1100 Ma RAPAKIVI GRANITES, LITTLE HATCHET MOUNTAINS, NEW MEXICO

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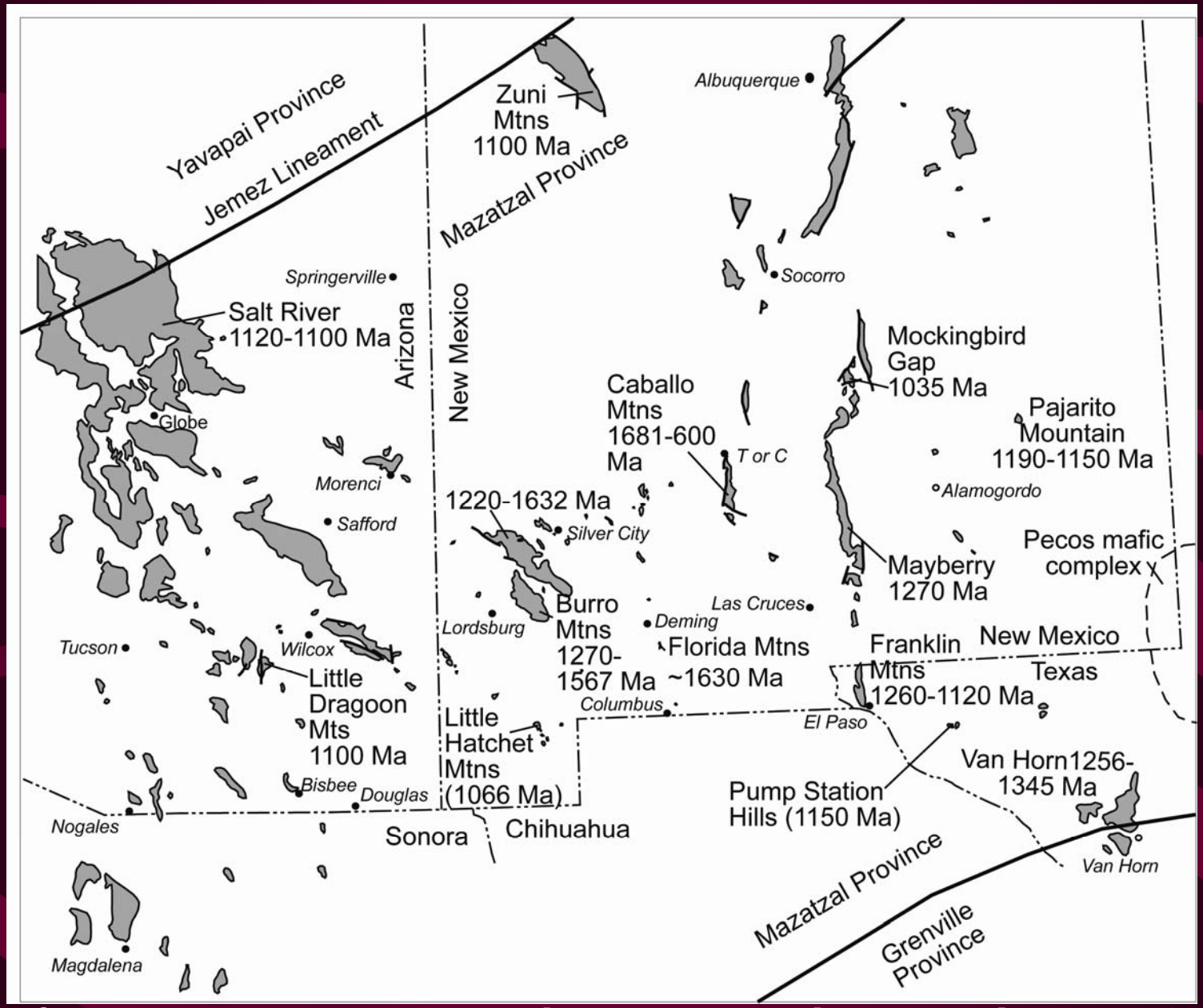
INTRODUCTION



Areas of Proterozoic exposure in southwestern United States and Mexico (modified from Condie, 1981). Names and ages of Grenville (~1200-1000 Ma) areas are shown.

IMPORTANCE OF LITTLE HATCHET MOUNTAINS

- The association of co-mingled rapakivi granites and diabase is not common in southwestern United States.
- There are two distinct granites (rapakivi and hornblende granites) in the Little Hatchet Mountains based on texture, mineralogy, and chemistry.
- The Little Hatchet Mountains are one of the southern-most exposures of Proterozoic rocks in southwestern United States.

Purpose

- To describe the lithology, chemistry, and age of the Proterozoic Little Hatchet granites and spatially associated diabase/gabbro

- To provide details on the southern edge of the southern margin of Laurentia

METHODS

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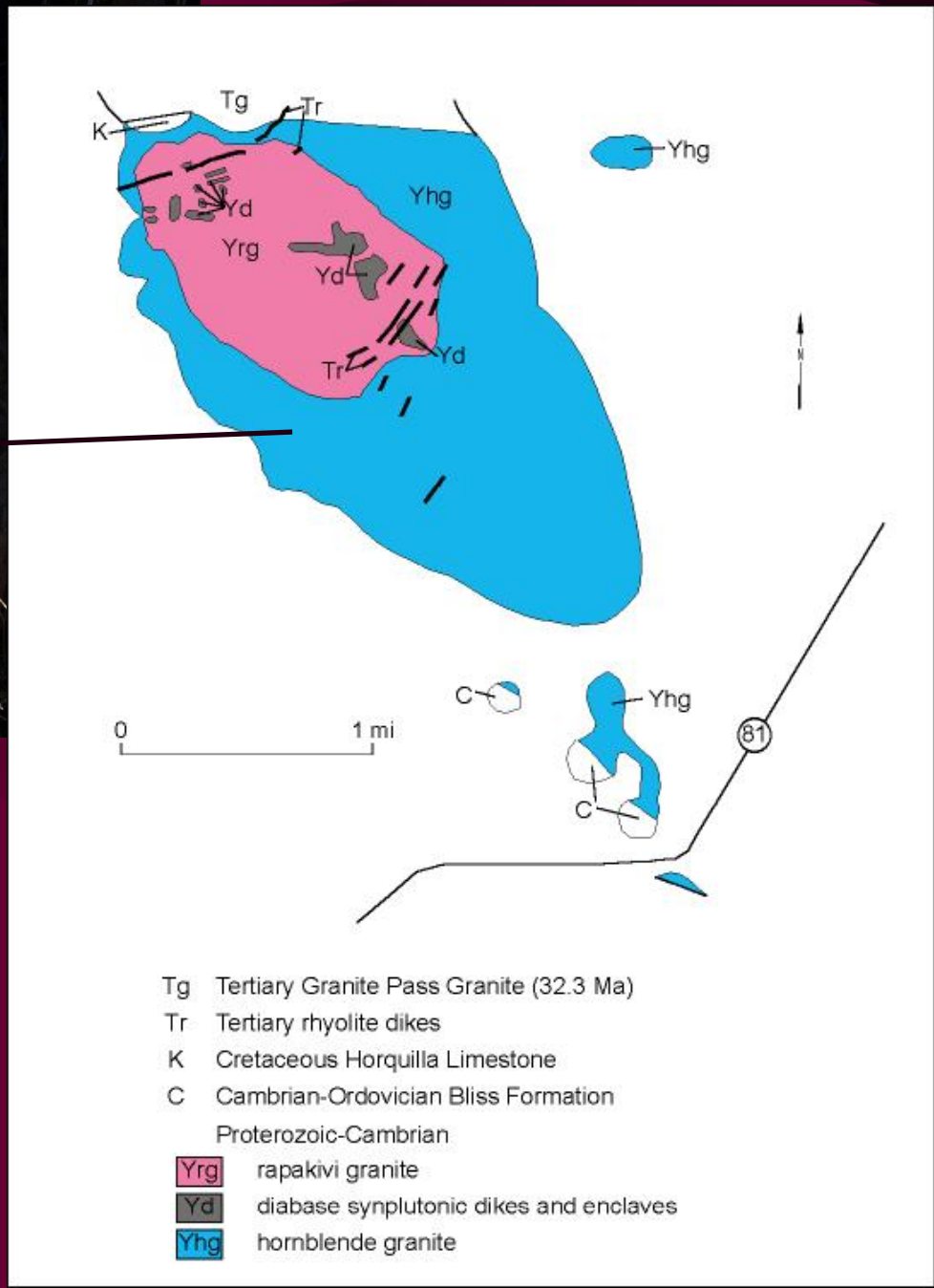
- Detailed geologic mapping
- Geochemistry
- U-Pb geochronology (LAM-ICP-MS method on zircon)
- Sm-Nd isotopes

GEOLOGY

hornblende granite/granodiorite

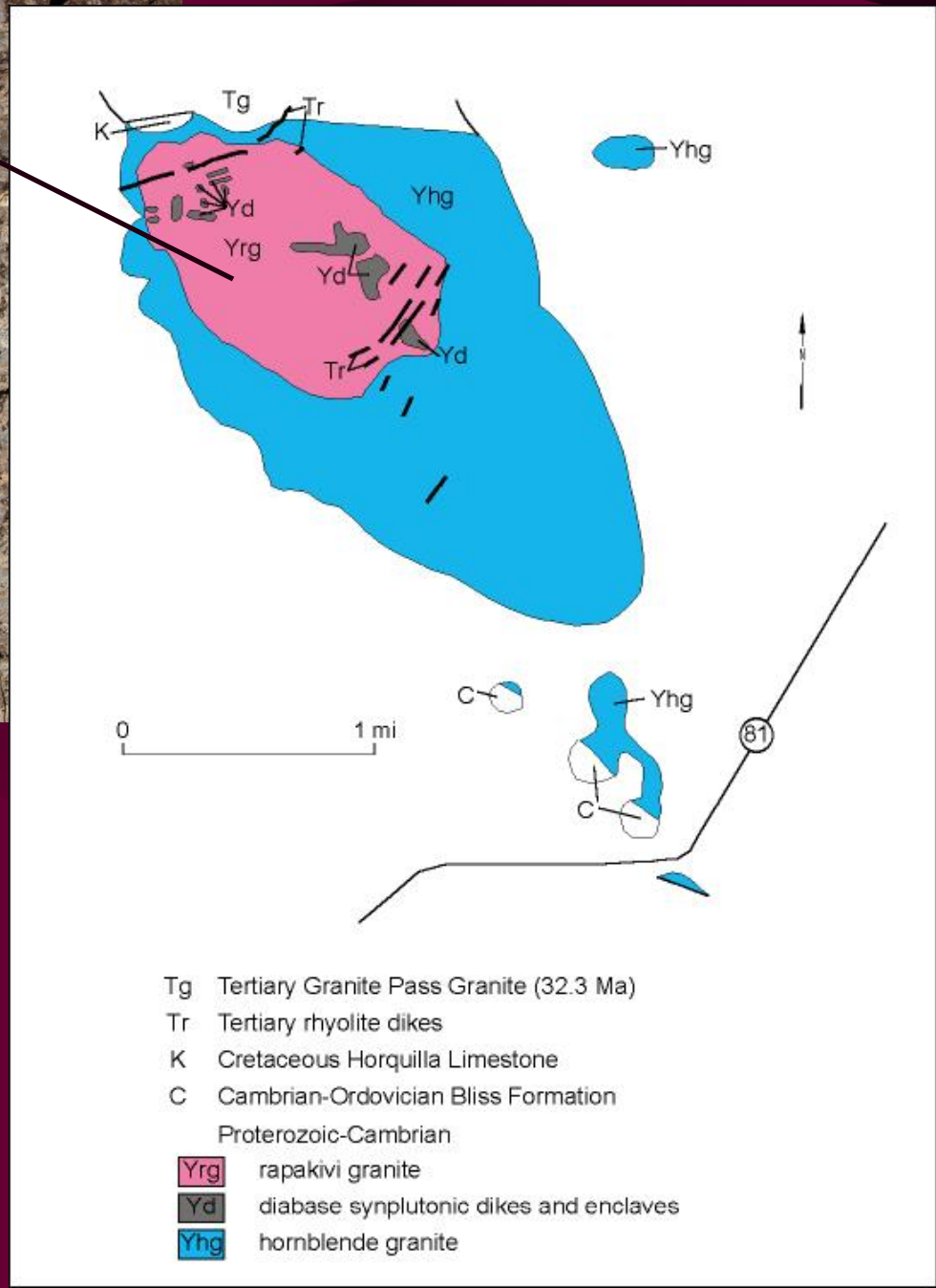
orange to red-brown and consists of plagioclase, K-feldspar, quartz, hornblende, and rare biotite



hornblende granite/
granodiorite

rapakivi granite

pink-gray to red-orange and medium to coarse grained and is characterized by large K-feldspar phenocrysts



comingled contact between rapakivi granite and gabbro/diabase

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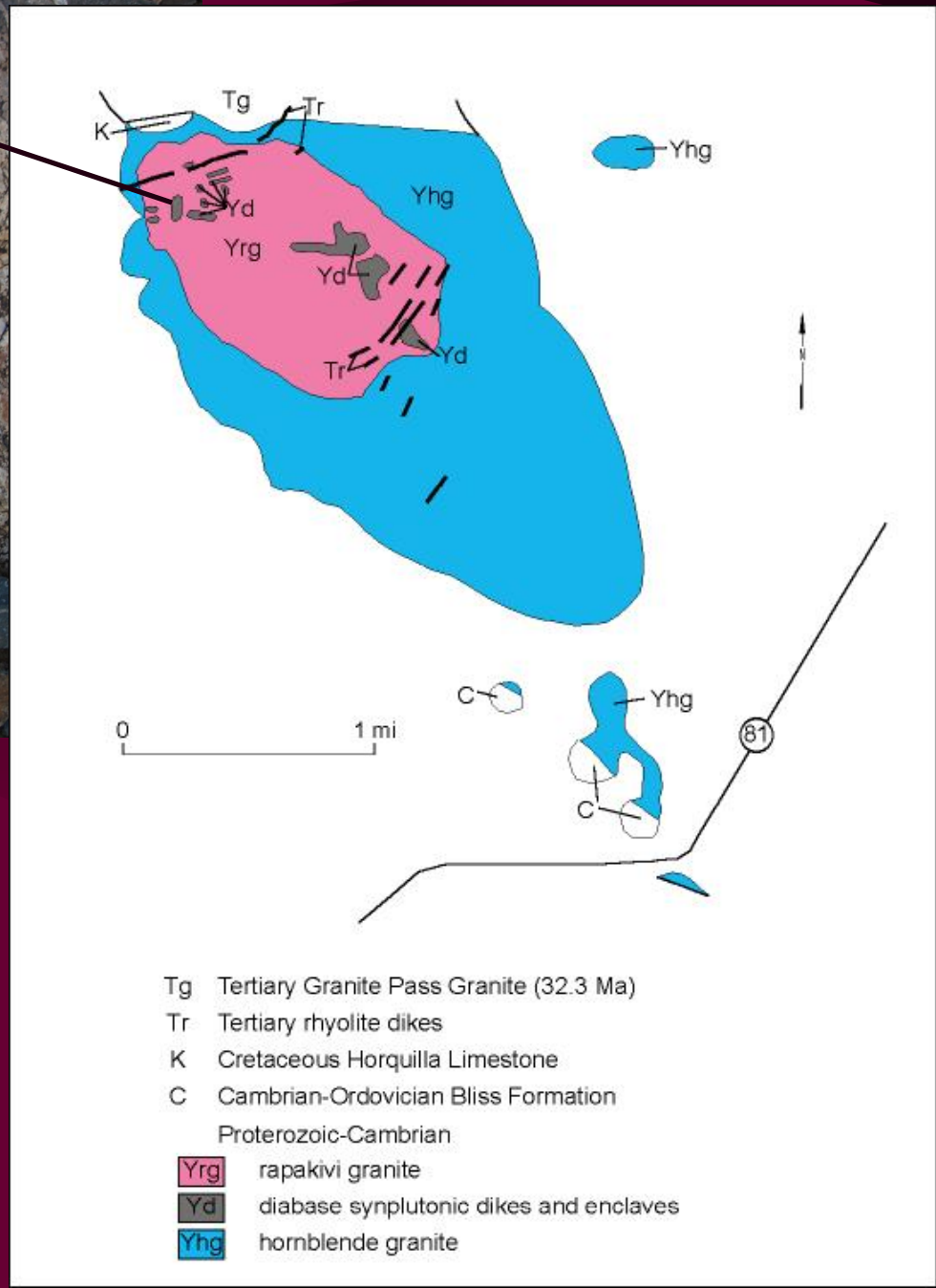
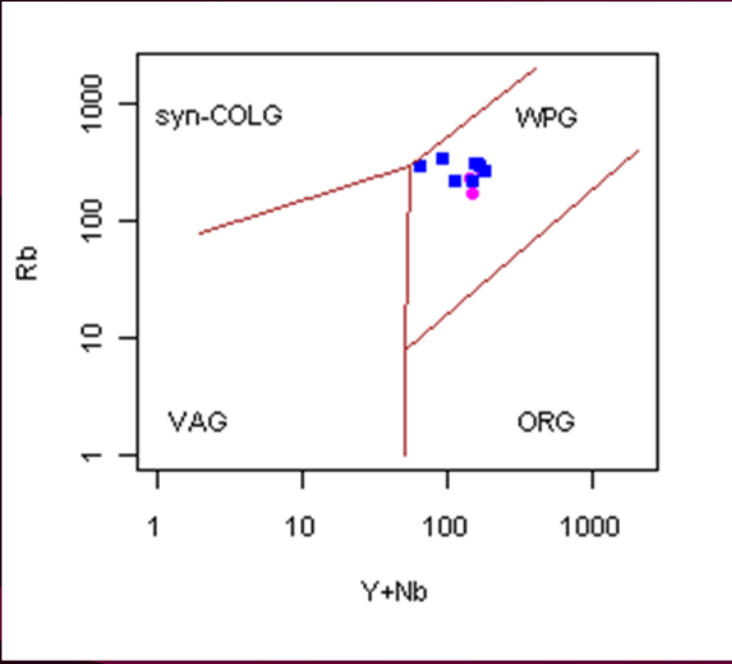
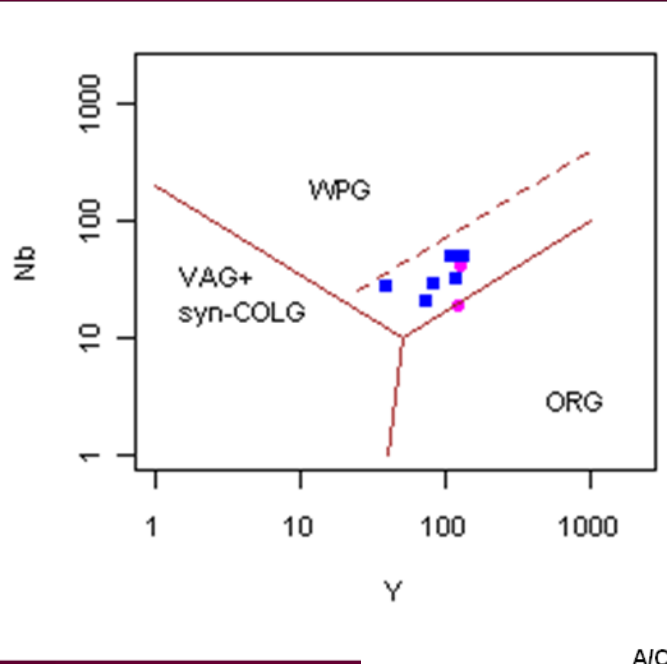
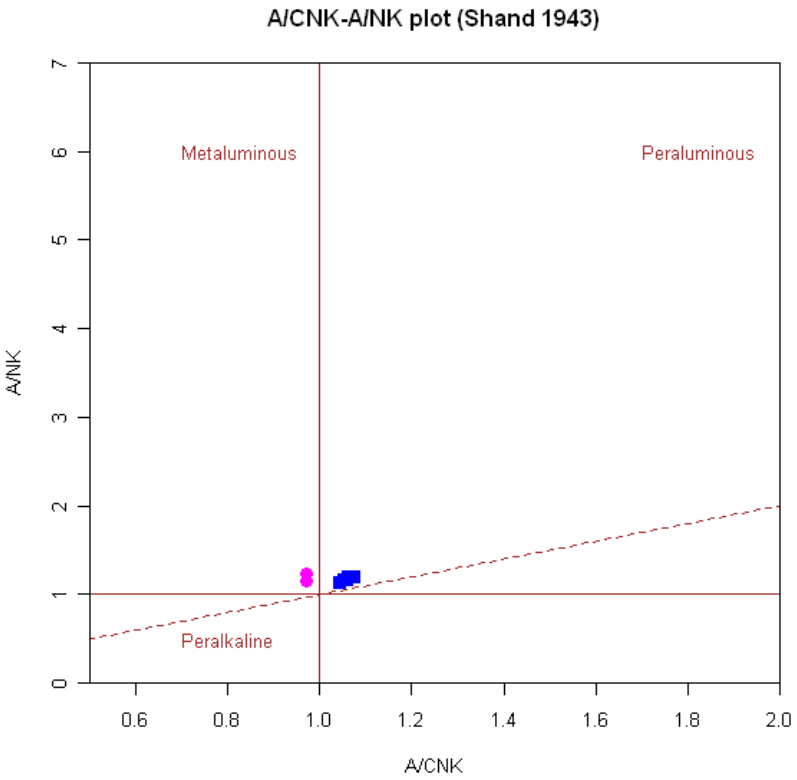


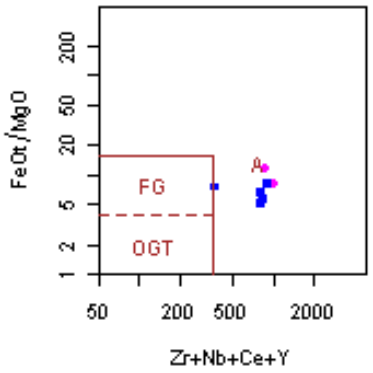
GEOCHEMISTRY

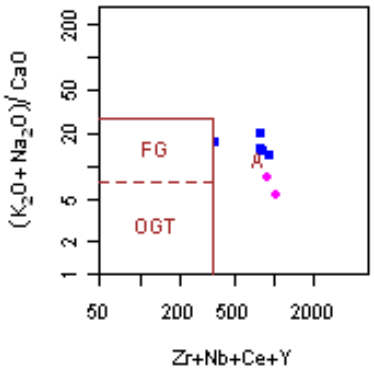


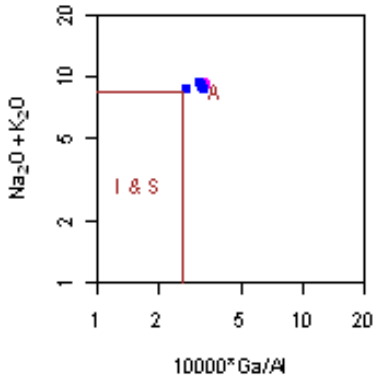


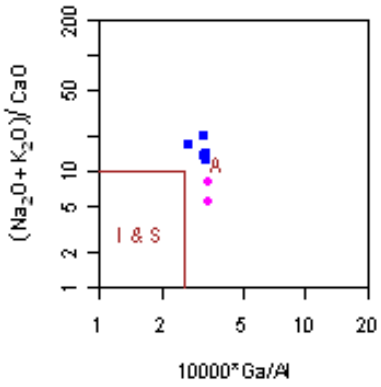
Granites (pink rapakivi biotite granite and blue hornblende granite) from the Little Hatchet Mountains

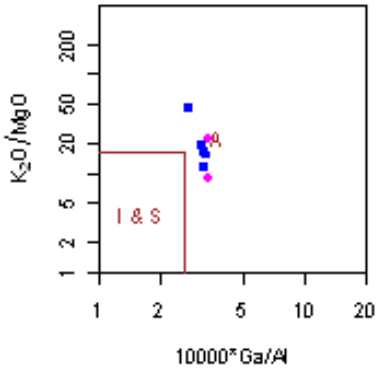


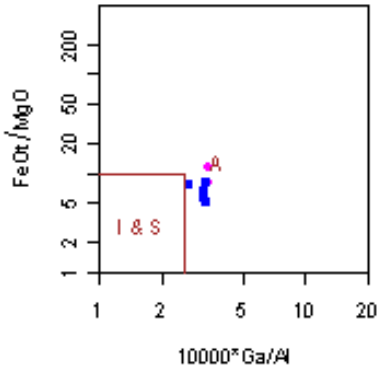


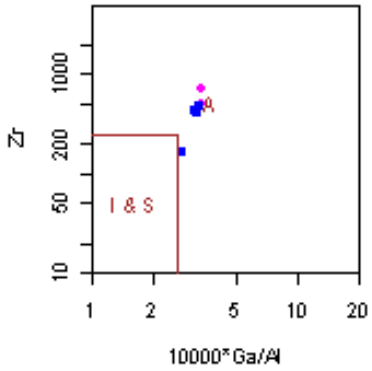


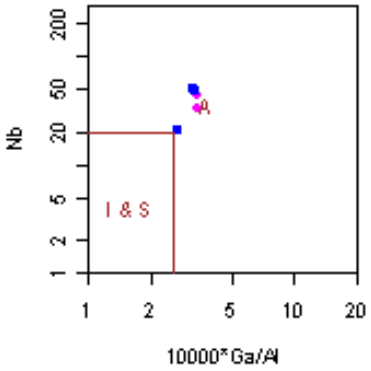


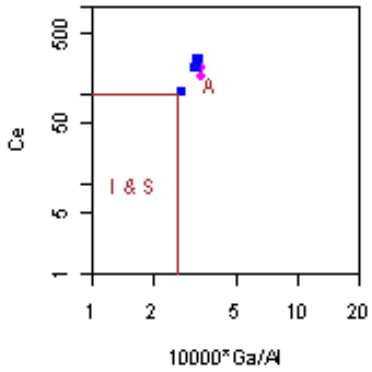


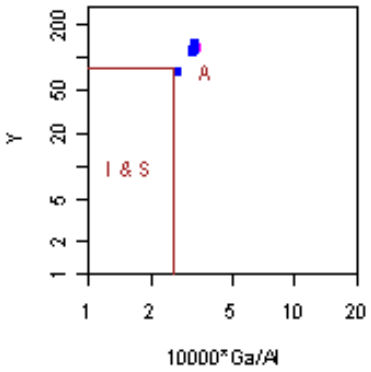


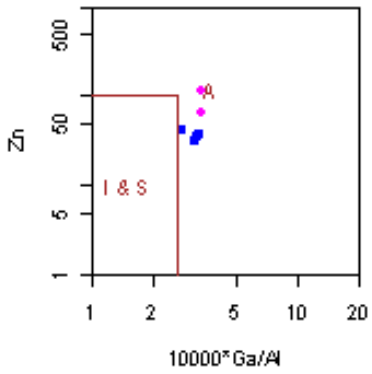


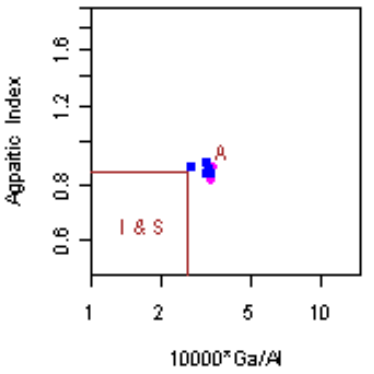




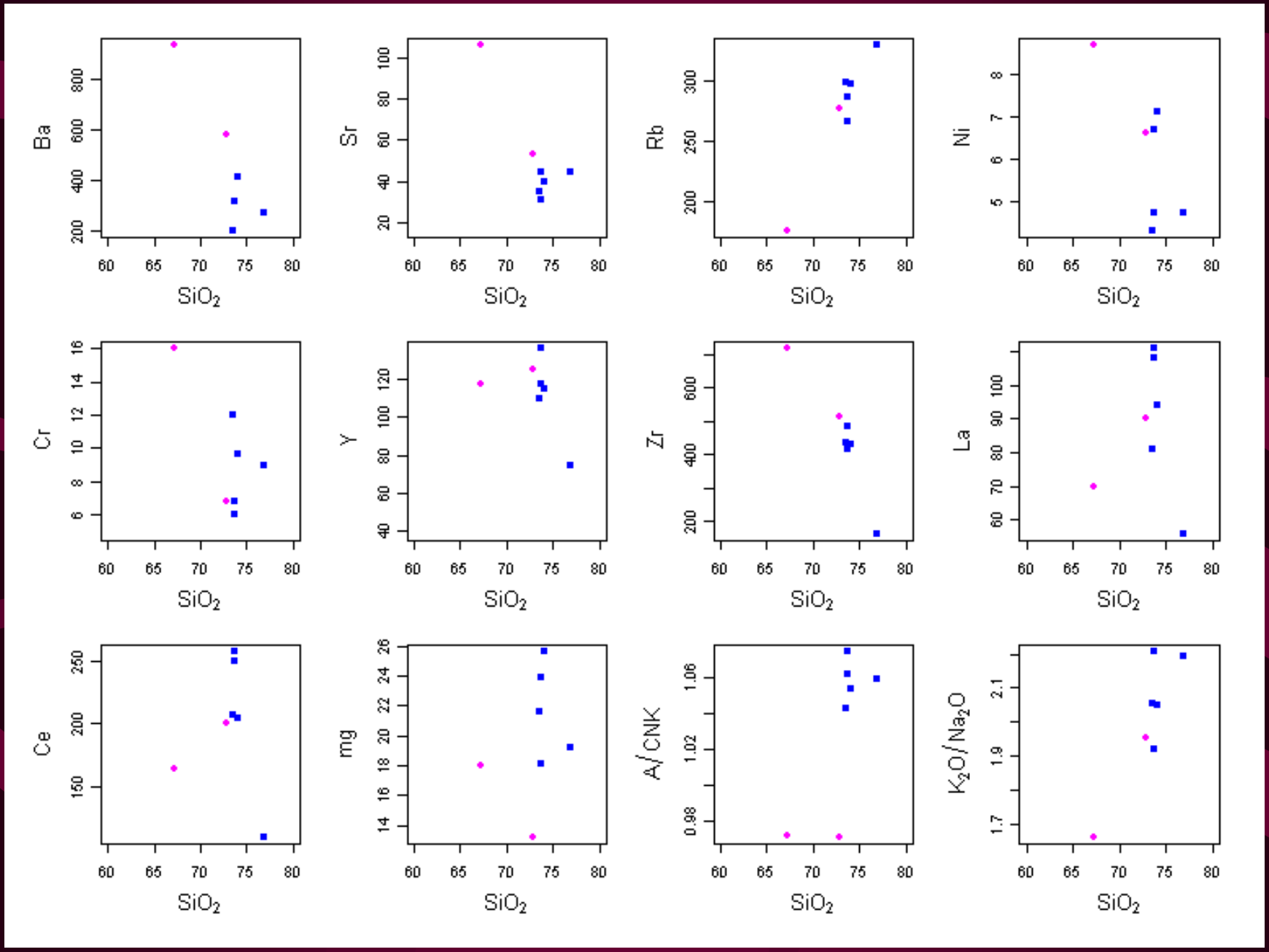




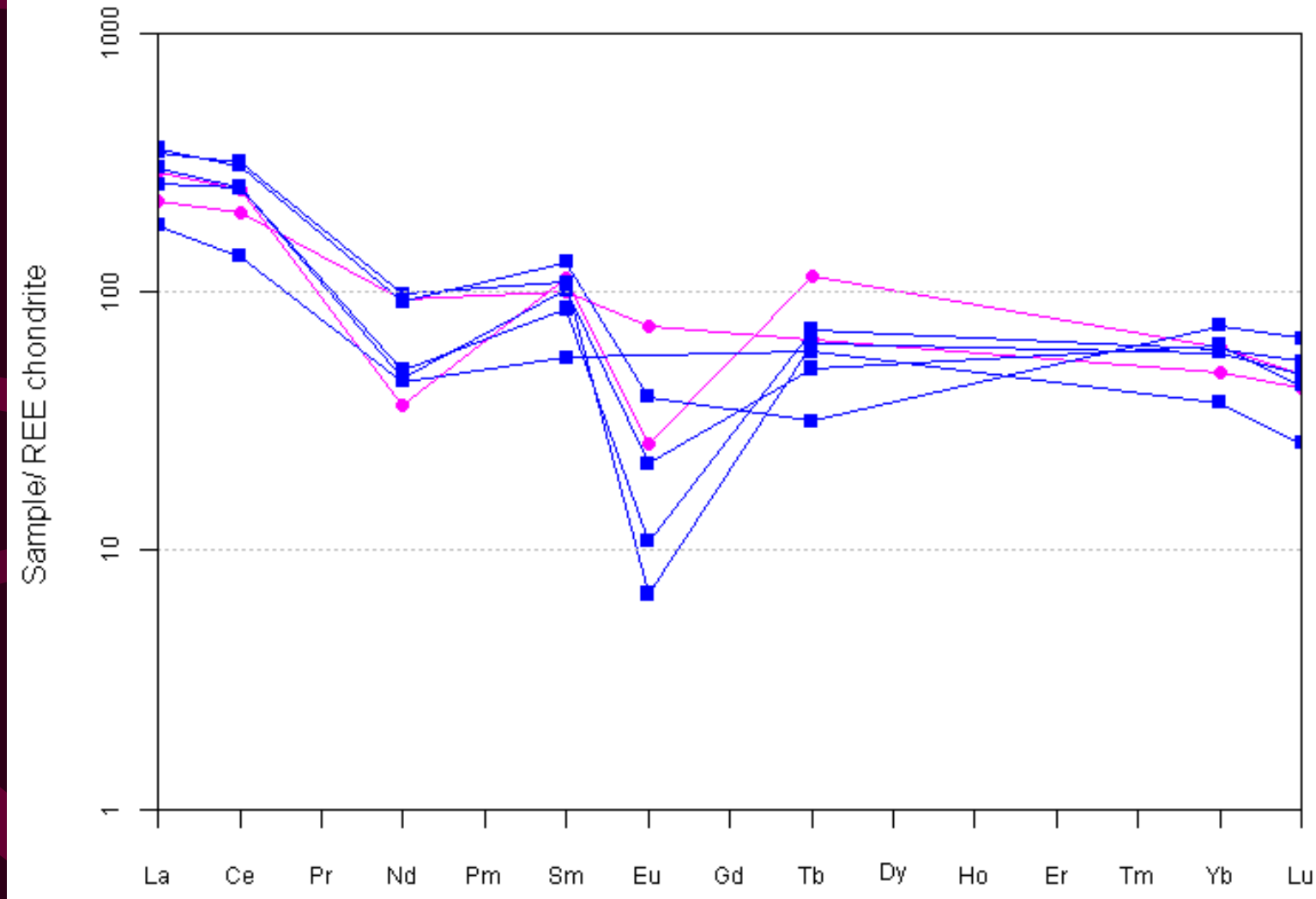




A-type granites



hornblende granite and rapakivi biotite granite have different compositions


Sample/ REE chondrite
1000
100
10
1
La
Ce
Pr
Nd
Pm
Sm
Eu
Gd
Tb
Dy
Ho
Er
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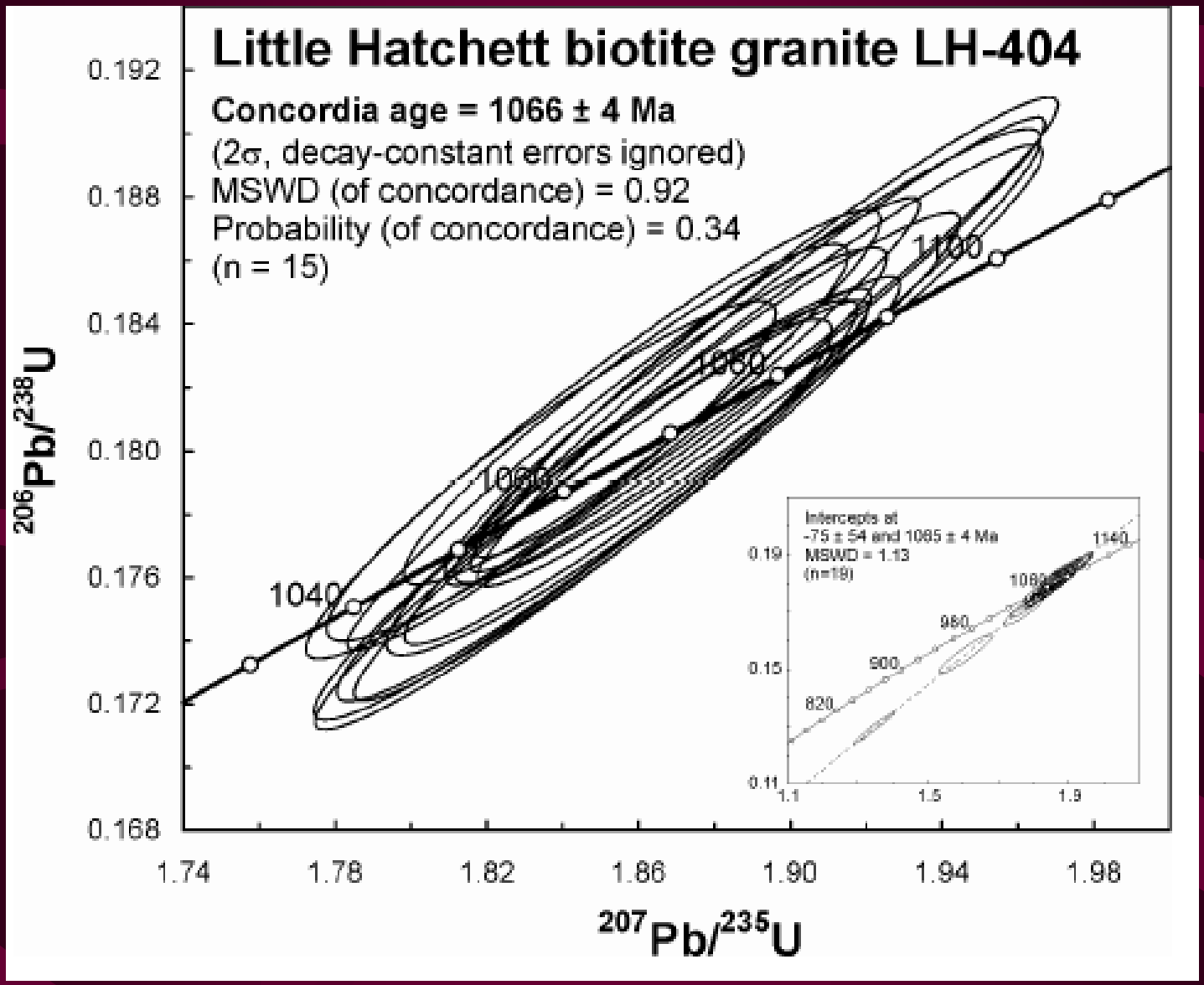
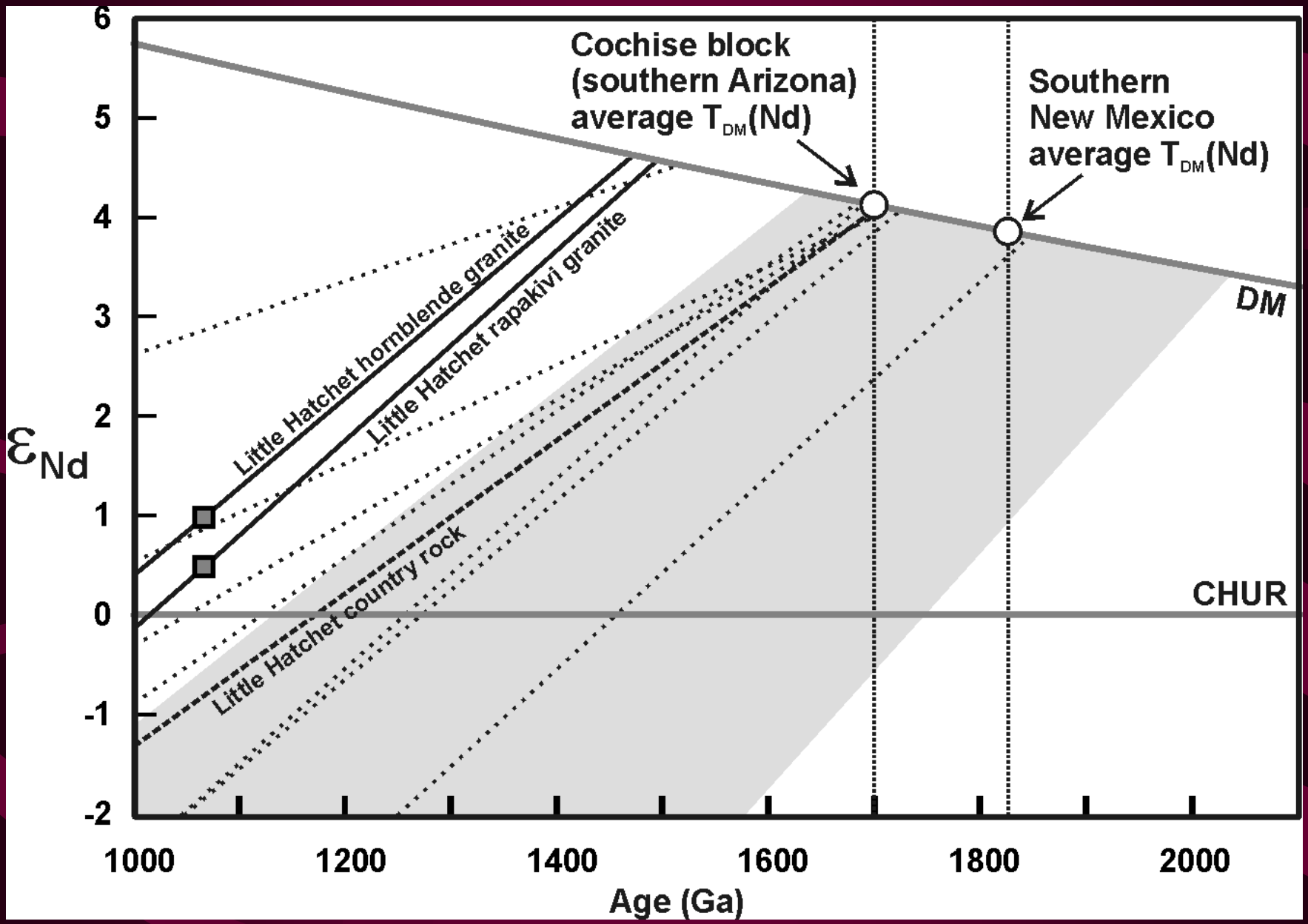
Yb
Lu

AGE



concordia diagram for the Little Hatchet rapakivi biotite granite—age is 1066± 4 Ma

ISOTOPIC GEOCHEMISTRY



Age vs Nd isotope compositions

CONCLUSIONS

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- The rapakivi granite and hornblende granite in the Little Hatchet Mountains are A-type, subalkaline, metaluminous to peraluminous granites.
- The hornblende granite and rapakivi granite are chemically different, possibly due to differentiation.
- The rapakivi granite and diabase are co-mingled, indicating a similar age—1066± 4 Ma.

CONCLUSIONS - continued

- The granites in the Little Hatchet Mountains are chemically similar to the ~1220 Ma Redrock Granite in the Burro Mountains.
- The granites in the Little Hatchet Mountains are chemically distinct from the Jack Creek Rapakivi Granite in the Burro Mountains, which is ~1400 Ma.

CONCLUSIONS - continued

- Co-mingling rapakivi granite and diabase is consistent with a process that involved melting in the upper mantle, emplacement of diabase in the crust resulting in partial crustal melting and thinning, and, finally, intrusion of shallow, high-level silicic plutons, the Little Hatchet rapakivi granite.

CONCLUSIONS - continued

- The initial Nd isotope compositions of the Little Hatchet granites do not overlap with the evolution of the older country rocks or the regional Paleoproterozoic basement at 1066 Ma.
- The granites also have significantly lower depleted mantle model ages (TDM ~1450 Ma) than the Paleoproterozoic rocks exposed at the current erosion level in southern New Mexico (TDM ~1700-1800 Ma)

CONCLUSIONS - continued

- This suggests that the granites were generated by partial melting of a lower crustal source that was segregated from the mantle during the ~1450 Ma “anorogenic” granite event rather than during the Paleoproterozoic Mazatzal orogeny (1700-1650 Ma)