



The Western Churchill Metallogeny Project: towards a regional tectonostratigraphic context for mineral deposits of the Churchill

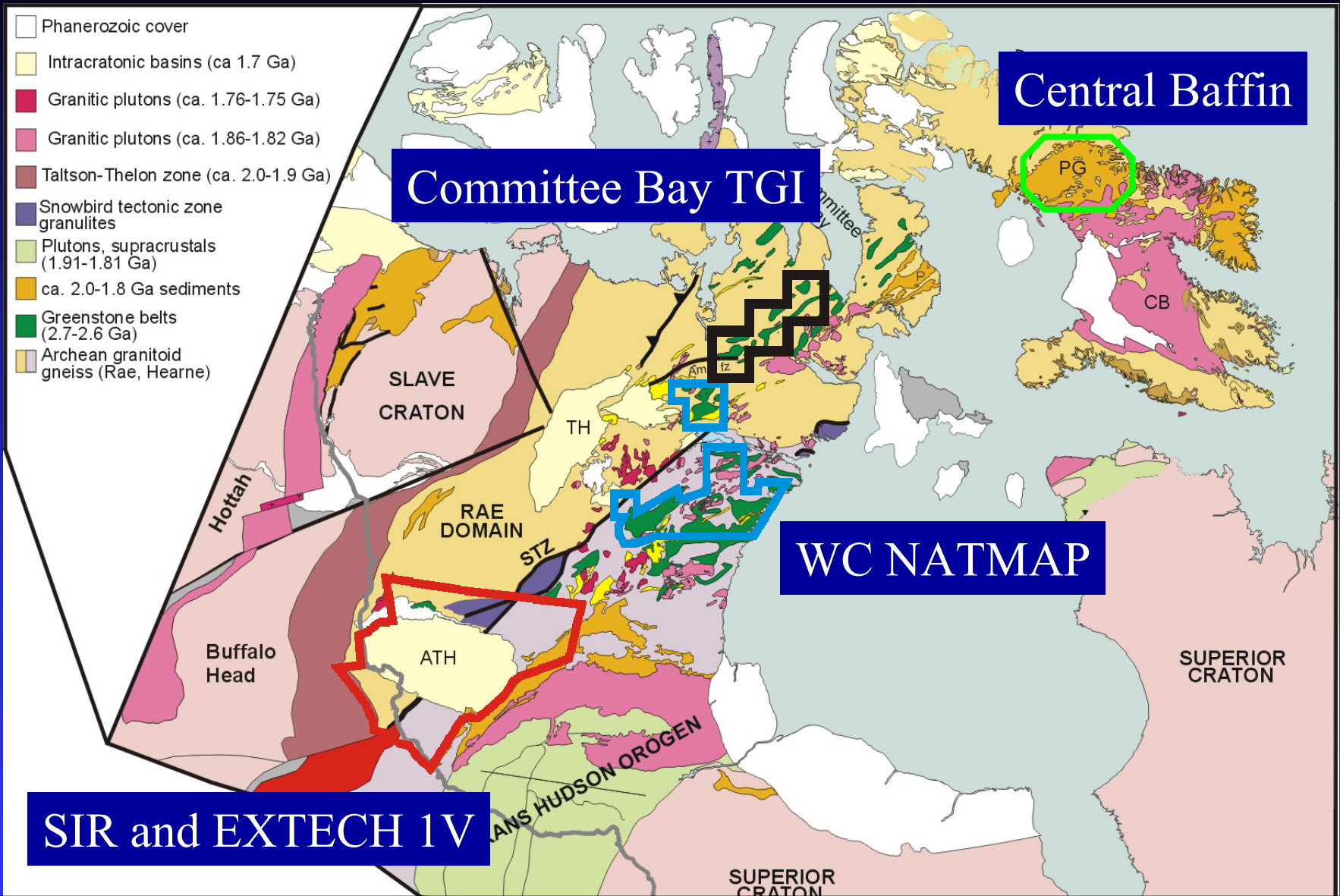
Sally Pehrsson and the Western Churchill
Metallogeny Project team



Outline

- What is the Western Churchill Metallogeny Project ?
 - Subprojects, Partners, Highlights, Plans
- Past, present and future? tectonostratigraphic subdivisions of the WCP
- Major outstanding questions

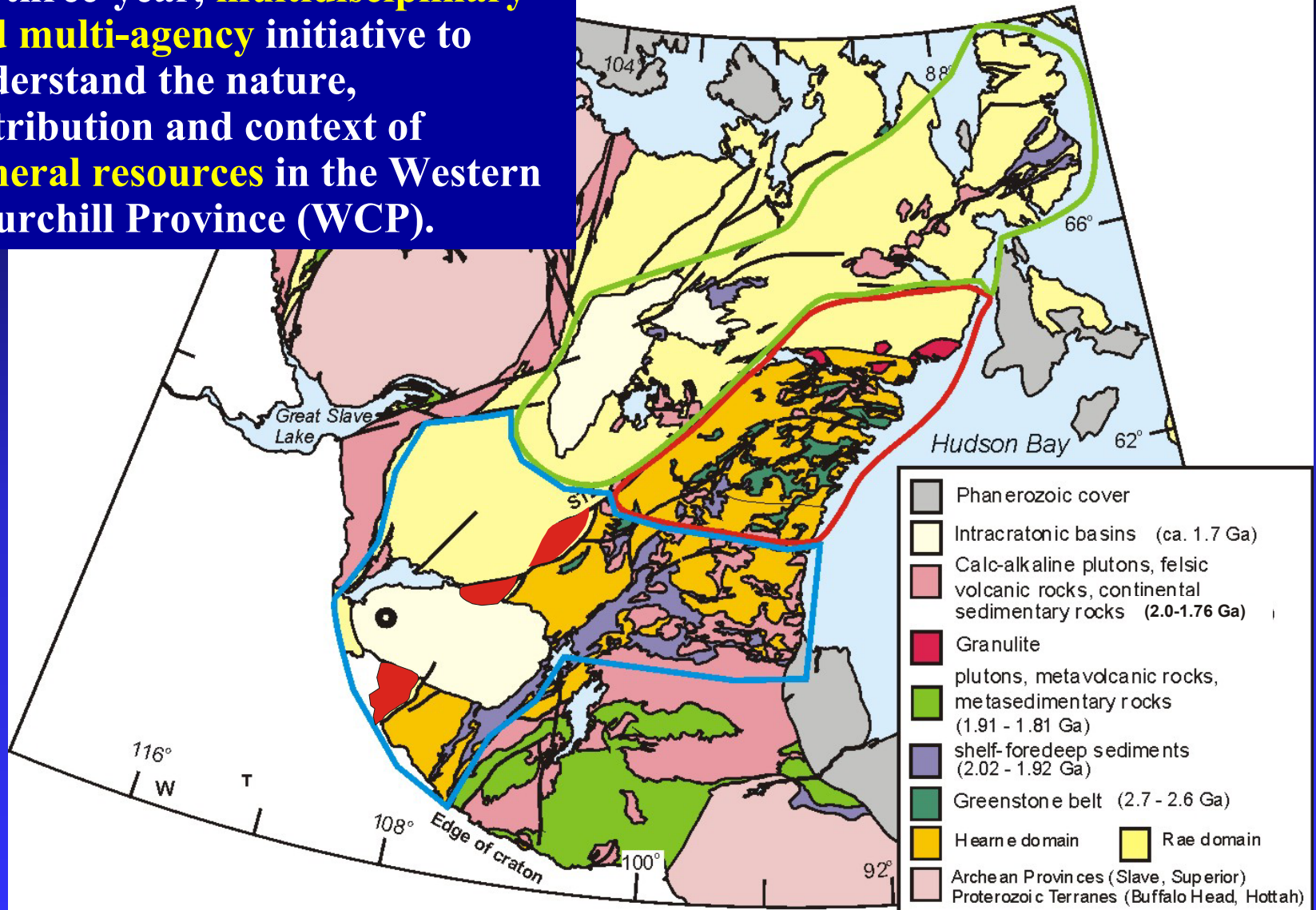
Recent mapping initiatives in the WCP



The Western Churchill Metallogeny project is a three-year, multidisciplinary and multi-agency initiative to understand the nature, distribution and context of mineral resources in the Western Churchill Province (WCP). One of the largest geologic provinces of the Canadian Shield, spanning Nunavut, the Northwest Territories (NWT), northern Saskatchewan, Manitoba and northeast Alberta, the

WCMP Overview

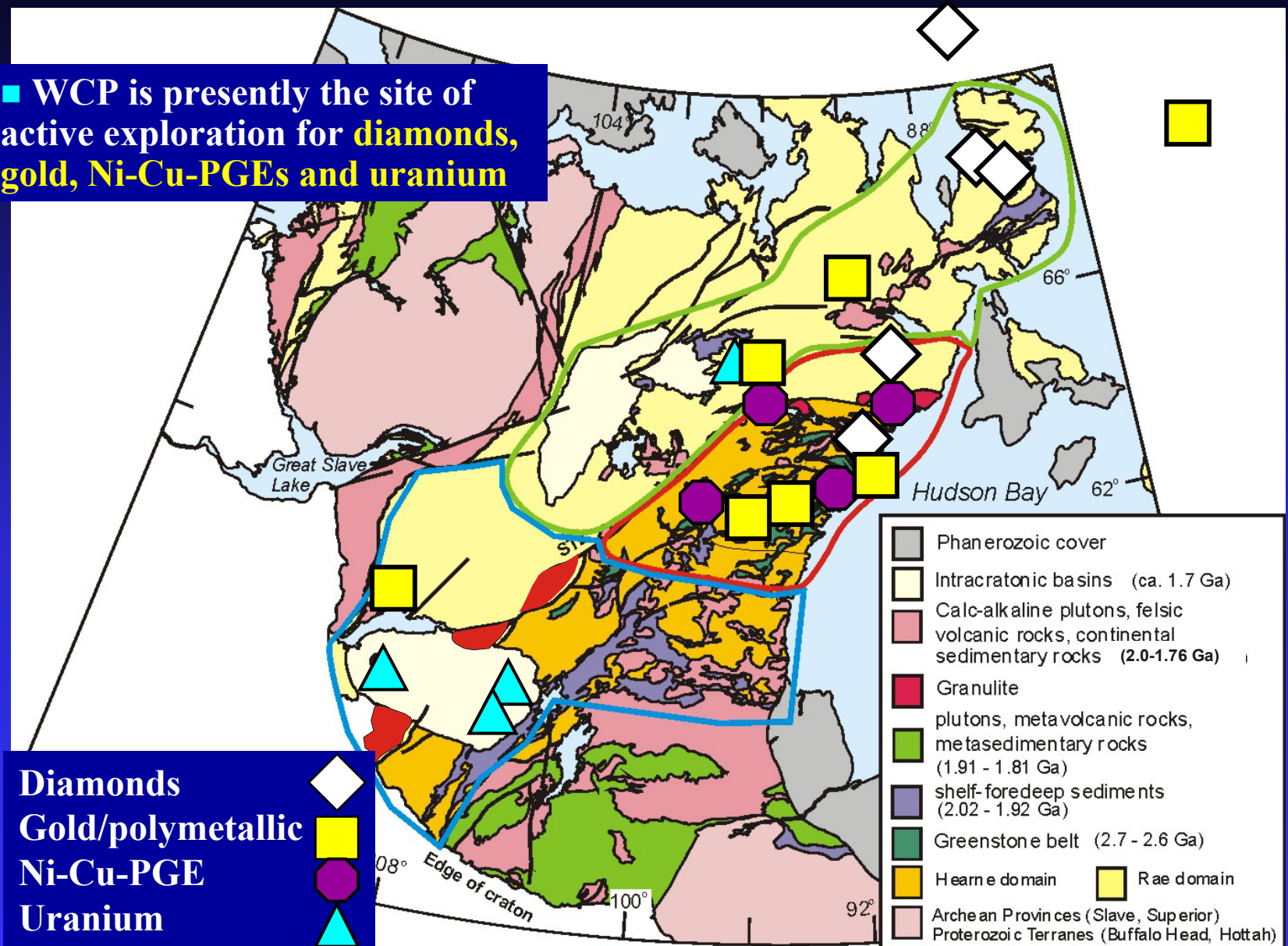
■ A three-year, **multidisciplinary and multi-agency** initiative to understand the nature, distribution and context of **mineral resources** in the Western Churchill Province (WCP).



WCMP Overview

■ WCP is presently the site of active exploration for **diamonds, gold, Ni-Cu-PGEs and uranium**

Diamonds 
Gold/polymetallic 
Ni-Cu-PGE 
Uranium 



WCMP Overview

Subproject 1/2: Communication and Outreach:

- Steering committee with industry, P/T agency, NGO representatives
- Outreach partnered with NTI, NT DSD, SIR

Subproject 4: N. Rae compilation

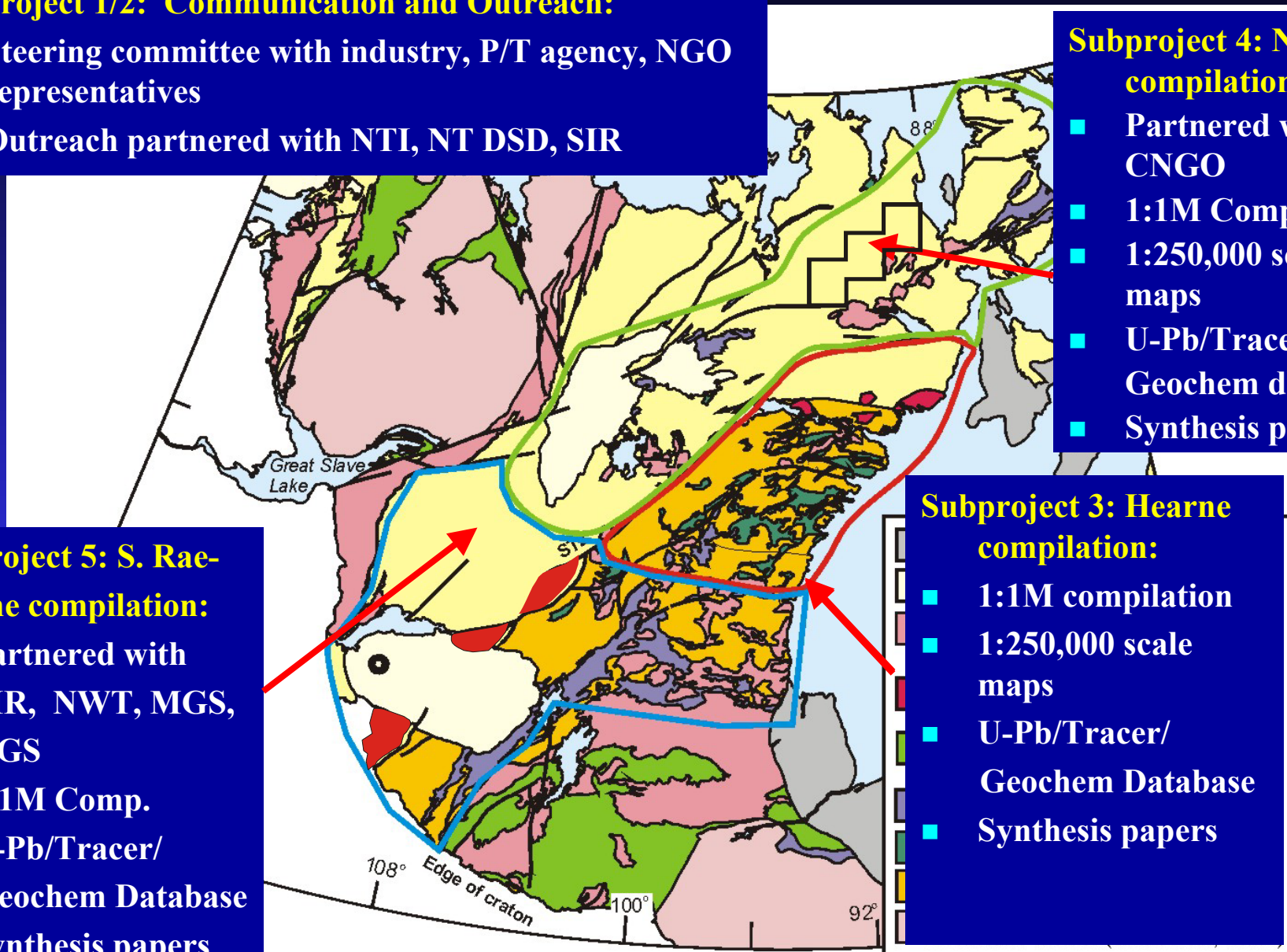
- Partnered with CNGO
- 1:1M Compilation
- 1:250,000 scale maps
- U-Pb/Tracer/Geochem dbase
- Synthesis papers

Subproject 3: Hearne compilation:

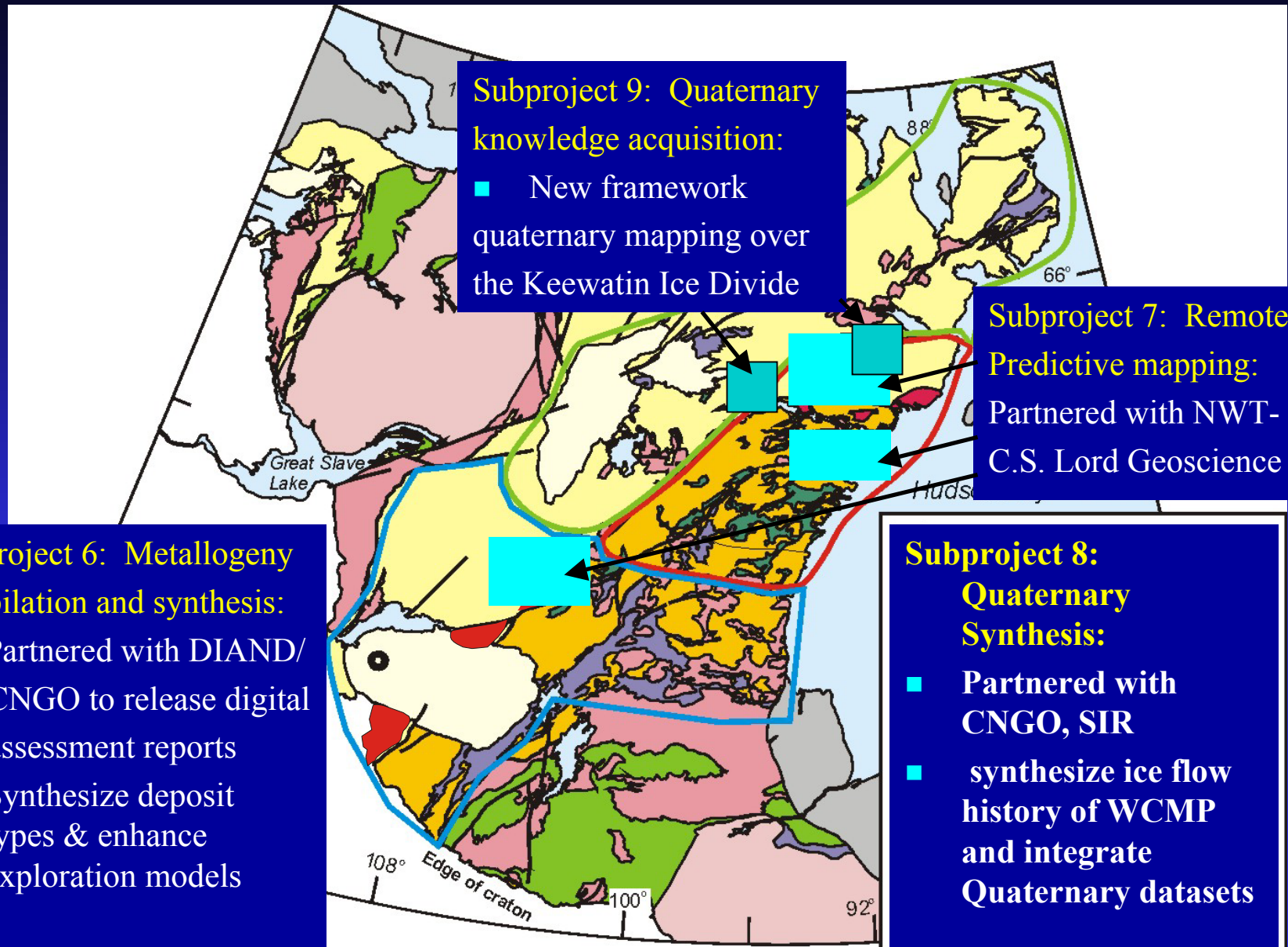
- 1:1M compilation
- 1:250,000 scale maps
- U-Pb/Tracer/Geochem Database
- Synthesis papers

Subproject 5: S. Rae-Hearne compilation:

- Partnered with SIR, NWT, MGS, AGS
- 1:1M Comp.
- U-Pb/Tracer/Geochem Database
- Synthesis papers



WCMP Overview



Subproject 9: Quaternary knowledge acquisition:

- New framework quaternary mapping over the Keewatin Ice Divide

Subproject 7: Remote Predictive mapping:

- Partnered with NWT-C.S. Lord Geoscience

Subproject 6: Metallogeny compilation and synthesis:

- Partnered with DIAND/CNGO to release digital assessment reports
- Synthesize deposit types & enhance exploration models

Subproject 8: Quaternary Synthesis:

- Partnered with CNGO, SIR
- synthesize ice flow history of WCMP and integrate Quaternary datasets

Partners

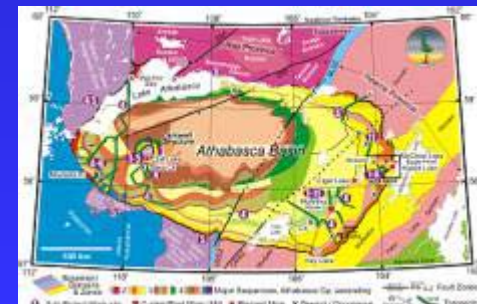
- ◆ Saskatchewan Industry & Resources
- ◆ Manitoba Geological Survey
- ◆ Alberta Geological Survey
- ◆ C.S. Lord Northern Geoscience Centre
- ◆ Canada-Nunavut Geoscience Office
- ◆ Dept. of Indian & Northern Affairs
- ◆ Nunavut-Tunngavik Inc.
- ◆ Saskatchewan Research Council
- ◆ Academia (University of Alberta, Laurentian University, University of Saskatchewan, University of Western Ontario, University of Waterloo, University of Calgary, Yale University, University of Western Australia)
- ◆ Exploration & Mining Industry (Cameco Corp., Cogema, BHPBilliton Ltd., Cumberland Resources Ltd., Falconbridge Ltd., Inco Technical Services Ltd., Stornaway, Shear Minerals, Dunsmuir Resources Ltd., Comaplex Minerals, M.F Resources, Petrogen Consultants)



Outputs -Year 1



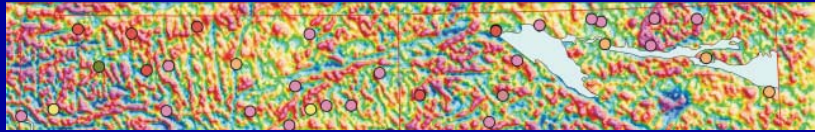
- 27 talks and posters presented at regional, national and international meetings
- 16 papers published in internal and peer-reviewed external journals
- 10 Open File maps/reports released
- Accomplished by project team of over 70 scientists, collaborators, representing 12 full person years.



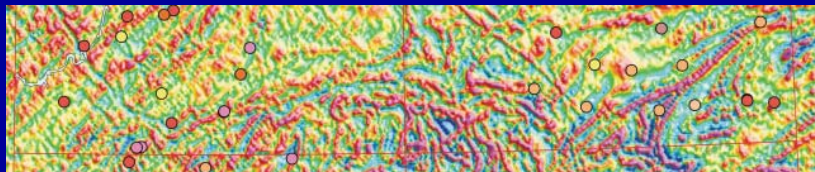
WCMP Highlights Year 1

■ Innovative map product: Tehery-Wager RPM

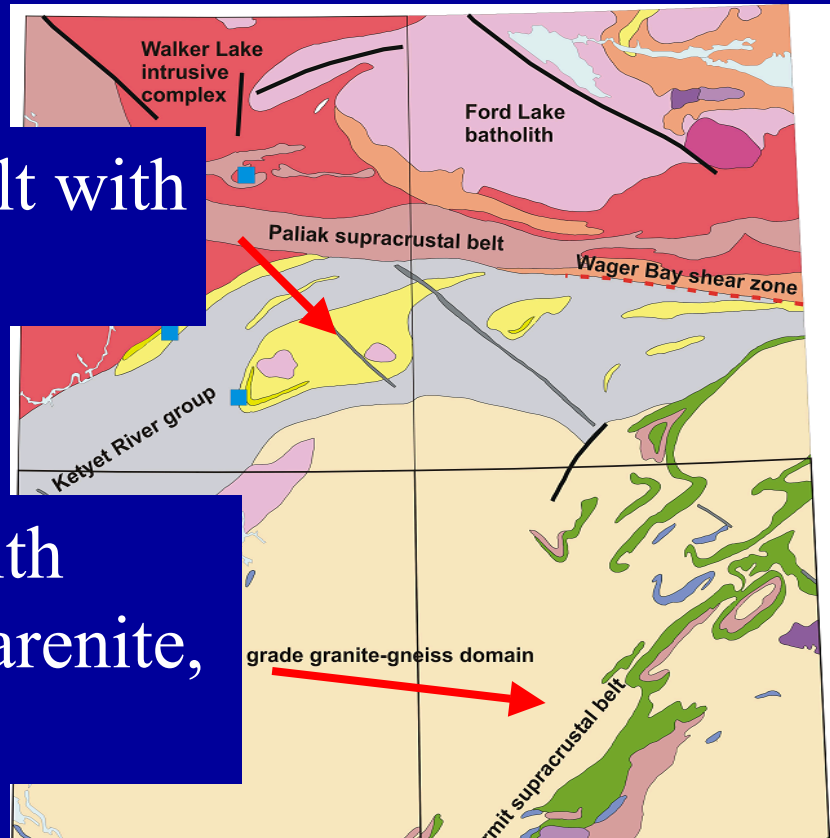
Revised geology from re-evaluation of archived bedrock samples & new analysis of geophysical datasets



Proterozoic supracrustal belt with Pb, Mo, U showings



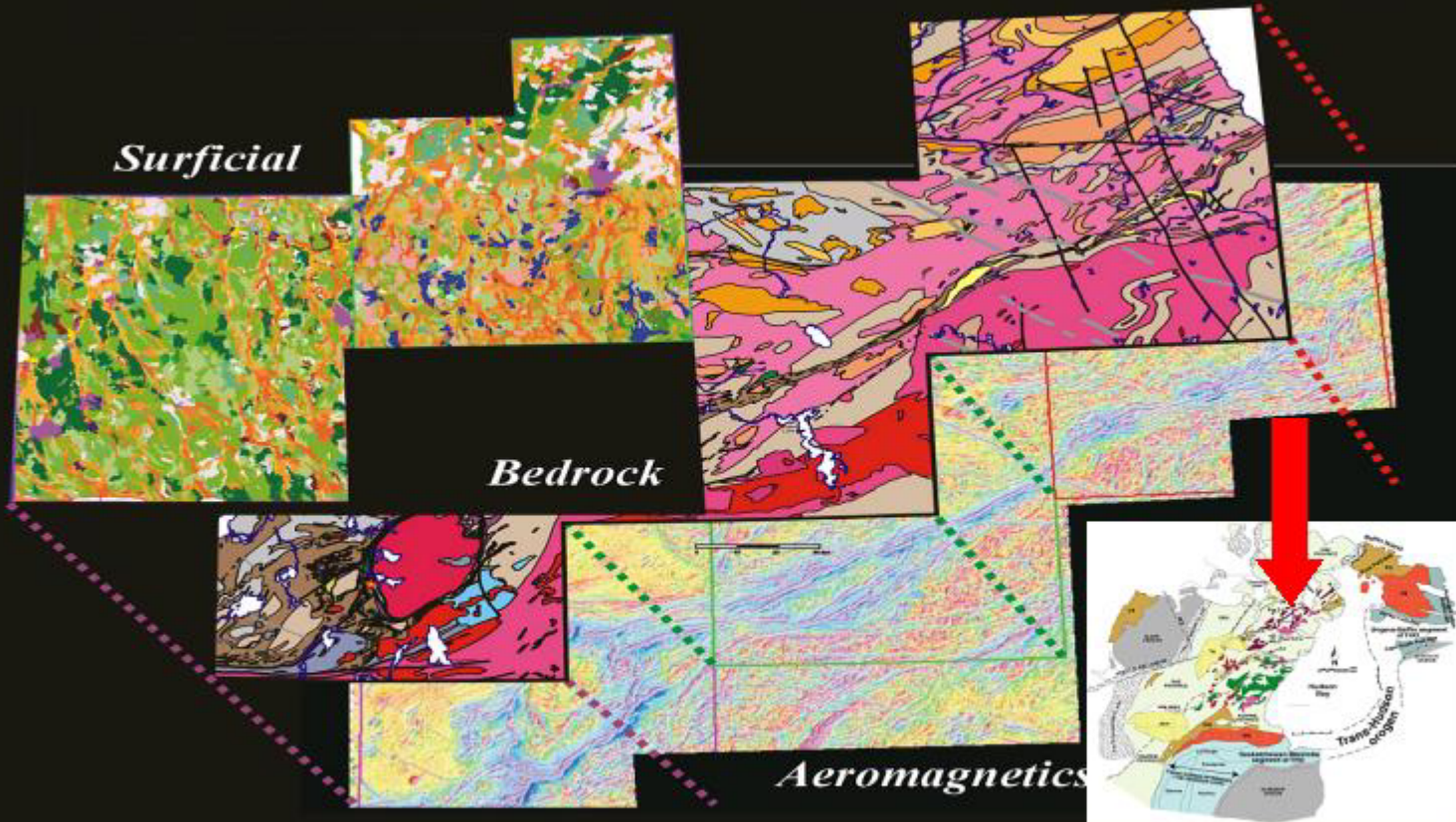
Archean supracrustal belt with Bif-mafic volcanics, quartz arenite, semi-pelite



WCMP Highlights Year 1

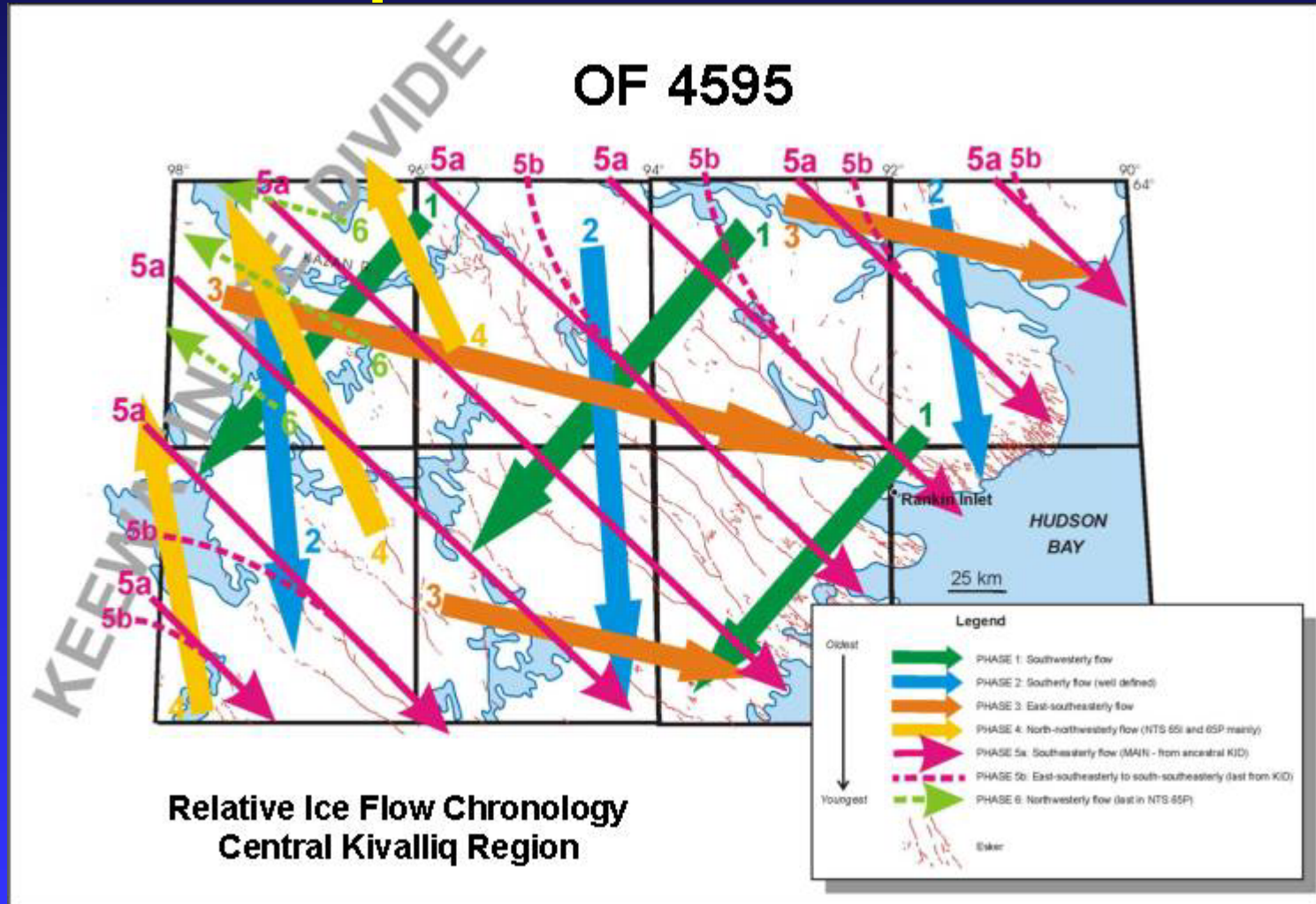
- Committee Bay bedrock and Quaternary maps, dataset releases and scientific papers

Committee Bay Framework Mapping Datasets



WCMP Highlights Year 1

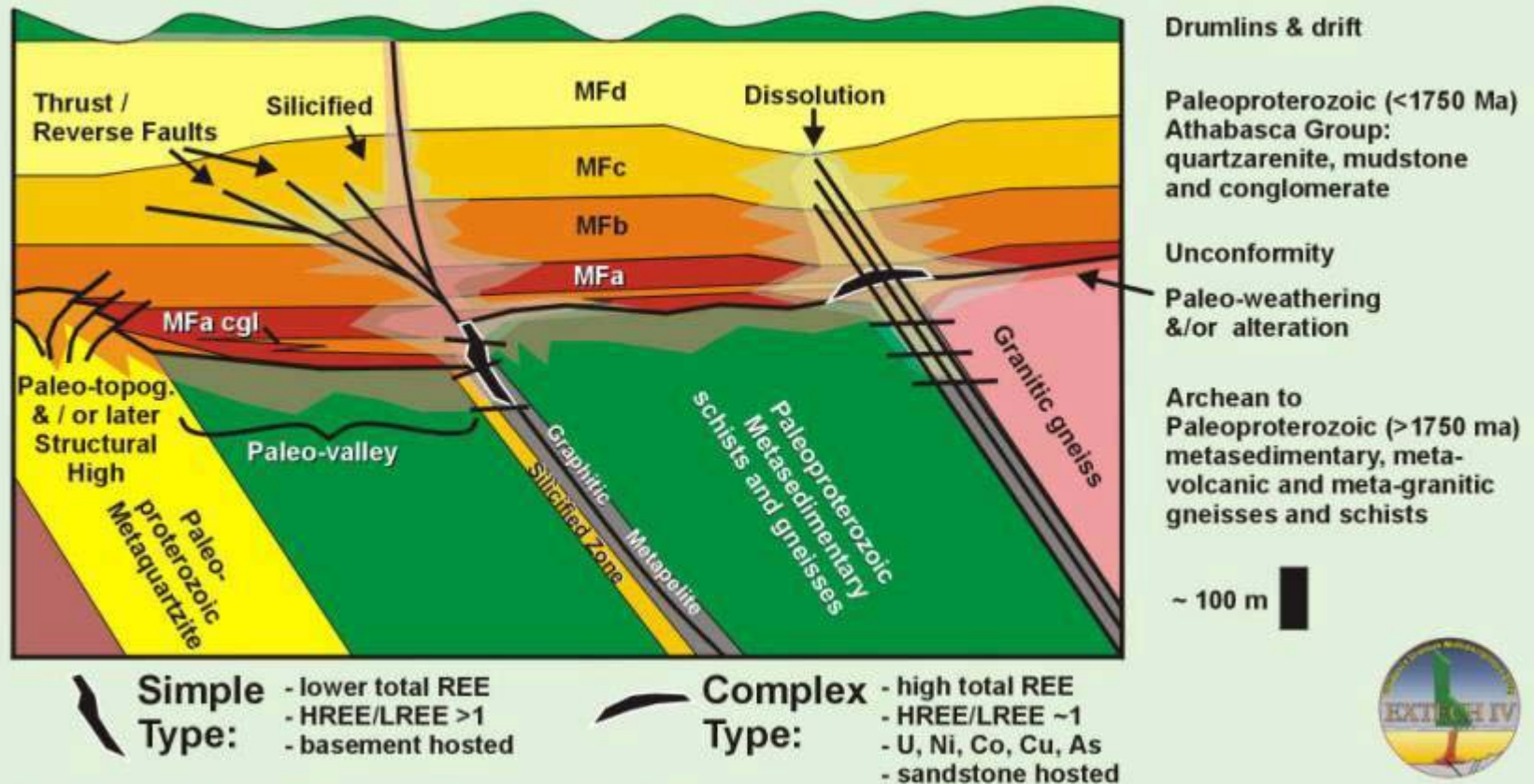
■ Quaternary OF releases for the Rankin Inlet, Central Kivalliq and North Baffin areas



WCMP Highlights Year 1

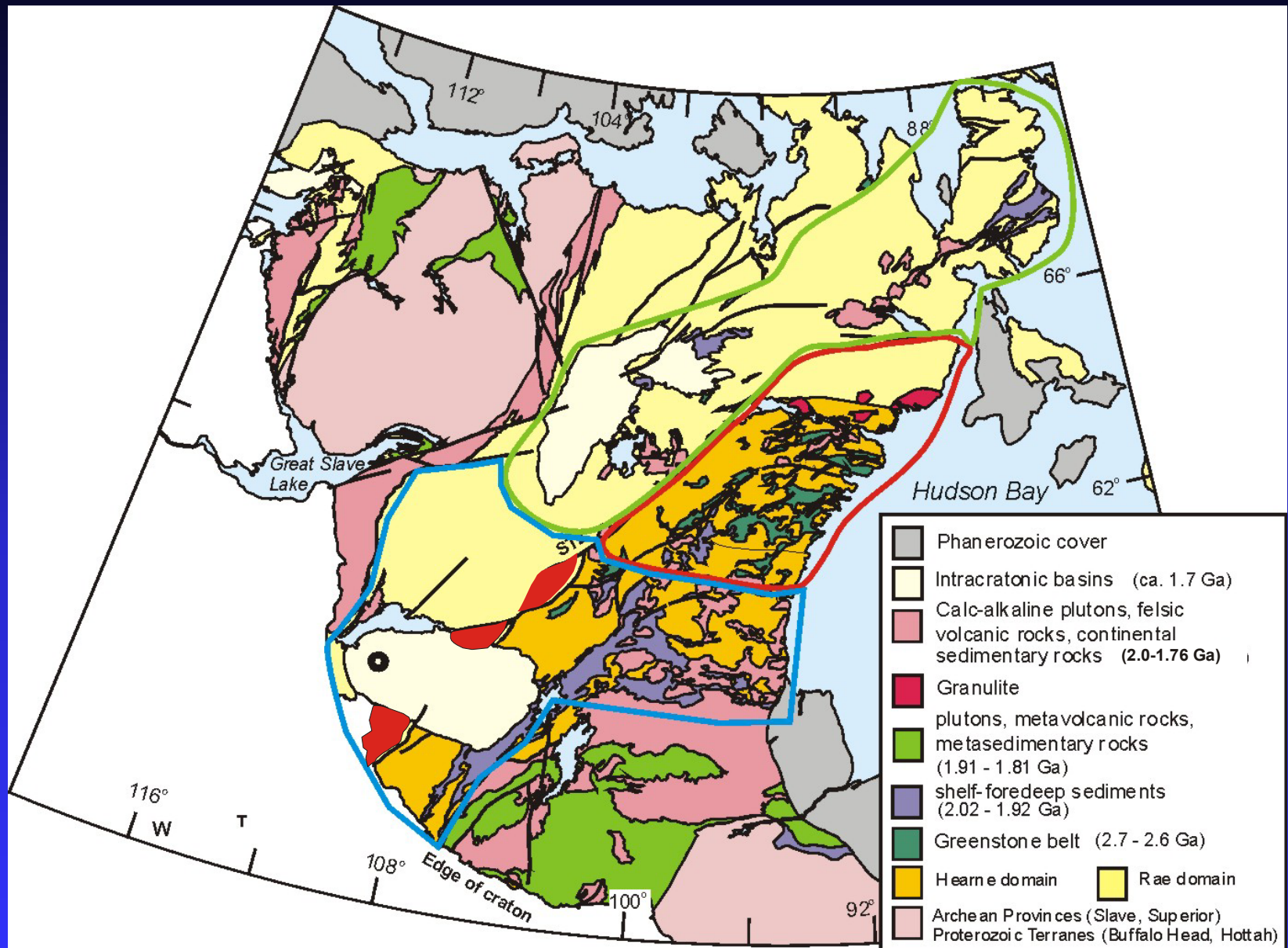
■ EXTECH IV / Athabasca Basin Synthesis

Generalized elements of simple and complex unconformity-associated uranium deposits in the eastern part of the Paleoproterozoic Athabasca Basin.

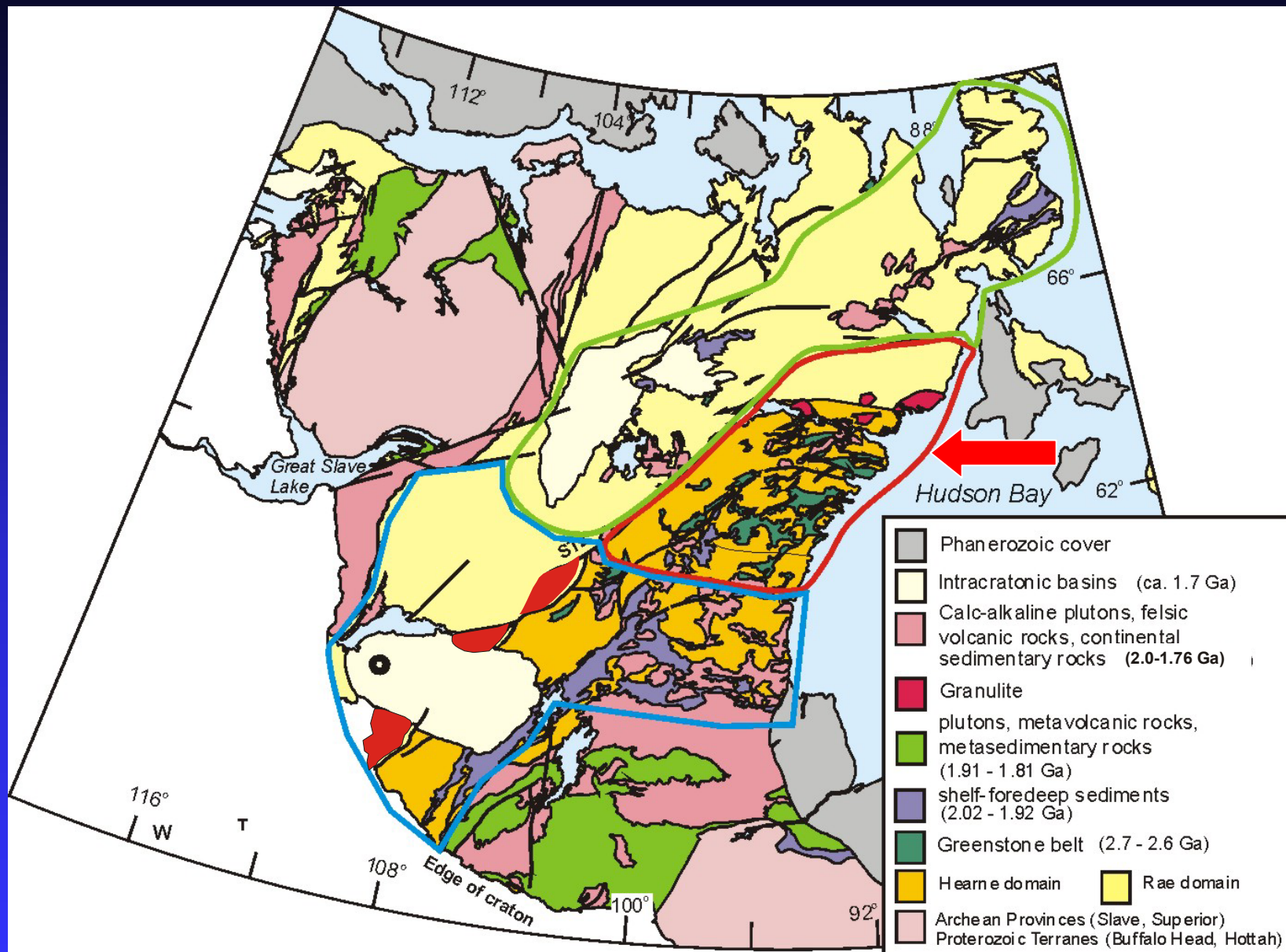


After Thomas et al., McGill et al., Tourigny et al., and Ruzicka

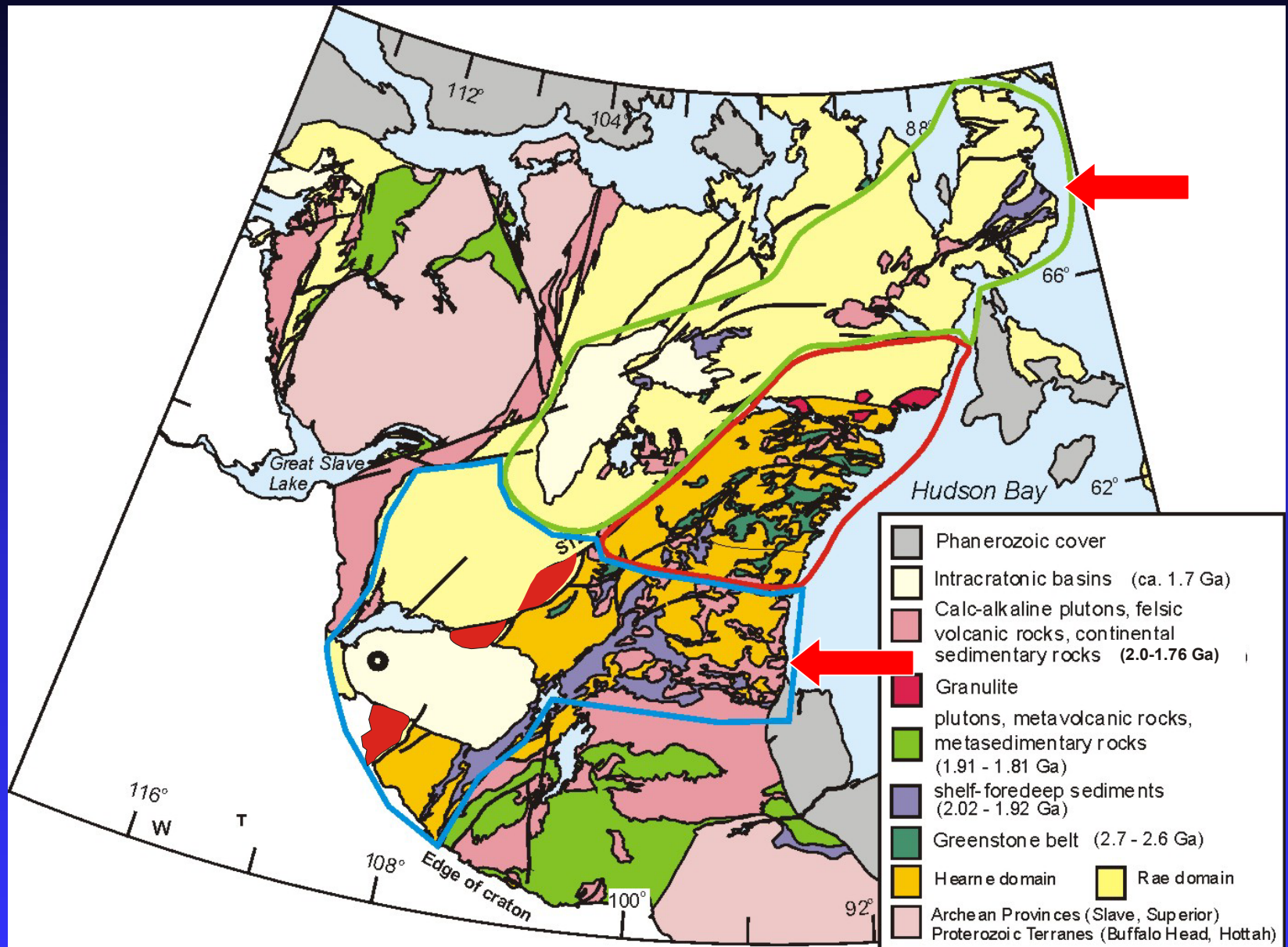
Planned activities year 2



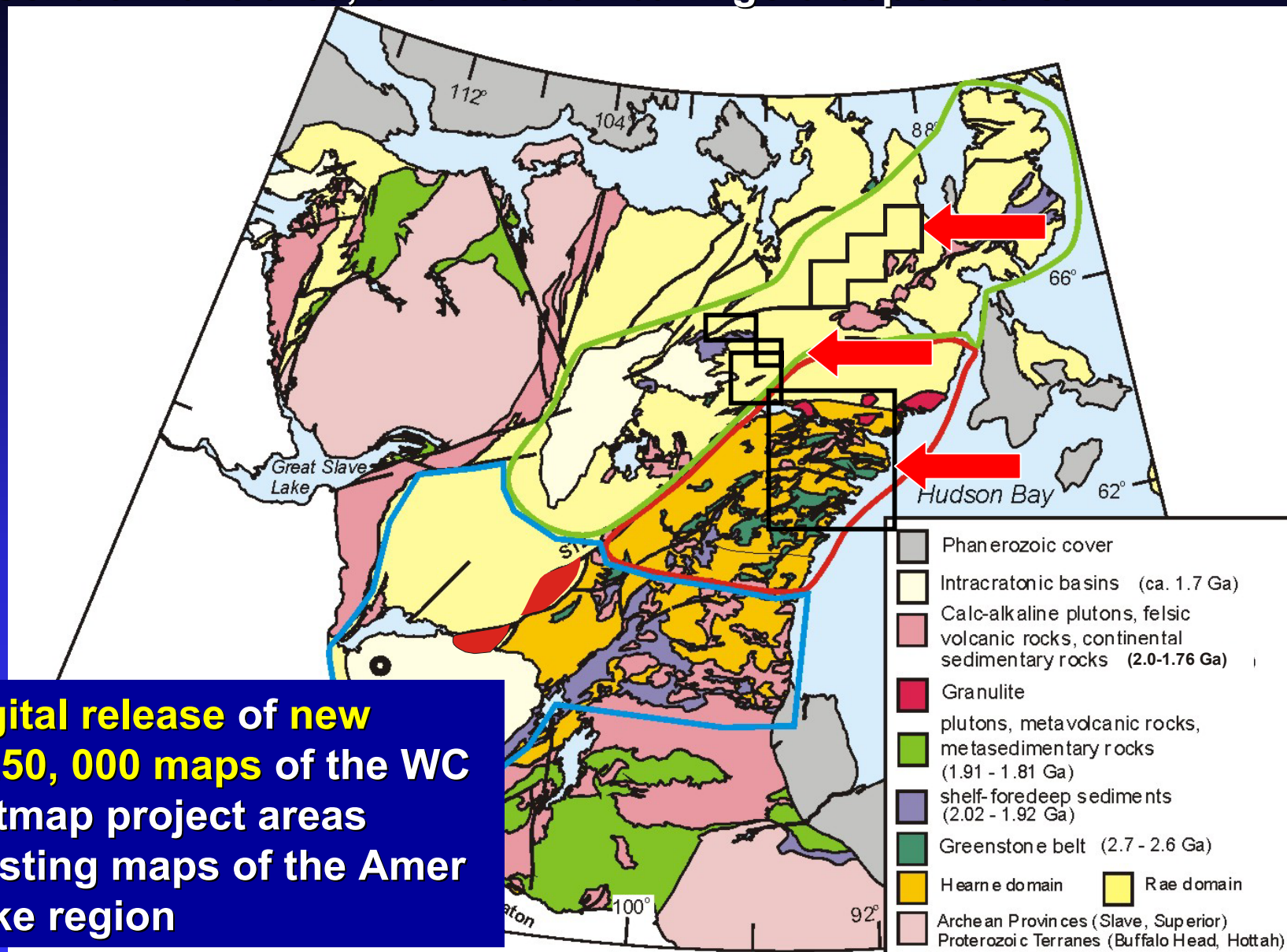
Interim release of 1:1 million central & NW Hearne compilation map and associated datasets



1:1 million geologic and metallogenic compilation and synthesis of S. Hearne and N. Rae

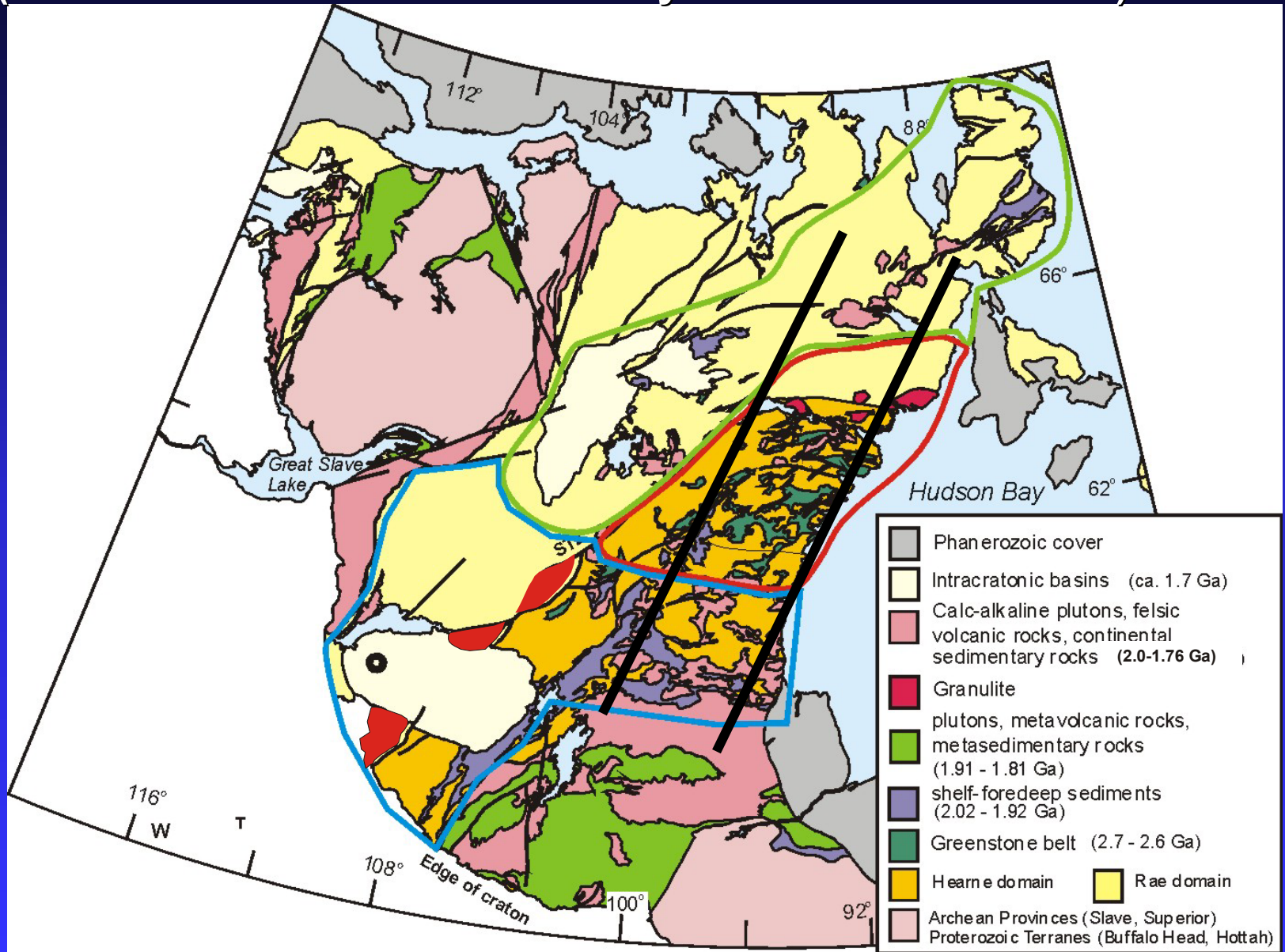


Release of **five new maps of Committee Bay** greenstone belt, Schultz Lake area, and Meadowbank gold deposit area

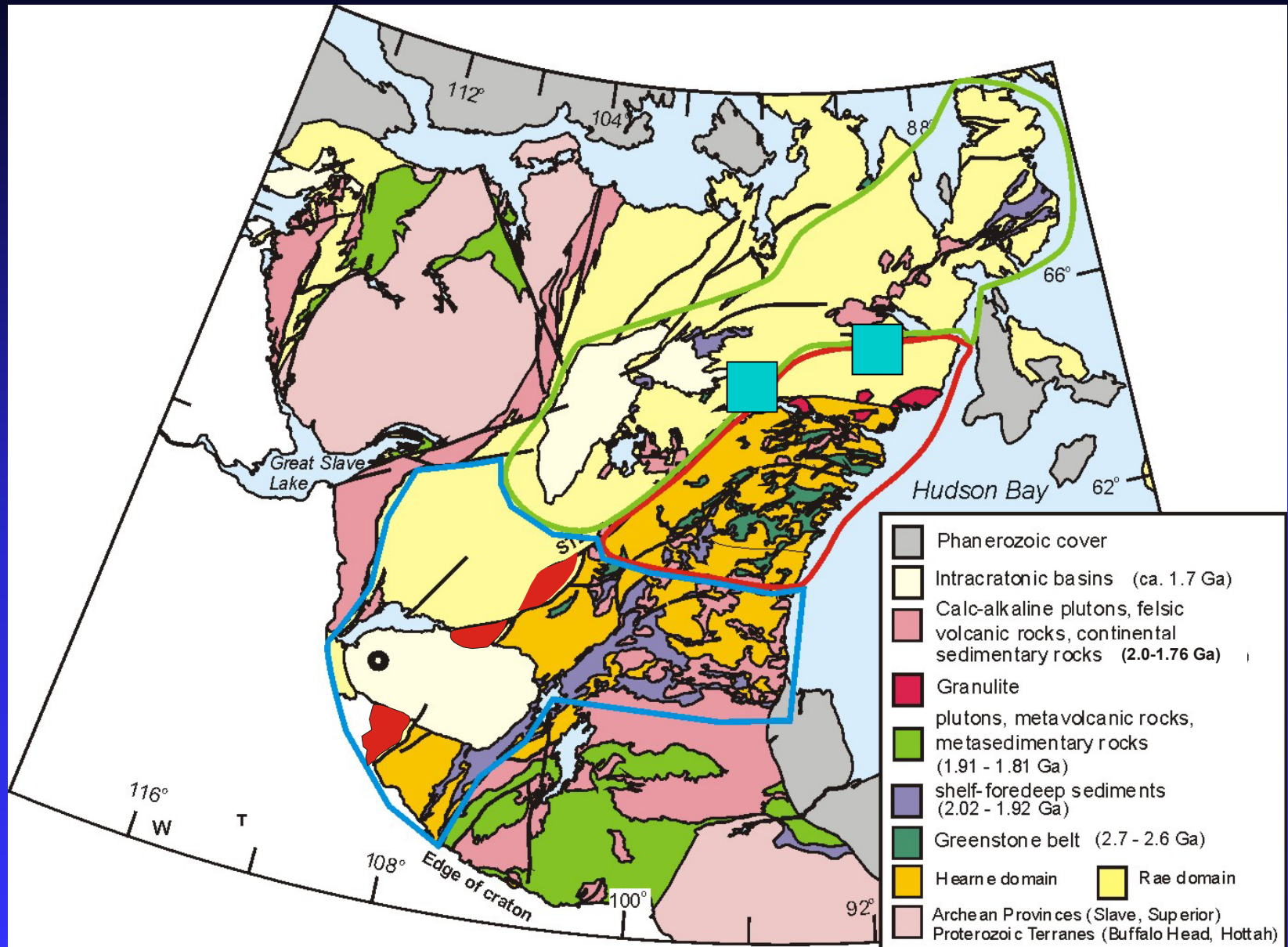


Digital release of new 1:250,000 maps of the WC Natmap project areas
existing maps of the Amer Lake region

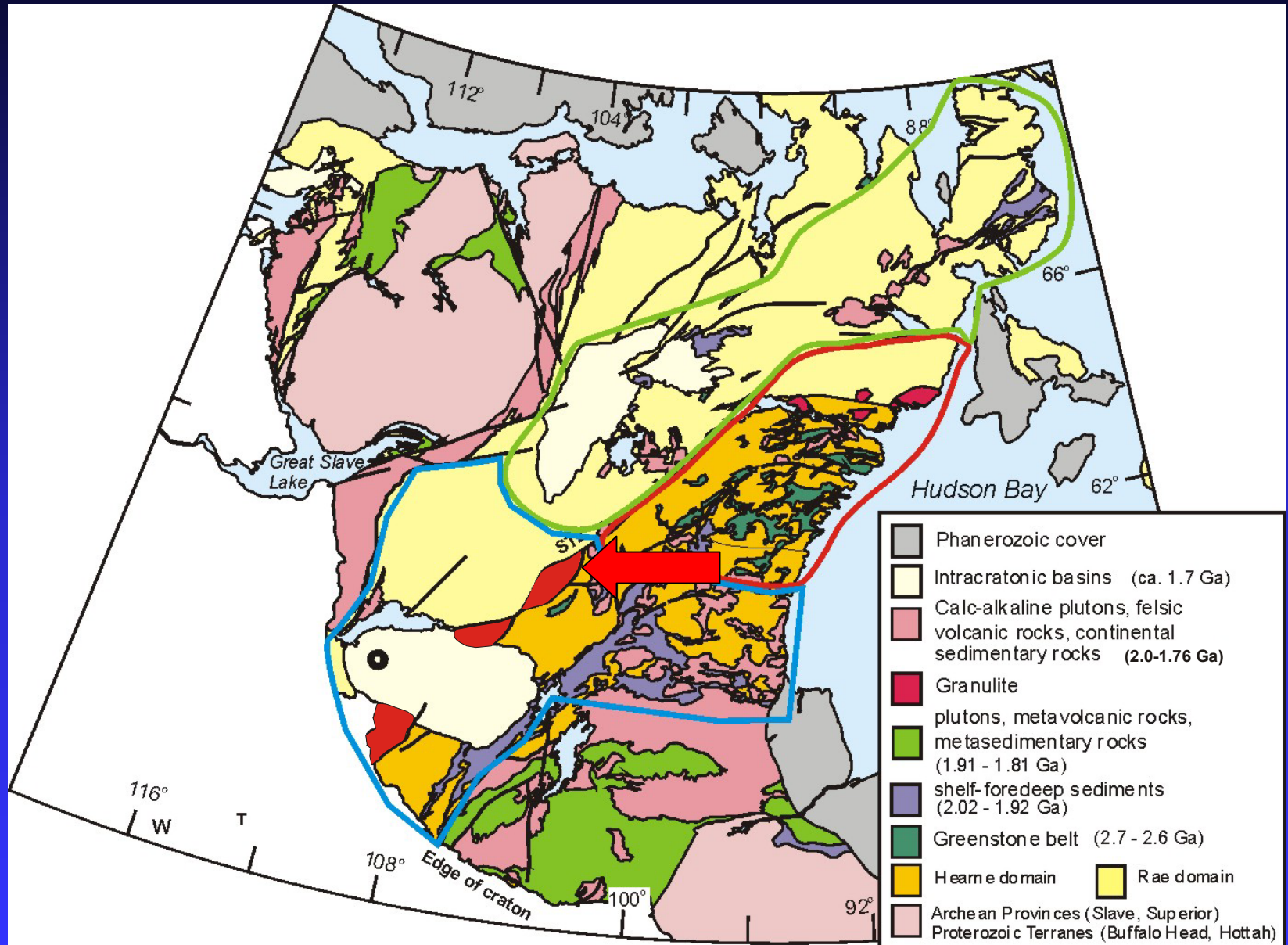
Assemble complete **first-ever cross section of the WCP and the Rae/Hearne domain boundary** through targeted acquisition of new geochronologic, tracer isotope, thermobarometric and lithogeochemical data (i.e. transect from Committee Bay to northern Manitoba)



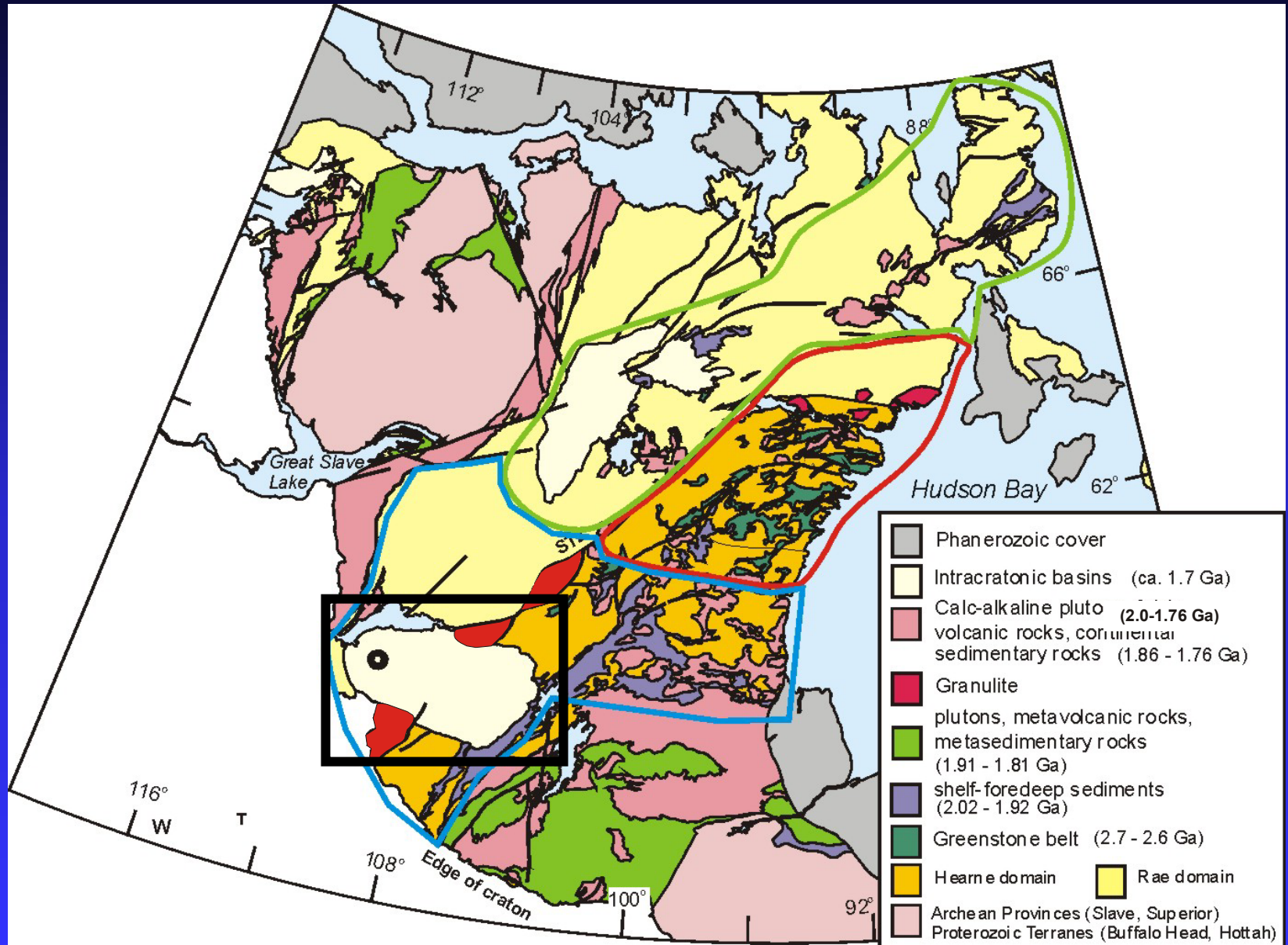
Framework Quaternary mapping and applied RPM techniques over the Keewatin Ice Divide, release of new Quaternary maps for N. Baffin



Integrate newly identified and existing Ni-PGE prospects into WCP metallogeny through targeted mapping, data collection, also with the C. Lord Northern Geoscience Center Snowbird Lake project



Release of Athabasca Basin Uranium multidisciplinary study volume





Building a regional tectonostratigraphic context

- Characterize extent of Proterozoic versus Archean crustal additions through magmatic or depositional processes
- Characterize the nature/extent of Proterozoic reworking and major structures
- Define the major Archean crustal blocks and their tectonic history
- Integrate mineral deposits knowledge with the new framework for regional tectonostratigraphy

Definition of the Western Churchill Province

A province of Archean and Paleoproterozoic domains that have been severely deformed and metamorphosed during the 'Hudsonian orogeny'

view following Stockwell 1961

Definition of the Western Churchill Province

“ that part of the Canadian Shield remaining after the adjacent, better defined, younger and older structural provinces have been delineated”

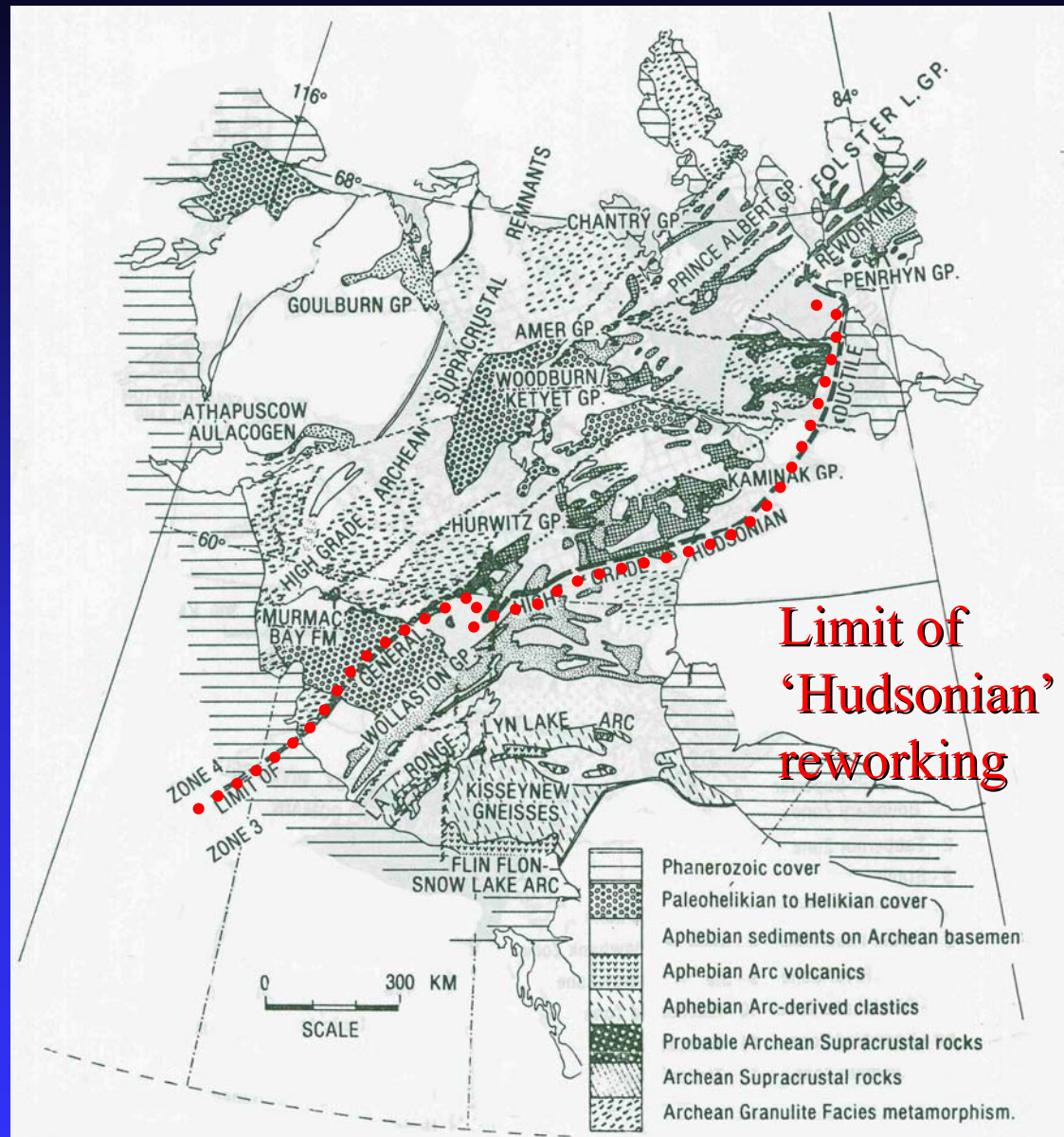
A. Davidson, 1972



Subdivision-1980's

Lewry et al.
1985

■ Major high grade THO reworking restricted to the south and eastern fringe of the Keewatin

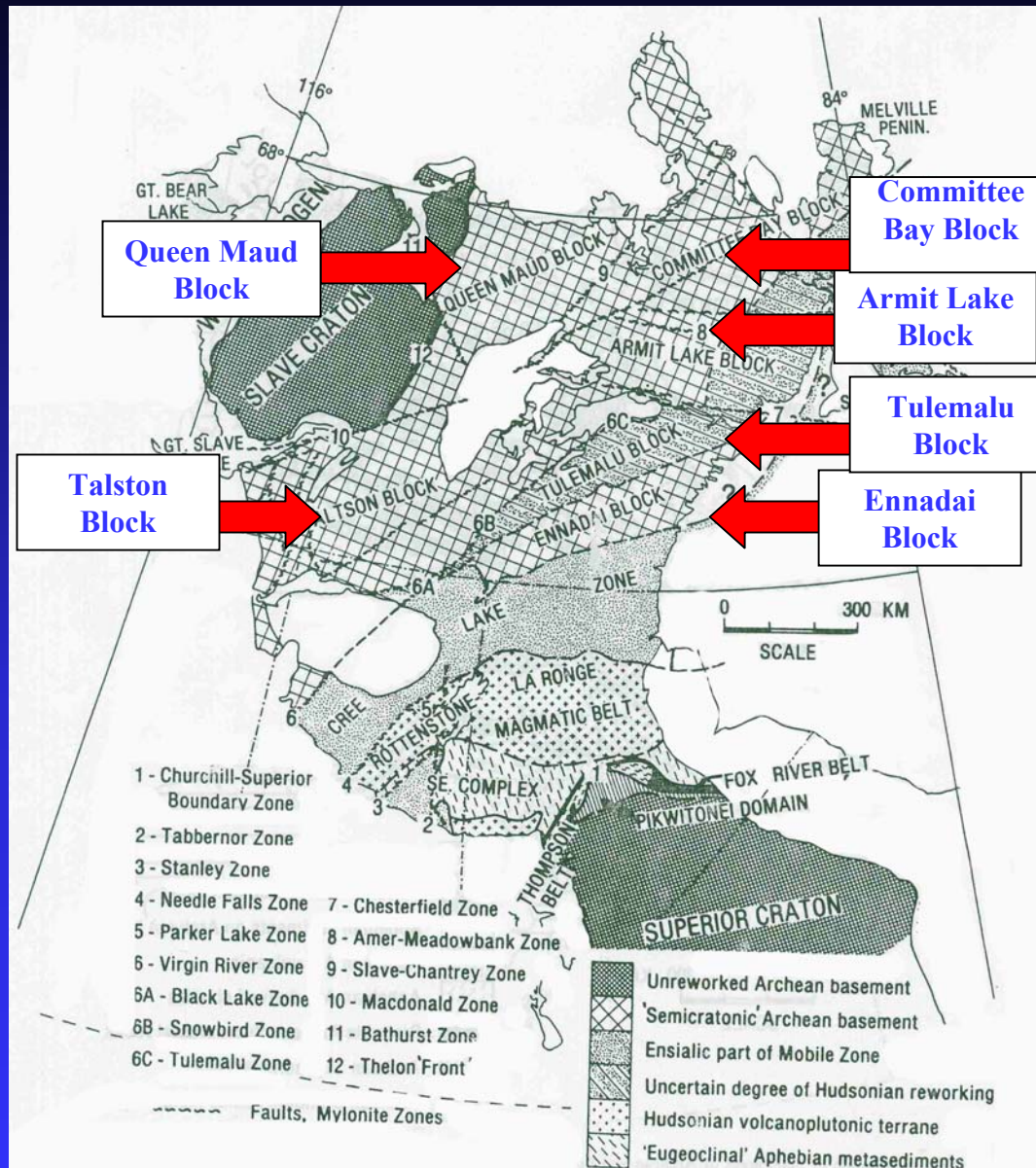


Lewry et al (1985) proposed a limit of high grade Hudsonian reworking, northwest of which there was nosignificant Proterozoic □



.....1980's cont.

- QM and Taltson blocks analagous to Archean Pikwitonei belt
- CB and Armit blocks are higher and lower level Archean crustal equivalents
- EB-low grade Archean and Aphebian sequences with Tulemalu reworked to an uncertain degree



They integrated the proposed subdivision of Heywood and Schau and also recognized a distinct high grade Archean Taltson block, □

Subdivision-late 1990's

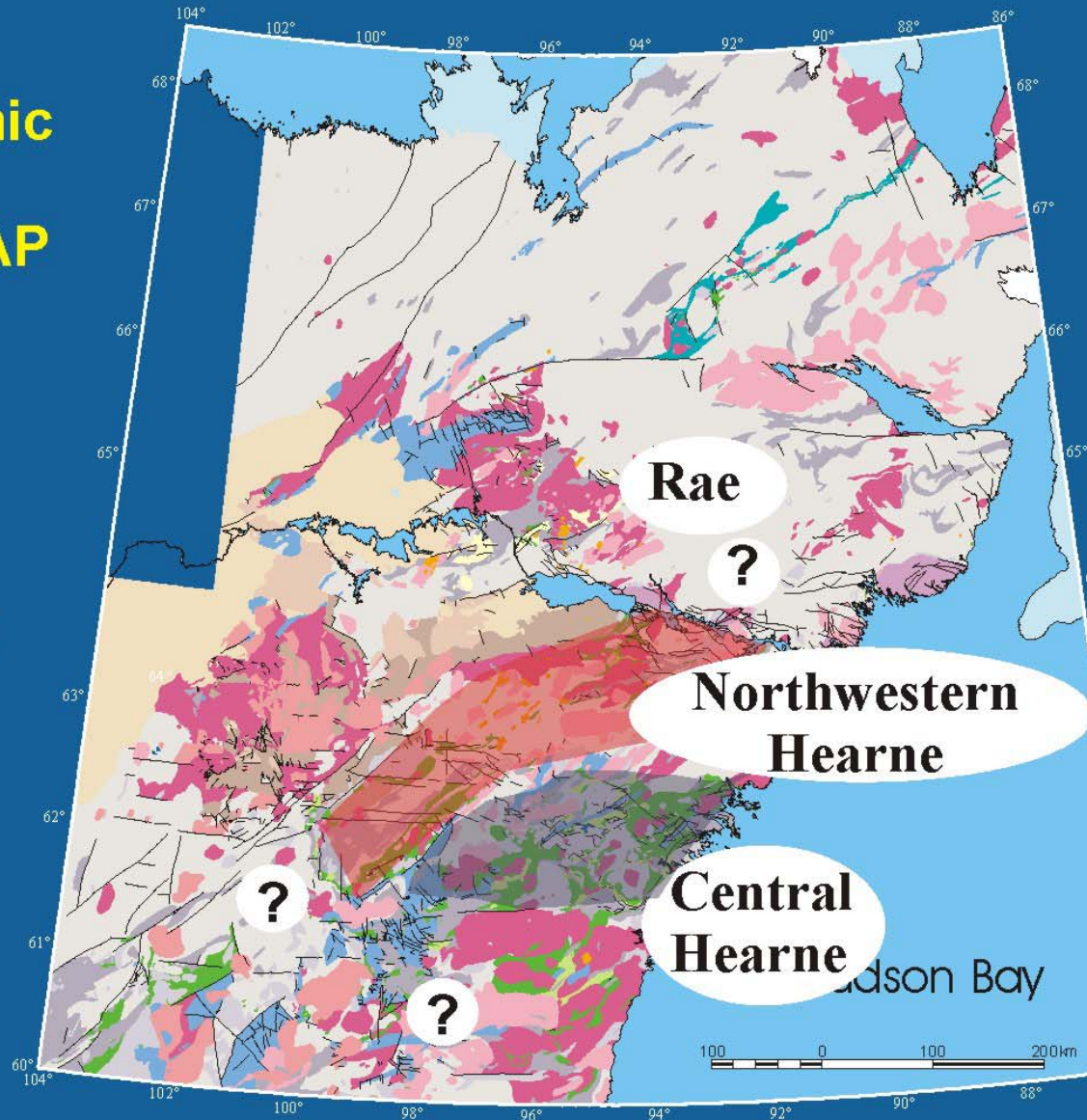
Proposed tectonic subdomains from WC NATMAP

Rae

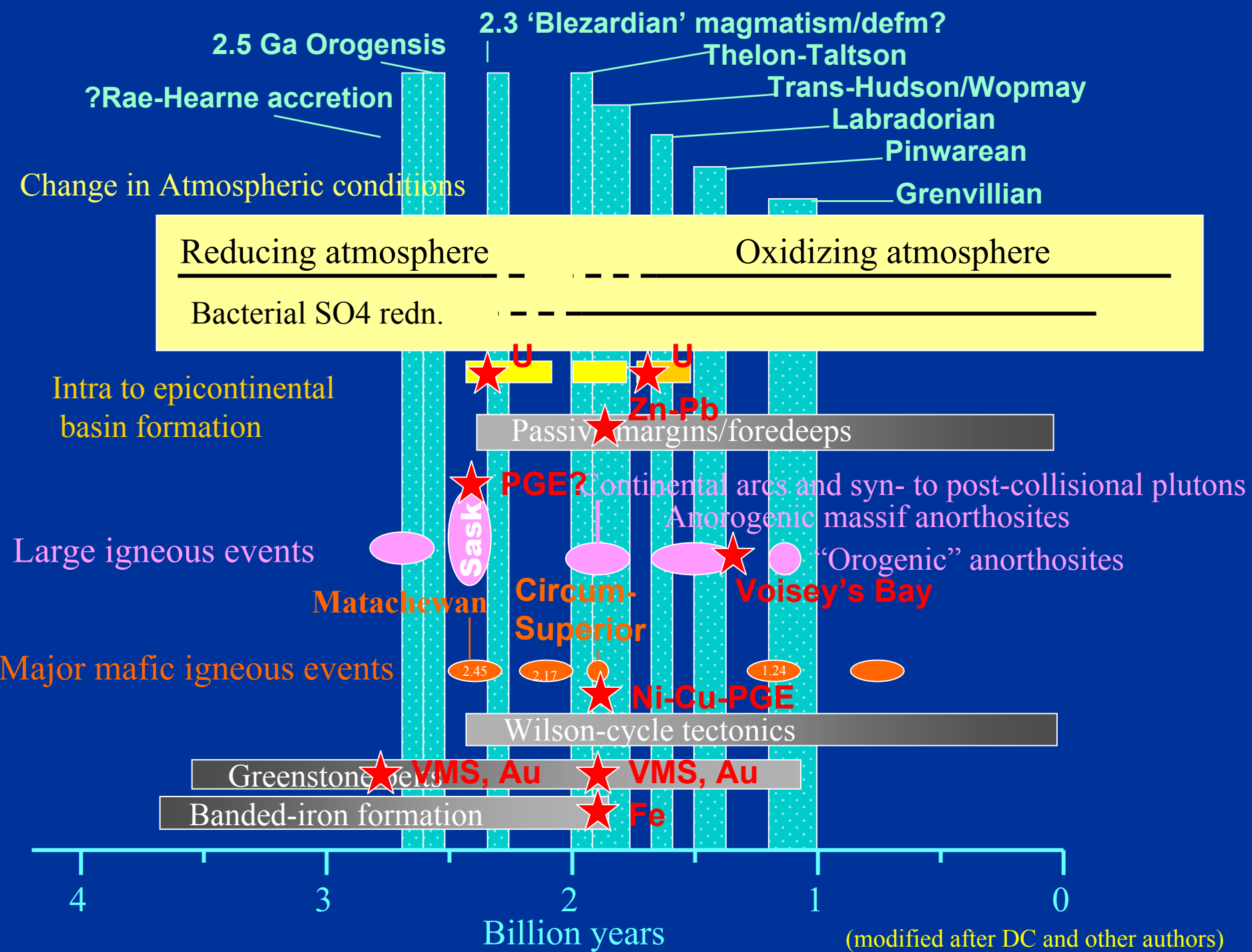
Hearne

■ northwestern

■ central



Utilizing first or
criteria stemm
Western Church
Targeted Geos
Saskatchewan
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integrating a va
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extending from
Saskatchewan,
the Taltson-The
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Present and evolving ideas

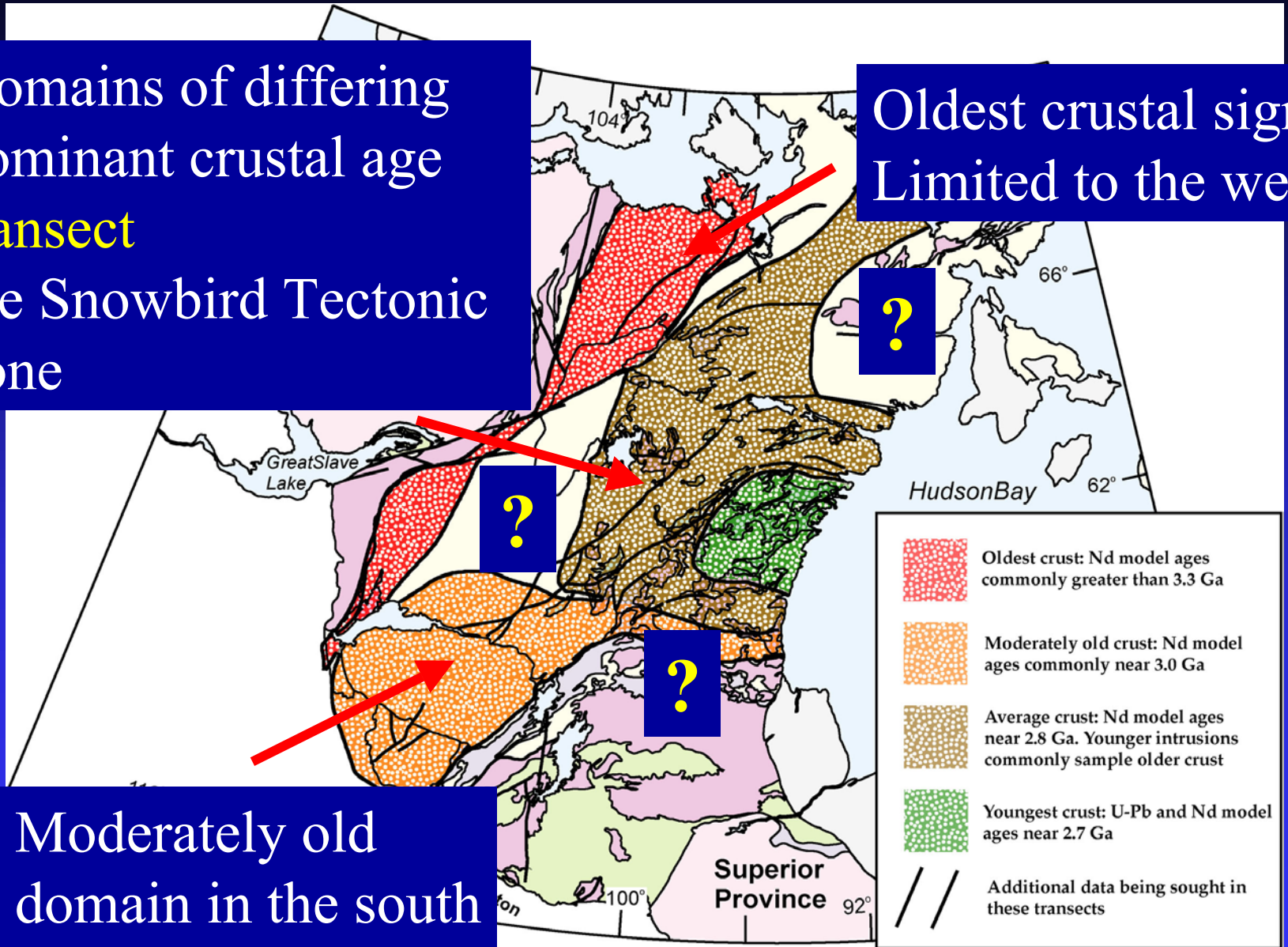
Domains of differing dominant crustal age

transect

the Snowbird Tectonic zone

Oldest crustal signature

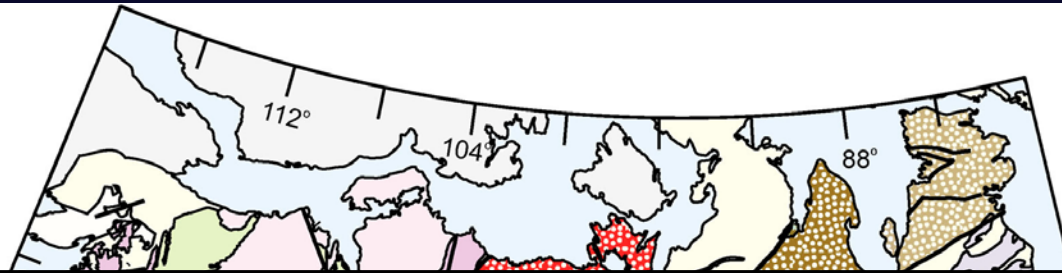
Limited to the west



Moderately old domain in the south
Rae/Hearne

interpreted age domains

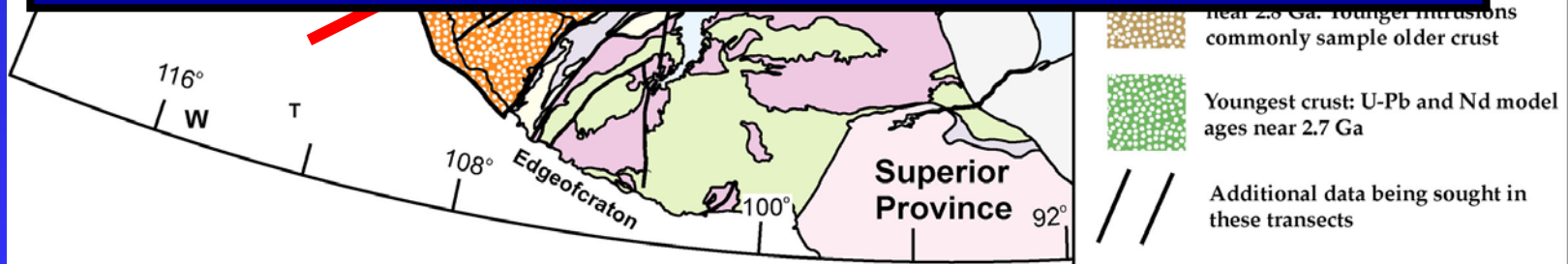
Present and evolving ideas



Was the Hearne assembled in the late **Archean** as part of a **Kenorland supercontinent**?

or

Could it represent an amalgam of Archean, peri-Rae and peri-Superior microcontinental fragments finally assembled during closure of the Manikewan ocean in the **Proterozoic**?



Interpreted age domains

Outstanding questions

The WCP includes at least four lithotectonic domains with distinct tectonic histories that affect their regional metallogeny and which straddle the five provincial and territorial borders

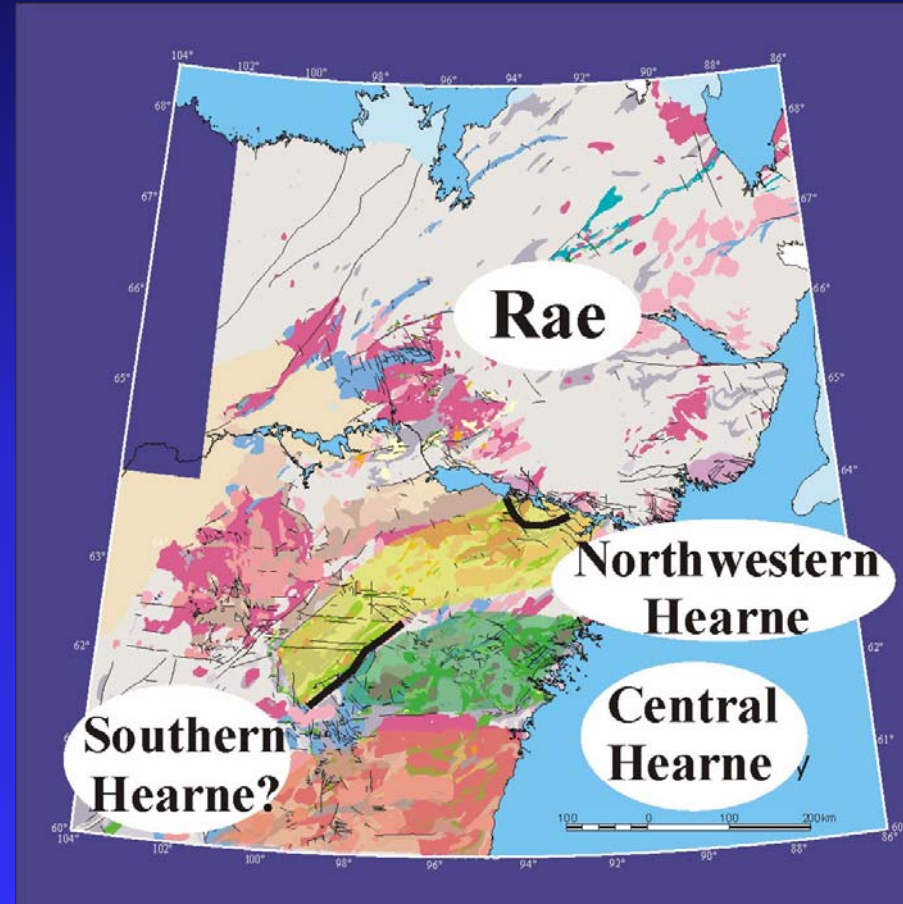
Many of the critical questions to be addressed are still fundamental;

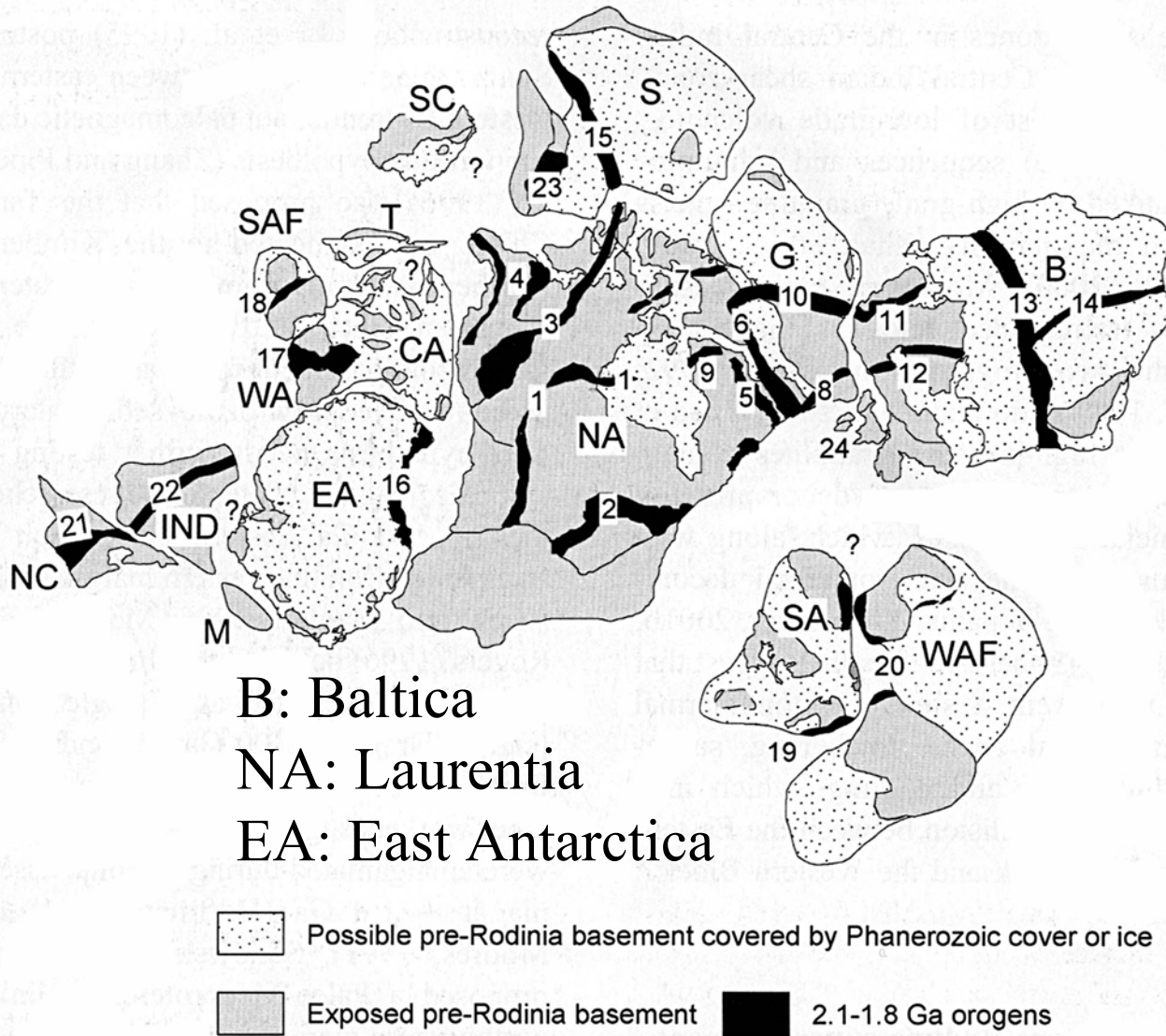
➤ the extent and nature of **Archean** versus **Proterozoic** crust

➤ the regional extent of **2.5 Ga**, **2.3 Ga**, **1.9 Ga** tectonometamorphic and magmatic events

➤ the distribution and degree of **ca. 1.85-1.8 Ga** Paleoproterozoic orogenic reworking

All of these influence the localization and distribution of mineral deposits





What do the various global reconstructions have to teach us about successful exploration models applied to cratons originally attached to the WCP and Laurentia?

One possible reconstruction: the Mesoproterozoic Columbia Supercontinent