

# Appendix A

## DEPARTMENT OF COMMERCE

---



### Principal Areas of Focus

The National Oceanic and Atmospheric Administration (NOAA) and the National Institute of Standards and Technology (NIST) comprise the Department of Commerce contribution to the CCSP.

NOAA's climate mission is to "understand climate variability and change to enhance society's ability to plan and respond." This is an end-to-end endeavor whose overall objective is to provide decisionmakers with a predictive understanding of the climate and to communicate climate information so that the public can incorporate it into their decisions. These outcomes are achieved through implementation of a global observing system, focused research to understand key climate processes, improved modeling capabilities, and the development and delivery of climate information services. NOAA aims to achieve its climate mission and outcomes through the following objectives:

- Describe and understand the state of the climate system through integrated observations, monitoring, and data management
- Understand and predict climate variability and change from weeks to decades to a century
- Improve the ability of society to plan for and respond to climate variability and change.

NOAA relies on its Federal, academic, private, and international partners to achieve its objectives. These objectives are implemented through three distinct, yet integrated, programs: Climate Observation and Monitoring, Climate Research and Modeling, and Climate Services Development.

NIST provides measurements and standards that support accurate and reliable climate observations. NIST also performs calibrations and special tests of a wide range of instruments and techniques for accurate measurements. In FY 2009, NIST is included as a discrete element of the CCSP cross-cut to provide specific measurements and standards of direct relevance to the program.

### Program Highlights for FY 2009

#### National Oceanic and Atmospheric Administration

##### *Climate Observation and Monitoring*

The Climate Observation and Monitoring Program develops and sustains integrated atmospheric, oceanic, and Arctic observation networks, primarily *in situ*, and maintains consistent and long-term archive and access to historical climate data. Examples of NOAA observation networks include the U.S. Climate Reference Network and the carbon dioxide (CO<sub>2</sub>) baseline observatories, including Mauna Loa and South Pole stations. NOAA routinely provides climatological information, such as basic statistics and extremes, based upon extended records usually greater than 30 years in length. The program has two basic capabilities: observations (atmosphere, oceans, and forcing), and data management and information. These capabilities taken together increase the value and utility of both *in situ* and satellite observations, improve the performance of models, and reduce the uncertainty of predictions. The program contributes to the national and global objectives outlined in the *Strategic Plan for the Climate Change Science Program*, as well as NOAA's Strategic Plan, the *Strategic Plan for the U.S. Integrated Earth Observation System (IEOS)*, and the *Global Earth Observation System of Systems (GEOSS) 10-Year Implementation Plan*.

Activities in FY 2009 will:

- Create a scientific data stewardship plan to generate, analyze, and archive data from climate satellite sensors in long-term climate data records
- Maintain the Global Ocean Observing System (GOOS)
  - Sustain progress toward completing the U.S. contribution to the international GOOS
  - Continue technology refresh to replace obsolete components of the Tropical Atmosphere Ocean Array, a critical El Niño-Southern Oscillation climate observing system
- Maintain the U.S. Climate Reference Network and continue the installation of soil moisture sensors at 114 stations in support of the National Integrated Drought Information System
- Continue to re-measure key ocean properties along cross-sections in the South Atlantic and North Pacific that were last measured in 1989 and 1991, respectively, via the Repeat Hydrography Program
- Continue to maintain and update Carbon Tracker, the combined measurement and modeling system that keeps track of the emissions (“sources”) and removal (“sinks”) of atmospheric CO<sub>2</sub> globally
- Integrate the North American Carbon Program and relevant aspects of the Ocean Carbon and Climate Change Program to better quantify and understand the carbon budget of North America and adjacent ocean basins, including terrestrial, freshwater, oceanic, and atmospheric sources and sinks that influence atmospheric CO<sub>2</sub> and methane (CH<sub>4</sub>).

### *Climate Research and Modeling*

The Climate Research and Modeling Program assimilates observations to produce retrospective and current analyses of climate conditions, examines the attribution of climate events, and develops models to make climate predictions and projections relevant to users. The program draws upon three capabilities: understanding climate processes; Earth system modeling, predictions, and projections; and analysis and attribution. The program maintains a suite of operational climate outlooks and strives to implement the next-generation operational climate outlooks and assessments by improving climate models, improving forecast generation techniques, and maintaining real-time climate monitoring data sets. Two essential components of the program are the global climate analysis data sets generated by synthesizing diverse data sources using state-of-the-art forecast models, and the regular and systematic attribution of causes of past, current, and evolving climate conditions using modern climate diagnostic techniques.

Activities under this program leverage an extensive array of peer-reviewed, university-based competitive research activities to understand atmospheric and oceanic processes, both natural and human-related. Research may be directly applied to climate projection and to policy decisions, and provides timely and adequate information.

This program provides the Nation with a seamless suite of environmental forecasts and projections from intraseasonal to multidecadal time scales and regional to global spatial scales. The program helps regional and national managers to better plan for the impacts of climate variability, and to provide climate assessments and projections to support policy decisions with objective and accurate climate change information.

Activities in FY 2009 will:

- Continue model experiments and paleoclimate research on potential mechanisms, patterns, causes, and impacts of abrupt climate change events
- Support research to assess the Atlantic Meridional Overturning Circulation variability and its implications for rapid climate change

## Appendix A

- Continue to construct high-quality reanalysis of the coupled ocean-atmosphere system from the start of the satellite era (late 1970s) through 2007
- Provide global climate analyses required to describe major features of 20th century climate and the capacity to address the causes of observed regional climate variations under the project Explaining Climate to Improve Predictions (ECIP)
- Study the interactions between aerosols and non-CO<sub>2</sub> gases, enhanced measurements of atmospheric water vapor, and interactions of pollutants with climate change
- Continue to focus on the calibration and validation of research-mode ensemble forecasting techniques for surface and subsurface hydrological parameters, especially on longer seasonal time scales
- Complete a coupled ocean/sea-ice model based on new ocean model code base
- Complete a high spectral resolution radiation model for use in next-generation attribution
- Continue to understand the transport and properties of absorbing aerosols and their precursors to the Arctic polar region in an effort to quantify the contribution of absorbing aerosols to the melting of Arctic ice
- Continue analysis of isotopes and other tracers to quantify the uptake of anthropogenic CO<sub>2</sub> by the global ocean and its distribution within the ocean's interior
- Improve the representation of two key processes in climate models in order to predict the future magnitudes of the two largest global carbon sinks: fertilization of forests by increasing atmospheric CO<sub>2</sub>, and draw-down of carbon in the Southern Ocean resulting in its storage in intermediate and deep waters.

### *Climate Services Development*

The Climate Services Development Program assesses impacts of climate variability and change, supports regional adaptation strategies, and develops climate information products and tools appropriate for evolving user needs. The program supports decisionmakers by providing information to improve management of the sectors and geographic areas that are sensitive to impacts from weather and climate. Management issues include annual losses from droughts and floods, heat and cold waves, the positive and negative impacts of El Niño and La Niña events, sea-level rise, and other high-impact climate events. The information the program provides includes assessments, supporting data sets, and stakeholder-driven research and applications.

The program addresses an increased demand for traditional climate services such as data and forecast dissemination and customer support, as well as identifying and satisfying new requirements for information on long-term climate trends; linkages between climate variability, climate change, and weather extremes; assessments of vulnerability; and decision support in sectors such as drought and water management, fire, emergency preparedness, health, transportation, energy, coastal, urban, and ecosystem management. Demand for increased services is met through research of decisionmaker needs, prototype product development, transition of research products into operations, and operational delivery and support. The National Integrated Drought Information System (<[www.drought.gov](http://www.drought.gov)>) is a new example of NOAA's leadership in the development of issue-focused climate services.

The program links producers and users of climate information, allowing decisionmaker-inspired creation of new knowledge, processes, tools, and products to improve planning, risk management, resource allocation, impacts assessment, adaptation, mitigation, early warning, and operational response in sectors sensitive to climate variability and change. The program relies heavily on NOAA's extensive U.S. infrastructure with more than 150 offices at the national, regional, and local levels contributing.

The program also leverages partners at the international, national, regional, State, and local levels, as well as academia.

Activities in FY 2009 will:

- Develop decision-support tools, such as climate-fisheries models and web-based climate-agriculture tools
- Increase the understanding of regional climate impacts through basic and applied research and diagnostic and modeling studies
- Develop methodologies and decision-support tools focused on sea-level rise, extreme events and community planning, climate and integrated ecosystem management, climate extension in coastal regions, and climate and urban drainage systems
- Continue—through the Regional Integrated Sciences and Assessments Program—to enhance integration of regional programs with applied research capabilities to strengthen end-to-end development and provision of climate information services
- Continue to develop the National Integrated Drought Information System
  - Continue development of the U.S. Drought Portal in conjunction with Federal partners (USGS, NASA, and USDA) and non-Federal partners (Drought Mitigation Center and the Earth Systems Integrated Enterprise)
  - Continue development of the next-generation Climate Forecast System (CFS) and of a multi-model ensemble prediction system with CFS to accelerate the transition of research advances to new and improved objective drought monitoring and prediction products.

## **National Institute of Standards and Technology**

NIST provides measurements and standards that support accurate and reliable climate observations. In FY 2009, NIST will address critical gaps in climate change science that are limiting long-term climate policy decisionmaking by:

- Resolving discrepancies in satellite measurements of radiation, including solar irradiance, reflected solar radiation, outgoing longwave radiation, and surface radiation
- Providing critical information about aerosols and atmospheric components believed to play a major role in global climate change.