

**Supplementary material S1 for the following article:**

Tonalite-dominated magmatism in the Abitibi Subprovince, Canada, and significance for Cu-Au magmatic-hydrothermal systems

by L. Mathieu ([lucie1.mathieu@uqac.ca](mailto:lucie1.mathieu@uqac.ca)), A. Crépon and D. Kontak

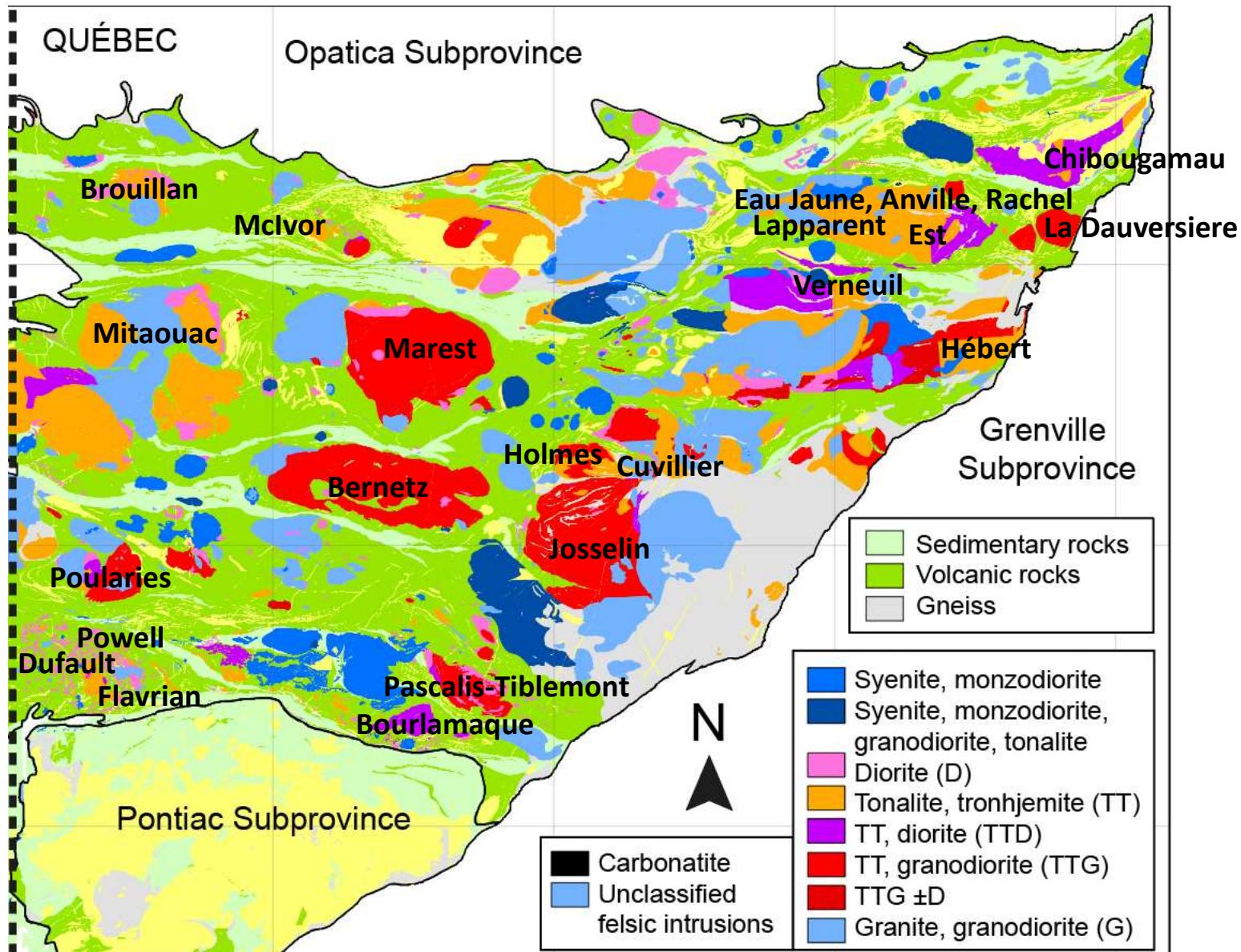
**Journal:** MDPI – Minerals

**Description:** Geology and chemistry of tonalite-dominated plutons of the Abitibi Subprovince

**Data source:**

- Sigeom dataset (<http://sigeom.mines.gouv.qc.ca>) - compiled by the *Ministère de l'Énergie et des Ressources Naturelles* of Québec (MERN)
- Ontario Geological Survey (OGS) data compiled by the Metal Earth project (<https://merc.laurentian.ca/research/metal-earth/superior-compilation>).
- Beakhouse, G. P. The Abitibi Subprovince plutonic record: Tectonic and metallogenic implications; Open File report 6268, Ontario Geological Survey, Sudbury, ON, Canada, 2011

**Eastern Abitibi  
Subprovince**  
(Sigeom dataset,  
MERN)



**Figure 1** (see  
manuscript for details)

## Intermediate and felsic intrusions characterized by $(La/Yb)_N > 6$

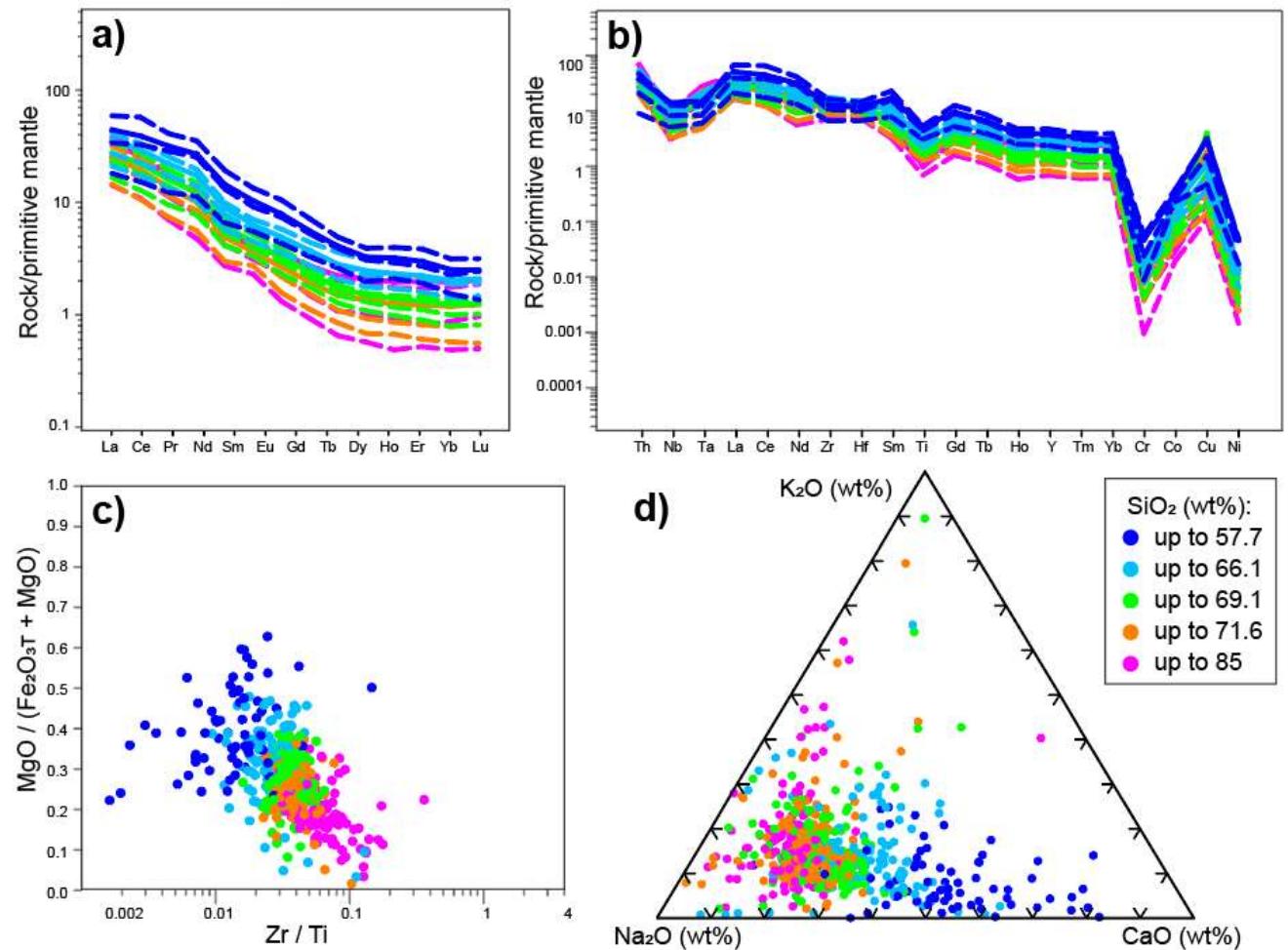
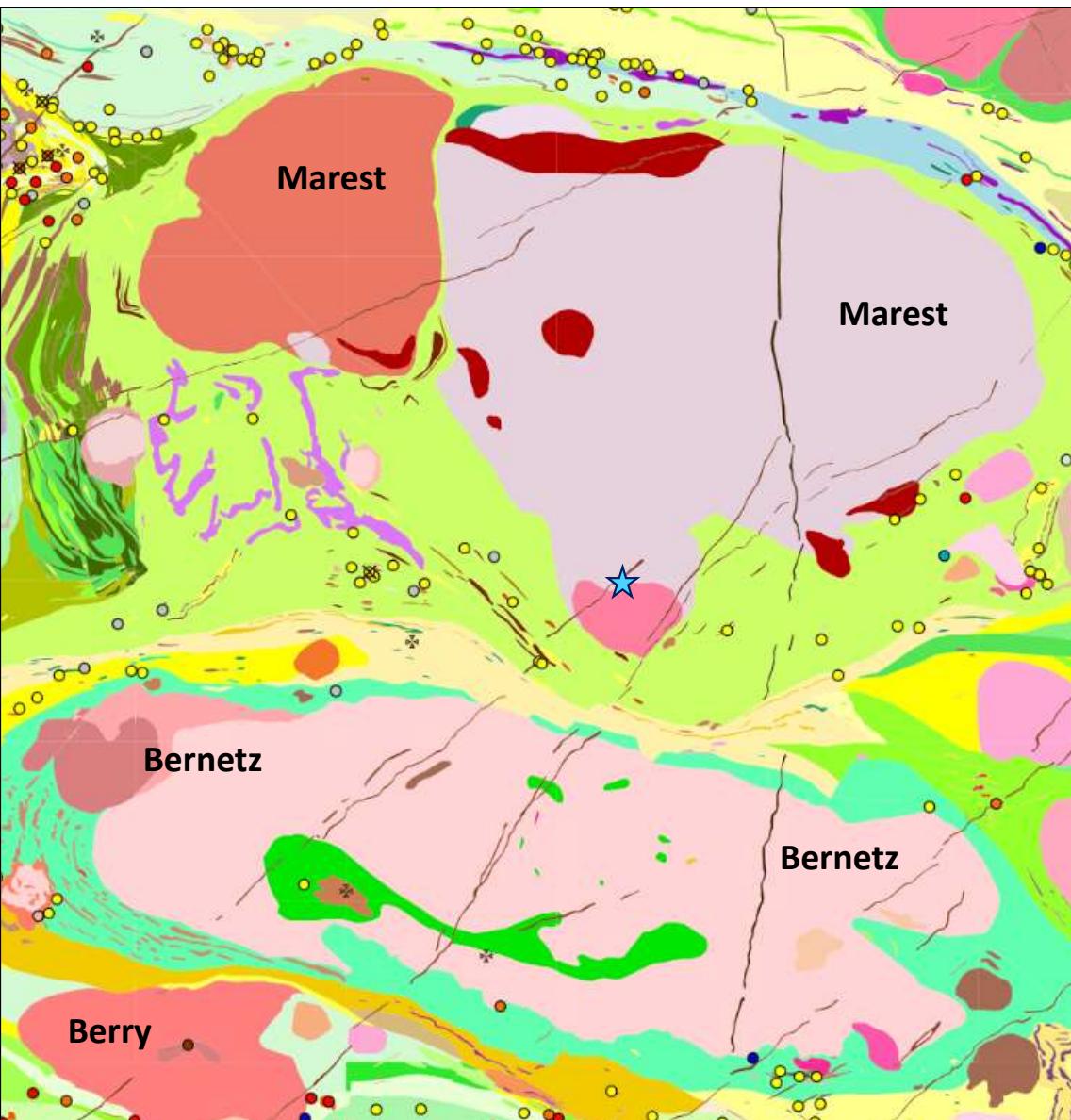


Figure 5 (see manuscript for details)



### Marest intrusive suite

[Light Blue Box]	Granodiorite and tonalite (Bt-Hnbl) – 68.7%
[Pink Box]	Granodiorite (Bt) – 2.0%
[Red Box]	Granite or granodiorite – 23.9%
[Dark Red Box]	Diorite ±Qz, Plag phenocryst – 5.4%

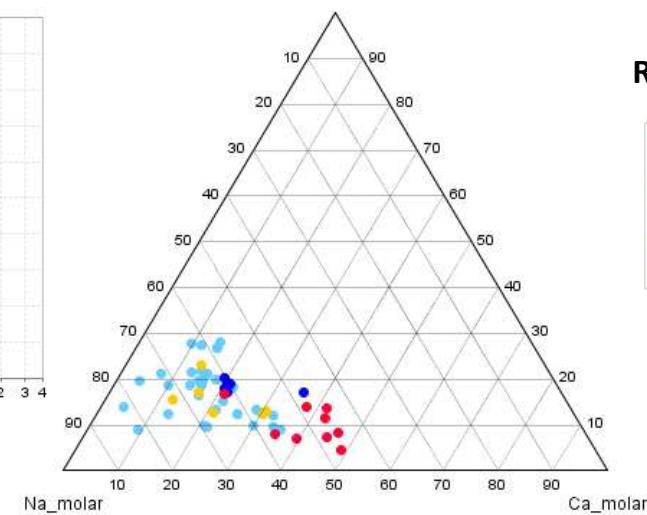
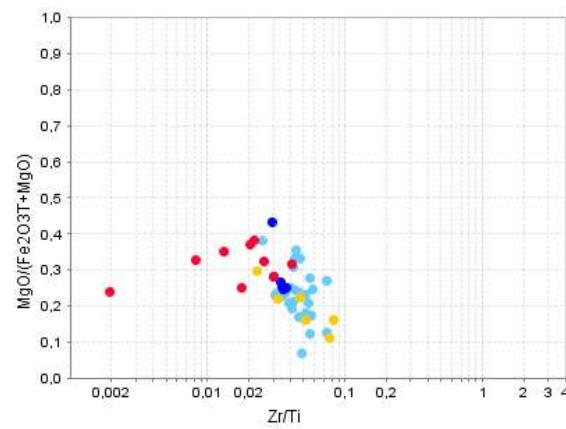
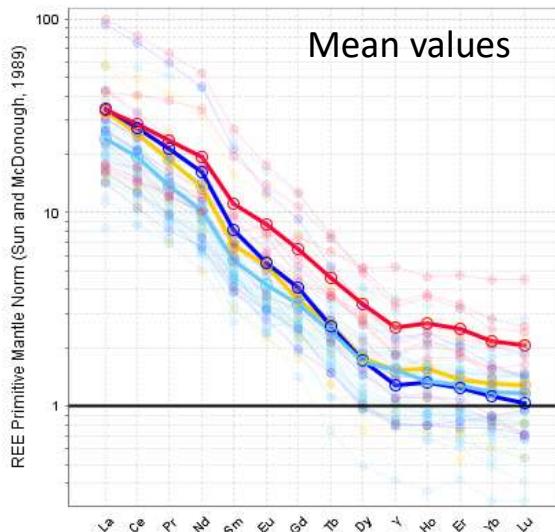
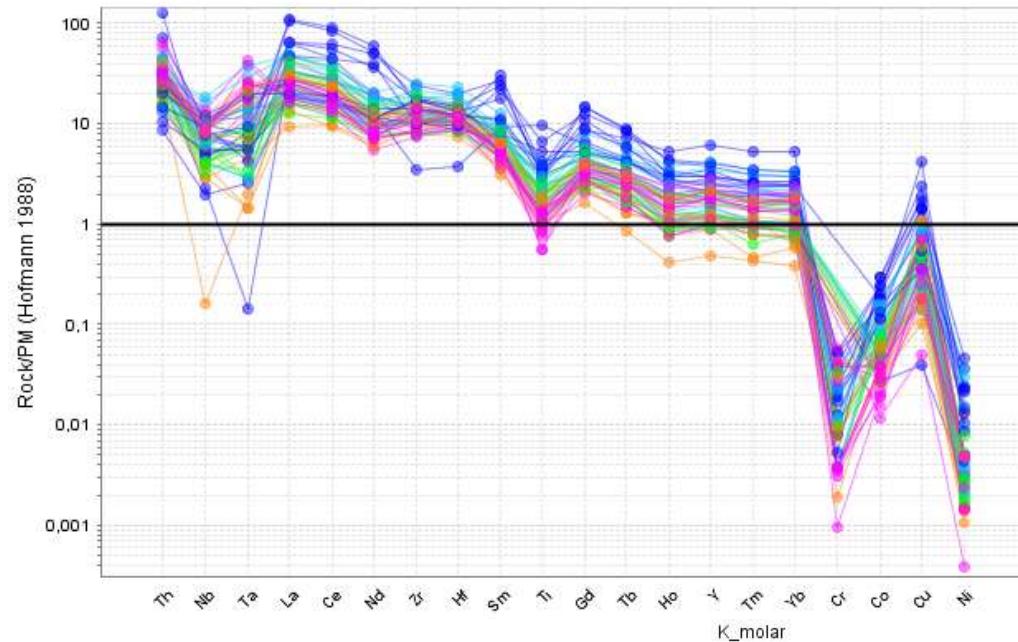
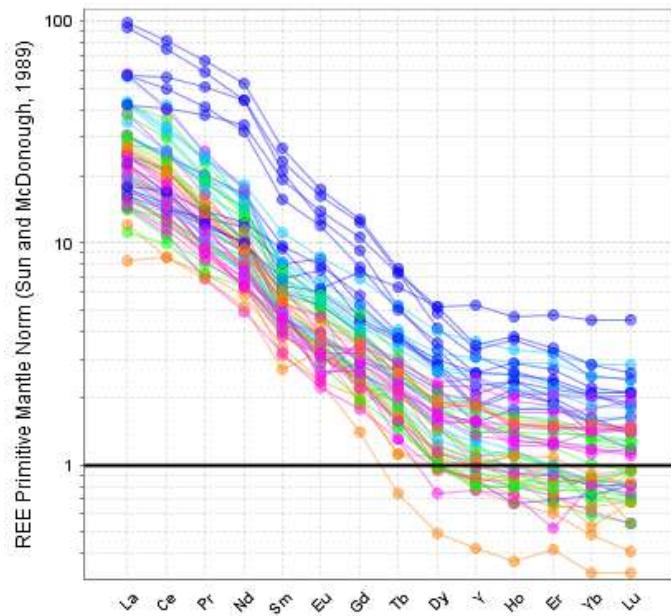
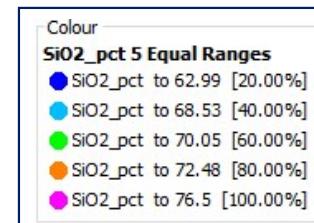
### Bernetz intrusion

[Light Blue Box]	Granodiorite and tonalite Bt (±gneiss) – 91.5%
[Dark Blue Box]	Granodiorite and granite with Qz-Fsp phenocrysts, Hnbl – 4.4%
[Medium Blue Box]	Granodiorite Bt-Hnbl (gneiss) – 3.1%
[Orange Box]	Diorite ±Qz, Hnbl – 1%

10 km

- Age U-Pb (granodiorite):
- ★ **2705 ±1 Ma (Rhéaume et al. 2010 – MB-2010-06)**

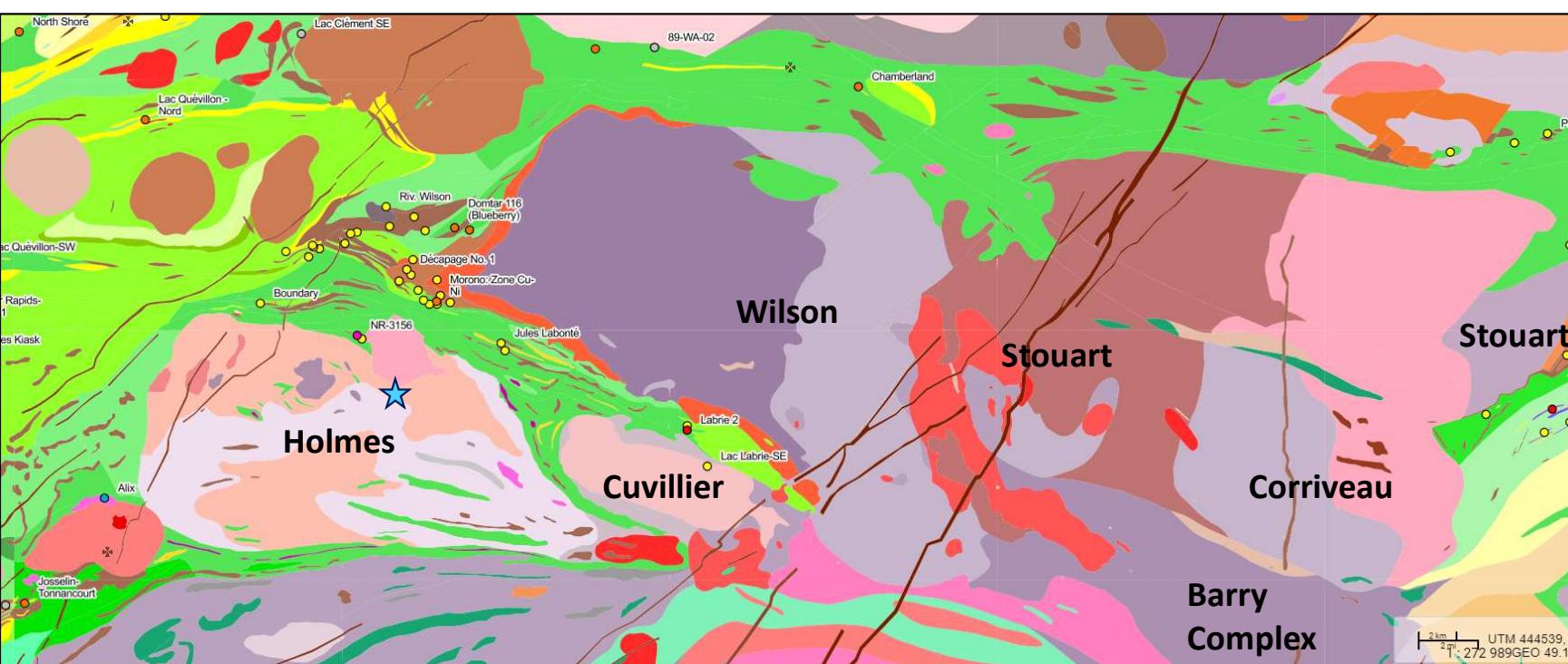
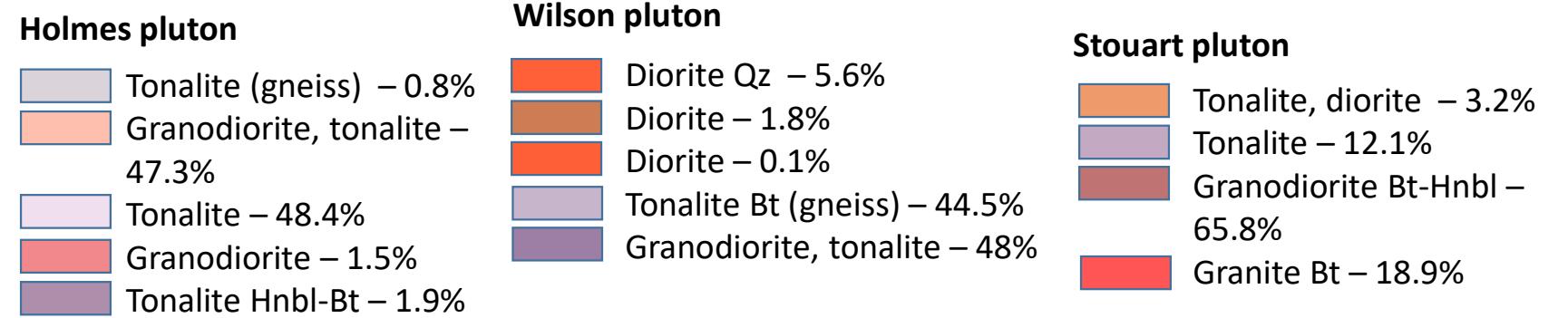
**Marest and  
Bernetz  
intrusive suites**



**Rock names (field)**

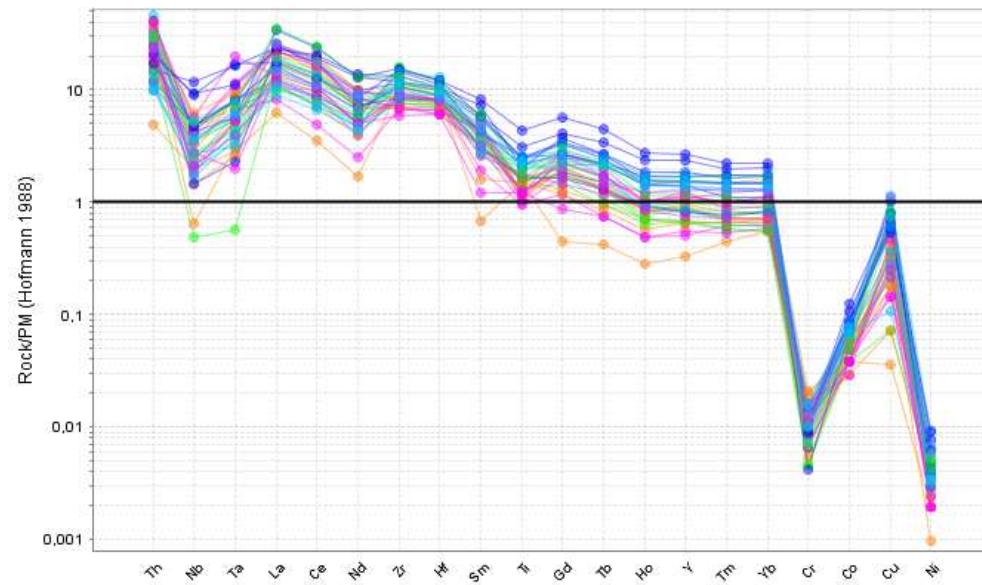
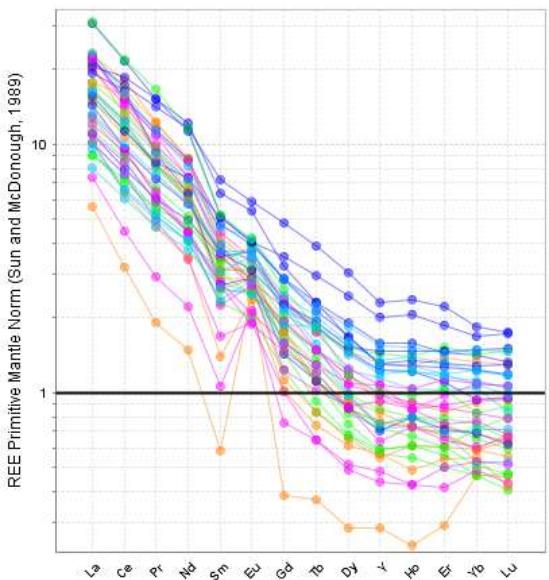


(unclassified rocks  
are not displayed)



**Corriveau pluton**

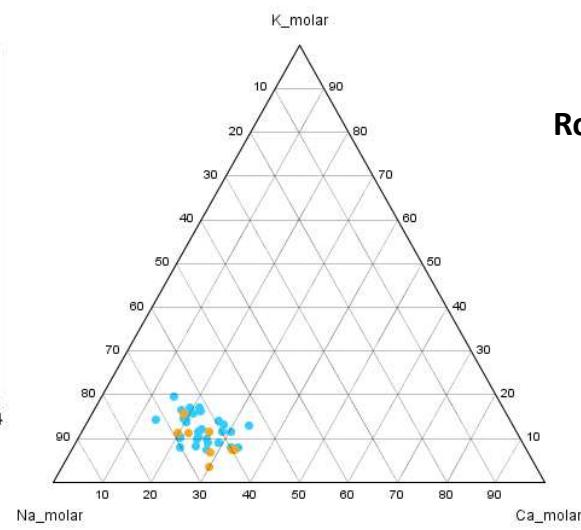
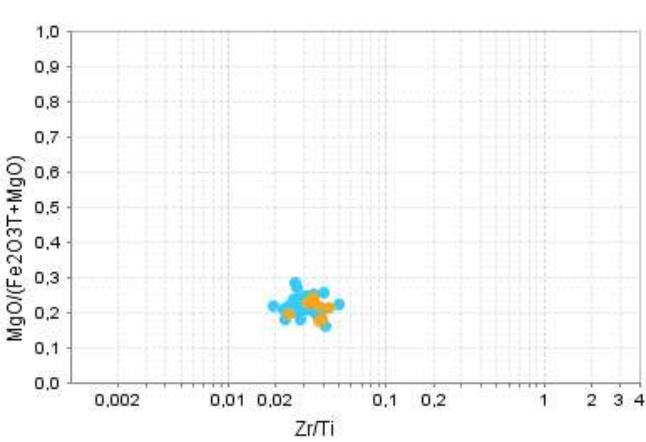
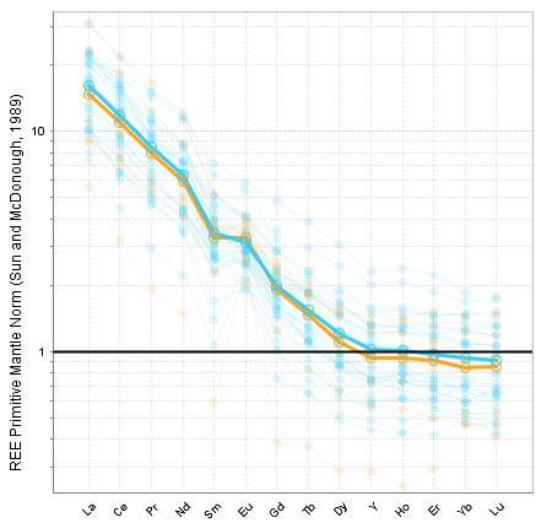
Tonalite Bt – 33.2%
Granodiorite Bt-Hnbl – 66.8%



**Holmes pluton**

**SiO<sub>2</sub>\_pct 5 Equal Ranges**

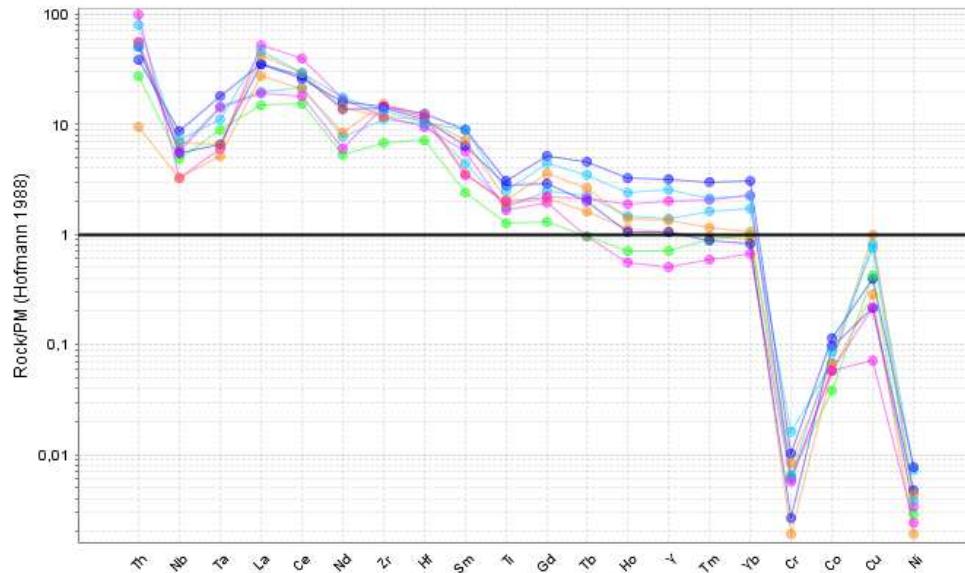
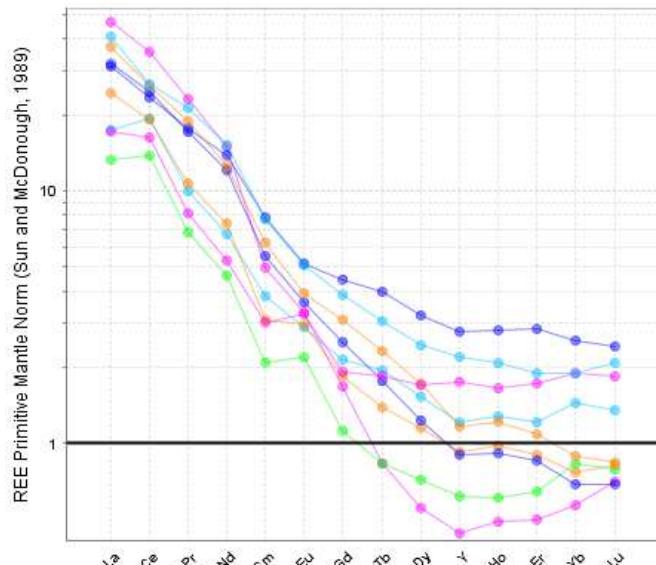
- SiO<sub>2</sub>\_pct to 66.97 [20.00%]
- SiO<sub>2</sub>\_pct to 68.92 [40.00%]
- SiO<sub>2</sub>\_pct to 70.53 [60.00%]
- SiO<sub>2</sub>\_pct to 71.34 [80.00%]
- SiO<sub>2</sub>\_pct to 73.6 [100.00%]



**Rock names (field)**

**CODE\_ROCH**

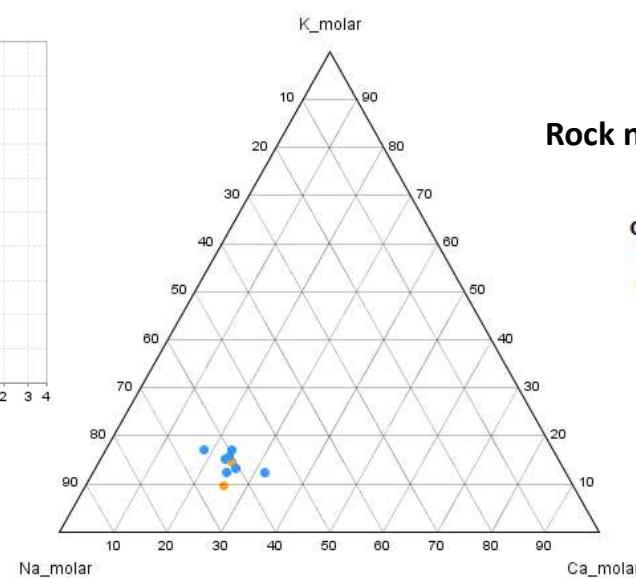
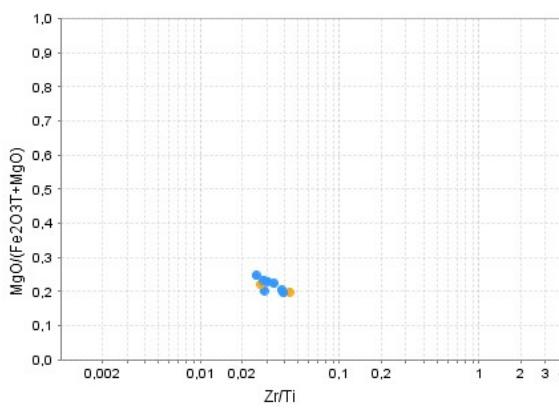
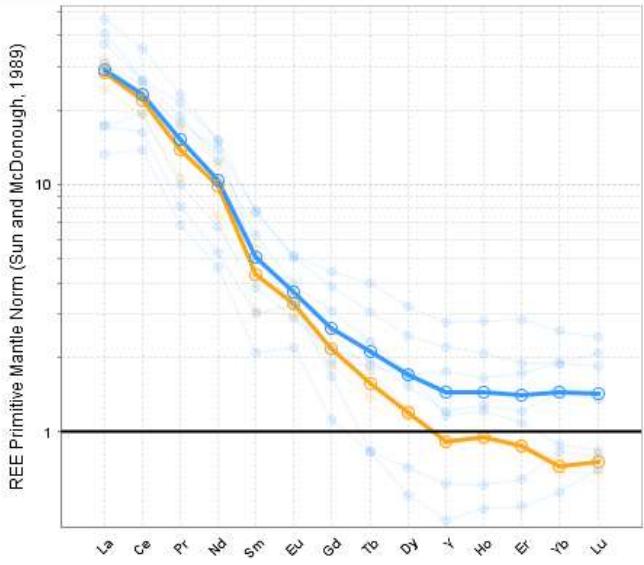
- granodiorite
- tonalite



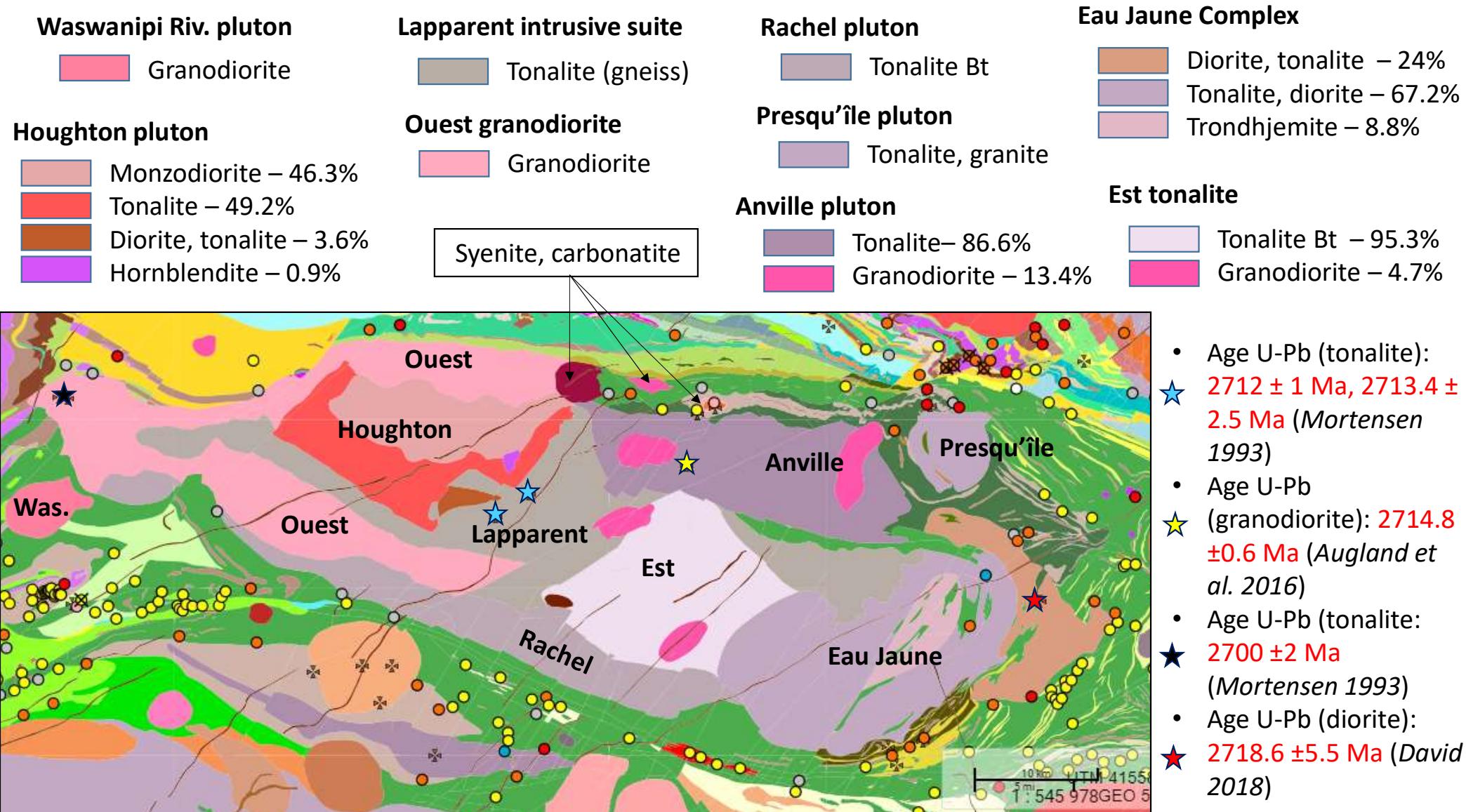
**Cuvillier platon**

**SiO<sub>2</sub>\_pct 5 Equal Ranges**

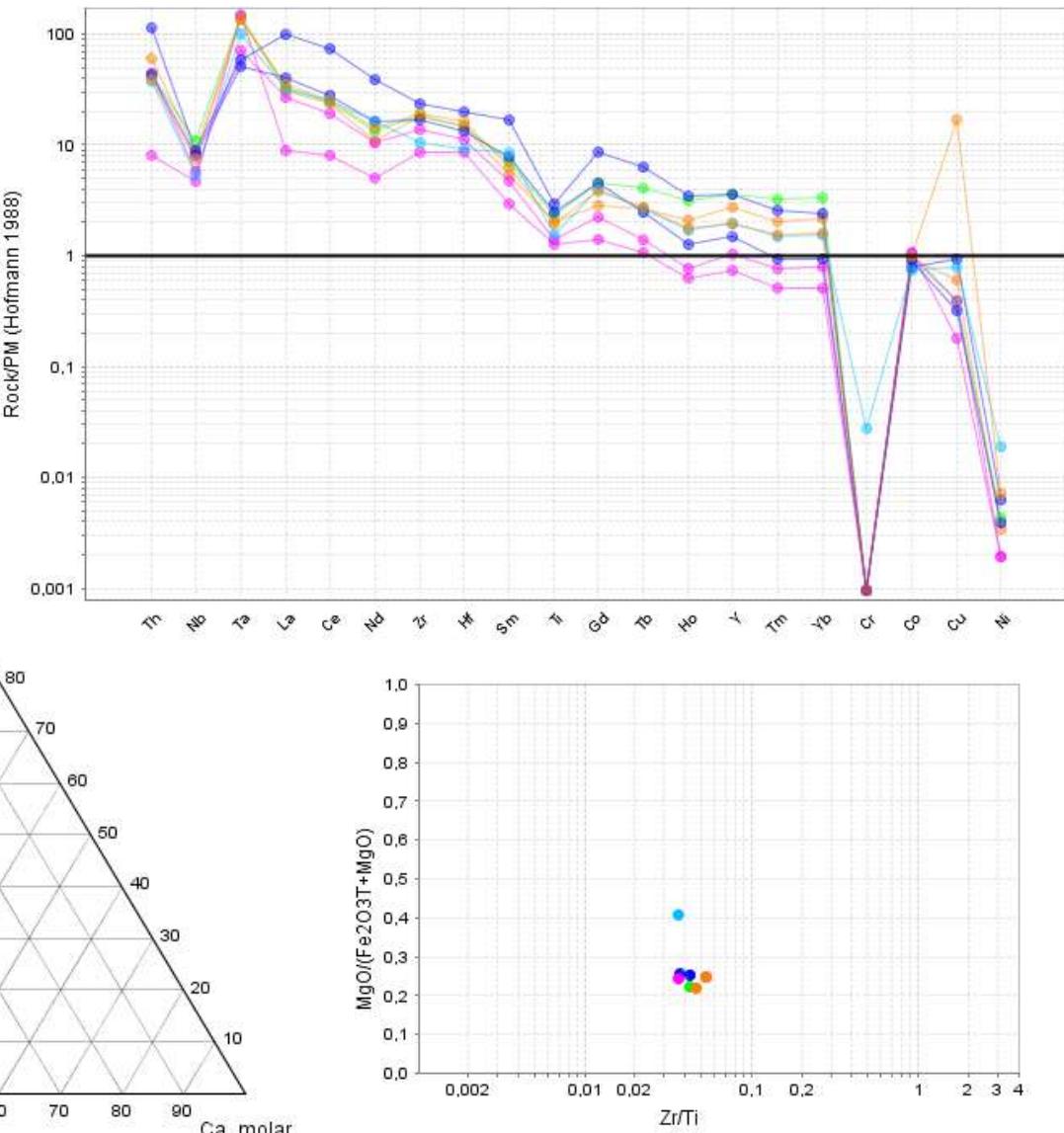
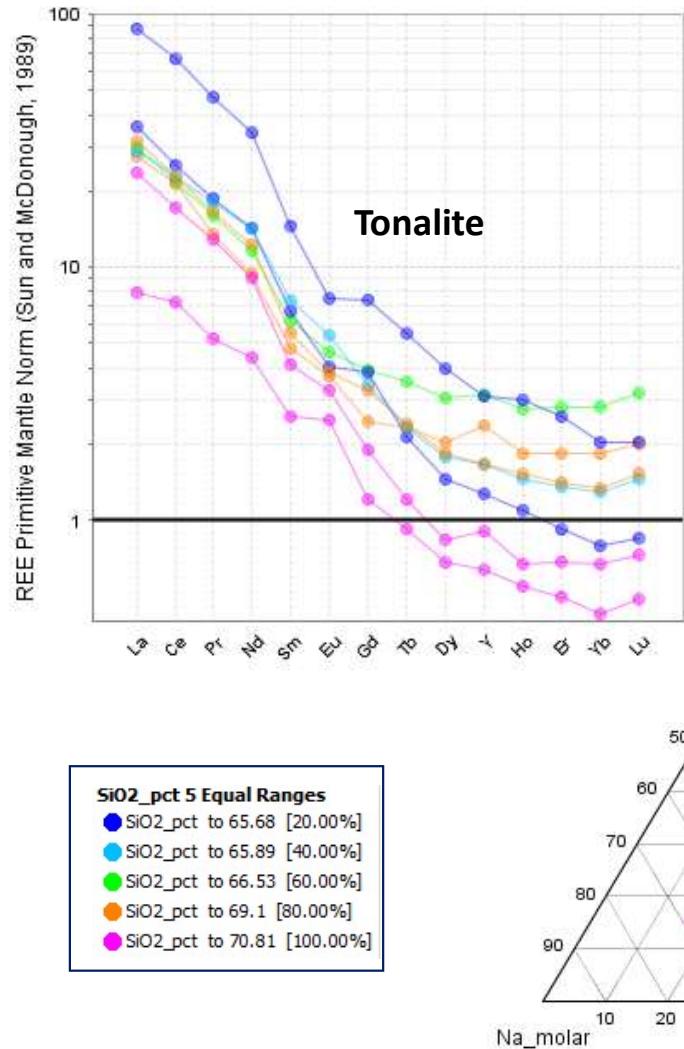
- SiO<sub>2</sub>\_pct to 66.65 [20.00%]
- SiO<sub>2</sub>\_pct to 69.34 [40.00%]
- SiO<sub>2</sub>\_pct to 69.53 [60.00%]
- SiO<sub>2</sub>\_pct to 70.42 [80.00%]
- SiO<sub>2</sub>\_pct to 71.06 [100.00%]

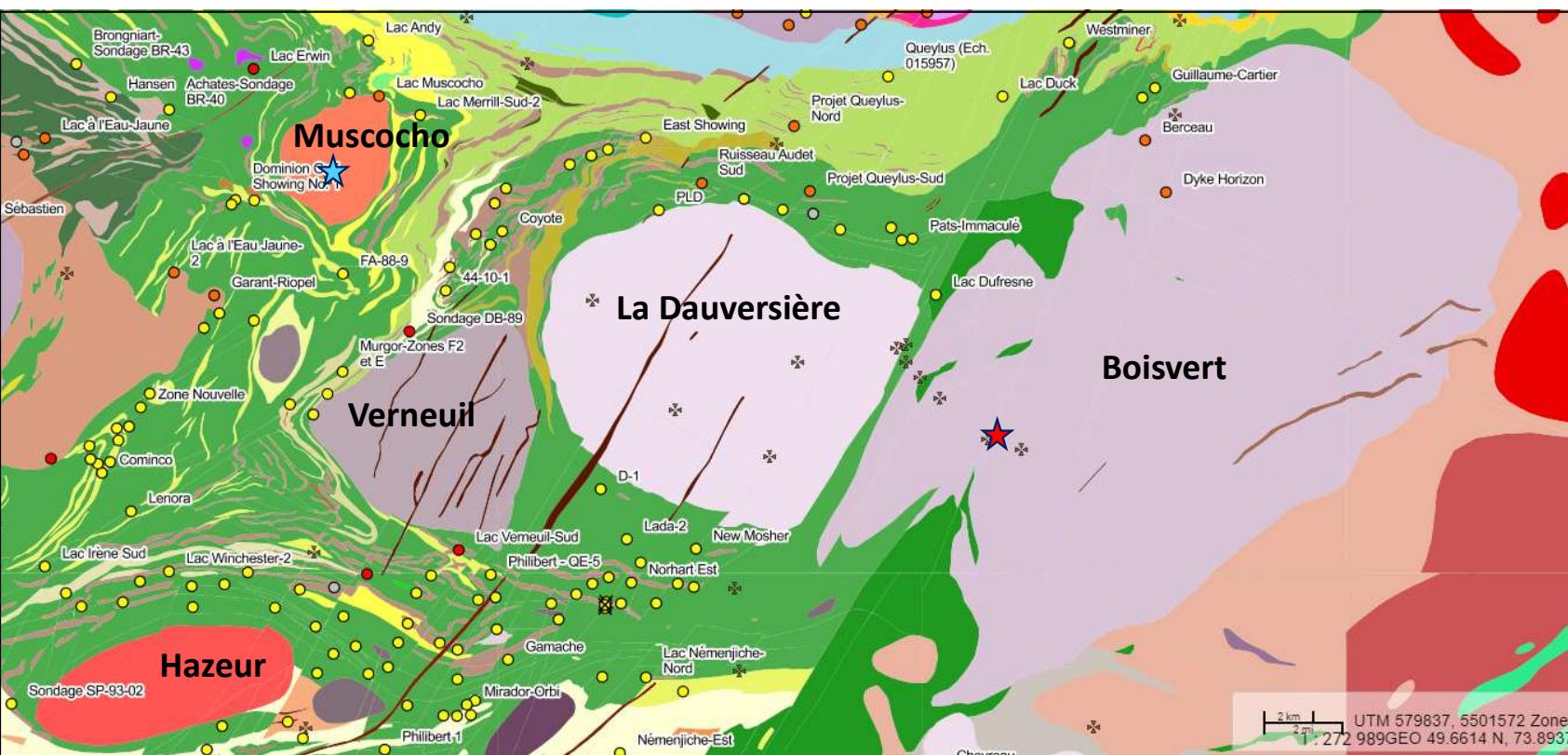
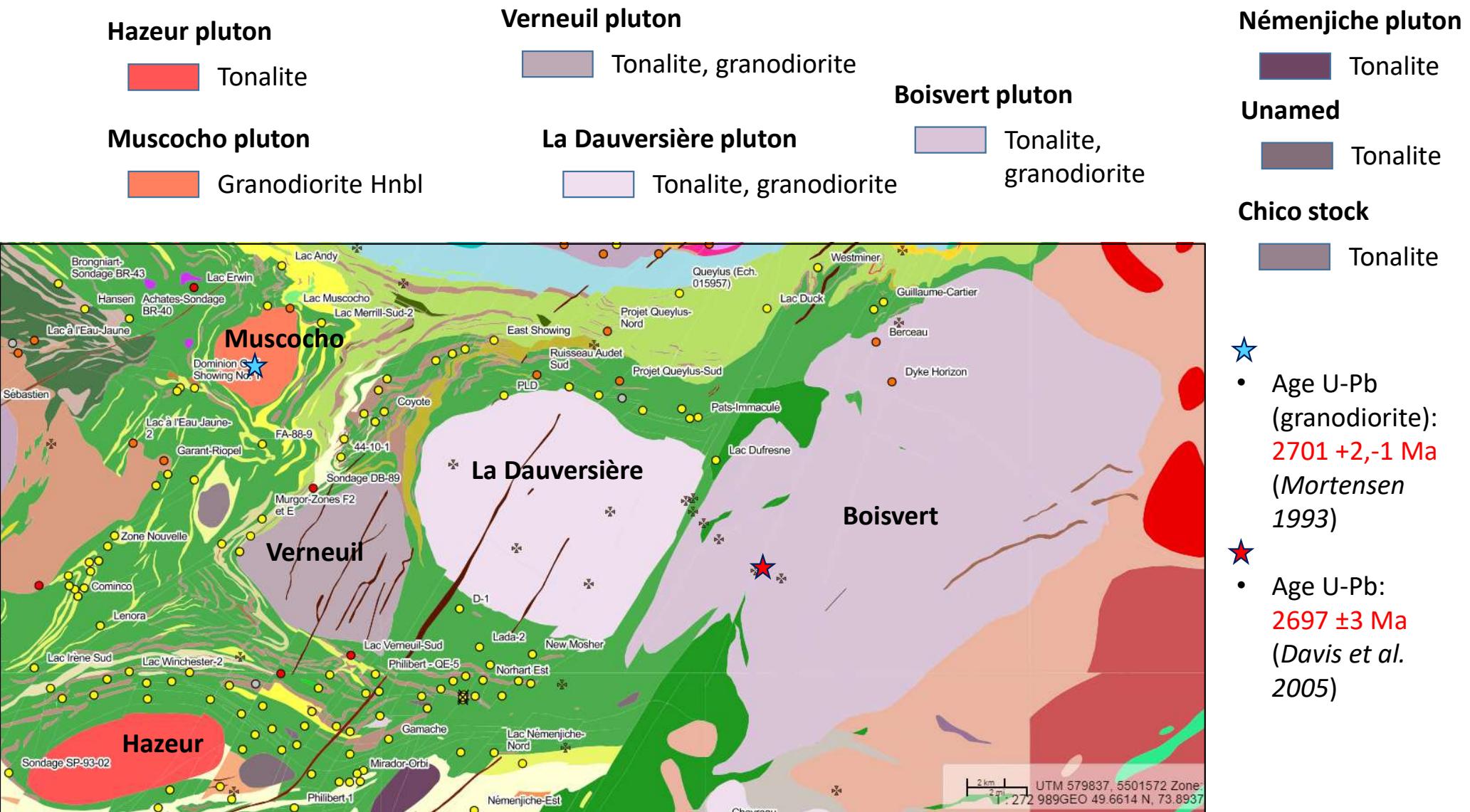


**Rock names (field)**

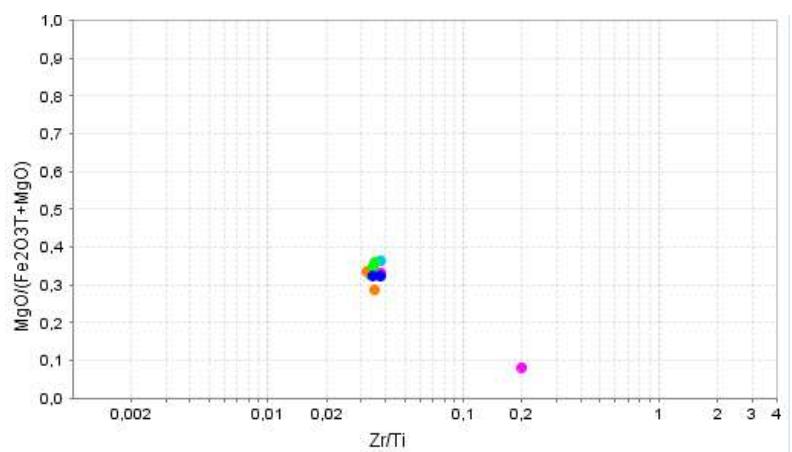
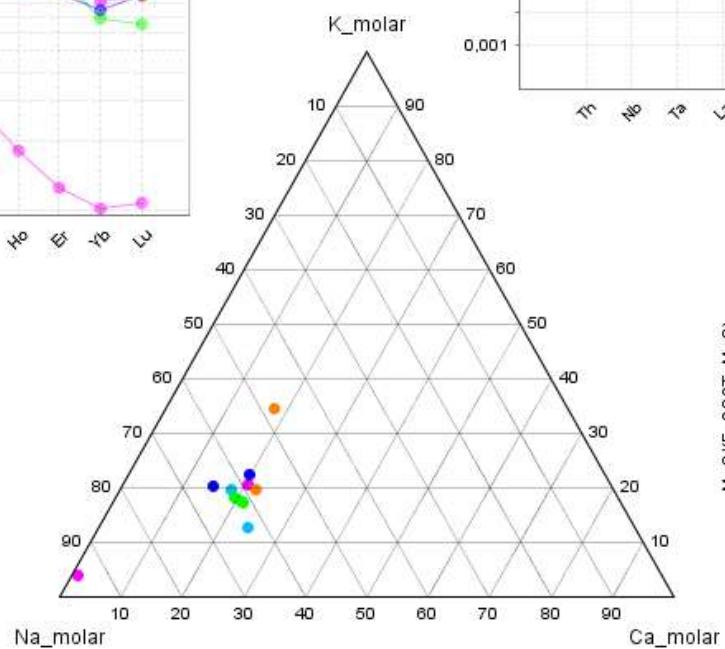
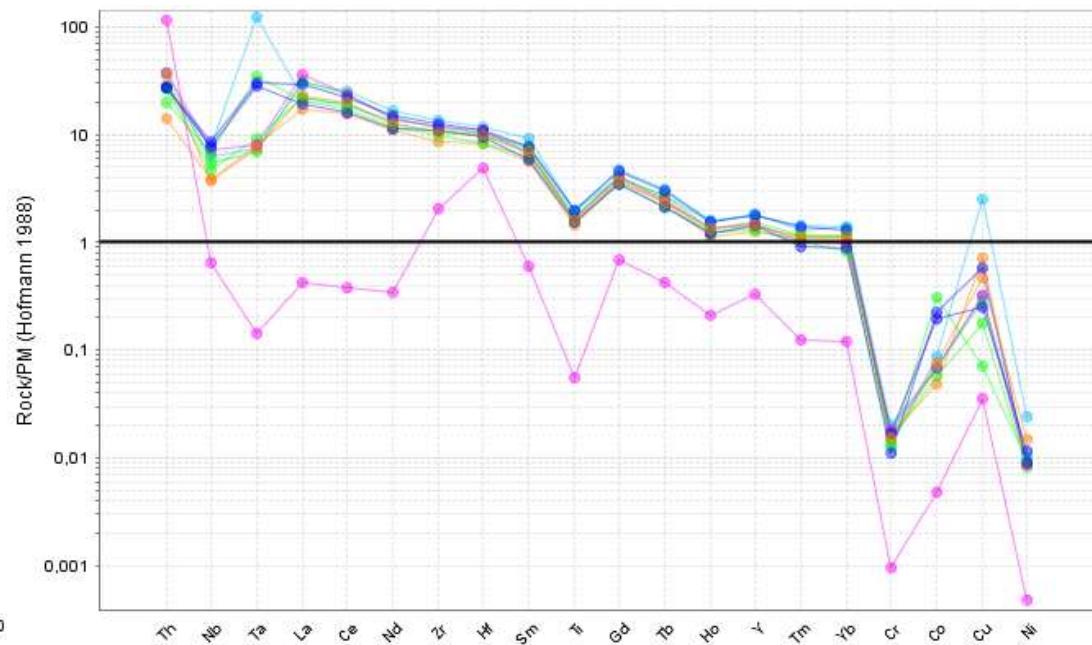
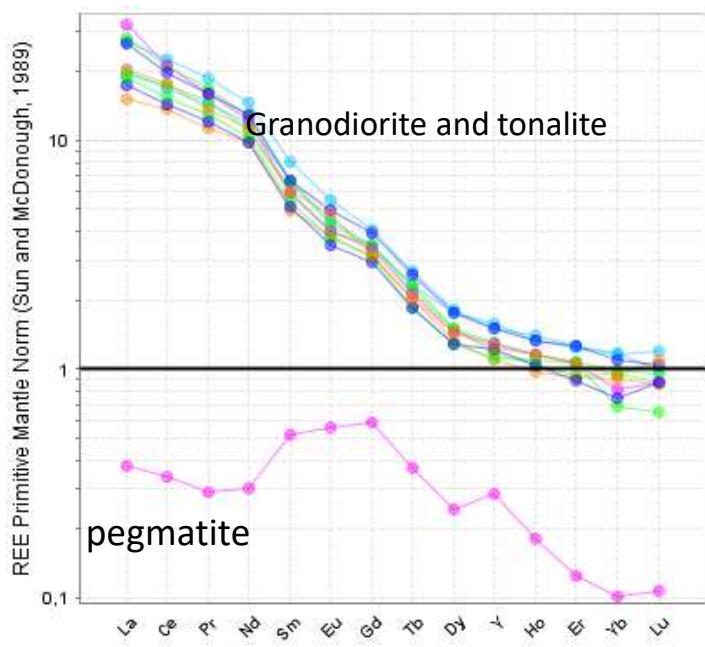


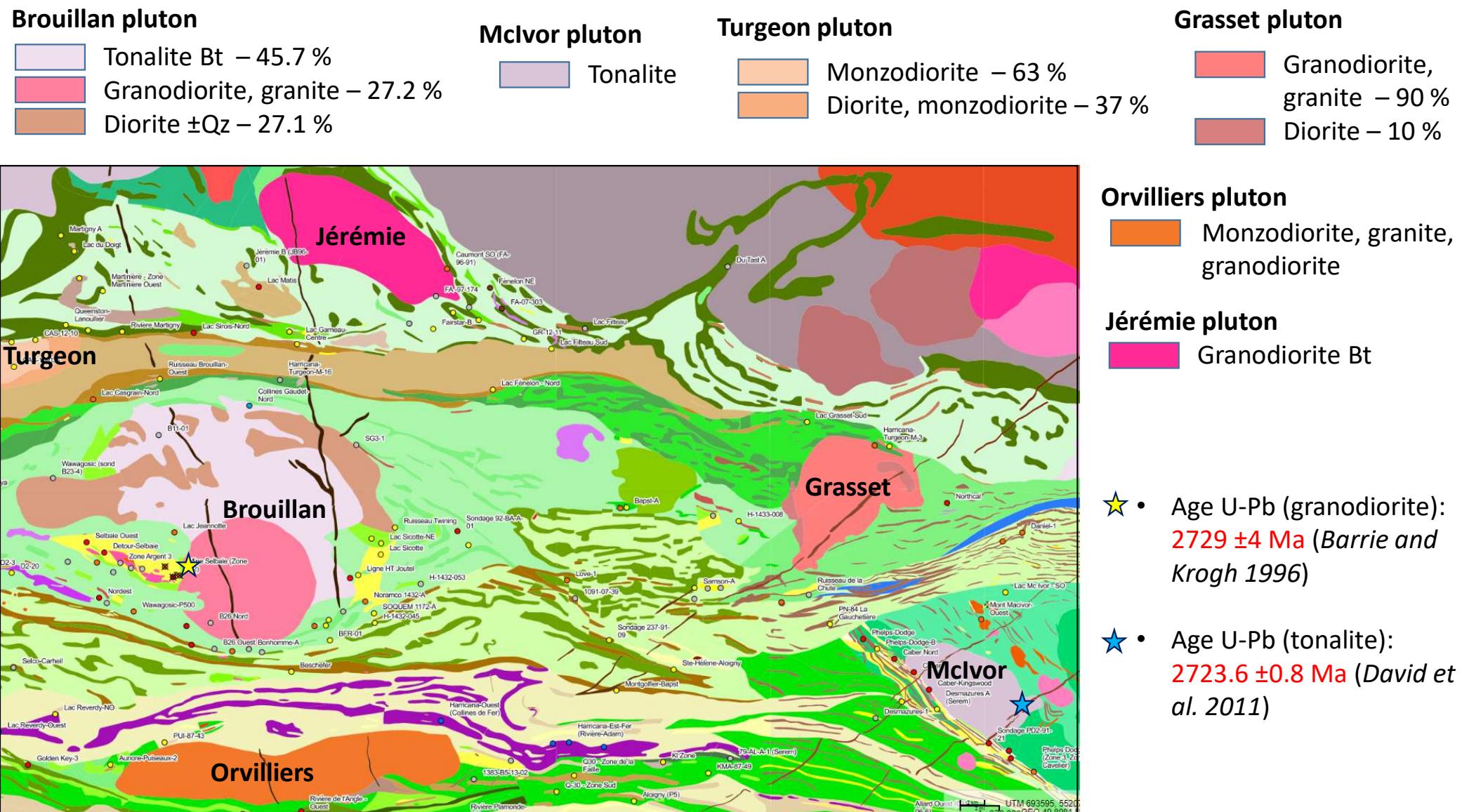
## East tonalite



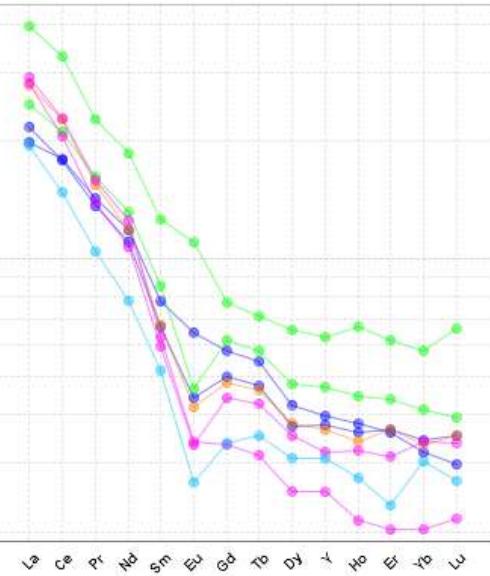


## Verneuil pluton

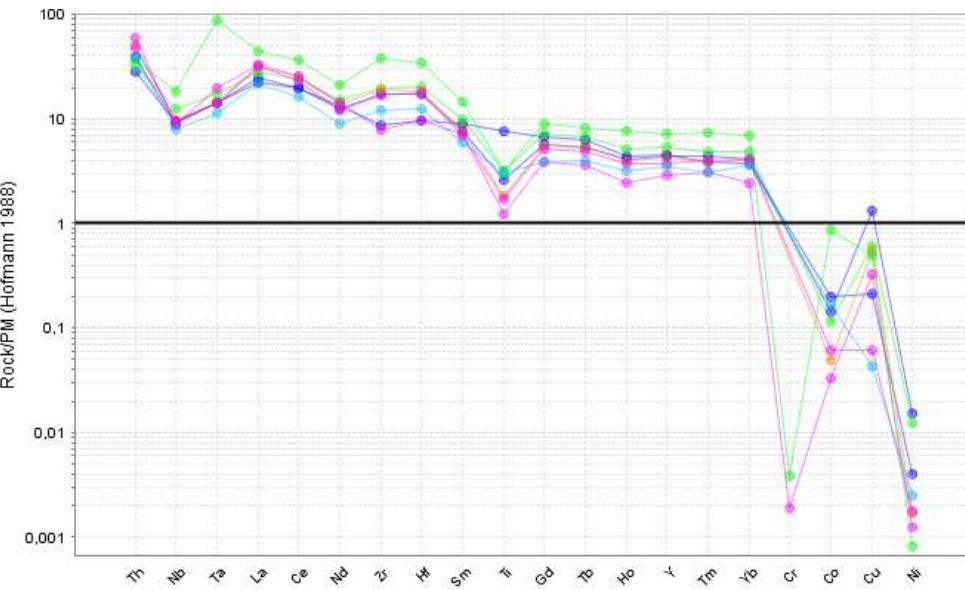
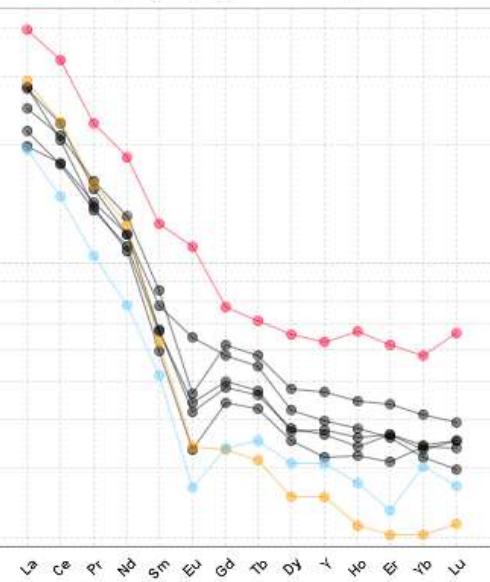




REE Primitive Mantle Norm (Sun and McDonough, 1989)



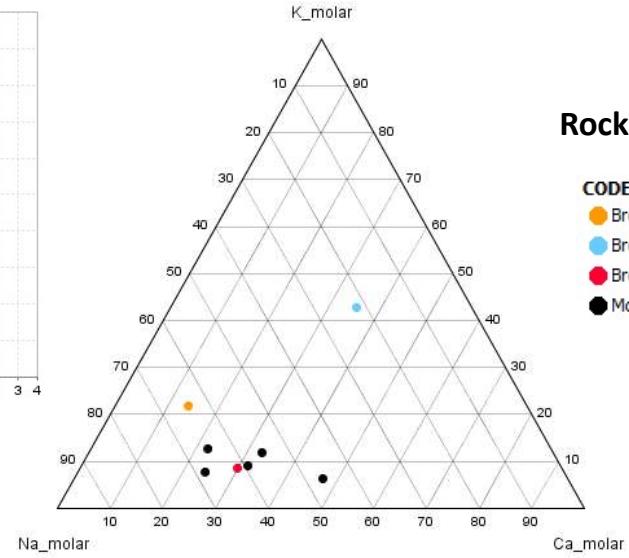
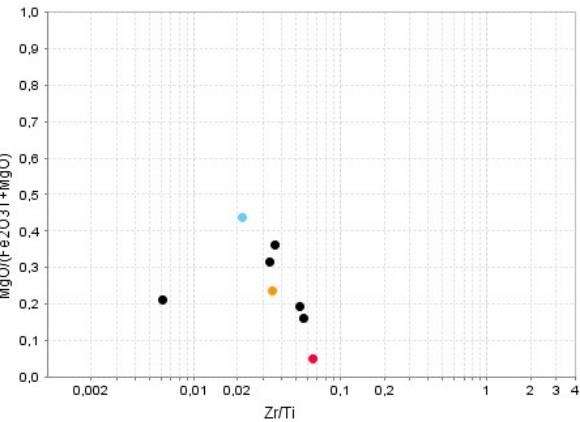
REE Primitive Mantle Norm (Sun and McDonough, 1989)



## McIvor and Brouillan pluton

**SiO<sub>2</sub>\_pct 5 Equal Ranges**

- SiO<sub>2</sub>\_pct to 65.81 [20.00%]
- SiO<sub>2</sub>\_pct to 68.48 [40.00%]
- SiO<sub>2</sub>\_pct to 70.8 [60.00%]
- SiO<sub>2</sub>\_pct to 72.44 [80.00%]
- SiO<sub>2</sub>\_pct to 73.24 [100.00%]

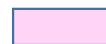


## Rock names (field)

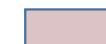
**CODE\_ROCH**

- Brouillan (granodiorite)
- Brouillan (intermediate rock)
- Brouillan (tonalite)
- McIvor (tonalite)

## Dufault and Powell plutons

 Granodiorite – 100%

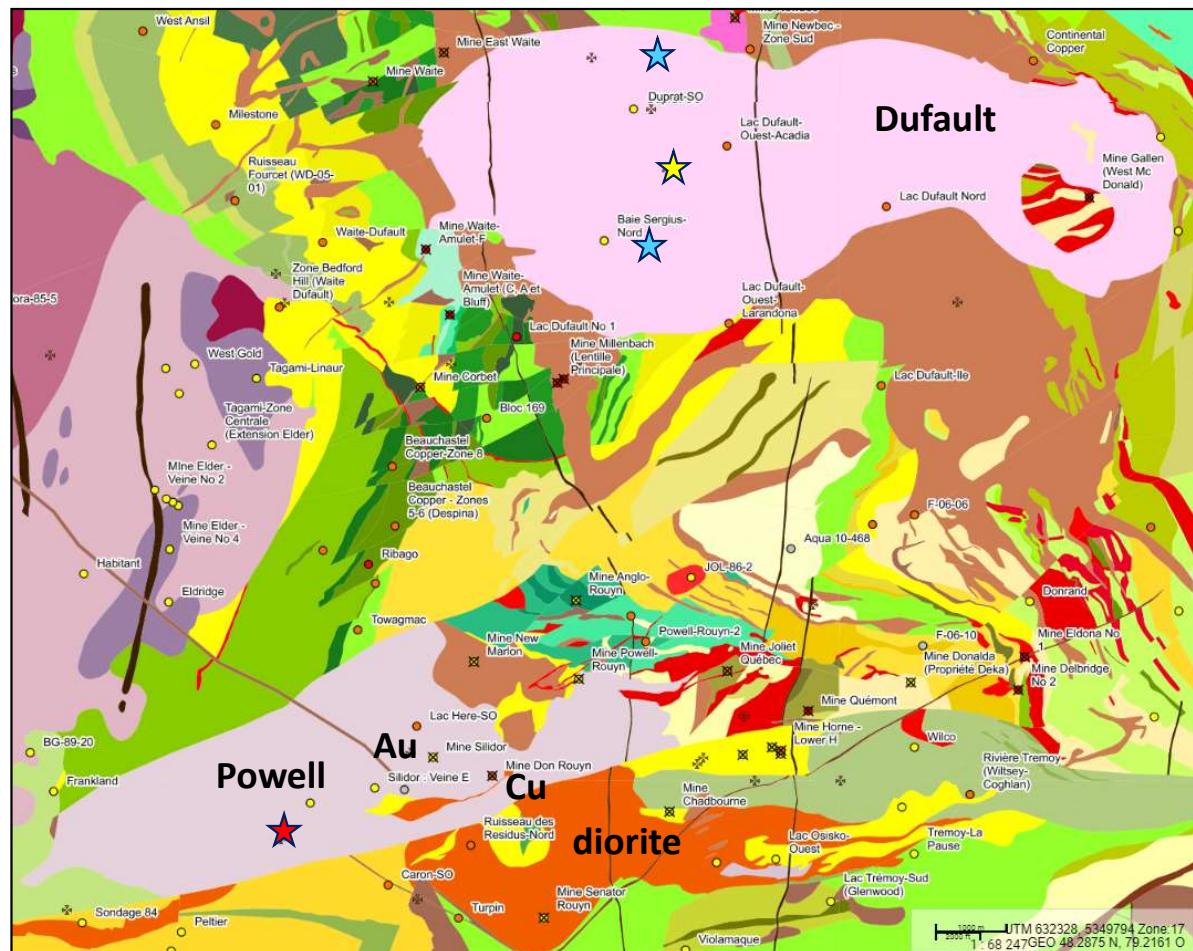
## Powell pluton

 Tonalite – 63.5%

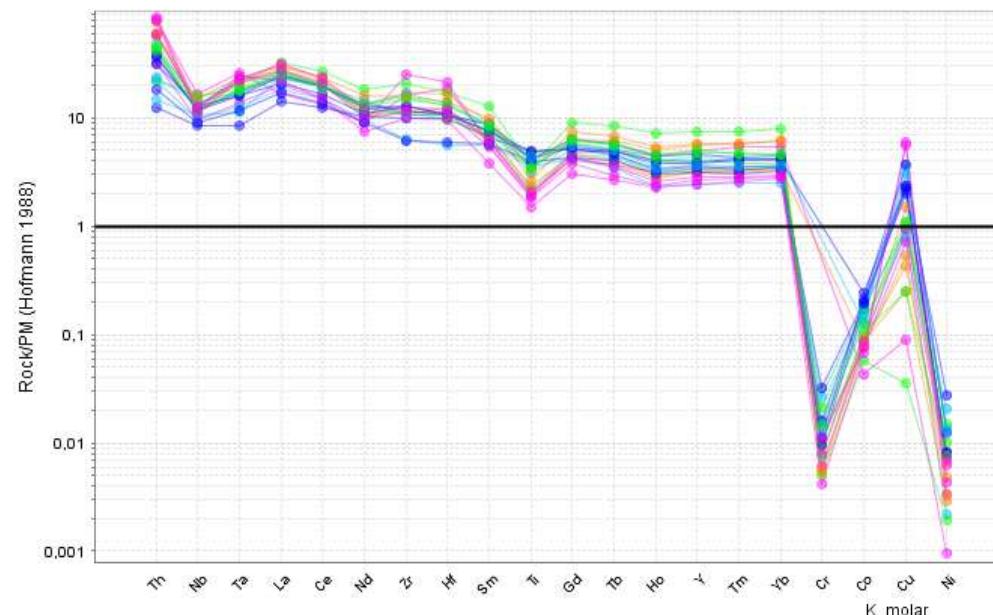
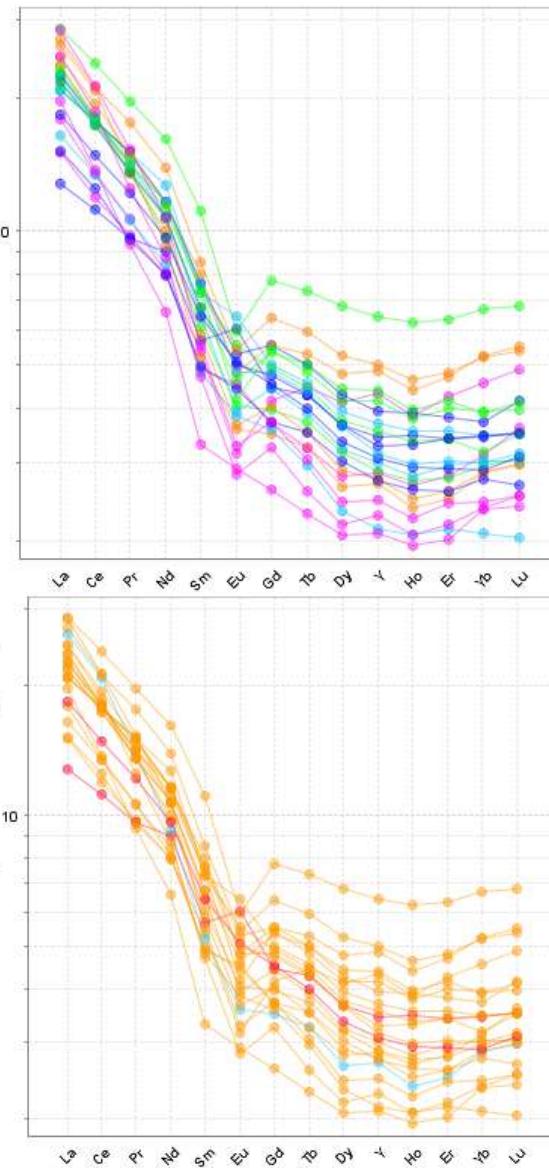
 Diorite – 36.5% **Powell pluton?**

- ★ • Age U-Pb (granodiorite):  $2690 \pm 2$  Ma,  $2698 \pm 2$  Ma (Mortensen 1993)
- ★ • Age U-Pb (tonalite):  $2720 +3, -1$  Ma (Mortensen 1993)
- ★ • Age U-Pb (tonalite):  $2700 \pm 1$  Ma (McNicoll *et al.* 2011)

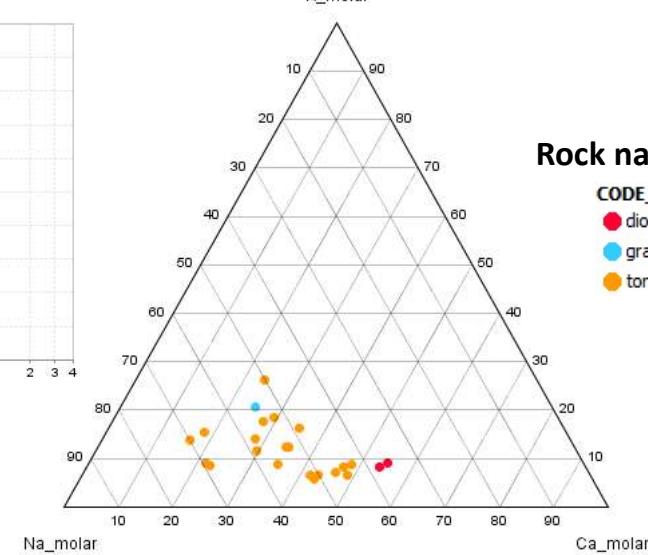
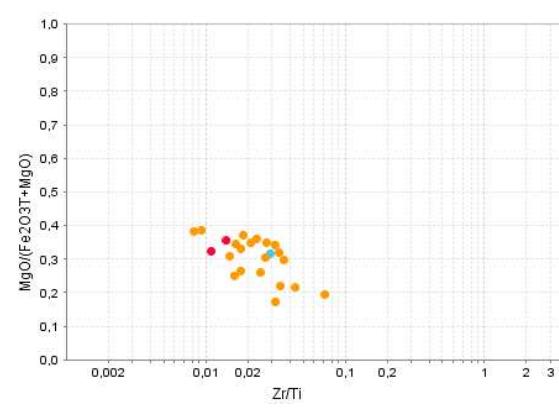
**Au** Mesothermal Au deposit in the Powell pluton  
**Cu** Cu-Mo-Au-Ag magmatic-hydrothermal ('porphyry-style') deposit associated with the Powell pluton



REE Primitive Mantle Norm (Sun and McDonough, 1989)

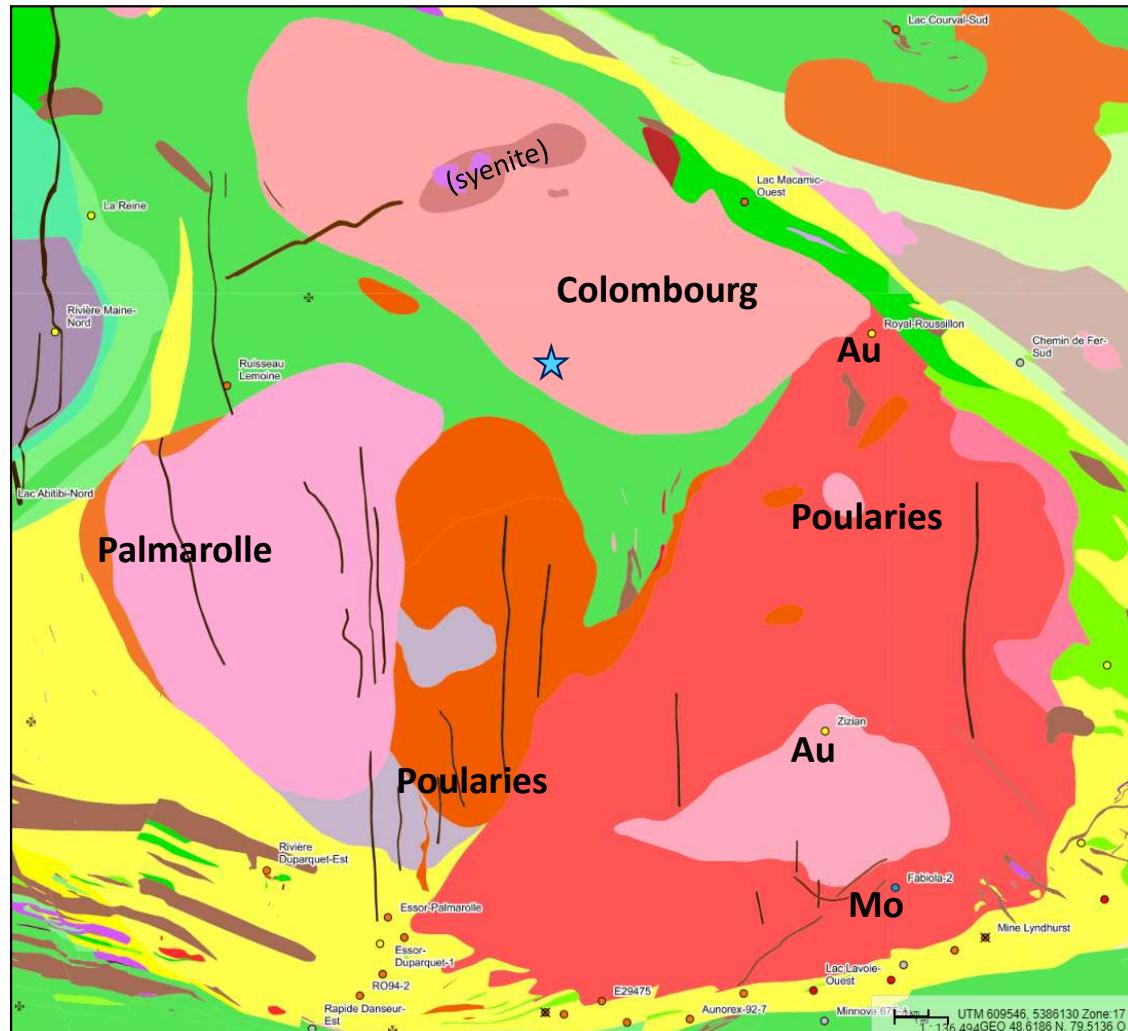


REE Primitive Mantle Norm (Sun and McDonough, 1989)



- SiO<sub>2</sub>\_pct 5 Equal Ranges**
- SiO<sub>2</sub>\_pct to 58 [20.00%]
  - SiO<sub>2</sub>\_pct to 61.4 [40.00%]
  - SiO<sub>2</sub>\_pct to 66.4 [60.00%]
  - SiO<sub>2</sub>\_pct to 68.7 [80.00%]
  - SiO<sub>2</sub>\_pct to 72.5 [100.00%]

# Colombourg, Palmarolle and Pouliaries plutons



## Colombourg batholith

Granite and granodiorite Bt-Hnbl – 100%

## Palmarolle pluton

Granodiorite Bt, Plag porphyry – 94.9%  
Diorite – 5.1%

## Pouliaries pluton

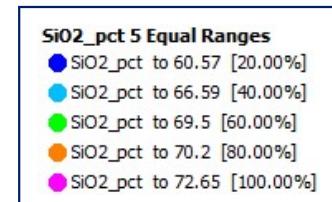
Tonalite and granite Bt-Hnbl – 65.8%  
Granodiorite – 9.5%  
Diorite ± trondhjemite injections – 17.6%  
Tonalite Bt-Hnbl – 4.1%  
Migmatite? – 3.0%

- Age U-Pb (granodiorite): **2696 +3,-2 Ma**  
 (*Mortensen 1993*)

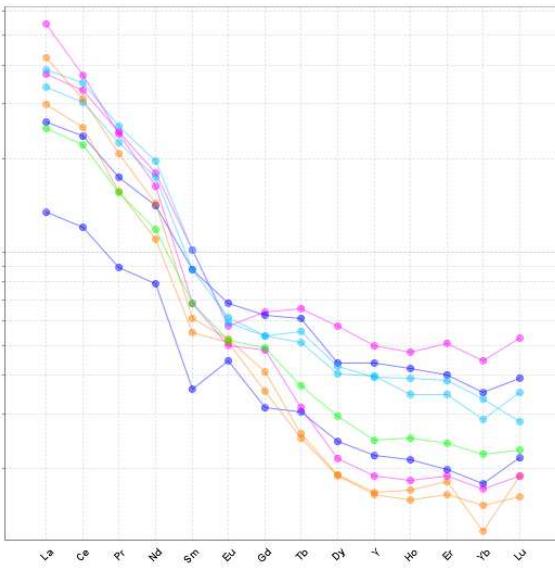
**Au** Au, Cu, Mo showings – magmatic-hydrothermal systems (possibly)

**Mo**

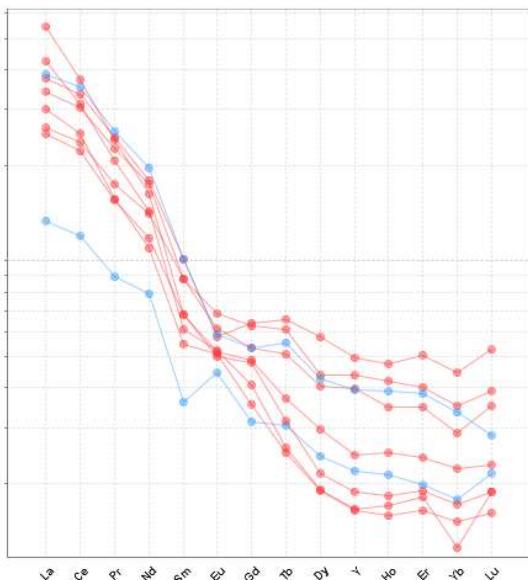
## Poularies pluton



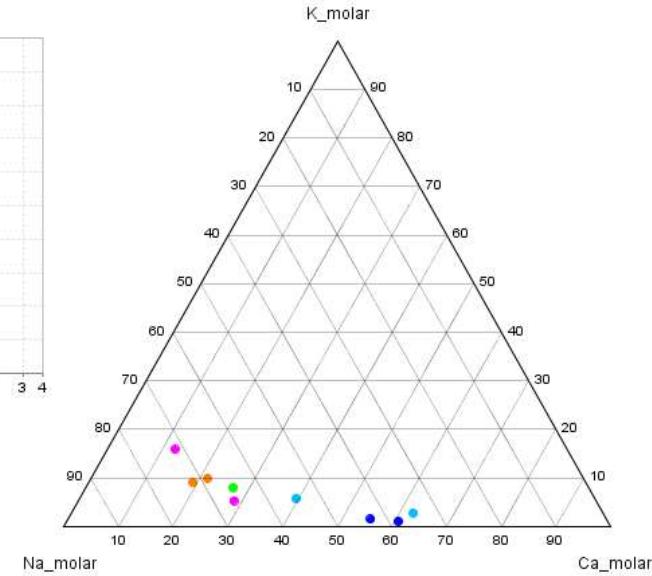
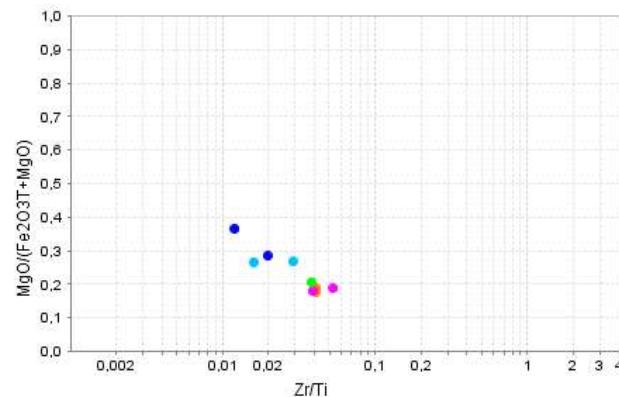
REE Primitive Mantle Norm (Sun and McDonough, 1989)



REE Primitive Mantle Norm (Sun and McDonough, 1989)

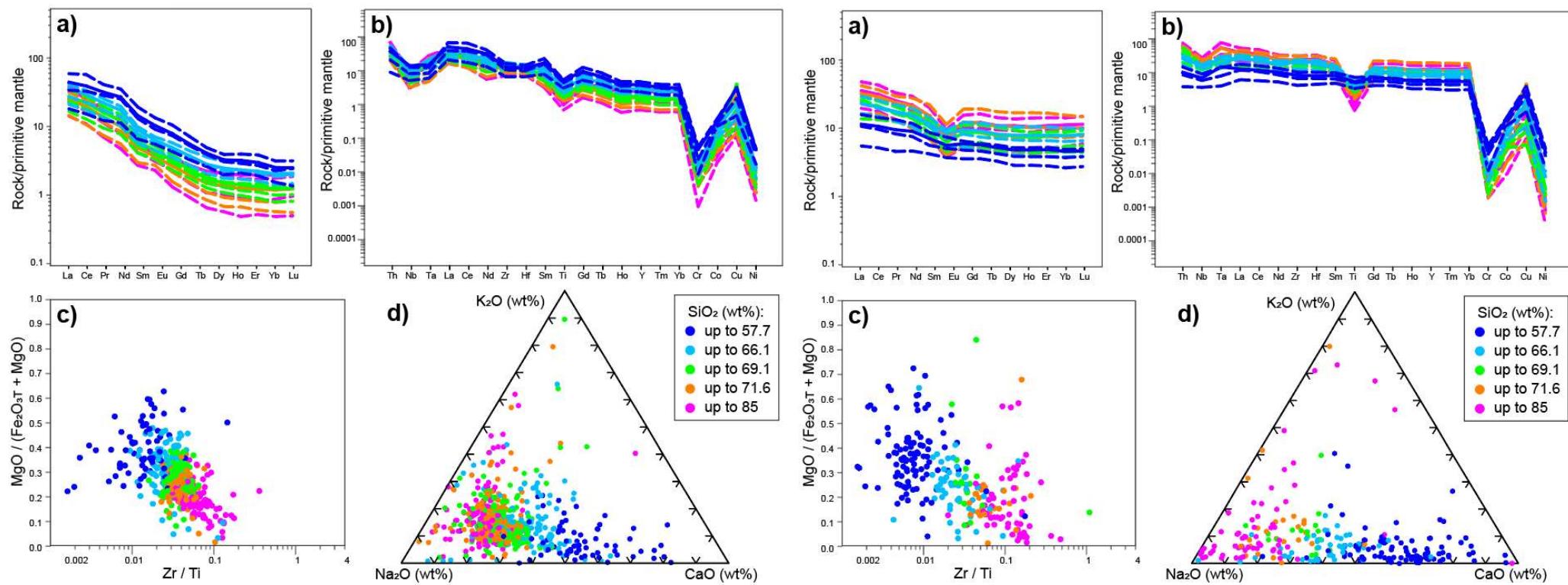


Tonalite  
Diorite

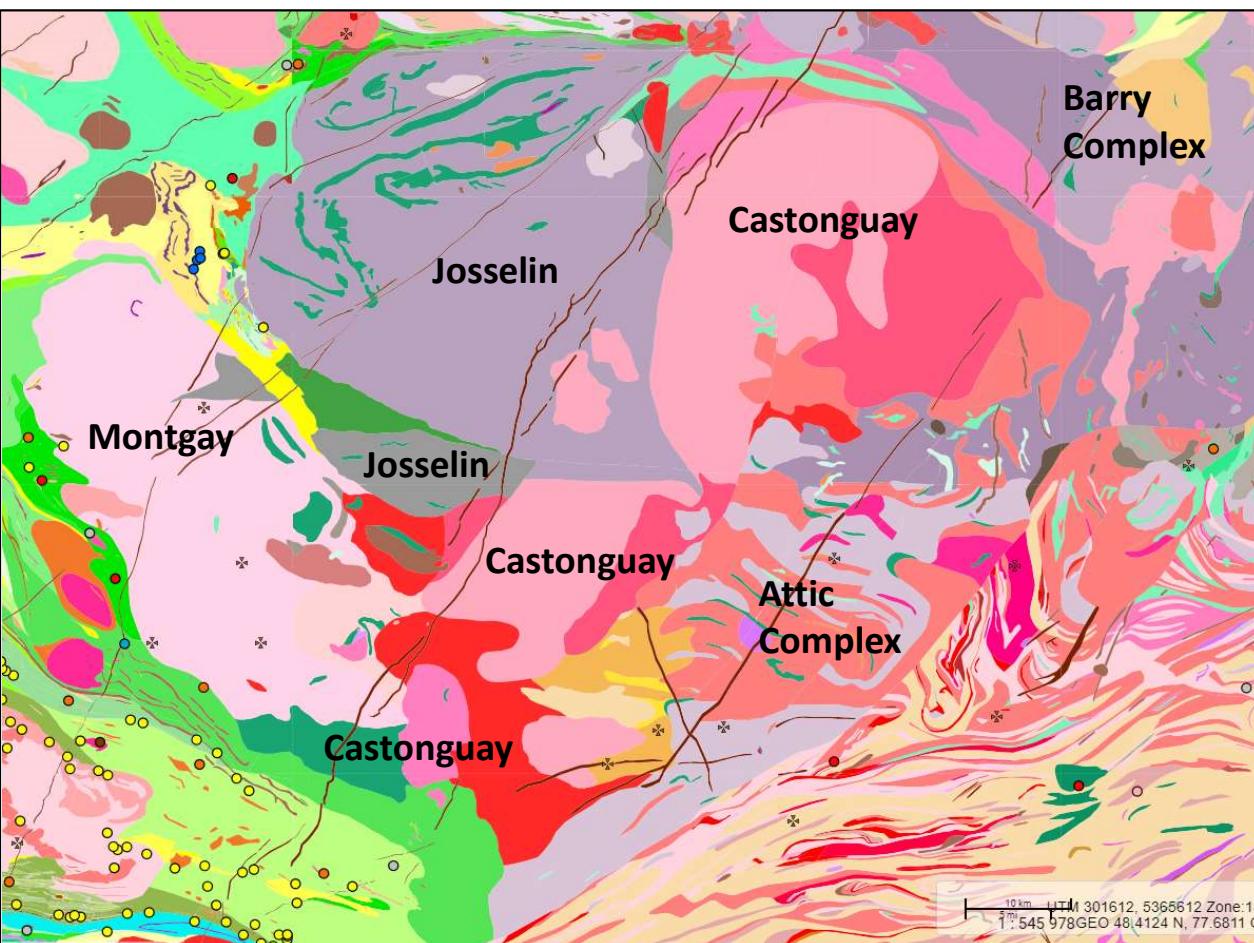


# Intermediate and felsic intrusions made of $(La/Yb)_N > 6$ and $(La/Yb)_N < 6$ rocks

**Figures 5 and 6** (see manuscript for details)



# Josselin batholith and Montgay batholith



## Josselin batholith

- Tonalite, diorite, granodiorite Bt-Amp (gneiss) – 12.5%
- Tonalite, granodiorite Bt-Hnbl (gneiss) – 87.0%
- Diorite ±Qz – 0.5%

## Montgay batholith

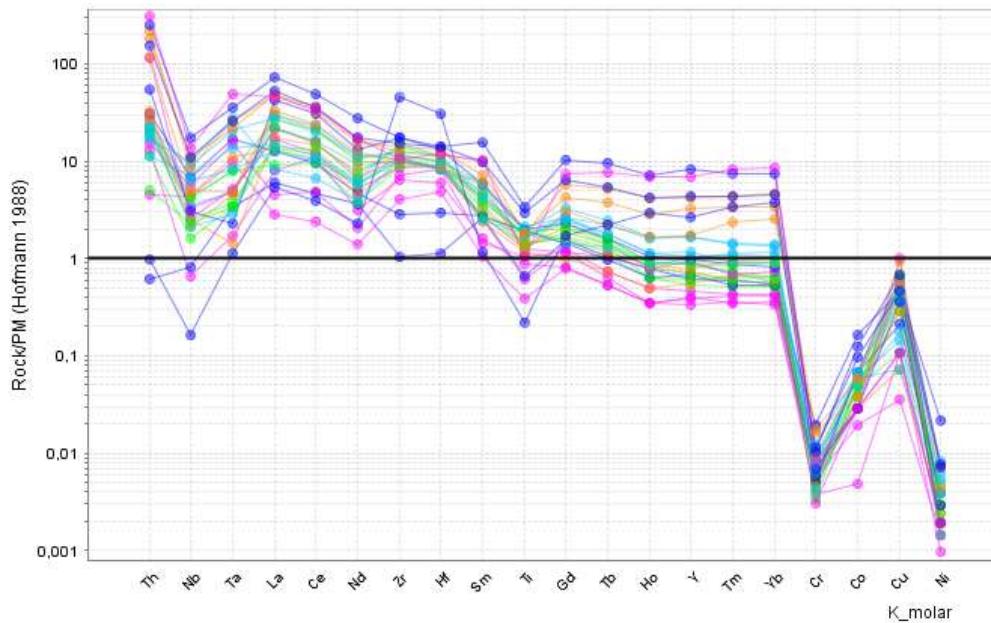
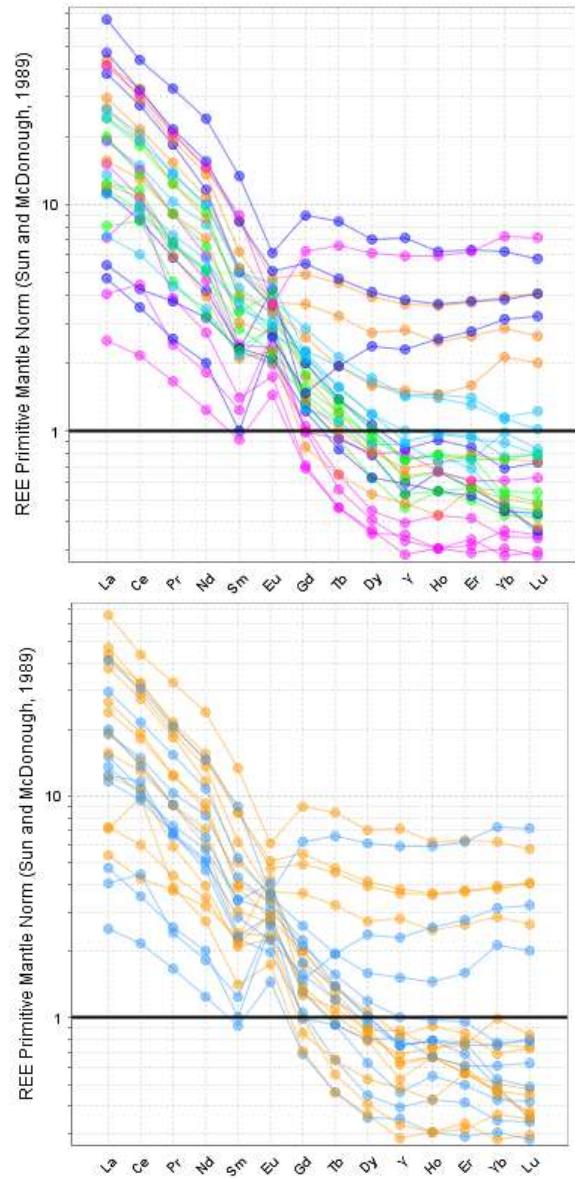
- Granodiorite, tonalite, granite, monzonite, diorite – 97.9%
- Granite – 2.1%

## Castonguay suite

- Granite Bt-Ab
- Granite gneiss
- Granite

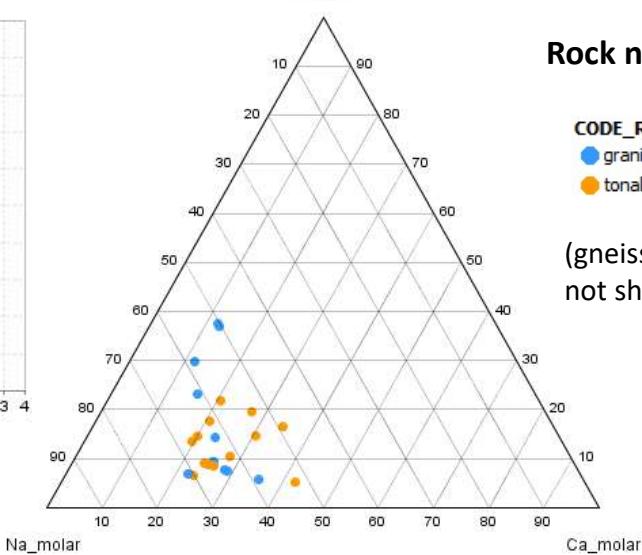
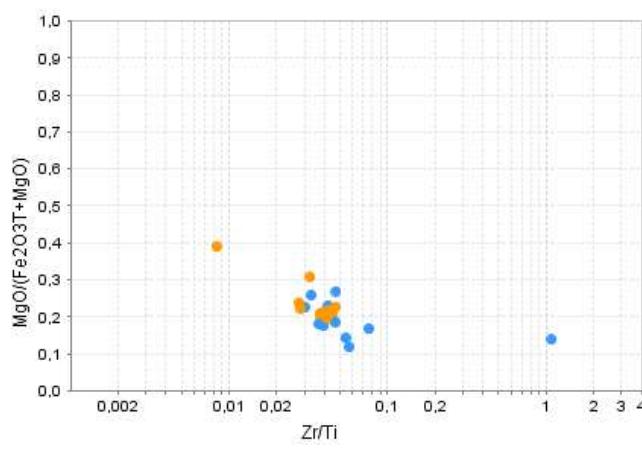
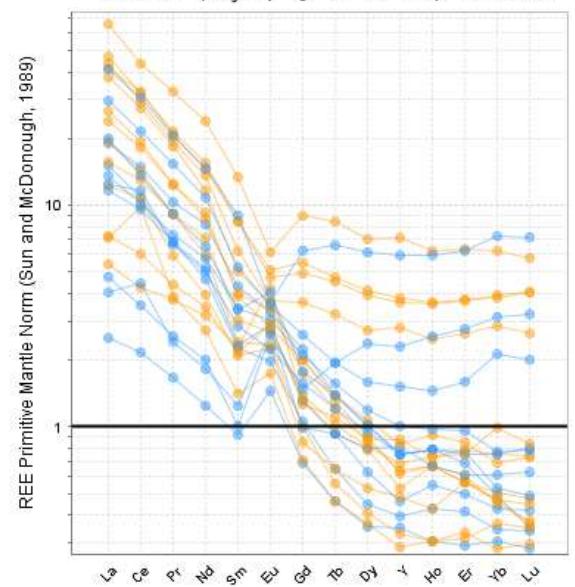
## Attic Complex

- Tonalite
- Granodiorite, granite, tonalite
- Gneiss Qz-Fsp-Bt
- Gneiss Bt-Amph
- Amphibolite
- Granite gneiss Amph paragneiss
- paragneiss



**Josselin batholith**

- SiO<sub>2</sub>\_pct 5 Equal Ranges**
- SiO<sub>2</sub>\_pct to 68.66 [20.00%]
  - SiO<sub>2</sub>\_pct to 70.23 [40.00%]
  - SiO<sub>2</sub>\_pct to 70.76 [60.00%]
  - SiO<sub>2</sub>\_pct to 72.73 [80.00%]
  - SiO<sub>2</sub>\_pct to 75.14 [100.00%]



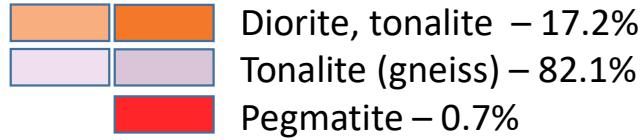
**Rock names (field)**

- CODE\_ROCH**
- granite granodiorite
  - tonalite

(gneiss – unclassified  
not shown)

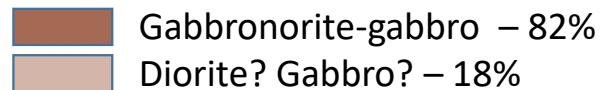
# Hébert pluton and other intrusions

## Hébert pluton



- Age U-Pb (Hébert pluton): 2695.3 ±1 Ma (David et al. 2009)

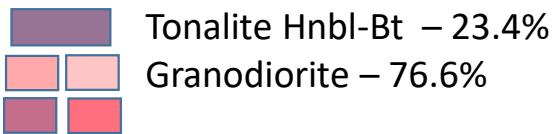
## Wetetnagami pluton



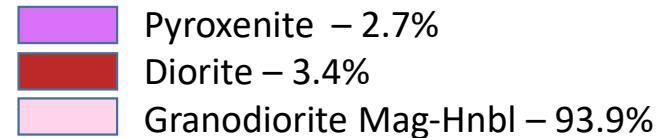
## Mountain pluton



## Father pluton



## Espinay pluton



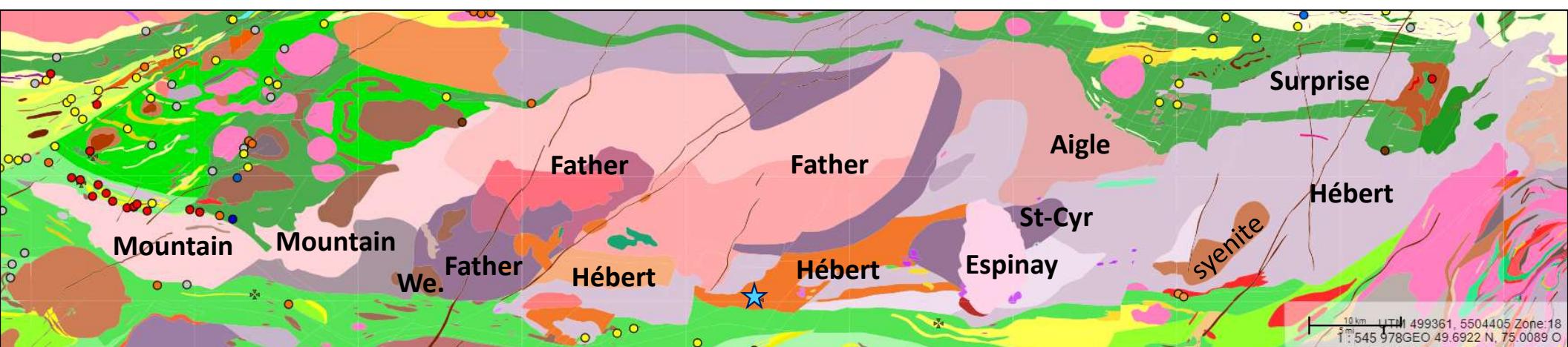
## Aigle pluton

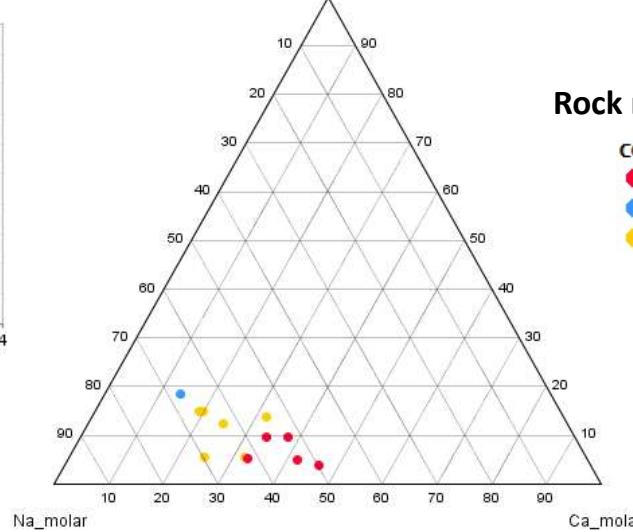
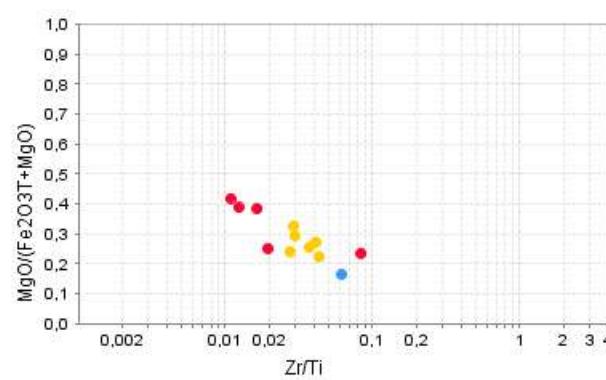
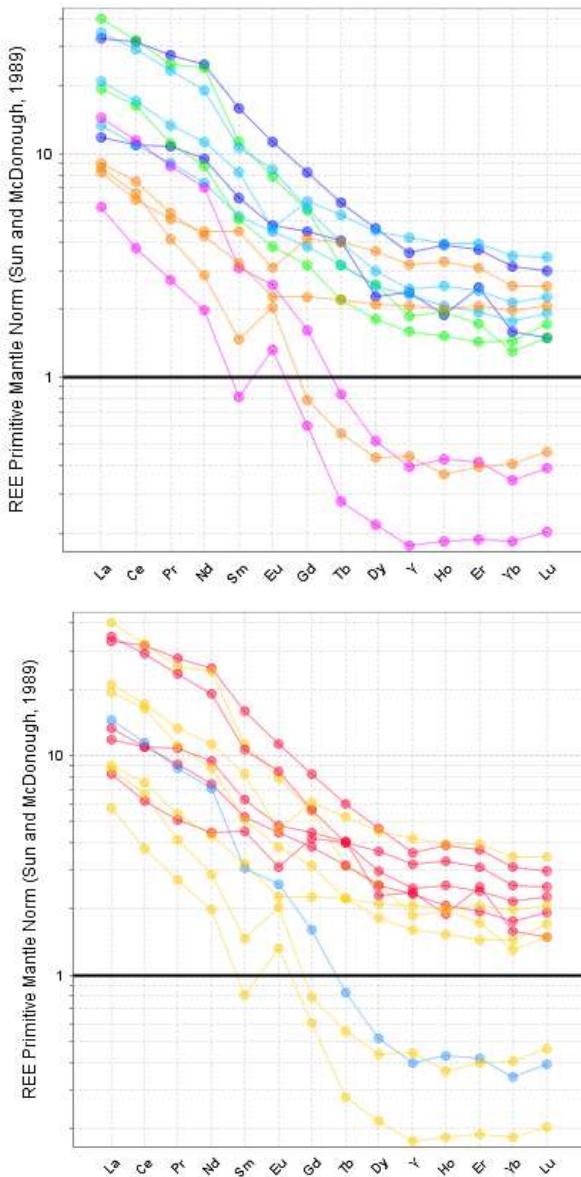


## Saint-Cyr pluton

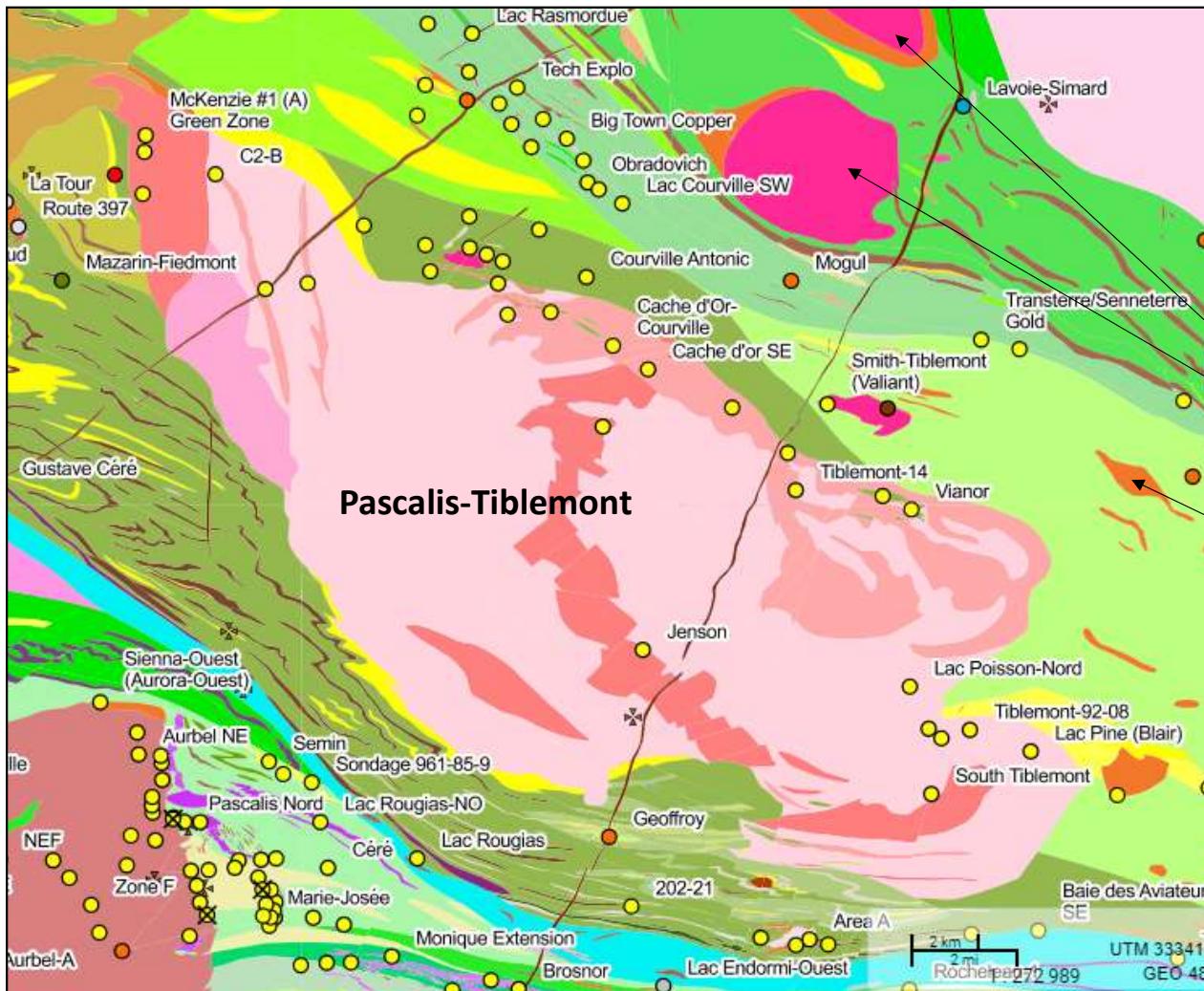


## Surprise pluton





# Pascalis-Tiblemont batholith



## Pascalis-Tiblemont batholith

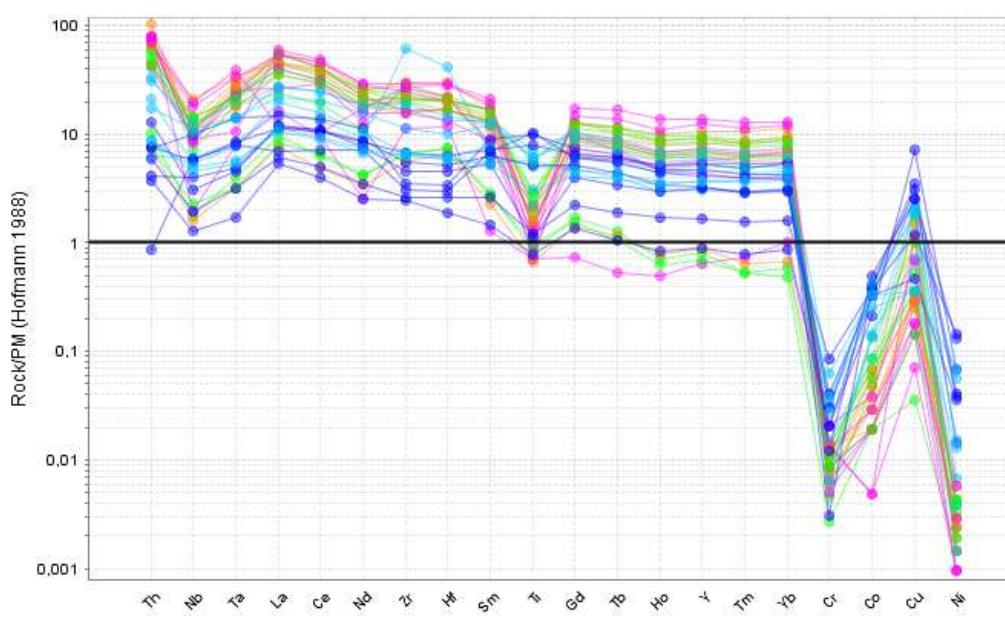
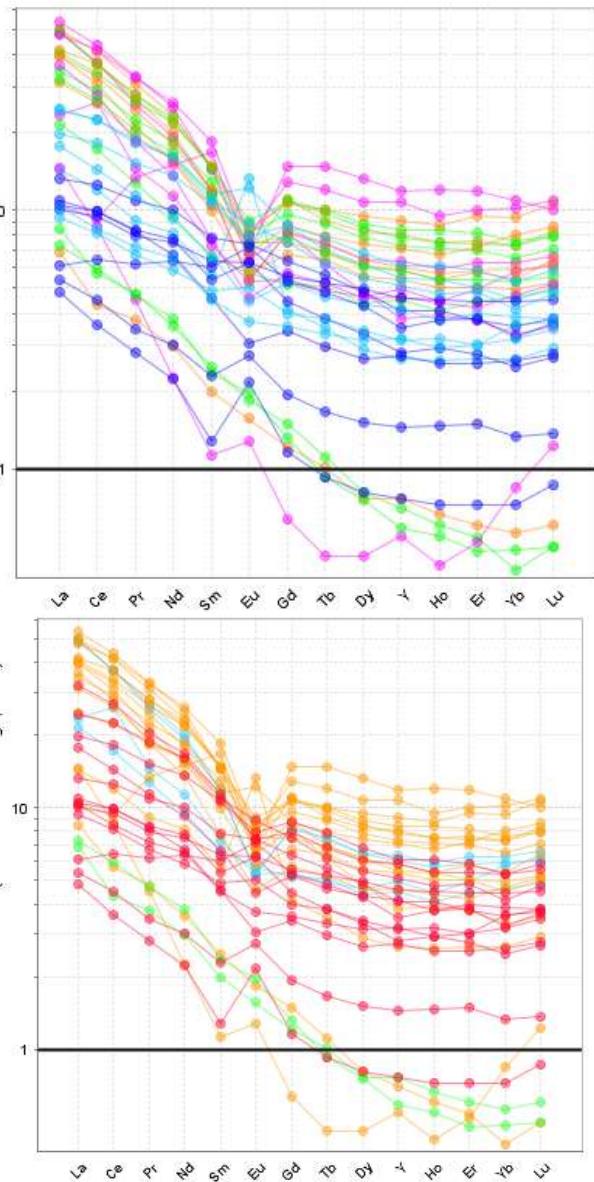
- Diorite Qz, tonalite,  $\pm$ granodiorite – 67.1%
- Tonalite, diorite Qz – 4.0%
- Diorite  $\pm$ Qz – 15.0%
- Diorite – 13.7%
- Diorite – 0.2 %

## Unnamed intrusions

- Granodiorite, tonalite
- Diorite
- Diorite

Au showings described as mesothermal Au.

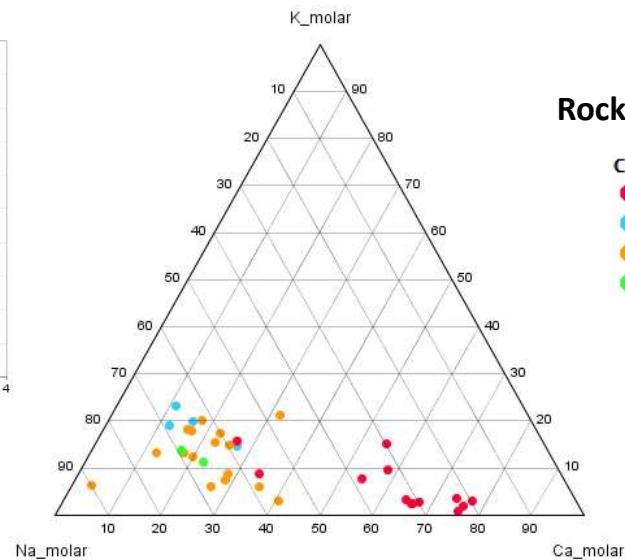
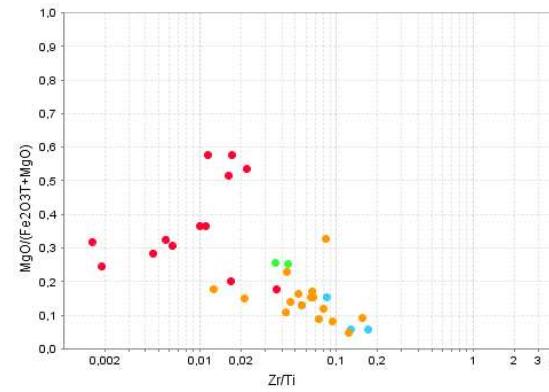
REE Primitive Mantle Norm (Sun and McDonough, 1989)



## Pascalis-Tiblemont batholith

**SiO<sub>2</sub>\_pct 5 Equal Ranges**

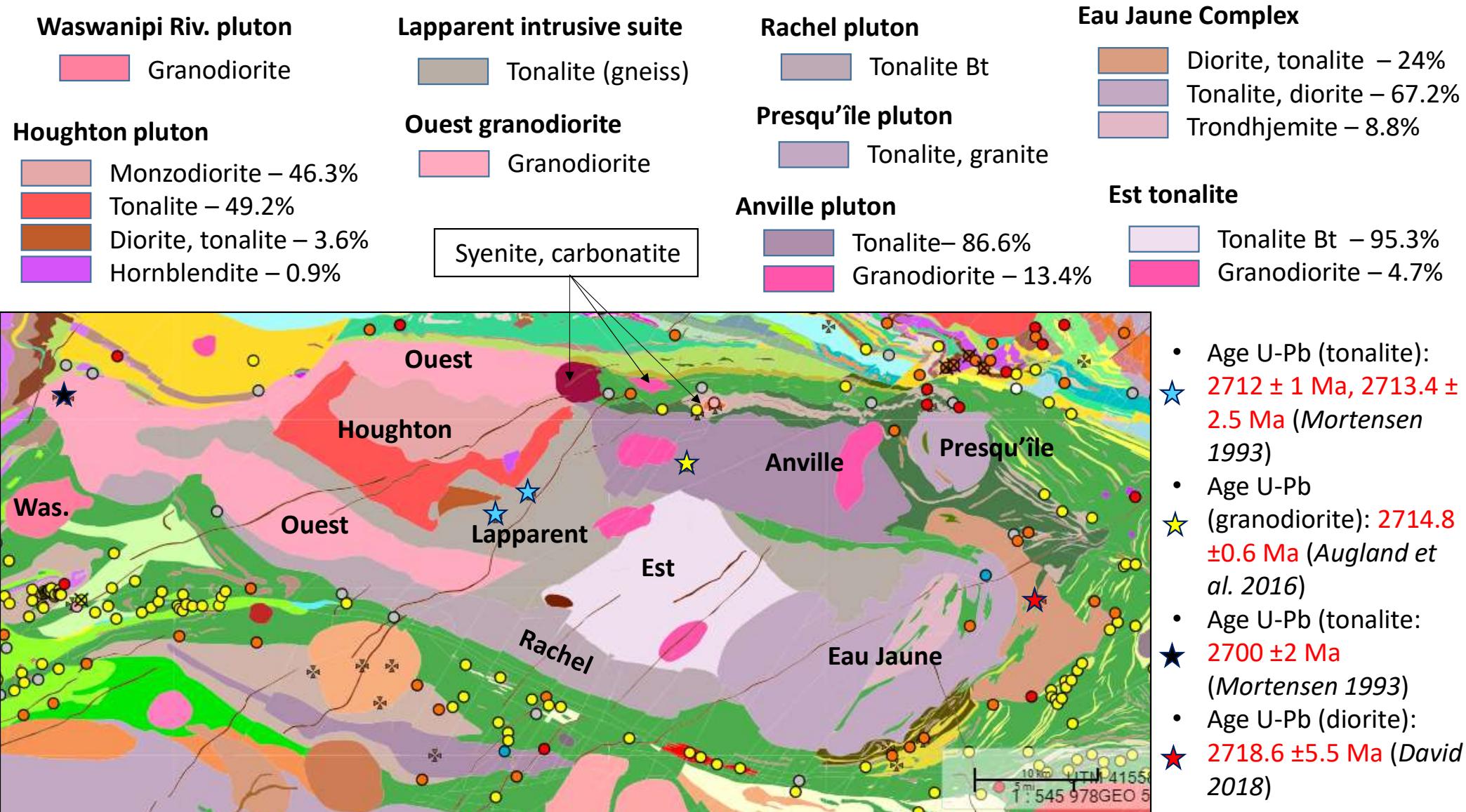
- SiO<sub>2</sub>\_pct to 50.92 [20.00%]
- SiO<sub>2</sub>\_pct to 65.6 [40.00%]
- SiO<sub>2</sub>\_pct to 70.96 [60.00%]
- SiO<sub>2</sub>\_pct to 74.5 [80.00%]
- SiO<sub>2</sub>\_pct to 84.55 [100.00%]



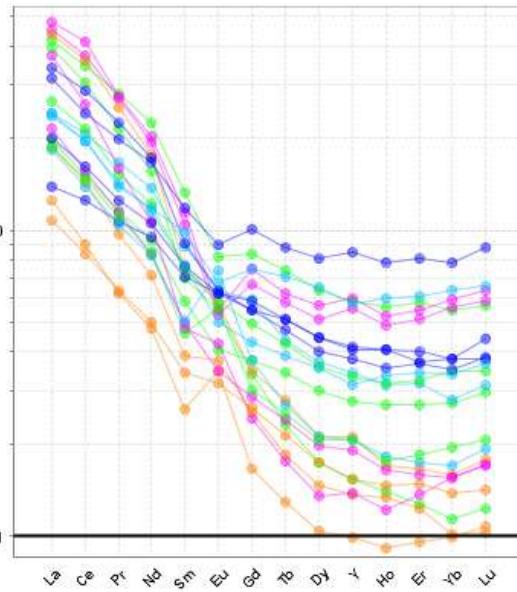
## Rock names (field)

### CODE\_ROCH

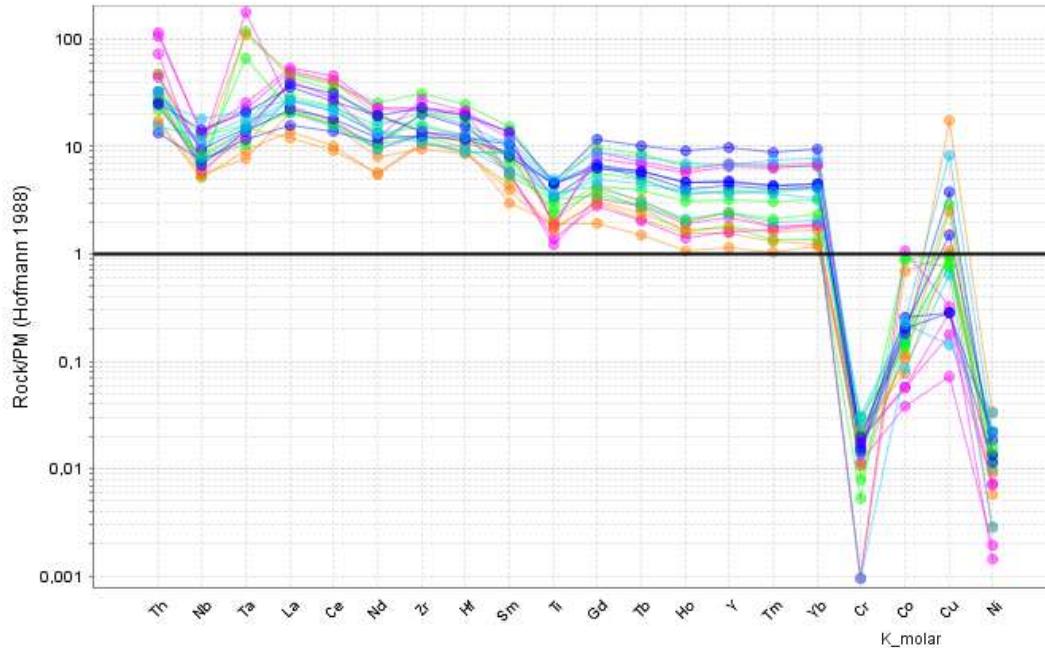
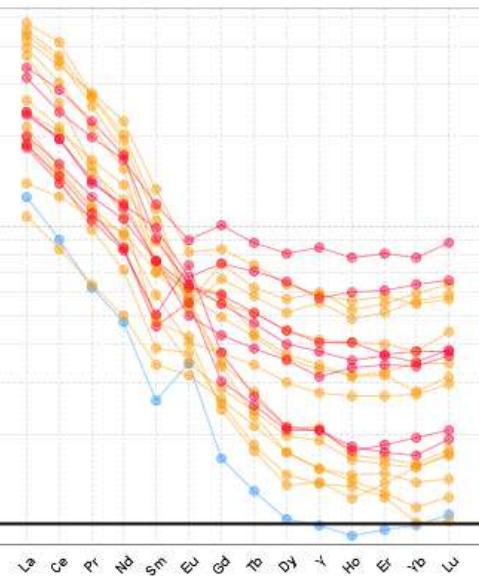
- diorite
- granodiorite
- tonalite
- trondhjemite



REE Primitive Mantle Norm (Sun and McDonough, 1989)



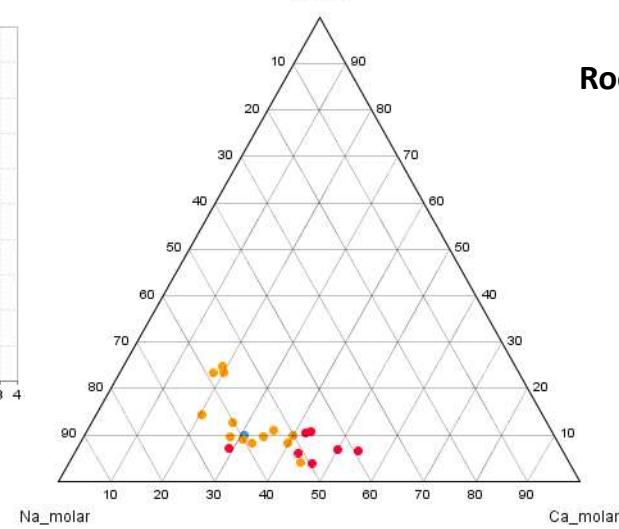
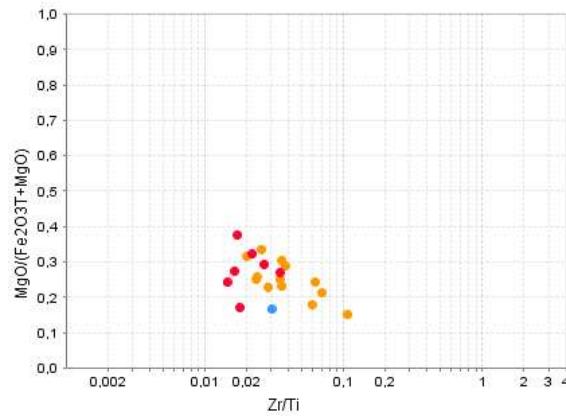
REE Primitive Mantle Norm (Sun and McDonough, 1989)



## Eau Jaune complex

**SiO<sub>2</sub>\_pct 5 Equal Ranges**

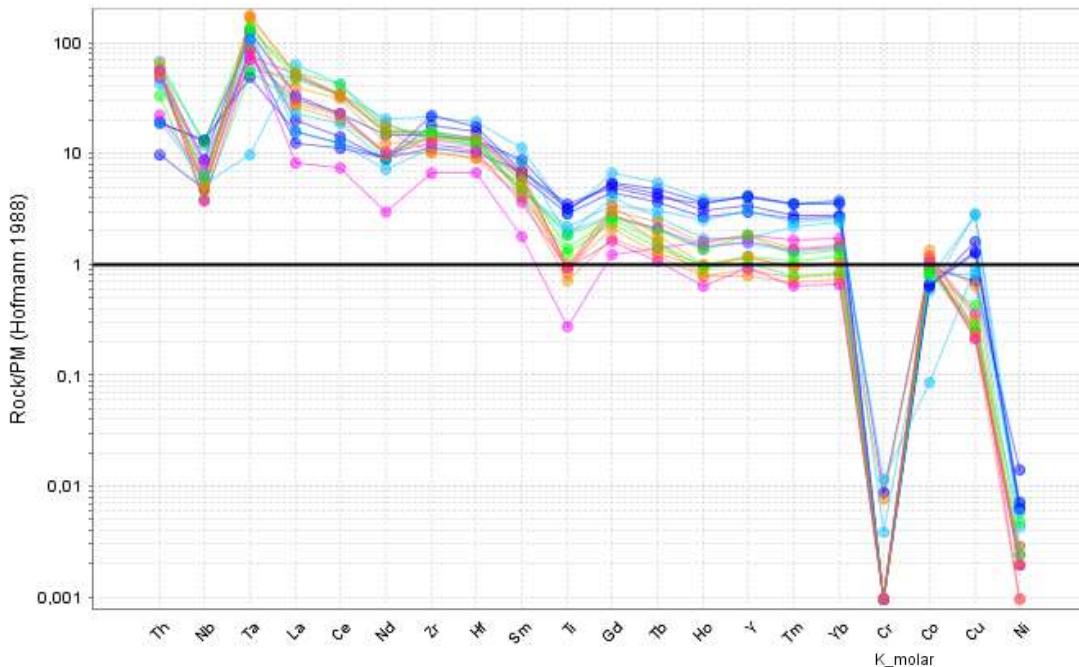
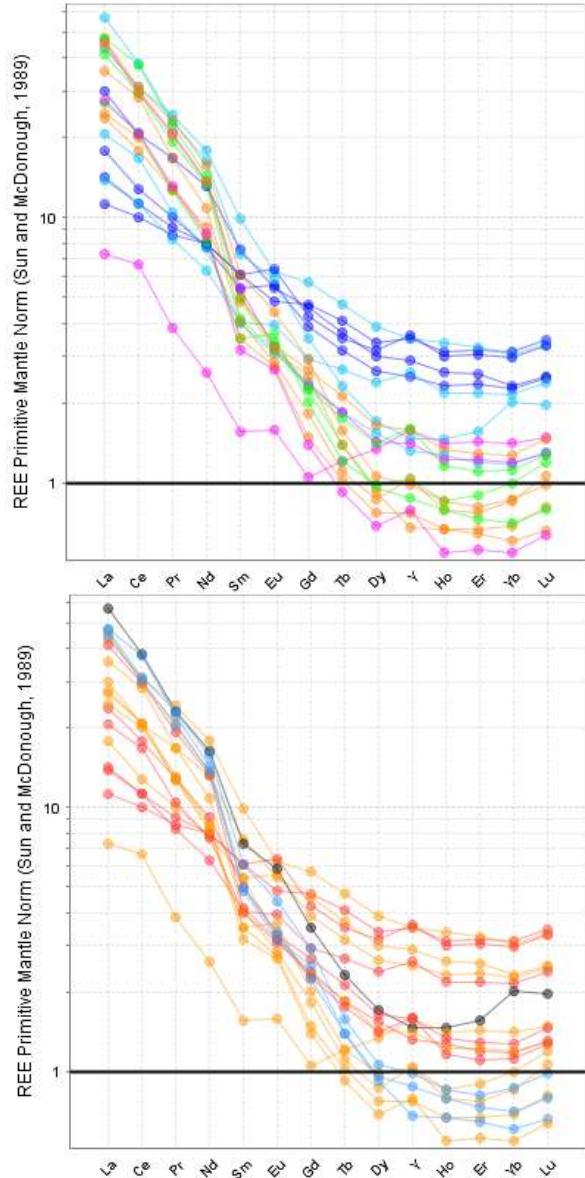
- SiO<sub>2</sub>\_pct to 59 [20.00%]
- SiO<sub>2</sub>\_pct to 60.15 [40.00%]
- SiO<sub>2</sub>\_pct to 66.96 [60.00%]
- SiO<sub>2</sub>\_pct to 69.31 [80.00%]
- SiO<sub>2</sub>\_pct to 75.45 [100.00%]



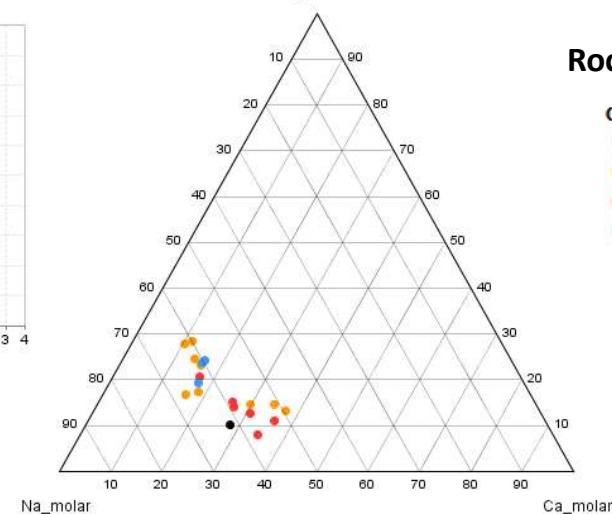
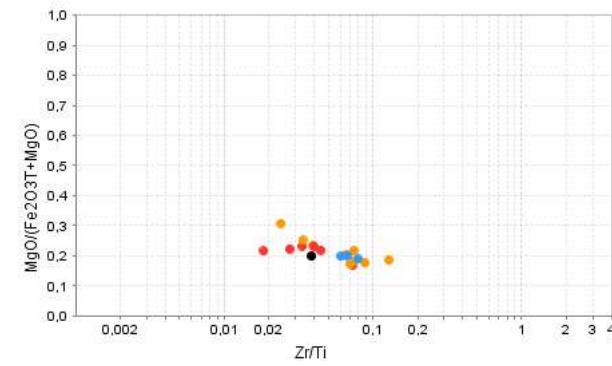
## Rock names (field)

**CODE\_ROCH**

- diorite
- granodiorite
- tonalite



Anville and  
Rachel  
plutons



**CODE\_ROCH**

- Anville (diorite)
- Anville (tonalite)
- Rachel (tonalite)
- tonalite (granodiorite)

### Hazeur pluton

Tonalite

### Muscocho pluton

Granodiorite Hnbl

### Verneuil pluton

Tonalite, granodiorite

### La Dauversière pluton

Tonalite, granodiorite

### Boisvert pluton

Tonalite, granodiorite

### Némenjiche pluton

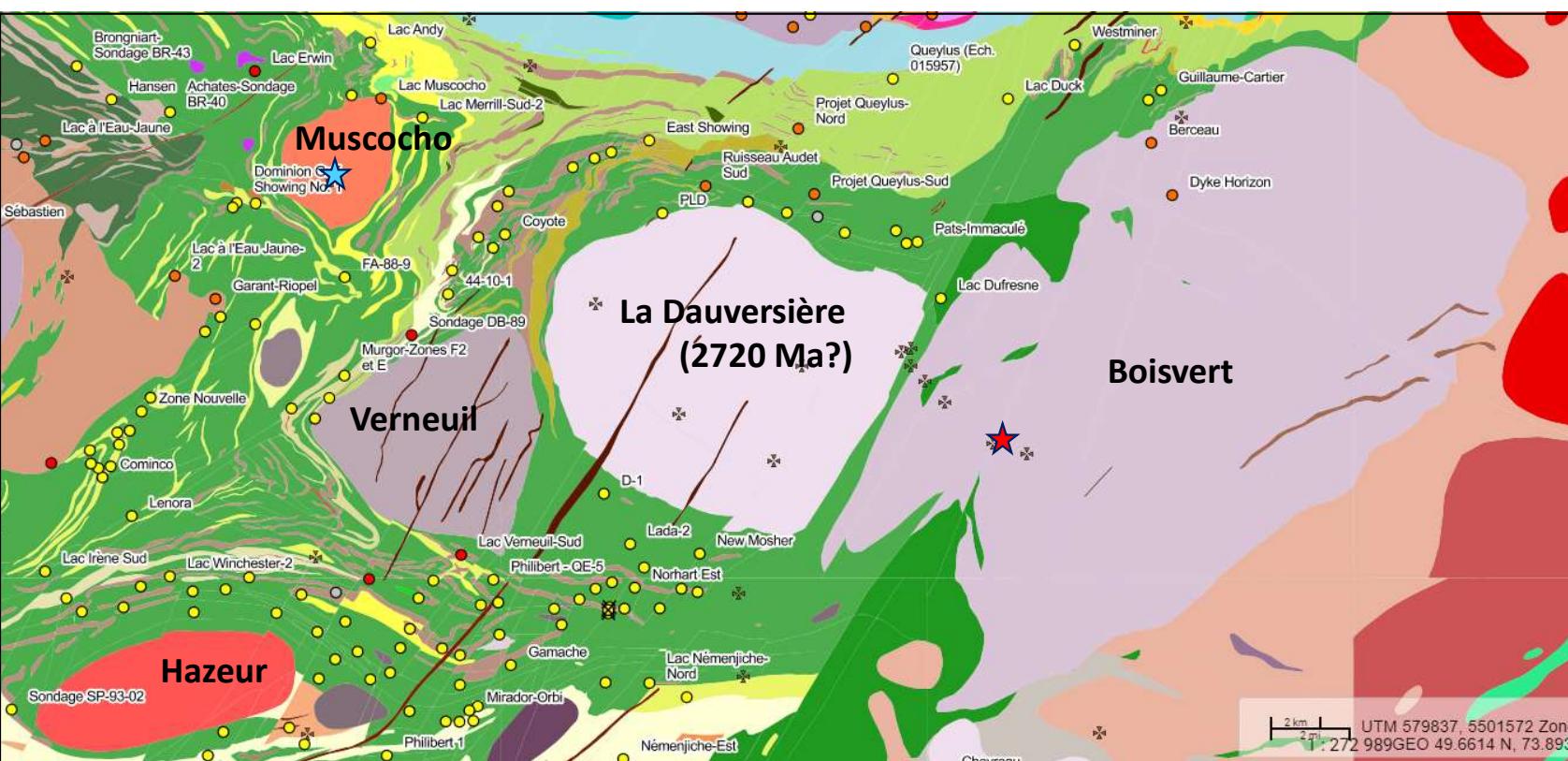
Tonalite

### Unnamed

Tonalite

### Chico stock

Tonalite

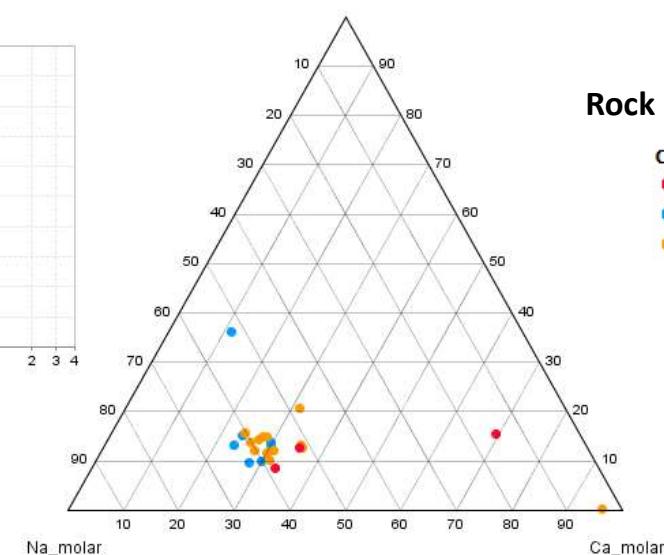
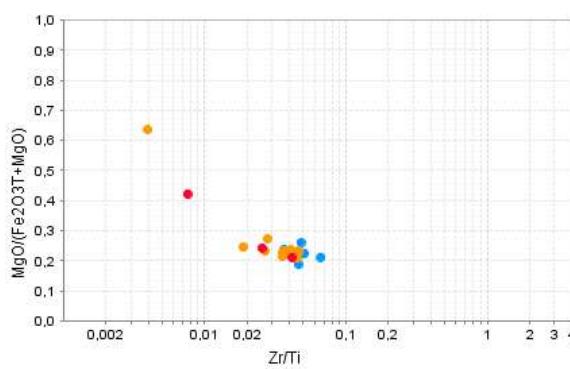
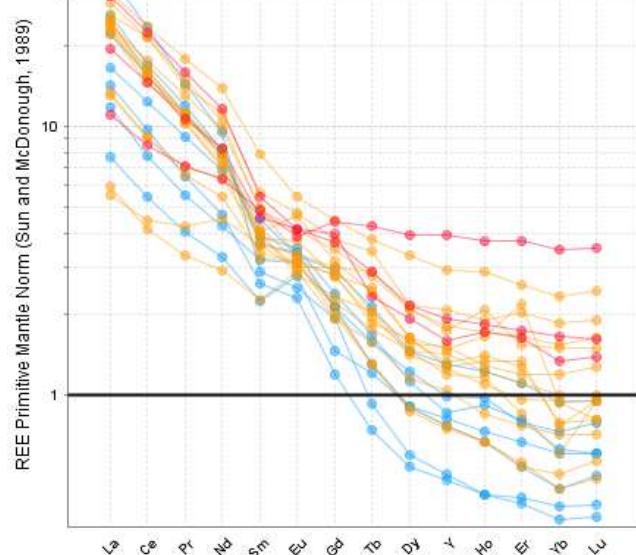
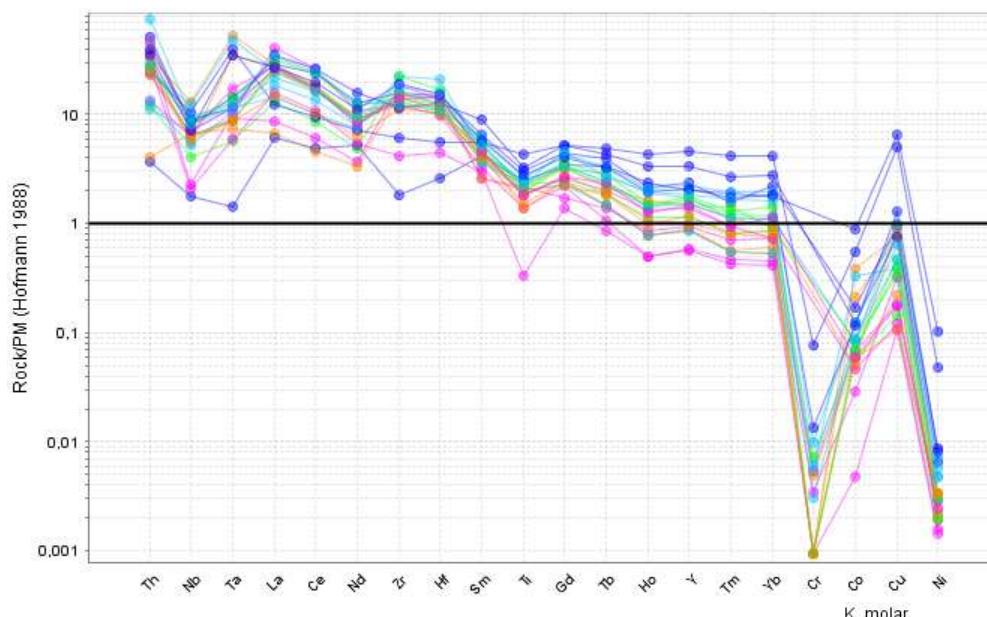
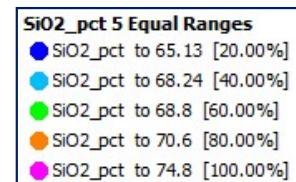


- Age U-Pb (granodiorite):  
 $2701 +2,-1$  Ma  
(Mortensen 1993)



- Age U-Pb:  
 $2697 \pm 3$  Ma  
(Davis et al. 2005)

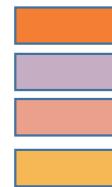
## La Dauversière pluton



## Rock names (field)



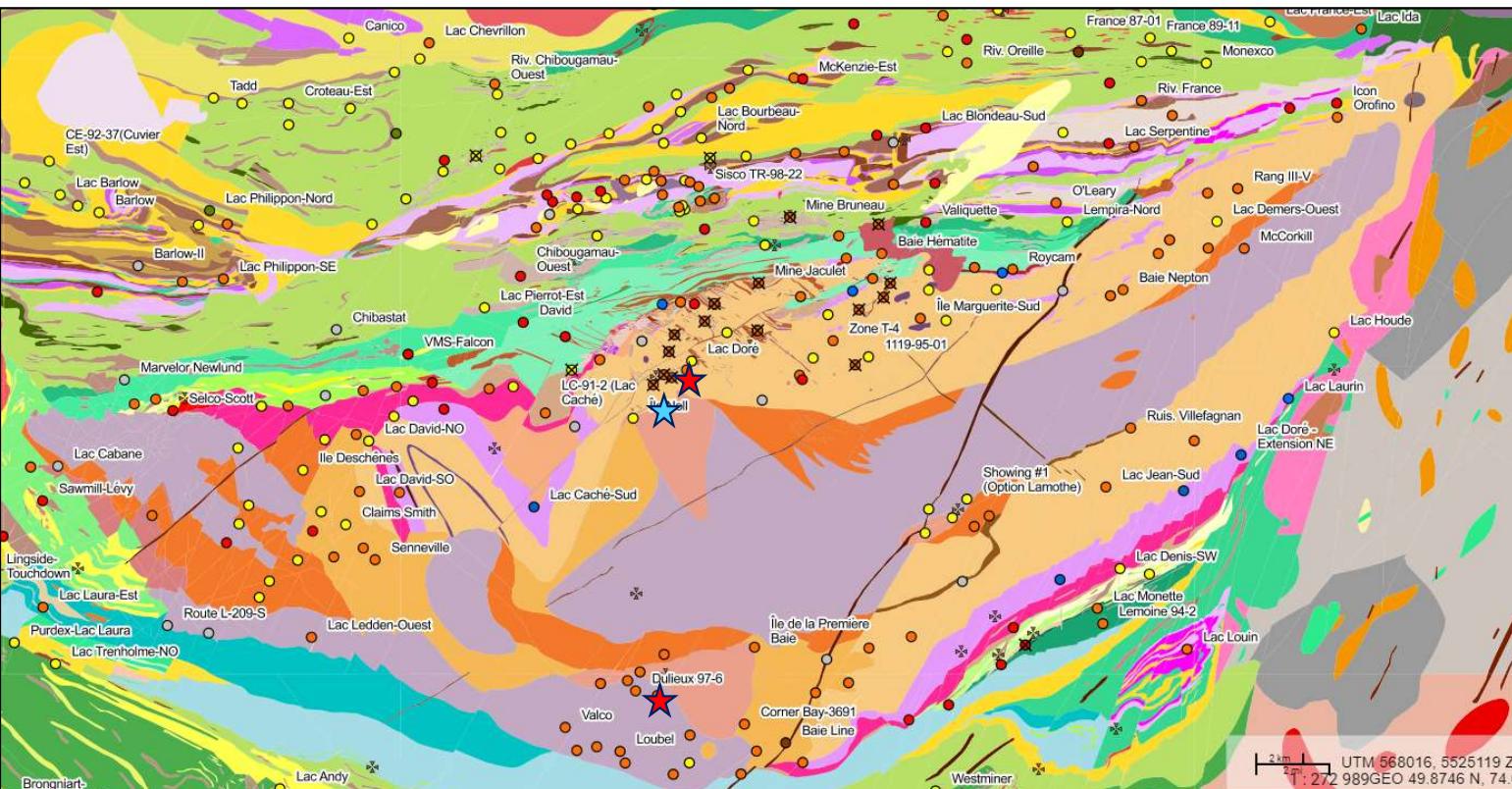
# Chibougamau pluton


 Diorite ±tonalite – 20.1% + dykes (0.1%)  

 Tonalite ±diorite – 71.0%  

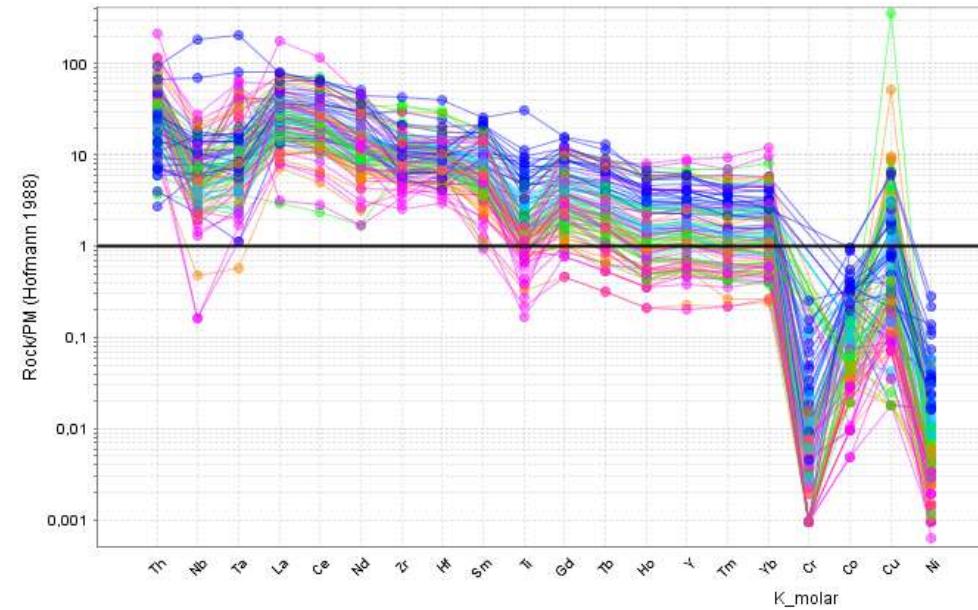
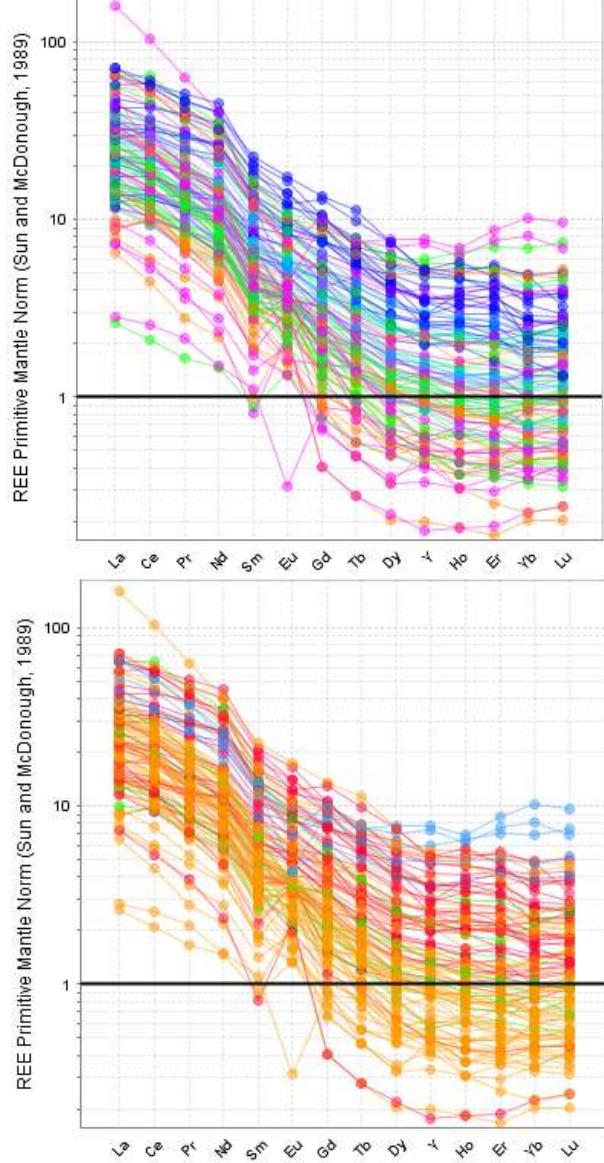
 Trondhjemite – 6.9%  

 Magmatic breccia (LDC injected by dykes from the Chibougamau pluton) – 1.9%



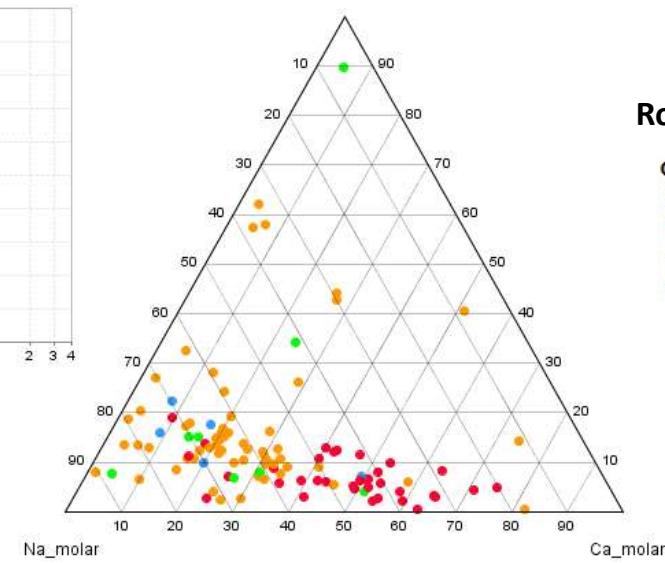
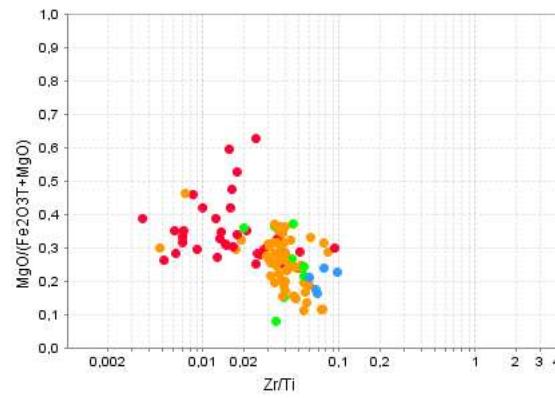
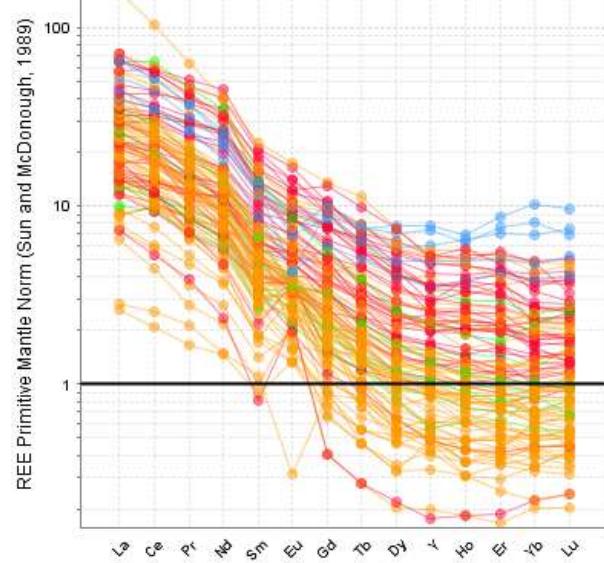
- ★ • Age U-Pb (tonalite):  **$2718 \pm 2$  Ma** (Krogh and Davis 1971)
- ★ • Age U-Pb:  **$2705-2701$  Ma** (David et al. 2010; McNicoll et al. 2008)

Several Cu-Au porphyry-style deposits and showings



**Chibougamau pluton**

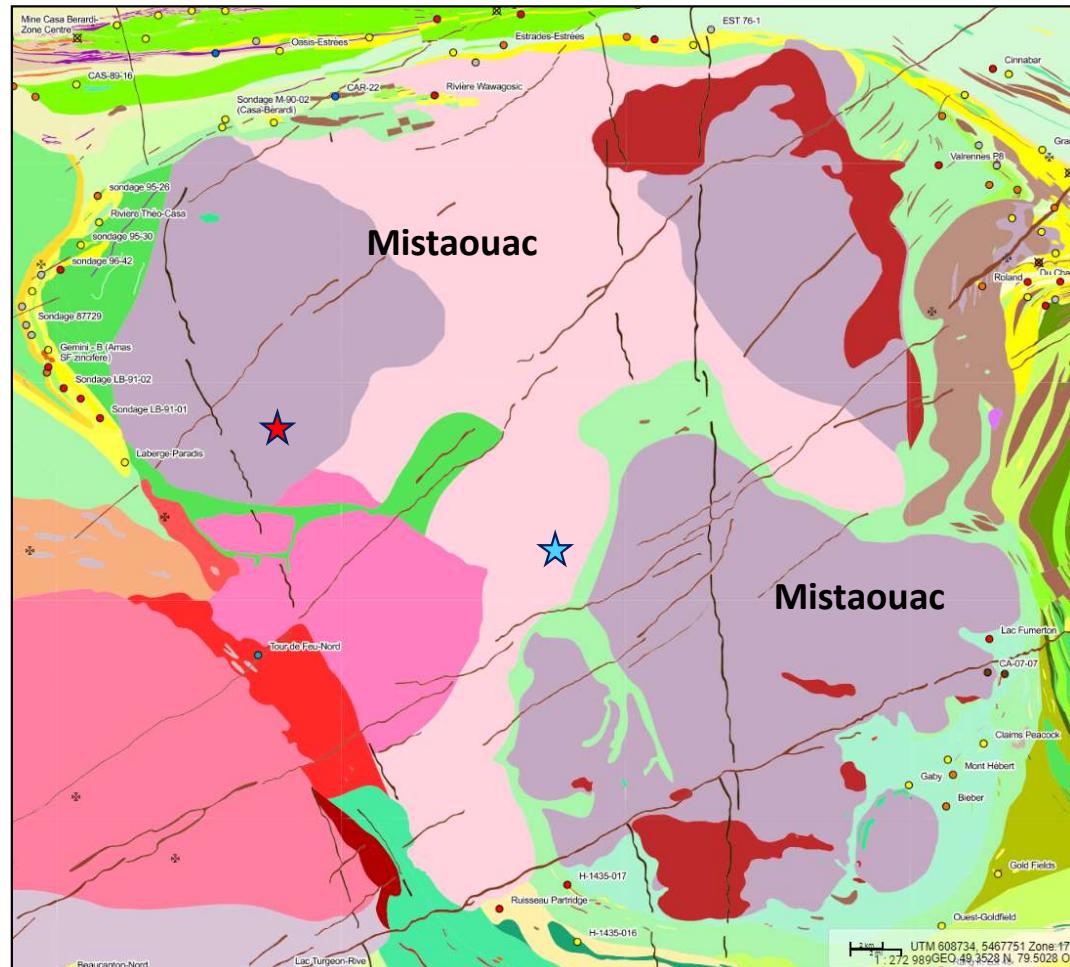
- SiO<sub>2</sub>\_pct 5 Equal Ranges**
- SiO<sub>2</sub>\_pct to 56.43 [20.00%]
  - SiO<sub>2</sub>\_pct to 66.98 [40.00%]
  - SiO<sub>2</sub>\_pct to 69.31 [60.00%]
  - SiO<sub>2</sub>\_pct to 71.1 [80.00%]
  - SiO<sub>2</sub>\_pct to 76.59 [100.00%]



**Rock names (field)**

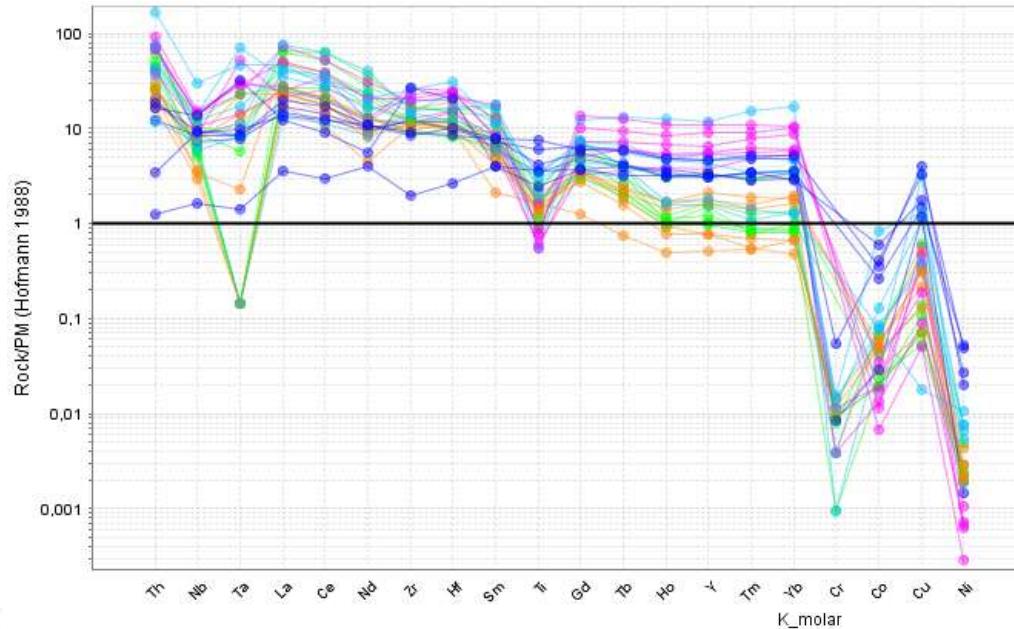
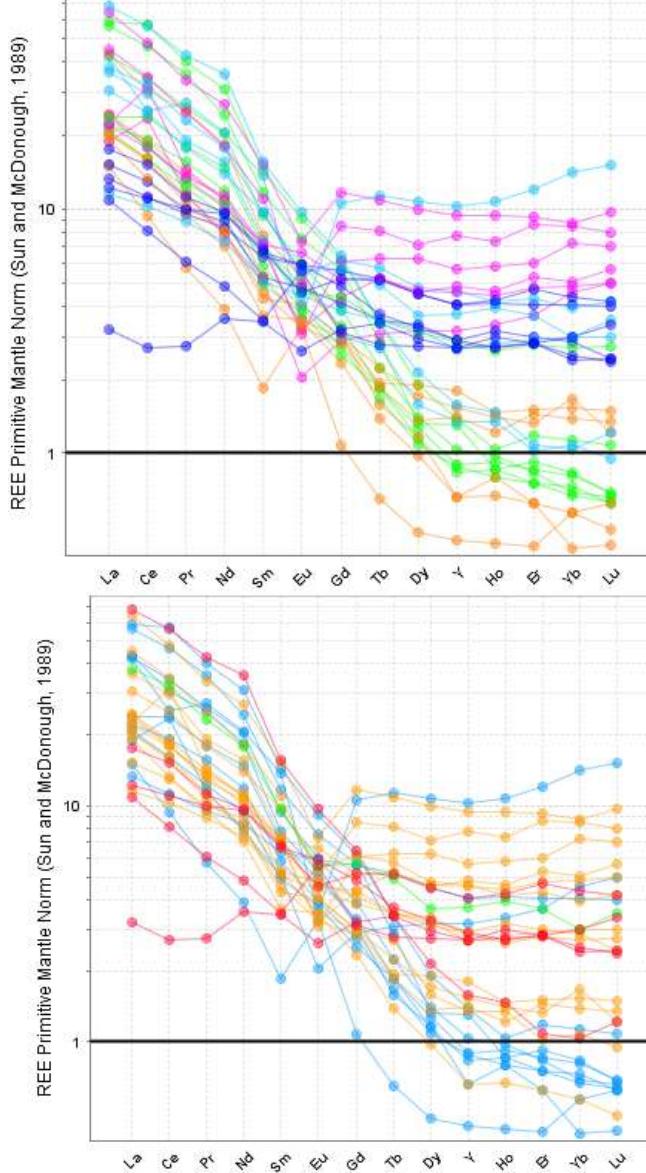
- CODE\_ROCH**
- diorite
  - granite, granodiorite
  - tonalite
  - trondhjemite

# Mistaouac pluton



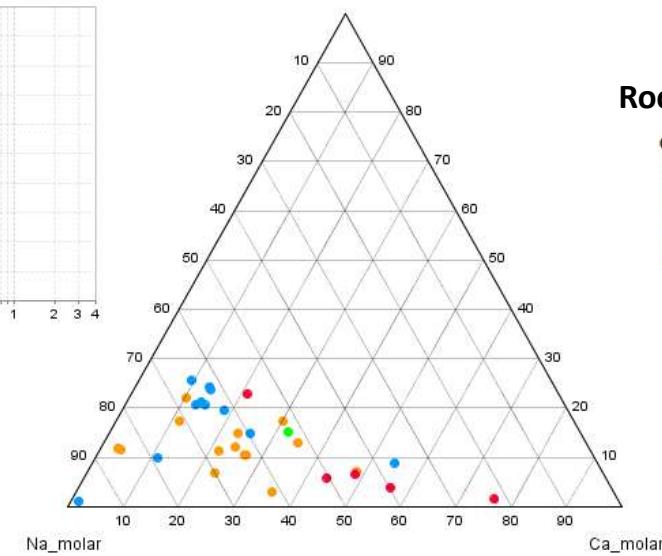
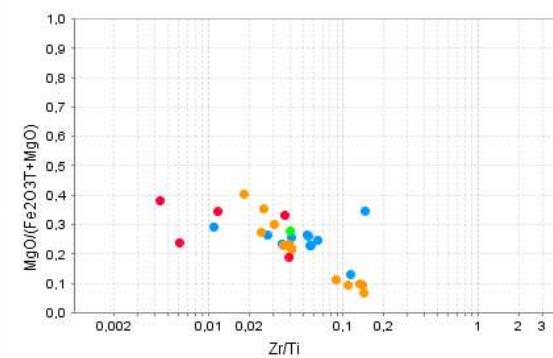
- |   |  |
|---|--|
|  | Tonalite Bt ±Hnbl – 51.0% (aerial surface) |
|  | Granite Bt – 8.4%                          |
|  | Granodiorite and granite Hnbl-Bt – 33.3%   |
|  | Diorite ±Qz, Hnbl – 7.3%                   |

- Age U-Pb (granodiorite-tonalite): **2727 ±9 Ma**; **2724 ±4 Ma** (*Davis et al. 1993*)
  - Age U-Pb (tonalite): **2726 ±2 Ma** (*Davis et al. 2000*)



Mistaouac pluton

- SiO<sub>2</sub>\_pct 5 Equal Ranges**
- SiO<sub>2</sub>\_pct to 63.22 [20.00%]
  - SiO<sub>2</sub>\_pct to 67.6 [40.00%]
  - SiO<sub>2</sub>\_pct to 69.6 [60.00%]
  - SiO<sub>2</sub>\_pct to 71.68 [80.00%]
  - SiO<sub>2</sub>\_pct to 78.2 [100.00%]



Rock names (field)

- CODE\_ROCH**
- diorite
  - granite, granodiorite
  - tonalite
  - trondhjemite

## Intermediate and felsic intrusions characterized by $(La/Yb)_N < 6$

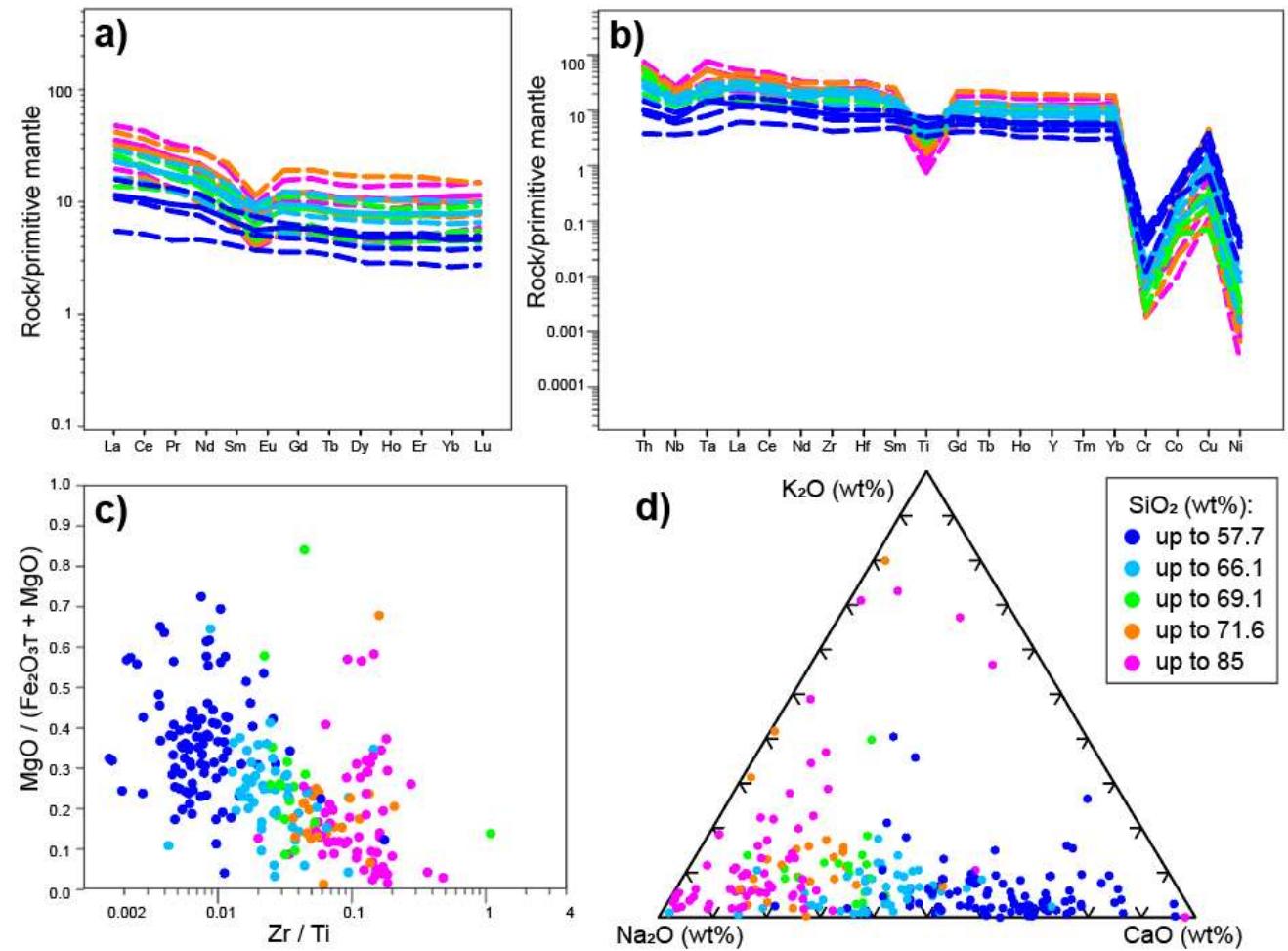


Figure 6 (see manuscript for details)

## Dufault and Powell plutons

- Au** Mesothermal Au deposit in the Powell pluton
- Cu** Cu-Mo-Au-Ag magmatic-hydrothermal ('porphyry-style') deposit associated with the Powell pluton

### Dufault pluton

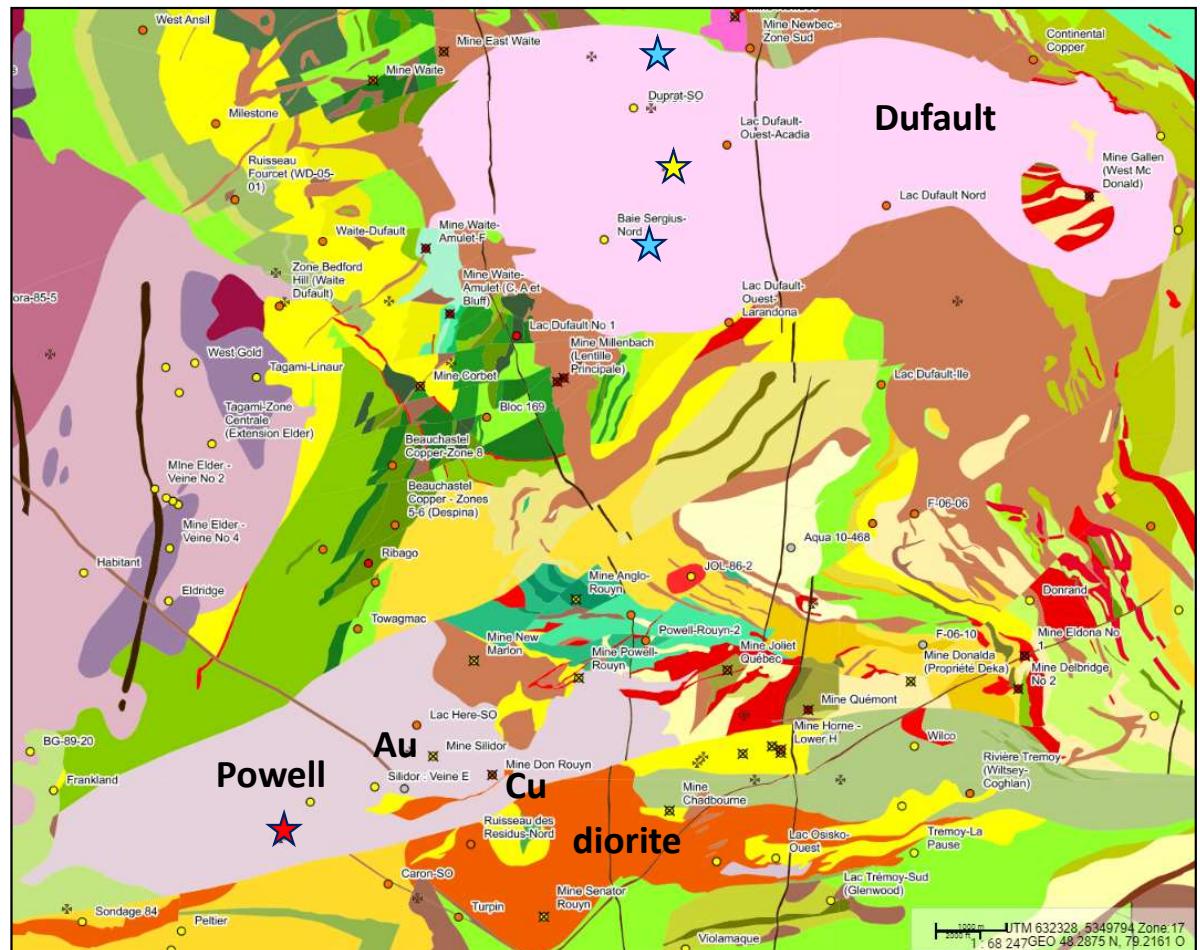
 Granodiorite – 100%

### Powell pluton

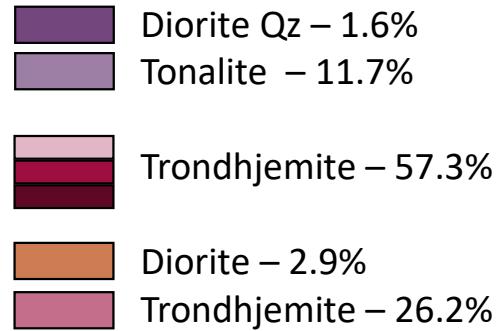
 Tonalite – 63.5%

 Diorite – 36.5%  
 Powell pluton?

- Age U-Pb (granodiorite):  $2690 \pm 2$  Ma,  $2698 \pm 2$  Ma (Mortensen 1993)
- Age U-Pb (tonalite):  $2720 +3, -1$  Ma (Mortensen 1993)
- Age U-Pb (tonalite):  $2700 \pm 1$  Ma (McNicoll et al. 2011)

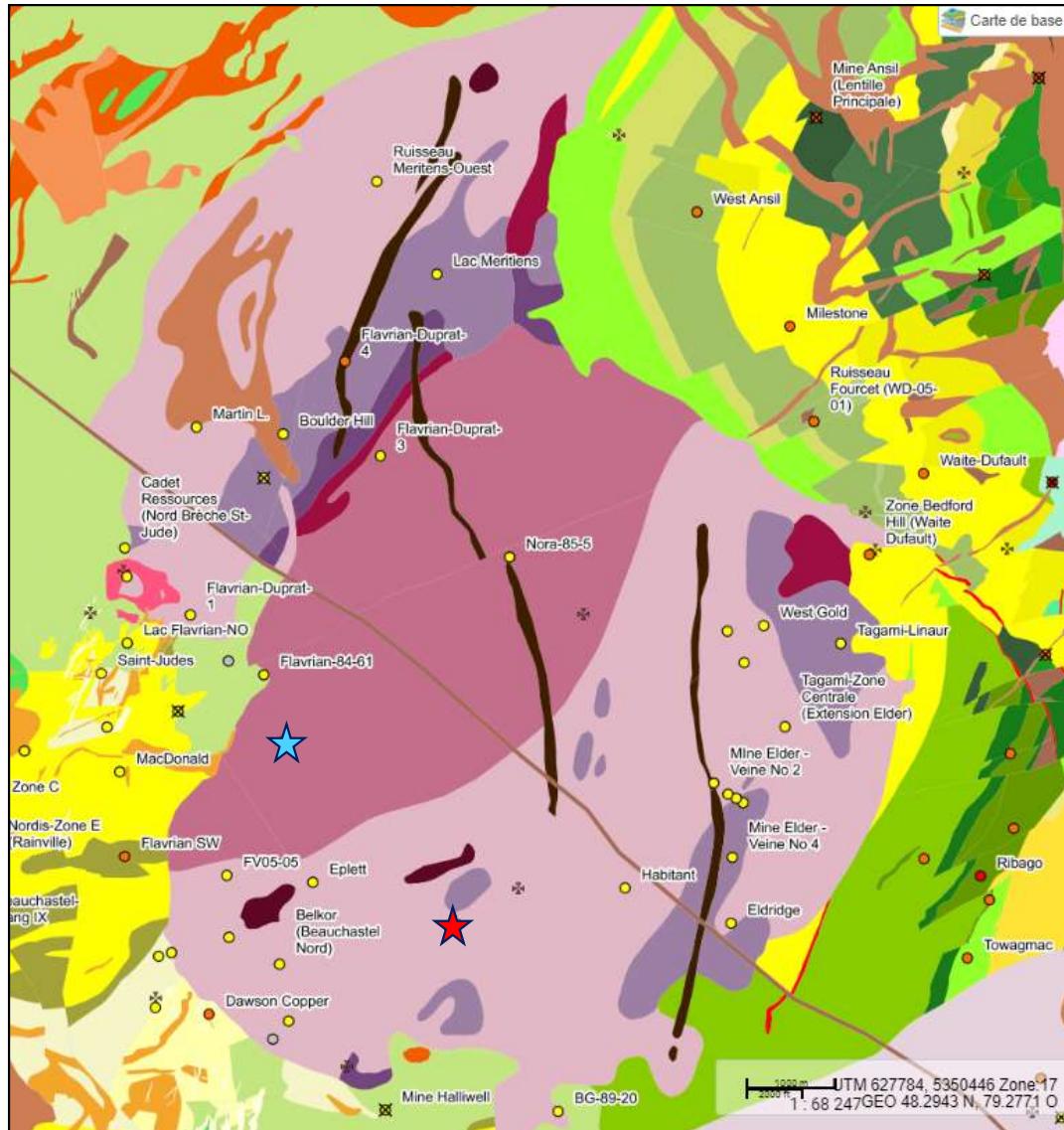


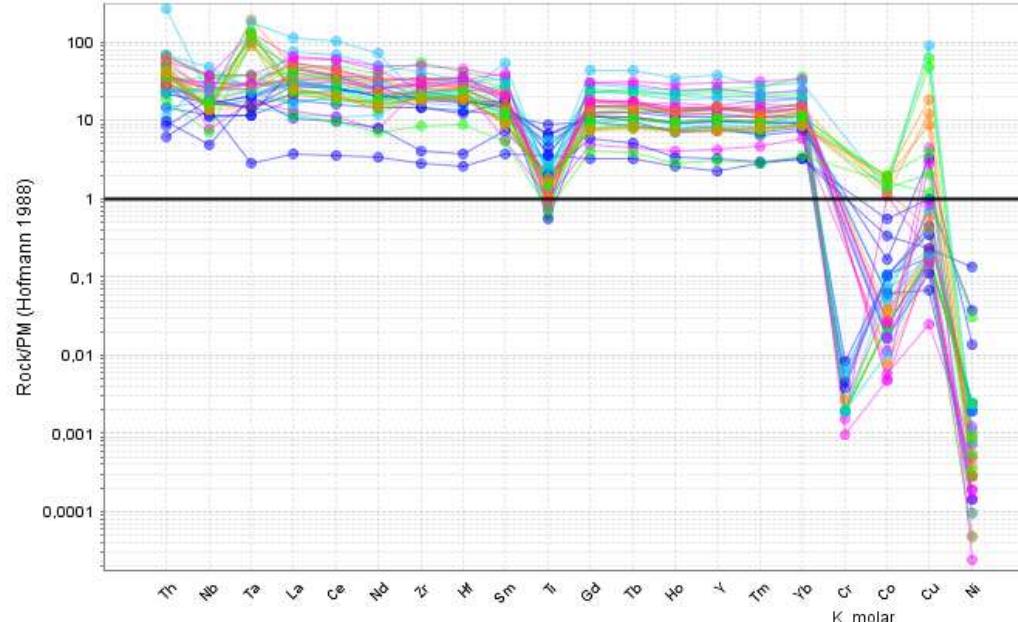
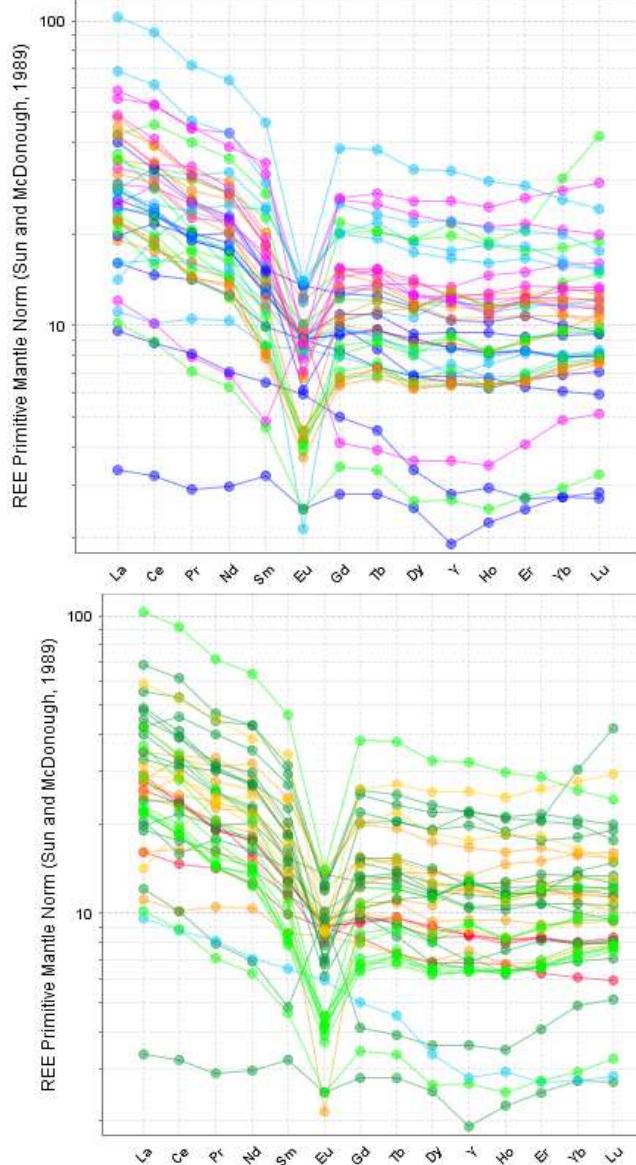
## Flavrian pluton



- Age U-Pb (trondhjemite):  $2700.7 \pm 0.6$  Ma (McNicoll et al. 2014) ★
- Age U-Pb (trondhjemite):  $2701 +3, -1$  Ma (Mortensen 1993) ★

Au showings and deposits in the Flavrian pluton mostly described as mesothermal Au.

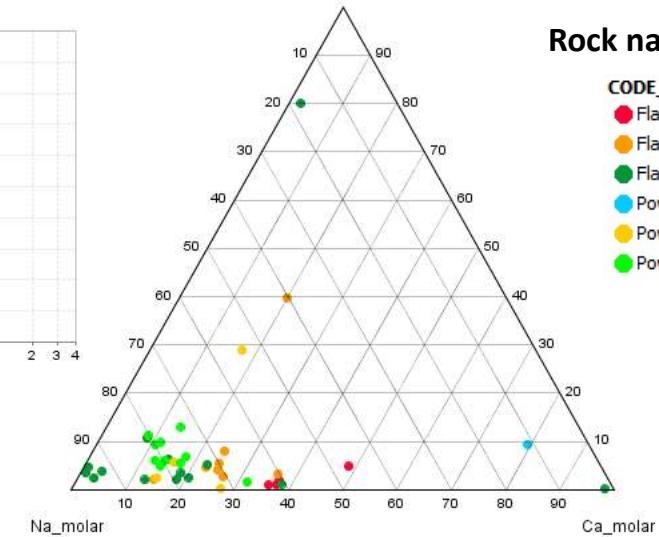
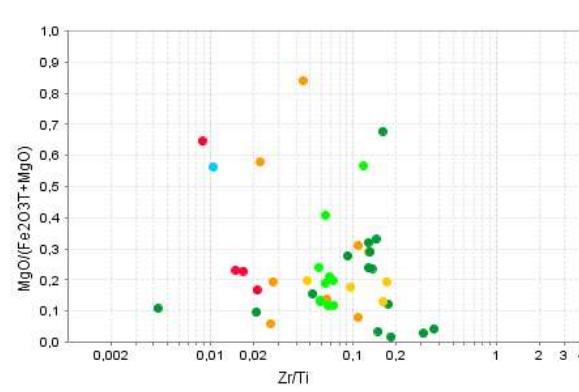




**Powell and Flavrian plutons**

**SiO<sub>2</sub>\_pct 5 Equal Ranges**

- SiO<sub>2</sub>\_pct to 64.26 [20.00%]
- SiO<sub>2</sub>\_pct to 71.36 [40.00%]
- SiO<sub>2</sub>\_pct to 74.02 [60.00%]
- SiO<sub>2</sub>\_pct to 75.95 [80.00%]
- SiO<sub>2</sub>\_pct to 78.75 [100.00%]

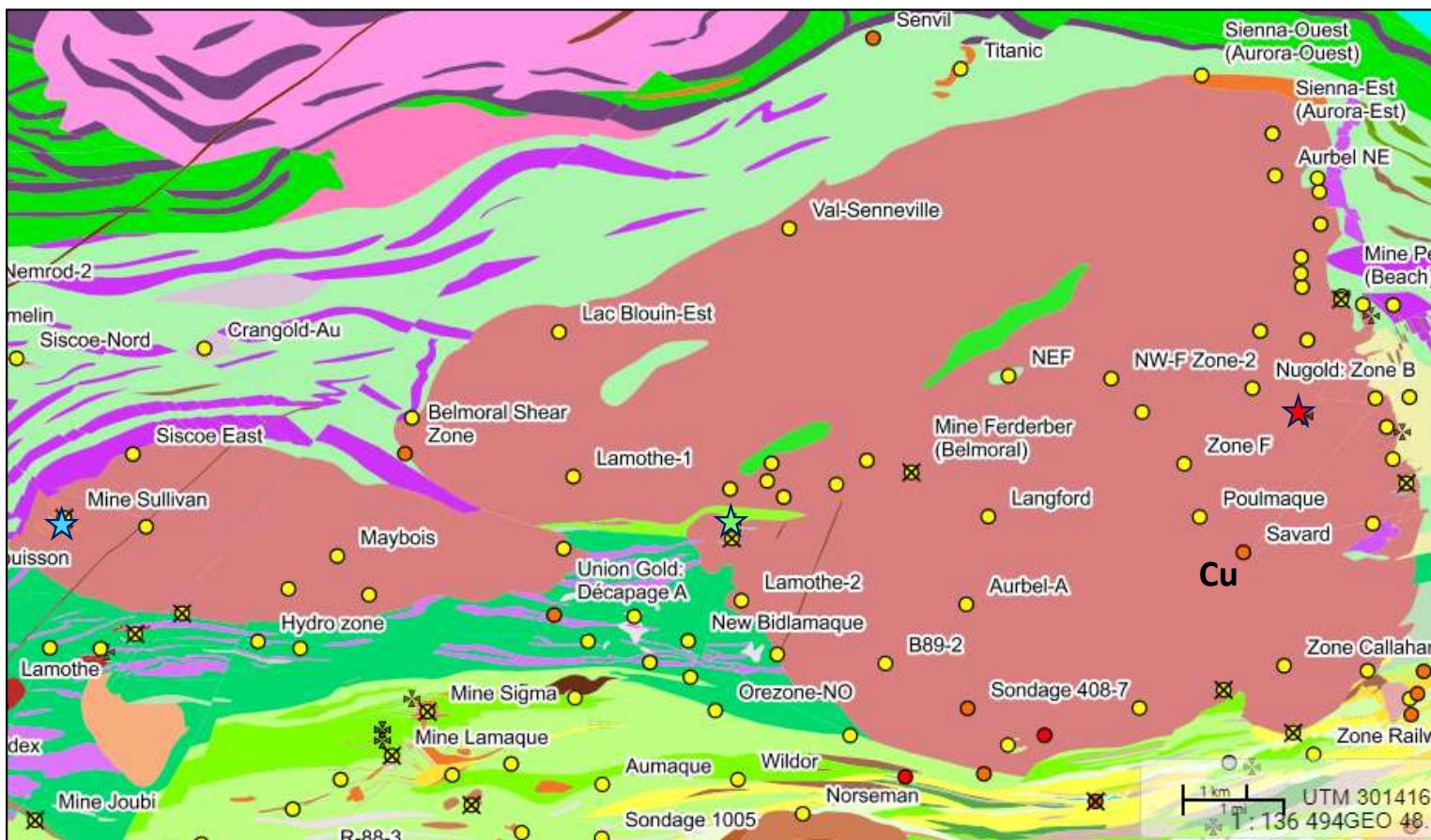


**CODE\_ROCH**

- Flavrian (diorite)
- Flavrian (tonalite)
- Flavrian (trondhjemite)
- Powell (granodiorite)
- Powell (tonalite)
- Powell (trondhjemite)

## Bourlamaque pluton

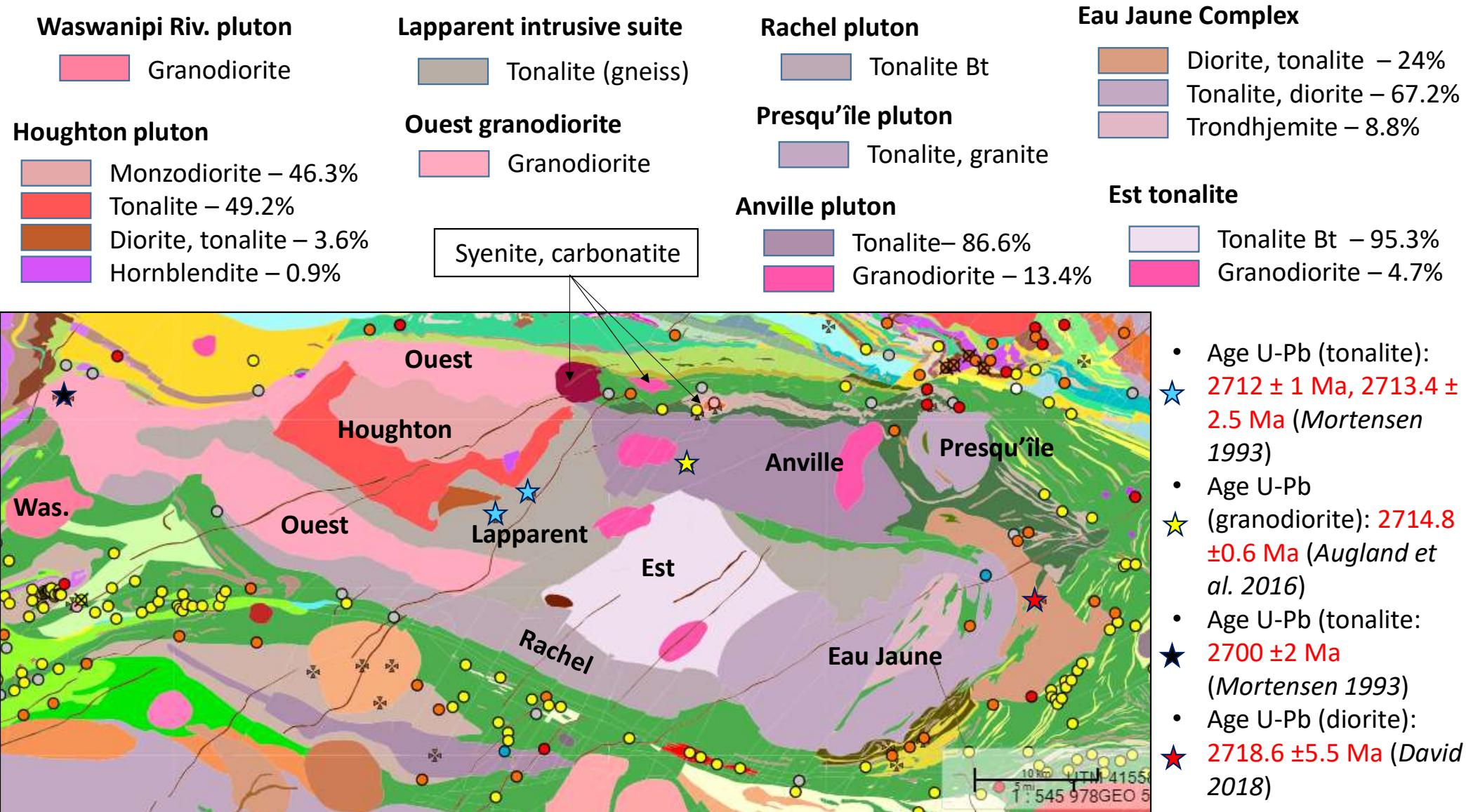
- Diorite and tonalite – 99.5%
- Diorite (Bourlamaque?) – 0.5%

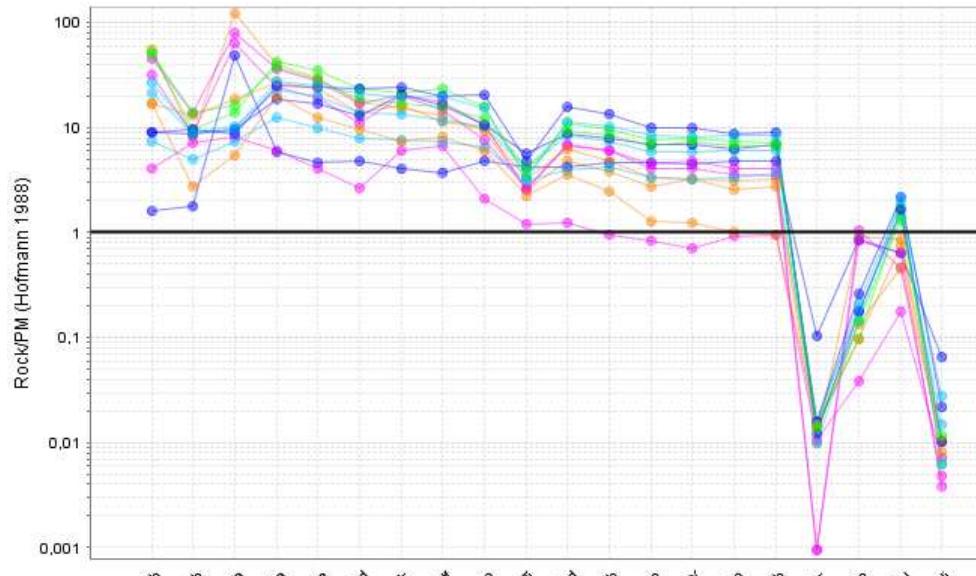
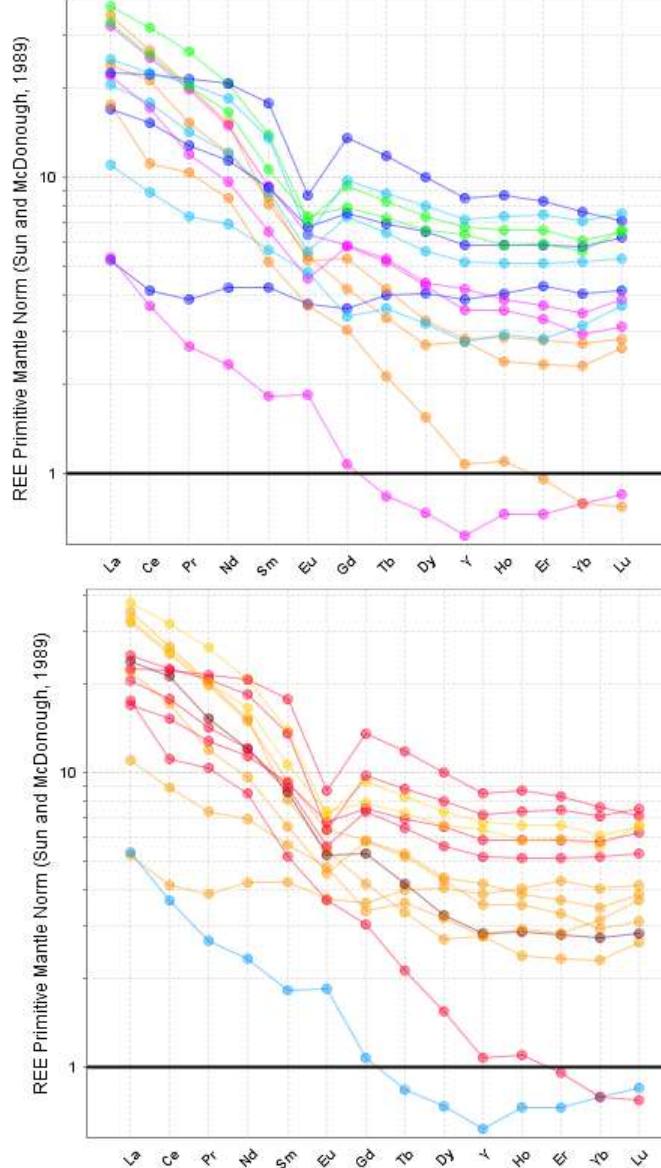


- Age U-Pb (diorite):  
★  $2704.7 \pm 0.8$  Ma (*David 2019*)
- Age U-Pb (altered ultramafic? rock):  
★  $2710 +5,-4$  Ma (*Taner and Trudel 1989*)
- Age U-Pb (altered granodiorite):  $2711 \pm 12$  Ma (*Claoué-long et al. 1990*)

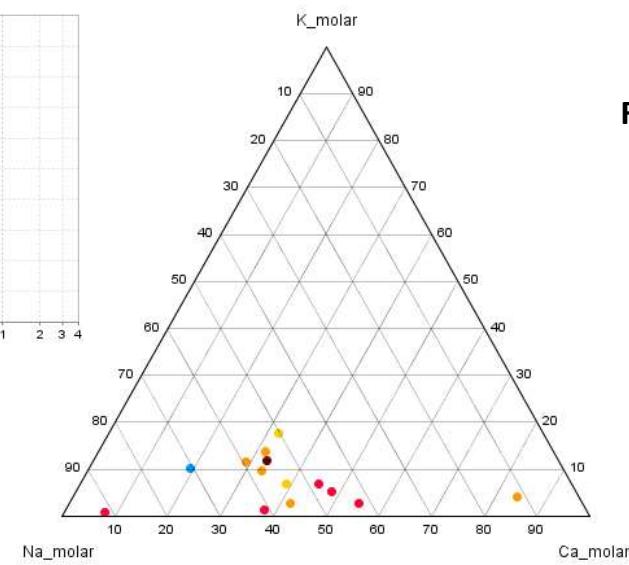
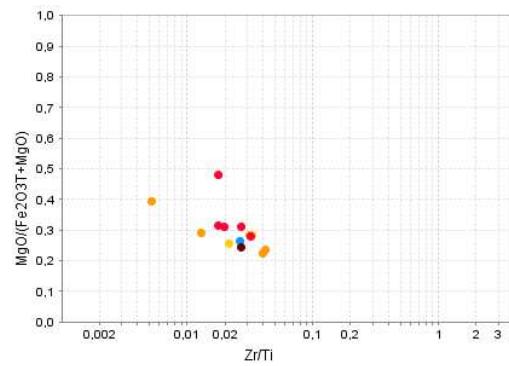
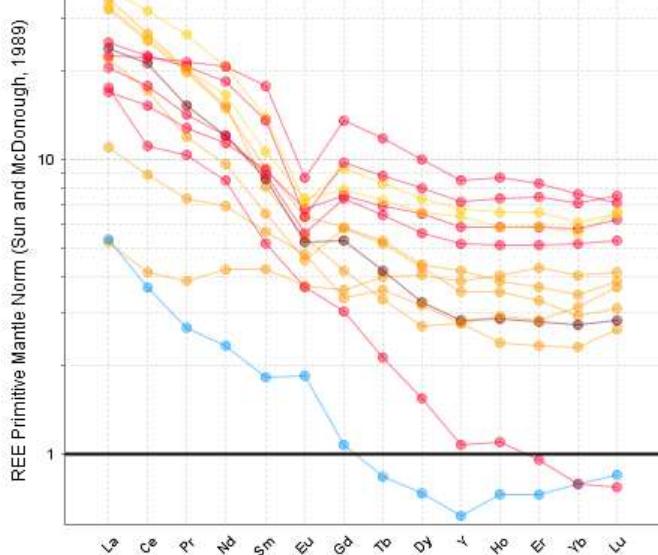
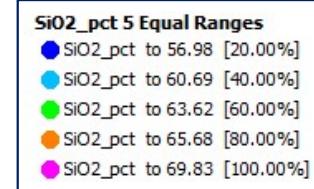
Au showings described as mesothermal Au.

**Cu** Cu showing associated with a porphyry dyke





## Bourlamaque pluton and Lapparent intrusive suite

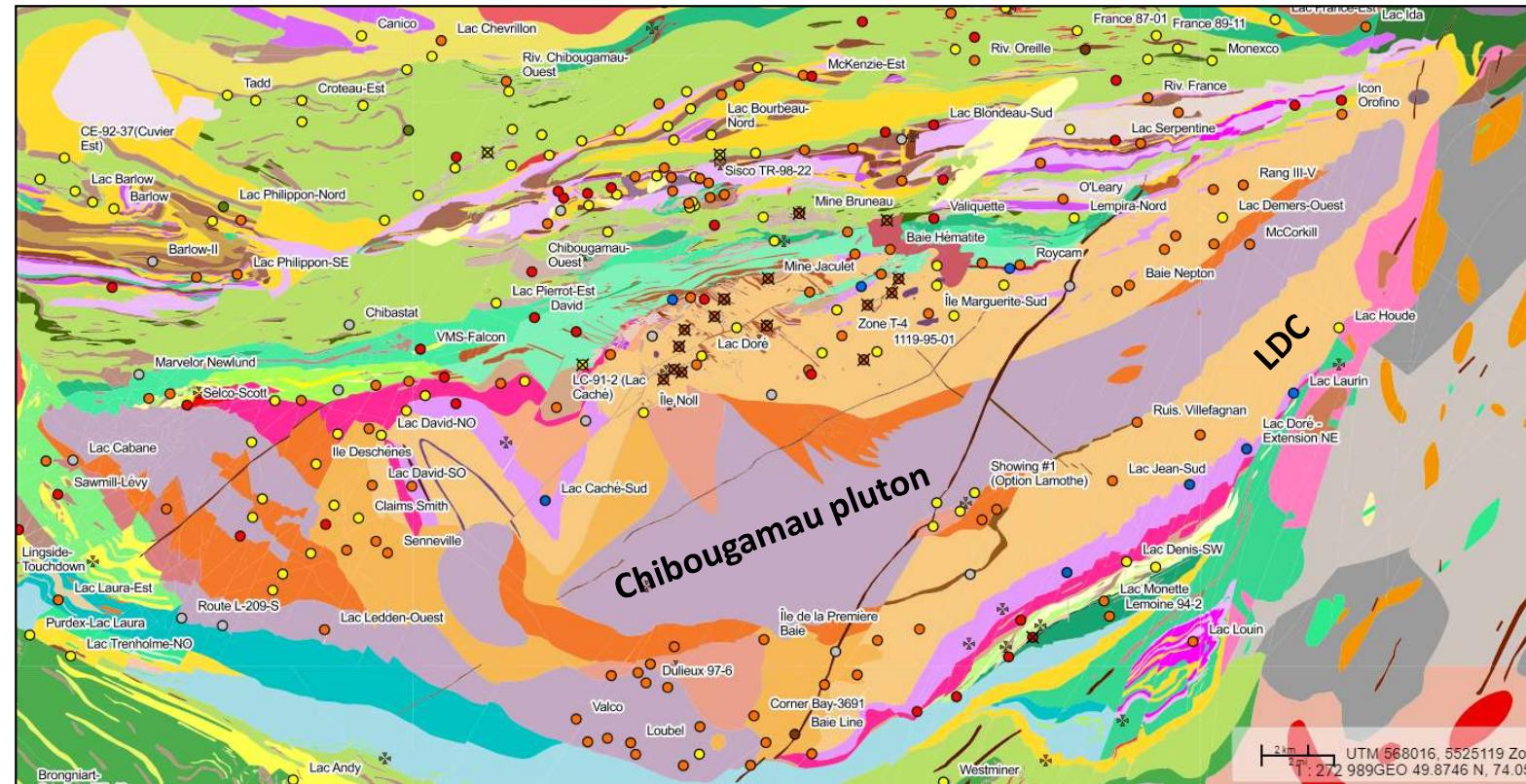


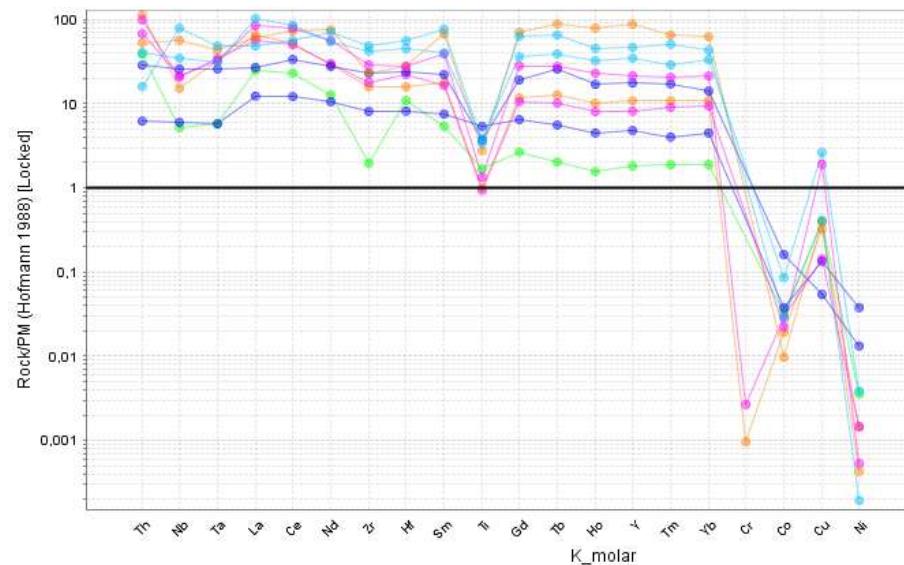
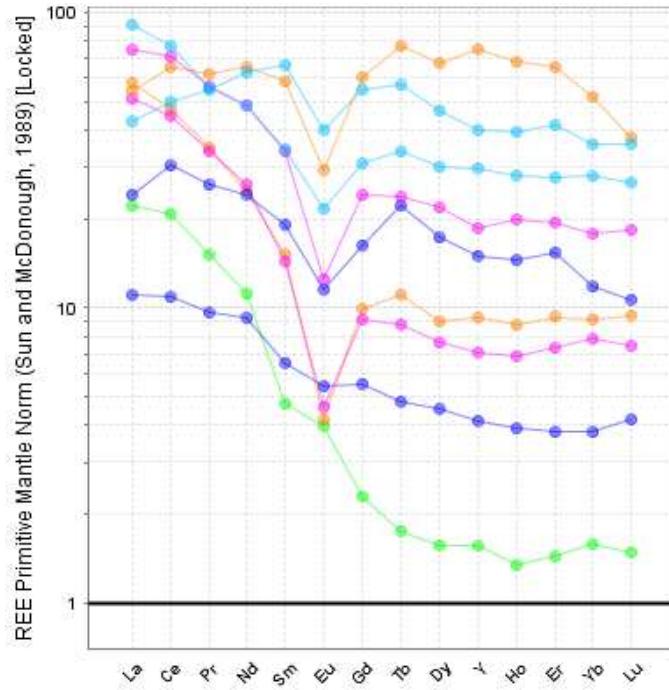
## Rock names (field)



# Sodagranophyre of Lac Doré Complex (LDC)

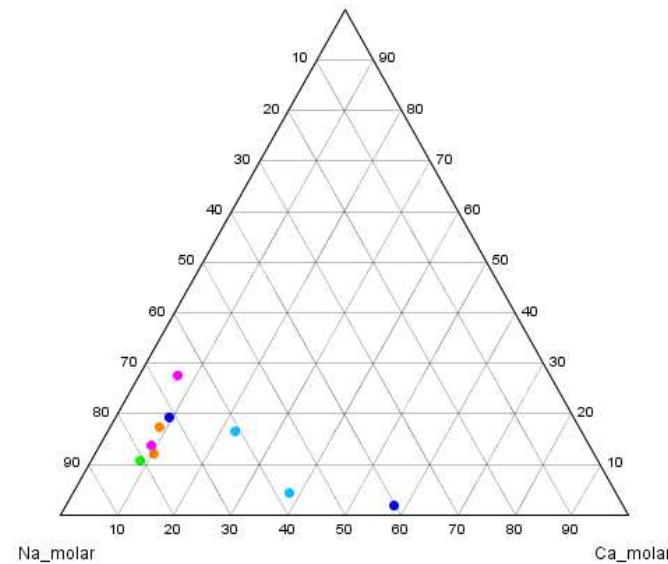
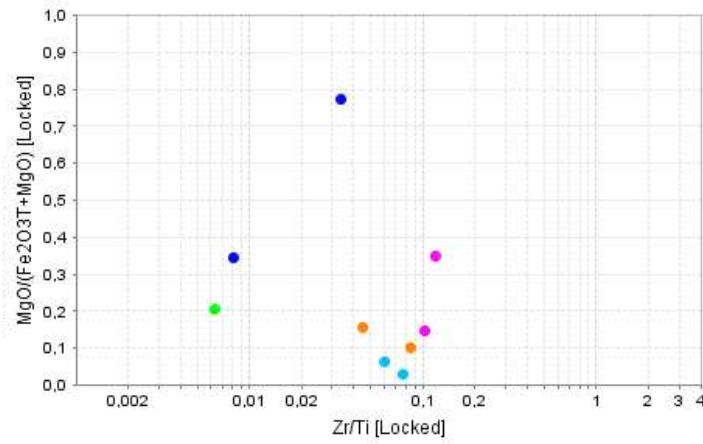
- Anorthosite – gabbro
- Magnetite-rich unit
- Tonalite
- Gabbro
- Dunite





## Sodagranophyre (tonalite) of Lac Doré Complex

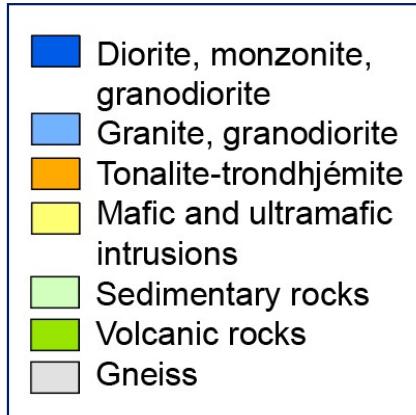
SiO <sub>2</sub> _pct 5 Equal Ranges	
●	SiO <sub>2</sub> _pct to 61.55 [20.00%]
●	SiO <sub>2</sub> _pct to 67.49 [40.00%]
●	SiO <sub>2</sub> _pct to 74.17 [60.00%]
●	SiO <sub>2</sub> _pct to 76.11 [80.00%]
●	SiO <sub>2</sub> _pct to 77.5 [100.00%]



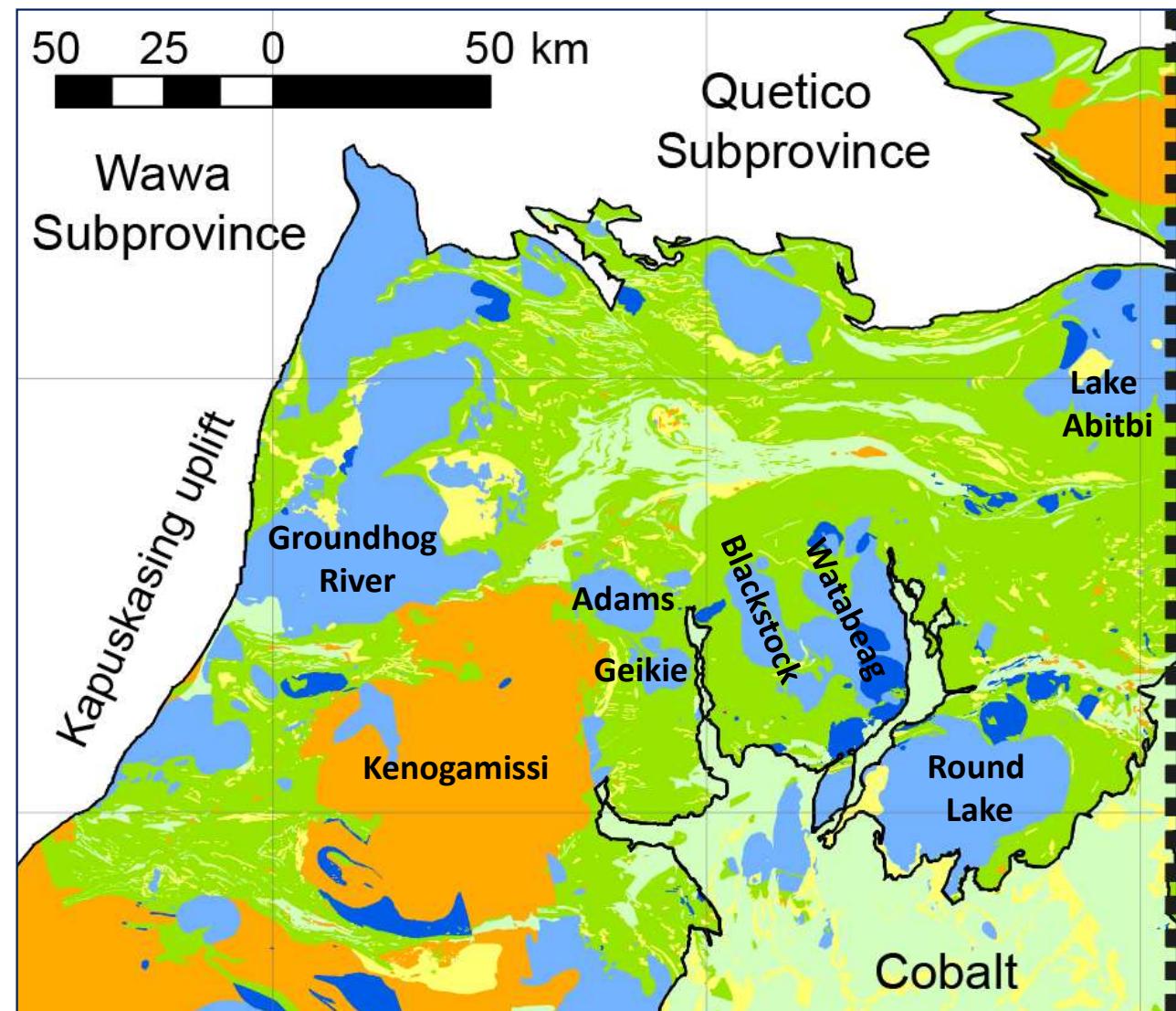
Rock names (field)

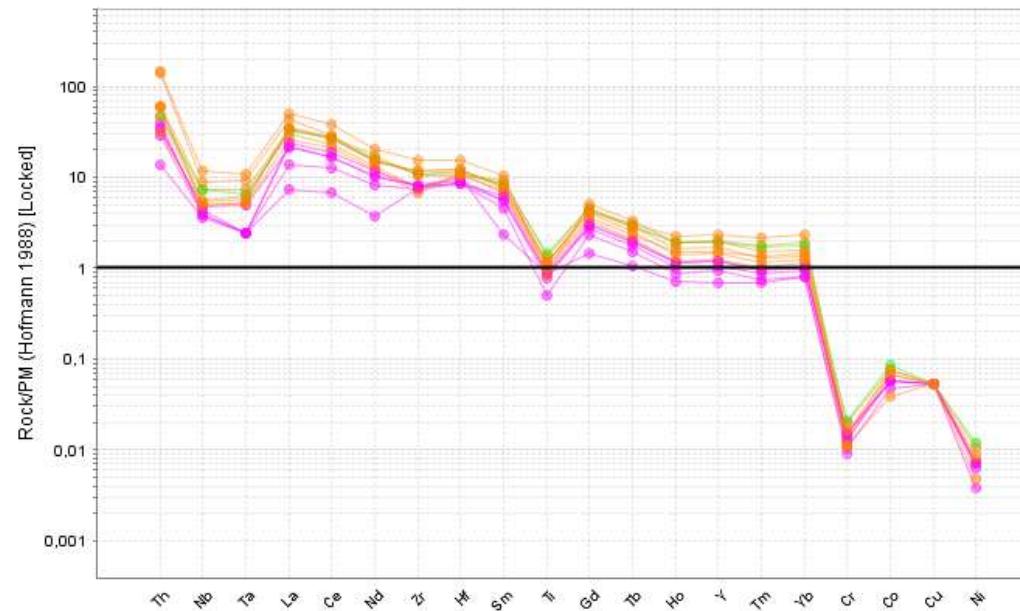
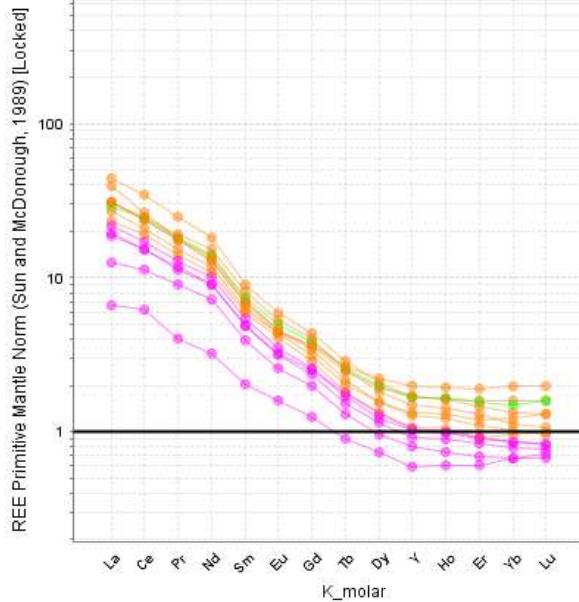
Tonalite

**Western Abitibi  
Subprovince**  
(OGS dataset)



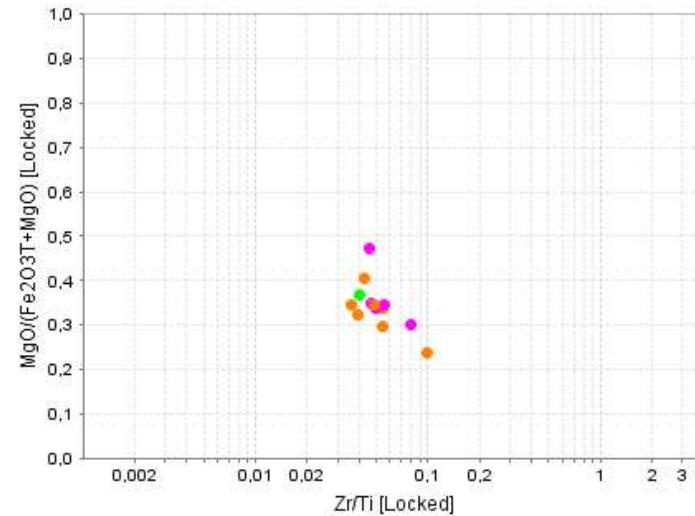
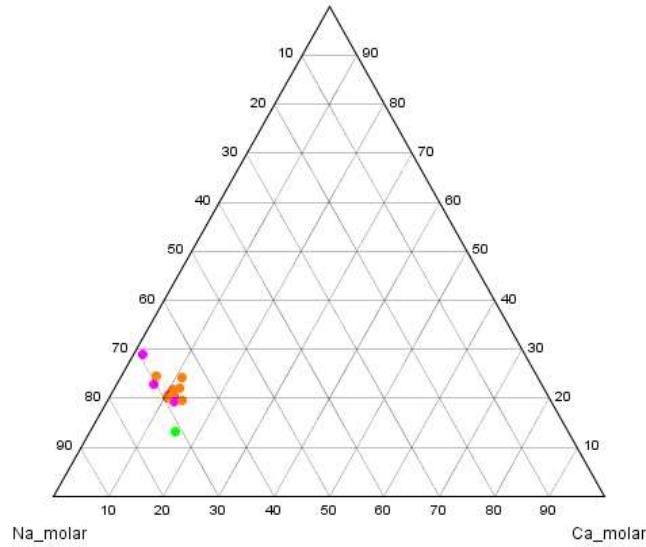
**Figure 1** (see  
manuscript for details)

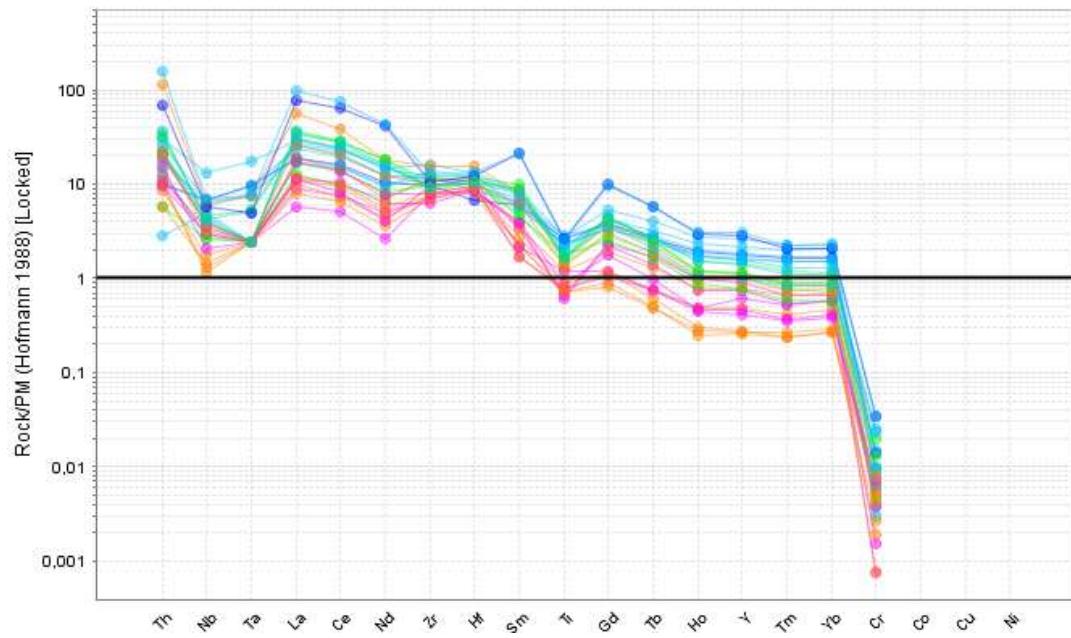
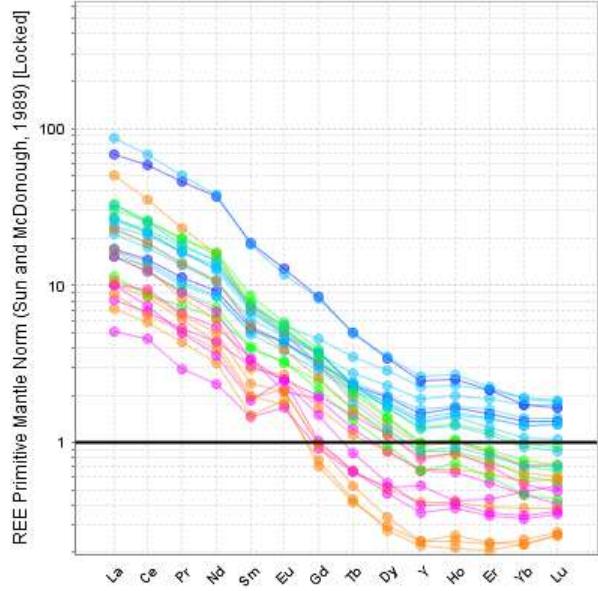




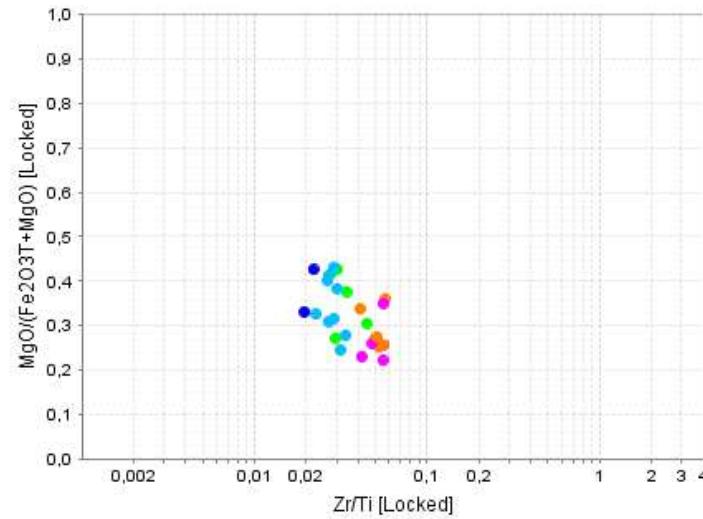
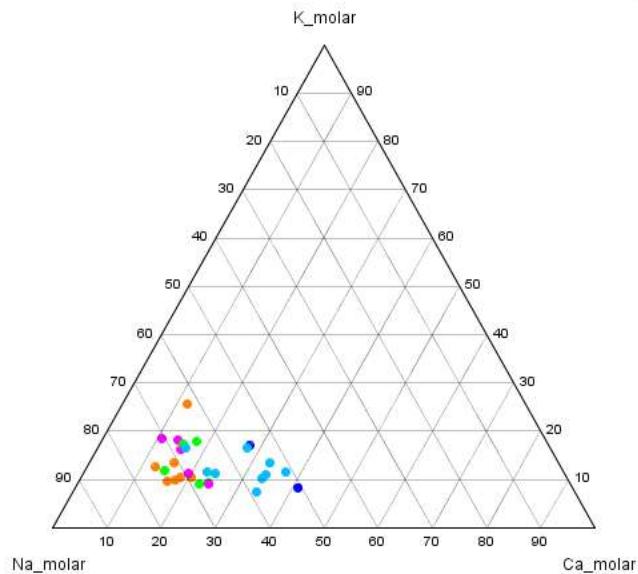
## Watabeag batholith

- SiO<sub>2</sub>\_pct 5 Equal Ranges**
- Default Colour
  - SiO<sub>2</sub>\_pct to 63.25 [20.00%]
  - SiO<sub>2</sub>\_pct to 67.5 [40.00%]
  - SiO<sub>2</sub>\_pct to 69.23 [60.00%]
  - SiO<sub>2</sub>\_pct to 70.81 [80.00%]
  - SiO<sub>2</sub>\_pct to 76.9 [100.00%]

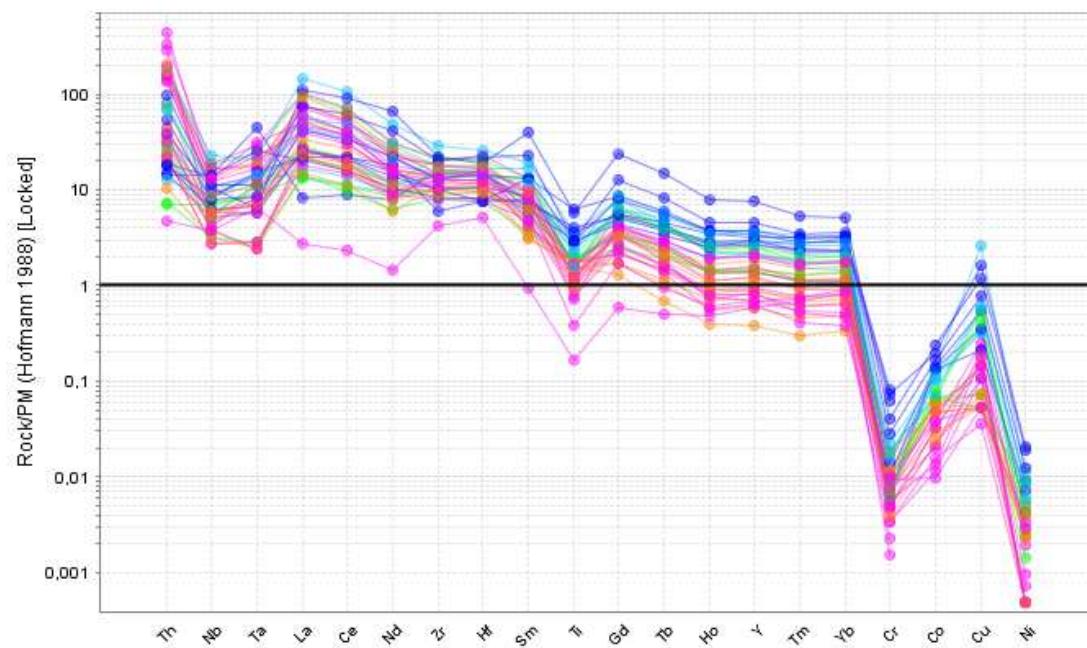
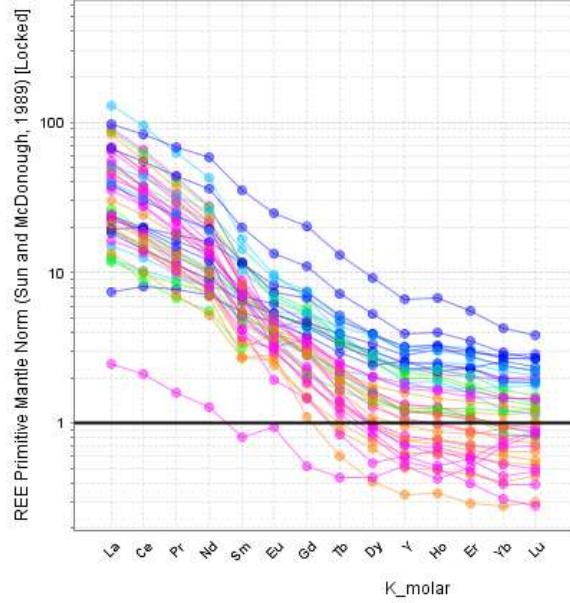




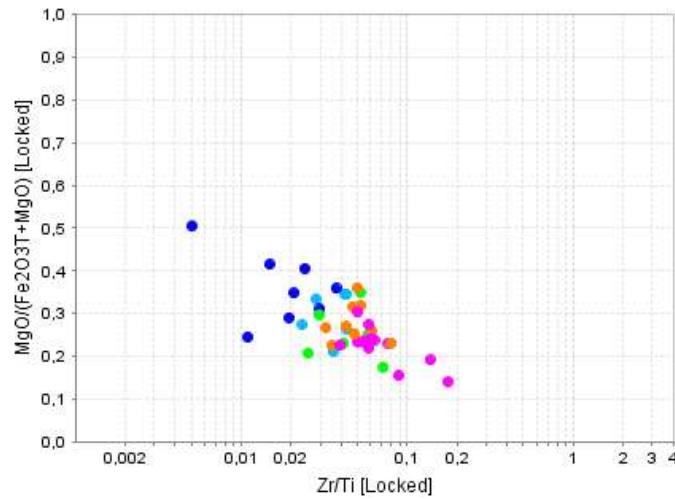
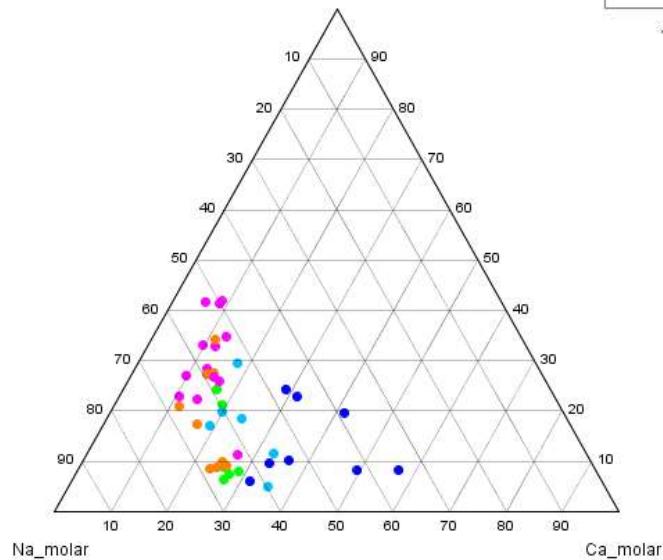
- SiO<sub>2</sub>\_pct 5 Equal Ranges**
- Default Colour
  - SiO<sub>2</sub>\_pct to 63.25 [20.00%]
  - SiO<sub>2</sub>\_pct to 67.5 [40.00%]
  - SiO<sub>2</sub>\_pct to 69.23 [60.00%]
  - SiO<sub>2</sub>\_pct to 70.81 [80.00%]
  - SiO<sub>2</sub>\_pct to 76.9 [100.00%]



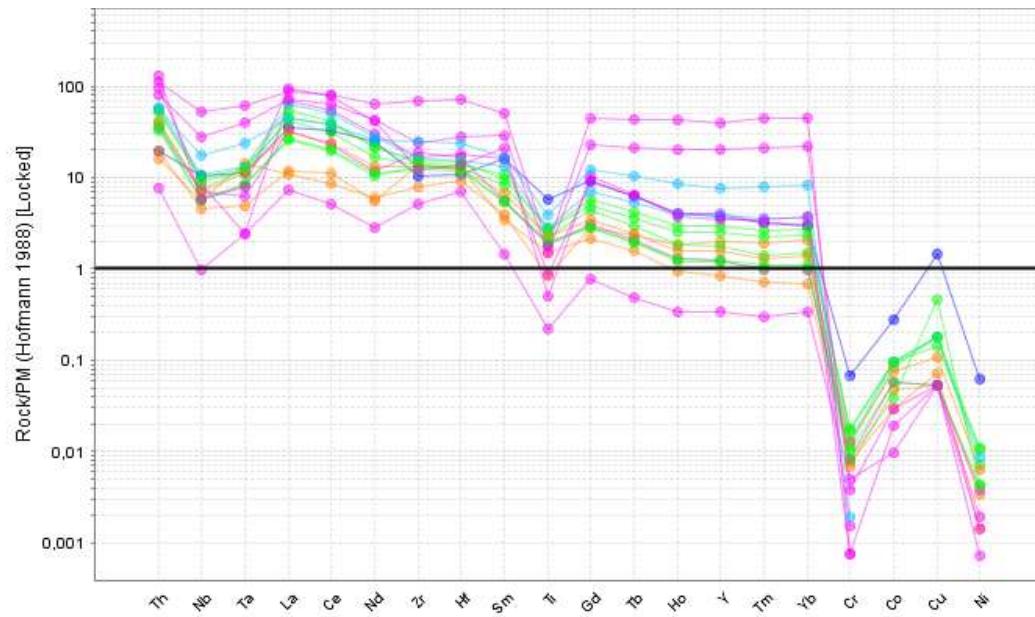
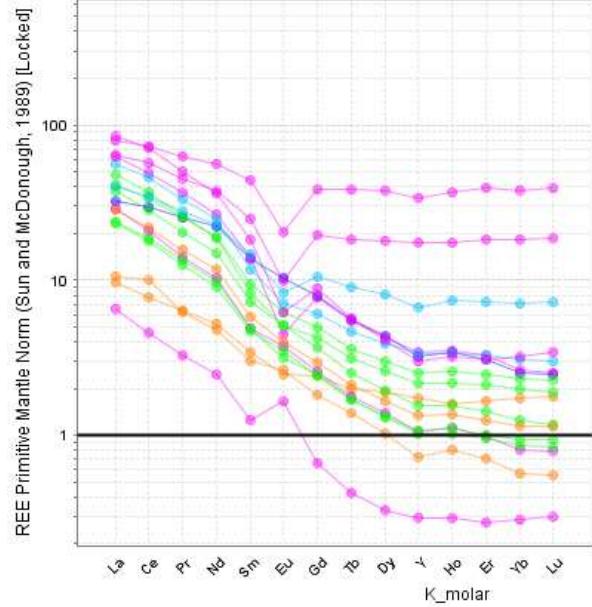
## Kenogamissi batholith



- SiO<sub>2</sub>\_pct 5 Equal Ranges**
- Default Colour
  - SiO<sub>2</sub>\_pct to 63.25 [20.00%]
  - SiO<sub>2</sub>\_pct to 67.5 [40.00%]
  - SiO<sub>2</sub>\_pct to 69.23 [60.00%]
  - SiO<sub>2</sub>\_pct to 70.81 [80.00%]
  - SiO<sub>2</sub>\_pct to 76.9 [100.00%]

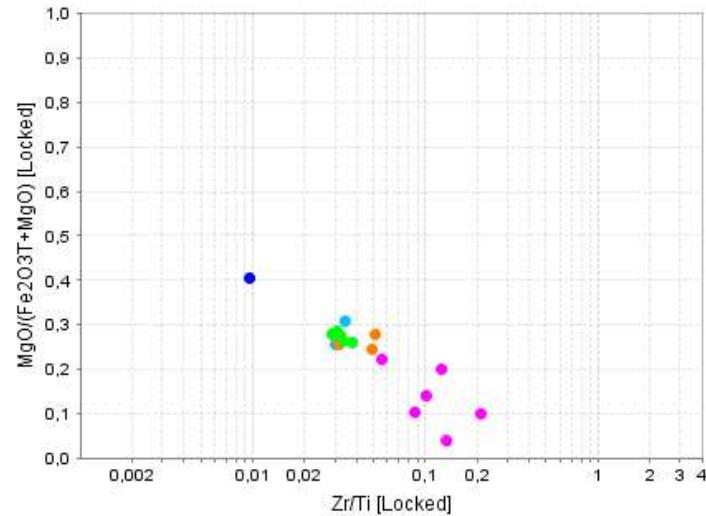
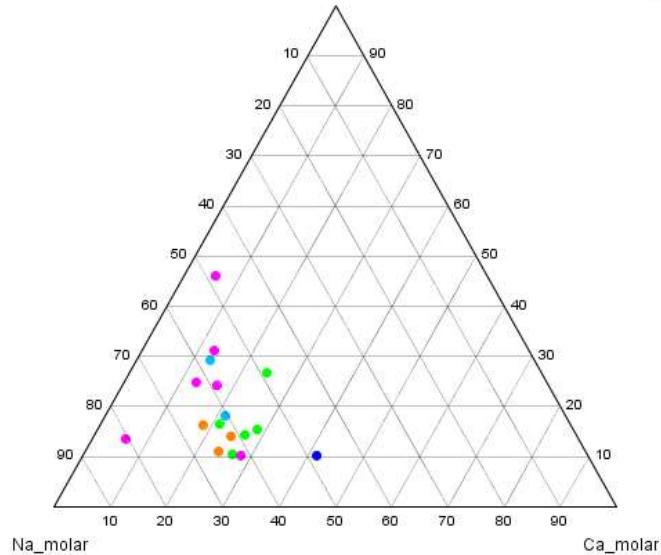


## Groundhog River batholith

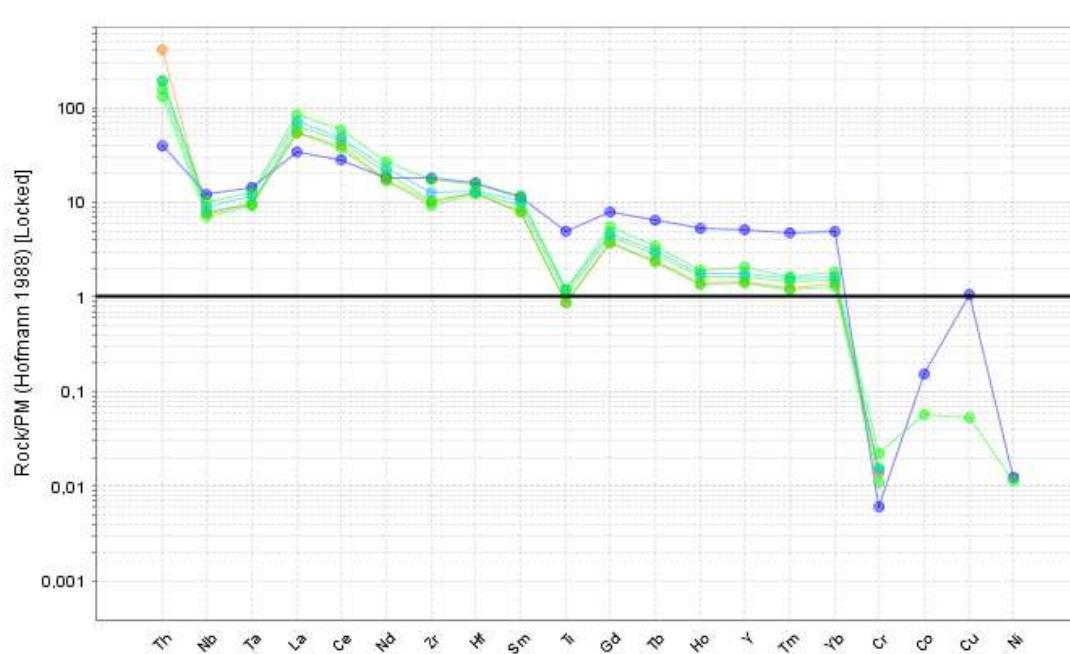
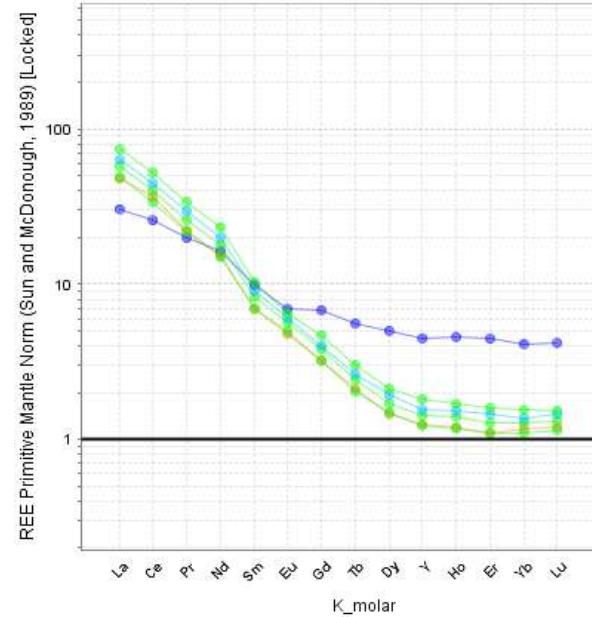


**SiO<sub>2</sub>\_pct 5 Equal Ranges**

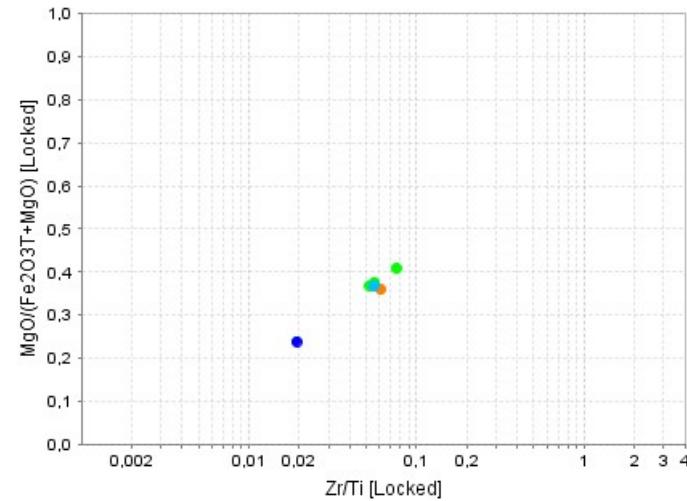
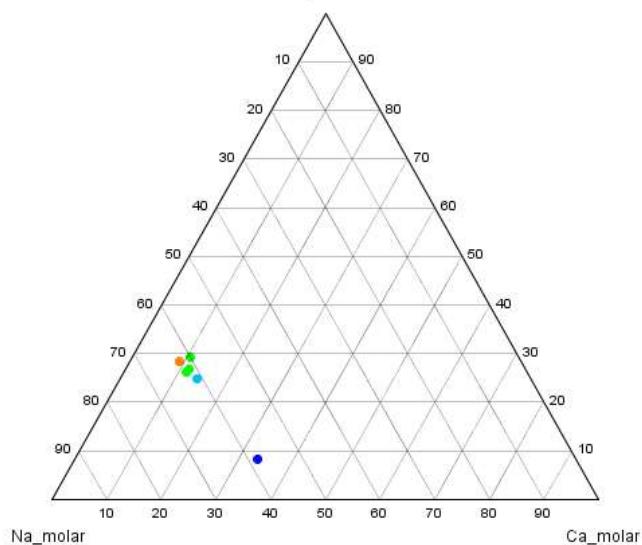
- Default Colour
- SiO<sub>2</sub>\_pct to 63.25 [20.00%]
- SiO<sub>2</sub>\_pct to 67.5 [40.00%]
- SiO<sub>2</sub>\_pct to 69.23 [60.00%]
- SiO<sub>2</sub>\_pct to 70.81 [80.00%]
- SiO<sub>2</sub>\_pct to 76.9 [100.00%]



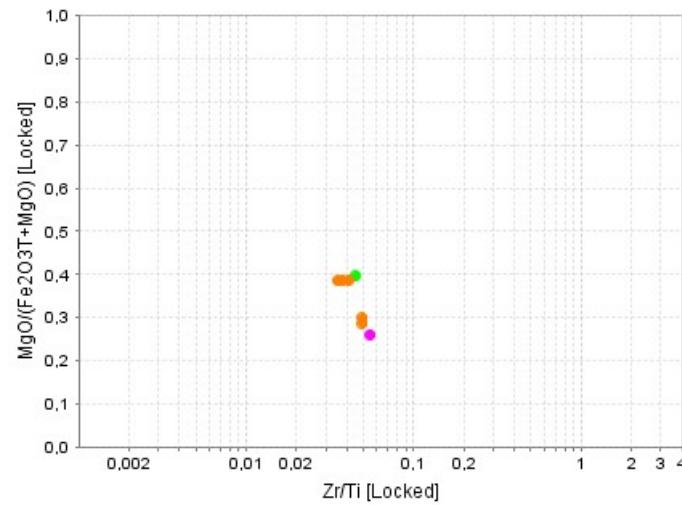
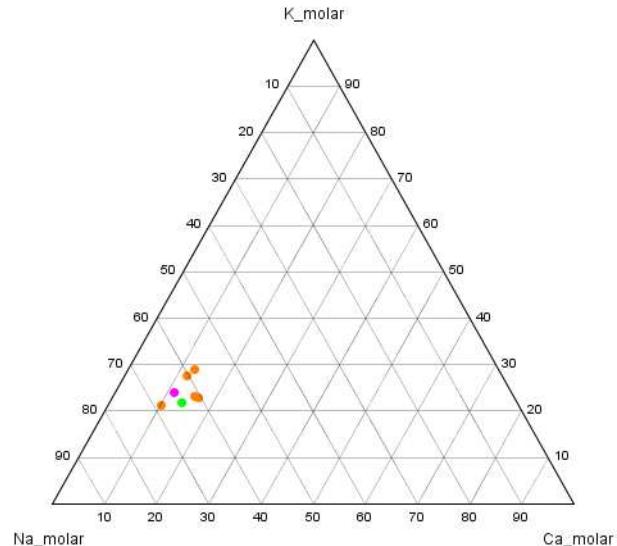
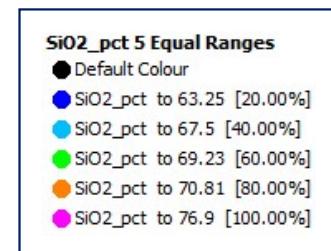
## Geikie pluto

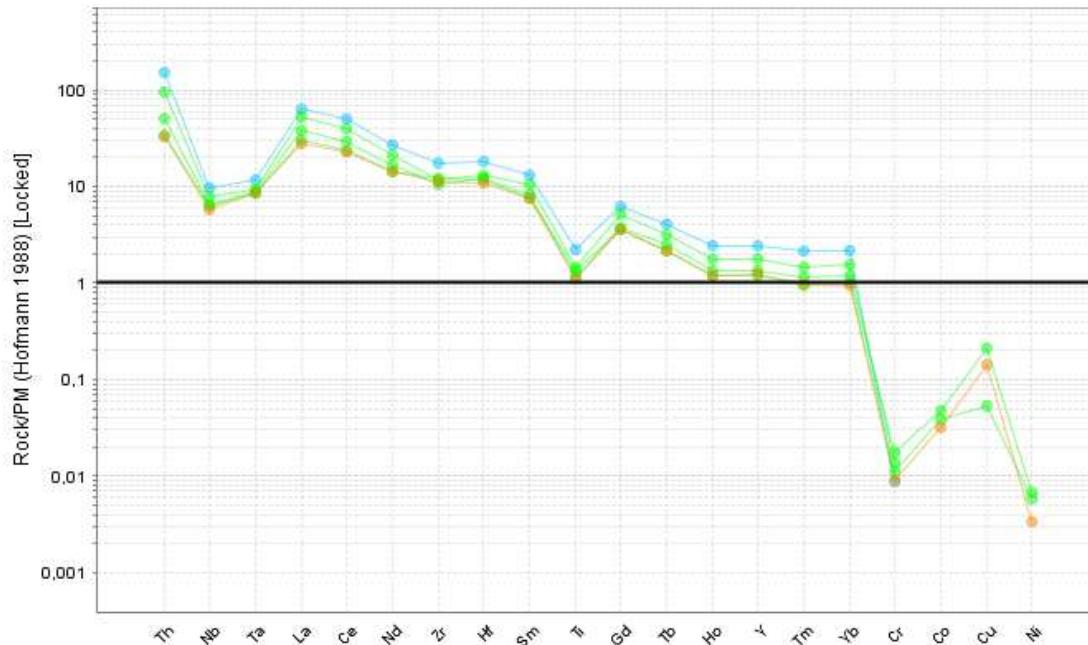
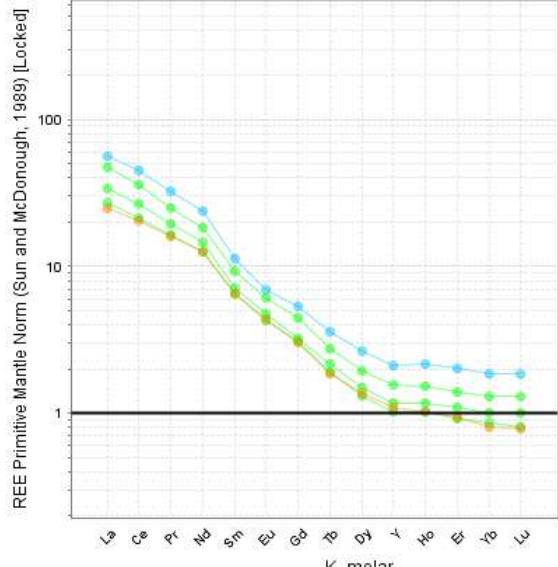


- SiO<sub>2</sub>\_pct 5 Equal Ranges**
- Default Colour
  - SiO<sub>2</sub>\_pct to 63.25 [20.00%]
  - SiO<sub>2</sub>\_pct to 67.5 [40.00%]
  - SiO<sub>2</sub>\_pct to 69.23 [60.00%]
  - SiO<sub>2</sub>\_pct to 70.81 [80.00%]
  - SiO<sub>2</sub>\_pct to 76.9 [100.00%]



## Blackstock pluton





Adams  
pluton

- SiO<sub>2</sub>\_pct 5 Equal Ranges**
- Default Colour
  - SiO<sub>2</sub>\_pct to 63.25 [20.00%]
  - SiO<sub>2</sub>\_pct to 67.5 [40.00%]
  - SiO<sub>2</sub>\_pct to 69.23 [60.00%]
  - SiO<sub>2</sub>\_pct to 70.81 [80.00%]
  - SiO<sub>2</sub>\_pct to 76.9 [100.00%]

