NSF Report to the GEM Workshop

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GEM Workshop
Snowmass Colorado
June 16-21, 2013

The GEM Report

- GEM White Paper produced – available through the GEM web page.
- 2013 GEM solicitation
  - 40 projects (48 proposals submitted)
  - Overall high quality proposals
  - No final budget numbers yet.
  - Four highly recommended proposals will be funded.
  - Several recommended proposals on hold pending final budget numbers.

Geospace Sciences: The study of the space environment of Planet Earth: A Strategic Plan - Goals

Fundamental Scientific Understanding

- How magnetic reconnection works and operates in the solar atmosphere, within the solar wind, at the dayside magnetopause, and in the magnetotail to initiate and facilitate energy transfer between the different regions of the space environment.
- How particles are accelerated at the Sun, in the interplanetary medium, and in the near-Earth space environment.
- How mass, energy, and momentum are transported through the heliosphere, magnetosphere, ionosphere, and atmosphere.
- How plasma waves and irregularities are produced in the ionosphere, magnetosphere, solar wind, and solar corona.
- Understanding the space environment of Earth in the context of other planets.

Geospace Sciences Strategic Plan: Goals

Linking Science with Societal Needs

- A robust systems approach to understanding and predicting space weather.
- Development of large-scale, global space environment models suitable for space weather specification and forecasting.
- Make current space weather forecasting take better advantage of the rapid developments in space weather research, observations, and modeling by transforming the existing relationship between research and operations.

GS Strategic Priorities

Basic Research Priorities

- Maintaining the integrity of core disciplinary programs through careful management and planning of new activities that potentially impact core budget levels.
- Ensuring that targeted programs such as the CEDAR, GEM, and SHINE remain at the cutting edge of science frontiers.
- Exploring the full scientific potential of the upcoming ATST facility.

- Promoting innovative approaches to space science research, particularly system science approaches that effectively integrate studies of the entire Earth-Sun system.
- Encouraging cross-disciplinary efforts that enhance scientific understanding and facilitate the application of research results to societal problems.

GS Strategic Priorities

Advanced Facilities and Instrumentation Priorities

- Expanding the section to include all ground-based solar facilities, particularly the ATST.
- An integrated suite of solar instrumentation to meet challenges during the coming decade and beyond, including the ATST, FASR, and COSMO.
- Taking advantage of the innovative AMISR radar technology through relocation of existing systems to other locations and the construction of new systems, particularly in the southern hemisphere where observations are seriously lacking.
- Funding a broad spectrum of instrumentation for space science research, including innovative space-based projects such as AMPERE and the CubeSat program.
- Working closely with the community in developing strategies for supporting these new observational capabilities.

- Exploiting new technologies for developing smart sensors that can be widely distributed and easily operated.

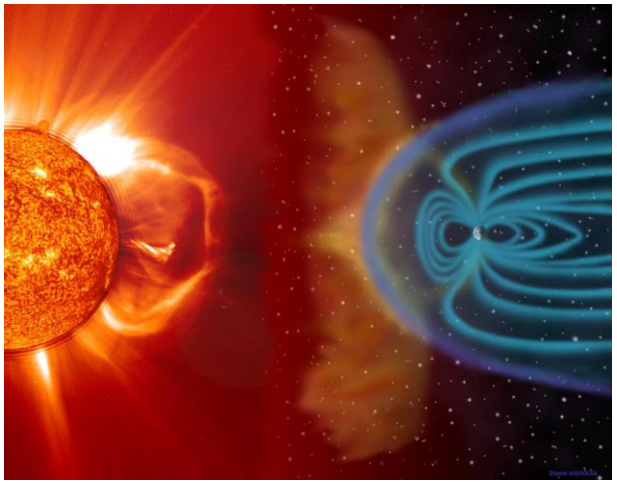
GS Strategic Priorities

Integrated and Coupled Models Priorities

- Strengthening inter-agency collaborations with NASA, AFOSR, DOE, and other partners to fund a new generation of coupled space weather models.

- Continuing to assist the transition of space weather research into operations. For example, the Community Coordinated Modeling Center is funded jointly by GS and NASA. GS recognizes the CCMC as an increasingly important resource both for space physics and space weather research and for the transition of research models into operational space weather forecasting.

- Ensuring that space science and space weather priorities are considered and included in all appropriate Directorate and NSF-wide new initiatives, such as FESD etc.

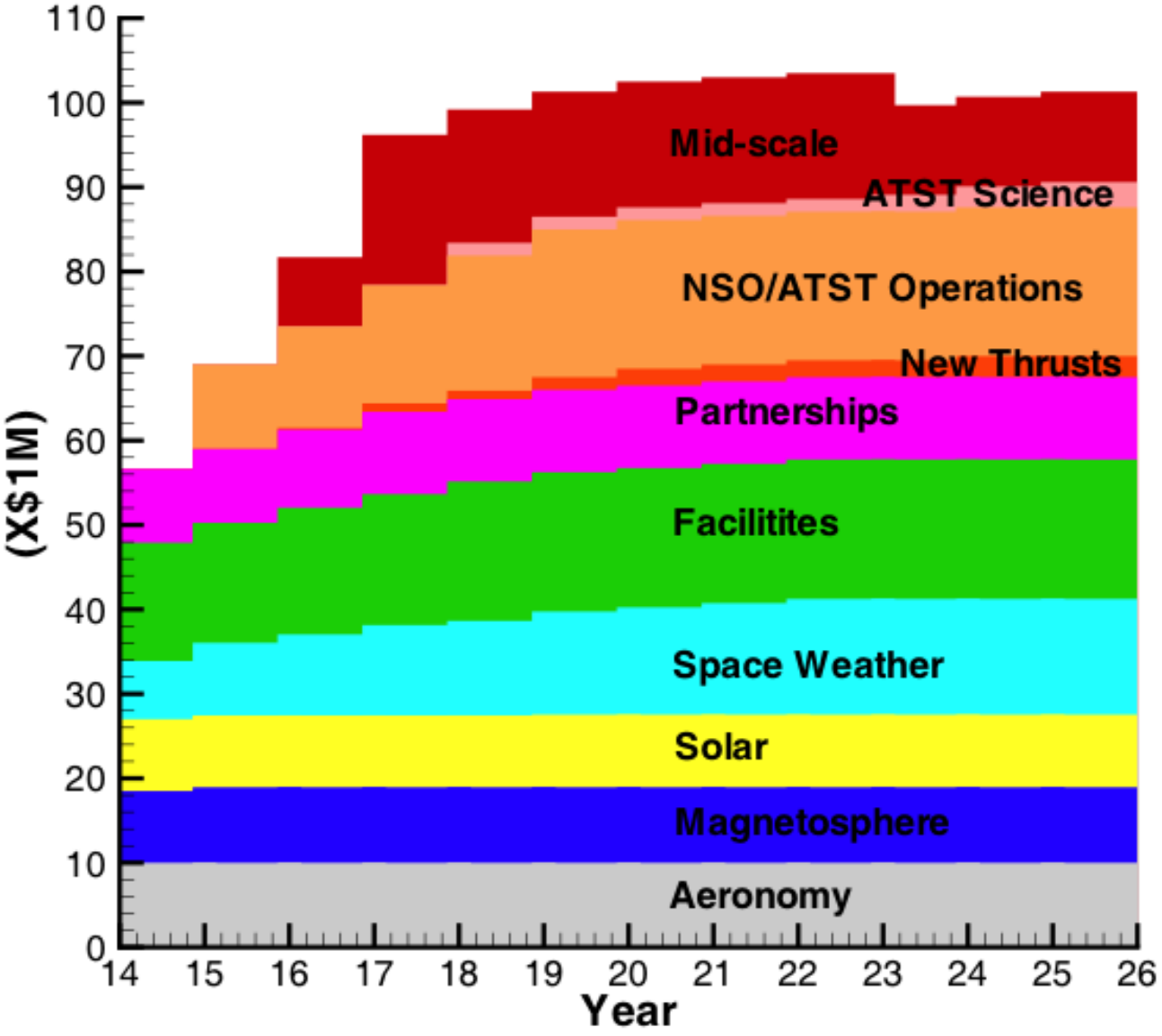


GS Strategic Priorities

Effective Education and Training Priorities

- Expanding the Cubesat program, which sustains the career development of students and researchers while producing a talented future cadre of trained professionals for the United States.
- Promoting the training of students to view the space environment as a strongly coupled system, a system that is intimately linked to Earth's lower atmosphere, and ultimately to the land and oceans of our planet.
- Maintaining the FDSS program by funding one or two faculty positions every two or three years.
- Continuing to support student attendance at meetings such as GEM, CEDAR and SHINE, which has proven to be a successful tool to increase student participation in research.
- Making education of and outreach to under-represented groups a special priority.
- Continuing the highly successful practice of supporting the participation of graduate students and undergraduate students in research projects.
- Increasing the use of RET supplements for awards, which has proven a highly effective way to extend space science education and outreach to the high-school level.

The Long Term Plan for Geospace at NSF



Geospace Sciences Strategic Plan: Approaches

Observations – Continuous and Global

- Development and fabrication of robust, cheap, and easily deployed instruments to facilitate global ground-based observational networks including magnetometers, passive optical instruments, lidars, and radars.
- Pursuit of cost-effective and innovative space-based observational capabilities to complement the broad portfolio of large, traditional space missions sponsored by NASA.
- Studies to determine the optimum type and placement of large observatories and instruments to make better use of limited resources and overcome logistical limitations.
- Development and implementation of new incoherent scatter radar technologies to modernize, maintain, and expand the existing ISR network.
- Expansion of the existing array of ground-based solar observatories to better understand the drivers of Geospace phenomena and origins of space weather disturbances

Geospace Sciences Strategic Plan: Approaches

Campaigns

- Development of small, easily transportable observing instruments and modular platforms that can be easily and quickly deployed.
- Implementation of advanced sensor technology, including smart sensors and networks of instruments that can be remotely operated and reconfigured.
- Utilization of collaboration technology that facilitates the execution of large, complex field campaigns, as well as the subsequent analysis of data and scientific research.

Geospace Sciences Strategic Plan: Approaches

Modeling

- Improved modeling techniques to handle multi-scale phenomena.
- Community access to adaptable, modular modeling framework to facilitate modifications and updates with science advances and utilization of new computer technology.
- Improved data assimilation techniques to generate more physically realistic models even when data are sparse.

Geospace Sciences Strategic Plan: Approaches

Capacity Building

Student Development

- The CEDAR, GEM, and SHINE programs conduct annual workshops with substantial student participation.
- The Cubesat Program is particularly successful in engaging student interest in space science and technology.
- GS also funds focused schools to provide educational training in areas not included in traditional undergraduate and graduate curricula, for example, space weather, incoherent scatter radar, and radio science.

Geospace Sciences Strategic Plan: Approaches

Capacity Building

Post-doctoral Opportunities

- The CEDAR, GEM, and SHINE programs all have annual solicitations for post-doctoral fellowships.
- Post-doctoral support from NSF has been strengthened through requirements for mentoring plans in all proposals requesting funds for post-doctoral researchers.
- For those seeking academic careers, the GS disciplinary programs fund CAREER awards on a nearly annual basis.
- GS supports the Faculty Development in Space Science (FDSS) Program. This highly successful initiative, so far, has resulted in the creation of more than eight new faculty positions for young space scientists. All eight received tenure.