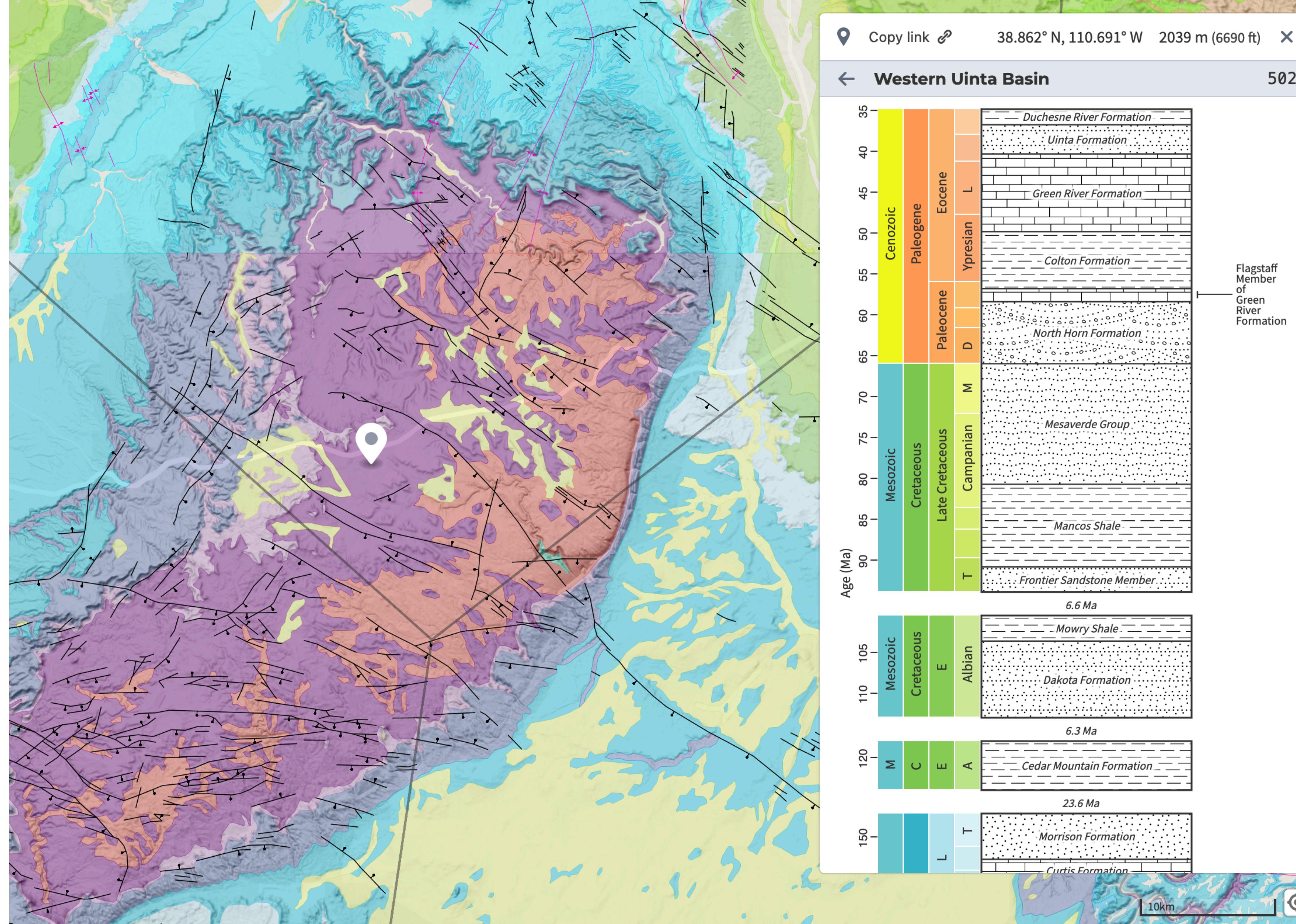


Building a useful (and persistently-identified) digital crust

Daven P. Quinn, UW–Madison Department of Geoscience

MACROSTRAT

A quantitative,
descriptive data
system for
geological
information



Shallow-marine sedimentary rock area through geologic time

LETTER

doi:10.1038/nature10969

Formation of the ‘Great Unconformity’ as a trigger for the Cambrian explosion

Shanan E. Peters¹ & Robert R. Gaines²

The transition between the Proterozoic and Phanerozoic eons, beginning 542 million years (Myr) ago, is distinguished by the diversification of multicellular animals and by their acquisition of mineralized skeletons during the Cambrian period¹. Considerable progress has been made in documenting and more precisely correlating biotic patterns in the Neoproterozoic–Cambrian fossil record with geochemical and physical environmental perturbations^{2–5}, but the mechanisms responsible for those perturbations remain uncertain^{1,2}. Here we use new stratigraphic and geochemical data to show that early Palaeozoic marine sediments deposited approximately 540–480 Myr ago record both an expansion in the area of shallow epicontinental seas and anomalous patterns of chemical sedimentation that are indicative of increased oceanic alkalinity and enhanced chemical weathering of continental crust. These geochemical conditions were caused by a protracted period of widespread

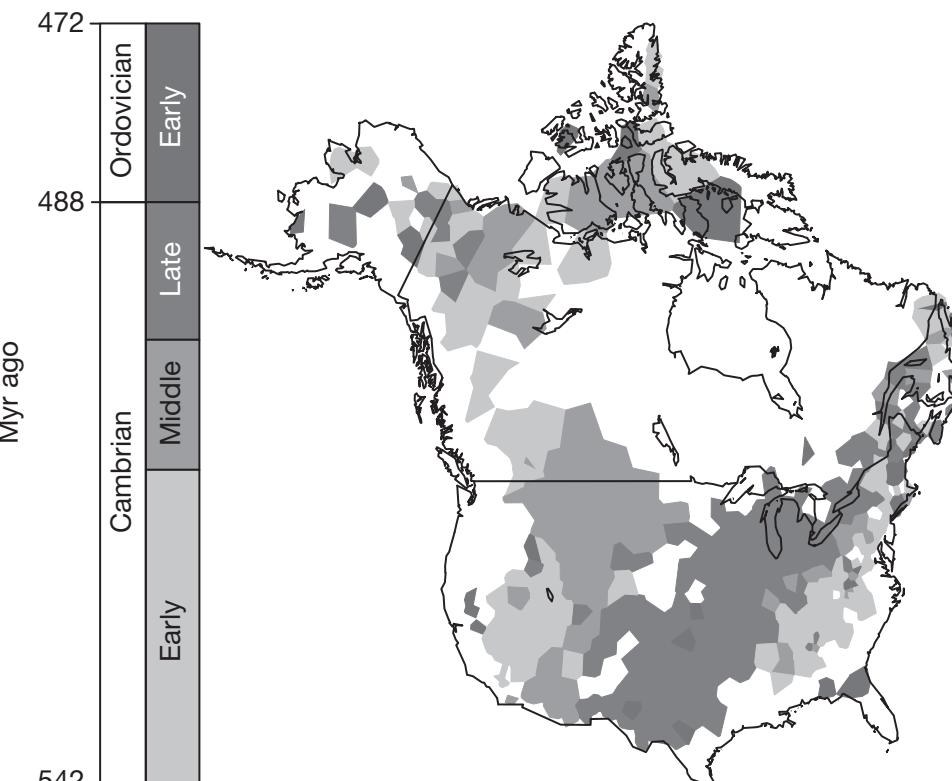
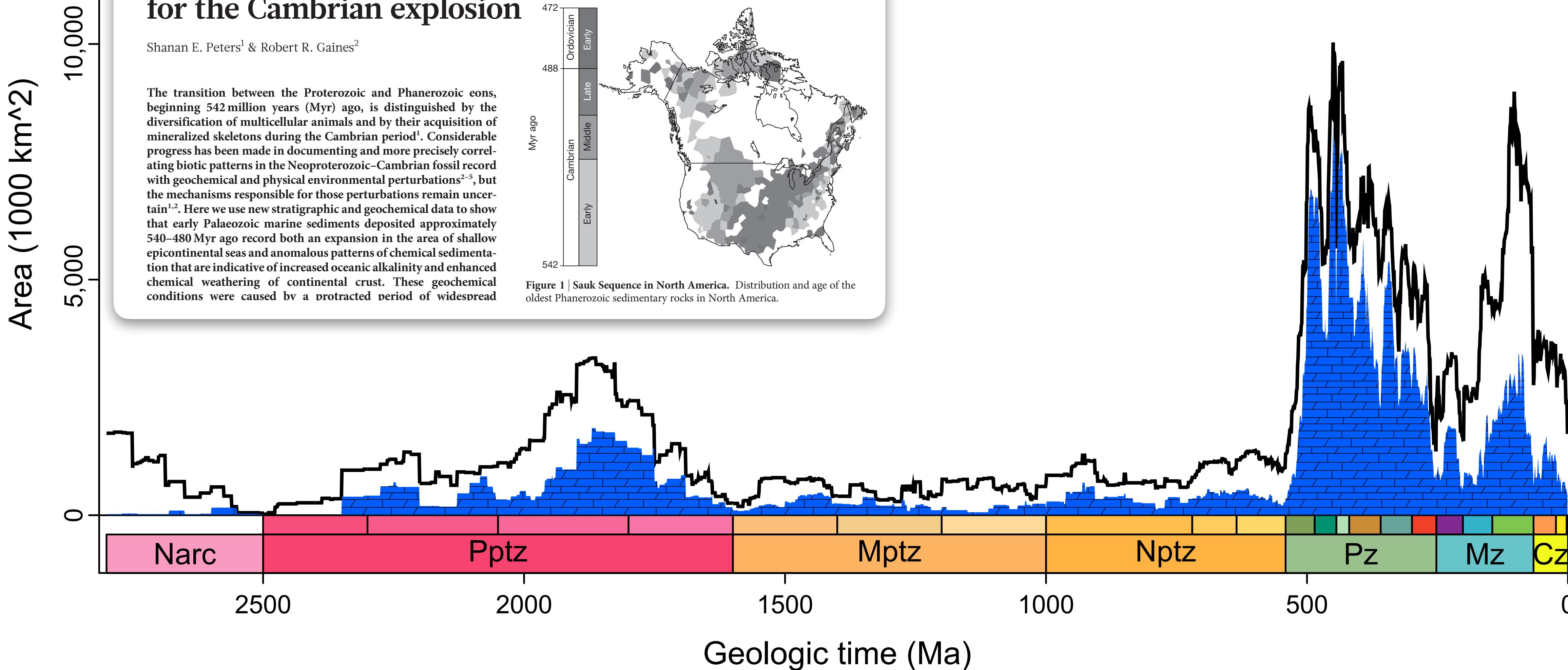
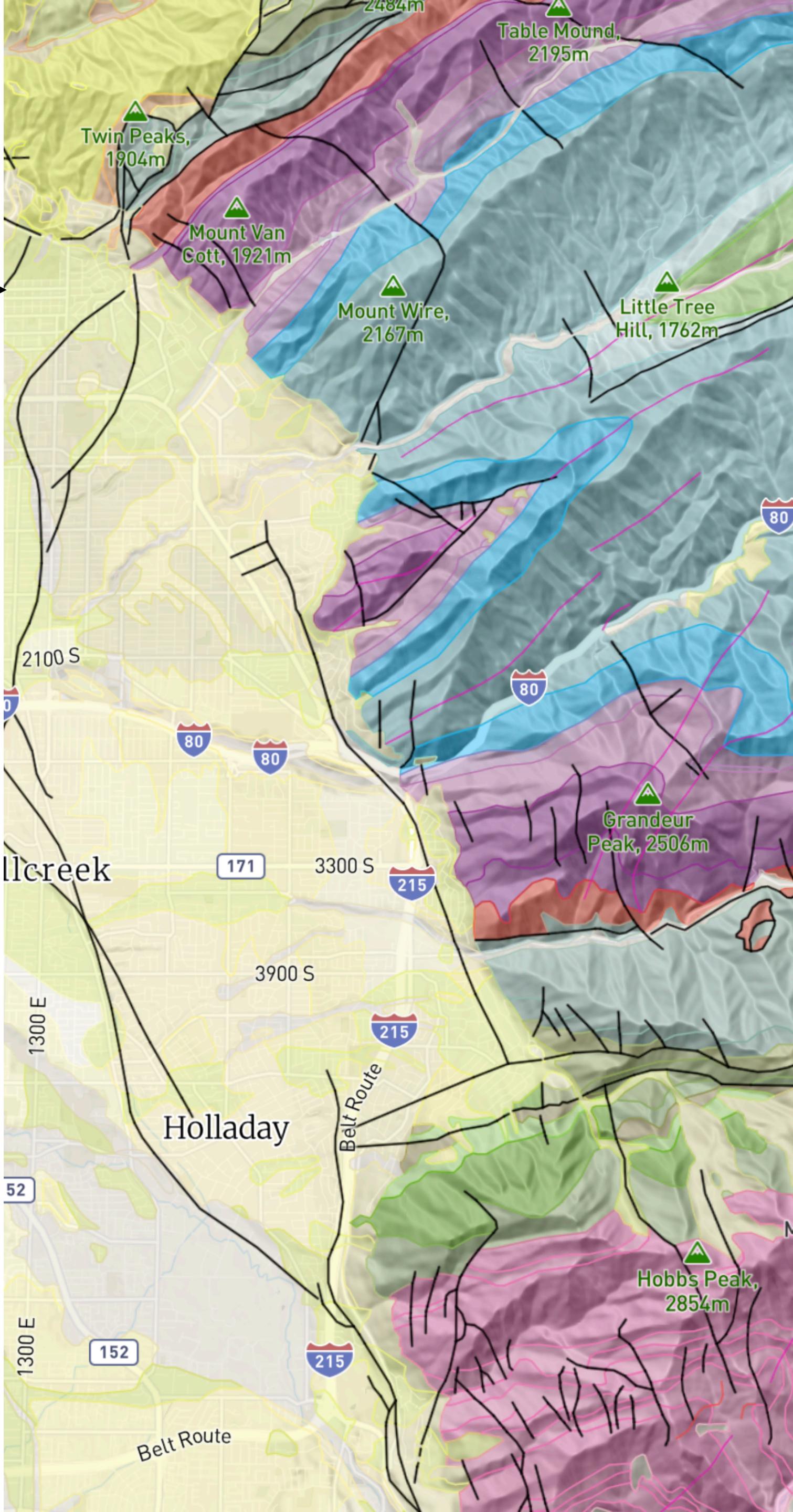
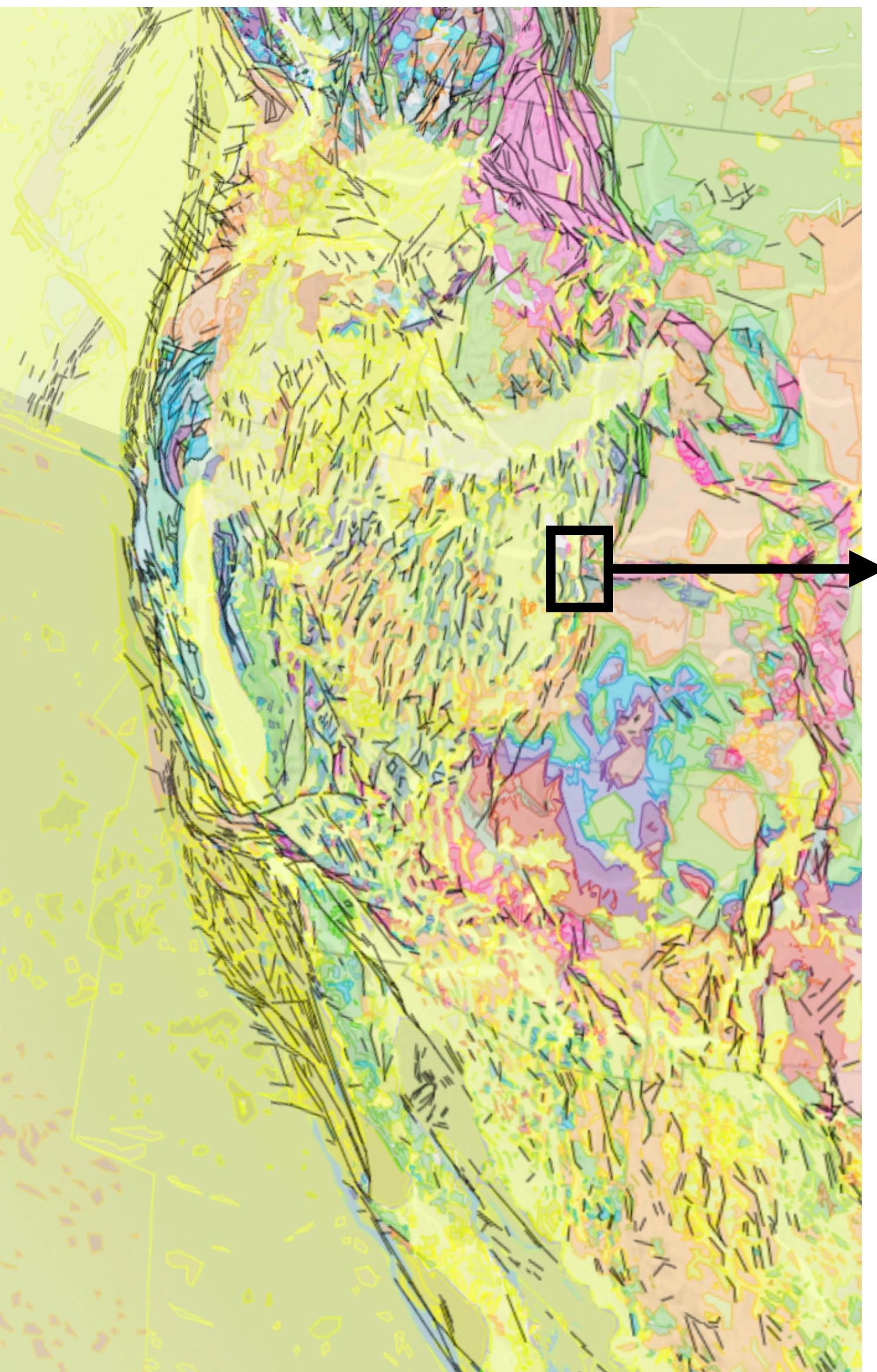


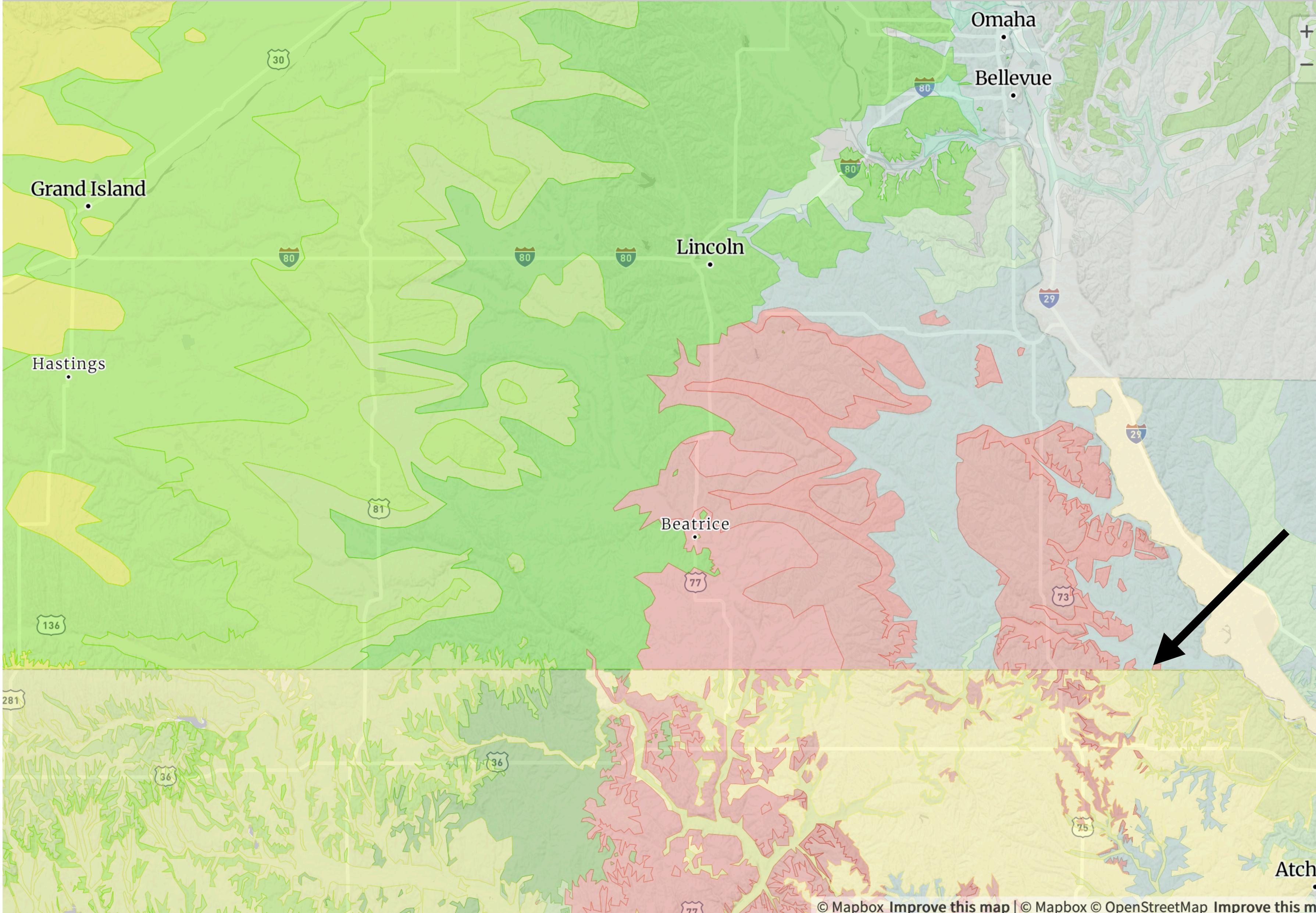
Figure 1 | Sauk Sequence in North America. Distribution and age of the oldest Phanerozoic sedimentary rocks in North America.



MACROSTRAT'S GEOLOGIC MAP



Macrostrat's geologic map punts on hard problems!

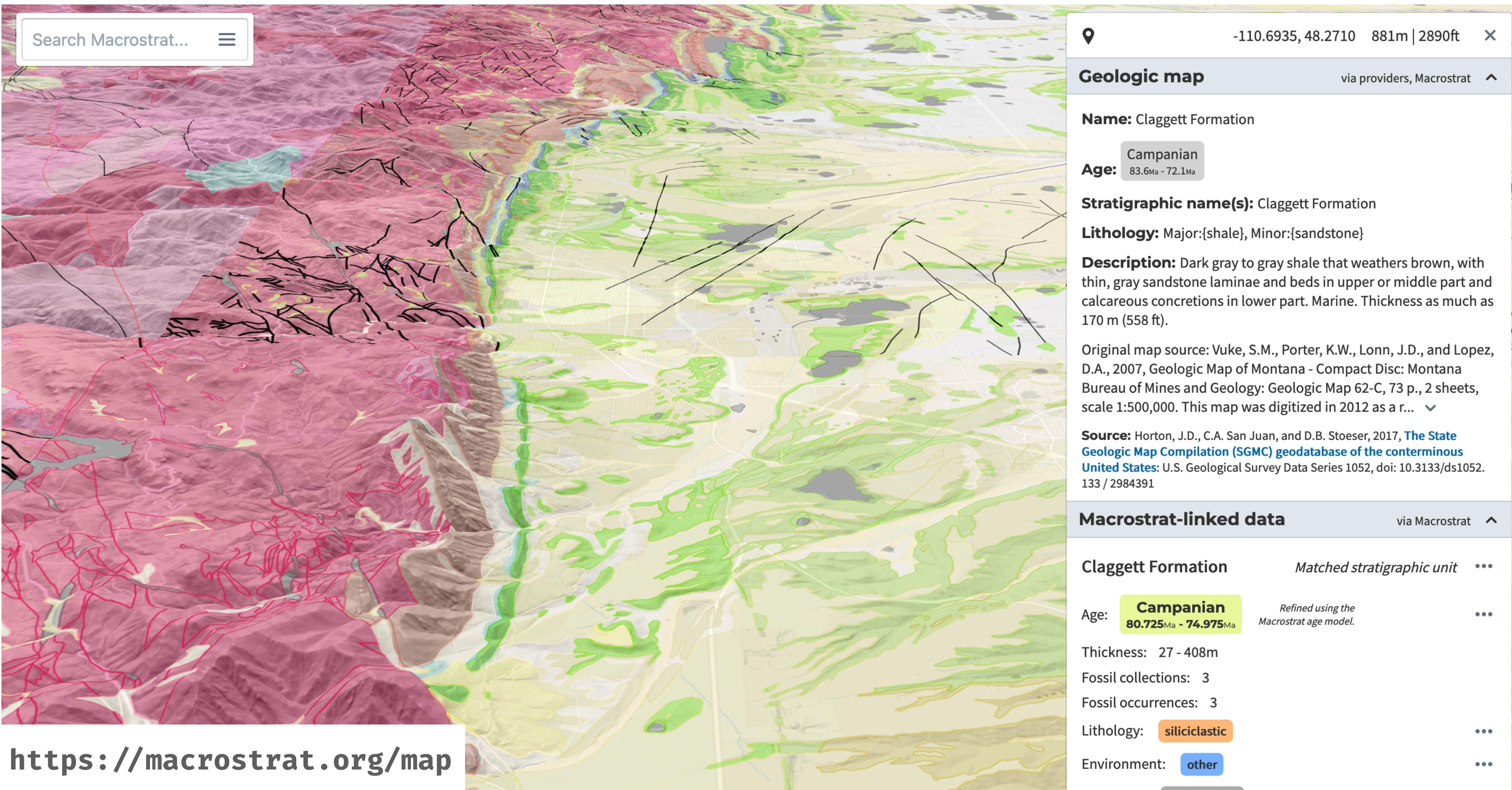


- **NOT seamless map units**
 - Source boundaries are often quite apparent
- Not a single map...a best-effort harmonization across many maps with a variety of core assumptions

This is controversial among data curators!

Macrostrat – A platform for geological exploration

Web interface





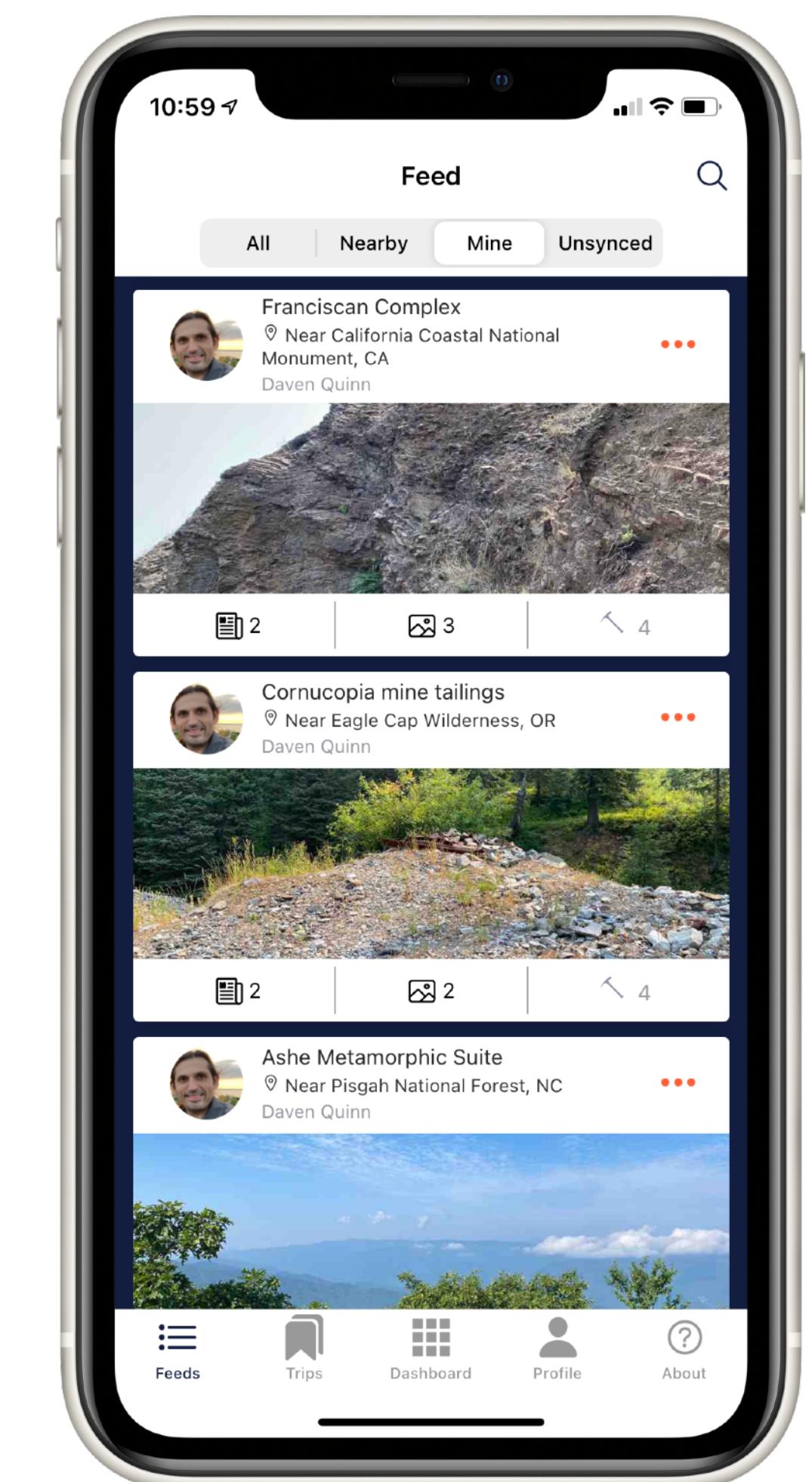
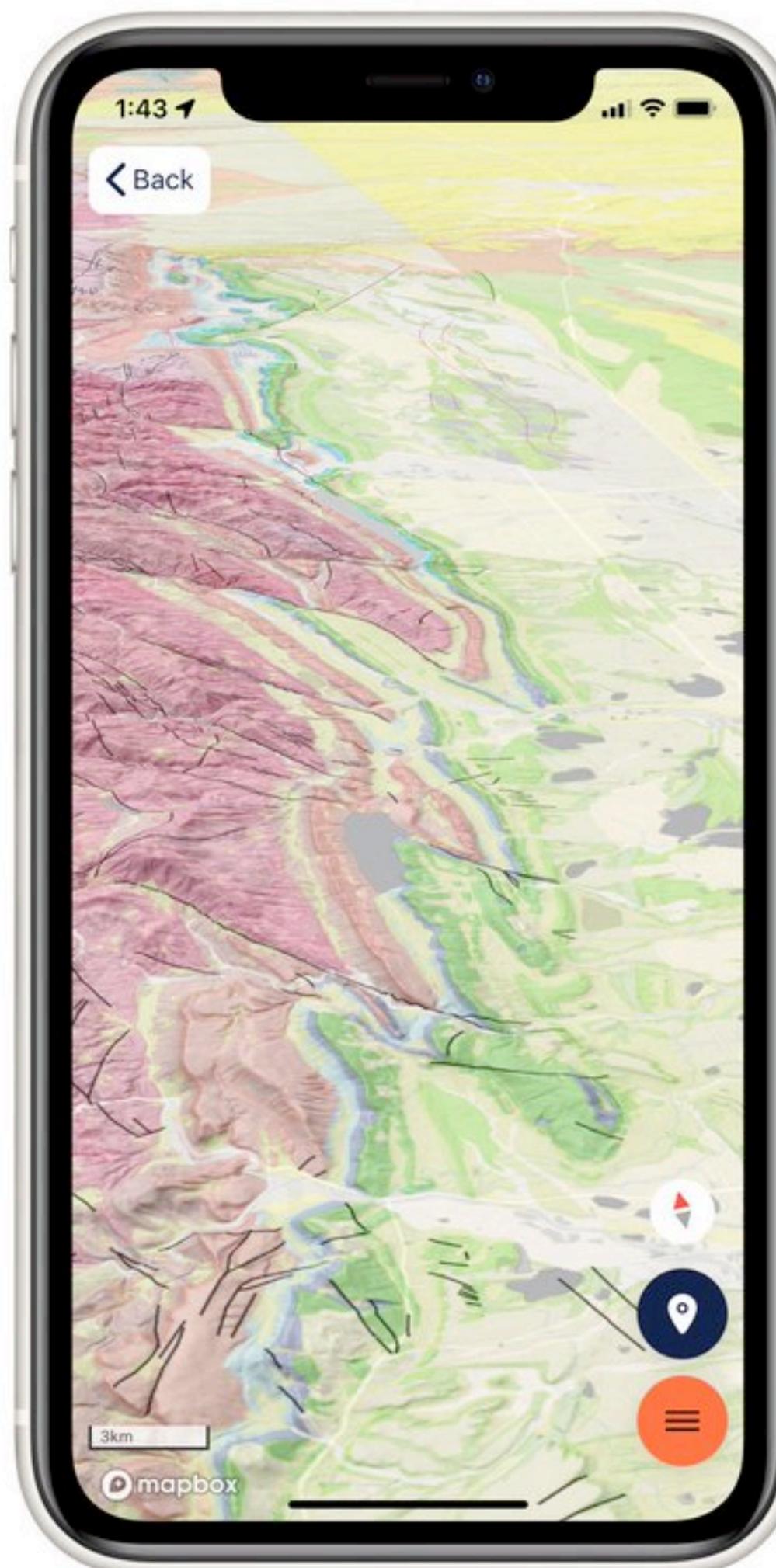
Rockd

<https://rockd.org>

Understand your geological surroundings

Explore Macrostrat's map

View and contribute local observations





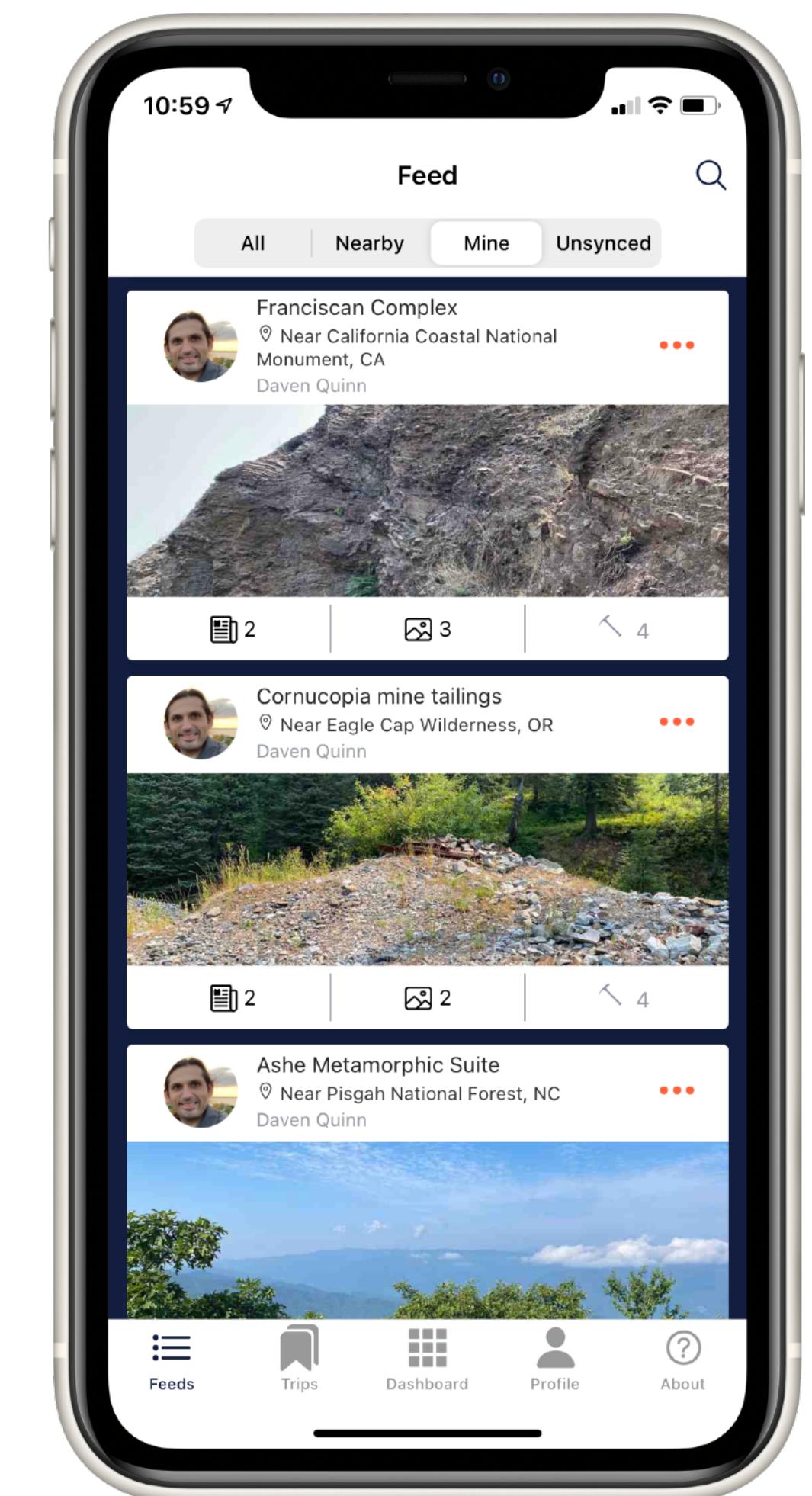
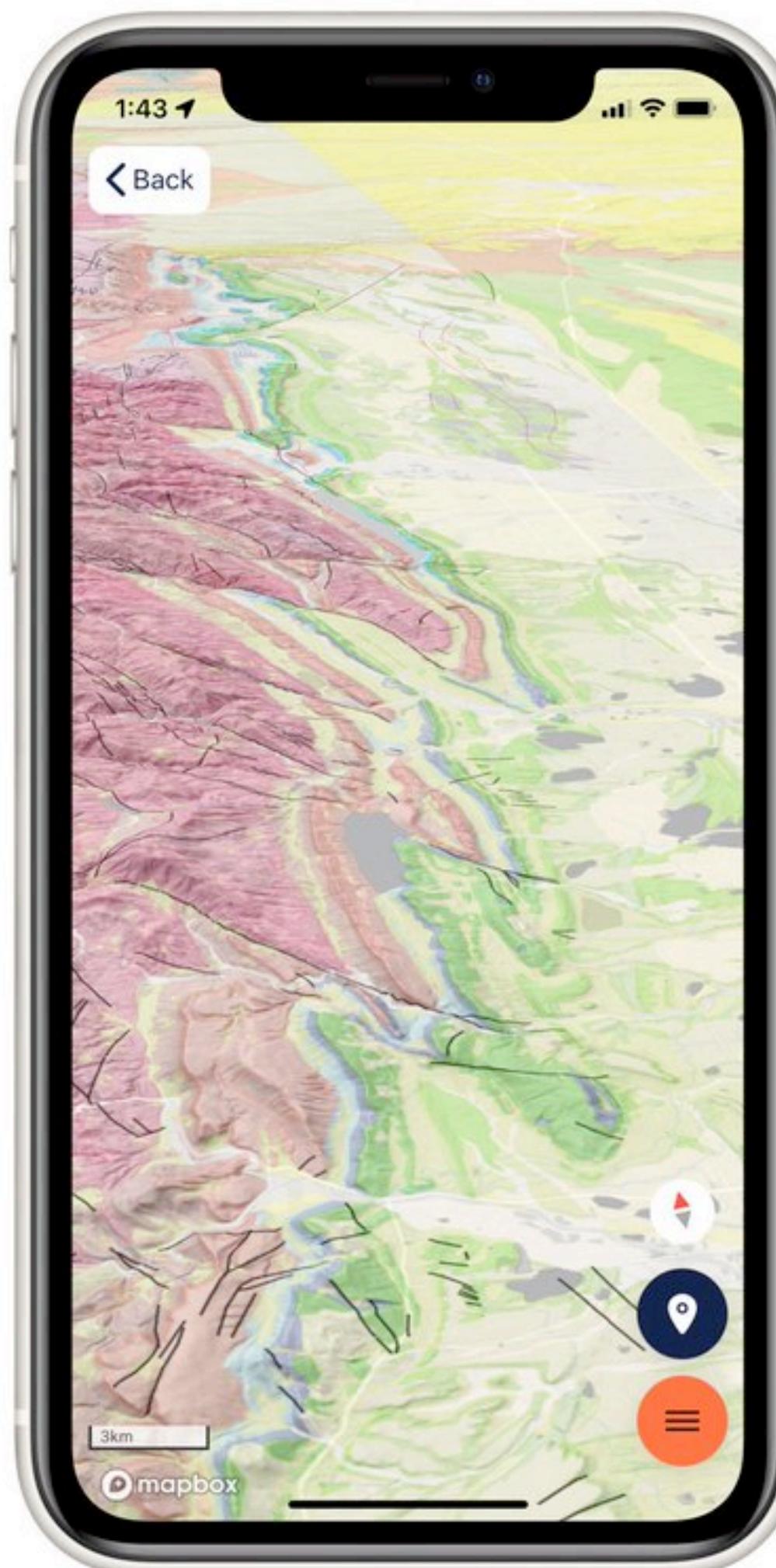
Rockd

<https://rockd.org>

Understand your geological surroundings

Explore Macrostrat's map

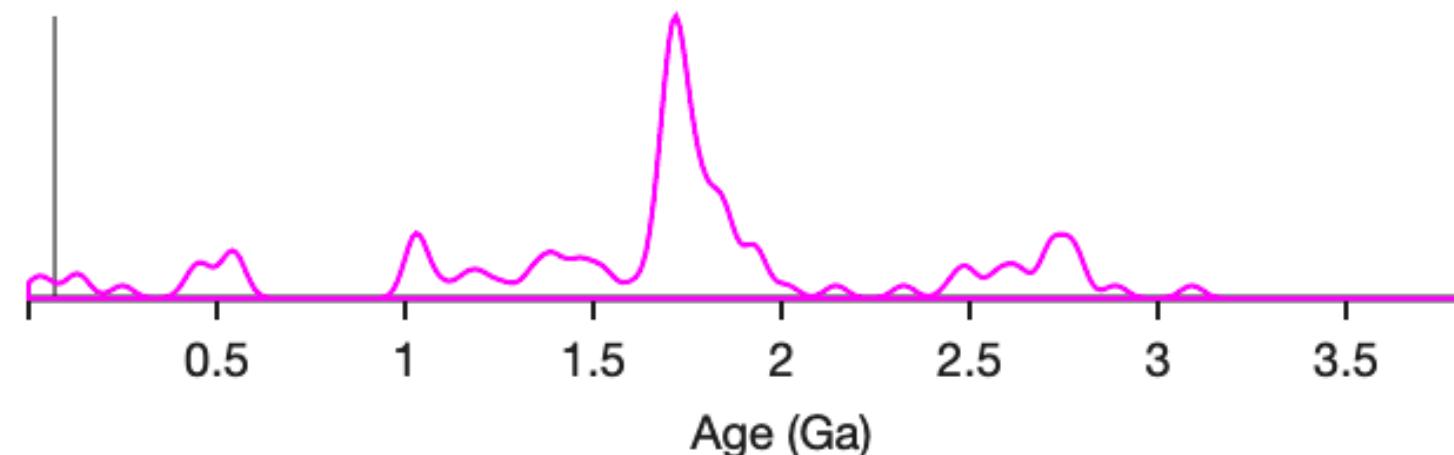
View and contribute local observations



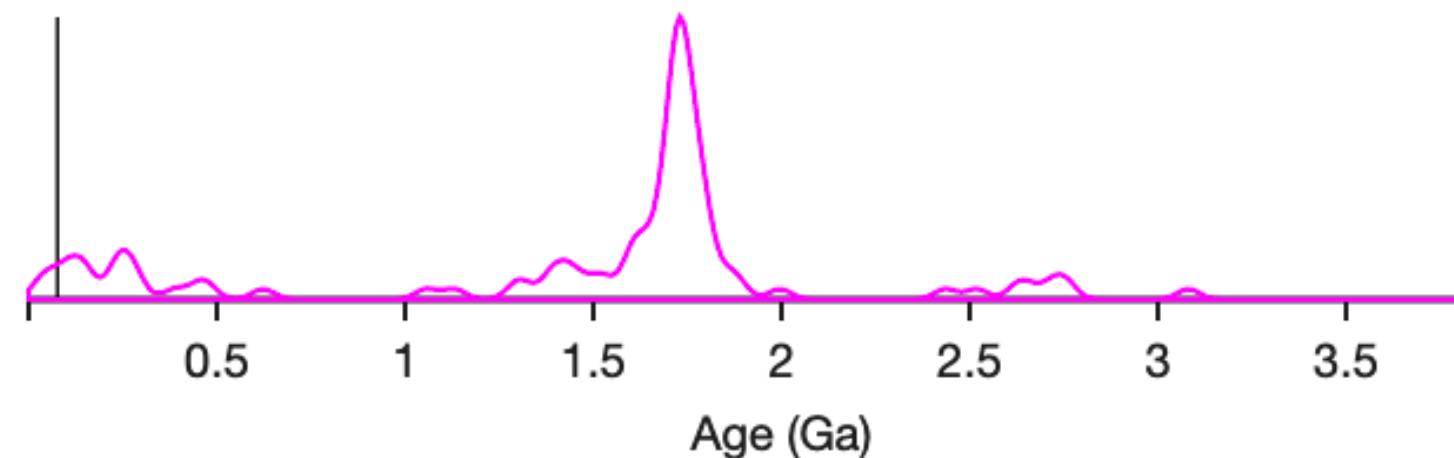
GETTING MORE GEOLOGICAL INFORMATION INTO THIS FRAMEWORK

Detrital-zircon geochronology

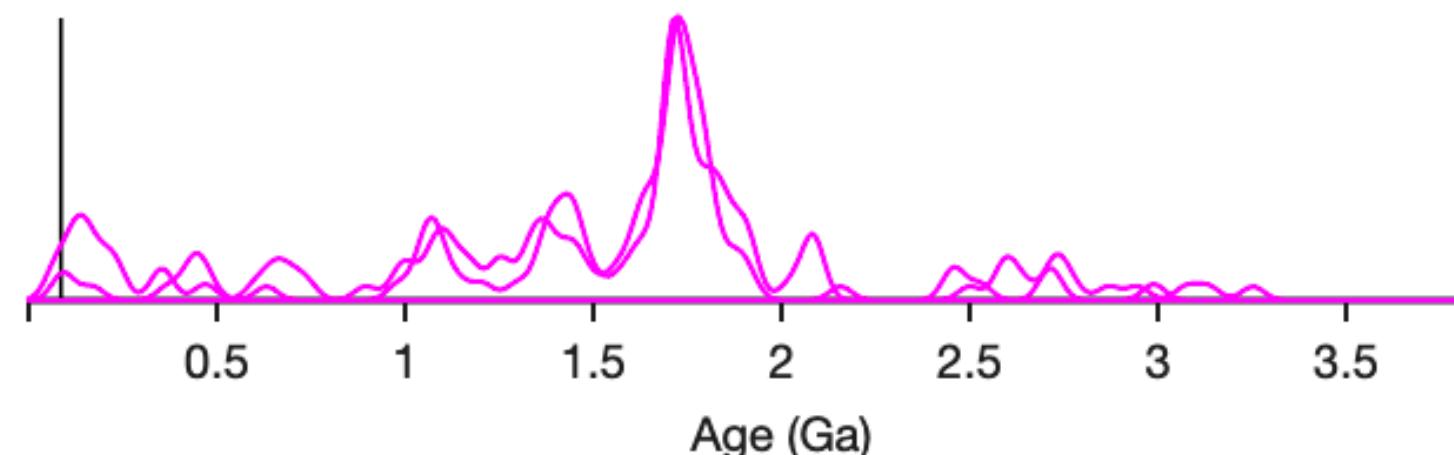
Lance Formation



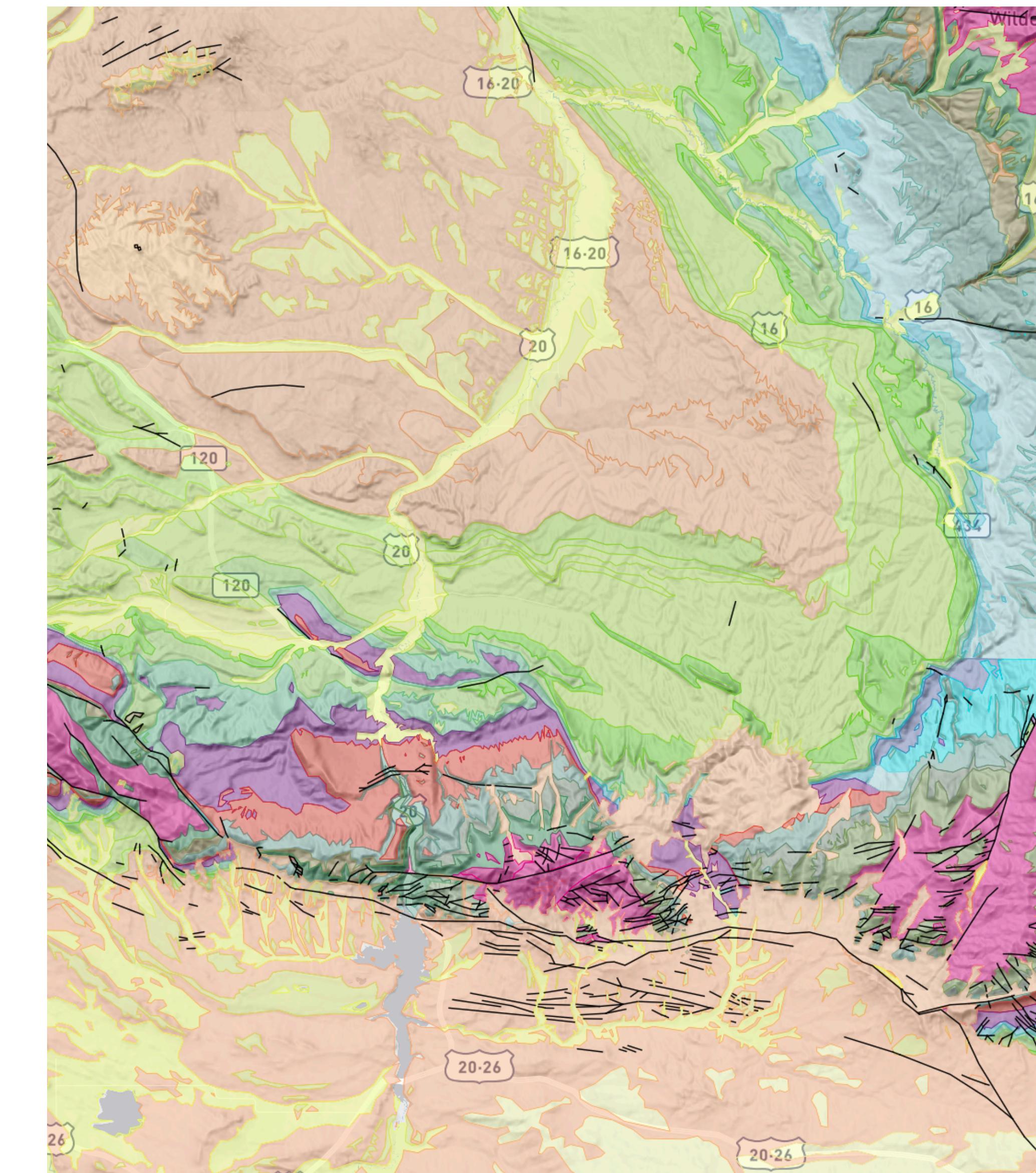
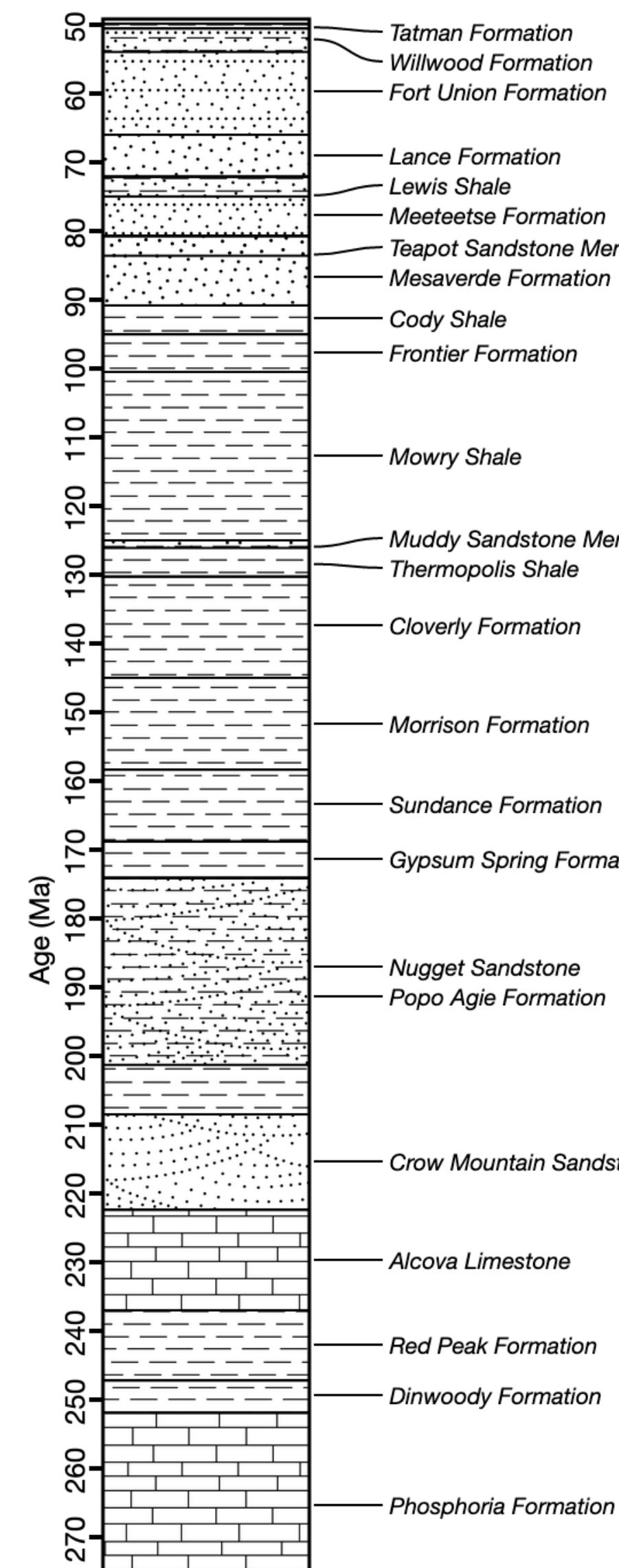
Meeteetse Formation



Mesaverde Formation



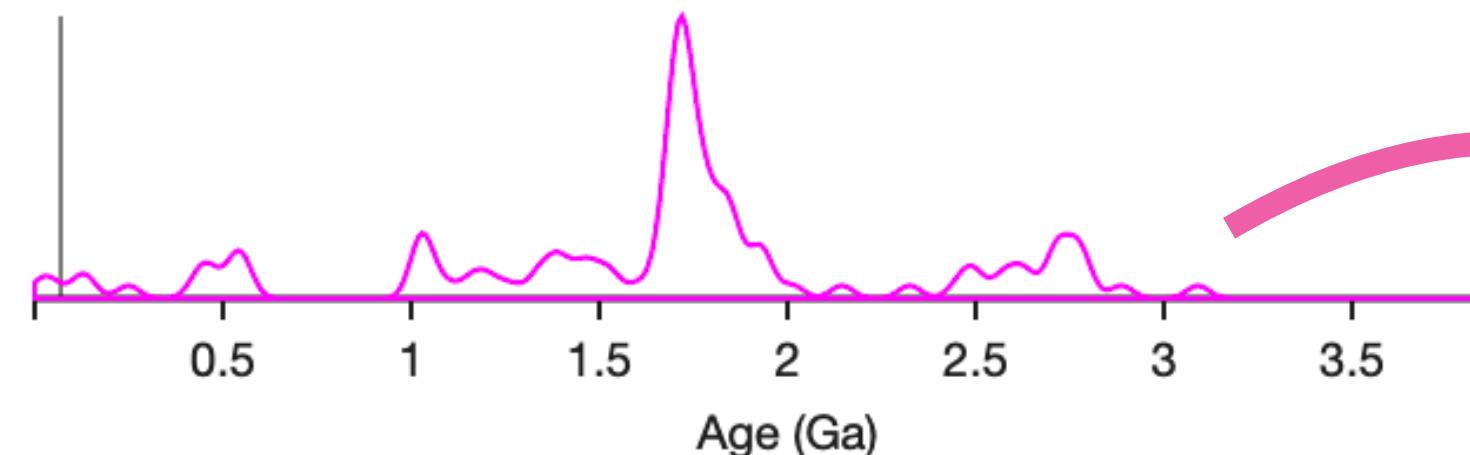
Bighorn Basin



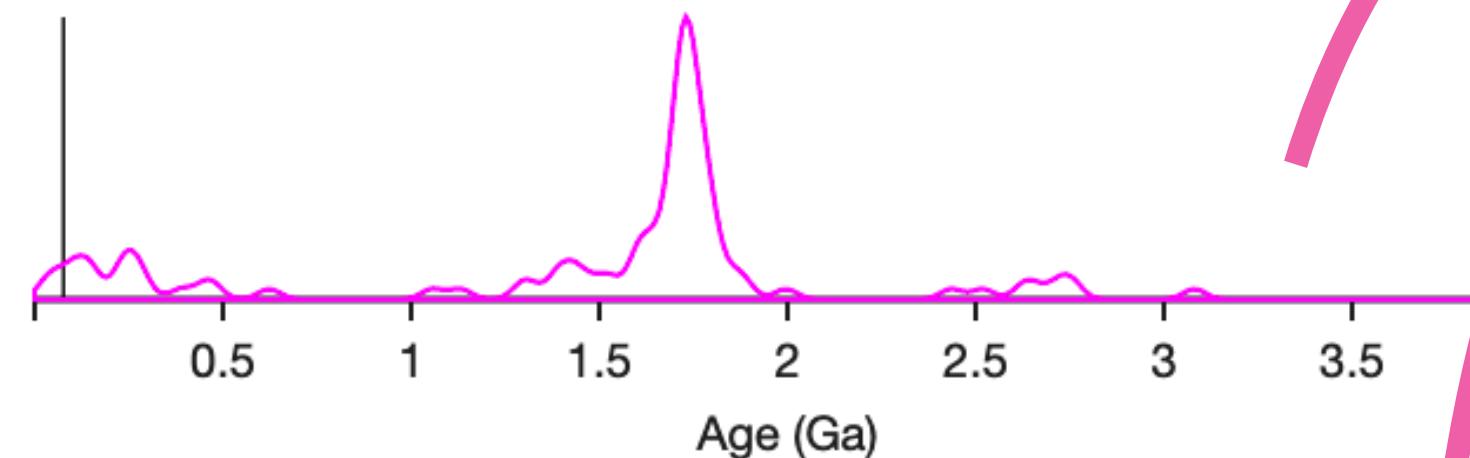
GETTING MORE GEOLOGICAL INFORMATION INTO THIS FRAMEWORK

Detrital-zircon geochronology

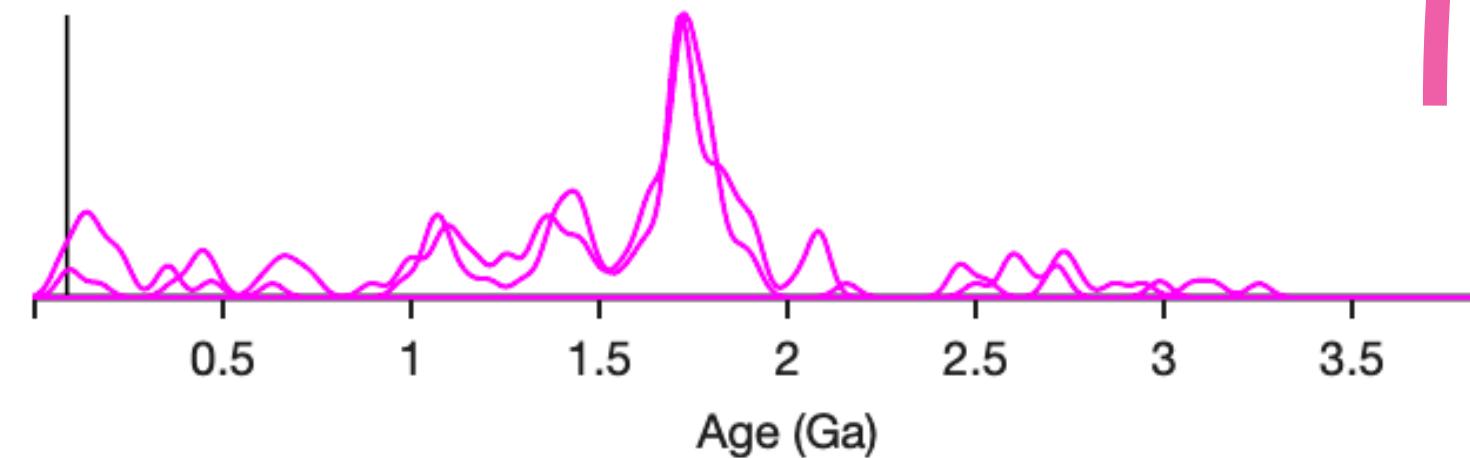
Lance Formation



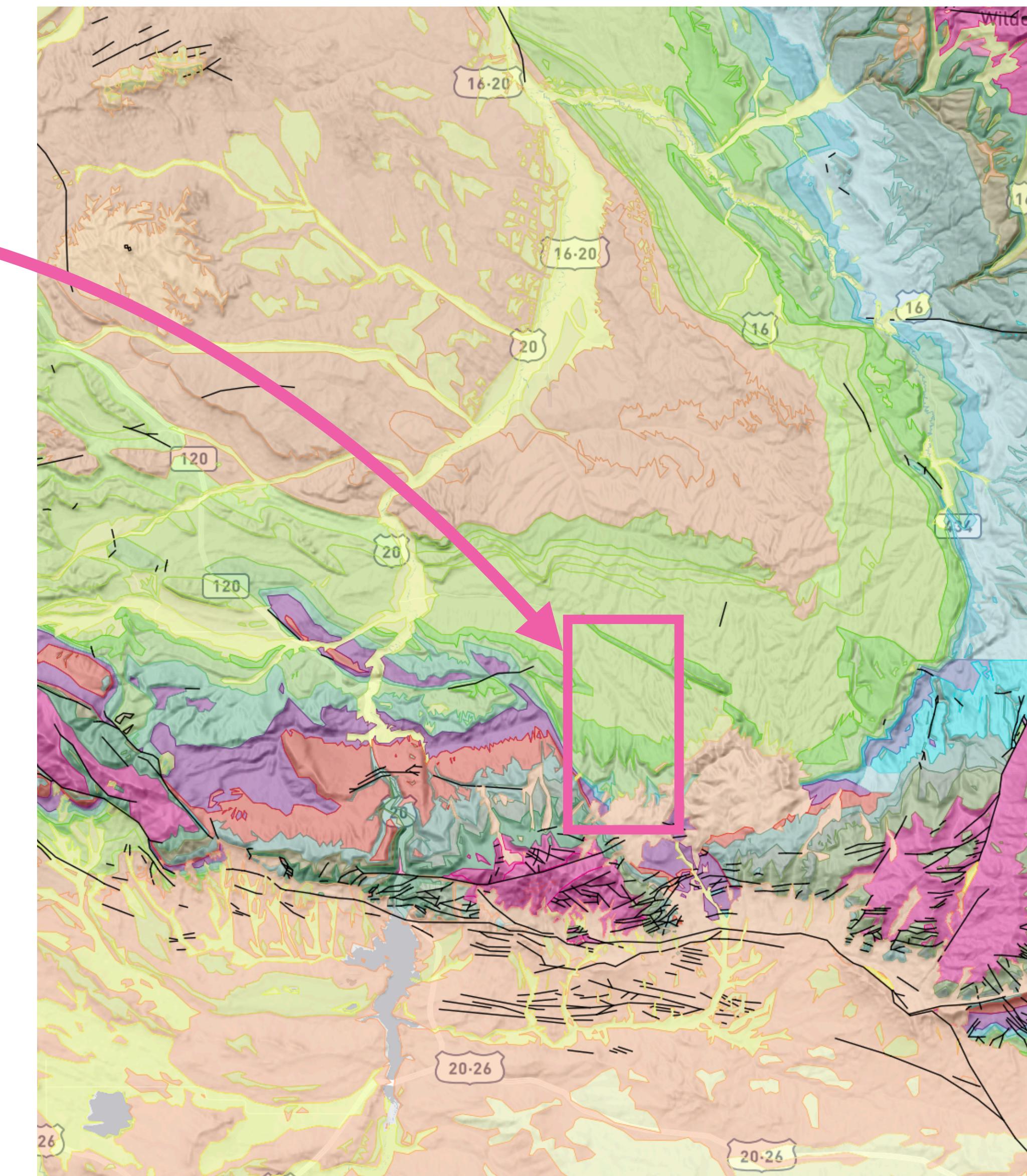
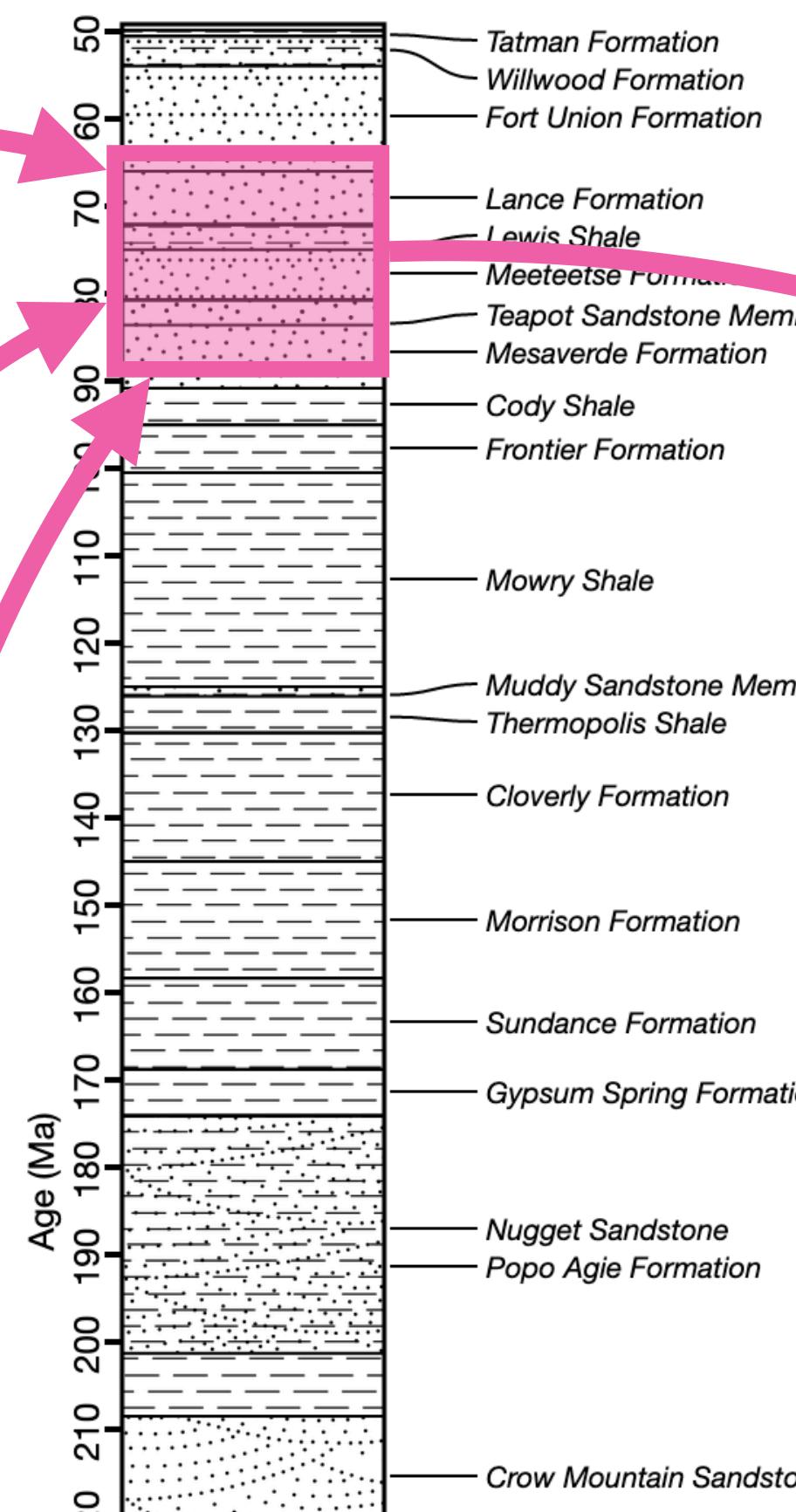
Meeteetse Formation



Mesaverde Formation



Bighorn Basin



- Geologic unit name forms a “primary key” that defines the relationship!
- Of course, labs often don’t track this data 😕

SOLUTION: METADATA TRACKING!

Need for good metadata is recognized in geoscience

USGS has a metadata mandate, supported by workflows, data curation staff, and tools

The screenshot shows the USGS Data Management website. At the top is a search bar with a magnifying glass icon. Below it is a table with columns C, D, E, and F. The table contains data for various elements found in stream sediment samples, including aluminum, calcium, iron, magnesium, phosphorus, titanium, silver, arsenic, barium, beryllium, cadmium, cerium, cobalt, chromium, copper, europium, gallium, lanthanum, lithium, manganese, and molybdenum. Each row includes a detailed description of the sample and its concentration.

Describe (Metadata/Documentation)

By [Data Management](#)

Throughout the data lifecycle process, documentation must be updated to reflect actions taken upon the data. This includes acquisition, processing, and analysis, but may touch upon any stage of the lifecycle. Updated and complete metadata are critical to maintaining data quality.

Exhortative explainer for agency staff

The screenshot shows the Tkme (Tk Metadata Editor) application. It displays a list of metadata entries. One entry is highlighted, showing details about latitude and longitude coordinates of a sample site. A red arrow points from the Tkme window to the right, indicating a connection to the 'Vocabulary management interface' shown below.

Vocabulary management interface

The screenshot shows the FGDC Validation Errors dialog box, which is part of a larger application window titled 'Metadata Wizard - Midway_coastline_N83_WV2_2010/an14_FGDC.xml'. The main window contains tabs for Identification, Data Quality, Spatial, Entity and Attribute, Distribution, and Metadata Reference. The 'Entity and Attribute' tab is active. A validation errors dialog box is open, listing numerous validation errors related to dataset title, author, and access constraints. The errors include issues like empty originator fields and missing enumeration values for certain elements.

Scary (and required) metadata wizard

Academic labs live in a world of Excel

The screenshot shows a Microsoft Excel spreadsheet titled "Data_Reduction_Sheet_repaired". The spreadsheet contains two main sections of data. The first section (rows 1-2) has headers for "try", "Mineral", "Np", "Dim Mass (µg)", "rs (µm)", "4He (nmol/g)", "±", "U (ppm)", "±", "Th (ppm)", "±", "Sm (ppm)", "±", "eU", "4He (ncc)", "±", "Re (%)", "U (ng)", "±", "Th (ng)", "±", "Sm (ng)", "±", "Th/U", and "Raw Date (Ma)". The second section (rows 3-41) contains data entries for each sample, including values for Dim Mass, rs, 4He, U, Th, Sm, eU, 4He, Re, U, Th, Sm, Th/U, and Raw Date. The "Re (%)", "U (ng)", "Th (ng)", and "Sm (ng)" columns contain many "#DIV/0!" errors. The "Th/U" column contains values such as 0.349, 0.364, 0.431, 0.162, 0.516, 0.526, 0.899, 0.507, 0.326, 0.507, 0.503, 0.652, 0.486, 0.436, 0.307, 0.259, 0.259, 0.788, 0.829, 0.554, 0.572, 0.556, 0.402, 0.421, 0.354, 0.354, 0.370, 0.336, 0.336, 0.370, 0.559, 0.625, 0.588, 0.579, 0.624, and 0.541. The "Raw Date (Ma)" column shows dates ranging from 44.52 to 22.06. The bottom of the screen shows several tabs: "ICPMS Data", "Spike Blanks", "Nb Blanks", "Multigrain Worksheet", "Calculations Page", "Alpha Ejection Compiler", "Alpha Ejection Calcs", "Alpha Ejection Constants", "Complete Summary Table", and a "+" button.

try	Mineral	Np	Dim Mass (µg)	rs (µm)	4He (nmol/g)	±	U (ppm)	±	Th (ppm)	±	Sm (ppm)	±	eU	4He (ncc)	±	Re (%)	U (ng)	±	Th (ng)	±	Sm (ng)	±	Th/U	Raw Date (Ma)	
1	try	Mineral	Np	Dim Mass (µg)	rs (µm)	4He (nmol/g)	±	U (ppm)	±	Th (ppm)	±	Sm (ppm)	±	eU	4He (ncc)	±	Re (%)	U (ng)	±	Th (ng)	±	Sm (ng)	±	Th/U	Raw Date (Ma)
2																									
3	z	1	0.93	31.87	40.559	0.194	155.64	1.87	54.28	1.19	0.00	#DIV/0!	168.4	0.849	0.004	100.0	0.1454	0.002	0.0507	0.001	0.000	0.000	0.349	44.52	
4	z	2	2.56	42.38	138.777	0.411	281.86	5.16	102.73	1.47	0.00	#DIV/0!	306.0	7.967	0.024	100.0	0.7219	0.013	0.2631	0.004	0.000	0.000	0.364	83.53	
5	z	2	4.80	55.11	205.913	0.599	452.70	7.12	195.01	2.25	0.00	#DIV/0!	498.5	22.152	0.064	100.0	2.1728	0.034	0.9360	0.011	0.000	0.000	0.431	76.12	
6	z	2	4.12	49.31	899.300	2.531	5223.55	84.02	846.04	10.48	0.00	#DIV/0!	5422.4	82.973	0.234	100.0	21.5022	0.346	3.4827	0.043	0.000	0.000	0.162	30.70	
7	z	2	3.97	50.28	103.972	0.305	305.57	6.53	157.54	3.88	0.00	#DIV/0!	342.6	9.262	0.027	100.0	1.2145	0.026	0.6261	0.015	0.000	0.000	0.516	56.02	
8	z	2	2.80	44.99	219.658	0.627	491.14	8.68	441.54	8.65	0.00	#DIV/0!	594.9	13.796	0.039	100.0	1.3762	0.024	1.2373	0.024	0.000	0.000	0.899	68.06	
9	z	2	4.47	44.66	136.464	0.401	384.74	6.23	202.19	5.45	0.00	#DIV/0!	432.3	13.676	0.040	100.0	1.7203	0.028	0.9040	0.024	0.000	0.000	0.526	58.27	
10	z	2	2.24	33.49	75.761	0.233	190.59	2.96	204.57	5.51	0.00	#DIV/0!	238.7	3.807	0.012	100.0	0.4273	0.007	0.4587	0.012	0.000	0.000	1.073	58.55	
11	z	2	2.69	39.47	109.186	0.350	334.90	5.97	122.65	1.25	0.00	#DIV/0!	363.7	6.573	0.021	100.0	0.8995	0.016	0.3294	0.003	0.000	0.000	0.366	55.43	
12	z	2	6.57	54.07	275.177	0.780	644.88	8.74	210.52	2.38	0.00	#DIV/0!	694.3	40.509	0.115	100.0	4.2355	0.057	1.3827	0.016	0.000	0.000	0.326	73.07	
13	z	2	5.38	64.13	85.671	0.250	215.25	4.45	109.17	1.52	0.00	#DIV/0!	240.9	10.339	0.030	100.0	1.1589	0.024	0.5878	0.008	0.000	0.000	0.507	65.59	
14	z	2	5.26	52.62	33.436	0.125	73.13	1.30	36.78	0.62	0.00	#DIV/0!	81.8	3.940	0.015	100.0	0.3844	0.007	0.1934	0.003	0.000	0.000	0.503	75.36	
15	z	0	50.44	134.99	6.811	0.028	12.69	0.24	8.27	0.15	0.00	#DIV/0!	14.6	7.700	0.032	100.0	0.6403	0.012	0.4172	0.008	0.000	0.000	0.652	85.66	
16	z	0	45.01	124.68	16.438	0.058	27.34	0.50	40.64	0.65	0.00	#DIV/0!	36.9	16.584	0.058	99.6	1.2307	0.023	1.8292	0.029	0.000	0.000	1.486	82.00	
17	z	0	83.41	152.20	12.787	0.031	25.71	0.56	11.21	0.15	0.00	#DIV/0!	28.3	23.907	0.058	100.0	2.1445	0.046	0.9354	0.013	0.000	0.000	0.436	83.09	
18	z	0	3.13	50.94	43.511	0.271	101.75	3.08	31.21	0.70	0.00	#DIV/0!	109.1	3.051	0.019	100.0	0.3184	0.010	0.0977	0.002	0.000	0.000	0.307	73.54	
19	z	1	2.50	47.43	0.020	0.010	0.00	#DIV/0!	1.31	0.03	0.00	#DIV/0!	0.3	0.001	0.001	75.3	0.0000	0.000	0.0033	0.000	0.000	0.000	#DIV/0!	12.23	
20	z	1	1.35	37.94	0.046	0.017	0.00	#DIV/0!	5.01	0.21	0.00	#DIV/0!	1.2	0.001	0.001	27.5	0.0000	0.000	0.0068	0.000	0.000	0.000	#DIV/0!	7.18	
21	z	0	3.34	47.32	24.439	0.093	71.81	2.00	18.59	0.25	0.00	#DIV/0!	76.2	1.829	0.007	100.0	0.2398	0.007	0.0621	0.001	0.000	0.000	0.259	59.23	
22	z	0	5.81	62.85	0.009	0.003	0.00	#DIV/0!	0.91	0.03	0.00	#DIV/0!	0.2	0.001	0.000	74.6	0.0000	0.000	0.0053	0.000	0.000	0.000	#DIV/0!	7.39	
23	z	0	2.34	48.52	46.766	0.235	130.03	1.74	102.50	2.69	0.00	#DIV/0!	154.1	2.457	0.012	100.0	0.3048	0.004	0.2403	0.006	0.000	0.000	0.788	56.00	
24	z	0	14.86	87.73	18.156	0.075	28.79	0.77	23.87	0.57	0.00	#DIV/0!	34.4	6.047	0.025	100.0	0.4278	0.011	0.3547	0.008	0.000	0.000	0.829	97.06	
25	z	2	14.38	74.24	216.536	1.055	337.90	3.79	187.07	2.57	0.00	#DIV/0!	381.9	69.788	0.340	100.0	4.8588	0.055	2.6900	0.037	0.000	0.000	0.554	104.24	
26	z	2	14.09	70.48	143.113	0.679	200.18	2.00	114.60	1.02	0.00	#DIV/0!	227.1	45.206	0.215	100.0	2.8211	0.028	1.6150	0.014	0.000	0.000	0.572	115.72	
27	z	2	9.65	64.80	178.421	0.728	274.80	4.78	152.76	2.11	0.00	#DIV/0!	310.7	38.579	0.157	99.8	2.6509	0.046	1.4736	0.020	0.000	0.000	0.556	105.55	
28	z	2	9.07	64.27	238.133	0.783	444.08	5.44	178.36	2.49	0.00	#DIV/0!	486.0	48.424	0.159	100.0	4.0289</								

Academic labs live in a world of Excel

The screenshot shows a Microsoft Excel spreadsheet titled "Data_Reduction_Sheet_repaired". The spreadsheet contains several tabs at the bottom: "ICPMS Data", "Spike Blanks" (highlighted in red), "Nb Blanks", "Multigrain Worksheet", "Calculations Page", "Alpha Ejection Compiler", "Alpha Ejection Calcs", "Alpha Ejection Constants" (highlighted in green), and "Complete Summary Table". The main content area displays a large table with columns for various mineralogical and analytical parameters. A formula in cell C4 is shown as '=Picking Information!H9'. The table includes rows for "try" and "Mineral" headers, followed by numerous data entries. The Excel ribbon is visible at the top, showing the "Home" tab is selected.

try	Mineral	Np	Dim Mass (µg)	rs (µm)	4He (nmol/g)	±	U (ppm)	±	Th (ppm)	±	Sm (ppm)	±	eU	4He (ncc)	±	Re (%)	U (ng)	±	Th (ng)	±	Sm (ng)	±	Th/U	Raw Date (Ma)
try	Mineral	Np	Dim Mass (µg)	rs (µm)	4He (nmol/g)	±	U (ppm)	±	Th (ppm)	±	Sm (ppm)	±	eU	4He (ncc)	±	Re (%)	U (ng)	±	Th (ng)	±	Sm (ng)	±	Th/U	Raw Date (Ma)
z	1	0.93	31.87	40.559	0.194	155.64	1.87	54.28	1.19	0.00	#DIV/0!	168.4	0.849	0.004	100.0	0.1454	0.002	0.0507	0.001	0.000	0.000	0.349	44.52	
z	1	2.50	47.43	0.020	0.010	0.00	#DIV/0!	1.31	0.03	0.00	#DIV/0!	0.3	0.001	0.001	75.3	0.0000	0.000	0.0033	0.000	0.000	0.000	#DIV/0!	12.23	
z	1	1.35	37.94	0.046	0.017	0.00	#DIV/0!	5.01	0.21	0.00	#DIV/0!	1.2	0.001	0.001	27.5	0.0000	0.000	0.0068	0.000	0.000	0.000	#DIV/0!	7.18	
z	0	3.34	47.32	24.439	0.093	71.81	2.00	18.59	0.25	0.00	#DIV/0!	76.2	1.829	0.007	100.0	0.2398	0.007	0.0621	0.001	0.000	0.000	0.259	59.23	
z	0	5.81	62.85	0.009	0.003	0.00	#DIV/0!	0.91	0.03	0.00	#DIV/0!	0.2	0.001	0.000	74.6	0.0000	0.000	0.0053	0.000	0.000	0.000	#DIV/0!	7.39	
z	0	2.34	48.52	46.766	0.235	130.03	1.74	102.50	2.69	0.00	#DIV/0!	154.1	2.457	0.012	100.0	0.3048	0.004	0.2403	0.006	0.000	0.000	0.788	56.00	
z	0	14.86	87.73	18.156	0.075	28.79	0.77	23.87	0.57	0.00	#DIV/0!	34.4	6.047	0.025	100.0	0.4278	0.011	0.3547	0.008	0.000	0.000	0.829	97.06	
z	2	14.38	74.24	216.536	1.055	337.90	3.79	187.07	2.57	0.00	#DIV/0!	381.9	69.788	0.340	100.0	4.8588	0.055	2.6900	0.037	0.000	0.000	0.554	104.24	
z	2	14.09	70.48	143.113	0.679	200.18	2.00	114.60	1.02	0.00	#DIV/0!	227.1	45.206	0.215	100.0	2.8211	0.028	1.6150	0.014	0.000	0.000	0.572	115.72	
z	2	9.65	64.80	178.421	0.728	274.80	4.78	152.76	2.11	0.00	#DIV/0!	310.7	38.579	0.157	99.8	2.6509	0.046	1.4736	0.020	0.000	0.000	0.556	105.55	
z	2	9.07	64.27	238.133	0.783	444.08	5.44	178.36	2.49	0.00	#DIV/0!	486.0	48.424	0.159	100.0	4.0289	0.049	1.6182	0.023	0.000	0.000	0.402	90.19	
z	2	13.67	73.23	219.312	0.578	381.45	5.50	160.74	2.05	0.00	#DIV/0!	419.2	67.186	0.177	100.0	5.2136	0.075	2.1970	0.028	0.000	0.000	0.421	96.24	
z	2	3.66	47.11	0.054	0.003	1.08	0.14	0.00	#DIV/0!	0.00	#DIV/0!	1.1	0.004	0.000	53.2	0.0040	0.000	0.0000	0.000	0.000	0.000	0.927		
z	2	4.17	49.82	844.329	4.532	1638.61	44.87	580.49	12.17	0.00	#DIV/0!	1775.0	78.983	0.424	99.7	6.8389	0.187	2.4228	0.051	0.000	0.000	0.354	87.58	
z	2	400.95	212.48	2.629	0.003	0.0416	0.0030	0.5512	0.0115	0.0000	#DIV/0!	0.1711	23.627	0.026	21.0	0.0167	0.001	0.2210	0.005	0.000	0.000	13.260	2542.80	
z	2	261.86	222.52	2.749	0.000	0.1212	0.0052	0.0448	0.0018	0.0000	#DIV/0!	0.1317	16.134	0.002	2.9	0.0317	0.001	0.0117	0.000	0.000	0.000	0.370	2952.29	
z	0	59.70	143.44	5.279	0.020	13.52	0.20	4.55	0.15	0.00	#DIV/0!	14.6	7.064	0.027	100.0	0.8072	0.012	0.2714	0.009	0.000	0.000	0.336	66.75	
z	1	1.21	37.32	0.030	0.022	0.00	#DIV/0!	0.00	#DIV/0!	0.00	#DIV/0!	0.0	0.001	0.001	88.9	0.0000	0.000	0.0000	0.000	0.000	0.000	#DIV/0!	#DIV/0!	
z	2	8.58	66.01	96.771	0.515	665.51	7.52	371.85	10.09	0.00	#DIV/0!	752.9	18.619	0.099	99.9	5.7127	0.065	3.1919	0.087	0.000	0.000	0.559	23.79	
z	2	4.80	50.88	66.388	0.259	449.99	9.75	281.34	3.24	0.00	#DIV/0!	516.1	7.138	0.028	100.0	2.1586	0.047	1.3496	0.016	0.000	0.000	0.625	23.81	
z	2	14.03	75.23	36.573	0.184	249.26	3.95	146.62	1.94	0.00	#DIV/0!	283.7	11.504	0.058	100.0	3.4980	0.055	2.0576	0.027	0.000	0.000	0.588	23.86	
z	2	9.88	67.18	41.483	0.125	291.23	4.16	168.63	3.29	0.00	#DIV/0!	330.9	9.187	0.028	100.0	2.8777	0.041	1.6663	0.033	0.000	0.000	0.579	23.21	
z	2	11.67	71.88	17.455	0.058	125.12	2.01	78.10	0.97	0.00	#DIV/0!	143.5	4.566	0.015	100.0	1.4604	0.023	0.9115	0.011	0.000	0.000	0.624	22.52	
z	2	4.57	51.13	58.987	0.176	439.28	8.90	237.58	4.94	0.00	#DIV/0!	495.1	6.042	0.018	100.0	2.0076	0.041	1.0858	0.023	0.000	0.000	0.541	22.06	

1000s of files
spanning 10+
years of
operation

Each lab has
different file
formats, data
standards, etc.



Sparrow

Web-based metadata management platform for a geochemical lab's data archive

- Set embargo for projects and samples
- Manage project- and sample-level metadata
- Search and link publications
- Access analytical data
- Import, export, and track original data files

CU TRail Admin | Metadata Map Terms Test

import-grain-images Options ▾ Start ▶ ✓ Connected

```
1 Starting task
2 /data/Photographs and Measurement Data/UG85-1_bp_z05b.tif
3 Already imported
4 /data/Photographs and Measurement Data/UG96-1_bp_z06b.tif
5 Already imported
6 /data/Photographs and Measurement Data/UG96-1_bp_z05a.tif
7 Already imported
8 /data/Photographs and Measurement Data/UG96-1_bp_z06a.tif
9 Already imported
10 /data/Photographs and Measurement Data/UG85-1_bp_z06a.tif
11 Already imported
12 /data/Photographs and Measurement Data/UG96-1_bp_z04b.tif
13 Already imported
14 /data/Photographs and Measurement Data/UG96-1_bp_z01b.tif
15 Already imported
```

WiscAr Admin API Explorer test

Admin views Base Projects Sessions

Projects

← Previous Next → 1 of 1 (2 records)

Delarof Islands Magmatic Evolution

Eocene to Pleistocene magmatic evolution of the Delarof Islands, Aleutian Arc

Publications
Eocene to Pleistocene magmatic evolution of the Delarof Islands, Aleutian Arc – doi: 10.1002/2015GC006067

Researchers
No researchers

Samples

AMT-13-11 Amatignak Island gabbro	AMT-13-10 Amatignak Island gabbro	SKA-13-3 Skagul Island basaltic andesite	SKA-13-2 Skagul Island basalt	SKA-13-1 Skagul Island andesite	KAV-13-2 Kavalga Island basalt
-----------------------------------------	-----------------------------------------	------------------------------------------------	-------------------------------------	---------------------------------------	--------------------------------------

DRI Luminescence Laboratory Admin API Explorer test

Admin Home Projects Samples Sessions

Sessions > 79

Monday, January 1st, 2018

Sample HWV-TP-1-1 quartz	Project Hawksy Walksy Valley	Technique OSL
---------------------------------------	---------------------------------	------------------

Analysis details

Mineral Separation

Material
mineral separate > multi-grain separate

Data

mask size: 4.00 mm
minimum grain size: 180 µm
maximum grain size: 250 µm

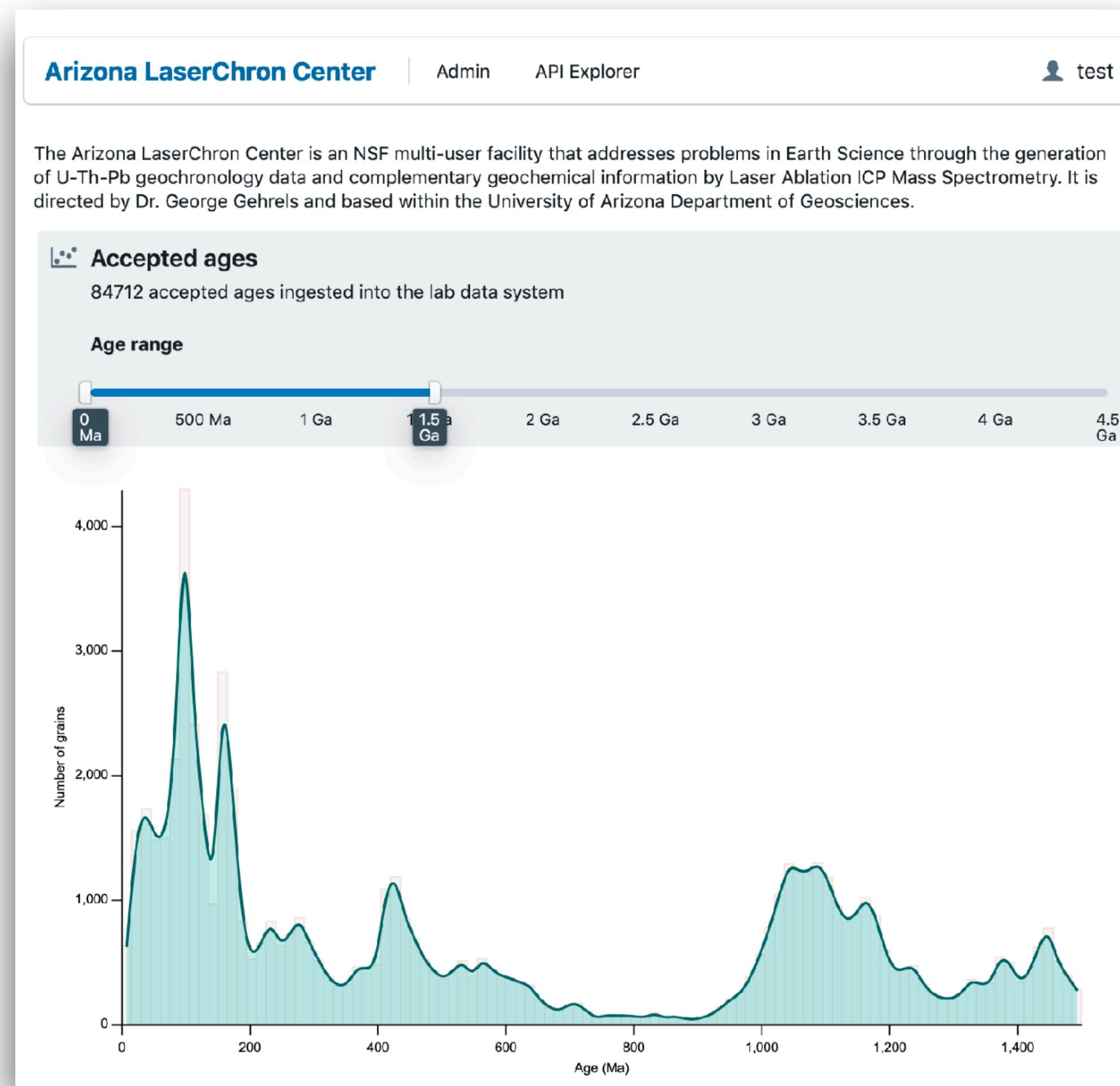


Sparrow's role in labs



A public data portal

- Summary statistics
- Publications links
- Maps of samples
- Sample-specific information
- Helps fulfill open-data and reporting requirements
- **Extensible** for method-specific needs



Boise State IGL | Admin API Explorer test

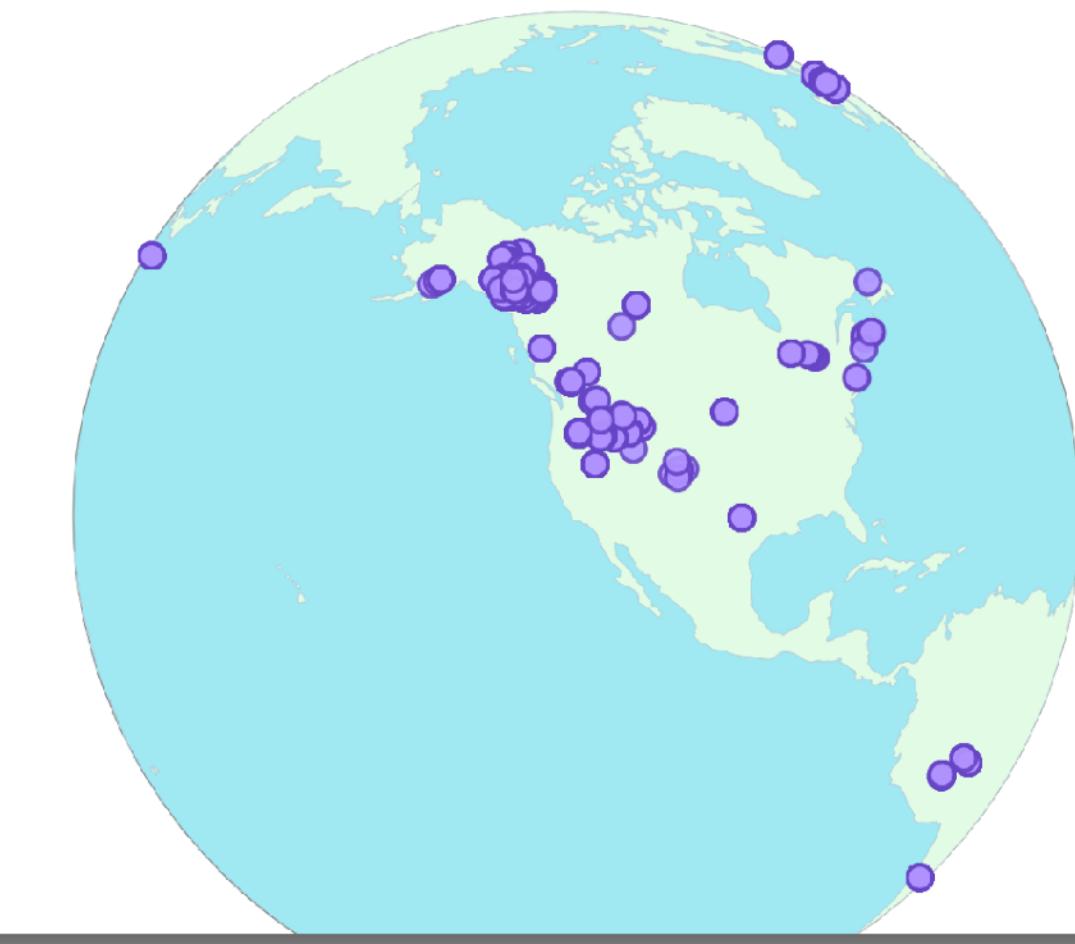
About the lab

The Boise State University Isotope Geology Laboratory (IGL) is a state-of-the-art facility for the analysis of radiogenic isotopes in Earth materials, with a focus on in situ and high-precision geochronology (U-Pb zircon) and tracer isotope geochemistry. These tools can be applied to a variety of problems in igneous and metamorphic petrology, structural geology and tectonics, paleobiological evolution and paleoclimate change in deep time. See our [main website](#) for further details.

Geochronology data system

The IGL is a node in the [EARTHTIME Network](#) for the Calibration of Earth History. It is also a partner in the NSF EarthCube Geochronology Infrastructure project. This [Sparrow](#) lab information management system is a product of that collaboration.

1707 measurements have been linked to their geologic metadata



WiscAr | Admin API Explorer Daven

About the lab

WiscAr is the Argon geochronology laboratory at the University of Wisconsin — Madison. This implementation of [Sparrow](#) holds the lab's data archive and makes it accessible via [an API](#) and this web interface.

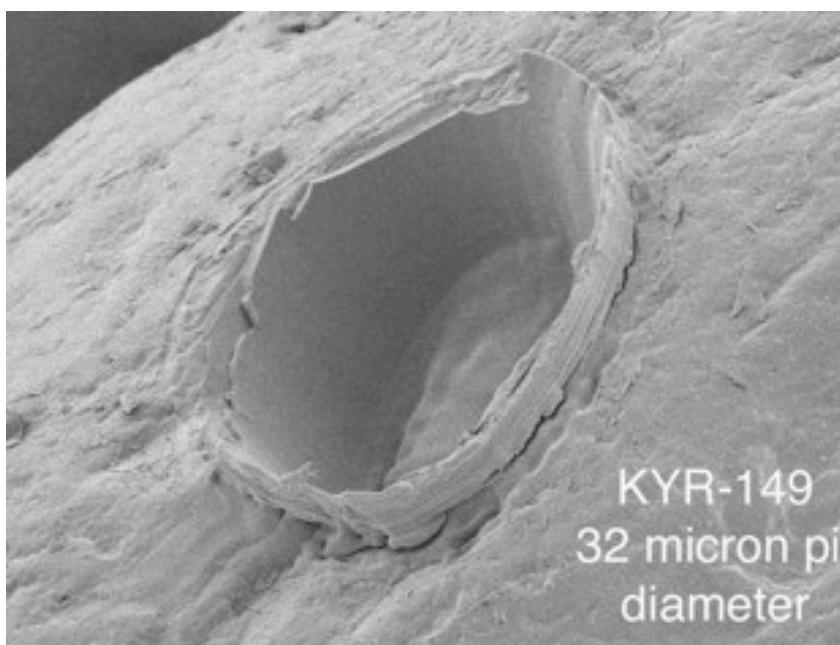


Sparrow's database

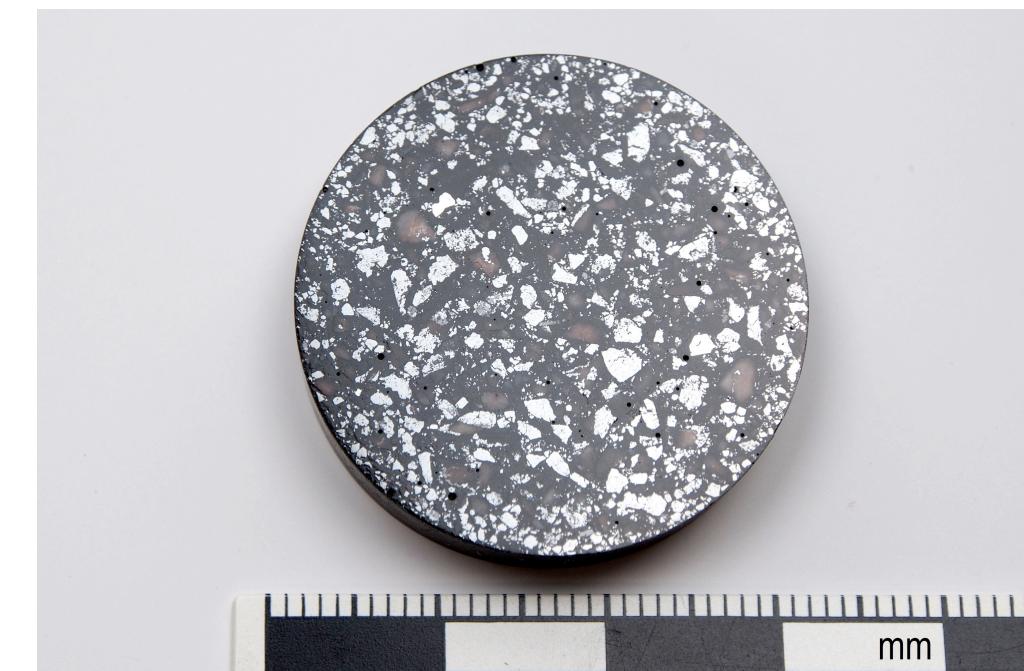
A single measured value

H ₂ O content:	5.34 ±0.534(1s) %
De:	21.6 ±0.900(1s) Gy
OD:	24.0 %
luminescence age:	5.36 ±0.342(1s) ka
total dose rate:	4.03 ±0.195(1s) Gy/ka

An instance of space- or time-resolved data collection



Grouped measurements in a single instrument run



The geologic material that was originally collected for analysis



Datum

Analysis

Session

Sample

Metadata tables

Geological context, publication status, embargo...

Instrument session

Project

Publication

Researcher

Location
Entity (e.g.
geologic unit)

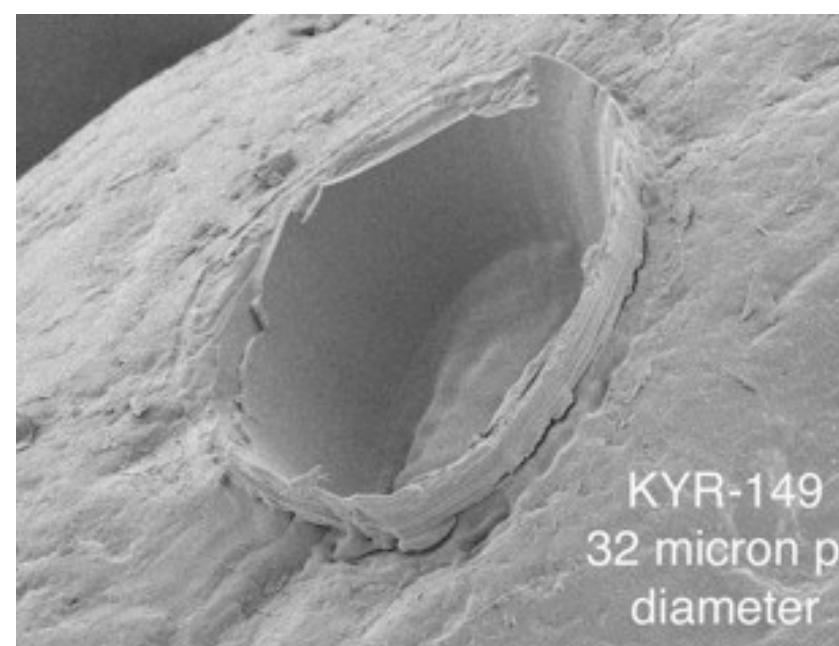
Sparrow's database

A platform for data curation

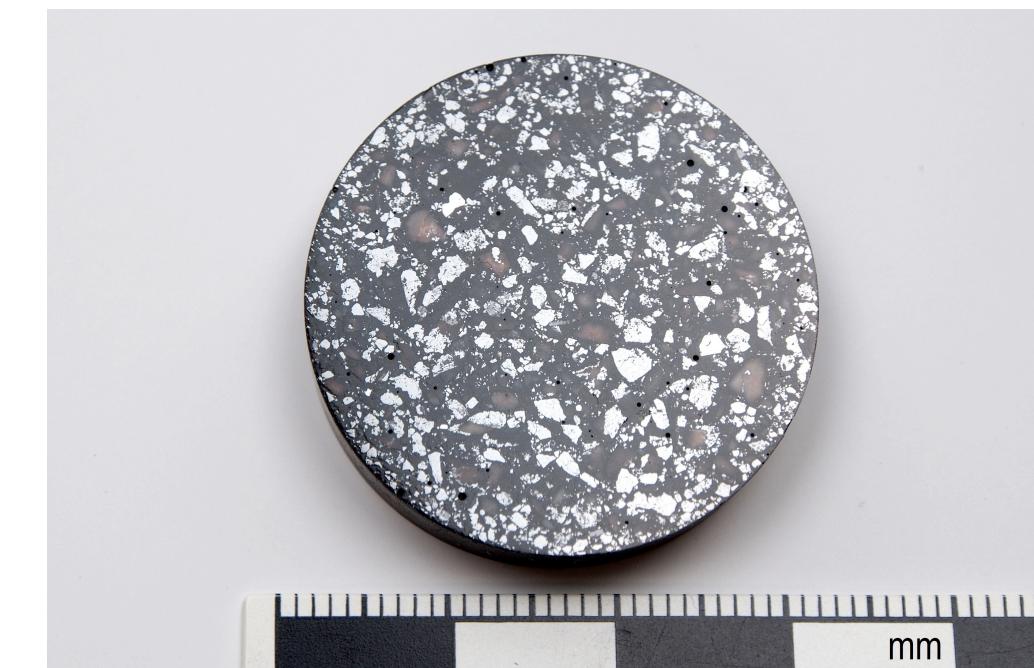
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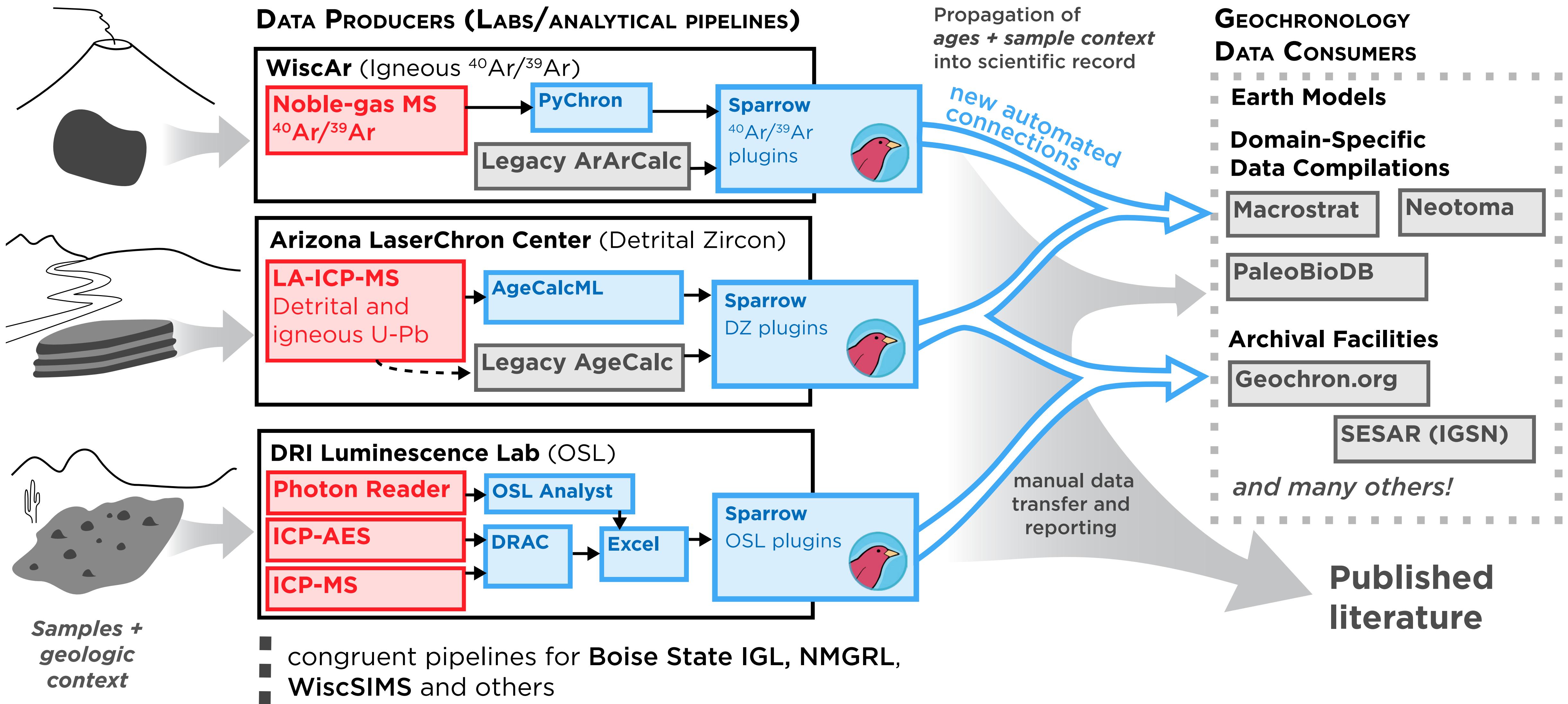
NSF ID

Researcher

ORCID

Vision: connecting lab data systems to the community

...in a way where labs also benefit on their own terms



SO HOW'S THAT GOING?

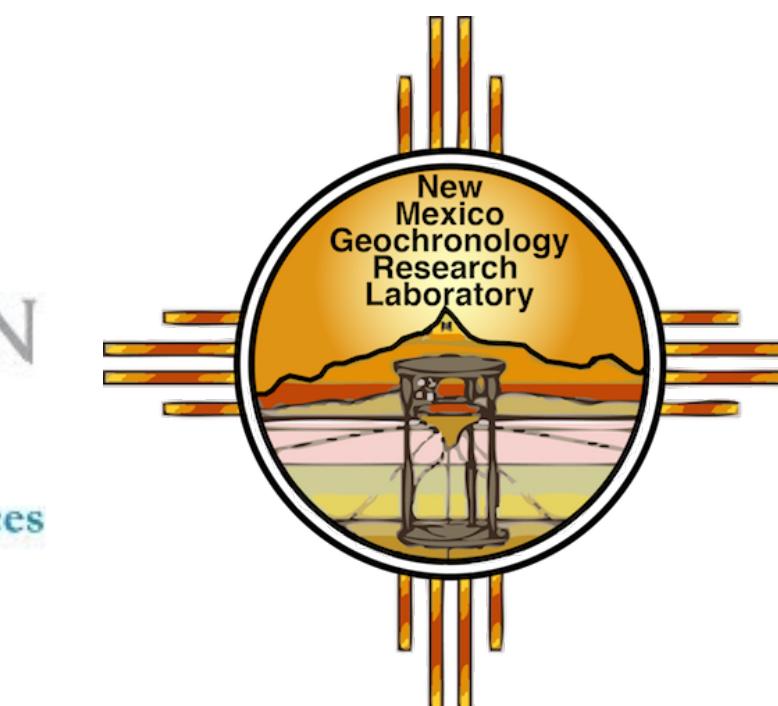


~10 in-progress laboratory implementations **across domains** of geochronology and geochemistry

- Uranium-Lead
- Argon-Argon
- Cosmogenic nuclides
- (U+Th)/He thermochronology
- Optically-stimulated luminescence
- In-situ stable isotope geochemistry (SIMS)
- Electron Microprobe
- Carbon radioisotopes/AMS (*planned*)



ARIZONA
LASERCHRON
CENTER
Department of Geosciences
University of Arizona



*UW Cosmogenic
Nuclide Lab*



DRI
Desert Research Institute

CONCORD
Microprobe lab

NAU
*Paleoclimate
Dynamics Lab*

BGS
British Geological Survey

SO HOW'S THAT GOING? *But really, how is it going? (five years in)*

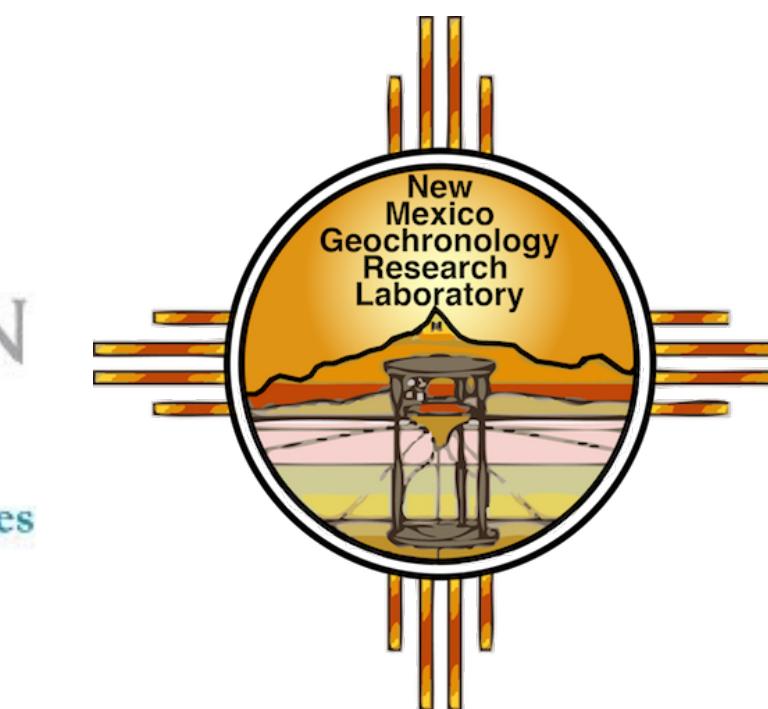


~10 in-progress laboratory implementations **across domains** of geochronology and geochemistry

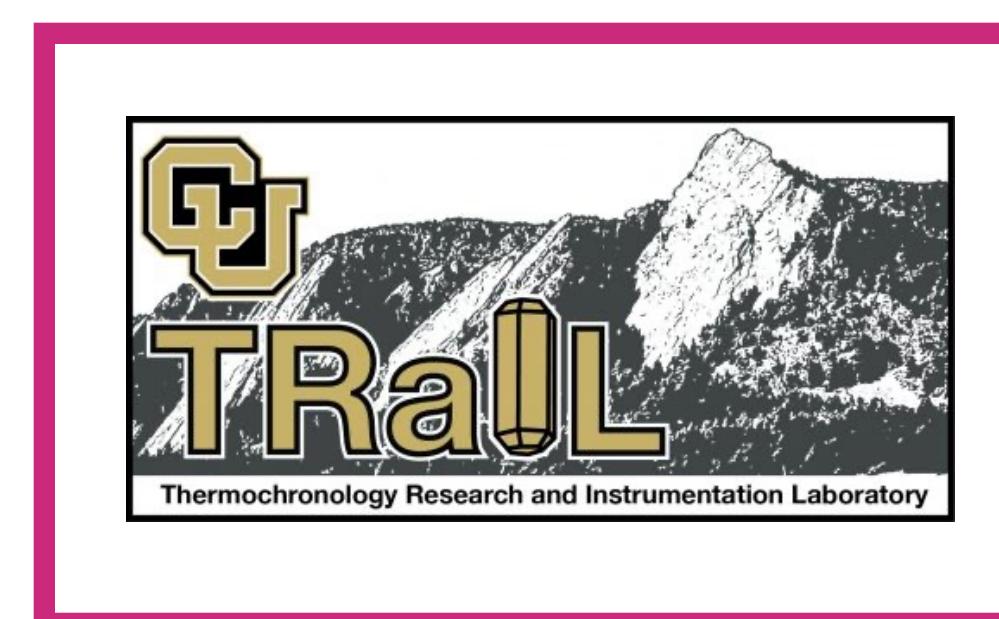
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Department of Geosciences
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UW Cosmogenic
Nuclide Lab



One operational pipeline



NAU
Paleoclimate
Dynamics Lab



British
Geological
Survey



Desert Research Institute

CONCORD
Microprobe lab

SO HOW'S THAT GOING? *But really, how is it going? (five years in)*



~10 in-progress laboratory implementations **across domains** of geochronology and geochemistry

- Uranium
 - Argon
 - Cosmogenic
 - (U+He)
 - Optical
 - In-situ
 - Electron
 - Carbon
- Academic labs lack expertise to implement/manage metadata tracking.
- It is just not their core task and is treated accordingly.*
- Even with purpose-built software, the “last-mile” problem is difficult to solve.

One operational pipeline



Desert Research Institute

SC
IS

Microprobe lab

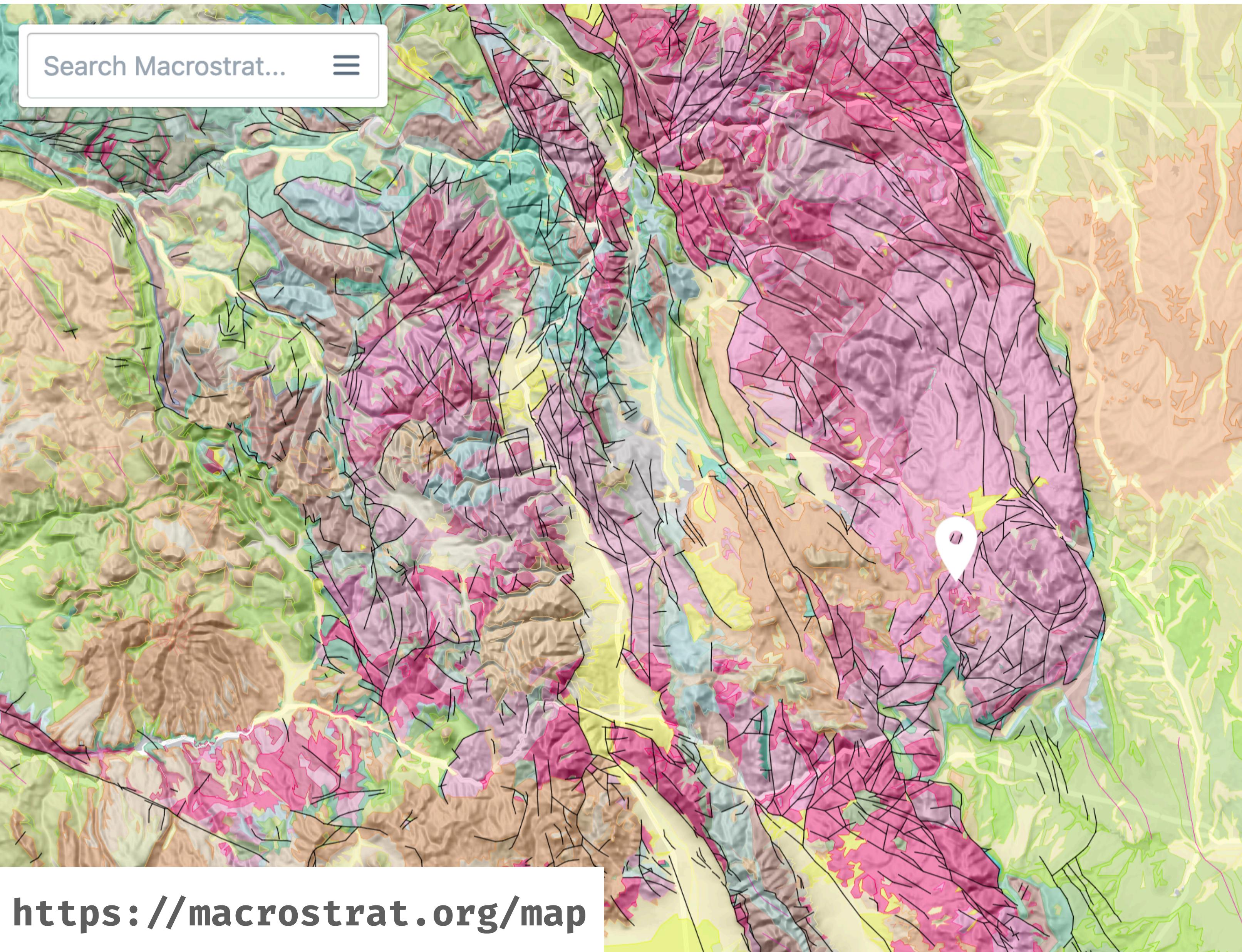


NAU
Paleoclimate
Dynamics Lab



British
Geological
Survey

Final note: Automation to the rescue? 🤖



Search Macrostrat... ⚙

-105.2245, 38.7848 2737m | 8980ft X

Primary literature via xDD ^

Robinson, Charles Sherwood, [Geology and ore deposits of the Whitepine area, Tomichi mining district, Gunnison County, Colorado.](#) ▾

Nash, J. Thomas, [Supergene uranium deposits in brecciated zones of Laramide upthrusts; concepts and applications.](#) ▾

Young, E. J., [Felsic-mafic ratios and silica saturation ratios; their rationale and use as petrographic and petrologic indicators.](#) ▾

Hills, F. A., Dickinson, K. A., [Silver Plume Granite; possible source of uranium in sandstone uranium deposits, Tallahassee Creek and High Park areas, Fremont and Teller counties, Colorado.](#) ▾

Finch, Warren Irvin, [Stratigraphic distribution of uranium clusters in the Rocky Mountain and Intermontane Basins Uranium Province.](#) ▾

Braddock, William A., Cole, James C., [Preliminary geologic map of the Greeley 1 degree by 2 degrees Quadrangle, Colorado and Wyoming.](#) ▾

Snyder, George L., [Preliminary geologic map of the central Laramie Mountains, Albany and Platte counties, Wyoming.](#) ▾

McCallum, M. E., Burch, A. L., [Uranium and thorium in Precambrian crystalline rocks of the Medicine Bow Mountains, north-central Colorado.](#) ▾

Stuckless, J. S., Hedge, C. F., Wenner, D. B., Nkomo, J. T., [Isotopic studies](#)

<https://macrostrat.org/map>

Final note: Automation to the rescue? 🤖

Search Macrostrat... ⚙

UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

Silver Plume Granite--Possible Source of Uranium in Sandstone Uranium Deposits, Tallahassee Creek and High Park Areas, Fremont and Teller Counties, Colorado

By Francis Allan Hills and Kendall A. Dickinson

-105.2245, 38.7848 2737m | 8980ft

Primary literature

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<https://macrostrat.org/map>

Final note: Automation to the rescue?

Macrostrat is linked to the xDD (formerly, GeoDeepDive) machine reading library, data infrastructure, and API

16,909,371 documents

108,486 added this month

25,112 added this week

3,683 added in the last 24 hours

- Detecting and surfacing references to geologic units in the scientific literature
- These aren't real metadata-level links, but they are pretty useful

-105.2245, 38.7848 2737m | 8980ft ×
via xDD ^

Primary literature

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Hills, F. A., Dickinson, K. A., [Silver Plume Granite; possible source of uranium in sandstone uranium deposits, Tallahassee Creek and High Park areas, Fremont and Teller counties, Colorado.](#) ^
...Anomalously high concentrations of thorium and of the light rare earth elements lanthanum and cerium suggest that the actinides and light lanthanides were enriched to an abnormal degree by the magmatic processes that formed the Proterozoic Y [Silver Plume Granite](#) in areas adjoining Tallahassee Creek and High Park
...Although a significant contribution of uranium from Tertiary volcanic rocks can not be ruled out and is even probable (Dickinson and Hills , 1982) , it appears probable that some of the uranium in deposits of the Tallahassee Creek area was derived from [Silver Plume Granite](#)
...Although uranium presently does not appear to be significantly enriched in sampled outcrops of [Silver Plume Granite](#) , a large part of the original uranium content of Silver Plume may have been removed by oxidizing ground waters , leaving behind mainly the uranium bound in resistate minerals such as zircon and monazite
...Creek area was [Silver Plume Granite](#) , and Tertiary volcanic rocks also probably supplied significant amounts of uranium (Dickinson and Hills , 1982) , the inferred fertility of the [Silver Plume Granite](#) , its abundance in areas adjoining Tallahassee Creek , and the demonstrated former existence of an appropriate paleohydrologic system for transporting lead from the Silver Plume and depositing it in the Tallahassee Creek area make highly probable that the [Silver Plume Granite](#) supplied part of the uranium now found in the Tallahassee Creek deposits
Nash, J. Thomas, S
Laramide upthrust
Young, E. J.
rational, and use
Hills, F. A., Dickinson,
uranium in sandst
Park areas, Fremo
Finch, Warren Irvin
the Rocky Mounta
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Greeley 1 degree b
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Mountains, Albany and Platte counties, Wyoming. ▾

