Geospace Science Update

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Outline

• Section Update
  • Staffing
  • Call for rotator

• FY17 Science Highlights
  • Highlight 1
  • Highlight 2

• FY18 Activities
  • Budgets
  • 10 Big Ideas
  • Facilities
  • CEDAR, GEM, SHINE
  • Cubesats

• Broader Impacts

June 26, 2018
Geospace Section Staff

Section Head
Michael Wiltberger

Program Specialist
Larissa Petrella

Solar Terrestrial Research
Ilia Roussev

Aeronomy
Ruth Lieberman

Magnetospheric Physics
Carrie Black (Acting)

Space Weather Research
S. Irfan Azeem

Geospace Facilities
John Meriwether

Geospace Expert
Sunanda Basu

June 26, 2018

CEDAR Meeting
Initial Reshuffling

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Sunanda Basu

We need you!
Call for rotators

• Need to fill in remaining position with IPA rotators
  • Initial term is 1 year with options for up to 4 years in total
  • Checkout
    • DCL – AGS 18-002
    • Google NSF Rotators for more information

• Looking for scientists with expertise Aeronomy

• Seek out me or any GS PO for more information

June 26, 2018
EOVSA X class flare obs

>100 frequencies, 2.5-18 GHz, 1-s cadence

Imaging spectroscopy at a single time, 15:54 UT:
(a) Individual images at 28 frequencies
(b-e) Spectra from locations 1-4, showing position-dependence
Lines are multi-parameter fits from theory, including B field
(f) Frame from multi-frequency movie used to locate spectra

Development of An Airborne Infrared Spectrometer (AIR-Spec) for the 2017 Great American Solar Eclipse
Ed DeLuca/Smithsonian Institution/AGS-MRI 1531549

IR Data Summary, 3 μm Channel

PROJECT DESCRIPTION

• Coronal magnetic field stores energy that is released in flares and CMEs and are directly responsible for space weather
• Direct measurements of the coronal magnetic field is easiest at IR wavelengths
• This proof of concept spectrograph was flown on the NSF GV to observe and characterize magnetically sensitive IR lines in the low corona – only possible during solar eclipses.

Key Results/Major Accomplishments:
• First ever detection of Fe IX line
• Identified several unknown IR emission lines in the corona and in a prominence

Next step:
• Develop a spectropolarimeter to determine magnetic field strength and direction.

December 11, 2017
SPA Agency Night
NSF and AGS Budgets

- Operated on CR from the beginning of the fiscal year until March 23
  - Recall President’s request had NSF down 10%
  - New Omnibus spending bill has NSF up 3.9%
    - Focuses mainly on top level numbers RRA (+5%), MREFC, HER, & AOAM
  - Nearly Final GS budget is $48.5M up 2% from FY17

- On Feb 12, 2018 as part of the budget process the NSF’s FY2019 request was submitted to Congress

<table>
<thead>
<tr>
<th>AER</th>
<th>MAG</th>
<th>STR</th>
<th>SWR</th>
<th>FAC</th>
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<thead>
<tr>
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<th>FY17 Enacted</th>
<th>FY19 Request</th>
<th>Change</th>
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<tr>
<td>NSF</td>
<td>$7,504M</td>
<td>$7,472M</td>
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<td>GEO</td>
<td>$825M</td>
<td>$852M</td>
<td>+3.3%</td>
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<td>AGS</td>
<td>$253M</td>
<td>$239M</td>
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- Prior to congressional action on budget caps NSF was down 30%
- GEO increase to support OOI and ARF in OCE
- Google NSF FY19 Budget for detailed information
NSF’s 10 Big Ideas

- FY19 Request includes $282M to support the 10 Big Ideas
  - Origin of the 5% reductions in RRA activities within each directorate
- 6 Research Ideas each get $30M for a total $180M

<table>
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<tr>
<th>Harnessing the Data Revolution</th>
<th>Navigating the New Arctic</th>
<th>Future of Work at Human Tech Frontier</th>
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<td>The Quantum Leap</td>
<td>Understanding the Rules of Life</td>
<td>Windows on the Universe</td>
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- Process Ideas get $102M total
  - Midscale Research Infrastructure $60M
  - INCLUDES $20M
  - Growing Convergence Research $16M
  - NSF 2026 Fund $6M

- Google [NSF 10 Big Ideas](#) for more information

June 26, 2018
Arecibo Observatory Moving Forward

• NSF has selected a UCF – UMET – YEI consortium to operate AO for 5 years
  • Funding profile reduces to a total of $2M per year by the end of the five year project period
    • Proposal included fund rising activities to help address this shortfall
  • They are currently operating AO and support GS related investigations

• Public Law 115-119 included $14.3M in disaster relief funding for repairs to restore AO world class status
  • Initial tranche ($2M) of includes generator repairs and new water pump
    • HF heater capability is operational, but waiting generator repairs for full return to operations
  • Repairing the 430MHz line feed is part of the plan

• NSF is welcomes proposals for science investigations at Arecibo.
Sondrestrom Research Facility

• After 35 years of exemplary science accomplishments ISR operations ended on 3/31

• Management of the site is now being handled by CPS
  • Environmental and engineering assessment of the site currently underway
  • PIs being supported in retrieving their instruments over the summer
  • Site is being prepared for a winter without power

• Future of the site will be based upon PR recommendations, environmental and engineering assessment, and interactions with the Greenland Self-rule government

• Begun discussions with EISCAT for US utilization options
Pathway to New Facilities

• Distributed Array of Small Instruments
  • Engagement at CEDAR, GEM, SHINE will be essential
  • Internally discussing how to implement the DASI recommendations in the Geospace portfolio review
    • Planning for an initial call in FY19

• Innovation and Vitality Program
  • Support renovation and upgrade of existing facilities
  • Facilitate the development of new instrumentation

• Midscale Projects
  • NSF Big Idea supporting $4-70M projects
Revision of CEDAR, GEM, & SHINE

• New solicitations for CEDAR and GEM released on Feb 28 and are now accepting proposals
  • Google NSF CEDAR or NSF GEM for details
  • PI’s encouraged to contact PO before submission

• Planning to release a SHINE call in FY19
  • Funding for STR program remains the same
  • “Roadmap for Reliable Ensemble Forecasting of the Sun-Earth System” workshop (held at NJIT March 28-30, 2018) is part of community input for next solicitation
Cubesat Program

• Cubesat Solicitation Deadline
  • Submissions where due June 13th
  • Google NSF CubeSat
  • Support for 1-2 missions at total cost $1.2M each

• CubeSat-Enabled Science and Engineering meeting has generated significant interest in collaborations with CISE/CNS and ENG/ECCS
  • Focused novel science applications of CubeSats and CubeSat constellations
Broader Impacts

• The Broader Impacts criterion encompasses the potential to benefit society and contribute to the achievement of specific, desired societal outcomes

• BI will depend upon many factors including size, duration, expertise, and field

• All proposals must address this evaluation criteria
  • PI has flexibility to chose the right fit for their project
  • Strong BI increases your chances for success
Broader Impacts

• Potential Broader Impacts
  • Increased participation of women, persons with disabilities, and underrepresented minorities in STEM
  • Improved STEM education at any level
  • Development of globally competitive STEM workforce
  • Increased public scientific literacy and public engagement with S&T
  • Increased partnerships between academia, industry, and others
  • Increased national security
  • Increased economic competitiveness of US
  • Enhanced infrastructure for research and education

• Not a checklist – remain open to other options
Further Discussions

• We will be participating in the SHINE town hall session
  • Thursday lunch at Hilton

• Geospace Team will be around all week and looks forward to additional conversations
STR Program at NSF: Opportunities and Challenges

ILIA I. Roussev

iroussev@nsf.gov

Program Director,
STR Program
Division of Atmospheric and Geospace Sciences

SHINE Workshop
July 30, 2017
SHINE Workshop

http://shinecon.org

Total SHINE Registrants
- 10 25 30 38 37 57 46 52 56 51 71 58 72 71 87

Students
- 14 36 57 52 56 51 71 71 87


Graph showing the total number of SHINE Registrants and students from 2002 to 2018.
The Solar-Terrestrial Research (STR) Program at NSF supports research on the processes by which energy in diverse forms is generated by the Sun, transported to the Earth, and ultimately deposited in the terrestrial environment. Major topics include space weather impacts, helioseismology, the solar dynamo, the solar activity cycle, magnetic flux emergence, solar flares and eruptive activity, coronal mass ejections, solar wind heating, solar energetic particles, interactions with cosmic rays, and solar wind/magnetosphere boundary problems.
STR Program (FY17-18)

Budget Allocation: $8.3M (was $7.8M in FY17)
- Core STR Research: ~$6.1M (was ~$3.2M in FY17)
- Solar, Heliospheric, and INterplanetary Environment (SHINE): ~$1.3M (was ~$3.5M in FY17)

Other Programs:
- Faculty Early Career Development Program (CAREER): ~$0.8M (was ~$0.6M in FY17)
- Atmospheric and Geospace Sciences Postdoctoral Research Fellowships (AGS-PRF): $0 (was ~$0.2M in FY17)
- NSF/DOE Partnership in Basic Plasma Science and Engineering: $0.1M (was ~$0.3M in FY17)

Important Statistics
- FY15: funding rate of 23% & mortgage rate of 78% for FY16
- FY16: funding rate of 17% & mortgage rate of 75% for FY17
- FY17: funding rate of 11% & mortgage rate of 46% for FY18
- FY18: funding rate of 43% & mortgage rate of 8% for FY19!
Roadmap for Reliable Ensemble Forecasting of the Sun-Earth System
28-30 March 2018
New Jersey Institute of Technology, Newark, NJ

Organizing Committee
Gelu Nita (NJIT)
Dale Gary (NJIT)
Rafal Angryk (GSU)
Scott McIntosh (HAO)
Farzad Kamalabadi (U Illinois)

The workshop will bring together solar and heliospheric data providers, expert modelers of solar and heliospheric phenomena, and data scientists, with the goal of identifying challenges in our path towards building an effective framework that will help us achieve transformative advances in understanding and forecasting the Sun-Earth system, from upper convection zone of the Sun to the boundary of Earth’s magnetosphere.

The workshop will help develop a research roadmap targeting the great science challenge of tightly coupling solar observations and modeling with emerging data-science research to discover new, fundamental knowledge from big volumes of data, while stimulating computer science with new research applications, and promote future transdisciplinary collaborations between these fields.

Workshop Participants:

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<tr>
<th></th>
<th>Name</th>
<th>Affiliation</th>
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<tr>
<td>1</td>
<td>Rafal</td>
<td>Angryk, Georgia State University</td>
</tr>
<tr>
<td>2</td>
<td>Berkey</td>
<td>Aydin, Georgia State University</td>
</tr>
<tr>
<td>3</td>
<td>Juan</td>
<td>Banda, Georgia State University</td>
</tr>
<tr>
<td>4</td>
<td>Tim</td>
<td>Bastian, NRAO</td>
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<tr>
<td>5</td>
<td>Tom</td>
<td>Berger, University of Colorado</td>
</tr>
<tr>
<td>6</td>
<td>Veronica</td>
<td>Bindi, University of Hawaii</td>
</tr>
<tr>
<td>7</td>
<td>David</td>
<td>Boboltz, NSF</td>
</tr>
<tr>
<td>8</td>
<td>Laura</td>
<td>Boucheron, New Mexico State University</td>
</tr>
<tr>
<td>9</td>
<td>Wenda</td>
<td>Cao, NJIT</td>
</tr>
<tr>
<td>10</td>
<td>Eric</td>
<td>Christian, NASA/GSFC</td>
</tr>
<tr>
<td>11</td>
<td>Georgia</td>
<td>de Nolfo, NASA Goddard Space Flight Center</td>
</tr>
<tr>
<td>12</td>
<td>Edward</td>
<td>DeLuca, Center for Astrophysics</td>
</tr>
<tr>
<td>13</td>
<td>Marc</td>
<td>DelRosa, Lockheed Martin Solar and Astrophysics Lab</td>
</tr>
</tbody>
</table>

Use RREF’s *Executive Summary Report* to prepare white papers to NSF. Specifically, we are looking for:

- **Cross-disciplinary research** involving investigators in solar/heliospheric physics, data/computer science, and applied mathematics/statistics;
- **Development of new and more capable modeling approaches** that integrate data and first-principles models; this development requires research in computational algorithms for data assimilation, machine learning, and advanced inversion techniques;
- **Quantifying uncertainties** in data and model forecasts;
- **Benchmarking certain datasets** for use by modelers, which are self-contained online repositories of all relevant data and derived data products for individual events or time periods; and,
- **Increased support for the creation of infrastructures** to create the needed data, algorithms, and computational capabilities.
PREEVENTS

• Basic purpose
  • Better understand risks posed by GEO-relevant natural hazards and extreme events, *including space weather events*, through basic geoscience research, in order to help increase resilience and reduce impacts on life, society, and the economy

• Primary targets (must address both to be eligible!)
  • *Enhance understanding of fundamental processes underlying natural hazards and extreme events on various scales, and variability inherent in such hazards/events*
  • *Improve capability to model and forecast such hazards and events*

• Subsidiary – encouraged, but not required
  • Improve understanding of effects of natural hazards/extreme events
  • *Enable development, with other support*, of tools to enhance societal resilience
Review and Funding

Solicitation for workshops (or Track 1) and Track 2 proposals (FY19):

Track 2 proposals (due on Sep 18) will have two-stage review process

  • Stage 1: thematic virtual panels + *ad hoc* → gave disciplinary depth
    • In FY17, 131 projects were submitted (total of 253 proposals)
  • Stage 2: physical panel for all Stage 2 proposals → gave overall breadth
    • In FY17, 44 projects (total of 86 proposals) made it to Stage 2
    • 13 PREEVENTS awards were made, of which 2 are related to space weather!

Co-funding via internal memo only (FY19)

  • Program reviews proposals, makes decision to fund or not
  • PREEVENTS Management Team reviews co-funding requests, makes decision to co-fund or not
Important Info for All Proposers

The latest NSF “Users’ Manual” can be found at:

Proposal & Award Policies & Procedures Guide

NSF 18-1
Awardee’s Reports to NSF

• In addition to your Final Report to NSF, you must also submit Project Outcomes online for the public, at http://www.research.gov

• Your Annual Report become due 90 days before your award anniversary date, and are overdue on anniversary date + 1 day

• Your funding increment – and that of any of your current Co-PIs on any NSF grant – is delayed until your annual report is approved!

• Please submit a No Cost Extension if you cannot expend your annual budget due to unforeseen circumstances – do not just delay the submission of your annual report...
Review Requests

Unless you have been informed that your review is for a special competition, or a specific NSF panel, your review is for a proposal submitted to my core STR program (fund code 1523). We need to obtain a minimum of 3 written reviews within 6 months.

Your help is greatly appreciated!!!

We would prefer to receive a delayed review than none at all.
Summary

- STR program at NSF has been very successful in achieving community (SHINE in particular) growth, and in supporting junior researchers
- STR program has been supporting research and EPO projects, which have yielded outstanding contributions to advancing present understanding of the coupled Sun–Earth system, and they have provided new opportunities for improving diversity, learning, and training in STEM disciplines at U.S. academic institutions
- Although funding rate in STR program took a big hit during FY 2015-2017, the recovery in FY 2018 is notable!
  - Although the high mortgage rate was a major issue during FY 2015-2016, now the STR program is “cleansed,” with a level of outstanding obligations for FY 2019 of 8%!
- RREF’s Executive Summary will guide future investments in STR program!
  - Take the lead and define SMART content – in the form of a white paper – in the context of the RREF’s Report!
  - Send to me for review and comments.
SMART Content

- Start with the “Big Picture”
  - How is my research going to impact the field, other fields (or across fields), Science in general, and Society at large?
  - Why is my project relevant to STR Program (and NSF in general)?
- Continue with defining the “Small Picture”
  - What are the SMART goals of my project?
  - What are the expected outcomes? (and how significant are they expected to be?)
  - What are potential risks involved and their impact?
- Link back to the “Big Picture”
Questions?

Thank you!
Questions

• Happy to provide answers 😊