

**Opportunity Title:** Solar System Exploration: Planetary Geochemistry via Laser

Ablation ICP-MS

**Opportunity Reference Code:** 0137-NPP-NOV23-GSFC-PlanetSci

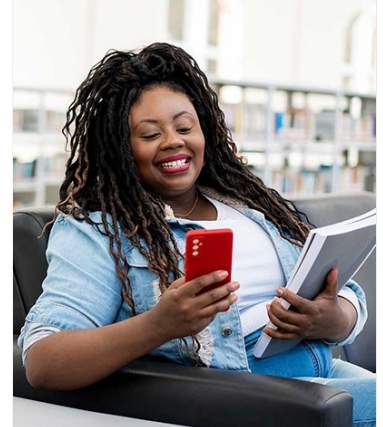
**Organization** National Aeronautics and Space Administration (NASA)

**Reference Code** 0137-NPP-NOV23-GSFC-PlanetSci

**Application Deadline** 11/1/2023 6:00:59 PM Eastern Time Zone

**Description** Proposals are invited that focus on developing novel techniques and applications for measuring trace (ppm-levels or below) element abundances, partitioning behaviors and isotopic compositions in planetary materials, analog samples and standard reference materials via solution preparation (e.g., column chromatography, isotope dilution and high-precision standard addition) and particularly in situ laser ablation (LA-) inductively-coupled plasma mass spectrometry (ICP-MS), as well as other complementary methods including laser ablation/desorption time-of-flight mass spectrometry (TOF-MS). The development of innovative analytical protocols and the quantitative determination of the chemical compositions of precious sample specimens, such as chondritic and achondritic meteorites and Mars analog samples, will be encouraged to explore (contemporary and ancient) surface and deep mantle processes associated with the differentiation of planetary bodies. Examples of potential research topics include: (1) Development and testing of cutting-edge LA-ICP-MS and/or complementary laser desorption/ionization TOF-MS methods to measure ultratrace elements at ppb-levels or lower and/or isotopic compositions with high precision and accuracy; (2) Cosmochemical analysis of planetary materials, including (but not limited to) stony and iron meteorites, Mars/Titan analog samples, and synthetically-derived interplanetary dust particles (IDPs) to support current flight projects and enhance our understanding of planetary processes associated with accretion and internal differentiation (e.g., magma ocean formation, core-mantle separation, and early silicate melting); (3) Investigation into the geochemical behavior, sequestration and chemical systematics of ultratrace elements in ancient terrestrial rocks (e.g., Tonalite-Trondhjemite-Granodiorite, or TTGs, basaltic komatiites, and Archean zircons) to better understand the planet's thermal evolution, initiation of plate tectonics and role of oxygen fugacity during the formation of distinct mantle reservoirs; and, (4) Expansion of analytical capabilities associated with radiogenic isotope geology and geochronology, particularly the development, demonstration and usage of in situ methods to analyze and date ancient geological materials.

Studies should take advantage of existing mass spectrometry and related laboratory facilities, including: 193 nm wavelength, 4 ns pulse-width excimer laser ablation system; high-resolution double-focusing ICP-MS; UV- and IR-laser TOF-MS prototypes; and, chemical fume hoods. Backgrounds in geology/chemistry/physics are preferred, and experience with ICP-MS operations, laser ablation/desorption processing, acid digestions and wet chemical procedures, development of new analytical methods, high vacuum systems, and general mass spectrometry knowledge is required.



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**Location:**

Goddard Space Flight Center  
Greenbelt, Maryland

**Field of Science:** Planetary Science

**Advisors:**

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301-614-6397

**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/oair/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.