

Madeline Raith

PhD Candidate, Department of Geology

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Education

University of Maryland, College Park

Graduated May 2023

Bachelor of Science in Geology with minor in Planetary Science

Graduated with High Honors, GPA: 3.89

Ph. D in Geology

(In progress, projected May 2028)

GPA: 3.89

Research Experience

NASA FINESST Future Investigator

January 2025 - Present

- Developing extending science return for spaceflight Laser Desorption Mass Spectrometry (LDMS) including quantification of elemental abundances and identification of mineralogy with machine learning models
- Understanding how and why mineralogy affects organic detectability using LDMS (see *Raith et al., in press*)
- Characterizing native organic distribution, mineralogy, and sedimentology of Mars analogs samples to understand correlations between organic inventory and geologic variables

Graduate Research Assistant – PLASMA

August 2024 – Present

- Characterizing the capacity for miniature Laser Ablation Microwave Induced Plasma Mass Spectrometry (LA-MIP-MS) to measure isotopic ratios and quantify elemental abundances in metal plates (see *Farcy et al., in press*)
- Optimizing instrument parameters to measure elemental abundances in basaltic glass reference materials and other geologic samples

Undergraduate Research Assistant with M-CLASS Lab

September 2020 – August 2023

- Developed techniques for measuring trace elements isotopes via laser ablation inductively coupled plasma mass spectrometry (LA-ICP-MS), and for measuring lipids via LDMS
- Completed summer-long project analyzing redox proxies and geochemical behavior previously collected dataset of mid-ocean ridge basalts, and completed senior thesis on mineralogical effects of organic detectability in Mars analog sediments using LDMS

NASA SUPPR Intern at GSFC

June 2022 – August 2022

- Completed field work in Iceland at Lake Sandvatn and Apavatn for drill core and surface sediment sample collection, then prepared samples for XRD and conducted XRD data analysis

Research Associate with Blue Marble Space Institute of Science

May 2021 – August 2021

- Analyzed extensive literature on perchlorates in Martian subsurface and collaborated with other students to write a manuscript on Martian subsurface habitability

Publications

Raith, M., Arevalo, R., Hanna, A., Thorpe, M., *in press*. Mineralogical Effects on Organic Detectability via Laser Desorption Mass Spectrometry. *Icarus*

Farcy, B., Graham, J., **Raith, M.**, Arevalo, R., Taghioskoui, M., Budinoff, S., McAdam, A., Lee, J., Danell, R., Kaplan, D., Gundersen, C., McDonough, B., *in press*. A miniature LA-MIP-MS for in situ compositional analyses of planetary surfaces. *Rapid Communications in Mass Spectrometry*

Ray, S., **Raith, M.**, Torrano, Z., Andrews, L., Southard, A., Danell, R., Thirkell, L., Colin, F., Briois, C., *submitted*. Non-traditional stable isotope measurements using laser desorption Orbitrap mass spectrometry: Implications for planetary missions. *International Journal of Mass Spectrometry*

Presentations

Raith, M., et al., (2025) “Spaceflight Laser Desorption Orbitrap Mass Spectrometry” presented at 2025 Harsh Environment Mass Spectrometry Workshop, Virginia Beach, VA, 15-18 Sept.

Raith, M., Arevalo, R., Boggs, J., (2024) “Mineralogical Identification via Laser Desorption Mass Spectrometry using a Neural Network” Abstract P41E-2946 presented at 2024 Fall Meeting, AGU, Washington D.C., 9-13 Dec.

Raith, M., Arevalo, R., Hanna, A., Thorpe, M., (2024) “Mineralogical Effects on Organic Detectability via Laser Desorption Mass Spectrometry” Abstract 517-05 presented at 2024 AbSciCon Meeting, Providence, RI, 5-10 May

Raith, M., et al., (2022) “Mineralogy and Geochemistry of Sediments from Basaltic Watershed of Lake Sandvatn, Iceland: Implications for Ancient Sedimentary Processes on Mars” Abstract EP42D-1644 presented at 2022 Fall Meeting, AGU, Chicago, IL, 12-17 Dec.

Raith, M., Willhite, L., Arevalo, R., (2021), “First-Row Transition Elements in Mid-Ocean Ridge Basalts” Abstract V43B-04 presented at 2021 Fall Meeting, AGU, New Orleans, LA, 13-17 Dec.

Honors and Awards

HEMS Workshop Student Award: Sept. 2025

Mars Exploration Program Travel Grant: May 2024

Dean’s Fellowship: Fall 2023, Spring 2024

Departmental Field Camp Fund: Spring 2022

Marc Lipella Memorial Scholarship: Fall 2020

Dean’s List: Fall 2019 – Spring 2023