

Opportunity Title: Circumstellar Matter: Jets and Dust

Opportunity Reference Code: 0030-NPP-NOV23-JPL-Astrophys

Organization National Aeronautics and Space Administration (NASA)

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

Description We are studying dust- and nucleosynthetically-enriched circumstellar matter ejected by low- and intermediate-mass stars at the end of their lives, utilizing data from e.g., Hubble, Spitzer and Chandra. This mass-ejection process is a crucially important part of the life-cycle of stars, because it sows the seeds (by injecting dust grains, and matter enriched in the biogenic elements C and N) for the birth of new stars and solar systems. The understanding of how the early Universe evolved into what we observe presently requires understanding the mass-loss processes from generations of stars slowly enriching the ISM with metals and dust. Recent discoveries of (i) crystalline silicates (which are abundant in the Solar system and young stars) in disks around dying stars, and (ii) large pre-solar grains containing olivine in interplanetary dust particle, highlights the importance of investigating the nature of the material returned to space by dying stars and the circumstellar environment in which it evolves. We need to understand the formation sites and properties (composition/sizes/shapes) of such grains, which are being found in the dense waists of bipolar nebulae around dying stars (using multiwavelength imaging of, and modeling of the dust emission, from these objects) (Ref. 1). We are also studying jet-like outflows in evolved stars which are empirically similar in many ways to those in young stars (Ref. 2). As part of a coronagraphic mission concept to directly detect giant planets around nearby stars in the visible and infrared, we want to investigate how such (or similar) techniques can help understand the the Kuiper Belt and Oort Cloud regions of our Solar system by searching for their analogs in red giant stars, which have sufficient luminosity to illuminate these regions for detection.

1. Sahai, R., S'anchez Contreras, C., & Morris, M. 2005, ApJ, 620, 948
2. Sahai, R et al. 2003, Nature, 426, 261

Location:

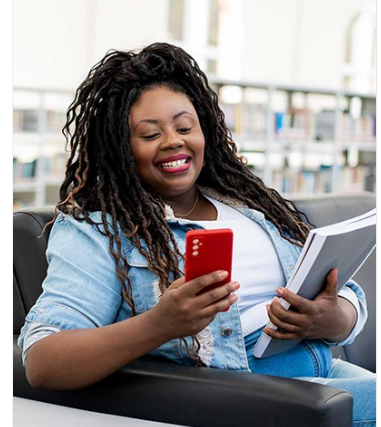
Jet Propulsion Laboratory
Pasadena, California

Field of Science: Astrophysics

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



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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.