



Science. Exploration.
Discovery.

Using Underutilized Gravity and Electromagnetic Data to Learn More About the Geology of the Quesnel Terrane

Dianne Mitchinson

April 4th, 2023
Kamloops Exploration Group Conference 2023



BARRICK



eldorado gold



RioTinto



Newmont

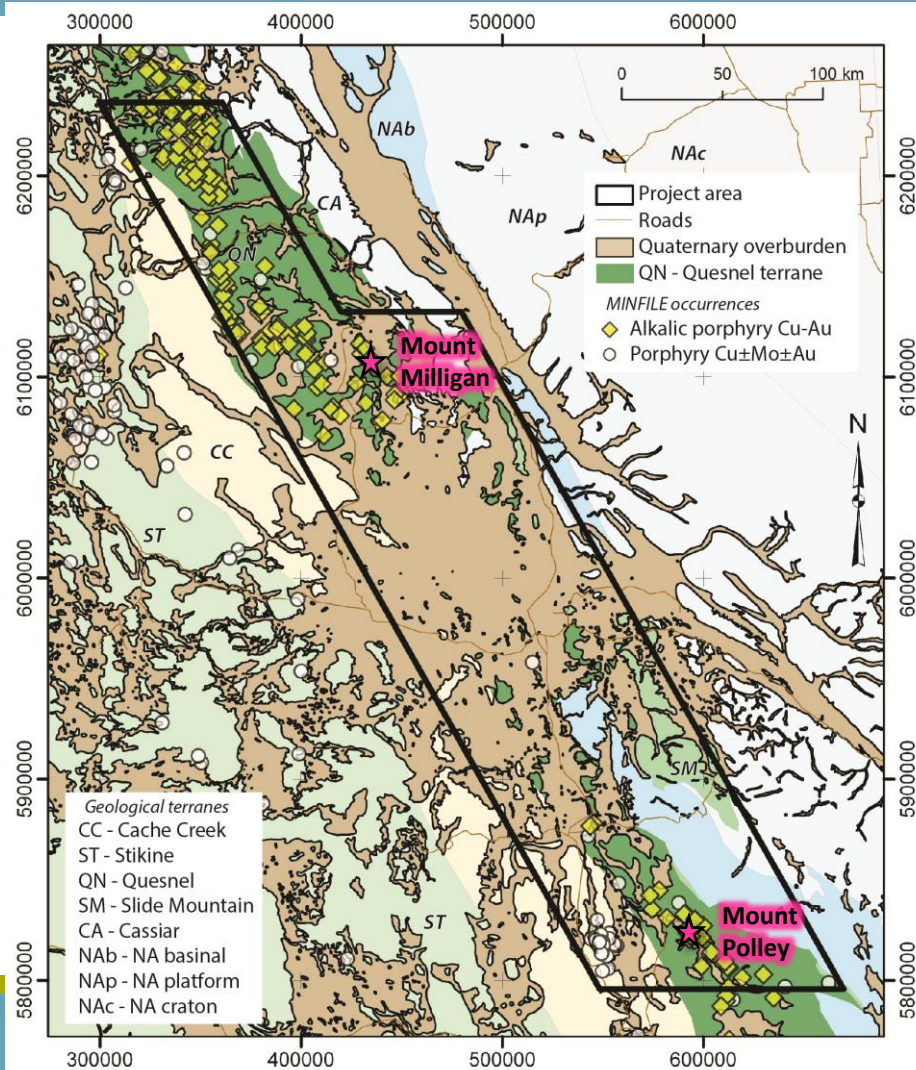
Teck

Outline

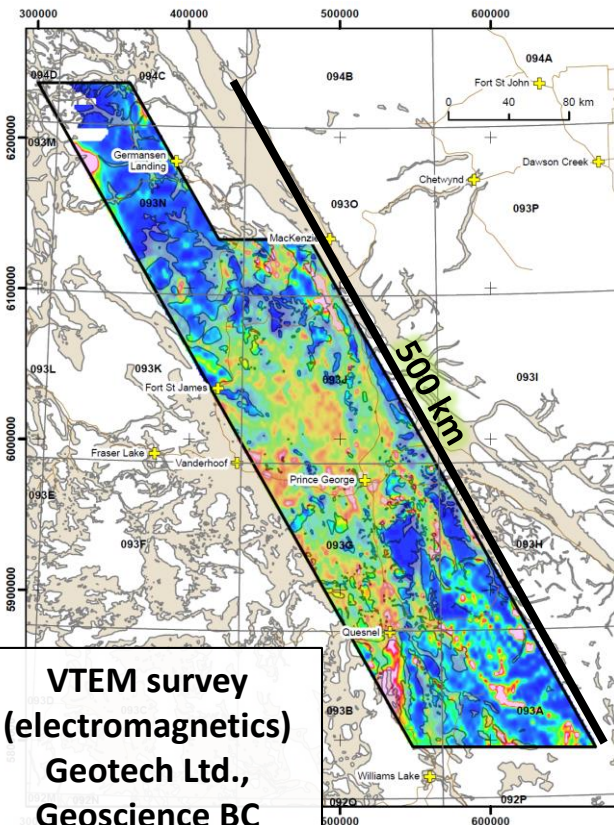
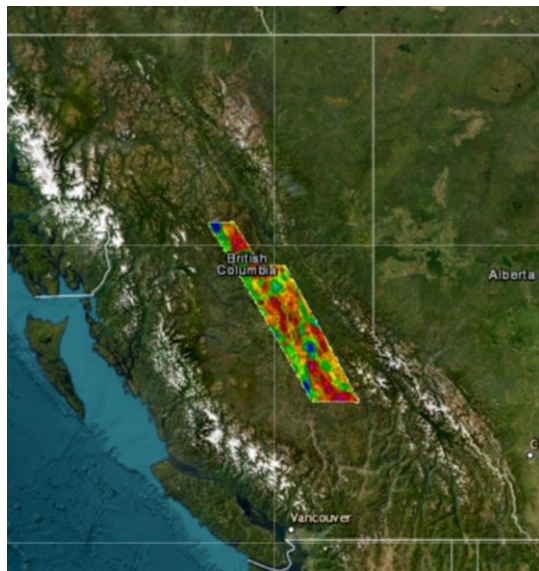
- Quesnel terrane and under cover porphyry potential
- QUEST geophysical surveys
- Density and electrical properties of Quesnel terrane rocks
- Trends in electromagnetics and gravity (and magnetic) data
- New geologic interpretations from Quesnel EM and gravity
- Summary (for now)

Still more to learn from QUEST geophysics!

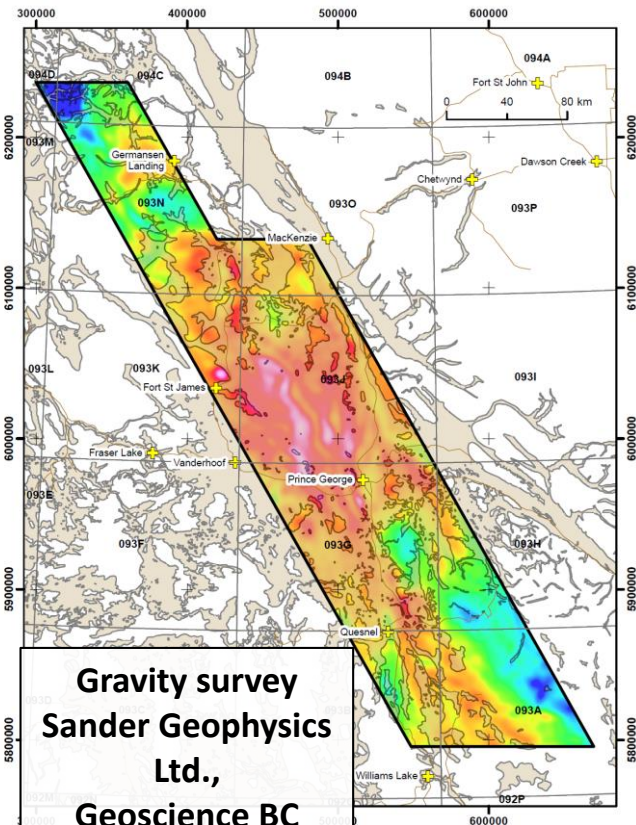
- 2007 electromagnetic and gravity surveys
- **Continuous coverage by several geophysical data sets** across this 'gap' – provides opportunities to understand cover and bedrock
- **Geoscience BC Project 2022-002 goal:** Analysis of underused QUEST gravity and electromagnetic data to improve geological knowledge under cover, and to attempt to identify stratigraphic correlations with northern and southern Quesnel geology



Geoscience BC QUEST geophysical surveys



**VTEM survey
(electromagnetics)
Geotech Ltd.,
Geoscience BC
Report 2008-04**



**Gravity survey
Sander Geophysics
Ltd.,
Geoscience BC
Report 2008-08**



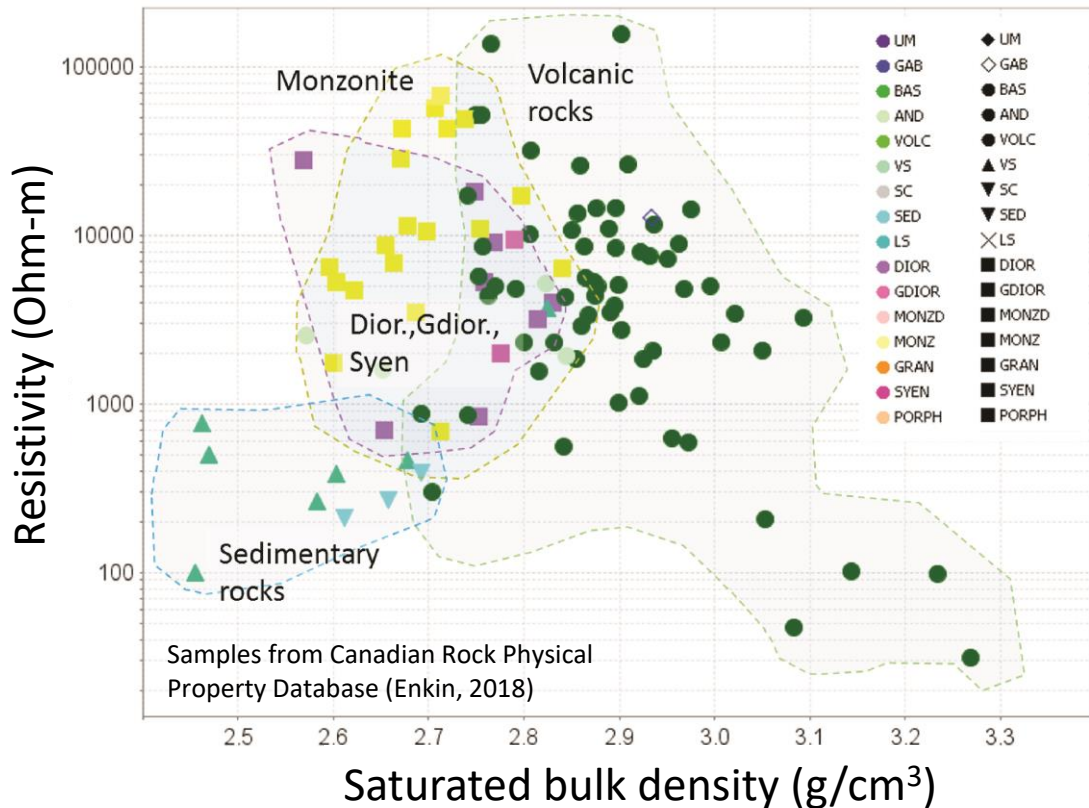
What can gravity and electromagnetic data 'see'?

Physical rock property data

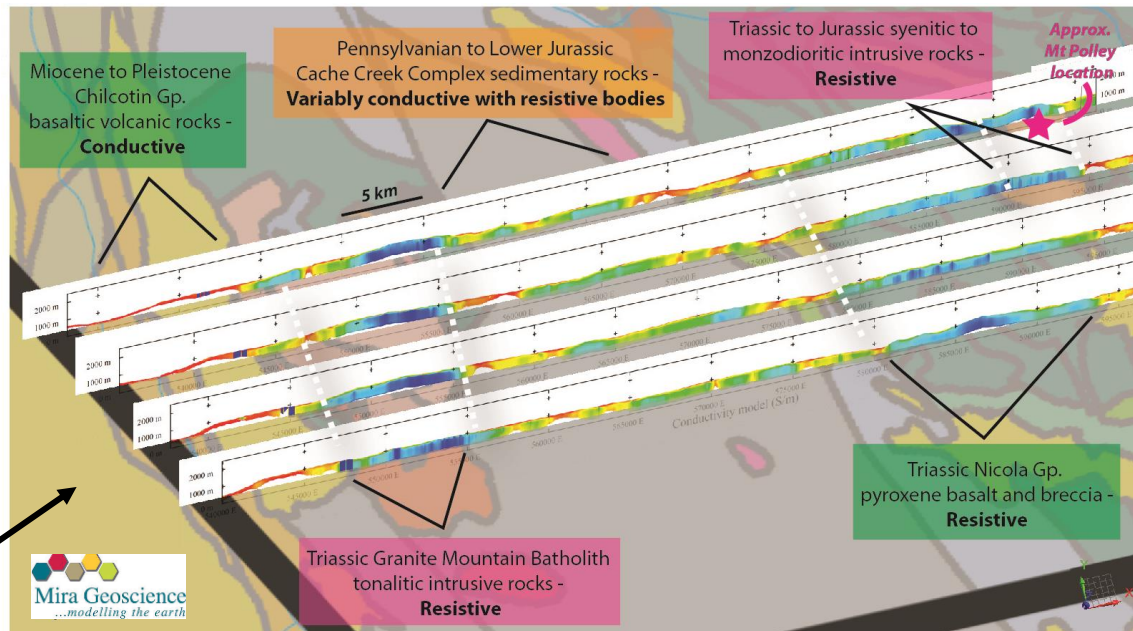
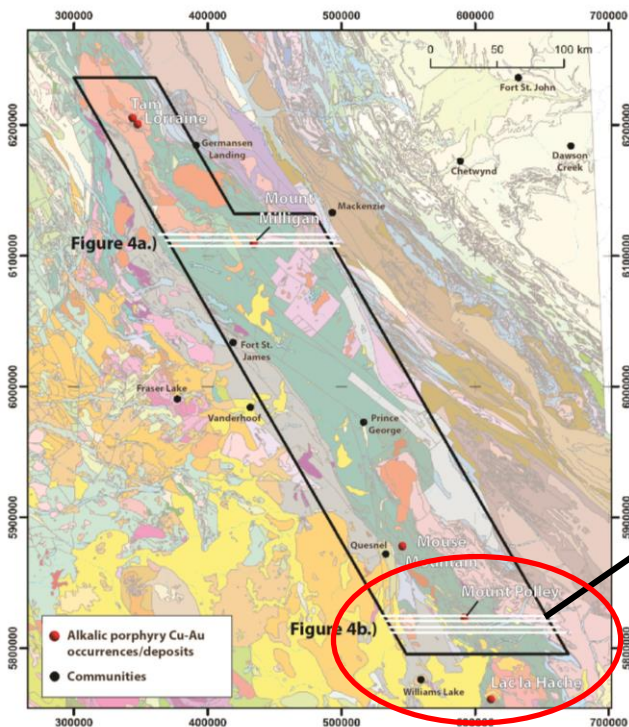
relates directly back to geology and will help us to understand geophysical responses

Gravity responses relate to **density** contrasts in the Earth's crust

Electromagnetic responses relate to **how current flows through the ground** – dependent on how resistive the medium is

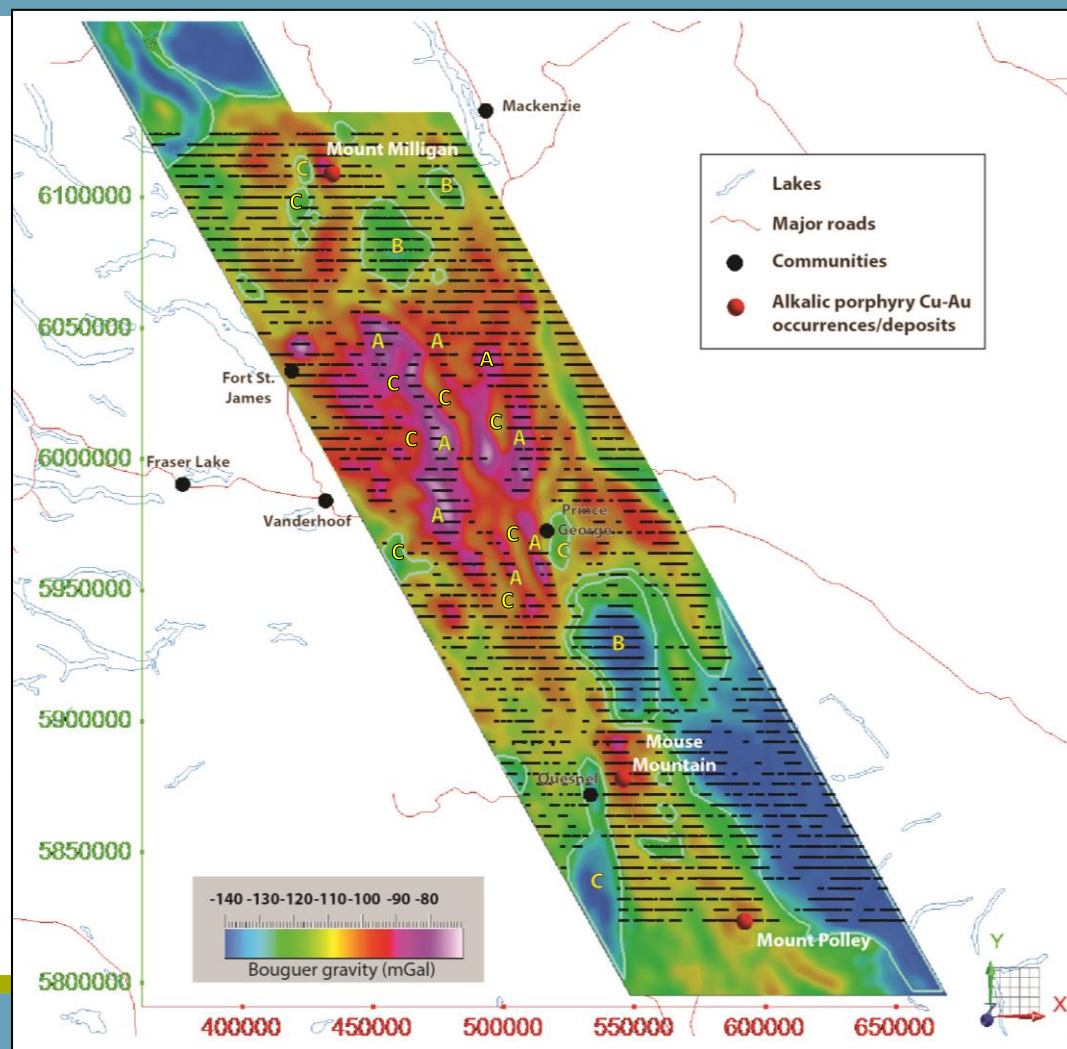
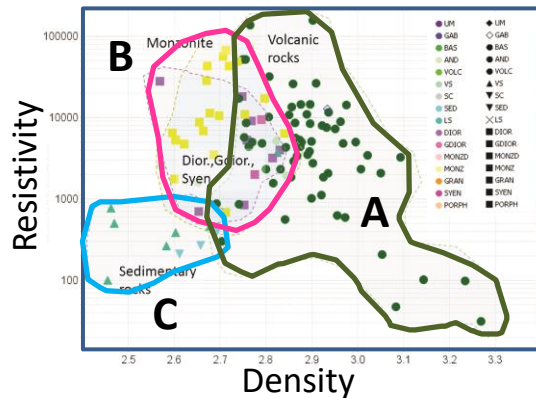


Electromagnetic data trends



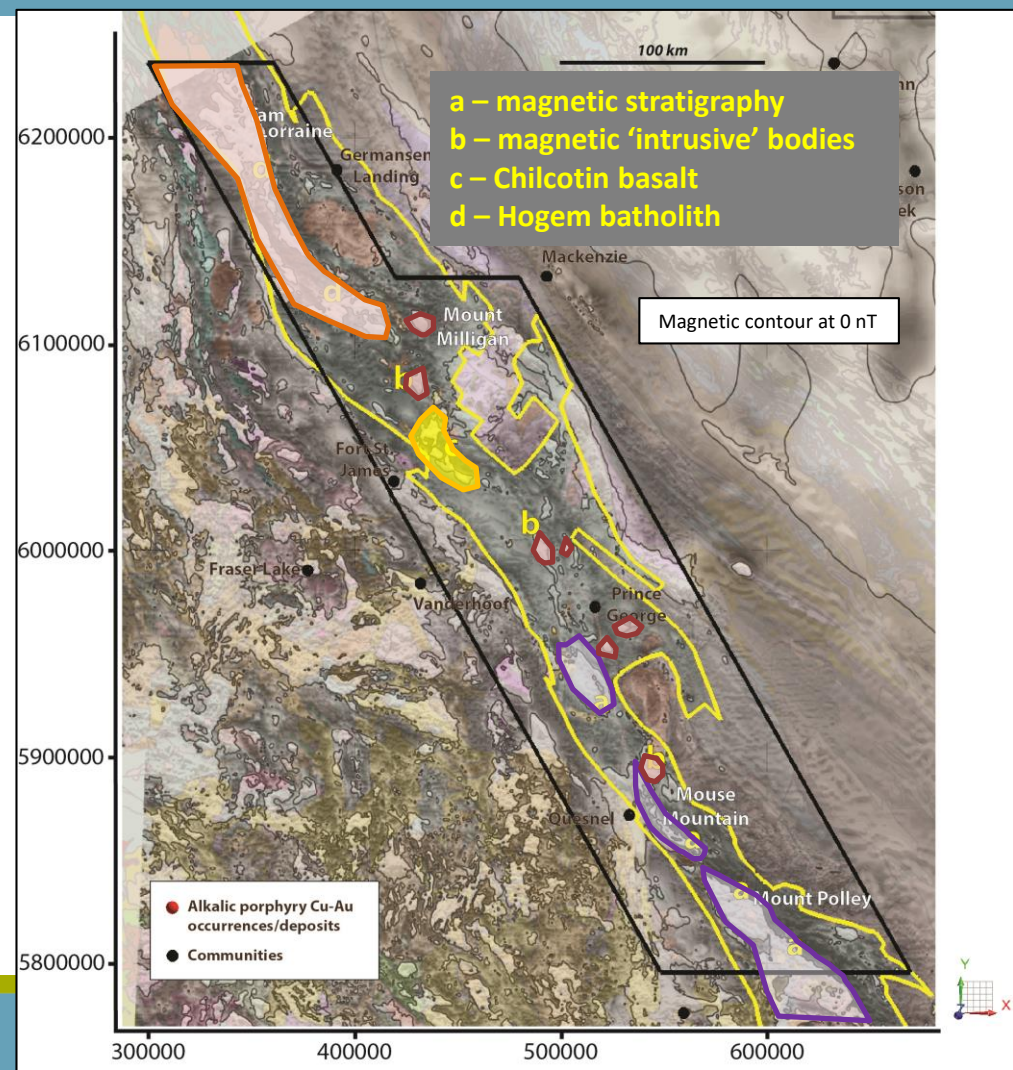
Correlations between gravity and EM

- “A” – high resistivity and gravity high (high density)
- “B” – high resistivity and gravity low (low density)
- “C” - low resistivity and gravity low (low density)



Magnetic data trends

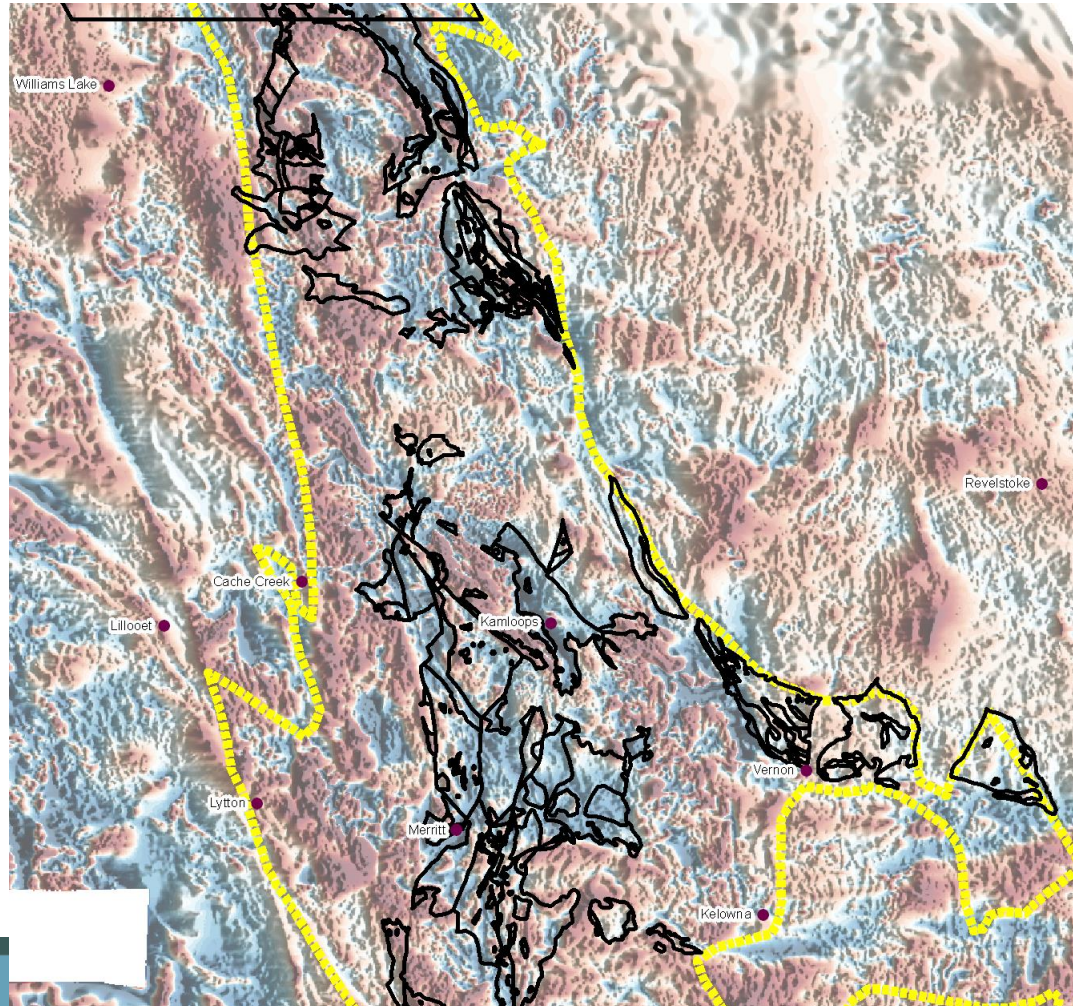
- Magnetic (magnetite-bearing) volcanic stratigraphy mainly south of Prince George
- In central Quesnel, magnetic anomalies are mainly intrusive rocks containing magnetite, or Chilcotin basalt
- To the north, phases of the Hogem batholith are magnetic
- In southern Quesnel, magnetic stratigraphy continues along west side of Takomkane batholith, but largely weakly magnetic stratigraphy there



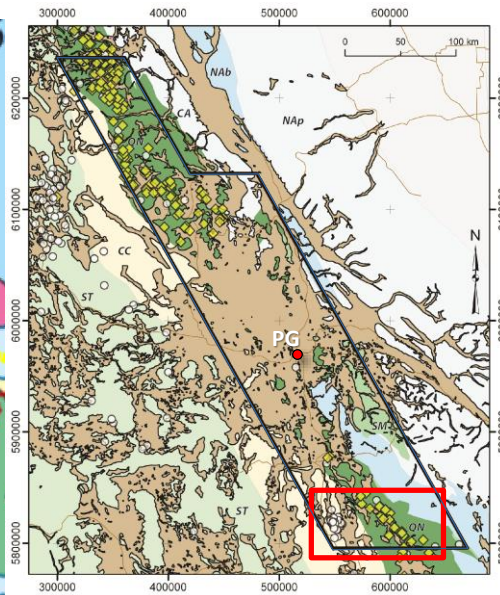
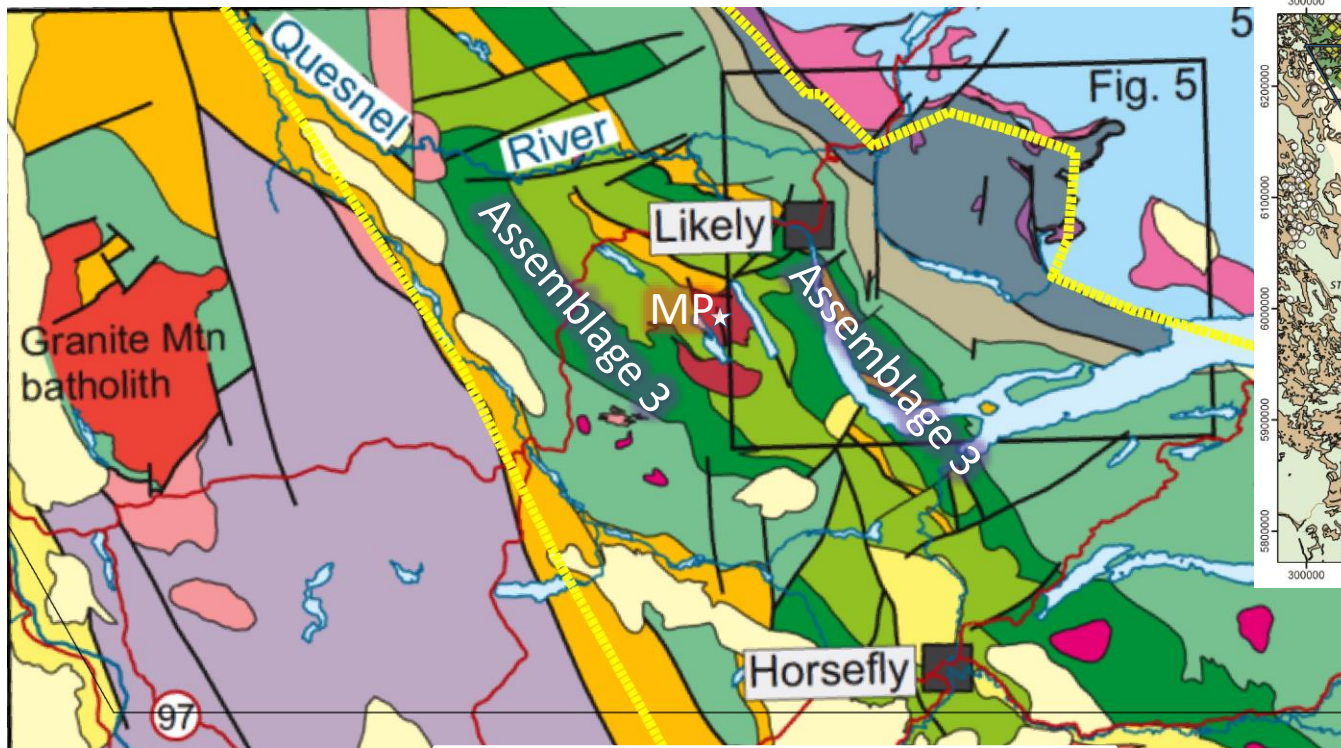
Magnetic data trends – southern Quesnel

Black outline –
Nicola Group
volcanic rocks

Yellow outline –
Quesnel terrane



Integrated geophysical interpretations in Quesnel



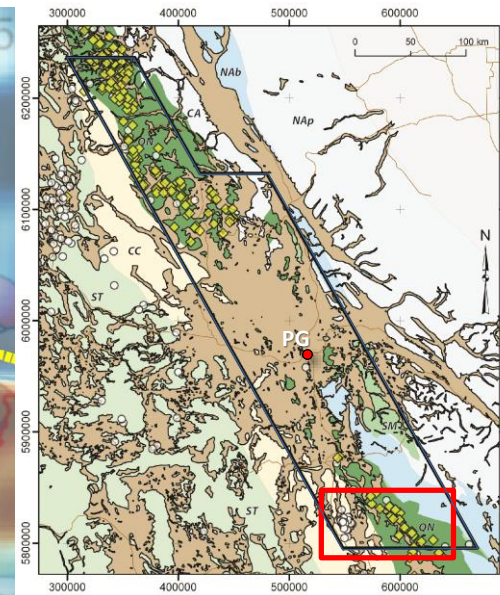
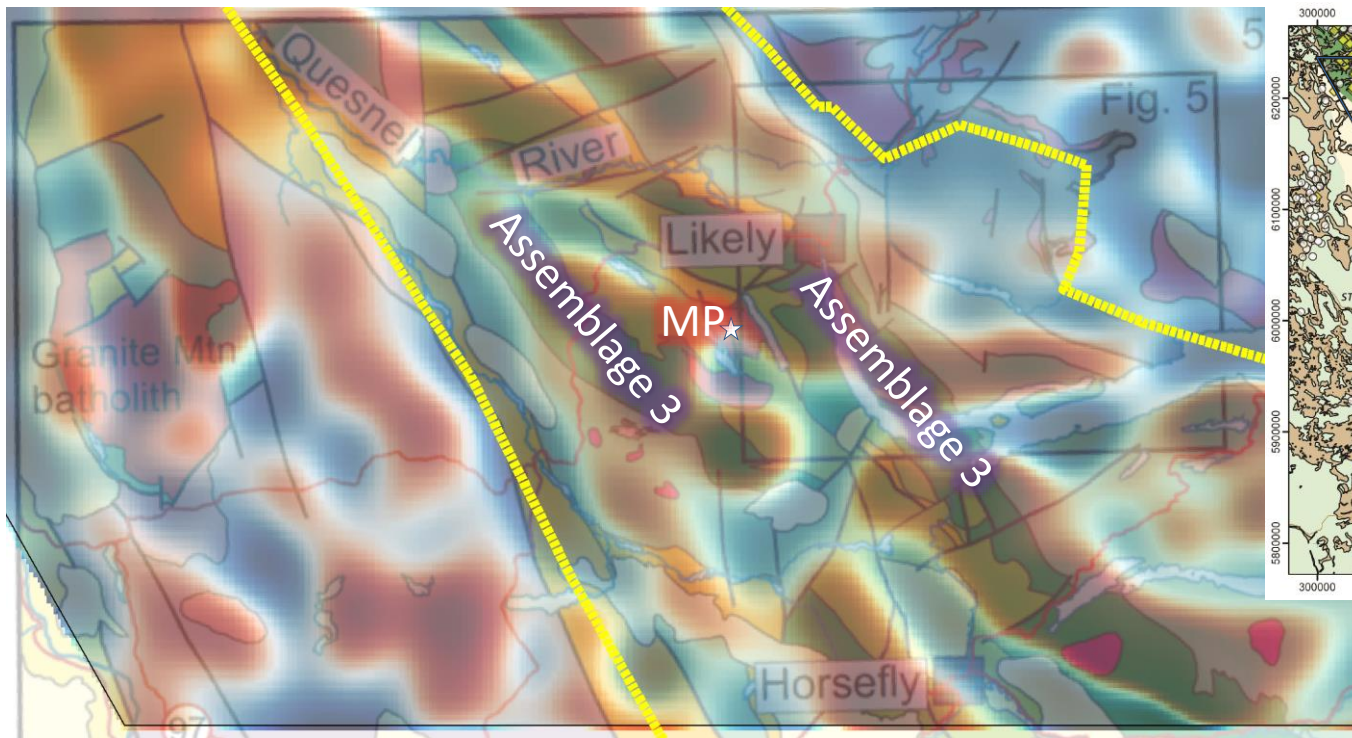
Schiarizza 2019,
Bridge Lake -
Quesnel River,
BCGS Paper 2019-01

MP = Mount Polley

“Assemblage 3”
Nicola Gp

Upper Triassic
Assemblage three
Pyroxene-phyric basalt,
pillowed basalt,
basalt breccia

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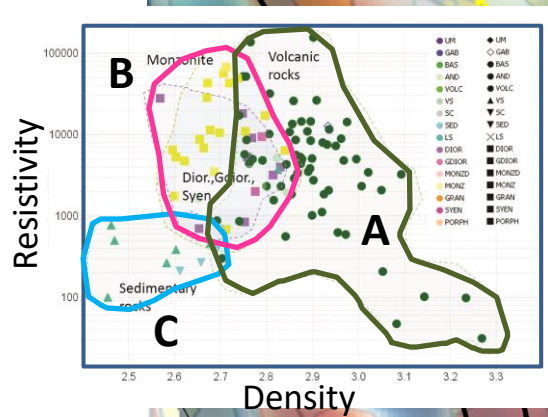
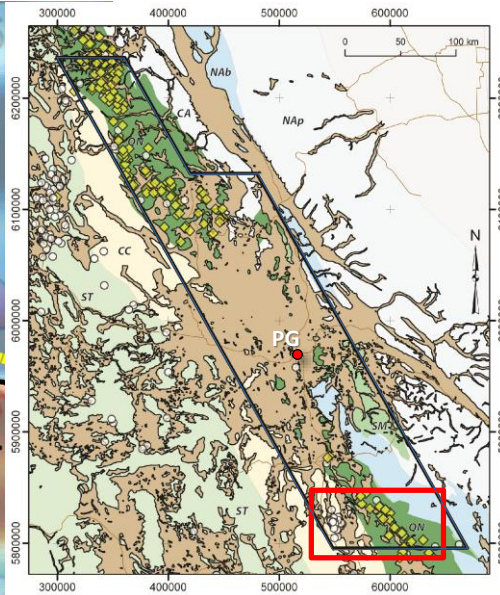
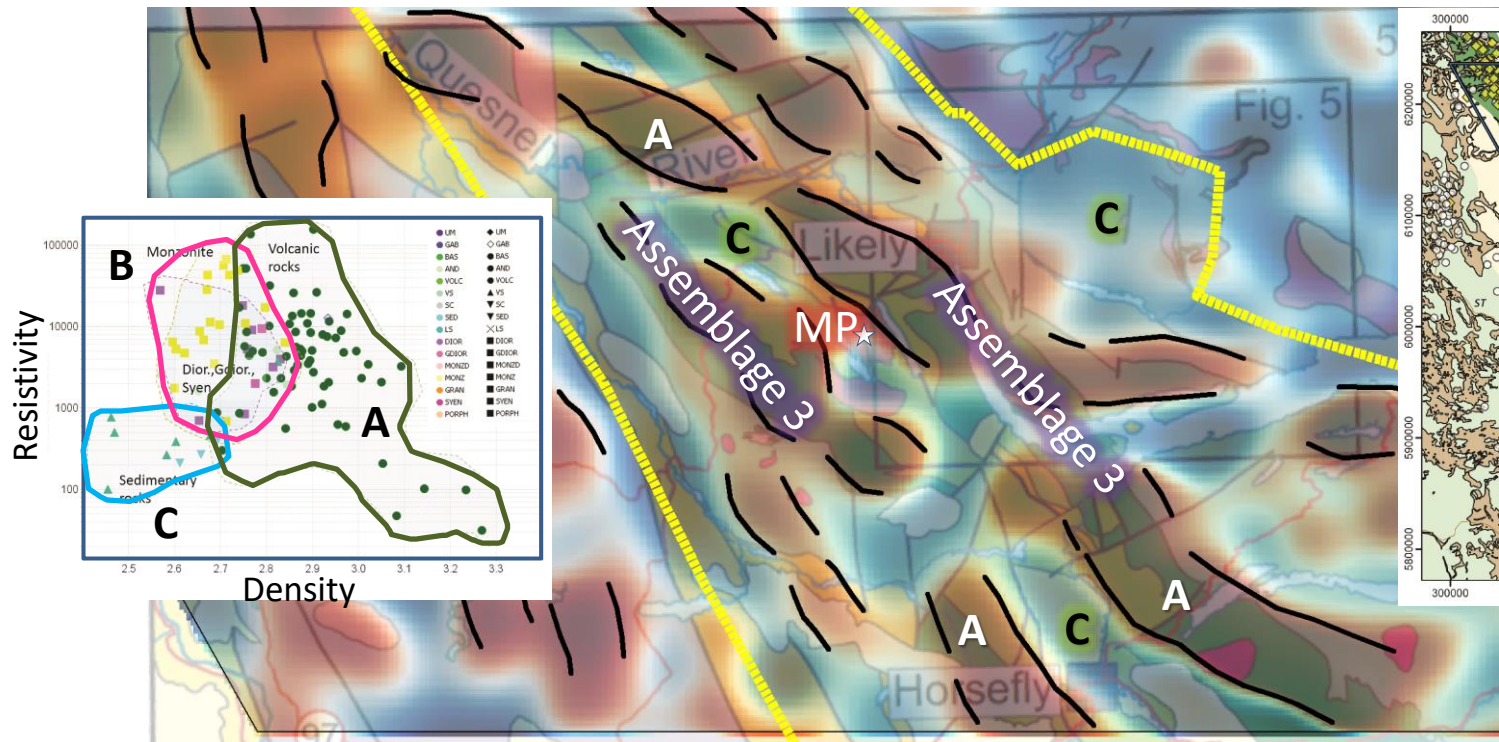
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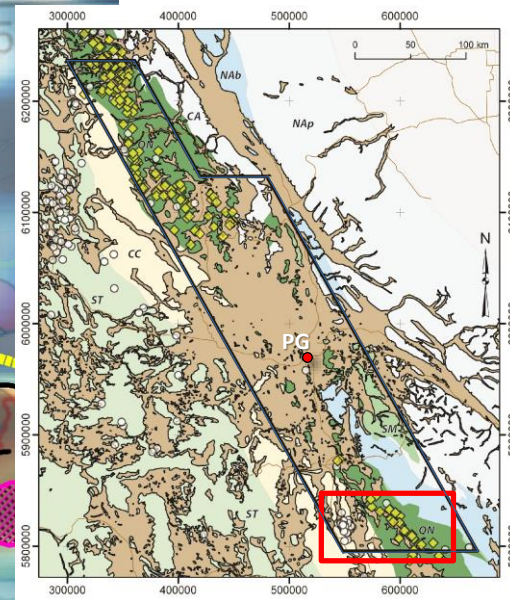
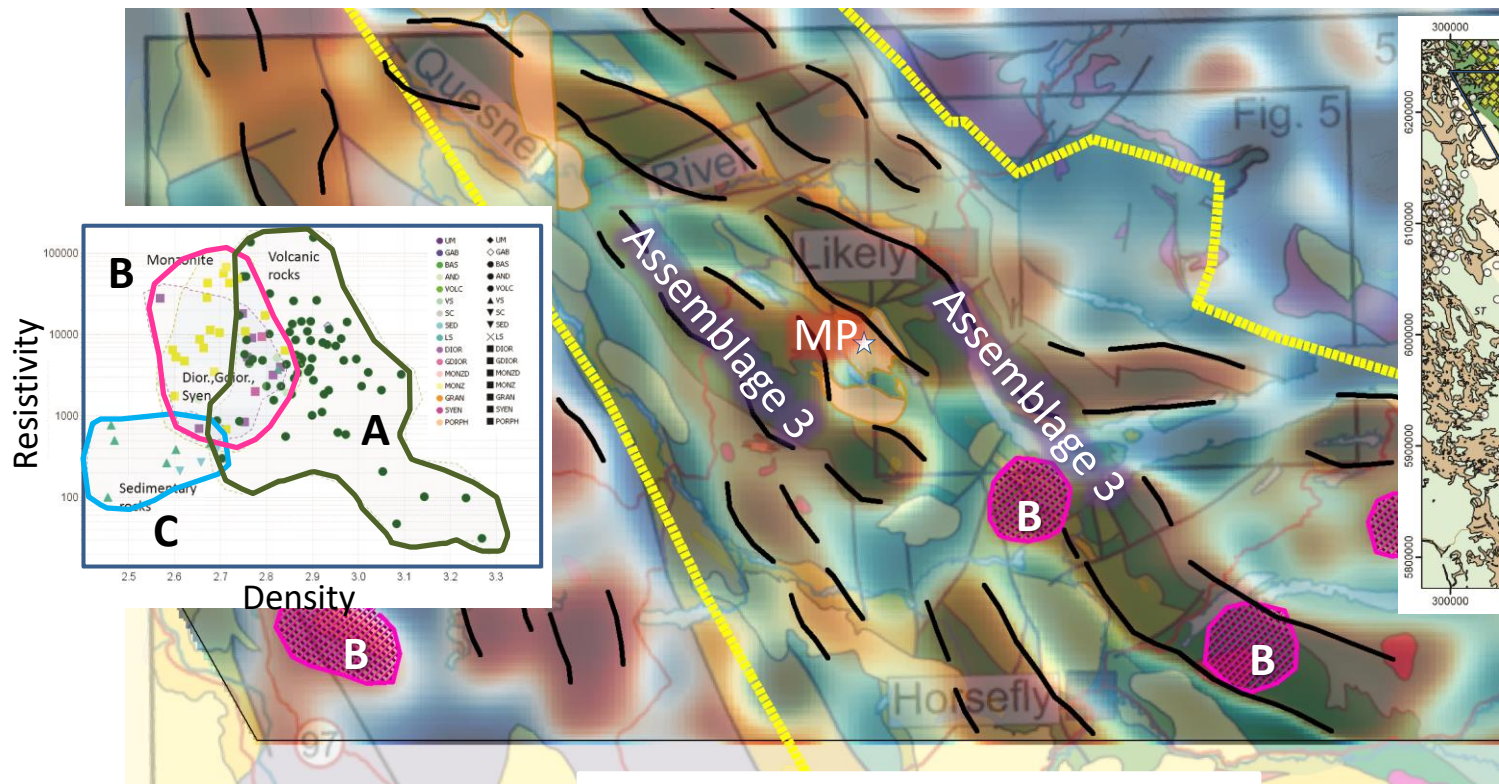
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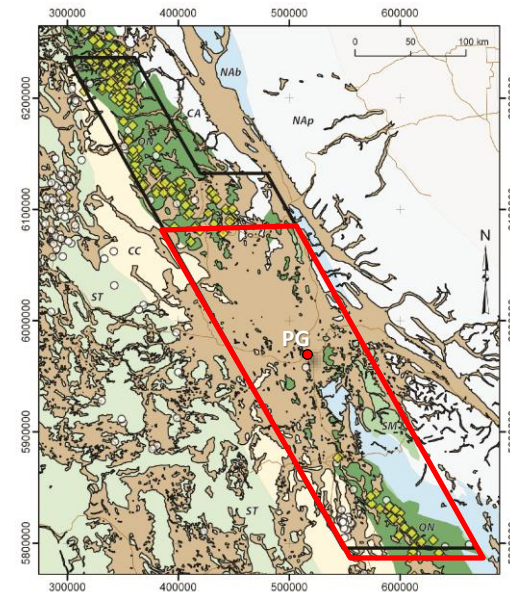
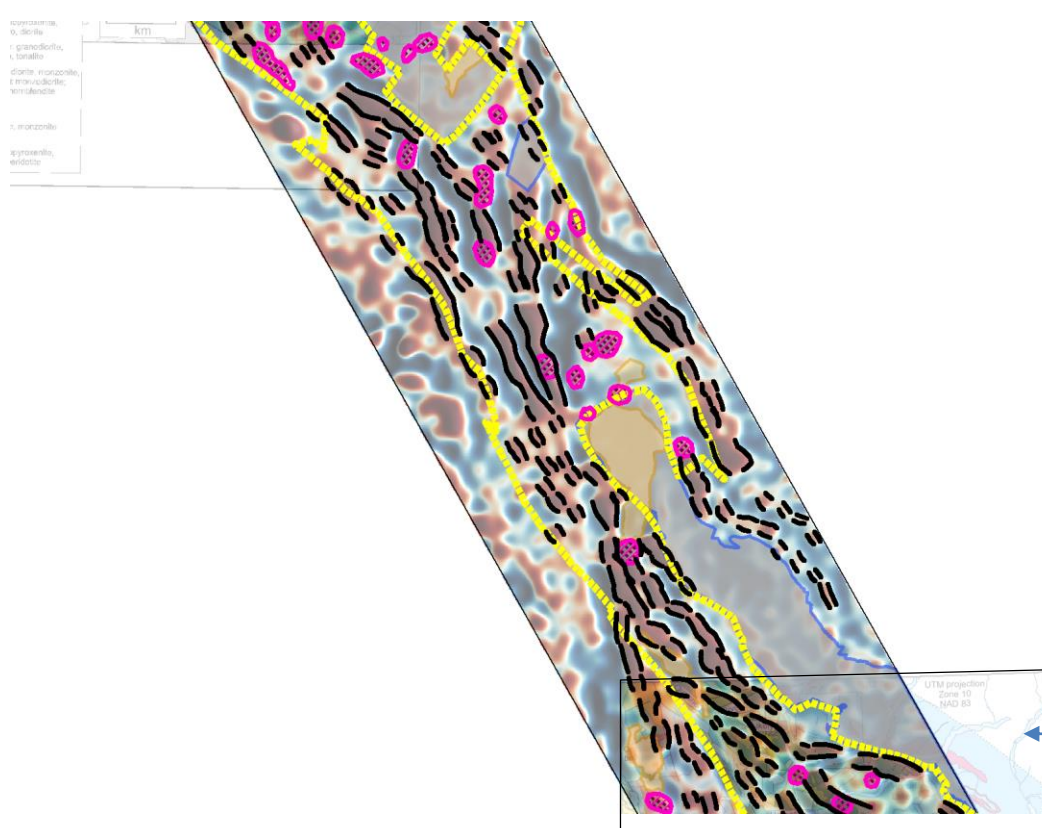
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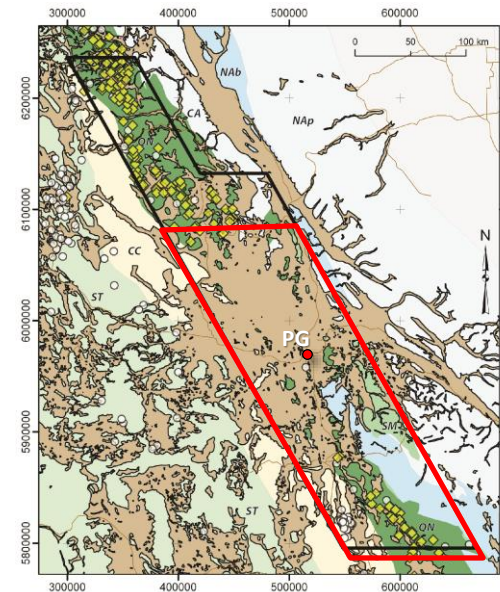
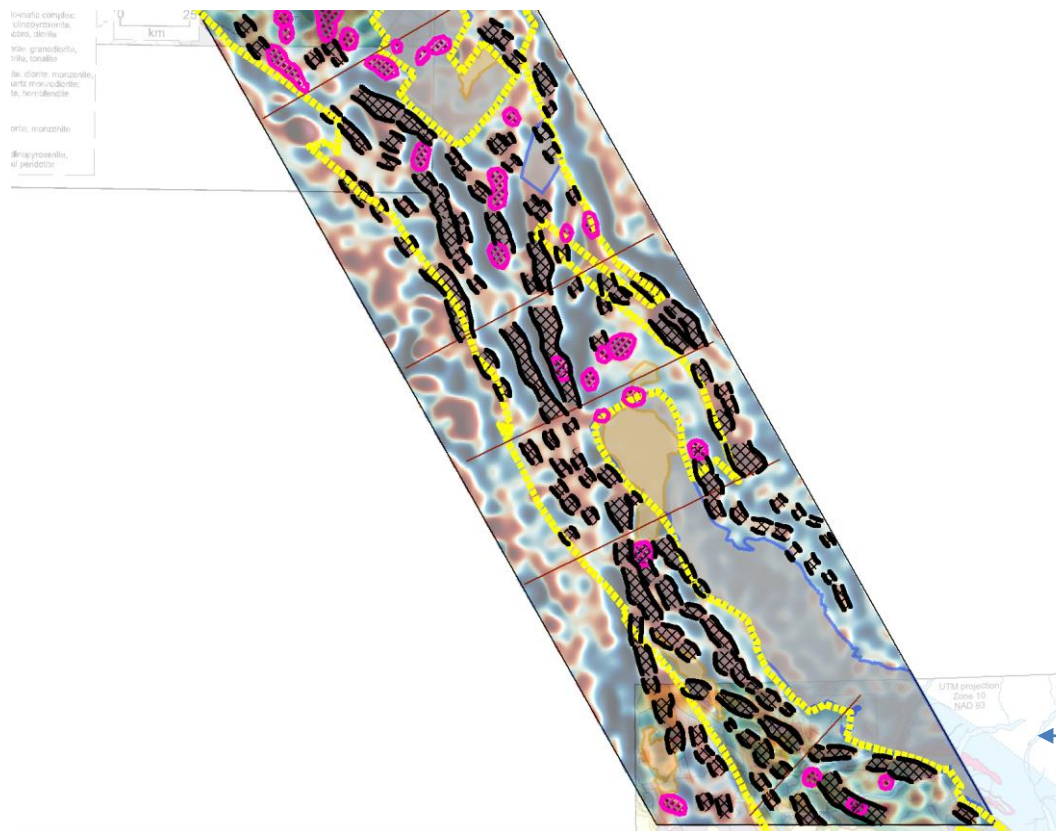
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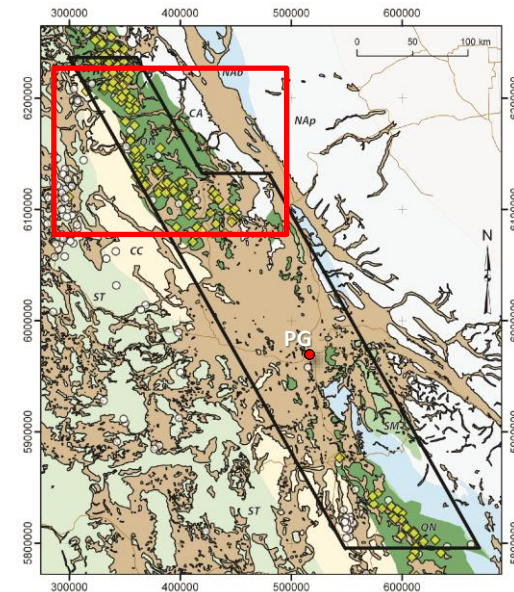
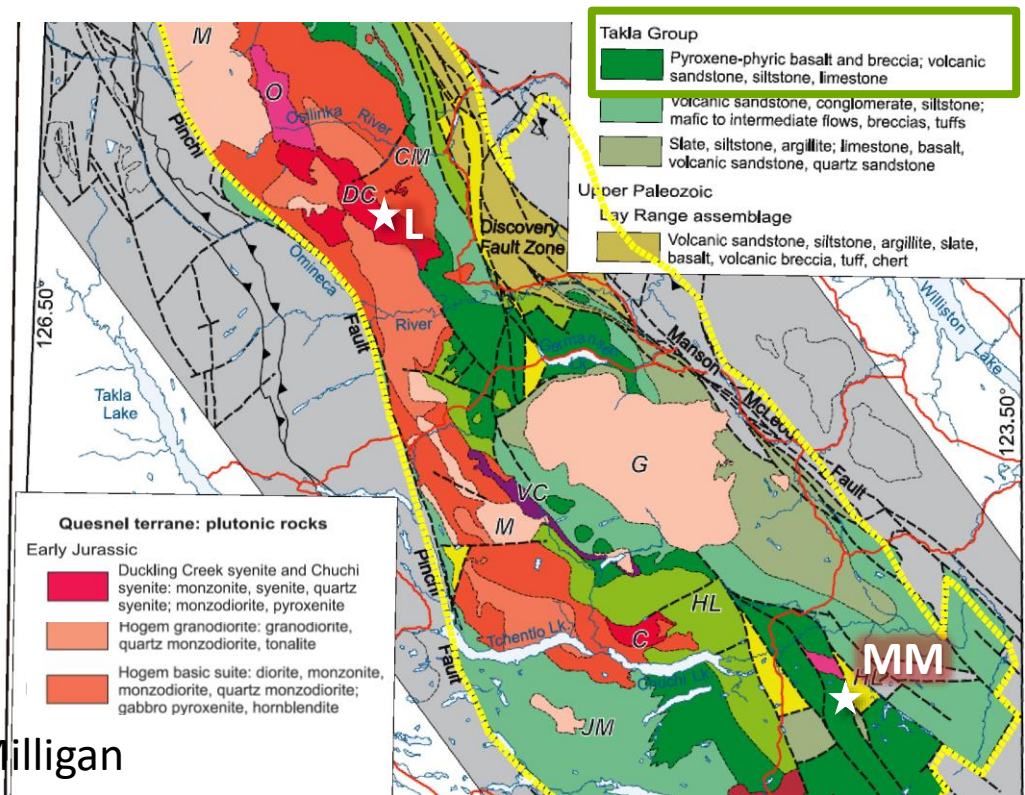
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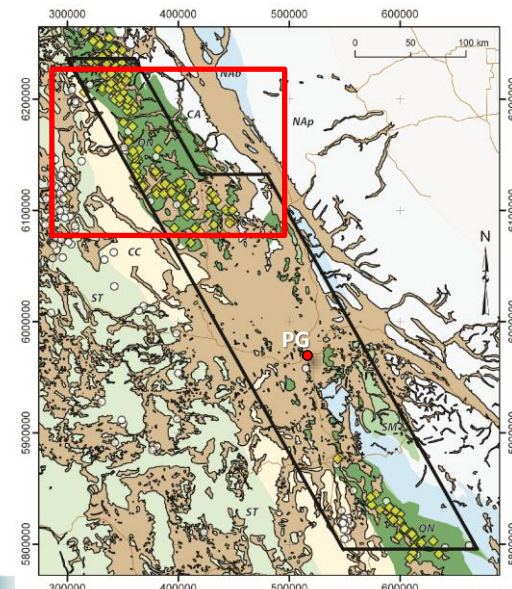
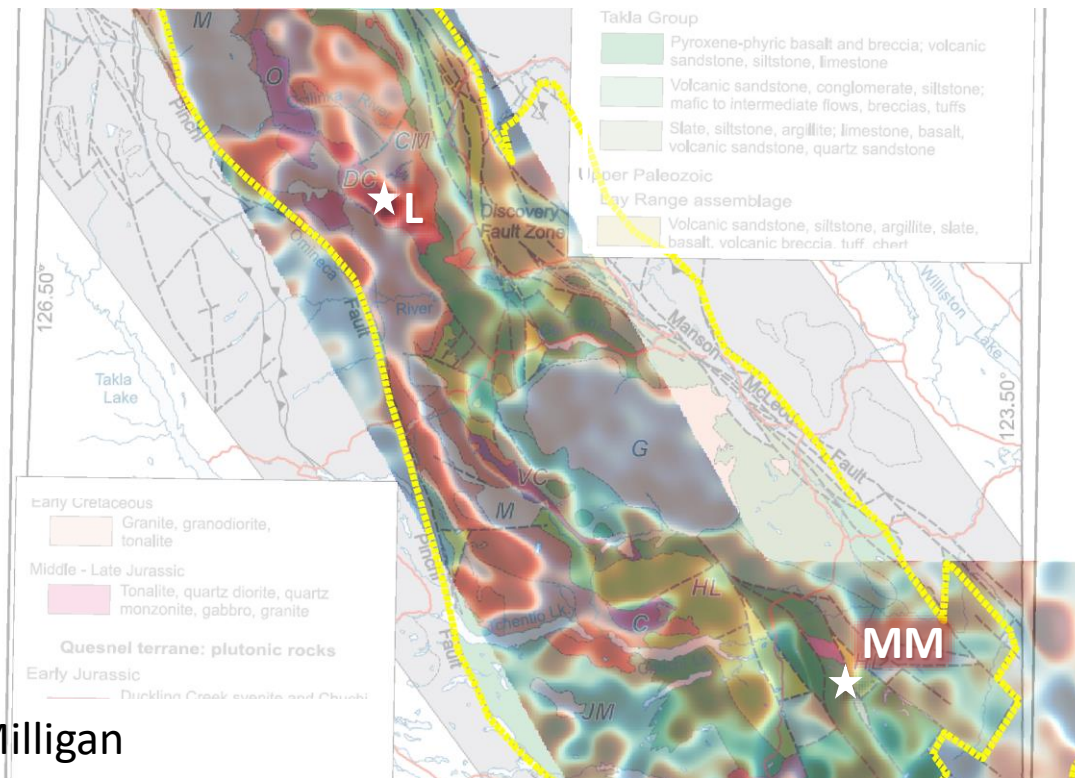
Logan,
Scharizza, and
Devine, 2020,
CIM SV57



L = Lorraine
MM = Mount Milligan

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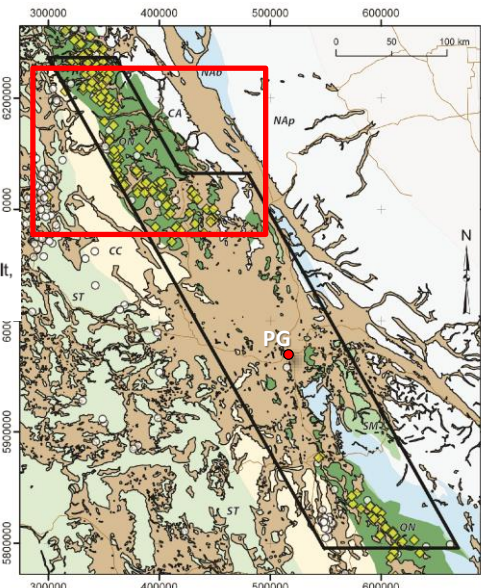
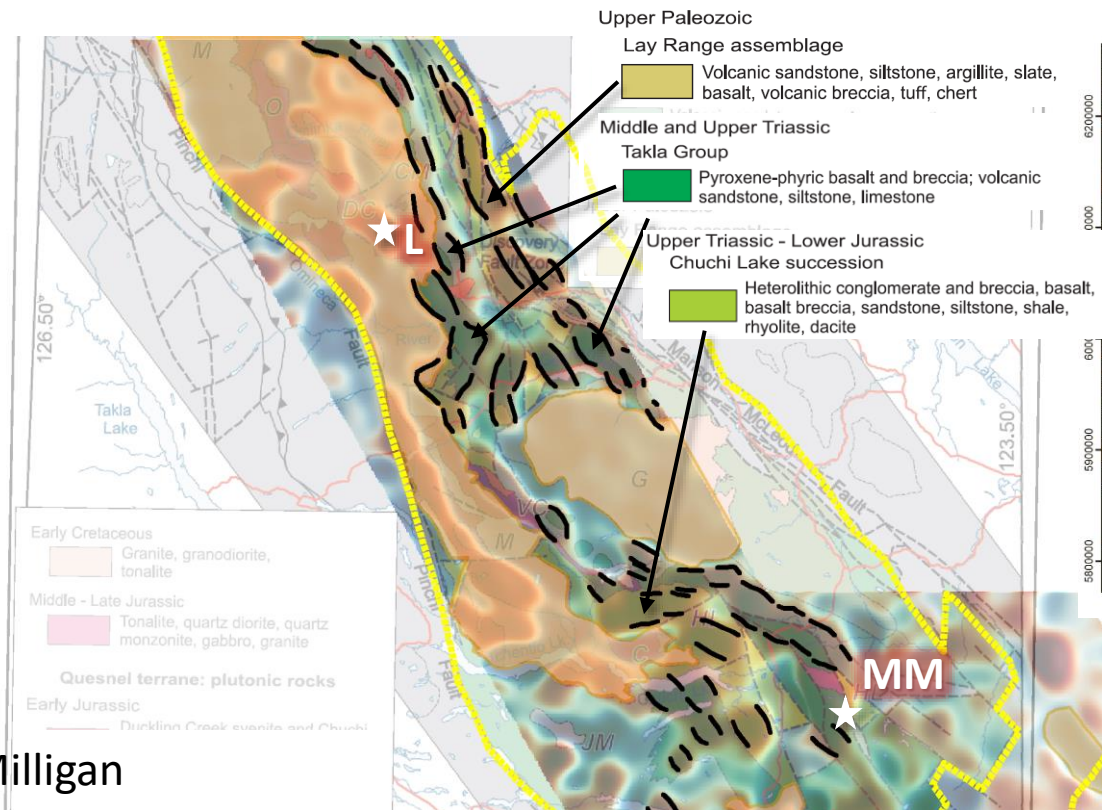


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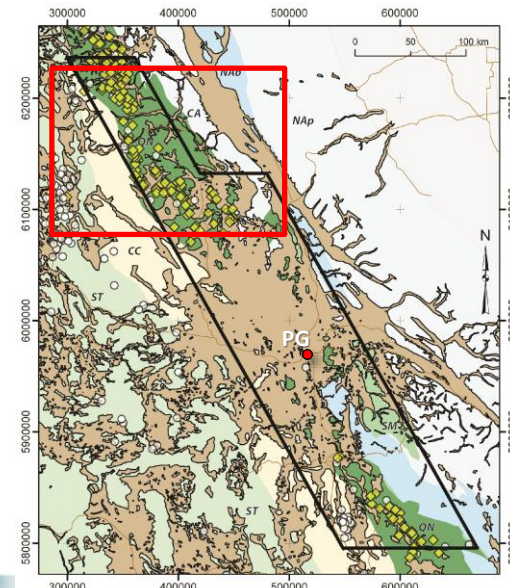
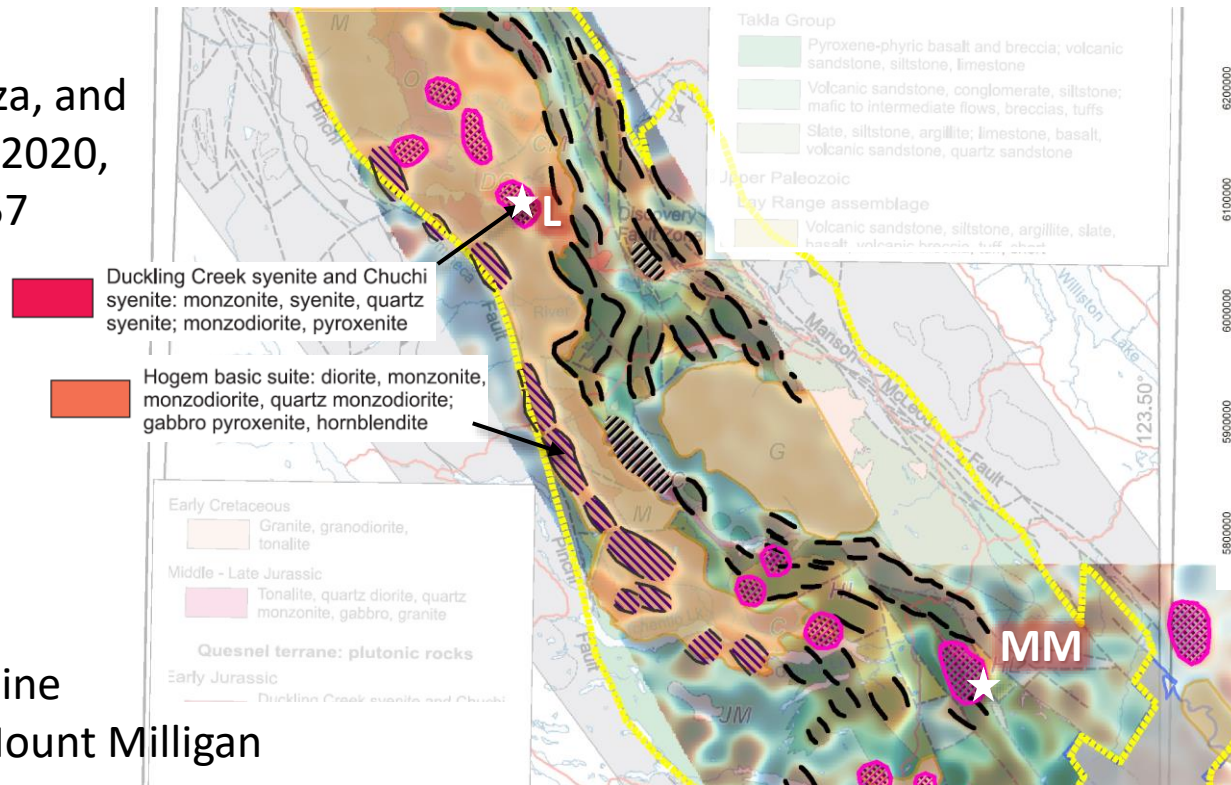
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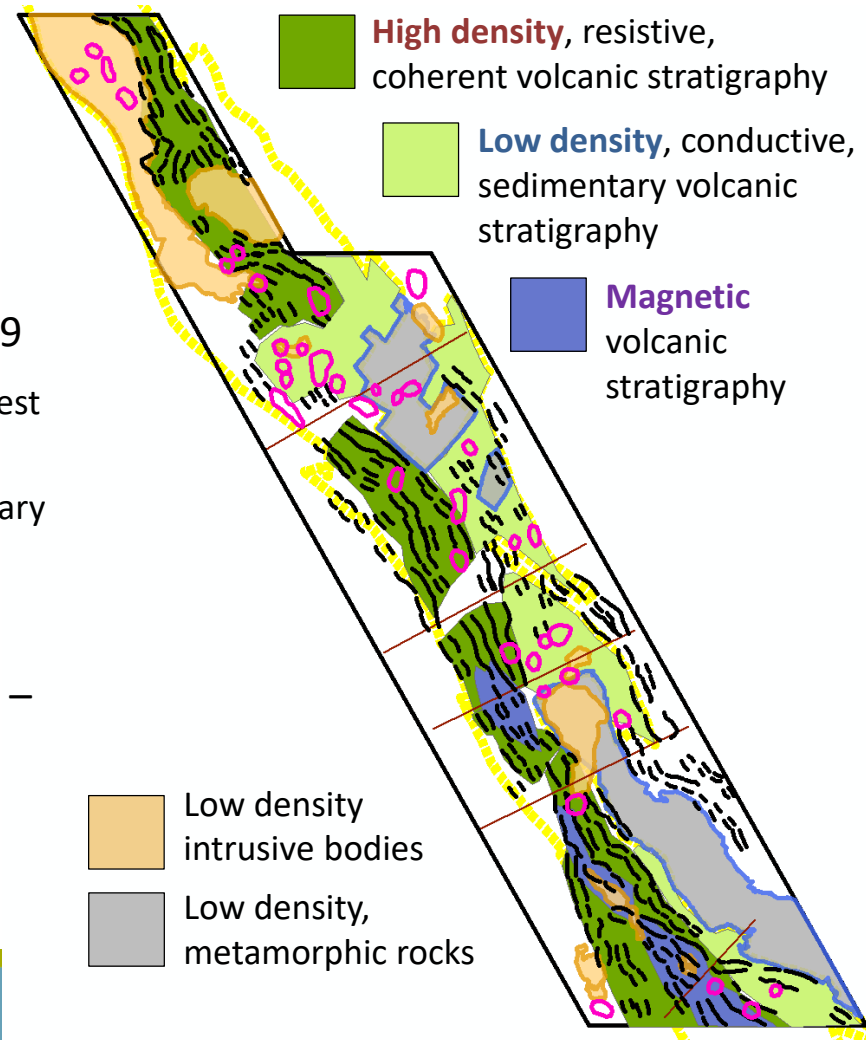


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Summary (for now)

- Gravity and EM indicates massive units (of the Nicola/Takla Gps), alternating with less coherent (sedimentary?) units
- Supports previous observations in Schiarizza, 2019
 - More massive/coherent volcanic stratigraphy in the west ('constructional phase of the Nicola Arc')
 - Less coherent stratigraphy in the east (more sedimentary rock packages?)
- Broken up along strike
- Possible intermediate to u/mafic intrusive bodies – rounded, dense, magnetic – resembling regional intrusives spatially related to Mount Milligan, Lorraine



Project deliverables

- Final report - Summer 2023
- Contact: dmitch@eoas.ubc.ca
- GBC project page:



THANK YOU!

Acknowledgements

- Geoscience BC, and Minerals TAC
- Peter Kowalczyk, Jim Logan, Paul Schiarizza
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