Goldschmidt 2022 Abstract
https://doi.org/10.46427/gold2022.12710

Mastcam-Z views of alteration in Jezero crater floor rocks

BRADLEY GARCZYNSKI[1], JEFFREY R JOHNSON[2], BRIONY H. N. HORGAN[1], ALICIA VAUGHAN[3], MELISSA RICE[4], JIM BELL[5], JORGE NÃºÑEZ[2], SABRINA CURTIS[4], CHASE MILLION[6] AND MICHAEL ST. CLAIR[6]

[1]Purdue University
[2]JHU APL
[3]USGS Astrogeology Science Center
[4]Western Washington University
[5]Arizona State University
[6]Million Concepts

Presenting Author: bgarczyn@purdue.edu

The NASA Mars 2020 Perseverance rover is currently exploring the floor of an ancient lacustrine environment at Jezero crater to investigate regional geology, evaluate past habitability, seek signs of ancient life, and cache samples for potential future return to Earth. The mission's first science campaign has sought to characterize the lithology and establish stratigraphic context of the Máaz formation, a heavily cratered terrain dominated by pyroxene visible/near-infrared (VNIR) spectral signatures from orbit, and the Séítah formation, a ridge- and dune-filled terrain with strong olivine spectral signatures. Despite these rocks' location on the crater floor, the relationship between their emplacement and the timing of the Jezero paleolake remain poorly constrained. Understanding the timing and extent of water-rock interaction will help further constrain the history of the Jezero paleolake, identify potential habitable environments, and better characterize samples collected for future return to Earth. Here we present Mastcam-Z images and VNIR multispectral data of abrasion patches to identify the presence of secondary alteration minerals on the Jezero crater floor.

The Mastcam-Z instrument, a pair of zoomable multispectral cameras on the rover, has a spectral range (442-1022 nm) that is useful for distinguishing ferrous (primary) and ferric (secondary) mineralogy. Multispectral data of abraded patches is consistent with the presence of both primary and secondary Fe-bearing minerals in both the Máaz and Séítah formations. Moderate to weak absorption bands near 528 and 866 nm over red-toned regions indicate the presence of fine-grained crystalline hematite. Spectra that exhibit reflectance peaks near 754 nm and broad near-IR absorptions centered near 910 nm are consistent with pyroxene and/or ferric alteration minerals (e.g., Fe^{3+}-bearing phyllosilicates). Some spectra in the Dourbes abrasion exhibit long NIR slopes typical of olivine, but their reflectance peak positions near 754 nm are consistent with weathering or oxidation.