

National Aeronautics and Space Administration



SCIENCE

NASA Space and Earth Science

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Science Mission Directorate, NASA

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www.nasa.gov



NASA's Strategic Goals

U.S. Space Exploration Policy

- To advance U.S. scientific, security, and economic interests through a robust space exploration program

NASA's Mission

- To pioneer the future in space exploration, scientific discovery, and aeronautics research

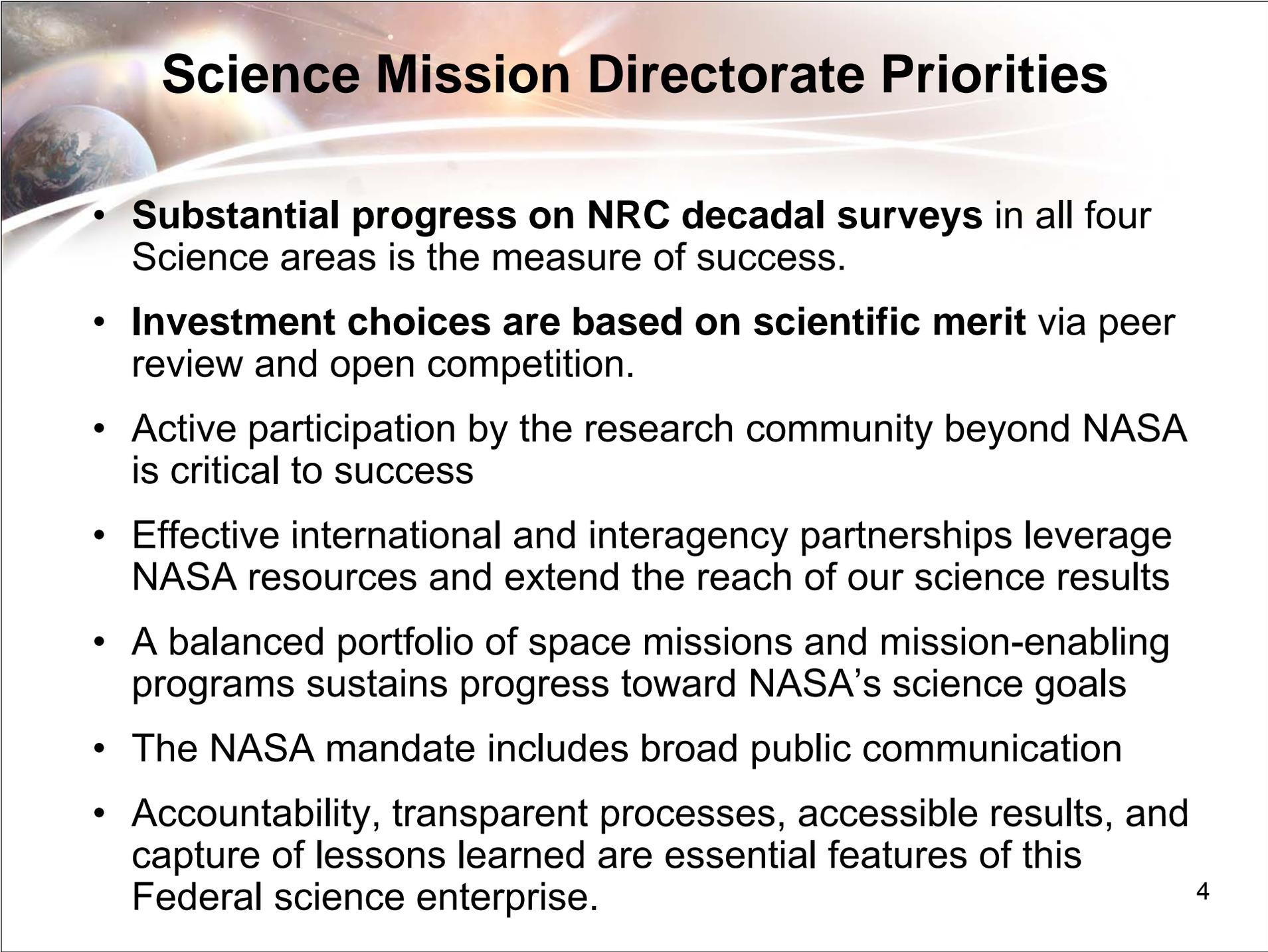
NASA's Strategic Goals for the Science Mission Directorate

- Advance Earth System Science to meet the challenges of climate and environmental change
- Understand the Sun and its interactions with Earth and the solar system
- Ascertain the content, origin, and history of the solar system, and the potential for life elsewhere
- Discover how the universe works, explore how the universe began and evolved, and search for Earth-like planets



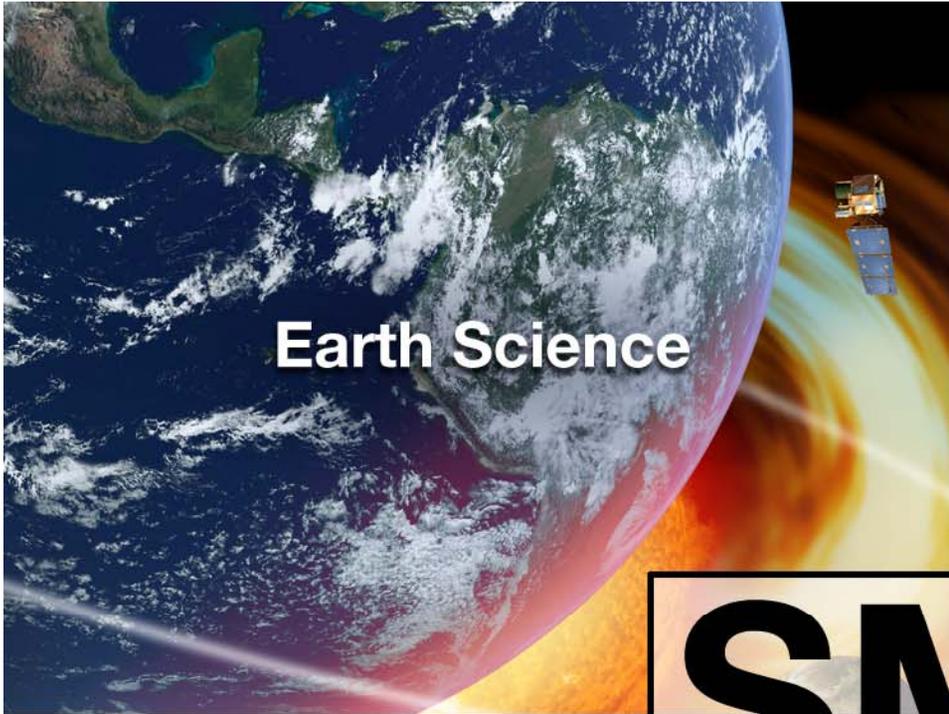
Science Mission Directorate Strategy

- **Pursue answers to big science questions** for which the view from space makes a defining contribution
- **Design programs that accomplish breakthrough science** and applications within the available budget.
- Partner with other nations' space agencies to pursue common goals
- Mature technologies through focused efforts prior to committing to implement missions that need them
- Share the story, the science, and the adventure of NASA missions and research to engage the public in scientific exploration and to improve science, technology, engineering, and mathematics (STEM) education nationwide

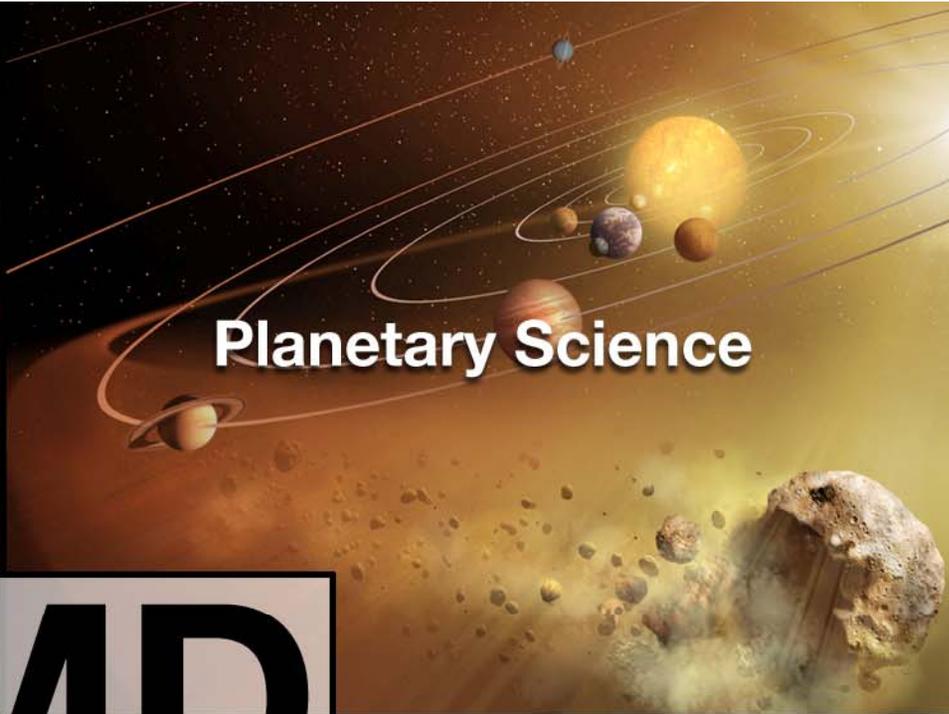


Science Mission Directorate Priorities

- **Substantial progress on NRC decadal surveys** in all four Science areas is the measure of success.
- **Investment choices are based on scientific merit** via peer review and open competition.
- Active participation by the research community beyond NASA is critical to success
- Effective international and interagency partnerships leverage NASA resources and extend the reach of our science results
- A balanced portfolio of space missions and mission-enabling programs sustains progress toward NASA's science goals
- The NASA mandate includes broad public communication
- Accountability, transparent processes, accessible results, and capture of lessons learned are essential features of this Federal science enterprise.

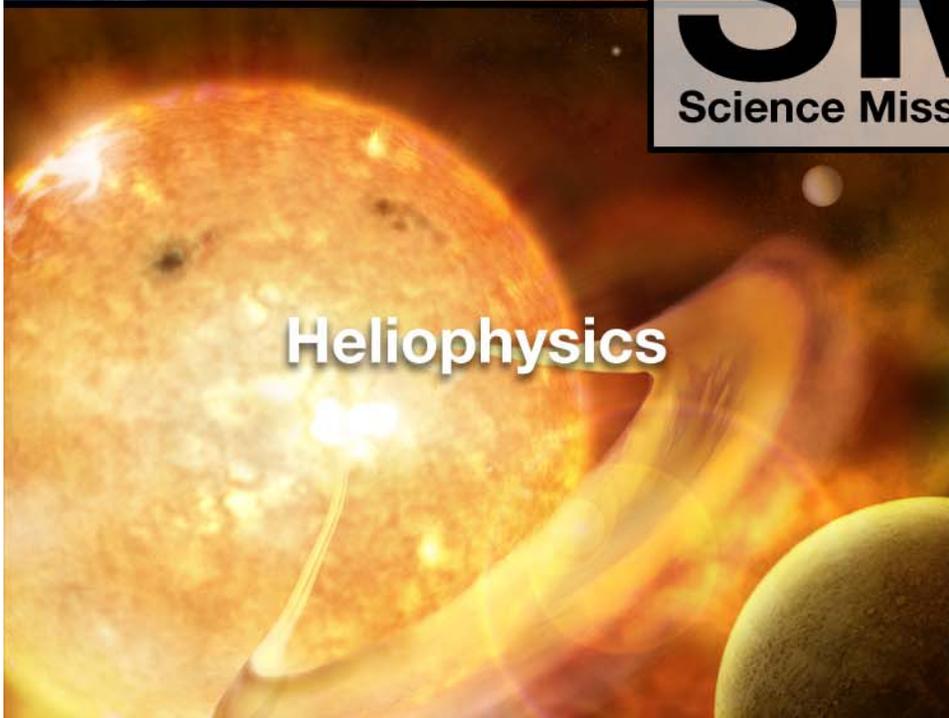


Earth Science



Planetary Science

SMD
Science Mission Directorate



Heliophysics



Astrophysics

SMD Science Plan

SMD's implementation plan for 2010-2020

- Required by the NASA Strategic Management and Governance Handbook
- Fulfills a Congressional requirement from the NASA Authorization Act of 2005
- Supports NASA advocacy and explanation of its science portfolio to Congress, science community, and the public

The Plan

- Articulates science questions to be pursued in the context of national priorities
- Defines and prioritizes missions
- Describes the associated research & analysis, technology, and related programs



Earth Science

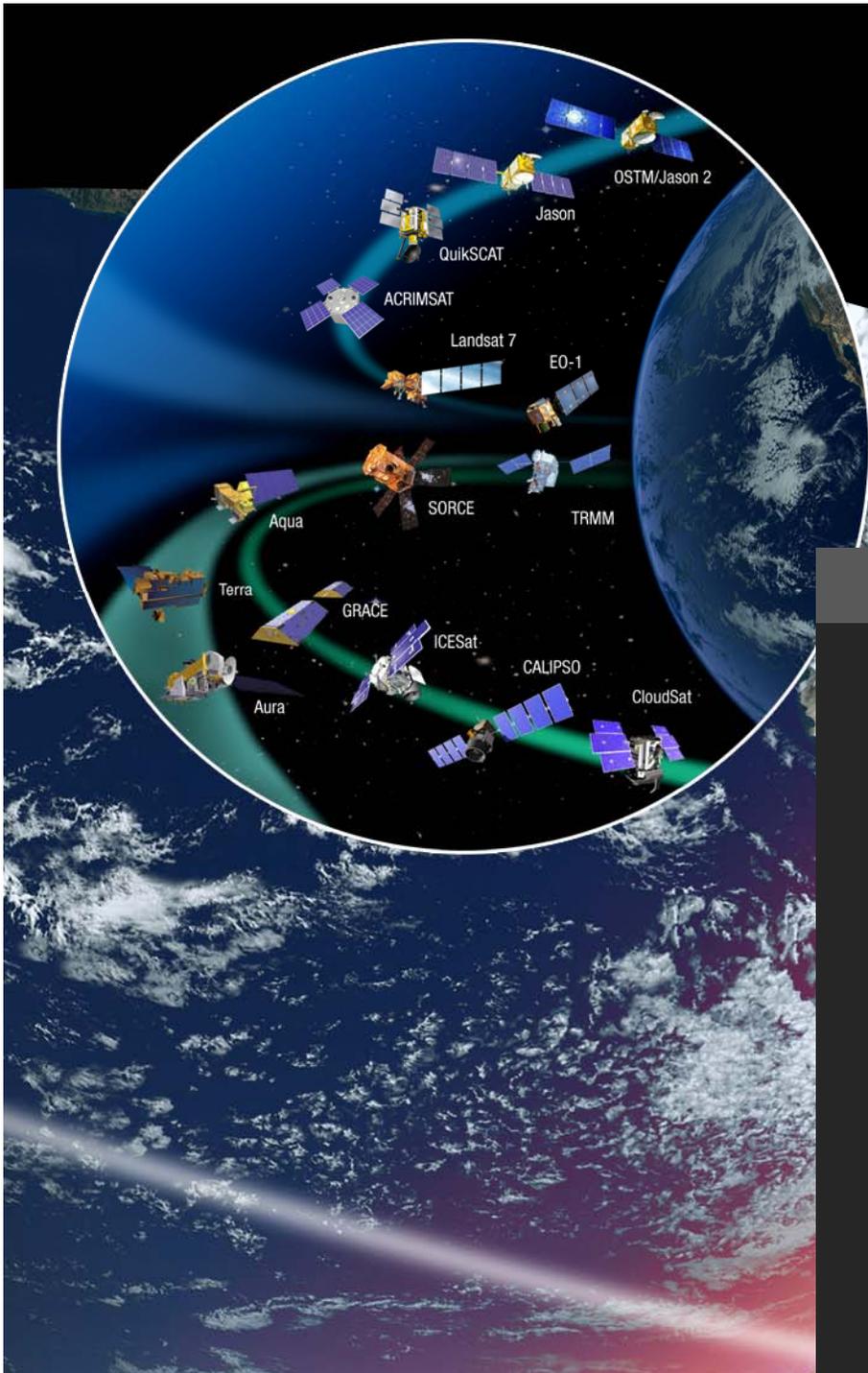
Questions

How is the global Earth system changing?

What are the sources of change in the Earth system and their magnitude and trends?

How will the Earth system change in the future?

How can Earth system science improve mitigation of and adaptation to global change?



Planetary Science

Questions

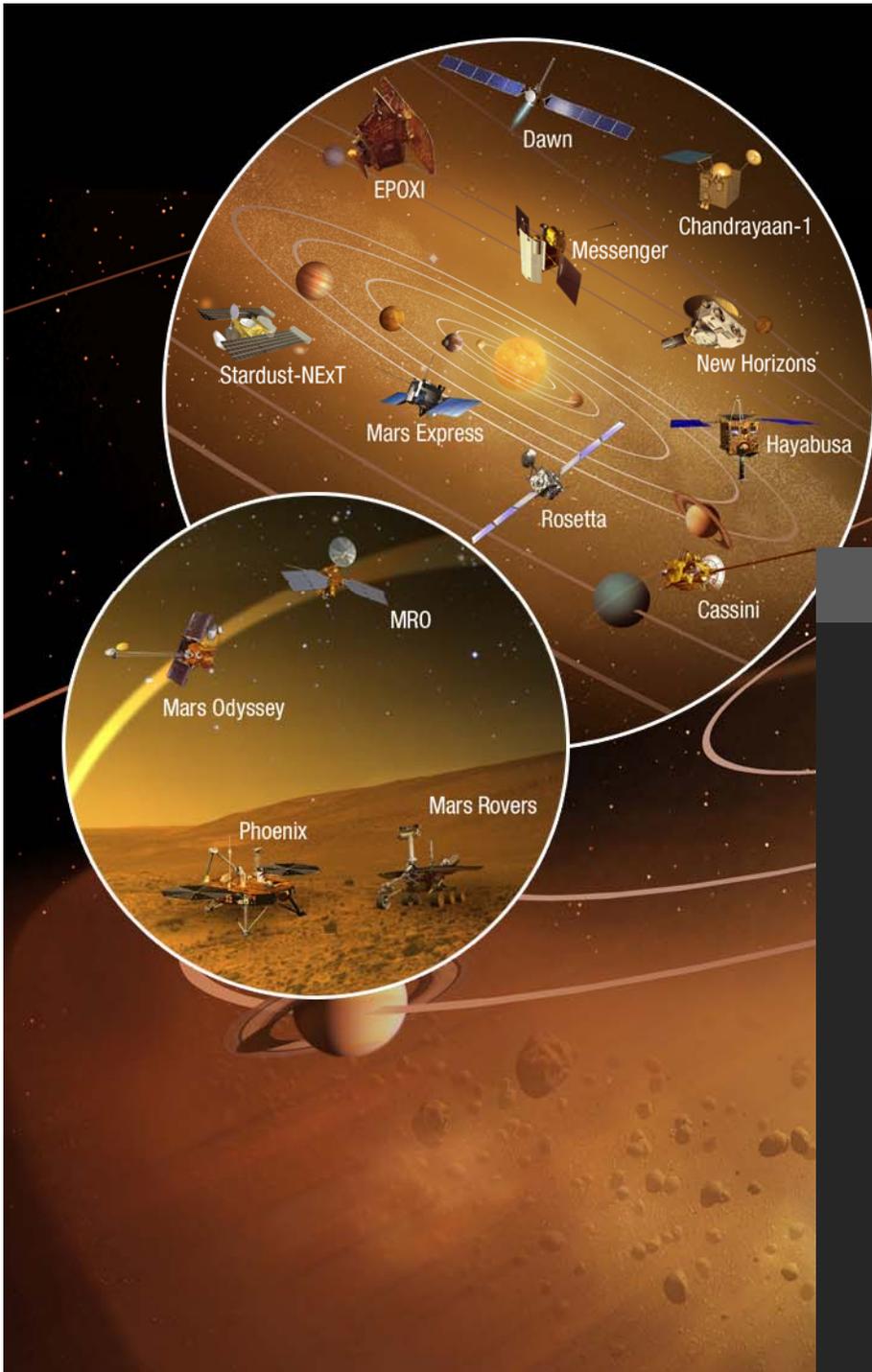
What is the inventory of solar system objects and what processes are active in and among them?

How did the Sun's family of planets, satellites, and minor bodies originate and evolve?

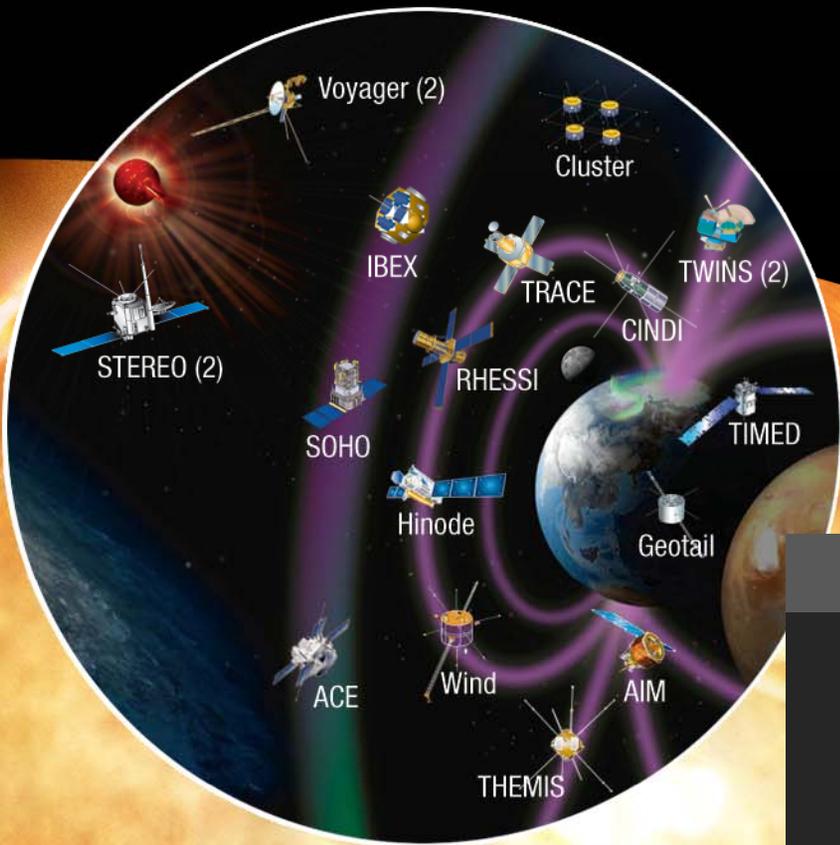
What are the characteristics of the solar system that lead to habitable environments?

How and where could life begin and evolve in the solar system?

What are the characteristics of small bodies and planetary environments that pose hazards or provide resources?



Heliophysics



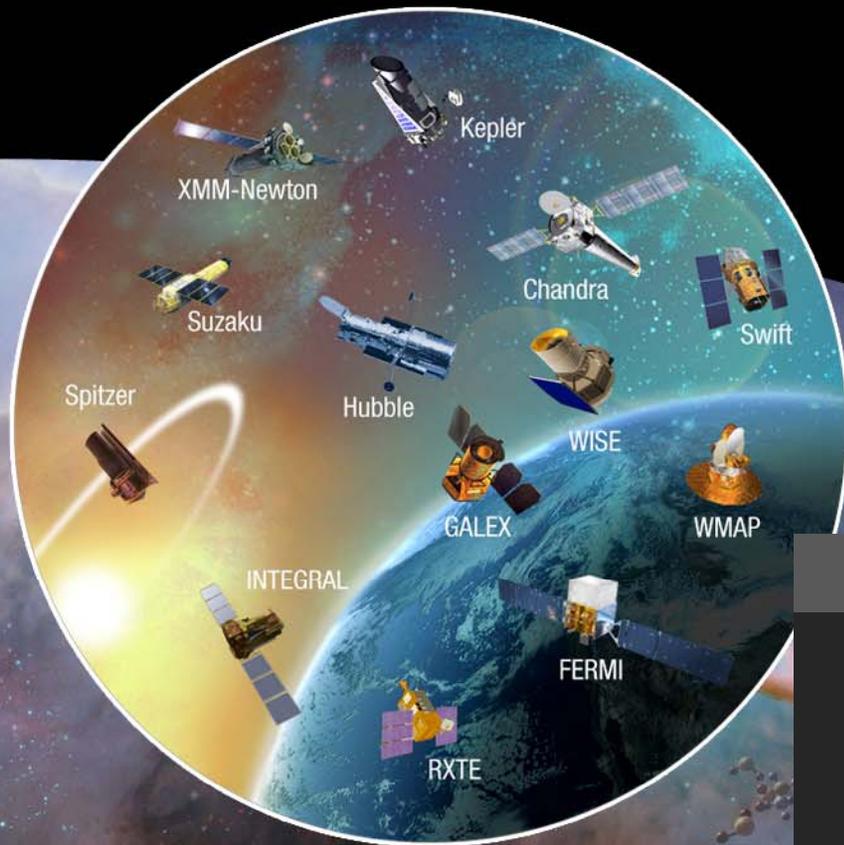
Questions

What causes the Sun to vary?

How do the Earth and Heliosphere respond?

What are the impacts of space weather on humanity?

Astrophysics



Questions

How do matter, energy, space and time behave under the extraordinary diverse conditions of the cosmos?

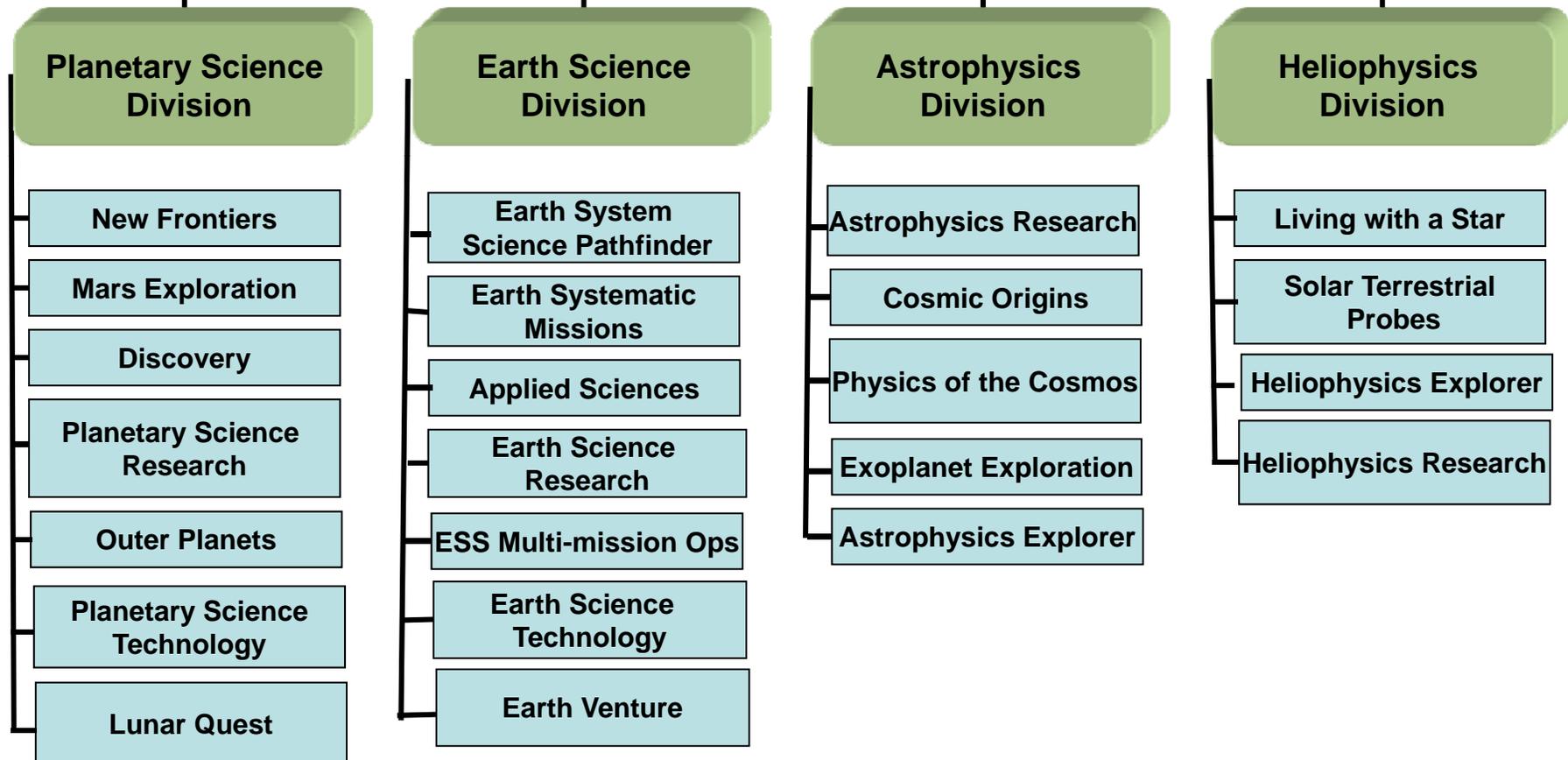
How did the universe originate and evolve to produce the galaxies, stars, and planets we see today?

What are the characteristics of planetary systems orbiting other stars, and do they harbor life?

SMD Programs

Science Mission Directorate

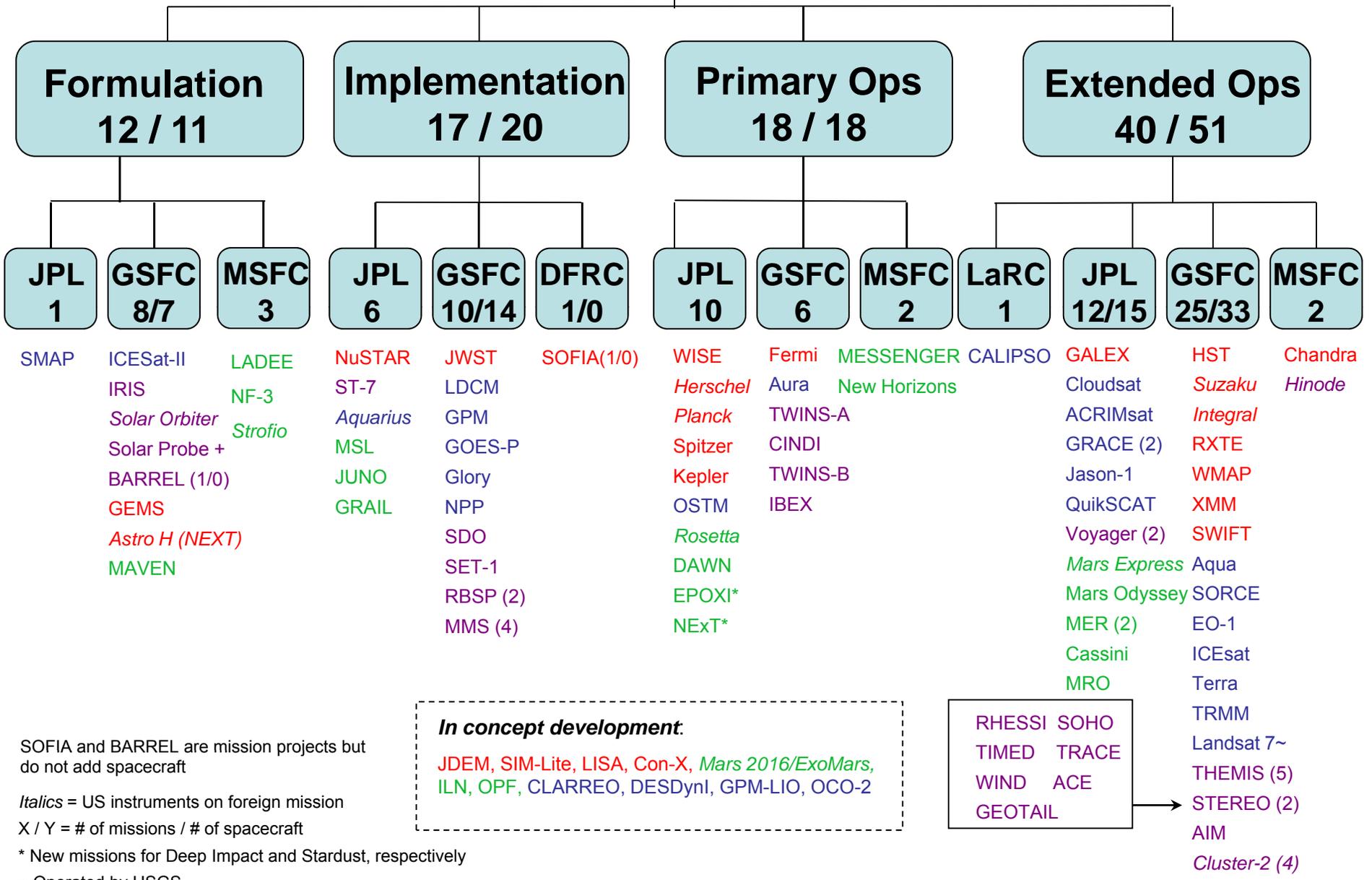
Division
Program



Astrophysics
 Earth Science
 Heliophysics
 Planetary Science

Total Missions / Spacecraft
87 / 100

1/20/10



SOFIA and BARREL are mission projects but do not add spacecraft

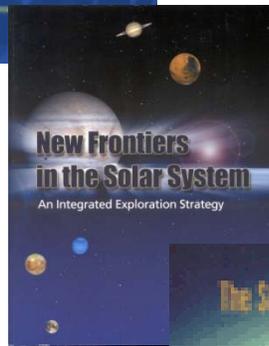
Italics = US instruments on foreign mission

X / Y = # of missions / # of spacecraft

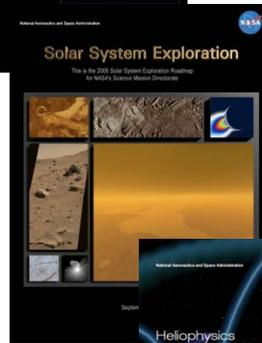
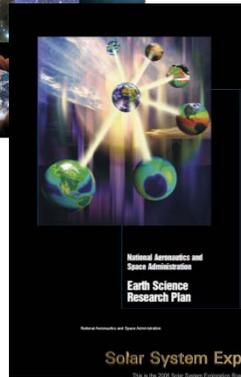
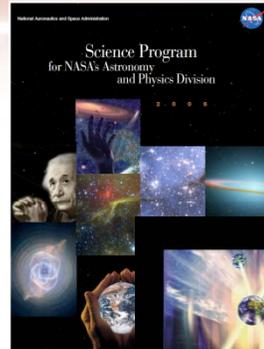
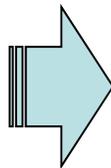
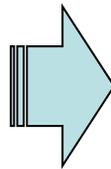
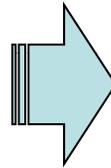
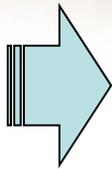
* New missions for Deep Impact and Stardust, respectively

~ Operated by USGS

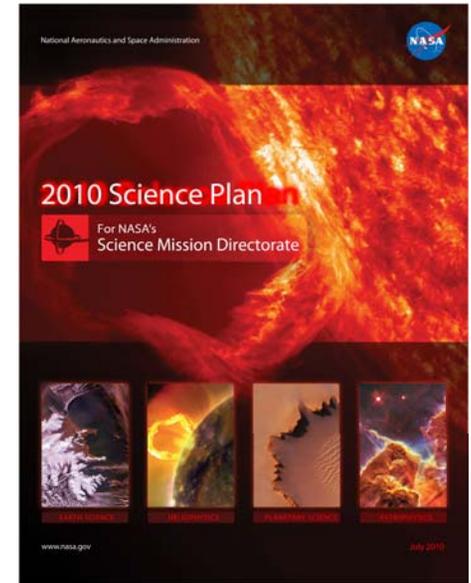
Community Participation in Strategic Planning



NRC Decadal Surveys



Community Roadmaps



***SMD Science Plan
(Reviewed by the
NRC, the NAC,
and NASA's
partners)***



Earth Science and Applications from Space: National Imperatives for the Next Decade and Beyond (2007)

Earth Science



New Frontiers in the Solar System: An Integrated Exploration Strategy (2002)

Planetary Science

New survey in progress, expected winter 2011

SMD

Science Mission Directorate

NAS/NRC Decadal Surveys

New survey being initiated in 2010

Heliophysics

New survey in progress, expected summer 2010

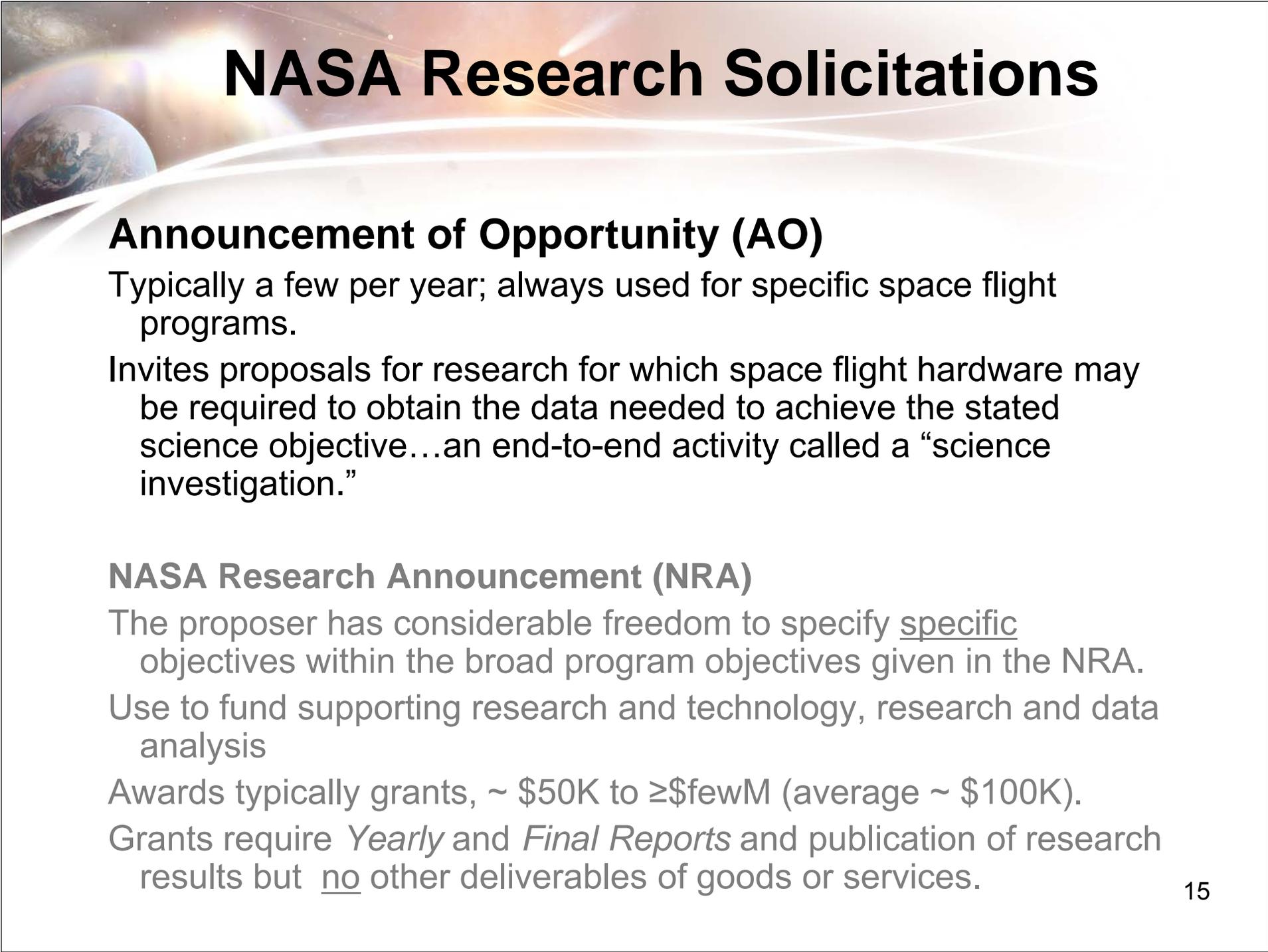
Astrophysics



The Sun to the Earth -- and Beyond: A Decadal Research Strategy in Solar and Space Physics (2003)



Astronomy and Astrophysics in the New Millennium (2001)

The slide features a background image of space with a view of Earth from orbit, a bright sun or star, and glowing white orbital lines. The title "NASA Research Solicitations" is centered at the top in a large, bold, black font.

NASA Research Solicitations

Announcement of Opportunity (AO)

Typically a few per year; always used for specific space flight programs.

Invites proposals for research for which space flight hardware may be required to obtain the data needed to achieve the stated science objective...an end-to-end activity called a “science investigation.”

NASA Research Announcement (NRA)

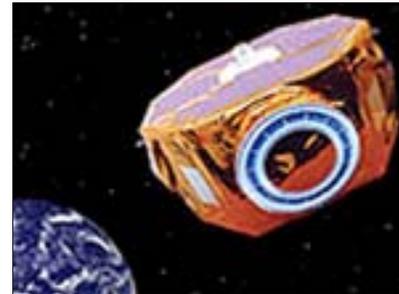
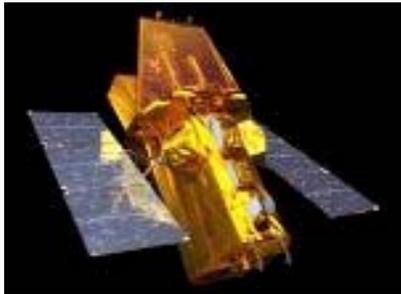
The proposer has considerable freedom to specify specific objectives within the broad program objectives given in the NRA.

Use to fund supporting research and technology, research and data analysis

Awards typically grants, ~ \$50K to ≥\$fewM (average ~ \$100K).

Grants require *Yearly* and *Final Reports* and publication of research results but no other deliverables of goods or services.

SMD ISS AO Opportunities: SALMON AO



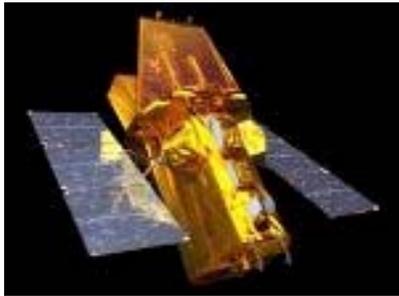
**Draft Explorer (EX) Mission of Opportunity
Announcement Released**

NNH10ZDA009J

Released: June 22, 2010

<http://explorers.larc.nasa.gov/EX>

SMD ISS AO Opportunities: SALMON AO

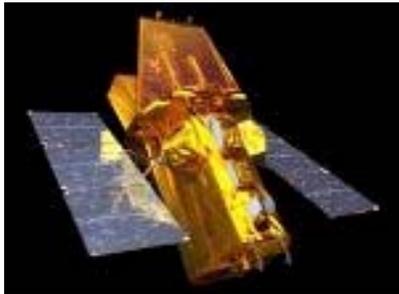


The Explorer Program conducts Principal Investigator (PI)-led space science investigations in SMD's astrophysics and heliophysics programs.

Explorer investigations are intended to obtain an understanding of the Sun and its effects on Earth and the Solar System and/or to discover the origin, structure, evolution, and destiny of the Universe and search for Earth-like planets.

Full information: <http://explorers.larc.nasa.gov/EX>

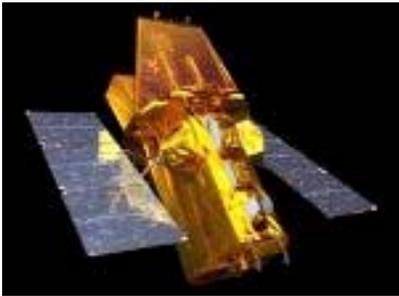
SMD ISS AO Opportunities: SALMON AO



- The PI-managed mission cost cap for an Explorer MO is \$55M in Fiscal Year (FY) 2011 dollars.
- Three MO types may be proposed – Partner Missions of Opportunity (PMOs), New Science Missions using Existing Spacecraft, and Small Complete Missions (SCMs), including investigations requiring flight on long duration balloons, investigations on the International Space Station (ISS), investigations launched as secondary payloads, or investigations launched as hosted payloads.

Full information: <http://explorers.larc.nasa.gov/EX>

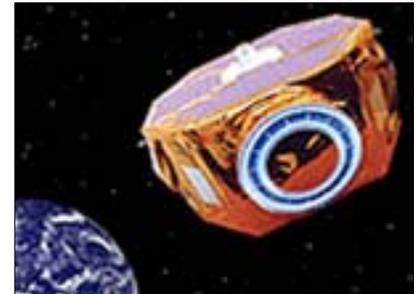
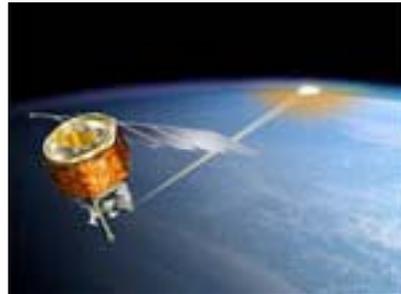
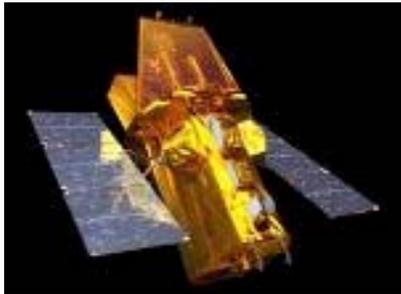
SMD ISS AO Opportunities: SALMON AO



- The currently approved Explorer Program planning budget is sufficient to select and execute at least one full Explorer mission to proceed into Phase B and subsequent mission phases.
- Assuming sufficient Explorer Program budget authority, NASA intends to select and execute a second full Explorer mission or one or more Mission(s) of Opportunity.
- NASA will clarify this statement when the Explorer AO is released based on the latest available Explorer Program planning budgets.

Full information: <http://explorers.larc.nasa.gov/EX>

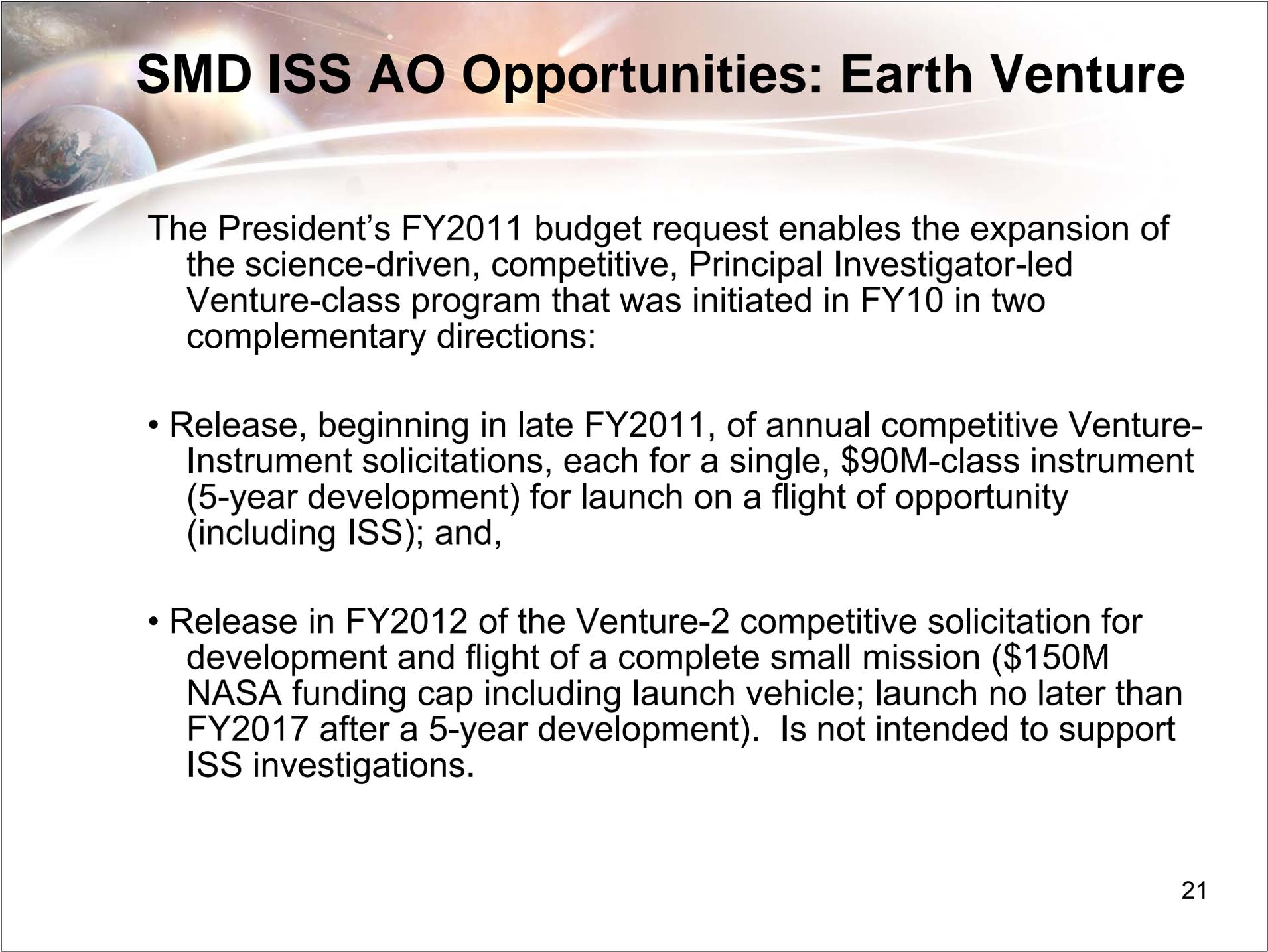
SMD ISS AO Opportunities: SALMON AO



The schedule for the solicitation is intended to be:

- Release of final AO: Late summer/early fall 2010 (target);
- Pre-proposal conference: ~3 weeks after final AO release;
- Proposals due: 90 days after AO release;
- Selection for competitive Phase A studies: Summer 2011 (target);
- Concept study reports due: Summer 2012 (target);
- Down-selection: Late 2012 (target);

Full information: <http://explorers.larc.nasa.gov/EX>

The background of the slide features a space-themed image. On the left, a portion of the Earth is visible, showing blue oceans and white clouds. In the upper left, the International Space Station (ISS) is seen in orbit against a bright, hazy sky. The overall color palette is dominated by warm tones of orange, yellow, and white, suggesting a sunrise or sunset in space. The title 'SMD ISS AO Opportunities: Earth Venture' is prominently displayed in the upper left quadrant in a bold, black, sans-serif font.

SMD ISS AO Opportunities: Earth Venture

The President's FY2011 budget request enables the expansion of the science-driven, competitive, Principal Investigator-led Venture-class program that was initiated in FY10 in two complementary directions:

- Release, beginning in late FY2011, of annual competitive Venture-Instrument solicitations, each for a single, \$90M-class instrument (5-year development) for launch on a flight of opportunity (including ISS); and,
- Release in FY2012 of the Venture-2 competitive solicitation for development and flight of a complete small mission (\$150M NASA funding cap including launch vehicle; launch no later than FY2017 after a 5-year development). Is not intended to support ISS investigations.



SMD ISS AO Opportunities: Earth Venture

Venture Instrument Solicitations: Annual starting in FY2011

- With the funding in the President's FY2011 budget request, NASA's Earth Science program will further enhance the current Venture-class competitions with yearly Announcements of Opportunity to solicit proposals to develop flight-ready instruments.
- The overall objectives for these Missions of Opportunity investigations will be required to be relevant to the science priorities, goals, and objectives of NASA's Earth Science Program.
- The adoption of common instrument-to-spacecraft interface standards—developed as part of the overall budget request and discussed at the end of this section—will facilitate the flight of these instruments on a variety of partnership opportunities and available capacity on planned missions.



NASA Research Solicitations

Announcement of Opportunity (AO)

Typically a few per year; always used for specific space flight programs.

Invites proposals for research for which space flight hardware may be required to obtain the data needed to achieve the stated science objective...an end-to-end activity called a “science investigation.”

NASA Research Announcement (NRA)

The proposer has considerable freedom to specify specific objectives within the broad program objectives given in the NRA.

Use to fund supporting research and technology, research and data analysis

Awards typically ~ \$50K to ≥\$fewM (average ~ \$100K).



Types of R&A Programs

Fundamental Research

- Basic research that extends our knowledge of fundamental processes and benefits current and future missions

Instrument and Technology

- Intended to provide advanced lab equipment, develop instruments and technologies for future missions
- Competition is more intense and budgets are larger

Data Analysis and Guest Investigator

- Research focused on using new or archived mission data
- Often attached to a single mission, sometimes short lived

Participating Scientist

- Intended to broaden participation in mission science teams
- Unique opportunities that typically occur once per mission

Others

- Theory, mission concept studies, fellowships, education and public outreach, history, policy, odd and unexpected stuff...



SMD ISS NRA Opportunities: ROSES 2010

**AMENDMENT NO. 11 TO THE NASA RESEARCH
ANNOUNCEMENT (NRA) ENTITLED**

**RESEARCH OPPORTUNITIES IN SPACE AND EARTH
SCIENCES (ROSES) 2010**

NNH10ZDA001N, RELEASED FEBRUARY 12, 2010

New proposal opportunities for Earth and space science experiments using commercial reusable suborbital research vehicles and the International Space Station.



SMD ISS NRA Opportunities: ROSES 2010

- NASA has determined that there may be payload opportunities for small space and Earth science research investigations, including both science and technology development, that utilize the International Space Station (ISS).
- Available external attach points include both zenith and nadir pointing locations, and internal attach points include nadir pointing locations.
- NASA has available annual external launch opportunities after 2011 on the Japanese HTV launch vehicle and the SpaceX vehicle.
- NASA also has regular opportunities on a suite of vehicles to launch pressurized cargo for use in the Window Observational Research Facility (WORF).



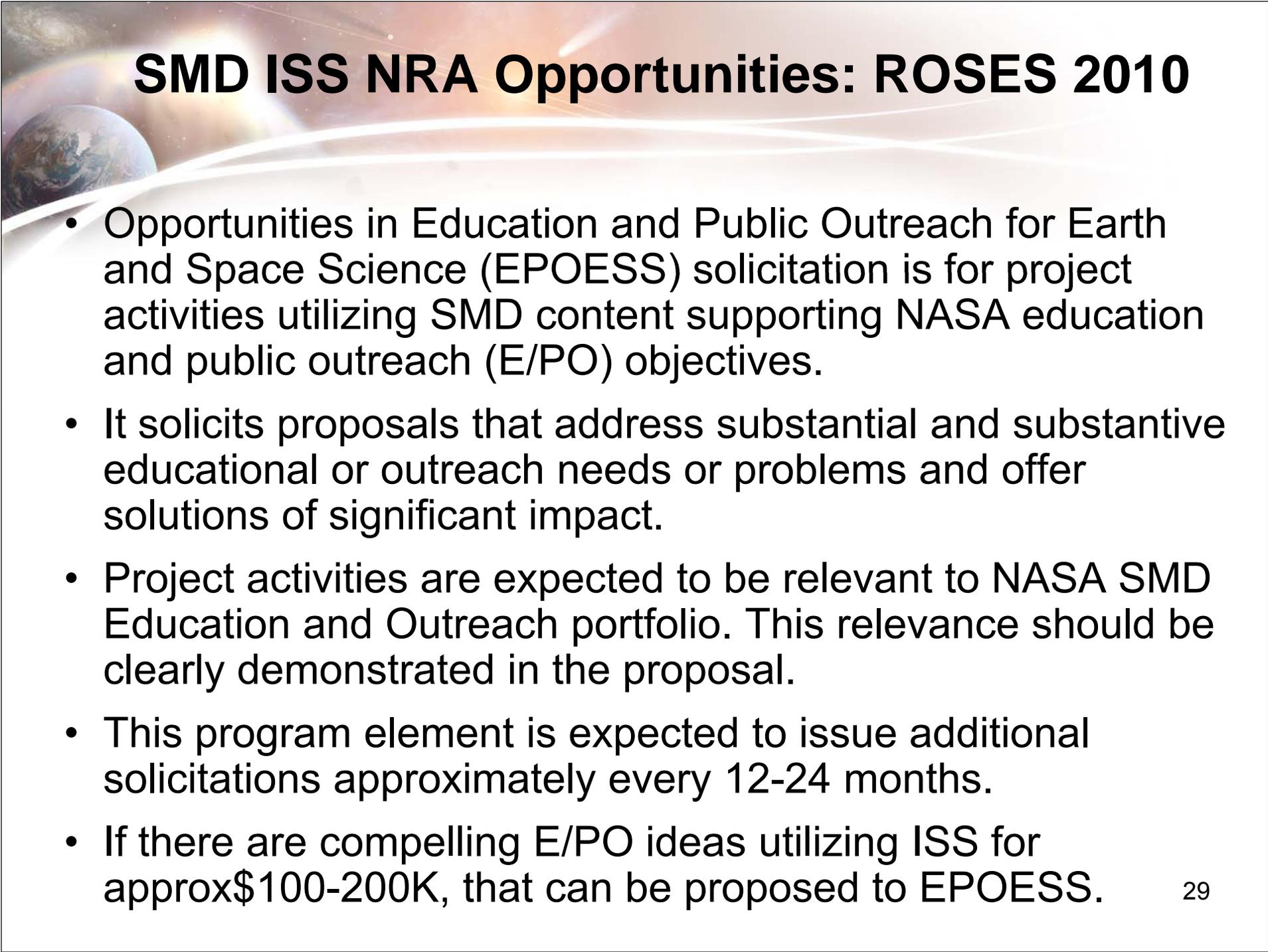
SMD ISS NRA Opportunities: ROSES 2010

- Proposals seeking use of the ISS must take advantage of the Station's unique capabilities.
- Proposers interested in using the ISS to conduct an Earth or space science investigation must identify a specific accommodation location that can provide the technical capabilities required to conduct the proposed investigation.
- Proposals for life and microgravity science investigations are not solicited through ROSES.



SMD ISS NRA Opportunities: ROSES 2010

- Proposals must be submitted to the appropriate ROSES program element depending on the science addressed by the proposed investigation.
 - Commercial Reusable Suborbital Research Platforms for Earth Science program (Appendix A.27),
 - Geospace Science program (Appendix B.3),
 - Solar and Heliospheric Science program (Appendix B.4),
 - Planetary Astronomy program (Appendix C.5), and the
 - Astrophysics Research and Analysis program (Appendix D.3).
- For any program whose due date has passed for 2010, please consult the next solicitation for that program

The background of the slide features a space-themed image. On the left, a portion of the Earth is visible, showing blue oceans and white clouds. To the right, the International Space Station (ISS) is depicted in orbit, with its complex structure of modules and solar panels. The background is a gradient of light colors, possibly representing the sky or the sun's glow, with some faint, wispy lines suggesting motion or light trails.

SMD ISS NRA Opportunities: ROSES 2010

- Opportunities in Education and Public Outreach for Earth and Space Science (EPOESS) solicitation is for project activities utilizing SMD content supporting NASA education and public outreach (E/PO) objectives.
- It solicits proposals that address substantial and substantive educational or outreach needs or problems and offer solutions of significant impact.
- Project activities are expected to be relevant to NASA SMD Education and Outreach portfolio. This relevance should be clearly demonstrated in the proposal.
- This program element is expected to issue additional solicitations approximately every 12-24 months.
- If there are compelling E/PO ideas utilizing ISS for approx \$100-200K, that can be proposed to EPOESS.

SMD ISS NRA Opportunities: ROSES 2010

ROSES Program Element	Proposal Due
Commercial Reusable Suborbital Research Platforms for Earth Science program (Appendix A.27)	Various, see individual elements
Geospace Science program (Appendix B.3)	6/18/10
Solar and Heliospheric Science program (Appendix B.4)	3/18/11
Planetary Astronomy program (Appendix C.5)	6/11/10
Astrophysics Research and Analysis program (Appendix D.3)	3/25/11
Opportunities in Education and Public Outreach for Earth and Space Science (EPOESS) (Appendix E.4)	6/3/10

For any program whose due date has passed for 2010, please consult the next solicitation for that program



SMD ISS NRA Opportunities: ROSES 2010

- Questions concerning the individual program elements through which ISS based experiments are solicited may be addressed to the NASA point of contact identified in the Summary of Key Information at the end of each program element appendix.
- General questions concerning the NASA Science Mission Directorate's solicitation for ISS based experiments may be addressed to:

Dr. Paul Hertz,
Science Mission Directorate,
NASA Headquarters,
Washington, DC 20546-0001;
Telephone: (202) 358-0986;
E-mail: paul.hertz@nasa.gov.



SMD Research Program

- Research is an essential part of SMD, and research is a part of every budget line
- Research is an integral part of missions:
 - a) Development (including PI-led mission development and PI-led instrument development);
 - b) Operations (including science operations and data processing);
 - c) Science Teams (including participating scientists and interdisciplinary scientists); and
 - d) Data Analysis (DA) (including guest observer/investigator programs)
- Individual investigator-led research is base of program:
 - a) Supporting Research and Technology (SR&T);
 - b) Suborbital Investigations (e.g., Aircraft, Balloon, Sounding Rockets); and
 - c) Research and Data Analysis (R&DA)



SMD Guidelines for Exploratory Discussions with Prospective International Partners

SMD encourages productive international partnerships

**Cooperative arrangements must conform to standard
NASA cooperation policies**

**To manage expectations during exploratory
discussions, special consideration to the following is
required**

- Contemplated cooperation must be of clear scientific and programmatic value to SMD, e.g., it must address established scientific priorities
- Potential partnership arrangements must not threaten to introduce unusual schedule or performance risk to NASA programs
- Establishment of the U.S. role must conform to standard SMD acquisition principles and policies, including competitive merit review for all NASA expenditures

New Vistas, New Perspectives . . .

You are here

