

Subactivity: Weather and Air Quality Research
Line Item: Laboratories & Cooperative Institutes

GOAL STATEMENT:

NOAA's Weather and Air Quality Research Programs are conducted towards fulfillment of two goals: (1) to provide the Nation with more accurate and timely warnings and forecasts of: (a) weather events, particularly high-impact weather events that disrupt economic productivity and cause loss of life and property, and (b) air quality, particularly ozone and aerosols (particulate matter) that impact human health and (2) to provide the scientific basis to develop public policy for air quality.

BASE DESCRIPTION:

The Weather and Air Quality Research objectives for the laboratories and cooperative institutes are to provide theoretical frameworks, remote sensing technologies, and scientific understanding to: (1) develop and assess new, cost-effective atmospheric observing systems; (2) develop data acquisition, management, analysis, and display systems; (3) develop and verify numerical models and other techniques to provide prediction guidance for all types of weather, particularly high-impact events; and (4) transfer research results to both aid the research and policy communities and improve operational warnings and forecasts. Included in the four activities are: daily and extreme weather forecasts; air quality forecasts; and crosscuts of weather, air quality, and climate change.

Improved forecasts and warnings require more frequent and higher-density observations, faster communications, and better local data-handling systems. NOAA has implemented a major capital investment that substantially upgrades its ability to collect weather data. In support of this modernization effort, research is needed to improve the spatial and temporal resolution of remote observations of the atmosphere and to integrate the resulting data into descriptions of the atmosphere for use in weather forecasting research and operations. The primary research activities currently include:

- Development of dual-polarization, phased-array, and multi-frequency Doppler radars and passive radiometers to study convective storms, in order to improve rainfall estimates, to detect damaging winds and tornadoes;
- Improvement of short-range (1-12 hour) forecasting by the development and evaluation of new local data system technologies and techniques;
- Incorporation of satellite-observed wind profile data into forecast models to determine whether the accuracy of weather forecasts is improved;
- Transition hurricane model and forecast decision aide improvements to operations;
- Development and transition to operational use air quality forecasting capabilities to include additional key pollutants (e.g., particulate matter) and extend forecast lead times;
- Identification and policy-relevant explanation of key atmospheric causes of serious air pollution problems;
- Accelerate improvements in medium range (3-14 day) numerical weather prediction;

- Development of improved atmospheric profiling systems to continuously measure vertical profiles of wind speed and direction, temperature, and humidity using ground and satellite-based remote sensing; and
- Development of advanced light detecting and ranging systems and infrared Doppler multi-frequency radars as research tools to improve our knowledge of atmospheric winds, turbulence, aerosols, and moisture processes.

Base activities support the objective, “Advance understanding and predict changes in the Earth’s environment to meet America’s economic, social, and environmental needs” under the Department of Commerce Strategic Goal of “Observe, protect, and manage the Earth’s resources to promote environmental needs.”

Previously, the LIDAR research activity at the Earth Systems Research Laboratory (ESRL) /Physical Sciences Division was carried under the Laboratories and Cooperative Institutes line item of the Ocean, Coastal, and Great Lakes subactivity. However, that work subsequently has been identified as being more closely aligned with the Coastal Estuaries and Oceans (CEO) program in the Weather and Water Goal via discussions between the scientists and managers involved in this program and the affected strategic goal and program leads. Accordingly, the resources for this research activity are being transferred in base to the Laboratories and Cooperative Institutes line item in the Weather and Air Quality Research budget subactivity. This will co-locate ESRL’s LIDAR research with its other CEO activities already carried under this line item.

PROPOSED LEGISLATION:

None.

SUMMARIZED FINANCIAL DATA

(Dollars in thousands)

Subactivity: Weather and Air Quality Research	FY 2005 ACTUALS	FY 2006 CURRENTLY AVAILABLE	FY 2007 BASE PROGRAM	FY 2007 ESTIMATE	INCREASE / DECREASE
Line Item: Laboratories & Cooperative Institutes					
Laboratories & Cooperative Institutes	34,278	35,641	35,838	38,258	2,420
NOAA Joint Institute for Northern Gulf of Mexico	-	2,959	-	-	-
TOTAL	34,278	38,600	35,838	38,258	2,420
FTE	167	178	182	182	-

Note: The dollars in this table represent budget authority.

PROGRAM CHANGES FOR FY 2007:

Earth System Research Laboratory: Regional Air Quality Assessments (+ 0 FTE, +\$2,420,000): NOAA requests an increase of 0 FTE and \$2,420,000 for a series of comprehensive Air Quality (AQ) regional assessments that will characterize atmospheric processes that are key causes of air quality problems. The centerpiece of each assessment is a comprehensive month-long field experiment that will measure many aspects of weather and air quality in a region with serious AQ problems. Each assessment provides both general and region-specific information to air quality decision-makers, including policy-makers at all levels of government, enabling them to develop plans that protect both public health and economic vitality. NOAA’s assessments also provide essential information for improving and evaluating numerical models of air pollution that are used to predict unhealthy conditions and evaluate potential policies. The regional assessment will be a collaborative effort among multiple institutions, including NOAA Laboratories (administered by the Earth System Research Laboratory), NOAA Marine and Aircraft Operations, NOAA joint institutes, the U.S. Environmental Protection Agency (EPA), other government agencies, and university grantees.

Background: More than a third of the U.S. population lives in areas where air pollution levels exceed EPA’s health-based standards. It is well known that air pollution, such as ozone and particulate matter (PM), can cause respiratory problems. (This discussion refers to ozone near the ground where it can be inhaled. High concentrations of such low-level ozone can be harmful. This is different from the “beneficial” ozone 30 miles up that shields the surface from ultraviolet radiation). There is now growing evidence that particulate matter, including dust, soot, and sulfates, can also trigger cardiac problems—often leading to premature deaths. The personal and economic consequences to the Nation are enormous (annually, an estimated 40,000 deaths caused by PM, up to \$150 billion in costs due to air pollution health effects, and more than \$20 billion for air pollution controls). NOAA serves two essential roles in the Nation’s response to AQ problems.

These regional assessments support both of NOAA's roles. First, NOAA serves as an "honest broker," providing objective scientific information to regulatory agencies, regulated parties, and other stakeholders about the causes of unhealthy air pollution—information that is necessary for making well informed decisions that balance society's many interests. The effectiveness of current air quality policies and strategies is, to a large extent, limited by the lack of a quantitative and area-specific understanding of the complex relationships among weather, atmospheric chemistry, and surface exchange that lead to unhealthy air pollution episodes. Its breadth of capability in all areas of atmospheric sciences and its lack of an air quality regulatory role make NOAA uniquely qualified to provide an integrated and trusted view of the atmospheric processes that control the formation and distribution of air pollution. Second, NOAA and EPA have signed a Memorandum of Agreement to implement an air quality forecasting program that will help communities take measures to protect public health when high pollution levels are expected. NWS is initiating air quality forecasts in phases with expanding geographic coverage, number of pollutants predicted, and length of forecast. OAR is working closely with NWS to ensure that reliable air quality forecast models are available to support these new capabilities.

Proposed Actions: The requested funding will allow OAR to develop and apply advanced particulate-matter instrumentation in biennial assessments to characterize the sources and processes responsible for the emission, atmospheric formation, growth, and transport of PM. Between field experiments, NOAA will develop new instruments to measure key characteristics of particulate matter, such as concentrations, composition, and transformation rates. This requires accurate measurements of minute quantities, such as masses of a microgram per cubic meter. Once developed and tested, these instruments will be deployed during month-long field experiments to best study processes that are important in a region. Often, instruments will be placed on an aircraft to obtain measurements at different altitudes and across a region. This allows the transport of pollutants over long-distances to be studied and regional averages and variability to be studied. Results from the field studies will be analyzed to obtain insights into the key drivers of air quality problems. Key findings will be reported to air quality decision-makers, policy-makers, and environmental managers in a form that enables them to understand and apply new scientific insights.

In response to a growing understanding of the relationships between air quality and climate (e.g., particulate matter in the air affects the amount of radiation that reaches and heats the ground), NOAA's air quality and climate programs will jointly conduct assessments. This will allow the information needs of both programs to be cost-effectively satisfied from the same field experiments and provide common datasets for evaluating air quality-climate relationships.

Benefits: This research will provide a comprehensive characterization of the atmospheric processes contributing to serious air quality problems. This characterization will provide factual information about air quality to decision-makers. Prior studies have generated significant economic and health benefits for the Nation. Discoveries NOAA made in 2000 allowed the State of Texas to develop a less onerous pollution control strategy that still protected public health while also saving the state more than \$9 billion and 64,000 jobs by 2010.

Earlier NOAA air quality assessments contributed to a National Research Council determination that the billions of dollars the Nation was spending to reduce tropospheric ozone levels were ineffectual because they were targeting the wrong precursor chemical. Those results changed the Nation’s entire approach to reducing ground-level ozone levels.

NOAA’s regional assessments also provide crucial information about atmospheric processes for evaluating and improving NOAA’s air quality forecasting capability. Understanding processes that control particulate matter formation, transport, and fate is essential for creating accurate PM forecast models, which will lead to more accurate PM forecasts.

Performance Goals and Measurement Data:

This increase will support the objective, “Advance understanding and predict changes in the Earth’s environment to meet America’s economic, social, and environmental needs” under the Department of Commerce Strategic Goal of “Observe, protect, and manage the Earth’s resources to promote environmental stewardship.” Specifically, this increase supports the “Improve accuracy and timeliness of weather and water information” performance outcome. The following performance measures support the NWS FY07 budget submission for air quality forecast accuracy target of 90%.

Performance Outcome: Improve accuracy and timeliness of weather and water information

Performance Measure	2007 w/o Incr.	2007 with Incr.
Increase the cumulative number of regions with serious air quality problems for which comprehensive air quality assessments have been completed.	1	2
The number of peer-reviewed articles accepted for publication in a year will meet or exceed the following goals:	13	15
Increase the number of atmospheric processes that are key causes of air quality problems that can be characterized in regional assessments.	12	13

TERMINATIONS FOR 2007: The following programs, or portions thereof, are terminated in FY 2007: Weather & Air Quality Research Laboratories & Cooperative Institutes (\$4,303,000); Laboratories & Cooperative Institutes (\$1,344,000); NOAA Joint Institute for Northern Gulf of Mexico (\$2,959,000).

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Subactivity: Weather and Air Quality Research
Line Item: U.S. Weather Research Program

GOAL STATEMENT:

The overarching goal of the United States Weather Research Program (USWRP) - THORPEX is to accelerate improvement of our forecasting capability for high-impact and severely disruptive weather--in particular, improvement in forecast timing, location, and specific rainfall amounts associated with hurricane landfall and flood events that significantly affect the lives and property of U.S. inhabitants through use of improvement in observation techniques.

BASE DESCRIPTION:

U.S. Weather Research Program: NOAA proposed to consolidate in the FY 2006 NWS President's Request the small part of USWRP / THORPEX that was funded in the FY 2005 OAR budget. In the FY 2006 Appropriation, Congress accepted this consolidation. In addition, Targeted Wind Sensing has been moved to the Weather and Air Quality Research Partnership Programs line item, which is a more appropriate location for this program.

PROPOSED LEGISLATION:

None.

SUMMARIZED FINANCIAL DATA

(Dollars in thousands)

Subactivity: Weather and Air Quality Research	FY 2005 ACTUALS	FY 2006 CURRENTLY AVAILABLE	FY 2007 BASE PROGRAM	FY 2007 ESTIMATE	INCREASE / DECREASE
Line Item: U.S. Weather Research Program					
U.S. Weather Research Program (USWRP) (THORPEX)	493	-	-	-	-
Targeted Wind Sensing	1,971	1,972	-	-	-
Hurricane Research and Model Improvements	699	-	-	-	-
TOTAL	3,163	1,972	-	-	-
FTE	5	-	-	-	-

PROGRAM CHANGES FOR FY 2007:

None.

Subactivity: Weather and Air Quality Research
Line Item: Weather & Air Quality Research Programs

GOAL STATEMENT:

The strength of NOAA Research is that it does not operate in isolation but rather in partnership with a multitude of external experts in its fields of research. These partnerships extend to other parts of NOAA; other Federal, state, and local government entities; universities; and industry. The contribution of the unique strengths of each partner greatly enhances the accomplishments of NOAA Research.

BASE DESCRIPTION:

Tornado/Severe Storm Research (Phased-Array Radar): NOAA is developing new technologies for forecasting and detecting tornadoes and other forms of severe weather and to disseminate this information to emergency managers, the media, and the general public for appropriate action. Phased-array radar has the potential to significantly extend lead times for tornadoes and other forms of severe and hazardous weather. Faster scan rates can reduce the time it takes to make a complete Doppler radar observation from six minutes to less than one minute. Coupled with artificial-intelligence-based decision-support systems, tornado lead times could be almost doubled from 12 to 22 minutes.

Major components of this program are continued research support and the construction of and experimentation with a phased-array research testbed at the National Severe Storms Laboratory (NSSL) in Norman, OK. Congress established a joint R&D program for NOAA, DOD, and FAA to investigate the feasibility and benefits of using military phased- array radars for improving severe weather forecast and warning systems. U.S. Navy SPY-1 Phased-Array Radar technology holds considerable promise for making significant improvements to the existing WSR-88D system. Using multiple beams and frequencies, The SPY-1 Phased-Array Radar reduces the scan time for severe weather from six minutes to less than one minute, which can lead to increased lead times for warnings of tornadoes and other forms of hazardous weather. NOAA/NSSL is designated to operate and maintain the equipment, provide facilities, approve associated research, and otherwise assist in all related efforts that may arise.

Base activities support the objective, “Advance understanding and predict changes in the Earth’s environment to meet America’s economic, social, and environmental needs” under the Department of Commerce Strategic Goal of “Observe, protect, and manage the Earth’s resources to promote environmental needs.”

PROPOSED LEGISLATION:

None.

SUMMARIZED FINANCIAL DATA

(Dollars in thousands)

Subactivity: Weather and Air Quality Research	FY 2005 ACTUALS	FY 2006 CURRENTLY AVAILABLE	FY 2007 BASE PROGRAM	FY 2007 ESTIMATE	INCREASE / DECREASE
Line Item: Weather & Air Quality Research Programs					
Tornado Severe Storm Research / Phased Array Radar	1,971	3,945	958	2,972	2,014
Coordinate NASA-NOAA Severe Storm R&D	-	1,972	-	-	-
TOTAL	1,971	5,917	958	2,972	2,014
FTE	-	2	2	2	-

Note: The dollars in this table represent budget authority.

PROGRAM CHANGES FOR FY 2007:

Tornado/Severe Storm Research (Phased-Array Radar (+0 FTE and \$2,014,000)). NOAA requests an increase of 0 FTE and \$2,014,000 to build upon its progress in developing new technologies for forecasting and detecting tornadoes and other forms of severe weather and disseminating this information to emergency managers, the media, and the general public for appropriate action.

Background: This program was requested by the President and first funded by Congress in FY 2003. Major accomplishments have been the construction of a phased array radar test-bed at the National Severe Storms Laboratory in Norman, OK and the establishment of a joint R&D program for NOAA, DOD, and FAA to investigate the feasibility and benefits of using military phased-array radars for improving severe weather forecast and warning systems. A U.S. Navy SPY-1 Phased-Array Radar (PAR) has been acquired, installed, and put into a research mode at NSSL. Early tests of the phased array radar system are proving promising, and the technology has the potential to vastly improve the NEXRAD system for all weather radar applications.

Using multiple beams and frequencies that are controlled electronically, phased-array radar reduces the scan time of severe weather from six minutes for NEXRAD radar to only one minute, producing quicker updates of data and, thereby, potentially increasing the lead time for tornado warnings well beyond the current average of 11 minutes. Other technology being developed at NSSL will extend lead times even farther.

Proposed Actions: A National Weather Radar Testbed is now being established at NSSL. The additional \$2 million requested for FY 2007 and future years will provide the first surveillance phased-array radar facility available on a full-time basis to the radar meteorological research community. The new system will be able to scan the atmosphere with more detail at lower elevations than current radar allows. It will also be able to re-scan areas of severe weather very quickly, improving forecasters' warning capability.

In addition, the new technology will gather storm information not currently available, such as rapid changes in wind fields, to provide forecasters with better conceptual storm models and to initialize storm-scale forecast models.

A unique Federal, private, state, and academic partnership will develop the phased-array radar technology. Participants include NOAA's National Severe Storms Laboratory and National Weather Service Radar Operations Center, Lockheed Martin, U.S. Navy, University of Oklahoma's School of Meteorology and School of Electrical and Computer Engineering, Oklahoma State Regents for Higher Education, the Federal Aviation Administration, and basic commerce and industries.

Benefits: Phased-array radar has the potential to significantly extend lead times for tornadoes and other forms of severe and hazardous weather. Faster scan rates can reduce the time it takes to make a complete Doppler radar observation from six to less than one minute. Coupled with artificial-intelligence-based decision-support systems, tornado lead times could be almost doubled from 12 to 22 minutes, helping to greatly reduce the loss of life from these storms.

TERMINATIONS FOR 2007: The following programs, or portions thereof, are terminated in FY 2007: Tornado Severe Storm Research/Phased Array Radar (\$2,957,000).

Subactivity: Weather and Air Quality Research
Line Item: Other Partnership Programs

GOAL STATEMENT:

The strength of NOAA Research is that it does not operate in isolation but rather in partnership with a multitude of external experts in its fields of research. These partnerships extend to other parts of NOAA; other Federal, state, and local government entities; universities; and industry. The contribution of the unique strengths of each partner greatly enhances the accomplishments of NOAA Research.

BASE DESCRIPTION:

The Other Partnership Programs line item contains various programs initiated by Congress. NOAA Research manages these programs in a manner that leverages their objectives consistent with key NOAA mission responsibilities and requirements.

PROPOSED LEGISLATION:

None.

SUMMARIZED FINANCIAL DATA

(Dollars in thousands)

Subactivity: Weather and Air Quality Research	FY 2005 ACTUALS	FY 2006 CURRENTLY AVAILABLE	FY 2007 BASE PROGRAM	FY 2007 ESTIMATE	INCREASE / DECREASE
Line Item: Other Partnership Programs					
New England Air Quality Study	1,971	2,959	-	-	-
NE Center for Atmospheric Science and Policy	1,479	1,480	-	-	-
Inst. For Study of Earth, Oceans & Space (AirMap - CCRC)	4,930	4,931	-	-	-
Risk Reduction in Water Forecasts (MSU)	1,971	1,972	-	-	-
Remote Sensing Research (ISU/BCAL)	487	493	-	-	-
STORM (U. of N. Iowa)	640	641	-	-	-
Central CA Air Quality Study	-	370	-	-	-
Great Plains Center for Atmosphere and Human Health	-	986	-	-	-
Urbanet	-	5,917	-	-	-
High Altitude Air Study	-	346	-	-	-
Reducing Wind-Induced Damages from Storms	-	986	-	-	-
TOTAL	11,478	21,081	-	-	-
FTE	3	-	-	-	-

PROGRAM CHANGES FOR FY 2007:

TERMINATIONS FOR 2007: The following programs, or portions thereof, are terminated in FY 2007: Other Partnership Programs (\$25,025,000); New England Air Quality Study (\$2,959,000); NE Center for Atmospheric Science and Policy (\$1,480,000); AIRMAP (\$4,931,000); Risk Reduction in Water Forecasts (\$1,972,000); Remote Sensing Research (\$493,000); STORM (U. of N. Iowa) (\$641,000); Central CA Air Quality Study (\$370,000); Great Plains Center for Atmosphere and Human Health (\$986,000); Urbanet (\$5,917,000); High Altitude Air Study (\$346,000); Reducing Wind-Induced Damages from Storms (\$986,000); Targeted Wind Sensing (\$1,972,000); Coordinate NASA-NOAA Severe Storm R&D (\$1,972,000).