An overview of SHERLOC Raman and fluorescence spectroscopy results obtained during Perseverance's Green Zone Campaign at Jezero crater, Mars

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The Perseverance rover landed in Jezero crater, Mars, in February 2021. The field site was chosen because orbiter data provided evidence that the crater hosted an ancient (>2.7 Ga) fluvio-lacustrine environment. The Octavia E. Butler landing site is located ~1.9 km east of the erosional remnant of the Jezero river delta. Scanning Habitable Environments with Raman and Luminescence for Organics and Chemicals (SHERLOC) is an arm-mounted instrument that combines fluorescence and Raman spectroscopy with microscopic imaging to analyze geological materials in order to better understand the history of the environments recorded in the rocks within Jezero crater and to search for potential biosignatures.

SHERLOC has two microscopic cameras, the Autofocus and Context Imager (ACI) and the Wide-Angle Topographic Sensor for Operations and eNgineering, (WATSON). These subsystems obtain high spatial resolution (10.1–100 µm/pixel) images to identify grain-scale structure and texture. SHERLOC spectroscopy enables high-sensitivity detection, characterization, and spatially-resolved correlation of trace organic materials. SHERLOC's 248.6 nm deep UV laser generates a 100 µm-diameter spot. Photons generated by Raman scattering and fluorescence emission are collected and the spectra are downlinked to Earth for analysis. Knowledge of where the laser is pointed allows for mineral and compositional maps to be generated and overlain in ACI and WATSON images.

Early spectroscopy observations focused on natural rock surfaces at targets named Nataani (sol 83), Bi_la_sana (sol 98) and Foux (sol 141). These surfaces included patches of aeolian dust that had settled upon the rocks. Perseverance's abrasion tool is expected to become available in August 2021; it will grind to depths of 14 mm to remove dust and penetrate coatings and weathering rinds. This presentation will summarize major results from analysis of the rocks examined by SHERLOC during Perseverance's first science and sample coring campaign (Green Zone Campaign).