Correlation of Proterozoic sequences from Greenland to Manitoba: implications for metallogeny

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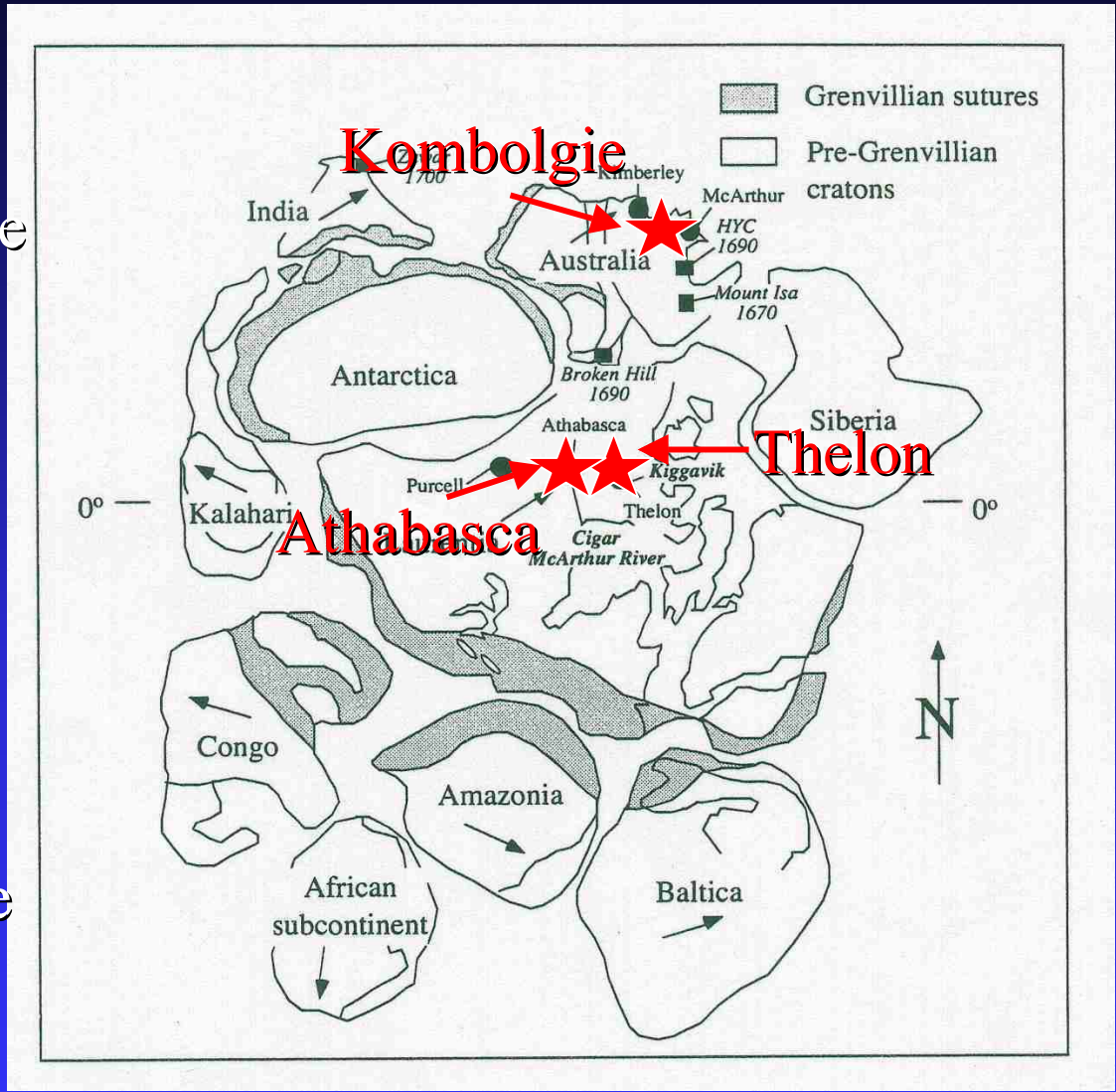
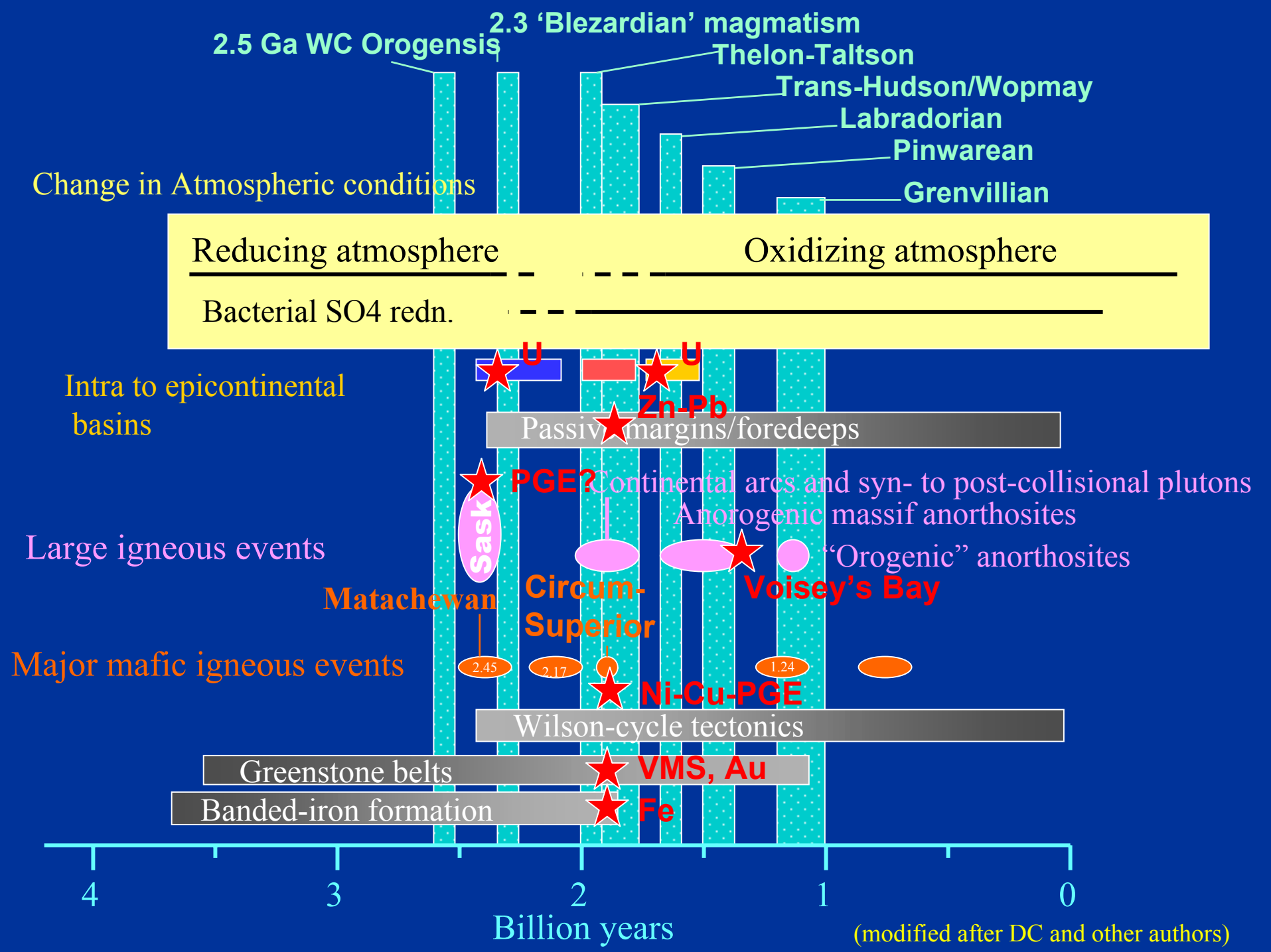
Outline

- Overview of Paleoproterozoic Sequences
- Revised distribution based on new compilation
- Revised regional stratigraphic and metallogenic correlation for mainland Churchill
- Links to areas outside mainland Churchill

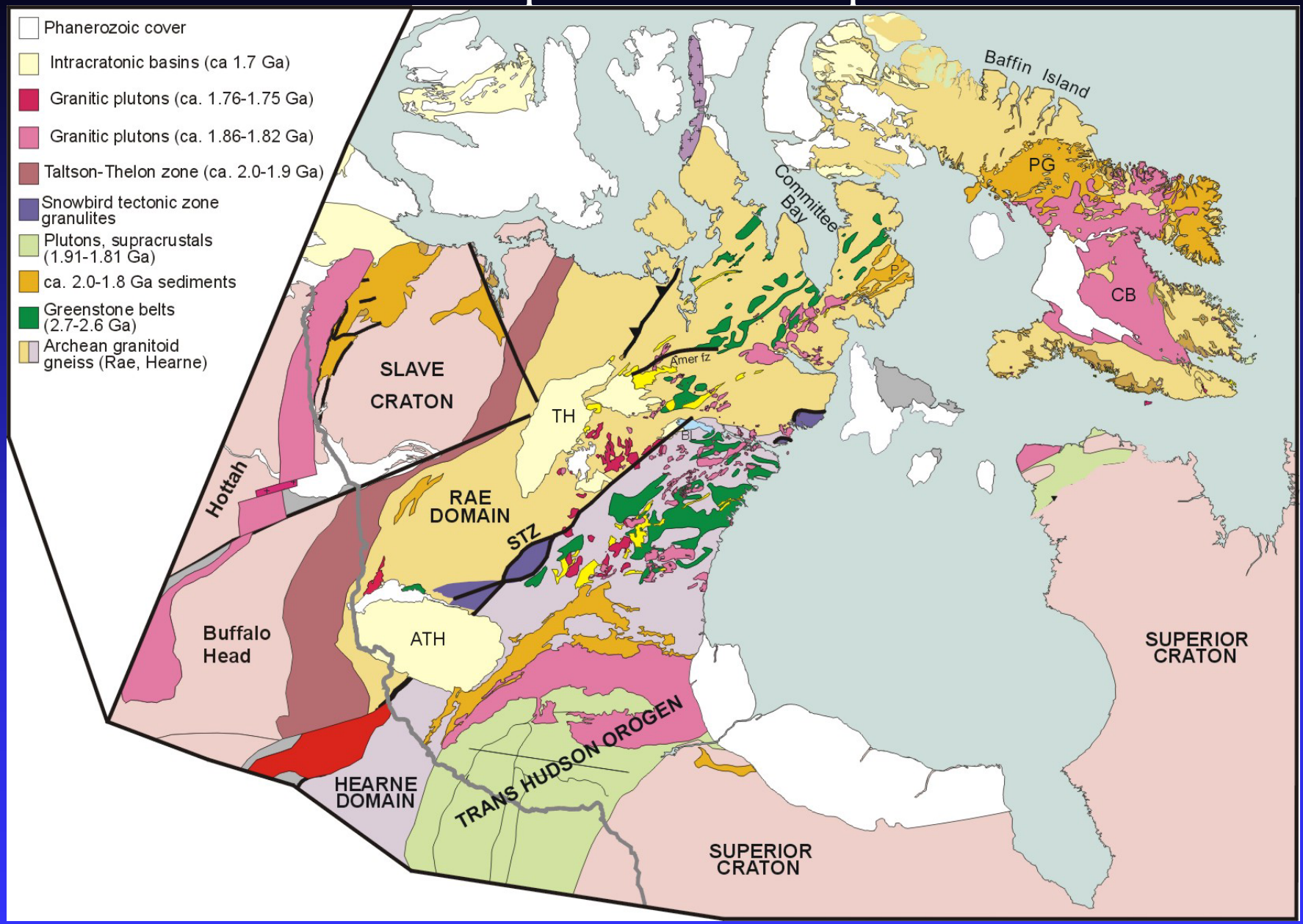
Global Paleogeographic Context

- pre-Rodinia reconstructions typically place Australia somewhere off the west or southwest side of Laurentia- itself cored by the Churchill province
- One key metallogenic-stratigraphic link: the ca. 1780-1300 Ma Thelon, Athabasca and Kombolgie intracontinental basins and associated U deposits




2.5 Ga WC Orogensis
2.3 'Blezardian' magmatism
Thelon-Taltson
Trans-Hudson/Wopmay
Labradorian
Pinwarean
Grenvillian
Change in Atmospheric conditions
Reducing atmosphere
Oxidizing atmosphere
Bacterial SO4 redn.
Intra to epicontinental basins
U
U
Zn-Pb
Passive margins/foredeeps
PGE?
Sask
Continental arcs and syn- to post-collisional plutons
Anorogenic massif anorthosites
Large igneous events
"Orogenic" anorthosites
Matachewan
Circum-Superior
Voisey's Bay
Major mafic igneous events
2.45
2.17
1.24
Ni-Cu-PGE
Wilson-cycle tectonics
Greenstone belts
VMS, Au
Banded-iron formation
Fe
4
3
2
1
0
Billion years
(modified after DC and other authors)

Distribution of Paleoproterozoic sequences in the WCP



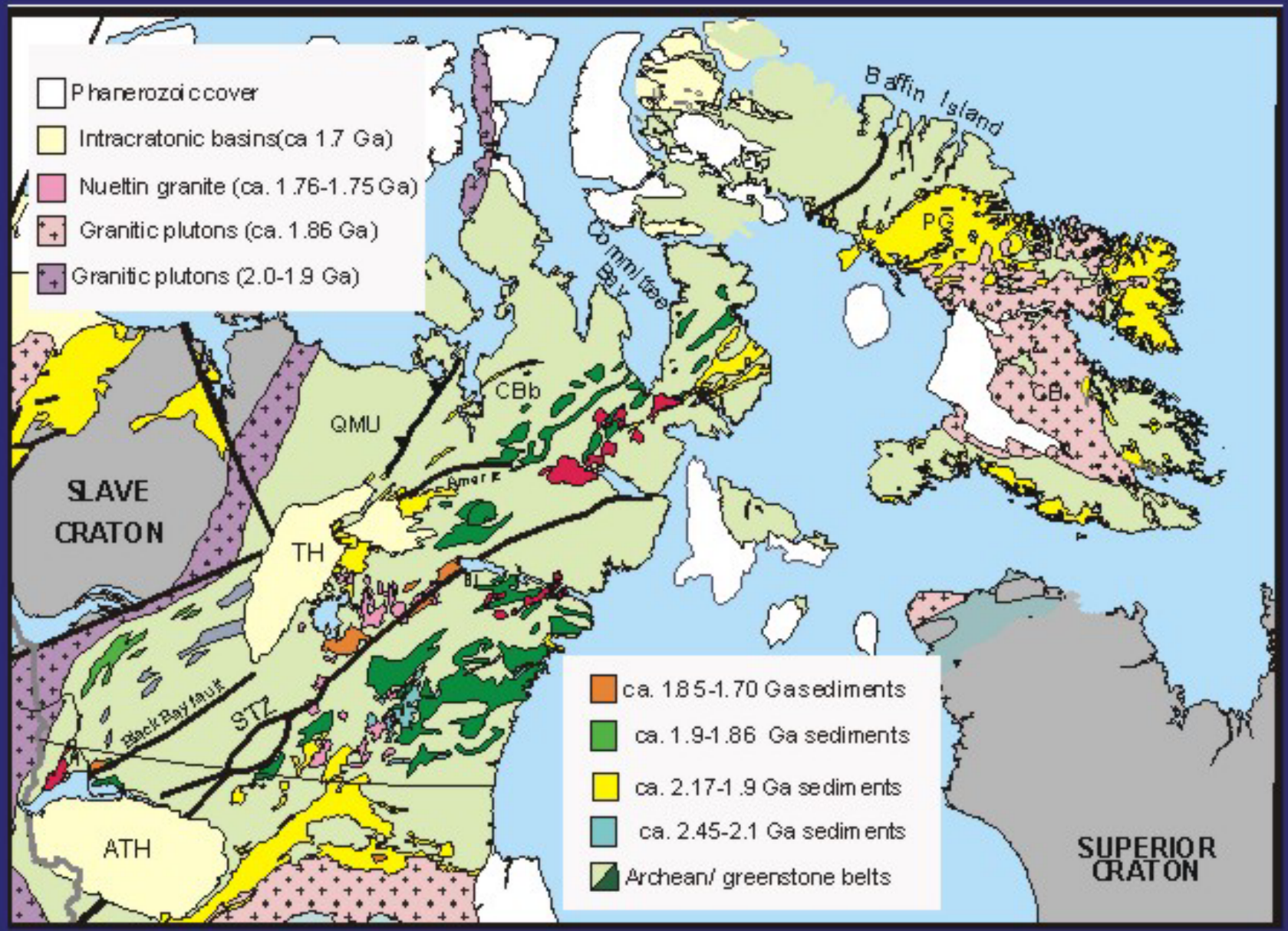
Outstanding Questions

- the extent and nature of Archean versus Paleoproterozoic supracrustal sequences?

- the regional extent of 2.45-2.1 Ga, 2.17 - 1.9 Ga, 1.85-1.7 Ga tectonostratigraphic sequences and 2.45, 2.17, and 1.88 Ga mafic magmatic events?

- All of these influence the localization and distribution of mineral deposits

Redesignation of former Archean or Unknown sequences



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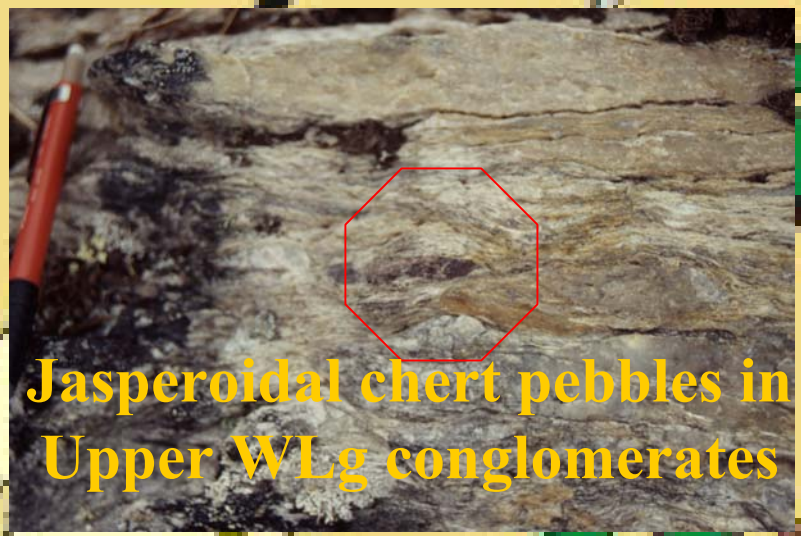
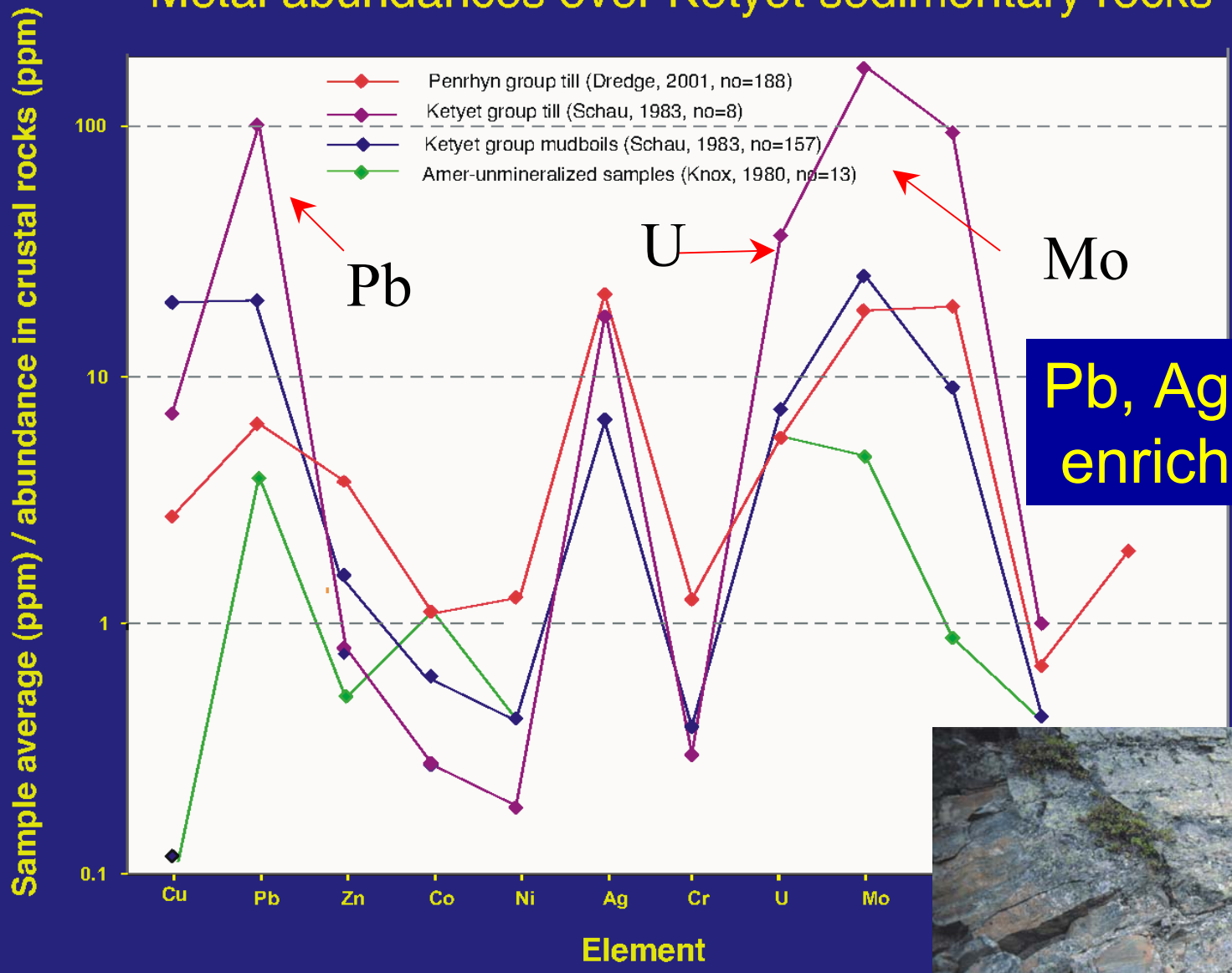


Jasperoidal chert pebbles in Upper WLg conglomerates

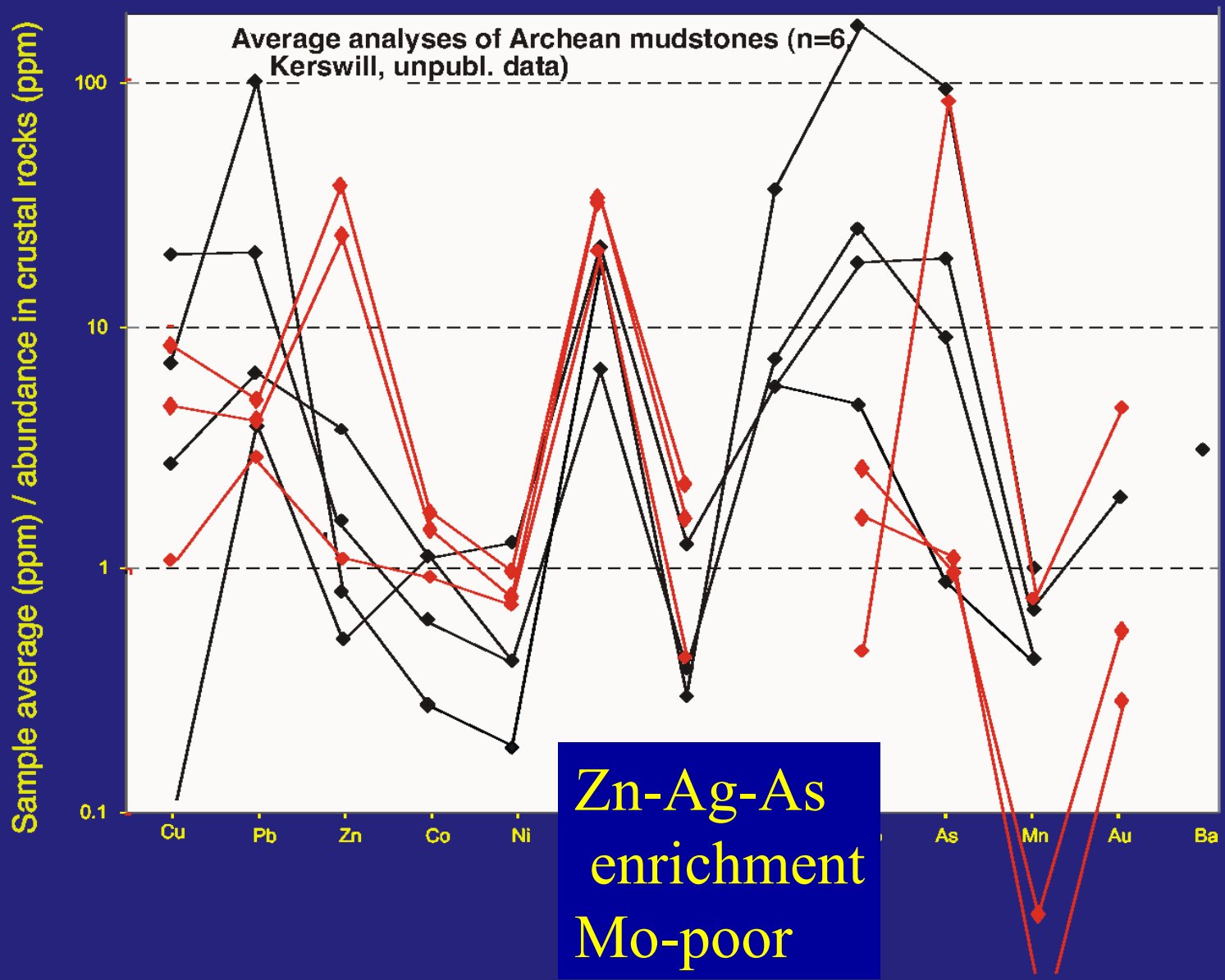
Pink ripple marked quartzites and pink quartzite boulders in entrained conglomerates

Metal abundances over Ketyet sedimentary rocks



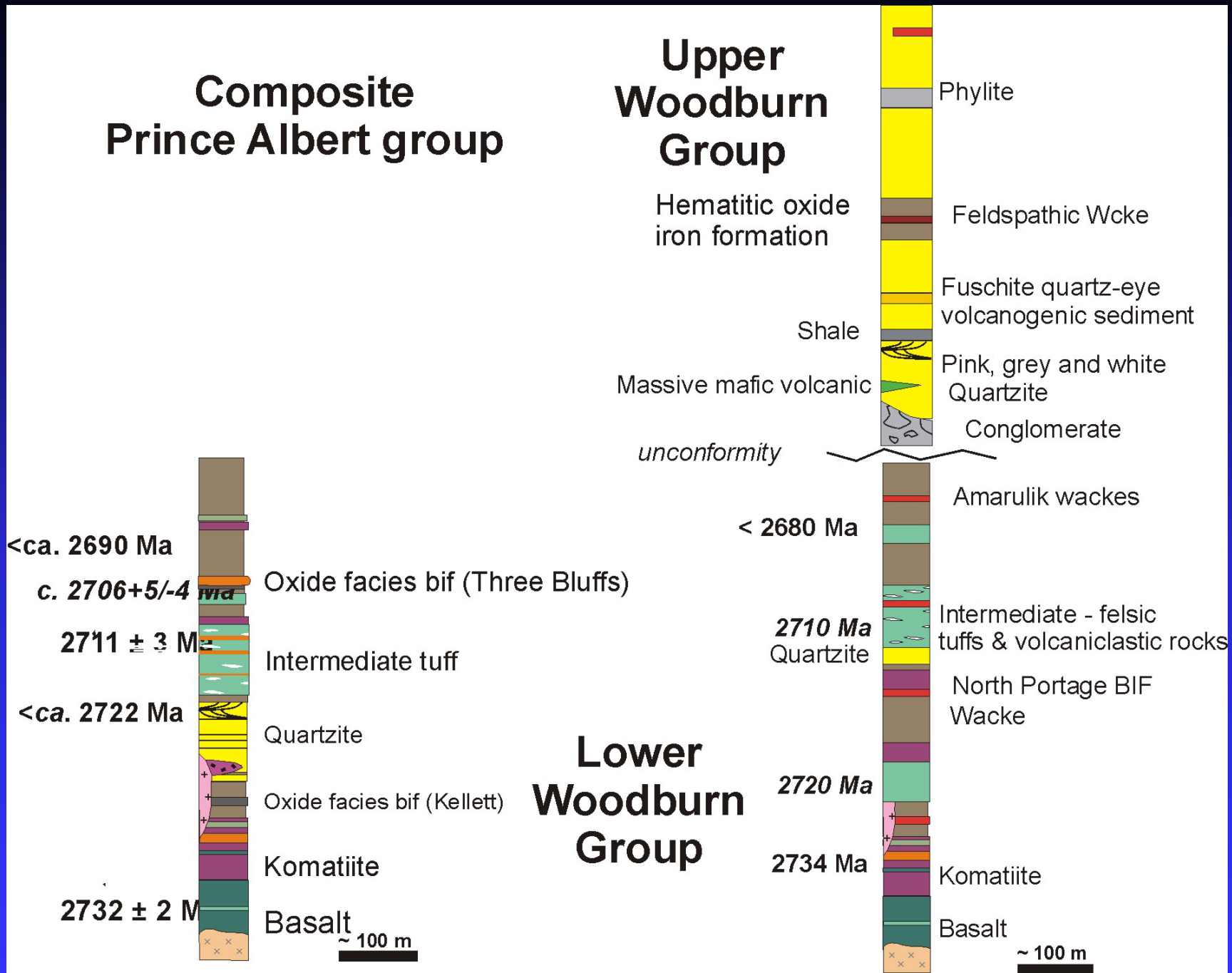
Pb, Ag, U, Mo enrichment

Comparative metal endowment versus Archean rocks



Zn-Ag-As enrichment

Mo-poor


Composite
Prince Albert group
<ca. 2690 Ma
c. 2706+5/-4 Ma
2711 ± 3 Ma
<ca. 2722 Ma
2732 ± 2 Ma
Oxide facies bif (Three Bluffs)
Intermediate tuff
Quartzite
Oxide facies bif (Kellett)
Komatiite
Basalt
~ 100 m
Upper
Woodburn
Group
Hematitic oxide
iron formation
Phylite
Feldspathic Wcke
Fuschite quartz-eye
volcanogenic sediment
Shale
Pink, grey and white
Quartzite
Massive mafic volcanic
Conglomerate
unconformity
Amarulik wackes
< 2680 Ma
2710 Ma
Quartzite
Intermediate - felsic
tuffs & volcaniclastic rocks
North Portage BIF
Wacke
2720 Ma
2734 Ma
Komatiite
Basalt
~ 100 m
Lower
Woodburn
Group

Composite Prince Albert group

Upper Woodburn Group

Phylite

eldspathic Wcke

schite quartz-eye
lcanogenic sediment

Geochemistry of upper Wg volcanics matches that of Proterozoic Ketyet R. g. volcanics

<ca. 2690 Ma

c. 2706+5/-4 Ma

2711 ± 3 Ma

<ca. 2722 Ma

2732 ± 2 Ma

Oxide facies b

Intermediate tu

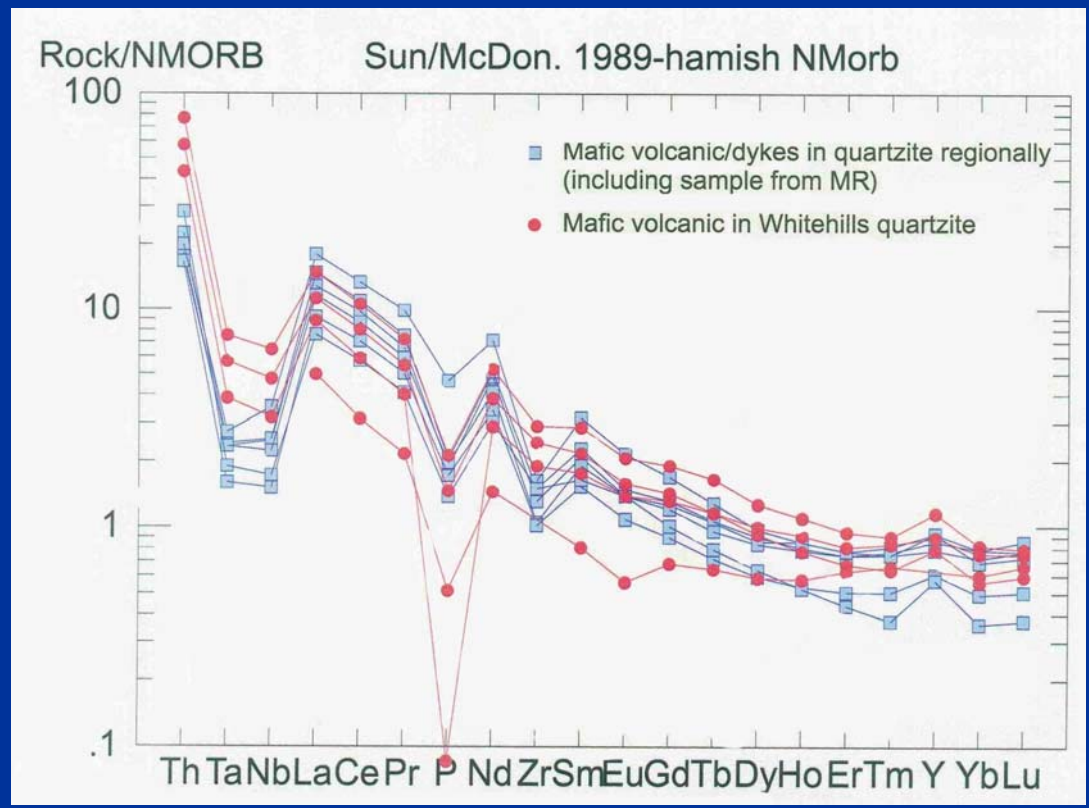
Quartzite

Oxide facies bif (

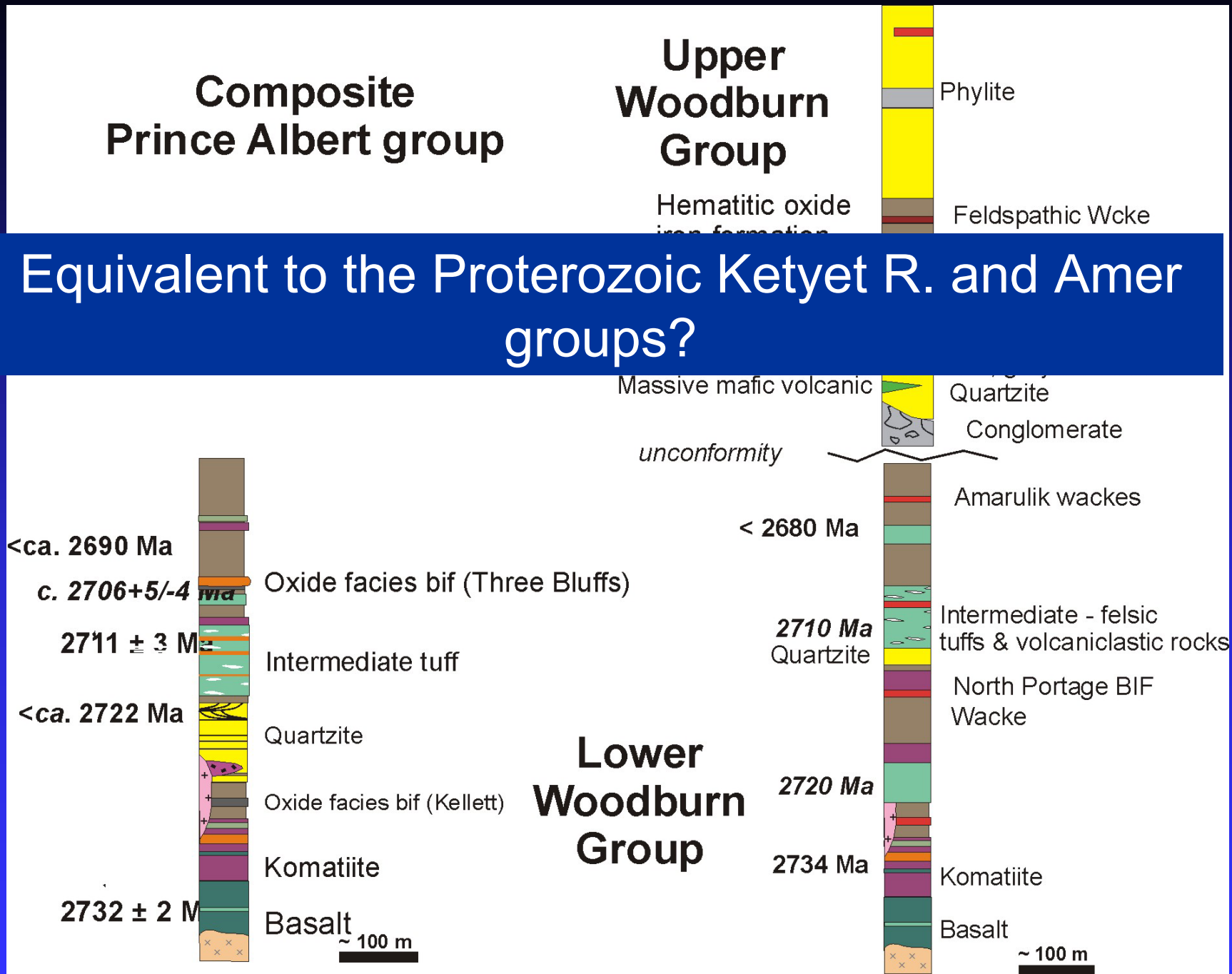
Komatiite

Basalt

~ 100 m

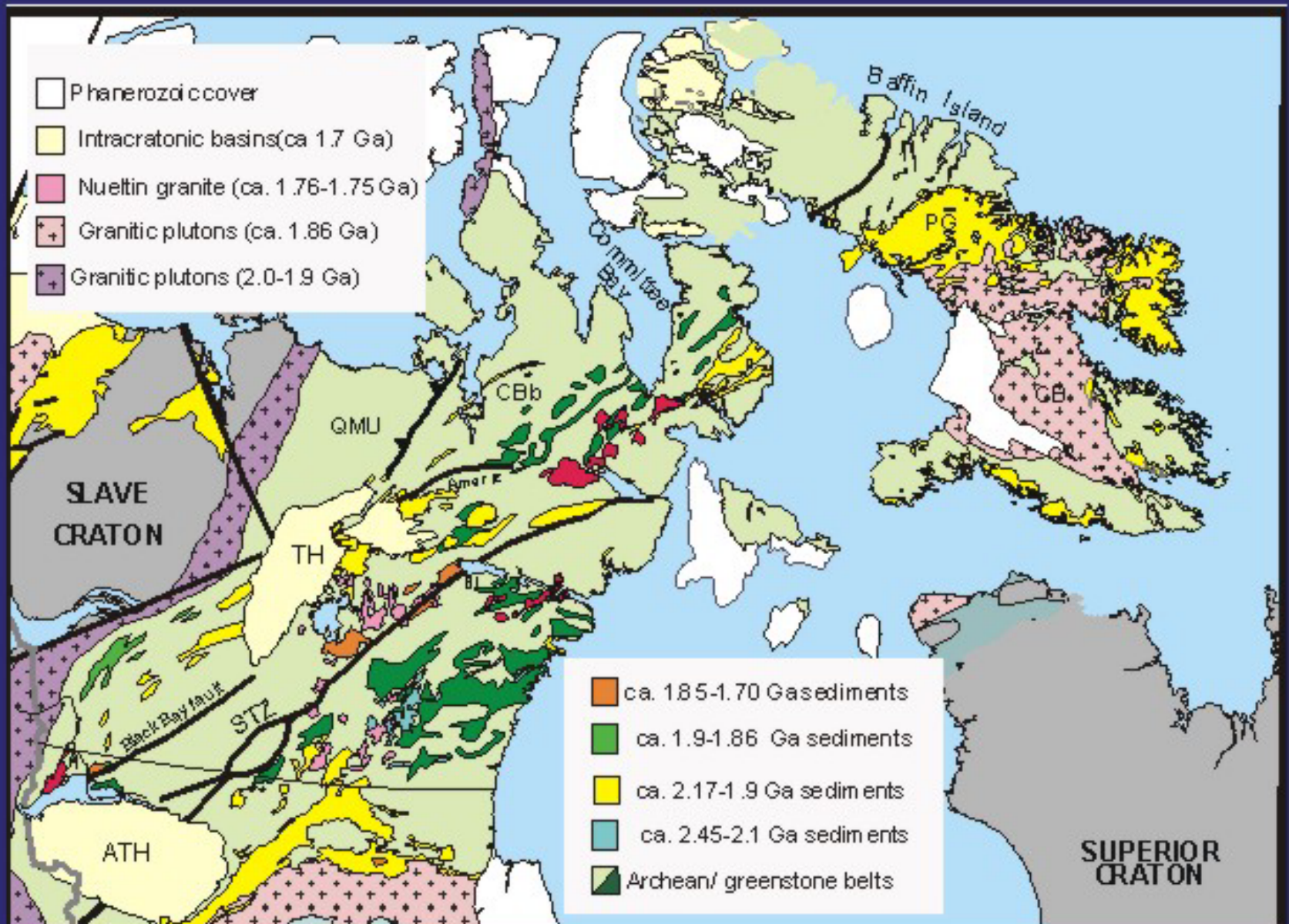


~ 100 m

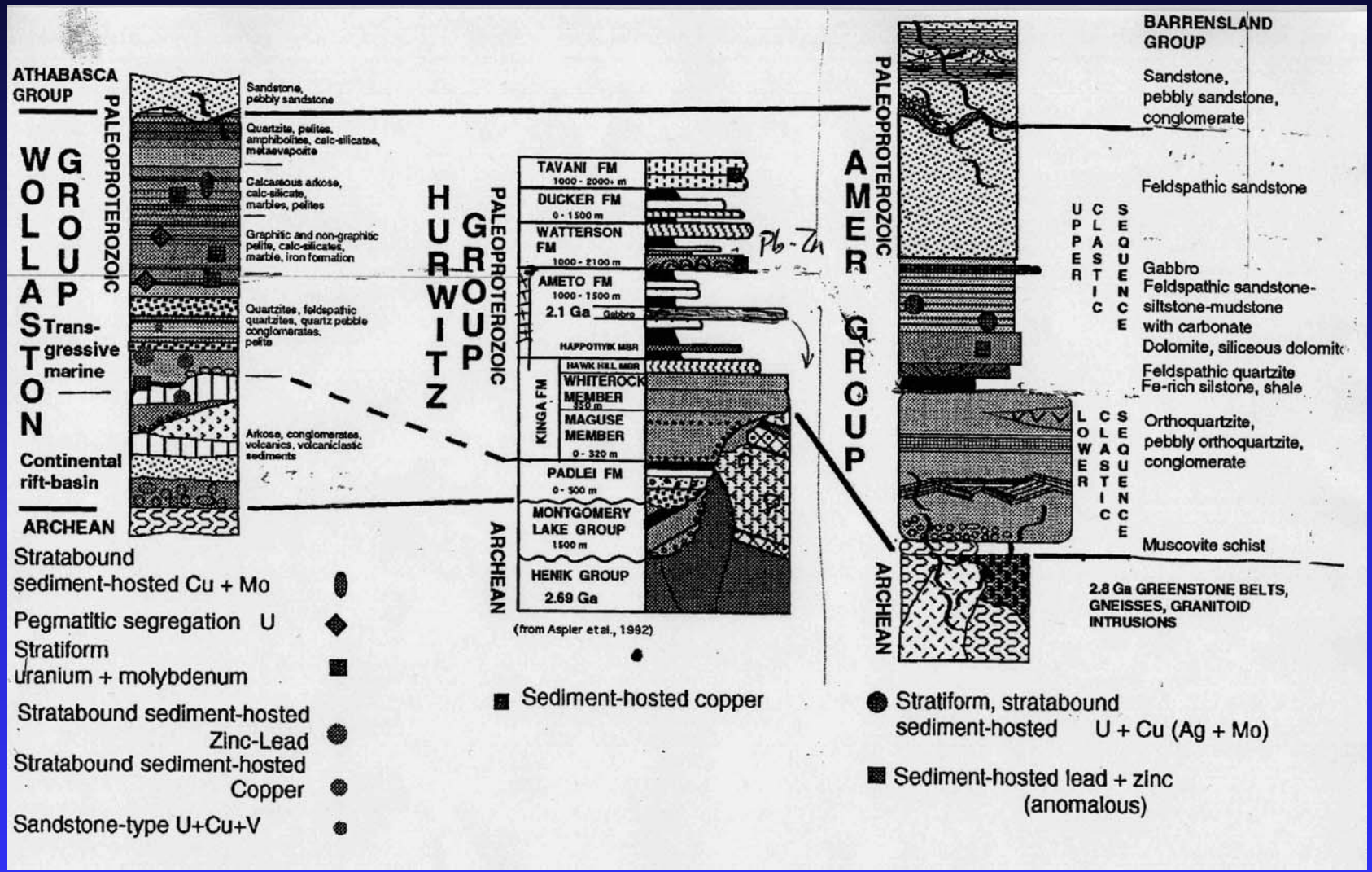


Equivalent to the Proterozoic Ketyet R. and Amer groups?

Revised distribution

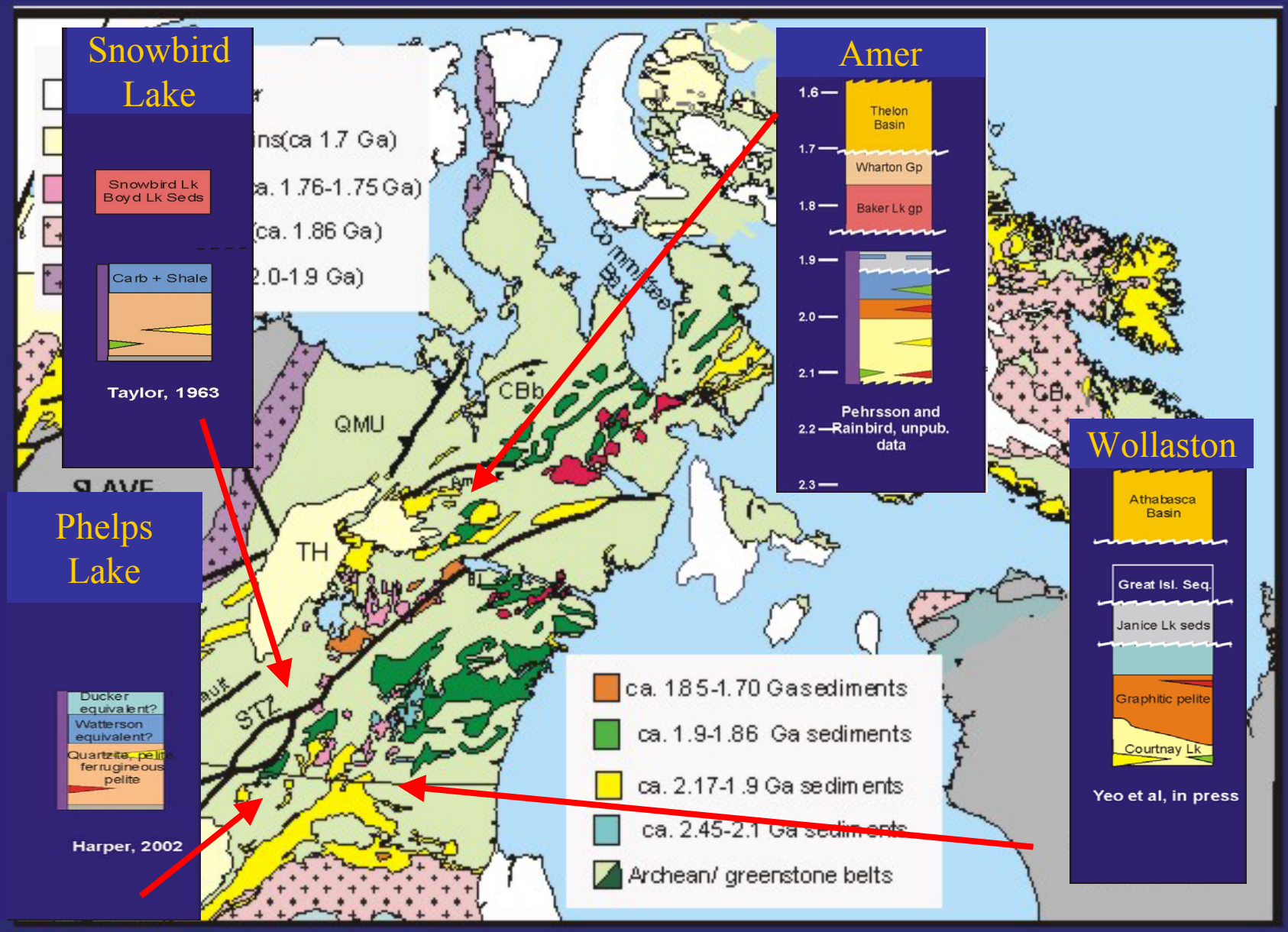


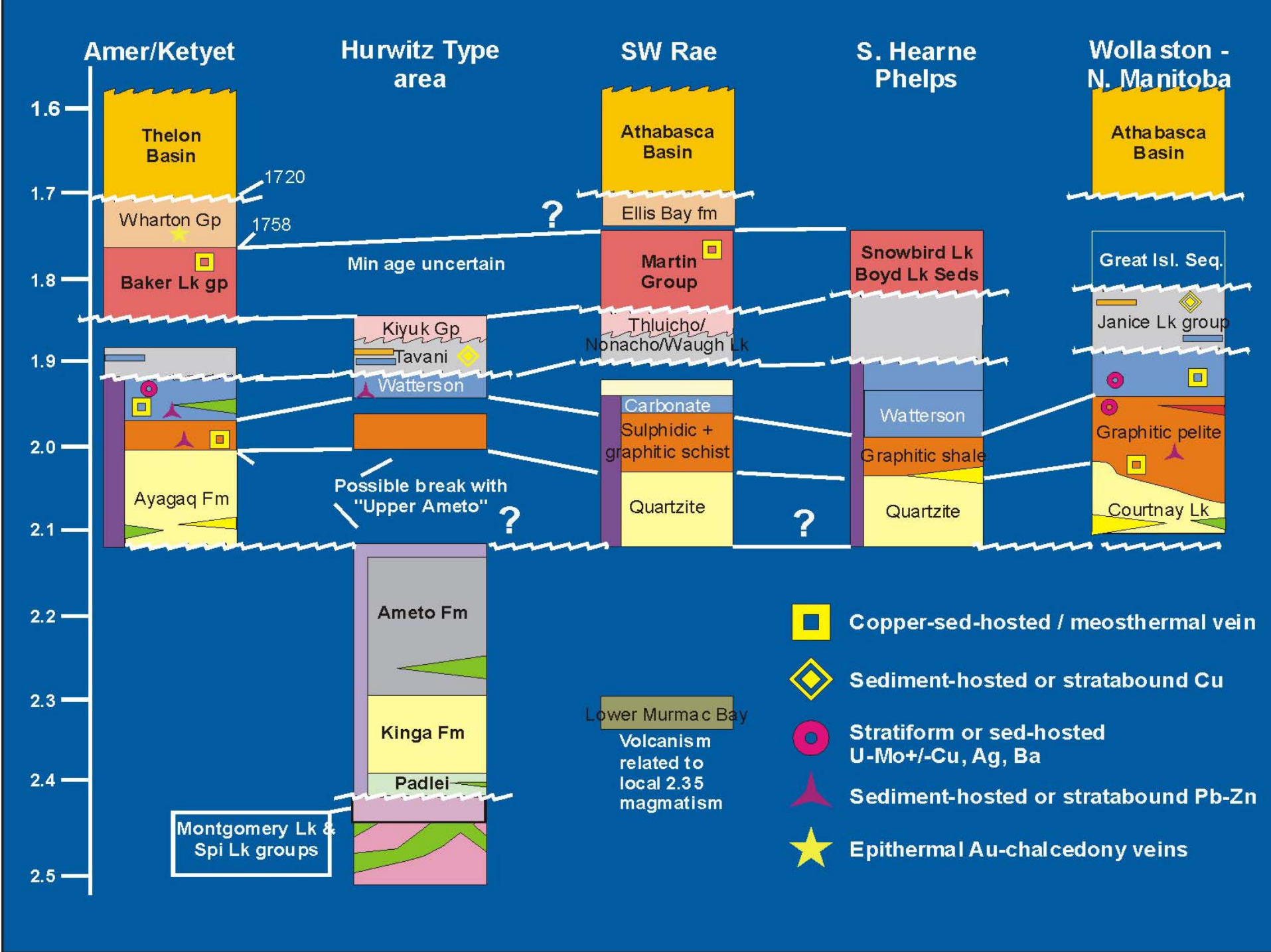
Recent regional correlation



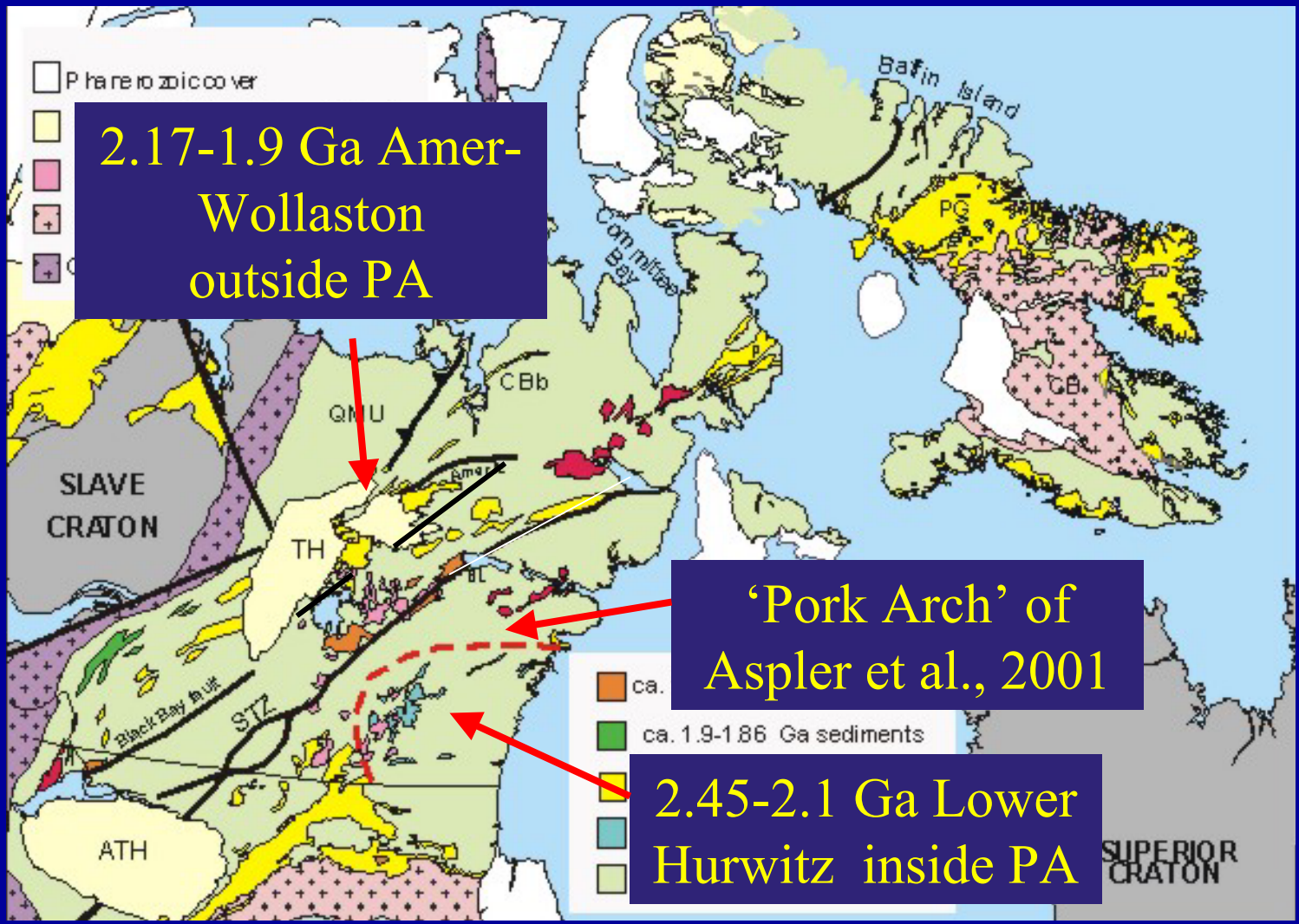
After Aspler et al., 1996

Proposed correlation

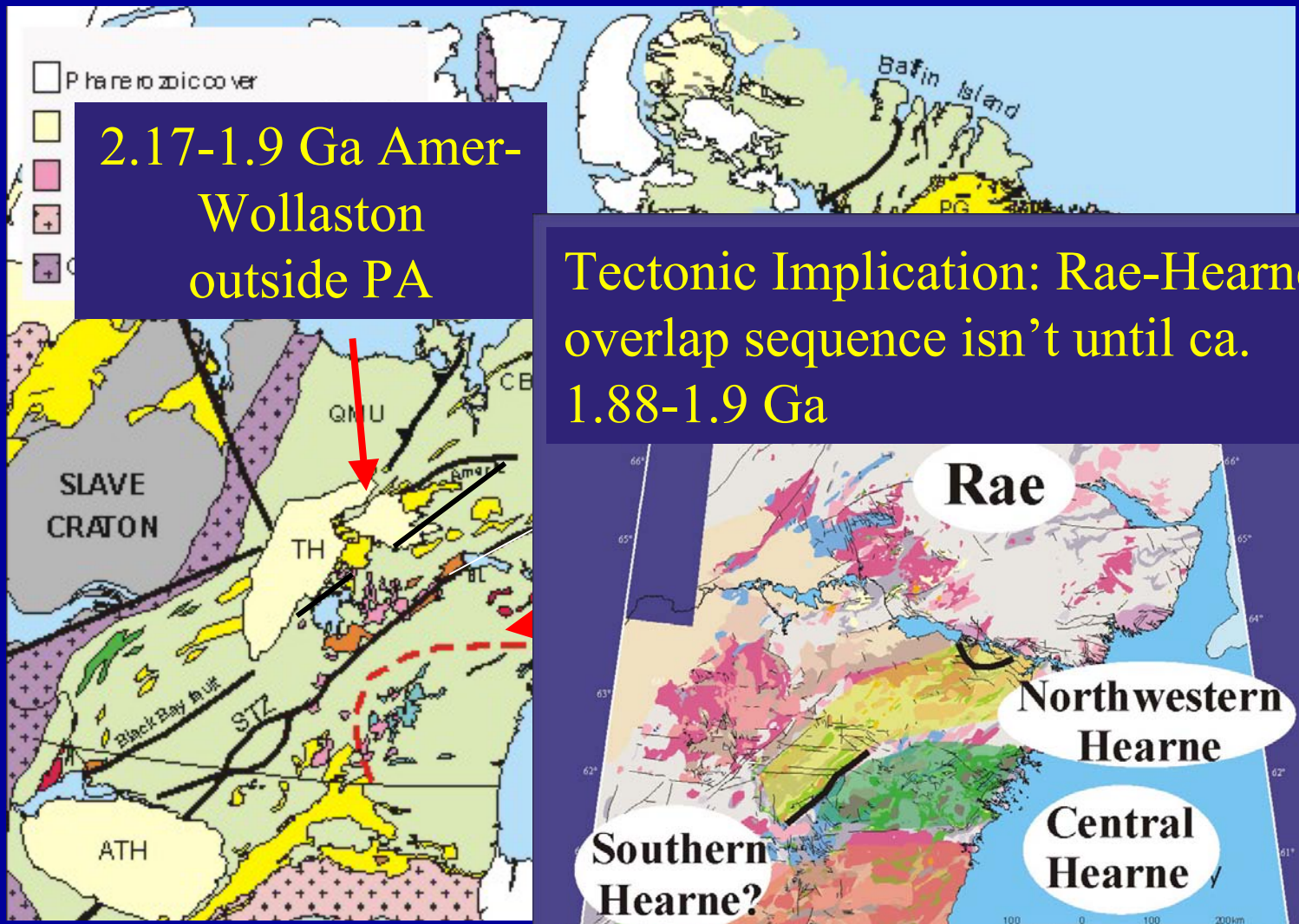



Amer/Ketyet
Hurwitz Type area
SW Rae
S. Hearne Phelps
Wollaston - N. Manitoba
1.6
1.7
1.8
1.9
2.0
2.1
2.2
2.3
2.4
2.5
Thelon Basin
1720
Wharton Gp
1758
Baker Lk gp
Min age uncertain
Athabasca Basin
Ellis Bay fm
Martin Group
Thluicho/ Nonacho/Waugh Lk
Snowbird Lk
Boyd Lk Seds
Great Isl. Seq.
Janice Lk group
Kiyuk Gp
Tavani
Watterson
Carbonate
Sulphidic + graphitic schist
Quartzite
Watterson
Graphitic shale
Quartzite
Graphitic pelite
Courtnay Lk
Ayagaq Fm
Possible break with "Upper Ameto"
Ameto Fm
Kinga Fm
Padlei
Montgomery Lk & Spi Lk groups
Lower Murmac Bay
Volcanism related to local 2.35 magmatism
Copper-sed-hosted / meosthermal vein
Sediment-hosted or stratabound Cu
Stratiform or sed-hosted U-Mo+/-Cu, Ag, Ba
Sediment-hosted or stratabound Pb-Zn
Epithermal Au-chalcedony veins

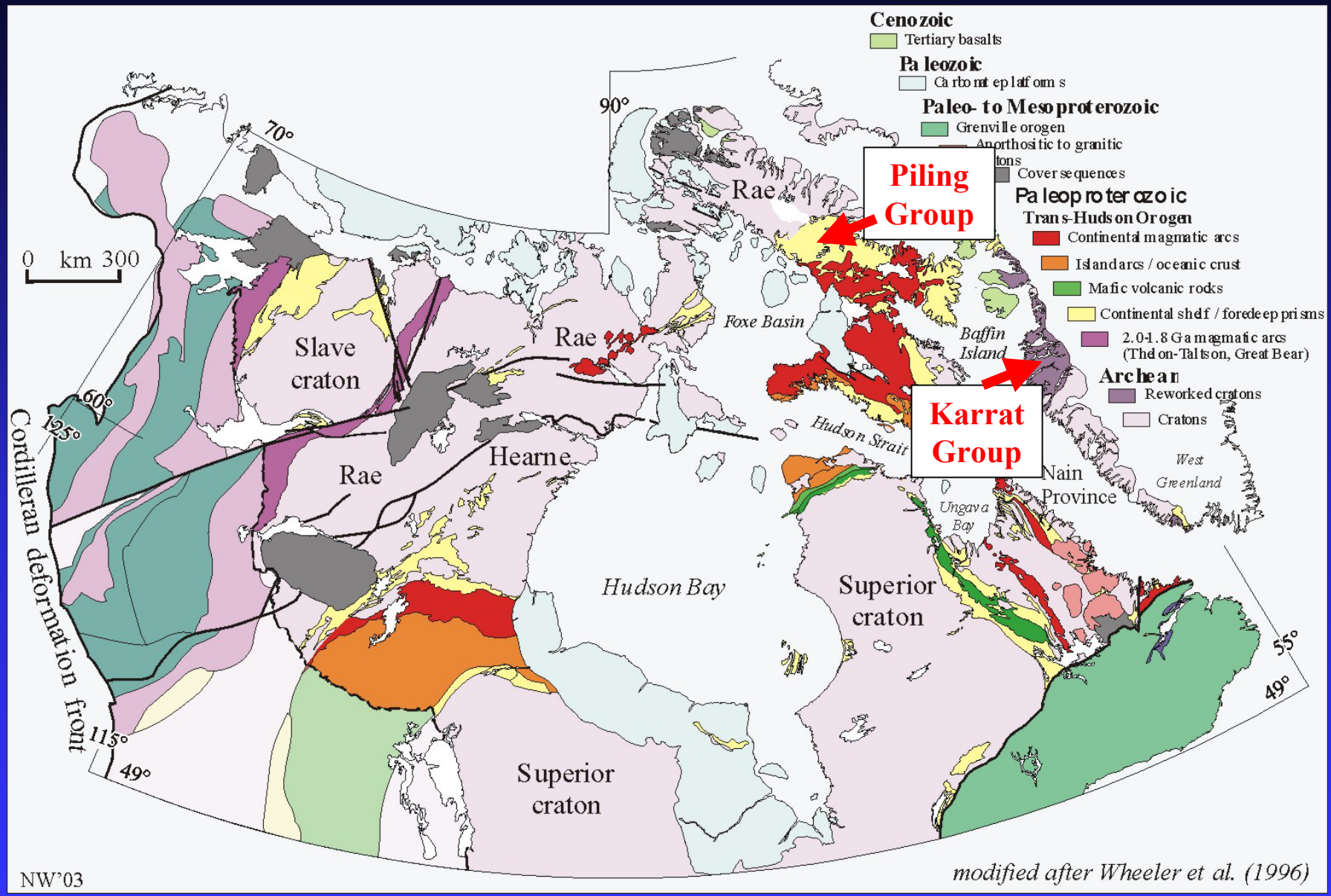
Proposed Hurwitz and Amer-Wollaston distribution



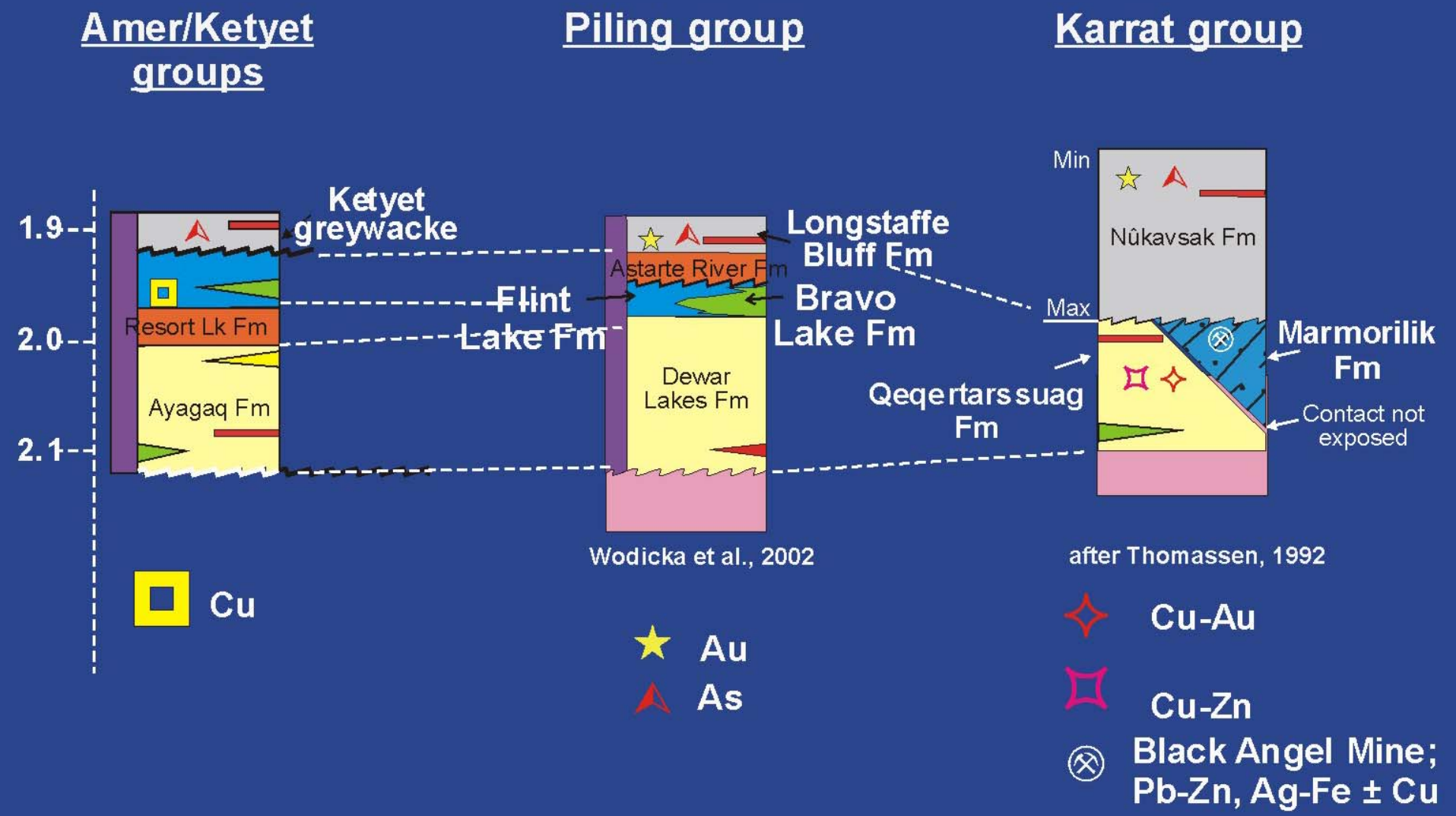
Proposed Hurwitz and Amer-Wollaston distribution



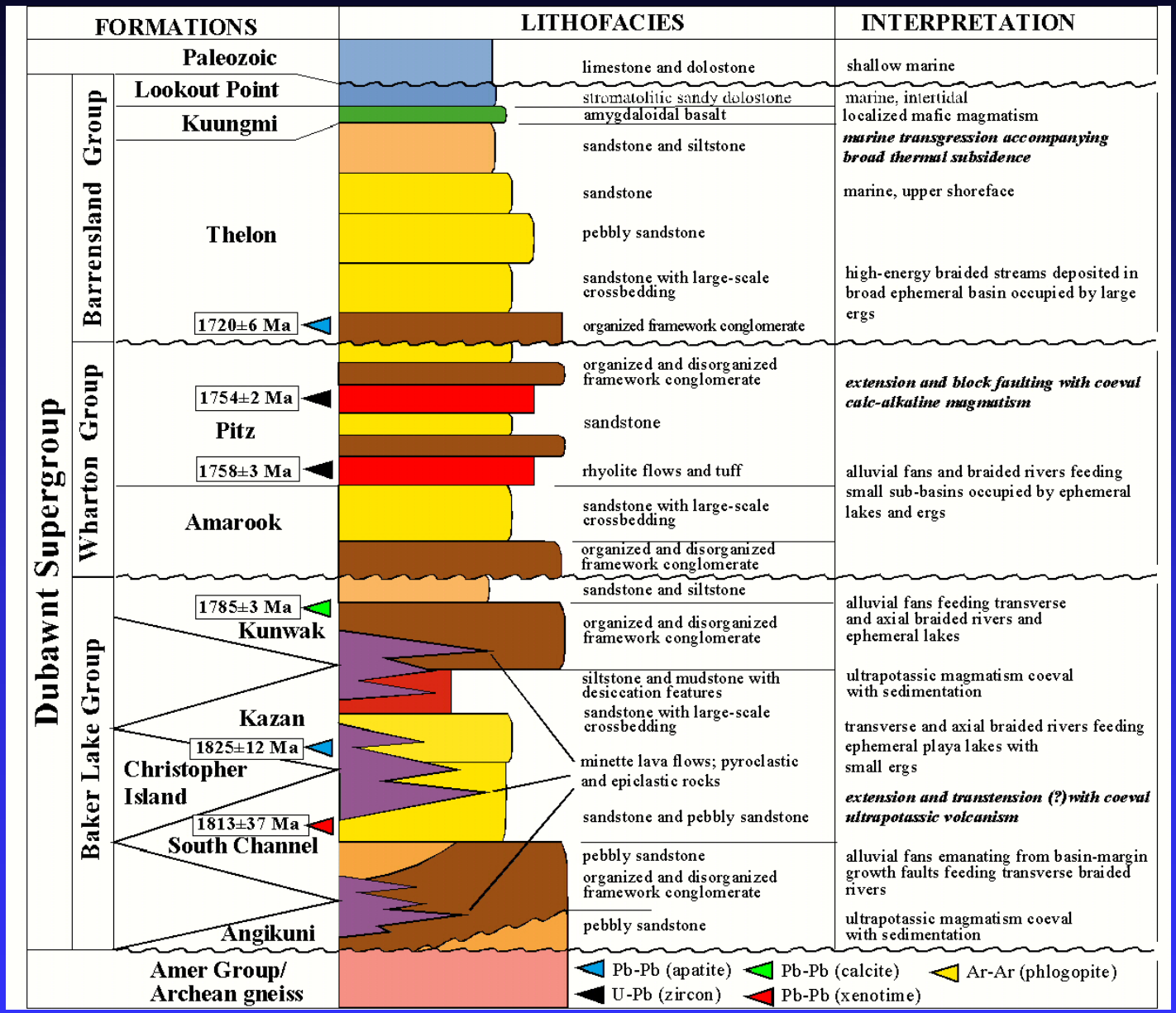
Correlation with the Eastern Arctic



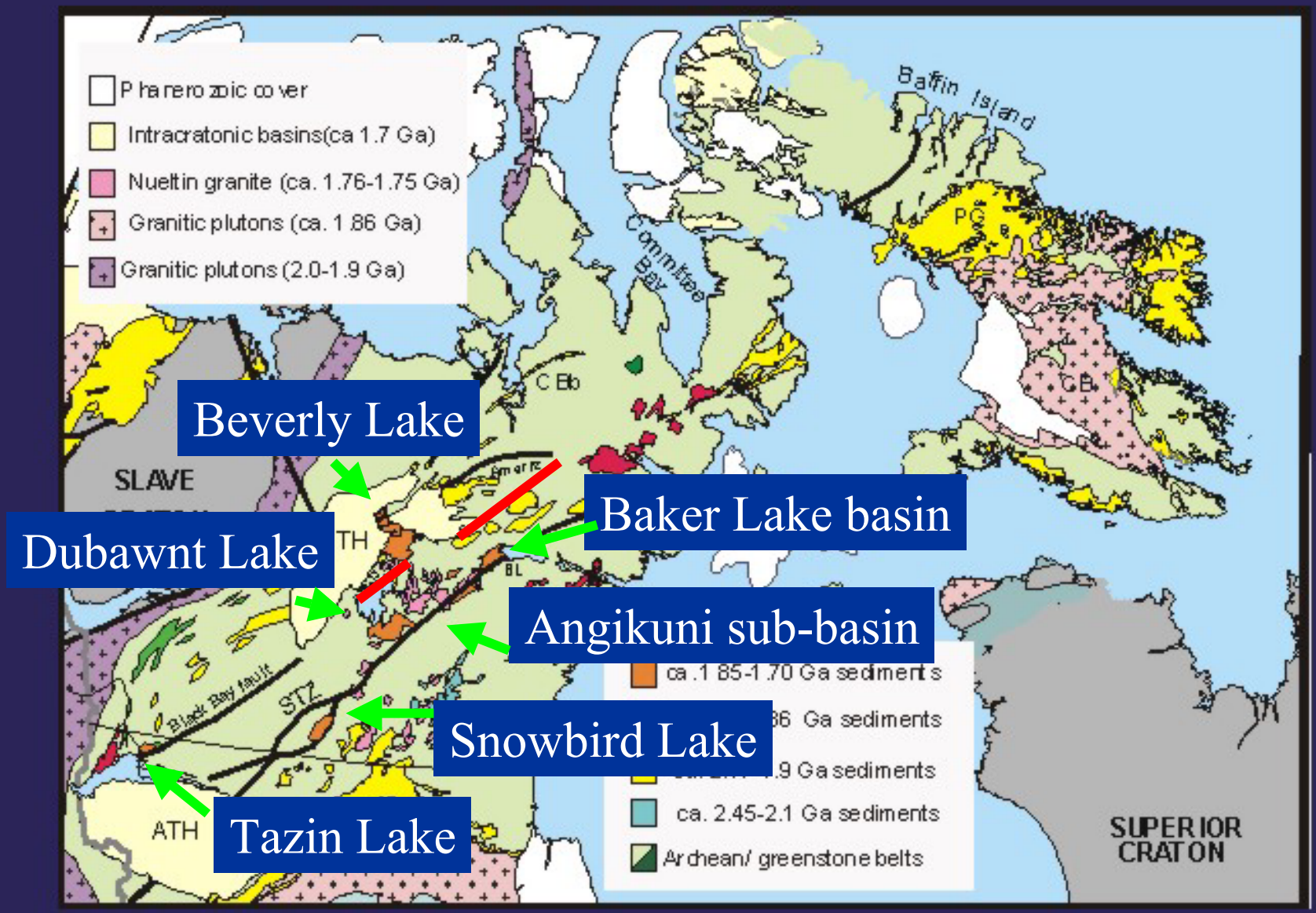
Compartive Baffin and Greenland sections



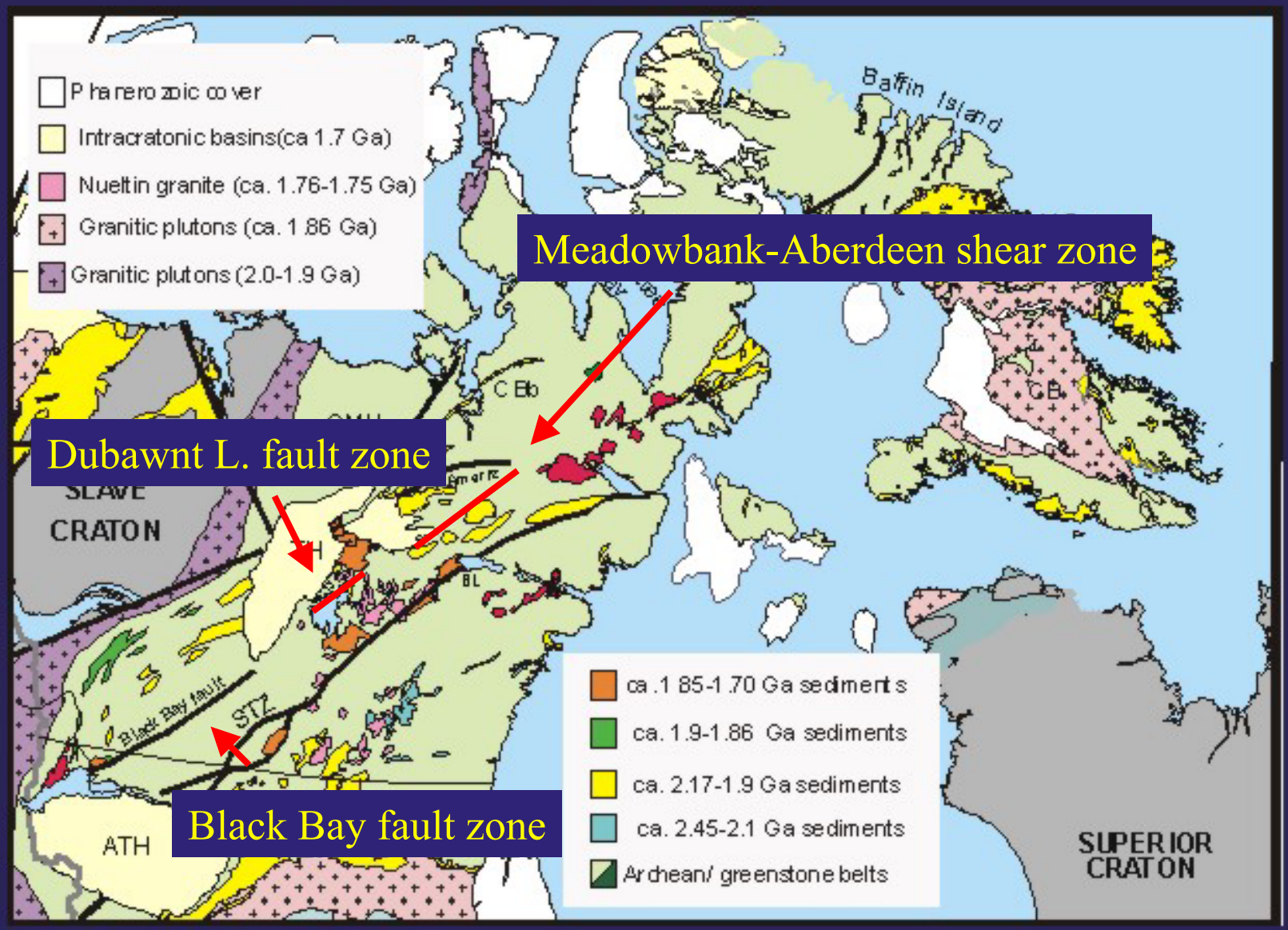
Regional Sequence 2-Dubawnt Supergroup



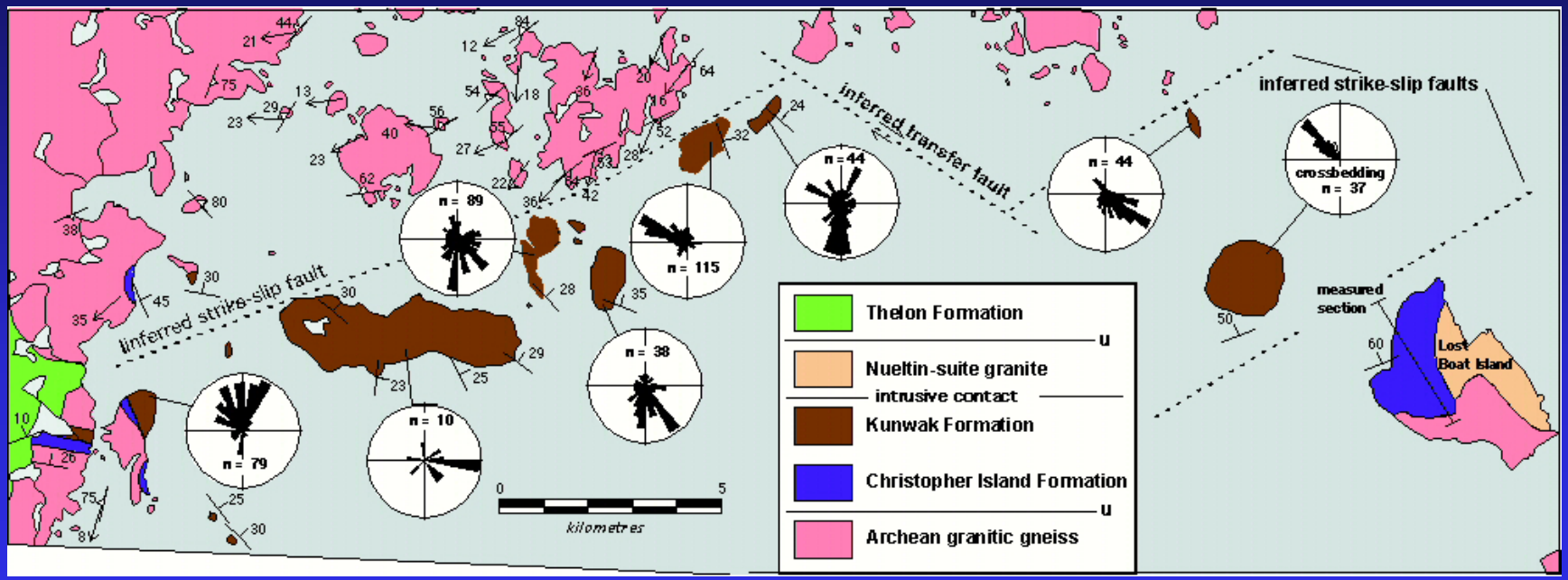
Distribution of Baker Lake and Wharton groups



Distribution of Baker Lake and Wharton groups



Baker Lake group strike-slip basin related to late reactivation of these major faults?

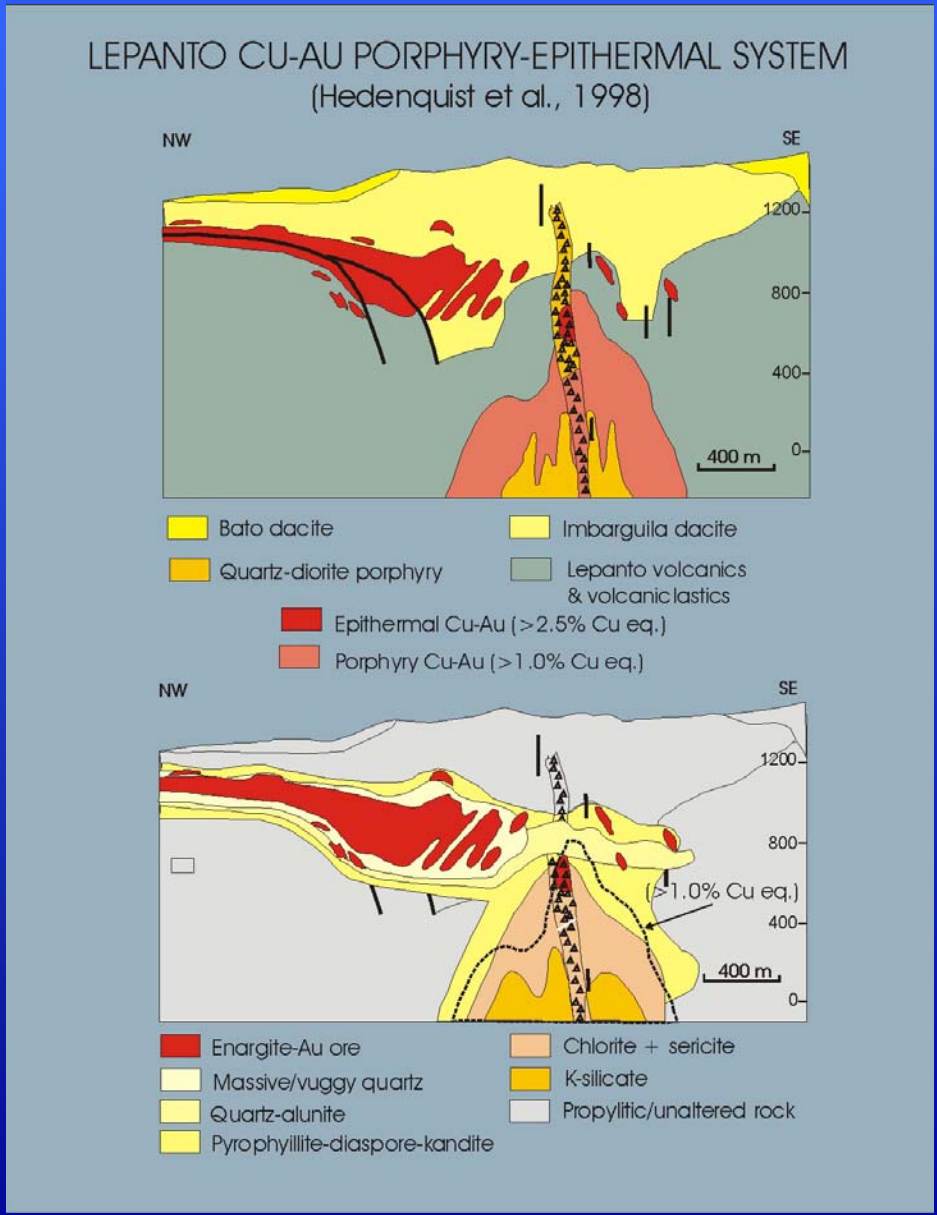


Major Au anomalies in till over BLg in the Thirty Mile Lake sheet

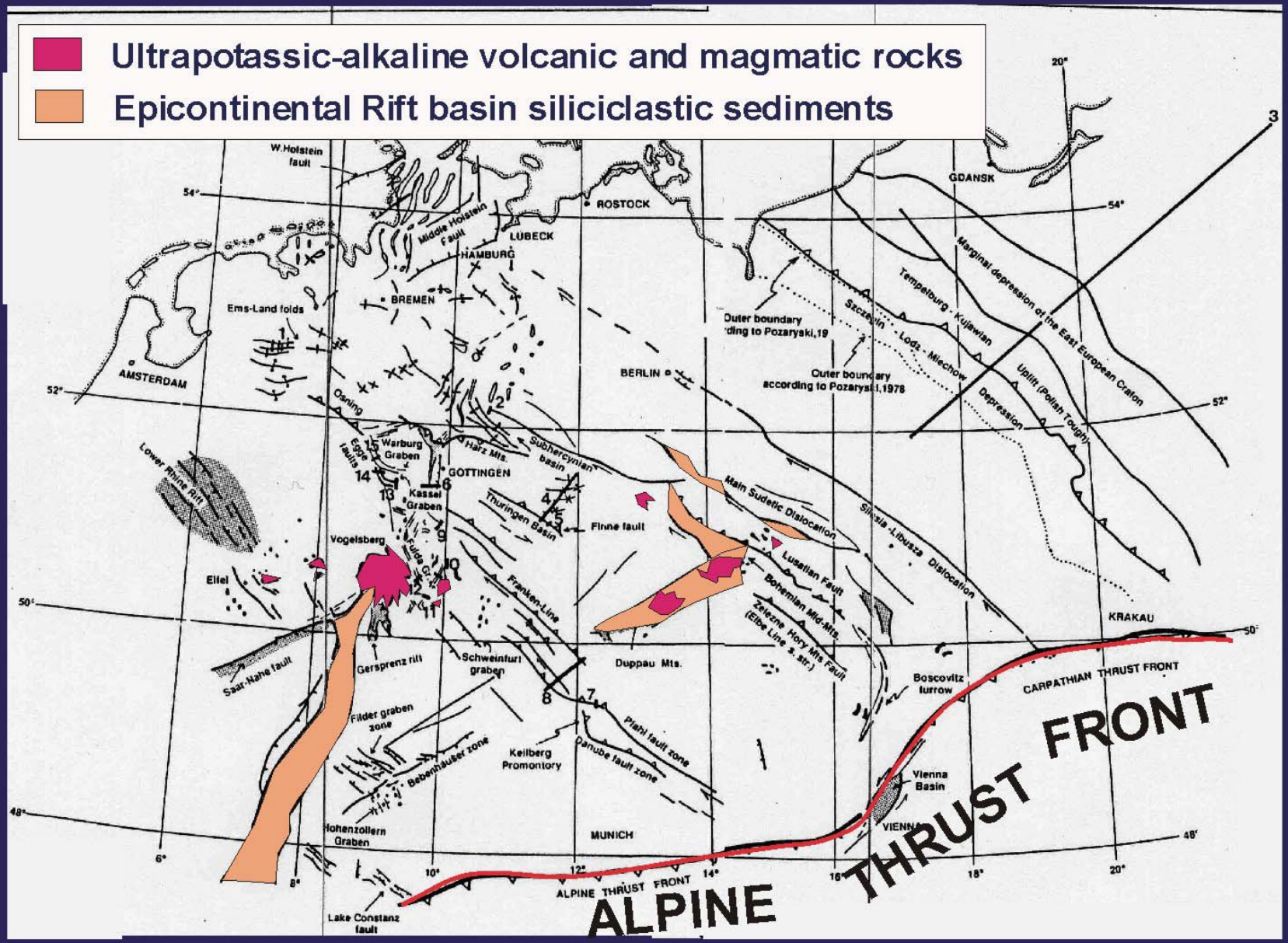
Au and Cu anomalies over BLg

- Could an epithermal Cu-Au porphyry System like Lepanto be one model?

Syn-deposition faulting and intrusion of coeval alkaline magmatic rocks into host seds may be prospective



Collision-related rift basin setting



(Busby et al., 1998 after Lotze, 1971)

Implications for Regional Metallogeny

- 'Amer-type' Pb-Mo-U mineralization may applicable now to much broader sequences outside the type area
- Cu occurrences in the Tavani may be related to prospects in upper Wollaston …potential new target for this type
- Low grade ca. 1830 Ma reactivation of major faults may be refocussing Au-? Au-Cu metallotect in the Baker Lake group?
- Ni potential in post 2.0 Ga sequence mafic-ultramafic sills is untested but could be high