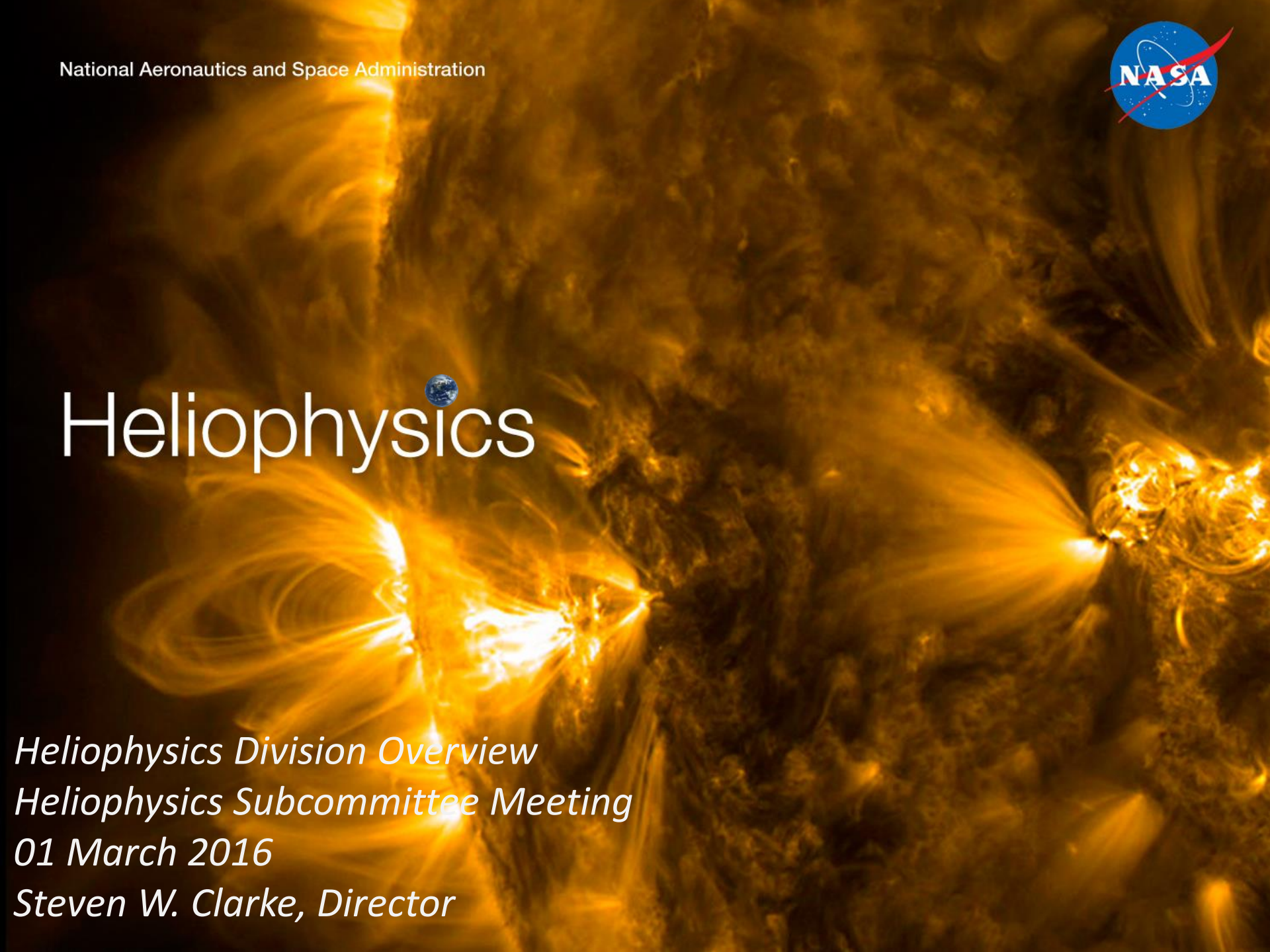
National Aeronautics and Space Administration



Heliophysics

Heliophysics Division Overview
Heliophysics Subcommittee Meeting
01 March 2016
Steven W. Clarke, Director

Overview Topics

- **Welcome and Opening Remarks**
- **Budget Update**
- **Division Assignment Changes**
- **National Space Weather Strategy**
- **Outreach**

Welcome and Opening Remarks

Budget Update

NASA: Fiscal Year 2017 Top Six Budget Points

HELIOPHYSICS

- The President is proposing a **$19.0 billion** budget for NASA, on top of the over $100 billion already invested in America's space program over the past six years.
- These investments have put NASA firmly on a **journey to Mars**. Building on the tremendous progress made this year, the budget enables further development of the Orion Multi-Purpose Crew Vehicle, Space Launch System (SLS), and Exploration Ground Systems (EGS) to send astronauts on deep space exploration missions.
- The budget supports the Administration's commitment for NASA to be a catalyst for the growth of a **vibrant American commercial space** industry and regain the capability to send astronauts into space cost-effectively and safely from American soil by the end of 2017.
- The Administration is committed to extending operation of the **International Space Station (ISS)** to at least 2024, providing a unique environment for research on human health and space operations necessary for future long-term human missions, for expanding commercial activity in low Earth orbit.
- The **budget funds a robust $5.60 billion science program**, including funding for the James Webb Space Telescope, increased support for Earth science, and funding for missions to Mars, Europa, and other destinations throughout the solar system.
- This budget supports continued progress in our development of **transformative capabilities and cutting-edge technologies** for aeronautics and space, which provide spinoffs and feed the economy. This work is part of the Administration's vital strategy to equip our nation with technologies for the future.

FY 2017 Budget Request ($M)

HELIOPHYSICS

Budget Authority ($ in millions)	Fiscal Year FY 2015	Enacted 2016	PBR 2017	Notional 2018	2019	2020	2021
NASA Total	**18,010.2**	**19,285.0**	**19,025.1**	**18,826.6**	**19,399.9**	**19,879.9**	**20,367.5**
Science	5,243.0	5,589.4	5,600.5	5,408.5	5,516.7	5,627.0	5,739.6
Earth Science	1,784.1		2,032.2	1,989.5	2,001.3	2,020.9	2,047.7
Planetary Science	1,446.7		1,518.7	1,439.7	1,520.1	1,575.5	1,625.7
Astrophysics	730.7		781.5	761.6	992.4	1,118.6	1,192.5
James Webb Space Telescope	645.4	620.0	569.4	533.7	304.6	197.2	149.8
Heliophysics	636.1		698.7	684.0	698.3	714.8	723.9
Aeronautics	642.0	640.0	790.4	846.4	1,060.1	1,173.3	1,286.9
Space Technology	600.3	686.5	826.7	704.4	718.5	732.9	747.5
Exploration	3,542.7	4,030.0	3,336.9	3,529.7	4,081.7	4,243.6	4,261.7
Exploration Systems Development	3,211.5	3,680.0	2,859.6	2,922.5	3,061.6	3,092.2	3,142.3
Exploration Research and Development	331.2	350.0	477.3	607.2	1,020.1	1,151.4	1,119.5
Space Operations	4,625.5	5,029.2	5,075.8	4,912.8	4,529.7	4,540.1	4,697.6
Space Shuttle	7.7		0.0	0.0	0.0	0.0	0.0
International Space Station	1,524.8		1,430.7	1,554.7	1,536.8	1,539.3	1,585.2
Space Transportation	2,254.0		2,757.7	2,475.0	2,118.7	2,144.4	2,213.9
Space and Flight Support (SFS)	839.0		887.4	883.2	874.1	856.4	898.6
Education	119.0	115.0	100.1	102.1	104.1	106.2	108.3
Safety, Security, and Mission Services	2,754.6	2,768.6	2,836.8	2,893.6	2,951.5	3,010.4	3,070.6
Center Management and Operations	2,023.7		2,017.7	2,058.1	2,113.5	2,155.6	2,198.8
Agency Management and Operations	730.9		819.1	835.5	838.0	854.8	871.8
Construction and Environmental Compliance and Restoration	446.1	388.9	419.8	390.2	398.0	406.0	414.1
Construction of Facilities	374.4		328.0	297.9	303.8	310.1	317.9
Environmental Compliance and Restoration	71.7		91.8	92.3	94.2	95.9	96.2
Inspector General	37.0	37.4	38.1	38.9	39.6	40.4	41.2
NASA Total	**18,010.2**	**19,285.0**	**19,025.1**	**18,826.6**	**19,399.9**	**19,879.9**	**20,367.5**

FY 2015 reflects funding amounts specified in the September 2015 Operating Plan per Public Law 113-235.

FY 2016 reflects only funding amounts specified in Public Law 114-113, Consolidated Appropriations Act, 2016. For projects in development, NASA's tentatively planned FY 2016 funding level is shown. FY 2016 funding levels are subject to change pending finalization of the FY 2016 Operating Plan.

FY 2017 includes $763 million in mandatory funding.

Heliophysics Budget Strategy

- Use the scientific priorities of the 2013 Decadal Survey to guide strategy and inform decisions
- Ensure funding for missions in development
- Ensure funding for currently operating missions per 2015 Senior Review
- Maintain and grow competed PI research award program at no less than current funding level (~$63M/year => ~$100M/year)
- Ensure funding for missions entering extended operations (SDO, Van Allen Probes, IRIS)
- Maintain and grow mission wedge for future missions, after launch of SOC and SPP
- Ensure balanced portfolio to meet Heliophysics science objectives: Research, LWS, STP, Explorers
- Maintain viable sounding rocket/range program for the benefit of the Agency
- Infuse technology and innovation for the benefit of future Heliophysics missions

Changes from the FY16 Budget

- Missions in Development
  - SPP launch vehicle award requires re-phase of payments from plan at confirmation with minor Mission Directorate UFE re-phase
  - SOC re-phase to accommodate LRD delay to October 2018 ABC
  - GOLD guideline changed to match KDP-C Confirmation
  - ICON minor re-phase of launch vehicle payment schedule
- Missions in Prime Ops
  - MMS out-year funding identified for Extended Ops after FY18. MMS LCC also decreased as a result of launch vehicle savings
  - SDO, Van Allen Probes, and IRIS funding identified to allow transition from Prime Ops to Extended Ops during FY15
- Missions in Extended Ops:
  - Minor adjustments to various missions per the 2015 Senior Review
- Future Mission funding
  - Release Explorer mission AO/MO in FY16
  - Release STP-5 mission AO/MO in FY17
  - Release LWS-7 mission AO/MO in FY18
- OMB Mandatory Spending (FY2017 only):
  - +$10.0M for Heliophysics/Cubesat program
  - +$10.0M for Heliophysics/Space weather research in support of the Space Weather Action Plan
  - +$5.0M for Research & Analysis

Areas Unchanged since the FY16 Budget

- Ensure missions in development (SET, ICON, GOLD, SOC, SPP) meet LRDs.
- Continue operating science missions with *minor changes* for extended missions per the 2015 Senior Review
  - Extended Ops: STEREO, TIMED, IBEX, AIM, THEMIS, TWINS, CINDI, ACE, RHESSI, Wind, Voyager
    - ➢ CINDI re-entered in December 2015
  - Partnered missions: Hinode, Geotail, SOHO, and Cluster II
    - ➢ NASA participation in Cluster II mission ended in FY15
- Continue development of innovative CubeSats as part of overall Low-Cost Access to Space (LCAS)
- Continue research (competed PI – ROSES) selections and awards, including DRIVE implementation
- Continue to support Solar Data Analysis Center, Space Physics Data Archive, Data & Modeling Services, Mission Ops Services, Community Coordinated Modeling Center (CCMC)
- Continue current-year funding level for Wallops Flight Research Range

FY17 Heliophysics President's Budget

	Op Plan FY15	Request FY16	FY17	FY18	FY19	FY20	FY21
Heliophysics	636.1	651.0	698.7	684.0	698.3	714.8	723.9
Heliophysics Research	192.0	158.5	180.1	192.0	210.0	215.9	214.2
Heliophysics Research and Analysis (791926)	34.1	34.0	38.9	48.9	53.9	53.9	53.9
Sounding Rockets (962880)	66.2	48.3	53.3	59.0	61.1	63.1	63.1
Research Range (153825)	21.3	21.6	21.7	21.7	25.1	25.1	25.2
Science Planning and Research Support (527813)	6.5	6.6	6.7	6.8	6.8	6.8	6.8
Directed Research & Technology (526310)	18.4	2.9	3.9	5.4	3.2	6.3	4.5
CubeSat (964105)	6.5	5.0	15.0	5.0	5.0	5.0	5.0
Voyager (925575)	5.5	5.7	5.6	5.5	5.6	5.5	5.5
SOHO (789743)	2.2	2.2	2.3	2.2	2.3	2.3	2.3
WIND (958044)	1.8	2.2	2.2	2.2	2.2	2.2	2.2
GEOTAIL (943305)	0.2	0.2	0.2	0.2	0.2	0.2	0.2
CLUSTER-II (959194)	0.2						
SOLAR Data Center (378077)	0.9	1.0	1.1	1.2	1.3	1.1	1.2
Data & Modeling Services (944022)	2.0	2.8	2.8	2.7	3.0	3.0	3.0
Space Physics Data Archive (380543)	2.0	2.0	2.3	2.3	2.3	2.3	2.3
Guest Investigator Program (955518)	10.8	10.5	10.3	15.2	24.3	24.7	24.7
Community Coordinated Modeling Center (382230)	2.2	2.0	2.2	2.2	2.3	2.4	2.4
Space Science Mission Ops Services (385616)	11.3	11.5	11.5	11.5	11.6	11.9	11.9
Solar Terrestrial Probes	70.6	50.5	39.8	38.8	127.3	179.4	198.4
Magnetospheric Multiscale (MMS) (943396)	52.4	30.1	17.4	14.6	11.0	11.0	4.0
STP Program Management and Future Missions (617871)	0.4	1.0	3.4	5.7	97.4	149.4	175.4
Solar Terrestrial Relations Observatory (STEREO) (619595)	7.5	9.5	9.5	9.3	9.5	9.5	9.5
Hinode (Solar B) (511432)	7.5	7.3	7.0	6.8	7.0	7.0	7.0
TIMED (370544)	2.8	2.7	2.6	2.4	2.5	2.5	2.5

FY17 Heliophysics President's Budget

	Op Plan FY15	Request FY16	FY17	FY18	FY19	FY20	FY21
Living with a Star	263.5	343.0	374.2	398.7	244.6	135.8	127.3
Solar Probe Plus (388443)	193.7	230.4	232.5	289.7	100.4	30.6	22.1
Solar Orbiter Collaboration (996805)	20.5	62.9	80.7	51.4	66.3	2.3	2.4
Balloon Array for Radiation-Belt Relativ (296527)	0.2						
Van Allen Probes (RBSP) (605745)	13.0	15.5	13.3	13.0	13.0	9.0	
LWS Space Environment Testbeds (499999)	0.4	0.4	0.4				
LWS Science (936723)	17.4	17.5	27.5	24.0	30.5	30.3	30.3
LWS Program Management and Future Missions (937818)	5.3	6.7	7.8	8.9	22.3	51.7	60.5
Solar Dynamics Observatory (SDO) (939252)	13.1	9.5	12.0	11.8	12.0	12.0	12.0
Heliophysics Explorer Program	110.0	98.9	104.6	54.5	116.3	183.8	184.0
Ionospheric Connection Explorer (581067)	61.0	49.8	49.4	9.0	4.5	1.3	
Global-scale Observations of the Limb an (496787)	13.9	17.5	16.3	8.6	4.6	2.0	
Interface Region Imaging Spectogr (IRIS) (649056)	8.2	7.7	7.7	6.8	7.0	6.5	6.5
Heliophysics Explorer Future Missions (516741)			3.3	8.5	74.5	149.3	156.1
Interstellar Boundary Explorer (IBEX) (576706)	3.4	3.4	3.4	3.3	3.4	3.4	3.4
TWINS (953004)	0.6	0.6	0.6	0.6	0.6	0.6	0.6
CINDI (953212)	1.2	0.6	0.3	0.2			
Aeronomy of Ice in Mesophere (SMEX-9) (956269)	3.0	3.0	3.0	2.9	3.0	3.0	3.0
Time History of Events and Macroscale In (960804)	5.4	4.6	5.4	5.0	5.1	4.5	4.5
Heliophysics Explorer Program Management (062285)	8.5	6.8	10.4	4.8	8.8	8.3	5.0
ACE (910989)	3.0	3.0	3.0	2.9	3.0	3.0	3.0
RHESSI (667339)	1.8	1.9	1.9	1.9	1.9	1.9	1.9

Budget Deltas Since FY16 Budget

	FY15	FY16	FY17	FY18	FY19	FY20	FY21
Heliophysics			13.5	(13.9)	(9.8)	(7.3)	723.9
Heliophysics Research			11.6	(10.1)	2.4	7.5	214.2
Heliophysics Research and Analysis (791926)			5.0				53.9
Sounding Rockets (962880)							63.1
Research Range (153825)					3.4	3.5	25.2
Science Planning and Research Support (527813)			(0.0)	(0.0)	(0.0)	(0.0)	6.8
Directed Research & Technology (526310)			(4.0)	(6.5)	(2.0)	1.1	4.5
CubeSat (964105)			10.0				5.0
Voyager (925575)				(0.1)			5.5
SOHO (789743)			0.0	(0.0)	0.0	0.0	2.3
WIND (958044)				(0.1)	0.2	0.2	2.2
GEOTAIL (943305)				(0.0)			0.2
CLUSTER-II (959194)							
SOLAR Data Center (378077)			0.1	0.2	0.3	0.1	1.2
Data & Modeling Services (944022)				(0.1)			3.0
Space Physics Data Archive (380543)			0.3	0.3	0.3	0.3	2.3
Guest Investigator Program (955518)				(4.0)		2.0	24.7
Community Coordinated Modeling Center (382230)			0.2	0.2	0.2	0.3	2.4
Space Science Mission Ops Services (385616)				(0.0)			11.9
Solar Terrestrial Probes			2.3	(3.0)	(6.0)	(9.8)	198.4
Magnetospheric Multiscale (MMS) (943396)			(0.1)	3.7	11.0	11.0	4.0
STP Program Management and Future Missions (617871)			2.4	(6.3)	(17.0)	(20.8)	175.4
Solar Terrestrial Relations Observatory (STEREO) (619595)				(0.2)			9.5
Hinode (Solar B) (511432)				(0.2)			7.0
TIMED (370544)				(0.1)			2.5

Budget Deltas Since FY16 Budget

	FY15	FY16	FY17	FY18	FY19	FY20	FY21
Living with a Star			(13.1)	(1.2)	32.0	32.5	127.3
Solar Probe Plus (388443)			6.0	(34.1)		5.4	22.1
Solar Orbiter Collaboration (996805)			(31.5)	32.1	23.5		2.4
Balloon Array for Radiation-Belt Relativ (296527)							
Van Allen Probes (RBSP) (605745)			(1.0)	(1.0)	(1.0)	(1.0)	
LWS Space Environment Testbeds (499999)							
LWS Science (936723)			10.0	(1.6)		0.8	30.3
LWS Program Management and Future Missions (937818)			0.9	1.1	7.0	24.9	60.5
Solar Dynamics Observatory (SDO) (939252)			2.5	2.2	2.5	2.5	12.0
Heliophysics Explorer Program			12.7	0.4	(38.2)	(37.5)	184.0
Ionospheric Connection Explorer (581067)			1.4	(0.1)	0.1		
Global-scale Observations of the Limb an (496787)			1.5		1.8	1.3	
Interface Region Imaging Spectogr (IRIS) (649056)				(0.2)			6.5
Heliophysics Explorer Future Missions (516741)			3.3	4.5	(40.8)	(37.9)	156.1
Interstellar Boundary Explorer (IBEX) (576706)				(0.1)			3.4
TWINS (953004)				(0.0)			0.6
CINDI (953212)							
Aeronomy of Ice in Mesophere (SMEX-9) (956269)				(0.1)			3.0
Time History of Events and Macroscale In (960804)			0.9	0.5	0.6		4.5
Heliophysics Explorer Program Management (062285)			5.7	(4.1)	0.1	(0.9)	5.0
ACE (910989)				(0.1)			3.0
RHESSI (667339)				(0.0)			1.9

Next Steps

- Plan for growth in ROSES competitions, implement DRIVE
- Plan for AOs
  - Explorers (+MO) highest priority
  - Develop near term strategy for STP-5 (+MO)
  - Begin planning for LWS-7 (+MO)

Division Assignment Changes

Division Assignment Changes

Heliophysics Division - Science Mission Directorate

24 February 2016

Director
Steve Clarke

Deputy Director
Peg Luce

Resource Management
Ralph Beaty+
Jennifer Holt+

Chief Scientist – *Vacant*

Secretary: *Gloria Stewart*
Admin Asst: *Aaluk Edwardson**
Program Support Specialist: *Jackie Mackall*

Cross Cutting

Education Manager: *Lika Guhathakurta*
Division Public Affairs: *Dwayne Brown*
Emerging Partnerships: *Lika Guhathakurta*
Space Weather Lead: *Elsayed Talaat*
Chief Technologist: *Dan Moses*
- SMD Cubesat Implementation Program (SCIP)

Policy Analyst: *Jeremy Stembler+*
Legislative Affairs: *Gabriel Adler+*
Interagency/International Relations: *Tim Tawney+/Mike Moore+*

Heliophysics Research

Program Manager: *Arik Posner*
Program Support: *Guan Le**, *EJ Summerlin**
Grand Challenge (GCR): *Mona Kessel*
Guest Investigator (GI): *Bill Paterson**
Infrastructure & Data Environment Enhancements (IDEE): *Jeff Hayes*
Supporting Research (SR): *Arik Posner (SH)/Elsayed Talaat (Mag/ITM)*
Technology & Instrument Development for Science (TIDeS)/Low-Cost Access to Space (LCAS): *Dan Moses*

* *Matrix*
* *Detailee, IPA, or contractor*

Programs / Missions

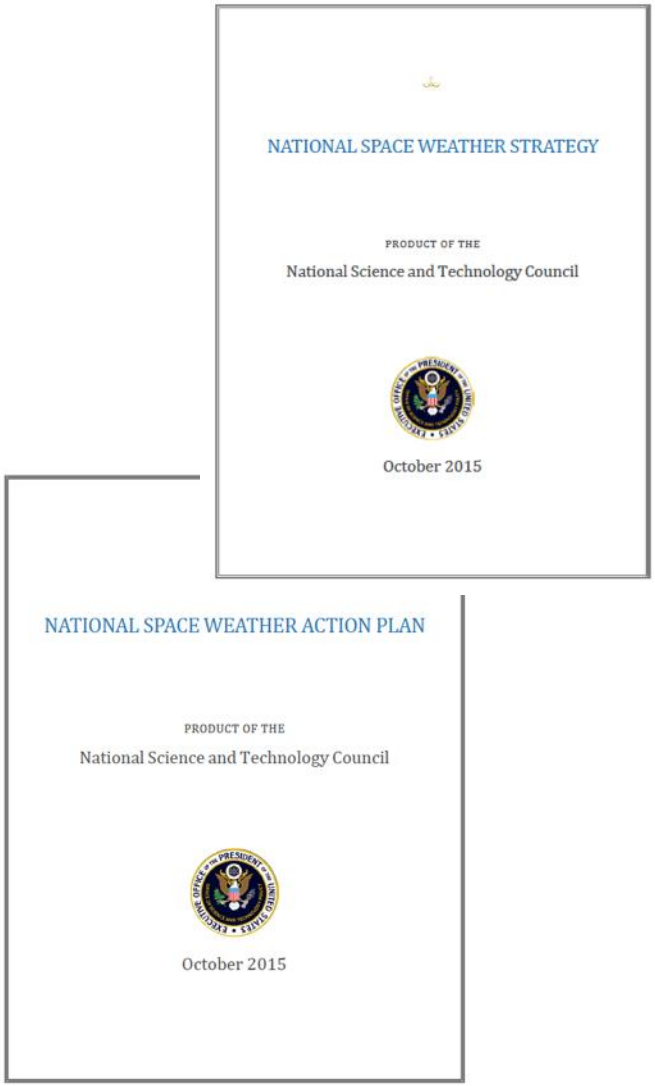
	Program Scientist	Program Executive
Living With a Star (LWS)		
Program	***Elsayed Talaat***	***Joe Smith***
Science	***Jeff Morrill****	
SET	*Jeff Newmark*	*John Lee*
SOC	*Jeff Newmark*	*Joe Smith*
SPP	*Elsayed Talaat*	*John Lee*
Solar Terrestrial Probes (STP)		
Program	***Mona Kessel***	***Bill Stabnow***
STP-5	*Arik Posner*	*Joe Smith*
Explorers		
Program	***Jeff Newmark***	***Willis Jenkins***
ICON	*Jeff Morrill**	*Willis Jenkins*
GOLD	*Elsayed Talaat*	*Bill Stabnow*
EXP-XX	*TBD*	*TBD*
Sounding Rockets & Range		
Program	***Dan Moses***	***George Albright***
Operating Missions		***Jeff Hayes***
ACE	*Arik Posner*	
AIM	*Elsayed Talaat*	
Geotail	*Bill Paterson*	
Hinode	*Jeff Newmark*	
IBEX	*Arik Posner*	
IRIS	*Jeff Newmark*	
MMS	*Mona Kessel*	
RHESSI	*Jeff Newmark*	
SDO	*Lika Guhathakurta*	
SOHO	*Jeff Newmark*	
STEREO	*Lika Guhathakurta*	
THEMIS	*Elsayed Talaat*	
TIMED	*Elsayed Talaat*	
TWINS	*Mona Kessel*	
Van Allen	*Mona Kessel*	
Voyager 1 & 2	*Arik Posner*	
Wind	*Arik Posner*	

Blue – In Development
Green – Pre-Formulation

National Space Weather Strategy

National Space Weather Strategy Update

- National Space Weather Strategy and Space Weather Action Plan were officially released on 29 October 2015.
  - www.whitehouse.gov/sites/default/files/microsites/ostp/final_nationalspaceweatherstrategy_20151028.pdf
  - www.whitehouse.gov/sites/default/files/microsites/ostp/final_nationalspaceweatheractionplan_20151028.pdf
- Subcommittee on Space Weather Operations. Research, and Mitigation (SWORM) established for Space Weather Action Plan follow-through.
- Establishment of working groups underway
- Process for reporting working group progress to Subcommittee being finalized



Subcommittee on Space Weather

HELIOPHYSICS

Committee on Environment, Natural Resources, and Sustainability (CENRS)

CENRS Co-Chairs:

Tamara Dickinson - OSTP
Kathryn Sullivan - NOAA
Thomas Burke - EPA

NATIONAL SCIENCE AND TECHNOLOGY COUNCIL (NSTC)

COMMITTEE ON ENVIRONMENT, NATURAL RESOURCES, AND SUSTAINABILITY (CENRS)
Tamara Dickinson (OSTP), Kathryn Sullivan (NOAA), Glenn Paulson (EPA)

AQRS: Air Quality Research (SC)		SOST: Ocean Science & Technology (SC)
CSMSC: Critical & Strategic Mineral Supply Chains (SC)	SDR: Disaster Reduction (SC)	SWAQ: Water Availability & Quality (SC)
IARPC: Interagency Arctic Research Policy Committee (IWG)	SES: Ecological Services (SC)	T&R: Toxics & Risk (SC)
ISTS: Integration of Science and Technology for Sustainability (TF)	SGCR: Global Change Research (SC)	USGEO: U.S. Group on Earth Observations (SC)

COMMITTEE ON HOMELAND & NATIONAL SECURITY (CHNS)
Patricia Falcone (OTSP), Alan Shaffer (DoD), Tara O'Toole (DHS)

BDRD: Biological Defense Research & Development (SC)	ISC: Infrastructure (SC)	SOS-CBRNE Standards (SC)
CDRD: Chemical Defense Research and Development (SC)	NDRD: Nuclear Defense Research & Development (SC)	TISTI: Topics in International Science, Technology and Innovation (SC)
D-IED: Domestic IEDs (SC)	FSLFI: Federal Security Laboratory Facilities and Infrastructure (IWG)	

COMMITTEE ON SCIENCE (CoS)
Francis Collins (NIH), Philip Rubin (OSTP), Cora Marrett (NSF)

IWGN: Neuroscience (IWG)*	PSSC: Physical Science (SC)	LSSC: Life Science (SC)*
Social, Behavioral, and Economic Science (SC)		

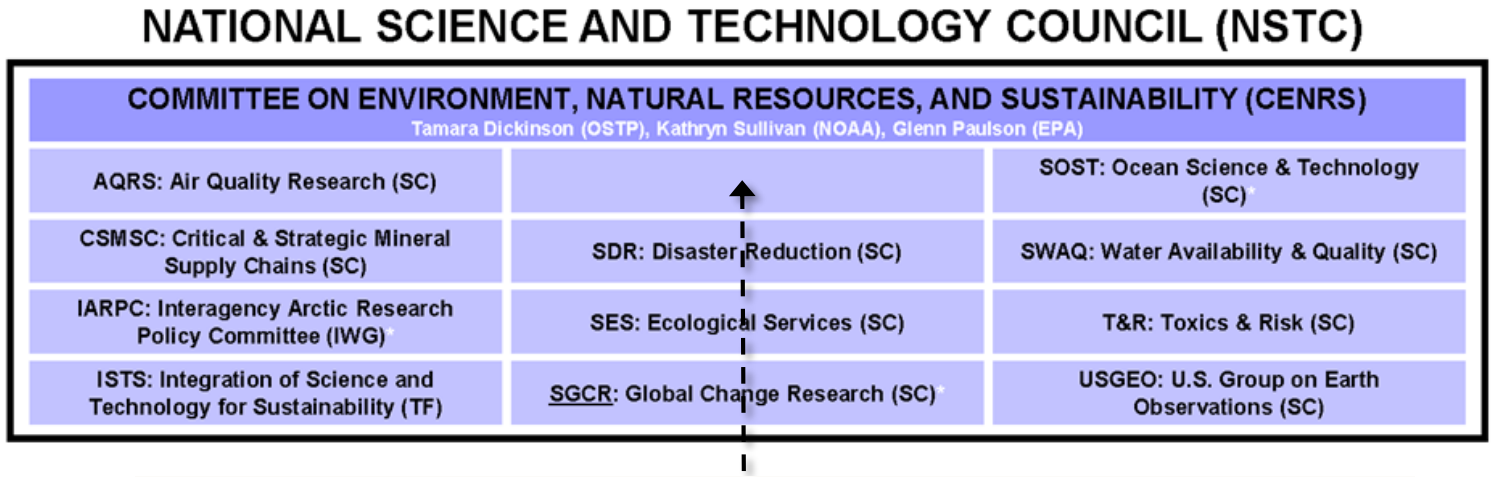
COMMITTEE ON STEM EDUCATION (CoSTEM)*
John Holdren (OSTP), Cora Marrett (NSF)

FC-STEM: Federal Coordination in STEM Education (TF)	

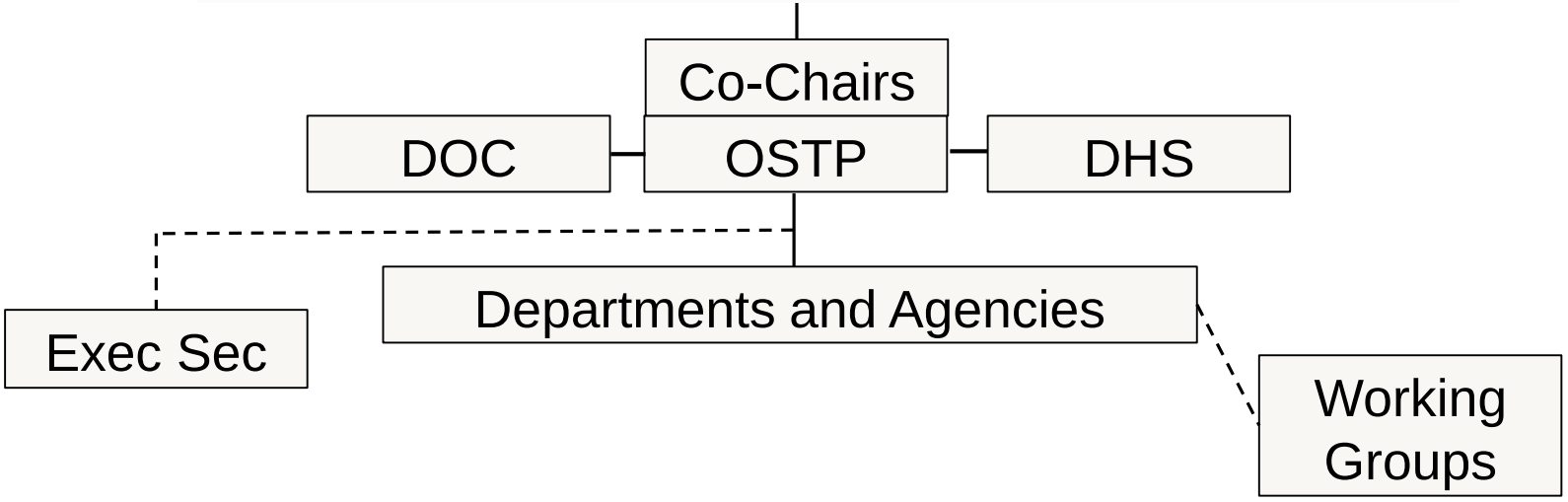
COMMITTEE ON TECHNOLOGY (CoT)
Thomas Kalil (OSTP)

ASTS: Aeronautics Science & Technology (SC)	AMS: Advanced Manufacturing (SC)*	SG: Smart Grid (SC)
BidM: Biometrics & Identity Management (SC)	DGT: Digital Game Technologies (IWG)	SMGI: Material Genome Initiative (SC)
P2I: Privacy (SC)	NITRD: Network and Information Technology R&D (SC)*	SoS: Standards (SC)
GIG: Global Internet Governance (SC)	NSET: Nanoscale Science Engineering & Technology (SC)*	
H2FC: Hydrogen & Fuel Cells (IWG)		

Subcommittee on Space Weather



Subcommittee on Space Weather Operations. Research, and Mitigation (SWORM)



SWORM Subcommittee

- Co-Chairs
  - OSTP (policy), DHS (preparedness), and NOAA (science)
- Executive Secretary
  - Administrative functions (compiles documents, scheduling, meeting minutes, etc.)
- Subcommittee
  - Meets quarterly to discuss progress, next steps, and to resolve issues associated with implementation
- (sub-)Working Groups
  - Six groups
  - Meet monthly, or as necessary, to track progress across all actions within each of the six-goals

SWORM Subcommittee

- Interagency body to coordinate the Federal Government departments and agencies to meet the goals and objectives specified in the *National Space Weather Strategy* and the complete the activities defined in the *National Space Weather Action Plan*

- SWORM will also provide space-weather focused input into the National Planning Frameworks called for by the Presidential Policy Directive 8 (PPD-8): *National Preparedness* (2011) and National critical infrastructure resilience initiatives outlined in PPD-21: *Critical Infrastructure Security and Resilience* (2013)

SWORM Subcommittee

- Coordinate and oversee the implementation of the activities, timelines, and milestones identified in the Action Plan.

- The SWORM Co-chairs, in coordination with OMB and SWORM-participating departments and agencies, shall develop annual multi-agency investment strategies and priorities that advance the implementation of the Strategy and Action Plan.

- Coordinate agency efforts to establish Federal and non-Federal stakeholder collaborations to enhance understanding, observing systems and networks, and data management activities related to space weather.

- Work with other NSTC bodies to coordinate international cooperation in space weather, including strategic communications; the exchange of data, information, models, and research personnel; joint research, planning, and exercises.

- Provide scientific and technical information to senior policymakers to enhance preparedness before, during, and after space weather events.

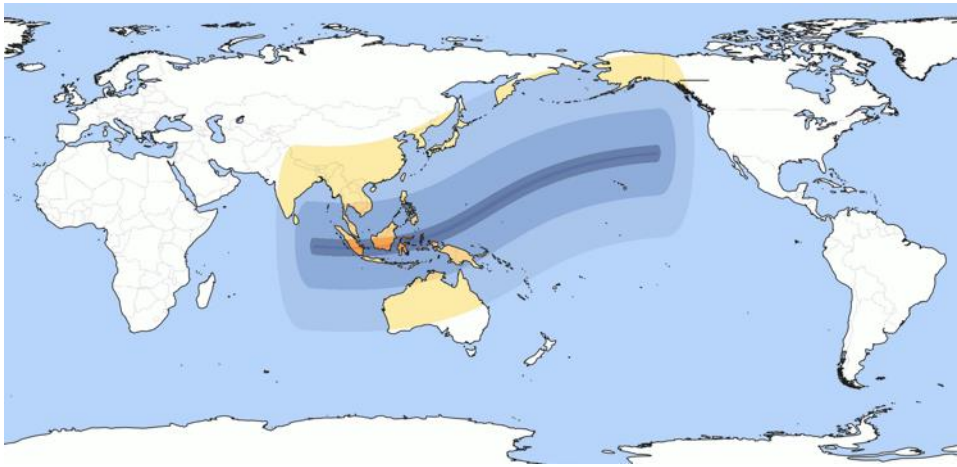
- SWORM may establish working groups, as necessary, to carry out these functions.

Outreach

Outreach Activities

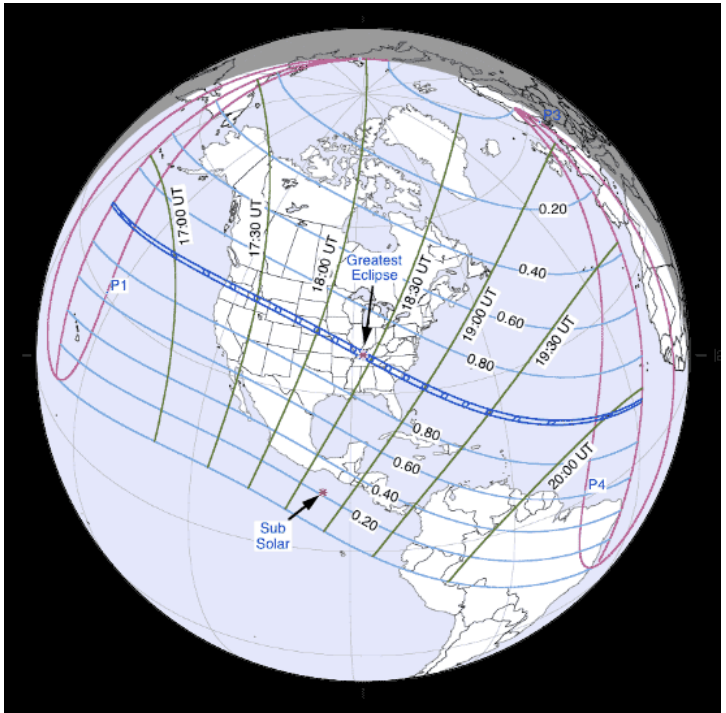
Indonesian Total Eclipse 2016

- A NASA team, consisting of scientists and public outreach specialists, will be in Indonesia to cover the March 8-9 total eclipse.



United States Total Eclipse 2017

- Lessons learned from covering the Indonesian event will be leveraged for the total eclipse event in August 2017



Outreach Activities

- NC State University @ Raleigh, NC
- SAO Atmospheric Imaging Assembly (AIA) Live Feed at James B. Hunt Library

SDO Celebrates its 6th Year Anniversary!

See "SDO: Year 6" at https://svs.gsfc.nasa.gov/cgi-bin/details.cgi?aid=12144

The Solar Dynamics Observatory (SDO), our first Living with a Star mission, launched in February of 2010 to help us understand where the Sun's energy comes from, how the inside of the Sun works, and how energy is stored and released in the Sun's atmosphere.

- ✓ SDO discovered a new class of solar flares with possible implications on changes in the Earth's atmosphere.
- ✓ SDO data and science results have appeared in almost 2500 refereed publications.
- ✓ Each day, about 1.5 TB flows into the Joint Satellite Operations Center (JSOC) from SDO and 7.5 TB in science data flows out to users around the world.
- ✓ During the extended mission we continue to add about 50 publications a month.

The images and data from SDO capture the public's attention in compelling ways. Goddard released a beautiful video showing the entire 6th year on YouTube which received more than 640,000 plays by the end of its first week**, becoming Goddard's most popular video over the last 3 months!** Superlative-laden news coverage came from **Gizmodo/Sploid, Gizmag, Discovery News, Discover Magazine** and others, including a quote from VOX news saying,

"SDO might be the space agency's most **beautiful mission.**"

The three powerful and technologically innovative instruments on SDO:

Helioseismic and Magnetic Imager (HMI) makes high resolution full disk maps of the solar magnetic fields and peers beneath the sun's opaque surface using a technique called helioseismology. A key goal of this experiment is to decipher the physics of the Sun's magnetic dynamo.

Atmospheric Imaging Assembly (AIA) provides continuous full-disk observations of the sun's surface and atmosphere using a battery of 4 telescopes, with filters that cover 10 different wavelength bands, or colors, selected to reveal key aspects of solar activity, spanning a temperature range from approximately 20,000 Kelvin to above 20 million Kelvin.

Extreme Ultraviolet Variability Experiment (EVE) measures fluctuations in the Sun's extreme ultraviolet output with unprecedented accuracy and timing. EUV radiation from the sun has a direct and powerful effect on Earth's upper atmosphere, heating it, puffing it up, and breaking apart atoms and molecules.

Backup Charts

FY16 Heliophysics President's Budget

	Op Plan FY14	Op Plan FY15	FY16	FY17	FY18	FY19	FY20
Heliophysics	641.0	636.1	651.0	685.2	697.9	708.1	722.1
Heliophysics Research	185.1	192.0	158.5	168.5	202.1	207.6	208.4
Heliophysics Research and Analysis (791926)	33.5	34.1	34.0	33.9	48.9	53.9	53.9
Sounding Rockets (962880)	53.4	66.2	48.3	53.3	59.0	61.1	63.1
Research Range (153825)	21.8	21.3	21.6	21.7	21.7	21.7	21.7
Science Planning and Research Support (527813)	6.3	6.5	6.6	6.7	6.8	6.8	6.8
Directed Research & Technology (526310)	27.2	18.4	2.9	8.0	11.9	5.3	5.3
CubeSat (964105)	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Voyager (925575)	5.4	5.5	5.7	5.6	5.6	5.6	5.5
SOHO (789743)	2.2	2.1	2.2	2.2	2.2	2.2	2.2
WIND (958044)	2.2	1.8	2.2	2.2	2.2	2.0	2.0
GEOTAIL (943305)	0.5	0.2	0.2	0.2	0.2	0.2	0.2
CLUSTER-II (959194)	0.6	0.2					
SOLAR Data Center (378077)	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Data & Modeling Services (944022)	3.1	3.0	2.8	2.8	2.8	3.0	3.0
Space Physics Data Archive (380543)	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Guest Investigator Program (955518)	8.1	11.3	10.5	10.3	19.2	24.3	22.7
Community Coordinated Modeling Center (382230)	2.0	2.2	2.0	2.0	2.0	2.1	2.1
Space Science Mission Ops Services (385616)	10.9	11.3	11.5	11.5	11.5	11.6	11.9
Solar Terrestrial Probes	143.3	70.6	50.5	37.6	41.8	133.3	189.2
Magnetospheric Multiscale (MMS) (943396)	120.9	52.4	30.1	17.5	10.8		
STP Program Management and Future Missions (617871)	2.0	0.4	1.0	1.0	12.0	114.4	170.2
Solar Terrestrial Relations Observatory (STEREO) (619595)	9.5	7.5	9.5	9.5	9.5	9.5	9.5
Hinode (Solar B) (511432)	8.0	7.5	7.3	7.0	7.0	7.0	7.0
TIMED (370544)	2.9	2.8	2.7	2.6	2.5	2.5	2.5

FY16 Heliophysics President's Budget

	Op Plan FY14	Op Plan FY15	FY16	FY17	FY18	FY19	FY20
Living with a Star	212.5	260.0	343.0	387.3	399.9	212.6	103.3
Solar Probe Plus (388443)	121.4	179.2	230.4	226.5	323.7	100.4	25.2
Solar Orbiter Collaboration (996805)	39.4	31.5	62.9	112.2	19.3	42.8	2.3
Balloon Array for Radiation-Belt Relativ (296527)	1.5	0.3					
Van Allen Probes (RBSP) (605745)	10.8	13.0	15.5	14.3	14.0	14.0	10.0
LWS Space Environment Testbeds (499999)	0.6	0.4	0.4	0.4			
LWS Science (936723)	18.2	16.3	17.5	17.5	25.5	30.5	29.5
LWS Program Management and Future Missions (937818	5.9	7.4	6.7	6.9	7.8	15.3	26.8
Solar Dynamics Observatory (SDO) (939252)	14.8	11.9	9.5	9.5	9.5	9.5	9.5
Heliophysics Explorer Program	100.2	113.5	98.9	91.9	54.1	154.5	221.3
Ionospheric Connection Explorer (581067)	59.8	61.0	49.8	48.0	9.0	4.5	1.3
Global-scale Observations of the Limb an (496787)	9.4	18.7	17.5	14.8	8.6	2.8	0.7
Interface Region Imaging Spectogr (IRIS) (649056)	8.6	8.6	7.7	7.7	7.0	7.0	6.5
Heliophysics Explorer Future Missions (516741)					4.0	115.2	187.2
Interstellar Boundary Explorer (IBEX) (576706)	3.6	3.4	3.4	3.4	3.4	3.4	3.4
TWINS (953004)	0.6	0.6	0.6	0.6	0.6	0.6	0.6
CINDI (953212)	0.9	1.2	0.6	0.3	0.2		
Aeronomy of Ice in Mesophere (SMEX-9) (956269)	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Time History of Events and Macroscale In (960804)	5.4	5.4	4.6	4.5	4.5	4.5	4.5
Heliophysics Explorer Program Management (062285)	3.8	7.2	6.8	4.7	8.9	8.7	9.1
ACE (910989)	3.0	3.0	3.0	3.0	3.0	3.0	3.0
RHESSI (667339)	2.1	1.4	1.9	1.9	1.9	1.9	1.9