National Aeronautics and Space Administration

2009 FERP Symposium

NASA Science Mission Directorate

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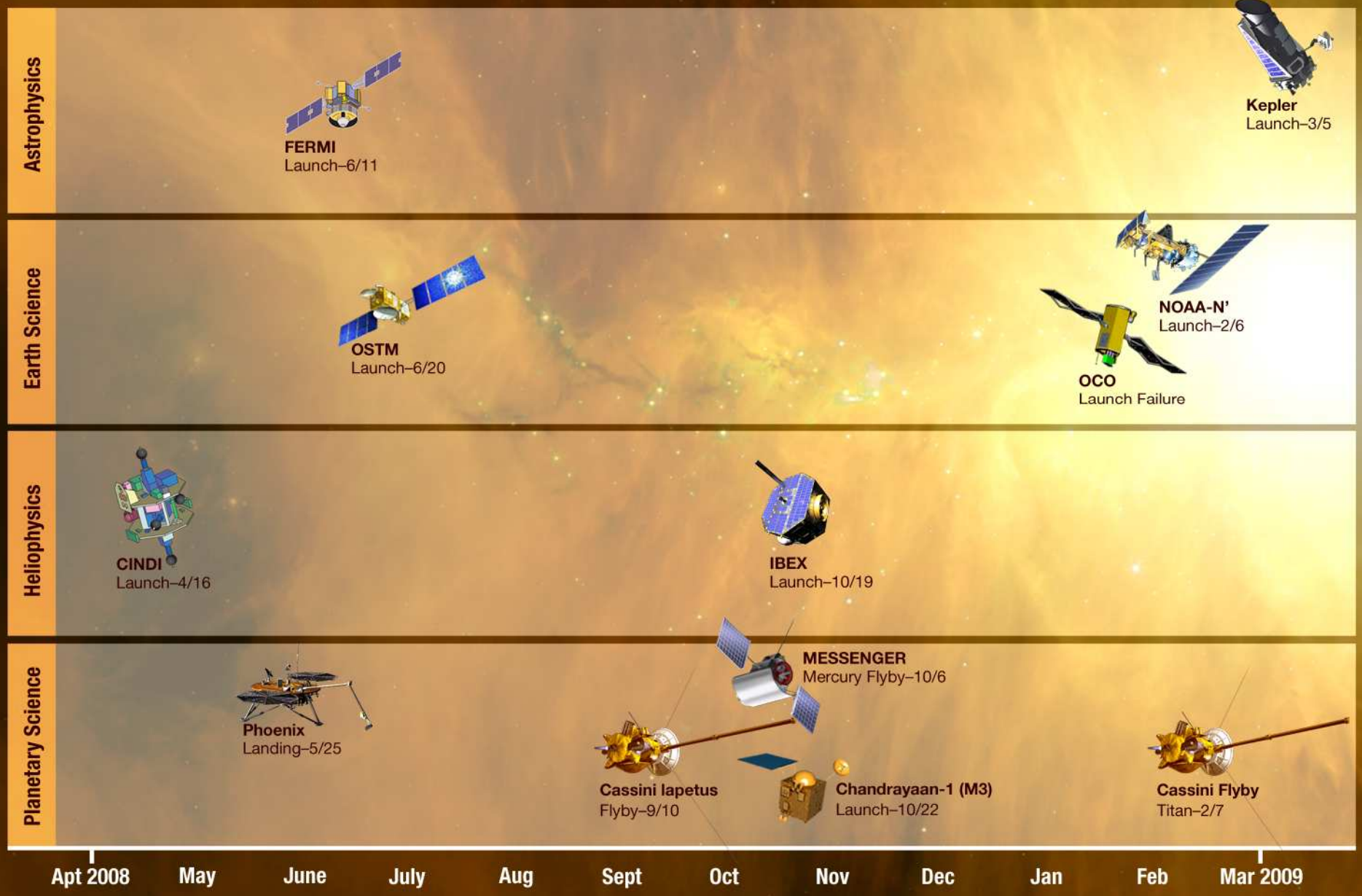
SMD Missions Past 12 Months



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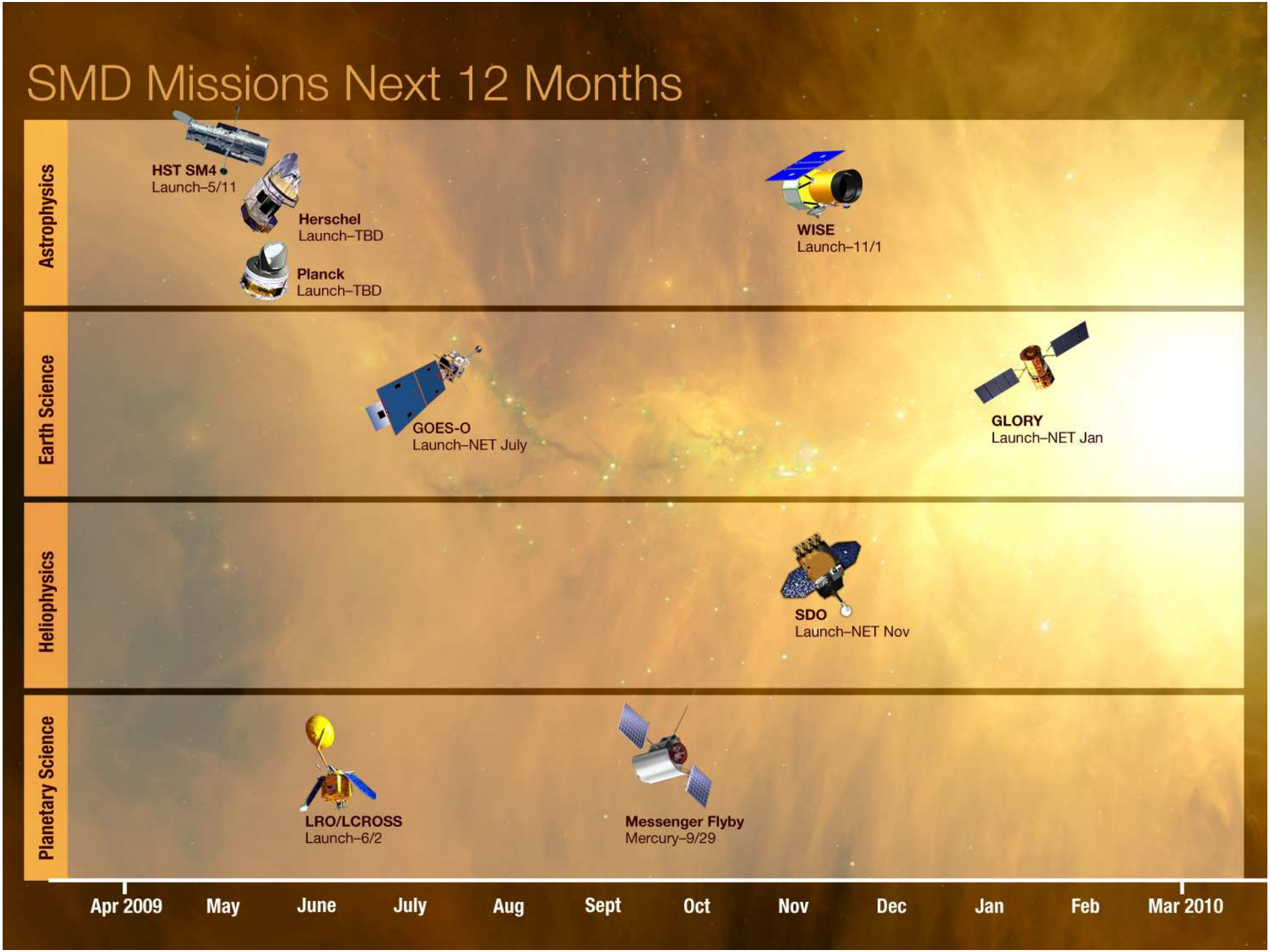
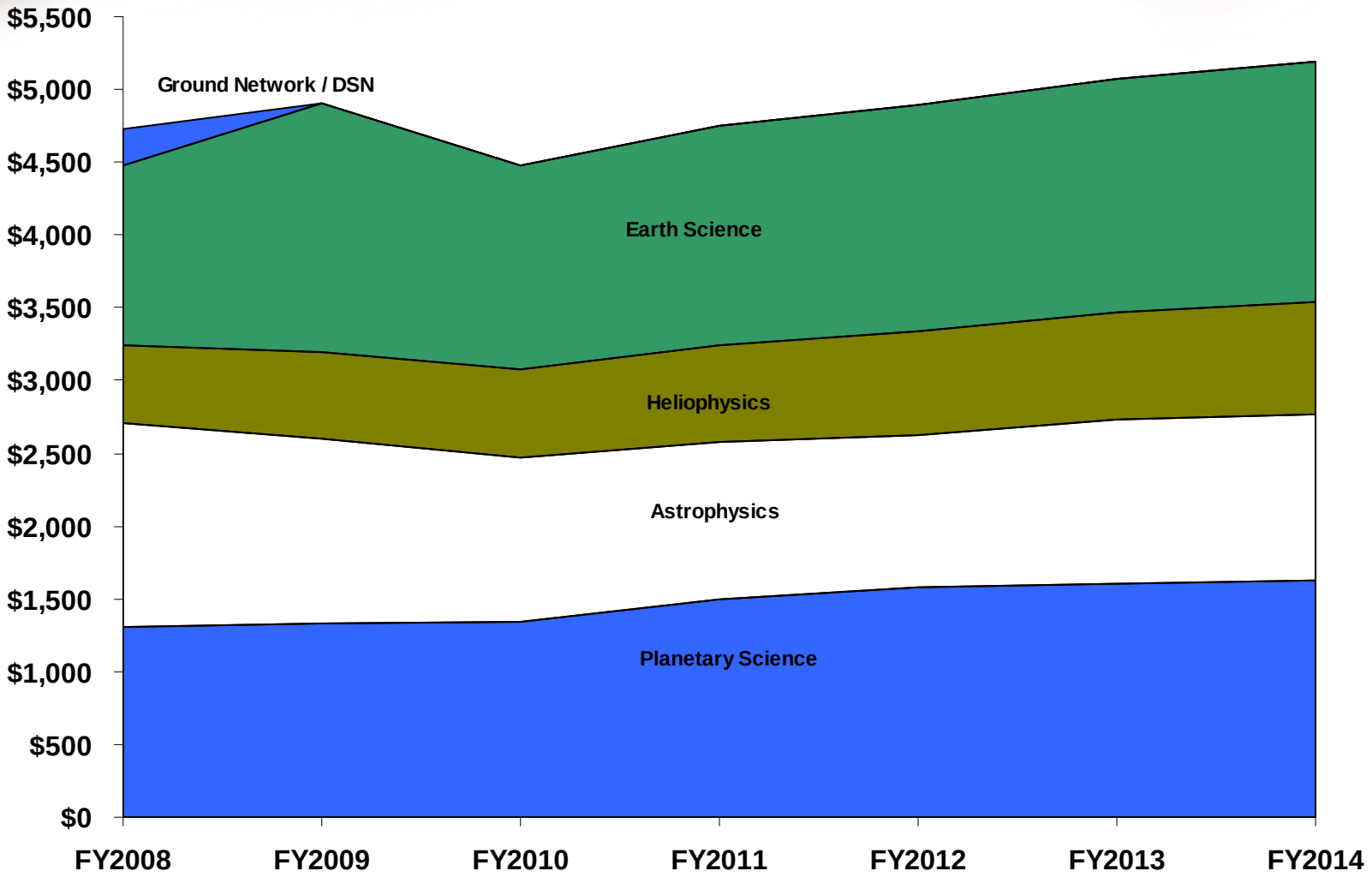


NASA FY10 Budget Overview

	FY2008	FY2009	FY2010	FY2011	FY2012	FY2013	FY2014
Total NASA	$17,401.9	$18,784.4	$18,686.0	$18,631.0	$18,613.0	$18,607.0	$18,858.0
Science	$4,733.2	$4,903.0	$4,477.2	$4,747.4	$4,890.9	$5,069.0	$5,185.4
Earth Science	$1,237.4	$1,704.6	$1,405.0	$1,500.0	$1,550.0	$1,600.0	$1,650.0
Planetary Science	$1,312.6	$1,325.6	$1,346.2	$1,500.6	$1,577.7	$1,600.0	$1,633.2
Astrophysics	$1,395.6	$1,281.2	$1,120.9	$1,074.1	$1,042.7	$1,126.3	$1,139.6
Heliophysics	$536.4	$591.6	$605.0	$672.6	$720.5	$742.7	$762.6
Ground Network / DSN	$251.2						
Aeronautics Research	$511.4	$650.0	$507.0	$514.0	$521.0	$529.0	$536.0
Exploration Systems	$3,299.4	$3,905.5	$3,963.1	$6,076.6	$6,028.5	$5,966.5	$6,195.3
Constellation Systems	$2,675.9	$3,433.2	$3,505.4	$5,543.3	$5,472.0	$5,407.6	$5,602.6
Advanced Capabilities	$623.5	$472.3	$457.7	$533.3	$556.5	$558.9	$592.7
Space Operations	$5,427.2	$5,764.7	$6,175.6	$3,663.8	$3,485.3	$3,318.6	$3,154.8
Space Shuttle	$3,295.4	$2,981.7	$3,157.1	$382.8	$87.8		
International Space Station	$1,685.5	$2,060.2	$2,267.0	$2,548.2	$2,651.6	$2,568.9	$2,405.9
Space and Flight Support (SFS)	$446.2	$722.8	$751.5	$732.7	$745.9	$749.7	$748.9
Education	$146.8	$169.2	$126.1	$123.8	$123.8	$123.8	$125.5
Cross-Agency Support Programs	$3,251.4	$3,356.4	$3,400.6	$3,468.4	$3,525.7	$3,561.4	$3,621.4
Center Management & Operations	$2,011.7	$2,024.0	$2,084.0	$2,119.2	$2,142.5	$2,166.1	$2,189.9
Agency Management & Operations	$834.1	$921.2	$961.2	$956.9	$964.5	$972.3	$981.5
Institutional Investments	$325.5	$343.7	$355.4	$392.3	$418.7	$423.0	$450.0
Congressionally Directed Items	$80.0	$67.5					
Inspector General	$32.6	$35.6	$36.4	$37.0	$37.8	$38.7	$39.6

SMD Budget by Theme (RY $M)



NASA FY10 Budget vs. FY09 Budget

	FY2008	FY2009	FY2010	FY2011	FY2012	FY2013	FY2014	FY08-13
Science 2010 Budget	$4,482.0	$4,903.0	$4,477.2	$4,747.4	$4,890.9	$5,069.0	$5,185.4	$28,569.5
Science 2009 Budget	$4,456.2	$4,441.5	$4,482.0	$4,534.9	$4,643.4	$4,761.6		$27,319.5
Science % change from 2009	0.6%	4.2%	-0.1%	4.7%	5.3%	6.5%		4.6%
Earth Science 2010	$1,237.4	$1,704.6	$1,405.0	$1,500.0	$1,550.0	$1,600.0	$1,650.0	$8,997.0
Earth Science 2009	$1,280.3	$1,367.5	$1,350.7	$1,250.9	$1,264.4	$1,290.3		$7,804.1
% change from 2009 Budget	-3.4%	24.7%	4.0%	19.9%	22.6%	24.0%		15.3%
Planetary Science 2010	$1,312.6	$1,325.6	$1,346.2	$1,500.6	$1,577.7	$1,600.0	$1,633.2	$8,662.7
Planetary Science 2009	$1,247.5	$1,334.2	$1,410.1	$1,537.5	$1,570.0	$1,608.7		$8,707.9
% change from 2009 Budget	5.2%	-0.6%	-4.5%	-2.4%	0.5%	-0.5%		-0.5%
Astrophysics 2010	$1,395.6	$1,281.2	$1,120.9	$1,074.1	$1,042.7	$1,126.3	$1,139.6	$7,040.8
Astrophysics 2009	$1,337.5	$1,162.5	$1,122.4	$1,057.1	$1,067.7	$1,116.0		$6,863.2
% change from 2009 Budget	4.3%	10.2%	-0.1%	1.6%	-2.3%	0.9%		2.6%
Heliophysics 2010*	$536.4	$591.6	$605.0	$672.6	$720.5	$742.7	$762.6	$3,868.8
Heliophysics 2009*	$590.9	$577.3	$598.9	$689.4	$741.2	$746.6		$3,944.3
% change from 2009 Budget	-9.2%	2.5%	1.0%	-2.4%	-2.8%	-0.5%		-1.9%

* FY2008 does not include DSN or Ground Network

** FY2009 column in the 2010 Budget is Enacted Budget. Does not reflect current planning.

SMD Total Budget Trace ($M)

	FY08	FY09	FY10	FY11	FY12	FY13	FY14
FY09 President's Budget	**4733.2**	**4441.5**	**4482.0**	**4534.9**	**4643.4**	**4761.6**	**4875.8**
Transfers without impact			9.4	16.5	16.5	16.5	
LPRP management from ESMD			9.4	16.5	16.5	16.5	
Reductions for Agency issues			(34.2)	(31.2)	(30.8)	(30.1)	(30.5)
SCaN Optical Communications			(11.0)	(8.3)	(8.3)	(8.3)	(8.3)
Agency Facility Strategy			(13.4)	(6.4)	(1.4)		
Ames Technical Capabilities			(4.3)	(4.5)	(4.6)	(4.8)	(5.0)
Chief Engineer / Safety Centers			(5.5)	(12.0)	(16.5)	(17.0)	(17.2)
Increases		461.5	20.0	227.2	261.8	321.0	340.1
Recovery Act		400.0					
Enacted		61.5					
Earth Science Program Increase			20.0	227.2	261.8	321.0	340.1
FY10 Submit to Congress	**4733.2**	**4903.0**	**4477.2**	**4747.4**	**4890.9**	**5069.0**	**5185.4**

Earth Science

What changed:

- OSTM is in prime mission Phase E operations
- OCO experienced a mission failure and was unable to reach orbit
- Precursor missions funded to ensure earliest possible launch dates, as well as maintain funding levels in-line with a 70% confidence level
- Funding for TIRS was added at a level sufficient for development in time for launch on LDCM in 12/2012
- SMAP moved into Phase A and ICESat 2 expected to do the same by Fall 2009
- Expanded funding for pre-formulation activities for CLARREO, DESDynI, and early mission studies/community workshops for Tier-2 missions
- Added funding for an ICEBridge project to extend the climate data record of precision ice topography from the expected demise of ICESAT-1 in Fall 2009 until launch of ICESAT-2
- Increased funding for Venture-class for selection in FY10 and FY12, as well as additional outyear funding.
- Invested funding in near-term Research, Airborne, Computing, Technology, and Applied Science projects to enhance current and future capabilities and science
- Glory and NPP LRD slipped to 1/2010 and 1/2011 respectively

What's the same:

- Maintains funding for Research, Technology, and Applied Sciences activities
- Maintains support for 7 missions in formulation and development
- Maintains support for 15 operating missions
- Maintains support for future mission development

Planetary Science

What Changed:

- Outer Planet Flagship (OPF) funded as studies
  - Continue to determine feasibility (science, technical, schedule, cost) and to align with the international partners science, technical and schedule requirements
- Mars Sample Return (MSR) delayed to TBD due to cost realism, budget constraints, and pending negotiation with ESA for partnership
  - Added funds to create executable Mars Exploration Program
  - Launch every opportunity, ~26 month (except 2009) through 2020 with a European Space Agency partnership
- Transferred Lunar Robotics Mgt from ESMD and NEO from ESD to PSD
- MSL slipped to 2011, the next launch opportunity for Mars, due to hardware development delays

What's the Same:

- Continue forward with the selected missions in development (Juno and GRAIL) and formulation (MAVEN, LADEE, and ILN) phases.
- Discovery program budget support launch about every 3 years, w/ the next Discovery mission (no. 12) LRD in 2014/2015
- New Frontiers budget supports a launch about every 5 years, w/ New Frontiers 3 LRD in ~2017/2018
- Funded operating missions (Cassini, MRO, MER, MEX, Odyssey, EPOXI, Dawn, MESSENGER, Aspera-3, New Horizons, etc), Research and Technology (ISP and RPS)

Astrophysics

What changed:

- JWST completed PDR/NAR and has entered the development phase; reflects 70% confidence level for budget and schedule (LRD 6/2014)
- Kepler and Herschel/Planck experienced launch delays to March and May 2009 due to external circumstances; Kepler launched successfully March 6, and H/P scheduled NET May 14
- HST SM4 delayed until May 2009 in order to restore redundancy to science instrument command and data handling unit
- SOFIA open door flight tests delayed to summer 2009 and initial science observations now early 2010
- Operating missions Senior Review results incorporated: extend GALEX, Swift and Spitzer-warm; ramp down XMM support (future ADP funding available through ROSES, like RXTE); maintain RXTE operation at minimum level until 2010 senior review; terminate NASA support for GP-B
- The JDEM and Exoplanet mission AOs are on hold pending results of the 2010 decadal survey
- Supporting research & technology lines established in each science area (COR, PCOS, ExEP); these support named fellowships (Hubble, Einstein, Sagan fellows), strategic GO opportunities (e.g., CSA/MOST), and mid-TRL technology development

What's the same:

- LISA, IXO (International X-ray Observatory, formerly Con-X) and SIM/SIM Lite continue technology development pending results of 2010 decadal survey (JDEM now has the same posture)
- WISE LRD November 2009
- NuSTAR LRD August 2011
- Balloon flight opportunities continue at a rate of ~16-20 per year
- R&A funding level

Heliophysics

What Changed:

- SDO launch delayed to November 2009
- Solar Probe launch delayed to 2018
- Explorer MoO selections
- Heliophysics EPO activities (and associated funding) have been consolidated and will now be managed at HQ
- RBSP budget increased at KDP-C, consistent with 70% cost and schedule confidence level
- Solar Orbiter instruments selected for Phase A studies
- Research range upgrades to launch range infrastructure

What's the Same:

- BARREL, MMS
- R&A, LWS Science
- NMP Phase out
- Sounding Rockets continue at 20-24 flights per year
- Operation of the Heliophysics System Observatory involving 15 missions with 26 spacecraft

NASA Science Mission Launches (CY09-CY18)

As of 5/7/09

For planning purposes only

- NASA Mission on US ELV
- Joint NASA - International Partner Mission
- ESMD mission with SMD participation
- International Mission with Substantial NASA Contribution
- Reimbursable for NOAA
- NASA Mission on STS

√= Successfully launched to date

* = Early science flights begin

✘= Launch failure

2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
LRO/LCROSS									
OCO									
SDO									
WISE									
✓Kepler									
HST SM-4	SOFIA*	NPP	LDCM	SMAP	GPM Const			ESDS-4	Venture 4
GOES-O	Glory	Juno	LADEE	Venture 1	MMS			Venture 3	ILN
✓NOAA-N'	Aquarius	MSL	RBSP	MAVEN	SMEX-13	ICESat-II	ESDS-3	New Front 3	Mars 2018
Herschel	GOES-P	GRAIL	LWS SET-1	GPM Core	JWST	Venture 2	EX-1	Astro-1	Solar Probe +
Planck	ST-7	NuSTAR	SMEX-12	Astro-H	GOES-R	Discovery-12	Mars 2016	EX-2	STP-5
							ExoMars	GOES-S	
								Solar Orbiter	