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Opportunity Title: High-energy Cosmic ray Astrophysics
Opportunity Reference Code: 0270-NPP-NOV23-GSFC-Astrophys

Organization National Aeronautics and Space Administration (NASA)

Reference Code 0270-NPP-NOV23-GSFC-Astrophys

How to Apply All applications must be submitted in Zintellect

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

Description **Description:**

The energetic nuclei and electrons which make up the galactic cosmic radiation are used to study the processes that lead to nucleosynthesis and the acceleration of the resulting nuclei as well as processes that lead to the direct or indirect production of particles and antiparticles. In both cases, the interactions o particles with the magnetic fields and matter in the galaxy are important. Experimental measurements of these particles are made from balloons and on near-Earth satellites.

Our current balloon projects involve measurements of antiprotons in the 100 MeV to several GeV range and the abundances of heavy nuclei in the cosmic radiation Typical instrumentation includes magnetic spectrometers, Cherenkov counters, time-of-flight detectors, and drift chambers. Opportunities exist to participate in th various phases of those projects from the identification and definition of the specific scientific objectives through the development, test, and operational phases of an experiment and finally, to carry out the data analysis and presentation of results. An active program of theoretical investigation into the origin, acceleration, and interstellar propagation of galactic cosmic-ray particles i also part of our program. There are also opportunities to participate in the development of an instrument for the International Space Station that will measur the abundances relative to Fe of every element in the cosmic radiation from B to Pb.

A new direction in which there are opportunities is the identification of complex antinuclei: antideuterons, antihelium, or heavier antinuclei, through their characteristic annihilation products when brought to rest in a detection medium. This work will utilize a fully-active liquid argon time-projection chamber (TPC)/calorimeter that also has important applications in MeV gamma-ray astrophysics and the measurement of heavy cosmic-ray isotopes.

We are planning a new research effort aimed at detailed in-situ measurements of the interactions of very-high-energy (VHE) to ultra-high-energy (UHE) cosmic particles with the Earth's atmosphere. We also have a new research effort to use the Earth as a neutrino converter to detect VHE and UHE cosmic neutrinos. This includes a dedicated neutrino modeling and simulation development program. Opportunities exist to participate in the modeling effort needed to support the experimental effort that we plan and to influence the designs of experiments to be proposed to NASA.

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 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.