



AHED

ASTROBIOLOGY

HABITABLE ENVIRONMENTS DATABASE

PILOT MARCH 30TH



Webinar Agenda

- Welcome and Introductions.
- Pilot goals.
- Overview of the AHED system.
- Demonstration of AHED Portal, Account Creation, Search, and Login.
- Dataset creation demonstration.



Pilot Goals

- Get feedback on AHED to improve the system before launch to wider community.
- Dataset creation by participants involving a variety of data types and use cases.
- Discuss impressions of the system and gather formal feedback using a 'user acceptance test' (UAT) document.



UAT

Capability		Test Results			Comments
		YES	NO	N/A	
Explore Datasets https://ahed.nasa.gov					
1	User able to explore datasets by astrobiology themes graphic.				
2	User able to explore datasets by location map.				
3	User able to explore datasets by keyword cloud.				
4	User able to explore featured datasets.				
5	Overall user experience with Explore Dataset tools is satisfactory.				
Search https://ahed.nasa.gov/search					

- The document is available in the **AHED Pilot Webinar dataset – link sent with meeting invitation.**
- Structured to guide you through various parts of the website systematically and help compile feedback.



Drop-in Sessions

- Two informal drop-in sessions to provide additional help and provide a forum for verbal feedback and discussion are scheduled for **Monday 11th April 10 am PT** and **Wednesday 13th April 12 noon PT**.
- For timely implementation of changes, we'd like UAT and other forms of feedback by **Friday 29th April**.
- Email thomas.f.bristow@nasa.gov and blafuente@seti.org for help.



Questions



AHED

The Astrobiology Habitable Environments Database (AHED) is envisioned as community-driven repository and productivity platform for the storage, discovery and analysis of data relevant to the field of astrobiology.

Project GOALS:

- **Serve** as a centralized and open-source digital library of NASA funded research relevant to the Astrobiology Program.
- **Enable** proposers to fulfill mandated data management plan (DMP) archiving requirements.
- **Serve** as resource for the broader scientific community promoting the advancement of astrobiology through data sharing and standardization – including non-NASA funded research data.
- **Provide** an example of a data management strategy for other long-tail (small teams and individual PIs) research efforts in the Planetary Science.



Project Motivation

- Astrobiology is an inherently **multidisciplinary** field. High impact science requires **integration of disparate sets of data** (often small, complex and specialized) that may extend beyond traditional scientific disciplines.
- However, repositories and archives are not currently designed around specific needs of astrobiologists.
- New approaches/tools are needed to foster adoption of open data practices by PI's and small teams that tend to do the bulk of research in astrobiology (See Bristow et al., 2020).
- Funding agencies (NASA) and publishers are making data sharing and accessibility a higher priority.
- NASA SMD is promoting the growth of the 'Planetary Data Ecosystem.'



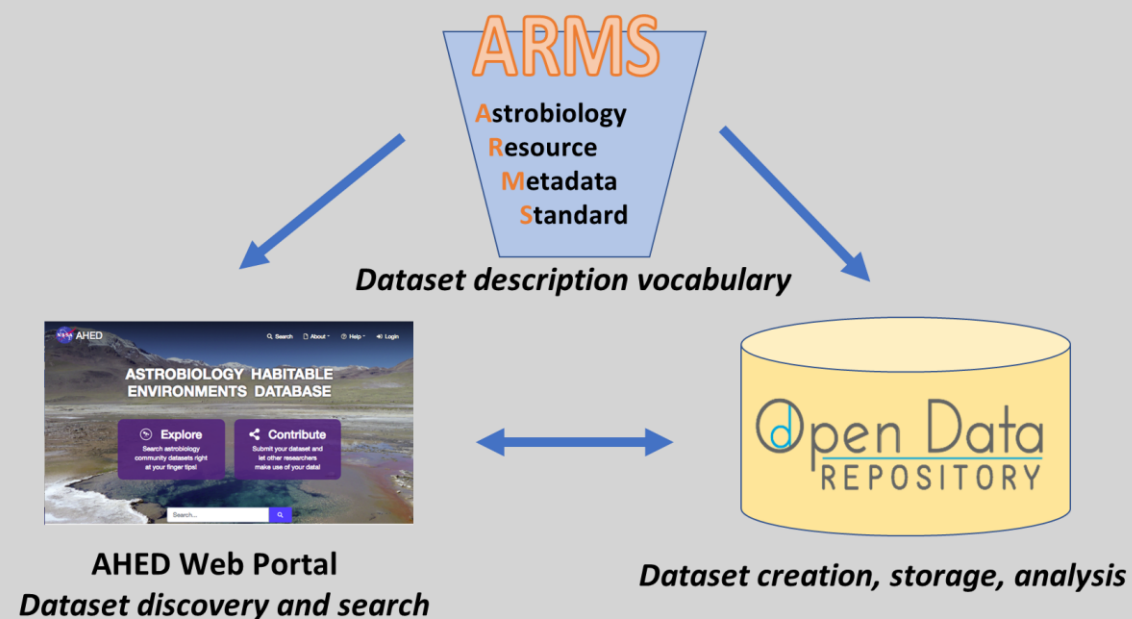


What makes up an AHED dataset?

- In AHED, 'data' consists of one or a combination of the following: a file, a collection of files, a link, or several links to other repositories or online resources (uniform resource locator URLs and digital object identifiers) containing relevant data.
- To become an AHED dataset, 'data' must be described and labeled using the Astrobiology Resource Metadata Standard (ARMS).
- Several dataset examples are described in the 'AHED Pilot Guide to dataset creation' document.
- For the Pilot, we one recommendation is creating a dataset containing the raw data and supporting materials to accompany a recent journal article. See this [example](#).
- You may also have created your own online resource/database that you can make more discoverable, like in this [example](#).

AHED System Overview

- 3 major components.
- An astrobiology specific standardized metadata framework called **ARMS**.
- The **AHED Portal** provides a web-based home to the project allowing new and returning users to create new ARMS compliant datasets, learn more about AHED and ARMS, and search for relevant datasets using a range of search tools designed around the needs of astrobiologists.
- Behind the scenes, the **Open Data Repository (ODR)** provides a powerful and flexible platform for the publication of datasets.



ARMS: Astrobiology Resource Metadata Standards

- Dataset description vocabulary to uniformly describe astrobiology ‘resources’.
- Required for all contributed AHED datasets.
- ARMS encourages common structure and metadata for all contributed datasets to facilitate cross-dataset search, integration, discovery and analysis.
- We are working with the SMD’s Catalog Team to help represent the Astrobiology community in their efforts.

CheMin Database

Last Revision Date: Dec 7, 2021 | Published Date: May 6, 2020

Description

The CheMin database is a living repository of CheMin and related MSL data integrated with tools and procedures for visualization and analysis.

Data

File or URL	Description/Data Usage	File Size	Date
https://pds-geosciences.wustl.edu/missions/msl/chemin.htm	CheMin PDS Dataset		Nov 3, 2020
https://www.odr.io/chemin	CheMin database		Nov 3, 2020
Blake_Characterization_Calibration_CheMin_	Characterization and calibration of the CheMin mineralogical instrument on	4.25 MB	Dec 7, 2021

```

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  <ResourceDescription>
    The CheMin database is a living repository of CheMin and related MSL data integrated with tools and procedures for visualization and analysis.
  </ResourceDescription>
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      https://cof.arc.nasa.gov/datasets/6f25935043eae36046f15942ae14
    </URL>
  </ResourceLocator>
  <ResourceLogo>
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      http://eta.odr.io/app_dev.php/view/downloadImage/15494
    </ImageURL>
    <ImageCredit>NASA</ImageCredit>
  </ResourceLogo>
  <TeamMember>
    <GivenName>Thomas</GivenName>
    <Surname>Bristow</Surname>
    <Email>thomas.f.bristow@nasa.gov</Email>
    <Role>Lead Investigator</Role>
    <Role>Point of Contact</Role>
  </TeamMember>
  <TeamMember>
    <Name>NASA Ames Research Center</Name>
    <Address>
      Moffet Field, California, United States of America (USA)
    </Address>
  </Affiliation>
  </TeamMember>
  <TeamMember>
    <GivenName>Barbara</GivenName>
    <Surname>LaFuente</Surname>
    <Email>blafuente@seti.org</Email>
    <Role>Point of Contact</Role>
  </TeamMember>
  <Affiliation>
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    <Address>
      Mountain View, California, United States of America (USA)
    </Address>
  </Affiliation>
  </TeamMember>
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    </URL>
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    <MaterialType>Other</MaterialType>
  </Data>
  <InitialReleaseDate>2020-05-06</InitialReleaseDate>
  
```



ARMS metadata

- **Dataset intrinsic**
 - Name
 - Description
 - Location
- **Support**
 - Team members
 - Funding
 - Project/mission
- **Research context**
 - Research theme
 - Science discipline
 - Keywords

Astrobiology keywords

- The ARMS keyword defined vocabulary is a compilation of publication-style keywords extracted from Astrobiology-related journals from the Web of Science for the past 10 years
- After careful curation of the keywords, we developed a 3-4 tier taxonomy with **757** taggable keywords
- Validated against 848 AbSciCon 2019 abstracts
 - 99% of the abstracts contained 1+ ARMS keywords
 - 67% of the ARMS keywords appeared in the abstracts
 - Cluster analysis revealed 36 potential new keywords, which were added to the lexicon

Open Data Repository

- Dataset Publication Platform
- Provides the backend for AHED
- Design & Create Databases Online
 - Design data entry forms for inputting data
 - Create a layout that displays your data
- Interactive Datasets
 - Graphing capability
 - Plugins for specific functionality
 - Integrate with 3rd party apps
- Manage access through permissions
- Dynamically update data via CSV imports and API
- To learn more about ODR's functionality:
 - <https://www.opendatarepository.org>

The screenshot displays a record for 'Cumberland' in the CheMin database. It includes a description of the analysis, location details (Mars Area Location: Yellowknife Bay), and XRD data. The XRD data is presented as a plot of intensity versus 2-theta degrees, with a legend for various mineral phases. Below the plot is a table of mineral abundances.

Mineral name	AMCSD Code #	Mass %	FWHM	a	b	c	α	β	v
Fayalite	0000174	0.9	0.300	4.7870	10.3410	6.0440	90	90	90
Pigeonite	0000248	12.4	0.300	9.6780	8.9050	5.2270	90	108.7100	90
Andesine	0001052	59.2	0.300	8.1790	12.8800	7.1120	93.4400	116.2100	90.2300
Saradine	0010740	6.4	0.300	8.5490	13.0280	7.1880	90	118.0200	90
Bessanite	0013868	1.7	0.300	12.0317	6.9269	12.6712	90	90.2700	90
Hematite	0000143	0.9	0.300	5.0380	5.0380	13.7720	90	90	120
Akaganeite	0003079	0.8	0.300	10.5870	3.0311	10.5150	90	90.0300	90
Magnetite	0020589	6.9	0.300	8.3969	8.3969	9.0	90	90	90
Anhydrite	0005117	0.6	0.300	6.9930	6.9950	6.2450	90	90	90
Cristobalite	0001629	0.2	0.300	4.9717	4.9717	6.9223	90	90	90
Ferrosilite	0000487	10.1	0.300	18.4180	9.0780	5.2366	90	90	90



Questions



Next steps

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Thank you!

Extra slides

Search Results

Beta 1.1

[Search](#) | [About](#) | [Help](#) | [Data](#) | [Login](#)

Keywords

- astronomical (2)
- biological (9)
- chemical (3)
- computational (0)
- environmental (3)
- exploration (8)
- geological (9)
- institutional (0)
- methods (5)
- planetary (3)
- process (0)

Themes

- Abiotic Building Blocks of Life (2)
- Characterizing Environments for Habitability and Biosignatures (17)
- Coevolution of Life and the Physical Environment (4)
- Constructing Habitable Worlds (3)
- Early Life and Increasing Complexity (1)
- Origins of Life (0)

Disciplines

[Show Map](#) [Reset](#)

1 2 »

1 - 20 of 27 Show: 20 Sort: Desc By: Date Name

Hydrothermal Precipitation of Sanidine (Adularia) Having Full Al,Si Structural Disorder and Specular Hematite at Maunakea Volcano (Hawai'i) and at Gale Crater (Mars).

A layer of weathering-resistant material is located within the walls of an erosional gully of the Pu'u Poliahu cinder cone in the summit region of Maunakea volcano (Hawai'i). The volcanic cone, initially composed of unaltered basaltic material (tephra), was extensively altered throughout by hot, sulfuric-acid solutions. The layer is a location where the alteration by hot water was particularly aggressive, cementing the volcanic sediment and causing extensive chemical and mineralogical changes. Instead of basaltic chemical and mineralogical compositions, altered tephra was enriched in iron from aqueous precipitation of the mineral hematite (Fe₂O₃) and was characterized by high sanidine with full structural disorder as the feldspar (instead of plagioclase, which was removed by dissolution) and by Mg-rich phyllosilicates as additional precipitation products. Hematite, often present as a red pigment in geologic materials, was precipitated from the hot water as specular (i.e., gray) hematite. By analogy, high sanidine and specular hematite at Gale crater (Mars) can be interpreted as alteration products of preexisting Martian basaltic sediment by hot-water solutions.

Last Revision Date: 10/24/21 | Date Published: 09/24/20 | Created Date: 09/24/20

DOI: [https://doi.org/10.1029/2019JCE006324](#)

Lead Investigator(s): [Morris, Richard](#) | Funding Source(s): other | Location: Maunakea volcano, Hawai'i | Themes: Characterizing Environments for Habitability and Biosignatures

Keywords: Mars analog, minerals (general), Mars Science Laboratory (MSL) Curiosity rover

Clay mineral diversity and abundance in sedimentary rocks of Gale crater, Mars

Clay minerals provide indicators of the evolution of aqueous conditions and possible habitats for life on ancient Mars. Analyses by the Mars Science Laboratory rover Curiosity show that ~3.5-billion year (Ga) fluvio-lacustrine mudstones in Gale crater contain up to ~28 weight % (wt %) clay minerals. We demonstrate that the species of clay minerals deduced from x-ray diffraction and evolved gas analysis show a strong paleoenvironmental dependency. While perennial lake mudstones are characterized by Fe-saponite, we find that stratigraphic intervals associated with episodic lake drying contain Al-rich, Fe³⁺-bearing dioctahedral smectite, with minor (3 wt %) quantities of ferripyrophyllite, interpreted as wind-blown detritus, found in candidate aeolian deposits. Our results suggest that dioctahedral smectite formed via near-surface chemical weathering driven by fluctuations in lake level and atmospheric infiltration, a process leading to the redistribution of nutrients and potentially influencing the cycling of gases that help regulate climate.

Last Revision Date: 10/23/21 | Date Published: 05/10/20 | Created Date: 05/10/20

DOI: [https://doi.org/10.1029/2019JCE006324](#)

Lead Investigator(s): Brislton, Thomas | Funding Source(s): other | Location: N/A | Themes: Characterizing Environments for Habitability and Biosignatures

Keywords: early Mars, Mars Science Laboratory (MSL) Curiosity rover, Mars Curiosity rover, clays, planetary environments

Hydrothermal Precipitation of Sanidine (Adularia) Having Full Al,Si Structural Disorder and Specular Hematite at Maunakea Volcano (Hawai'i) and at Gale Crater (Mars).

Last Revision Date: Oct 24, 2021 | Published Date: Sep 24, 2020 | Created Date: Sep 24, 2020

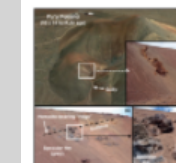


Image credit: Morris et al 2020

Description

A layer of weathering-resistant material is located within the walls of an erosional gully of the Pu'u Poliahu cinder cone in the summit region of Maunakea volcano (Hawai'i). The volcanic cone, initially composed of unaltered basaltic material (tephra), was extensively altered throughout by hot, sulfuric-acid solutions. The layer is a location where the alteration by hot water was particularly aggressive, cementing the volcanic sediment and causing extensive chemical and mineralogical changes. Instead of basaltic chemical and mineralogical compositions, altered tephra was enriched in iron from aqueous precipitation of the mineral hematite (Fe₂O₃) and was characterized by high sanidine with full structural disorder as the feldspar (instead of plagioclase, which was removed by dissolution) and by Mg-rich phyllosilicates as additional precipitation products. Hematite, often present as a red pigment in geologic materials, was precipitated from the hot water as specular (i.e., gray) hematite. By analogy, high sanidine and specular hematite at Gale crater (Mars) can be interpreted as alteration products of preexisting Martian basaltic sediment by hot-water solutions.

Data

File or URL	Description/Data Usage	File Size	Date
https://odr.io/Morrisetal2020_JGR_2019JCE006324	Access to supplementary material archived in ODR.		Oct 24, 2021

Related Works

DOI	Description
https://doi.org/10.1029/2019JCE006324	Hydrothermal Precipitation of Sanidine (Adularia) Having Full Al,Si Structural Disorder and Specular Hematite at Maunakea Volcano (Hawai'i) and at Gale Crater (Mars)

Summary

Lead Investigator(s)	Morris, Richard	Fieldwork Location(s)	Maunakea volcano, Hawai'i 19.820584, -155.483058
Funding Source(s)	other		
Mission/Project(s)	Mars Science Laboratory (MSL)		
Themes	Characterizing Environments for Habitability and Biosignatures		
Keywords	Mars analog; Mars Science Laboratory (MSL) Curiosity rover; minerals (general)		
Disciplines	planetary geology		
Team Members	Lafuente Valverde, Barbara		

Contact info

[Lafuente Valverde, Barbara](#)

How to Cite

When using this dataset, please cite the data package provided here as well as original publications, when available. [License terms and conditions apply.](#)

Dataset: Morris, R; Lafuente Valverde, B. Hydrothermal Precipitation of Sanidine (Adularia) Having Full Al,Si Structural Disorder and Specular Hematite at Maunakea Volcano (Hawai'i) and at Gale Crater (Mars). Astrobiology Habitable Environment Database. Retrieved Date: Oct 24, 2021.

DOI implemented through DOIMS

<https://ahed.nasa.gov/10.80300/c72m-rq68>

Contribution

step-by-step dataset creation wizard

Implementation of login for NASA and non-NASA users.

File/URL upload

Description

Data

Astrobiology

Team

Funding

Review

Data

There are two different options to provide data:

- **uploading files** directly from your computer (up to 20GB per dataset).
- **providing URLs** to for example other public databases where data is already stored, project's website, etc.

When uploading software, code packages or scripts, we recommend including a License (e.g. MIT, GNU GPLv3, etc) with the upload of your software, code packages or scripts. For guidance on what license to choose, check <https://choosealicense.com/>

We recommend checking [Check TIPS TO PREPARE YOUR DATA](#) for more information.

Click on **New Data** for each data entry. At least one "Data" element is required. Fields marked with (*) are required.

Total File Size Used: 2.21 MB / 20 GB

New Data

External URL: *

https://odr.io/lunar-regolith-xrd

Description/Data Usage: *

\times_2 \times^2 *I* Ω I_k

Dataset

URL Is Valid.

Select File: *

Taylor_et_al_2019.pdf

Size: 2.21 MB

Date: Dec 7, 2021

Description/Data Usage: *

\times_2 \times^2 *I* Ω I_k



DOI implementation through DOIMS

- DOIs are included with every dataset. to follow the FAIR guidelines making each dataset findable, accessible, interoperable, and reusable.
- The implementation of AHED DOIs has been done with the NASA STI Program Office through their Digital Object Identifier Management System (DOIMS).
- We have worked with them to develop their API to provide DOI services to us and another NASA systems.
- Once created, the DOI, along with guidance for citing the data by the DOI, are provided on each dataset's landing page in AHED. Researchers can use this data citation and reference the data in publications and articles.

Link to data from: Brine driven destruction of clay minerals in Gale crater, Mars

Last Revision Date: Sep 8, 2021 | Published Date: Sep 8, 2021 | Created Date: Sep 8, 2021

DOI: <https://handle.stage.datacite.org/10.80300/vrt7-cy20>

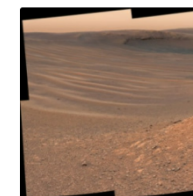


Image credit: NASA/JPL/MSS

Description

This repository contains files and non-commercial software associated with the journal article "Brine Driven Destruction of Clay Minerals in Gale Crater, Mars."

The article presents mineralogical, geochemical, and sedimentological observations made by the Mars Science Laboratory rover *Curiosity* in an area called Glen Torridon, Gale crater, Mars. Rocks exposed in Glen Torridon were deposited in a lake that occupied the floor of Gale crater about 3.5 billion years ago and are stratigraphic and depositional equivalents of rocks exposed ~ 400m away on Vera Rubin ridge. The mineralogy of rocks in these two areas are different despite forming in the same lake at the same time. Glen Torridon rocks contain about 30 wt % clay minerals and 2 wt % or less of the mineral hematite (an iron oxide). In contrast, Vera Rubin ridge rocks contain 5 to 13 wt % clay minerals, with larger quantities (between 9 and 16 wt %) of iron oxide and oxyhydroxide minerals. The observed differences in mineralogy are attributed to preferential post-depositional alteration of Vera Rubin ridge rocks by silica-poor brines. These brines are thought to have formed during the deposition of sedimentary strata of the 'sulfate-bearing unit' that overlies Glen Torridon and Vera Rubin ridge rocks. Orbital spacecraft have detected magnesium sulfates in the sulfate-bearing unit. The presence of these highly soluble salts imply that changing climate and/or hydrological conditions in Gale crater resulted in the formation of dense brines during deposition of the sulfate-bearing unit. It is hypothesized that brines infiltrated older clay-bearing sediments, converting iron-rich clay minerals to iron oxides and oxyhydroxides. Glen Torridon rocks also contain a mineral phase not previously identified on the mission. This mineral gives rise to a distinctive x-ray diffraction peak represents an interplanar spacing of 9.22 angstroms. This phase is identified as a mixed-layer serpentine-talc and is thought to have been transported into the crater floor by rivers.

How to Cite

When using this dataset, please cite the data package provided here as well as original publications, when available. [License terms and conditions apply.](#)

Dataset: Bristow, T. Link to data from: Brine driven destruction of clay minerals in Gale crater, Mars. *Astrobiology Habitable Environment Database*. Retrieved Date: Oct 24, 2021.

<https://handle.stage.datacite.org/10.80300/vrt7-cy20>



Long-tail research

White paper submitted to the **Planetary Science and Astrobiology Decadal Survey 2023-2032**:

Bristow, T.F. et al. (2020) Strategy for Managing NASA's Long Tail of Planetary Research Data Insights from the Development of the Astrobiology and Habitable Environments Database (AHED).

