THE FEDERAL WEATHER ENTERPRISE

Fiscal Year 2019 Budget and Coordination Report

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The Federal Weather Enterprise:

Fiscal Year 2019 Budget and Coordination Report

FEDERAL COORDINATOR FOR METEOROLOGICAL SERVICES AND SUPPORTING RESEARCH

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Preface

This year's Budget and Coordination Report continues in the streamlined format introduced last year, with the addition of a strategic view of the Federal Weather Enterprise's coordination efforts.

Section 1 describes the coordinating mechanisms and efforts at work within the FWE. The efforts of the committees and working groups which address interagency concerns are highlighted against the goals of the Federal Plan for Strategic Weather Coordination, which was published this past fall at the direction of the Federal Committee for Meteorological Services and Supporting Research (FCMSSR). The full Strategic Plan, along with information on the individual proceedings of the FCMSSR, committees, and working groups, can be found on OFCM's website.

Section 2 of this report provides agency budget summaries, with the FY19 figures in Table 1 reflecting the most recent President's Budget Request. The presentation here is intended to satisfy the requirements of Public Law 87-843, Section 304, which requires an annual cross-agency look at resources applied to meteorological services and supporting research. Table 2 displays interagency transfers related to meteorological issues. The tables are accompanied by brief descriptions from each agency, highlighting selected budget elements.

We at OFCM are particularly excited to be able to issue this edition of the Report in the spring. This will be the annual goal, and we hope that it will enhance the Report's utility.

Thank you to our agency partners for their continued contributions to the coordination efforts within the Federal Weather Enterprise, and for their timely technical assistance in preparing this Report.

William Schulz
Federal Coordinator for Meteorological Services and Supporting Research

Purpose

This annual report is prepared for delivery to the Office of Management and Budget and the Congress to satisfy the requirements of PL 87-843 section 304. It consists of two main sections. Section 1 is a description of the Federal weather coordination structure and the ongoing collaborative efforts supporting the goals and objectives of the Strategic Plan for Federal Weather Enterprise (FWE) Coordination. Section 2 consists of the meteorological services and/or supporting research funding requested by and assigned to the Federal Weather Enterprise. The budgetary information in this section provides a 'horizontal' look at the meteorological funding requested in the current President's Budget Request and the funding enacted over the previous two fiscal years.

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Federal Coordination and Planning for Meteorological Services and Supporting Research

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The mission of the Office of the Federal Coordinator for Meteorological Services and Supporting Research (OFCM) is to foster the effective use of federal meteorological resources by encouraging and facilitating the systematic coordination of weather services and supporting research across the Federal Weather Enterprise.

The OFCM operates with policy guidance from the Federal Committee for Meteorological Services and Supporting Research (FCMSSR). The principal work in coordinating meteorological activities and in the preparation and maintenance of OFCM reports, plans, and other documents is accomplished by the OFCM staff with the advice and assistance of the Interdepartmental Committee for Meteorological Services and Supporting Research (ICMSSR) and 18 program councils, committees, working groups, and joint action groups. The individuals who serve on these coordination entities are federal agency representatives.

Statutory Basis for the Federal Coordination Process

Congress directed in Section 304 of Public Law 87-843 (the Appropriations Act for State, Justice, Commerce, and Related Agencies) the Bureau of the Budget prepare an annual horizontal budget for all meteorological programs in the federal agencies. The Bureau of the Budget (now the Office of Management and Budget, OMB) issued a set of ground rules to be followed in the coordination process. The Bureau tasked the Department of Commerce (DOC) to establish the coordinating mechanism in concert with the other Federal agencies. It also reaffirmed the concept of having a central agency—the DOC—responsible for providing common meteorological facilities and services and clarified the responsibilities of other agencies for providing meteorological services specific to their mandated missions.

The implementation of these directives by DOC led to the creation of the OFCM and the appointment of the first Federal Coordinator for Meteorological Services and Supporting Research (the Federal Coordinator). FCMSSR was established in 1964 to provide policy-level agency representation and guidance to the Federal Coordinator in addressing agency priorities, requirements, and issues related to services, operations, and supporting research.

FCMSSR comprises representatives of the 15 Federal agencies that engage in meteorological activities or supporting research, have a major need for meteorological services, or set policy and direction for such services and research. These 15 agencies are the Departments of Agriculture (USDA), Commerce (DOC), Defense (DOD), Energy (DOE), Homeland Security (DHS), Interior (DOI), State (DOS), and Transportation (DOT); the Environmental Protection Agency (EPA), National Aeronautics and Space Administration (NASA), National Science Foundation (NSF), National Transportation Safety Board (NTSB), Nuclear Regulatory Commission (NRC); OMB and the Office of Science and Technology Policy (OSTP). The Under Secretary of Commerce for Oceans and Atmosphere, who is also the Administrator of the National Oceanic and Atmospheric Administration (NOAA), serves as the FCMSSR Chairperson.

OFCM Coordinating Infrastructure

The Federal Meteorological Coordinating infrastructure diagram (Figure 1) shows the current committees, working groups (WGs), and joint action groups (JAGs) through which OFCM carries out its mission. FCMSSR is shown at the top of the diagram as the policy guidance advisor to its subordinate elements and the Federal Coordinator.

Image from NOAA's National Severe Storms Lab.
Image has been cropped from the original.

Program councils are executive bodies that coordinate the acquisition and management of cross-agency systems or important, broad initiatives. Working groups are intended to serve enduring coordination functions. Joint action groups are temporary elements established to address specific, short-term objectives.

The program councils, committees, working groups, and joint action groups operate at the executive, management, and subject matter expert levels to provide

1. A forum for reporting activities, challenges, and achievements;
2. A mechanism for coordinating change and solving problems;
3. A method for collecting, documenting, and consolidating agency requirements and inventories;
4. A body for coordinating cross-agency system development;
5. A vehicle for collaborating with other groups internal and external to the coordinating infrastructure; and
6. A mechanism for preparing studies, agreements, standards, protocols, reports, and national plans.

Using these multiagency groups, OFCM pursues the following objectives as the means to achieve its mission:

- Coordinating the exchange of information, plans, and concerns among the FWE agencies, to help the Nation get the most effective use from the $5.3 billion collectively spent annually by the partner agencies.
- Coordinating Federal agency efforts toward achieving strategic coordination goals and objectives, as outlined in the Strategic Plan for Federal Weather Enterprise Coordination
- Producing and maintaining foundational meteorological documents including Federal Meteorological Handbooks and the National Hurricane Operations Plan.

Goals and Objectives of the Strategic Plan for Federal Enterprise Weather Coordination (FY2018-2022)

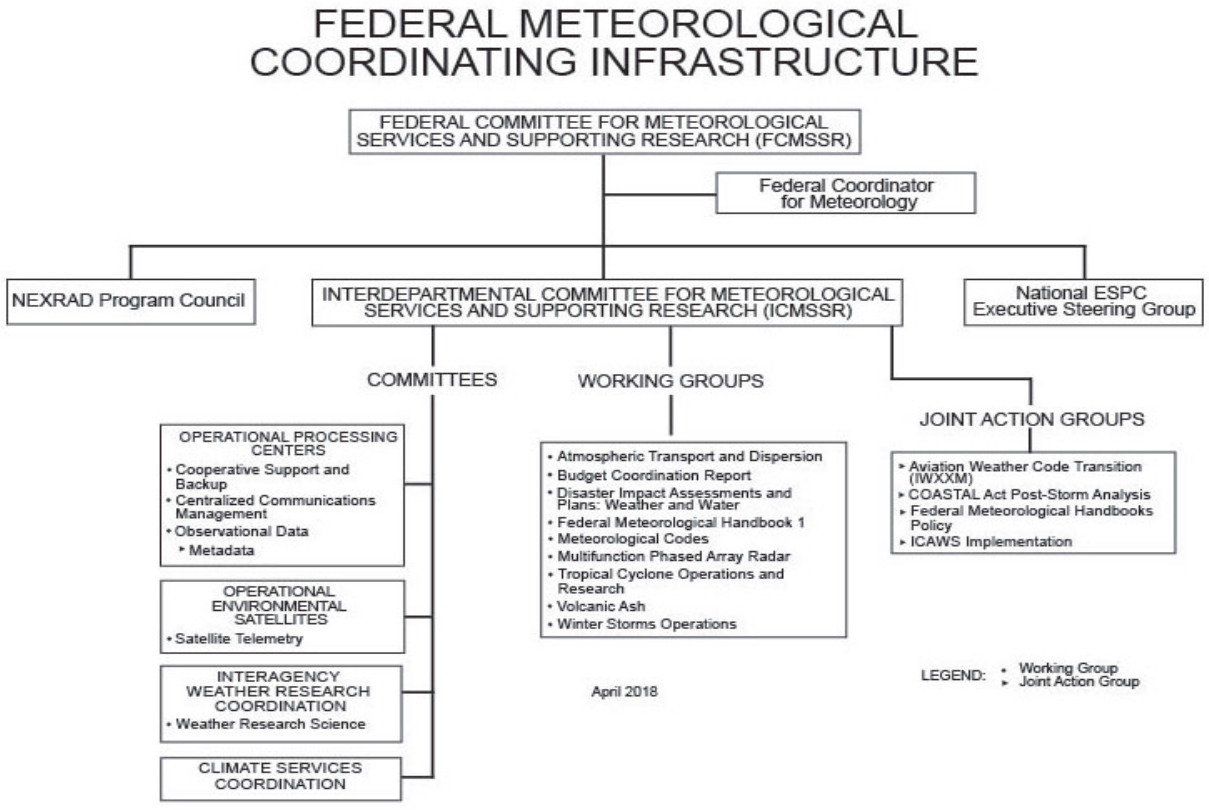

Figure 1: The Federal Coordinating Infrastructure.

The Strategic Plan for Federal Weather Enterprise Coordination describes six coordination goal areas, each with several objectives that were determined by the FCMSSR to be areas readily benefited by interagency coordination. The goals and objectives are as follows:

1. Observing Capabilities

1.1: Enable interagency discussions of observation system acquisition at the capability planning stage.

1.2 Provide forums to discuss and promote development, deployment, and sustainment of common-use systems through formalized interagency processes.

1.3 Coordinate data formatting, processing, communication, management, and stewardship standards to optimize the exchange, timeliness, usability, and value of earth observations.

1.4 Coordinate the development of new observing technology and technology to extract information from observations.

2. Forecasting Processes

2.1 Strengthen interoperability among interagency forecasting centers in producing accurate, timely, and precise weather products, information, and services.

2.2 Ensure interagency utility (data types, precision, web services, etc.) of short-term to long-term forecasts.

2.3 Support agency efforts to plan and develop the cooperative use of processing resources to increase the Nation's computing power for enhancing data assimilation and modeling systems.

3. Decision support products, information, services

3.1 Coordinate interagency outreach efforts to identify weather and water-related information needs for decision making and risk management.

3.2 Improve the consistency of decision support and risk management products, information, and services across the FWE.

3.3 Cross feed processes and lessons learned between agencies to improve decision support tools.

4. Research

4.1 Exercise leadership in coordinating U.S. efforts in international weather research priorities including the current World Meteorological Organization Grand Challenges.

4.2. Foster interagency collaboration of research initiatives starting at the planning stage.

4.3 Support efforts among FWE participants to coordinate task definition and sponsorship of National Academies research initiatives.

4.4 Expand interagency use of data and information for research.

5. Workforce management

5.1 Coordinate Office of Personnel Management definitions and requirements for meteorology-related positions to ensure appropriate education and experience of the FWE workforce.

5.2 Coordinate opportunities to leverage outreach, including education efforts, recruiting, and diversity and inclusion initiatives.

5.3 Cross feed information on career path planning, training opportunities, diversity and inclusion, professional development, and retention programs.

6. Messaging priorities and needs

6.1 Coordinate input about FWE priorities to the Executive and Legislative branches, including communicating these priorities to federal agencies that are not FWE participants.

6.2 Coordinate messaging about FWE priorities to academia, professional and industry associations, non-federal governmental entities, and the general public.

Coordination Goal and Objective Activities

This section describes the Enterprise's efforts in support of these goals. Groups that have taken actions applicable to the goals and objectives are listed, followed by bulleted descriptions of their actions. Since this plan was published within the last few months, not every area has been addressed and therefore several groups have been omitted and some goals activities are not represented. We expect these gaps will be filled over the life of the strategic plan. The matrix in Appendix A summarizes the groups addressing these goals and objectives.

Detailed descriptions of the committees, working groups, and joint action groups, including records of

their meetings, are available at the OFCM Groups web page.

Interdepartmental Committee for Meteorological Services and Supporting Research (ICMSSR)

- Provided the National Weather Service a platform to organize a response to the Seasonal to Sub-Seasonal provisions of P.L.15-25 and how they affect the FWE. (Objective 2.2)
- Discussed the potential resource challenges required to fully exploit exascale computing. This level of computing capability will serve to dramatically improve National Earth System Prediction Capability. (Objective 2.3)
- Provided a primary means to coordinate interagency outreach for Impact-Based Decision Support Services (IDSS). (Objective 3.1)
- Provided an interagency perspective on the FWE to various groups from academia (BASC), professional associations such as the American Meteorological Society (AMS), non-fed government entities (Commercial groups), and the general public. (Objective 6.2)
- Continuing to support the Government Accountability Office (GAO) R 10-799 recommendation 3. GOES-R program updates are annually briefed to the interagency partners of the FWE through the ICMSSR and Committee for Operational Environmental Satellites. (Objective 1.1)
- Examining how to best coordinate U.S. position on WMO issues (Objective 4.1)
- Coordinating with the Interagency Coordinating Committee for Airborne Geoscience Research and Applications (ICCAGRA) to provide high-level interagency visibility into efforts to develop and share capabilities to advance meteorological research. (Objective 4.2)
- Developing a coordinated position on the OPM qualification standards for series 1340 – Meteorologist. (Objective 5.1)

Joint Action Group for the Federal Plan Revision (JAG/FPR)

- Drafted the initial version of a 4-year (FY18-FY22) Strategic Plan for Federal Meteorological Coordination for the Federal weather enterprise. (Objective 6.1)
- Produced a structure and timeline for the FY19 annual report on Federal meteorological coordination in support of the Strategic Plan and a transitional FY18 Annual Report—a streamlined version of the traditional, annual Federal Plan for Meteorological Services and Supporting Research (FedPlan). (Objective 6.1)

Committee for Operational Processing Centers (COPC)

Working Group for Cooperative Support and Backup (WG/CSAB)

- Coordinated a solution for distributing the Himawari-8 data from the National Centers for Environmental Prediction (NCEP) across the COPC Network circuits to improve the IA posture, utilize the increased Navy bandwidths, and provide a more reliable data exchange. (Objective 1.2)
- Coordinated each Operational Processing Center's (OPC) GOES-R (16) data implementation strategy and the transition to GOES-East. (Objective 1.2)
- Coordinated the OPC's need for the Meteosat-8 move to Indian Ocean Area and the transition from Meteosat-10 to Meteosat-11. (Objective 1.2)
- Coordinated the DOD OPC's data exchange for satellite data from the USAF's MARK IVB capability. (Objective 1.2)
- Worked to implement the data exchange with the OPCs through the NWS-Telecommunications Gateway (NWS-TG) move from Silver Spring to a primary in College Park and a backup in Boulder. (Objective 1.3)
- Worked to implement the satellite data exchange with the OPCs through the NESDIS new enterprise Product Dissemination and Access (PDA) capability. (Objective 1.3)
- Documented the OPCs' cooperative support and outage mitigation mechanisms to assist in coordinating, preparing, and maintaining operations, and for identifying processes to reduce impacts from emergency outages. (FCM-P14-2018). (Objective 2.1)

Working Group for Centralized Communications Management (WG/CCM)

- Establishing a new fiber connection between the NOAA Satellite Operations Facility (NSOF) building and the National Maritime Intelligence Center (NMIC) building for moving forward with Mission Partner Gateway (MPG) implementation at the primary NOAA to DOD data exchange point. (Objective 2.1)

- Supporting and monitoring the DOD's Joint Information Environment-Joint Regional Security Stack (JIE-JRSS) implementation for potential latency impacts. (Objective 2.1)

Working Group for Observational Data (WG/OD)

- Participated in the operational test and evaluation and successful implementation of High Resolution, Binary Universal Form Representation (BUFR) Radiosonde (RRS) data made available in real time on the Global Telecommunications System for U.S. stations. (Objective 1.2)
- Continued to coordinate the U.S. implementation of data management procedures in response to the WMO migration from Traditional Alphanumeric Code (TAC) forms to BUFR formatted meteorological data. (Objective 1.3)
- Assumed the lead role in the U.S. implementation of the WMO Integrated Global Observing System and the Observing Systems Capability Analysis and Review tool (WIGOS and OSCAR/Surface), the future observing framework in support of weather, climate, water and relevant environment services—a WMO priority. (Objective 1.3)
- Initiated a coordinated effort to develop a U.S. systematic approach for assigning new U.S. WIGOS station identifiers, addressed a number of other data quality and data accessibility issues, and implemented an OPC-collaborative observational data quality control process for metadata error discovery, reporting, tracking, and correction. (Objective 1.3)
- Coordinated testing of the Critical Infrastructure Protection satellite data services system that functions as a transparent backup for the most critical Earth System Prediction Capability data services. (Objective 1.3)
- Coordinated data access and preparation for Jason-2, Sentinel-3A, GOES-16 (R), and Meteosat-8 satellites. (Objective 1.3)
- Tracked and routinely satisfied Operational Processing Center requests for satellite data. (Objective 1.3)

Committee for Operational Environmental Satellites (COES)

- Reviewed potential satellite data sources from India to support national security needs for observation of the Indian Ocean and surrounding territories. (Objective 3.1)
- Coordinated with NASA on user interests regarding Time-Resolved Observations of Precipitation structure and storm Intensity with a Constellation of Smallsats (TROPICS) and Plankton, Aerosol, Cloud, ocean Ecosystem (PACE) missions. (Objective 4.2)
- Coordinated with NOAA's Center for Satellite Applications And Research (STAR) to provide insight to STAR capabilities to support interagency research and operational needs. (Objective 4.4)
- Coordinating NOAA, USAF, and NASA efforts to obtain and evaluate commercial weather satellite data sources. (Objective 1.2)

Interagency Weather Research Coordination Committee (IWRCC)

- Re-chartered in 2017 to work within the Federal Weather Enterprise to "promote and help coordinate basic and applied U.S. research activities aimed at a getter fundamental understanding and improved prediction" of important atmospheric phenomena. (Objective 4.1)
- Established the Weather Research Science Working Group (SWG), composed of academic and other scientific community experts in the fields under IWRCC's areas of focus (i.e. High Impact Weather, Polar Prediction, and Seasonal forecasting.) (Objective 4.2)
- Developing a coordination process which will increase visibility among agencies of priorities and projects, with specific focus on the WMO focus areas of High-Impact Weather, Polar Prediction, and Seasonal to Sub-seasonal forecasting. (Objective 4.1)
- Developing a collaboration process to include sharing of interagency research priorities and to look for synergistic partnerships. (Objective 4.2)

National Earth System Prediction Capability (ESPC), Executive Steering Group

- Coordinated the development of a 63 member multi-model (from multiple agencies) ensemble, forecasting out to 16 days; and is planning to extend to a 32 day forecast in the coming year. (Objective 2.3)
- Amended its charter to align under the Federal Weather Enterprise, and to mandate regular communication with the National Science and Technology Council's Committee on Environment, Natural Resources, and Sustainability. (Objective 4.2)

- Established an ESPC working group to examine Exascale Computing Issues and needs. (Objective 4.2)
- Submitted a "Position Paper on High Performance Computing Needs in Earth System Prediction" to National Science Foundation, advocating for a shift in processor design to increase emphasis on memory bandwidth so that Earth system models run more efficiently. (Objective 4.2)
- Conducted an interagency workshop on "Metrics and Post-Processing for Subseasonal-to-Seasonal Forecasts". (Objective 4.2)
- Published an article in the Bulletin of the AMS "The National Earth System Prediction Capability: Coordinating the Giant," which informed the greater meteorological community of ongoing federal coordination efforts in extended range forecasting. (Objective 6.2)
- Coordinated with the National Academies of Sciences, Engineering and Medicine and drew from the National Academies' 2016 Consensus Study Report "Next Generation Earth System Prediction: Strategies for Subseasonal to Seasonal Forecasts." (Objective 6.2)
- Initiated plans for an inter-governmental workshop on the "Building an Interannual to Decadal (2-30 year) Prediction/Projection Capability for Decision Support" in July. (Objective 6.2)
- Working toward Common Model Architecture policies and standards, and towards producing a multi-model (from multiple agencies) ensemble for sub-seasonal to seasonal prediction. (Objective 2.3)
- Updating a joint roadmap describing an overarching investment strategy of earth system developmental and operational activities(Objective 2.3)

NEXRAD Program Council

- Conducting a manpower review of the Radar Operations Center, jointly manned by NWS and U.S. Air Force. (Objective 5.1)

Working Group for Disaster Impact Assessments and Plans: Weather and Water Data (WG/DIAP)

- Coordinated interagency wind and water data collection responses to landfalling hurricanes Harvey, Irma, Jose, and Maria, for use in federal, private sector, and academic post-storm investigations and research. (Objectives 1.3, 3.2, 4.4)
- Assessed glacier dammed lake flooding potential on the Kenai Peninsula, AK, damage assessments resulting from several tornado outbreaks in TX and GA, and flooding of the Tetlin Road, Fairbanks AK. (Objectives 1.3, 3.2, 4.4)

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Joint Action Group for the COASTAL Act Post-Storm Analysis (JAG/CAPSA)

- Assisted NOAA to coordinate development of the Coastal Wind and Water Event Database to meet the requirements of the COASTAL Act. (Objective 1.3)
- Supported NOAA efforts to develop the Named Storm Event Model (NSEM) which will ingest a wide variety of observational data to produce inland flooding and inundation analyses for COASTAL Act cases. (Objective 1.4)
- Facilitated interagency coordination in support of the development of the Named Storm Event Model (NSEM) and examined required computer, data assimilation, and model architectures(Objective 2.3)
- Facilitated discussion between NOAA and FEMA to determine the post-storm assessment output needed to be incorporated in the "COASTAL Formula" to determine the extent to which water vs. wind contributed to the destruction (thereby determining the cost responsibility between the National Flood Insurance Program and private home insurers). (Objective 3.1)
- Assisted NOAA and FEMA in determining what products and information services would be made available from the execution of the COASTAL Act. (Objective 3.2)
- Facilitated open dialog between the federal agencies and academic partners in developing decision support tools required by the COASTAL Act. (Objective 3.3)
- Coordinating the acquisition of data via USGS storm tide gauges and Digital Hurricane Consortium mobile meteorological systems. (Objective 1.1)
- Coordinating weather and hydrological products, information and services needed to meet the requirement of the COASTAL Act. (Objective 2.1)

Working Group for Meteorological Codes (WG/MC)

- Coordinated U.S. proposals to the WMO Interprogramme Expert Team on Codes Maintenance (IPET-CM)WMO for table-driven code forms, the Manual on Codes, and the interoperability of metadata and data between WMO standards and formats. (Objective 1.4)

Working Group for the Space Weather Enterprise Forum (WG/SWEF)

- Initiated plans to conduct the SWEF as a public meeting on Capitol Hill to provide congressional members and the public insights on the need for space weather services and supporting research to mitigate the impacts of space weather on vulnerable, essential technological infrastructure. (Objectives 6.1, 6.2)

Satellite Telemetry Interagency Working Group (STIWG)

- Working to coordinate the use of OpenDCS software used by agencies to collect, validate, and disseminate data from Data Collection Platforms (DCP's); primarily via GOES DCS. (Objective 1.3)
- Pursuing opportunities to educate public about GOES DCS, spectrum allocation, growing number of GOES transmitting platforms, the consequences of interference to ground stations by terrestrial radio towers. (Objective 6.2)

Working Group/Tropical Cyclone Operations and Research (WG/TCOR)

- Conducted the 2018 Tropical Cyclone Operations and Research Forum (TCORF) / Interdepartmental Hurricane Conference. Participants of the annual TCORF review the National Hurricane Operations Plan and the hurricane forecasting and warning program. (Objectives 1.2, 2.1, 4.2)
- Reached agreement to modify aerial weather reconnaissance message formatting leading to improvements to data transmission and utilization. (Objective 1.3)

Joint Action Group for Federal Meteorological Handbook Number 1 (JAG/FMH-1)

- Coordinated the need for software updates on the Automated Surface Observing System (ASOS) to accommodate new cloud height observing standards. (Objective 1.2)
- Coordinated new standards for surface weather observing and published a revised Federal Meteorological Handbook for the FWE. (Objective 1.3)

Joint Action Group for Aviation Weather Code Transition (JAG/AWCT)

- Coordinating federal agency efforts for transitioning aviation weather codes from the Traditional Alphanumeric Character (TAC) format to an extensible mark-up language (xml) based code generally referred to as the ICAO Meteorological Information Exchange Model (IWXXM). (Objectives 1.3, 3.2)

Agency Funding for Meteorological Services and Supporting Research: Resource Information and Agency Program Updates

2

The narratives and tables in this section summarize selected budgetary information for the Federal government for fiscal years (FY) 2017 through 2019. The funds shown are used to provide meteorological services and associated supporting research, which includes research and development with service improvements as their direct objectives. Fiscal data are current as of the end of March 2018 and are subject to later changes. The data for FY 2019 are derived from the President's Budget Request for FY 2019 and thus do not have legislative approval and do not constitute a commitment by the United States Government. The data for FY 2017 represents enacted (congressionally approved) funding amounts. The data for FY 2018 represents an annualized funding estimate under a Continuing Resolution. At the time this report was prepared the FY 2018 omnibus appropriations bill had not yet passed. The budget data are submitted by each agency or entity and prepared by the Office of the Federal Coordinator for Meteorological Services and Supporting Research (OFCM) in compliance with Section 304 of Public Law 87-843, in which Congress directed that an annual horizontal budget, across Federal departments and agencies, be prepared for meteorological programs conducted by the Federal agencies.

Department of Agriculture

The Department of Agriculture's (USDA) budget request for meteorological operations and supporting research for FY 2019 is $109.5 million, a 2.8% decrease from the FY 2018 funding level. The decline is largely due to a nearly 6% decrease in the request for funding by the National Institute of Food and Agriculture (NIFA) for its research and development programs, combined with a requested drop of about 3% in research funding for the Agricultural Research Service (ARS). This decrease offset a modest increase in the budget request by the Forest Service (FS) for its Wildland Fire and Weather programs. Other agencies saw no change in their year-to-year funding requests.

- USDA has requested $89.2 million for research and development programs, about $3.2 million less than in 2018, due the aforementioned requests from NIFA and ARS. NIFA funding commonly supports weather and climate research initiatives, including drought and water quality issues facing our Nation's producers. ARS, the USDA's principal in-house scientific research agency, conducts research on how to cope with annual variations of weather on crop and animal production, ecosystem services, and the environmental and economic sustainability of agricultural enterprises.
- The FY 2019 amount requested by USDA for meteorological operations is approximately $20.3 million, virtually unchanged from the funding level in FY 2018. Operational activities include specialized weather observing networks such as the SNOTEL (SNOw pack TELemetry) network operated by the Natural Resources Conservation Service (NRCS) Snow Survey and Water Supply Forecasting program (SSWSF) and the Remote Automated Weather Stations (RAWS) network managed by the Forest Service. The SNOTEL and RAWS networks provide cooperative data for NOAA's river forecast activities, irrigation water supply estimates, and Bureau of Land Management operations. The SSWSF program, managed by the NRCS National Water and Climate Center, provides western states and Alaska with information on future water supplies. The Forest Service uses meteorological data and interpretation skills data for decision making regarding wildland fire management. The meteorological staff of the Office of the Chief Economist's World Agricultural Outlook Board (OCE/WAOB) routinely collects global weather

Image of a tree on fire in Montana on August 30, 2006, from NOAA's Flickr site. Image cropped from original.

data and agricultural information to assess the impact of growing season weather conditions on crops and livestock production prospects, keeping USDA commodity analysts, the Chief Economist, and the Secretary of Agriculture and top staff well informed of weather impacts on crops and livestock worldwide. The Risk Management Agency (RMA) provides administration and oversight of programs authorized under the Federal Crop Insurance Act. RMA's Strategic Data Acquisition and Analyses (SDAA) unit works with Oregon State University's Parameter-Elevation Regressions on Independent Slopes Model (PRISM) Climate Group to develop and utilize spatial climate data sets to detect potential waste, fraud and abuse in the Federal crop insurance program and to assist underwriting in developing crop suitability mapping.

Reference: 2019 USDA Budget Congressional Justifications

USDA Budget Explanatory Notes for Committee on Appropriations

2019 President's Budget Office of the Chief Economist

Department of Commerce/ National Oceanic and Atmospheric Administration

National Weather Service

The National Weather Service (NWS) funding request for the FY 2019 President's Budget totals $1.1 billion. This is a 5.5% decrease from the FY 2018 annualized continuing resolution. NWS provides weather, water, and climate forecasts and warnings for the United States, its territories, adjacent waters, and ocean areas for the protection of life and property and the enhancement of the national economy, 24 hours every day. NWS is the sole, official and authoritative U.S. voice for issuing warnings during life-threatening weather situations. With this request, NOAA proposes to focus on the core weather mission with more efficient processes to provide forecasts and warnings. NWS will also continue to pursue the NWS Weather-Ready Nation goals including activities to sustain forecast accuracy and consistency.

Significant requested increases and decreases in funding from the FY 2018 annualized continuing resolution level included below were derived based on complex decisions and may affect more than one program.

Increase for the Refreshment of Advanced Weather Interactive Processing System (AWIPS). NOAA requests an increase of $5.1 million to fully fund the cyclical refreshment of AWIPS Information Technology hardware. AWIPS integrates and displays meteorological, hydrological, satellite, and radar data at NWS field offices. AWIPS enables increasingly accurate weather predictions and dispenses time-sensitive, highly reliable warnings and advisories. With this increased funding, NWS will reduce risk by achieving cyclical hardware replacement every three-to-five years.

Reduce Surface and Marine Observations. NOAA requests a decrease of $15.5 million to reduce the scope and operations of surface and marine observation platforms. NOAA will focus on surface observations with the National Mesonet program in highest priority geographic areas, and will eliminate NOAA support of the NOAA Water Level Observation Network (NWLON) and the U.S. Geological Survey Seismic network in Alaska and Hawaii. NOAA will also eliminate seven marine buoys in the Weather and Ocean Platform network that are farthest from U.S. shores in the Atlantic and Pacific Oceans and that are most costly to operate. NOAA will eliminate 15 of 55 buoys in the Tropical Atmosphere Ocean array. Finally, NOAA will terminate targeted water level and seismic observations that support the Tsunami program.

NWS Workforce Savings. NOAA requests a decrease of $15.0 million to reduce the number of Analyze, Forecast and Support personnel by 248 positions (110 FTEs) by implementing recommendations outlined in the NWS's Operations and Workforce Analysis (OWA). The OWA recognized inherent inefficiencies in the rigid field office structure. NWS will begin implementing a series of operational reforms aimed at increasing staffing flexibility to best match service demands with available resources. To enable these reforms, NOAA will implement three operational changes: increase flexibility while streamlining administrative processes at NWS offices, incorporate collaborative forecast processes and technological innovations while changing the forecasters' career paths to unlock current resources to meet demand, and by varying office sizes to best match the needs of the local public and its many partners given available resources rather than follow the current uniform staffing model.

Reduce the Tsunami Warning Program. NOAA requests a decrease of $11.0 million to streamline the Tsunami Warning program by merging the Pacific Tsunami Warning Center (PTWC) in Hawaii and the National Tsunami Warning Center (NTWC) in Alaska. NOAA will prioritize functions that provide the observational infrastructure, capabilities, and staff

to produce timely and accurate tsunami warnings, watches, and advisories. The reduction will limit support for tsunami monitoring and reporting, modeling research, and support to partners.

Reduce Service Life Extension Program for NEXRAD. NOAA requests a decrease of $16.3 million reflecting a planned program decrease for the Service Life Extension Program (SLEP) to sustain aging Next Generation Weather Radar (NEXRAD) infrastructure. The proposed funding also reflects an additional $4.4 million in reductions to the Observation Portfolio. The Service Life Extension Program (SLEP) will extend the useful life of the NEXRAD array by approximately 15 years. Refurbishing the existing system is a cost effective approach to preserving this $3.1 billion capital investment[1]. Investment in this SLEP mitigates high operational risk by extending the useful life of the radars.

Reduce Science and Technology Integration Investments. NOAA requests a total decrease of $14.4 million as a result of reprioritization and deceleration of programs within the Science and Technology Integration portfolio. NOAA also proposes to decelerate investment in transition of numerical weather prediction modeling research advancements into improved operational warnings and forecasts, and to reduce the investment in the National Water Model. NOAA will slow down the development of the Next Generation Global Prediction System (NGGPS) by reducing support to unified data assimilation, reducing collaborative research for the Hurricane Forecast Improvement Project (HFIP), and slowing the effort to transition new physics into the global and hurricane forecast systems. NOAA will slow upgrades to the National Water Model resulting in re-phasing the development of centralized water prediction products and services at the National Water Center.

Reduce High Performance Computing Contributions. NOAA requests a decrease of $8.2 million that will eliminate funding for the "Jet" supercomputing system and contract support in Boulder, CO, and to reduce the NWS supercomputing use and contract support in Fairmont, WV. Major transition projects including hurricane forecast improvement, the Next Generation Global Prediction System, and storm surge modeling will need to compete for space on NOAA's remaining supercomputing assets. NOAA also requests a reduction to procure additional operational high-performance computing resources to support coupling of the current generation of terrestrial and coastal models. This reduction maintains the existing water modeling capability.

References: NOAA FY2019 Congressional Justification

NWS Overview: page NWS-1

Increase Advanced Weather Interactive Processing System Cyclical Refreshment: page NWS-39

Reduce Surface and Marine Observations: page NWS-33

NWS Workforce Savings: page NWS-48

Reduce Tsunami Warning Program: NWS-50

Reduce the Investment in Numerical Weather Prediction Modeling: page NWS-65

Reduce the Investment in the National Water Model: page NWS-67

Reduce Testing, Evaluation, and Implementation of Evolve Initiatives: page NWS-68

Reduce Service Life Extension Program for Next Generation Weather Radar: page NWS-85

Eliminate Integrated Water Prediction High Performance Computing: page NWS-89

Reduce Research and Development High Performance Computing: page NWS-90

National Environmental Satellite, Data, and Information Services

The National Environmental Satellite, Data, and Information Services (NESDIS) funding request for the FY 2019 President's Budget totals $1.6 billion. This is a 25% decrease from the FY 2018 Annualized Continuing Resolution. NESDIS will support key initiatives committed to providing real-time operations and data services as well as working toward developing the next generation of satellites to continue meeting its primary mission essential functions without incurring gaps in coverage.

NESDIS is responsible for managing all aspects of remotely gathered environmental data. This includes procurement, launch, operation, product development, and product distribution of the nation's civil operational environmental satellites and corresponding data. In addition, NESDIS manages the NOAA environmental data collections, provides routine assessments that provide relevant weather, climate, and environmental information (e.g. precipitation, temperatures, temperature extremes, sea surface temperature), and disseminates data and information to meet the needs of users in commerce, industry, agriculture, science, and engineering, as well as federal, state, and local governments.

Significant requested increases and decreases in funding over the FY 2018 Annualized Continuing Resolution program include the following:

GOES-R. NESDIS requests a planned decrease of $334.9 million for a total of $408.4 million in the Geostationary Operational Environmental Satel-

1 Derived from "The Federal Plan for Meteorological Services and Supporting Research", FY 1980-2000.

lites – R (GOES-R) Series program after GOES-16 became operational as GOES-East on December 18, 2018. The remaining funding of $408.4 million will be used to continue satellite engineering development, production, integration, and launch activities to ensure the continuity of the GOES-R Series program geostationary observing platforms. The GOES program, which has provided essential observational data since 1975, supports the National Weather Service (NWS) in forecasting, tracking, and monitoring severe storms

Polar Weather Satellites. NOAA combined the Joint Polar Satellite System (JPSS) and the Polar Follow On programs into the Polar Weather Satellites program line that now funds all satellites in the JPSS series and requests a net decrease of $230.6 million for a total of $878 million. Merging these program lines will ensure cost and programmatic efficiencies and is the first step towards organizing the NESDIS budget by thematic portfolios rather than hardware based portfolios. These funds will be used to operate and sustain the Suomi National Polar-orbiting Partnership (Suomi NPP) and NOAA 20 (formerly JPSS-1) satellites, continue development of the instruments for JPSS-2, JPSS-3 and JPSS-4, as well as continue the development, operations, maintenance and sustainment of the ground system for the satellites in this series.

Projects, Planning and Analysis (PPA). NOAA requests an increase of $11.5 million for a total of $36.5 million to support the ongoing use of Metop data in NOAA's weather prediction function. Activities will include sensor activation, verification, data validation and transition into operations—activities that turn data from the U.S. instruments on Metop-C into usable information for weather forecasting by the National Weather Service (NWS). Funding in FY 2019 will allow NOAA to begin preparations to ingest Metop-SG data including preparation for the future development of ground infrastructure, processing and distribution capability for Metop-SG data. NOAA must receive, ingest, process, validate and distribute these data to the NWS (this is the equivalent of the NOAA upgrade from the POES NOP series to the JPSS series). Forecasters rely on this data to produce the 3-7 day outlook.

Space Weather Follow On. NOAA requests $10 million, an increase of $5.0 million, to accelerate work with the Naval Research Laboratory (NRL) to develop a compact coronagraph (CCOR) for launch by 2024. NASA's Solar and Heliophysic Observatory (SOHO), launched in 1995 and significantly past its mission design lifetime, currently provides coronal mass ejection imagery used operationally by the National Weather Service's Space Weather Prediction Center for geomagnetic storm watches. The CCOR would continue these observations. While SOHO is relatively healthy at the moment, the solar arrays are degrading. CCOR will be hosted on the NOAA Geostationary Operational Environmental Satellite system (GOES)-U Sun-pointing platform, or another partnership mission.

References: NOAA FY 2019 Congressional Justification
Overview: page NESDIS-1
GOES-R Series: page NESDIS-51
PWS: page NESDIS-53
PPA: page NESDIS-58
SWFO: page NESDIS-75

Office of Oceanic and Atmospheric Research

The Office of Oceanic and Atmospheric Research (OAR) request for funding related to meteorological supporting research in the FY 2019 President's Budget totals $164.6 million. This is a 4.6% decrease over the FY 2018 Annualized Continuing Resolution budget. OAR will continue to provide the nation with critical environmental information to support informed decision-making and promote healthy, productive, and resilient ecosystems, communities, and economies. OAR will continue research focused on improving our understanding and forecasting capabilities for atmospheric events that endanger lives and property and research focused on establishing a greater understanding of, and ability to predict, climate variability and change, and to enhance society's ability to plan and respond. OAR also will conduct innovative research for the development of the next generation of products and services.

Climate Labs and Cooperative Institutes. NOAA requests a net decrease of $1.9 million for a total of $73.0 million to support research activities that will help to gain a comprehensive understanding of the physical, chemical, and dynamical processes that shape our climate. NOAA will continue to support the world-class climate science that takes place at NOAA, but will eliminate arctic research and remaining Climate Competitive Research funding which was originally reduced in the FY2018 President's Budget. This will result in the dismantling of the Climate Program Office (CPO) as it currently exists. NOAA will reduce competitive research grants to Cooperative Institutes, universities, NOAA research laboratories, and other partners. NOAA's extramural grant competitions fund research in all 50 states and

support nine Cooperative Institutes (CI) focused on climate research.

With the remaining climate funding, OAR will preserve priority activities including 1) Earth System Research within the OAR laboratories [dedicated annual funding will be moved from Climate Competitive Research to the Climate Laboratories and CIs PPA]; 2) National Integrated Drought Information Systems (NIDIS) [funding will be maintained in the Regional Climate Data and Information PPA]; 3) Long-term observations and climate records [funding will be maintained in the Climate Laboratories and CIs PPA]; 4) Research and development associated with Seasonal to Sub-seasonal (S2S) atmospheric research [funding currently in both the Climate Laboratories and CIs PPA, which will be maintained, and Climate Competitive Research PPA, which will be moved to U.S. Weather Research Program PPA to consolidate S2S program funds]; and 5) legislatively mandated work on the National Climate Assessment [funding will be maintained in the Regional Climate Data and Information PPA].

Weather and Air Chemistry Research (W&ACR). This sub-activity includes Laboratories and Cooperative Institutes (CIs) and Weather and Air Chemistry Research Programs. NOAA requests a net decrease of $28.1 million for a total of $91.7 million. Within this level of funding NOAA would increase priority weather research contained within the US Weather Research Program by $2.7 million, which leads to near-term, affordable, and attainable advances in weather forecasting and computer and modeling capabilities to deliver substantial improvements in weather forecasting. The following labs, programs and activities are proposed for reduction or termination:

- Air Resources Laboratory
- Unmanned Aircraft Systems Program
- Vortex SE
- Multi-Function Phased Array Radar
- Infrasonic Research
- Airborne Phased Array Radar
- Joint Technology Transfer

References: NOAA FY2019 Congressional Justification
OAR Overview: page OAR-1
Climate Research: page OAR-9
Weather Research: page OAR-25

National Ocean Service

The National Ocean Service (NOS) request for funding related to meteorological services in the FY 2019 President's Budget totals $32.0 million. This is the same as the FY 2018 Annualized Continuing Resolution. These funds allow for continued operation of the National Water Level Observation Network (NWLON), the Physical Oceanographic Real-Time System (PORTS®) program, the data quality control program known as the Continuous Operational Real-time Monitoring System (CORMS), and the Ocean Systems Test and Evaluation Program (OSTEP), which is a development program for bringing new sensor technology into operations. Both the NWLON and PORTS® programs include subsets of operational water level stations with meteorological sensors installed for various partners and users, including the NWS. NOS will continue to provide meteorological observations that are critical to navigation activities and the safety of life and property.

Though traditionally oceanographic observing systems, NWLON and PORTS® technology allows multiple other sensors to be added, including meteorological sensors such as wind speed/direction/gusts, air temperature, relative humidity and barometric pressure. These meteorological observations provide important data for improving and verifying marine weather forecasts and warnings. Additionally, NOS has thirteen PORTS® stations with operational visibility sensors located in Mobile Bay, AL, San Francisco Bay, CA, Narragansett, RI, Northern Chesapeake Bay, Tampa Bay FL and Jacksonville, FL. NOS has upgraded and enhanced the majority of its NWLON stations with new meteorological sensors. This increase in meteorological observations has led to a 10% increase in the probability of detection of marine weather events and a ten minute increase in lead times for marine warnings, according to actual verification data for special marine warnings.

Navigation data users require a complete picture of their operating environment, which includes local meteorological data, to make safe and cost-effective decisions. Leveraging existing observing infrastructure is a cost-effective alternative to establishing new platforms to collect these data. The additional meteorological data improves the accuracy of NWS forecasts for storm surge, marine wind speed, and marine wave heights, used by both marine navigation and coastal communities when extreme weather events occur. The real-time data can be used by emergency responders to make sound decisions based upon the most up to date and accurate information. For

example, when coastal areas are flooding, emergency responders must know which evacuation routes are still viable and other related information that most accurately reflects the current state of the physical environment. WFO Mobile call PORTS the backbone of the Coastal Flood Program.

References: NOAA FY2019 Congressional Justification

NOS Overview: page NOS – 1

Navigation Services: page NOS – 4

Ocean and Coastal Observations (NWLON, NCOP, Modeling, PORTS): pages NOS – 5-7

Office of Marine and Aviation Operations

The FY 2019 President's Budget requests $38.3 million for the Office of Marine and Aviation Operations (OMAO) in funding to support meteorological operations and research activities. This is a 7.3% increase over the FY 2018 continuing resolution. OMAO supports meteorological operations and research activities through collection of related data from the aircraft and ship fleet. The fleet supports NOAA's science, service, and stewardship mission. The fleet operates throughout the United States and around the world; on and over open oceans, mountains, coastal wetlands, and the Arctic. NOAA's fleet fulfills multiple missions in support of NOAA's programs providing capable, mission-ready platforms and professional crews that survey snowpack levels for flood prediction, improve hurricane prediction models, assess air quality, survey coastal erosion, investigate oil spills and conduct oceanographic research and weather forecasts. In FY 2019, OMAO will continue to support meteorological observations through its Aircraft Operations PPA and Marine Operations and Maintenance PPA. OMAO's airplane and ships also help local decision makers respond to real-time meteorological events, including hurricane reconnaissance and research.

References: NOAA FY2019 Congressional Justification

OMAO Overview: page OMAO-67

Marine Operations and Maintenance: page OMAO-68

Aviation Operations and Aircraft Services: page OMAO-68

Department of Defense

U.S. Air Force

The U.S. Air Force request for meteorological program support FY 2019 is $153 million. Air Force resources for meteorological support fall into three categories: general operations and maintenance, procurement, and research, development, test & evaluation. This is a 9.4% increase from FY18. This does not include all meteorological activities conducted within the Air Force.

Operations

Operational resources are dedicated to providing dedicated, tailored weather support to U.S. Air Force/U.S. Army forces and platforms performing contingency and non-contingency operations around the globe.

Programs with Research to Operations Efforts

As part of the Air Force Strategic Weather Modernization Plan, the USAF continues investing in modernized environmental prediction and commercial-off-the-shelf technologies that enhance automation and save resources. The USAF plans to invest in the following efforts:

Weather Data Analysis (WDA). WDA provides a net-centric infrastructure that assimilates worldwide sources of atmospheric and space weather data and produces decision-quality information for warfighters across multiple security enclaves. This information is provided through both machine-to-machine and machine-to-human capabilities. Research, development, test and evaluation activities will enhance the capability to ingest, process, store, access, and disseminate meteorological data via upgrades to the web services architecture to expand the Open Geospatial Consortium services, implement a modular open system architecture, and upgrade the large-scale data processing to accommodate new environmental satellite and numerical weather modeling data.

Numerical Weather Modeling (NWM). NWM includes numerical weather prediction models; cloud analysis and forecasting models; land surface characterization models; aerosol, atmospheric constituent, and point analysis models/applications; and both global and mesoscale ensembles.

References:

U.S. Air Force FY2019 Congressional Justification

OPERATION AND MAINTENANCE, AIR FORCE VOLUME II

Pg 145 and 146, Depot maintenance

Other Procurement, Air Force - Vol 1

Pg 167-182, (Weather Service)

Research, Development, Test & Evaluation, Air Force Vol–III Part 2, Vol 3b -183-194

U.S. Army

The U.S. Army (USA) estimates a $23.3 million request for FY 2019 for meteorological operations, research, and development, an increase of 8.4%

compared to FY 2018 enacted funding. The increase is primarily due to expected training and new equipment.

Operations

The U.S. Army funds meteorological support for developmental and operational tests and evaluations at ranges across CONUS, Alaska and Panama to provide essential information to acquisition decision makers and commanders. The Army also funds systems which provide highly accurate meteorological data for missile defense tests and for operational employment of Field Artillery weapon systems. In its civil operational activities, the U.S. Army Corps of Engineers (COE) funds an extensive network of land-based gages collecting hydrologic and meteorological data used in support of COE major water projects, flood control, navigation, hydroelectric power, irrigation, water supply, and water quality. Within the Army's Training and Doctrine Command, funds are provided to conduct meteorological education and training at several Centers of Excellence while the Army Test and Evaluation Command (ATEC) utilizes their funds for indirect meteorological support costs not billable to ATEC subordinate and for replacement and upgrade of meteorological instrumentation and support systems.

Research and Development

The U.S. Army funds laboratories to conduct basic and applied research in atmospheric science and technology with a focus on atmospheric sensing, modeling, and dynamics. The Army also provides funding to conduct research, development, and engineering services to solve the challenging problems in military engineering, geospatial sciences, water resources, and environmental sciences.

References: Army Budget Materials - Fiscal Year 2019

Army Procurement - Procurement Justification Book: Other Procurement Army (OPA) 2 - Communications & Electronics; p147, p303, p362.

Operation and Maintenance - Volume 1 Justification Book: Army Budget Activity 01: Operating Forces Activity Group 13: Land Forces Readiness Support Detail by Subactivity Group 131: Base Operations Support; p185.

Army Justification Book of Research, Development, Test & Evaluation Army RDT&E – Volume I, Budget Activity 1; p21, p22, p97.

Army Justification Book of Research, Development, Test & Evaluation Army RDT&E – Volume I, Budget Activity 2; p60, p198, p206.

Army Justification Book of Research, Development, Test & Evaluation Army RDT&E – Volume I, Budget Activity 3; p97.

U.S. Navy

The U.S. Navy FY 2019 budget request for meteorological programs is $128.3 million, made up of $101.1 million for operations and $18.2 million to support enabling research. This represents a 7.8% decrease from FY2018 enacted funding. The Chief of Naval Operations, through the Oceanographer of the Navy, sponsors the Naval Oceanography Program (NOP) consisting of operational Navy Meteorology and Oceanography (METOC) services and related research and development. Navy Headquarters, Navy Information Forces and the Commander, Naval Meteorology and Oceanography Command work together to field new capabilities. Funding for significant systems and capabilities include the following:

Naval Integrated Tactical Environmental System – Next (NITES-Next) The FY19 request of $11.0 million reflects a $5.4 million decrease from the FY18 enacted. These equipment ingest, store, process, distribute, and display conditions of the physical environment needed to optimize employment and performance of naval warfare systems. These capabilities make the warfighter and planner more aware of the operational impacts of the meteorological and oceanographic factors within the air and ocean environments. Changes in FY19 funding for NITES-Next was the result of a series of Congressional Marks and Navy's re-phasing of the program to better align with the Program Manager's fielding schedule.

Shipboard Weather RADAR Capability The FY19 request of $1.65 million reflects a minimal difference of $30K increase from FY18 enacted. This program taps Navy radar systems to organically obtain local area weather and environmental measurements to provide near real-time weather information without adversely affecting tactical operations. Tactical Environmental Processor (TEP) exports real-time knowledge of evaporation duct refractivity to optimize shipboard sensors contributing to enhanced situational awareness.

Primary Oceanographic Prediction System (POPS) The POPS FY19 request is $19.8 million. The program consists of shipboard and shore based IT architectures and the High Performance Computers (HPC) at Fleet Numerical Meteorology and Oceanography Center (FNMOC) and the Naval Oceanographic Office (NAVOCEANO). Networks, servers, uninterruptible power supplies, and other peripherals at FNMOC and NAVOCEANO, and onboard the T-AGS 60 Pathfinder class ships are under operational control of Commander, Meteorology and Oceanography Command (CNMOC). The

HPC systems are used by the METOC Community of Interest (COI) to host, generate, and disseminate high resolution, state-of-the-art numerical ocean and atmospheric models capable of resolving tactically significant small scale features, especially in the complex littoral regions.

Earth Systems Prediction Capability (ESPC) The Navy's Earth System Prediction Capability (ESPC) program will provide a more accurate, longer range, global ocean, atmosphere, and sea ice forecast system of global coupled ensemble technologies for lead times of 1-10 days as well as a new capability for accurate forecasts from the Tropics to the Arctic at tactical, operational, and strategic lead times. It will develop a Navy interface to NOAA's products for seasonal to multi-annual lead times for deliberate planning through integrating atmosphere, ocean, ice, land and near-space forecast models into a seamless prediction system. Program changes were the result of internal adjustments to better align Meteorology programs with Department of Defense and Department of the Navy strategic priorities.

METOC Satellite Sensor Data Processor Systems. METOC Satellite Sensor systems exploit environmental satellite sensor data for the enhancement of Navy Oceanographic and Atmospheric modelling capabilities needed to receive, store, ingest, and process new and expanded satellite sensor data streams. The METOC Space systems project includes R&D investigations of new sensors and hardware/software upgrades which allow forward-deployed and reach-back METOC forces to provide decision superiority products to the warfighter. There were no changes to this program.

References:

NAVY METOC FY 2019 Congressional Justification

RDT&E Air/Ocean Equipment Engineering PE 0604218N appears in Volume 3 page 93

RDT&E Air/Ocean Tactical Applications PE 0603207N appears in Volume 2 page 1 -4.

OPN Navy Meteorological and Ocean Sensors-Space PE 0305111N appears on volume 5 page 821

OMN NITES-Next is documented as PE 0702207N in Exhibit OP-5 1C5C pages 197-200

Department of Homeland Security

Federal Emergency Management Agency

The FY 2019 requested funding for FEMA's meteorological operations and supporting research programs is $1.93 million, no change from the FY 2018 Continuing Resolution. The majority of this funding, $1.17 million, supports National Hurricane Program HURREVAC operations and maintenance of decision support tools used by federal, state, local, and tribal governments, along with technology modernization.

FEMAs Response Directorate administers the National Hurricane Program (NHP), which provides technical assistance supporting deliberate hurricane response/evacuation planning and operational decision making during an event. Under an Interagency Agreement between FEMA and the National Weather Service's National Hurricane Center (NWS/NHC), the NHC develops and applies its SLOSH (Sea, Lake, and Overland Surges from Hurricanes) storm surge model to provide planning and operational products to support storm surge risk analysis. Development of these products includes model runs and simulations, as well as inundation mapping. The operational products are used to support state and local evacuation decisions and are used at all levels of government to prepare for the potential impacts and required response. The planning products are used as the basis for the hazard analysis and evacuation zone development work done as part of the Hurricane Evacuation Studies (HESs) process. Planning products are also used to assess the potential storm surge risk for an approaching hurricane prior to the availability of the operational products.

As part of the NHP, FEMA also develops, operates, maintains and distributes the HURREVAC decision-support software tool. HURREVAC combines real-time NHC forecast data with evacuation clearance times from the HESs to guide emergency managers as to when decisions on hurricane evacuations would need to be made to ensure evacuation is completed before the arrival of hazardous conditions. The software is also widely used as a situational awareness and briefing tool and as a common operating platform to view official NHC hurricane forecast and risk information. Currently the NHP is working with NHC and other program partners on the development of the next generation platform for emergency manager hurricane decision support, which will aim to increase accessibility and capability.

FEMA's Recovery Directorate provides the necessary funding for NOAA's National Centers for Environmental Information (NCEI) to improve, maintain, and update its Snow Climatology Database (SCDB) and allows for more stations to participate in climatological and near-real time snowfall datasets and comparisons. These activities are necessary to support FEMA's emergency and major disaster decla-

ration process and assistance to state, local, and tribal governments related to snow events.

References: DHS Congressional Budget Justification FY 2019
FEMA FY18 Operating Expenses not yet released

U.S. Coast Guard

All of the U.S. Coast Guard's (USCG) funding for meteorological programs is for operations support. For FY 2019, the requested funding level is an estimated $30.3 million, a slight (0.3%) increase from the FY 2018 estimate. The Coast Guard does not have a specific program and budget for meteorology—all meteorological activities are accomplished as part of general operations. The USCG does not track meteorological costs at an organizational level, so the funding level is an estimate. The Coast Guard's activities include the collection and dissemination of meteorological and iceberg warning information for the benefit of the marine community. The Coast Guard also collects coastal and marine observations from its shore stations and cutters and transmits these observations daily to the Navy's Fleet Numerical Meteorology and Oceanography Center and NOAA's National Weather Service. These observations are used by both the Navy and NOAA in generating weather forecasts.

The Coast Guard also disseminates a variety of weather forecast products and warnings to the marine community via radio transmissions. Coast Guard shore stations often serve as sites for NWS automated coastal weather stations, and the National Data Buoy Center provides logistics support in deploying and maintaining NOAA offshore weather buoys from Coast Guard cutters. The International Ice Patrol conducts iceberg surveillance operations and provides warnings to mariners on the presence of icebergs in the North Atlantic shipping lanes. Coast Guard efforts in meteorological operations and services have not changed significantly during recent years.

References: USCG Operating Expenses are found in the USCG Attachment of the DHS Congressional Budget Justification FY 2019

Department of the Interior

Bureau of Land Management

The Bureau of Land Management (BLM) requested funding for meteorological activities for FY 2019 is $4.4 million, which is a 5.6% decrease from enacted funding in FY 2018. The BLM funds two principal programs related to meteorological services and supporting research —the soil, water, and air (SWA) program and the fire weather activities of the Office of Fire and Aviation (OFA).

References: BLM FY2019 Budget Justification
SWA Overview: page VI-33
References: DOI Wildland Fire Management FY2019 Budget Justification
Preparedness Program, predictive services: page 12

Bureau of Ocean Energy Management

The Bureau of Ocean Energy Management (BOEM) requests an estimated $568K to continue ongoing air quality studies in FY 2019, an estimated 68% decrease from FY2018 funding levels. These studies, initiated in FYs 2016 and 2017, are environmental and technical studies to inform the safe management and development of U.S. Outer Continental Shelf energy and mineral resources in an environmentally and economically responsible way. Any funding that goes towards the federal weather enterprise is usually in the form of supporting research for marine air quality modeling and monitoring; and meteorological-oceanographic resource assessment and characterization.

References: BOEM FY2019 Budget Justifications
Pages: 84, 103, 107

National Park Service

The National Park Service (NPS) budget request for meteorological operations and research for FY 2019 is an approximate $2.75 million, approximately an 11% reduction in this area from FY 2018 enacted funding. The NPS expends about $700K on atmospheric research with a focus on measurements of all forms of atmospheric reactive nitrogen and on aerosol science. The goal of this research is to identify the sources of air pollution that are affecting park ecosystems and visibility and to quantify their impacts. The NPS also expends approximately $2.3 million in routine air quality, visibility, and meteorological monitoring networks.

References: DOI National Park Service FY2019 Budget Justification

Note: The NPS budget request and enacted funding is not this granular - Natural Resource Management is the lowest level in the authorized budget. The allocations estimated here are based on internal assessment of needs and are not explicitly indicated by Congress. The FY 2019 estimate is based on the overall reduction for Natural Resource Management in the President's budget request.

U.S. Geological Survey

The U.S. Geological Survey (USGS) requested funding for FY 2019 is an estimated $30.00 million, no change from the FY 2018 enacted. This reflects

funding requirements for the Water Mission Area and the elimination of the Geomagnetism Program.

Hydrometeorological Data Collection and Distribution and Post-wildfire debris flow warning operations. The FY2019 request for this mission area is an estimated $30.00 million. The USGS Water Mission Area collects streamflow, precipitation, water quality, ground-water level, and other water resources and climatological data as part of a national network and for a number of projects concerning rainfall-runoff, water quality, and hydrologic processes. A number of federal, state, and local agencies contribute to the costs of collection and distribution of these data.

USGS water related programs and associated budget line items were reorganized in 2015 and 2016 and the hydrometeorological related research was reorganized correspondingly. The water programs now involved include the Groundwater and Streamflow Information Program (GWSIP) and the Water Availability and Use Science Program (WAUSP).

- The GWSIP FY19 request is an estimated $29.5 million. GWSIP items that support hydrometeorological research include the USGS streamgage network.
- The WAUSP request is an estimated $500K. The WAUSP reductions eliminate much of the USGS research related to evapotranspiration from irrigated lands.

Geomagnetism Program. The FY 2019 budget request for the USGS Geomagnetism Program is $0, a decrease of $1.88 million from the FY 2018 Annualized Continuing Resolution (CR) funding level. This eliminates the Geomagnetism Program, an element of the U.S. National Space Weather Program. Terminating this program will reduce the accuracy of NOAA and U.S. Air Force forecasting of the magnitude and impact of geomagnetic storms. In addition to eliminating the data provided to partner Federal agencies, the elimination of the program will also reduce the availability of geomagnetic information to the oil drilling services industry, geophysical surveying industry, several international agencies, and electrical transmission utilities.

References: FY 2019 Department of Interior Budget Justifications – U.S. Geological Survey

pages J 79-91 Water Resources

pages I 20,61,122 Geomagnetism Program

Department of Transportation

Federal Aviation Administration (FAA)

For FY 2019, the FAA is requesting a total of $202 million for Aviation Weather related Operations Support, Major Systems Acquisition and Recurring Research and Development Costs, an approximate 26% decrease from FY 2018 continuing resolution funding. The changes are comprised of:

- A decrease in requested funding for Operations Support: from $213 million continuing resolution funding in FY 2018 to a requested $159 million in FY 2019, in line with Agency needs and priorities.
- A decrease in requested funding for Major Systems Acquisitions: from $45 million continuing resolution funding in FY 2018 to a requested $36 million in FY 2019, in line with Agency needs and priorities.
- A decrease in requested funding for recurring Research and Development Costs: from $15 million continuing resolution funding in FY 2018 to a requested $7 million in FY 2019, in line with Agency needs and priorities.

The funding changes reflect major initiatives in the Aviation Weather programs to support the Next Generation (NextGen) National Air Transportation System. These changes will bring enhancements, including the dissemination of weather products and decision-making information.

For FY 2019, we will continue to research and make progress in the weather area to support NextGen weather requirements. Research projects may include integration of weather products into the air traffic decision-making, weather sensor improvement, weather needs in the flight deck, and refresh of the weather infrastructure.

United States (U.S.) Code Title 49 Section 44720 (49 U.S.C. 44720) designates the FAA as the Meteorological Authority for domestic and international aviation weather services of the U.S. In this capacity, the FAA provides requirements for the administration of aviation weather services to the National Weather Service (NWS). The FAA is responsible for ensuring compliance with these services and with maintaining International Civil Aviation Organization (ICAO) Standards and Recommended Practices as specified in Annex 3-Meteorological Service for International Air Navigation.

References:

The weather Operations Support numbers source is the documentation from the Operations Review Board (ORB) process within ATO.

US DOT FAA FY-2019 President Budget Submission

Page 72 (199) - Facilities and Equipment; Detailed Justification for 2A15A - NextGen Weather Processors (NWP) Work Page 1

Page 115 (199) - Facilities and Equipment; Detailed Justification for 2C01A - Aviation Surface Observation System (ASOS/ASWON)

Page 45 (80) - Research, Engineering & Development; Detailed Justification for A11.j - Weather Programs

Federal Highway Administration

The current transportation authorization, the Fixing America's Surface Transportation (FAST) Act, allocates funds for Research, Technology and Education. This authorization includes core Highway Research and Development as well as Intelligent Transportation Systems (ITS). Of this, for both FY 2018 and FY 2019, the Road Weather Management Program (RWMP) was budgeted at $1.5 million. All of RWMP's funding is for applied research, with an increased emphasis on knowledge and technology transfer to assist operating agencies in the deployment of the research products. RWMP research activities involve the development, test and evaluation of decision support systems that integrate high-resolution road weather and connected vehicle data to enable transportation system owners and operators to make more effective and efficient management decisions. Such decisions save lives, time and money for both the operating agencies and the traveling public. Work is also underway to explore the challenges and opportunities of automated vehicles operating under adverse weather conditions.

Reference: FHWA FY 2019 Budget Estimates

Section IV Research, Development and Technology

Page IV-3 Core Highway Research and Development Programs

Page IV-8 Intelligent Transportation Systems

Environmental Protection Agency

The anticipated funding level in FY 2019 for directed meteorological research is approximately $2.1 million, a 66% decrease from FY 2018 funding. All of the Environmental Protection Agency's (EPA) funding of meteorological and air quality programs is for supporting basic and applied research.

Continued but reduced attention is being paid to the effects of airborne toxins, ozone, and fine particulate matter on human health, and the impact of air pollution on human health and sensitive ecosystems. Research related to climate change has been eliminated in the proposed FY 2019 budget. To promote excellence in environmental science and engineering, the EPA historically has supported a national research grants program for investigator-initiated research. The funding for grants (with reliance on quality science and peer review) and for graduate fellowships (to support the education and careers of future scientists) has provided for a more balanced, long-term capital investment in improved environmental research and development. The funding for the grants program is proposed for elimination in FY 2019.

The EPA continues its development and evaluation of air quality models for air pollutants on all temporal and spatial scales as mandated by the Clean Air Act as amended in 1990. Research at reduced levels compared to previous years will focus on urban, mesoscale, regional, and multimedia models, which will be used to develop air pollution control policies, human and ecosystem exposure assessments, and air quality forecasts. Emphasis will be placed on meteorological research into global-to-regional-to-urban-local formation and intercontinental transport of air contaminants in support of the revisions to the National Ambient Air Quality Standards and ecosystem protection strategies. Some increased efficiency of computation and interpretation of model results are being made possible by means of supercomputing and scientific visualization techniques.

Reference: EPA FY2018 Congressional Justification

Page 11: Research

Note: Based on historical records (pre-FY17), a proportion of the Air, Climate, and Energy research program is estimated to apply to meteorological services and supporting research. Year-to-year changes in these budget values reflect annual variations in the total ACE/AE budget. Note that the FY18 PBR has restructured the research program from ACE to AE.

National Aeronautics and Space Administration

The National Aeronautics and Space Administration's (NASA) estimated FY 2019 funding related to meteorological operations and research is $506 million, a decrease of approximately 20 percent from the projected FY 2018 Continuing Resolution. The budget figures reported are based on relevant missions and programs in the Earth Science Di-

vision[2] and the Heliophysics Division[3] within the Science Mission Directorate (SMD). Only missions and programs relevant to meteorological operations and research are included as part of this report, with select missions and programs highlighted below.

- **Earth Science Research:** Projected FY19 budget of $51 million, up from $50 million in FY18. Earth Science Research addresses complex, interdisciplinary Earth science problems in pursuit of a comprehensive understanding of the Earth system. This strategy involves six interdisciplinary and interrelated science focus areas, one of which is specifically dedicated to weather research. The projected FY19 budget will provide continued investment in weather related Research and Analysis (R&A) projects, including competed atmospheric dynamics and precipitation science investigations, as well as Global Modeling and Assimilation Office (GMAO), Short-term weather Prediction Research and Transition (SPoRT) center, the Convective Process Experiment (CPEX) airborne field campaigns, and the NASA-NOAA-DoD Joint Center for Satellite Data Assimilations (JCSDA). The GMAO is responsible for building the state-of-science Earth system modeling and data assimilation system for fundamental research in atmospheric science, disastrous weather phenomena including hurricanes and floods, and techniques to utilize satellite observation in the models through the data assimilation process. The SPoRT center is responsible for transitioning NASA developed satellite algorithms and data products into operational weather forecast environments especially the National Weather Service. The CPEX campaign represents a suborbital flight field campaign within the Research and Analysis program focusing on the convective storm initiation, organization, growth, and dissipation. It is also a test bed for NASA developed Doppler Aerosol WiNd Lidar (DAWN) instrument. The JCSDA is a multi-agency effort building the nation's infrastructure of satellite data assimilation for weather forecast purpose.
- **Earth Science Flight Missions:** The projected FY19 budget is $189 million, a decrease from $199 million in FY18. Earth Science Flight Missions include those that are operational and those under development, covering a broad range of multi-disciplinary science investigations aimed at understanding the Earth system and its response to natural and human-induced forces and changes. Global Precipitation Measurement (GPM), Aqua, and Surface Water and Ocean Topography (SWOT) are the three missions most relevant to the Federal Weather Enterprise. The 2017 Earth Science senior review endorsed the GPM and Aqua satellite missions for continued operations through 2020, and preliminarily, through 2023. The projected FY19 budget of $40 million will constitute the weather relevant portion supporting the continuing operation of both GPM and Aqua and producing long-term data records. In FY18, the SWOT mission completed its implementation phase. A projected FY19 budget of $91 million, an increase of $13 million from FY18, is planned for SWOT to complete development of the Ka-band Radar Interferometer and Global Positioning System-Payload and Global Positioning System-Payload instruments, initiate development of the integrated payload module, and complete the System Integration Review. Following a detailed review in FY18, NASA canceled the Radiation Budget Instrument (RBI) due to cost overruns that cannot be accommodated within the budget. NASA requests $0 for RBI in FY19, representing a reduction of $28 million from the FY18 level. In addition, consistent with the FY18 budget request, NASA assumes the termination of data processing for the Deep Space Climate Observatory (DSCOVR) Earth-viewing instruments in FY19.

A projected FY19 budget of $17 million is requested for the weather-relevant portion of missions and instruments in Earth System Science Pathfinder (ESSP). ESSP provides frequent, competitively-selected Earth science research opportunities, including space missions and remote sensing instruments for space-based missions of opportunity or extended duration airborne science missions. Two missions of most relevance are the Time-Resolved Observations of Precipitation structure and storm Intensity with a Constellation of Smallsats (TROPICS) and Cyclone Global Navigation Satellite System (CYGNSS); TROPICS will provide rapid-refresh microwave measurement over the Tropics to observe the thermodynamics and precipitation structure of Tropical

2. The Earth Science Division (ESD) reported budget includes an estimate of weather observations and research and other closely related program activities. Research and satellite mission budgets are calculated based on their estimated overall contributions to the weather focusing activities reported, noting that the objective of ESD's program is to advance Earth System science.

3. This report includes Heliophysics Division research assets and programs that contribute significantly to the advancement of space weather knowledge and to the transfer of that knowledge into space weather prediction systems.

Cyclones over much of the system's lifecycle, while CYGNSS has the mission objective to measure ocean surface winds throughout the life cycle of tropical storms and hurricanes, to facilitate better weather forecasting. A projected FY19 budget of $3 million is planned for TROPICS to enter its final design and fabrication activities, and $3 million is planned for CYGNSS to complete its prime mission.

- **Heliophysics Space Weather:** The projected FY19 budget is $264 million, a decrease from $379 million in FY18, largely reflecting the end of development and the launch of the Parker Solar Probe. NASA supports space weather research through the Heliophysics Division. One of the division's objectives is to understand the Sun and its interactions with the Earth and the solar system, including space weather. As part of this, the Living with a Star (LWS) Parker Solar Probe mission will trace the flow of energy to help scientists better understand the heating of the solar corona, the Sun's outer atmosphere, and explore what accelerates the solar wind, by flying through the solar corona in the region where these processes happen. Spacecraft-level environmental and mechanical testing, as well as launch and early orbit mission operations were funded at a level of $242 million in FY18. The launch window is July 31 – August 23, 2018. A projected FY19 budget of $107 million will support the mission's first and second close approach/science collection phase and return science data from both collection periods. Another LWS mission, Solar Orbiter is a collaborative mission with the European Space Agency (ESA). The mission, including instruments contributed by NASA, will perform a close-up study of our Sun and inner heliosphere using a combination of in-situ and remote-sensing instruments. In FY18, $59 million supported spacecraft testing and preparations for launch. A projected budget of $62 million in FY19 will support continued preparations for the anticipated February 2020 launch and subsequent data collection. A projected FY19 budget of $13 million will support mission operations for the Van Allen Probes mission as it continues its investigation of the Earth's radiation belts. FY19 also includes a projected budget of $38.5 million in investment within the Living With a Star Science program to accelerate space weather research efforts in support of the Administration's multi-agency Space Weather Action Plan.

References: NASA FY2019 Congressional Justification
Earth Science Research: pages ES-2, ES-9
Earth Science Flight Missions: pages ES-14,15, 27, 60, 63, 71, 74
Heliophysics Space Weather: pages Helio-2,16, 23, 30, 32

Nuclear Regulatory Commission

The Nuclear Regulatory Commission's (NRC's) request for meteorological activities in the FY 2019 President's budget request totals $805K. This is a 27% decrease from the FY 2018 enacted funding. This funding supports NRC's total planned contract expenditures for meteorological operations and supporting research and included the following areas:

- **Research on Application of Point Precipitation Frequency Estimates to Watershed-Scale Flood Modeling.** The objective of this project is to develop guidance on the application of NOAA point precipitation estimates to watersheds (i.e. conversion of point estimates to areal estimates).
- **Radiation Protection Dispersion and Consequence Computer Codes Analysis & Maintenance.** Resources are used to maintain and develop the NRC's Radiation Protection computer codes and for performing safety and environmental reviews for all activities involving nuclear power plant siting, design, construction, and operation. The MELCOR Accident Consequence Code System (MACCS) atmospheric transport and dispersion model uses a Gaussian plume segment model for probabilistic consequence assessment due to its flexibility, computational efficiency, and modest data needs. In FY18, the NOAA HYSPLIT model is being integrated with MACCS to offer both puff and particle dispersion model which will accept a wide variety of high quality publicly available meteorological data and provide graphical capabilities. These models are used to support regulatory applications involving health effects, environmental analyses and activities with the ICMSSR and FCMSSR.
- **Hydrometeorology, Water Resource Services & Nuclear Power Plant Licensing.** NRC staff review licensees' site-specific probable maximum precipitation (PMP) analyses that have been submitted in preference over generalized PMP estimates typically provided in NOAA's Hydrometeorological Reports (HMRs). As part of the review effort, the NRC is engaging with other Federal agencies and subject matter experts in this particular field. NRC continues to observe and determine how these studies relate to the existing HMRs and what acceptance criteria should be applied to determine the adequacy of

this methodology, from both a meteorological and hydrological perspective. NRC develops case studies for modeling and reviews probabilistic coastal hazards assessments which includes evaluating the occurrence of tropical and extratropical cyclones and their impact on storm surge. Activities include reviewing safety features and environmental impact of combined license, early site permit, design certification, construction permit, and operating license applications for new nuclear power plants as well as for review of license amendment requests of currently operating reactors. NRC staff will also review various license amendment requests associated with an operating fleet of approximately 99 reactors during FY19.

Reference: USNRC FY 2019 Congressional Budget Justification
Operating Reactors/Major Activities: page 15
New Reactors/Major Activities: page 30

Department of Energy

The Department of Energy (DOE) requested funding for meteorological activities in FY 2019 is an estimated $130.16 million a 46% decrease from enacted funding in FY 2018. DOE conducts meteorological services and supporting research and related activities within several DOE entities: the Office of Science/Biological and Environmental Research (BER), the National Nuclear Security Administration (NNSA) for emergency operations, and in the Office of Energy Efficiency and Renewable Energy (EERE) for the Wind Forecasting Improvement Project in Complex Terrain (WFIP 2).

References: DOE FY2019 Budget Justification
Vol 1: National Nuclear Security Administration
Vol 4: Science
Vol 3: Energy Efficiency and Renewable Energy

Office of Science/Biological and Environmental Research (BER)

The Office Science/BER FY 2019 request for funding is $128.6 million, a 46% decrease from FY18 enacted funding. The Office of Science supports research involving atmospheric and ecological sciences as well as research on integrative earth system modeling. The BER Earth and Environmental Systems Sciences (EESS) activity (formerly the Climate and Environmental Sciences activity) focuses on a predictive, systems-level understanding of the fundamental science associated with a systems level understanding of the predictability of atmospheric, ecological, climate, and earth system dynamics, variability, and change. As a basic science funding organization within the DOE Office of Science, EESS activity does not provide climate services to federal, state, or local agencies nor does it conduct research for the purpose of improved operations or climate services. Through its support for basic research, BER contributes to the fundamental understanding of Earth system models and dynamics.

National Nuclear Security Administration (NNSA)

Office of Emergency Operations. The DOE/NNSA request for funding related to coordinating and supporting operational meteorological programs at Defense Nuclear Facilities (DNF) in the FY 2019 President's budget request is $350K compared to FY 2018 enacted funding of $400K, a 12.5% decrease (no DMCC sites assist visits are scheduled for FY 2019). Requested FY 2019 funds would allow NNSA to continue funding the DOE Meteorological Coordinating Council (DMCC) activities, provide meteorological expertise, and support Consequence Assessment Modeling tools in support of the NNSA Emergency Management and Response Enterprise.

Office of Energy Efficiency and Renewable Energy (EERE)

Wind Energy Technologies Office/Wind Forecasting Improvement Project in Complex Terrain (WFIP 2). The DOE/EERE request for funding related to meteorological supporting research for FY2019 is $1.2 million, a 22.4% decrease from FY2018 enacted funding. Requested FY2019 funds would allow DOE-EERE to continue to fund the analysis from the Wind Forecasting Improvement Project in Complex Terrain (WFIP 2) that completed in FY18. WFIP 2 is focused on improving the physical understanding of atmospheric processes in complex terrain impacting wind industry forecasts and incorporating the new understanding into foundational weather forecasting models. Funding will also support a new initiative targeting wind energy specific forecasting. Using the Weather Research and Forecasting (WRF) model as a starting point, the Energy Research and Forecasting (ERF) simulation framework will provide high-fidelity weather and environment-dependent energy inflow and boundary condition information to the microscale wind plant simulator (Nalu), within DOE's advanced HPC environments.

Department of State

In the FY 2019 President's budget request, the Department of State (DOS) requests $6.4 million to fund U.S. contributions to the UN Framework Convention on Climate Change (UNFCCC) and the Intergovernmental Panel on Climate Change (IPCC), including for related research programs such as the Global Climate Observing System and/or the Group on Earth Observations. This funding will facilitate U.S. engagement in climate change assessment, research, and negotiations. International climate policies will continue to have a significant impact on global energy and development outcomes. Contributions to these bodies are critical for enhancing U.S. influence, protecting U.S. interests, and advancing an approach that balances energy security, economic development, and environmental protection. The Department of State did not request funds for the World Meteorological Organization in FY 2019. However, in both FY 2017 and FY 2018, Congress included $1 million for the WMO in the appropriation for the Department.

References: FY 2019 Congressional Budget Justification for Foreign Operations (Appendix 2)

State Bureau of Oceans and International Environmental and Scientific Affairs (OES), page 39

Smithsonian Institution

Global Volcanism Program (GVP). The Smithsonian Institution requested funding for meteorology-related activities in FY 2019 is $15K to support the Natural History Museum, Global Volcanism Program. This funding level is comparable to FY2018 levels. The GVP collects, catalogs, and disseminates information on over 1,500 volcanoes active in the last 10,000 years, using a small staff working regular business hours Monday to Friday in the Natural History Museum in Washington, D.C.

National Science Foundation

The National Science Foundation (NSF) request for funding related to meteorological supporting research in the FY 2019 President's budget request is $126.6 million, a 5.6% decrease from FY 2018 enacted funding levels. Requested FY 2019 funds will allow NSF to continue to fund research related to basic meteorology, climate, and space weather. NSF proposal requests are community-driven, which allows funding to move to emerging areas of interest. In addition, the funding would ensure that facilities, both observational and computational, are made available for community use. NSF awards grants to single investigators or small collaborative groups working on specific topics, as well as larger interdisciplinary groups and the National Center for Atmospheric Research.

- NSF will fund research on processes related to physical and mesoscale meteorology at a projected level of $57.3 million in FY19. This level of funding will allow NSF to support basic research on observational systems, analysis techniques and understanding of phenomena that will help to improve weather forecasts and public safety. Recent major investments include the study of the initiation and upscale growth of convection into organized systems and the characteristics of boundary layer flow over terrain. The PREEVENTS (Prediction of and Resilience against Extreme Events) program, which has high relevance to basic meteorological processes, will help to fund proposals related to potentially high-impact weather such as hurricanes, tornadoes, and space weather (below).
- NSF will fund basic climate research, modeling, and process studies at a projected level of $48.3 million in FY19. NSF invests in the Community Earth System Model (CESM), a fully-coupled global climate model that provides state-of-the-art simulations of the Earth's past, present, and future climate states. NSF also funds the supporting infrastructure for climate studies by making computing resources required to perform data-intensive simulations available for community use. As a basic science funding agency, NSF does not directly provide climate services to federal, state, and local agencies, but through its funding of basic science research, NSF contributes to the fundamental understanding of the climate system which is required for the provision of climate services.
- NSF will fund supporting research on Space Weather at a projected level of $22.1 million in FY19. NSF supports the National Space Weather Strategy and National Space Weather Action Plan in pursuing the program's objective to perform the research and technology transfer needed to improve the specification and forecasts of space weather events that can cause disruption and failure of space-borne and ground-based technological systems and that can endanger human health. Space weather relevant research efforts include the development of large-scale space weather forecast models, construction and operation of advanced ground-based instruments and networks for the observation of space

weather parameters, and the development and demonstration of innovative and creative small space weather satellites.

- NSF has initiated funding for new priorities related to the 10 Big Ideas. It is anticipated that supporting research for meteorological processes will have connections to the Navigating the New Arctic (NNA), Harnessing the Data Revolution (HDR), and Mid-Scale Research Infrastructure Big Ideas. Across NSF, $120M is set aside for these activities. Funding from these sources is not guaranteed for meteorological research, and will depend on the outcome of the peer review process.

References: NSF FY2019 Budget Request to Congress
Geosciences Section – GEO-5

Budget Tables

Table 1. Meteorological Services and Supporting Research by agency–funding levels (not actual spending) for three consecutive fiscal years:

- Enacted Budget for Fiscal Years 2017 and 2018
- President's Budget Request for Fiscal Year 2019

Table 2. Funds transferred (or planned) during FY2018 for meteorological services and supporting research activities:

- Only transfers near or exceeding a $1 million dollar threshold are included

Table 1: Meteorological Services and Supporting Research* (.00M)

Agency	FY17	FY18	FY19
USDA	**74.88**	**112.7**	**109.50**
DOC/NOAA (Subtotal)	**3566.60**	**3541.77**	**2927.69**
NWS	1121.56	1114.02	1052.77
NESDIS	2202.27	2187.45	1640.02
OAR	174.90	172.60	164.60
NOS	31.97	32.00	32.00
OMAO	35.90	35.70	38.30
DOD (Subtotal)	**247.80**	**300.50**	**304.60**
Air Force	104.00	139.90	153.00
Navy	116.80	139.10	128.30
Army	27.00	21.50	23.30
DHS (Subtotal)	**32.12**	**32.13**	**32.23**
FEMA	1.92	1.93	1.93
USCG	30.20	30.20	30.30
DOI (Subtotal)	**43.36**	**39.51**	**37.72**
BLM	4.66	4.66	4.40
BOEM	0.00	1.76	0.57
NPS	3.20	3.09	2.75
USGS	35.50	30.00	30.00
DOT (Subtotal)	**254.50**	**275.50**	**203.50**
FAA	253.00	274.00	202.00
FHWA	1.50	1.50	1.50
EPA	6.36	6.22	2.12
NASA	**641.23**	**630.61**	**505.96**
NRC	**0.87**	**1.11**	**0.81**
DOE (Subtotal)	**229.68**	**240.96**	**130.16**
Science/BER	228.93	239.00	128.60
NNSA	0.35	0.40	0.35
EERE	0.40	1.56	1.21
DOS	**	**	**6.40**
Smithsonian	**0.02**	**0.02**	**0.02**
NSF	**134.10**	**134.10**	**126.60**
Total	**5231.52**	**5315.13**	**4381.31**

* FY17 and FY18 amounts reflect Congressionally appropriated funds.
FY19 amounts reflect funding requested in the President's FY19 budget submission to Congress
** unavailable

Table 2 - Interagency Fund Transfers for Meteorological Operations and Supporting Research for FY2018, Estimated or Planned

Transferred			
From:	**To:**	**(.00 M)**	**Purpose**
DOC/NOAA			
NESDIS	NASA	150.10	Activities to continue development and implementation of JPSS program through Sep 2019. GOES-R series spacecraft, instruments, launch vehicles. GOES-NOP, POES/MetOp-A/MetOp-B on-orbit anomaly support
NESDIS	DOD	6.80	GOES-R technical and satellite support for satellite development programs
NESDIS	NTIA	2.65	Satellite Ground Services assistance with acquisition of a Radio Frequency Interference Monitoring System
NWS	NASA	2.56	Occupancy services provided by Stennis Space Center
NWS	NSF	1.20	Consortium of Universities for the Advancement of Hydrologic Science, Inc. (CUAHSI) to plan, coordinate, and execute the Summer Institute component of the OWP Innovators Program
NWS	DOE (via NOAA OCIO)	1.07	Recapitalization funding for an additional rack of computing for the c4 partition, in support of the Consumer Option for an Alternative System to Allocate Losses (COASTAL) Act and Named Storm Event Model (NESM)
DOD			
Air Force	NRL	0.80	DMSP Sensor Support
Air Force	DOC/NOAA/NWS	7.88	DAPE, DOMSAT, JPSS, MDCRS, NEXRAD (NWS PME/DPEM)
Air Force	USARL	0.95	WS Live Virtual Constructive
Air Force	NSF/NCAR	1.50	Cloud Analysis Forecast (CAF)
Air Force	DOE/ORNL	7.90	Oak Ridge National Lab
Air Force	NWS/NOAA	4.89	NEXRAD Service Life Extension Program/Spares
Navy	NASA	2.30	Stennis Space Center, operations
Navy	NOAA	1.00	Satellite Data and Analysis
Army/ATEC	NCAR	3.46	4DWX Model Support
USACE	DOI/USGS	22.50	Hydro-meteorological collection
DOT			
FAA Weather	DOC/NOAA/NWS	19.00	IAA-Center Weather Service Unit
FAA Weather	DOC/NOAA/NWS	14.00	IAA-ASOS/ALDARS

Federal Coordination and Planning Crosscut Matrix

A

Strategic Plan Objectives

	1.1	1.2	1.3	1.4	2.1	2.2	2.3	3.1	3.2	3.3	4.1	4.2	4.3	4.4	5.1	5.2	5.3	6.1	6.2
ICMSSR	X				X	X	X	X			X	X			X				X
JAG/FPR																		X	
WG/CSAB		X	X		X														
WG/CCM					X														
WG/OD		X	X																
COES		X						X				X		X					
IWRCC											X	X							
ESPC ESG							X					X							X
NEXRAD PC															X				
WG/DIAP			X						X					X					
JAG/CAPSA	X		X	X	X		X	X	X	X									
WG/MC				X															
WG/SWEF																		X	X
STIWG			X																X
WG/TCOR		X	X		X							X							
JAG/FMH1		X	X																
JAG/AWCT			X									X							

OFCM Activities B

2017 Activities Review

January

- *American Meteorological Society Annual Meeting

February

- Interagency Weather Research Coordination Committee

March

- Climate Services Committee
- Tropical Cyclone Operations and Research Forum/71st IHC
- Committee for Operational Environmental Satellites
- Interdepartmental Committee for Meteorological Services and Supporting Research

April

- Federal Committee for Meteorological Services and Supporting Research

May

- Committee for Operational Processing Centers
- *AMS Washington Forum
- *Space Weather Workshop
- NEXRAD Program Council

June

- GMU Atmospheric Transport and Dispersion Conference Special Session on Federal Agency Activities
- *Interagency Coordinating Committee for Airborne Geosciences Research and Applications (ICCAGRA)
- Research Coordination Committee
- Committee for Operational Environmental Satellites
- Interdepartmental Committee for Meteorological Services and Supporting Research
- Space Weather Enterprise Forum

July

- *Friends and Partners in Aviation Weather

August

- Research Coordination Committee

September

- Committee for Operational Environmental Satellites
- Interdepartmental Committee for Meteorological Services and Supporting Research

Asterisks indicate meetings not sponsored by OFCM.

FY 2017 OFCM Publications

The publications listed in table 3 were added to OFCM's website during FY 2017.

Bird in a stream, courtesy of the US Environmental Protection Agency's Flickr page..

Table 3: FY17 OFCM Publications

OFCM Publication	Date	Number
Federal Plan for Meteorological Services and Supporting Research, Fiscal Year 2017	September 2016	FCM-P1-2016
National Hurricane Operations Plan 2017 Build 17.X Dual Pol WSR-88D Tropical Cyclone Operations Plan 17.X "QUICK CHECK" List 2017 Build 16.1 Dual Pol WSR-88D Tropical Cyclone Operations Plan 16.1 "QUICK CHECK" List	May 2017	FCM-P12-2017
2017 Tropical Cyclone Operations and Research Forum/71st Interdepartmental Hurricane Conference Summary Report	April 2017	n/a
Summary report of the Special Session, 21st Annual George Mason University (GMU) Atmospheric Transport and Dispersion Modeling Conference	July 2017	n/a
Federal Standard for Siting Meteorological Sensors at Airports Change 1	December 2016	FCM-S4-1994
National Plan for Disaster Impact Assessments: Weather and Water Data	March 2017	FCM-P33-2017
Summary Report of the Space Weather Enterprise Forum	July 2017	n/a

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OFCM External Involvement

C

American Meteorological Society (AMS)

OFCM supports AMS activities by participating in AMS conferences and workshops, and serves on committees, groups, and teams as appropriate. OFCM staff serves on the AMS Committee for Nationwide Network of Networks and the AMS Water Resources Committee.

Interagency Coordinating Committee for Airborne Geosciences Research and Applications

The United States Interagency Coordinating Committee for Airborne Geosciences Research and Applications (ICCAGRA) was formed in the late 1990s to improve cooperation, foster awareness, and facilitate communication among the partner agencies within the U.S. government. Membership consists of most of the Federal agencies participating in the FWE. These agencies oversee numerous and varied manned and unmanned aircraft dedicated to geosciences research. ICCAGRA recently has been involved in overseeing standardization of instrument interfaces and data formats within the United States to improve access across the different agencies. OFCM participates as a member of ICCAGRA and has raised its profile by facilitating an overview presentation to ICMSSR.

National Academies of Sciences, Engineering, and Medicine (NAS)

The OFCM continues its mutually beneficial interactions with the National Academies of Sciences Engineering, and Medicine (the National Academies). The Federal Coordinator participates in the National Academies' Board on Atmospheric Sciences and Climate (BASC) strategic planning workshops and attends regularly scheduled BASC meetings.

In addition, the OFCM provided program updates to the National Academies' Space Science Board (SSB) and its Committee on Space and Solar Physics (CSSP).

The NAS and its members address all Goals of the Strategic Plan for FWE Coordination.

Office of Science and Technology Policy (OSTP)

OFCM provides Executive Secretary support for the Space Weather Operations, Readiness, and Mitigation (SWORM) Subcommittee and all six of its subordinate Working Groups. By pursuing interagency activity through the National Space Weather Action Plan, SWORM supports the National Space Weather Strategy and most Goals and Objectives of the Strategic Plan for FWE Coordination.

OFCM also participates in the US Group for Earth Observations (USGEO) managed through OSTP. USGEO activities support the National Plan for Civil Earth Observations and Goals 1, 3, 4, and 6 of the Strategic Plan FWE Coordination.

Sailor releases a weather balloon on fantail aboard USS John C. Stennis, courtesy of the Official U.S. Navy Page on Flickr.