Opportunity Title: Atmospheres of the Ice Giants from Sub-Millimeter Observations

Opportunity Reference Code: 0200-NPP-NOV23-GSFC-PlanetSci

Organization	National Aeronautics and Space Administration (NASA)
Reference Code	0200-NPP-NOV23-GSFC-PlanetSci
Application Deadline	11/1/2023 6:00:59 PM Eastern Time Zone

Description The outermost planets, Uranus and Neptune, remain amongst the least understood objects in the solar system, in part due to their extreme distance and few visits by spacecraft. In addition, their cold temperatures imply study at long wavelengths, greatly reducing the spatial resolution obtainable except for very few radio frequency, and more recently sub-millimeter, telescope arrays.

The completion of the ALMA telescope array in the present decade has revolutionized our ability to study cold, distant astronomical objects, ranging from cool stars to dense molecular clouds. ALMA's great potential to study solar system objects, remains largely untapped due to a traditional focus on shorter wavelength imaging for solar system astronomy. In particular, there remains only a single publication as of 2018 on either Uranus or Neptune, using ALMA data. In fact, large quantities of data on these objects exist already in the public domain, accessible through the ALMA archive and awaiting analysis and modeling, providing an exciting opportunity for post-doctoral research.

The post-doctoral project will be to extract, calibrate and deconvolve spectral image data of the outer 'ice giant' planets from the ALMA archive using the CASA software suite. The search will focus in the first instance on confirming previous detections of CO and HCN in their atmospheres, and then move on to detections of these molecules at other frequencies. If successful, time variability and isotopic lines will be searched for next. Spectral lines will be modeled using the existing NEMESIS radiative transfer program provided by our collaborators at Oxford University. This study will lead to greatly improved understanding of the chemistry and dynamics of the atmospheres of these distant worlds, an important precursor to developing future missions.

The qualified candidate will already have significant prior experience in solar system astronomy using terrestrial telescope or spacecraft remote sensing data. Ideally, the candidate will also have previous experience in radiative transfer analysis for planetary atmospheres. Strong mathematical and computer skills are essential. Familiarity with data analysis computer languages such as IDL, MatLab and/or python is a considerable asset. The applicant should have strong references and a demonstrated track record of recent publications.

Location:

Goddard Space Flight Center
Greenbelt, Maryland

Field of Science: Planetary Science
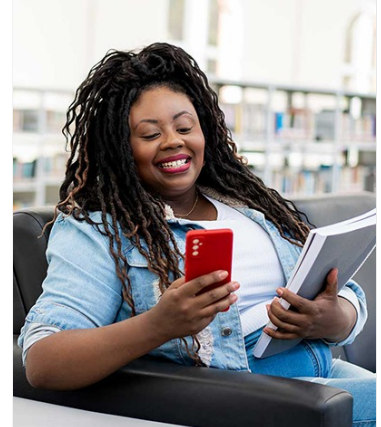
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Advisors:

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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/oiir/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.