Fiscal Year 2023 Competition Information Sheet
NOAA OAR Weather Program Office - Observations Program

This information summarizes key content for the Observations Competition from the WPO Notice of Funding Opportunity (NOFO). Please refer to NOAA-OAR-WPO-2023-XXXXXXX on grants.gov for the official content.

Program Name

NOAA/OAR/WPO Observations Program

Observations Program: https://wpo.noaa.gov/Programs/Observations

Program Manager

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Funding for FY2023

Pending the availability of funds in FY2023, the Observations program anticipates a funding allocation of up to $4,500,000.00 per year for this competition. Projects may be for up to two years, with up to $300,000/year. A total of approximately 10-16 projects may be funded.

Timeline for FY2023

Letters of Intent (LOI) due date: September 15, 2022 5:00 p.m. Eastern Time (ET)
Expected NOAA response date on LOIs: October 19, 2022
Full application package due date: November 17, 2022 5:00 p.m. Eastern Time (ET)
Funding recommendations: May 2023
Anticipated Start Date: August 1, 2023

Program Objectives for FY2023

The aim of this competition is to develop, demonstrate, and/or analyze innovative sensor and observing technologies and strategies that have high potential for advancing an observation systems portfolio that is mission-effective, integrated, adaptable, and affordable. Proposed research should demonstrate relevance and support to the weather enterprise.

Observations from the surface through the troposphere serve as critical inputs for the analysis and forecasts of the operational weather enterprise for the protection of life and property and enhancement of the national economy. Given that the relative scarcity of high resolution surface and planetary boundary layer/tropospheric observations impedes progress in skillful predictions of high-impact and disruptive weather, proposals should focus on technologies with the potential to improve the accuracy, reliability, spatial coverage, cost effectiveness, deployability, safety, and sustainability of observations for eventual use by the operational weather enterprise including NOAA, the National Mesonet Program, the private sector, and other government sectors.

The scope includes weather-related observations from the surface through the planetary boundary layer/troposphere including, but not limited to, in-situ surface, profiling, balloon-borne, radar, and airborne and/or uncrewed systems (UxS) based technologies. Satellite-based sensors are not included in this scope except to calibrate, validate, or integrate with in-situ observations as a secondary objective.

Realizing that surface through boundary layer and tropospheric observations are unevenly distributed in space, time and purpose, proposals of particular interest should leverage in-situ surface, profiling, balloon-borne, radar, airborne, and/or UxS based observing technologies for use in sampling and/or sensing adverse weather phenomena beyond just severe thunderstorms and tornadoes, such as extreme precipitation, extreme temperatures, floods, tropical cyclones, atmospheric rivers, and fire weather, and that are cost-effective, widely available, and/or affordably available for purchase, independent of investment beyond the grant award period.

The strongest proposals should:

- include **substantial collaboration with one or more operational weather stakeholder(s)** with the potential to benefit from the work and deliver sample data to the stakeholders for evaluation during the practical portion of the award period
- clearly **document linkage to operational weather needs** and demonstrate or allocate effort to understand how new observations may be used in the operational weather enterprise, e.g. NOAA National Weather Service, National MesoNet Program, State Climatologist Programs (see below for additional information), and tailor aspects of the observation collection and instrument design accordingly
- demonstrate **potential to transition to operations, applications, commercialization, or a final product**, and, if applicable (e.g., the path to operations is *not* commercialization),explain how **NOAA can sustain the observational capabilities** and outcomes of the proposed work in an operational capacity

Opportunities for collaboration with operational stakeholders: As stated above, strong proposals should have substantial collaboration with one or more operational stakeholders. One source of collaboration is with NOAA National Weather Service (NWS) that has 122 Weather Forecast Offices around the country as well as National Centers, River Forecast Centers, and Center Weather Service Units (https://www.nws.noaa.gov/organization.php). Proposers are encouraged to report their planned interactions with NWS offices to Jordan Gerth, Jordan.Gerth@noaa.gov, at the National Weather Service Office of Observations.

Examples of potential collaboration with operational stakeholders include the National Mesonet Program (https://nationalmesonet.us/nmp-partners/) and State Climatologist Programs (https://stateclimate.org/). Engagement with, and participation by the operational weather commercial sector is also encouraged.

Projects appropriate for this competition range from Readiness Level (RL) 5 to RL 7 (see https://wpo.noaa.gov/R2O/Transitions/RLevels) and have potential to transition to operations, application, commercialization, or final product at either NOAA or the weather enterprise within the next 3 to 6 years.

Program Priorities for FY2023

The WPO Observations Program, in collaboration with the NWS and other NOAA stakeholders, developed the following six priorities.

Obs-1: Analyses of existing weather observations. In addition to exploring and developing new types of observations, NOAA invests in the maintenance and operation of a diverse and geographically distributed array of weather observations for situational awareness and environmental modeling. However, the unique impact of individual observations, or one type of observations, from legacy platforms on weather predictions is less understood as the portfolio of various observations has grown. The development of tools that enable the examination of a network of weather observations or various observation deployment scenarios, especially those that account for cost, is highly desired. Secondarily, research that examines the relative benefit of different observations through Observing System Experiments (OSEs) with numerical weather prediction models is sought, including, but not limited to, whether:

- Aircraft observations and radiosondes are complementary at some locations and/or some times;
- Existing targeting strategies for reconnaissance missions are maximizing the benefits of airborne resources;
- The time, frequency, and location of radiosonde launches is optimized to maximize benefit to the NWS mission;
- Location, longevity, or network reliability of surface weather stations, cooperative observer reports, and/or buoys is more beneficial to weather prediction skill; and
- New, unused, or underused observations could replace other existing observations to improve or sustain weather predictions, particularly for the same or lower cost.

Projects may consider the use of satellite data as a secondary emphasis (e.g., the value of satellite scatterometer winds as an alternative to buoys), but research and network analyses with in situ observations are the greatest priority to the NWS in this current competition. NOAA's numerical weather systems must be included in the analysis. In addition, OSEs are of greater interest than Observing System Simulation Experiments (OSSEs) for this priority.

Obs-2: Analyses of gaps in current observations. Observing System Simulation Experiments (OSSEs) involving the operational NOAA modeling framework that evaluate the impact of spatial and temporal data gaps in the current observational network on numerical weather prediction model output are sought. The strongest proposals in this category will conduct OSSEs for several different types of current observational gaps that might inform NOAA decisions related to improving the robustness of its network. OSSEs involving future potential observing systems that are not currently deployed are outside of the scope of this priority.

Obs-3: Fire Weather. As documented by the National Wildfire Coordination Group, Fire Environment Committee's analysis in 2017, and reinforced in the 2022 ICAMS and USGEO report (Observation and Information Shortfalls in Support of Wildland Fire Activities Report) observations and decision support tools are critical priorities for improvements in the forecasting, nowcasting, and mitigation of Wildfire events. This priority seeks proposals that fall under at least one of the following categories:

- **Decision Support:** This priority seeks proposals for the capability for a system to integrate, graphically display, and analyze fire weather observations that can be used and sustained across collaborating agencies and partners. The observation analysis must be capable of being integrated into local forecasting systems, such as the NWS Spot Program, to alert forecasters to changing environmental conditions that could affect forecast products localized for fires.
- **Observations:** This priority seeks proposals for the development, demonstration and establishment of operational protocols for relevant boundary layer and fire perimeter observations (i.e. UXS, lidar, etc.) that can be safely, cost effectively and routinely deployed in challenging wildfire environments, including prescribed fire locations requiring NOAA/NWS spot forecasts.
- **Smoke Plumes and Fire Weather Environment**:This priority seeks proposals for expanding the capability of deployed lidar data up to and including 50,000 ft cloud height and ceiling. Additional height can provide backscatter data for fire weather, and augment balloon flights for atmospheric data. Other data uses include improved cloud layering and related information for air traffic management, along with localized data for forecasters and emergency managers.

Obs-4: Mesonet Boundary Layer Observations. The NOAA Science Advisory Board (SAB) Priorities for Weather Research (PWR) report documents the need for efforts to improve and expand planetary boundary layer observations. This priority solicits proposals that aim to develop and demonstrate capabilities for sustained boundary layer profile observations within formal mesonet programs to improve the operational detection and forecasts of severe weather.

Obs-5: Tropical Cyclone Observations. Tropical cyclones are extreme weather events that are capable of imparting long lasting structural, economical, and social devastation on coastal communities. This priority seeks proposals that address one or more of the following sub bullets for advancing tropical cyclone observing capabilities that aim to improve tropical cyclone predictions, situational awareness, and understanding of these systems, particularly for the tropical cyclone boundary layer.

- Improve wind measurements from the mid-troposphere to the ocean surface to improve calibration and reliability of existing and future wind observation platforms for analysis of tropical cyclone intensity and structure
- Improve estimates of surface wind speed in the tropical cyclone vortex by combining information from multiple reconnaissance instruments (including the observations themselves as well as the uncertainty in the observation)
- Demonstrate or advance uncrewed systems to provide cost effective observations in data sparse regions relevant to improving tropical cyclone forecasts. This might include unmanned aircraft or long-duration balloons to sample the tropical cyclone itself or to pre-sample the atmosphere before crewed systems are deployed.
- Analyze existing and/or potential observing systems to identify optimal design, deployment, or assimilation strategies and demonstrate the potential improvement to tropical and marine forecasts and products.
- Use NOAA Unified Forecast Systems, including the Global Forecast System (GFS) and Hurricane Analysis and Forecast System (HAFS) to:
    - improve use of reconnaissance observations already in the operational data stream, such as through super-obbing of high-resolution data
    - assimilate experimental reconnaissance data not already in the operational data stream
    - assimilate other new or experimental data from poorly sampled regions that pertain to improving tropical cyclone forecasts; in particular, examine how new or experimental data can be coordinated with airborne reconnaissance data
- OSSEs to improve assimilation strategies for the next-generation airborne radar
- Enhance WSR-88D algorithms to derive curvature and track the movement of individual cells and bands within tropical cyclones. Areas of improvement may address tropical cyclones, such as: tracking the movement of the storm center; deriving the two-dimensional wind field; deriving curvature and track the movement of individual cells and bands; and assessing storm strength (maximum wind speeds) and trend. This can also be applied to extratropical systems.

Obs-6: Innovative observing technologies including observations of opportunity. Innovative and nontraditional observing technologies are key in the continued advancement of current observing systems, techniques, and data delivery to improve forecast challenges, situational awareness, and critical data gaps.

- **Innovative Observing Technologies -** This priority solicits proposals recommending cost effective observing technologies targeting the planetary boundary layer that hold high potential for improving severe weather forecasts and services.The proposed technology must demonstrate a strong linkage to operational needs and a potential for transition.

- **Observations of Opportunity** - Observations that are being collected by commercial industry, states, local authorities, and private citizens, but are not presently part of an operational weather observing network, are of interest.These nonconventional observations include data collected in densely populated urban areas, gaps in the United States and territories' observing networks, and surrounding oceans. Examples include but are not limited to networks of personal weather stations, data from smartphones, citizen scientist reports, mesonets, and aircraft data.