



GEOLOGICAL SURVEY OF CANADA OPEN FILE 6962

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Canada The logo for Natural Resources Canada, featuring the word "Canada" in a bold, sans-serif font with a small Canadian flag icon above the letter "a".



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Consortium: AREVA, Bayswater, Cameco, Forum, Mega, NTI, Titan, U-North, Western
Universities: Carleton, Concordia, McMaster, N. Brunswick, Ottawa, Queen's, Regina
Guidance and support: from INAC, GN, CNGO, KIA, Baker Lake, Rankin Inlet



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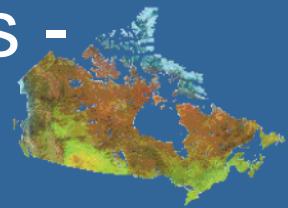
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After Jefferson et al. (2011a)

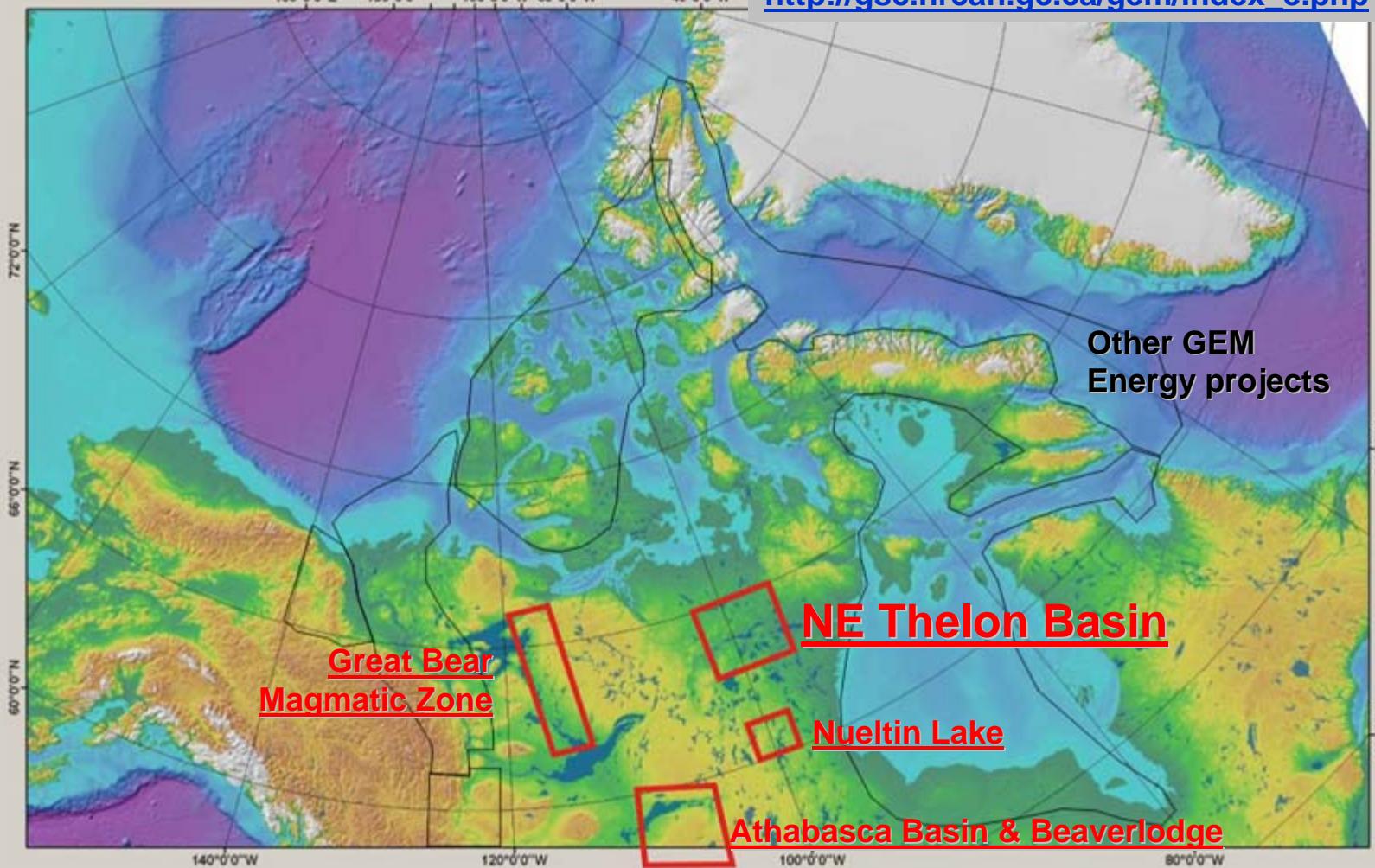
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Geomapping for Energy and Minerals - GEM Current Uranium Activities



2

http://gsc.nrcan.gc.ca/gem/index_e.php



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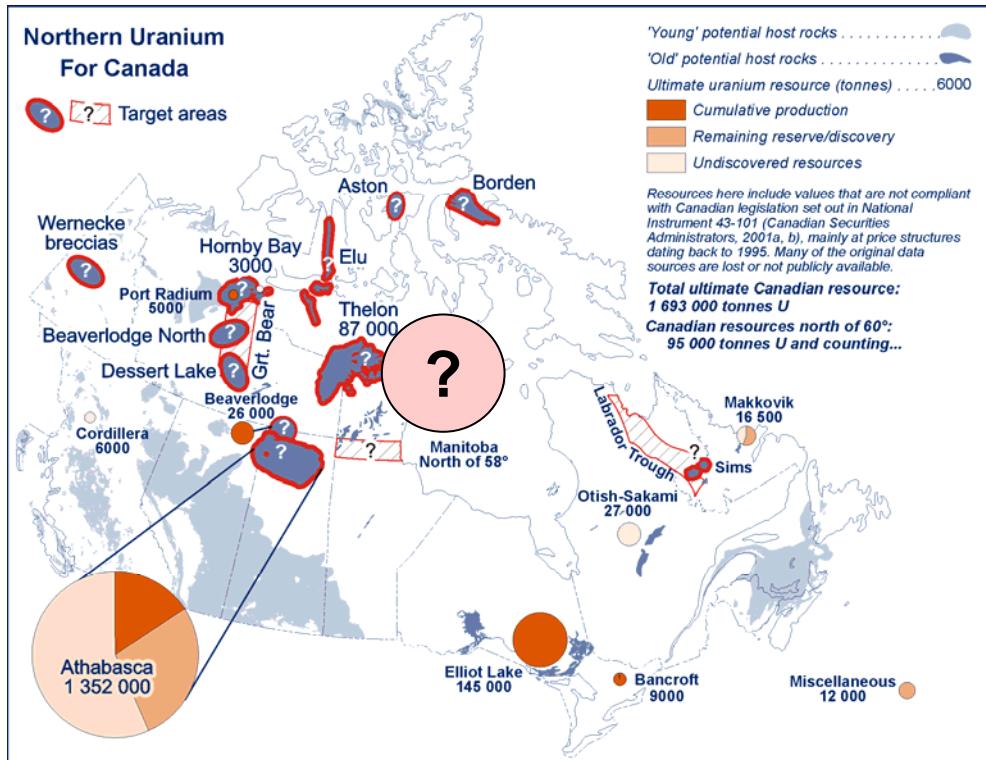
3

Hypothesis:

The Thelon Basin, western frontier Athabasca and other northern basins and basement have untapped U potential that can be revealed by test-fitting the eastern Athabasca Basin unconformity U Model

Tests:

- Extrapolate U source & key basement units beneath basins by improved mapping, geophysics and satellite data.
- Track and date basin development; U-related alteration, sources & pathways.



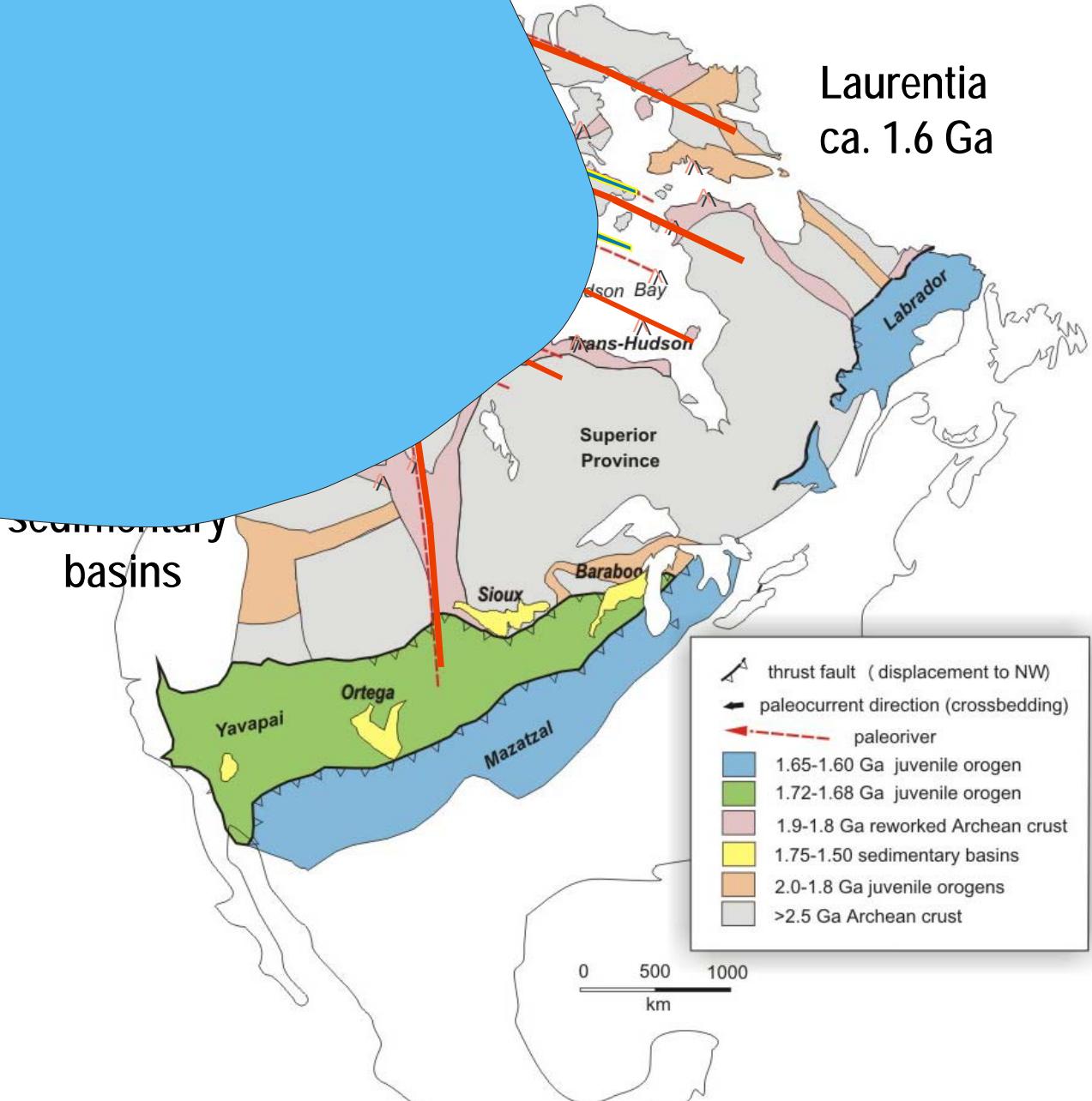
Planned Outputs:

- Better maps and knowledge to inform decision-making by governments and industry

Athabasca & Thelon as lakes of sand in evolving big river systems

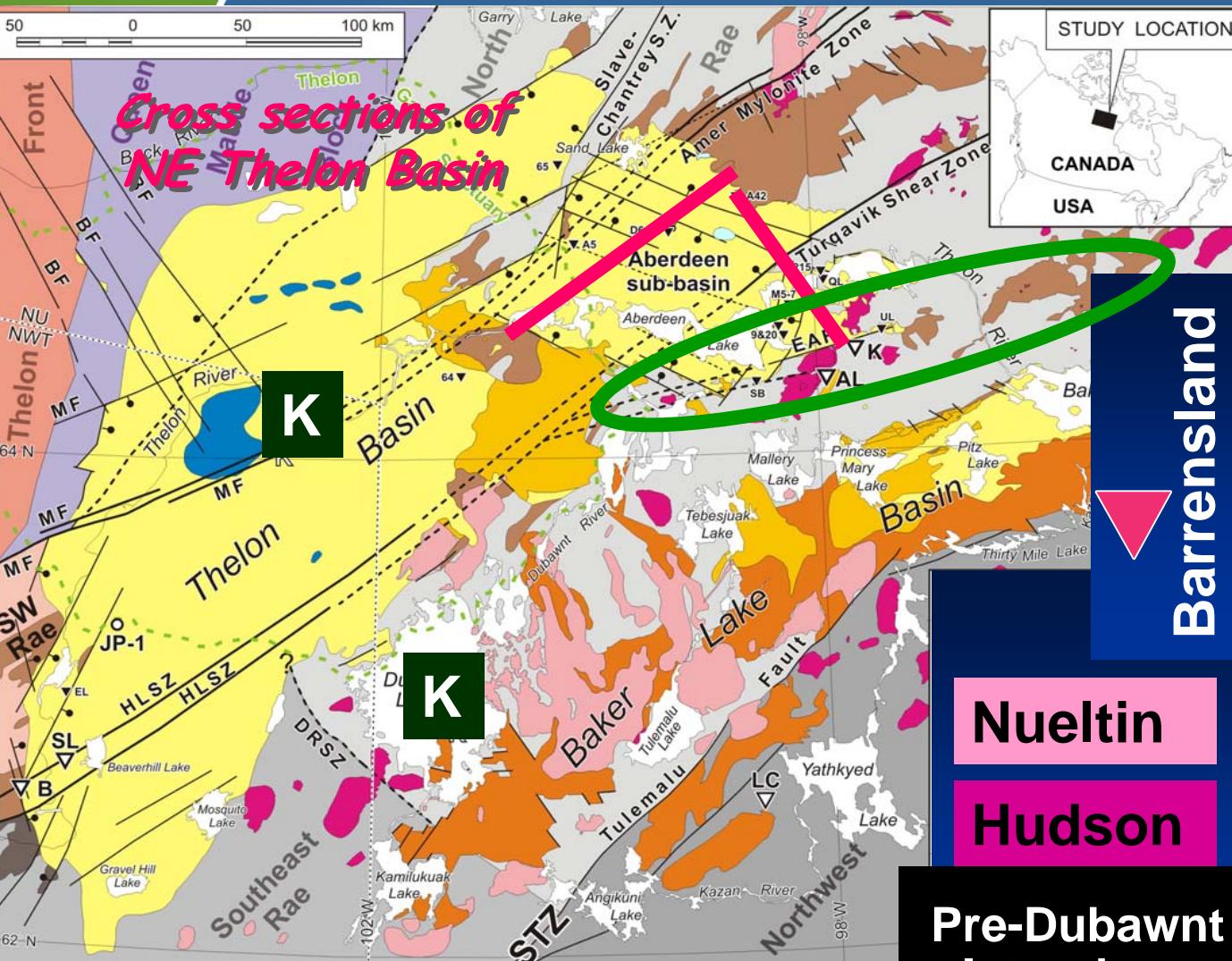
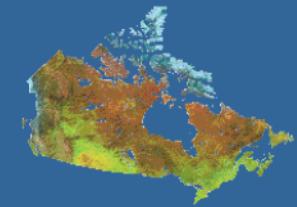
Seq. 1 local
Sequence 2
near-fluvial
Sequence 3
far-fluvial

After
Jefferson et al. (2009a)



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GEM-U Thelon Basin Compilation: Introduction and Progress to 2009



Dubawnt Supergroup

Lookout Pt

Kuangmi 1.54

U: Apatite 1.67

Thelon <1.75

Wharton 1.76

Baker 1.84-1.80

Nueltin

Hudson

Pre-Dubawnt
Intrusions
not shown

Amer <2.2 & 1.92

Archean >2.5



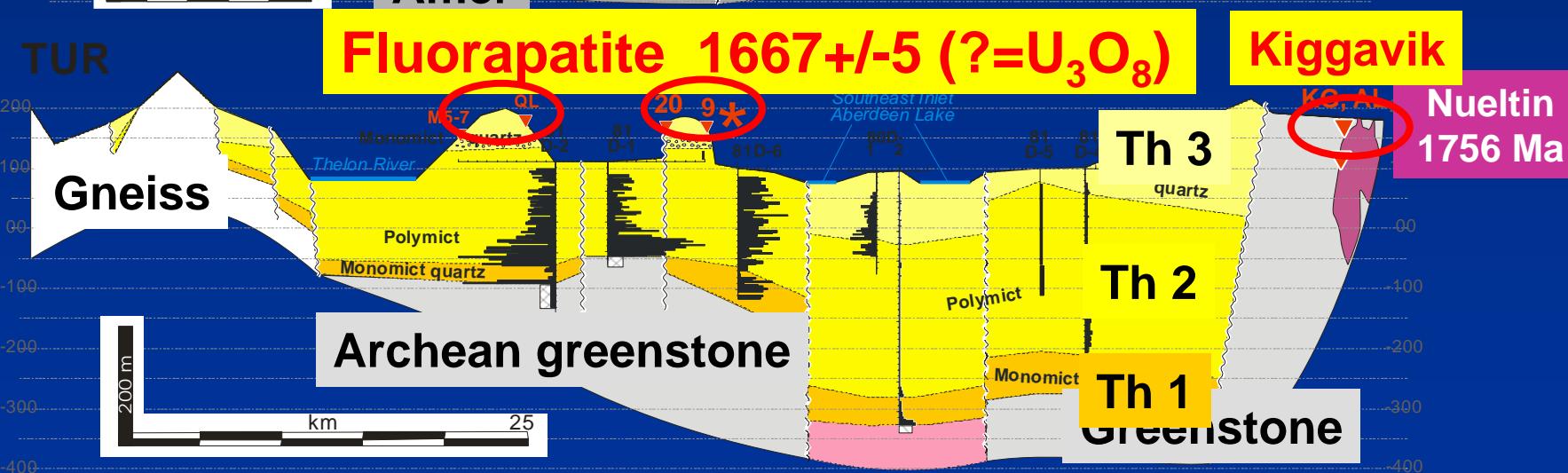
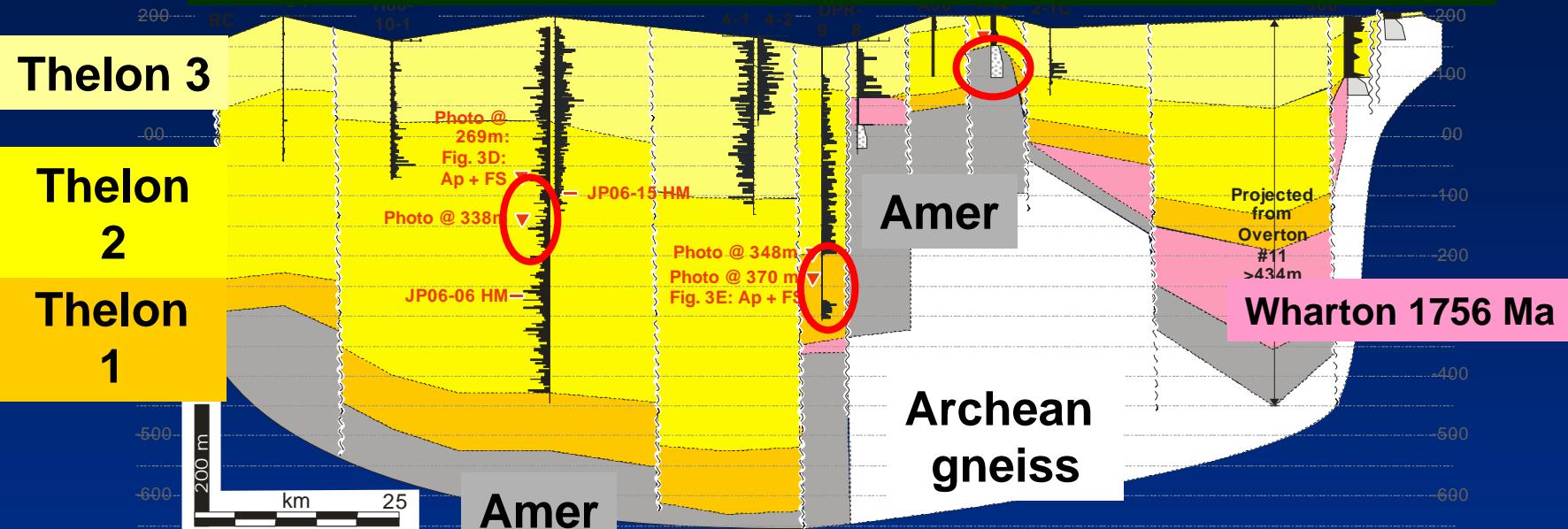
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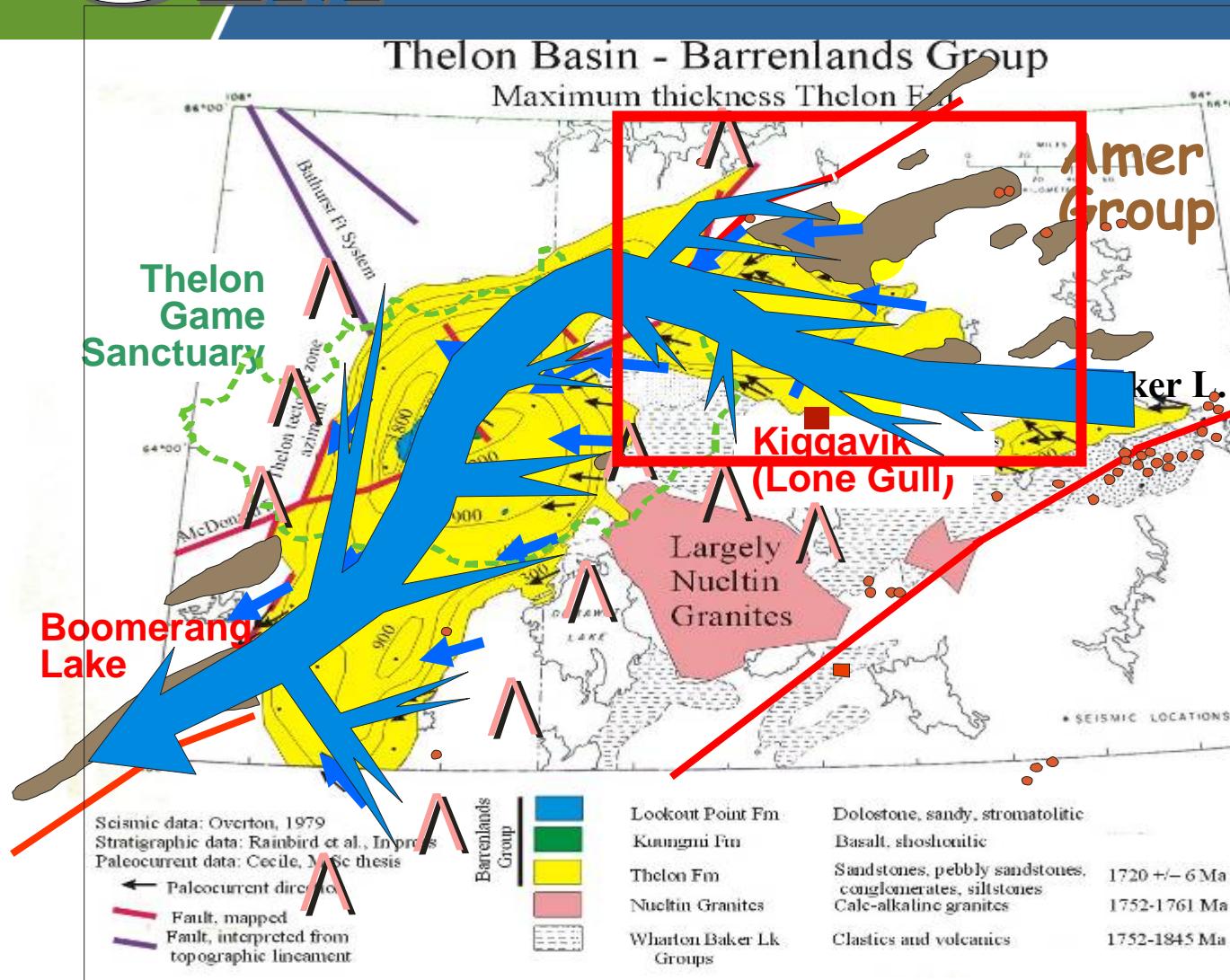
Thelon Basin Compilation (Davis et al. 2011)

Kuungmi to SW: 1540+/30 Ma; Chamberlain et al. (2010)



GEM

Thelon Basin Compilation: Refined Intracontinental Context



Using old and new data on faults, grain size, facies changes, paleocurrents and isopachs

(after Cecile (1973); Davidson and Gandhi (1989), Fuchs and Hilger (1989), Gandhi (1989), Miller et al. 1985, Miller and LeCheminant (1985), Overton (1979) (seismic depths), Rainbird et al. (2003a); pers. comm by Paul Ramaekers (2006))

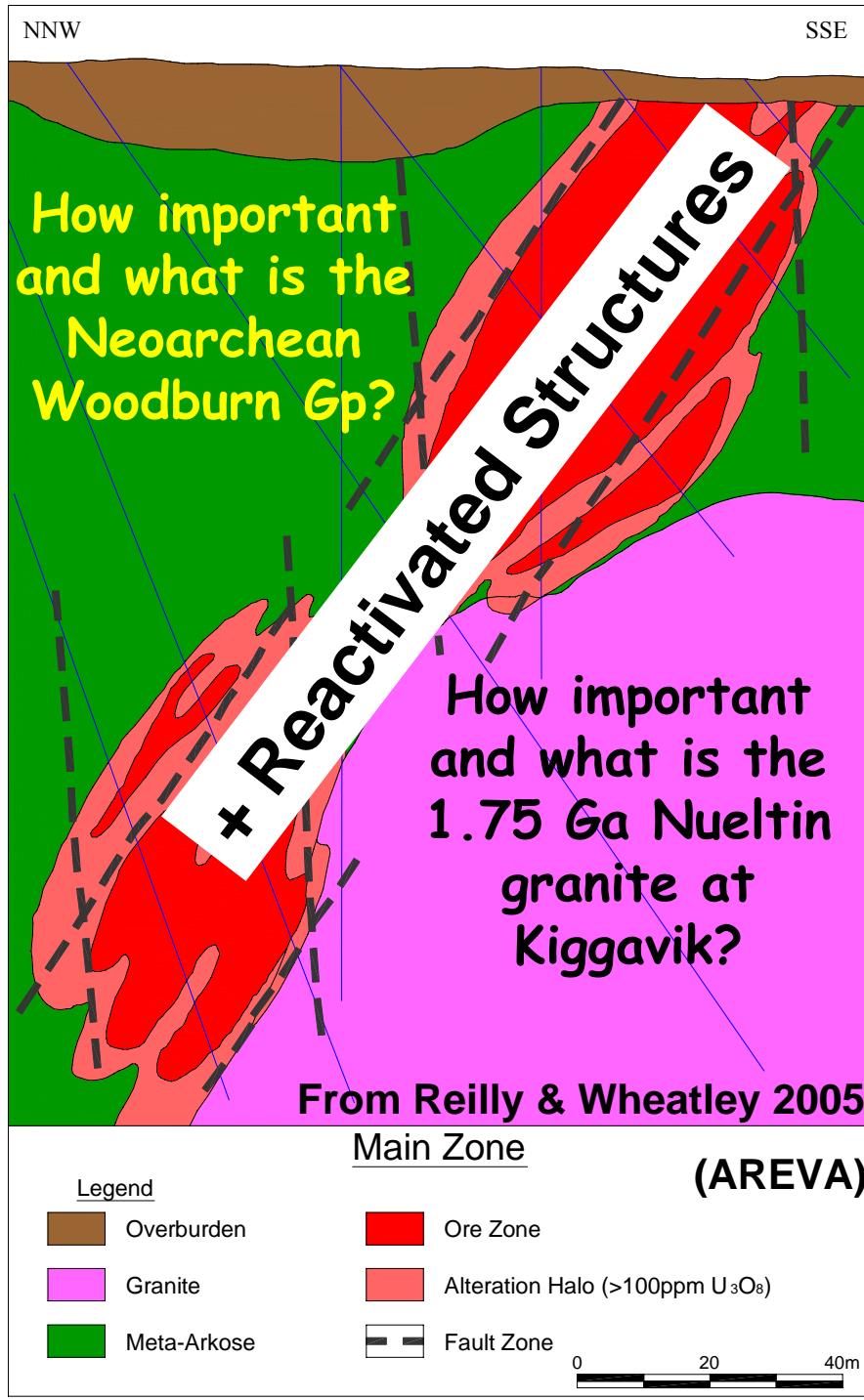


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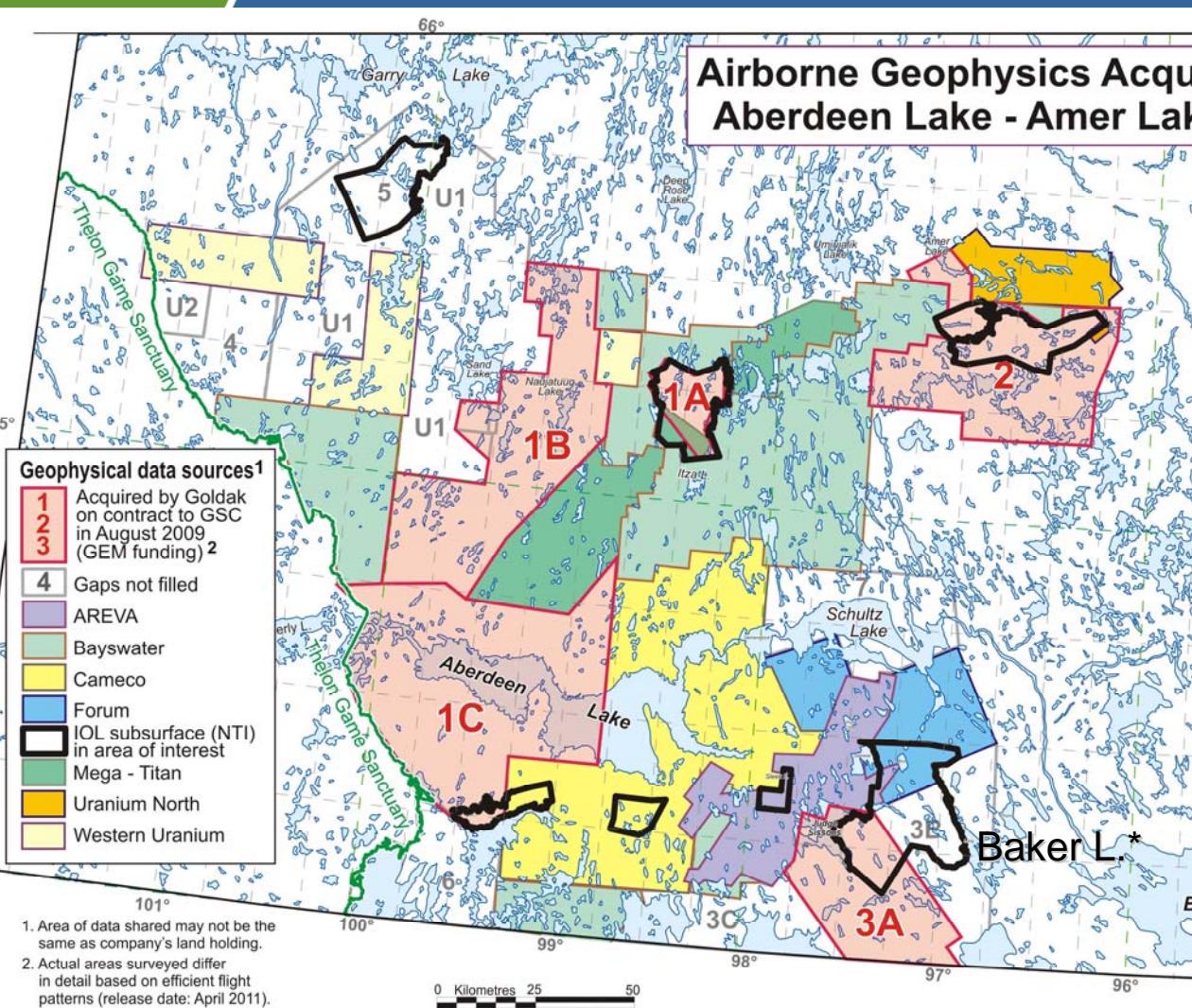
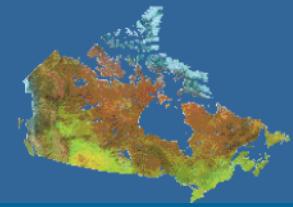
Thelon Basin Compilation: Adapting the Athabasca model

Intersecting faults coinciding with granite and sulphidic alteration
(Reilly & Wheatley, 2005 (YK Forum))

Still potential for Athabasca type U associated with graphitic metapelite.

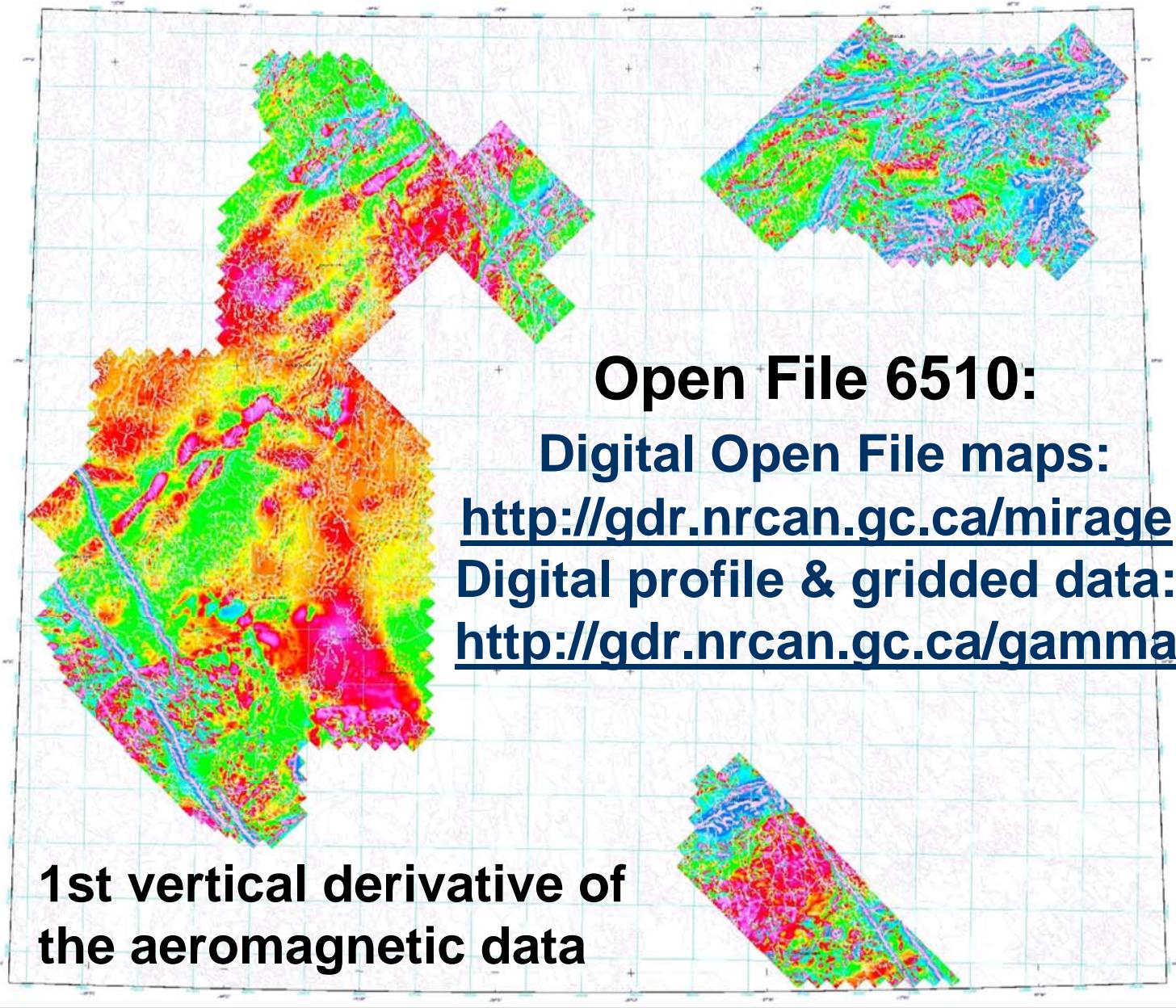


Thelon Basin Consortium: New geophysics for RPM



LOA with 8 companies
Including NTI

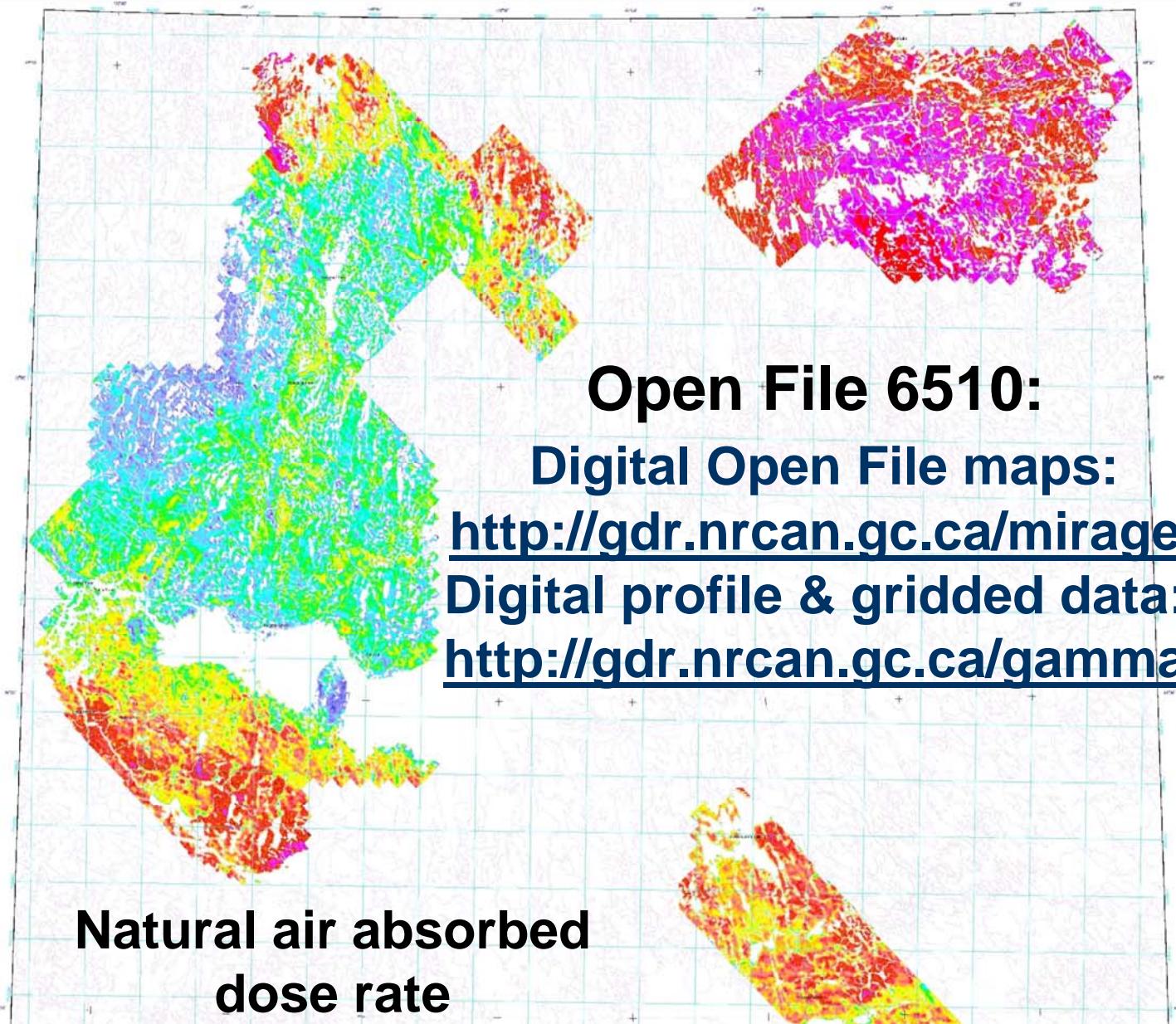
- Sharing aeromagnetic & gamma ray data
- GEM geophysics is filling data gaps
- PhD at McMaster is stitching, modeling geophysics and integrating geology
- Aims are:
 - save legacy data
 - improve detailed geology maps
 - develop and apply geophysical models for 3-D mapping



1st vertical derivative of the aeromagnetic data

Open File 6510:
Digital Open File maps:
<http://gdr.nrcan.gc.ca/mirage>
Digital profile & gridded data:
<http://gdr.nrcan.gc.ca/gamma>

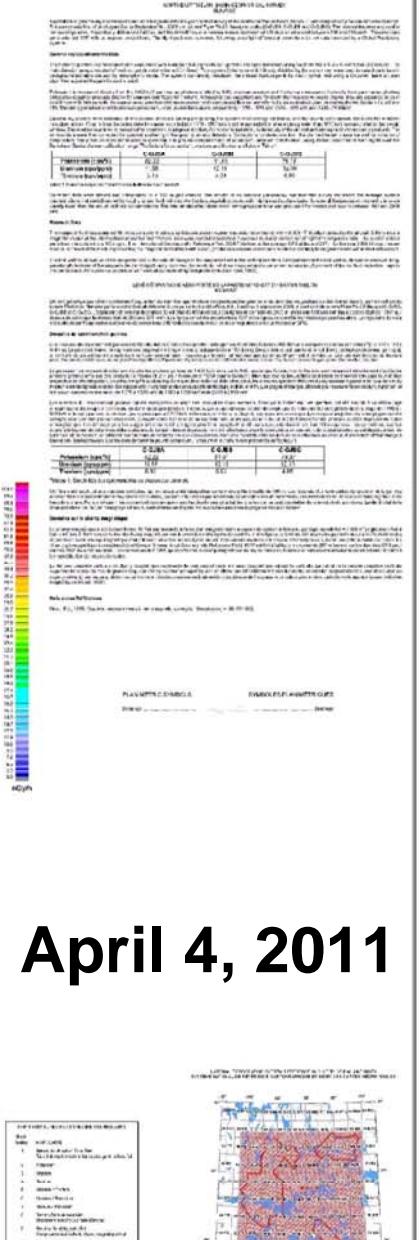
April 4, 2011



Natural air absorbed dose rate

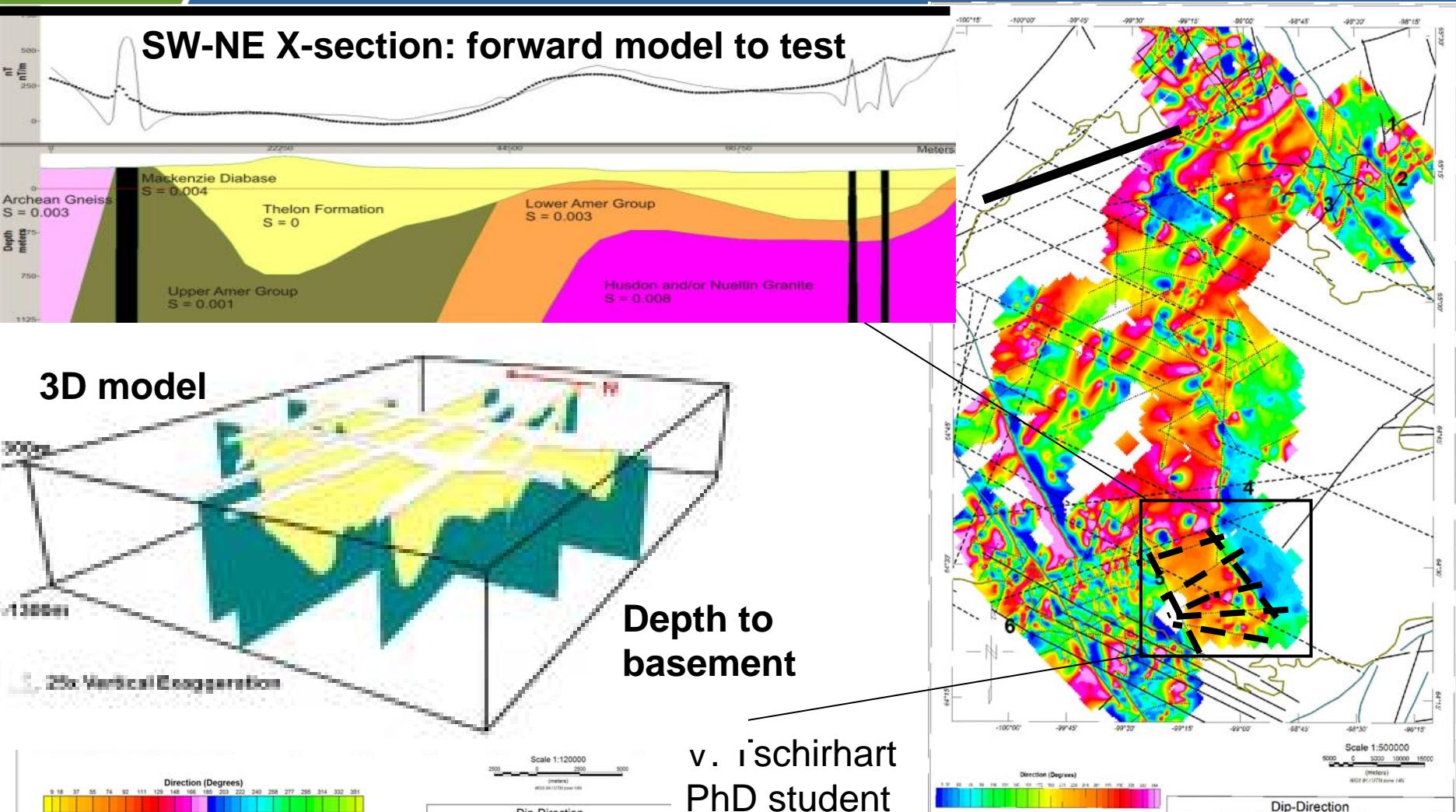
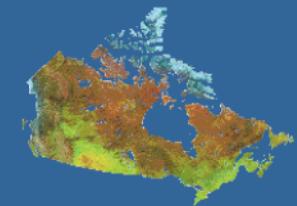
Open File 6510:
Digital Open File maps:
<http://gdr.nrcan.gc.ca/mirage>
Digital profile & gridded data:
<http://gdr.nrcan.gc.ca/gamma>

April 4, 2011



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Geophysical modeling in progress



v. Ischirhart
PhD student

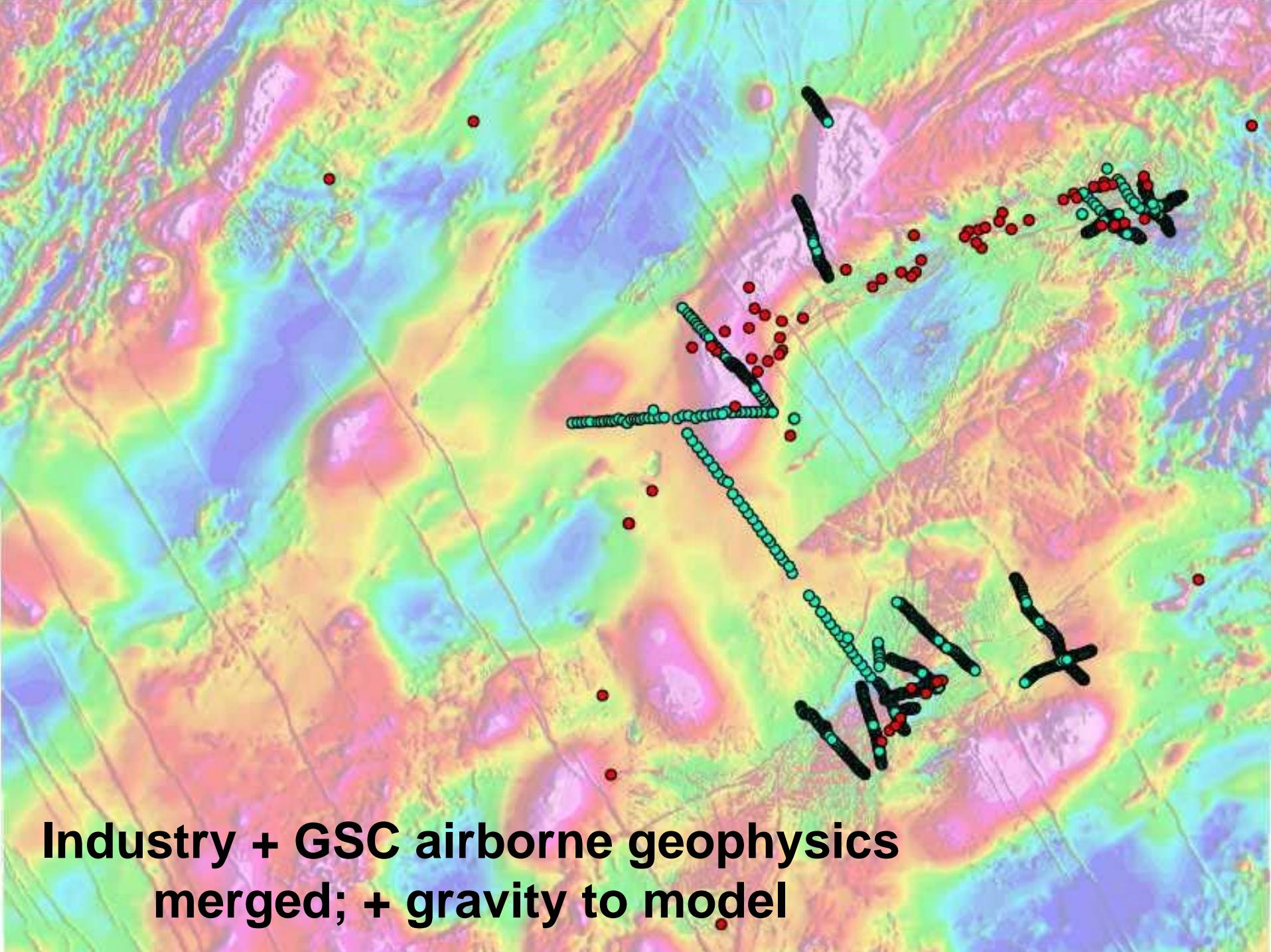


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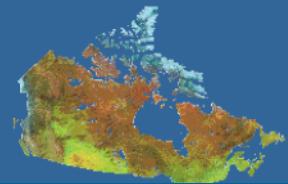
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Industry + GSC airborne geophysics
merged; + gravity to model

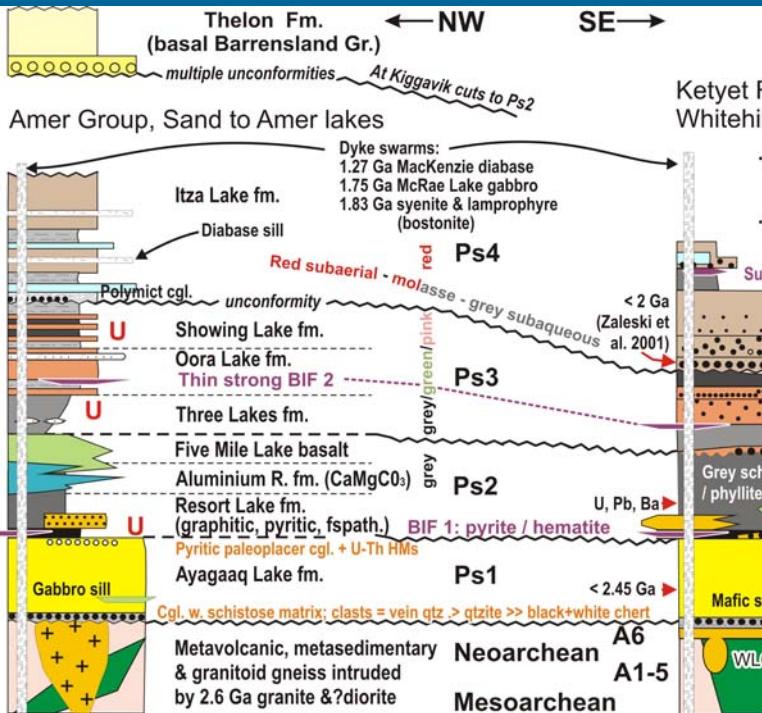
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Thelon Consortium: New Geology for geophysical RPM

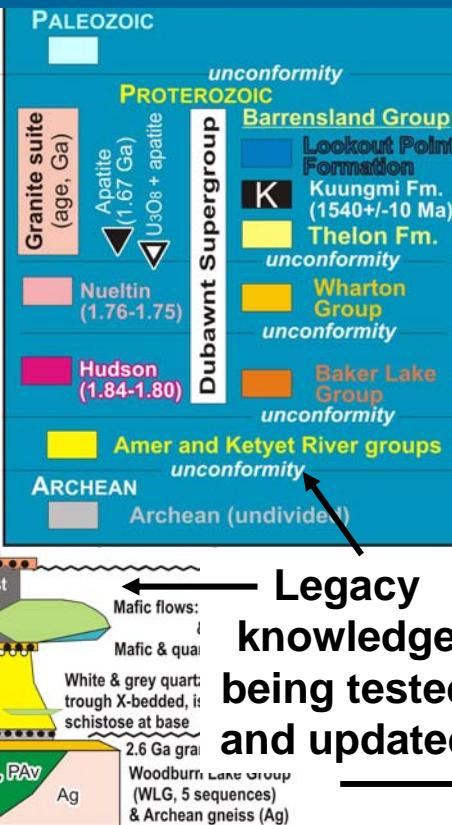


Field mapping (3 M.Sc.) focussed on resolving major basement elements:

- Archean vs early Paleoproterozoic
 - 6 Neoarchean sequences
 - Early Paleoproterozoic sequences
Ps1 to Ps4; deformed 4 times



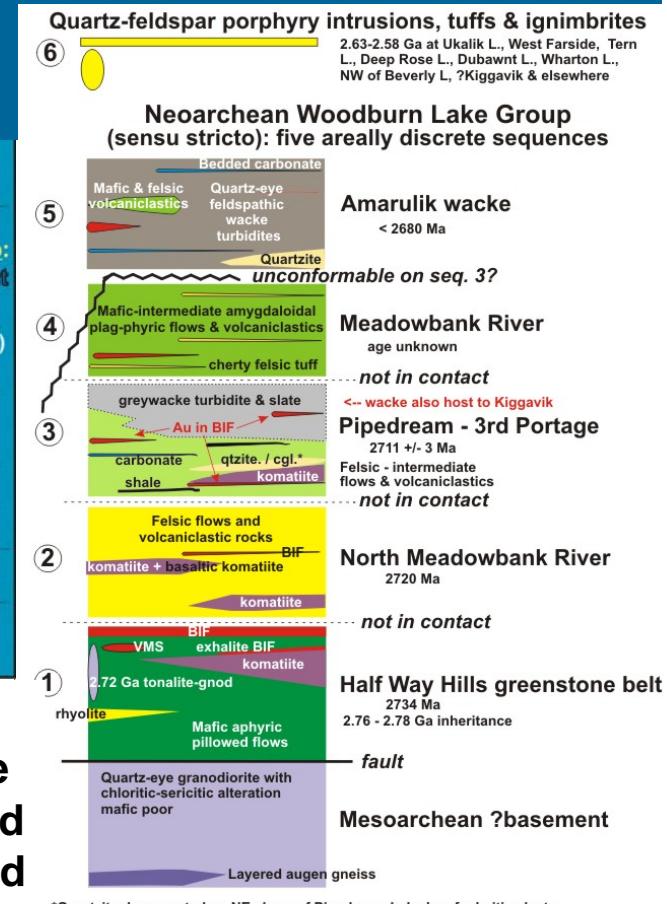
- Alkalic magmatism part of & linked to Late Paleoproterozoic Dubawnt Supergroup



— Legacy knowledge being tested and updated

Ketyet Group

5 Neoarchean Woodburn Gp Plus 2.6 Ga regional felsic



*Quartzite documented on NE shore of Pipedream Lake has fuchsite clasts including komatiite. Also documented in drilling: quartzite/cobble conglomerate between komatiite and intermediate volcanics



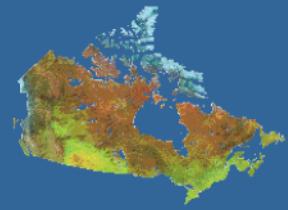
15

- Air photographs & LANDSAT (base for Ganfeld)
- DEM (Skulski, Tschirhart)
- RADARSAT (Shelat, LaRocque)
- Legacy map data (many pioneers)
- Airborne Gamma Ray (incomplete)
- Aeromagnetic (high resolution, complete)**
(Tschirhart-Morris-Keating)

The Challenges: “Seeing through”

- **Surficial cover (2% outcrop) & magnetism**
- **Thelon Formation sandstone (100% cover)**
- **In five 1:250,000 sheets at 1:100,000 + scale**

Neoarchean Geophysical markers



16

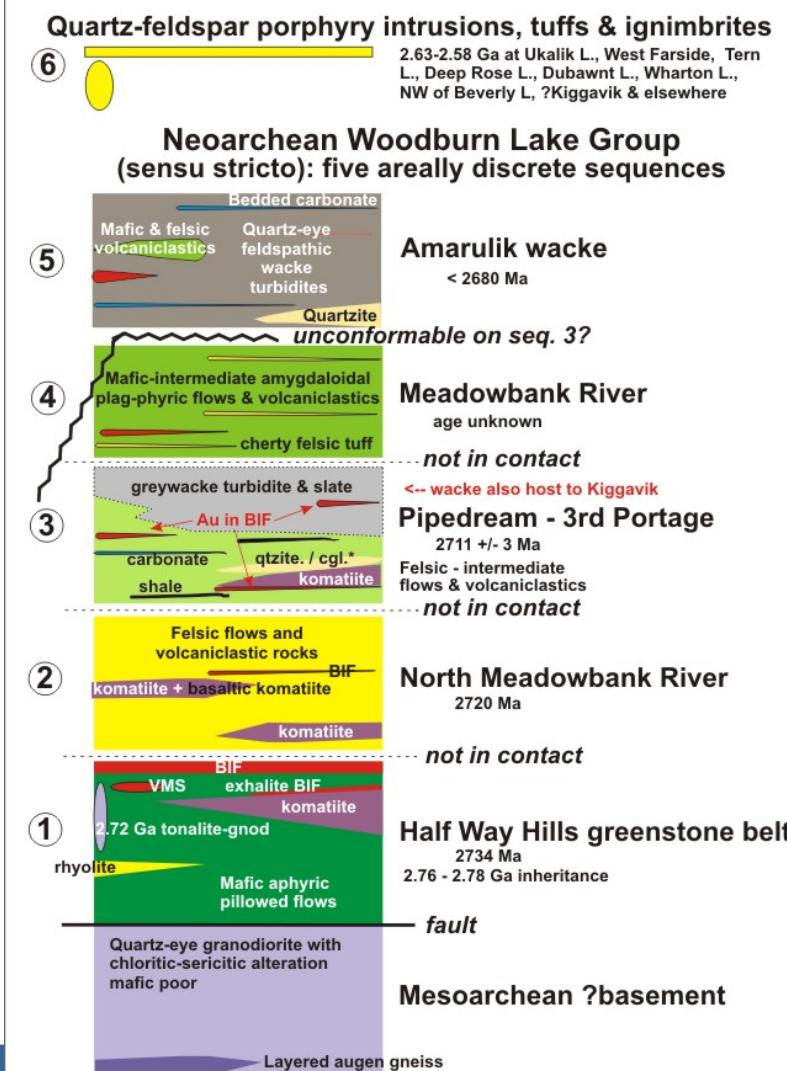
Strong thin BIF

Powerful BIF

Moderate BIF

Thin BIF

Powerful thick BIF



**Possible conductors?
may be
Proterozoic
structural
infolds**



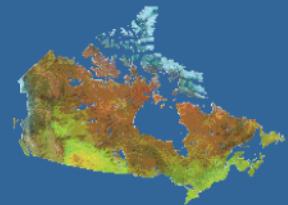
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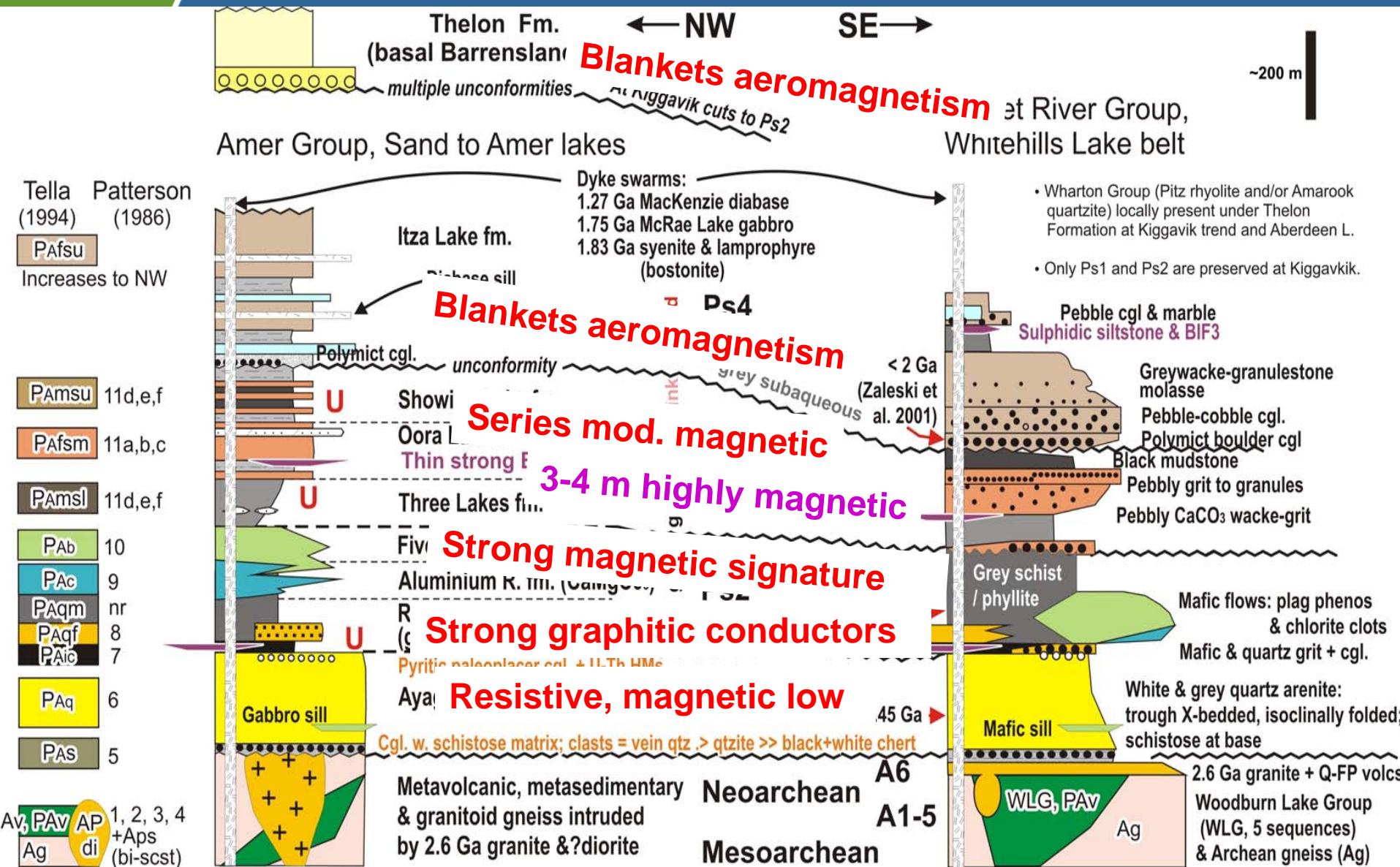
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Paleoproterozoic Geophysical markers

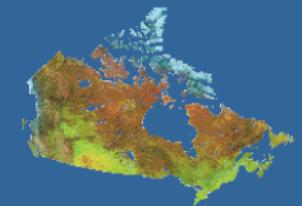


~200 m



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Alkalic magmatism linked to sequences + uranium - REE



Bong 40A

McRae Lake and 075° dykes magnetic



Pitz rhyolite / Nueltin granite non-magnetic

1.76-1.75 Ga
Nueltin Suite:
Rapakivi granite
Pitz rhyolite
Diabase dykes:
McRae L. 010°
+ no-name 075°



RM-238A

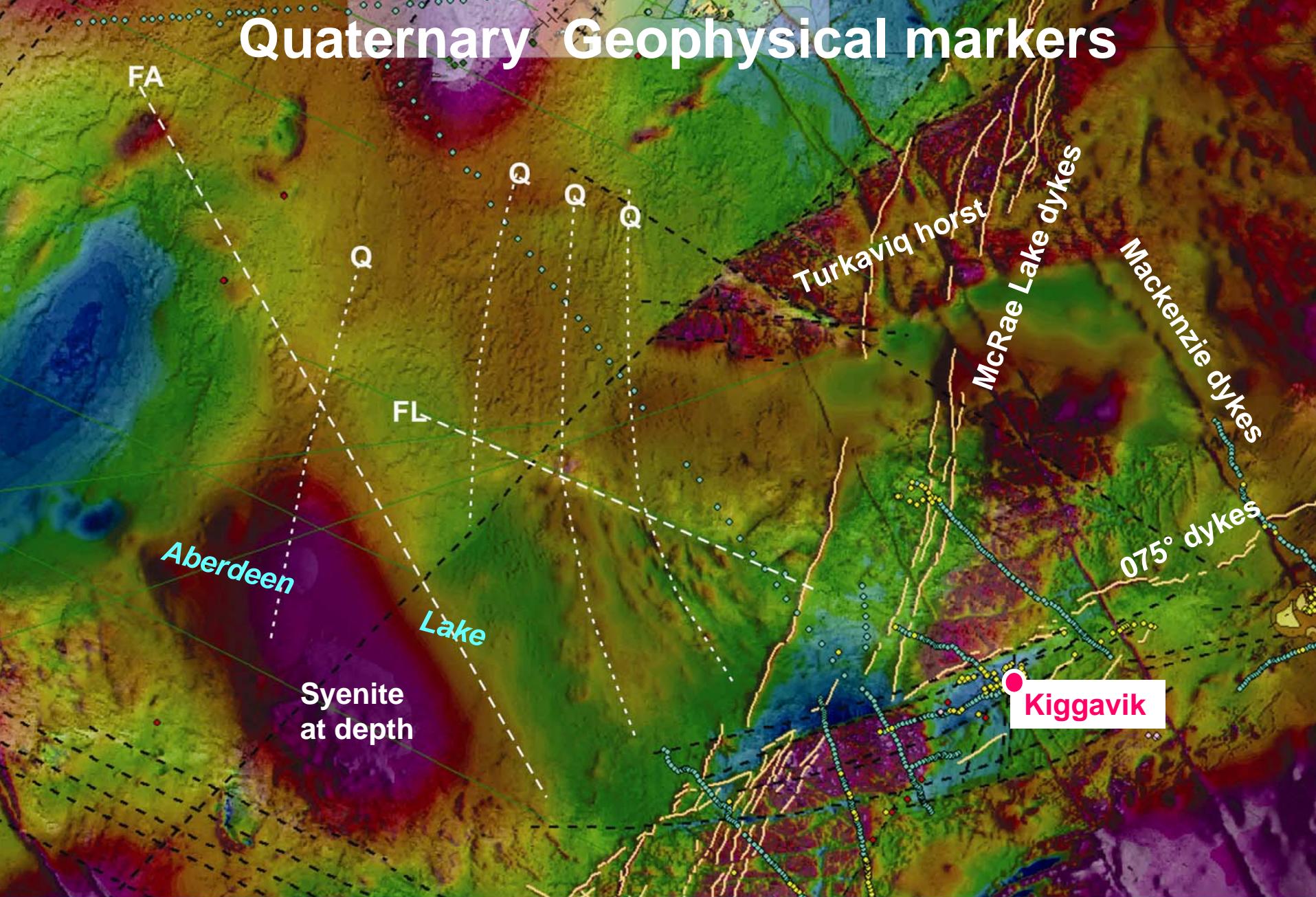
1.84 – 1.80
Hudson granite /
Bostonite - minette
/ Martell syenite



Hudson weakly; Martell strongly magnetic



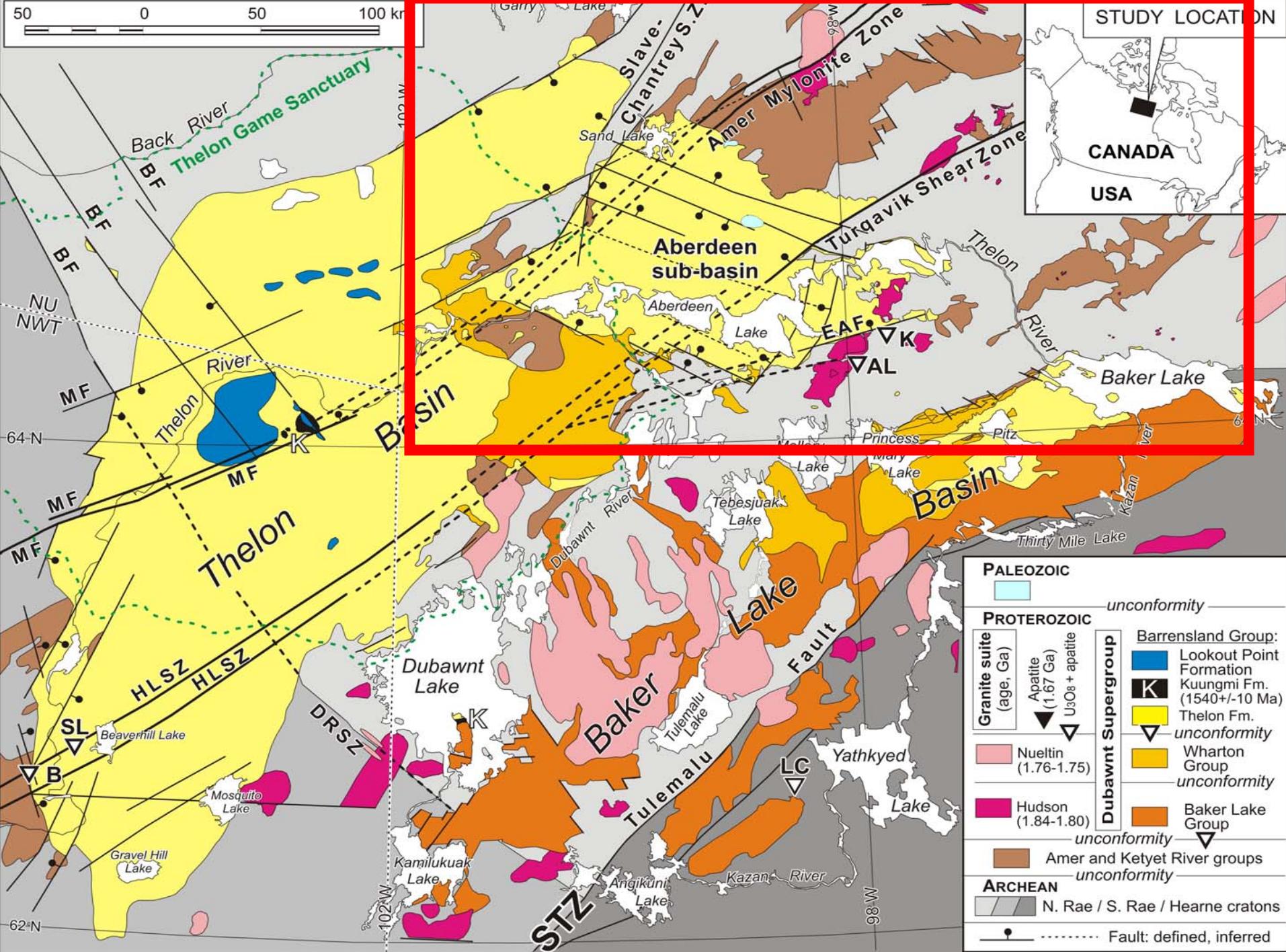
Quaternary Geophysical markers

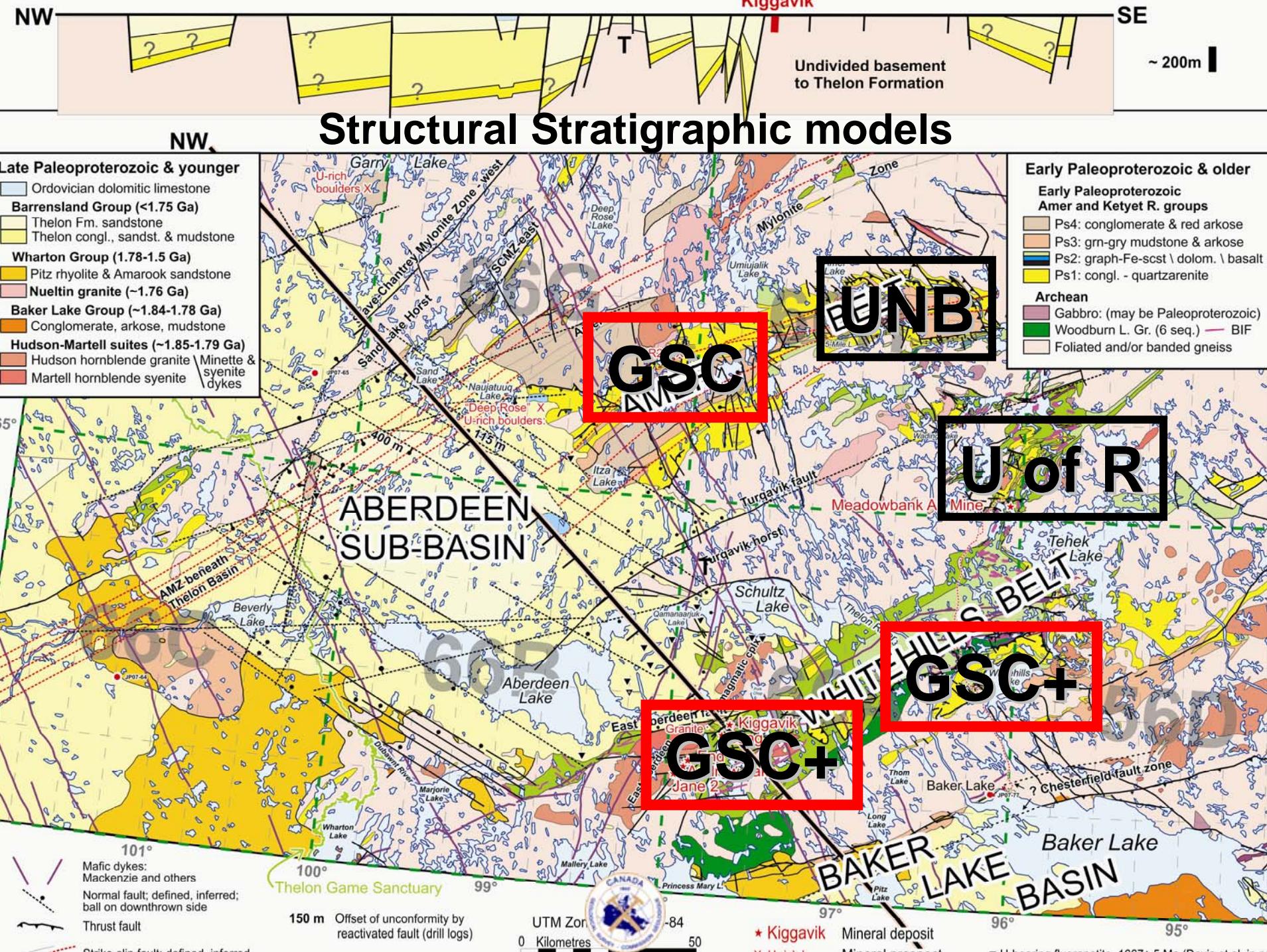


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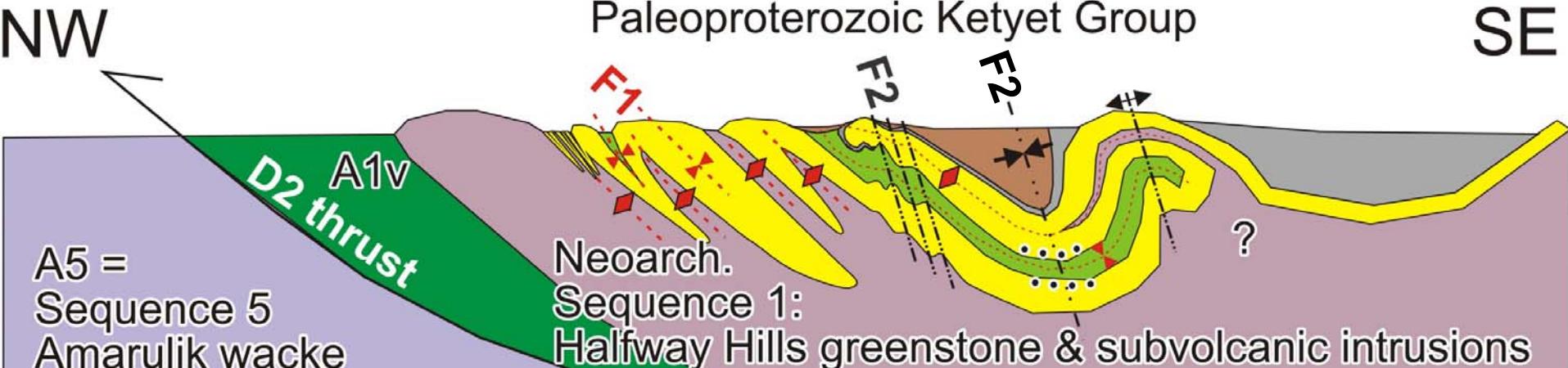
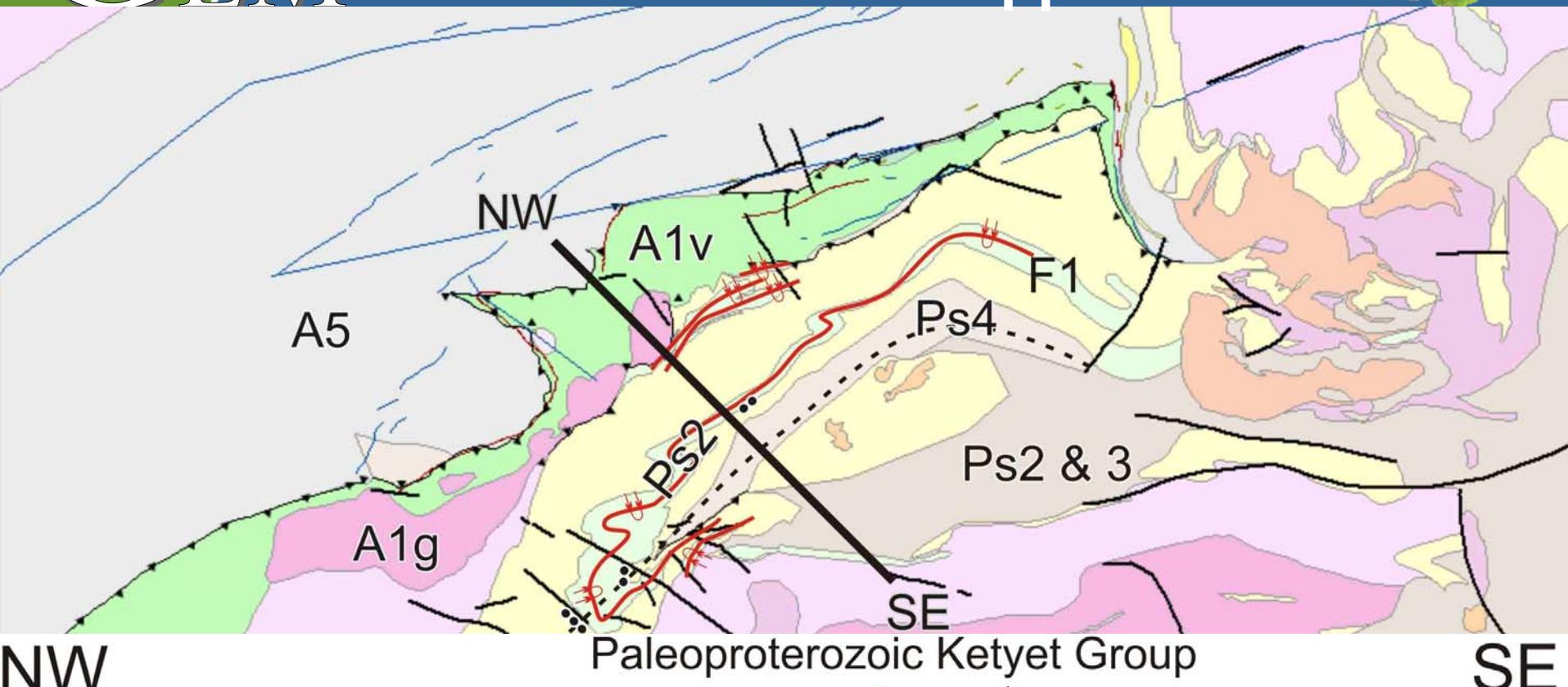
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Whitehills F2 & F3 refolds of D1 nappe

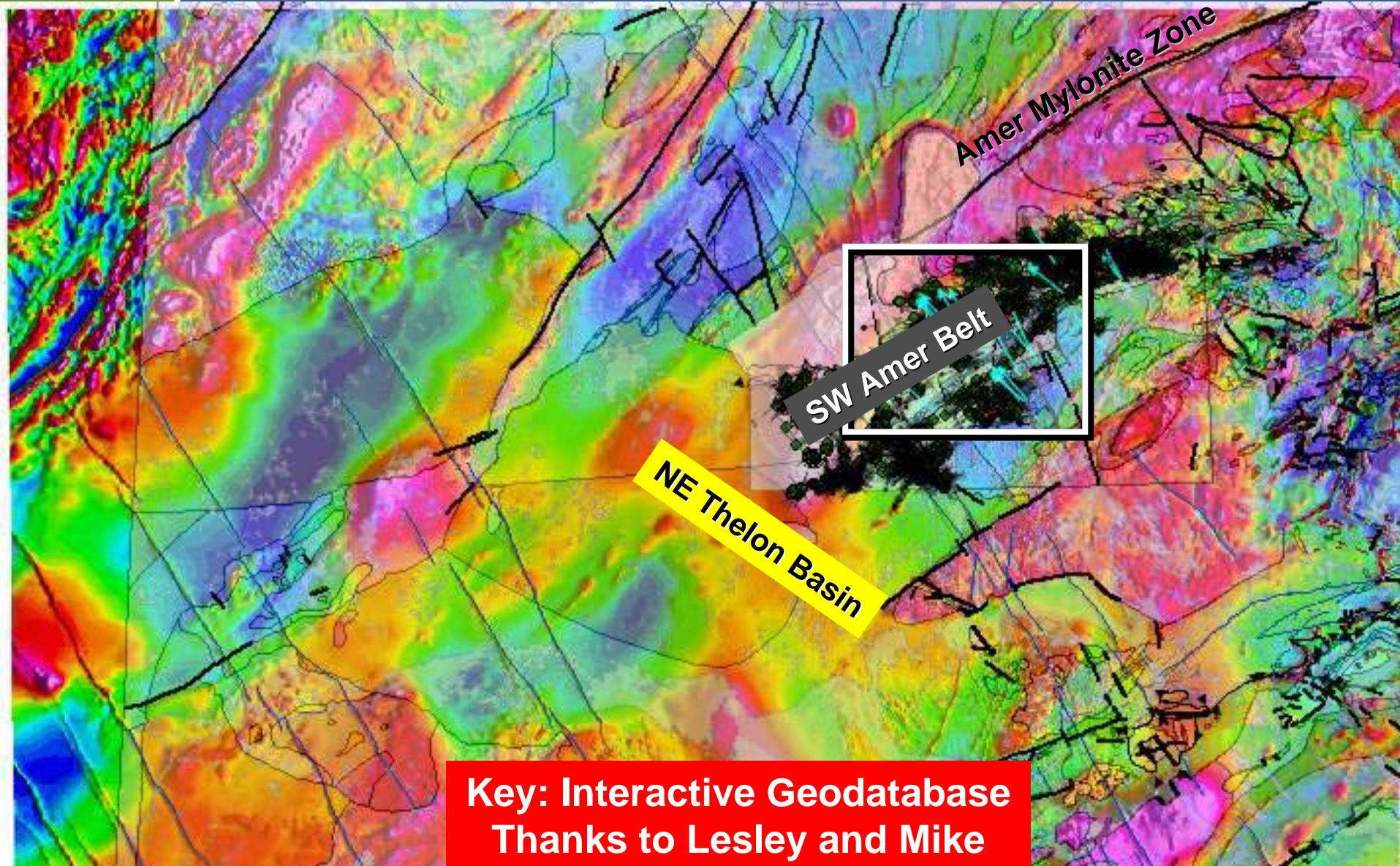
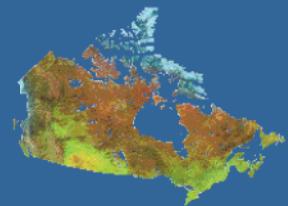


A5 =
Sequence 5
Amarulik wacke

Neoarch.
Sequence 1:
Halfway Hills greenstone & subvolcanic intrusions

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If you have conductors as well as
detailed outcrop geology and
high-resolution aeromagnetic data?



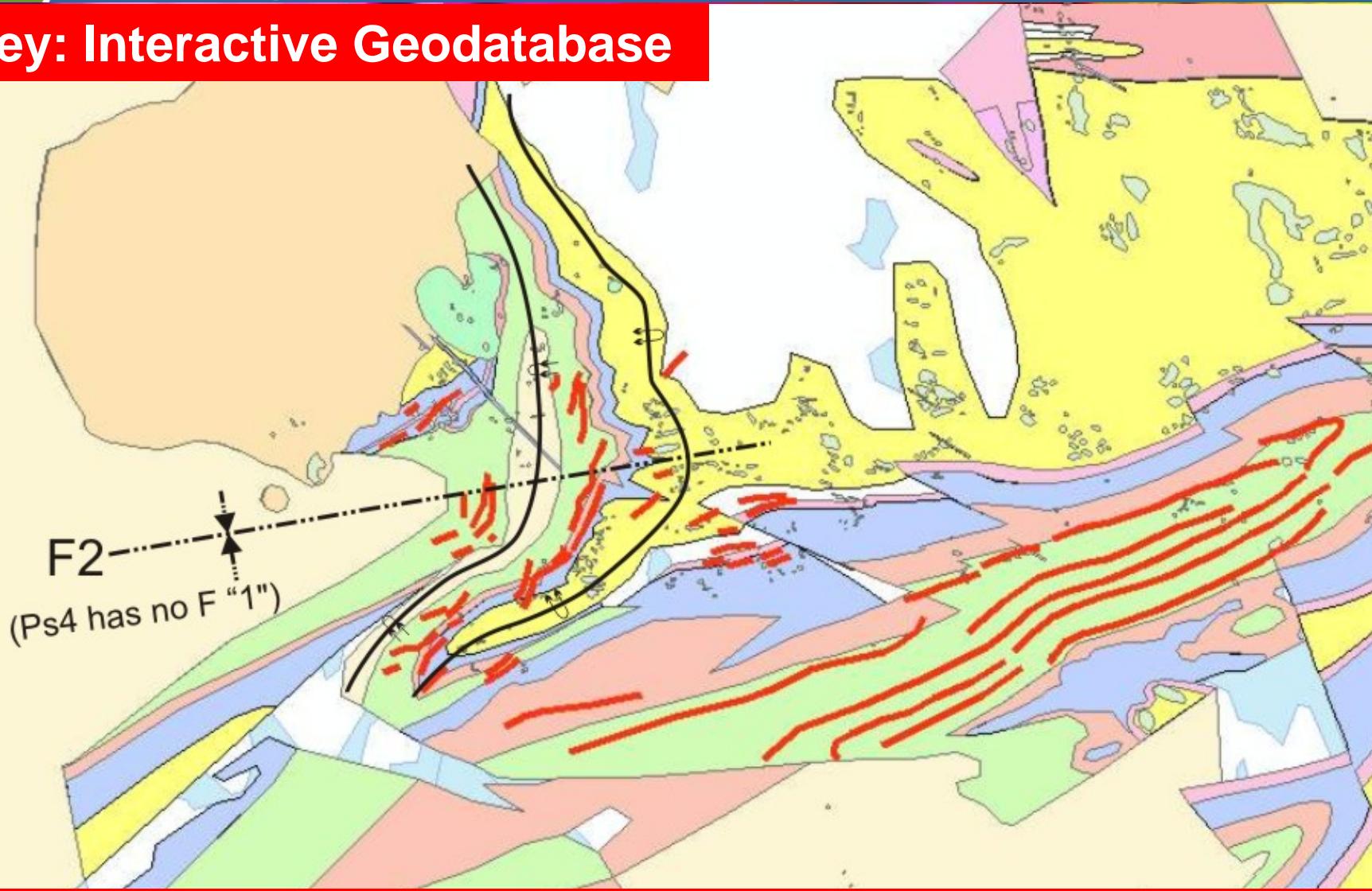
Key: Interactive Geodatabase
Thanks to Lesley and Mike

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If you have conductors as well as
detailed outcrop geology and
high-resolution aeromagnetic data?



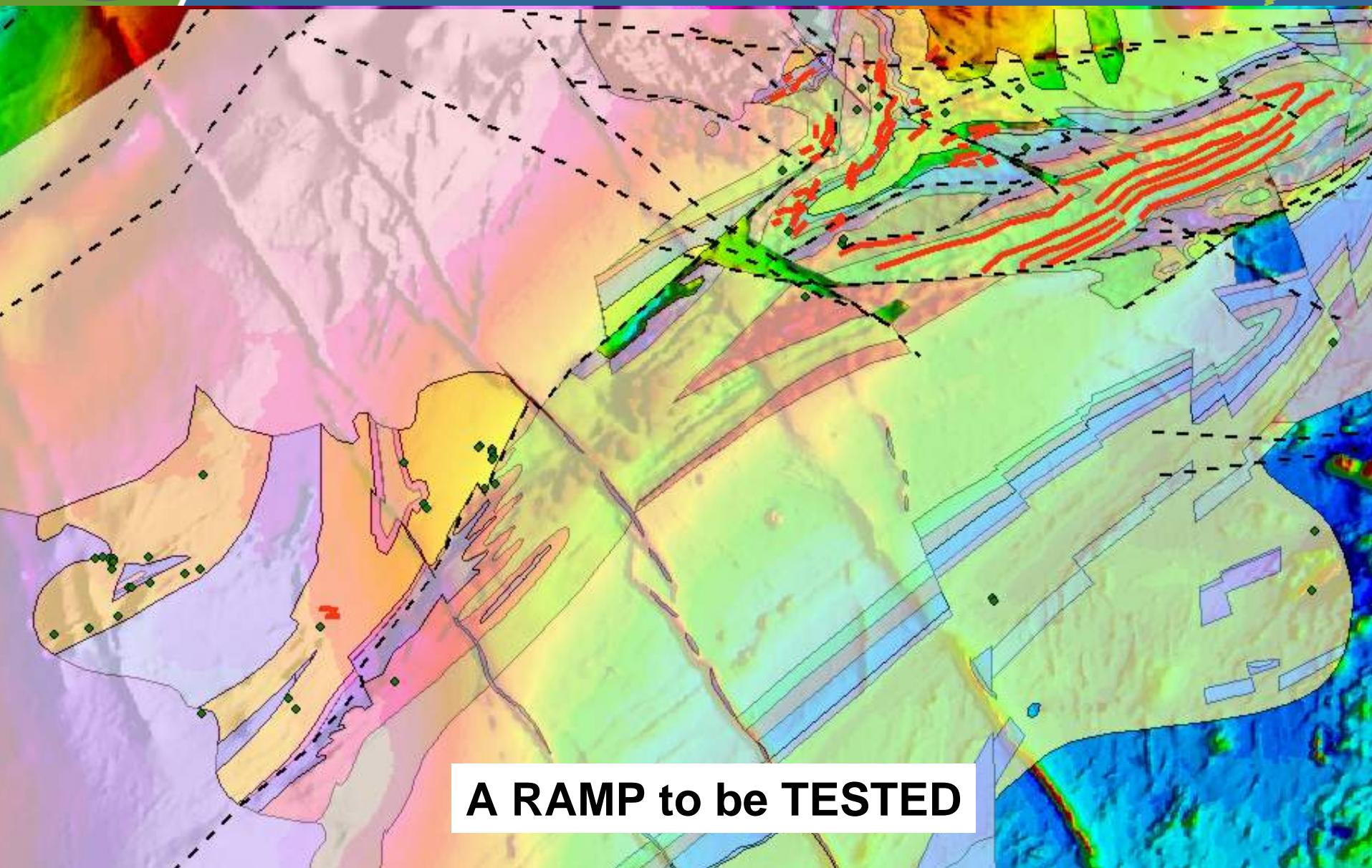
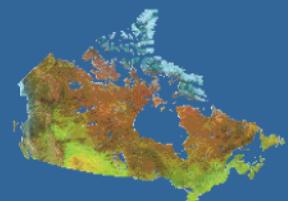
1st Key: Interactive Geodatabase



2nd Key: New conceptual knowledge (we are just beginning)

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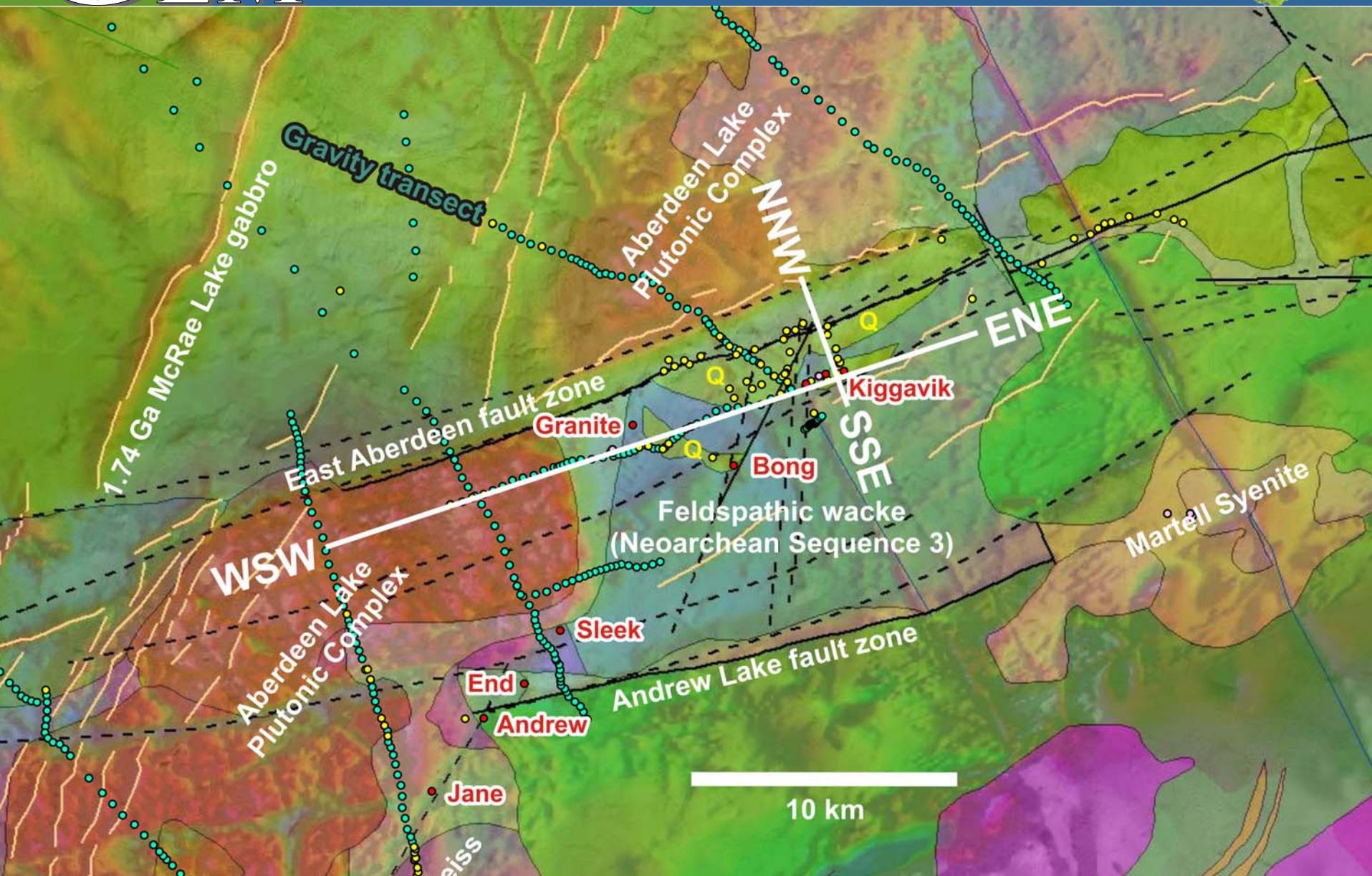
Aeromagnetic discontinuities correspond to faults in outcrop



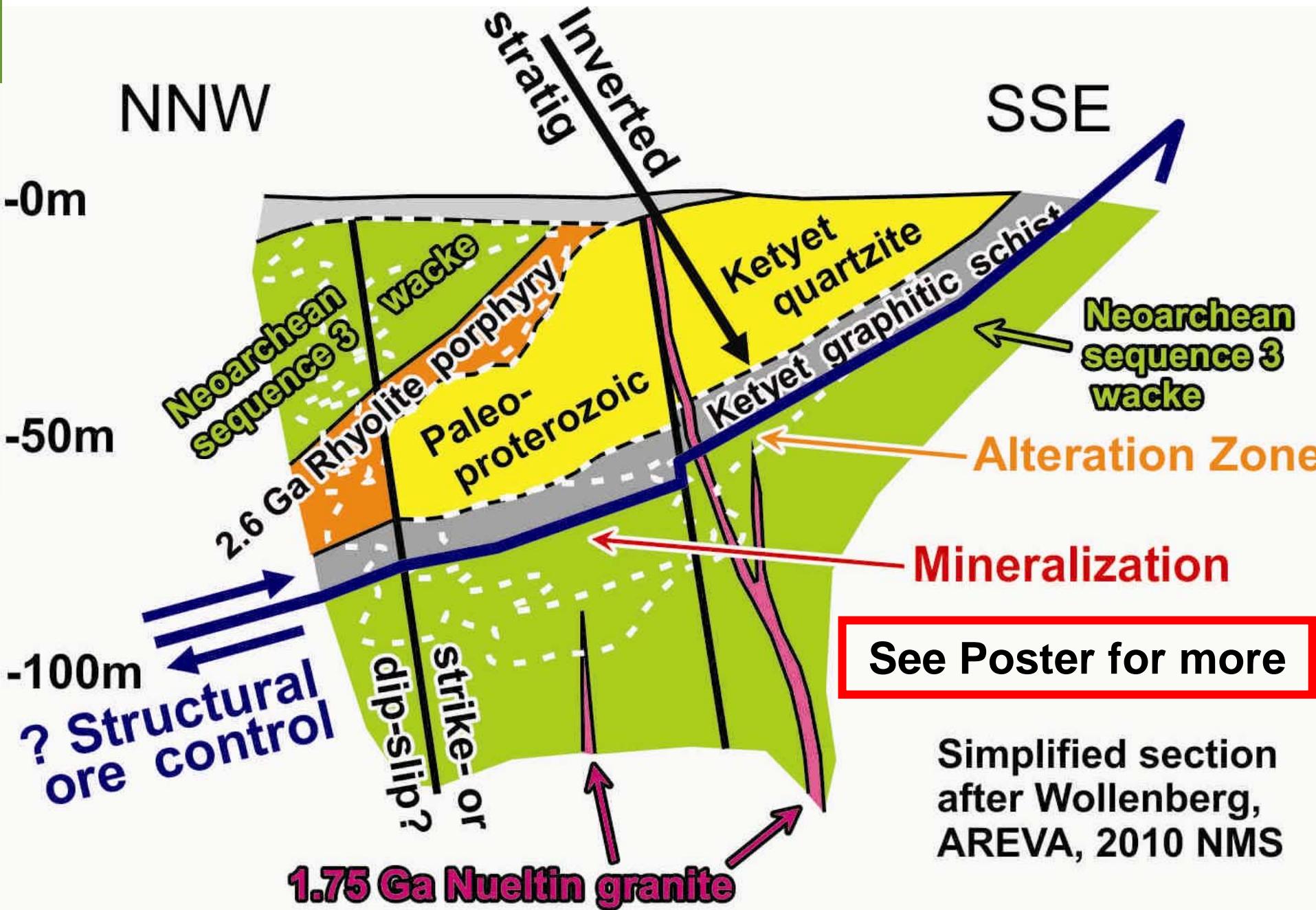
A RAMP to be TESTED

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Applying new knowledge to the Kiggavik Trend

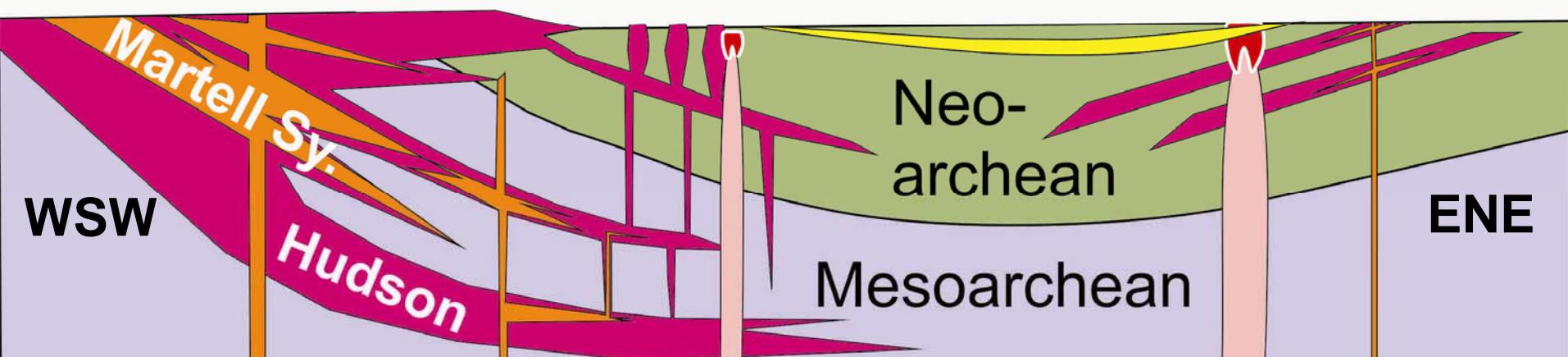
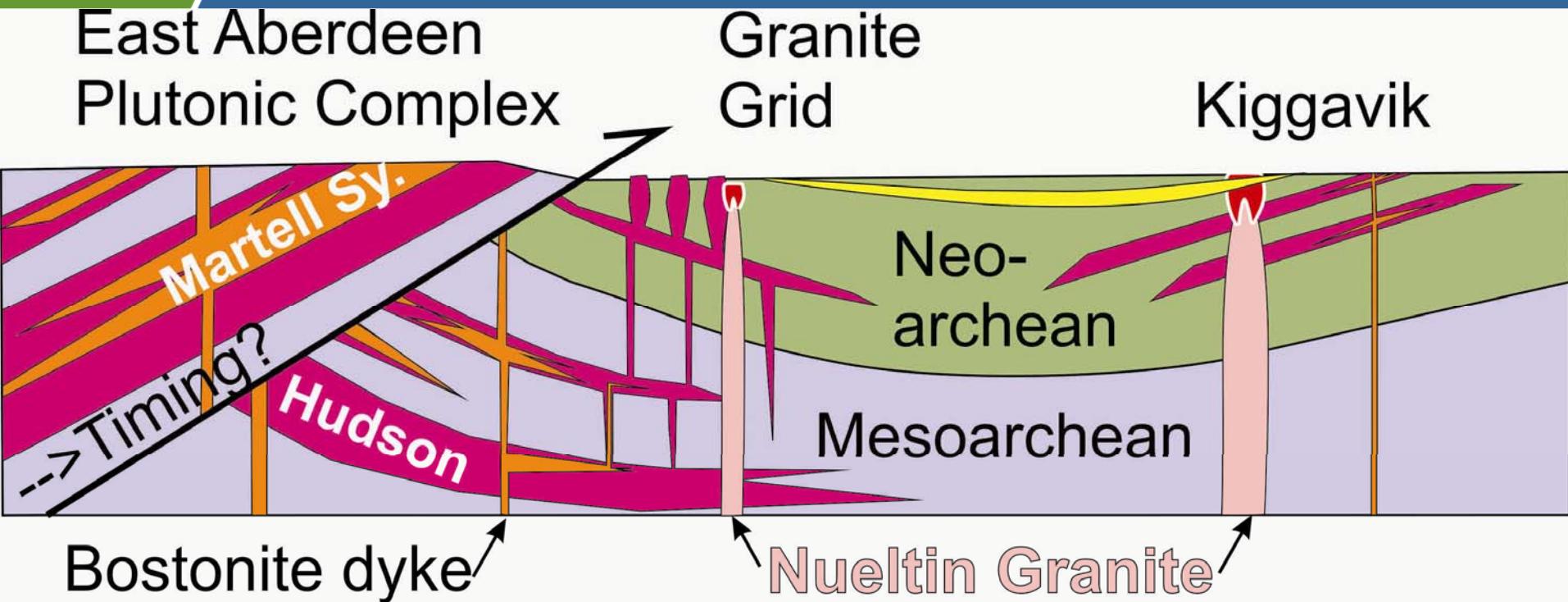
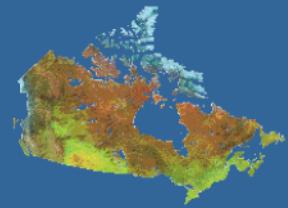


Seeing structure behind the ore and alteration

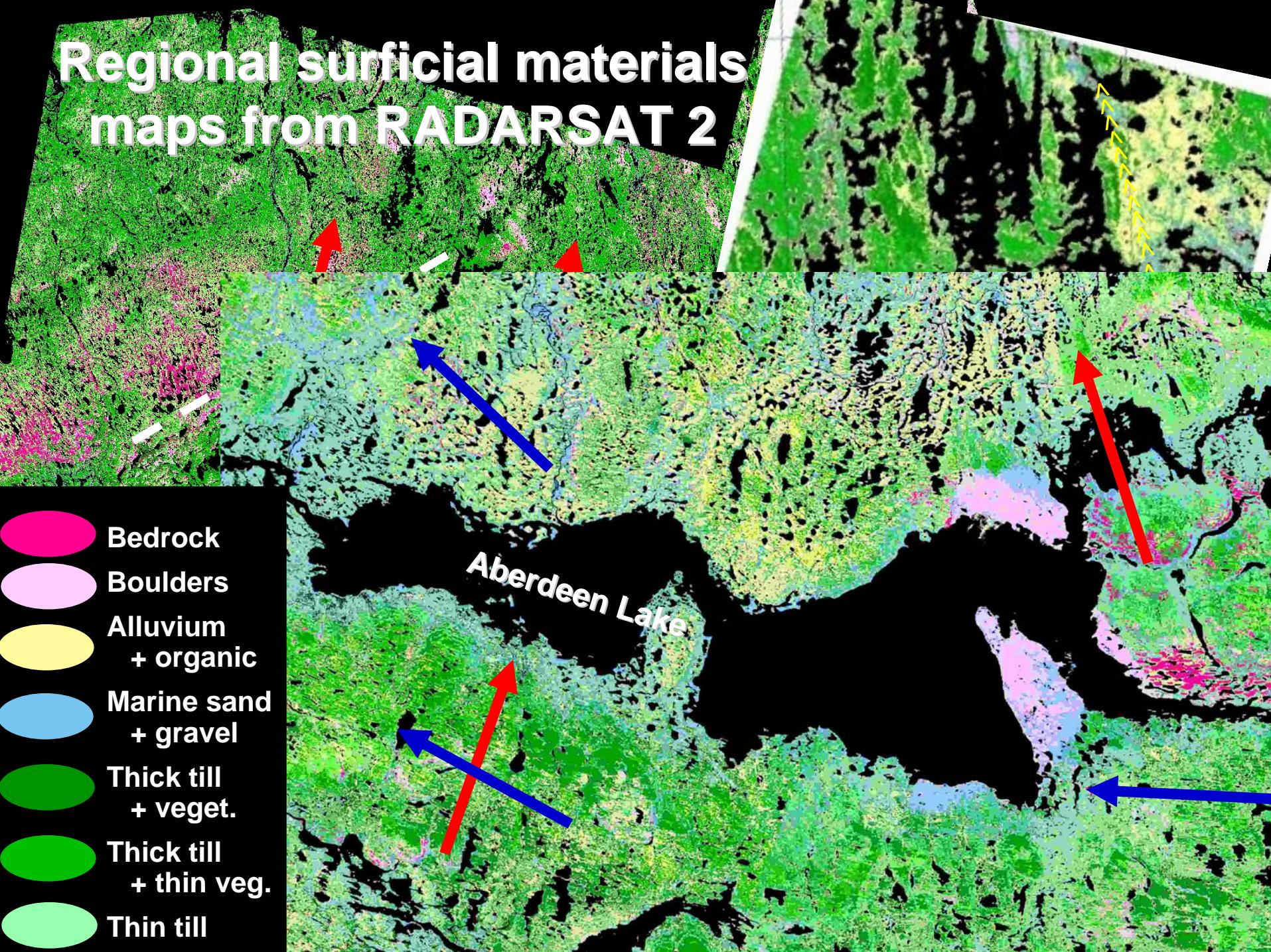


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Alternate hypotheses to test for Aberdeen Plutonic Complex

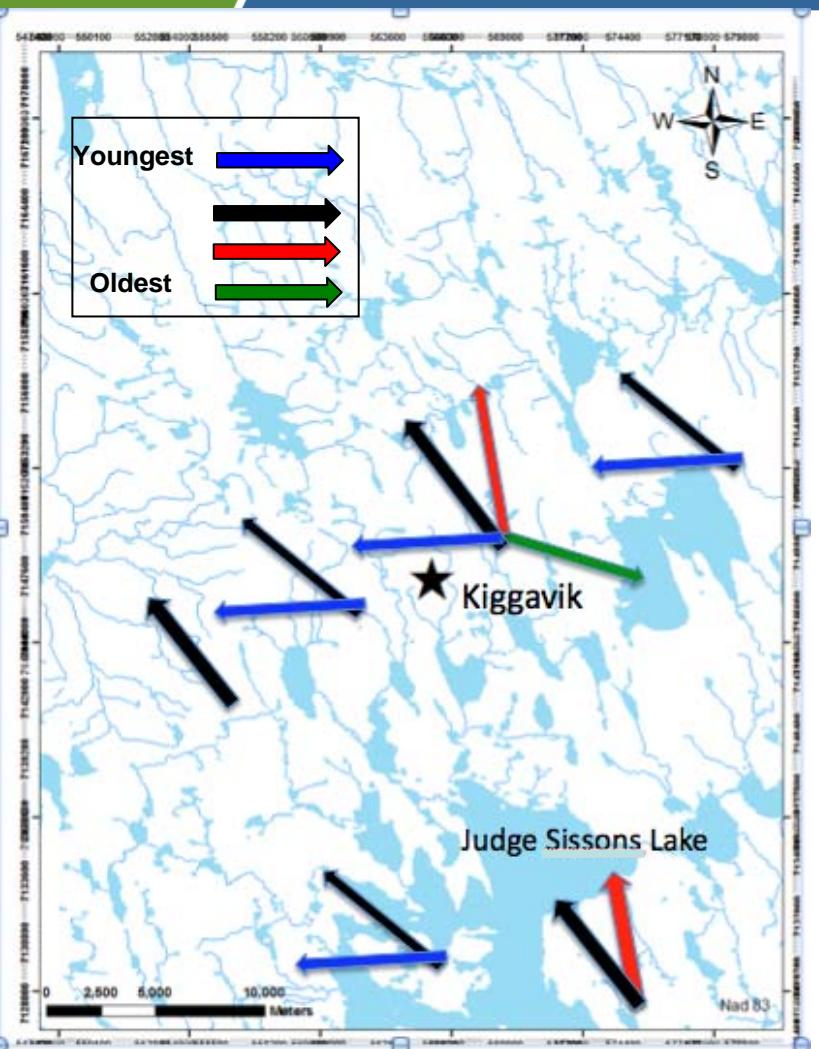
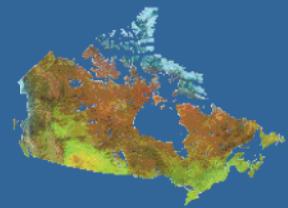


Regional surficial materials maps from RADARSAT 2



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Drift prospecting for U proof of concept: context

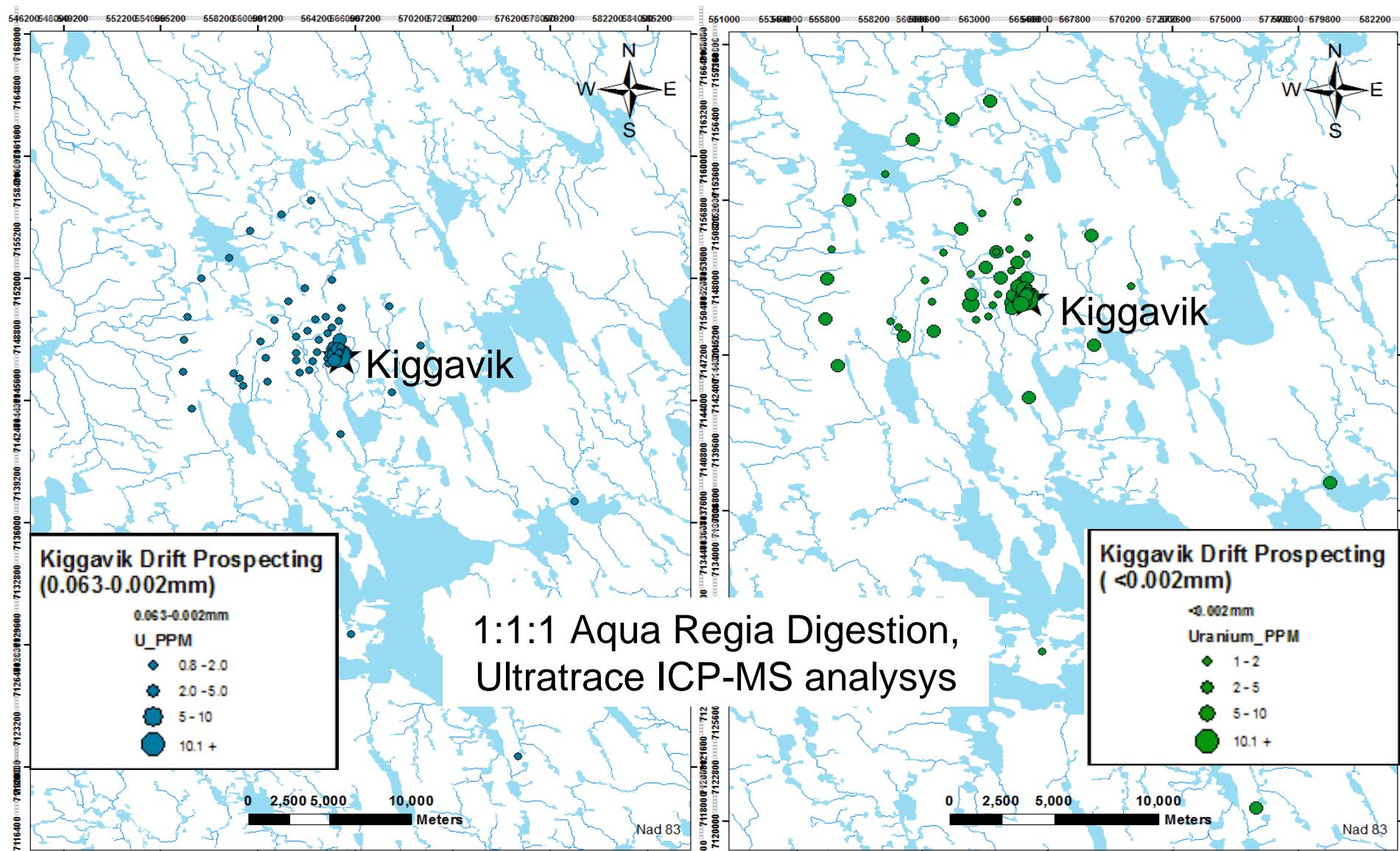
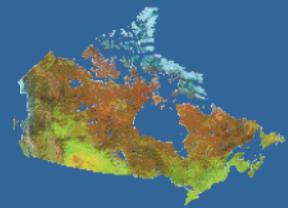


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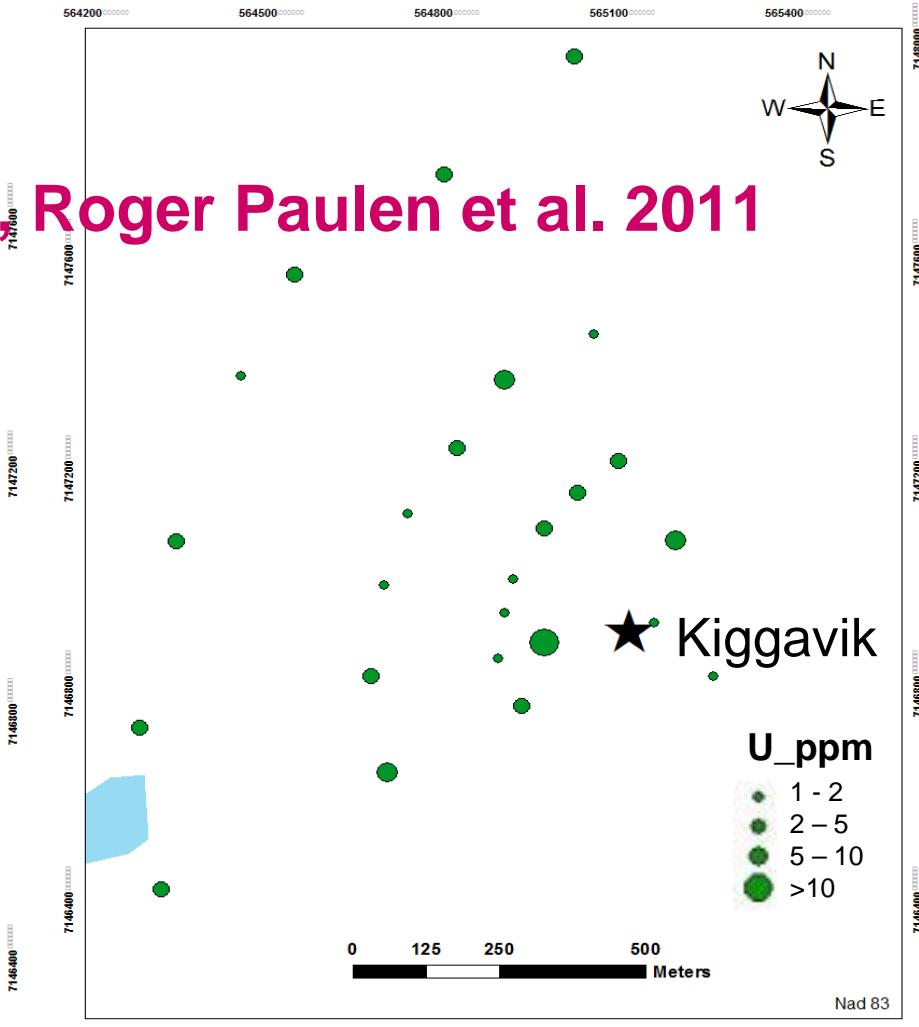
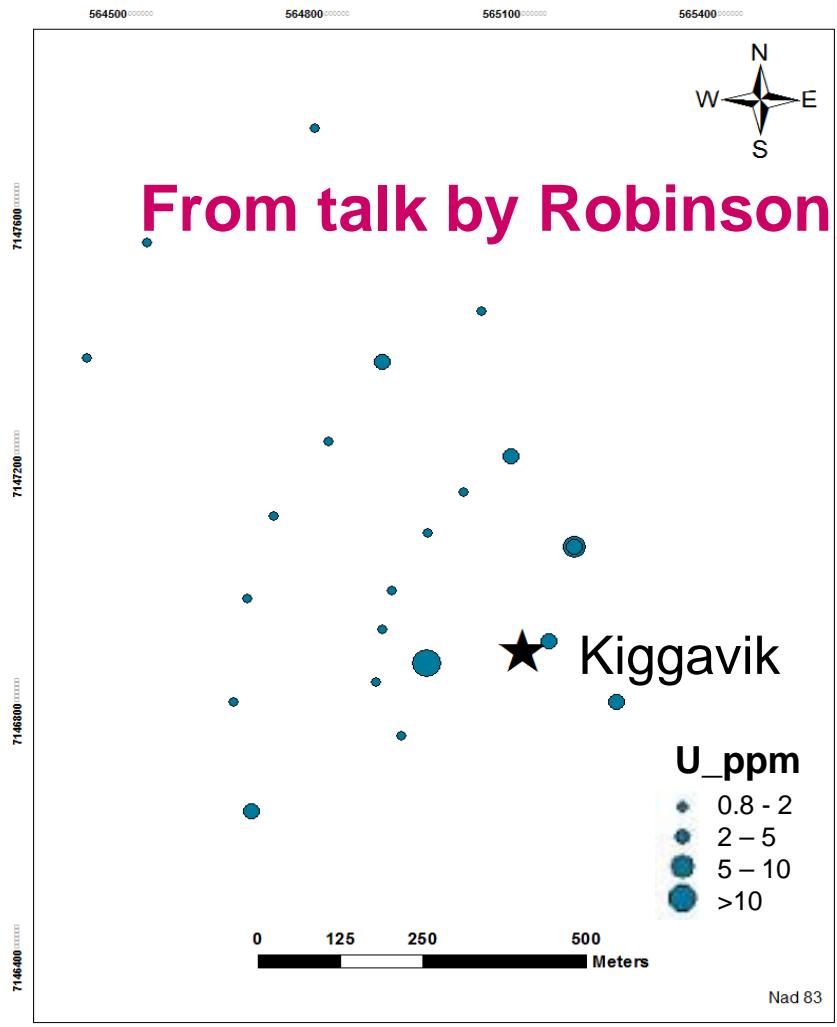
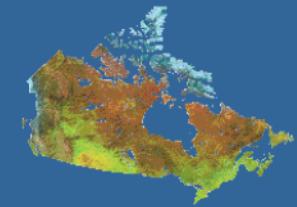
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Sand vs Clay <0.063 mm <0.002 mm Full study area grid



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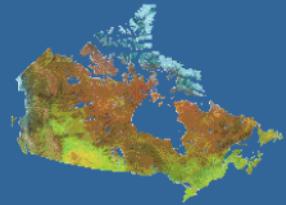
Sand vs Clay <0.063 mm <0.002 mm Detailed grid



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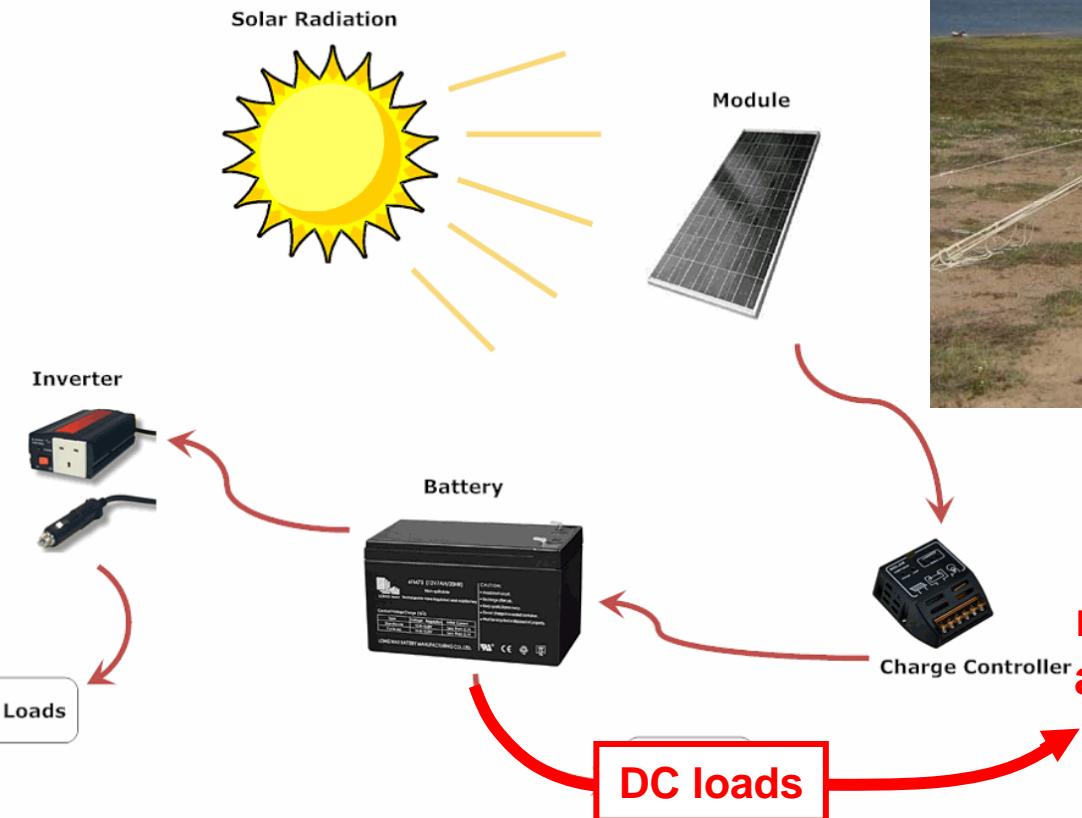
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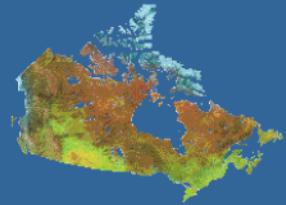


33

Most systems these days go through an inverter which results in power losses to and from AC



Our system avoids inverters, sending DC power directly via regulators that adjust the voltage and amperage for each appliance being charged – more efficient!



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What can it power?

Device	Volts	Amps	Hours
HP iPAQ (PDA)	5	1.5	2
Handheld GETAC	5	1.5	2
iPhone / Blackberry	5	1	2
Iridium Sat. Phone	6	0.85	2
G-SAT GPS	5	1	2
Laptop (any model)	15-23	3-7	3
Mobile phone,	5-9	1-2	2
RS-230 Spectrometer	9	3	3

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- One more month of field work:
 - test hypotheses, models, solve problems
- Complete and write up:
 - 6 theses and geology-geophysics synthesis
 - Multi-university GEM-NSERC-AREVA CRD on reactivated faults & U; use this framework as context.
 - Transferred interim geodatabase to Consortium; when complete will publish along with exploration models.



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Industry Partners:

AREVA, Bayswater U, Cameco, Forum U, Titan U, Mega-U,
NTI, U-North, Western U

Academic Partner and Contributors:

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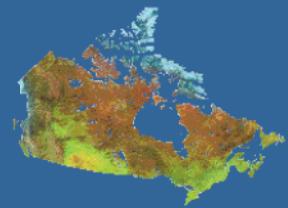
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Thomas Riegler, AREVA Resources Canada, on recumbent F1 mullions, Kiggavik



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- See full references in notes box below.