The No Name Pluton

A Potential Rare-Earth Element (REE) Resource in the Ruby Batholith

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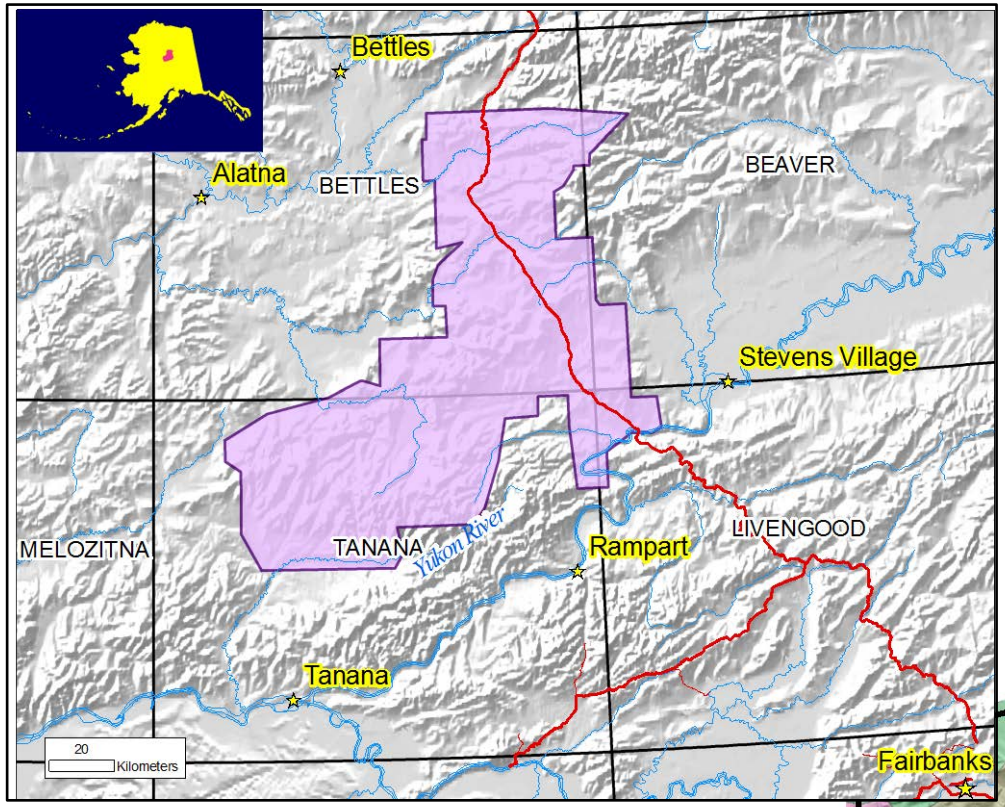
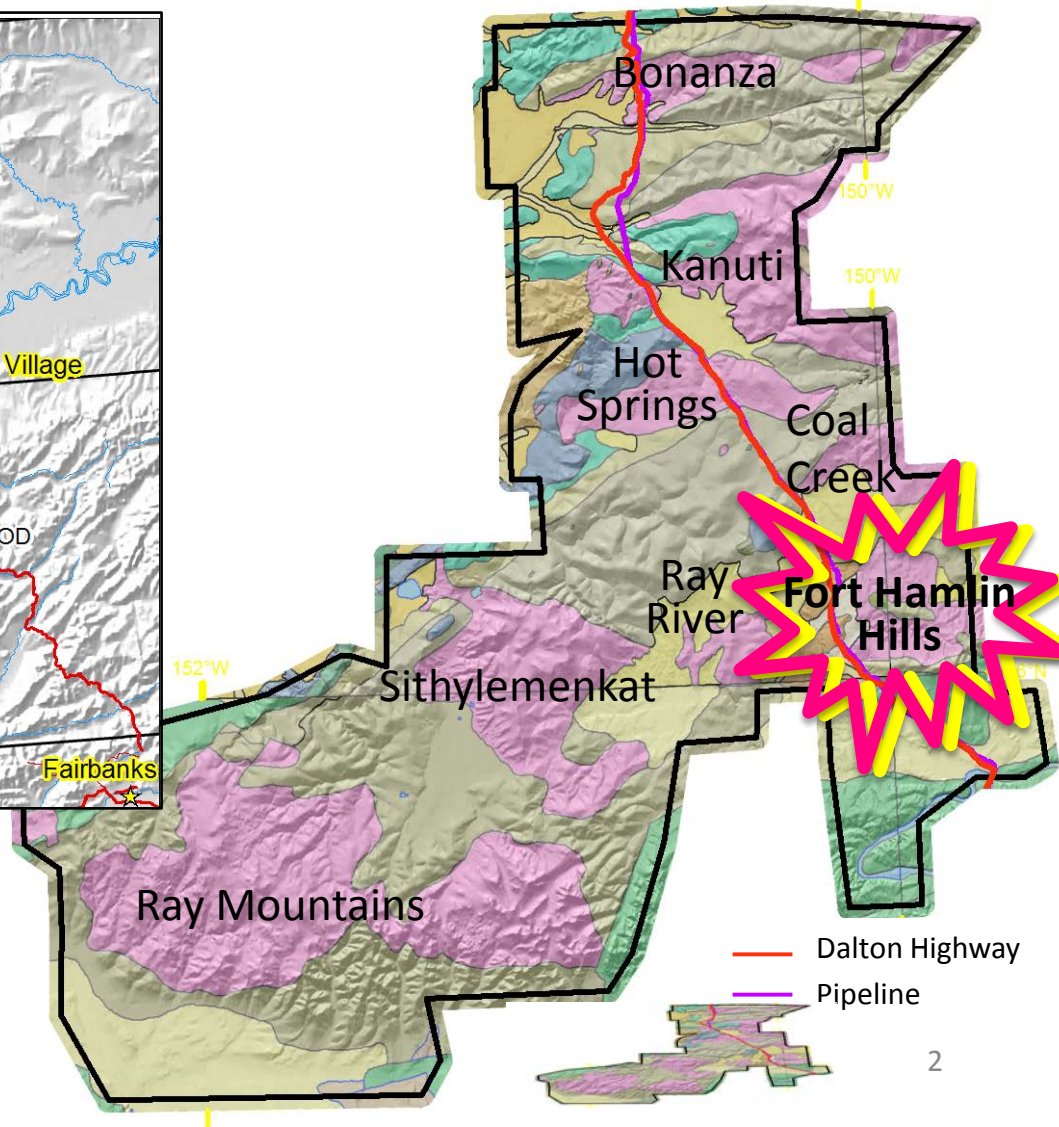
Ruby Batholith: An REE Resource



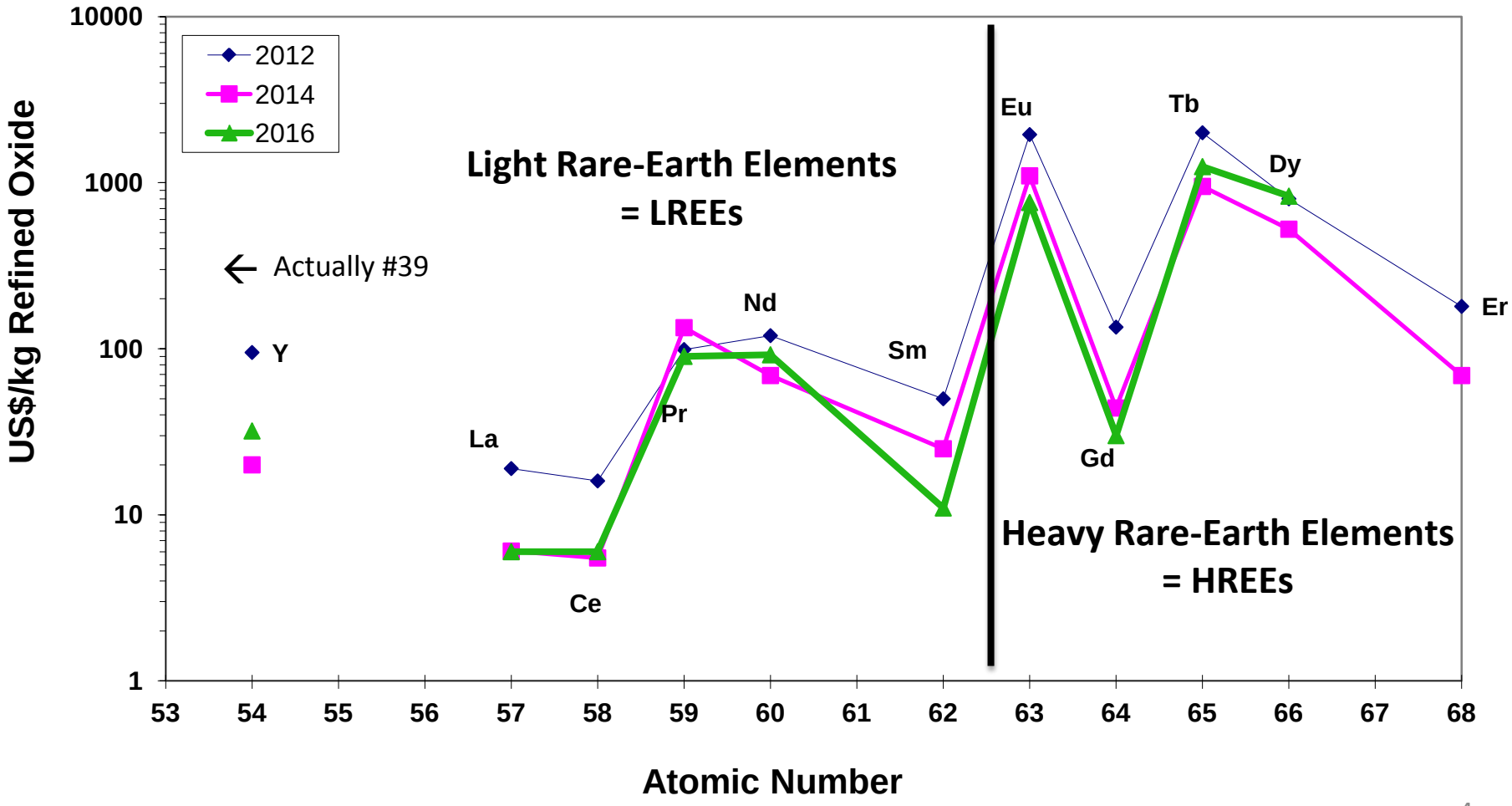


Maps Adapted from Labay et. al, 2006; Freeman et. al, 2012

A Batholith: Divided

1. Gravels in South better than North
2. SE gravels = the best
3. Variations due to plutons

REE Prices: HREEs More Valuable



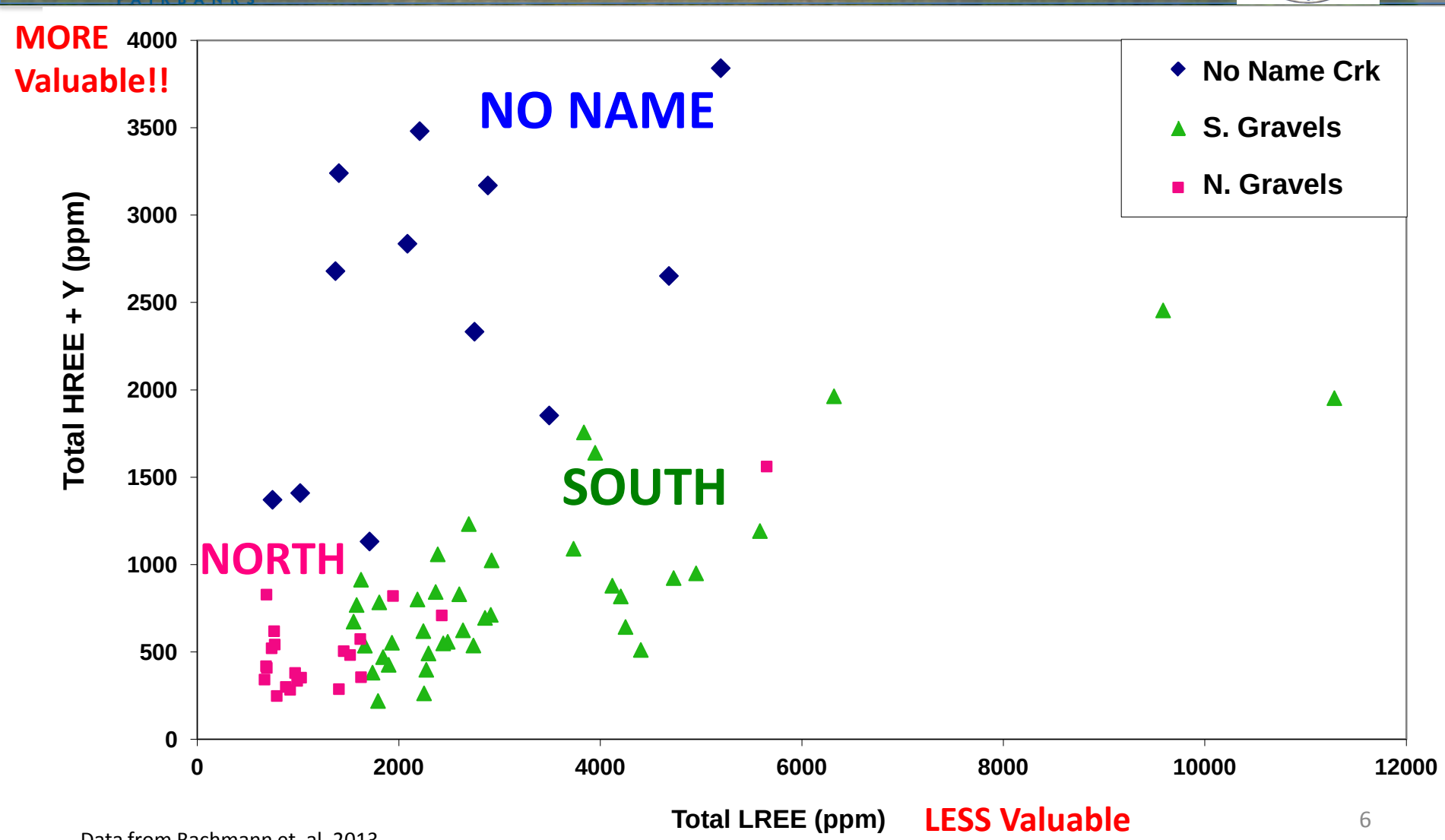
www.mineralprices.com

REE-Enriched Panned Concentrates

- Larger symbol = Higher tREE conc.
  ➔ More REEs in South
- LREEs/HREEs
- Lowest ratios in RED
- Highest HREE

Data from Bachmann et. al, 2013

Variable REE Concentrations Within Gravels

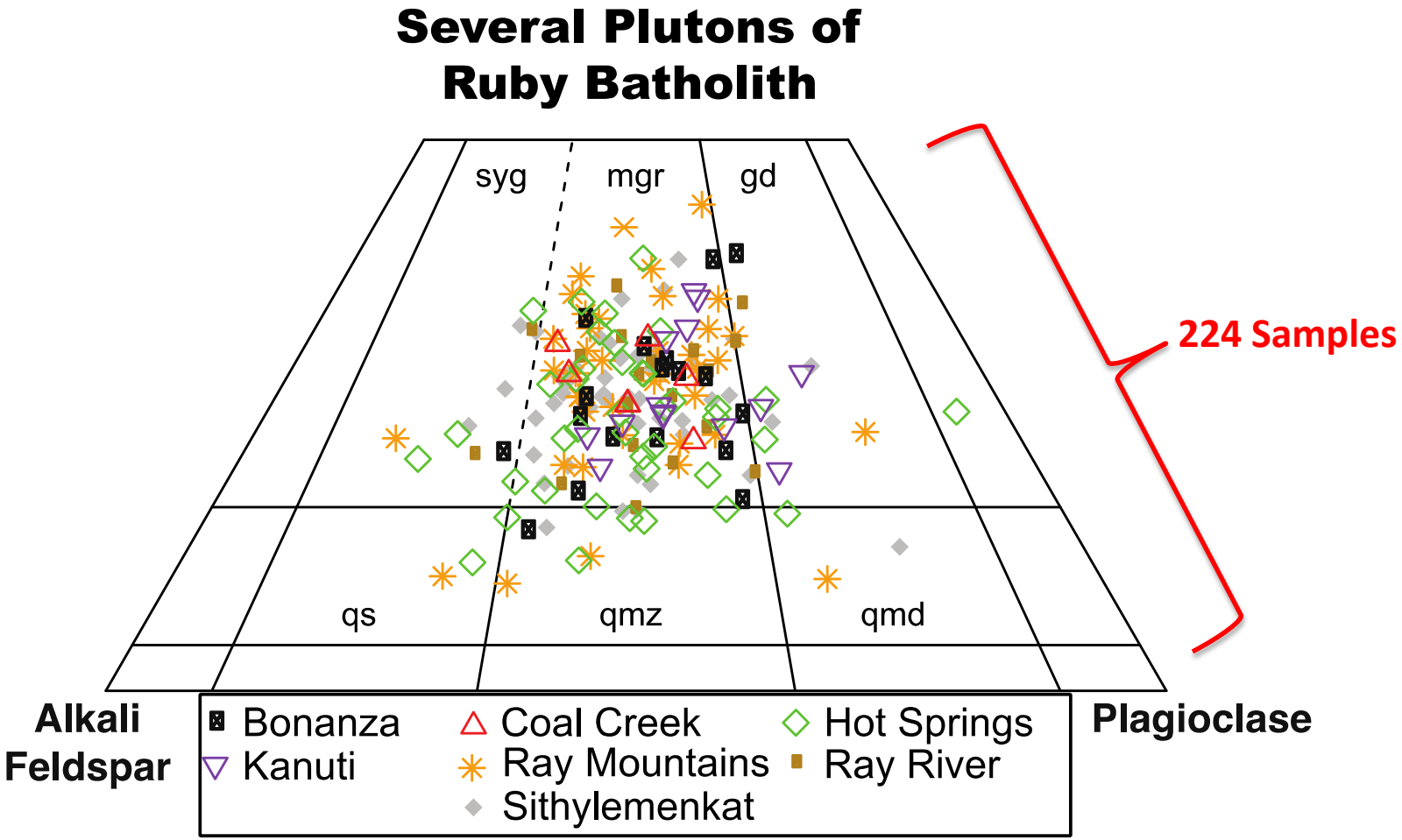


Data from Bachmann et. al, 2013

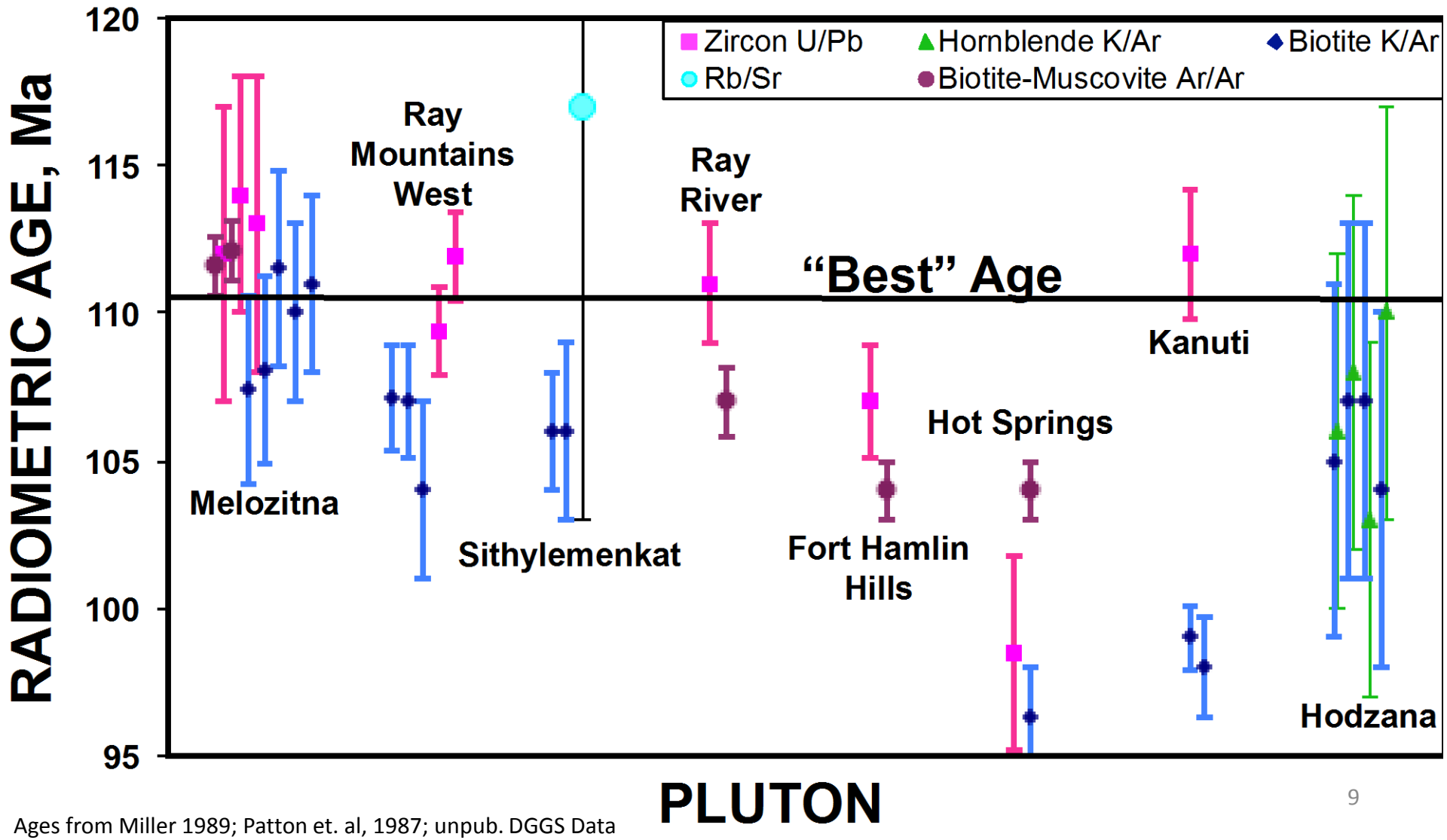
Why the Variation?

- Why N vs. S?
- Why is No Name Creek different?

Ruby Batholith: Mostly Monzogranite

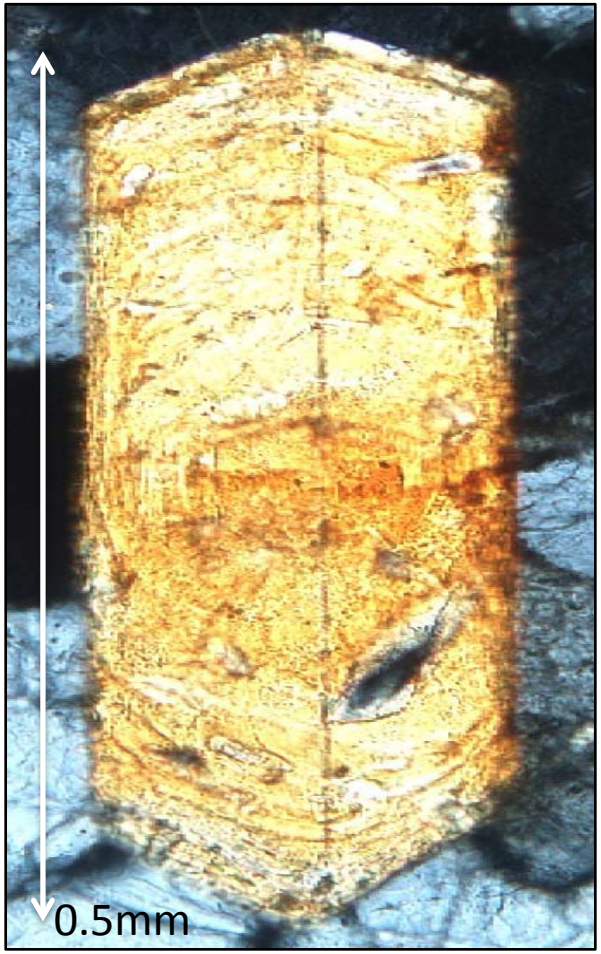


Ruby Batholith: ≈ 110 Ma



Ages from Miller 1989; Patton et. al, 1987; unpub. DGGS Data

North: High-Ca Minerals



Allanite

- Allanite ~ REE epidote

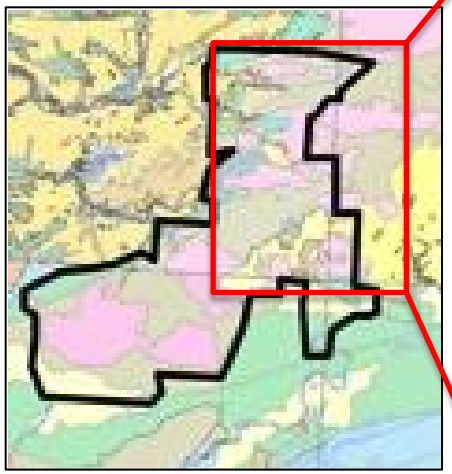
  ρ = 3.4

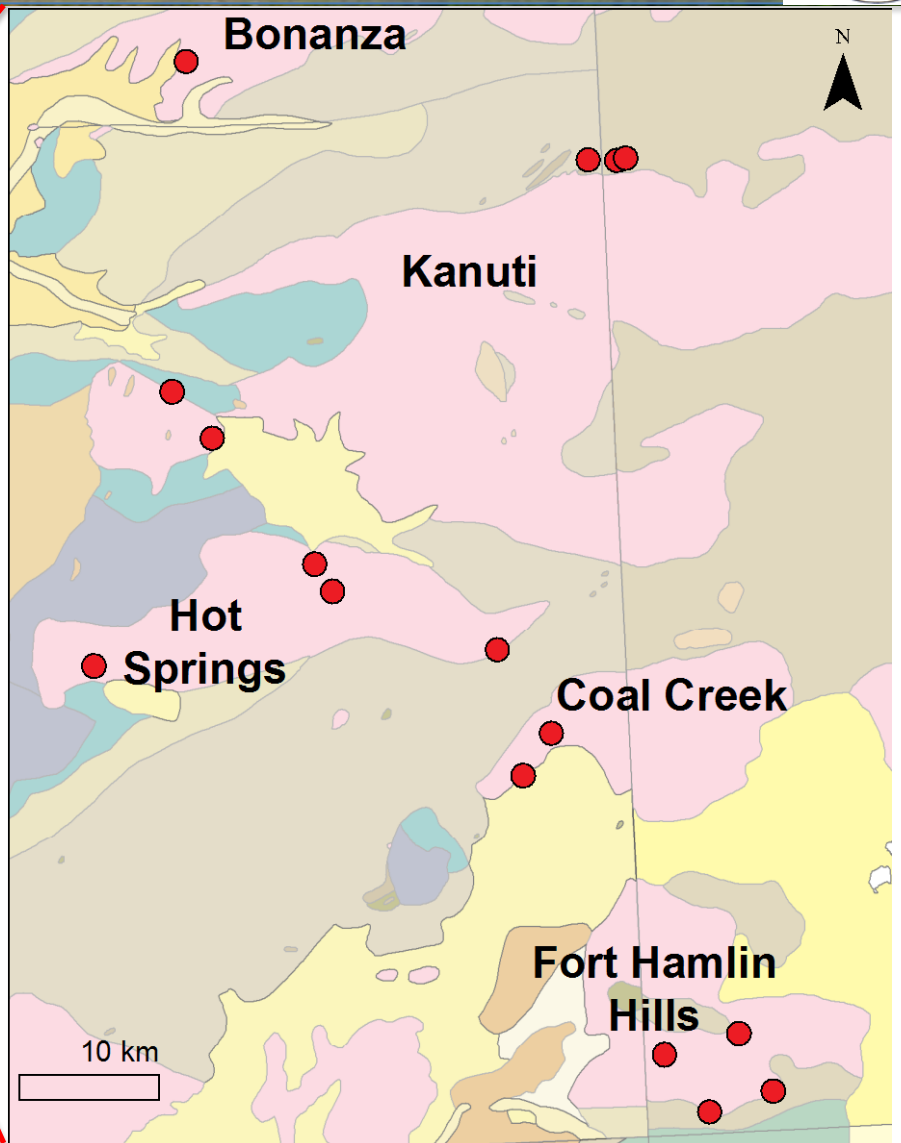
  $((Ca,REE)Al,Fe)_3(SiO4)_3(OH)$
- Sphene

  $CaTiSiO_5$
- Hornblende
- Monazite
- Magnetite

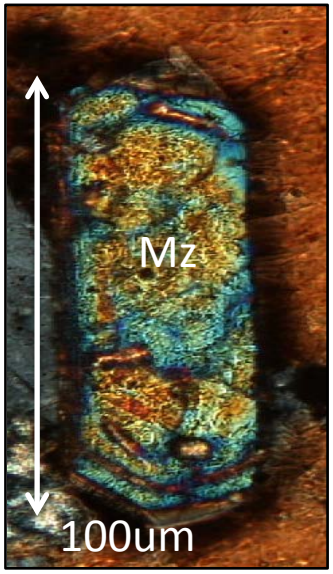
Sphene (top) & Hornblende (bottom)

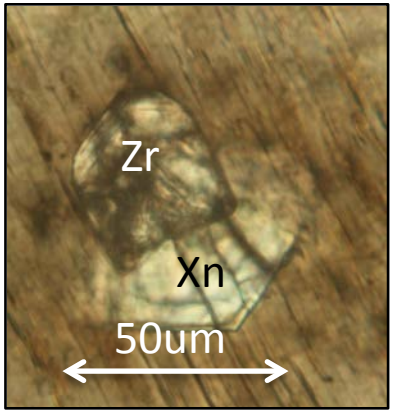
Characteristic Thin Section Locations For Northern Group





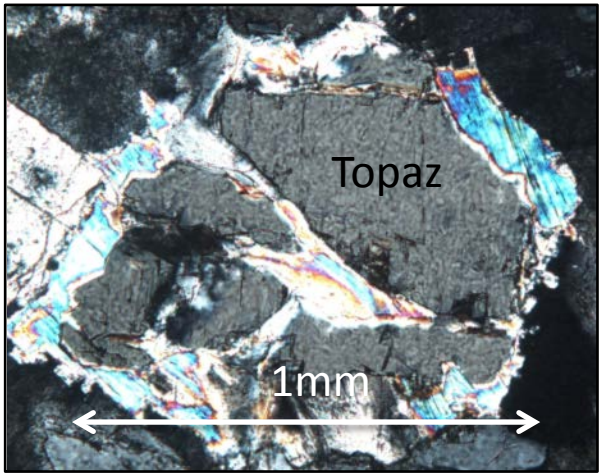
South: Phosphates & Fluorine

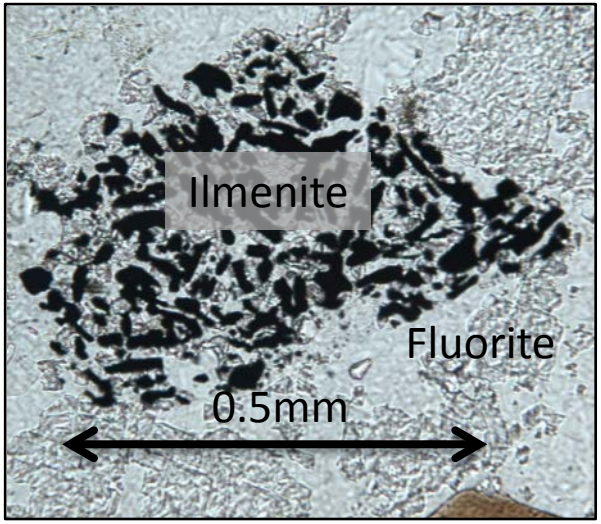




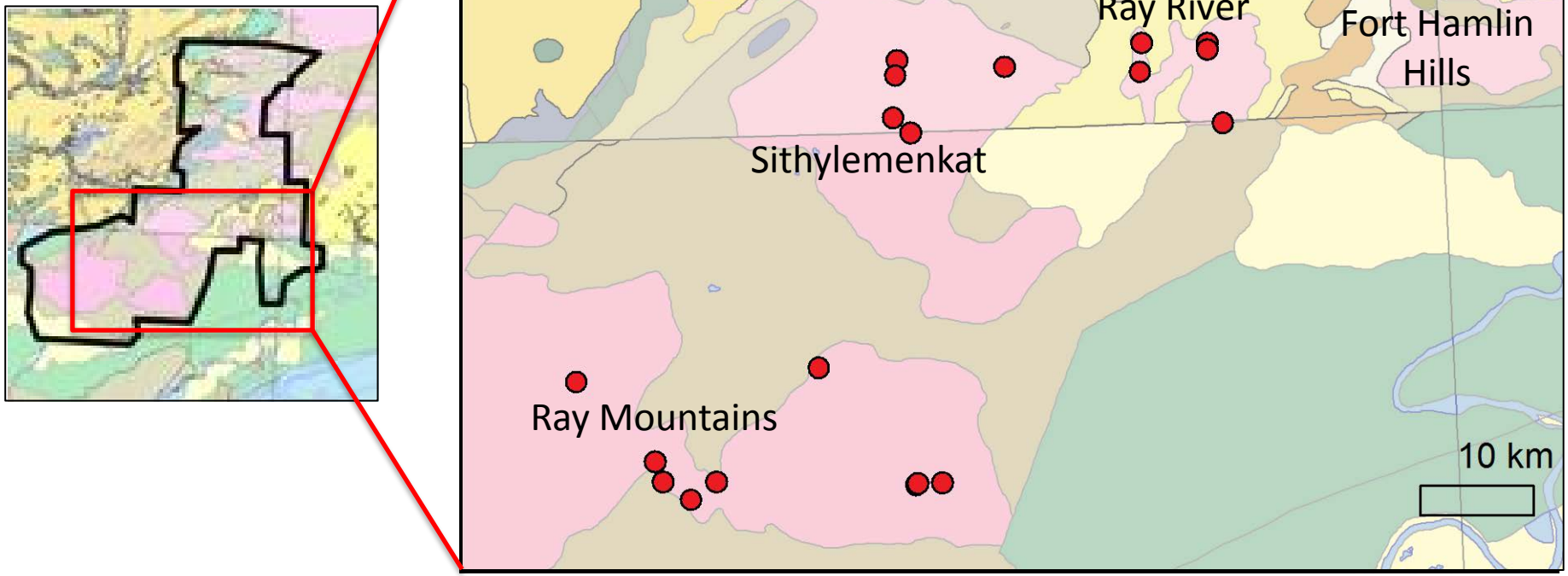
- Monazite, ρ = 5.2
  $(LREE)PO_4$
- Xenotime, ρ = 4.8
  $(Y,HREE)PO_4$
- Coarse Muscovite
- Ilmenite
- ± Fluorite
- ± Topaz
  $Al_2SiO_4(F,OH)_2$

*** Approx. No Allanite!**

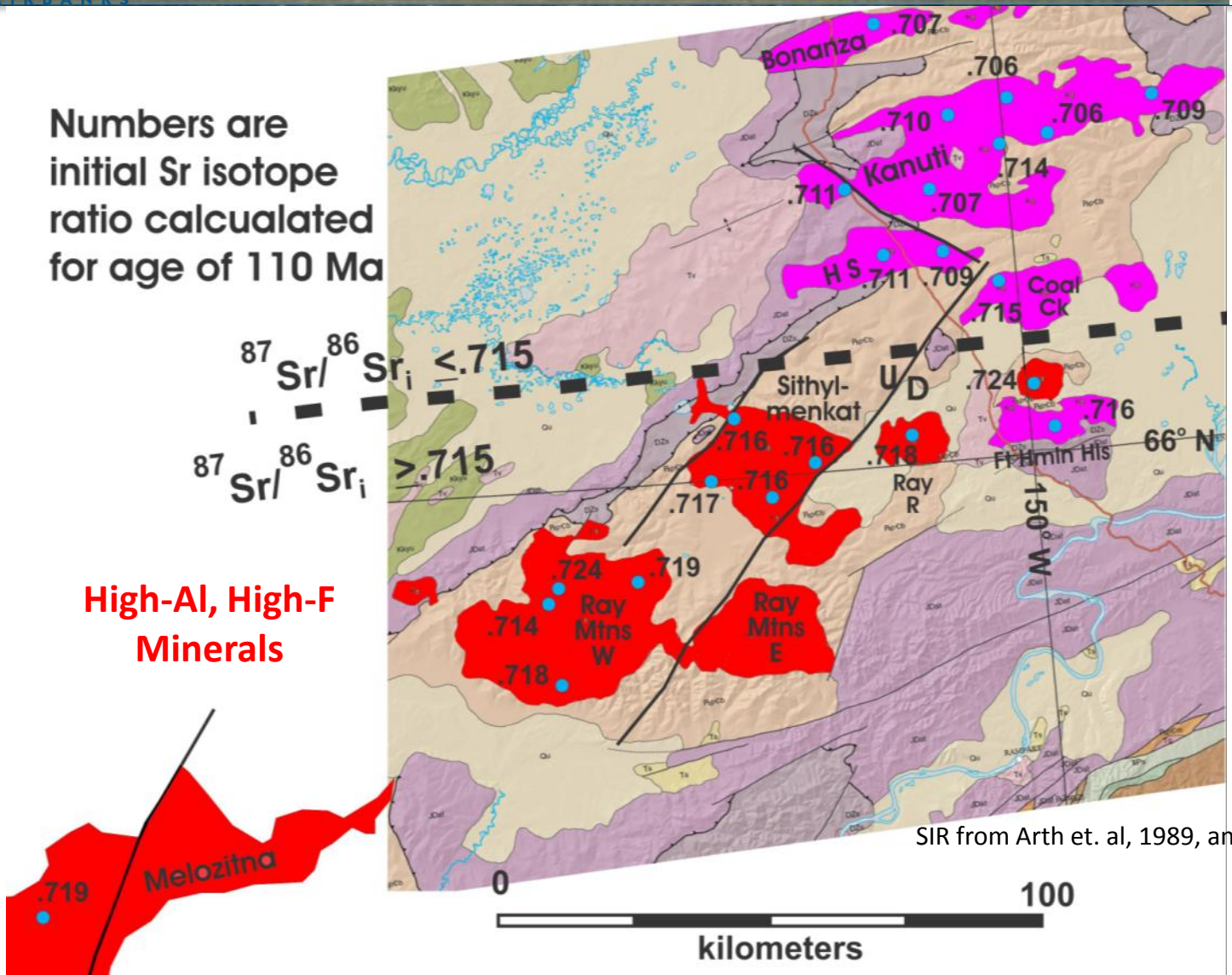




Characteristic Thin Section Locations For Southern Group



Initial Sr Isotope Ratios (SIR): Dividing the Ruby

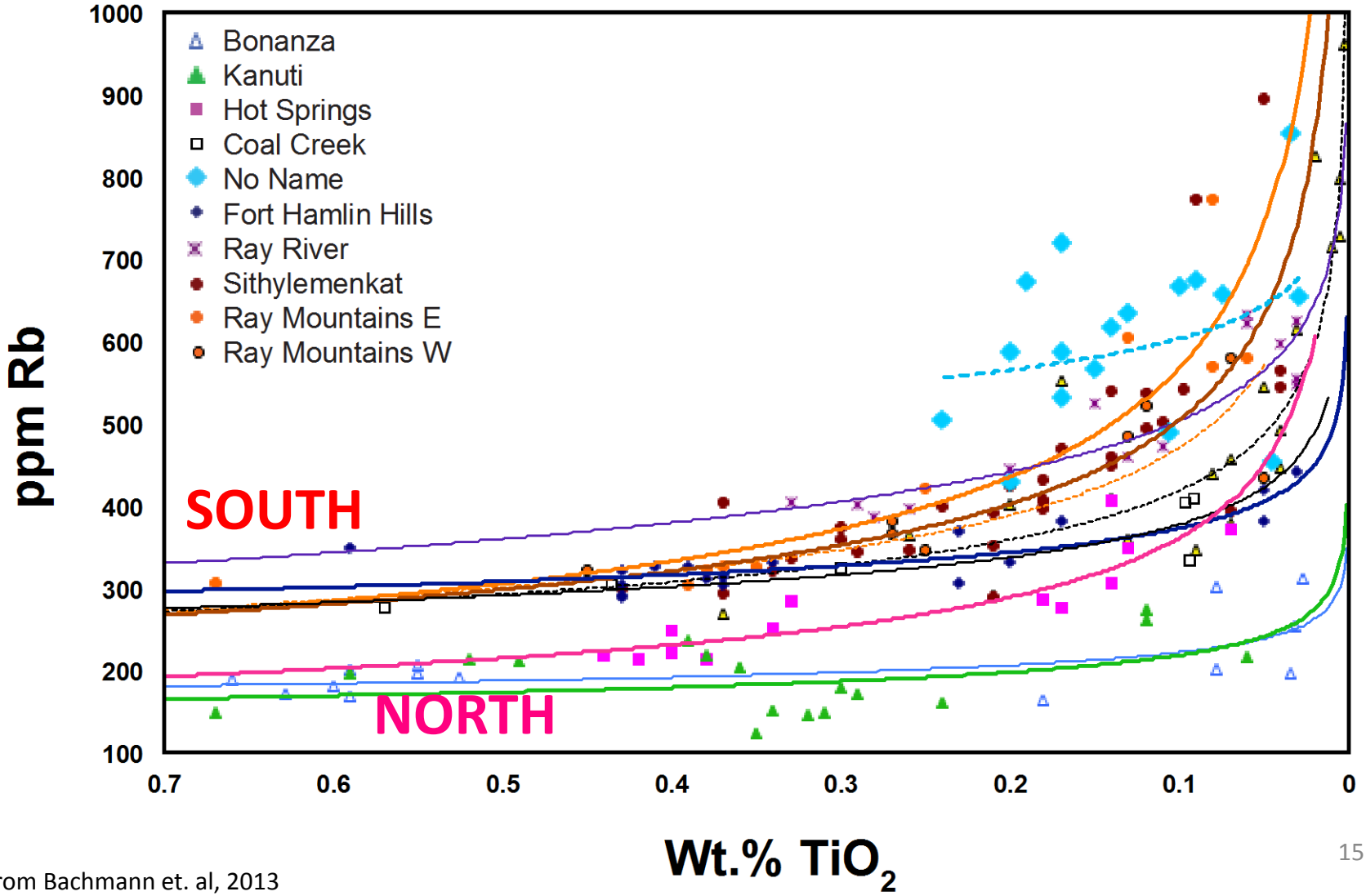


Calcic Assemblage

High-Al, High-F Minerals

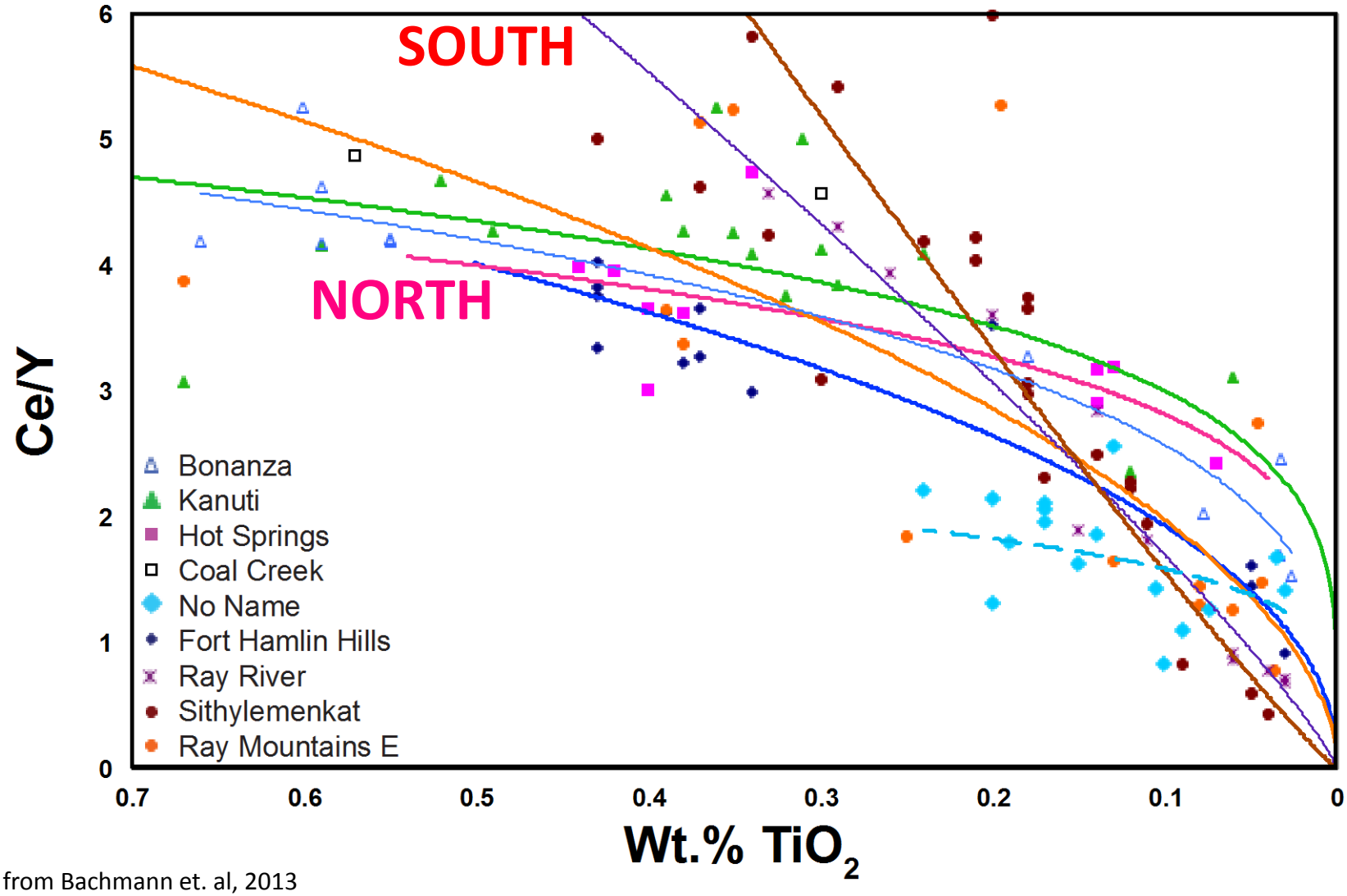
SIR from Arth et. al, 1989, and unpub. DGGS Data

Fractionation Trends: North & South



Data from Bachmann et. al, 2013

Fractionation Trends: North & South



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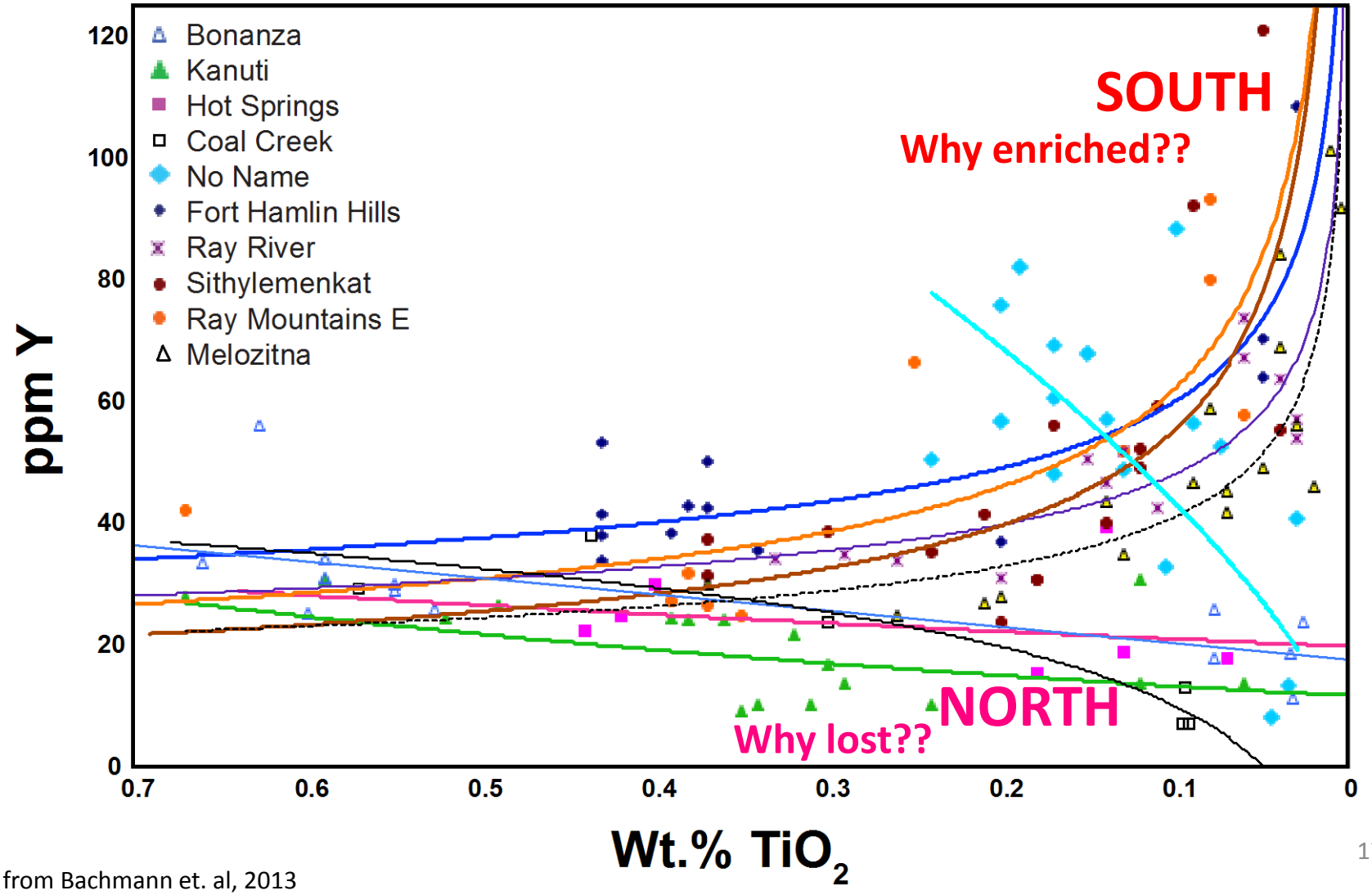
Fractionation Trends: North & South



Data from Bachmann et. al, 2013

North vs. South: Materials & Processes

North

- High-Ca
- High fO_2
  - Sphene + magnetite
  - Allanite
- Bulk of REEs in allanite ($\rho = 3.4$)
- Low Rb
- SIR ≤ 0.715

➔ Source = Mafic? + Shale?

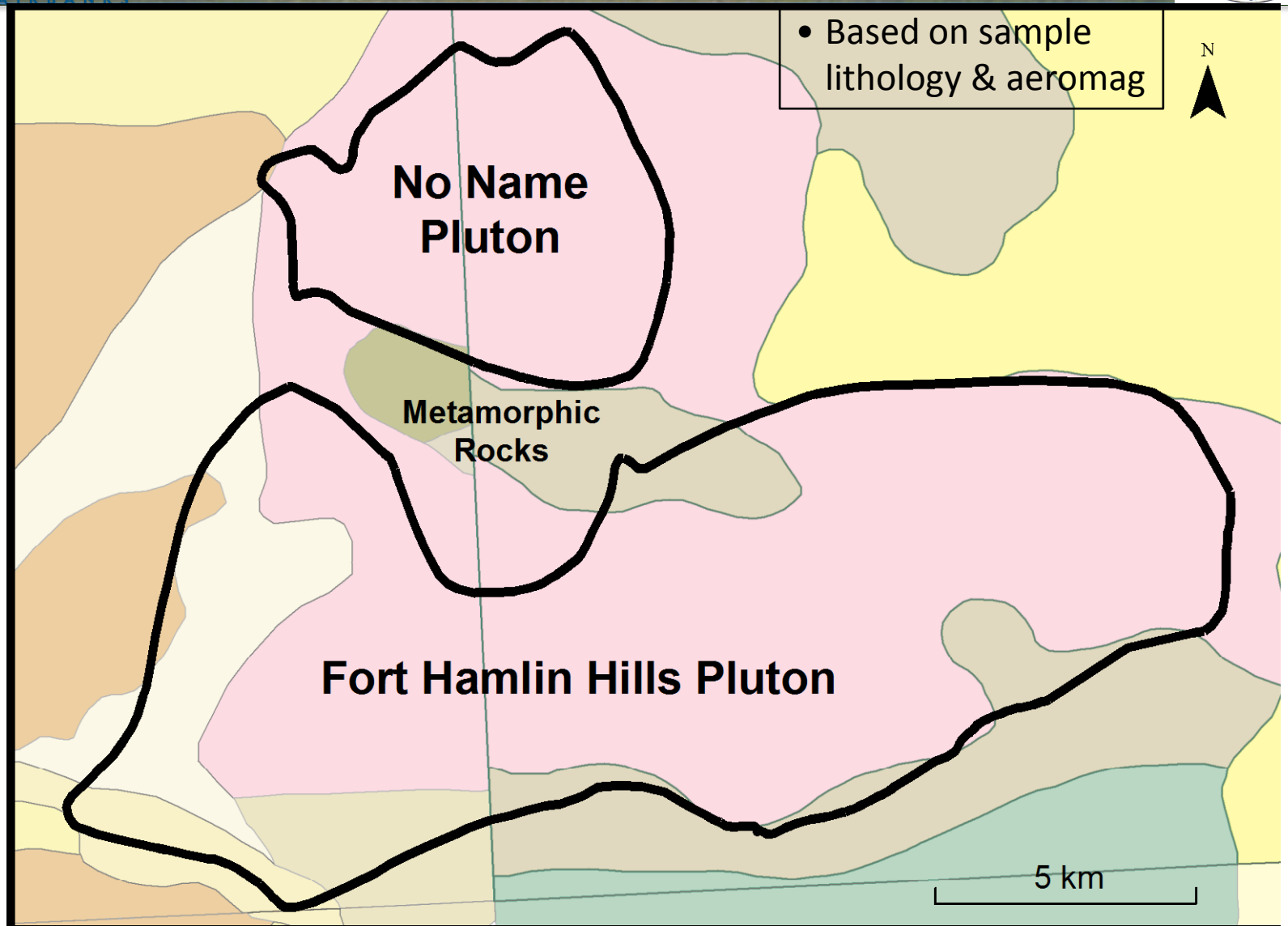
South

- High-Al
- High-F
- Lower Ca
- Low fO_2
- REEs in phosphates ($\rho = 5$)
- More REEs in gravels
- High Rb
- SIR > 0.715

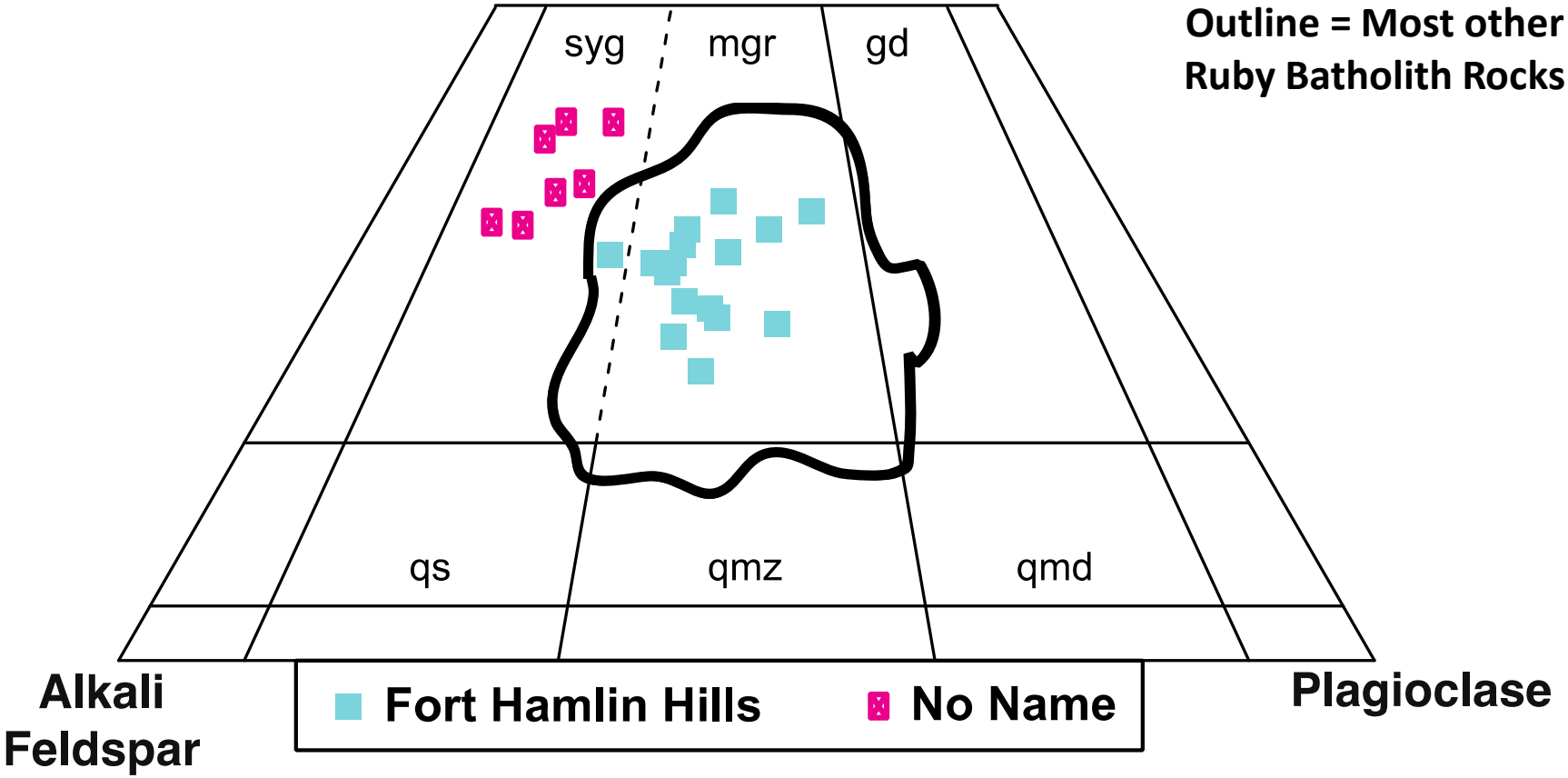
➔ Source = Shale?

What about the indecisive Fort Hamlin Hills pluton???

Fort Hamlin Hills: Two Distinct Plutons

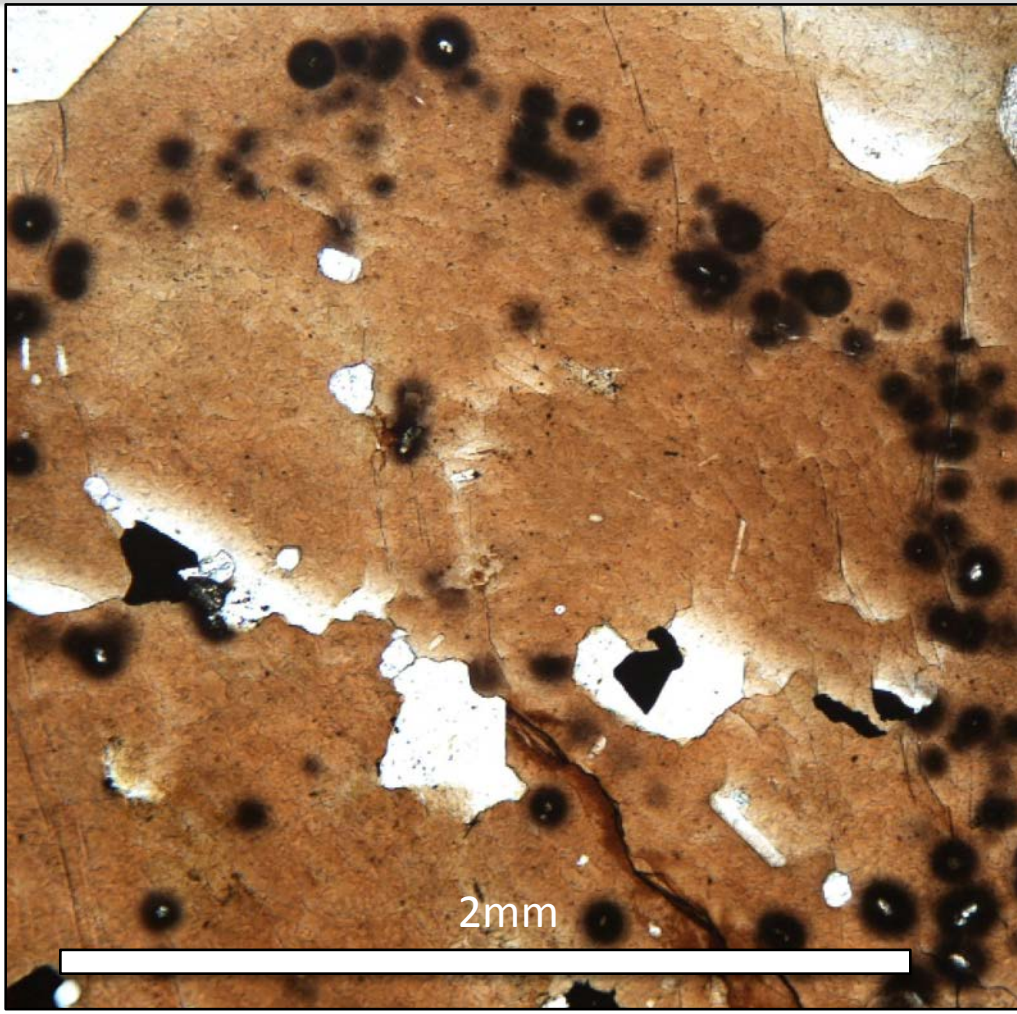


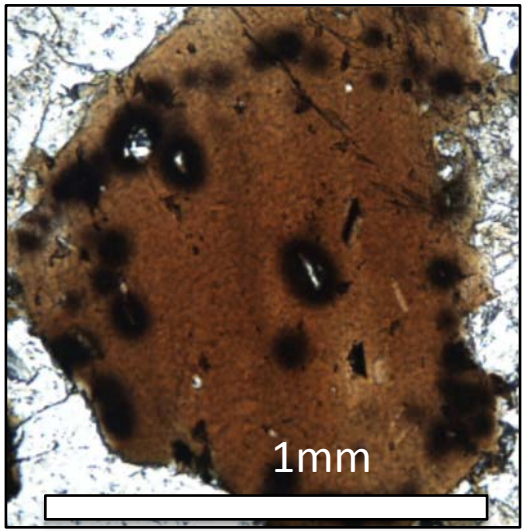
No Name:
Not a Monzogranite



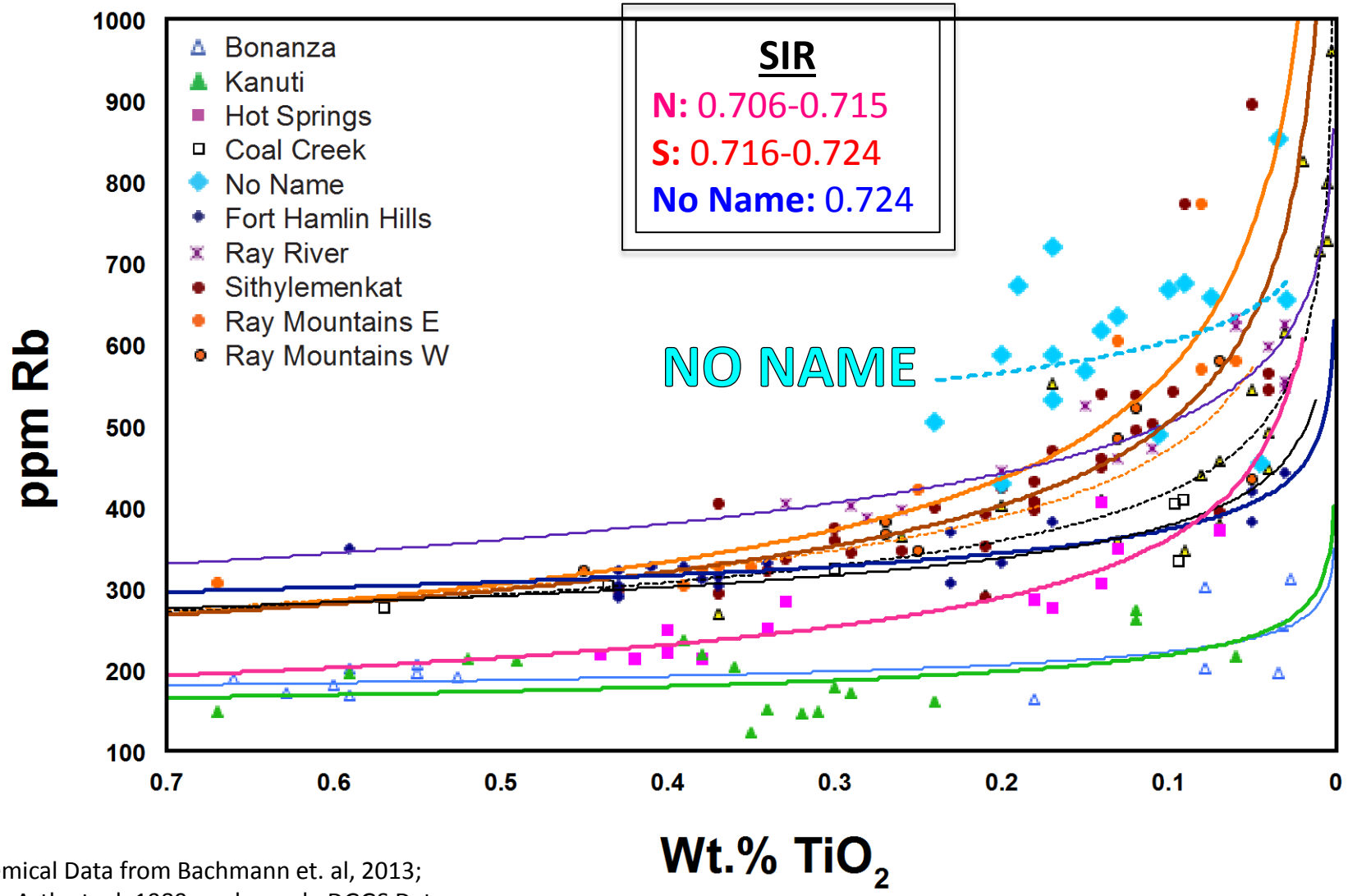
No Name:
Low Ca, High F

- Most fluorite & topaz
- NN = lacks allanite
- Rings of inclusions in biotites



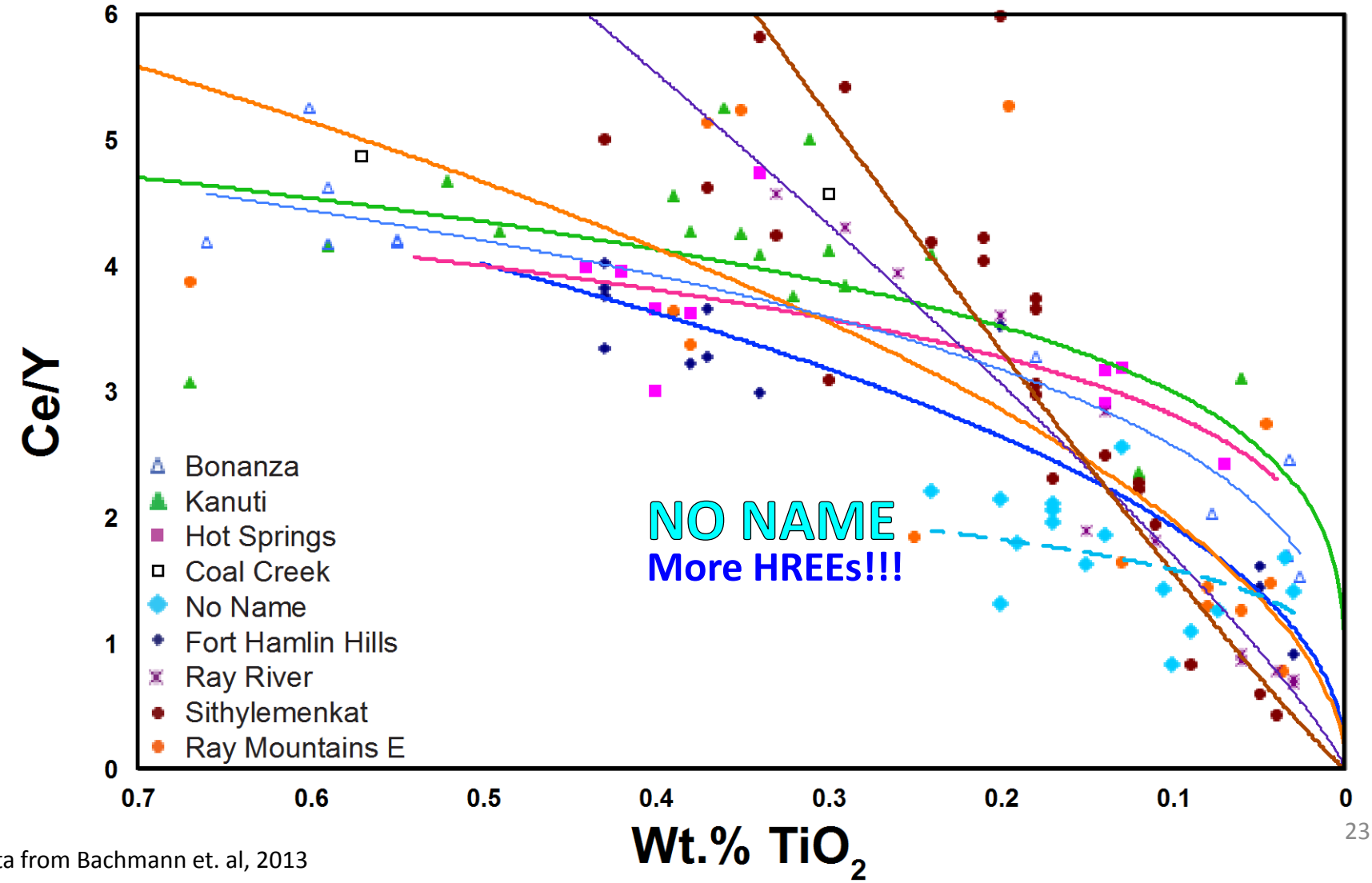


Elevated Rb in No Name



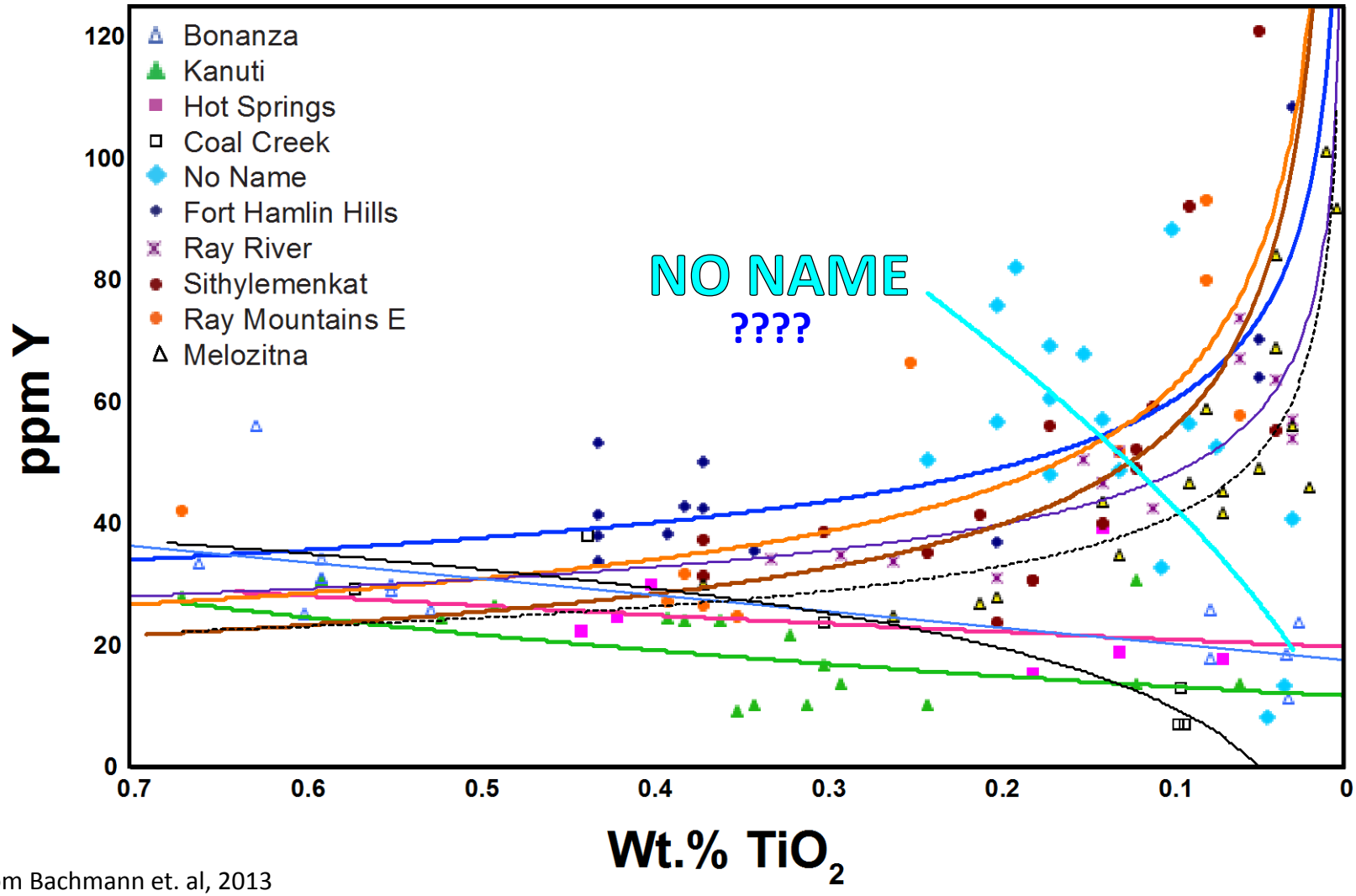
Geochemical Data from Bachmann et. al, 2013;
SIR from Arth et. al, 1989, and unpub. DGGS Data

No Name:
Low LREEs/HREEs



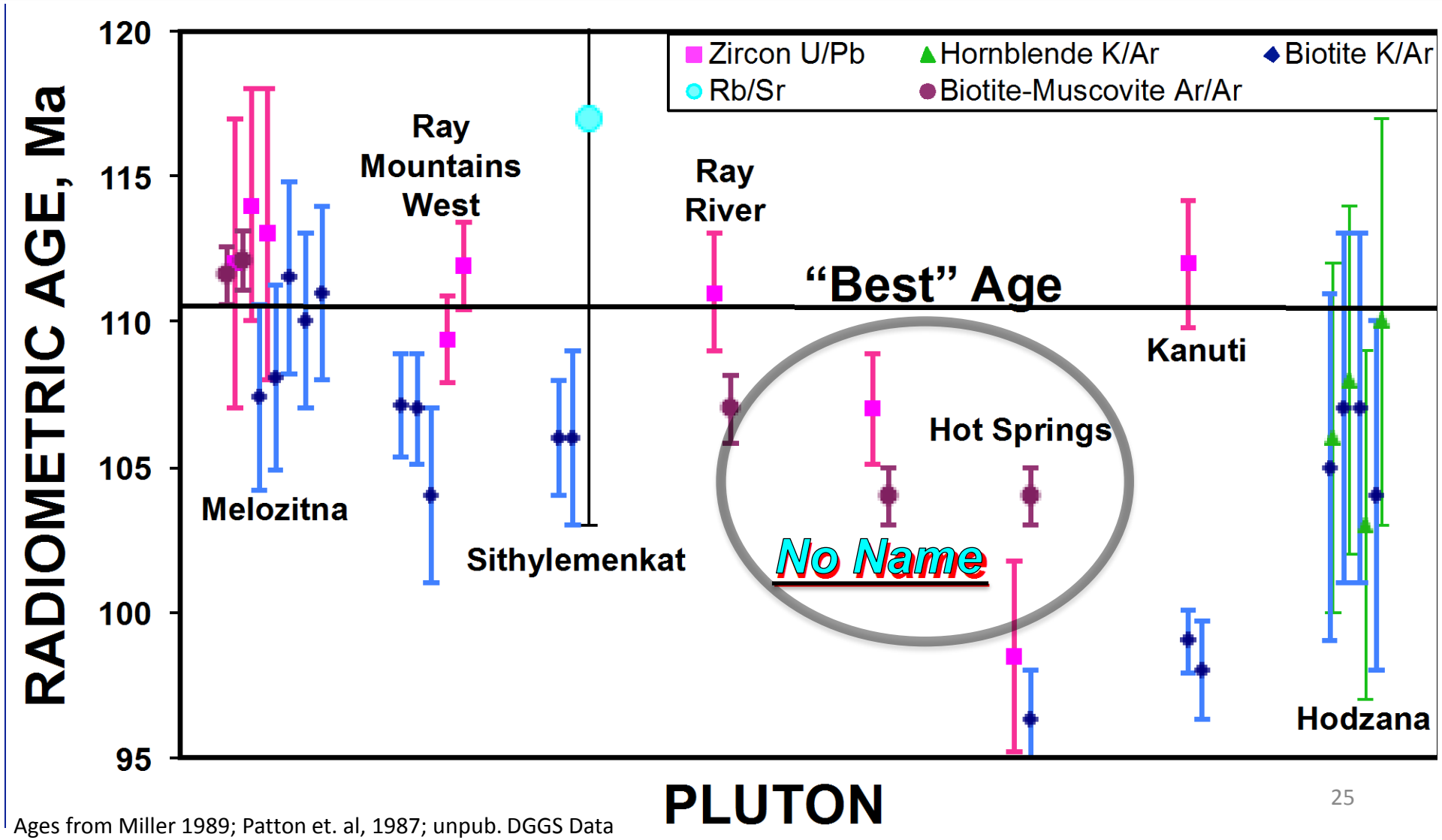
Data from Bachmann et. al, 2013

No Name: Losing Y



Data from Bachmann et. al, 2013

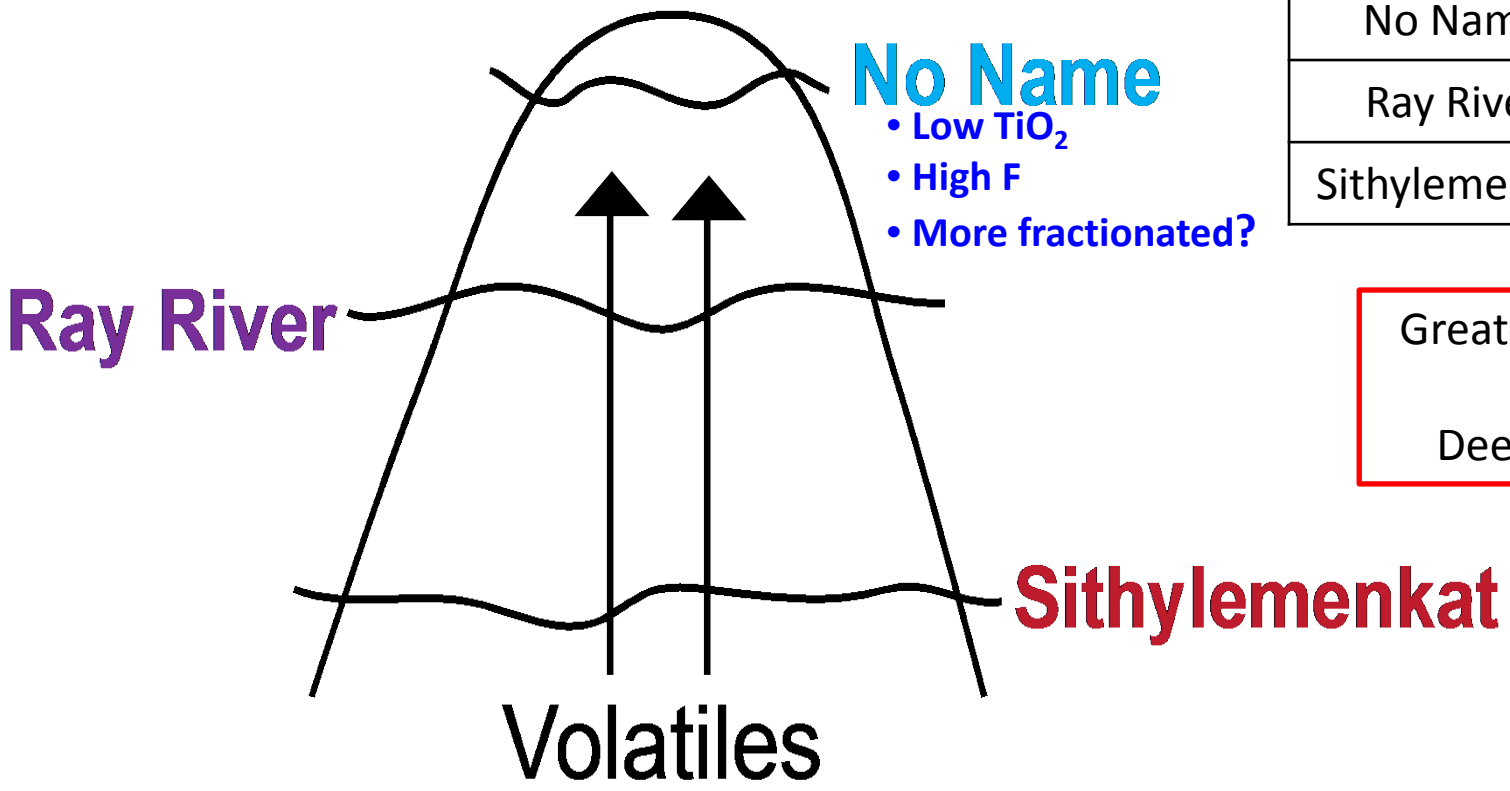
No Name: Young, but Not Unique



Ages from Miller 1989; Patton et. al, 1987; unpub. DGGS Data

Effects of Erosion On Southern Plutons

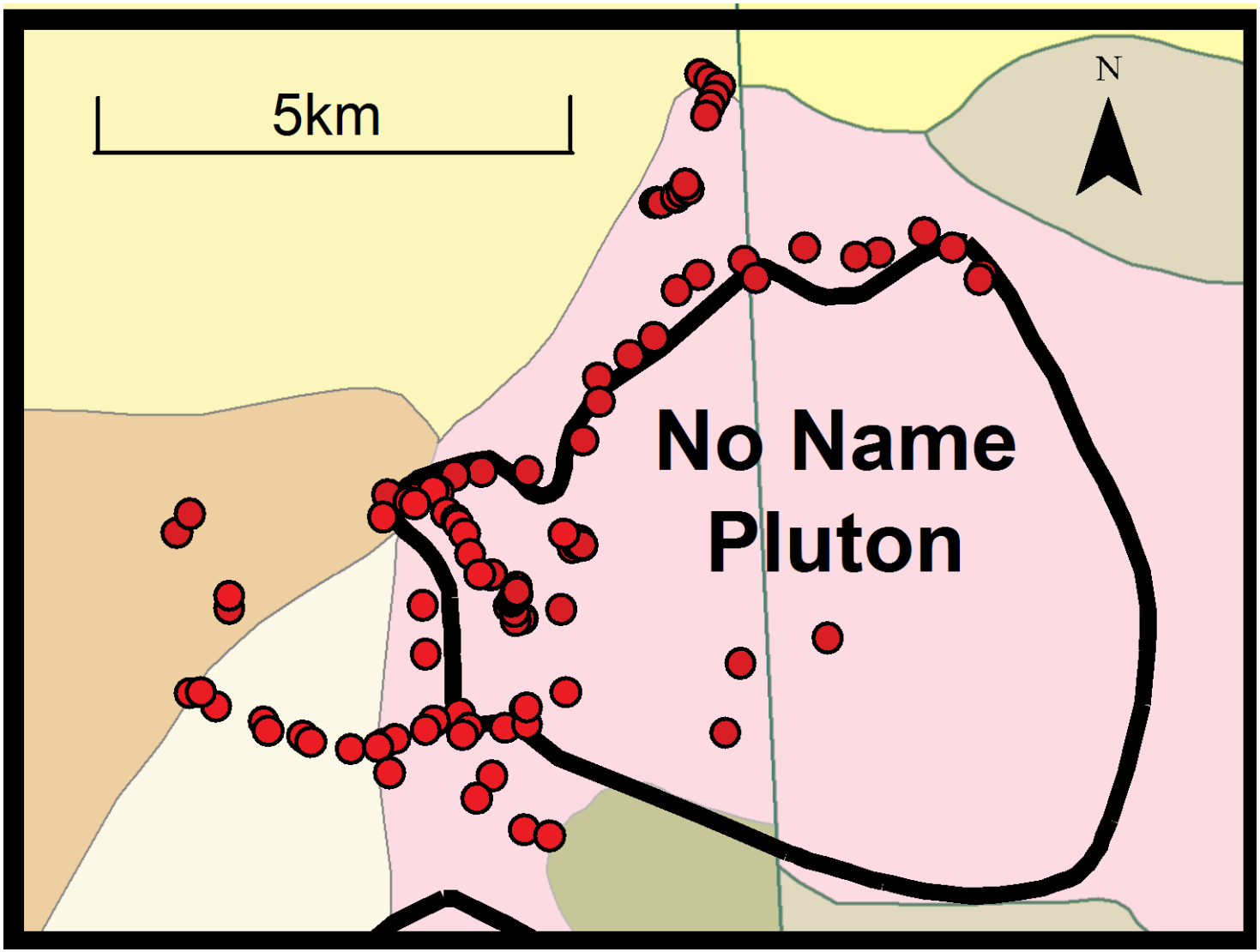
EROSION LEVELS



Pluton	Sq. Km of Exposure
No Name	50
Ray River	100
Sithylemenkat	500

Greater Surface Area
➔
Deeper Exposure

No Name:
More to See



NO NAME:

It’s worth another look.

Acknowledgements

- Alaska Miners Association
- The Alaska State Legislature for funding the Strategic and Critical Minerals Assessment Program under the Airborne Geological/Geophysical Mineral Inventory Program
- Thesis funding in part by Cooperative Research Intern Program through the UAF Geology & Geophysics Department, the Geophysical Institute and ADGGS
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- Rainer Newberry, again
- ADGGS Staff
- Ken Severin of UAF's Advanced Instrumentation Laboratory

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