

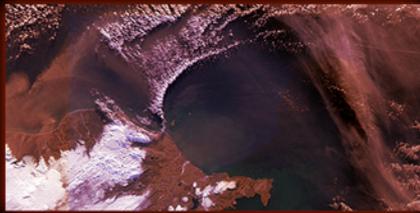


# NASA Science

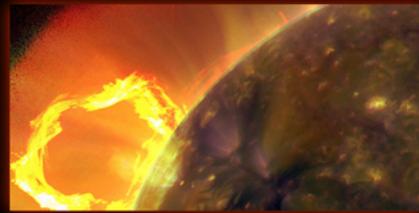
Presentation to NASA 2011 Facilities Engineering  
and Real Property Conference

Roy A. Maizel  
Deputy AA for Management  
Science Mission Directorate

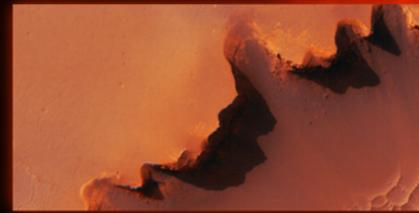
May 4, 2011



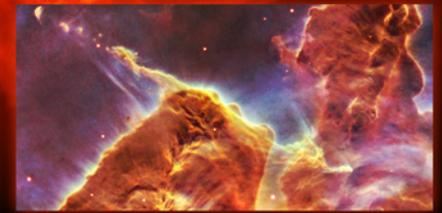
EARTH SCIENCE



HELIOPHYSICS

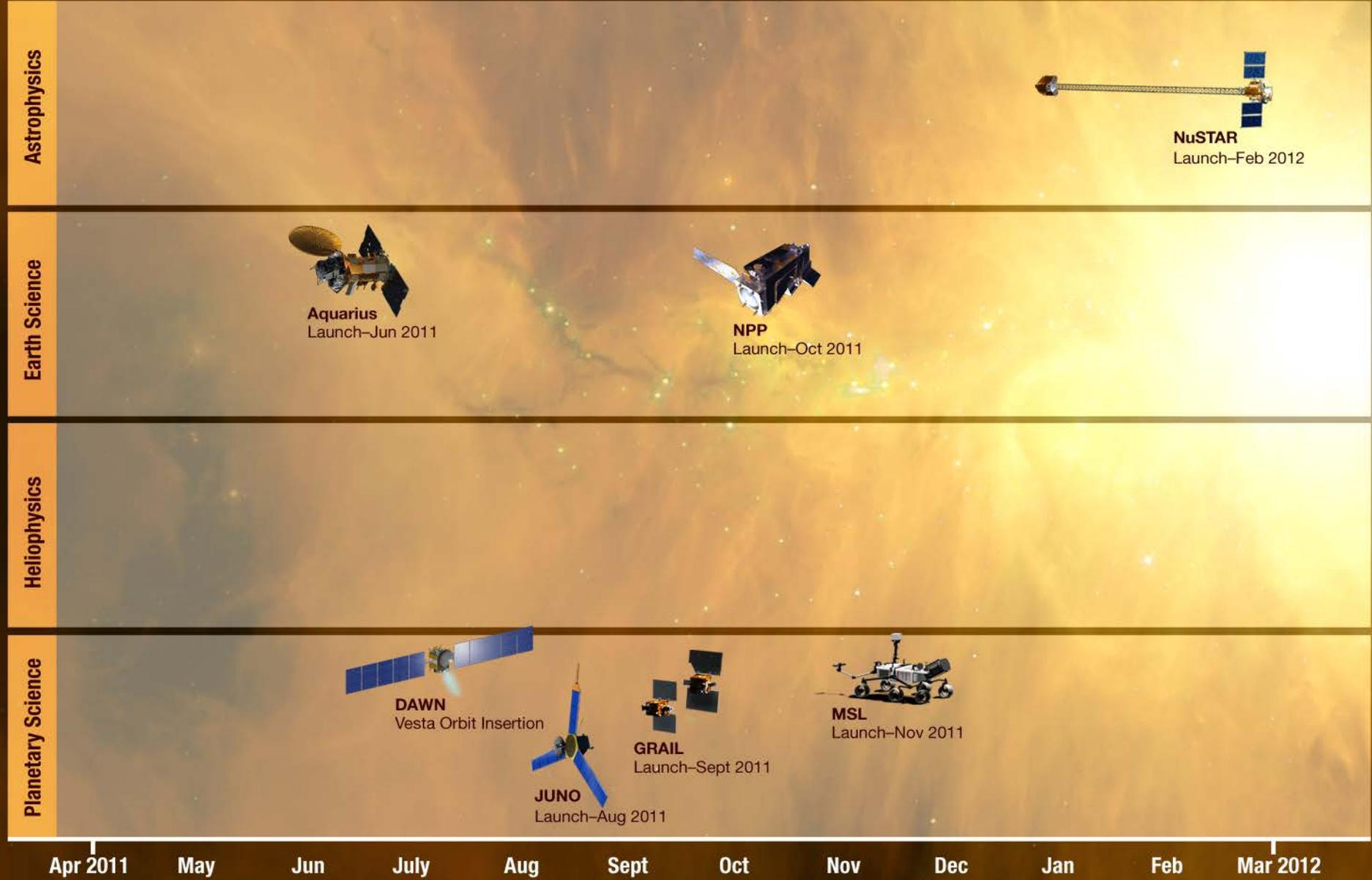


PLANETARY SCIENCE

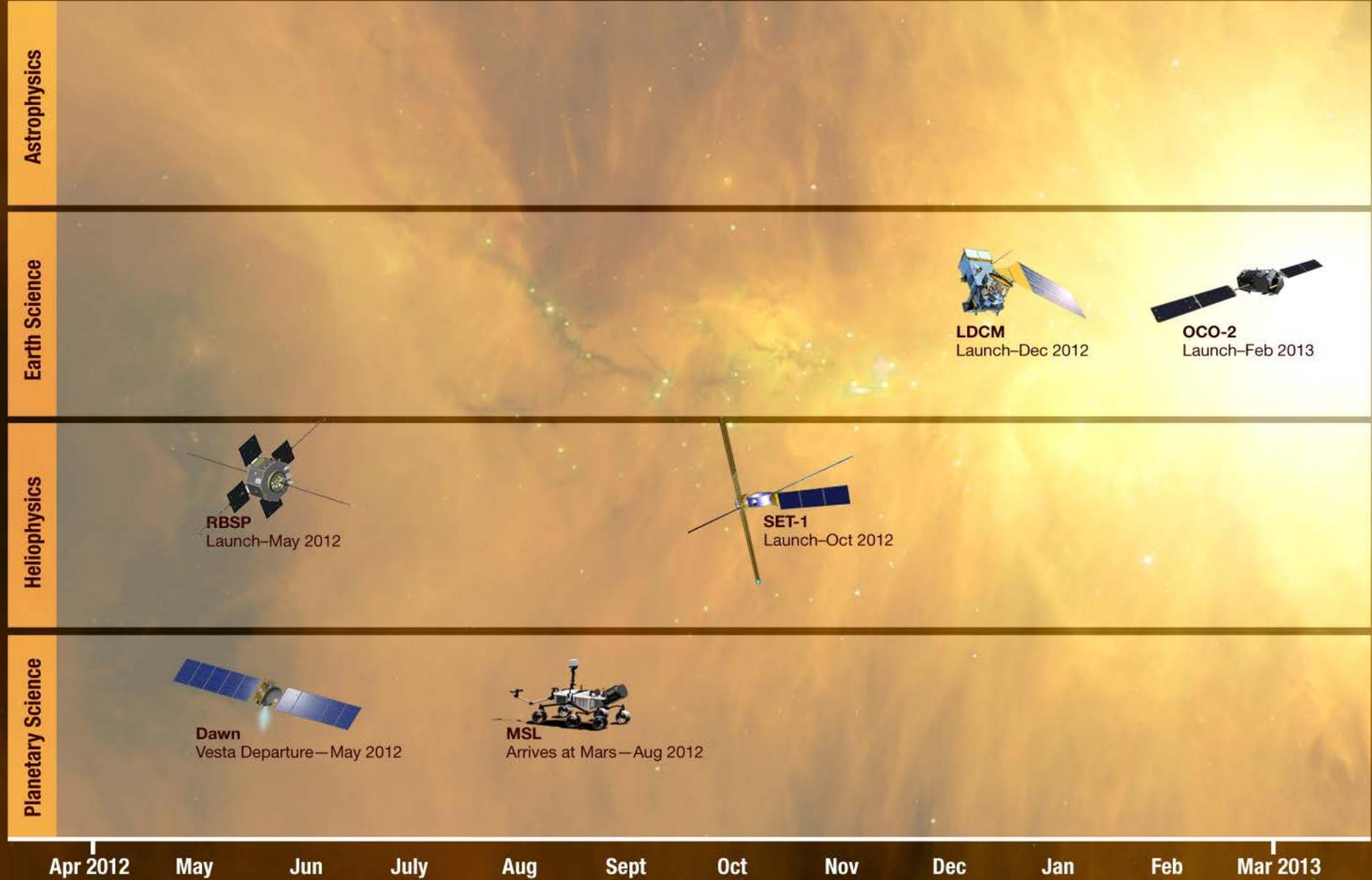


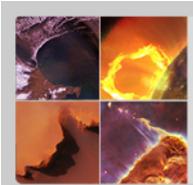
ASTROPHYSICS

# SMD Missions Through March 2012



# SMD Missions April 2012–March 2013





# Science Program Summary

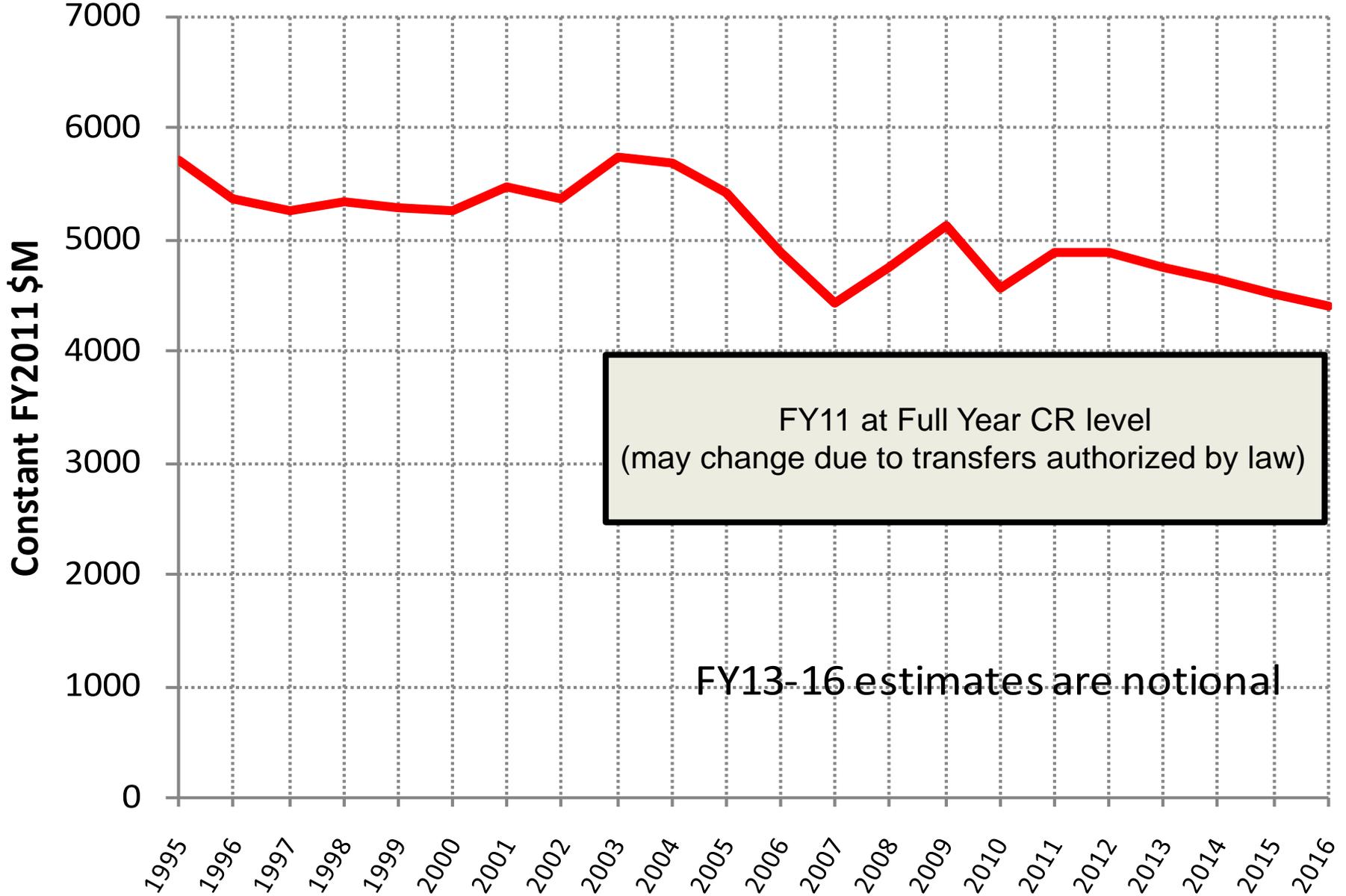
Budget Authority (\$M)	FY 2010 Actual	FY 2011 Auth Act	FY 2011* Full Year CR	FY 2012 Request	FY 2013	FY 2014	FY 2015	FY 2016
<b>Science</b>	<b>4,497.6</b>	<b>5,005.6</b>	<b>4.9 B</b>	<b>5,016.8</b>	<b>5,016.8</b>	<b>5,016.8</b>	<b>5,016.8</b>	<b>5,016.8</b>
<u>Earth Science</u>	<u>1,439.3</u>	<u>1,801.8</u>		<u>1,653.0</u>	<u>1,679.2</u>	<u>1,665.3</u>	<u>1,691.4</u>	<u>1,727.3</u>
Earth Science Research	375.8			409.6	419.0	427.3	436.7	444.6
Earth Systematic Missions	705.2			816.5	838.7	761.6	763.2	810.7
Earth System Science Pathfinder	128.4			187.8	180.6	229.5	238.4	214.3
Earth Science Multi-Mission Operations	149.0			159.9	158.8	159.4	162.9	166.6
Earth Science Technology	45.6			46.1	47.9	51.9	53.6	54.2
Applied Sciences	35.3			33.1	34.3	35.5	36.7	36.9
<u>Planetary Science</u>	<u>1,364.4</u>	<u>1,485.7</u>		<u>1,488.9</u>	<u>1,365.7</u>	<u>1,326.4</u>	<u>1,271.0</u>	<u>1,188.9</u>
Planetary Science Research	161.6			183.9	196.0	208.6	208.4	210.5
Lunar Quest Program	94.5			114.5	81.2	48.9	28.1	19.5
Discovery	184.5			175.6	205.1	245.7	265.5	242.8
New Frontiers	279.6			176.9	265.8	245.5	291.1	296.3
Mars Exploration	438.2			594.4	433.1	408.7	309.0	245.9
Outer Planets	100.6			120.8	80.5	82.2	84.1	88.5
Technology	105.5			122.9	104.1	86.6	84.9	85.4
<u>Astrophysics</u>	<u>647.3</u>	<u>1,076.3</u>		<u>637.7</u>	<u>708.3</u>	<u>721.0</u>	<u>713.5</u>	<u>741.9</u>
Astrophysics Research	149.1			161.6	200.1	211.8	229.3	238.6
Cosmic Origins	225.3			219.7	219.4	209.9	195.2	184.5
Physics of the Cosmos	116.0			100.3	112.4	111.9	98.1	96.8
Exoplanet Exploration	43.4			48.2	65.5	63.6	62.1	69.8
Astrophysics Explorer	113.5			107.8	110.9	123.7	128.7	152.0
<u>James Webb Space Telescope</u>	<u>438.7</u>	-		<u>354.6</u>	<u>359.3</u>	<u>365.3</u>	<u>371.6</u>	<u>371.6</u>
<u>Heliophysics</u>	<u>608.0</u>	<u>641.9</u>		<u>577.9</u>	<u>591.0</u>	<u>612.4</u>	<u>627.2</u>	<u>628.6</u>
Heliophysics Research	171.8			144.5	147.5	149.3	149.5	150.8
Living with a Star	221.9			204.7	202.2	200.9	336.3	354.9
Solar Terrestrial Probes	148.0			163.5	170.4	171.9	50.2	38.0
Heliophysics Explorer Program	65.1			65.2	70.8	90.2	91.1	84.9
New Millennium	1.2							
<u>SCMD Civil Service Labor and Expenses</u>	-	-		<u>304.7</u>	<u>313.2</u>	<u>326.5</u>	<u>342.2</u>	<u>358.6</u>

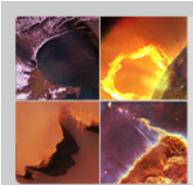
FY 2013 -  
FY 2016  
estimates  
are notional

\*FY2011 level  
may change due  
to transfers  
authorized by law

# SMD FY12 BUDGET REQUEST

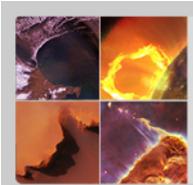
NORMALIZED TO REMOVE DSN AND GROUND NETWORK, AND ADJUST FOR FULL COST





# SMD FY12 Budget Strategy

- Be responsive to the science community by supporting the priorities established in the NRC Decadal Surveys and emphasizing competitive peer review.
- Responsive to national priorities (e.g. 2010 Earth Science Climate Initiative Plan)
- Per usual SMD practice, each Theme manages within its existing budget envelope.
- Projects in development are budgeted to a LCC reflecting a 70% joint-cost-and-schedule confidence (JCL) level.
- SMD is actively refining the cost ranges for projects in formulation to improve budget estimates as these projects make their way through Phases A and B.



# Commercial Launch Vehicle Availability and Pricing

- SMD portfolio has been affected by rising launch costs since the closing of the workhorse Delta II line
  - Prices of available vehicles rising much faster than inflation
  - Launch rates decreasing
- Future launch services are costing significantly more than commercial vehicle press release quotes due to NASA's mission assurance requirements
- One example: launch vehicle cost increases required descope of Solar Orbiter Collaboration



# NASA Science Budget Changes

- Budget is up \$500 million in FY12 from 2010 enacted levels, but constrained outyear funding compared to FY11 President's Budget projections have forced some reductions
- Earth Science DESDynI and CLARREO Tier-1 missions significantly delayed compared to 2011 plan; GMI-2 development for GPM LIO cancelled; non-flight program expansions curtailed
- Cannot support all 5 Planetary development programs; Decadal Survey has provided priorities to guide decision-making on which programs will be implemented as planned, and which may have to be cancelled, delayed, or descoped.
- Astrophysics able to fund the highest decadal priorities, but only technology development for large missions beyond JWST
- JWST budget held to \$375M/year (including Labor); schedule under review
- Heliophysics: launch vehicle cost increases required descope of Solar Orbiter Collaboration
- The NASA Exploration budget proposal eliminates funding for exploration-focused robotic precursor missions. Going forward, SMD and ESMD will collaborate to identify and prioritize robotic data collection to enable future human exploration beyond low Earth orbit.

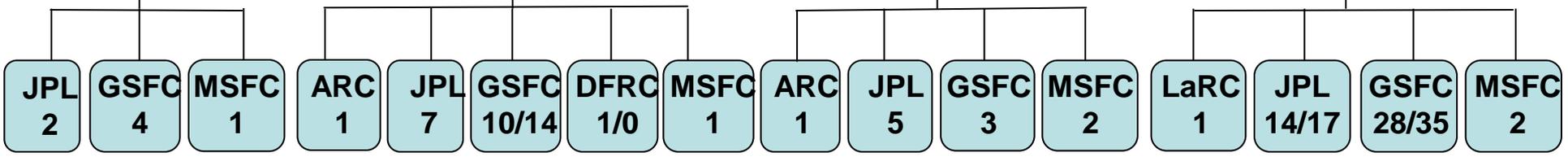
# Total Missions / Spacecraft 83 / 96

**Formulation 7 / 7**

**Implementation 21 / 24**

**Primary Ops 11 / 11**

**Extended Ops 45 / 55**



- |                      |   |                  |                 |   |   |                           |                  |  |                                     |                  |                  |   |   |                      |                  |
|----------------------|---|------------------|-----------------|---|---|---------------------------|------------------|--|-------------------------------------|------------------|------------------|---|---|----------------------|------------------|
| <b>JPL</b><br>2      | <b>GSFC</b><br>4  | <b>MSFC</b><br>1 | <b>ARC</b><br>1 | <b>JPL</b><br>7   | <b>GSFC</b><br>10/14  | <b>DFRC</b><br>1/0        | <b>MSFC</b><br>1 | <b>ARC</b><br>1  | <b>JPL</b><br>5                     | <b>GSFC</b><br>3 | <b>MSFC</b><br>2 | <b>LaRC</b><br>1  | <b>JPL</b><br>14/17   | <b>GSFC</b><br>28/35 | <b>MSFC</b><br>2 |
| SMAP<br><i>EMTGO</i> | ICESat-2<br><i>GEMS</i><br><i>Solar Orbiter</i><br><i>Solar Probe +</i> | NF-3             | LADEE           | NuSTAR<br><i>ST-7</i><br><i>Aquarius</i><br>OCO-2<br>MSL<br>Juno<br>GRAIL | JWST<br><i>Astro H</i><br>LDCM<br>GPM<br>NPP<br>MAVEN<br>SET-1<br>RBSP (2)<br>MMS (4)<br>IRIS | SOFIA(1/0) <i>Strofiø</i> | Kepler           | Herschel<br><i>Planck</i><br><i>Rosetta</i><br>DAWN<br>OSTM/Jason 2~ | Fermi<br><i>SDO</i><br>New Horizons | MESSENGER        | CALIPSO          | GALEX<br><i>Spitzer</i><br>Cloudsat<br>ACRIMsat<br>GRACE (2)<br>Jason-1<br>Voyager (2)<br><i>Mars Express</i><br>Mars Odyssey<br>MER (2)<br>Cassini<br>MRO<br>Deep Impact<br>Stardust | HST<br><i>Suzaku</i><br><i>Hinode</i><br><i>Integral</i><br>RXTE<br>XMM<br>SWIFT<br>Aqua<br>Aura<br>SORCE<br>EO-1<br>Terra<br>TRMM<br>Landsat 7~<br>ARTEMIS* (2)<br>THEMIS (3)<br>STEREO (2)<br>AIM<br><i>Cluster-2 (4)</i> | Chandra              |                  |

SOFIA is a mission project but does not add spacecraft

*Italics* = US instruments on foreign mission  
X / Y = # of missions / # of spacecraft

\* New missions for Stardust and two of the THEMIS spacecraft, respectively

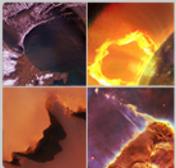
~ Operated by another agency

***In concept development/pre-formulation:***  
 WFIRST, *Euclid*, LISA, IXO, Mars 2018, OPF, Discovery 12, CLARREO, DESDynI, GRACE FO, SAGE III, SWOT, ASCENDS, PACE, EV-2

***NOAA Reimbursable:***  
 GOES-R series, Jason-3, JPSS-1&2

RHESSI SOHO TIMED  
 WIND ACE GEOTAIL  
 TWINS-A CINDI  
 TWINS-B IBEX

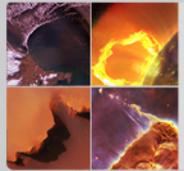




# Open and Planned Solicitations

TYPE: NAME OF SOLICITATION	RELEASE DATE	PROPOSAL DUE DATE	TARGET SELECT DATE
<b><u>OPEN SOLICITATIONS</u></b>			
NRA: RESEARCH OPPORTUNITIES IN SPACE AND EARTH SCIENCES – 2010 (ROSES-2010) NNH10ZDA001N 31 Amendments (as of 1/24/11) 74 due dates (60 have passed)	2/12/10	4/30/10 thru 4/30/11	Goal: ≤ 150 d after due date
NRA: RESEARCH OPPORTUNITIES IN SPACE AND EARTH SCIENCES – 2011 (ROSES-2011) NNH11ZDA001N	2/18/11	4/30/11 thru 4/30/12	Goal: ≤ 150 d after due date
<b><u>CLOSED SOLICITATIONS</u></b>			
AO: Discovery 2010 NNH10ZDA0070	6/7/10	9/3/10	April 2011
New Frontiers Downselect		1/28/11	June 2011
AO: Explorer 2011 and SALMON (Explorer Missions of Opportunity) Explorer AO NNH11ZDA0020 Explorer MO PEA for SALMON NNH08ZDA0090-EXPMO11	11/1/10	2/16/11	August 2011
<b><u>PLANNED SOLICITATIONS</u></b>			
AO: SOFIA Second Generation Instruments (PEA for SALMON)	Spring 2011		
AO: Jupiter Europa Orbiter Instruments	Draft in Early 2011		
AO: ESSP Earth Venture – 2: Small Missions	Draft in Winter 2011		
AO: ESSP Earth Venture – Instruments (PEA for SALMON)	Draft in Spring 2011		

# NASA Science Mission Launches (Fiscal Years 2010-2020)



As of 3/15/11

For Internal NASA Planning Purposes  
Only

- NASA Mission on US ELV
  - Reimbursable for NOAA
  - Reimbursable for USGS
  - Joint NASA - International Partner Mission
  - International Mission with NASA science instrument or related contribution
- = Early science flights begin  
 □ = Mission successfully launched  
 X = Launch vehicle failure

