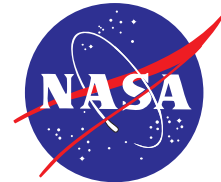


NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

Principal Areas of Focus

NASA's Earth science programs are essential to the implementation of three major Presidential initiatives: Climate Change Research (June 2001), Global Earth Observation (July 2003), and Ocean Action (December 2004). The first is the subject of the Climate Change Science Program and this document. The second is related, and focuses on national and international coordination of Earth observing capabilities to enhance their use in meeting important societal needs. The third uses NASA's observing technologies and knowledge of Earth as a system to advance ocean research and applications with partner agencies.



NASA Earth science programs are aimed at understanding the Earth system and applying Earth system science to improve prediction of climate, weather, and natural hazards in partnership with other Federal agencies and international space and research programs. NASA's *Research Strategy* orchestrates observing and modeling programs to address the question "How is the Earth changing, and what are the consequences for life on Earth?" Five subordinate questions describe NASA's Earth system science approach via a paradigm of variability, forcing, response, consequence, and prediction:

- How is the global Earth system changing?
- What are the primary causes of change in the Earth system?
- How does the Earth system respond to natural and human-induced change?
- What are the consequences of change in the Earth system for human civilization?
- How well can we predict future changes in the Earth system?

NASA's portfolio includes observations, research, analysis, modeling, and advanced technology development, in order to answer selected science questions, and benchmarking decision support resources to ensure society receives the benefits of this research.

NASA pioneered the interdisciplinary field of Earth system science, which explores the interaction among land, oceans, atmosphere, ice, and life. To study these interactions, NASA has developed and deployed the Earth Observing System (EOS) and related satellites, and suborbital and surface-based sensors—collecting, processing, archiving, and distributing these data through the EOS Data and Information System (EOSDIS). EOSDIS is the largest "e-science" system in the world. In 2004, EOSDIS was accessed by over 2 million distinct users, with over 200,000 users receiving 34 million data products. Following the Earth system science construct, NASA has organized its research into six science focus areas. The table on the facing page identifies these six areas and how they align with the CCSP research elements.

Program Highlights for FY 2006

In FY 2006, NASA will make significant progress in three high-priority CCSP research areas: aerosols, carbon, and polar regions. NASA will begin routine acquisition and analysis of data on the three-dimensional structure of clouds and aerosols in the atmosphere from the Cloudsat and Calipso satellites. NASA will continue to be a leader in the North American Carbon Program (NACP), contributing to

Appendix

CCSP RESEARCH ELEMENTS	NASA EARTH SCIENCE FOCUS AREAS
Atmospheric Composition	Atmospheric Composition
Climate Variability and Change	Climate Variability and Change
Global Water Cycle	Global Water and Energy Cycle
Land-Use/Land-Cover Change Global Carbon Cycle Ecosystems	Carbon Cycle and Ecosystems
Human Contributions and Responses	
	Weather
	Earth Surface and Interior

the observations, field campaigns and experiments, and model development needed to reduce scientific uncertainties of carbon sources and sinks in North America. NASA will continue development and scientific preparations for space-based measurements of global atmospheric carbon to detect global carbon dioxide sources and sinks worldwide. NASA will continue to develop new ways to measure sea-ice thickness using ICESat data and new innovative instrumentation currently under development. NASA will develop new observations and models of other critical polar processes to better understand their behavior and interactions with global climate.

NASA will implement a recently restructured computational Earth system modeling program through an open, competitive process to focus its efforts on the key science challenges of the decade ahead. NASA will also implement computational modeling efforts, selected through similar competitive processes, to exploit its new Project Columbia—the second largest supercomputing cluster in the world (behind IBM’s Blue Gene).

In FY 2006, NASA will make further strides in enhancing Earth observation and monitoring. NASA and the National Polar-orbiting Operational Environmental Satellite System (NPOESS) Integrated Program Office will complete development of the NPOESS Preparatory Project Mission for launch in early FY 2007. This satellite mission will extend key measurements from NASA’s Terra and Aqua satellites as well as demonstrate new remote-sensing instruments for NPOESS. Following the path of Cloudsat and Calipso, three new satellites will be under development to observe atmospheric carbon dioxide, global ocean surface salinity, and global soil moisture. NASA will continue its work through the Interagency Working Group on Earth Observations to transition responsibilities for mature measurements to operational systems to assure long-term data continuity.

Related Research

NASA’s other science focus areas (Weather, Earth Surface and Interior, and Sun-Earth Connection) seek to understand and predict Earth system change. The NASA-sponsored Socio-Economic Data Center

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(SEDAC) archives and distributes data used in CCSP's Human Dimensions research area. NASA also manages an Earth Science Applications program in partnership with other Federal agencies, State and local governments, academia, and industry to test new uses of remote-sensing data to solve practical societal problems in twelve applications of national priority:

<u>National Application</u>	<u>Partner Agencies</u>
Renewable Energy	DOE, EPA
Agricultural Efficiency	USDA, EPA
Carbon Management	USDA, EPA, DOE, USGS, USAID
Aviation	DOT/Federal Aviation Administration
Homeland Security	Department of Homeland Security, National Governors Association, USDA, USGS, NOAA, DOD
Ecological Forecasting	USGS, USDA, USAID
Disaster Preparedness	Federal Emergency Management Agency, USGS, NOAA, USDA
Public Health	Centers for Disease Control, DOD, NIH, EPA, USGS, NOAA
Coastal Management	NOAA, EPA
Invasive Species	USGS, USDA
Water Management	Bureau of Reclamation, USGS, EPA, USDA
Air Quality	EPA, NOAA, USDA, DOT/Federal Aviation Administration

