EGU21-986
https://doi.org/10.5194/egusphere-egu21-986
EGU General Assembly 2021

Initial SuperCam Visible/Near-Infrared Spectra from the Mars 2020 Perseverance Rover

Jeffrey Johnson[1], Thierry Fouchet[2], Olivier Forni[3], Jean-Michel Reess[2], Pernelle Bernardi[2], Raymond Newell[4], Ann Ollila[4], Chip Legett[4], Pierre Beck[5], Agnes Cousin[3], Clement Royer[6], Cedric Pilorget[6], Francois Poulet[6], Ed Cloutis[7], Tim McConnochie[8], Roger C. Wiens[4], and Sylvestre Maurice[3]

[1]United States of America (jeffrey.r.johnson@jhuapl.edu)
[2]LESIA, Meudon, France
[3]IRAP, Toulouse, France
[4]LANL, Los Alamos, USA
[5]IPAG, Grenoble, France
[6]IAS, Orsaym, France
[7]University of Winnipeg, Canada
[8]University of Maryland, USA

The SuperCam Instrument Suite [1-4], a US-French-Spanish-Danish collaboration, consists of three separate units: the Body Unit (BU) within the Rover [2], the Mast Unit (MU) at the top of the Perseverance Remote Sensing Mast [3], and Calibration Targets [4] located on the rover deck. SuperCam includes a passive visible/near-infrared (VISIR) spectroscopy system that will identify minerals near the rover (mm-scale) to distant outcrops (m-scale) over an extended wavelength range (0.385-0.465 μm, 0.536-0.853 μm, 1.3-2.6 μm) that is diagnostic for most mineral classes.

The infrared spectrometer (IRS) in the MU [5] uses an acousto-optic tunable filter (AOTF) excited by a RF signal to successively diffract up to 256 different wavelengths ranging between 1.3 and 2.6 μm on one of two available photodiodes to produce a single spectrum in about 80 seconds at a spectral resolution of 5-20 nm. The field-of-view (FOV) of the IRS is 1.15 mrad and is co-aligned with the RMI boresight. The visible (VIS) system in the BU comprises three spectrometers covering the UV (245 – 340 nm), violet (385 – 465 nm), and visible and near-infrared (VNIR, 536–853 nm). The spectrometers are fed by light collected by the telescope in the MU through an optical fiber connecting the MU and BU. The violet spectrometer has a spectral resolution of 0.12 nm, and the VNIR transmission spectrometer has a spectral resolution of 0.35 – 0.70 nm. The VIS FOV is 0.74 mrad and co-aligned with the IR FOV.

Several SuperCam calibration targets (SCCT) are dedicated to VISIR spectroscopy, including an AluWhite white target, an Aeroglaze Z307 black target, and red, cyan, and green color targets [4]. Several of the other targets whose primary purpose is for other techniques exhibit useful VISIR spectral features and will be observed [5].

Raw data will be converted to radiance (W/m2/sr/μm) with calibrated wavelengths using the

instrument transfer function [6-7]. Relative reflectance spectra will be generated by dividing the calibrated radiance spectrum by either (1) a Mars atmospheric transmission spectrum and then by a modeled solar irradiance spectrum; or (2) a radiance spectrum of the white SCCT taken close in time to the surface observation, as is done with Mastcam-Z calibration [8].

This poster will show initial VISIR data acquired on Mars, compared with test and performance data obtained at Paris Observatory, LANL, and JPL. As of this writing, the planned observations during the first ~30 sols include spectra of the white and black SCCTs, and at least one Mars target spectrum.

[1] Farley et al. (2020), Space Sci. Rev. 216, 142. [2] Wiens et al. (2020) Space Sci. Rev. 216, in press, [3] Maurice et al. (2020) Space Sci. Rev. 216,in press, [4] Manrique et al. (2020) Space Sci. Rev. 216, 8, 1-27; [5] Cousin et al. (2021) this meeting [6] Fouchet et al. (2021) Icarus, in prep. [7] Royer et al. (2020) Rev. Scient. Instrum. 91, 063105. [8] Bell, J.F. et al. (2021), Space Sci. Rev, in press.