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Infrared Reflectance of Jezero geological units from Supercam/Mars2020 Observations

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On February 18, 2021, NASA's Mars 2020 *Perseverance* rover landed successfully in Jezero crater. Several geological and compositional units were previously identified from orbital data analysis : a dark pyroxene-bearing floor unit; an olivine-bearing unit exposed in erosional windows and partially altered into phyllosilicates and carbonates ; a deltaic complex and its possible erosional remnants and a marginal carbonate-bearing unit. As of Sol 300 (December 2021), the rover has visited two geological units in situ: the dark pyroxene-bearing floor unit and the olivine-bearing floor unit. Others investigations of geological units of interest have been carried out using long distance (up to several kilometers) observations.

The SuperCam instrument contains a suite of techniques including passive spectroscopy in the 0.40-0.85 (VIS) and 1.3-2.6 microns (IR) wavelength ranges, and a color camera (RMI- Remote Micro-Imager) providing high resolution context images. Since the landing, SuperCam has acquired thousands of VISIR spectra of nearby rocks (including both natural and abraded surfaces), as well as hundreds of spectra of distant targets (from 10s of m to 20 km). The VISIR field of view of each individual spectrum ranges from a few mm for the rock of the workspace to 20 m to 20 km. The aim of this contribution is to summarize the main results of VISIR spectra up to Sol 300.

The two geological units investigated in situ have distinct spectra. The crater floor rough unit (Cf-fr) has a pervasive 1.9 μm absorption indicative of hydration. Additional absorption at 2.28 μm indicate the presence of iron-rich phyllosilicates. Correlations between 1.9 μm and 2.4 μm

absorption bands or between 2.1 μm and 2.4 μm bands suggest the presence of both poly and monohydrated sulfates. Spectra similar to oxy-hydroxides have also been observed in some rocks. Unmixing methods such as factor analyses highlight a high calcium pyroxene component. To sum up, the Cf-fr is an altered pyroxene rich unit. The second unit investigated in situ is a region called Seitah, which is dominantly olivine-rich from orbital analyses. Supercam VISIR data confirm the strong signature of olivine of the unit and display a complex suite of absorptions in the 2.3 μm - 2.4 μm region suggesting the presence of iron and magnesium phyllosilicates and/or carbonates. The alteration signature seems to be associated with olivine grains.

Distant observations were acquired on the western delta front, several remote mesas and hills, on Jezero floor unit (the unit on which Perseverance landed on and investigated in situ), on Seitah before being visited by the rover, and on even more distant targets such as the crater rim or the marginal carbonate-bearing unit. The observed spectral signatures form different clusters depending on the type of target, highlighting the spectral diversity of Jezero geological units. Remarkably, the long distance observations of Seitah region are in perfect agreement with the in situ measurements confirming the relevance of long distance observations to assess the geological/mineralogical context of Perseverance's future traverses.