Opportunity Title: Understanding Particle Acceleration and Transport
Opportunity Reference Code: 0231-NPP-NOV23-GSFC-HelioSci

Organization National Aeronautics and Space Administration (NASA)

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

Description The goal of this NPP is to contribute to instrument development of the IMAP/HIT instrument as well as to investigate particle acceleration using archival data. The research program will focus on folding solar energetic particle observations from missions such as ACE, GOES, and IMP8 together with gamma-ray observations from the COMpton TELescope (COMPTEL) on the Compton Gamma Ray Observatory (CGRO), to focus on the connection between related signatures of acceleration at the Sun with SEP detections at Earth.

Instrument development will focus on the High-energy Ion Telescope (HIT) instrument on the IMAP mission. IMAP is a heliophysics mission in the Solar Terrestrial Probes program specifically to investigate two critical frontiers of research: the acceleration of energetic particles and the interaction of the solar wind with the local interstellar medium. IMAP is a sun-pointed spinner in orbit about the Sun-Earth L1 point scheduled to launch in 2025. IMAP has ten instruments that provide a complete set of observations to simultaneously dissect the particle injection and acceleration processes at 1 AU, while remotely probing the global heliospheric interaction and its response to particle populations generated by these processes. IMAP is a collaboration between Goddard and 24 institutions from the US, Germany, Poland, Switzerland, and Japan. Goddard is responsible for the High-energy Ion Telescope (HIT) that will measure the elemental composition, energy, spectra, angular distributions and arrival times of H to Ni ions from ~2-~40 MeV/nucleon. One of the major focuses of this program is to make contributions to the development, testing, and calibration of the HIT instrument.

With an MeV Î³ sensitivity an order of magnitude improved over SMM, COMPton TELescope (COMPTEL)/CGRO archival data offers the best, and perhaps only, possibility to investigate a connection between small-flare Î³-ray emission, thermal and bremsstrahlung continuum emission from accelerated electrons (and associated radio emission), and SEPs. Another major goal of this proposed work is to search the archival COMPTEL data for small flare signatures in the Î³-ray emission using three proxies: soft X-ray emission (as measured by GOES), hard X-ray emission (as measured by BATSE), and SEPs focusing on the numerous small impulsive or 3He-rich SEP events. Furthermore, the small flare Î³-ray emission will be characterized as well as the spectral index, any Î³-ray line features, and time resolved spectra where possible, to deduce the relationship, both in energy spectra and composition, between SEPs and flare accelerated particles (electrons and ions).

The research program offers a valuable opportunity to combine experience in instrument development in addition to data analysis, both of which are expected to lead to several publications. The postdoctoral scholar will work

closely with scientists at Goddard Space Flight Center and the University of New Hampshire.

Location:
Goddard Space Flight Center
Greenbelt, Maryland

Field of Science: Heliophysics Science

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Eligibility Requirements

- **Citizenship:** LPR or U.S. Citizen
- **Degree:** Doctoral Degree.