Opportunity Title: Astrophysics: Infrared Stellar Interferometry: Instrumentation and Observations of Circumstellar Material around Young and Late Type Stars
Opportunity Reference Code: 0039-NPP-NOV23-GSFC-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

Stellar Interferometry
Stellar interferometry is a technique in high-angular resolution astronomy that utilizes discrete separated telescopes to synthesize a telescope that is effectively the size of an equivalent telescope of diameter equal to the maximum spacing. This technique was initially developed in radio astronomy. In the past 20 years, a number of ground-based interferometers at optical and infrared wavelengths have been successfully developed and are in routine operation in the US and Europe.

Debris Disk Observations with the LBTI
Dr. Danchi is a member of the Science Team for the Large Binocular Telescope Interferometer (LBTI) Hunt for Observable Signatures of Terrestrial Systems (HOSTS) program supported by NASA Headquarters. The team is tasked with performing a survey of nearby stars to determine the amount of warm dust in the habitable zones of solar type stars. This dust, called exozodi, by analogy with the zodiacal dust in our solar system, is the main astrophysical noise source that affects the search for earth-sized or terrestrial planets in the habitable zone of such stars. However, the exozodi material is also sculpted by interactions with nearby planets to form gaps, clumps, spiral features, and other complex morphologies. This project is in the commissioning phase, and it is expected that the survey will begin in the summer of 2015 and will last until 2018.

Protoplanetary Disk and YSO Observations with MATISSE
Dr. Danchi is also a member of the MATISSE (Multi-Aperture mid-Infrared SpectroScopic Experiment) Science Team. MATISSE is a second-generation instrument to be installed at the Very Large Telescope Interferometer (VLTI). It combines four of the Unit Telescopes (UTs – 8 m diameter) or four of the Auxiliary Telescopes (ATs – 1.8 m diameter) to provide six simultaneous visibilities and four closures, and over a night, it is possible to use aperture synthesis techniques to create complex images of the terrestrial planet forming regions of disks of nearby Herbig Ae/Be and T Tauri stars, as just one example. It operates simultaneously at L, M, and N bands (3.8, 4.5, and 10 microns, respectively), with spectral resolutions from approximately 30 to a few thousand. Dr. Danchi as a member of the Science Team is involved in Guaranteed Time Observations (GTO) with this instrument in the areas of star and planet formation, and other science topics such as massive stars and late-type mass-losing stars. MATISSE is currently under construction and integration. It will be installed at the VLTI on Mt. Paranal in late 2015, with commissioning and GTO observations commencing shortly thereafter.

Citizen Science with WISE
The Disk Detective citizen science project is scouring the data archive from NASA's WISE mission to find new planetary systems, homes of planetary

systems and candidate advanced extraterrestrial civilizations. Volunteers on this project, a partnership with Zooniverse, have already performed nearly 1,000,000 classifications of WISE sources, searching a catalog 8x the size of any previous survey. They have worked with us to write observing proposals and prepare for observing runs on telescopes at Mt Palomar, Mt Hopkins and in Argentina. We are working to harvest the output of Disk Detective, follow up interesting candidates, and plan future citizen science projects using NASA data.

Supercomputer Models of Planetesimal Disks
Detailed observations of resolved debris disks show a spectacular variety of features and asymmetries, including inner cavities and gaps, inclined secondary disks or warps, and eccentric, sharp-edged rings. Embedded exoplanets could create many of these features via gravitational perturbations, which interact with the the collisional evolution of the disk. Using supercomputers and new superparticle-based codes like SMACK (Superparticle-Method Algorithm for Collisions in Kuiper belts and debris disks), we are modeling these phenomena to help us decode images of disks from ALMA, HST and JWST to help us understand debris disk physics and find new exoplanets. We also plan to apply these techniques to model the history of the solar system and space debris around the Earth.

Location:
Goddard Space Flight Center
Greenbelt, Maryland

Field of Science: Astrophysics

Advisors:
William C. Danchi
William.C.Danchi@nasa.gov
301-286-4586

Marc Kuchner
Marc.J.Kuchner@nasa.gov
301-286-5165

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

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pending status

Eligibility Requirements

- **Degree:** Doctoral Degree.