Opportunity Title: Debris Disks Modeling and Observations
Opportunity Reference Code: 0098-NPP-NOV23-JPL-Astrophys

Organization National Aeronautics and Space Administration (NASA)

Reference Code 0098-NPP-NOV23-JPL-Astrophys

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

Description Debris disks found around main sequence stars are the remnants of planetary formation. The outer colder parts of these disks, analogous to our solar system Kuiper belt, were first detected via their far infrared excess emission in the 80's, and then abundantly imaged at visible to sub-millimeter wavelengths, most recently with SPITZER, Herschel and ALMA. Conversely, very little is known about the warmer dust component of debris disks, similar to the zodiacal dust residing in the inner 3AU of our own solar system. Only a handful of warm (> 200K) debris disks have been found around mature stars by Spitzer or spatially resolved by near/mid-infrared interferometry. However, this situation is changing rapidly, as illustrated by the many detections of resolved hot/warm excess around nearby main sequence stars by the CHARA and VLTI interferometric arrays (FLUOR, PIONIER and GRAVITY instruments) and at LBTI. Our JPL team is strongly engaged in 3 surveys which recently concluded: the NASA sponsored LBTI-HOSTS mid-infrared exozodi survey (Mennesson is a key science team member), the CHARA hot exozodi disks survey (funded through past NASA ROSES grant, PI: Mennesson) and the Palomar Fiber nuller near infrared hot exozodi survey (Mennesson served as science PI).

While at JPL, the postdoctoral fellow will have access to these complementary dataset acquired at different wavelengths and spatial resolutions. He will be invited to participate in their reduction, theoretical modeling and interpretation, both per individual target and in a statistical sense. The main objectives are: (i) to use and develop advanced models to reconcile all available data (including ancillary spectral measurements) and produce a consistent view of the observed disks morphology and physical characteristics; (ii) to gather, reduce and interpret new exozodiacal observational data using existing ground-based facilities (e.g. VLTI and CHARA); (iii) to understand the potential of exozodiacal disks visible observations with the WFIRST coronagraph instrument and other possible future space-based instruments; (iv) to understand the impact of current and future exozodiacal dust detections on the feasibility of possible future NASA direct imaging missions targeting habitable zone exoplanets such as HabEx and LUVOIR.

References:

- Ertel S. et al. 2018: ""The HOSTS Survey—Exozodiacal Dust Measurements for 30 Stars"", AJ, 155, 194
- Nunez P., Scott N., Mennesson B. et al. 2017, ""A near-infrared interferometric survey of debris-disc stars. VI. Extending the exozodiacal light survey with CHARA/JouFLU"", A&A, 68, 113
- Gaudi B., Mennesson B., Seager S. et al. 2018, ""The Habitable Exoplanet Observatory (HabEx)"", SPIE Proc. 10698
- Mennesson et al. 2018, ""The WFIRST coronagraph instrument: a major

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step in the exploration of sun-like planetary systems via direct imaging"", SPIE Proc. 10698
- Mennesson et al. 2016: "" Making high-accuracy null depth measurements for the LBTI exozodi survey"", SPIE Proc. 9907
- Mennesson B. et al. 2014: ""Constraining the Exozodiacal Luminosity Function of Main-sequence Stars: Complete Results from the Keck Nuller Mid-infrared Surveys"", ApJ, 797, 119
- Lebreton J. et al. 2013: ""An Interferometric Study of the Fomalhaut inner debris disk. III. Detailed models of the exozodiacal disk and its origin"", A&A, 555, 146
- Mennesson, B. et al. 2013. ""An Interferometric Study of the Fomalhaut inner debris disk. II. Keck Nuller Mid-Infared Observations"", ApJ, 763, 119
- Mennesson, B. et al. 2011: “New constraints on companions and dust within a few AU of Vega”, ApJ, 736, 14

Location:
Jet Propulsion Laboratory
Pasadena, California

Field of Science: Astrophysics

Advisors:
Bertrand Mennesson
Bertrand.Mennesson@jpl.nasa.gov
818-354-0494

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.