

A.4.0 Overview: The Sun-Earth Connection Science Theme

1. Program Description

The Sun-Earth Connection (SEC) science theme of NASA's Office of Space Science (OSS) supports investigations of the Sun and planetary space environments, including the origin, evolution, and interactions of space plasmas and electromagnetic fields in the heliosphere and in connection with the galaxy. Understanding the origin and nature of solar activity and its effect on the space environment of the Earth is a particular focus. Current discipline interests are:

- Heliospheric Physics: the origin and behavior of the solar wind, energetic particles, and magnetic fields in the heliosphere and their interaction with the interstellar medium;
- Solar Physics: the Sun as a typical dwarf star, and as the dominant, time-varying source of energy, plasma, and energetic particles in the solar system, especially concerning its influence on the Earth;
- Magnetospheric Physics: the physics of magnetospheres, including their formation and fundamental interactions with plasmas, fields, and particles; the Earth's magnetosphere is emphasized, but studies of the magnetospheres of planets, comets, and other primordial bodies are also supported; and
- Ionospheric, Thermospheric, Mesospheric (ITM) Physics: the physics of the mesosphere, thermosphere, ionosphere, and aurorae of the Earth, including the coupling of these phenomena to the lower atmosphere and magnetosphere.

The emphasis in all of these disciplines is the study of processes that occur naturally in the space environment and/or the study of artificially induced perturbations that elucidate natural plasma processes. Details of the purview of these disciplines are given in respective subsections of Section A.4 of Appendix A of this ROSS-98 NRA.

The strategic vision for the Sun-Earth Connection is embodied in the *Sun-Earth Connection Roadmap - Strategic Planning for the Years 2000-2020*. This document is accessible through the World Wide Web at <<http://espsun.space.swri.edu/~roadmap/index.html>>.

2. Program Types

Proposals for several different types of program elements of the Sun-Earth Connection research program are solicited in this NRA. These include the Supporting Research and Technology (SR&T) and suborbital programs in the various disciplines, The Sun-Earth Connection Theory Program, as well several Guest Investigator programs. Generic

program descriptions follow immediately below, while discipline specific information can be found in the individual SEC program elements in Section A.4 of this Appendix.

(1) Supporting Research and Technology Program. The SEC theme program elements support between 20 and 80 individual research tasks each that employ a variety of research techniques, *e.g.*, theory, numerical simulation, and modeling; analysis and interpretation of space data; development of new instrument concepts; and laboratory measurements of relevant atomic and plasma parameters, all to the extent they have a clearly stated and specific application to contemporary problems of the natural phenomena and to the NASA Sun-Earth Connection program. The individual SR&T programs are described further in Sections A.4.2, A.4.3, A.4.4, and A.4.5 that follow.

(2) Suborbital Programs. The objectives of the suborbital programs are: (i) to allow the study of naturally-occurring phenomena in space or near-space that can be obtained with relatively low cost instruments flown from unique locations and/or in conjunction with special events (*e.g.*, a solar eclipse or to gather ancillary data for a related orbiting spacecraft); and (ii) to proof-test new concepts in experimental techniques that may ultimately find application for orbital missions for Sun-Earth Connection program objectives. The suborbital program for Solar Physics is treated in Section A.4.5 of this NRA and the combined suborbital program for Magnetospheric and ITM physics is treated in Section A.4.6.

(3) Sun-Earth Connection Theory Program (SECTP). This program supports efforts to attack problems concerning phenomena relating to the Sun-Earth Connection program that are beyond the scope of the nominally smaller SR&T tasks discussed above using relatively large "critical mass" groups of investigators. Funding for SECTP is competed in its entirety every three years, and proposals for the period FY 1999 through FY 2001 are being solicited in this ROSS-98 NRA; see Section A.4.1 of this Appendix.

(4) Guest Investigator (GI) Programs. Guest Investigator Programs are intended to maximize the return from currently ongoing missions by providing support for research which heavily utilizes mission specific data from currently operating spacecraft. This NRA solicits proposals for an Advanced Composition Explorer (ACE) GI Program (see Section A.4.7) and an interdisciplinary SEC GI Program (see Section A.4.8).

(5) Data Restoration Program. This program has as its goal to identify space physics data archives that are considered of significant value to the OSS scientific community at large and provides funding to restore, archive, and prepare these holdings for public access. This program activity has been integrated into the Applied Information Systems Research Program (see Section A.5.2).

Proposals to any of the SEC program elements are expected to present, within their *Scientific/Technical/Management Section* (see Section C.5.3 of Appendix C):

- a clear description of a specific scientific problem;
- a description of how the attack on this problem will be carried out; and
- a discussion of the relevance of the proposed research to NASA's current and/or future programs.

3. Limitations on Objectives of Proposals

Proposals whose intent or purpose is to extend or directly supplement investigations selected for approved space flight missions are not appropriate for this NRA. Investigators who are members of the science teams of ongoing missions and who propose to use data from these missions in their SR&T efforts must clearly delineate between their mission responsibilities and the proposed efforts.

Proposals for fabrication of complete flight instruments are not appropriate to this NRA except in the suborbital programs. However, the development of instrument concepts and/or critical subassemblies (e.g., detectors, filters, etc. through to the stage of laboratory ("brass board")) verification may be proposed as SR&T tasks, provided the proposed activity is in the context of a clearly defined science objective.

Proposals that focus on reprocessing, archiving, and/or routine reduction of flight data are appropriate only for the Data Restoration Program (see above).

Some areas of study within the Sun-Earth Connection theme overlap with research objectives supported by other OSS disciplines. In particular, proposals dealing with the following disciplines are outside the purview of the SEC program elements in this Appendix:: galactic cosmic rays, cosmic x-rays and gamma rays; the neutral components of planetary toruses, rings, and/or atmospheres of extra-terrestrial planets; comparison of the Sun to other stars; and the chemistry and/or dynamics of the lower, neutral terrestrial atmosphere (i.e., below the mesosphere). If there are any questions, contact the appropriate Discipline Scientist(s) as identified in this Appendix.