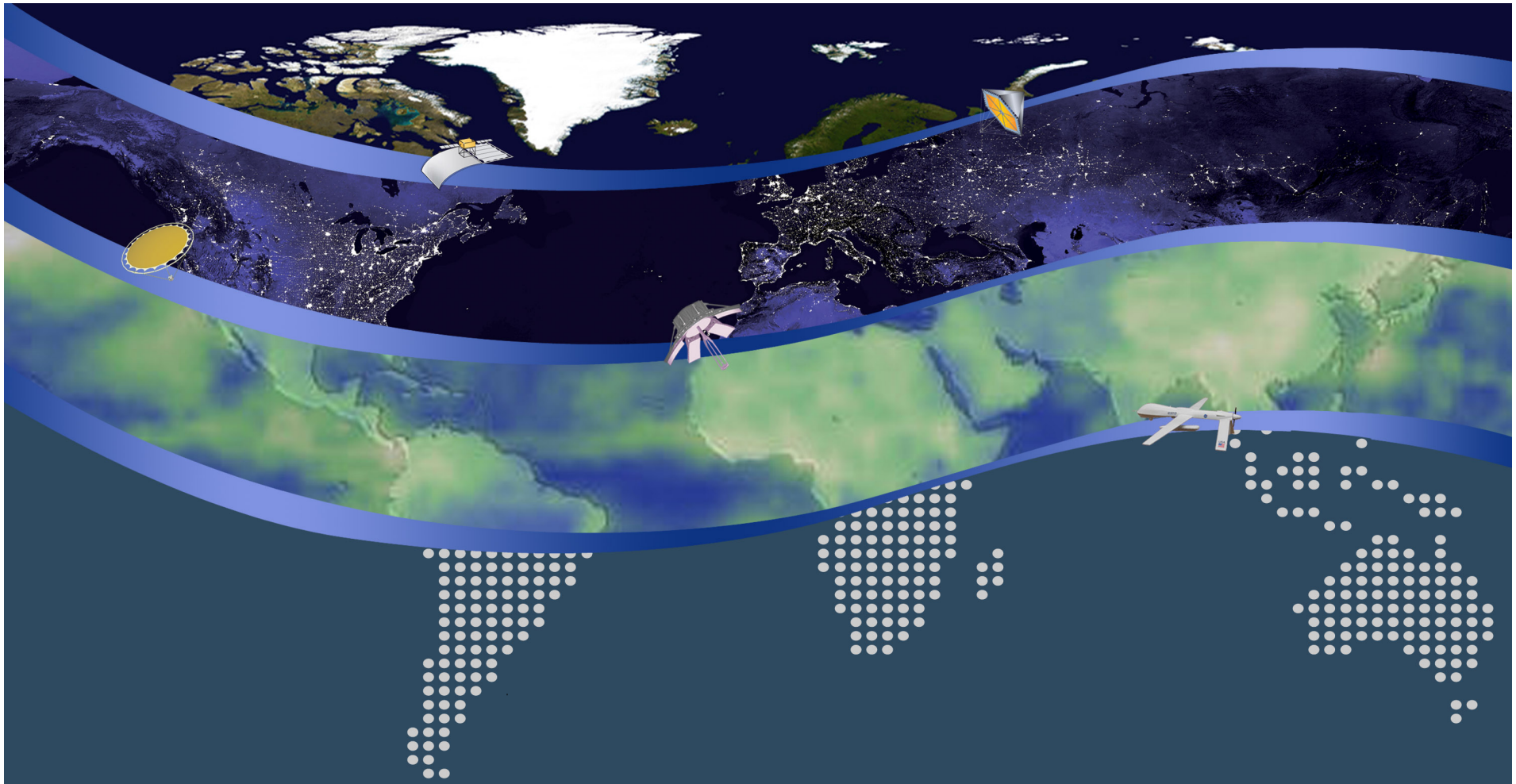


Town Hall Meeting
Earth Science Technology Forum 2011

June 21, 2011

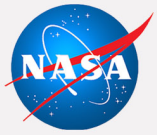
George J. Komar
Associate Director/Program Manager
Earth Science Technology Office

Topics

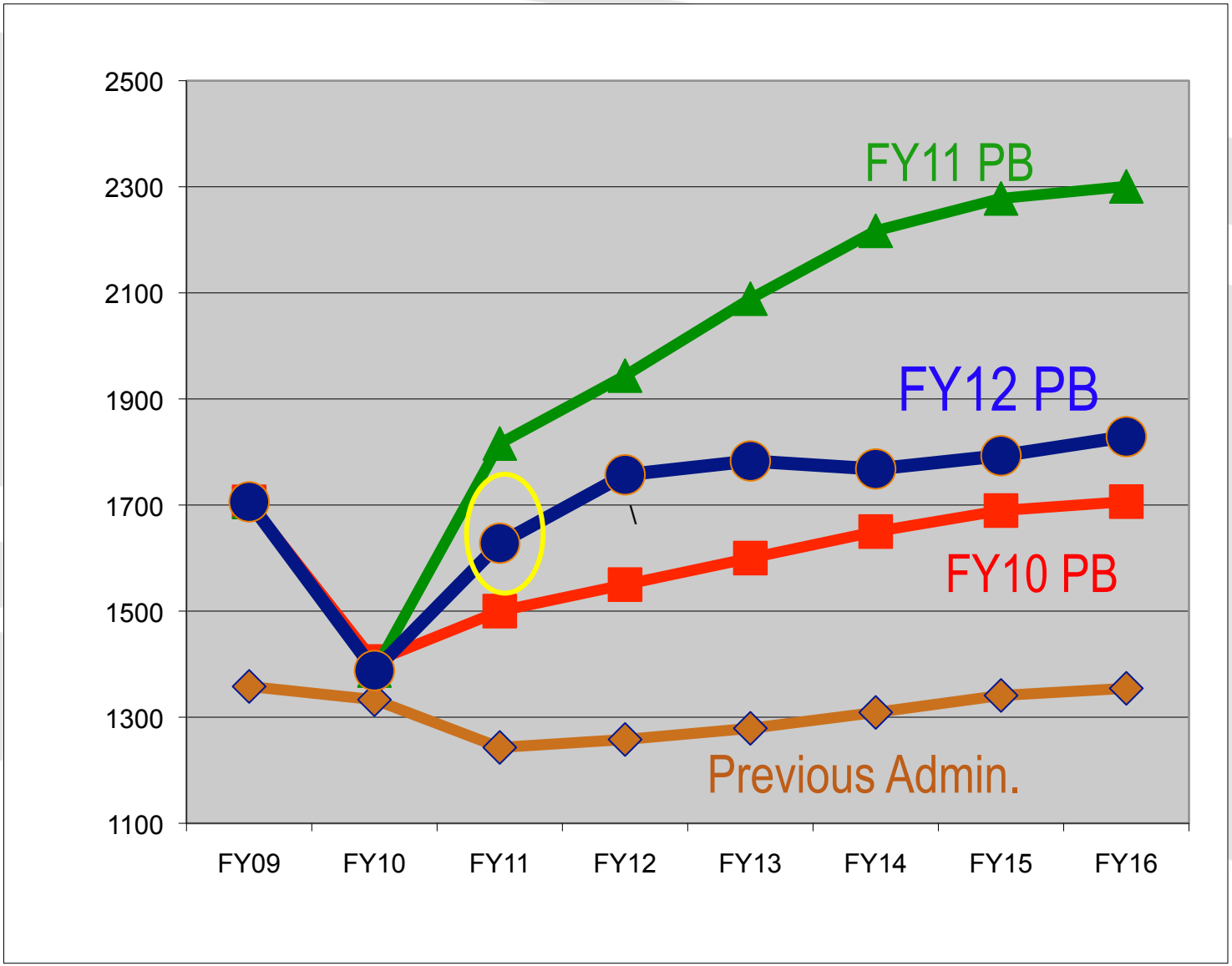
- ***Earth Science at NASA***
  - Highlights of May presentation to Earth Science Subcommittee of NASA Advisory Committee, including:
    - » Budget and activity status
    - » Current/Anticipated Announcements of Opportunity
  - Future Climate emphasis of Earth Science activities

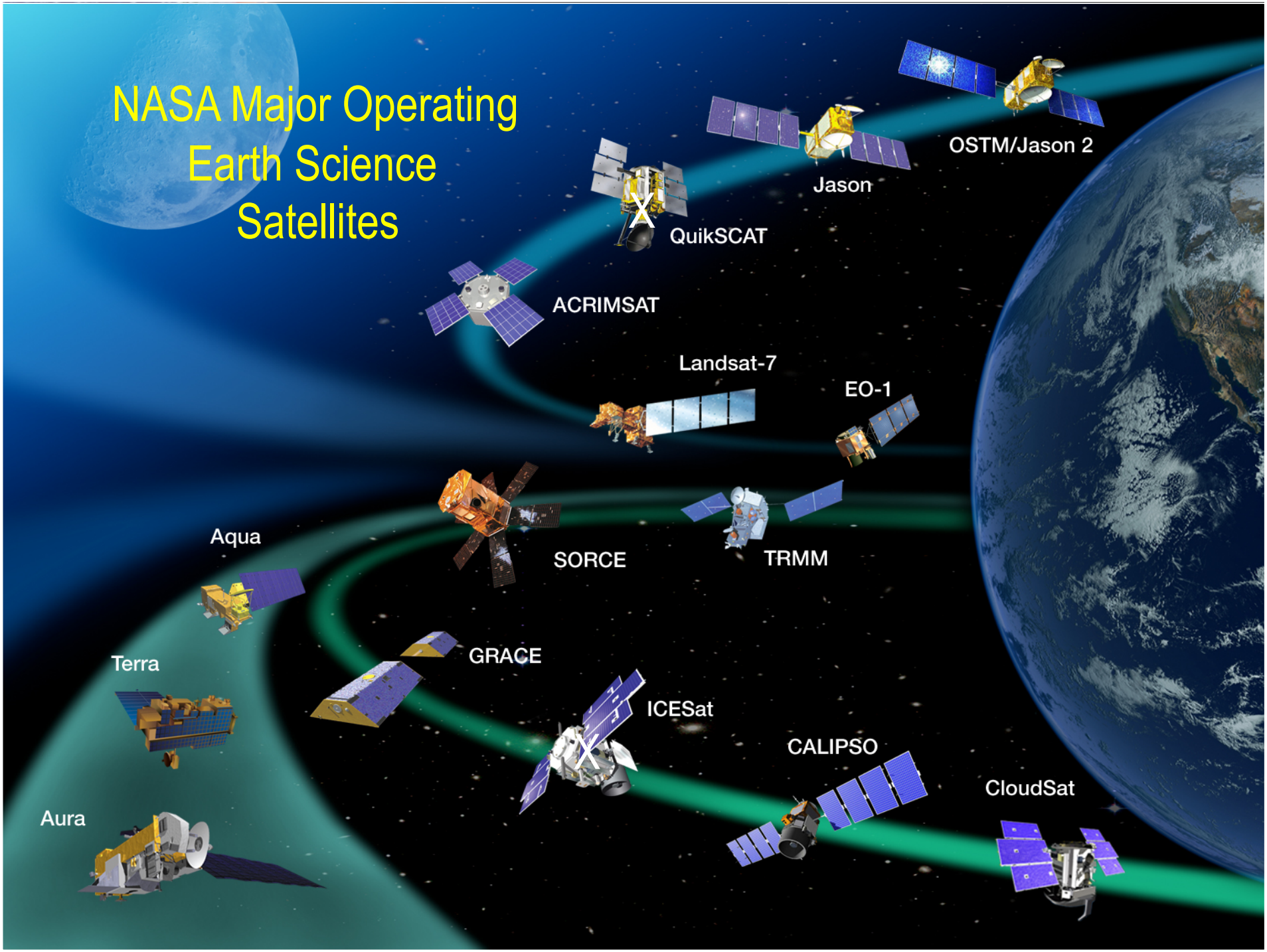
- ***Technology Activities***
  - ESTO Investments
  - Current and Anticipated Solicitations
  - Future Opportunities for Involvement

- ***Your Questions and Comments***

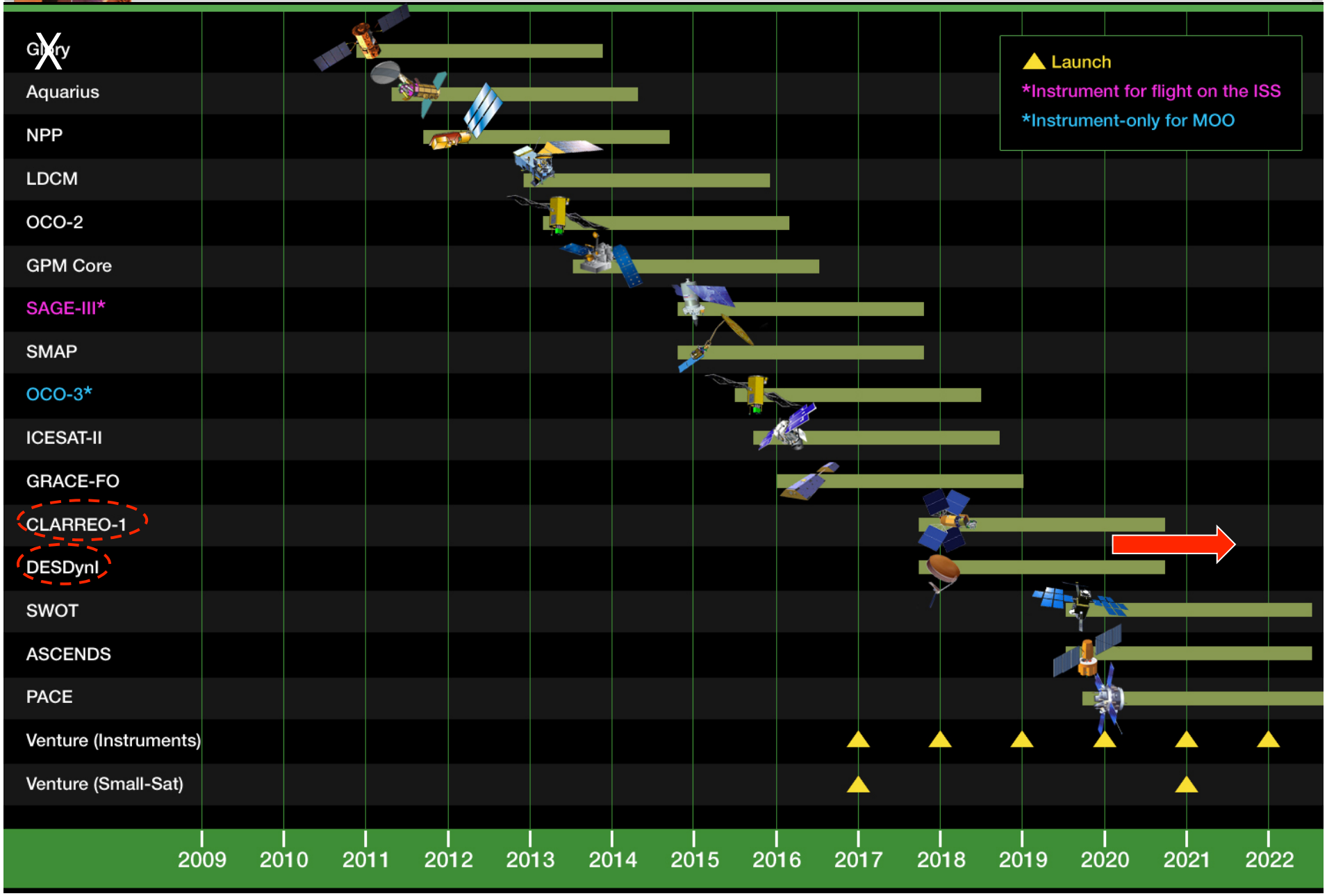


BUDGET OUTLOOK (incl. FY11 Appropriation)




NASA Major Operating Earth Science Satellites
OSTM/Jason 2
Jason
QuikSCAT
ACRIMSAT
Landsat-7
EO-1
SORCE
TRMM
Aqua
Terra
GRACE
ICESat
CALIPSO
CloudSat
Aura

Future Orbital Flight Missions – 2011 – 2022



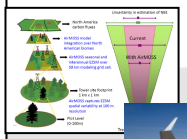
VENTURE-CLASS UPDATE/STATUS

- **Venture-Class is a Tier-I Decadal Survey recommendation**
  - Science-driven, PI-led, competitively selected, cost- and schedule-constrained, regularly solicited, orbital and suborbital
  - Venture-class investigations complement the systematic missions identified in the Decadal Survey, and provide flexibility to accommodate scientific advances and new implementation approaches

- **Venture-Class is fully funded, with 3 "strands"**
  - EV-1: suborbital/airborne investigations (5 years duration)
    - Solicited in FY09 (selections in FY10) ***and every 4 years***
    - 5 investigations selected; flights beginning in FY11
  - EV-2: small complete missions (5 years duration)
    - Solicited in FY11 (selections in FY12) ***and every 4 years***
    - Small-sat or stand-alone payload for MoO; $150M total development cost
    - AO release June 17, 2011; Proposals Due September 15, 2011
  - EV-Instrument: Spaceborne instruments for flight on MoO (5 years dev.)
    - Solicited in FY11 (selections in FY12) ***and annually thereafter***
    - Final AO release in 2nd half of FY11
    - ~$90M development costs, accommodation costs budgeted separately
    - Common Instrument Interface specs being developed

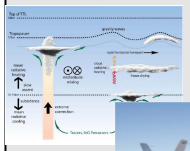
Earth Venture-1

Summaries



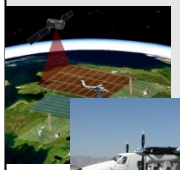

Airborne Microwave Observatory of Subcanopy and Subsurface (AirMOSS) - Univ Mich/JPL

North American ecosystems are critical components of the global exchange of the greenhouse gas carbon dioxide and other gases within the atmosphere. To better understand the size of this exchange on a continental scale, this investigation addresses the uncertainties in existing estimates by measuring soil moisture in the root zone of representative regions of major North American ecosystems. Investigators will use NASA's Gulfstream-III aircraft to fly synthetic aperture radar that can penetrate vegetation and soil to depths of several feet.




Airborne Tropical Tropopause Experiment (ATTREX) - ARC

Water vapor in the stratosphere has a large impact on Earth's climate, the ozone layer and how much solar energy the Earth retains. To improve our understanding of the processes that control the flow of atmospheric gases into this region, investigators will launch four airborne campaigns with NASA's Global Hawk remotely piloted aerial systems. The flights will study chemical and physical processes at different times of year from bases in California, Guam, Hawaii and Australia.

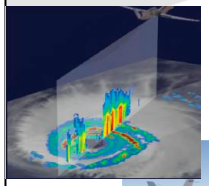



Carbon in Arctic Reservoirs Vulnerability Experiment (CARVE) - JPL

This investigation will collect an integrated set of data that will provide unprecedented experimental insights into Arctic carbon cycling, especially the release of the important greenhouse gases such as carbon dioxide and methane. Instruments will be flown on a Twin Otter aircraft to produce the first simultaneous measurements of surface characteristics that control carbon emissions and key atmospheric gases.


Deriving Information on Surface Conditions from COlumn and VERtically Resolved Observations Relevant to Air Quality (DISCOVER-AQ) - LaRC

The overarching objective of the DISCOVER-AQ investigation is to improve the interpretation of satellite observations to diagnose near-surface conditions relating to air quality. NASA's B-200 and P-3B research aircraft will fly together to sample a column of the atmosphere over instrumented ground stations.



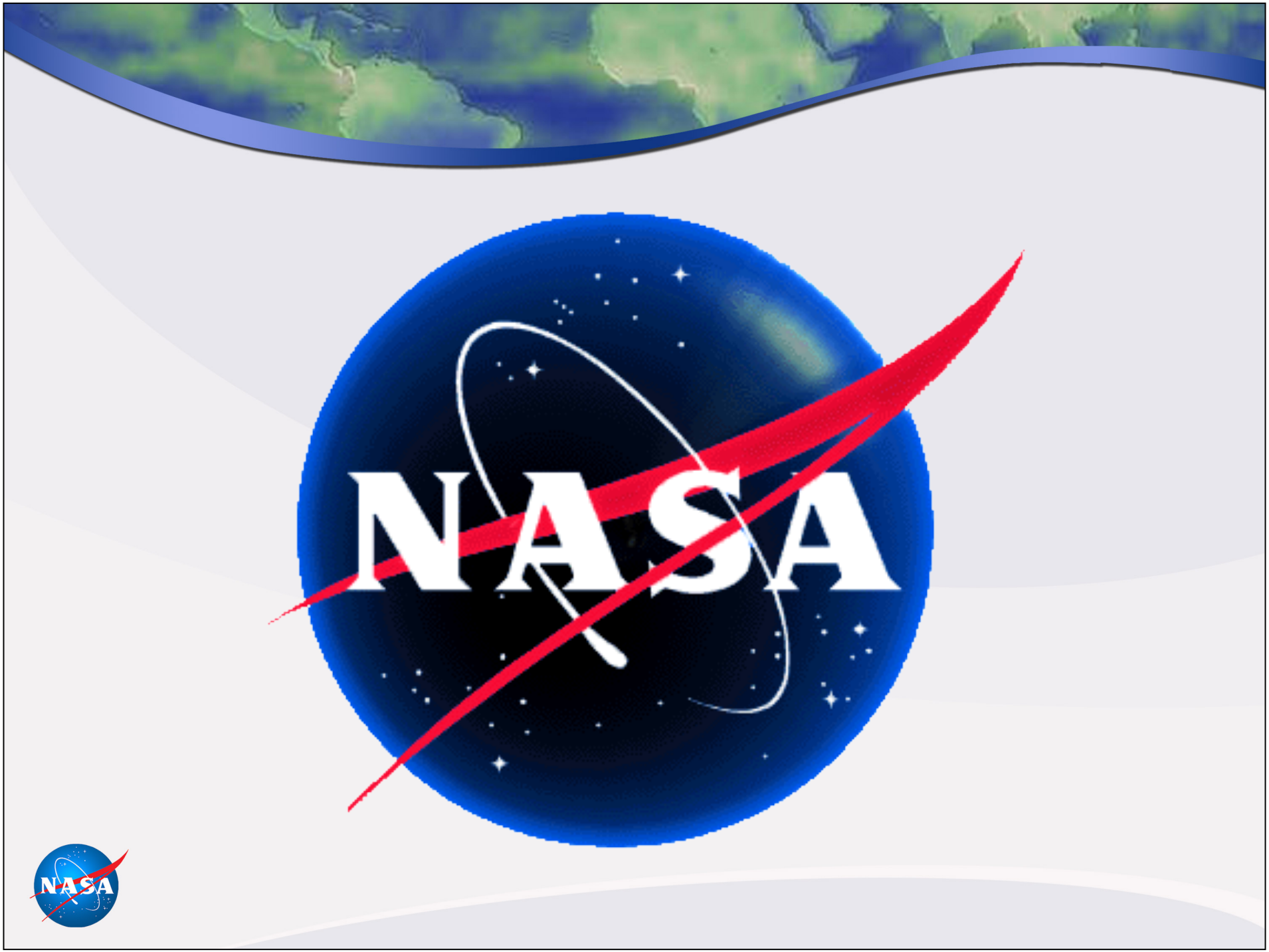

Hurricane and Severe Storm Sentinel (HS3) – GSFC/ARC

The prediction of the intensity of hurricanes is not as reliable as predictions of the location of hurricane landfall, in large part because of our poor understanding of the processes involved in intensity change. This investigation focuses on studying hurricanes in the Atlantic Ocean basin using two NASA Global Hawks flying high above the storms for up to 30 hours. The Hawks will deploy from NASA's Wallops Flight Facility in Virginia during the 2012-14 Atlantic hurricane seasons.

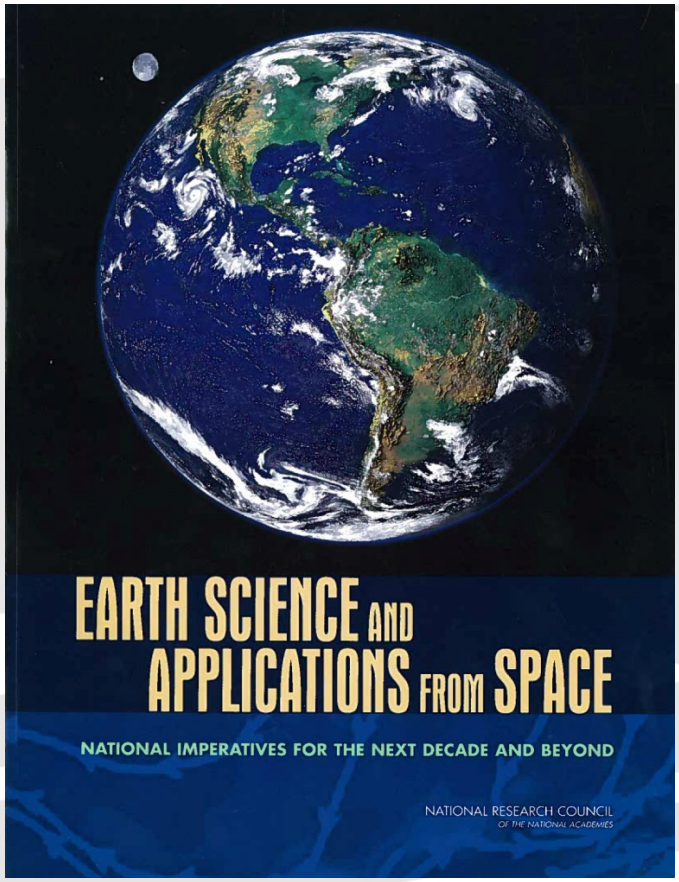
7

Glory Aftermath/Status

- **Glory mission was lost - LV failure (fairing non-sep) on 4 March**
  - Total Irradiance Monitor (TIM) and Aerosol Polarimetry Sensor (APS) + Cloud Cameras
  - Refurbished Vegetation Canopy Lidar satellite bus
  - Taurus-XL failure has similar manifestations to OCO loss (24 Feb 2009)
- **Way forward: Glory**
  - Carbon-copy Glory recovery mission will ***not*** be developed – VCL bus obsolete
- **Way forward: TIM**
  - SORCE, ACRIMSAT missions continuing through at least 2016
  - TSIS instrument development passed KDP-C in 1/2011 (reimbursable, NOAA-funding to NASA SMD/JASD)
  - Instrument delivery planned late CY2012; no s/c or LV yet identified
- **Way forward: APS**
  - Science viability study – 90-days (due late June)
    - Utility of flight of APS-capability sensor in 3-5 years
    - Possible NRC (or ESS) review
  - Implementation study for APS replacement mission – 120 days (late July)
    - Cost, schedule, instrument approach, satellite approach, LV
  - No recovery mission without top-line ESD budget augmentation
    - Same programmatic approach as for OCO-2

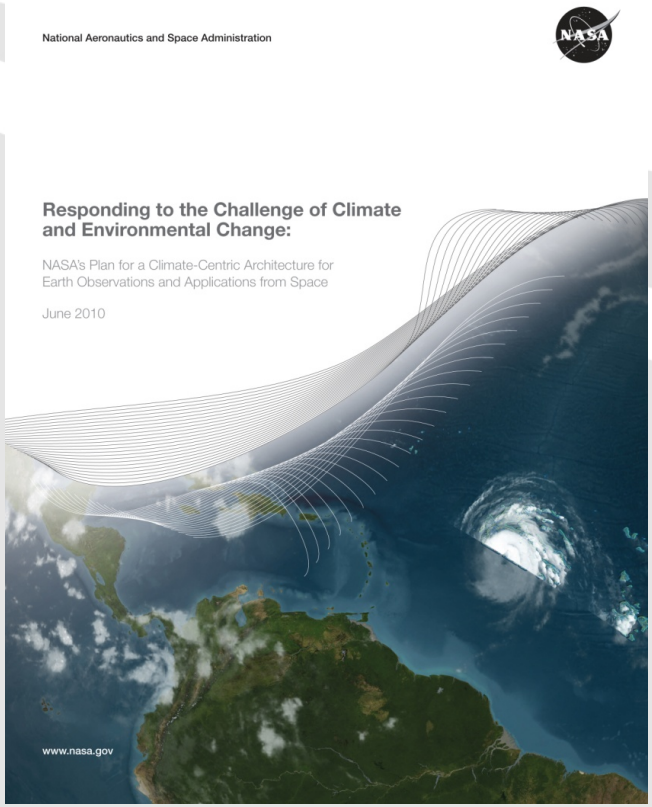

NASA

Guiding Recommendation Documents



Administration priorities and constraints

Decadal survey,
OCO-2,
climate continuity missions,
balanced program
Integrated Program



2007 Decadal Survey

- Research and Applications communities priorities
- No realistic budget constraint (calls for $2B funding [FY06 constant $$ beginning in FY10)

http://science.nasa.gov/media/medialibrary/2010/07/01/Climate_Architecture_Final.pdf

- Dec Surv + Administration priorities
- Executable for FY11 Pres. Bud.
- OSTP, USGCRP, OMB approval

CLIMATE INITIATIVE

- **Present budget enables significant mission accelerations and program expansions**
  - **All Foundational missions launched by mid-CY2013** (~~Glory~~, Aquarius, NPP, LDCM, GPM)
  - **Build on existing balanced program (non-flight as well as flight)**

- **Enables OCO-2 development and launch by 2/2013**

- **Accelerates selected Decadal Survey systematic missions**
  - **Launches all 2 of 4 Tier-1 missions between 2014 and 2017**
    - SMAP: 11/2014; ICESAT-2: 10/2015 ~~DESDynI*: 2017; CLARREO-1*: 2017~~

- **Expands and accelerates Venture-class competitive, PI-led program**
  - **ANNUAL solicitations for major flight instruments PLUS biannual alternating airborne and small-mission solicitations**
    - **First small-sat, instrument selections in 2012**
    - Develops Common Instrument Interface, encouraging flight on ISS, international partner missions, private/commercial missions

**Constrained, focused refined mission; deferred in FY12 budget submit*

(continued)

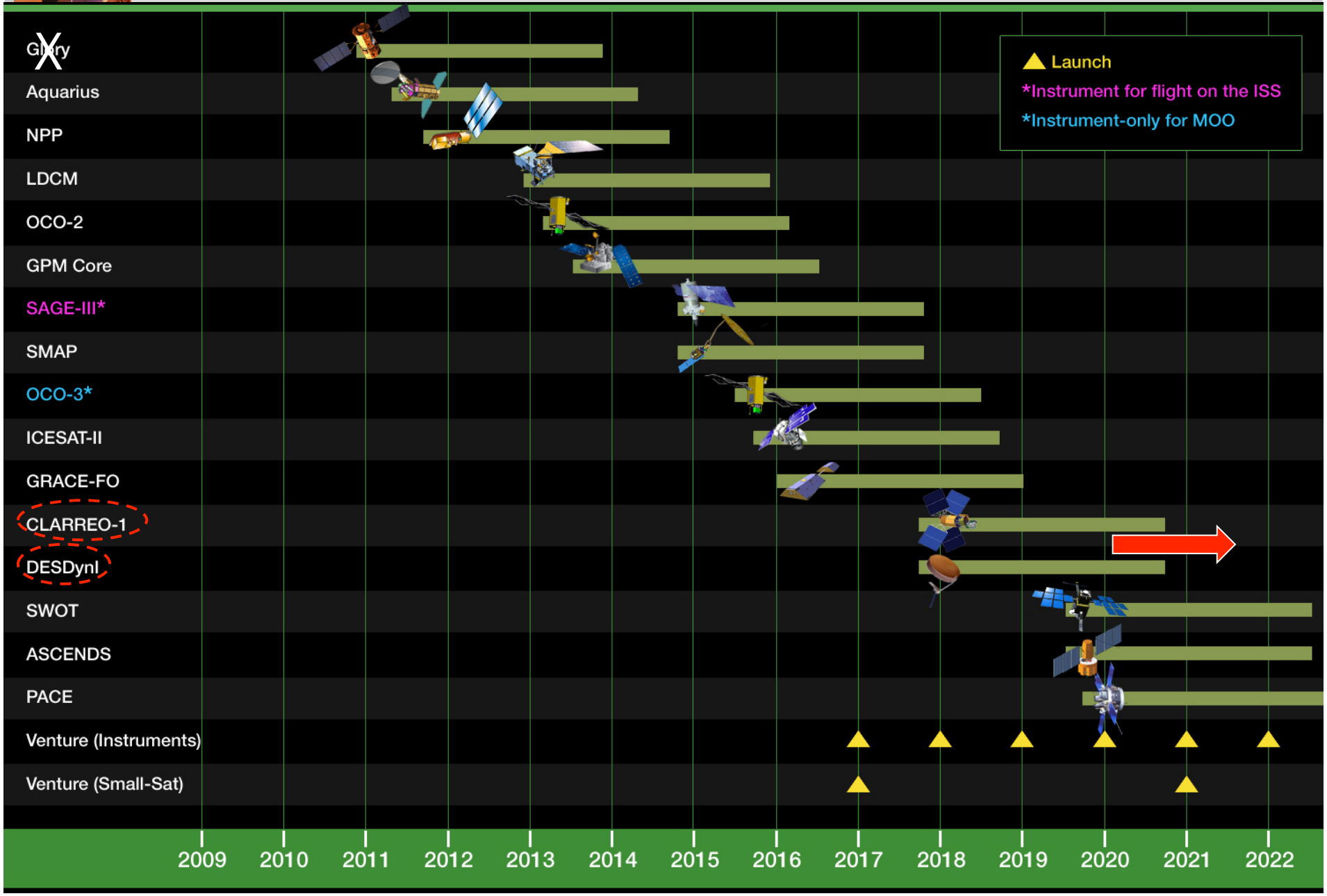
CLIMATE INITIATIVE (cont.)

- **Develops selected Climate Continuity Missions**
  - **SAGE-III** refurbishment/hexapod development, ready for **flight to ISS** late CY2014-2015
  - **GRACE-FO** (GRACE Follow-on), launch late CY2016 (joint with DLR)
  - **PACE** (Pre-ACE, ocean color/productivity and aerosol polarimetry, 2019/2020)

- **Accelerates all Tier-2 Decadal Survey missions, launches 2 before 2021**
  - **ASCENDS** (Active lidar for atmospheric CO2), launch 2019/2020
  - **SWOT** (Wide-swath altimeter for land hydrology, ocean processes) with CNES, launch 2019-2020)

- **Enables Key Non-Flight activities**
  - Multi-year **carbon monitoring pilot** program
  - Expanded Earth Science-specific **technology** program
  - **SERVIR expansion**
  - **Expanded modeling, synthesis, computing capability**
  - **NASA substantial support/participation in National Assessment activities**
  - **Geodetic ground network expansion/modernization**
  - **Expanded NASA support for GLOBE**

Future Orbital Flight Missions – 2011 – 2022



Earth Science Technology Program

Observation Technologies:

Advanced Technology Initiatives (ATI) / Advanced Component Technologies (ACT):
Critical component and subsystem technologies for instruments and platforms.
- Complete 15 ACT-08 projects; Proposals for ACT-10 awarded in September

Instrument Incubator Program (IIP): *New instruments and measurement techniques.*
- Complete 20 IIP-07 projects; Start 16 new IIP-10 ROSES awards

Information Technologies:

Advanced Information Systems Technology (AIST): *Innovative on-orbit and ground capabilities for communication, processing, and management of remotely sensed data and the efficient generation of data products and knowledge.*
- Complete 20 AIST-08 projects; Proposals for AIST-11 ROSES due in August

Flight Validation:

Technology Flight Validation: *Targeted Earth Science validation program.*
- Use CubeSats, International Space Station and partnerships with industry, academia and other agencies

Technology Program Schedule / Budget

($M)	FY12				FY13				FY14				FY15				FY16				FY17			
Q	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
ROSES Solicitations		▲				▲				▲				▲				▲				▲		
ATI/ACT Solicitation NRA Release									ACT-14 ▲												ACT-17 ▲			
Budget	12.5				13.4				12.9				13.6				13.5							
IIP Solicitation NRA Release					IIP-13 ▲												IIP-16 ▲							
Budget	25.0				25.6				26.4				27				27.6							
AIST Solicitation NRA Release									AIST-14 ▲												AIST-17 ▲			
Budget	8.6				8.9				12.6				12.9				13.2							
In-Guide Totals ($M)	**46.1**				**47.9**				**51.9**				**53.6**				**54.2**				**54.7**			
Total ESD Budget ($M)	1,653				1,679				1,665				1,691				1,727							
% of Total ESD Budget	2.8%				2.9%				3.1%				3.2%				3.1%							

ESTO
Earth Science Technology Office

Annual Opportunities for Participation

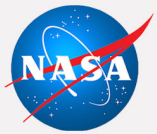
Instrument Incubator – in first year of award

Advanced Component Technology – in process of selection

Advanced Information Systems Technology

• Solicitation Released	February 18, 2011
• NOIs Due	June 17, 2011
• Proposals Due	August 11, 2011
• Announcement of Award	~February 2012

The annual American Geophysical Union (AGU) meeting, held in San Francisco in December of each year – program topics have just been announced, and calls for participation (papers and posters) are now open.



Technology Enables our Future

Visit us at esto.nasa.gov