

Petrology and geochemistry of Precambrian basement rocks in Walsh County, North Dakota

BEAUDRY, Clare¹, HESS, Madelyn¹, PEREIRA, Cristian¹, and SAINI-EIDUKAT, Bernhard^{1,2}

¹*Department of Earth, Environmental and Geospatial Sciences, ²Department of Chemistry and Biochemistry, North Dakota State University, Fargo, ND 58102, USA*

In 1977, thirty-two cores were drilled in eastern North Dakota and western Minnesota along the Red River, for the purpose of evaluating uranium potential (Figure 1). The project was funded by the Department of Energy and overseen by Bendix Corporation. A technical report (Moore, 1978), a M.S. thesis that focused on the weathered horizon at the top of the Precambrian bedrock (Kelley, 1980), and several ILSG abstracts were published.

For this study, three cores from Walsh County, North Dakota were sampled at the North Dakota Geological Survey Drill Core Library (Grand Forks, ND). Samples were taken from RRVD #17, RRVD #18, and RRVD #19A to focus the study to Walsh County, ND. Figure 2 shows the lithology of the three cores and outlines sample locations.

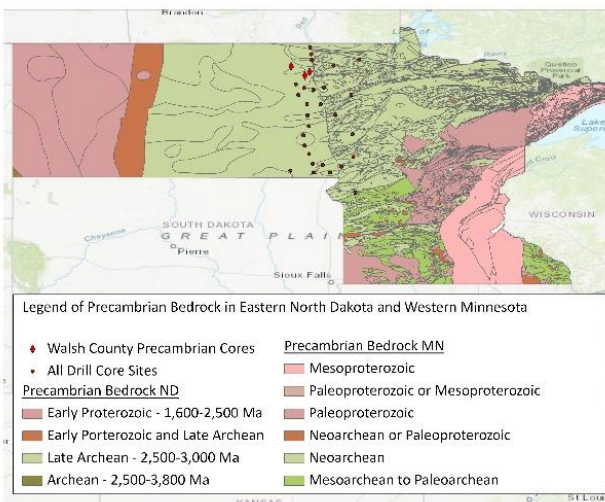


Figure 1: Location map of Eastern North Dakota and Western Minnesota. Era of Precambrian Bedrock is outlined. Red River Valley Drill Cores are outlined.

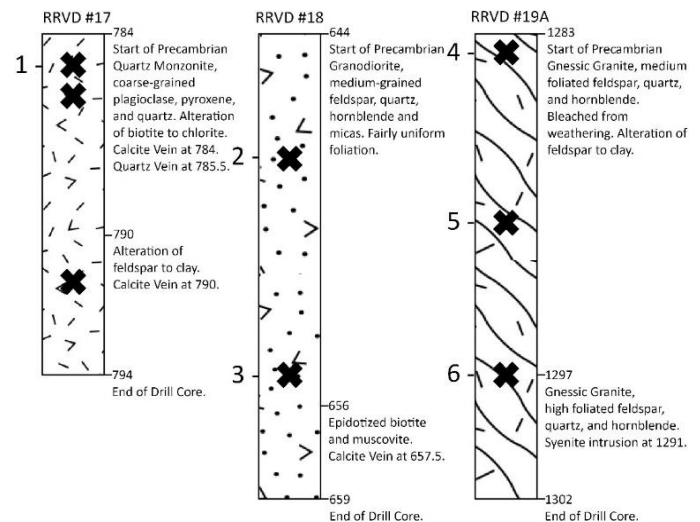


Figure 2: Stratigraphic column of RRVD drill core Precambrian layers. Black Xs indicate sample locations. Numbers to the left correspond to the XRF analysis in Table 1. Data taken from Moore (1979) and optical observations.

Petrography and whole rock geochemical analyses (Table 1) were carried out on Precambrian layers. Precambrian sediments are buried under younger layers in Eastern North Dakota, the sampled areas are underlain by Archean gneiss, (Klasner and King, 1986). RRVD #17 was characterized as quartz monzonite with heavier alterations of biotite and feldspar farther up in the core. The alterations may be due to stronger weathering agents on the paleoweathered horizon. RRVD #18 was characterized as a granodiorite with uniform foliation and mineral percentages throughout the drill core. RRVD #19A was characterized as a gneissic granite with

higher foliation as the sample increases in depth. The top of the cores is bleached, likely an effect of paleoweathering processes. Analyses were plotted on AFM and TAS diagrams (Figure 3).

Table 1: RRVD #17-785, 2: RRVD #18-645.5, 3: RRVD #18-655.5, 4: RRVD #19A-1284.5, 5: #19A-1291, 6: #19A-1296.5. Chemical data from NDSU XRF analysis.

wt%	1	2	3	4	5	6
SiO ₂	59.1	69.2	71	68.2	73.5	73.6
TiO ₂	0.58	0.39	0.32	0.31	0.21	0.22
Al ₂ O ₃	23.6	14.7	13.8	20.4	13.5	13.1
Fe ₂ O ₃	6.77	3.55	3.06	3.53	2.54	2.57
MnO	0.07	0.05	0.04	0.03	0.03	0.03
MgO	2.25	1.19	1.04	0.87	0.44	0.44
CaO	3.44	3.83	3.44	N.D.	3.12	2.8
Na ₂ O	5.32	5.23	5.51	N.D.	4.82	4.32
K ₂ O	1.84	1.46	1.32	6.4	1.36	2.47
P ₂ O ₅	0.20	0.15	0.13	0.07	0.09	0.07
Total	103.1	99.75	99.66	99.81	99.61	99.62

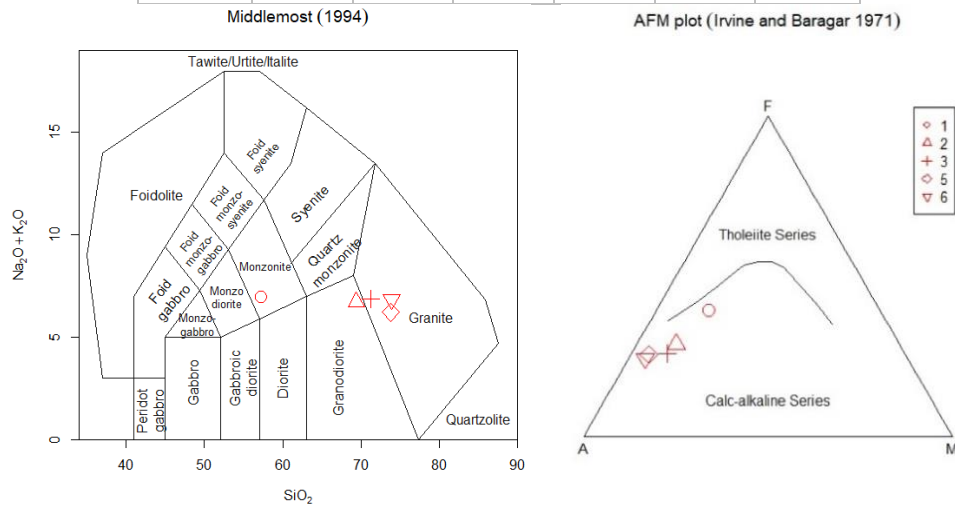


Figure 3: Classification diagrams for measured samples.

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