Earth Science and Applications from Space

(http://qp.nas.edu/decadalssurvey)

AMS/AGU/UCAR Heads and Chairs
12 October 2006
Boulder, CO
Long ago and far away....
ESAS Charge

• Recommend a prioritized list of flight missions and supporting activities to support national needs for research and monitoring of the dynamic Earth system during the next decade.

• Identify important directions that should influence planning for the decade beyond.

*Sponsors: NASA SMD, NOAA NESDIS, USGS Geography*
Organization of Study

• Executive Committee (18 members)
• Seven Thematically-Organized Panels
  1. Earth Science Applications and Societal Needs
  2. Land-use Change, Ecosystem Dynamics and Biodiversity
  3. Weather (incl. space weather and chemical weather)
  4. Climate Variability and Change
  5. Water Resources and the Global Hydrologic Cycle
  6. Human Health and Security
  7. Solid-Earth Hazards, Resources and Dynamics
Executive Committee

- Rick Anthes, UCAR, co-chair, atmospheric science
- Berrien Moore, U. New Hampshire, co-chair, biogeochemical cycling
- Jim Anderson, Harvard, atmospheric science, chemistry
- Bruce Marcus, TRW (ret), remote sensing
- Bill Gail, Ball Aerospace, civil space and transition to operations
- Susan Cutter, U. South Carolina, hazards and risk
- Tony Hollingsworth, ECMWF, weather forecasting
- Tony Janetos, Heinz Center, ecology and land remote sensing
- Kathie Kelly, U. Washington, physical oceanography/satellite obs
- Neal Lane, Rice, policy
- Warren Washington, NCAR, climate
- Mary Lou Zoback, USGS, solid earth
- Ruth DeFries, U. Maryland, land cover change and remote sensing
- Susan Avery, CIRES and CU, meteorology, space weather
- Eric Barron, Penn State, climate, paleoclimate
- Dennis Lettenmaier, U. Washington, hydrology
- Mark Wilson, U. Michigan, infectious disease and remote sensing
- Brad Hager, MIT, solid earth
1. Identify needs and opportunities for observations from space to advance Earth science and applications for the next decade and beyond;

2. Propose programs or missions to meet these needs and opportunities, in priority order;

3. Describe each proposed mission in terms of
   • Contributions to science and applications
   • How it meets prioritization criteria
   • Benefits to society
   • Technical aspects
   • Schedule
   • Costs

4. Briefly identify needs for obs that are needed to complement space-based obs

5. Identify essential other components (telemetry, data processing, management and stewardship)
Criteria for Prioritization

• Contributes to the most important scientific questions facing Earth sciences today (scientific merit-discovery, exploration);
• Contributes to applications and policy making (societal benefits);
• Contributes to long-term observational record of the Earth;
• Complements other observational systems, including national and international plans;
• Affordable (cost considerations, either total costs for mission or costs per year);
• Degree of readiness (technical, resources, people);
• Risk mitigation and strategic redundancy (backup of other critical systems);
• Makes a significant contribution to more than one thematic application or scientific discipline.

Above not in priority order
Interim Report (April 2005)

- Overriding Concern: Absence of Plans for Future Research Missions (Mission Queue)
- Consequences of canceled, descoped, and delayed missions: LDCM, OVWM, GIFTS, Glory (APS and TIM), WSOA, and GPM
- Delays in Explorer (Earth System Science Pathfinder) line
- Steps to ensure climate data records
- Technology base to support new missions, for example:
  - InSAR
  - Wide-swath ocean altimetry
  - Measurement from space of tropospheric winds

Recommendations related to above
Since the Interim Report
Since the Interim Report...

- Major problems with NPOESS
  - Delays of several years
  - Descoping
    - Many instruments lost
    - Reduction of satellites from 6 to 4
  - Doubling of cost to ~11.5B

- Major problems with GOES (Hyperspectral sounder eliminated)

- NASA terminates two more missions and delays 2 others
  - DSCOVR (Deep Space Climate Observatory, fmr Triana)
  - HYDROS
  - GPM Delayed 2.5 years—may be cancelled
  - NPP Delayed 1.5 years
  - R&A cuts 15+% 

- NASA Administrator remarks on university scientists and students, resignation of Kennel, Huntress, Levy from NASA Science Advisory Committee
Number of U.S. space-based Earth Observations missions in the current decade. Emphasis on climate and weather is evident as is the decline in number of missions near the end of the decade. Information was obtained from NASA and NOAA websites for mission durations. For the period from 2007 – 2010, missions were generally assumed to operate for four years past their nominal
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The NASA budget for Earth science research and application demonstrations for the period 1996 to 2010 (in fixed 2006-year dollars).
The NOAA NESDIS budget for Earth applications and research for the period 1996 to 2010 (in fixed 2006-year dollars)
Remaining Schedule

- Report to reviewers ~Oct 20
- Reviews back ~Nov 20
- Dec 06 Final report