Porphyry Vectoring within Advanced Argillic-Altered Rocks of British Columbia

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Introduction

Property	AAA	HS	PCD
Sutlahine River area:			
- Thorn, Daisy, Ink, Camp Creek	X	X	X
- Kay, Lin, Lin 1-8	X	X	
Iskut River area:			
- Johnny Mountain/REG/Quartz Rise	X	X	
- Treaty Glacier	X		
Dease Lake area:			
- Tanzilla-McBride	X		X
Toodoggone River area:			
- Alunite Ridge	X	X	X
- Quartz Lake	X		
- Brenda	X	X	
- Black Gossan	X		X
- Silver Pond	X		
- Baker	X		X
Central BC:			
- Equity Silver mine	X		
- Limonite Creek	X		X
Taseko River/Mount McClure area:			
- Empress	X		
- Taylor-Windfall	X	X	
Vancouver Island:			
- Hushamu	X	X	X
- Macintosh, Pemberton Hills	X		
- Red Dog	X		
- Wanokana	X		
- Island Copper mine	X		X
Kyuquot Sound (Easy Inlet)	X		
Southern BC:			
- Riverside	X		
- Pyro	X		

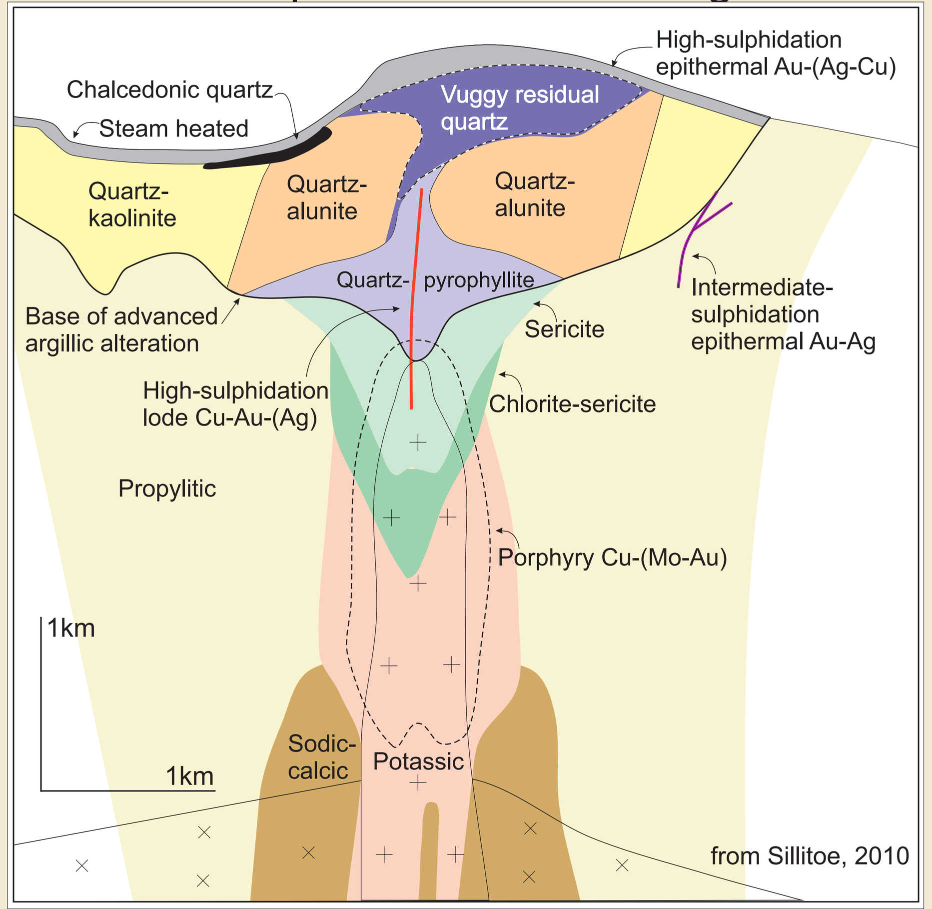
AAA: advanced argillic alteration, **HS**: high sulphidation alteration, **PCD**: porphyry copper alteration.

Advanced argillic alteration is the shallow expression of porphyry systems (Sillitoe, 2000). However, the location of the porphyry system beneath this lithocap is rarely apparent and new tools are required to inform exploration decision-making in these geological situations.

Areas with advanced argillic alteration have been recognized at several B.C. localities (Panteleyev, 1992). Identifying the textural, mineralogical and geochemical trends within these advanced argillic alteration zones will guide BC explorers in better identifying porphyry copper potential and provide tools that point toward mineralization.

Vectoring in Advanced Argillic Alteration

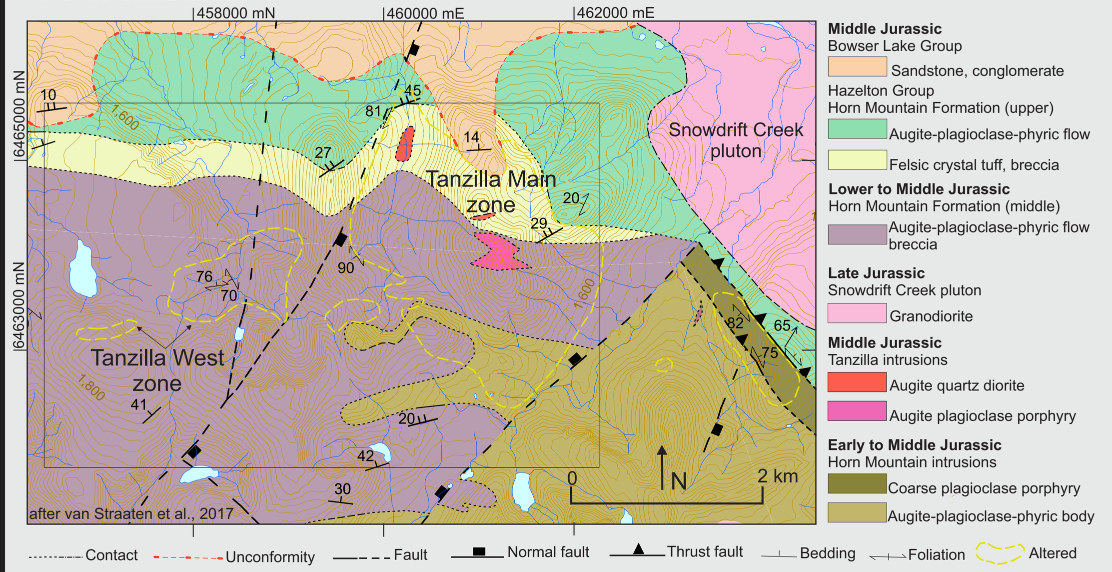
Mineralogical patterns provide a fundamental opportunity to vector towards high sulphidation gold and potential underlying porphyry mineralization. This project will develop exploration techniques and protocols to map alteration footprints in advanced argillic altered rocks.



Project goals are:

1) Characterize clay minerals and distributions
2) Characterize quartz types and identify those most closely related to the mineralization.
3) Map the geochemical footprint for vectoring.
4) Characterize rock physical properties for vector towards central zones.
5) Establish a toolkit to explore in advanced argillic altered rocks in BC.

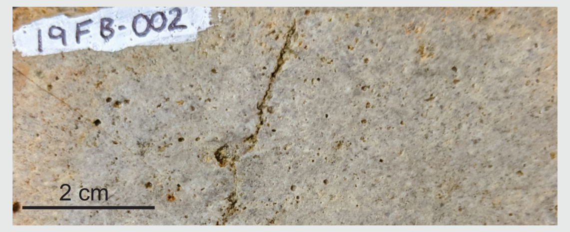
Tanzilla



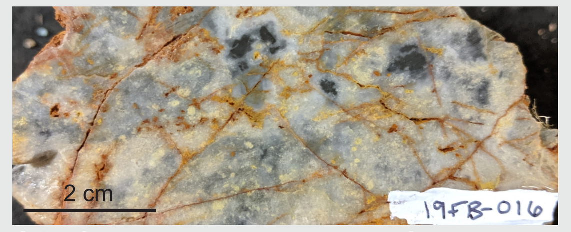
The Tanzilla property is underlain by the Horn Mountain Formation volcanic succession (late Early to Middle Jurassic). The Late Jurassic Snowdrift Creek pluton (160.43 ± 0.16 Ma) cuts the Horn Mountain strata.

The Horn Mountain Formation hosts aerially extensive advanced argillic alteration for at least 17 km along strike. At Tanzilla, the advanced argillic-alteration zone overlies porphyry-style alteration at depth with anomalous copper and molybdenum centred around a 173 Ma plagioclase porphyry body (van Straaten and Gibson, 2017).

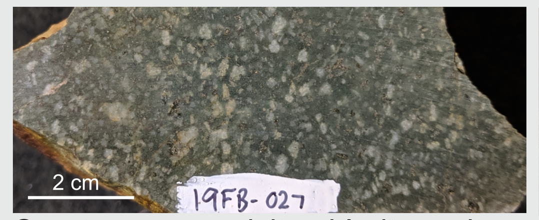
Tanzilla Main zone advanced argillic alteration in the background. Foreground is a small body of monzodiorite with biotite and K-feldspar alteration cut by quartz-magnetite-(chalcopyrite) veinlets.



Quartz-white sericite-pyrite alteration.



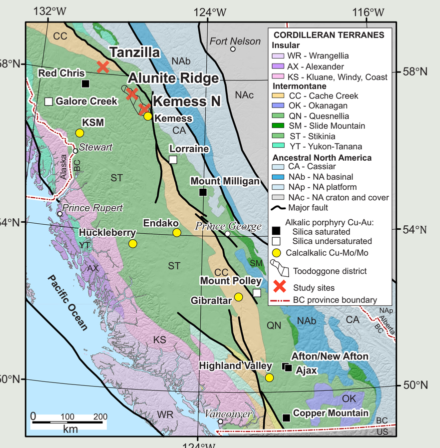
Silicification with remnants of sericite.



Quartz-green sericite-chlorite-pyrite alteration.

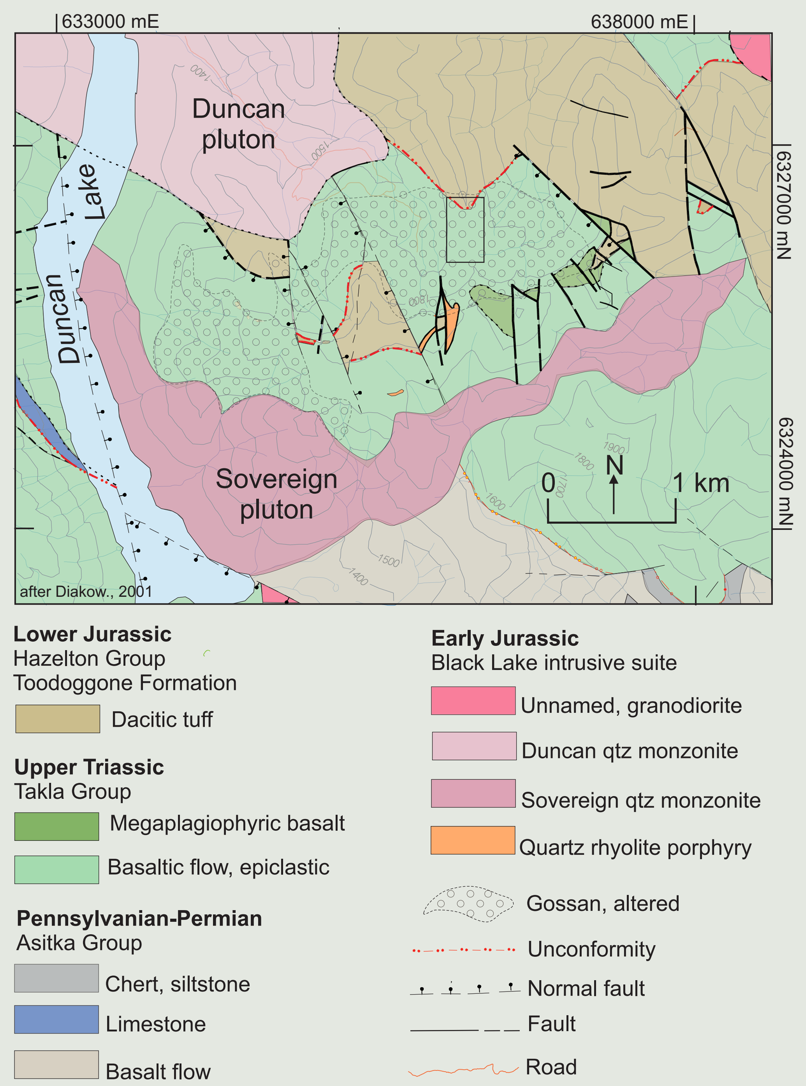
Dark green chlorite-sericite-pyrite alteration.

Study Sites



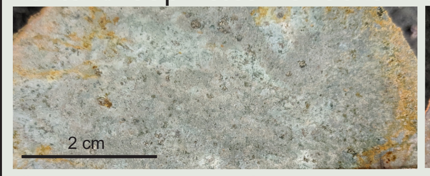
In this study, three areas in northern BC with notable advanced argillic-alteration zones are evaluated: Tanzilla, Alunite Ridge and Kemess North.

Kemess North

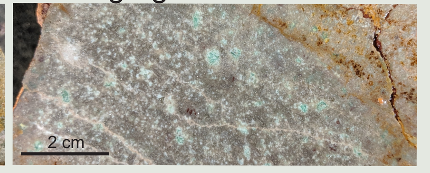


At Kemess North, porphyry mineralization is centred around a quartz diorite body (ca. 202 Ma). Associated phyllic-type alteration and is characterized by very fine-grained quartz sericite-chlorite-pyrite alteration which transition to sericite at shallow levels. At depth, the K-silicate alteration is characterized by quartz-magnetite stringers with decrease in the pyrite to chalcopyrite ratio.

Looking SE to the Kemess North ridge showing altered Takla Group volcanic rocks with orange gossan coloration.



Green sericite-chlorite-pyrite

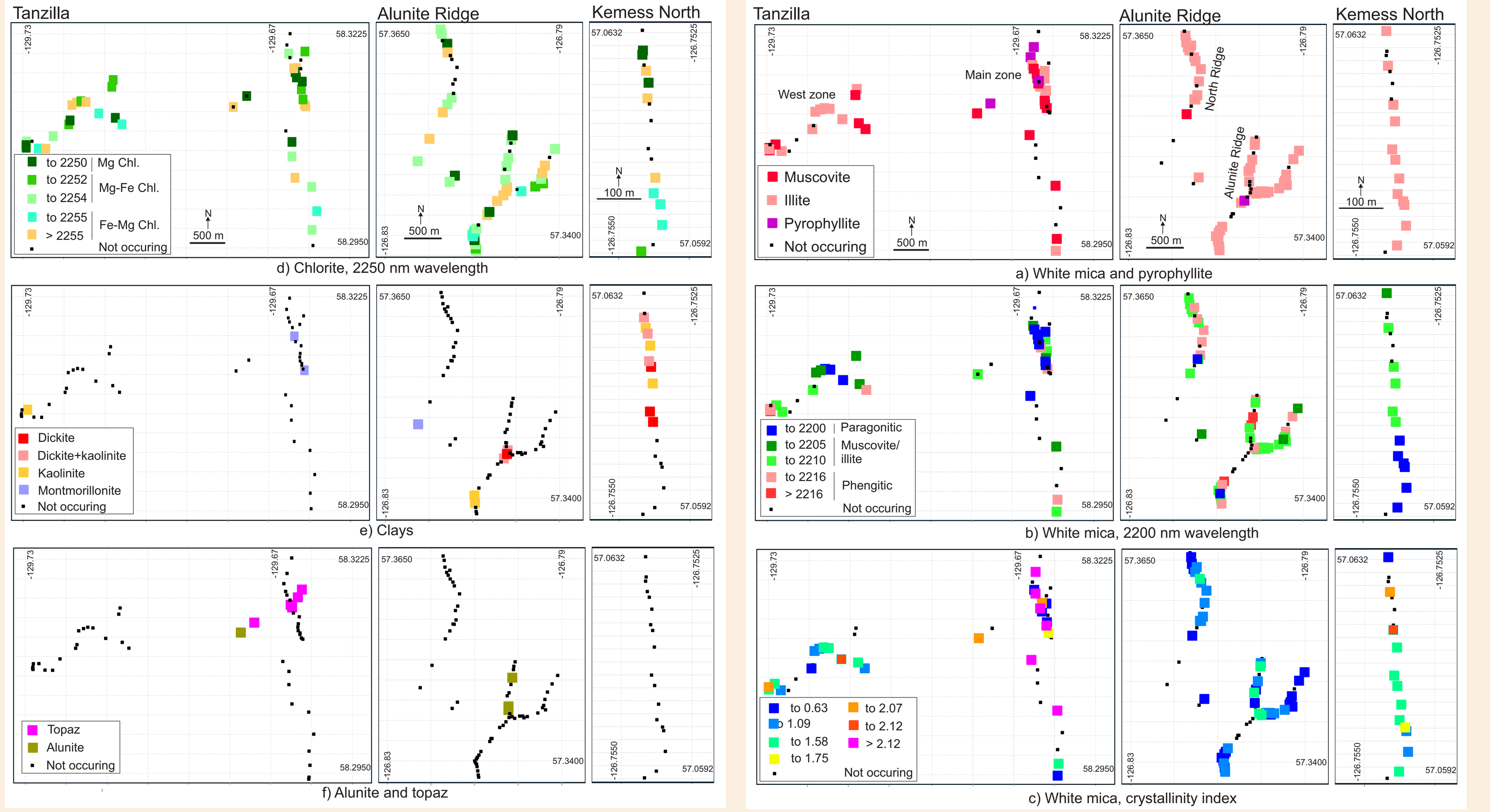


Green-grey sericite-pyrite

Grey-white sericite-clay-pyrite

Chlorite-epidote altered.

SWIR Mineralogy and Zoning



White mica at Tanzilla is muscovite whereas at Alunite Ridge and Kemess North is illite.

Pyrophyllite occurs in the Main zone at Tanzilla and with the quartz-alunite at Alunite Ridge.

K-rich muscovite/illite and paragonite are abundant at Tanzilla. K-rich illite is abundant at Alunite Ridge especially with the quartz-alunite-white sericite altered rock, whereas phengitic illite is more abundant with the pale green sericite-chlorite alteration. At Kemess North, paragonitic illite occurs in the south, whereas K-rich illite occurs to the north.

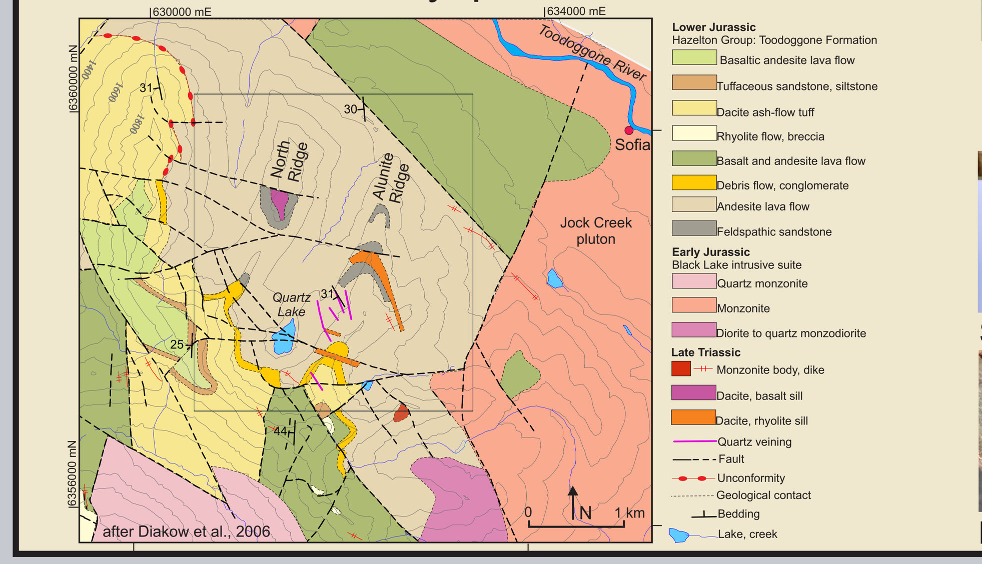
Sericite crystallinity index shows that white micas at the Tanzilla Main zone are well crystalline (>2.0) whereas further south and at the West zone they are less crystalline (<1.5). At Alunite Ridge, the crystallinity varies from moderate (ca. 1–1.5) to poor (<1) distally. At Kemess North, white mica crystallinity increases from south (ca. 1) to north (>2).

Chlorite was identified in most rock samples, shows a wide range of composition from Mg-rich to Fe-Mg rich with no obvious trends.

Clay minerals are not typical at Tanzilla, whereas dickite and kaolinite occur in the Alunite Ridge with alunite-white sericite and at Kemess North with grey-white sericite alteration.

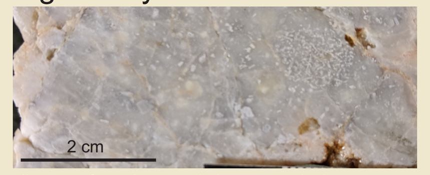
Alunite Ridge

NW-trending alteration hosts 10-15 m wide gold mineralization in a silicified rock with quartz-alunite surrounded by quartz-sericite alteration.



Alunite Ridge: silicified-alunite-sericite zone followed by limonite stained green sericite-chlorite alteration and chlorite-sericite-epidote occurring distally.

Silicified with vuggy texture



Qtz-alunite-white sericite

Pale-green sericite-chlorite

Chlorite-sericite-epidote

Conclusions:

- The central parts of the advanced argillic alteration zone are characterized by strong silicification, both as quartz flooding and veining.
- Alunite, pyrophyllite and topaz locally occur with the silicified rock.
- The silicified zones are surrounded by quartz-white to grey sericite-(kaolinite and dickite) alteration.
- Kaolinite is less abundant due to mafic character of the volcanic rocks.
- Alteration outside is characterized by a pale greenish rock containing assemblages of quartz-green sericite-chlorite.
- The crystallinity of the sericite increases towards and within the quartz-white to grey sericite-(clay) zone.
- More distally, chlorite increases to form green chlorite-sericite alteration and chlorite-epidote-(sericite) more distally.

Acknowledgements

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Selected References

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