

FY23 Strategic Initiatives Research and Technology Development (SRTD)

Analog Mars Sample Return Science (AMaSRS)

Principal Investigator: Michael Tuite (3227)

Strategic Focus Area: Enabling Mars Sample Return Science at JPL | Strategic Initiative Leader: Paul V Johnson

Objectives

- Conduct Mars analog coring & sampling
- Develop analog sample workflow
- Conduct analog sample analysis – small, MSR-like samples
- Data stewardship – maintain MADlib as MSR resource
- MSR community leadership – publication, conferences, outreach

Background

Our focus is on the complex biosignatures that record the history of life and the environment on Earth with the goal of eventually applying that knowledge to returned Mars samples. Our approach includes the use of an analog coring device and a workflow that mimics the experience of a returned sample. The broader motivation for this program is maintaining JPL's MSR leadership and participation in the final phase of the MSR program.

LIDAR scan of hydrothermal "thing"

scan QR to view in 3D on Scaniverse

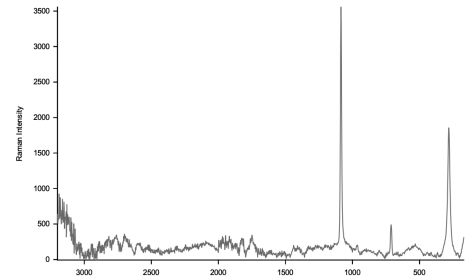


↑ We have added LIDAR scans of samples and outcrops to our in situ contextual data collection.

Significance/Benefits to JPL and NASA

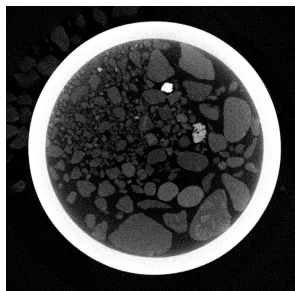
Four years of SR&TD funding has resulted in these contributions to JPL's mission:

- A facility that integrates diverse approaches to biosignature detection and characterization in ancient Earth rocks – precisely what will be required to make a claim for the biogenicity of a feature in an actual returned sample.
- A sample data infrastructure that is first-in-class
- A unique, high-fidelity analog sample and data collection capability
- A network of active collaborators both at JPL and other institutions around the world
- Active participation and leadership within the Mars returned sample community



↑ Raman spectrum of carbonate sample from Hawthorne hydrothermal mound.

← New Zealand Space agency intern Michaela Dobson examines layering in a Pleistocene hydrothermal mound near Hawthorne, Nevada.



↑ X-ray CT image by collaborator at the University of Alberta of regolith sample collected in Western Australia



↑ Bore holes and tailings produced by our M2020 analog coring bit.

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Publications:

Aramendia J, Tuite M, Castro K, Madariaga, J.M., "A New Methodology for Kerogen Maturity Estimation Based on Raman Spectroscopy and Chemometric Analysis." *Science of the Total Environment*, 887 (2023).

Tuite, Michael L, Jr, David Flannery, Teresa Fornaro, Juan M Madariaga, Sunanda Sharma, Justin I Simon, Christopher Herd, et al. 2023. "MARSnet." OSF. 2023. doi:10.17605/OSF.IO/ZB62Y.

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