

**Opportunity Title:** Energetics and Kinematics of Feedback from Massive Young Stars

**Opportunity Reference Code:** 0200-NPP-NOV23-JPL-Astrophys

**Organization:** National Aeronautics and Space Administration (NASA)

**Reference Code:** 0200-NPP-NOV23-JPL-Astrophys

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

**Description:** Massive young stars return energy to their surroundings via radiative and mechanical processes. This feedback may well control the rate of star formation and thus the evolution of galaxies. Probing this feedback requires measurement of momentum and energy inputs from the stars to their surroundings. These quantities can best be measured by far infrared fine structure line emission, particular of ionized carbon ([CII]), ionized nitrogen ([NII]), and atomic oxygen ([OI]). These lines can be observed at high spectral resolution required to measure velocity shifts and thus dynamics. Platforms to date have included SOFIA and the STO-2 balloon mission. We have large quantities of data from SOFIA, both new and archival, that directly relate to this important issue. In addition we are heavily involved in the GUSTO ultra-long duration balloon mission that will observe all three of these species over a significant portion of the Galactic plane. GUSTO is scheduled for flight in December 2022, and data will be available almost immediately. The ASTHROS mission to study [NII] is just starting, and will fly in 2023. The holder of NPP will work at JPL with group of scientists involved in analysis of fine structure lines and modeling of photon dominated regions. He or she will develop improved methods of data reduction and extraction of key parameters for determining the kinematics and dynamics of the gas surrounding massive young stars. The Astrophysics and Space Sciences Section at JPL includes scientists working on a wide range of astrophysical problems and provides a broadly stimulating environment along with the chance to interact with engineers developing new instrumentation, and scientists working on concepts for new missions.

References:

""Probing ISM Structure in Trumpler 14 and Carina Using the Stratospheric Terahertz Observatory 2,"" Seo, Y., Goldsmith, P.F., Walker, C. K., et al. 2019, ApJ, 878, 120.

""Electron Densities and Nitrogen Abundances in Ionized Gas Derived Using [NII] Fine-structure and Hydrogen Recombination Lines,"" Pineda, J.L., Horiuchi, S., Anderson, L., Luisi, M., Langer, W.D., Goldsmith, P.F., Kuiper, T.B., Bryden, G., Soriano, M., & Lazio, J.W. 2019, Ap.J., 886, 1.

""Modeling Collisional Excitation of [OI] Fine Structure Line Emission from PDRs: I. Homogeneous Clouds,"" Goldsmith, P.F. 2019, Ap.J., 887, 54.

**Location:**

Jet Propulsion Laboratory  
Pasadena, California

**Field of Science:** Astrophysics



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**Advisors:**

Paul F. Goldsmith

Paul.F.Goldsmith@jpl.nasa.gov

(818) 393-0518

**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/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.