

Opportunity Title: Astronomical Investigation of Titan's Chemical Complexity

Opportunity Reference Code: 0136-NPP-NOV23-GSFC-PlanetSci

Organization National Aeronautics and Space Administration (NASA)

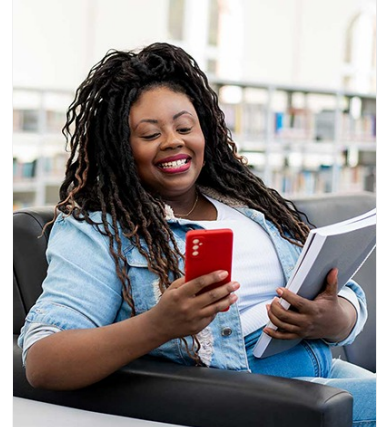
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Application Deadline 11/1/2023 6:00:59 PM Eastern Time Zone

Description Titan is the largest moon of Saturn, and the only moon in the solar system with a substantial atmosphere. The atmosphere, largely composed of nitrogen (N₂) and methane (CH₄) is subjected to continuous bombardment from solar UV and Saturn's magnetospheric electrons, initiating reactions that convert these simple substances to more complex compounds, including hydrocarbons (C_xH_y) and nitriles (C_xH_yCN). The Cassini space mission has yielded valuable compositional information about Titan's atmosphere from both the mass spectrometer (INMS) and remote sensing instruments in the infrared and UV, which can measure gas composition through emission or absorption of light. However, at the end of the Cassini mission, many open questions remain which will require another generation of missions to fully answer. From Earth, much progress has recently been made in investigating Titan's chemical composition using large astronomical observatories such as ALMA. ALMA, operating at millimeter and sub-millimeter wavelengths, has been used by a Goddard-led team to identify two new molecules in Titan's atmosphere in the last 3 years. These are the nitriles C₂H₃CN (vinyl cyanide) and C₂H₅CN (ethyl cyanide), which may have important astrobiological significance as possible building blocks for membrane structures in Titan's hydrocarbon seas ("azotosomes").

The post-doctoral project will be to acquire and then model observational data of Titan from ALMA and other large observatories (JWST, SOFIA) across a range of wavelengths, near-infrared to millimeter. Some data is already available, in the ALMA science archive, for example, while further data is being acquired by the NPP project advisor (Nixon) on a regular basis from ground-based telescopes, and starting in 2019, from JWST. The project may include proposing further observations, and attending observing runs at telescopes. The core part of the project will be to model the spectral data using the NEMESIS computer code for radiative transfer in planetary atmospheres, and retrieve new information about Titan's atmosphere including composition and dynamical state (temperature, winds). This information will be used to inform development of future NASA missions to further investigate the origins of life in the solar system.

The ideal applicant would have previous experience in acquiring, reducing, calibrating and/or modeling astronomical or remote sensing data of solar system bodies. Computer skills are required: preferably experience with data analysis and plotting languages such as IDL and Python, and astronomical packages such as CASA or AIPS. However, training will be provided and candidates with some relevant research experience, combined with a strong background in the physical sciences and mathematics and a demonstrated interest in planetary science and a research career, are encouraged to apply.



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Location:

Goddard Space Flight Center
Greenbelt, Maryland

Field of Science: Planetary Science

Advisors:

Conor Nixon
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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/oior/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.