Cambrian-Ordovician rocks in New Mexico and Colorado; Evidence for a failed rift?

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Background

In New Mexico there exists a suite of alkaline rocks that span New Mexico and Southern Colorado. The locations define a N-S trending band.

Suite composed of:

- Syenites
  - Si-deficient felsic primary igneous rocks
- Episyenites/Fenites
  - Si-deficient felsic secondary metasomatic rocks
- Carbonatites
  - Carbonate-rich, Si-depleted primary igneous rocks
- Mafic/Ultramafic cumulates

Figure 1. Map of suite. Filled stars have Cambrian-Ordovician ages, empty stars have not been dated. Adapted from McMillian and McLemore, 2004.

Previous Work

Significant economic potential research for uranium.

Some indications of a failed rift system ~560 Mya

Figure 2. Cambrian-Ordovician regional plate reconstruction. This suite is in green. Adapted from McMillian and McLemore, 2004.

Problem

Ages across the suite and in single locations are often poorly constrained, obscuring important geographical and compositional trends.

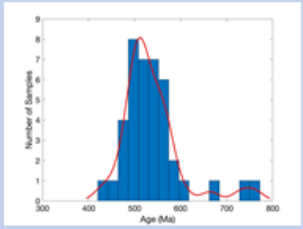

Figure 3. Age distribution of reported ages from Iron Hill. Note the chaotic distribution of ages from a single location spanning ~200Ma.

This Work

Six samples spanning The geographical and compositional range have been collected for future zircon U-Pb age determinations using LA-ICP-MS (Laser Ablation Inductively Coupled Plasma Mass Spectrometry) at UCSB.

Figure 4. Sample location for this study. Stars indicate general location of sampled rocks. Adapted from McMillian and McLemore, 2004

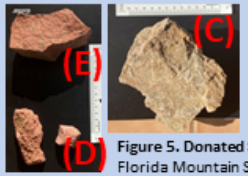

Figure 5. Donated Syenite and Episyenite Florida Mountain Syenite **(C)**, Caballo Hills Episyenite **(D)**, and Lobo Hill episyenite **(E)** samples generously donated by Dr. McLemore.

Field Work

Primary Syenites:
Spring Mountain Syenite **(A)**
Democrat Creek Syenite **(B)**

Carbonatites:
Lemitar Mountain Carbonatite **(F)**

Mafic/Ultramafic Cumulates:
Democrat Creek Cumulates **(B)**

Figure 6. Spring Mountain Syenite. Not observed in outcrop. Hammer for scale.

Figure 7. Lemitar Mountains Carbonatites. Observed as brown, weathered dike swarm. Local fenitization was observed. Book for scale.

Figure 8. Democrat Creek Syenite. Observed as large parallel dikes. Hammer and backpack for scale.

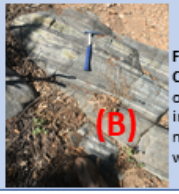

Figure 9. Democrat Creek Cumulate. Observed as local outcrops. Notice the banding indicating accumulation of material. Green Chloritization was observed. Hammer for scale

Future Work

New zircon U-Pb ages will be determined using LA-ICP-MS. This will give new insight to the Failed Rift Hypothesis.

References: Fenton, M. D., and Faure, G., 1970, Rb-Sr whole rock age determinations of the Iron Hill and McClure Mountains carbonatite alkalic complexes, Colorado: The Mountain Geologist, v. 7, no. 4, pp. 269–275. McMillian, N.J., and McLemore, V. T., 2004, Cambrian–Ordovician magmatism and extension in New Mexico and Colorado: New Mexico Bureau of Geology & Mineral Resources, Bulletin 160, pp. 1-12. Olson, J. C., Marvin, R. F., Parker, R. L., and Mehnert, H. H., 1977, Age and tectonic setting of Lower Paleozoic alkalic and mafic rocks, carbonatites, and thorium veins in south central Colorado: U.S. Geological Society, Journal of Research, v. 5, pp. 673–687.