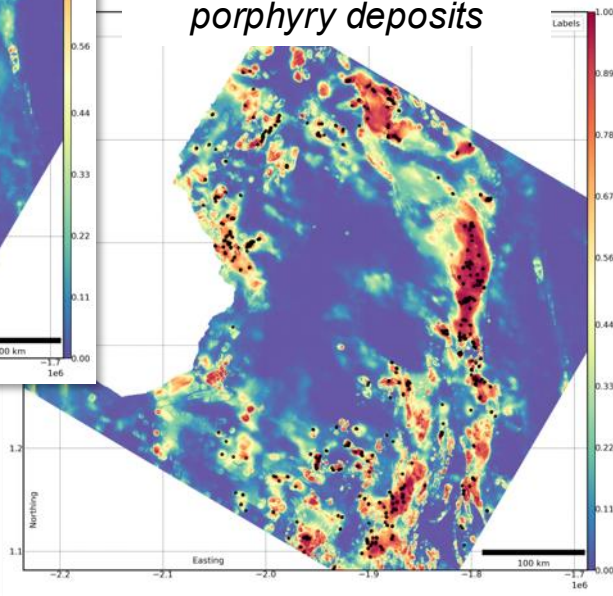
ML – regional magnetics and gravity, Mitchinson et al.

Do different deposit types have different regional geophysical signatures?

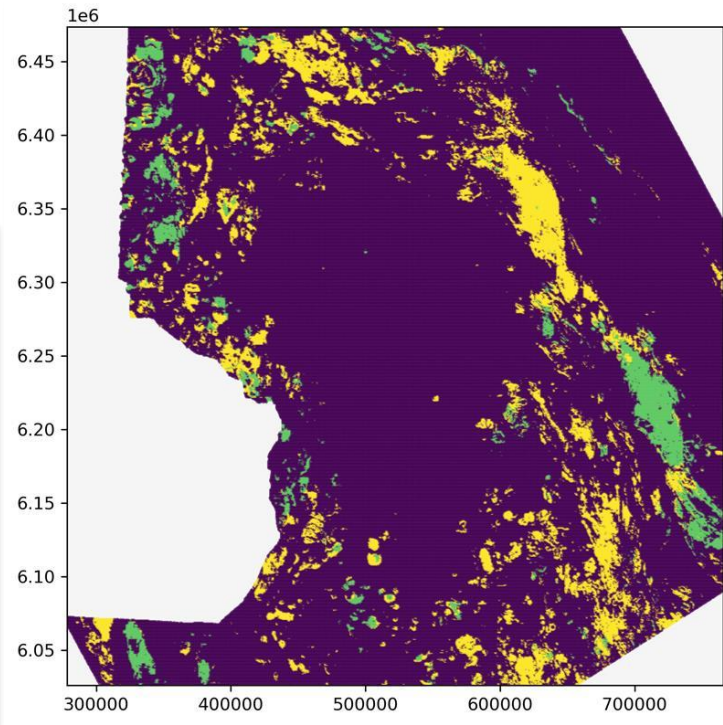
Trained on alkalic porphyry deposits



Trained on calc-alkalic porphyry deposits



Prospectivity analysis based on geophysics – indicate regional mag. and grav. signatures are different for alkalic vs calc-alkalic deposits



Clustering results – indicating features correlated to 2 types of porphyry deposits

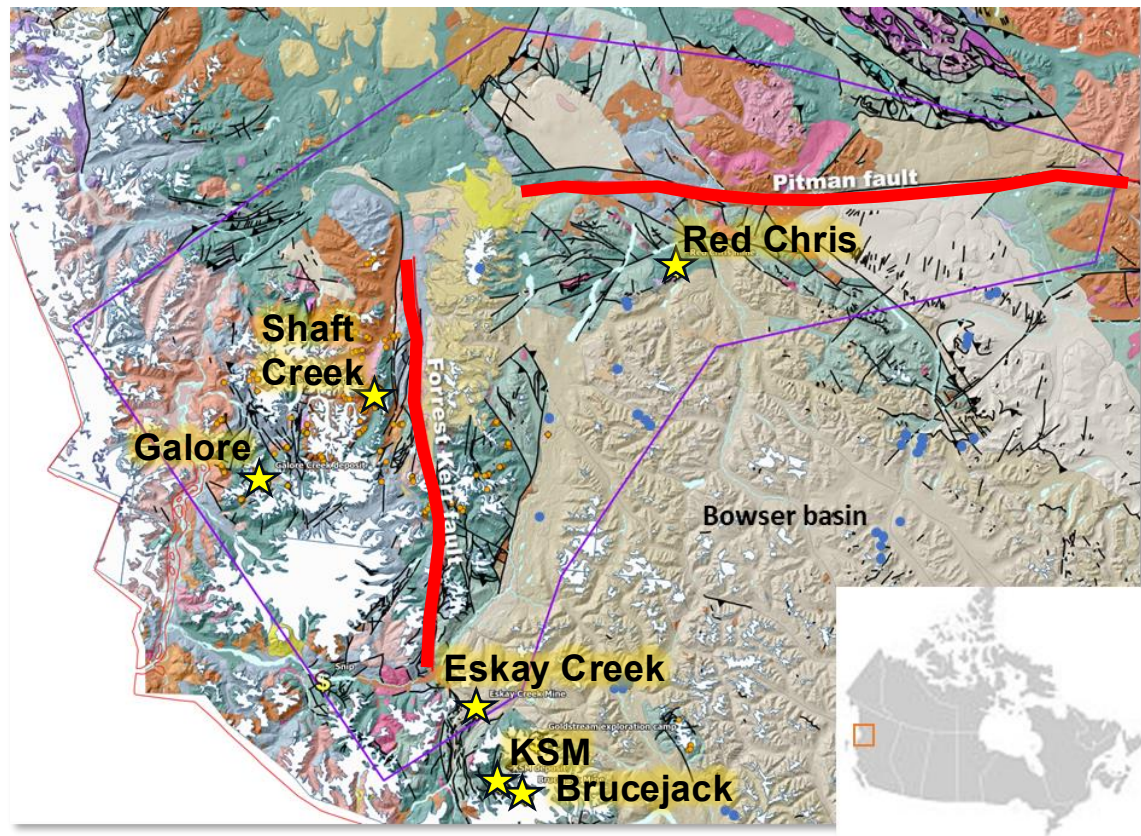
Fault and landscape evolution, Kellett et al., new project

Has landscape evolution has played a significant role in ore preservation?

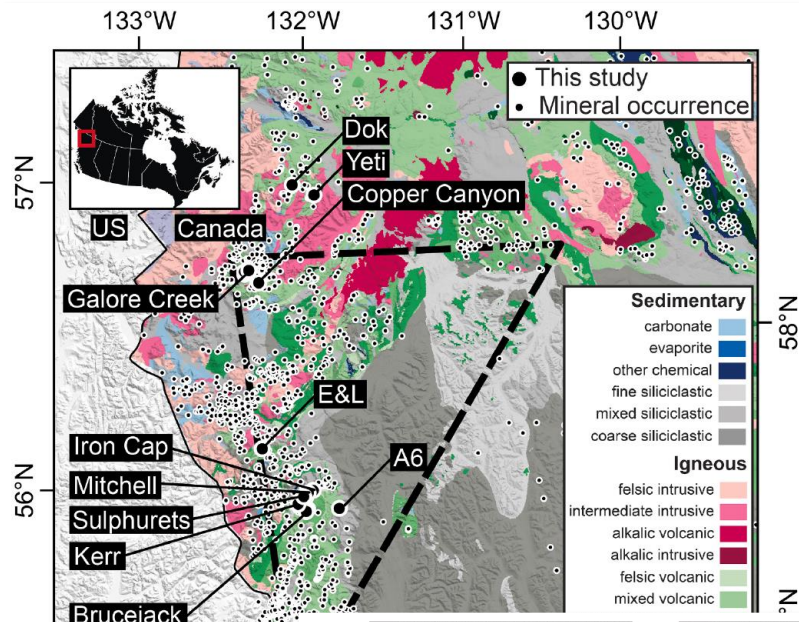
- *The structural evolution of major orogen-parallel and orogen-perpendicular fault corridors* - fault gauge clay dating (K-Ar dating), U-Pb dating of fault and vein carbonate, and microstructural analysis of samples
- *The exhumation history of the Golden Triangle region and how it has contributed to preservation of ore systems* - low temperature thermochronology including including zircon (U-Th)/He, apatite fission track and apatite (U-Th)/He methods

Geological map of Golden Triangle region, NW British Columbia

Purple – perimeter of proposed study area; Red – main fault corridors to be investigated

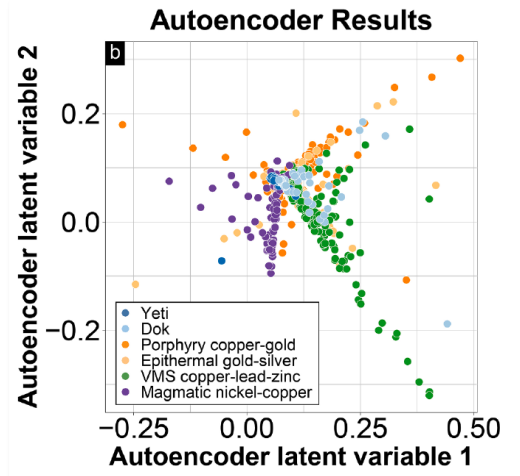


Pyrite characterization, Lawley et al., 2025



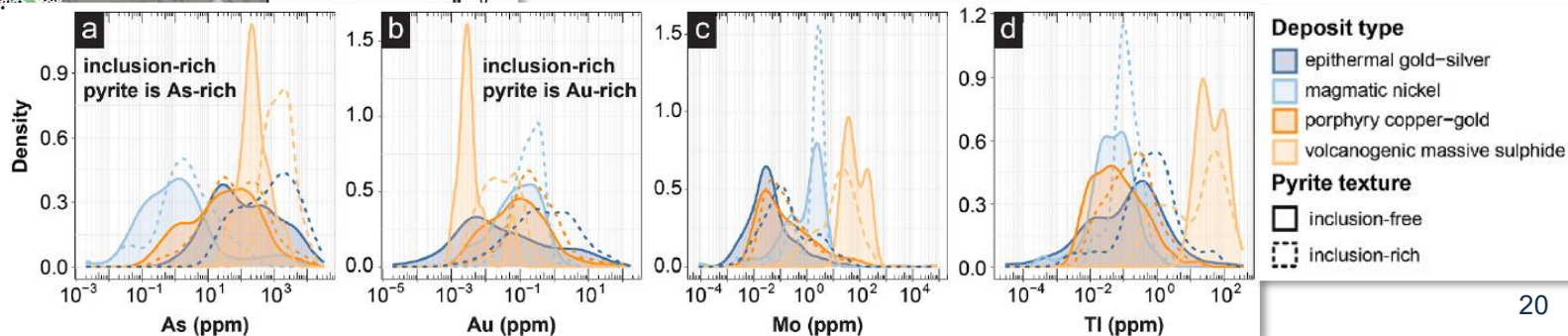
ML to predict deposit type using pyrite

Pyrite morphology, texture, grain size, and paragenesis are important predictors of deposit type when combined with trace element concentrations



Deep learning on LA-ICP-MS analysis of pyrite

Pyrite from 4 mineral deposit types, porphyry, epithermal, magmatic Ni-Cu, and VMS



Summary

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- The Stikine terrane of British Columbia hosts significant copper and gold porphyry and epithermal deposits
- An island arc geological setting, with ore related magmatism occurring over specific time frames, with significant deposits forming near Triassic-Jurassic boundary
- This transition is marked by an unconformity where there was uplift, crustal thickening, erosion, variably impacting preservation of mineral deposits
- Significant efforts ongoing to improve the understanding of geological and mineralization history:
 - Age dating plutonic suites
 - Structural studies
 - Geophysics and petrophysics
 - Alteration mineral chemistry
 - Genomics
 - AI and ML
- GSC is contributing in areas of regional geophysical data interpretation, structural and exhumation history, and use of AI and machine learning to find new mineral vectors and relationships to regional crustal features



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Canadian Critical Minerals strategy

- **Objective 3: Advance reconciliation with Indigenous peoples.**
- While Indigenous leadership and communities across the country will determine how they view success regarding critical mineral development on or near their territories, the Government of Canada will start with the following outcomes:
 - **Economic reconciliation is prioritized**
 - **Aboriginal and treaty rights are respected**
 - **Responsible critical mineral development contributes to the socio-economic well-being of Indigenous communities**