Perspectives & Lessons Learned: Decadal Surveys in Space Science

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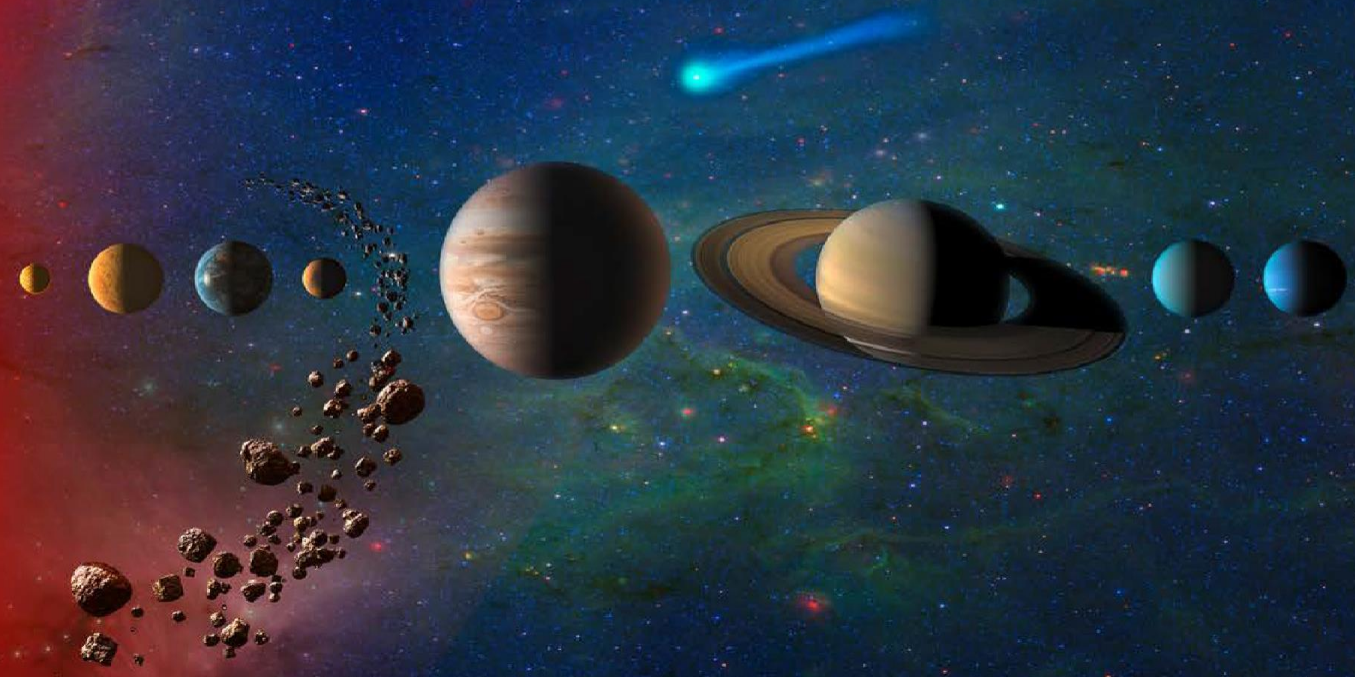
Director, Space Studies Board



National Academies of Sciences, Engineering, and Medicine

What is a Decadal Survey?

- Assesses the status of an entire scientific discipline
- Defines and prioritizes the key scientific questions for the next decade
- Defines and prioritizes the most important initiatives addressing the most important scientific questions

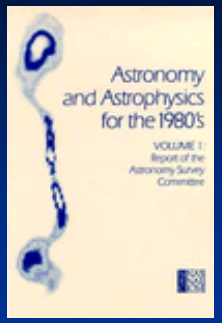
Decadal Surveys are conducted by the National Academies, independently of sponsoring agencies and organizations

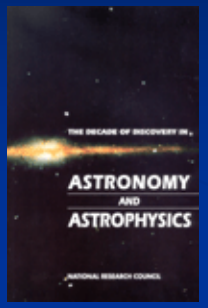
Decadal Surveys

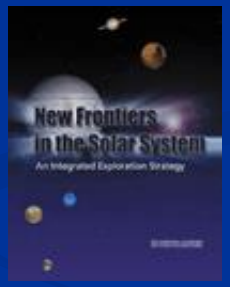
Sponsoring Agencies and Congress use decadal surveys as the formal statement of priority by the US space science community, and give highest priority to the missions identified in the survey whenever possible.

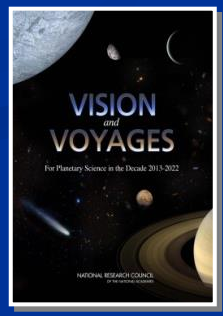
Space Science Decadal Surveys

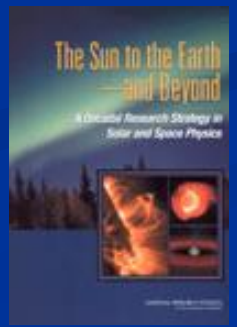
- Astronomy and Astrophysics
  1963, 1973, 1982, 1991,
  2001, 2010, (2020)
- Planetary Science
  2003, 2011, (2022)
- Solar and Space Physics
  2003, 2012, (2024)
- Earth Science and Applications from Space
  2007, 2018, (2029)
- Biological and Physical Research in Space
  2011, (2022)











White Papers Deadlines Extended

Science white papers – due July 15
Mission concept white papers – due Aug 15
All other white papers – due Sept 15

Schedule for Decadal Survey

2020	
January	National Academies posts Statement of Task
February	NAS Proposal to NASA, NSF
March	Funding Received, Early-career event and town hall at LPSC
May	Second Early-career event, writing white papers
Spring	White paper submission begins, co-chairs Robin M. Canup and Phil R. Christensen
July 2	Third Early-career event, Perspectives and Lessons
Summer	White paper deadline Steering Committee and Panels Formed, meetings
2021	
Autumn	Complete draft of survey report assembled
2022	
Spring	Survey report released, dissemination starts
2023	End of dissemination/NASA contract

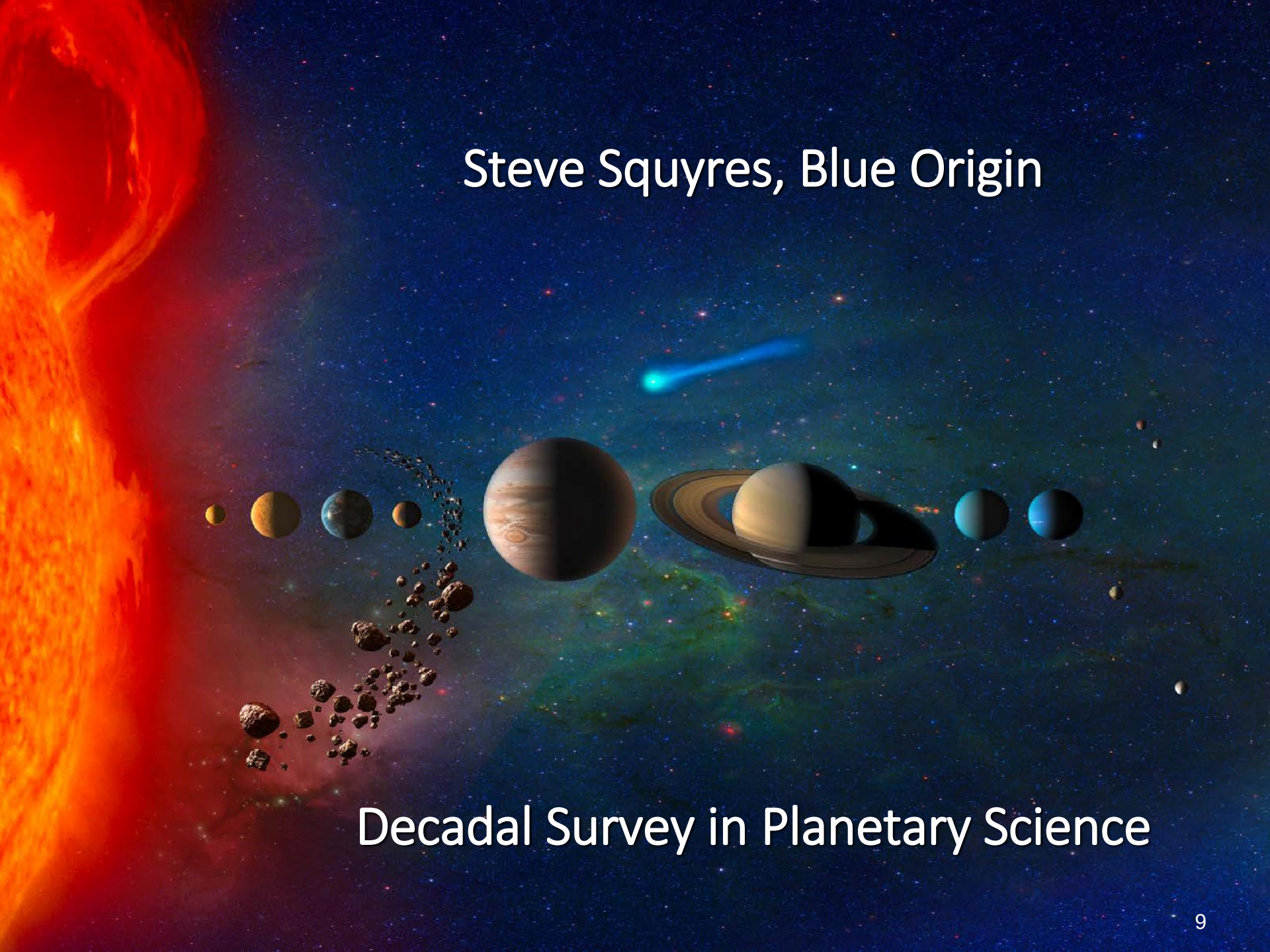
Early-Career Opportunities

- ***Note Takers*: once meeting dates are set, we will recruit graduate students to take meeting notes**
- ***Lloyd V. Berkner Internship Program: for* undergraduates (summer and autumn) and grad students (autumn only) https://sites.nationalacademies.org/SSB/index.htm**
- ***Christine Mirzayan Fellowship*: for current graduate students and those <5 years of Ph.D. https://sites.nationalacademies.org/pga/policyfellows/**

Robin Canup, Southwest Research Institute
Phil Christensen, Arizona State University

Decadal Survey in Planetary Science and Astrobiology

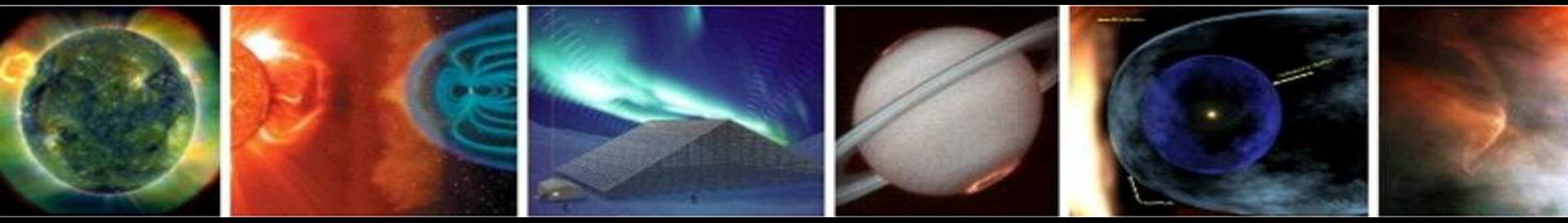
Steve Squyres, Blue Origin



Decadal Survey in Planetary Science

Dan Baker, University of Colorado

Decadal Survey in Solar and Space Physics



The 2013-2022 NRC Decadal Survey in Solar and Space Physics (Heliophysics)

Daniel N. Baker, University of Colorado, Chair

National Academy of Sciences, Engineering, and Medicine (NASEM) Report

Characteristics of Study

- Study initiated in Fall 2010.
- National in scope, including NASA, NSF, NOAA and DoD investments in solar and space physics
- Review was community based
  - 300 white papers with ideas and new concepts
  - Numerous town-hall meetings and workshops
  - 85 NRC-appointed participants
  - 18 Steering Committee members
- Recommended program fit to available resources.
  - Cost and technical evaluation (CATE) of selected NASA reference mission concepts performed by the Aerospace Corp., which worked under contract with the NRC.
- Considered challenging financial constraints

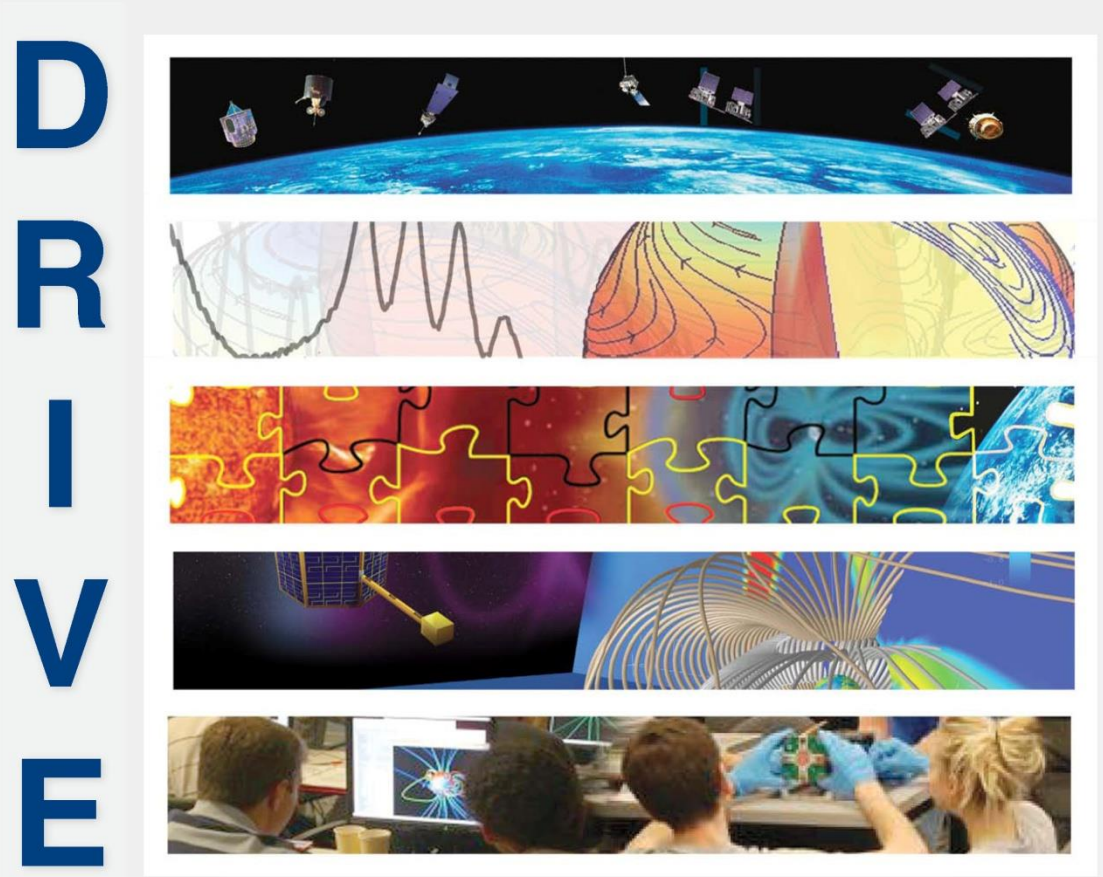
Overarching Goals

for a Decade of Discovery

- Determine the origins of the Sun's activity and predict the variations of the space environment.
- Understand the dynamics and coupling of Earth's magnetosphere, ionosphere, and atmosphere and their responses to solar and terrestrial inputs.
- Determine the interaction of the Sun with the solar system and the interstellar medium.
- Discover and characterize fundamental processes that occur both within the heliosphere and throughout the universe.

Summary for NASA (in order of priority)

1. Complete implementation of missions that were previously selected
2. Initiate the DRIVE program
3. Execute a robust Explorer program
4. Launch strategic missions in the reinvigorated Solar Terrestrial Probe (STP) line and in the Living With a Star (LWS) line to accomplish the committee's highest-priority science objectives. (This includes first the notional IMAP investigation and then DYNAMIC and MEDICI in the STP program and GDC as the next larger-class LWS mission).



Diversify observing platforms with microsatellites and mid-scale ground-based assets

Realize scientific potential by sufficiently funding operations and data analysis

Integrate observing platforms and strengthen ties between agency disciplines

Venture forward with science centers and instrument and technology development

Educate, empower, and inspire the next generation of space researchers

Accelerate and Expand the NASA Heliophysics Explorer Program

- The recommended augmentation of the Explorer line allows for missions in a restored MIDEX line to be deployed in alternation with SMEX missions at a 2-3 year cadence; also allows regular selection of Missions of Opportunity (MOOs).

Restructure Solar-Terrestrial Probes as a Moderate-scale PI-led Line

- NASA's Solar Terrestrial Probes program to be restructured as a moderate-sized, competed, principal investigator-led (PI-led) mission line that is cost-capped at ~$500 million per mission in fiscal year 2012 dollars including full lifecycle costs.

Space Weather Recommendations (prioritized)

1. Re-charter the National Space Weather Program
2. Multi-agency Partnership for Solar/Solar Wind Observations
   - L1 Solar Wind (DSCOVR, IMAP)
   - Coronagraph and Solar Magnetograph
   - Evaluate New Observations and Platforms
   - Establish a Space Weather Program for Effective Research to Operations Transition at NOAA
   - Establish Distinct Programs for Space Physics Research and Space Weather Forecasting and Specification

National Space Weather Action Plan

A National Space Weather Action Plan (NSWAP) establishes a process to implement the National Space Weather Strategy

The NSWAP establishes specific activities with:

- implementation timelines
- detailed actions
- specific agency assignments

Summary of Survey

The 2013-2022 Decadal Survey:

- Fit the 2012 fiscal boundary;
- Focused both on research and its **societal impact**;
- Endeavored to empower the community to innovate, take advantage of the unique constellation of missions and data available now and to **study the coupled domains of heliophysics *as a system***;
- Strove to build on the community's strength and to facilitate development of cost-effective PI-class missions; and
- Recommended exciting missions of historical significance that held tremendous promise for new discoveries that could also **serve powerfully the needs of Space Weather**.

Lessons Learned (Heliophysics)

1. Charter and Survey Initiation
   - Agency alignment and adoption
   - International involvement
   - Comprehensive task definition
   - Academy member involvement
2. Study Phase and Report Preparation
   - CATE as mission existence proof (not point design)
   - Avoid “current-year syndrome”
   - Proactive and effective staffing (minimizing delays)
   - Worry about unintended consequences
3. Report Rollout and Recommendation Promotion
   - Dangers of agency (or congressional office) misalignment
   - Study “shelf life” (2-3 years) must be recognized
   - Worked generally OK, but could better engage community

Recommendation: Have your Vice Chair appointed NASA AA

Key Strategy Point

Plans are useless—Planning is indispensable

General Dwight D. Eisenhower

Thank you.

Assessment

The 2013-2022 Decadal Survey:

- Joined Astro and Planetary decadal surveys in facing challenges to implementation;
- Was restrained by budget inaction of NASA, OMB, Congress;
- Required intervention by NASA leadership to improve prospects of key forward motion;
- Still needs continued community pressure to assure action on larger goals in the designated decadal interval; and
- Also demands reinvigoration of the National Academy processes in the present budgetary and political climate.

Waleed Abdalati, University of Colorado
William Gail, Global Weather Corporation

Decadal Survey in Earth Science and Applications from Space

Thank You

Decadal Surveys
http://sites.nationalacademies.org/SSB/SSB_052297

The Space Studies Board
http://sites.nationalacademies.org/SSB/index.htm