

GEM

New insights on the geology and mineral potential of the under-explored Rae province and its margins

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Bill Davis, Vicki Tschirhart

Geological Survey of Canada
Ottawa

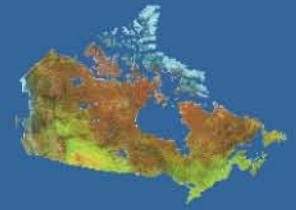
joperciv@NRCan.gc.ca



Natural Resources
Canada

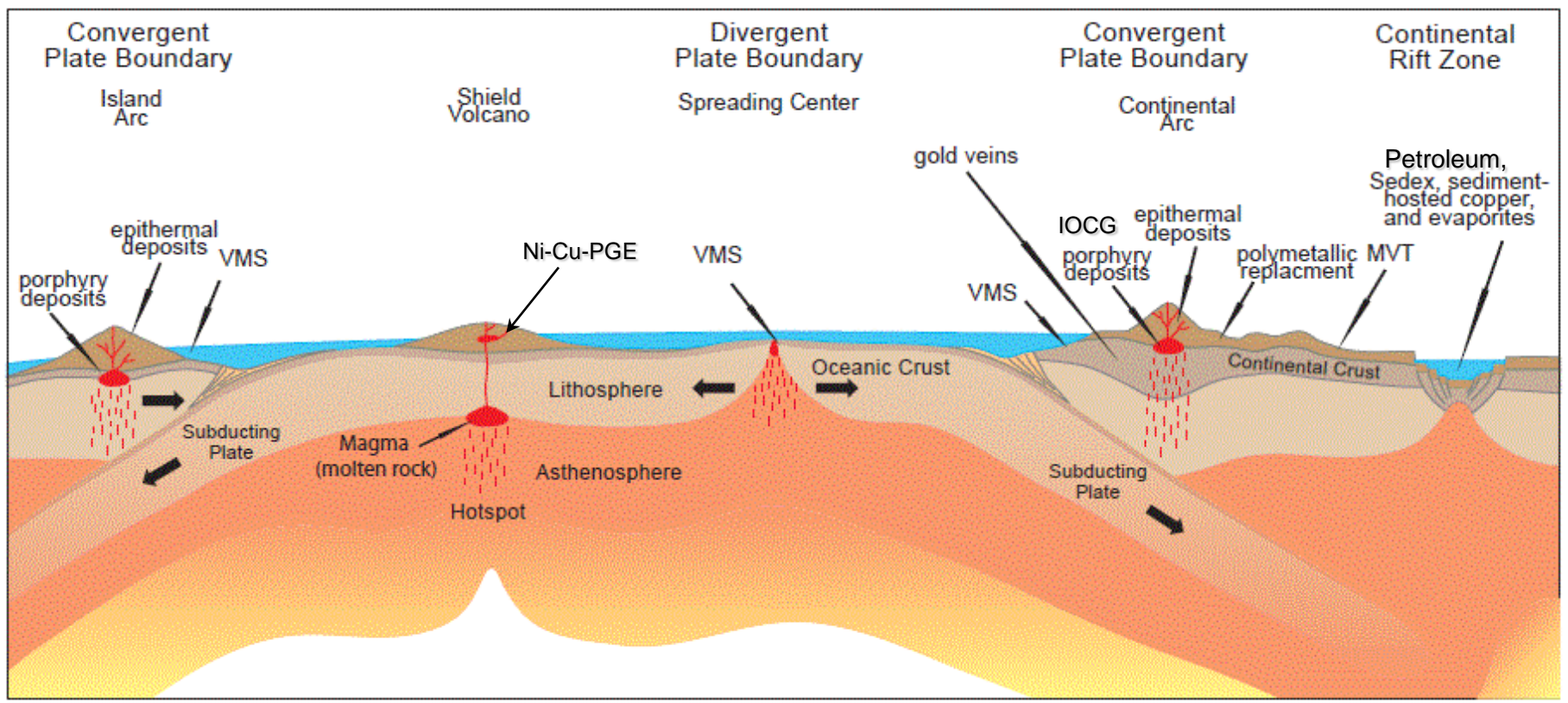
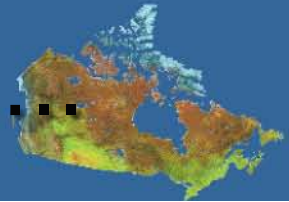
Ressources naturelles
Canada

Canada

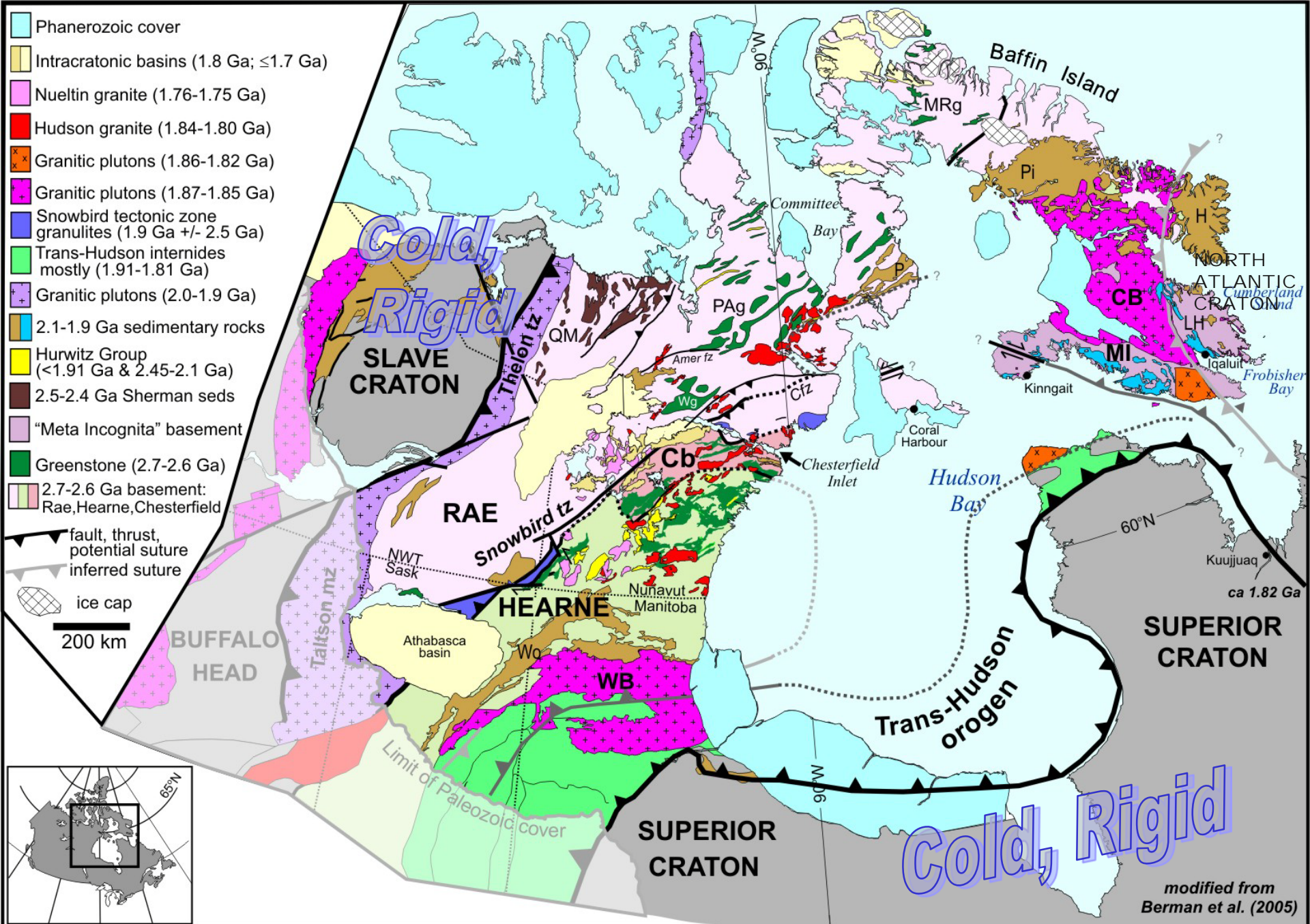


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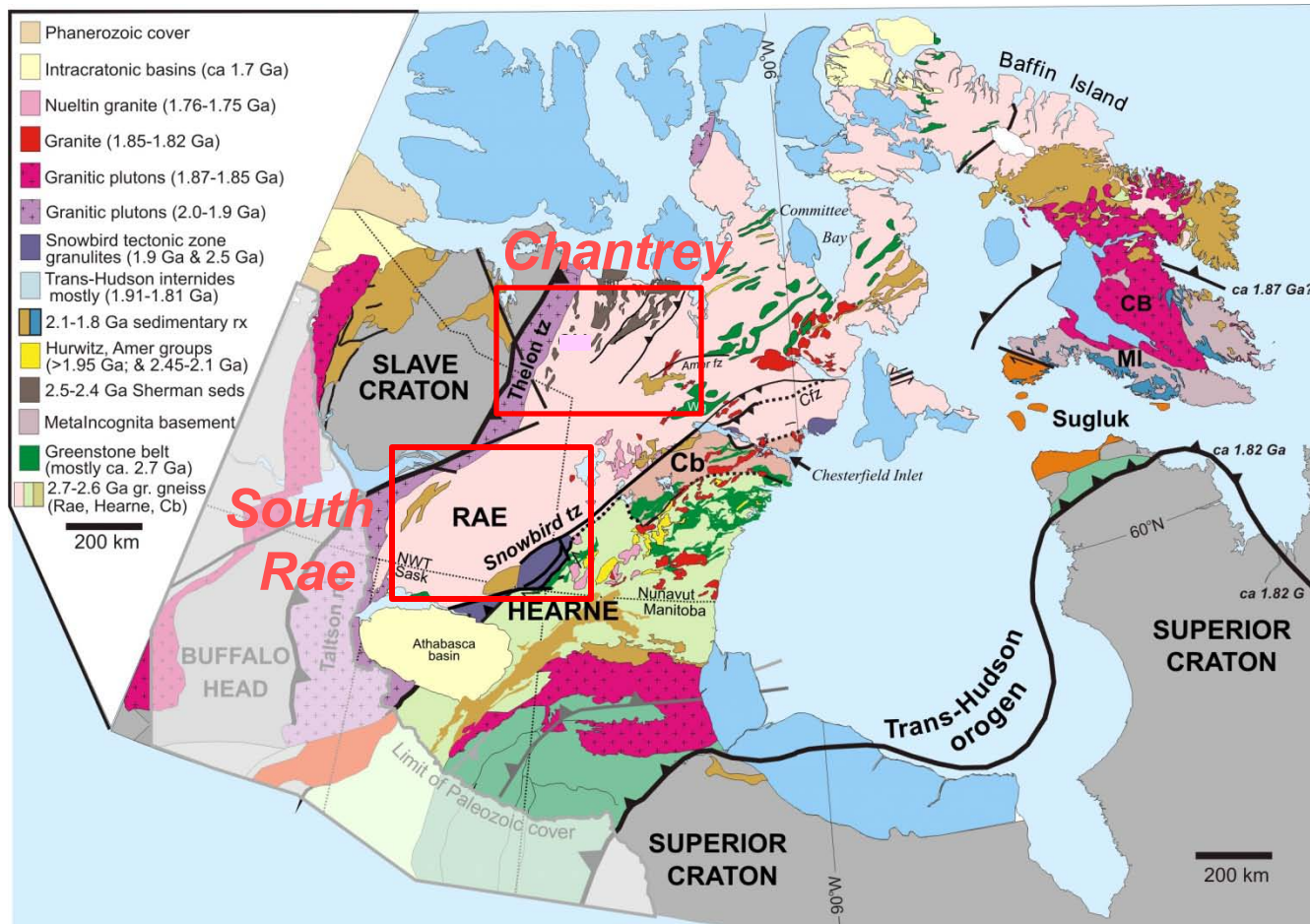
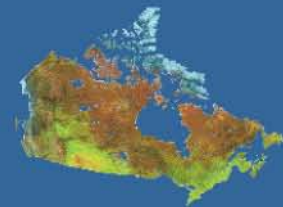
- Geo-mapping approach to building framework knowledge
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 - *mafic-intermediate suites
 - **Queen Maud-Thelon** region
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 - *Hudsonian extension, magmatism, mineralization
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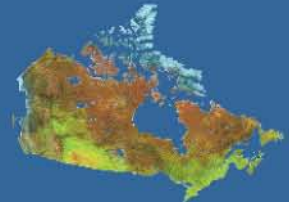


.....linked to prospective geological environments:
we find the haystacks

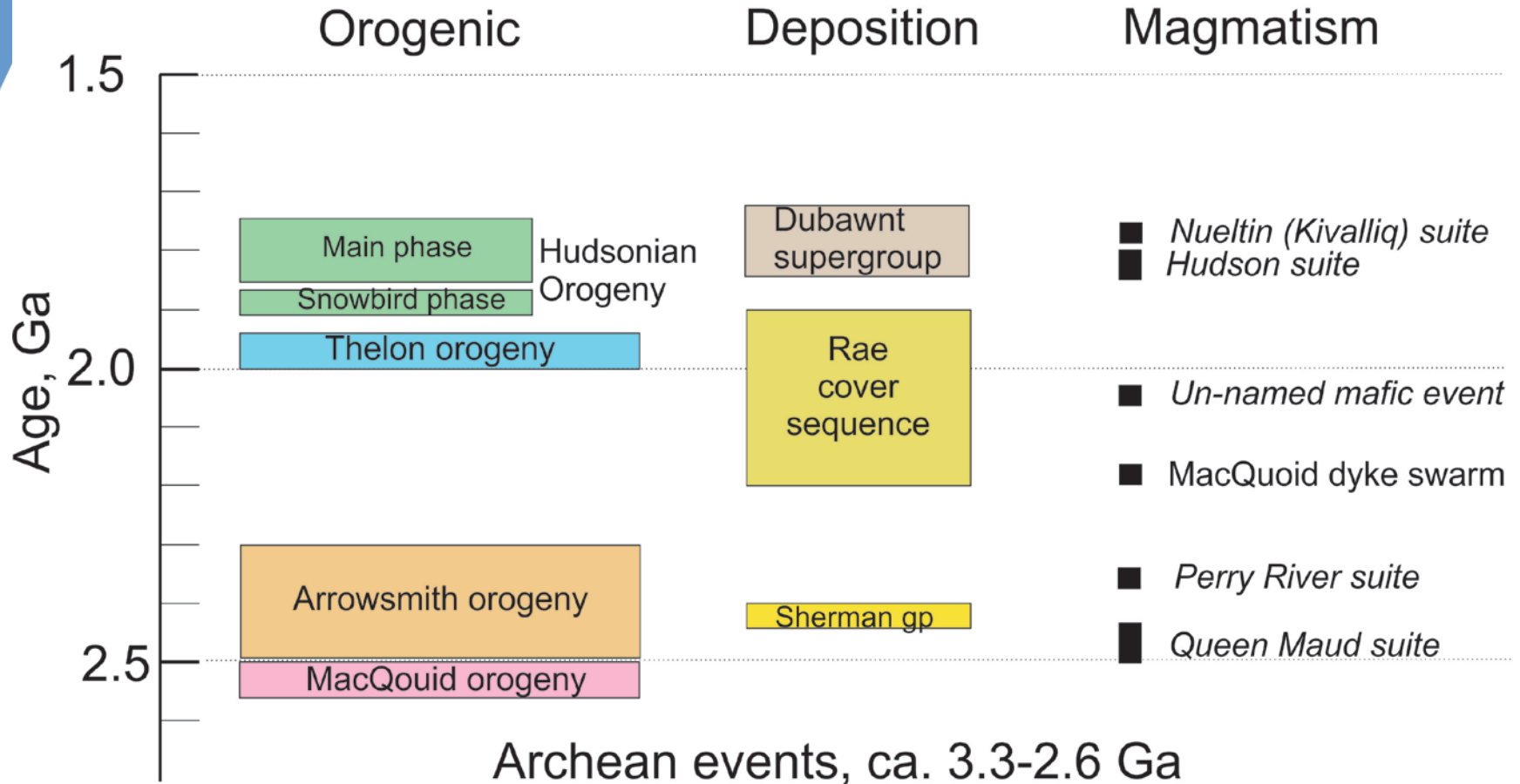


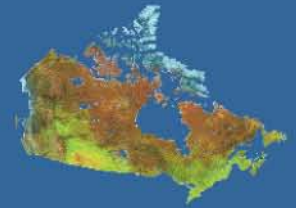
Simplified geological map modified after Berman et al. (2005)





Paleoproterozoic events





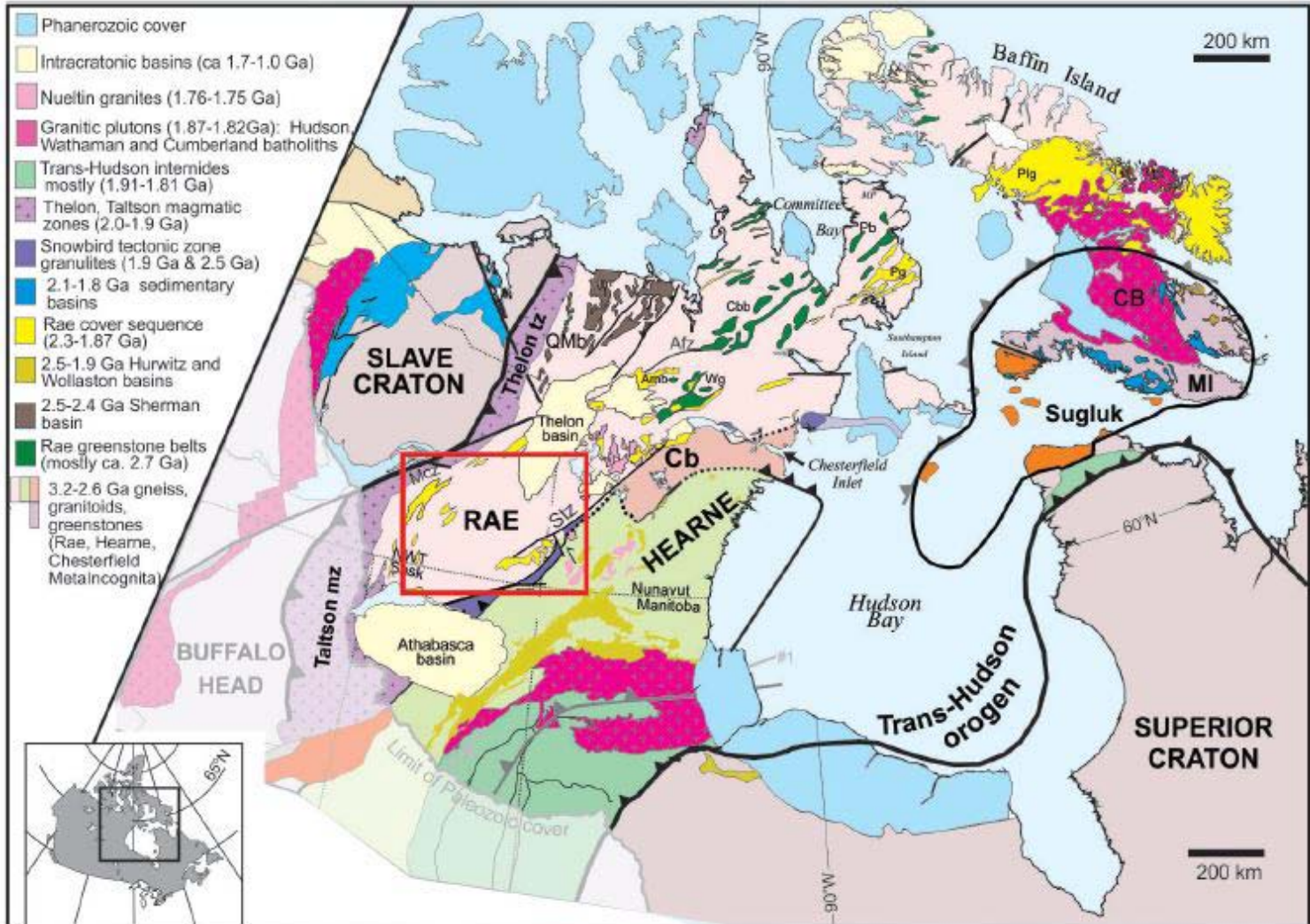
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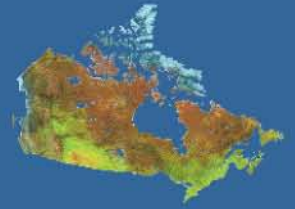
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South Rae



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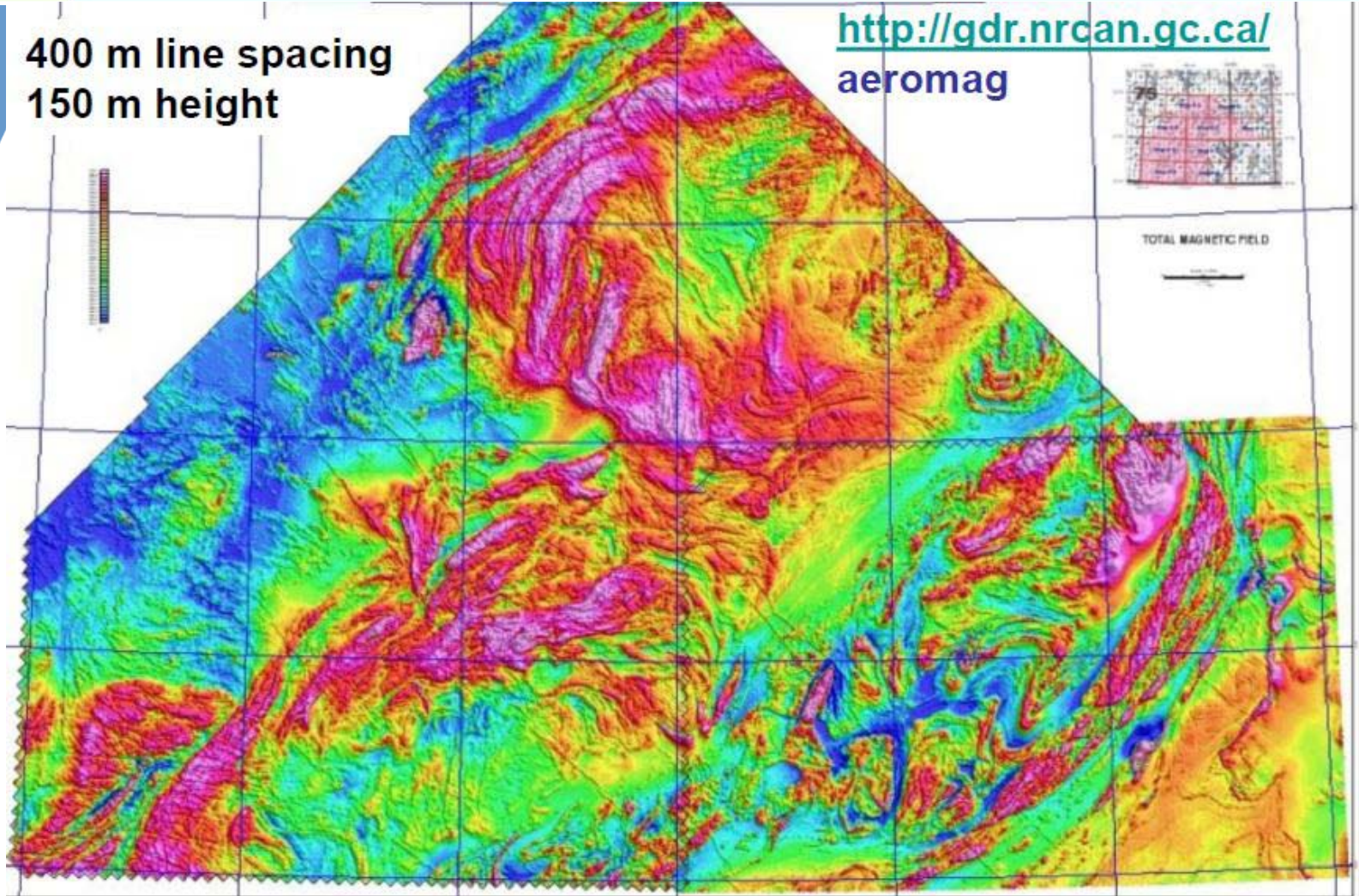




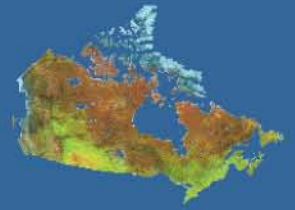
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400 m line spacing
150 m height

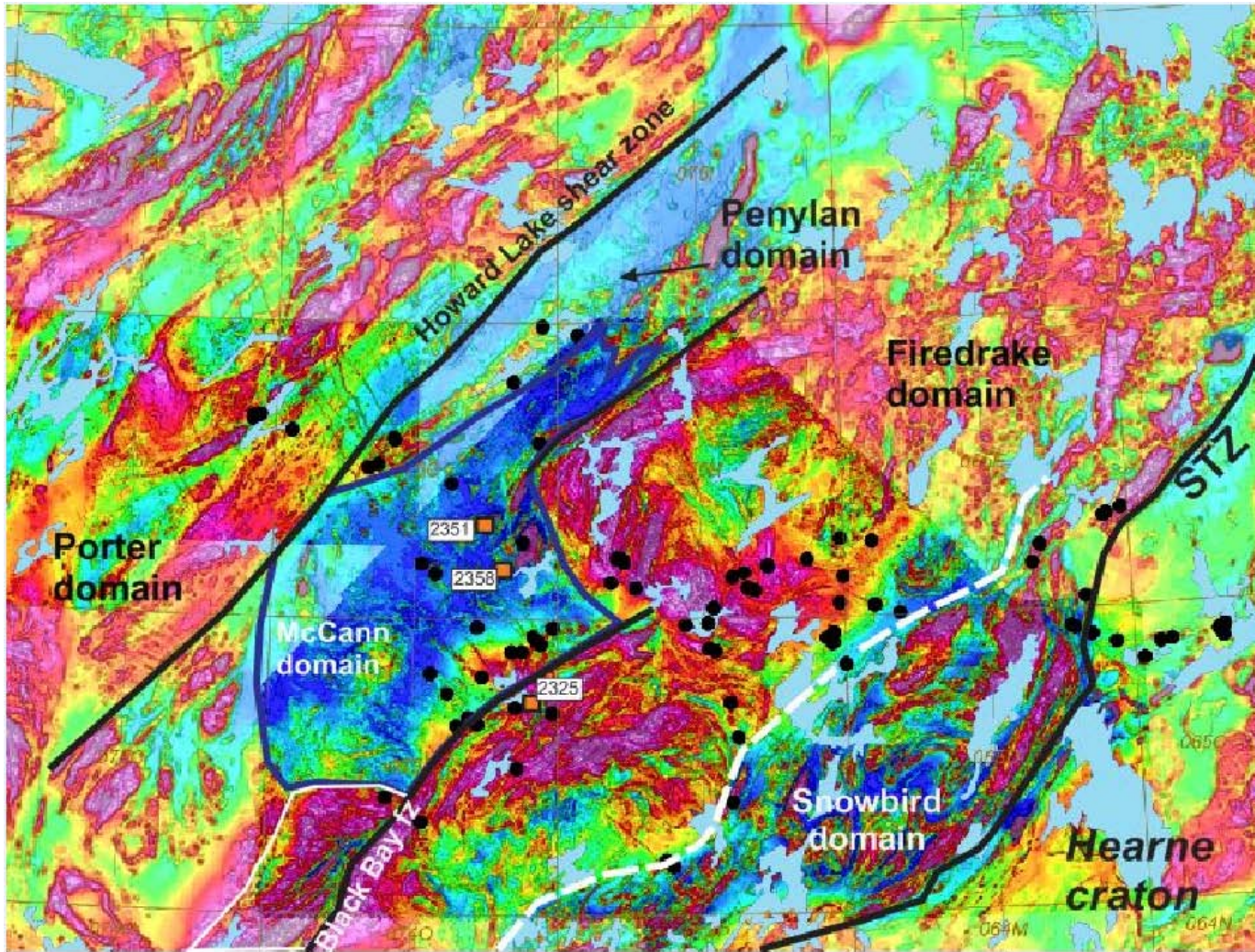
<http://gdr.nrcan.gc.ca/aeromag>

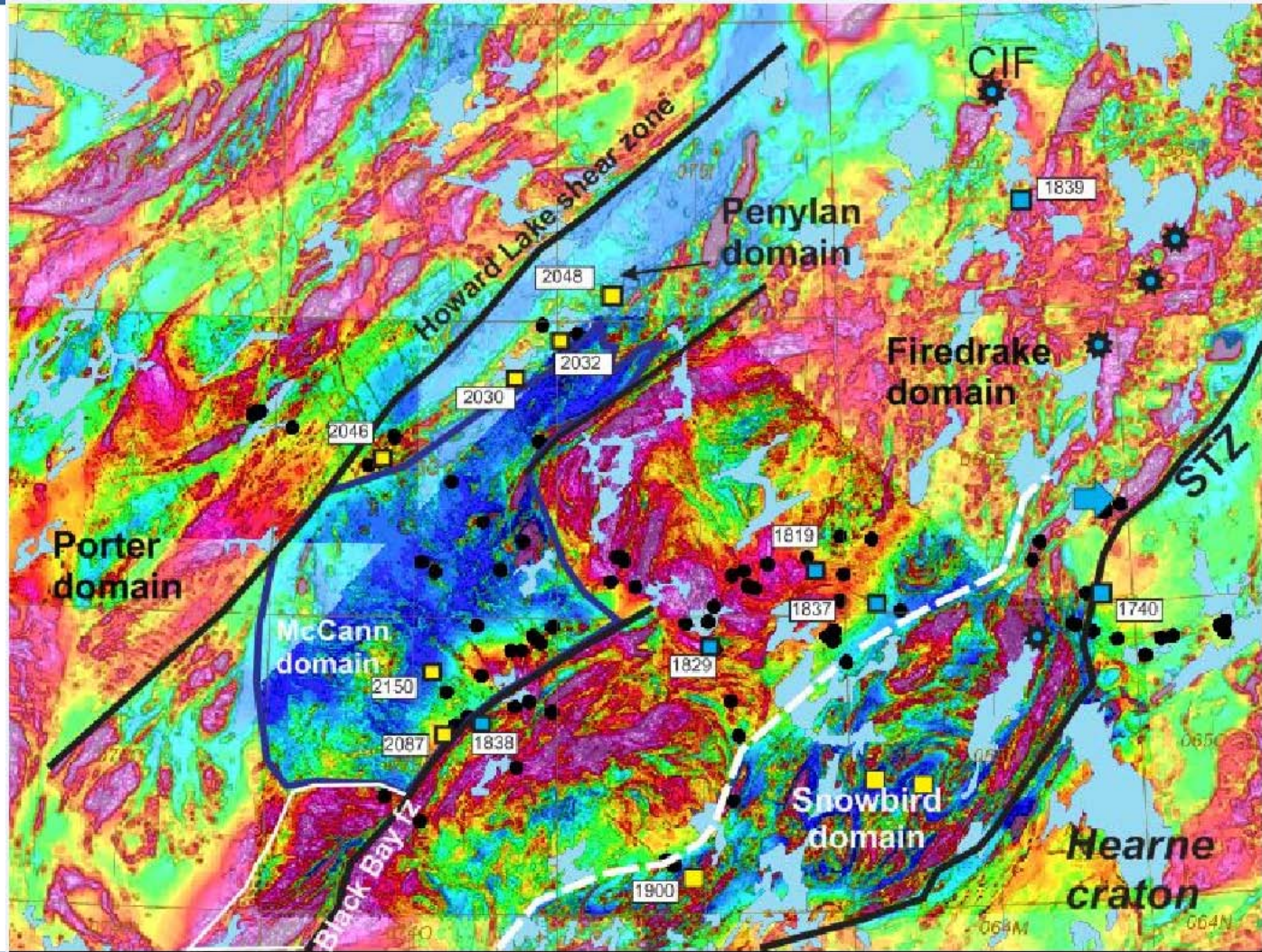


Arrowsmith (ca. 2.35 Ga) events



10

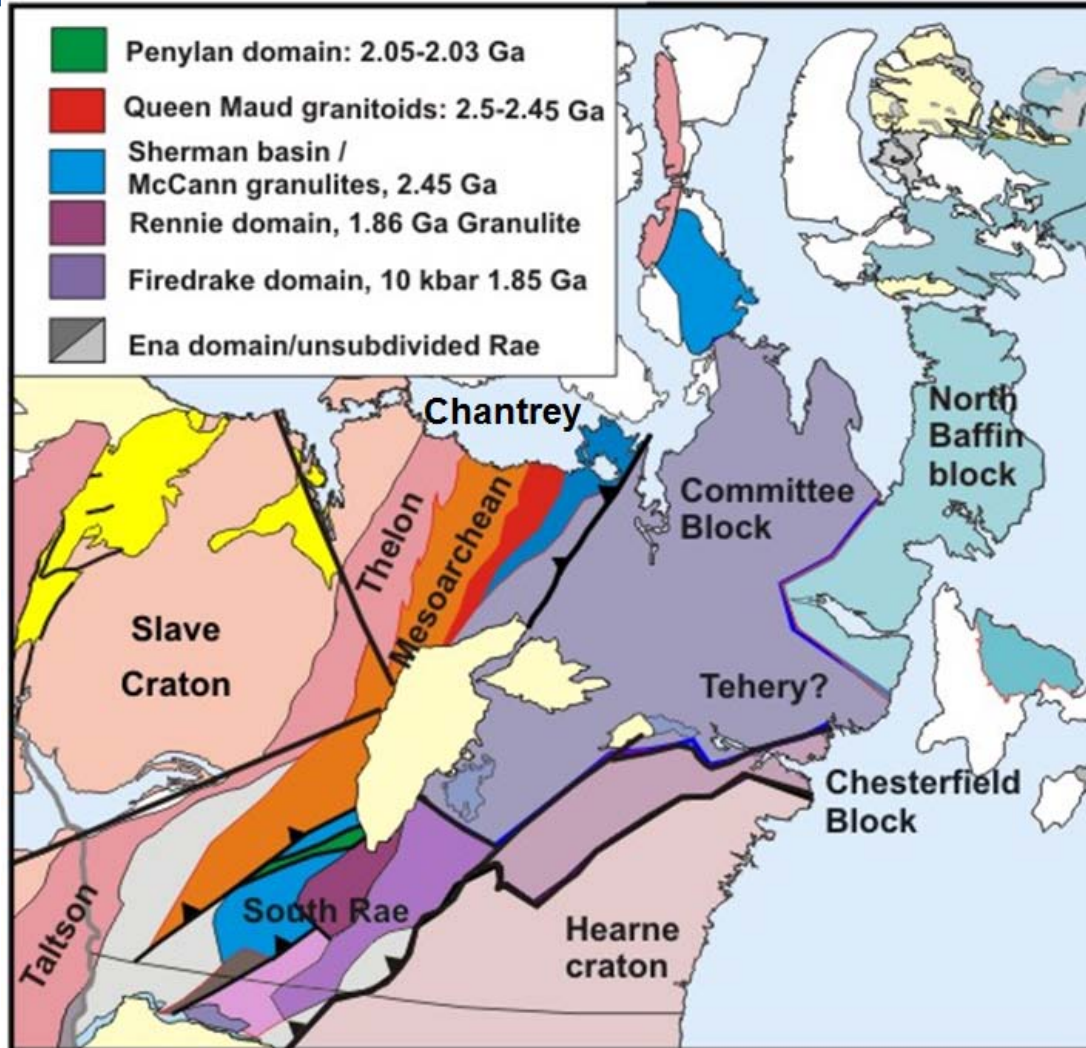


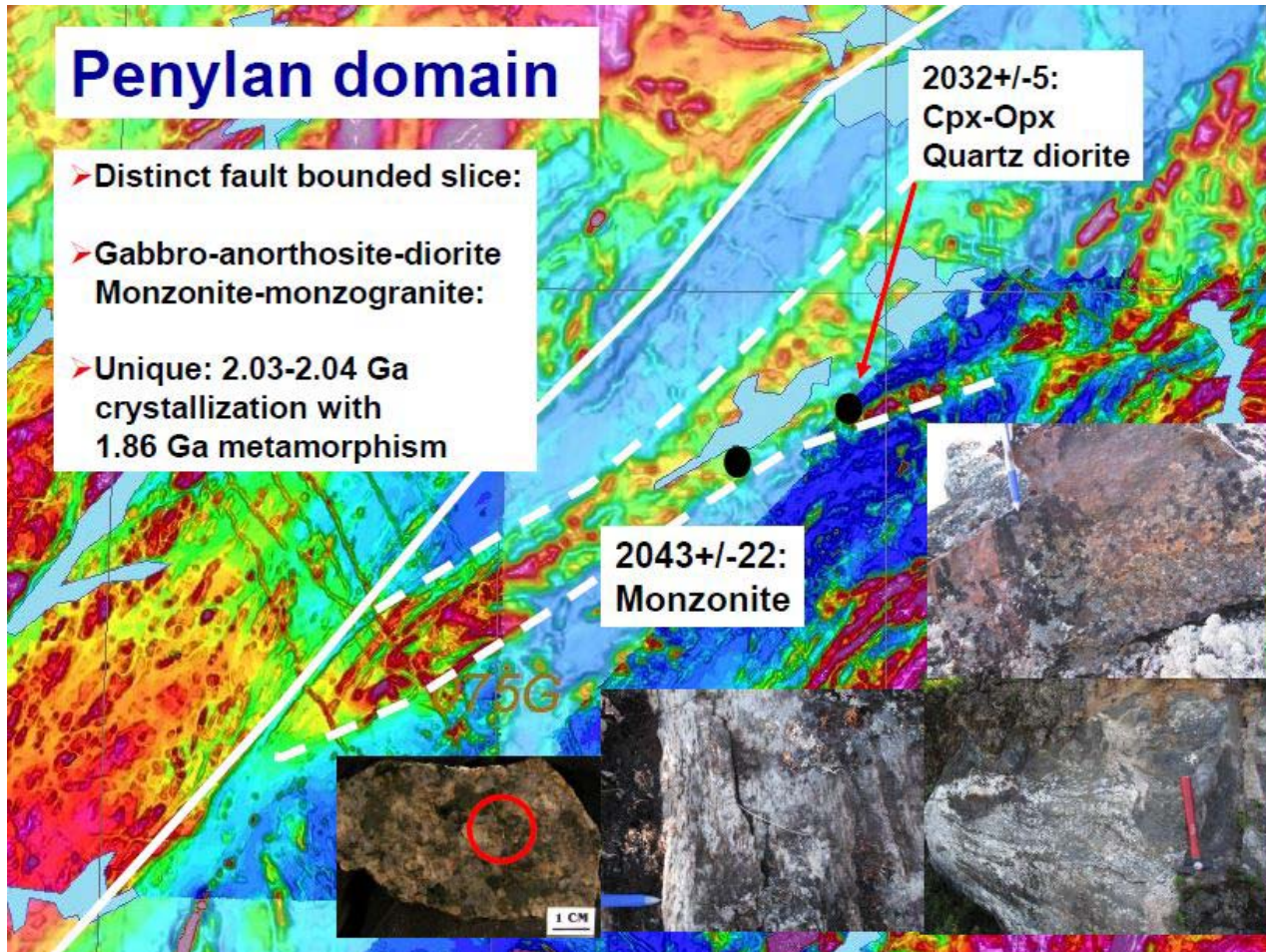
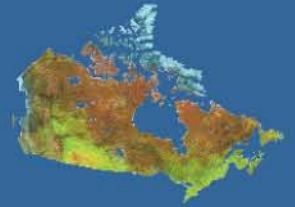


South Rae domains



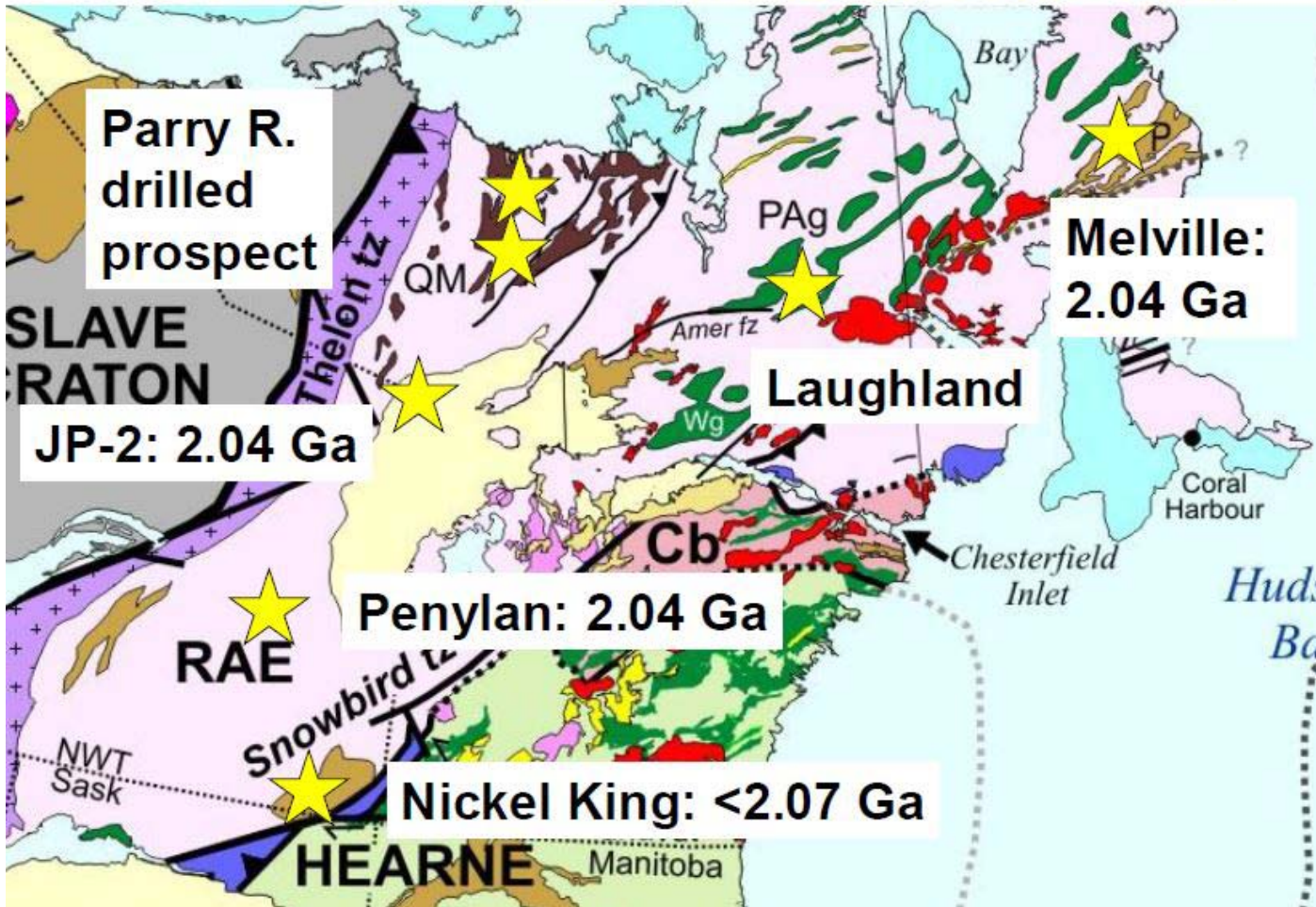
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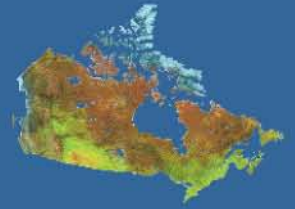






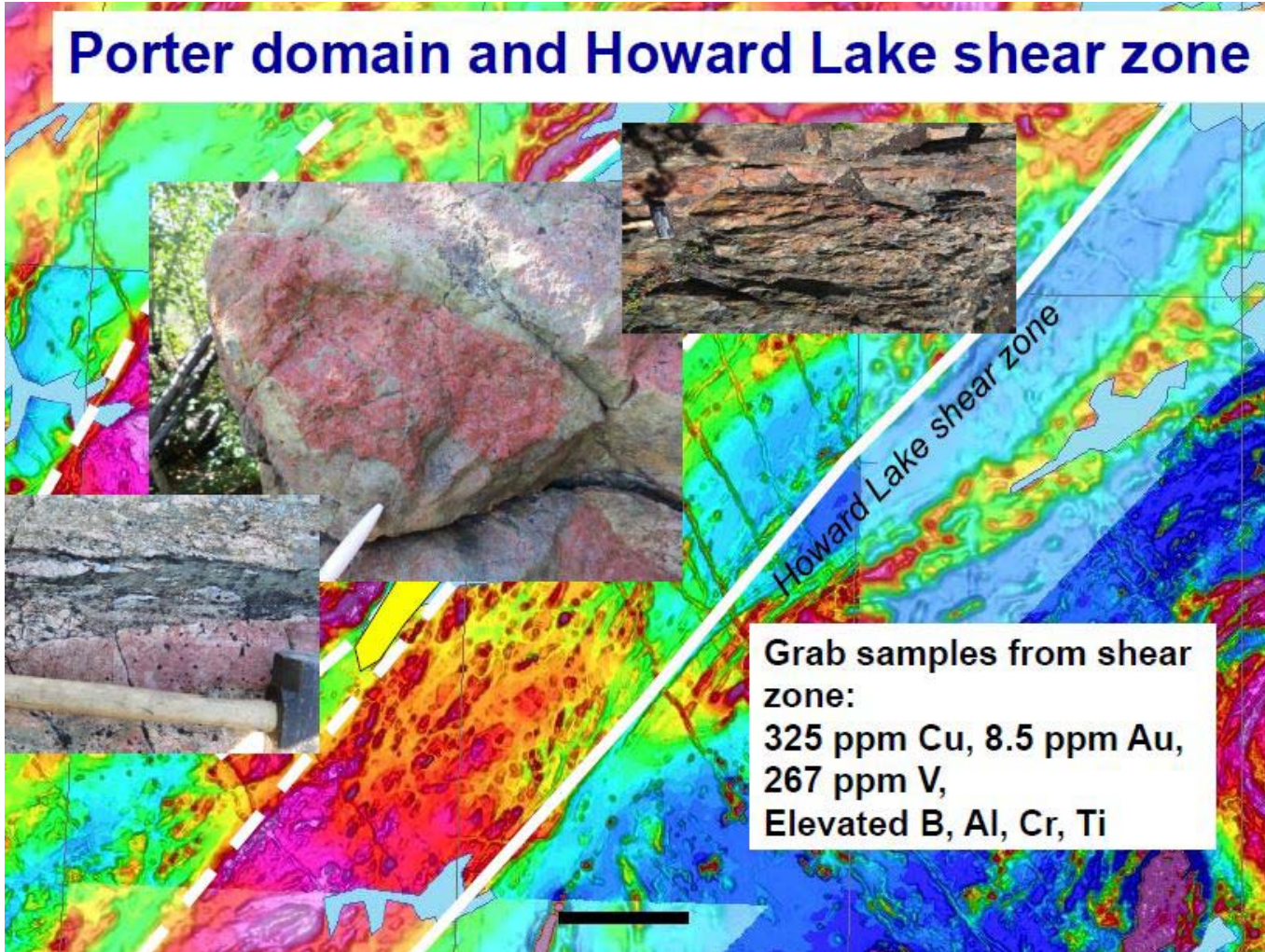
2.0 Ga mafic intrusions and Ni-Cu-PGEs?



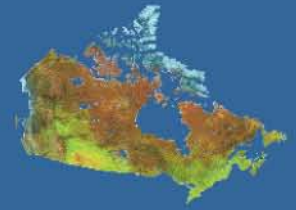


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Porter domain and Howard Lake shear zone



Grab samples from shear zone:
325 ppm Cu, 8.5 ppm Au,
267 ppm V,
Elevated B, Al, Cr, Ti

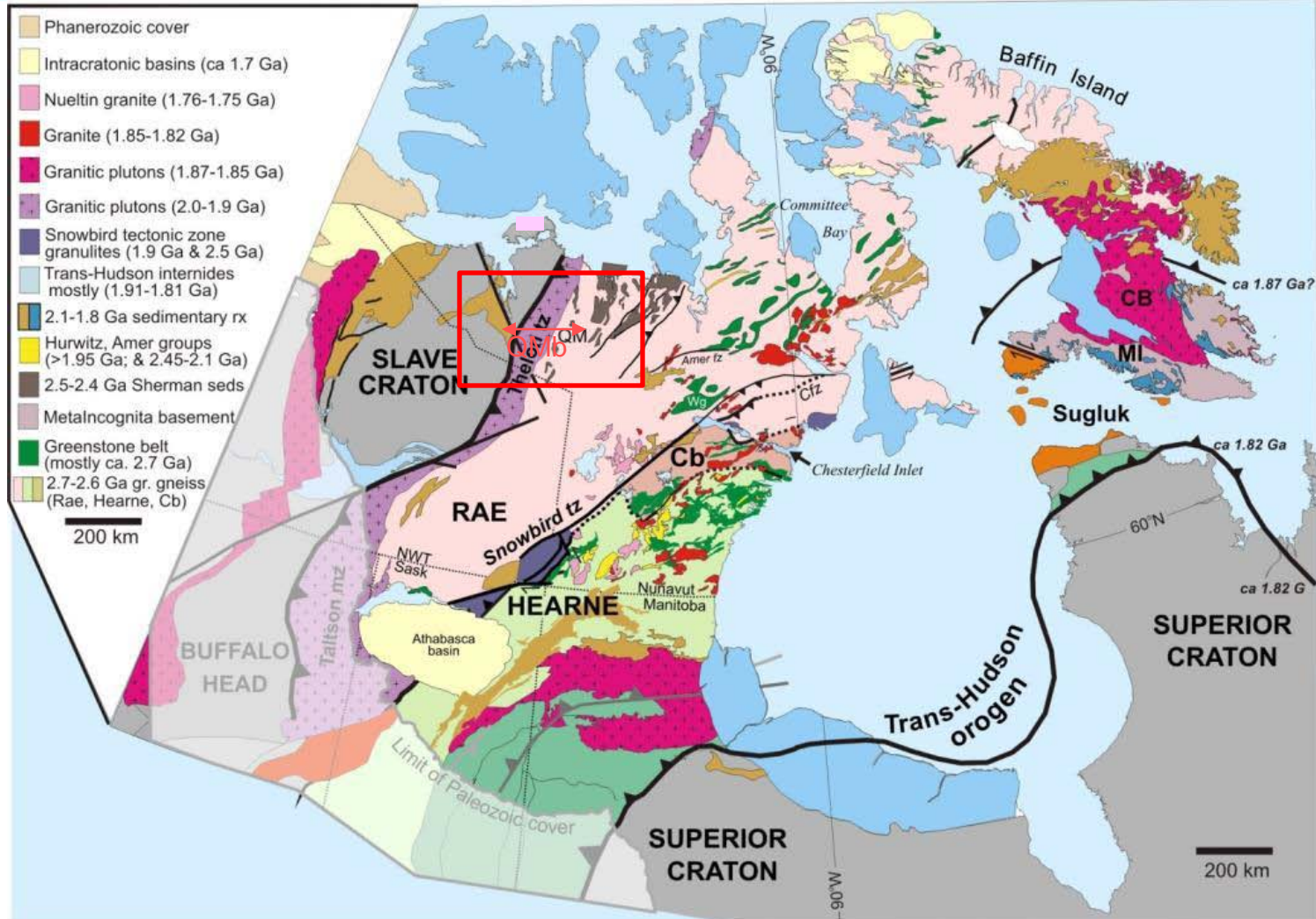
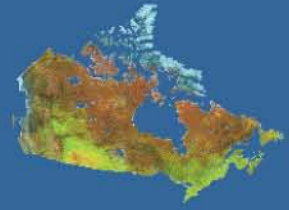


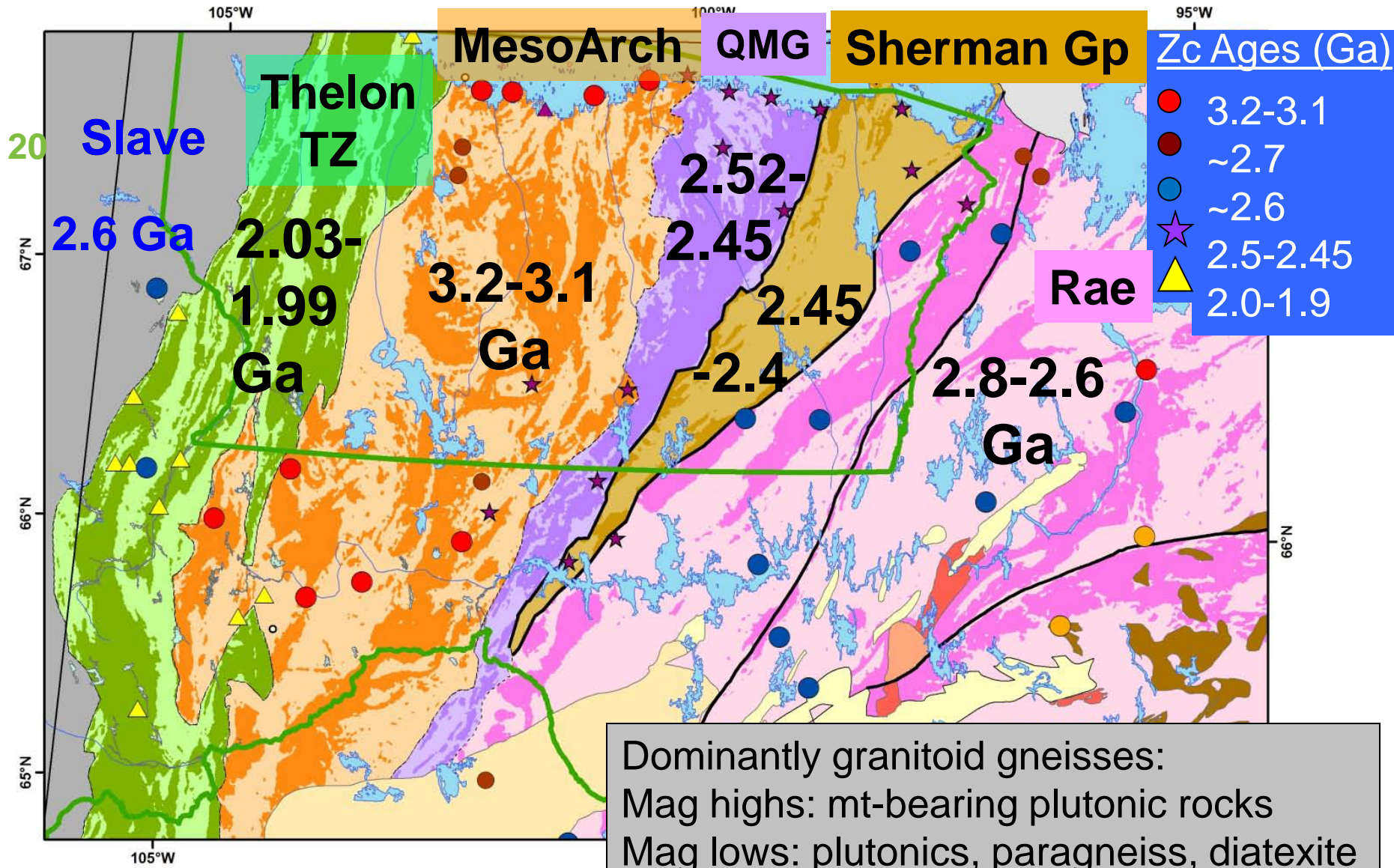
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Chantrey – Thelon transect

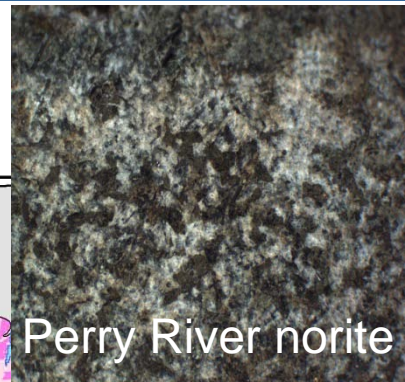
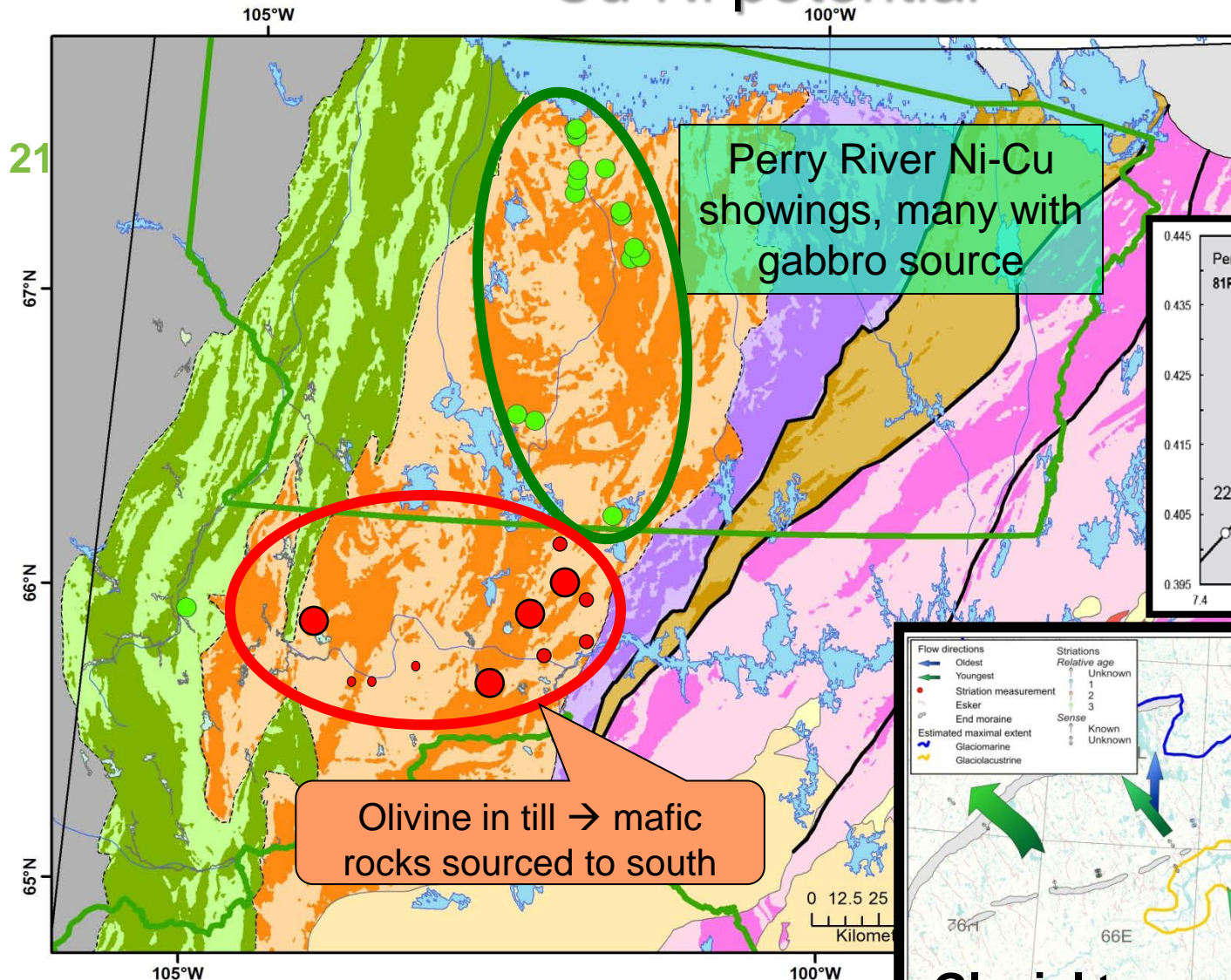




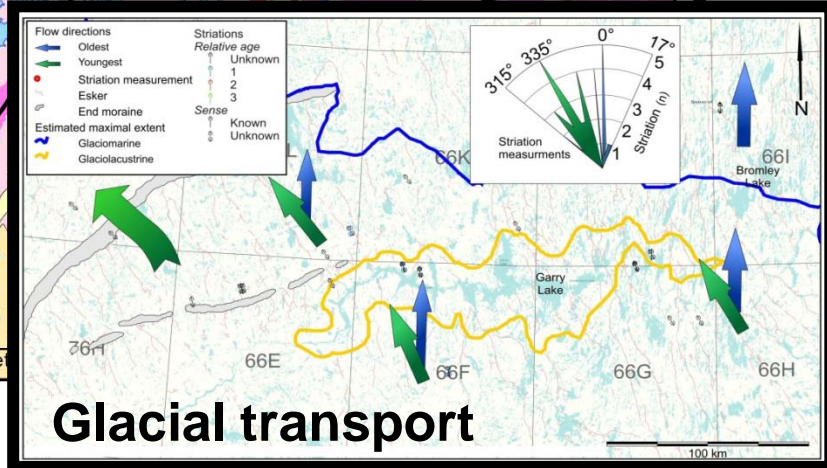
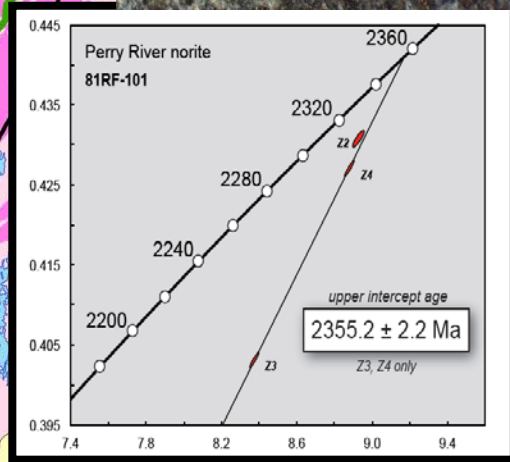
Dominantly granitoid gneisses:
 Mag highs: mt-bearing plutonic rocks
 Mag lows: plutonics, paragneiss, diatexite



Cu-Ni potential



Perry River norite



Glacial transport

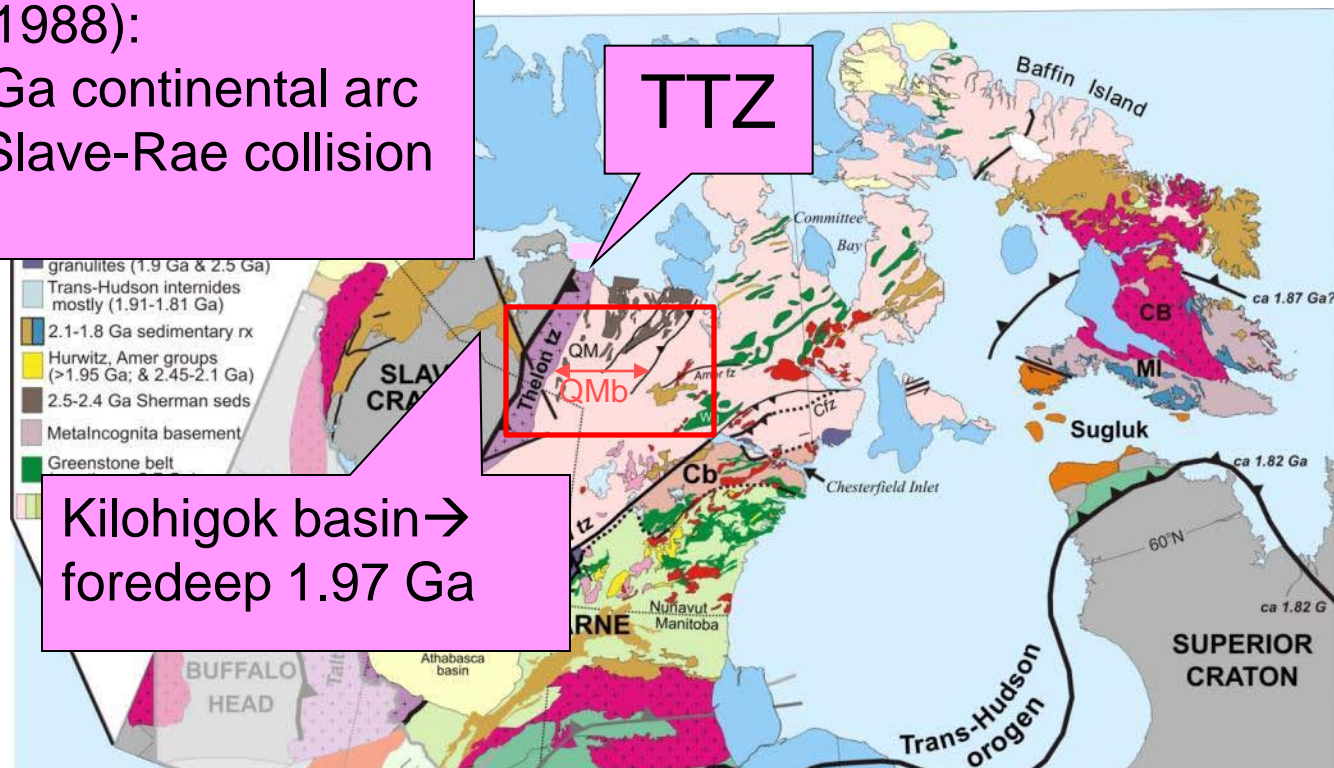
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Contrasting Tectonic Models



Hoffman (1988):

- 2.0-1.97 Ga continental arc
- 1.97 Ga Slave-Rae collision



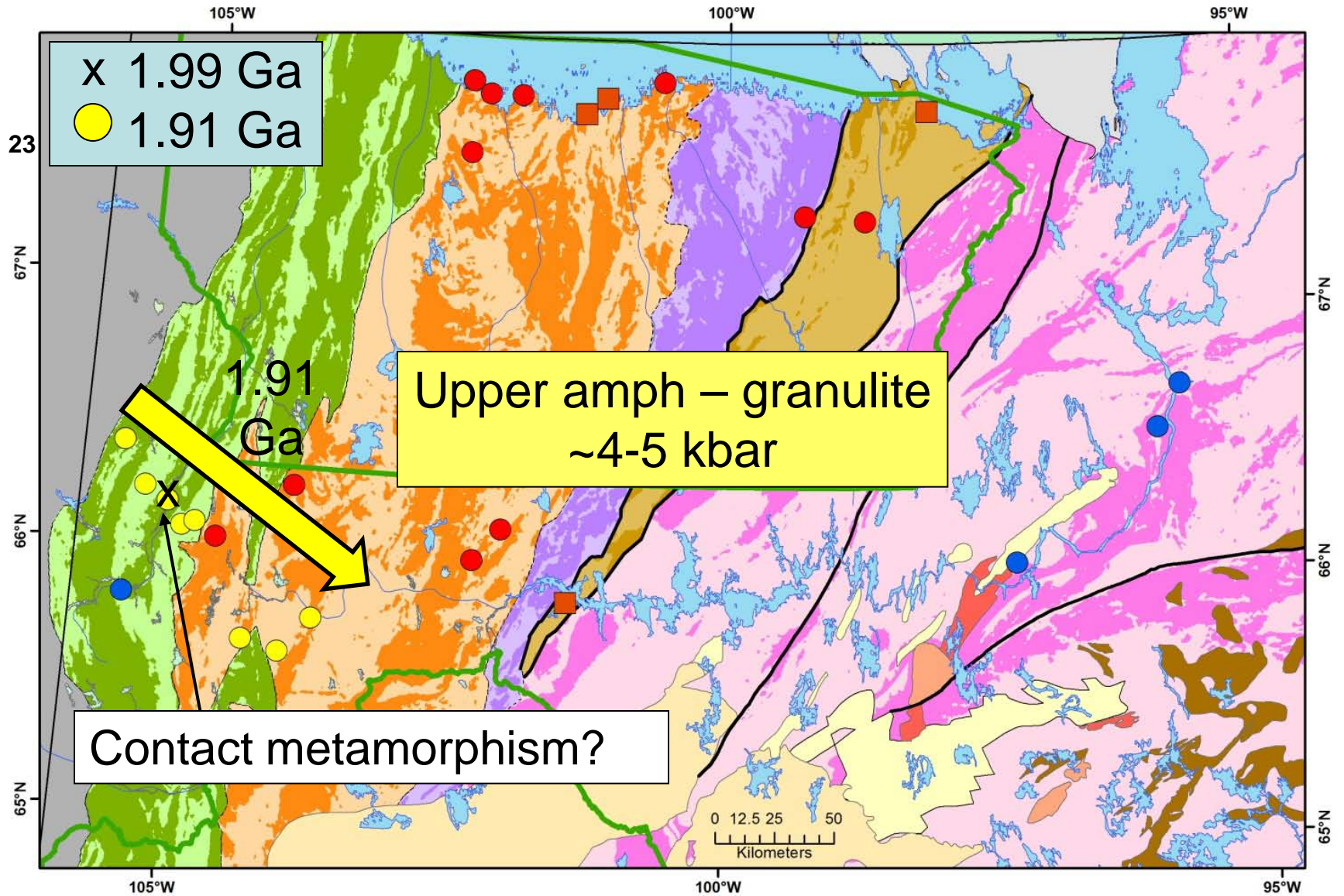
Kilohigok basin → foredeep 1.97 Ga

Chacko et al. (2000):

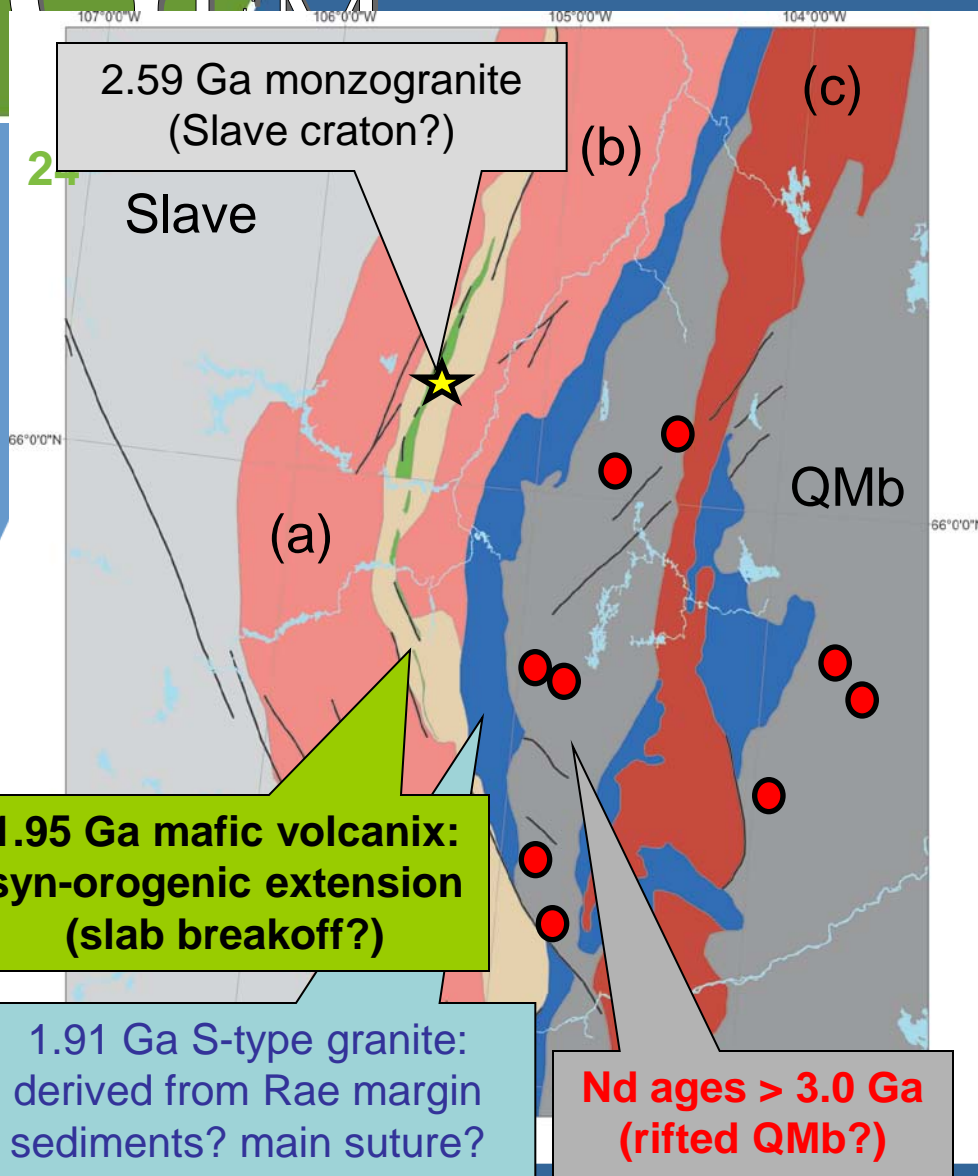
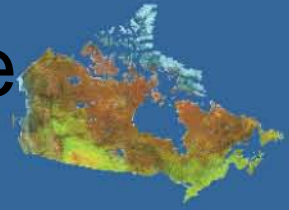
- 2.0-1.97 Ga intracontinental belt (Taltson mz)
- Slave-Rae collision during 2.35 Ga
- Arrowsmith Orogeny (Schultz et al., 2007)



Metamorphism: Thelon orogen



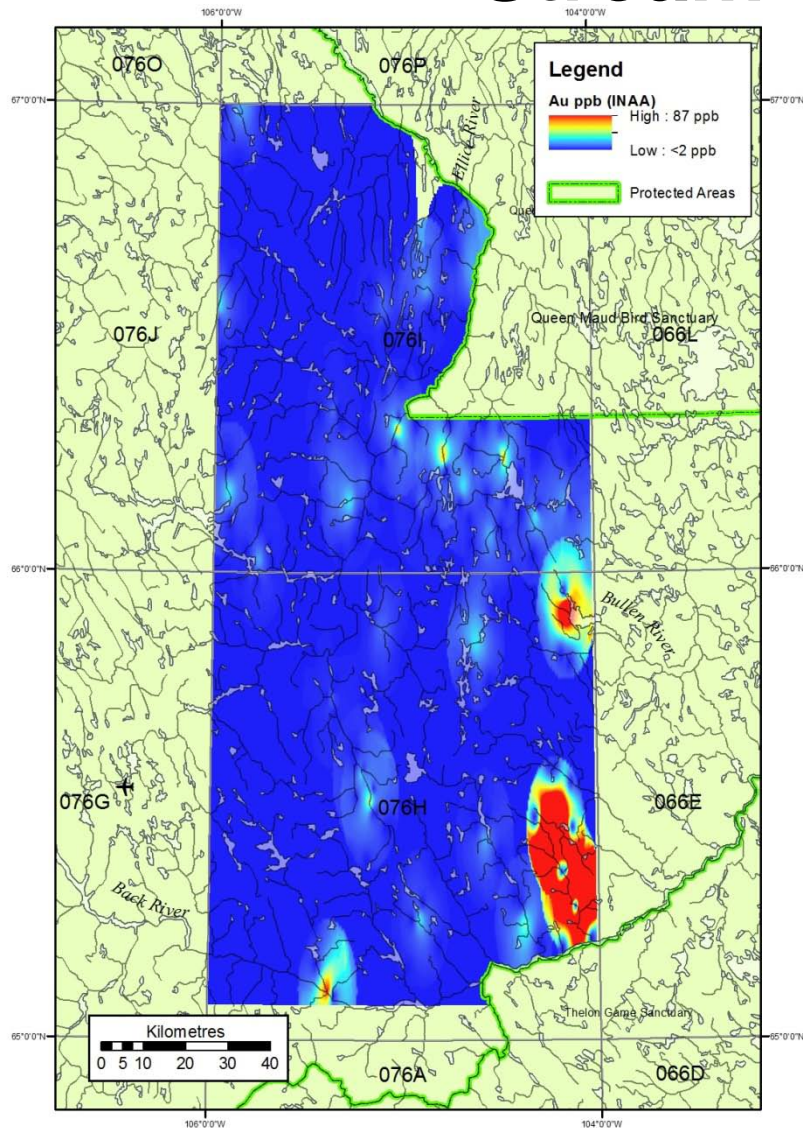
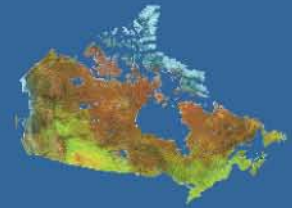
Thelon tectonic zone boundary zone



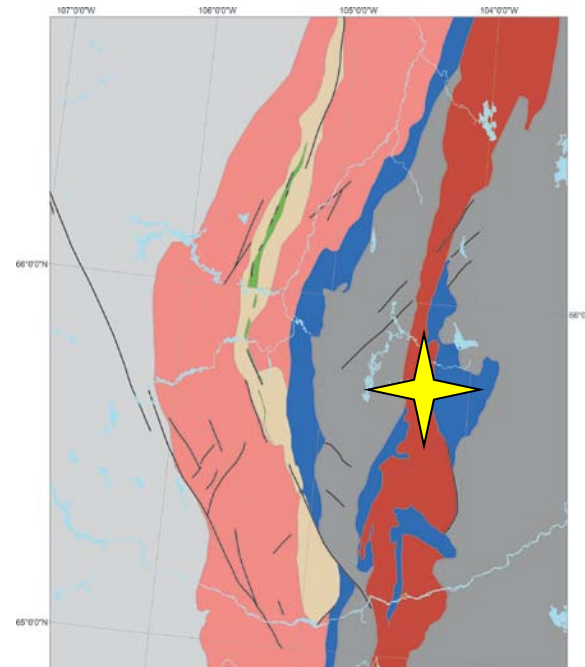
- 1.91 Ga S-type granite; mgr
- 1.95 Ga mafic volcanix; <2.08 Ga psammite/pelite (underlain by 2.6 Ga crust?)
- 2.03-1.99 Ga plutonic rocks +/- diatexite
- (a) 1.99 Ga Kfs gdi; 2.03 Ga Qtz monzonite
- (b) monzogranite-gdi
- (c) Qtz diorite; 2.01 Ga mgr +/- Fe-rich diatexite
- 3.2-2.9 Ga granitoid gneiss (Queen Maud block)



Economic Potential: Stream Sediment Survey



- anomaly from 3 sites on 1 tributary of Back River
- source is Fe-rich metasediments intruded by 2.0 Ga granitoid plutons (Fe formation at high grade?)

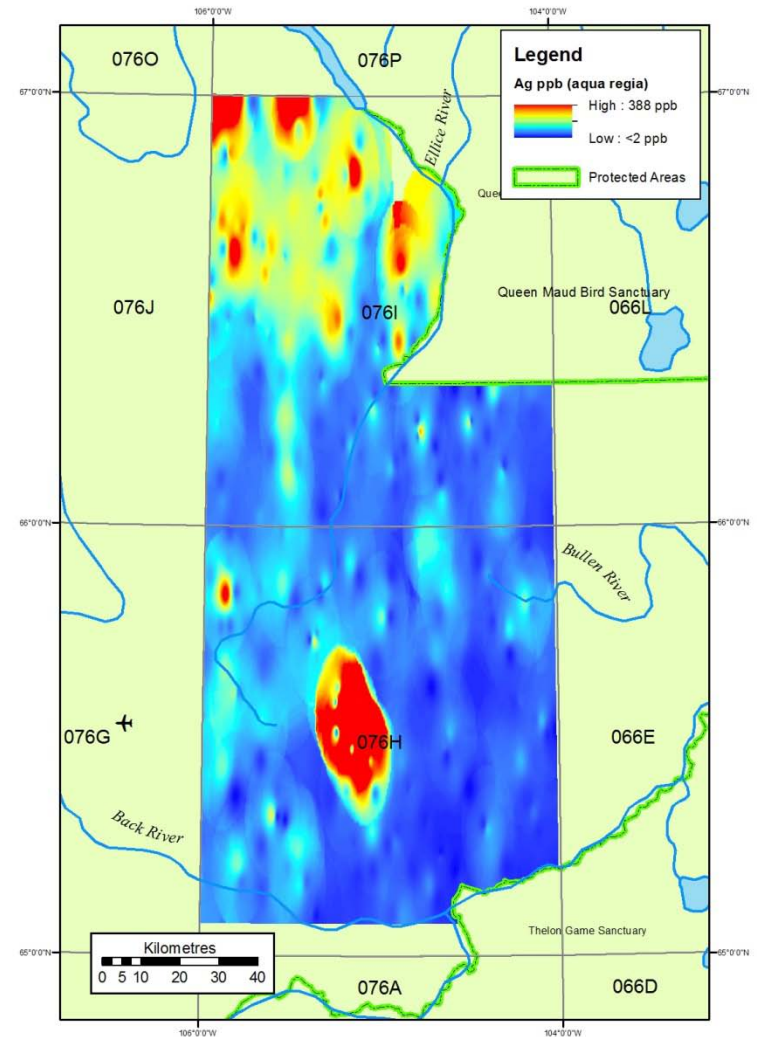
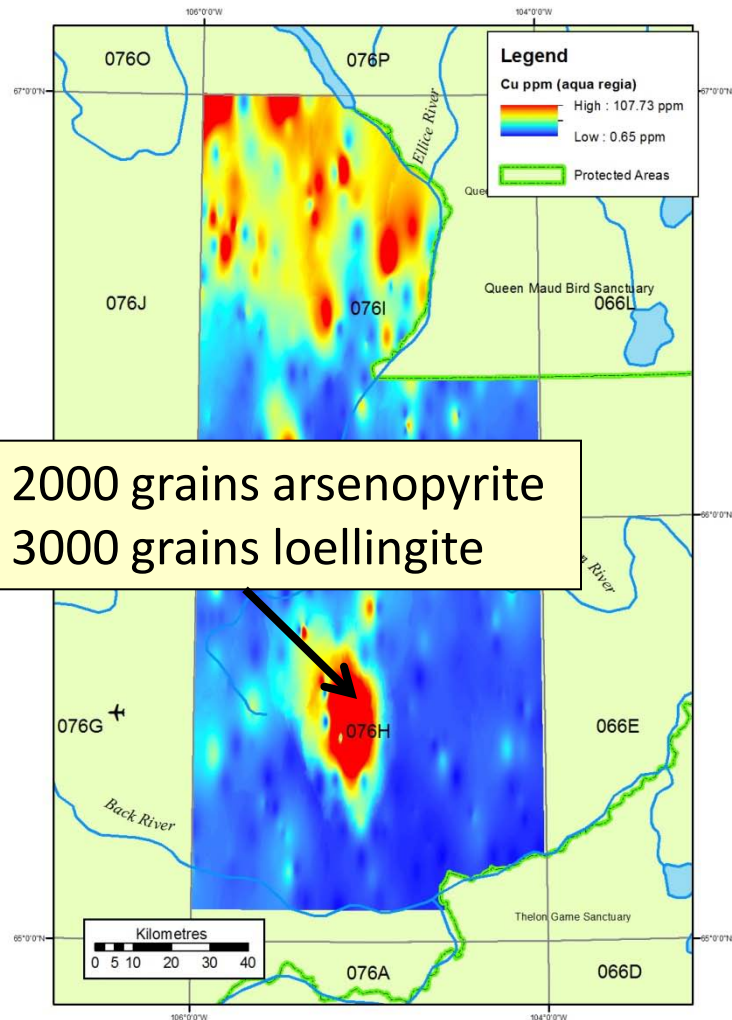


McCurdy et al. (2013, 2015; GSC open files)



Cu-Ni-Pb-Zn

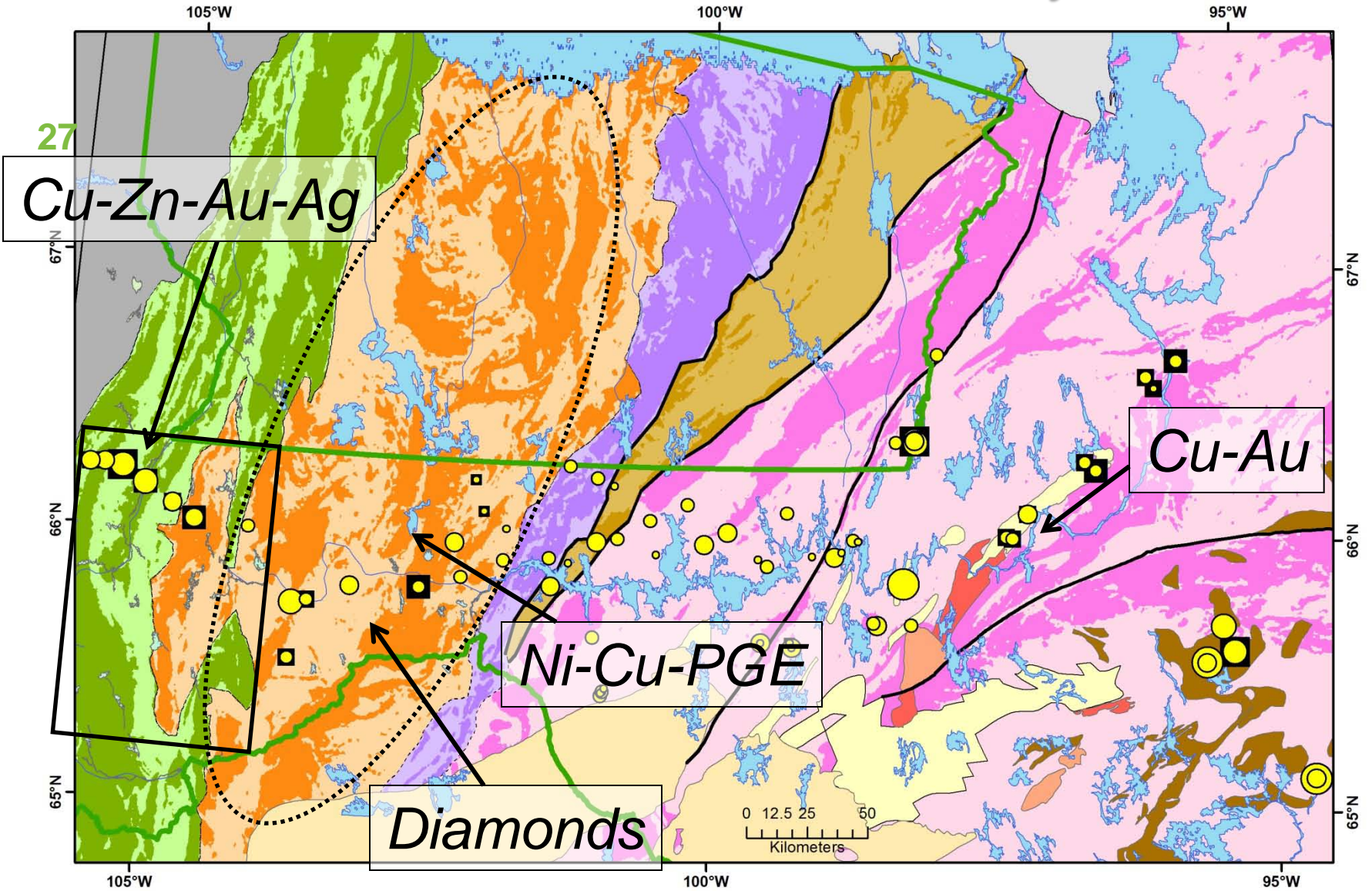
Ag

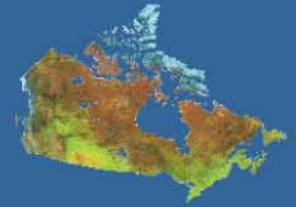


- Southern anomalies: 1.95 Ga mafic-ultramafic volcanic rocks
- Northern anomalies: volcanic belts mostly in Slave craton



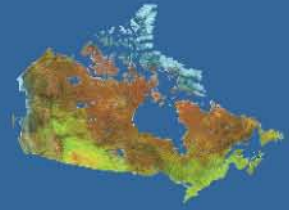
Mineral Potential - Summary



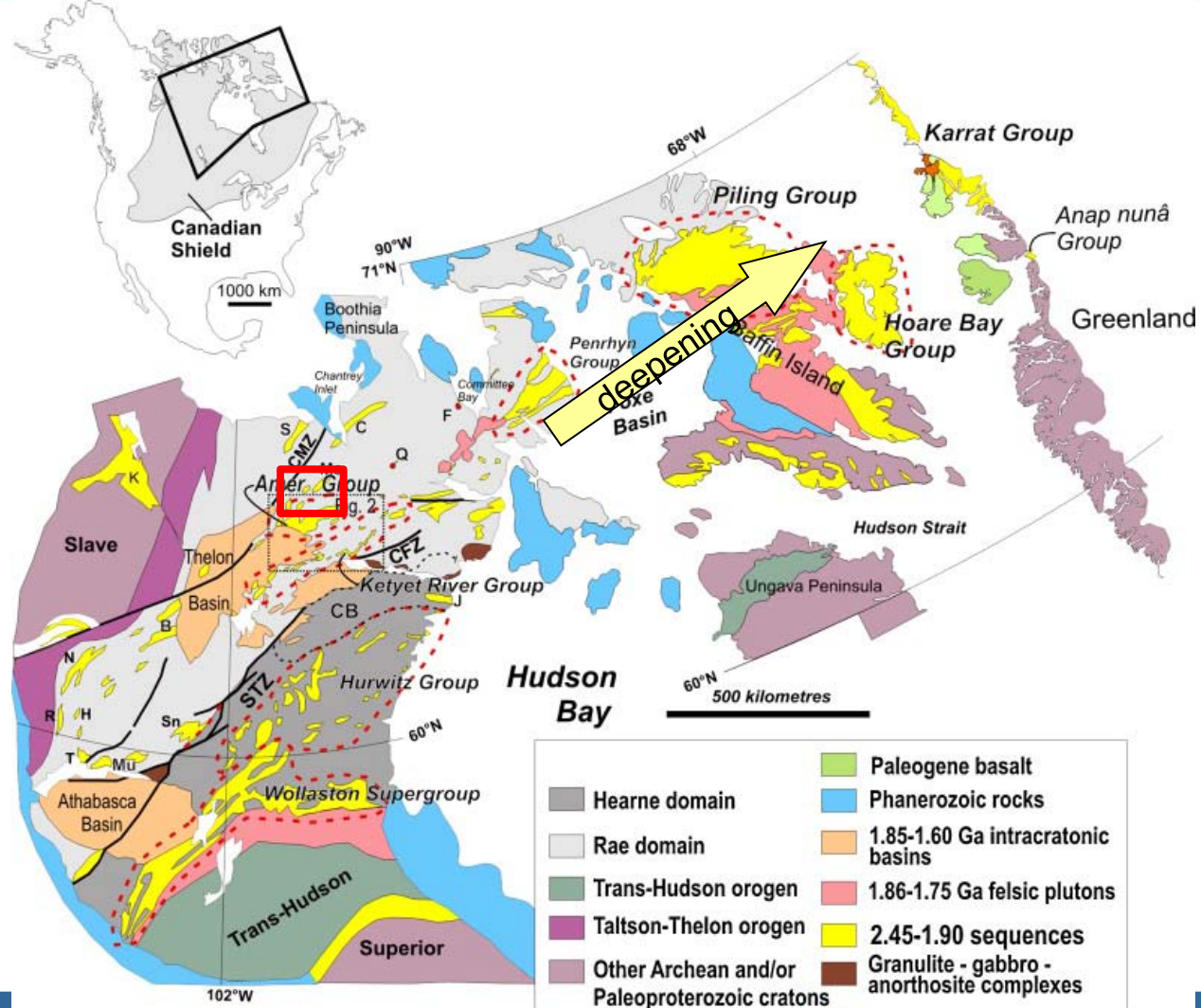


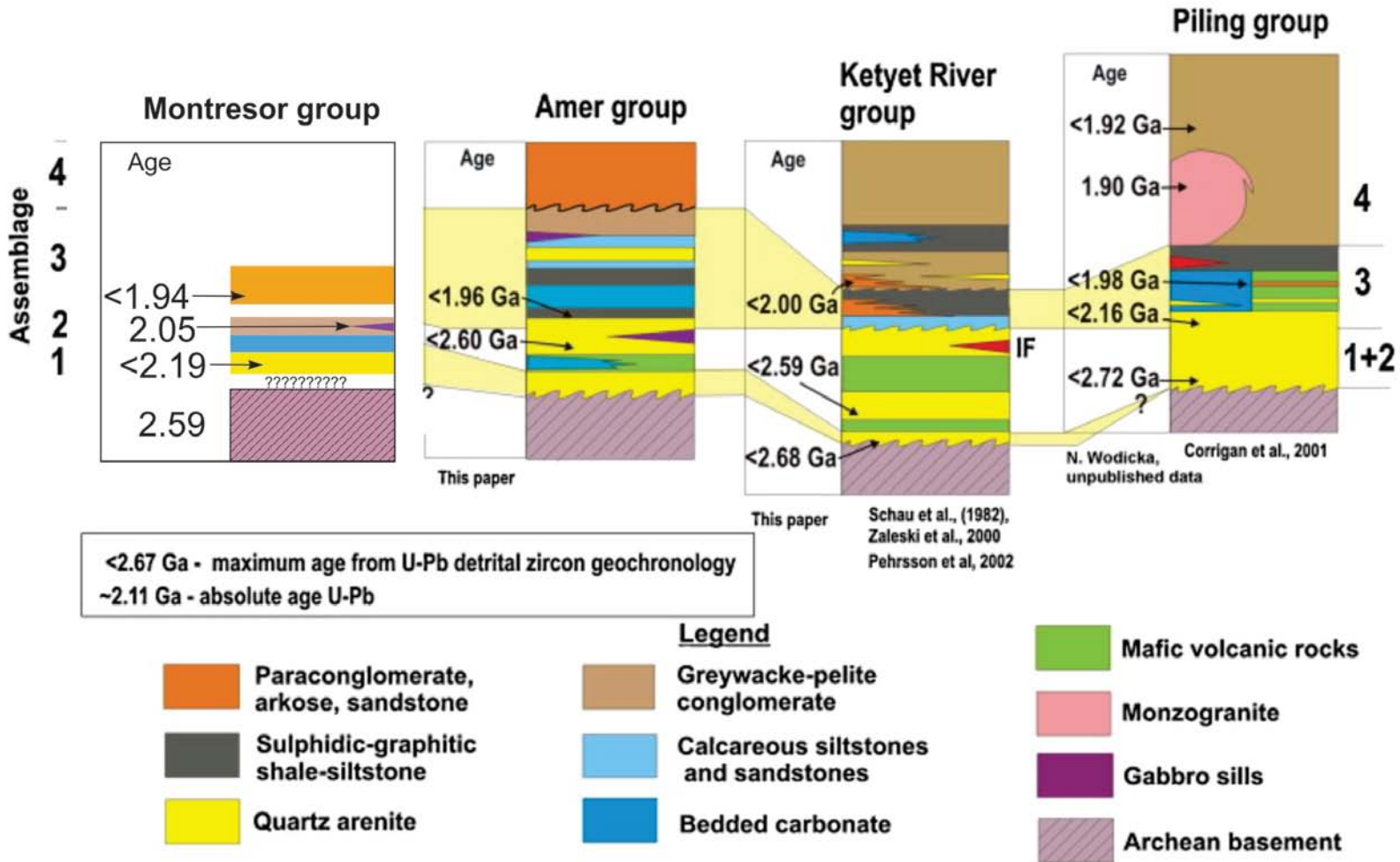
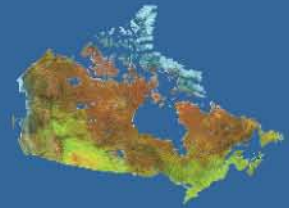
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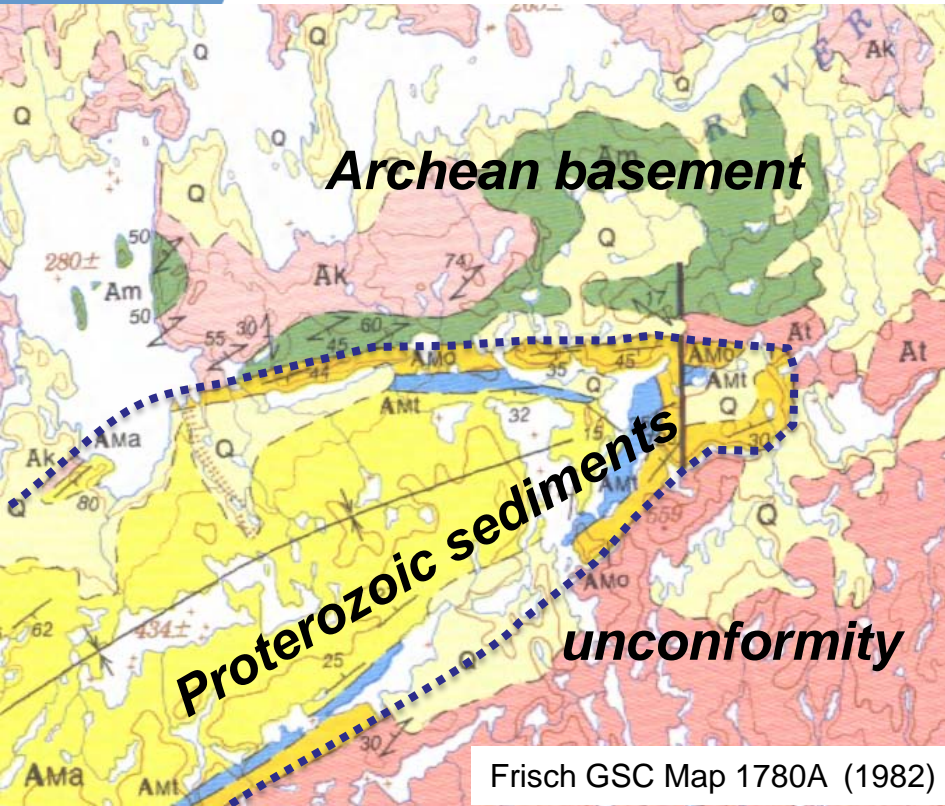
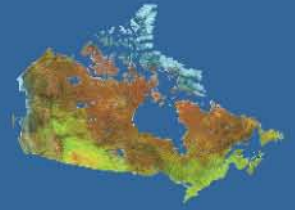
Rae cover sequence: distribution



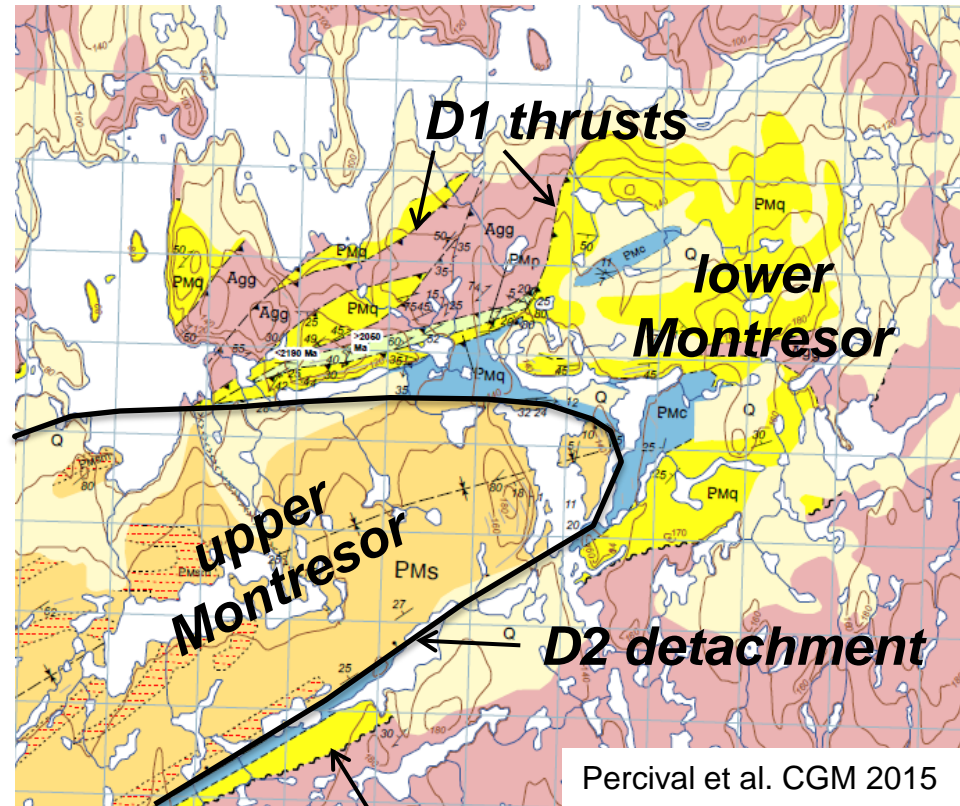
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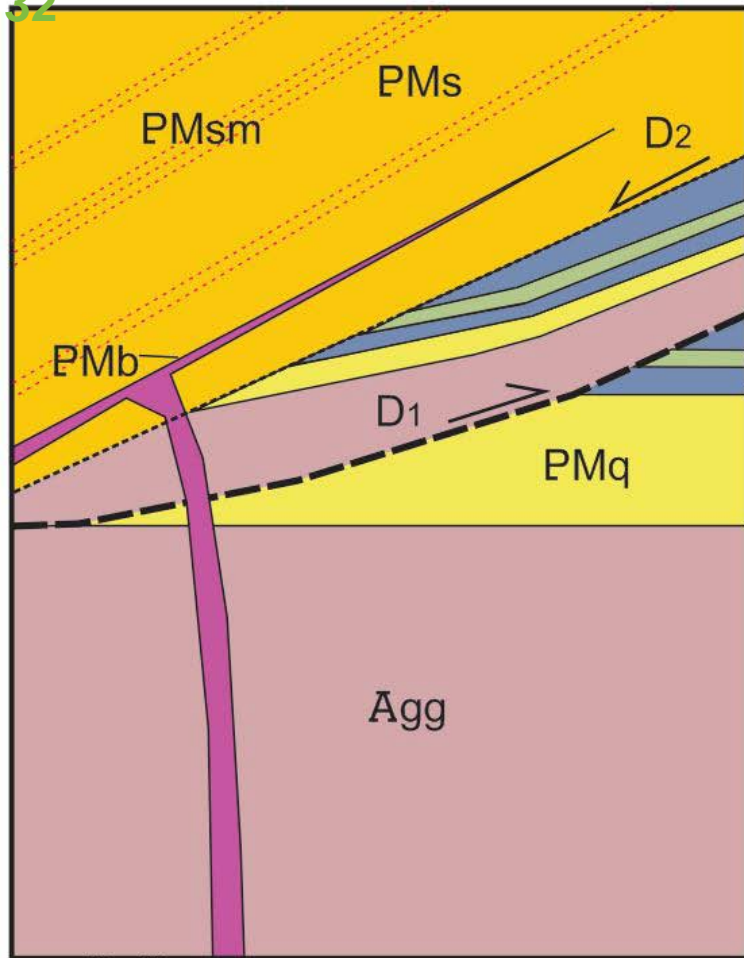
1982



2015



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Upper Montresor group (<1938 Ma)

Greenschist facies

D2 detachment fault

Imbricated gneiss and Lower Montresor group

Amphibolite facies

D1 thrust faults

(3.3 kbar, 600°C; 1863, 1844 Ma U-Pb monazite ages)

PMp

PMc

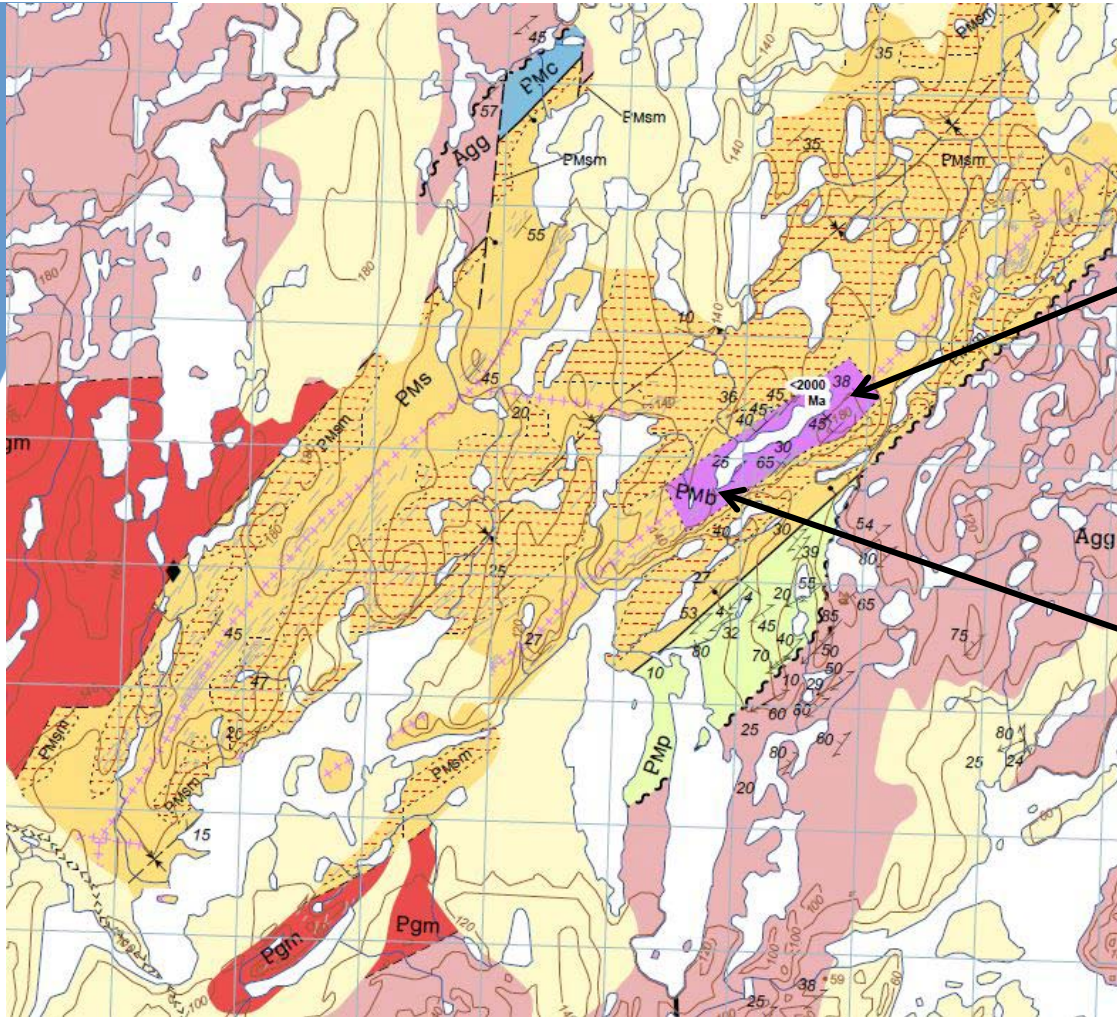
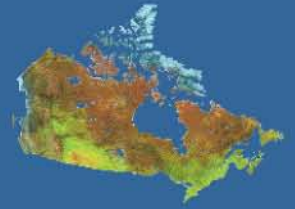
Lower Montresor group (<2190 Ma)

inferred unconformity

Archean granodiorite, augen gneiss (ca. 2.59 Ga)

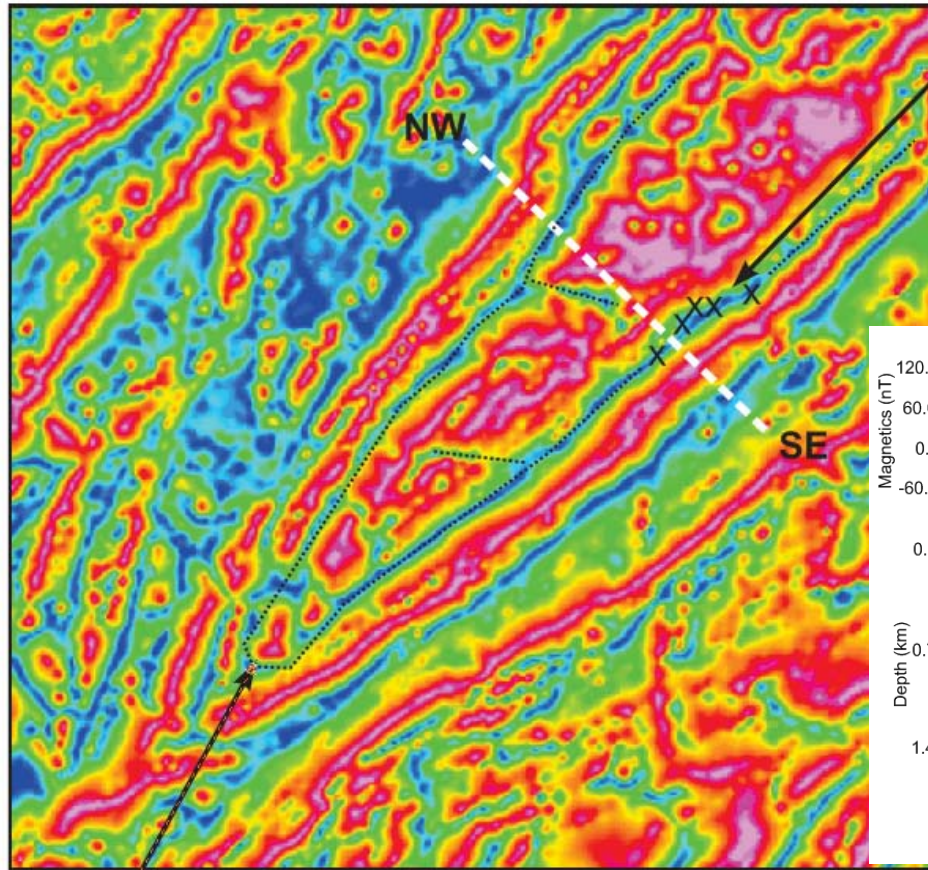
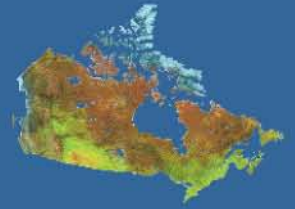
alkaline magma





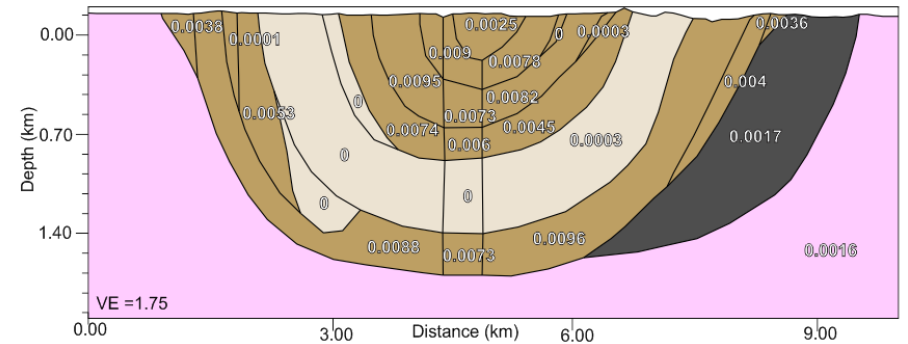
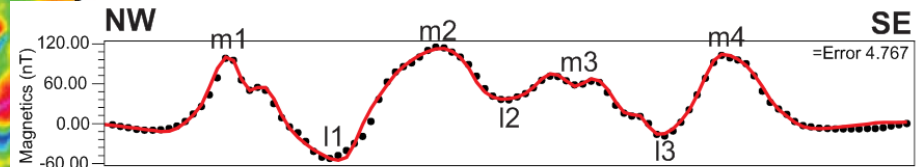
0 1
cm

Montresor breccia zone: geophysical expression



Breccia observed in outcrop

Extrapolated breccia/alteration zone





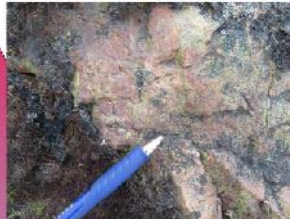
Cu 1600 ppm
Bi 8.9 ppm
Se 36 ppm
Te 1.5 ppm
Ag 1700 ppb
Au 24 ppb

Magmatism



Cu 1600 ppm
Bi 8.9 ppm
Se 36 ppm
Te 1.5 ppm
Ag 1700 ppb
Au 24 ppb
0 1 cm

hydrothermal

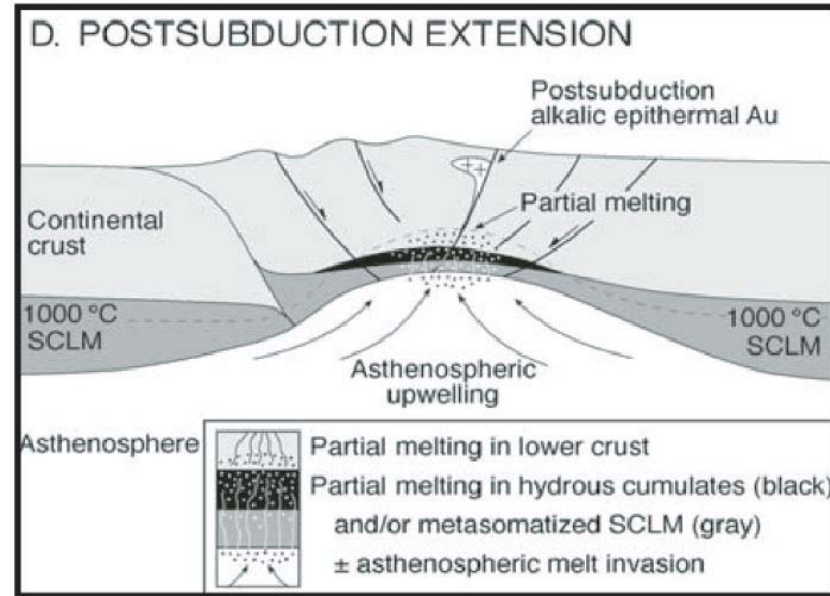


epithermal

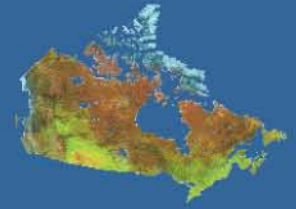


Alteration

Brecciation



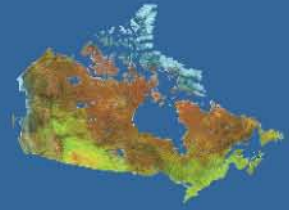
Richards, 2009



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Rae project: Proposed future directions



Devon- SE Ellesmere

