

Opportunity Title: Tunable Laser Spectroscopy of Planetary Atmospheres

Opportunity Reference Code: 0009-NPP-JUL24-JPL-TechDev

Organization: National Aeronautics and Space Administration (NASA)

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Application Deadline: 7/1/2024 6:00:59 PM Eastern Time Zone

Description: Opportunities exist that directly support the goals of NASA's solar system exploration programs by conducting laboratory research that will (i) support an existing instrument on the MSL mission (Tunable Laser Spectrometer TLS on SAM) and (ii) develop new measurement and sampling techniques for the next-generation of tunable laser spectrometers for future planetary missions to targets including the Moon, Mars, Venus, Saturn, Titan, and small bodies. With the Tunable Laser Spectrometer (TLS) having successfully operated on NASA's Mars Science Lab (MSL) Curiosity rover for nearly a decade, the NPP will conduct research that will contribute to the accurate interpretation of abundance and isotopic composition of gases in the atmosphere and evolved from rock pyrolysis. Specifically, the NPP will conduct laboratory research activities in the area of high-resolution infrared spectroscopy and isotope fractionation, including the effects of the chemistry and physics of wall and surface interactions on gas detection and possible isotope scrambling. For future planetary missions under the Discovery and New Frontiers proposal opportunities, the NPP will investigate spectroscopic line broadening, and vacuum pumping and fill schemes applicable to target planets such as Venus and Saturn. Gases of interest include methane, water, carbon dioxide, ammonia, and sulfur gases, in dominant atmospheres of carbon dioxide, nitrogen and helium. This will have direct relevance to the measurement strategy and observational interpretations for the data acquired during current and future missions. In addition, it is desirable that the NPP have interest and expertise in developing new infrared laser instrumentation for planetary missions.

""Herriott Cell Spot Imaging Increases the Performance of Tunable Laser Spectrometers"", C.R. Webster et al., Appl. Opt. Vol. 60, No. 7, (2021).

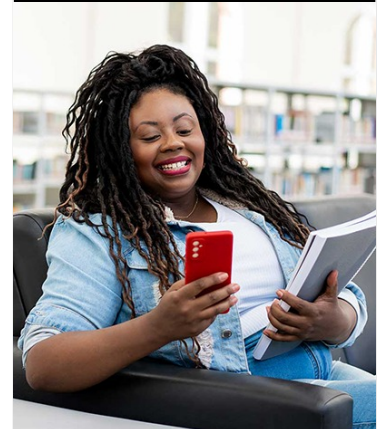
"Background levels of Mars' methane show strong seasonal variations", C.R. Webster et al., Science 360, 1093-1096 (2018).

""Determination of spectral parameters for lines targeted by the Tunable Laser Spectrometer (TLS) on the Mars Curiosity rover", J. Manne and C.R. Webster, J. Quant. Spectr. & Radiative Transfer (JQSRT), 171, 28-38 (2016).

"Isotope Ratios of H, C, and O in CO₂ and H₂O of the Martian Atmosphere," C. R. Webster, et al., Science 341, 260 (2013).

Location:

Jet Propulsion Laboratory
Pasadena, California



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Field of Science:Technology Development

Advisors:

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Applications with citizens from Designated Countries will not be accepted at this time, unless they are Legal Permanent Residents of the United States. A complete list of Designated Countries can be found at: <https://www.nasa.gov/oiiir/export-control>.

Eligibility is currently open to:

- U.S. Citizens;
- U.S. Lawful Permanent Residents (LPR);
- Foreign Nationals eligible for an Exchange Visitor J-1 visa status; and,
- Applicants for LPR, asylees, or refugees in the U.S. at the time of application with 1) a valid EAD card and 2) I-485 or I-589 forms in pending status

Eligibility Requirements

- **Degree:** Doctoral Degree.