



Space Studies Board Spring Meeting 2015

John M. Grunsfeld, PhD

Associate Administrator for Science Mission Directorate





Westerlund 2

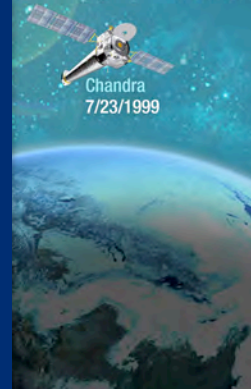
NASA/ESA HST

■ Formulation
■ Implementation
■ Primary Ops
■ Extended Ops



Science @ NASA executes:

-  97 missions
-  124 spacecraft
-  8 Balloon launches (FY 2014)
-  12 Sounding rockets (FY 2014)
-  4,600 Airborne hours (FY 2014)

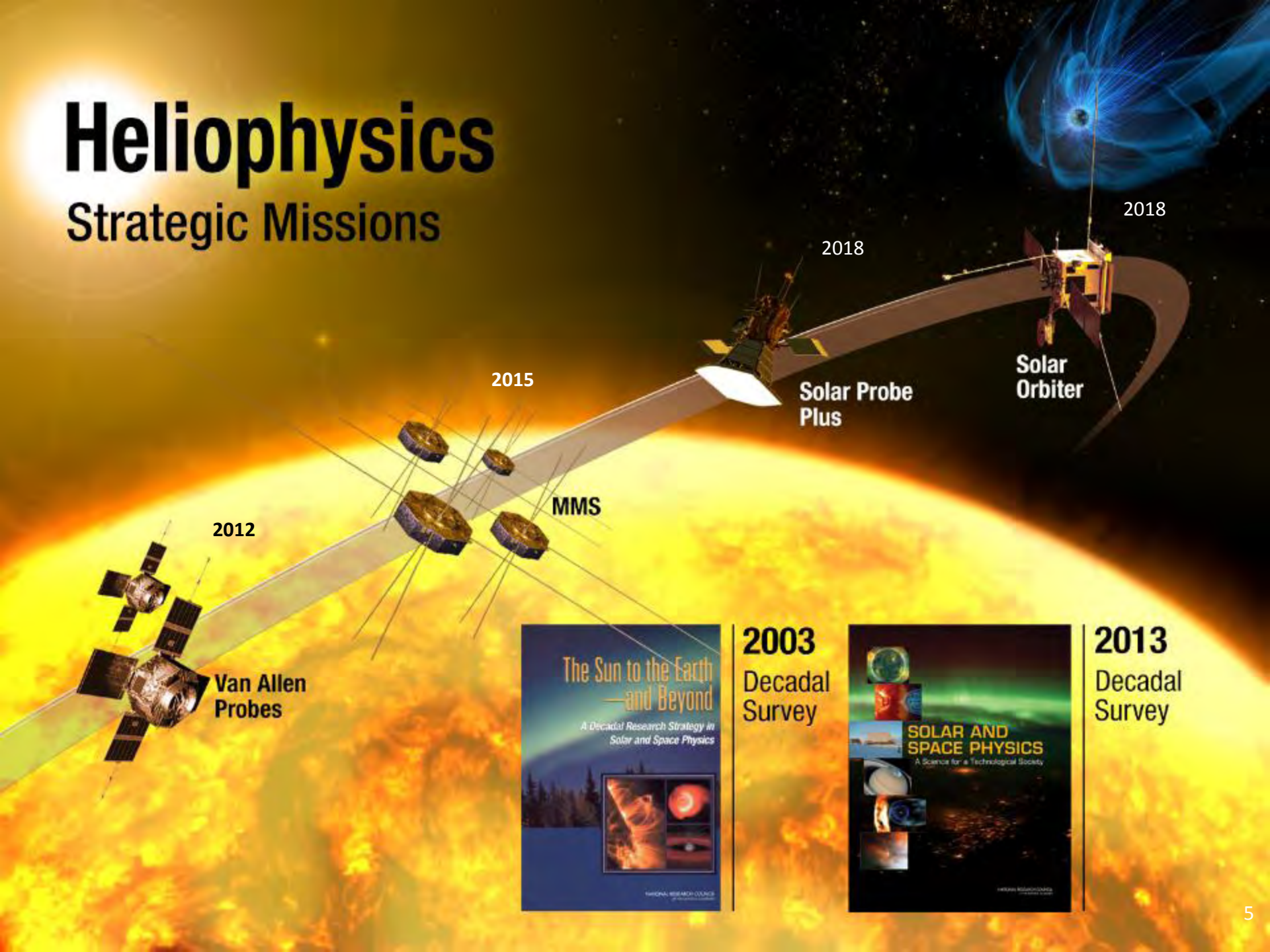


FY 2016 Program/Budget Strategy

- Provide the most productive Earth & space science program for the available resources
 - Guided by national priorities
 - Informed by NRC Decadal Surveys recommendations
 - Incorporating new ideas and partnerships
 - Increase NASA-wide collaboration on strategic projects (ISS, Mars 2020, NEOs...)
- Responsibly manage the national investment in robotic space missions
 - Confirm new missions only after sufficient technology maturation, and budget at an appropriate confidence level
 - Take aggressive steps with missions that do not stay within budget
 - Proactively manage JWST to the cost and schedule baseline
- Increase cadence of competed PI-led flight missions

Heliophysics

Strategic Missions



2012

Van Allen
Probes

2015

MMS

2018

Solar Probe
Plus

2018

Solar
Orbiter



2003
Decadal
Survey



2013
Decadal
Survey

Launch Begins MMS Mission in Spectacular Fashion on Mar. 12, 2015



Credit: NASA

Two New Explorers for Heliophysics

Selected in 2013 for Flight Development

ICON

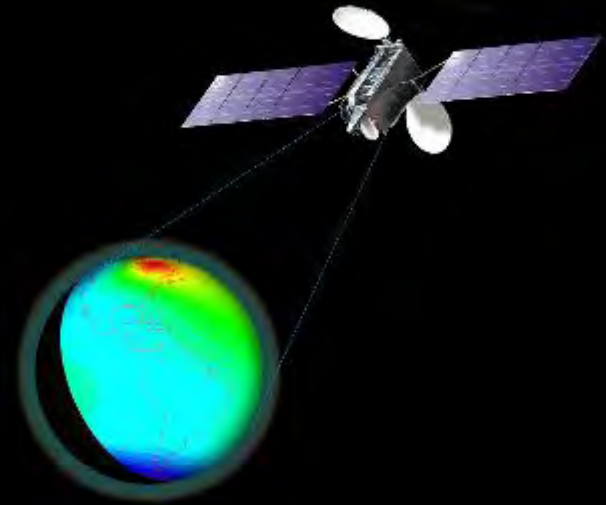
Ionospheric Connection Explorer



Nov. 2015

GOLD

Global Scale Observations
of the Limb and Disk



2017

Earth Science



GPM



OCO-2



RapidScat



CATS



SMAP



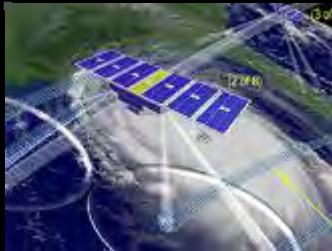
New NASA Earth Science Missions
Expand View of Our Home Planet

Credit: NASA

Earth Venture Program

Earth Venture Mission

CYGNSS
Tropical Cyclone
Genesis/Intensification
Launch: Oct 2016
PI: Chris Ruf (Univ. Mich.)



Earth Venture Instruments



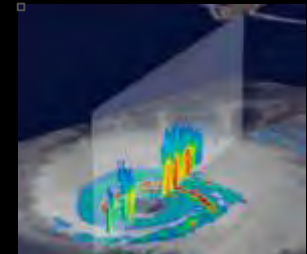
ECOSTRESS
Plant water use/stress
Launch: Aug 2017
PI: Simon Hook (JPL)

TEMPO
Atmospheric pollutants
Launch: Nov 2018
PI: Kelly Chance (SAO)

GEDI
Vegetation/Canopy
Launch: Dec 2018
PI: Ralph Dubayah (Univ. Md.)

Earth Venture Suborbital

Twelve Selected Investigations
2009, 2013



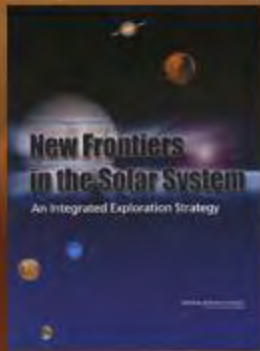
HS3



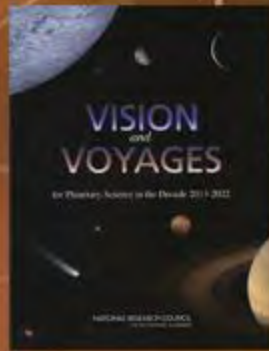
AirMOSS

Planetary Science

Decadal Survey Missions



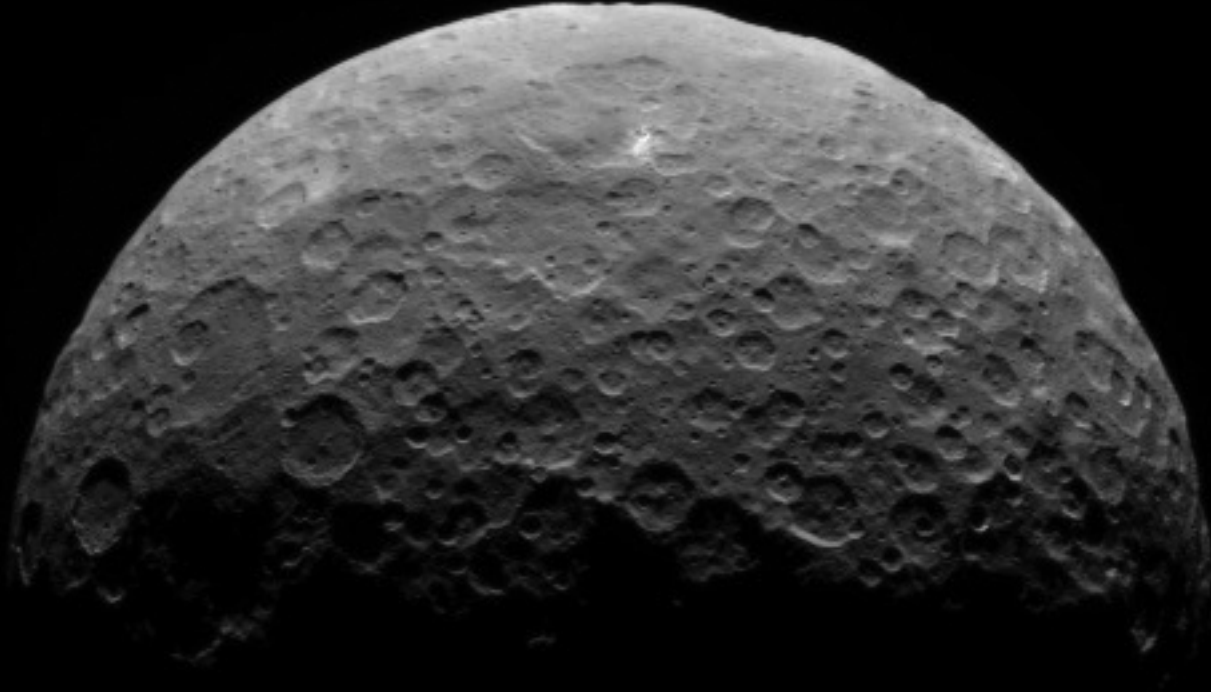
2003
Decadal Survey



2011
Decadal Survey



Dawn at Ceres



New Frontiers Program

1st NF mission
New Horizons:

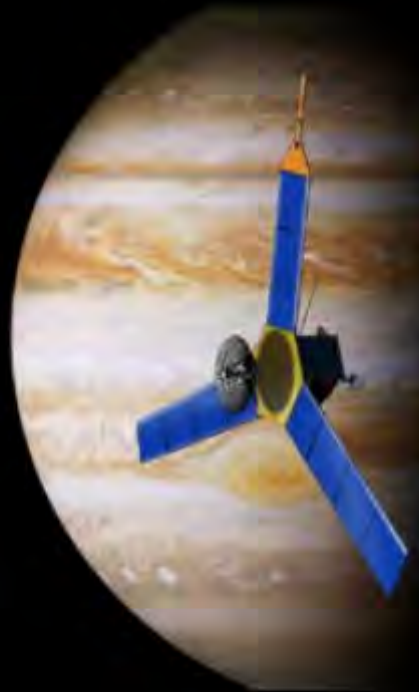
Pluto-Kuiper Belt



Launched January 2006
Arrives July 2015
PI: Alan Stern (SwRI-CO)

2nd NF mission
JUNO:

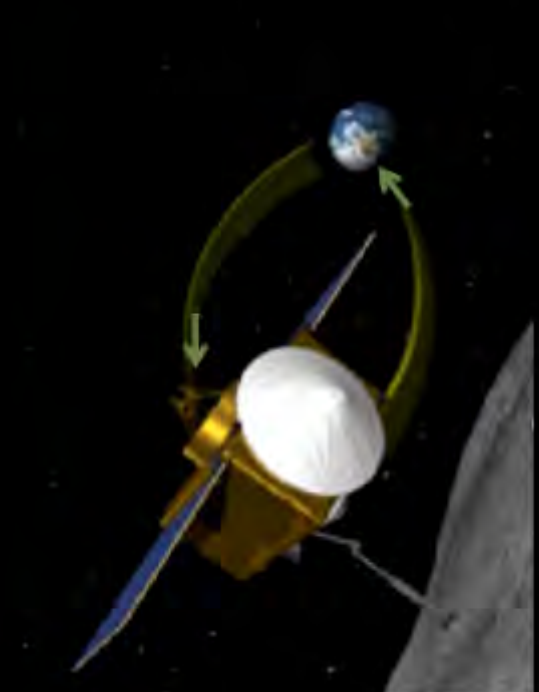
Jupiter Polar Orbiter



Launched August 2011
Arrives July 2016
PI: Scott Bolton (SwRI-TX)

3rd NF mission
OSIRIS-REx:

Asteroid Sample Return



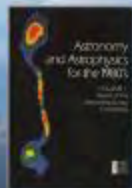
To be launched: Sept. 2016
PI: Dante Lauretta (UA)

ASTROPHYSICS

Decadal Survey Missions



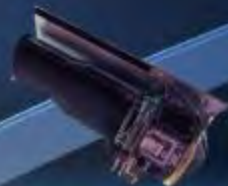
1972
Decadal Survey
Hubble



1982
Decadal Survey
Chandra



1991
Decadal Survey
Spitzer



2001
Decadal Survey
JWST, SOFIA



2010
Decadal Survey
WFIRST



New Explorers for Astrophysics

ASTRO-H

(JAXA-led mission)

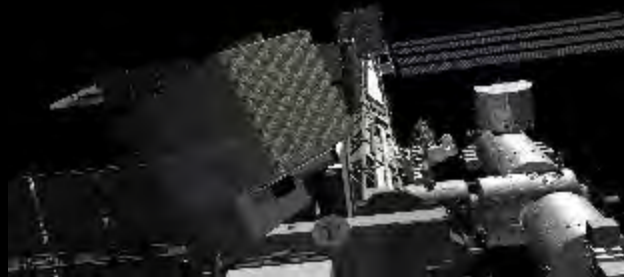


- NASA to supply the Soft X-ray Spectrometer (SXS) instrument only

Nov. 2015

NICER

Neutron Star Interior
Composition Explorer



Aug. 2016

TESS

Transiting Exoplanet
Survey Satellite



Aug. 2017

James Webb Space Telescope



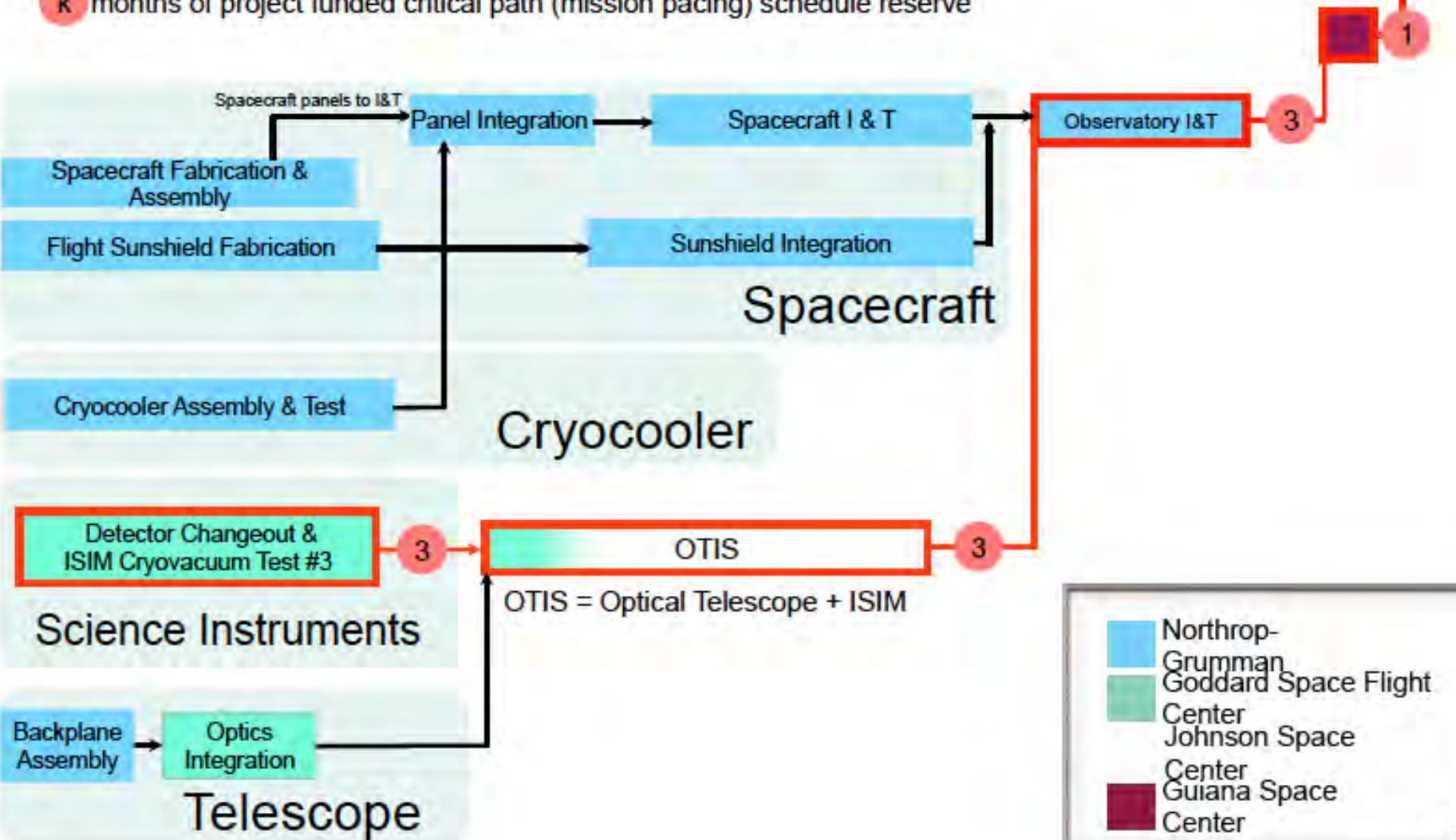
...going where no Hubble has gone
before



JWST Simplified Schedule

2015												2016												2017												2018											
J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D

k months of project funded critical path (mission pacing) schedule reserve



Deep Space Climate Observatory (DSCVR) Launched on Feb. 11, 2015



Credit: NASA TV

Science Budget Request Summary

	Op Plan	Enacted	Notional				
	FY14	FY15	FY16	FY17	FY18	FY19	FY20
Science	5148.2	5244.7	5288.6	5367.9	5448.4	5530.2	5613.1
<u>Earth Science</u>	<u>1824.9</u>		<u>1947.3</u>	<u>1966.7</u>	<u>1988.0</u>	<u>2009.3</u>	<u>2027.4</u>
Earth Science Research	456.7		485.3	471.0	480.4	475.2	470.6
Earth Systematic Missions	837.2		895.2	919.7	948.6	994.1	1004.8
Earth System Science Pathfinder	257.4		267.7	272.8	255.4	238.7	244.8
Earth Science Multi-Mission Operations	179.0		190.7	192.5	193.7	192.4	195.8
Earth Science Technology	59.6		60.7	62.1	61.5	61.2	62.7
Applied Sciences	35.0		47.6	48.7	48.4	47.6	48.8
<u>Planetary Science</u>	<u>1345.7</u>		<u>1361.2</u>	<u>1420.2</u>	<u>1458.1</u>	<u>1502.4</u>	<u>1527.8</u>
Planetary Science Research	221.8		276.3	282.0	292.0	291.7	285.7
Lunar Quest Program	11.4						
Discovery	297.4		156.1	201.6	277.2	337.4	344.9
New Frontiers	231.6		259.0	124.0	81.5	85.7	137.8
Mars Exploration	288.0		411.9	539.3	561.3	531.5	464.2
Outer Planets	152.4		116.2	117.7	81.6	87.6	110.5
Technology	143.1		141.7	155.5	164.4	168.5	184.7
<u>James Webb Space Telescope</u>	<u>658.2</u>	<u>645.4</u>	<u>620.0</u>	<u>569.4</u>	<u>534.9</u>	<u>305.0</u>	<u>197.5</u>
<u>Astrophysics</u>	<u>678.3</u>		<u>709.1</u>	<u>726.5</u>	<u>769.5</u>	<u>1005.5</u>	<u>1138.3</u>
Astrophysics Research	145.2		187.7	228.1	226.9	229.1	253.2
Cosmic Origins	224.2		199.3	200.4	199.1	207.9	244.5
Physics of the Cosmos	112.6		107.6	81.9	86.9	96.0	106.6
Exoplanet Exploration	106.7		64.2	67.8	148.4	302.2	365.7
Astrophysics Explorer	89.6		150.3	148.2	108.1	170.4	168.3
<u>Heliophysics</u>	<u>641.0</u>		<u>651.0</u>	<u>685.2</u>	<u>697.9</u>	<u>708.1</u>	<u>722.1</u>
Heliophysics Research	185.1		158.5	168.5	202.1	207.6	208.4
Living with a Star	212.5		343.0	387.3	399.9	212.6	103.3
Solar Terrestrial Probes	143.3		50.5	37.6	41.8	133.3	189.2
Heliophysics Explorer Program	100.2		98.9	91.9	54.1	154.5	221.3

FY16 Program Highlights

- Support Mars 2020 mission and formulation of a potential Europa mission
- Pre-formulation of WFIRST/AFTA
- Provide for a sustained land imaging capability beyond Landsat 8
- Increase efforts to detect and study NEOs
- Increase collaboration with NASA's Space Technology Mission Directorate
- Implement the revised and competed STEM education program to ensure that the most meritorious activities within SMD are supported

Anticipated Future Mission Opportunities

(Based on Notional Outyear Budgets)

EARTH: Venture Class 2015 AO EVI-3 Instruments

EARTH: Venture Class 2015 AO EVM-2 Mission

HELIOPHYSICS: Explorer Mission AO NET 2016 for Mission and Mission of Opportunity

PLANETARY: New Frontiers 4 Mission AO in 2016 for launch ~2024

EARTH: Venture Class 2017 AO EVI-4 Instruments

EARTH: Venture Class 2017 ROSES PEA EVS-3 Suborbital

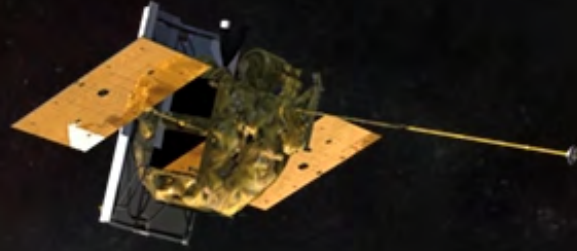
PLANETARY: Discovery Mission AO in 2017 for launch ~2023

HELIOPHYSICS: Solar Terrestrial Probes Mission AO NET 2017

ASTROPHYSICS: Medium-class Explorer (MIDEX) Mission FY2017 AO for Mission and Mission of Opportunity

How Can the SSB Help?

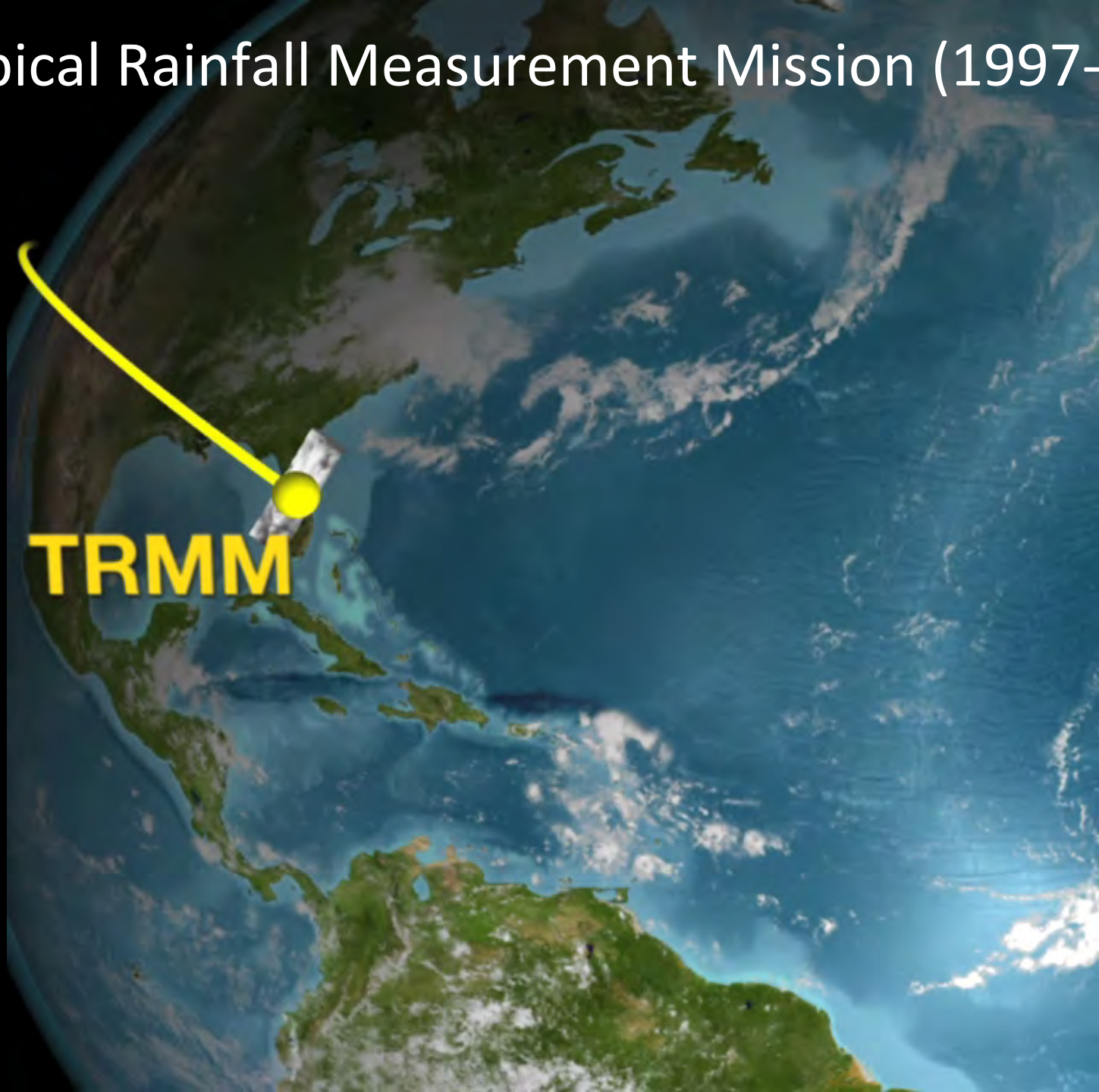
- NRC Study on Extended Missions and Senior Reviews
- NRC Study on achieving science goals with cubesats
- Joint NRC-European Science Foundation review of the MEPAG SAG2 (Special Regions Assessment Group) Report
- Astro 5-yr midterm performance assessment
- Planning for Earth Science & Applications from space Decadal Survey
- NRC Study on role of Large Missions
- NRC Study on review of Astrobiology program



Farewell Messenger 30 April 2015

Long Live Messenger (science)!

Tropical Rainfall Measurement Mission (1997-2015)



Questions?

