

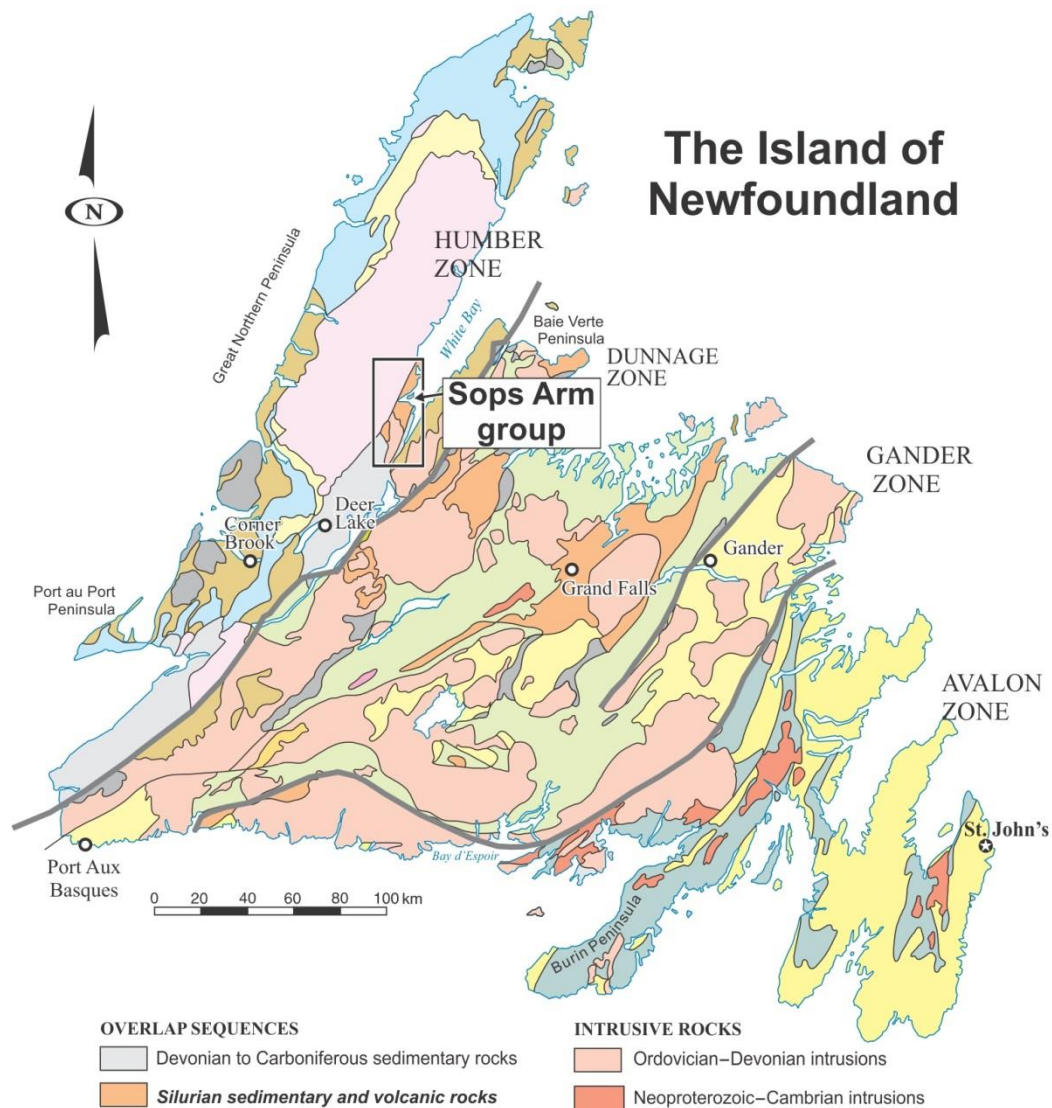
**Preliminary geochronology and petrochemistry of  
volcanic rocks and felsic dykes of the Silurian  
Sops Arm Group, western White Bay,  
Newfoundland (NTS 12H/10 & 15)**



# Outline

- Brief summary of historical work in the study area
- Summary of the geology of the area (rock shots)
- New, U-Pb and  $^{40}\text{Ar}/^{39}\text{Ar}$  geochronology
- Geochemistry of the volcanic rocks and felsic dykes of the Sops Arm group
- Implications, future work etc

# Location of the study area



**HUMBER ZONE**  
Neoproterozoic to Ordovician

- Clastic and metasedimentary rocks
- Platformal carbonate rocks
- Basal clastic, carbonate and volcanic rocks

**Meso–Neoproterozoic**

- Gneisses and granites

**DUNNAGE & GANDER ZONES**  
Cambrian to Silurian

- Marine clastic and volcanic rocks
- Ophiolitic rocks

**Neoproterozoic–Ordovician**

- Metasedimentary rocks and migmatite

**AVALON ZONE**  
Neoproterozoic to Ordovician

- Subaerial–marine sedimentary rocks
- Mafic and felsic volcanic rocks

# History of mining-exploration-research

- Late 1800's discovery of gold in Pollards Point by J. Jackman and R. Rendell (Browning Mine)
- Visits by A. Murray, J.P. Howley and A.K. Snelgrove in late 1800's early 1900's.
- Renewed interest in gold in area in 1930's
- Dissertations of Heyl (1937) & Betz (1948) and definition of Sops Arm group
- Regional mapping GSC surveys of 1960's (Neale and Nash, 1963)
- PhD of Lock (1969) on geology & stratigraphy of group

- Early 1980's saw new road access and 1:50,000 scale maps (Smyth & Schillereff, 1982).
- Discovery of Rattling Brook & Viking in mineralized PC granitoids in mid-late 1980's
- Renewed study of lithostratigraphy and auriferous mineralization in early 2000's.
- 2002-2006, geophysical surveys over a number of claim packages covering much of the group
- Prospecting, soil, till and lake sediment sampling and discovery of new gold showings (e.g., Thor)
- Drilling on Thor vein (Northern Abitibi Mining)
- Discovery of Kramer & acquisition of Thor and affiliated showings (Spruce Ridge Resources).
- Discovery of the Shrik, Boot n Hammer and Stocker zones in Coney Head complex (Metals Creek Resources). Not yet drilled!

Sops Arm Group and  
environs (12H/10 & 15)

Plutonic rocks (Siluro-Devonian)

- Gull Lake Intrusive Suite (G) and Devils Room Granite (D)

SOPS ARM GROUP (Silurian)

Natlns Cove Formation

- Hypabyssal plutonic rocks
- Felsic (F) and mafic (M) volcanic / pyroclastic rocks
- Siltstones and sandstones

Simms Ridge Formation

- Calcareous siltstone, minor limestone

Frenchmans Cove Formation

- Conglomerates and sandstones

Jacksons Arm Formation

- Conglomerates

Pollards Point Formation

- Mafic (M) to felsic (F) volcanic / pyroclastic rocks
- Limestone and dolostone

- C - Carboniferous rocks
- SW - Southern White Bay Allochthon
- CHC-SW - Coney Head Complex
- CO - Cambro-Ordovician platformal rocks
- PC - Precambrian rocks (Grenville)

Geologic contact

Fault

Assumed/inferred thrust fault

★ Gold prospect

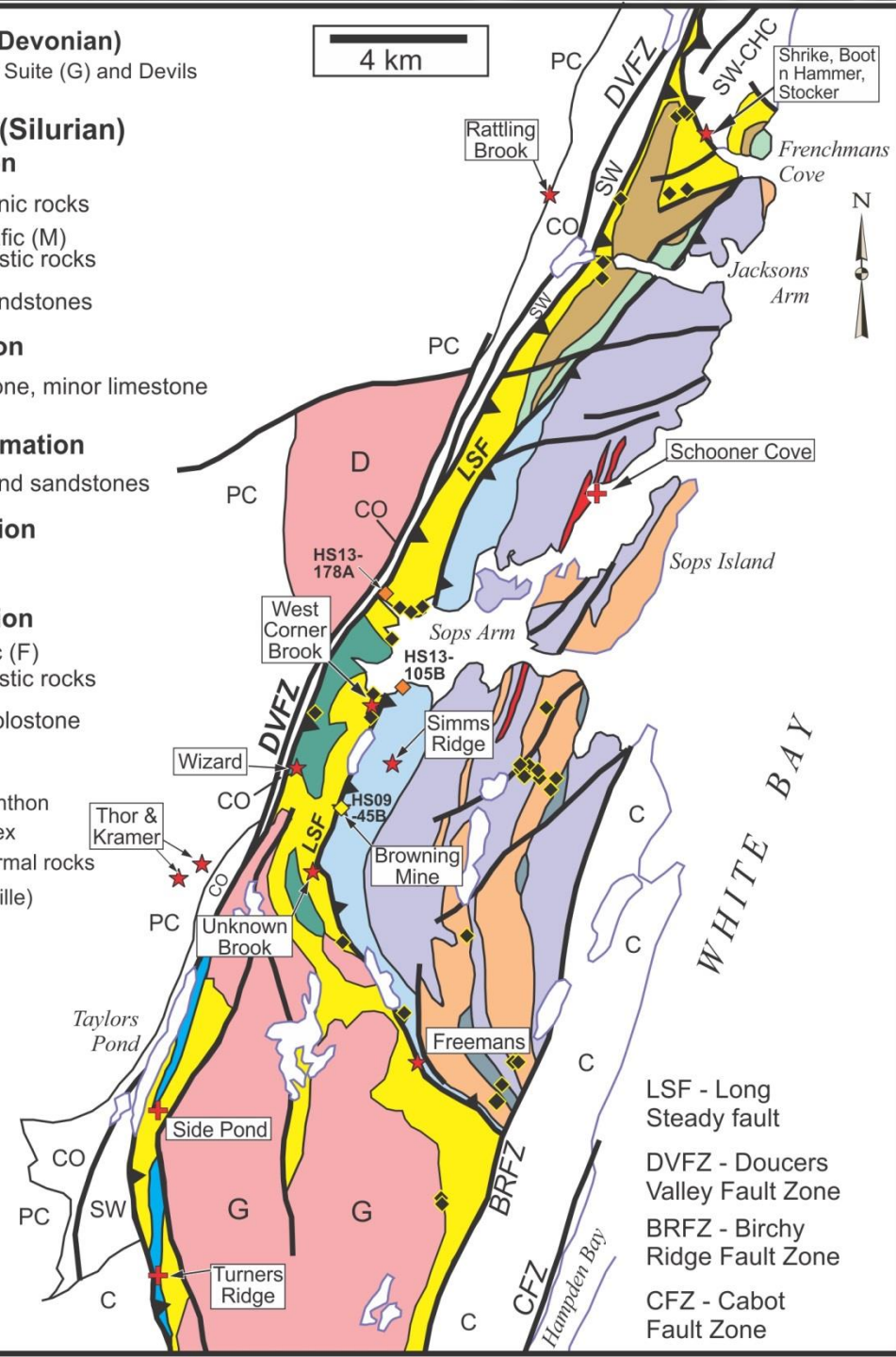
⊕ Pb, Zn or Ag prospect

◆ litho geochemistry sample location

◆ HS13-105B U-Pb sample location

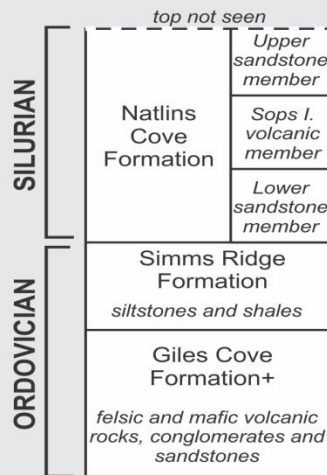
◆ HS09-45B <sup>40</sup>Ar-<sup>39</sup>Ar sample location

4 km

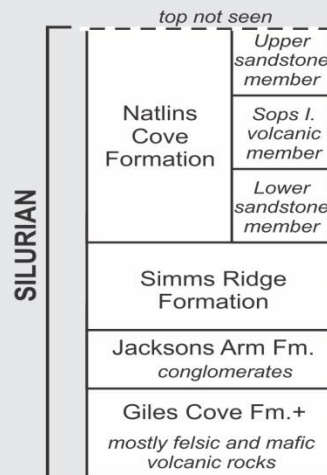


Summary of stratigraphic relationships

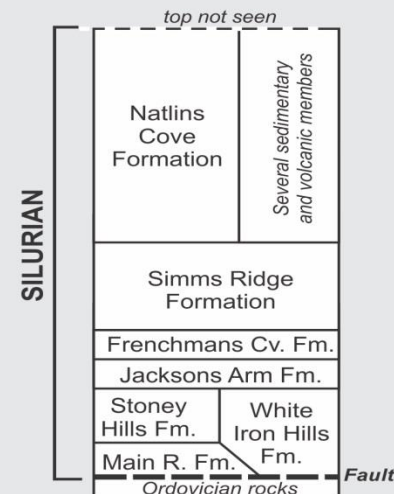
From (Kerr (2006))



(a) Heyl (1937) and Betz (1948)

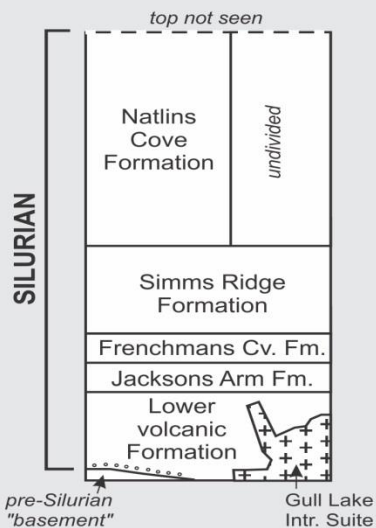


(b) Neale and Nash (1963)

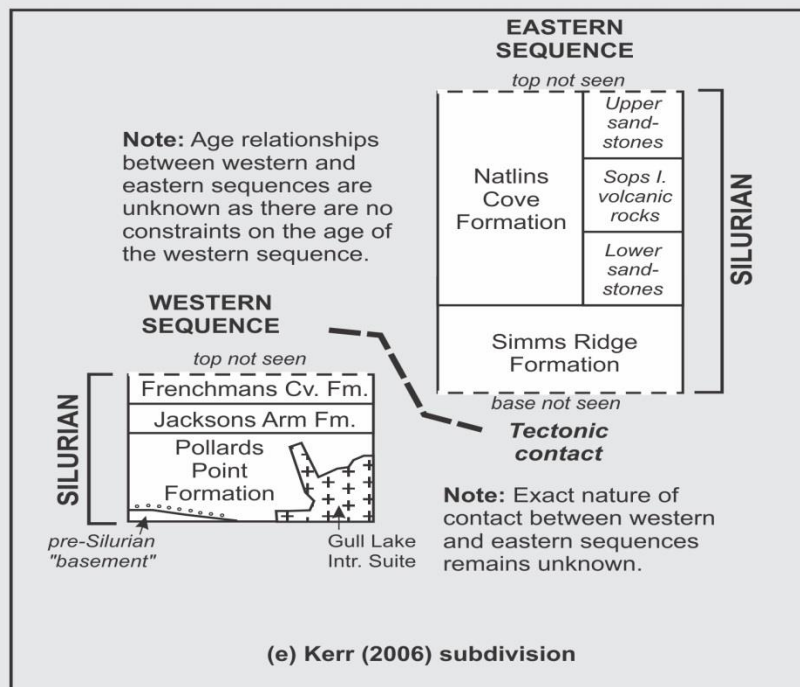


(c) Lock (1969a, b)

+ This formation included Ordovician rocks now included within the Southern White Bay Allochthon

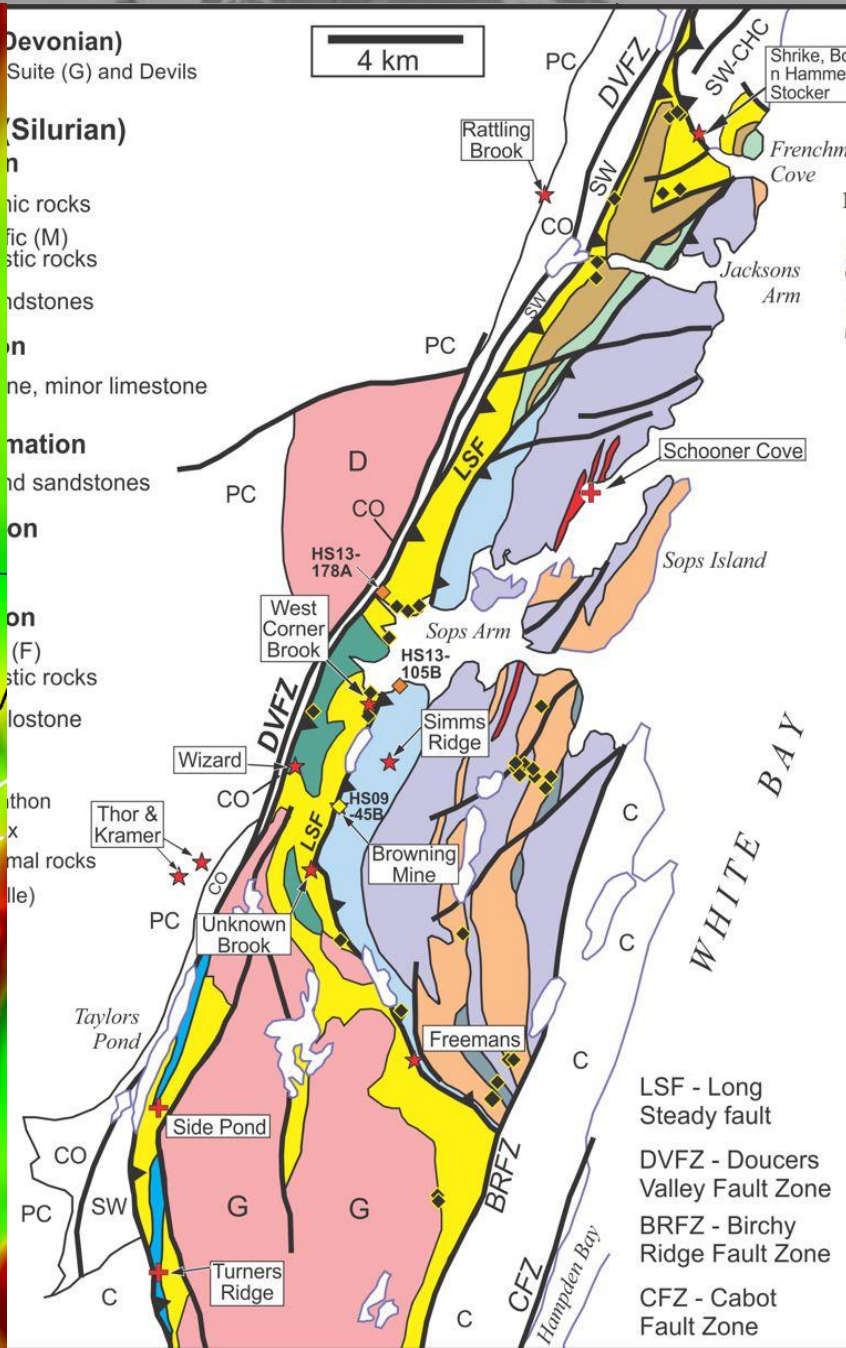
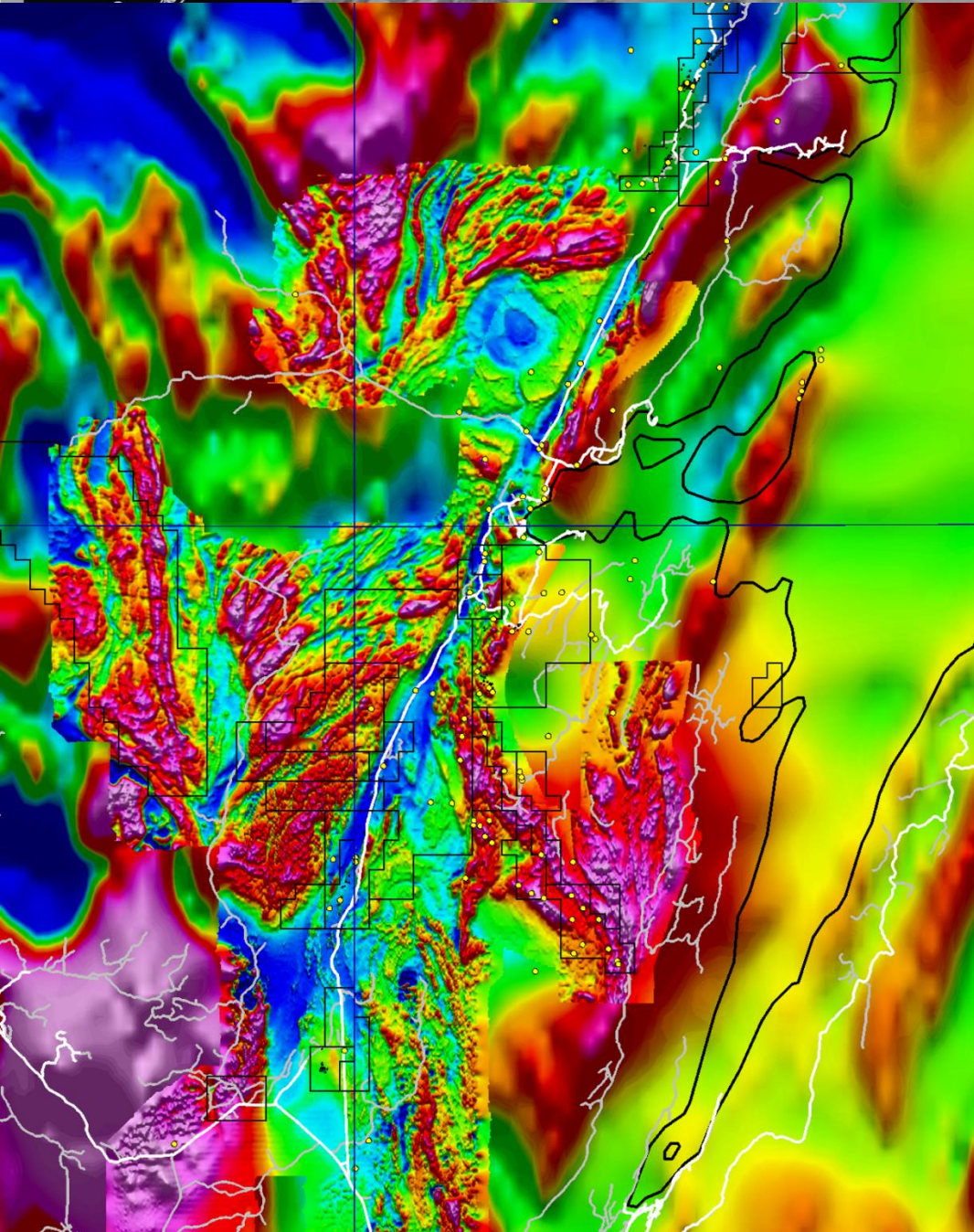


(d) Smyth and Schillereff (1982)



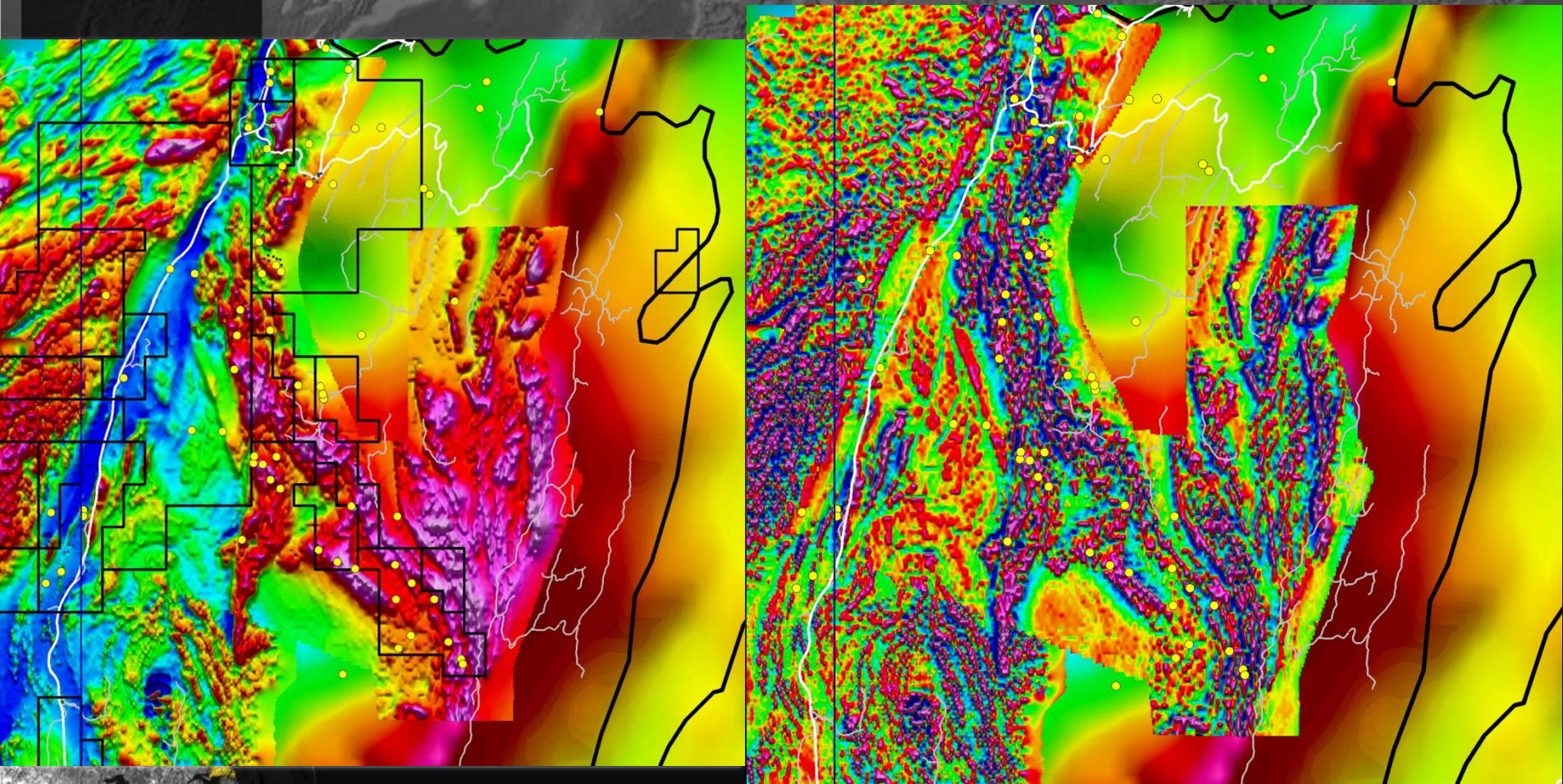
(e) Kerr (2006) subdivision

# Airborne geophysics





# Sops Arm South (S of Pollards Point)



**Plutonic rocks (Siluro-Devonian)**

- Gull Lake Intrusive Suite (G) and Devils Room Granite (D)

**SOPS ARM GROUP (Silurian)**

**Natlines Cove Formation**

- Hypabyssal plutonic rocks
- Felsic (F) and mafic (M) volcanic / pyroclastic rocks
- Siltstones and sandstones

**Simms Ridge Formation**

- Calcareous siltstone, minor limestone

**Frenchmans Cove Formation**

- Conglomerates and sandstones

**Jacksons Arm Formation**

- Conglomerates

**Pollards Point Formation**

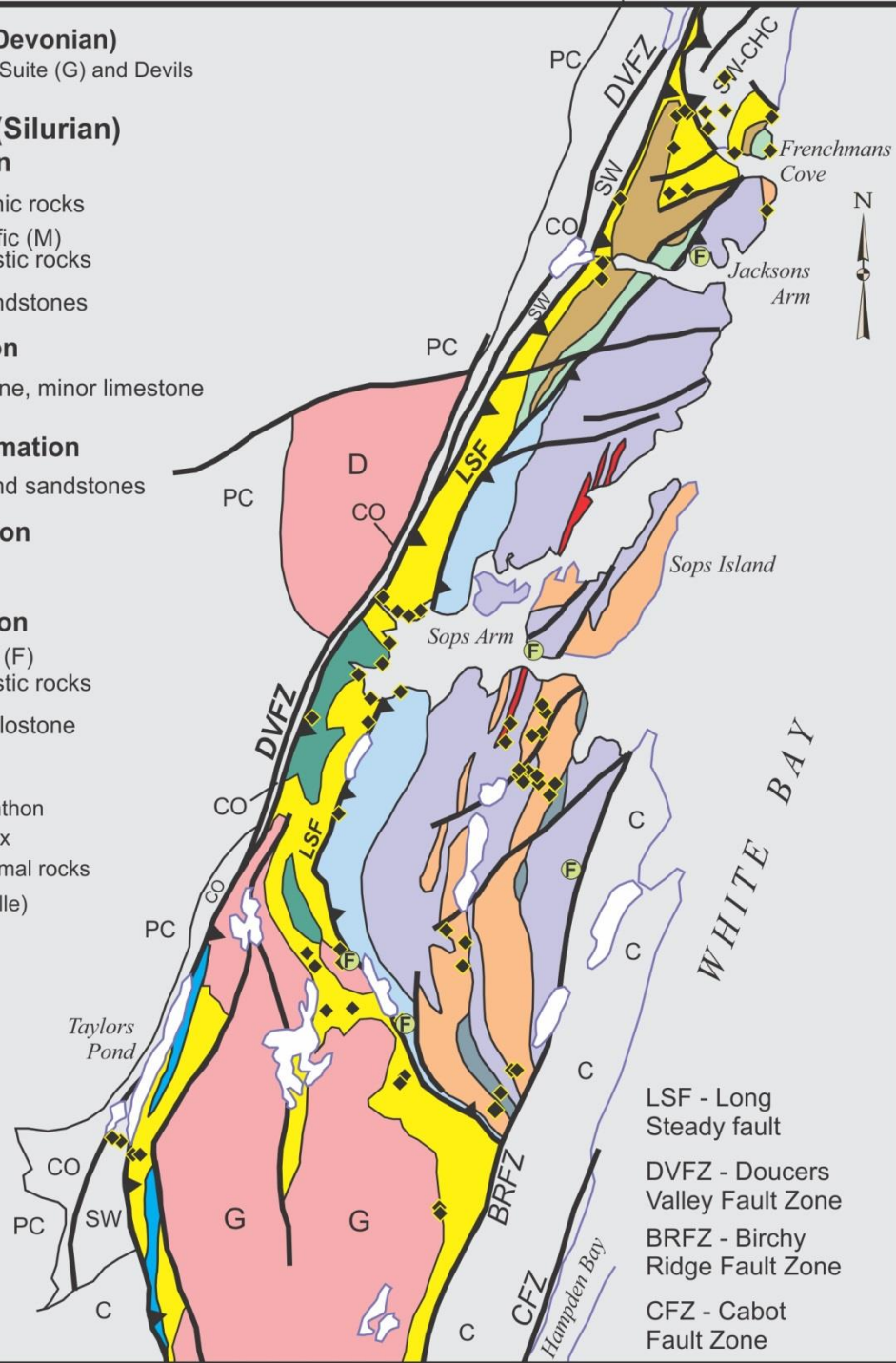
- Mafic (M) to felsic (F) volcanic / pyroclastic rocks
- Limestone and dolostone

EASTERN SEQUENCE

WESTERN SEQUENCE

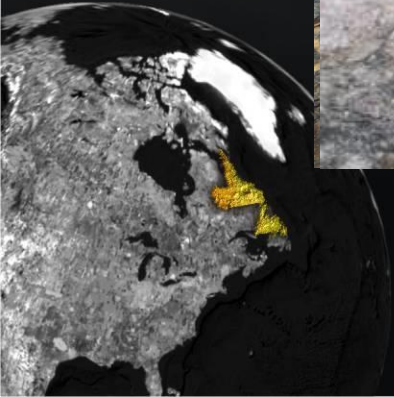
- C - Carboniferous rocks
- SW - Southern White Bay Allochthon
- CHC-SW - Coney Head Complex
- CO - Cambro-Ordovician platformal rocks
- PC - Precambrian rocks (Grenville)

- Geologic contact
- Fault
- Assumed/inferred thrust fault
- Fossil locality
- litho-geochemistry sample location

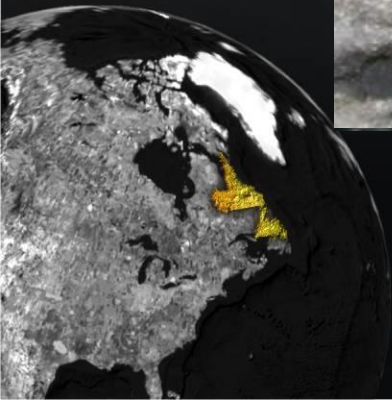


- LSF - Long Steady fault
- DVVZ - Doucers Valley Fault Zone
- BRFZ - Birchy Ridge Fault Zone
- CFZ - Cabot Fault Zone

# Rocks of the Western sequence



# Rocks of the Eastern sequence

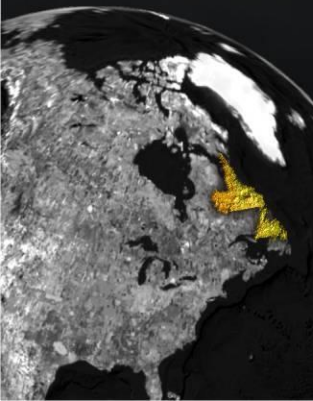


# Rocks of the Eastern sequence

Newfoundland  
Labrador

Natural Resources

Geological Survey



# Felsic dyke rocks of the group



Geochronology sample locations

Plutonic rocks (Siluro-Devonian)

- Gull Lake Intrusive Suite (G) and Devils Room Granite (D)

SOPS ARM GROUP (Silurian)

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Pollards Point Formation

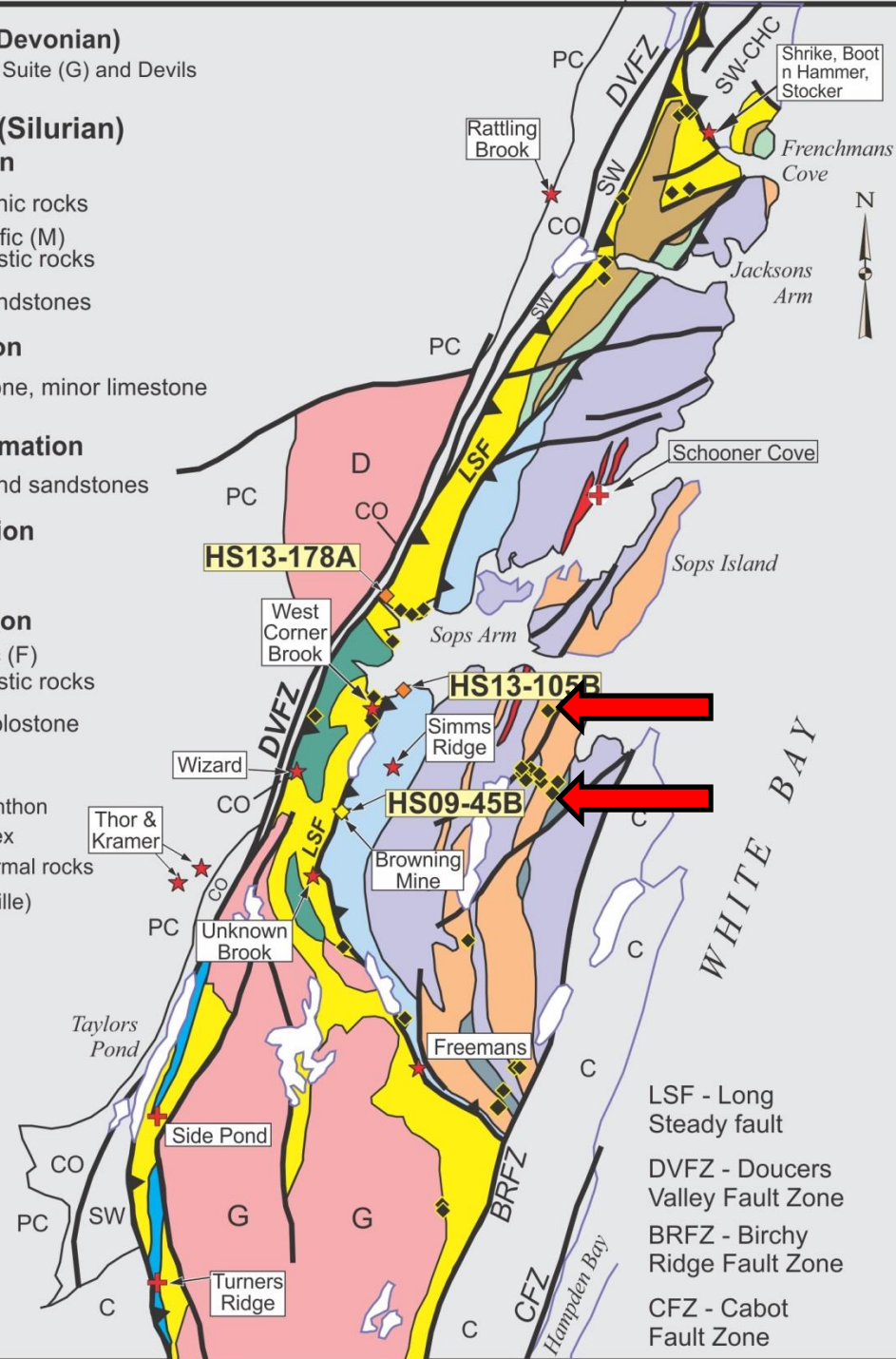
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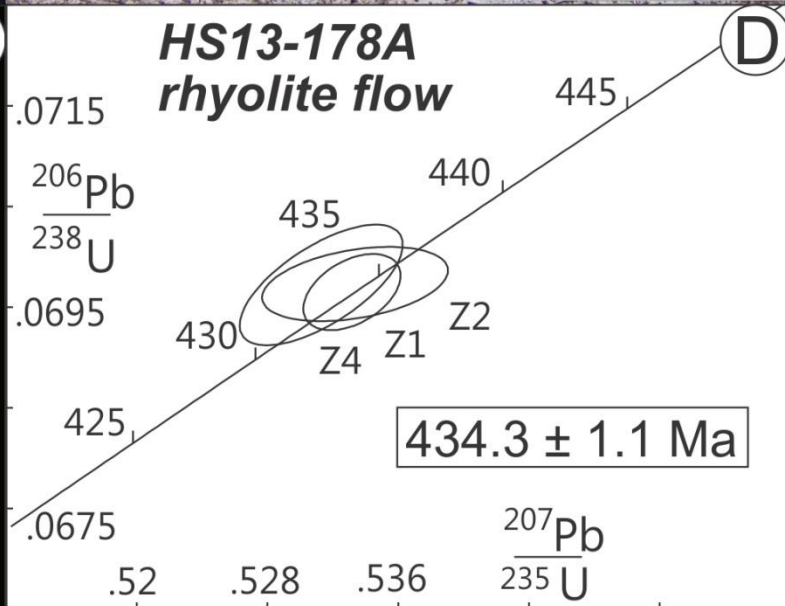
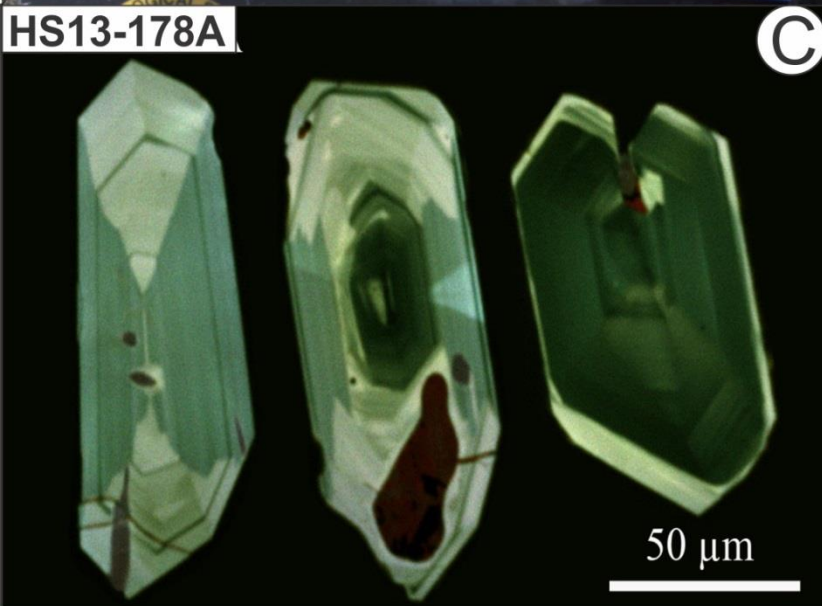
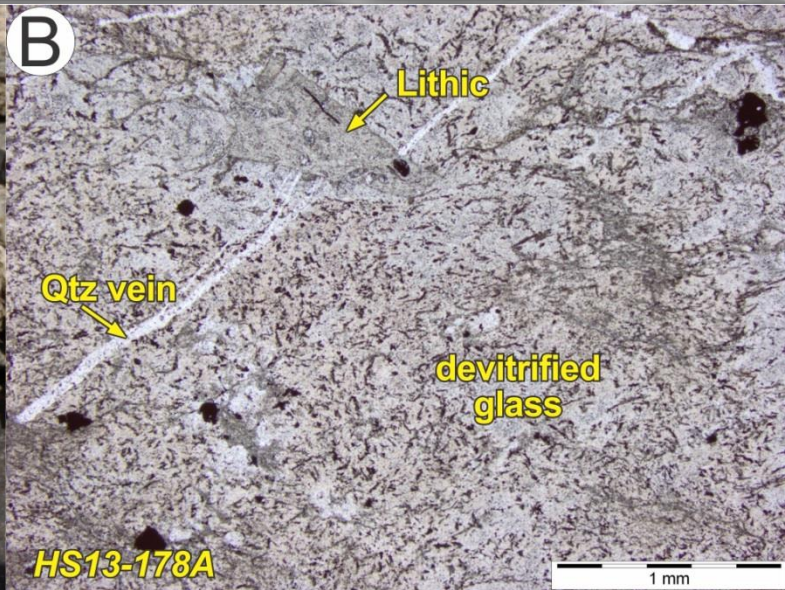
- Geologic contact
- Fault

- Assumed/inferred thrust fault

- Gold prospect
- Pb, Zn or Ag prospect
- litho geochemistry sample location
- HS13-105B U-Pb sample location
- HS09-45B <sup>40</sup>Ar-<sup>39</sup>Ar sample location

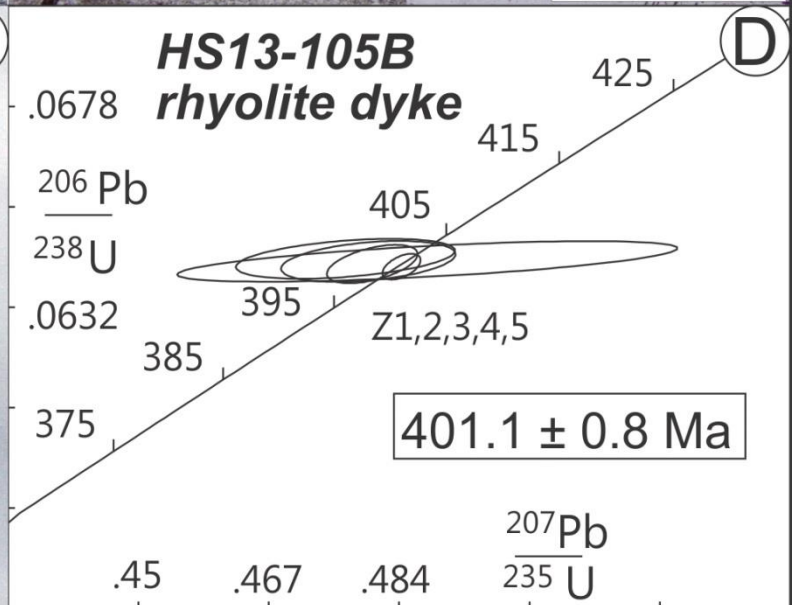
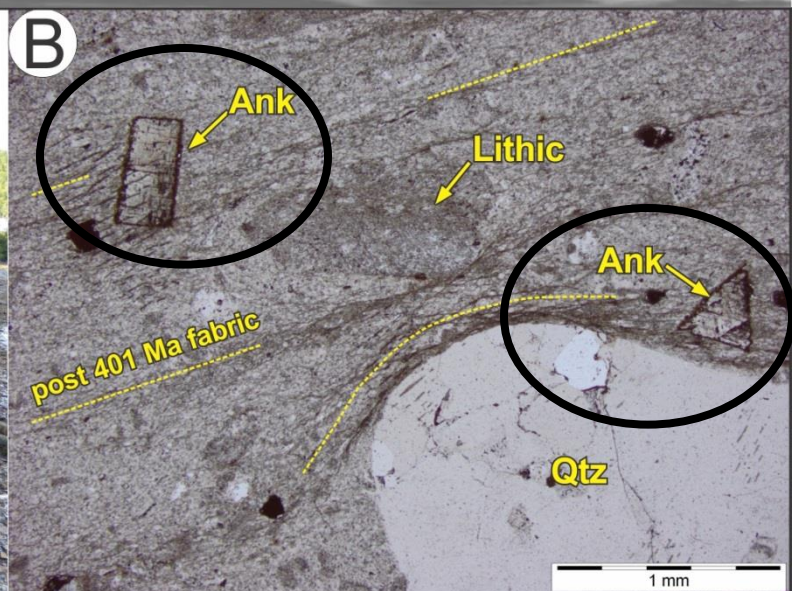


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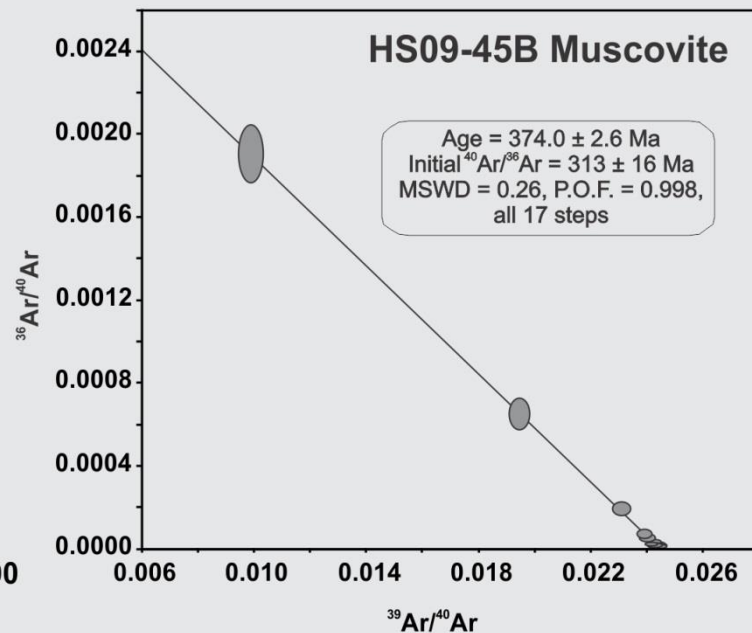
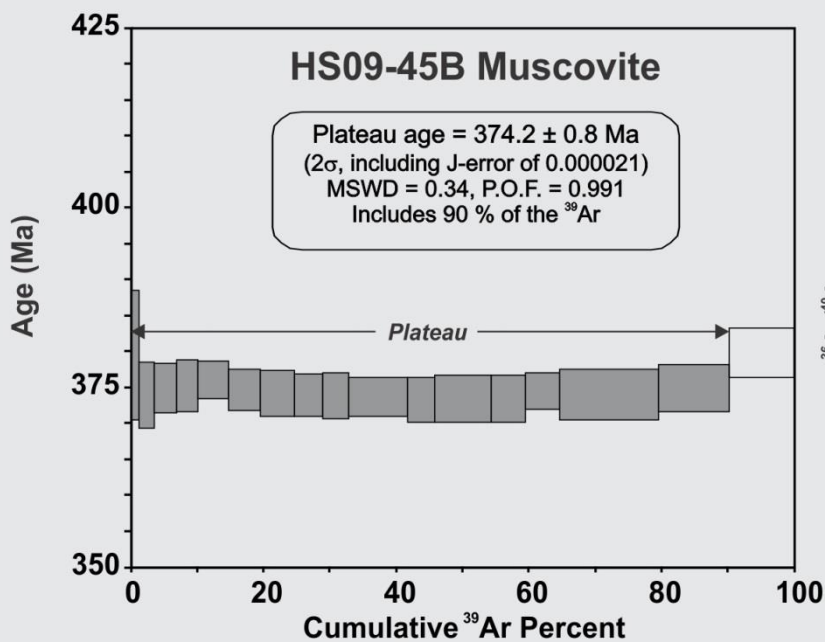
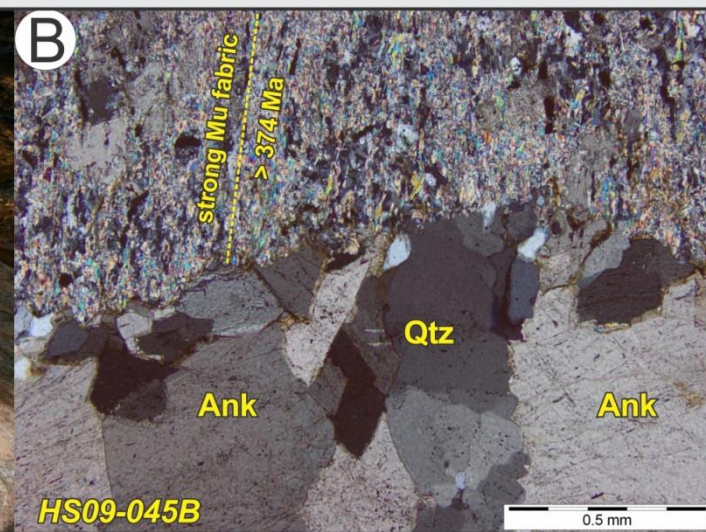
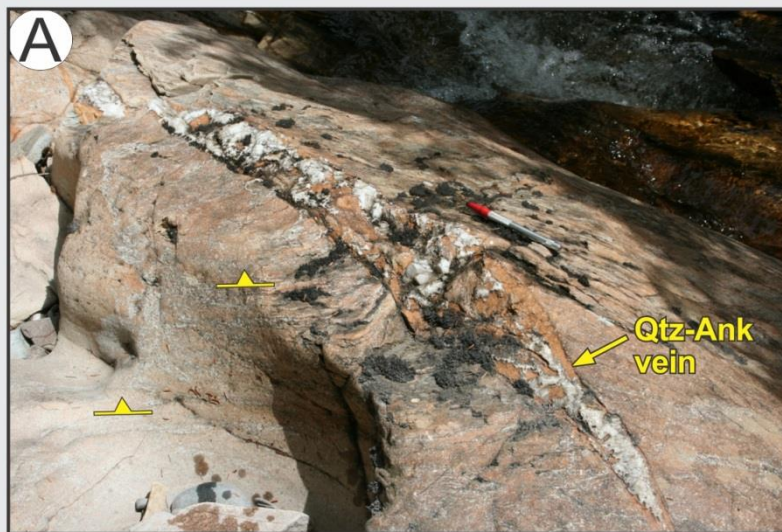


**U-Pb zircon geochronology rhyolite HS13-178A**

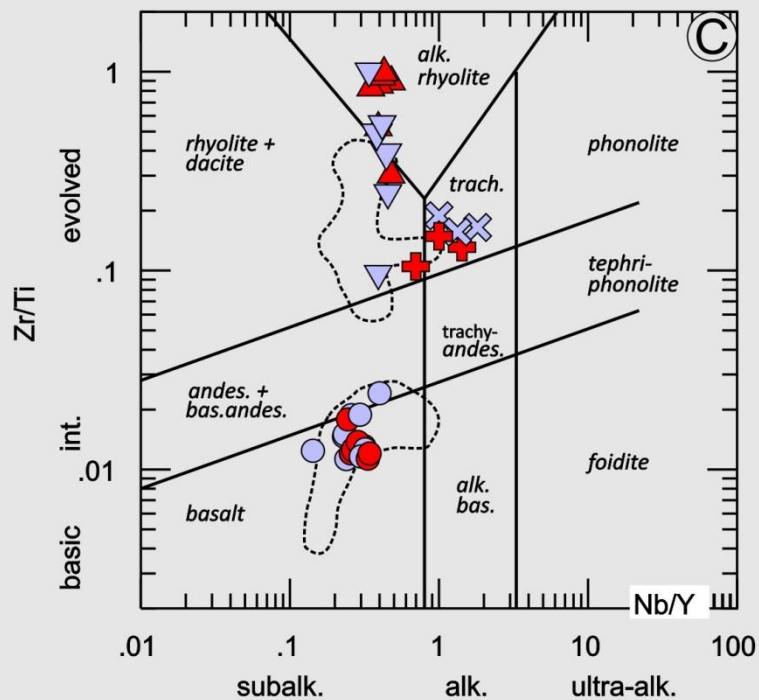
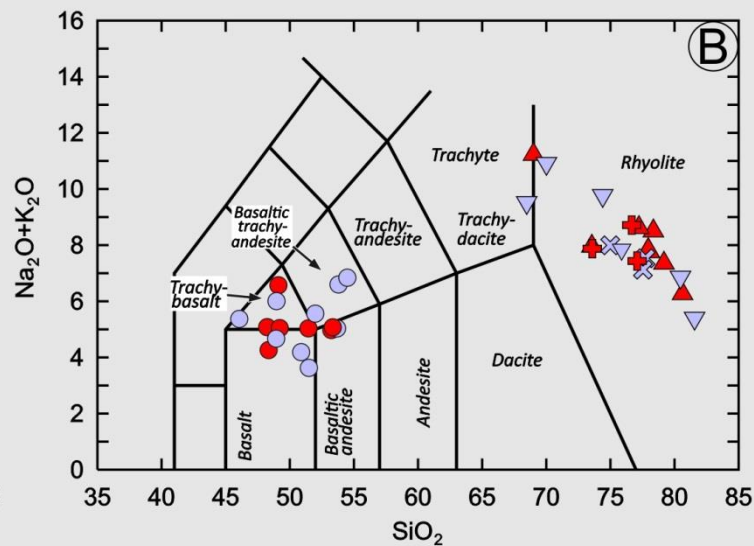
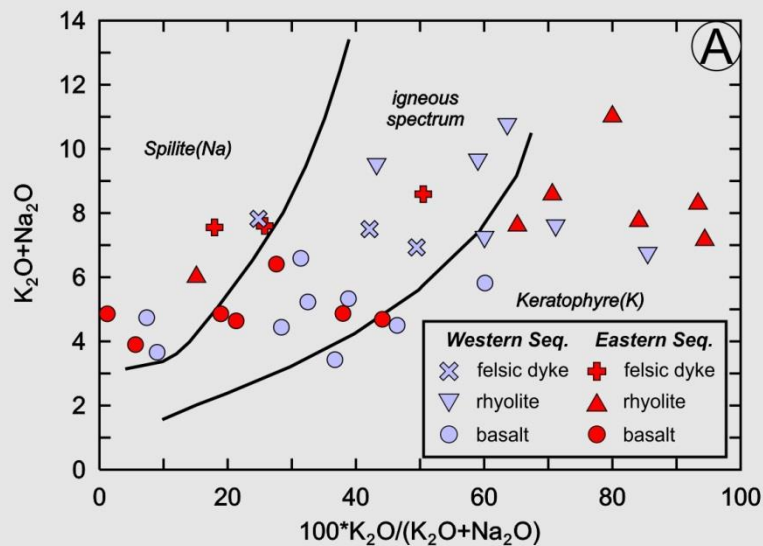




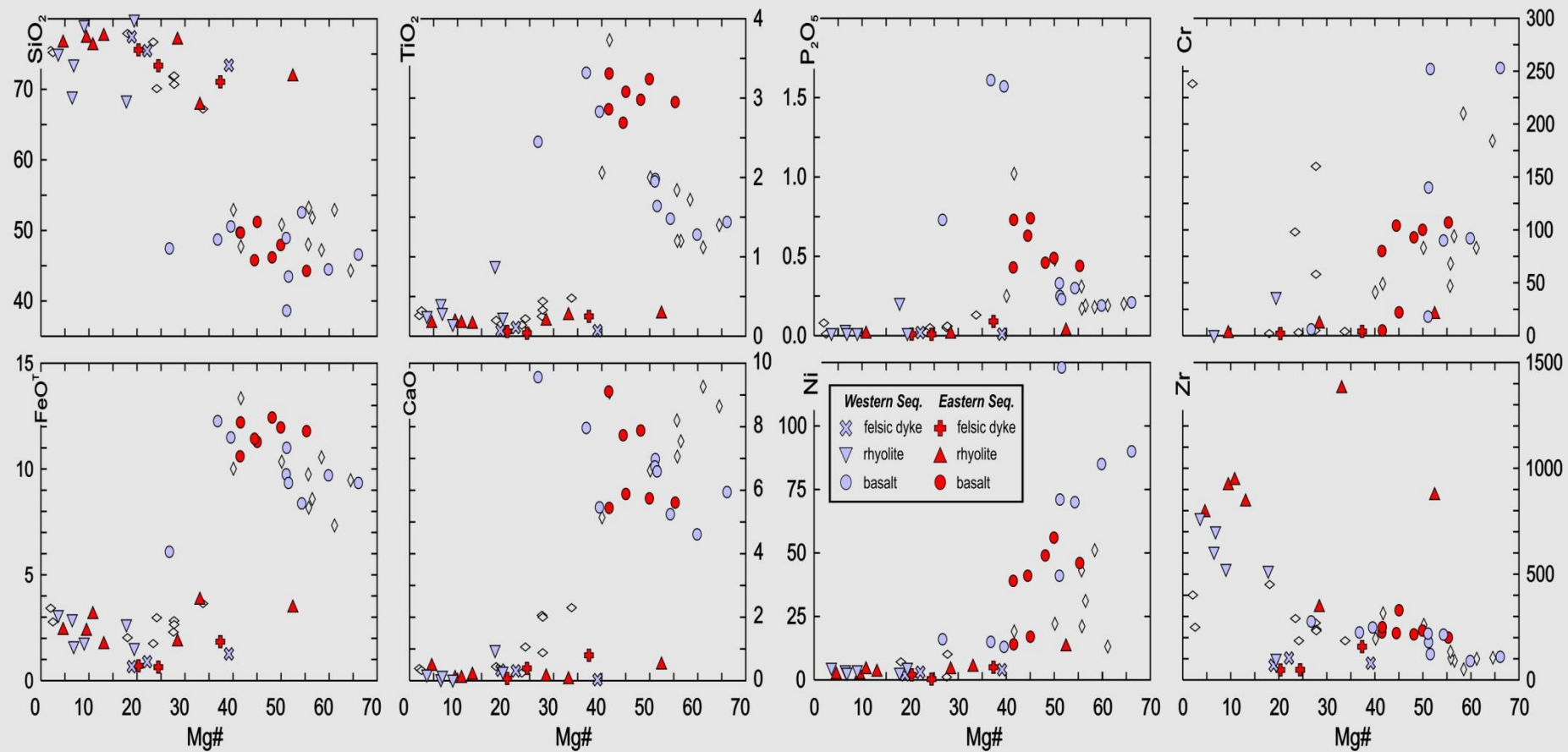
**U-Pb zircon geochronology dyke HS13-105B**



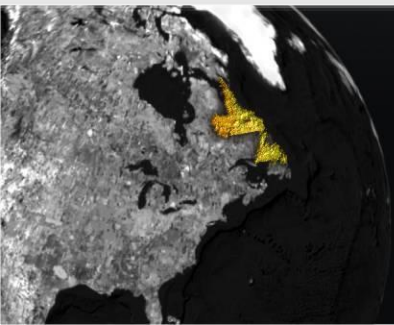
**$^{40}\text{Ar}/^{39}\text{Ar}$  geochronology fabric-defining muscovite Browning Mine HS09-45B**

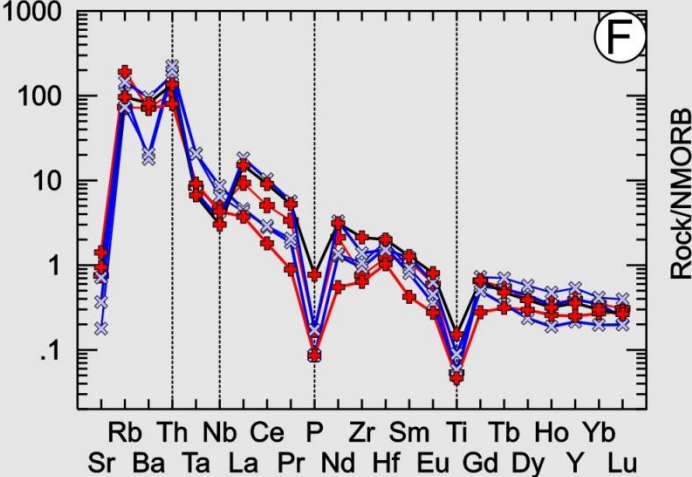
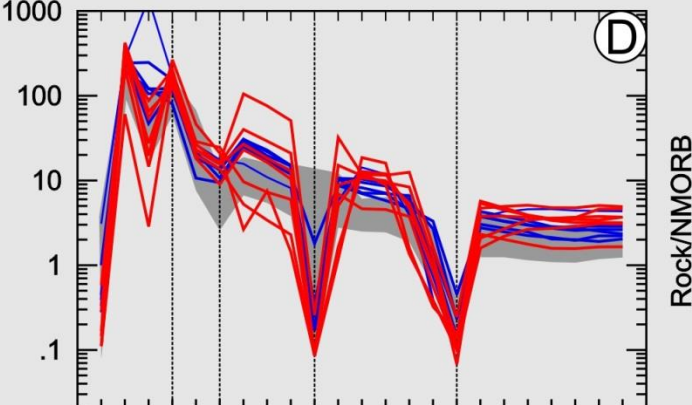
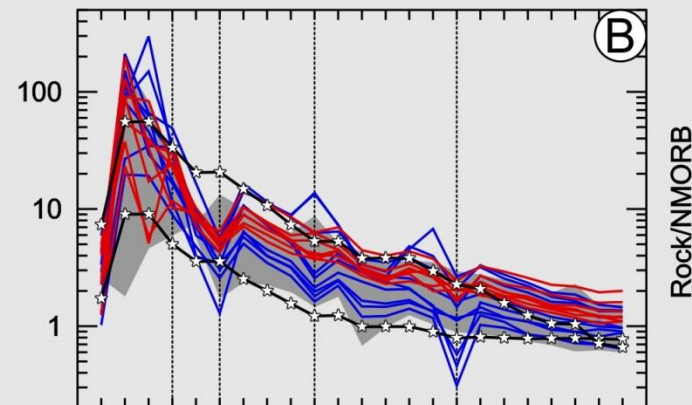
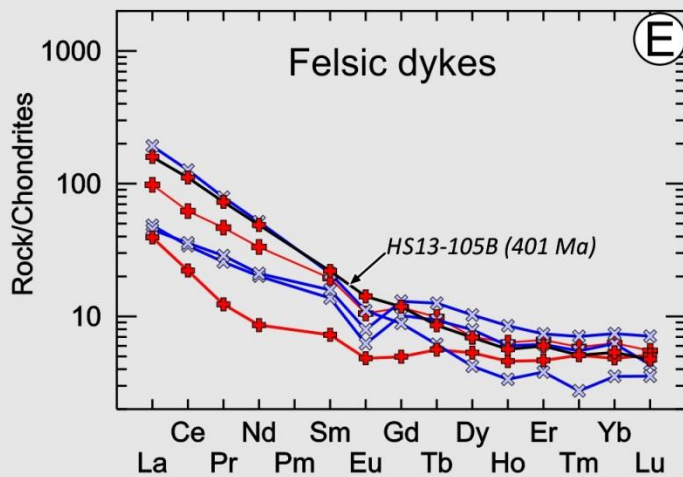
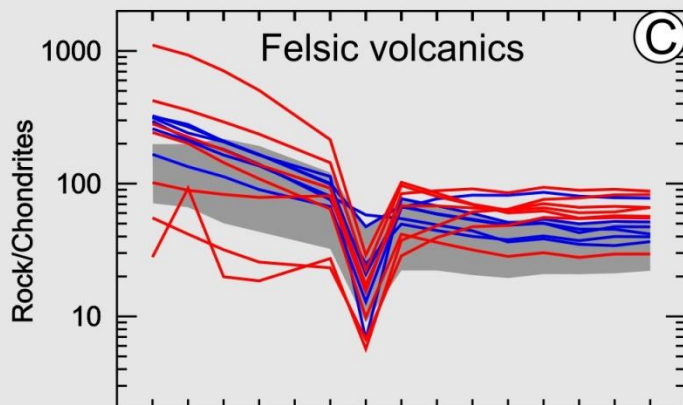
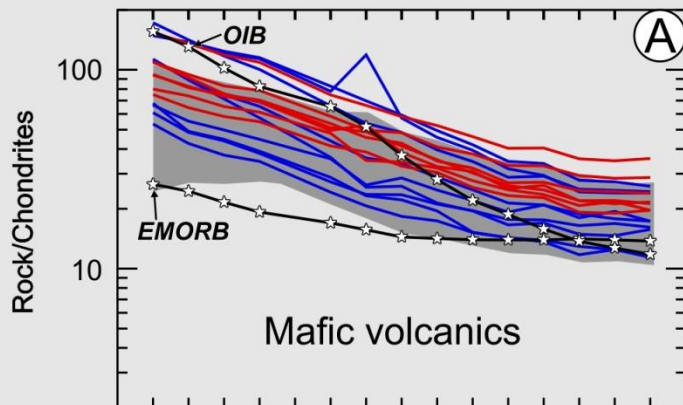


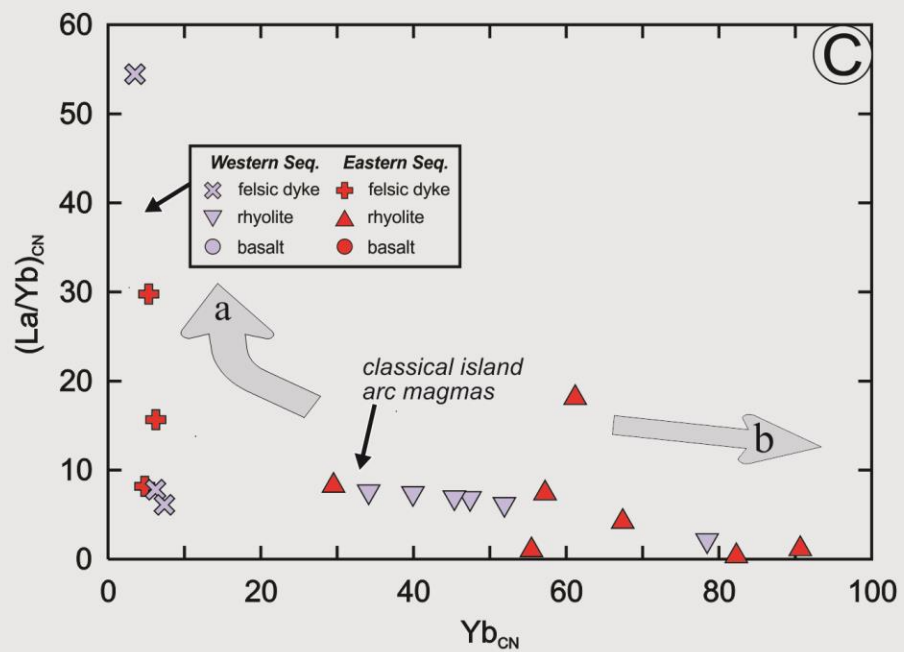
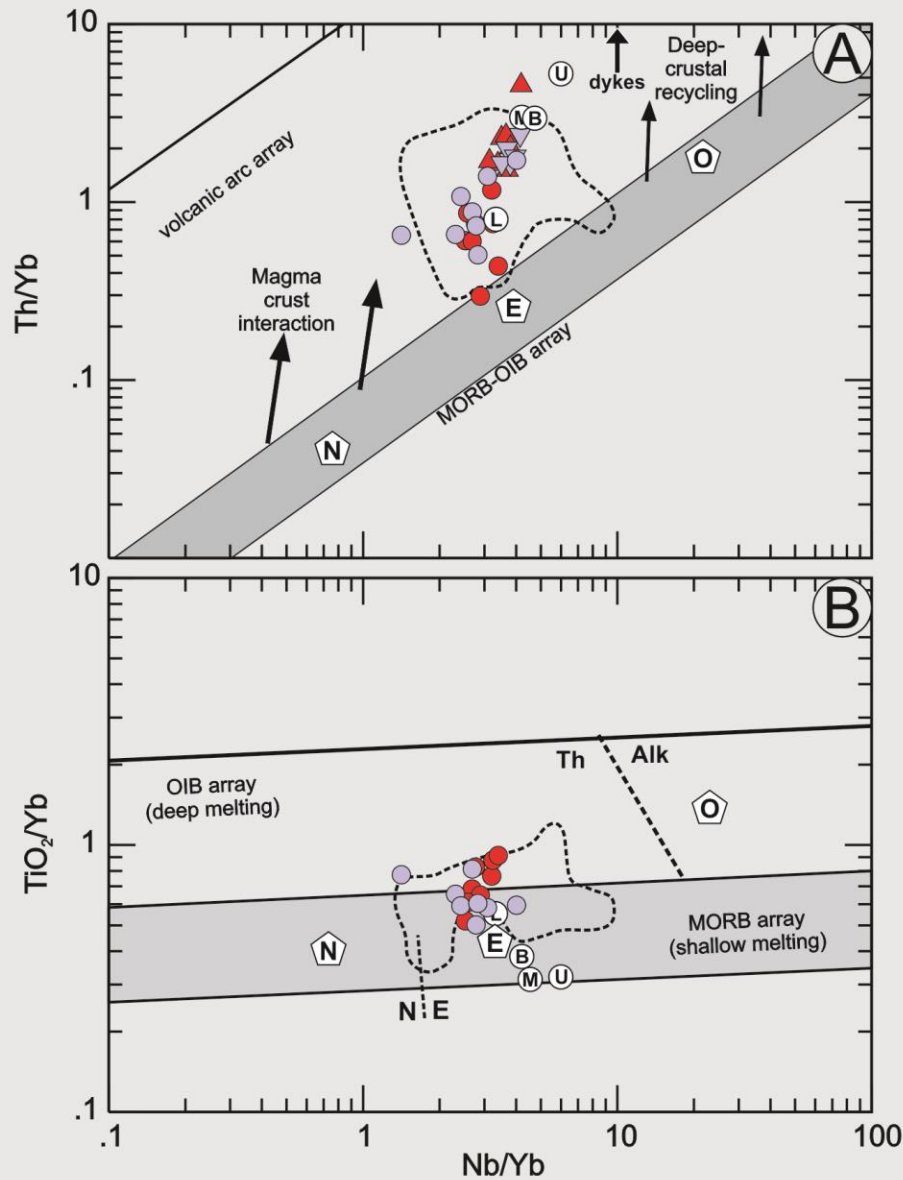
## Lithogeochemical Classification



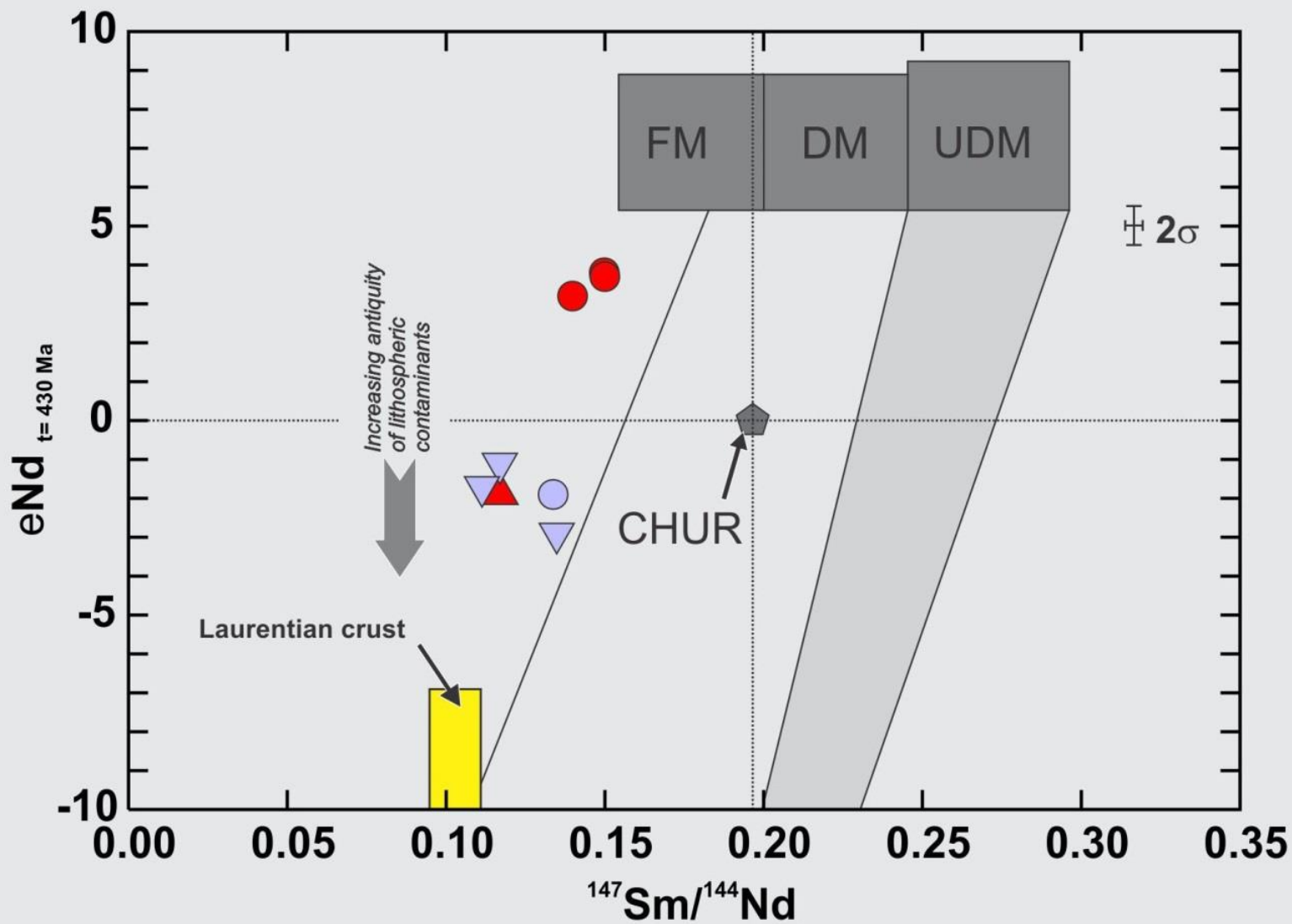
## Variation diagrams



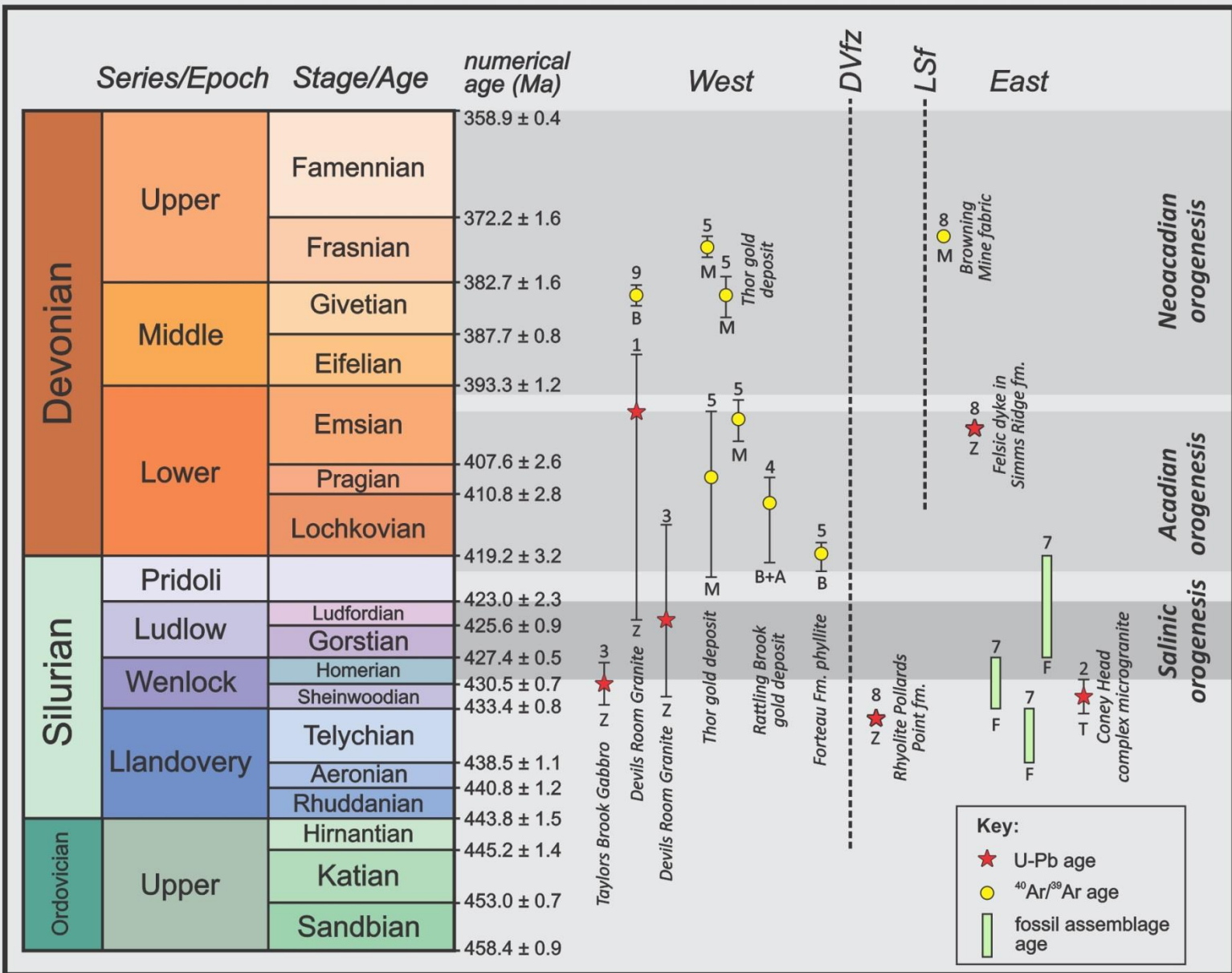




**Trace element constraints on their petrogenesis**



Preliminary Sm-Nd isotopic data



# Summary chronostratigraphy



## Summary: Sops Arm group

- Western sequence volcanic rocks are oldest Silurian volcanic-sedimentary rocks in NL ( $434 \pm 1$  Ma)
- Eastern sequence not yet dated
- Eastern sequence basalts are more primitive and alkaline
- Felsic volcanics from both sequences are similar, calc-alkaline to peralkaline upper crustal fractionates
- Felsic dykes cutting both sequences are distinct, lower-mid crustal melts (Hrb  $\pm$  Gt – bearing source)
- One dyke cutting the Simms Ridge fm. (ES) was dated at  $401 \pm 1$  Ma. Appears to be syn- to post-deformation
- Maximum age of massive quartz-ankerite-pyrite-chalcopyrite-precious metal veins at Browning Mine ca. 374 Ma ( $^{40}\text{Ar}/^{39}\text{Ar}$  on Mu).



## **Acknowledgements**

- *Andy Kerr, Matt Minnett, Jonathan Hull, Kendra Power, Chris Voisey, Wyonetta and Morris Pitmann, Gerry Kilfoil and Neil Stapleton*
- *Metals Creek Resources, Northern Abitibi Mining*

