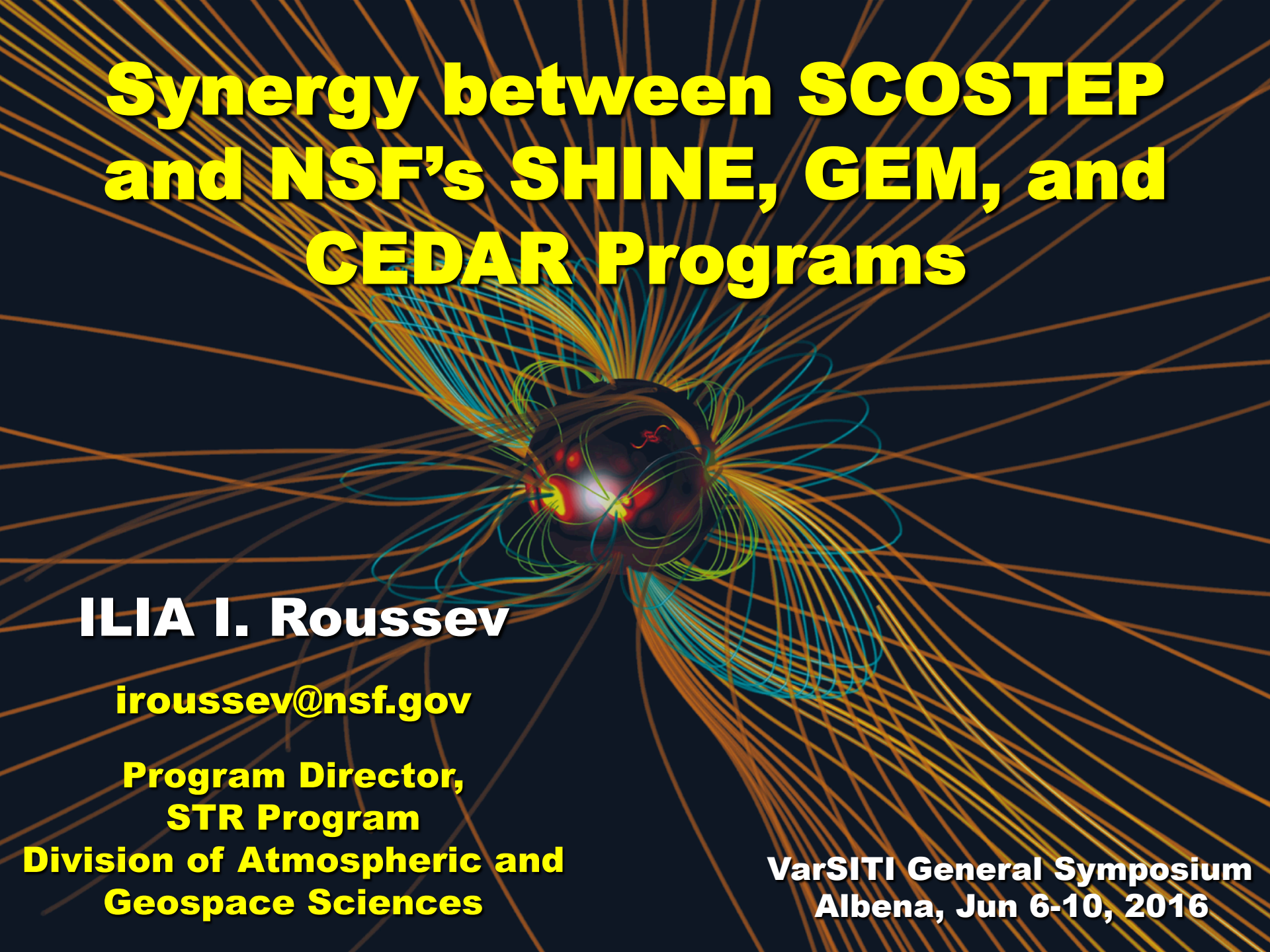
Synergy between SCOSTEP and NSF's SHINE, GEM, and CEDAR Programs



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VarSITI General Symposium
Albena, Jun 6-10, 2016

Solar-Terrestrial Research (STR) Program – Structure

- Core STR program
- SHINE (Solar Heliospheric and INterplanetary Environment) program

- Interface w/ MAG, Geospace Facilities, Space Weather, and others

STR Program – Goals

Solar-Terrestrial Research (STR) program at NSF has been supporting research projects which deal with improving present understanding of:

1. Fundamental physical processes that govern solar and space plasmas (*e.g.*, magnetic reconnection, turbulence, *etc*.); and,
2. Physical drivers of Space Weather, namely flares, Coronal Mass Ejections (CMEs), and related phenomena (*e.g*., SEP events).

The transport of magnetic flux, helicity, mass, and energy from the solar convection zone through the inner heliosphere is a fundamental area of research funded by the STR program!

STR Program – Goals (Cont.)

STR program has been supporting research projects dealing with detailed understanding of physical processes governing the Sun-Earth system

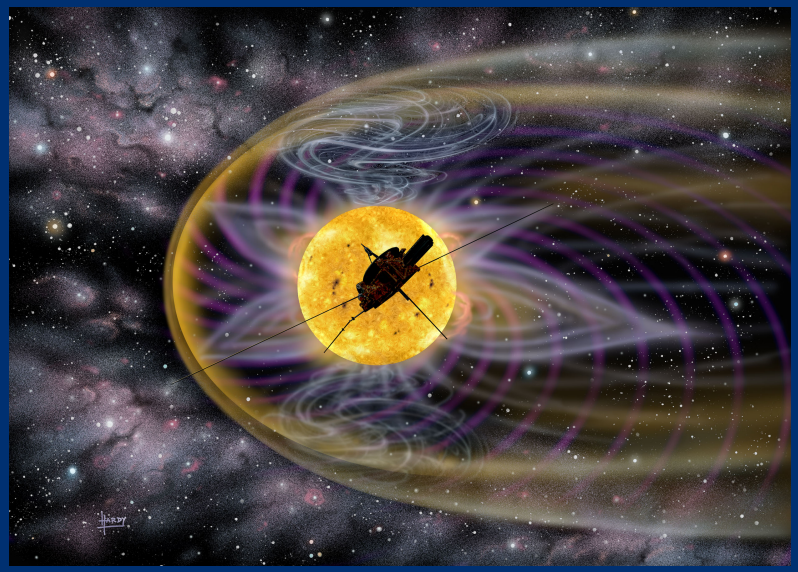
- This requires extensive observations of the Sun and the solar wind, both remote sensing and *in-situ*, as well as complementary numerical modeling efforts that incorporate (or assimilate) these observations

STR program has been supporting research and EPO activities in various ground-based facilities (BBSO, IfA, HAO, NSO, *etc.*), academic institutions (NMSU, MSU, *etc.*), and non-profit organizations (PSI, Helioresearch, *etc.*)

- The supported ground-based facilities have been providing state-of-the-art observations needed to drive those computational models (*e.g.*, at CCMC)

What is SHINE?

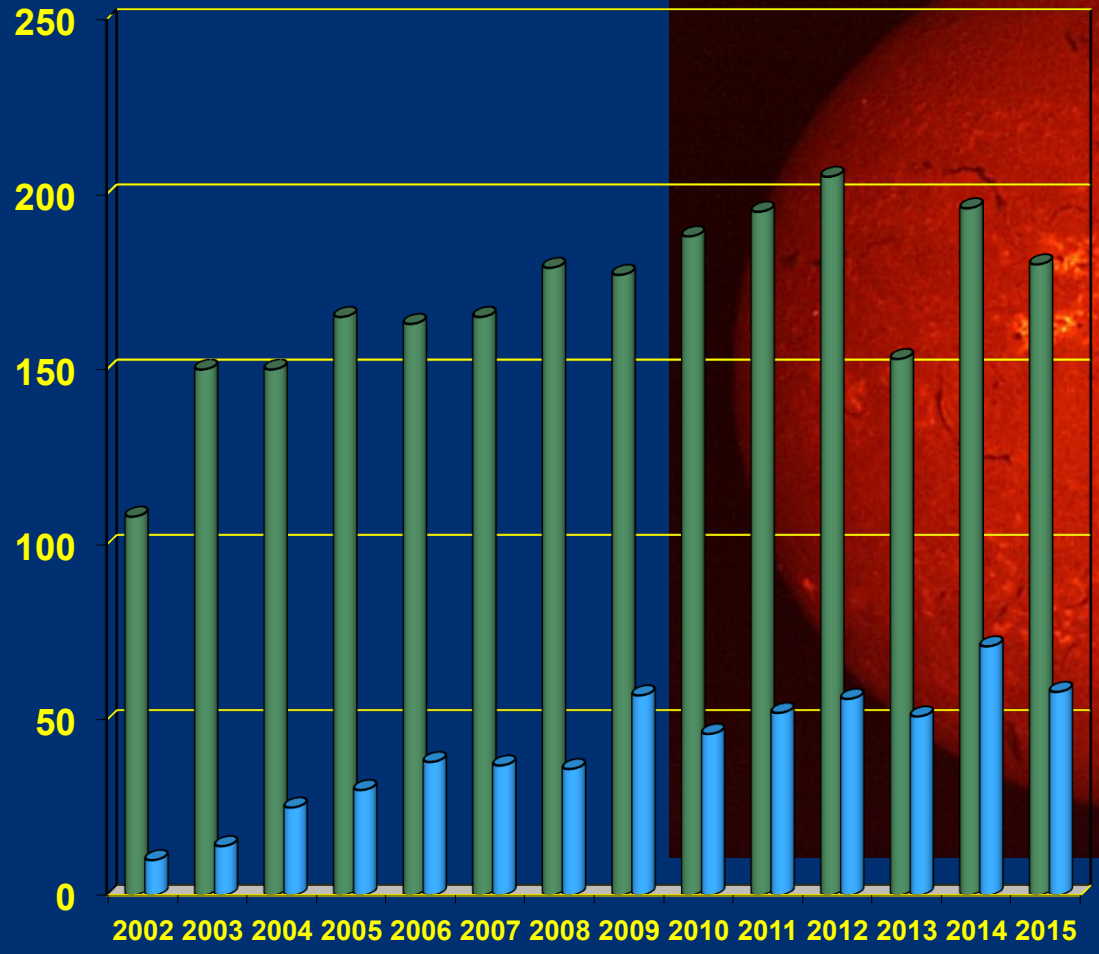
The SHINE research focuses in particular upon the connection between events and phenomena on the Sun and their relation to solar wind structures in the inner heliosphere. The goal of SHINE activities is to enrich and strengthen both physical understanding and predictive capabilities for these phenomena.



- **Origin and evolution of flares, CMEs, solar wind, IP turbulence, and SEPs**
- **Impact of solar drivers on near-Earth space environment**
- **Observational and instrumentation strategies**
- **Data and numerical modeling challenges**

SHINE Workshop

http://shinecon.org



Magnetospheric Physics (MAG) Program – Goals

Magnetospheric Physics (MAG) program at NSF has been supporting research on the physics of the Earth's magnetosphere and the coupling of the magnetosphere to the atmosphere and the solar wind.

Some of the important elements are:

- Support research dealing with the dynamical and structural properties of the geospace environment
- Improve present understanding of the physical interaction of the solar wind with the Earth's magnetic field (*e.g.*, reconnection processes)

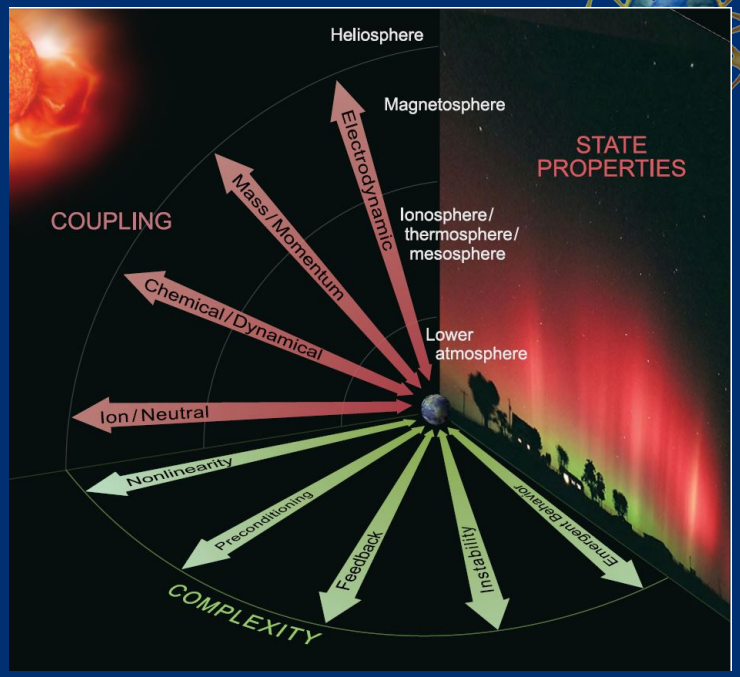
MAG Program – Structure

- Core MAG program
- GEM (Geospace Environment Modeling) program

- Interface w/ STR, Aeronomy, Geospace Facilities, Space Weather, and others

What is GEM?

The GEM's mission is to understand the physics of the Earth's magnetosphere and the coupling of the magnetosphere to the atmosphere and the solar wind.



- **Support basic research into the dynamical and structural properties of geospace, leading to the construction of a global *Geospace General Circulation Model* (GGCM) with predictive capability**
- **Undertake a series of campaigns and focus groups, in both theory and observational modes, each focusing on particular aspects of the geospace environment**

Aeronomy (AER) Program – Goals

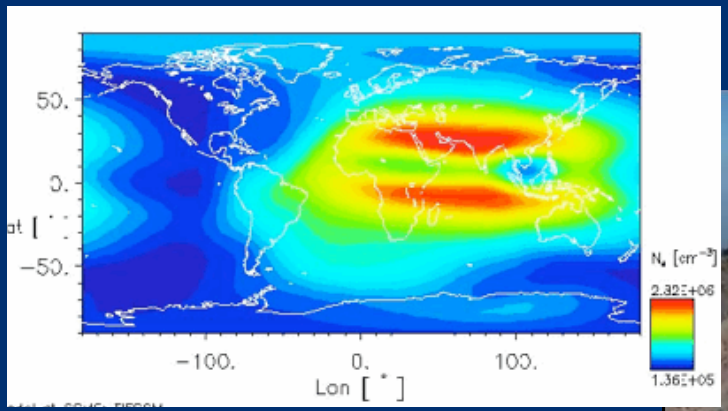
Aeronomy (AER) program at NSF has been supporting research on the mesosphere-thermosphere-ionosphere system, including ionization, recombination, chemical reaction, photo emission, and the transport of energy and momentum.

Some of the important elements are:

- Coupling of this global system to the stratosphere below and the magnetosphere above
- Plasma physics of the coupled ionosphere-magnetosphere system, including the effects of high-power radio wave modification

AER Program – Approaches

- Measurements/instruments
- Laboratory studies
- Data analysis
- Theory and modeling



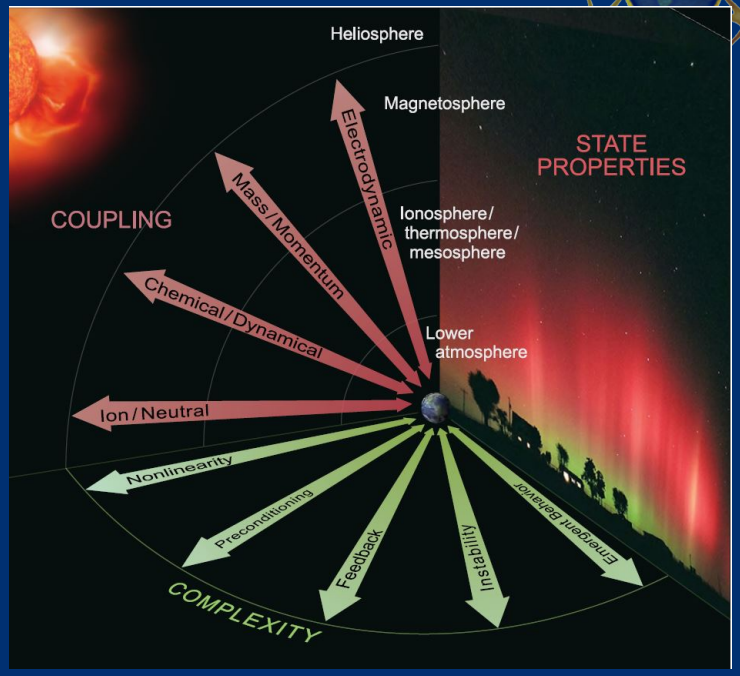
AER Program – Structure

- Core AER program
- CEDAR (Coupling, Energetics and Dynamics of Atmospheric Regions) program

- Interface w/ MAG, Geospace Facilities, Space Weather, and others

What is CEDAR?

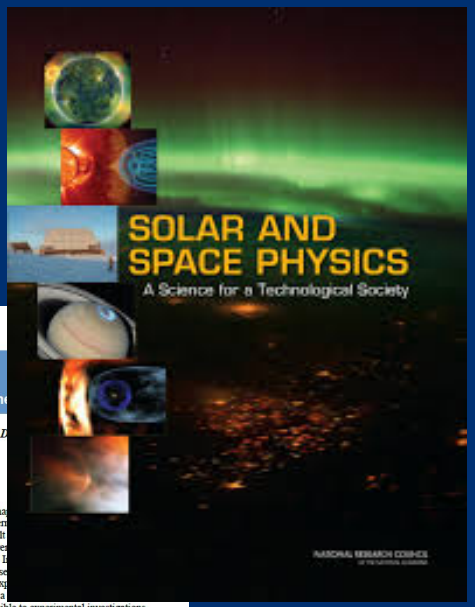
The CEDAR's mission is to understand the fundamental properties of the space-atmosphere interaction region (SAIR); identify the interconnected processes that define the SAIR's global behavior, evolution, and influence on the Sun-Earth system; and, to explore the SAIR's predictability.

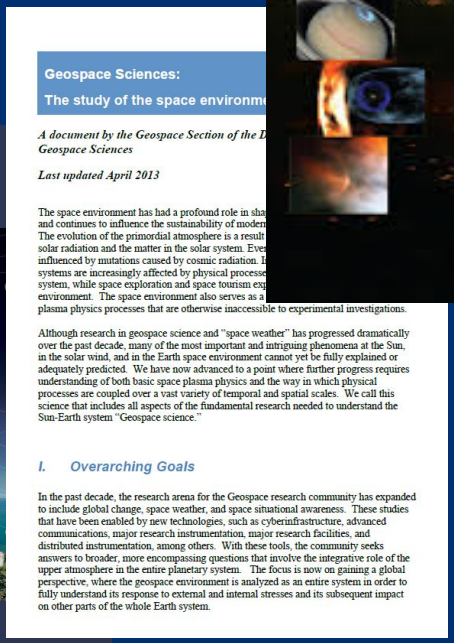


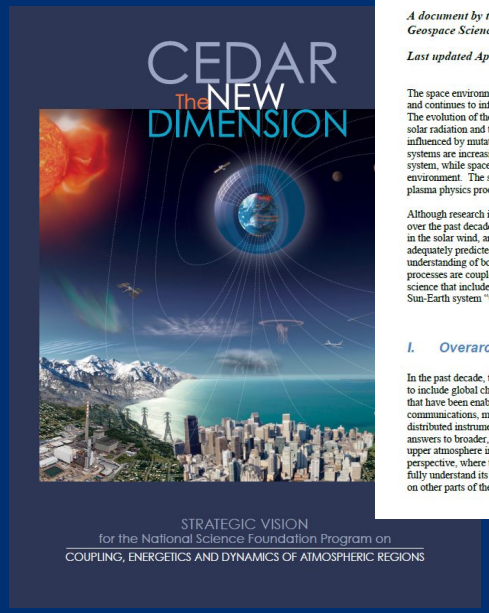
- **Integrated system's perspective**
- **Exchange processes at boundaries and transitions in geospace**
- **Geospace evolution**
- **Observational and instrumentation strategies**
- **Cross-disciplinary in the geosciences data and models**

AER, MAG, and STR Programs – Sources of Guidance

- NRC's Decadal Survey on Solar and Space Physics
- Geospace Section "strategic plan"
- GS Portfolio Review
- CEDAR, GEM, and SHINE plans







INSPIRE

Integrated NSF Support Promoting Interdisciplinary Research and Education

- Requires authorization from two ***intellectually distinct programs*** to apply
- $1M awards (5 years in duration)
- Bold interdisciplinary projects
- In FY2016 co-funding from OIIA is 33% (was 50% in FY2015)

http://www.nsf.gov/pubs/2016/nsf16023/nsf16023.pdf

EarthCube

- NSF places significant emphasis on computational and data-rich science and engineering, with the goal of providing a sustainable, community-based and open cyberinfrastructure for researchers and learners.

- This goal is a major challenge because the number and volume of data sets have grown to proportions well beyond the range of applicability of traditional data handling tools.

- The vision of EarthCube is to transform the conduct of research by supporting the development of community-guided CI to integrate data and information for knowledge management across the Geosciences.

http://www.nsf.gov/geo/earthcube/

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

Part of NSF Risk & Resilience Activity

Risk and Resilience Funding by Directorate
(Dollars in Millions)

	FY 2015 Actual	FY 2016 Estimate	FY 2017 Request	
CISE	$5.50	$6.00	$6.00	CRISP
ENG	12.00	12.00	14.00	CRISP
GEO	-	17.75	17.75	PREEVENTS
MPS	-	0.50	0.50	CRISP
SBE	1.84	4.90	4.90	CRISP
Total	**$19.34**	**$41.15**	**$43.15**	

Totals may not add due to rounding.

Overarching goals

- Improve predictability & risk assessment, increase resilience
- Reduce impact of extreme events on life, society, and economy

Program Design

	Co-funding	Track 1 (workshops)	Track 2
Purpose	Leverage other programs Provide additional support Flexibility on "extreme" **New data collection OK**	Workshops to foster new communities and interdisciplinary methods	Projects addressing both primary goals that don't fit existing GEO programs **No support may be requested for new data collection**
Request	Internal memo only*	PREEVENTS solicitation every two years	
FY16 ($M)	17.75**	-	-
FY17 ($M)	8.0	0.50	18.5
FY18 ($M)	8.0	0.50	
FY19 ($M)	TBD	TBD	TBD
FY20 ($M)	TBD	TBD	

*Max co-funding per project: 50% of total project or $1M, whichever is less. Under *exceptional* circumstances, the management team may elect to consider requests for up to $1.5M per project.

**FY16 - $9M for co-funding under management team, remainder distributed in Divisions for PREEVENTS-relevant work

Review and Funding

Co-funding via internal memo only

- Program reviews proposals, makes decision to fund or not
- MT reviews co-funding requests, makes decision to co-fund or not

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

http://www.nsf.gov/pubs/2016/nsf16562/nsf16562.htm

Track 2 proposals will have two-stage review

- Stage 1: thematic virtual panels + *ad hoc* – gives disciplinary depth
- Stage 2: physical panel for all Stage 2 proposals – gives overall breadth

Status and Plans

Co-funding Round 1 underway, Round 2 in mid June

- 17 requests received, 15 eligible, 2 had already been awarded
- MT sought clarification on five requests
- MT ultimately recommended 14 for co-funding

Timeline

• Track 1	Proposals any time after 1 August 2016
• 29 July 2016	Track 2 LOIs required
• 19 Sept 2016	Track 2 Proposals due
• Nov/Dec 2016	Track 2 Stage 1 review
• Jan/Feb 2017	Track 2 Stage 2 physical panel
• Mar 2017	Track 2 Award recommendations to DGA

Portfolio Review of GS

Portfolio Review of Geospace Section of AGS (Feb 2015 – Apr 2016)

- Final Report accepted and released by NSF's Advisory Committee for Geosciences on Apr 14, 2016
- NRC assessment of GS Portfolio Review due in Oct of 2016

http://nsf.gov/geo/geoac_subcomm_rpts.jsp

PR Recommendations (Cont.) (New Elements)

Redirect funding to 5 new program elements by 2025

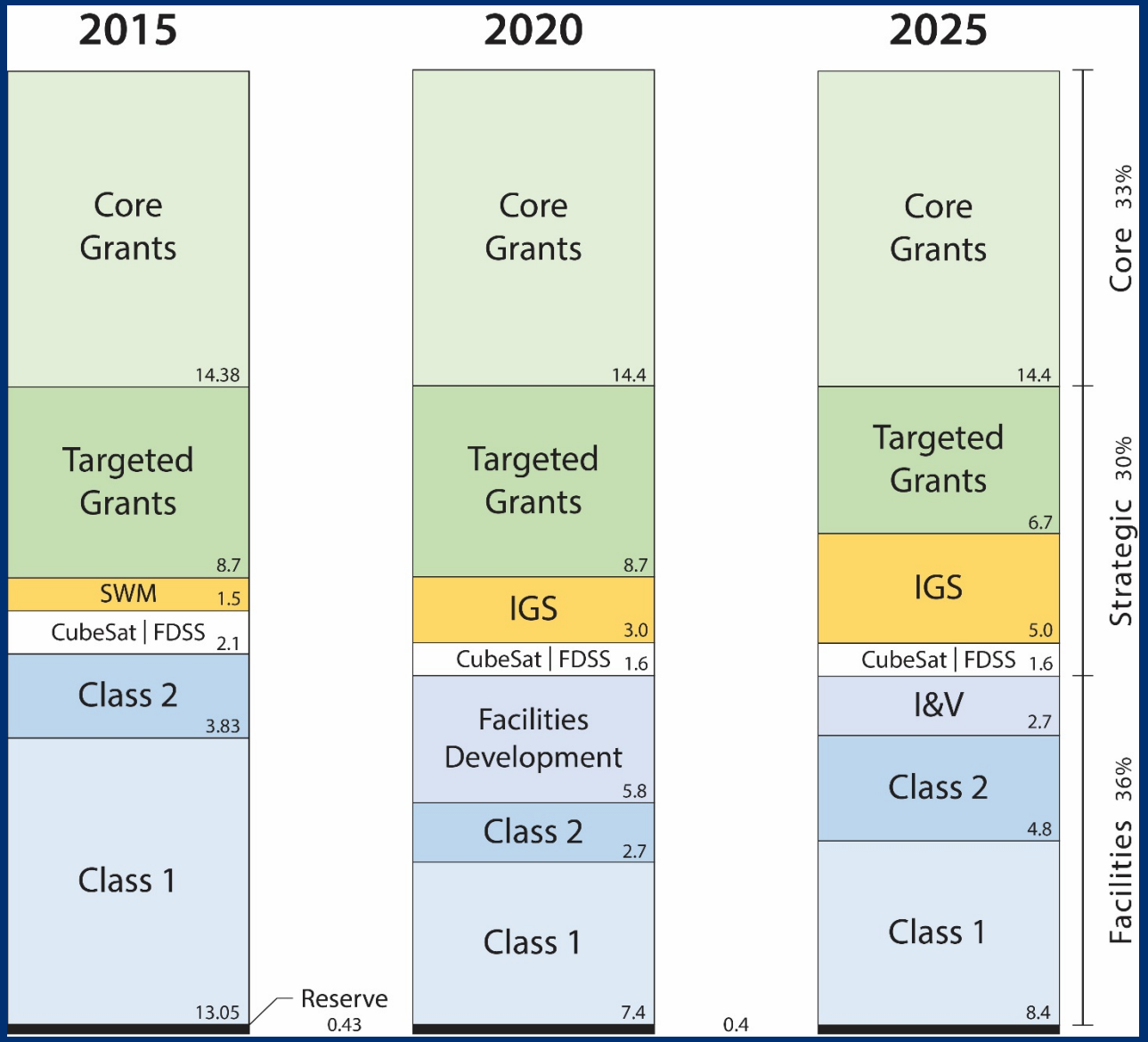
- **Grand Challenge Projects:** *Element of* **Integrative Geospace Science (IGS)** *grants program together with* **SWM**
- **Data Systems:** *Facilities to exploit emerging information technologies for integrated software and data analysis tools, geospace data mining and data assimilation. Peer-reviewed projects receiving support from this program are expected to become Class 2 facilities by 2025*
- **Distributed Arrays for Scientific Instruments (DASI):** *Development of distributed measurement systems. Peer-reviewed projects receiving support from this program are expected to become Class 2 facilities by 2025*

PR Recommendations (Cont.) (New Elements)

Redirect funding to 5 new program elements by 2025

- **Innovation and Vitality:** *Peer-reviewed grants for innovations in facilities and models and upgrades (as needed) to maintain state-of-the-art*
- **European Incoherent Scatter Scientific Association (EISCAT):** *Begin forging a partnership with the EISCAT consortium to use new EISCAT-3D capability and EISCAT-Svalbard as a replacement for Sondrestrom*

Recommended GS Portfolio




Questions?
Thank you!