



Present and Future Opportunities for Geospace Science Research in the USA

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Outline

- Section Update
 - Staffing
- FY18 & FY19 Quick Review
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 - Science Highlights
- FY19 Activities
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 - Geospace Facilities Update
 - Mid-Scale and DASI
 - New CubeSat Awards
 - FDSS
 - SWORM and NSB



AGS and the Geospace Section



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Magnetosphere
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Aeronomy
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Expert
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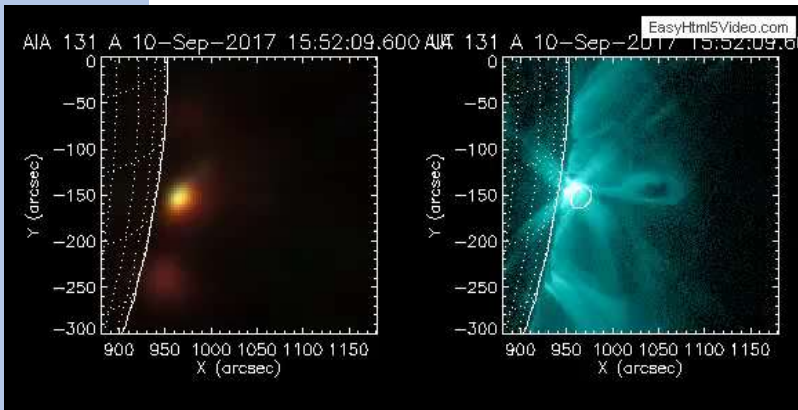
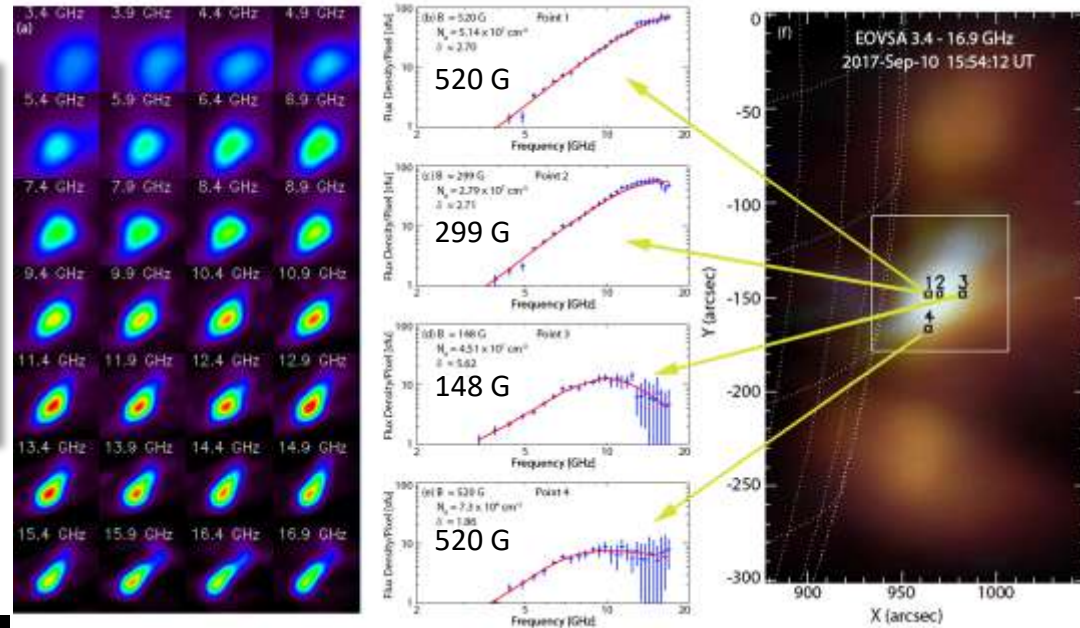


EOVSA X-Class Flare Obs.

Expanded Owens Valley Solar Array



>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

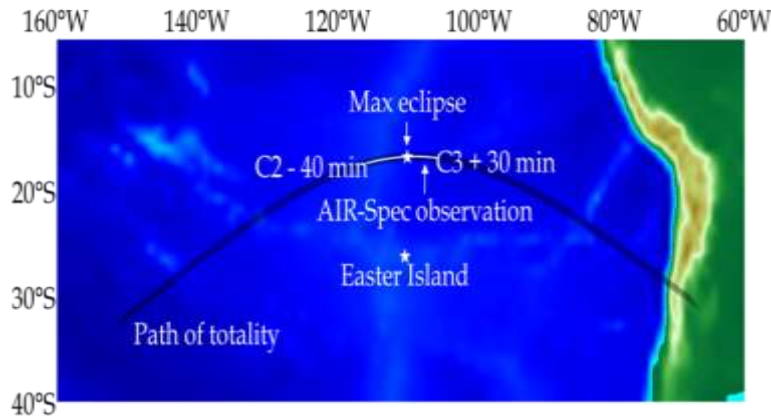
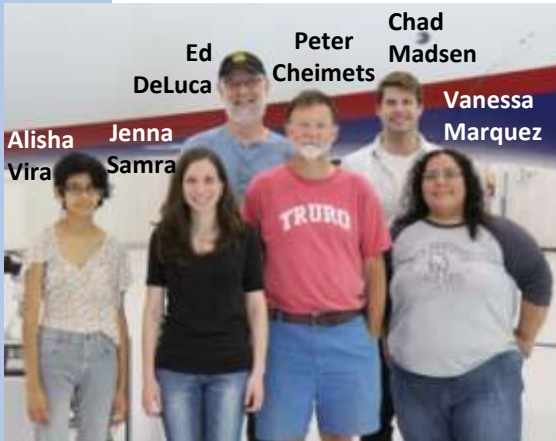
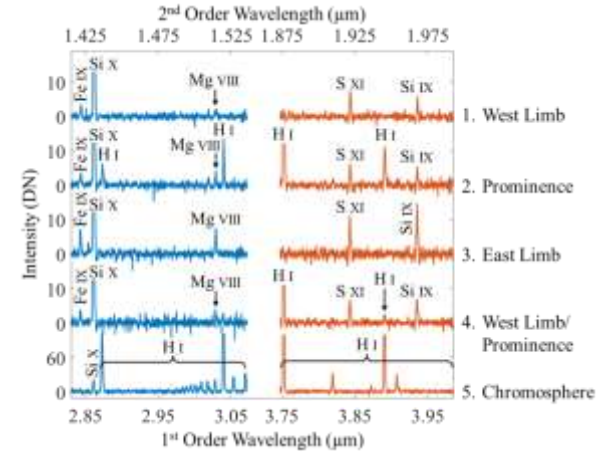
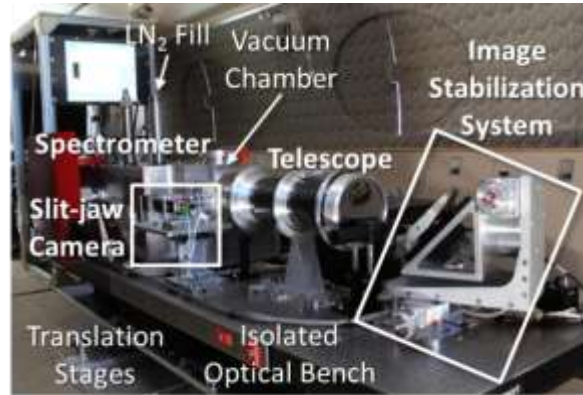
Gary et al. (2018), *ApJ*, **863**, 83



Air Spec 2017 & 2019 Eclipse Obs.

The 2017 eclipse flight was fully successful.

- AIR-Spec observed its **5 target lines & more**
 - First detection of Fe IX, 2.844/1.427 μm
- 1 chromospheric and 4 coronal positions
- **Radial intensity gradient** measurements
 - Info on line excitation processes
- **Line-of-sight velocity** measurements



The 2019 eclipse observation will feature:

- *Improved SNR*
 - 15-20x reduction in dark background
- *Improved pointing stability*
 - 20x reduction in jitter
- *Improved operability*



Quick Facts about FY18 & FY19

- Overall spending in section was \$50.3M up 4% from FY17
 - Support for CubeSat program from AGS Division Director
 - Funds from division to pay down mortgage rates

AER 12.6M	MAG 7.9M	STR 8.3M	SWR 3.5M	FAC 17.9M
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- These reflect “loans” from SWR to AER (1.5M) and FAC (2.7M)
- Additional facts about AER, MAG, STR, SWR grants in 2018
 - 124 Actions resulting 56 new awards with a 45% success rate
 - ~70% of new awards made as standard grants
 - ~25% average mortgage rate for the section



GS Facilities Update

AMISR



- NSF remains committed to the continued operation of this important facility
 - Beginning discussions with awardee resulting from recent solicitation
- A new generator was purchased for RISR low power continuous operations

Arecibo



- UCF – UMET – YEI consortium to operating AO for 5 years
 - Participated in recent World Day campaign
 - HF heater tests successful
- OMB allowing 5 years to spend disaster relief funds
 - Line feed workshop made design recommendations

SRF



- After 35 years of exemplary science accomplishments ISR operations ended on Mar 31, 2018
- Future of the site will be based upon PR recommendations, environmental and engineering assessment, and interactions with the GoG



NSF's 10 Big Ideas



- FY19 budget includes \$282M in support of 10 Big Ideas
- 6 Research Ideas each get \$30M for a total \$180M

Harnessing the Data Revolution	Navigating the New Arctic	Future of Work at Human Tech Frontier
The Quantum Leap	Understanding the Rules of Life	Windows on the Universe

- 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



Mid-Scale Solicitation



- Mid-Scale 1 – NSF-19-537
 - Begins to address the need for research infrastructure
 - Implementation projects - \$6-20M
 - Design projects - \$600K-20M
 - Two step process with prelim. proposals due in Feb, 2019
 - Google [NSF Mid-scale 1](#) for full solicitation
- Mid-Scale 2 – NSF-19-542
 - Supports major shared community infrastructure and resources as may be required to enable community-scale research.
 - Implementation projects between \$20-70M
 - Two step process with prelim. proposals due in Mar, 2019
 - Google [NSF Mid-scale 2](#) for full solicitation



Distributed Arrays of Small Instrumentation

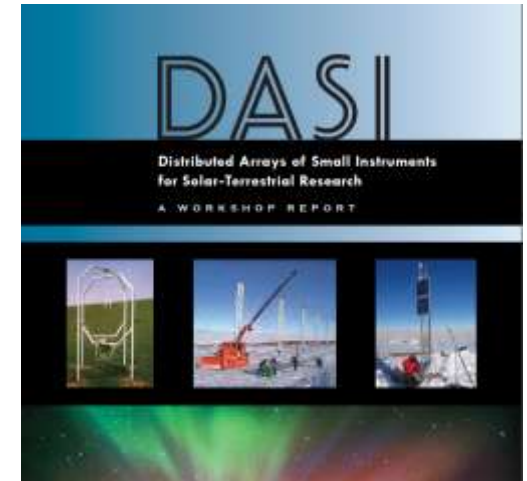
- New solicitation designed to address the increasing need for high spatial and temporal resolution measurements to determine the local, regional, and global scale processes
- Track 1 – Instrument Development
 - Limited term projects focused on proof concept operations of instruments for DASI networks
- Track 2 – Deployment and Operations
 - Support an array of instruments
- Solicitation Basics
 - Due date of Apr, 2019
 - Max award \$2M over 4 years - Expect to make 3-4 awards
 - Mix of project sizes expected
 - Google [NSF DASI](#) for details





Pathway to New Facilities

- Distributed Arrays of Small Instruments
 - Focused on distributed observations of the Geospace system
 - Two tracks
 - Track 1 – Instrument development
 - Track 2 – Deployment and operations
- Innovation and Vitality Program
 - Support renovation and upgrade of existing facilities
 - Facilitate the development of new instrumentation
 - Considering initial call in FY20
- Mid-Scale Projects
 - NSF Big Idea supporting \$4-70M projects





New CubeSat Awards

- CubeSat: Climatology of Anthropogenic and Natural VLF wave Activity in Space (CANVAS)
 - PI Robert Marshall, University of Colorado at Boulder
 - *Climatology of Anthropogenic and Natural VLF wave Activity in Space (CANVAS) CubeSat which will measure Very Low Frequency (VLF) wave energy that originates from lightning and ground-based transmitters and propagates to the magnetosphere.*
- Collaborative Research: CubeSat: High-Cadence Measurement of Solar Flare Hard X-rays
 - PI Glesener, Lindsay, University of Minnesota-Twin Cities
 - Sample, John, Montana State University
 - Caspi, Amir, Southwest Research Institute
 - *IMPRESS will perform hard X-ray spectroscopy of solar flares in the rising phase of Solar Cycle 25. The target launch date is late 2021 into a Low Earth Orbit (LEO) with an inclination angle less than 60° and altitudes greater than 450 km.*



CubeSat Ideas Lab

- AGS has developed a partnership with the ENG and CISE directorates to support a new CubeSat Initiative
 - Designed to support both engineering and tech development for Geospace research using CubeSat constellations
 - Supports 1-2 \$4M missions
 - Appl. deadline Feb, 2019
 - Google [NSF CubeSat Innovations](#) for full solicitation



Image: Equities Today

Ideas Lab: Cross-cutting Initiative in CubeSat Innovations

PROGRAM SOLICITATION

NSF 19-530



National Science Foundation

Directorate for Geosciences
Division of Atmospheric and Geospace Sciences

Directorate for Engineering
Division of Electrical, Communications and Cyber Systems
Engineering Education and Centers

Directorate for Computer & Information Science & Engineering
Division of Computer and Network Systems

Preliminary Proposal Due Date(s) (required) (due by 5 p.m. submitter's local time):

February 08, 2019

Full Proposal Deadline(s) (due by 5 p.m. submitter's local time):

May 30, 2019



Ideas Lab: What is it?

- An Ideas Lab is an intensive, interactive workshop designed to produce radically innovative research project proposals.
- Participants, from a diverse range of disciplines, come together in a creative, free-thinking environment and immerse themselves in a collaborative process around an important problem or challenge.
- **The goal is to provoke out of the ordinary science that would not otherwise be funded.**
- **NSF encourages the community to participate as PIs or get involved as mentors**





Faculty Development in Space Sciences

- FY19 sees the return of the FDSS program to support the creation of new faculty positions in space sciences
- Solicitation Information
 - Proposal shall support a new space physics hire with the university or college
 - Typical awards will be 300k/year with a maximum of \$1.5M
 - Limit 1 per university
 - Proposals due in May, 2019
 - Google [NSF FDSS](#) for more information





Support for SWORM

- SWORM is producing a new strategy
 - Now that Kelvin Droegemeier is in place as OSTP Director progress is moving forward
- Goal 1 – Space Weather Benchmarks
 - NSF and NASA are leading a Next Step Benchmarking activity
- Goal 5 – Advance Understanding and Forecasting
 - Lead an interagency team develop space weather research priorities
- Goal 6 – International Cooperation
 - Participated in “Space Weather as Global Challenge” meeting at the Japanese Embassy





Next Step Benchmarks for Space Weather

- Objectives

- Improve on existing space weather benchmarks
- Inform Federal research and development priorities

- Process

- Engagement with the space weather community
 - White papers will be solicited
 - Community Working groups will be formed
 - Workshops and townhalls will be used to gather input and disseminate results

- Roles

- Geoff Reeves (LANL) will chair the community steering group
- IDA Science and Technology Policy Institute will oversee process with support from NSF and NASA





Questions?

Happy to answer, if I can!