

ANNUAL REPORT ON THE NATIONAL OCEANOGRAPHIC PARTNERSHIP PROGRAM FISCAL YEAR 2025

Prepared by the
INTERAGENCY WORKING GROUP
ON THE NATIONAL OCEANOGRAPHIC PARTNERSHIP PROGRAM

September 2026

About the National Oceanographic Partnership Program

The National Oceanographic Partnership Program (NOPP) was established by Congress in 1997 and reauthorized in 2021 to promote the national goals of advancing economic development, protecting quality of life, strengthening science education and communication, and assuring national security by improving knowledge of the ocean. These goals are achieved through partnerships among federal agencies, academia, industry, and nongovernmental organizations that advance administration priorities through interagency science and technology initiatives that cut across agency missions and multiple disciplines. Through NOPP, public and private sectors across the ocean science community coordinate to support larger, comprehensive projects, promote sharing of resources, and foster community-wide innovative advances in ocean science, data, technology development, resources, education, and communication.

About this Document

In accordance with the William M. (Mac) Thornberry National Defense Authorization Act for Fiscal Year 2021 (Public Law 116–283, §1055(b)(2)(A)), this report publicly documents NOPP’s activities during fiscal year 2025.

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Interagency Working Group on the National Oceanographic Partnership Program

Co-Chairs

Reginald Beach, DOW/ONR

William Mowitt, DOC/NOAA

Jeremy Weirich, DOC/NOAA

Frank Cantelas, DOC/NOAA

Those listed on this page were in these positions during the fiscal year 2025 time period covered by this report.

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Introduction

The National Oceanographic Partnership Program (NOPP) is the nation's flagship program to facilitate ocean research partnerships across government and other sectors. NOPP was established by Congress in fiscal year (FY) 1997 to promote the goals of ensuring national security, advancing economic development, protecting quality of life, and strengthening science education and communication by improving knowledge of the ocean. These goals are accomplished through partnerships among federal agencies, academia, industry, and nongovernmental organizations. The program is an effective forum for advancing national goals through the development of interagency initiatives and projects that span agency missions, research sectors, and scientific and technological disciplines. Ocean knowledge informs and augments marine stewardship by bringing agencies together to drive forward research and education missions.

NOPP focuses on two strategic goals:

- Facilitate and promote interagency ocean research partnerships
- Catalyze and support scientific and technological research on critical and emerging issues

In FY 2025, NOPP agencies initiated 12 new projects. Eight of these projects focused on internal wave energy and the development of low-cost profiling Conductivity, Temperature, and Depth (CTD) floats, aiming to improve global ocean models and operational forecasts. The remaining four projects focused on ocean surface topography, utilizing ocean altimetry satellite data to better understand Earth's oceans and their interaction with the climate system. These 12 projects bring the total number of active awards to 61 and the total number of awards funded since the inception of NOPP to 307. The combined agency funding dedicated to new FY 2025 projects totaled \$4.23 million. An additional \$10.92 million was provided in FY 2025 for ongoing multi-year NOPP projects, bringing the total FY 2025 investment in all NOPP-solicited activities, both new and continuing, to \$15.15 million. NOPP partner agencies also provided continued oversight of 49 ongoing projects funded in FY 2024 and earlier.

NOPP Interagency and External Interactions

Interagency and external partnerships are a central tool of NOPP. Agency participation in NOPP includes sponsoring research through partnership funding opportunities and prize competitions. Within the U.S. government, collaboration is accomplished largely through an Interagency Working Group (IWG) that aims to develop, plan, and oversee NOPP ocean research and technology projects and to address topics of mutual and emerging interest. The IWG NOPP meets monthly to advance projects that benefit from the collaboration of more than one agency, require government-private-academic partnerships, and work toward fulfilling the missions of multiple agencies.

Fiscal Year 2025 NOPP Activities

Annual Solicitation and New Partnership Projects

Each year, NOPP partner agencies identify ocean research and technology topics of mutual interest

that would benefit from cross-agency and cross-sector partnerships leading to an agency-issued formal Broad Agency Announcement (BAA), Request for Proposal (RFP), or Federal Funding Opportunity. Proposals are received, usually in the fall, and funded projects are then selected through a formal merit review process developed with the guidance and approval of the participating federal agencies. Details of the procedure for developing these funding opportunities are described in Appendix 1.

The IWG NOPP developed topics and language for a FY 2025 BAA, published on August 22, 2024. The solicitation was intended to provide up to \$23M over three years and was focused on two topics: 1) A Global Multi-agency Experiment on Internal Wave Energy, Mixing and Interactions in the Ocean and Their Representation in Global Ocean Models and Operational Forecasts and 2) Low-Cost, Air Deployable 400m Profiling CTD Floats for investigating submesoscale eddies – Design, Study and Demonstration. Proposals were received, reviewed, and selected for funding in FY 2025. In addition, the National Oceanic and Atmospheric Administration (NOAA) partnered with the National Aeronautics and Space Administration (NASA) on a joint solicitation for the Ocean Surface Topography Science Team (OSTST) which brings together international scientists to understand Earth's oceans and their interaction within the climate system using ocean altimetry satellite. NOAA and NASA jointly select and support U.S. investigations for the OSTST through the Research Opportunities in Space and Earth Science (ROSES) solicitation.

In FY 2025, 12 new NOPP projects (8 of them selected from the FY 2025 BAA) were funded, totaling \$4.23M:

1. *Diagnosing and validating nonlinear internal wave processes in idealized, regional, and global ocean simulations*
2. *Improving the representation of internal wave processes in the Navy data assimilative forecasting system*
3. *A distributed network of internal wave resolving moored arrays for assessing nonlinear internal wave processes in operational forecast models*
4. *Expendable air-deployable floats for upper ocean measurements*
5. *Air-deployed microFloats for profiling the ocean submesoscale: a systems-level design approach and demonstration*
6. *CALANOID: A modular, air-deployable ocean profiler*
7. *Development of a low-cost, air-deployable ocean CTD profiler for in-situ investigation of sub-mesoscale eddies*
8. *The low-cost profiler (LCP): enabling ocean science at scale*
9. *Towards the unification of radar altimetry processing approaches for different surface types*
10. *Assessing decadal-scale variability and trends in Arctic Ocean surface topography with high latitude altimetry*
11. *From the shelves to the deep: satellite-derived profiles for operational ocean heat content applications in the North Atlantic and Pacific Oceans*
12. *Mapping coastal currents in midlatitudes and the Arctic*

Abstracts for all 12 projects can be found in Appendix 2.

Prior Year Project Continuations

NOPP partner agencies also continue to oversee 49 additional ongoing NOPP projects. FY 2025 funding totaling \$10.92 million was provided to support the ongoing multiyear NOPP projects. The partnering agencies for these efforts include but are not limited to NOAA, NASA, Office of Naval Research (ONR), Bureau of Ocean Energy Management (BOEM), United States Geological Survey (USGS), Department of Energy (DOE), Environmental Protection Agency (EPA), and National Science Foundation (NSF). Further information for these additional projects, along with the new FY 2025 projects, can be found in Appendix 2.

FY 2026 Plans and Partnership Priorities

In FY 2026, the IWG NOPP will continue to identify, facilitate, and foster collaboration on priority interagency ocean research projects through engagement with representatives from federal ocean agencies and other appropriate avenues. The IWG NOPP continues to examine and discuss ocean science and technology areas needing further advancement to meet agency missions.

National Oceanographic Partnership Program Office

The NOPP Office, contracted to Integrated Systems Solutions, Inc., facilitates communication across ocean science sectors to expand the scope of public/private partnerships; plans and facilitates fora and workshops; provides administrative support to IWG NOPP; supports the NOPP peer review grant process; facilitates the annual NOPP Excellence in Partnership (EiP) Award; supports drafting the NOPP annual report to Congress; and coordinates NOPP outreach and education activities including the www.nopp.org website.

NOPP Partnership Forums

NOPP Partnership Forums are a newly established component of NOPP focused on facilitating partnerships in ocean science, research, and education that address pressing ocean science topics and priorities. Partnership forums, convened individually or in conjunction with scientific conferences, are in-person meetings between federal agencies, academia, and the private sector, including industries, nongovernmental organizations, and philanthropic organizations. Information on NOPP Partnership Forums can be found [here](#).

In FY 2025, the NOPP Office partnered with the Marine Technology Society (MTS) to organize the Ocean Biodiversity TechSurge held in Baltimore, MD October 1-2, 2024. This forum brought together over 70 representatives from federal government, tribal communities, academia, nonprofit organizations, industry, and venture capital to discuss how to form multi-sector partnerships and implement United States ocean biodiversity technologies and knowledge, such as are highlighted in the National Ocean Biodiversity Strategy. Topics included the value of biodiversity, aggregating demand for development and conservation, financial tools to scale biodiversity conservation, as well as technology and data innovations for biodiversity monitoring, reporting, verification, forecasting and integration.

The NOPP Office also co-organized the NOPP Ocean Life Forum 2.0 on September 15-16, 2025 at Johns Hopkins University Applied Physics Laboratory in Laurel, MD with MTS, U.S. Integrated Ocean

Observing System (IOOS), and the Marine Biodiversity Observation Network (MBON). Building on previous events, the forum used a "sandbox" approach, bringing together representatives to prioritize practical ideas for integrated ocean life observations and standardized data, advancing efforts for single and multi-species applications. Participants formed groups to develop sandbox ideas on invasive species, large mammal detection, nearshore habitat change, deep-water seabed biodiversity, and fisheries monitoring. These were presented to a panel of experts who provided feedback in a "shark tank" like format, and groups refined their ideas based on that feedback on the second day. The refined ideas detailed participants and costs, demonstrating the value of integrated technologies for biodiversity assessment and decision-making, and outlined needs and expected outcomes for end-users, identifying champions for future activities.

NOPP Excellence in Partnering Award

Each year, the NOPP EiP Award is presented to a research team that best demonstrates the partnership objectives of the NOPP. The 2025 NOPP EiP Award was awarded to the [NOPP Hurricane Coastal Impacts Project \(NHCI\)](#). NHCI has 9 teams, each with a lead principal investigator (PI), consisting of 13 unique academic institutions, 13 government agencies or divisions, and 6 industry/nonprofit performers. The lead PIs are: Jon Moskaitis of the U.S. Naval Research Laboratory (NRL), Dean Gesch (retired) and Jeff Danielson of the USGS Earth Resources Observation and Science (EROS) Center, Roland Romeiser of the University of Miami, Luca Centurioni of UC San Diego's Scripps Institution of Oceanography, Jim Thomson of the University of Washington, Jenna Brown of USGS, Rick Luettich of the University of North Carolina-Chapel Hill, Ap van Dongeren and Kees Nederhoff of Deltares USA, and Maitane Olabarrieta of the University of Florida.

The goal of NHCI was to improve coastal storm impact prediction, focusing on complex effects like breaching, erosion, and property damage, beyond standard inundation. Three modeling teams used common data to predict impacts from six hurricanes, with public data available for future research. Key project achievements include: strong performance of the three community models in predicting waves, water levels, breaching, erosion, and damages for the studied hurricanes; operationalization of new national capabilities at USGS for initializing model boundary conditions from space; public availability of all study data for future research and model improvements in Design Safe; and the publication of 9 scientific articles and 24 conference presentations by NHCI authors at the time they were awarded this recognition.

Summary of NOPP Investments

FY 2025 funding for new and ongoing projects under NOPP totaled \$15.15 million. From FY 1997 through FY 2025, the total expenditures on NOPP are \$590 million. Figure 1 shows a sand chart of recent NOPP funding by agency and year. The same data are presented as a table in Appendix 3. Appendix 4 provides a list of the 61 active NOPP projects. All historical projects supported by NOPP can be found at www.nopp.org.

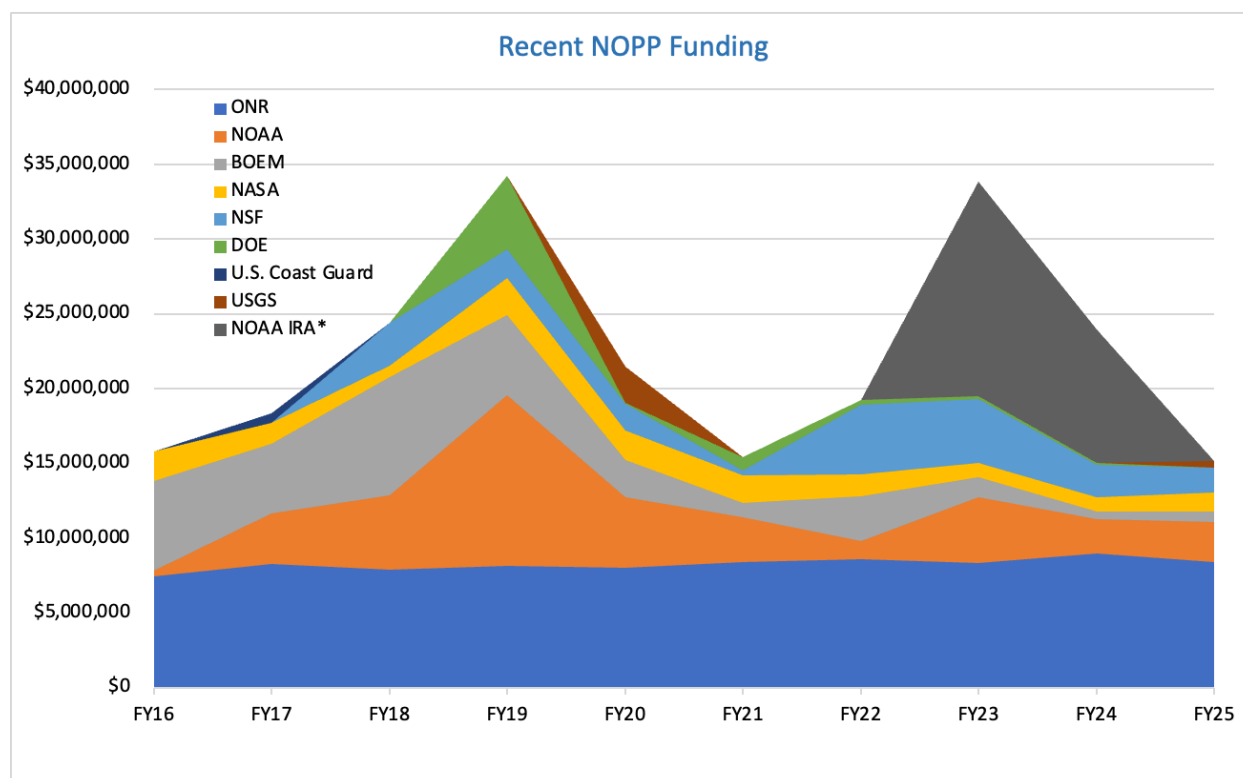


Figure 1. Reported agency contributions to NOPP projects from FY 2016 to FY 2025. *The IRA provided \$14.36 million of one-time funding for 10 NOAA NOPP projects in FY 2023 and \$8.9 million for 5 NOAA NOPP projects in FY 2024.

Conclusion

In FY 2025, NOPP launched 12 new projects while continuing successful projects from previous years. The NOPP Office, in partnership with MTS and others, organized two forums—the Ocean Biodiversity TechSurge in October 2024 and the NOPP Ocean Life Forum 2.0 in September 2025—to discuss and develop multi-sector partnerships, financial tools, and integrated technology and data innovations to advance United States ocean biodiversity and conservation efforts. Going forward, NOPP will draw upon its 29 years of experience and lessons learned to serve as an efficient mechanism for implementing productive ocean partnerships among federal agencies, industry, academia, and other sectors; supporting IWGs focused on key ocean research and facilities issues; and supporting federal ocean science priorities.

Appendix 1. Development and Process for NOPP Solicitations

Being a funded NOPP project requires multi-sector partnerships among academia, industry (including nongovernmental organizations), and government (including federal, Tribal, state, and local entities). Research topics funded through NOPP are initiated via interactions among agency program officers and managers, most often at IWG NOPP meetings. Partner agencies then discuss the research topic with other agencies through NOPP. At this point, a follow-up meeting is conducted where interagency partnerships are formed and tentative levels of support are pledged on an as-available basis. The research goals, partner resources, solicitation mechanisms, and language are then proposed, and the lead agency and agency project coordinator are identified.

Once the solicitation is approved by the lead agency and its partners, NOPP then reviews the funding announcement language, which is then presented as either a BAA, RFP, or other federal funding opportunity by the lead agency on behalf of NOPP.

Once a funding opportunity is announced, submitted proposals undergo a review process which fulfills the review standards of all agencies sponsoring that topic. For instance, when NSF is a co-sponsor, this may be some combination of mail and panel peer review. Proposals are reviewed based on:

- Relevance of the proposed research to NOPP objectives and federal science and technology priorities,
- Overall scientific and technical merits of the proposal,
- Level of support of critical research objectives or operational goals,
- Quality of proposed partnerships,
- The offeror's capabilities, related experience, and access to facilities that are critical to the proposal objectives,
- The long-term commitment of the partners to the proposed objectives,
- The qualifications and experience of the proposed principal investigator and key personnel, and
- Rationale of proposed cost.

At the conclusion of the review process, agency program officers or managers recommend funding. After NOPP discussions and receipt of appropriations, the awarded research projects are announced.

Appendix 2. New NOPP-Awarded Activities in Fiscal Year 2025

NOPP BAA: A Global Multi-agency Experiment on Internal Wave Energy, Mixing and Interactions in the Ocean and Their Representation in Global Ocean Models and Operational Forecasts (3 projects, \$6.6M total funding over 3 years)

Project website: [NOPP BAA FY25](#)

Diagnosing and Validating Nonlinear Internal Wave Processes in Idealized, Regional, and Global Ocean Simulations

PI: Maarten Buijsmann, University of Southern Mississippi

Partners: University of Michigan, University of Minnesota, NRL

This proposal aims to quantify the decay of primary-frequency internal tides into super-tidal internal waves due to wave-wave and wave-mean flow interactions using global, regional, and idealized model simulations, and validate those simulations with in-situ and satellite observations. Key observational data include full-depth moorings, current- and pressure-sensor equipped inverted echo sounder (CPIES), satellite altimetry (SWOT), and synthetic aperture radar (NISAR). While previous studies have focused on Parametric Subharmonic Instabilities (PSI), this work emphasizes the "superharmonic cascade," where primary-frequency internal tides interact to generate higher harmonic (supertidal) waves. This process, particularly pronounced in the tropics, leads to solitary wave-train formation that impact Navy operations and underwater acoustics. Internal tides also decay via wave-mean-flow interactions and scattering in eddy-rich regions. It is unclear how accurately any of these nonlinear processes are represented in the regional and global ocean models that provide operational forecasts for the US Navy. Here, we propose to quantify the impacts and accuracy of nonlinear processes in existing and newly proposed global and regional model simulations. To accomplish these goals, we propose to (1) conduct high-resolution measurements of nonlinear processes in internal-tide beams radiating from strong generation sites in tropical regions with and without strong mesoscale eddy activity and (2) perform high-resolution idealized, regional, and global simulations in synergy with these observations. The proposal comprises three collaborative efforts: 1. University of Southern Mississippi led: High-resolution modeling of internal-tide decay mechanisms in idealized, regional, and global simulations. 2. UCSD Scripps Institution of Oceanography led: In-situ data collection and analysis using moorings and CPIES in regions of strong nonlinear internal wave activity. 3. Florida State University led: Evaluation and improvement of internal wave representation in the Navy's data-assimilative forecast system using SWOT observations. Together, these efforts will improve understanding, modeling accuracy, and forecasting of nonlinear internal wave processes in Navy operational models.

Improving the representation of internal wave processes in the Navy data assimilative forecasting system

PI: Eric Chassignet, Florida State University

Partners: University of Michigan, NRL

The main objectives of this Florida State University led proposal are to improve the accuracy of internal wave processes in the Navy data assimilative forecasting systems and to develop a 1/50

degree global Hybrid Coordinate Ocean Model (HYCOM) simulation with realistic and phase accurate internal waves as the first step towards an operational 1/50 degree global ocean model. The phase accuracy of the internal waves will be tested through comparison to swath (SWOT) and nadir altimetry, and the impacts of assimilating SWOT into HYCOM will be quantified. The 1/50 degree HYCOM simulations, global and Atlantic, will form the boundary condition for the regional simulations. There are several known issues with the current Navy ESPC forecasts that our group has been working on and this proposal aims to a) quantify the errors in the representation of internal tides and waves in the existing global 1/25 degree Navy system by taking advantage of the latest SWOT observational dataset and b) reduce these errors by improving the Navy system's configuration, physics, and data assimilation. The latter will be achieved by systematically evaluating the impact of the bathymetry, bottom boundary layer, and horizontal/vertical resolution on the accuracy of internal tide/wave predictions and on the generation of high-frequency noise introduced by data assimilation. Our ultimate goal is to demonstrate the value-added of a kilometer-scale 1/50 degree global HYCOM simulation with realistic and phase accurate internal waves in generating boundary conditions for regional NCOM simulations and forecasts. The improvements in the HYCOM global modeling system will directly impact the US Navy's ability to conduct regional modeling with boundary conditions that include remotely generated internal tides and waves. Both global HYCOM and the regional simulations driven by HYCOM internal wave boundary conditions will be tested with an array of in-situ observational assets. This proposal is a compendium of three collaborative proposals: (1) this proposal "Improving the Representation of Internal Wave Processes in the Navy Data Assimilative Forecasting System", (2) the University of Southern Mississippi led proposal "Diagnosing and Validating Nonlinear Internal Wave Processes in Idealized, Regional, and Global Ocean Simulations" which aims to better understand the decay of the primary frequency internal tide due to wave-wave and wave-mean flow interactions and the generation of supertidal internal waves in global ocean, regional, and idealized model simulations, and (3) the UCSD Scripps Institution of Oceanography led proposal "A Distributed Network of Internal Wave Resolving Moored Arrays for Assessing Nonlinear Internal Wave Processes in Operational Forecast Models", which focuses on the collection and analysis of in-situ data with full-water depth moorings and CRIESs in regions with strong nonlinear internal wave generation and variable mesoscale.

A distributed network of internal wave resolving moored arrays for assessing nonlinear internal wave processes in operational forecast models

PI: Andrew Lucas, UC San Diego Scripps Institution of Oceanography

Partners: Woods Hole Oceanographic Institution (WHOI), University of Massachusetts Dartmouth, NASA Jet Propulsion Laboratory (JPL)

This proposal aims to quantify the decay of primary-frequency internal tides due to wave-wave and wave-mean flow interactions. We will use a combination of global, regional, and idealized model simulations, validated by in situ and satellite observations. Key observational data will be provided by full-depth moorings, CRIES, satellite swath altimetry (SWOT), and satellite synthetic aperture radar (NISAR). While previous studies have focused on PSI, this work emphasizes the "superharmonic cascade," where primary-frequency internal tides interact to generate higher harmonic (supertidal) waves. This process, particularly pronounced in the tropics, leads to solitary wave-train formation that impact Navy operations and underwater acoustics. Internal tides also decay via wave-mean-flow interactions and scattering in eddy-rich regions. It is unclear how accurately any of these nonlinear

processes are represented in the regional and global ocean models that provide operational forecasts for the US Navy. Here, we propose to quantify the impacts and accuracy of nonlinear processes in existing and next-generation global and regional model simulations. To accomplish these goals, we will (1) conduct high-resolution measurements of nonlinear processes in internal-tide beams radiating from strong generation sites in tropical regions with and without strong mesoscale eddy activity, (2) contextualize these in situ observations globally with satellite remote sensing, and (3) perform high-resolution idealized, regional, and global simulations in synergy with the observations. The overall program is comprised of three collaborative, but separately proposed, projects: 1. UCSD Scripps Institution of Oceanography led: In-situ data collection and analysis using moorings, CRIES, and satellites in regions of strong nonlinear internal wave activity globally (this proposal). 2. University of Southern Mississippi led: High-resolution modeling of internal-tide decay mechanisms in idealized, regional, and global simulations (Buijsman, lead PI). 3. Florida State University led: Evaluation and improvement of internal wave representation in the Navy's data assimilative forecast system using SWOT observations (Chassignet, lead PI). Our joint efforts will increase the fidelity of US Navy global HYCOM simulations and forecasts, enable HYCOM to assimilate SWOT data, and improve the ability of HYCOM to provide useful boundary conditions to regional simulations run by the US Navy. The project will also strengthen and deepen collaborations between the HYCOM team and ocean observationalists, as well as between Navy- and NASA-funded research.

NOPP BAA: Low-Cost, Air Deployable 400m Profiling CTD Floats for investigating submesoscale eddies – Design, Study and Demonstration (5 projects, \$1.1M total funding over 1 year)

Project website: [NOPP BAA FY25](#)

Expendable air-deployable floats for upper ocean measurements

PI: Knut Streitlien, Apeiron Labs, Inc.

Partners: WHOI

Sub-mesoscale meanders and eddies, occurring at spatial scales of 10-100 km, are fundamental to both horizontal and vertical heat transport mechanisms in global ocean systems. Despite their critical role, these phenomena remain inadequately characterized due to their inherent spatiotemporal variability and the constraints of today's measurement platforms, which provide slow, sparse, and sporadic coverage. As computational models of intermediate-scale ocean dynamics continue to advance in sophistication and capability, corresponding improvements in subsurface measurement methodologies are essential. This project has two objectives. The first is to demonstrate a drone-launched expendable float that is capable of measuring conductivity and temperature as a function of depth up to 400 meters over several months to provide dense 3D measurements within sub-mesoscale ocean features. We are using drone-launch as a proxy for air launch from aircraft. The second objective is to present a design package that shows a feasibility roadmap to achieving the eventual cost objective of \$1000 in modest quantities.

Air-deployed microFloats for profiling the ocean submesoscale: a systems-level design approach and demonstration

PI: Trevor Harrison, University of Washington Applied Physics Laboratory

Partners: MarineSitu

The scientific community's growing interest in how subsurface dynamics contribute to submesoscale

processes highlights the difficulty in resolving these small scales due to the lack of low-cost vehicles that can be deployed in large numbers. We will fill this need for a shallow inexpensive air-deployable profiling float by undertaking a holistic design process: combining highly experienced engineers, users, and scientists to design a vehicle that not only meets the engineering constraints (cost, technical specs, and production), but that also reduces the real-world limitations of using profiling floats designed for the Argo mission. In particular, the new design will aim to minimize effort from expert engineers or scientists on a per-float basis in three areas: pre-deployment preparation, piloting and control, and data processing and dissemination. The design effort will work from two existing and proven systems, the microFloat and the microSWIFT, that together meet many of the desired performance specs. Informed by these platforms, we will develop a new inexpensive air-deployable microFloat design that enables deployments at scales of 1000 floats. In developing the new design, the critical subsystems we will evaluate and refine are air deployability, buoyancy engine performance, satellite communications, sensor choices - including a novel conductivity sensor concept, energy budget, float controls, and downstream data processing. Design choices will be evaluated for their overall impact on operations - from fabrication and assembly, to initial deployment setup, to post-deployment logistics - to avoid “hidden costs” that can severely hinder deployments at large scales and minimize the total cost per profile. As a first step toward refining air deployment, we will build a parachute system for the existing microFloat and use local tests in Puget Sound to inform our float design. Throughout the design process, we will incorporate expert system-level input by bringing together a highly experienced team including: design engineers who have developed dozens of vehicles; production and field engineers who make custom and commercial vehicles perform reliably in the field; a company that produces underwater monitoring products with simple and automated software and data management; and scientists who plan and carry out deployments to advance our awareness and understanding of the ocean.

CALANOID: A Modular, Air-Deployable Ocean Profiler

PI: Anuscheh Nawaz, University of Washington

Partners: Sofar Ocean Technologies, Inc.

Current ocean sensing platforms face critical limitations in scalability, cost, and data accessibility. As a result, submesoscale ocean dynamics—small-scale processes essential to ocean mixing and climate—remain undersampled due to the lack of distributed in-situ observations. Addressing this gap requires a modular, cost-effective profiling float capable of dense, scalable deployment. Sofar Ocean and the University of Washington aim to design and validate such a platform: an affordable, air-launched, mass-deployable ocean sensor system. The proposed system, CALANOID, leverages modularity and the Bristlemouth open standard to enable interchangeable and upgradeable components, including sensors, telemetry, and buoyancy engines. This flexibility allows CALANOID to adapt to diverse scientific and operational missions—including submesoscale eddy dynamics—without fundamental redesign. As part of the effort the University of Washington focuses on a dramatically lower-cost CTD sensor payload. The NanoCTD incorporates a low-cost, low-power salinity sensor based on solid-state potentiometry that directly measures chloride ion concentration, avoiding the size and power demands of traditional CTD sensors. This salinity sensor is paired with advanced MEMS-based temperature and pressure sensors to complete the payload. Sofar Ocean will iteratively prototype and test CALANOID designs to ensure air deployability and compliance with A-size sonobuoy specifications. The ABS plastic hull will be pressure-tested to 400 meters, and robust, modular buoyancy and battery systems will be developed to support two-month missions. Manufacturing costs are minimized through the use of off-the-shelf components and proven

engineering practices. Once developed, CALANOID will deliver critical observations of submesoscale processes and improve ocean models, while supporting applications ranging from naval operations to climate research.

Development of a Low-Cost, Air-Deployable Ocean CTD Profiler for In-Situ Investigation of Sub-Mesoscale Eddies

PI: Xueju (Sophie) Wang, University of Connecticut

Partners: University of Connecticut, LBI Inc.

Understanding mass, heat, and energy transfer in the ocean is essential for assessing climate processes, particularly those involving sub-mesoscale eddies that span areas of 100–10,000 square kilometers. Satellite observations provide continuous surface data—such as ocean color, sea surface temperature, and occasionally sea surface height—but they cannot resolve subsurface structure or vertical stratification, especially temperature and salinity variations with depth (CTD). As a result, obtaining synoptic, cost-effective, in situ measurements of sub-mesoscale eddies remains a significant challenge. To address this gap, we have formed a multidisciplinary team combining UConn’s expertise in sensors and telemetry with LBI’s capabilities in buoyancy control and package fabrication. Our goal is to design and demonstrate a new, low-cost, air-deployable ocean profiler capable of performing CTD measurements of sub-mesoscale features in situ. This Phase I effort focuses on four objectives:

- a) Designing and fabricating power-efficient, compact, low-cost soft CTD sensors with measurement performance comparable to conventional systems.
- b) Developing a low-cost buoyancy engine capable of cycling between the ocean surface and 400 m depth for vertical profiling.
- c) Integrating the sensors, buoyancy engine, and data telemetry into a robust, fully functional package and validating system durability.
- d) Demonstrating the feasibility of the approach through extensive laboratory, boat-based, and airborne deployment testing, culminating in operational profiling with a demonstrator float.

The resulting profiler will fill a critical capability gap by enabling high-resolution, in situ sampling of temperature and salinity structure in sub-mesoscale eddies at a fraction of current system costs. This technology represents an important step in the Navy’s efforts to enhance subsurface observational capacity and will provide unprecedented data for understanding ocean mixing and its influence on climate. By enabling scalable, synoptic observations of subsurface eddy dynamics, this work lays the foundation for next-generation oceanographic measurement systems and improved predictive capabilities.

The Low-Cost Profiler (LCP): Enabling ocean science at scale

PI: Noah Lawrence-Slavas, NOAA Pacific Marine Environmental Laboratory (PMEL)

Partners: Cooperative Institute for Climate, Ocean and Ecosystem Studies (CICOES)/University of Washington

This project will complete the development of an opensource, air-deployable, Low-Cost ocean Profiler (LCP) technology to reduce the cost of collecting critical ocean observations in support of making forecasts that protect life and property. This LCP technology has numerous operational applications from hurricane intensity forecasting, to real-time fisheries management data collection, to Arctic and coastal research. The LCP can be configured pre-mission to perform in different observational roles,

including drifting, timed release and moored, making it a unique tool for autonomously profiling the upper ocean. The LCP, which is currently undergoing engineering field trials, uses a direct-drive buoyancy engine to reduce mechanical complexity and incorporates OEM manufacturer calibrated sensors to enable it to be manufactured at scale. The LCP has been designed to be assembled primarily from off-the-shelf commercially available components, and significant effort went into minimizing the complexity and number of custom machined parts. This makes the LCP an ideal candidate for the transition of the technology to an open source manufacturing solution. Key benefits of the LCP technology for filling gaps in the U.S. coastal observing arrays include. a) Low cost allows them to be deployed in greater numbers in high risk locations where they can fill observational gaps between expensive observing nodes; b) In moored mode the LCP's small size does not require the high level of infrastructure and operational support of current coastal moorings and it can be easily moved in response to changing conditions; c) Sonobuoy A-size aircraft deployment package allows for rapid deployment in response to extreme events (hurricanes) and in areas where ship-based deployments are too risky or expensive (around sea ice). Design objectives for this project are: a) Develop and qualify the LCP's air deployment package; b) Re-design the LCP's electronics hardware and controlling software for ultra-low power consumption, to reduce cost, and improve reliability; c) Develop user documentation in preparation for transitioning the LCP technology to an open source solution.

Other NOPP funded Opportunities

From the Shelves to the Deep: Satellite-Derived Profiles for Operational Ocean Heat Content Applications in the North Atlantic and Pacific Ocean

PI: David Trossman, University of Maryland, College Park

Partners: NOAA, NASA

The proposers will develop the Next Generation Enterprise Ocean Heat Content (NGE OHC) algorithm to produce high-resolution (~10 km along-track and $\frac{1}{4}^\circ$ gridded) temperature and salinity (T/S) upper-ocean profiles operationally in the continental shelf and open ocean regions of the North Atlantic and Pacific Oceans using satellite data and machine learning techniques. These profiles will enable us to monitor and investigate the processes associated with extreme events, among other applications. The NGE OHC algorithm is rooted in the well-established gravest/geostrophic empirical mode (GEM) approach, which utilizes the widespread nature and dominance of lowmode baroclinic variability in the ocean to estimate subsurface profiles from surface information. Corrections to the GEM to account for temporal variability in boundary (i.e., sea surface) conditions are also derived from remotely sensed surface data, including sea surface temperatures and salinities, as well as additional parameters to address seasonal and latitudinal variability. The NGE OHC algorithm estimates T/S profiles at 2 dbar resolution from the surface to an appropriate maximum depth (typically ~1000 dbar in the open ocean and ~500 dbar in continental shelf zones) and related parameters of interest such as OHC and mixed layer depth. In the open North Atlantic Ocean, a preliminary version of the algorithm is currently applied. This version of the NGE OHC algorithm can reproduce more than 80% of the variance in quality-controlled Argo temperature profile data over 0--600 dbar and more than 90% of the variance over 0--50 dbar. The algorithm reproduces more than 70% of the variance in quality-controlled Argo salinity profile data in the upper 100--600 dbar and more than 60% of the variance over 0--100 dbar, which we plan to improve upon in our proposed work with developments described below. Further assessment of the NGE OHC algorithm will be performed in this work using independent in-situ data, including those from deep gliders collected along the altimeter tracks. The team will both expand the domain of the current algorithm and enhance its fidelity with several novel

developments. The existing open ocean North Atlantic NGE OHC algorithm is applied separately over areas with different stratification regimes, which are identified by applying a machine learning clustering method to historical temperature profile data. When adapting the algorithm to the continental shelves, we will need to estimate new clusters that capture the variability of this dynamic region. We will need to identify new clusters for the open Pacific Ocean and surrounding continental shelves applications of the algorithm as well. Further optimization of the stratification-based clusters (e.g., by also considering salinity) will also be explored. We plan to improve the algorithm itself in several ways, including: making separate GEM estimates within/below the mixed layer, using atmospheric forcing data for additional corrections to the GEM, and parameterizing the factors that impact surface S anomalies on time scales not resolved by satellite data. Upon finalizing the NGE OHC algorithm for each domain, we will quantify the uncertainties in our T/S profile estimates. Together with existing products (e.g., Argo-based velocity estimates), the profiles and associated uncertainties from the NGE OHC algorithm can then be used to analyze heat budgets that are critical to understanding the processes that control the life cycles of marine heat waves. The team will then apply the NGE OHC algorithm to assess the benefits of using its outputs for tropical cyclone and marine heatwave forecast evaluation in the North Atlantic and Pacific Oceans using observing system experiments. The NGE OHC output can also be used to monitor the subsurface characteristics of these extreme events, which can have major impacts on fisheries and coral reefs.

Assessing Decadal-Scale Variability and Trends in Arctic Ocean Surface Topography with High Latitude Altimetry

PI: Sinead Farrell, University of Maryland, College Park

Partners: NOAA, NASA

Accelerated warming and increased storminess at high latitudes is driving rapid changes in the composition of the polar oceans and their sea ice cover. Ocean remote sensing has revealed a statistically significant decline in Arctic sea ice extent over the last four decades, and observations from dedicated polar altimeters, spanning the last twenty years, indicate a loss in mean sea ice thickness and volume. This includes the near disappearance of the oldest, thickest multi-year sea ice in the Arctic Ocean and the subsequent doubling of the seasonal sea ice zone, from ~35% in 1985 to ~70% in 2020. Multiple, positive feedbacks between the ocean, ice and atmosphere, most notably the ice-albedo feedback in the Arctic, have triggered this decline. Since sea ice regulates the exchange of heat, moisture, gases and momentum between the ocean and atmosphere, and its high albedo influences Earth's energy budget, it plays a key role in the climate system. Declining sea ice is not only a leading indicator of a warming planet, but it is also an important driver of climate change. Improving knowledge of how and why the sea ice cover is evolving in both space and time is therefore essential for better prediction of Earth's future climatic conditions. Our goal is to produce the highest-quality satellite altimeter observations of polar ocean surface topography and apply these data to address key questions in polar climate science. We address both sub-elements 2.2 "regional and coastal dynamics" and 2.3 "operations and applications" of the A.12 solicitation. First, we will evaluate and advance new geophysical algorithms to improve the quality of sea surface height (SSH) data in ice-covered water using merged altimetric data from ICESat, ICESat-2 and CryoSat-2. Using these data, we will conduct regional studies of the Arctic Ocean and Nordic Seas to investigate variability in SSH, dynamic ocean topography and geostrophic circulation. We will quantify changes in significant wave height (SWH) and sea state conditions in the Nordic Seas. We will also assess variability and trends in sea ice freeboard in the Arctic Ocean. We will generate new sea ice data products and publicly disseminate them for use in novel polar applications through the dedicated NOAA PolarWatch web portal. Through

our proposed work we will contribute to the overarching goals of the NOAA/NASA OSTST), i.e., "to demonstrate the value of the satellite altimetry records from the continued reference missions in Earth science and applications". Our major objectives are: (1) To quantify seasonal and interannual variability and trends in SSH in the ice-covered Arctic Ocean using the suite of available radar/laser altimeter data for the period 2003-2028. (2) To quantify seasonal and decadal-scale variability and trends in SSH and SWH in the ice-free Nordic Seas and assess the impacts at the sea ice edge. (3) To generate a complete 25-year record of Arctic sea ice freeboard using all available radar/laser altimeter data. (4) To quantify changes in open water/lead fraction and sea ice distributions in the Arctic and subpolar seas. The investigators seek to renew their membership of the OSTST and to continue producing the best possible satellite-derived altimetry data products describing polar ocean surface topography. The team have extensive knowledge of the combined use of satellite laser and radar altimetry for monitoring the polar oceans and the relevant experience to successfully conduct the proposed studies. Our proposed work will advance knowledge of the role that polar sea ice plays in the climate system. We will contribute scientific analysis in preparation for the Copernicus Polar Ice and Snow Topography Altimeter (CRISTAL) mission, the next dedicated polar altimeter due for launch in 2027/2028 and our work will also inform pre-launch algorithm development for Sentinel-3 Next Generation - Topography Mission (S3NG-TOPO).

Mapping coastal currents in midlatitudes and the Arctic

PI: James Carton, University of Maryland College Park

Partners: NOAA, NASA

Central objectives: Community-standard data-driven sea level and associated surface current products available now are designed for the open ocean and do not resolve the fine $O(10-50\text{ km})$ spatial scales and short $O(1-10\text{ dy})$ time-scales needed in high human and economic impact coastal zones and the Arctic. This project will conduct research with the goal of improving sea level and surface current products to extend into these areas and thus explore the limits of space- and time-resolution. The project will use the resulting software to produce global daily gridded sea level, surface current and uncertainty estimates 1993-2024. Emphasis will be placed on realistic evaluation of uncertainty in both sea level and surface current. Methods/techniques: Two approaches are presented. Approach 1 uses multiscale 3DVar built on the community-standard Joint Center for Satellite Data Assimilation JEDI framework, which ingests along-track nadir altimetry and ancillary information and produces uniformly gridded daily sea level and current estimates. These can be compared to independent observations such as HF RADAR currents, drifter tracks, and tide gauges. The prespecified error covariances are adjusted to improve spatial and temporal resolution. Results from the ongoing 'Ocean Data Challenges' community effort suggest that machine learning-based algorithms are developing the potential to improve on linear estimators such as that of Approach 1. In our second approach we will explore this potential by adding a convolutional neural network layer to extract additional information from the observation-analysis misfits resulting from Approach 1. Because this builds on Approach 1 we allow simple ocean dynamics to inform the machine learning. This software structure clarifies the contribution of the neural network and to makes it easier to interpret the origins of various features in the output fields. Uncertainty is explored through a series of data withholding and parameter varying experiments as well as by comparison to independent observations and exploration of dynamical balances. Perceived significance: Populations living in coastal regions depend on maritime operational and commercial activities such as fisheries, weather forecasting, and debris tracking, all of which require knowledge of nearshore mesoscale currents and their seasonal and decadal climatology. This need is highlighted in the most recent NAS Space Studies Board which

ranks sea level and surface current as targeted environmental variables. By using continuous reference mission sea level and ancillary nadir sea level over the full 40+ year record to map surface currents in coastal and high latitude zones and their connection to the global context, this proposal directly addresses item 2.2: Regional and coastal dynamics.

Towards the Unification of Radar Altimetry Processing Approaches for Different Surface Types

PI: Christopher Buchhaupt, University of Maryland, College Park

Partners: NOAA, NASA

Satellite altimetry has revolutionized our understanding of ocean surface topography, offering unprecedented insights into global oceanographic processes. From Geos-3 in 1975 to the recently launched Jason-3, most satellite radar altimeters have employed the conventional or low-resolution mode (LRM) for data processing. The introduction of delay/Doppler altimetry in 1998 marked a paradigm shift, significantly enhancing the precision of satellite radar measurements. This technique, akin to unfocused synthetic aperture radar (SAR), drastically reduces the altimeter footprint along the flight direction and improves surface measurement accuracy. It also significantly enhances the signal-to-noise ratio in retrieving geophysical parameters. Recent advances have improved the agreement between LRM and SAR processing schemes, addressing discrepancies crucial for accurate ocean measurements. For example, in SAR mode parameter retrieval--also known as retracking--it has been shown that vertical wave particle velocities and the mean line-of-sight velocity need to be considered as otherwise the sea surface heights and significant wave height estimates will not align with LRM results. Conversely, LRM waveform retracking, and to some extent SAR stack retracking, requires a more accurate antenna pattern in the signal model. Although minor questions remain, the reconciliation of discrepancies between SAR and LRM measurements is largely complete. Despite these advancements, current methods face challenges with non-ocean surfaces, such as sea ice and coastal areas. Existing models often rely on empirical approaches or inadequately represent the unique characteristics of these surfaces. For example, sea-ice surfaces are typically handled with empirical methods or physical models that are not well-suited to their specific conditions. Coastal ocean surfaces are retracked using non-numerical signal models that approximate the point target response with a Gaussian function and overlook crucial vertical and mean-line-of-sight wave motions important for SAR mode retracking. Our project aims to bridge these gaps by integrating advanced retracking techniques across different surface types, including open ocean, coastal ocean, and sea-ice. We will develop a unified geophysical numerical retracking approach and utilize machine learning to enhance surface type classification and consistency.

Appendix 3. Reported Annual Agency Contributions to NOPP Projects

Agency	FY 2016*	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024	FY 2025
BOEM	\$5,968,527	\$4,694,001	\$7,913,019	\$5,391,734	\$2,475,464	\$990,269	\$3,003,277	\$1,325,889	\$521,769	\$701,479
BSEE	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
DOE	\$0	\$0	\$0	\$4,900,000	\$100,000	\$890,000	\$350,000	\$200,000	\$123,160	\$0
NASA	\$1,978,308	\$1,411,618	\$776,886	\$2,447,638	\$2,000,000	\$1,861,996	\$1,484,595	\$999,991	\$1,000,000	\$1,284,997
NOAA	\$409,000	\$3,347,554	\$5,009,402	\$11,412,750	\$4,700,000	\$3,000,000	\$1,227,092	\$4,369,000	\$2,300,000	\$2,670,962
NSF	\$0	\$0	\$3,072,498	\$2,529,448	\$1,575,680	\$287,408	\$4,612,635	\$2,376,422	\$2,138,808	\$1,690,833
ONR	\$7,441,000	\$8,278,806	\$7,864,000	\$8,137,000	\$8,034,238	\$8,364,000	\$8,569,754	\$8,356,944	\$8,938,000	\$8,383,000
U.S. Coast Guard	\$0	\$586,250	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
USGS	\$0	\$0	\$0	\$0	\$2,400,000	\$0	\$0	\$0	\$8,000	\$421,859
NOAA IRA**	N/A	N/A	N/A	N/A	N/A	N/A	N/A	\$14,360,000	\$8,900,000	N/A
Total	\$15,796,835	\$18,318,229	\$24,635,805	\$34,818,570	\$21,285,382	\$15,393,673	\$19,247,353	\$31,988,246	\$23,929,737	\$15,153,130

*The past ten years of NOPP contributions are represented in this report; those from before FY 2016 can be found in previously released NOPP Annual Reports.

**The IRA provided \$14.36 million of one-time funding for ten NOAA NOPP projects in FY 2023 and \$8.9 million for five NOAA NOPP projects in FY 2024.

Appendix 4. All NOPP Projects Active through Fiscal Year 2025

Title	Project Web Link	Partners	Lead Principal Investigator(s)	Lead Institution(s)	Duration (years)	Start (FY)
Diagnosing and validating nonlinear internal wave processes in idealized, regional, and global ocean simulations	https://nopp.org/projects/diagnosing-and-validating-nonlinear-internal-wave-processes-in-idealized-regional-and-global-ocean-simulations/	University of Michigan, University of Minnesota, NRL	Buijsmann, Maarten	University of Southern Mississippi	3	2025
Improving the representation of internal wave processes in the Navy data assimilative forecasting system	https://nopp.org/projects/improving-the-representation-of-internal-wave-processes-in-the-navy-data-assimilative-forecasting-system/	University of Michigan, NRL	Chassignet, Eric	Florida State University	3	2025
A distributed network of internal wave resolving moored arrays for assessing nonlinear internal wave processes in operational forecast models	https://nopp.org/projects/a-distributed-network-of-internal-wave-resolving-moored-arrays-for-assessing-nonlinear-internal-wave-processes-in-operational-forecast-models/	WHOI, University of Massachusetts Dartmouth, NASA JPL	Lucas, Andrew	UC San Diego Scripps Institution of Oceanography	3	2025
Expendable air-deployable floats for upper ocean measurements	https://nopp.org/expendable-air-deployable-floats-for-upper-ocean-measurements/	WHOI	Streitlien, Knut	Apeiron Labs, Inc.	1	2025
Air-deployed microFloats for profiling the ocean submesoscale: a systems-level design approach and demonstration	https://nopp.org/air-deployed-microfloats-for-profiling-the-ocean-submesoscale-a-systems-level-design-approach-and-demonstration/	MarineSitu	Harrison, Trevor	University of Washington Applied Physics Laboratory	1	2025
CALANOID: A modular, air-deployable ocean profiler	https://nopp.org/calanoid-a-modular-air-deployable-ocean-profiler/	Sofar Ocean Technologies, Inc.	Nawaz, Anuscheh	University of Washington	1	2025

Title	Project Web Link	Partners	Lead Principal Investigator(s)	Lead Institution(s)	Duration (years)	Start (FY)
Development of a low-cost, air-deployable ocean CTD Pprofiler for in-situ investigation of sub-mesoscale eddies	https://nopp.org/development-of-a-low-cost-air-deployable-ocean-ctd-profiler-for-in-situ-investigation-of-sub-mesoscale-eddies/	University of Connecticut, LBI Inc.	Wang, Xueju (Sophie)	University of Connecticut	1	2025
The low-cost profiler (LCP): enabling ocean science at scale	https://nopp.org/the-low-cost-profiler-lcp-enabling-ocean-science-at-scale/	CICOES/University of Washington	Lawrence-Slavas, Noah	NOAA PMEL	1	2025
From the shelves to the deep: satellite-derived profiles for operational ocean heat content applications in the North Atlantic and Pacific Ocean	https://nopp.org/projects/from-the-shelves-to-the-deep-satellite-derived-profiles-for-operational-ocean-heat-content-applications-in-the-north-atlantic-and-pacific-ocean/	NOAA, NASA	Trossman, David	University of Maryland, College Park	4	2025
Assessing decadal-scale variability and trends in Arctic Ocean surface topography with high latitude altimetry	https://nopp.org/projects/assessing-decadal-scale-variability-and-trends-in-arctic-ocean-surface-topography-with-high-latitude-altimetry/	NOAA, NASA	Farrell, Sinead	University of Maryland, College Park	4	2025
Mapping coastal currents in midlatitudes and the Arctic	https://nopp.org/projects/mapping-coastal-currents-in-midlatitudes-and-the-arctic/	NOAA, NASA	Carton, James	University of Maryland, College Park	4	2025
Towards the unification of radar altimetry processing approaches for different surface types	https://nopp.org/projects/towards-the-unification-of-radar-altimetry-processing-approaches-for-different-surface-types/	NOAA, NASA	Buchhaupt, Christopher	University of Maryland, College Park	4	2025
Multi-trophic level expansion of the Gulf of Maine Marine	https://nopp.org/projects/multi-trophic-level-expansion-of-the-gulf-of-maine-marine/	NERACOOS, NMFS, ONMS/Stellwagen Bank,	Kritzer, Jake	NERACOOS	5	2024

Title	Project Web Link	Partners	Lead Principal Investigator(s)	Lead Institution(s)	Duration (years)	Start (FY)
Biodiversity Observation Network: meeting management challenges in a rapidly changing ecosystem	of-maine-marine-biodiversity-observation-network-meeting-management-challenges-in-a-rapidly-changing-ecosystem/	National Marine Sanctuary, BOEM				
Mid-Atlantic MBON: dynamic biodiversity and telemetry data for a changing coast	https://nopp.org/projects/mid-atlantic-mbon-dynamic-biodiversity-and-telemetry-data-for-a-changing-coast/	MARACOOS/University of Delaware, Smithsonian Environmental Research Center, BOEM	Kuska, Gerhard; Ogburn, Matthew	MARACOOS/University of Delaware	5	2024
An Operational BioTrack: monitoring at-risk marine species biodiversity hotspot Interactions with Management and resource use areas to support stakeholder needs in the face of global change	https://nopp.org/projects/an-operational-biotrack-monitoring-at-risk-marine-species-biodiversity-hotspot-interactions-with-management-and-resource-use-areas-to-support-stakeholder-needs-in-the-face-of-global-change/	U.S. IOOS (NERACOOS, MARACOOS, SECOORA, Axiom, BOEM, NMFS, South Atlantic Fisheries Management Council, NOAA ONMS) (Florida Keys, Monitor, Gray's Reef, Stellwagen Bank)	Hammerschlag, Neil	Shark Research Foundation, Inc.	5	2024
Marine Biodiversity Observation Network in the Northern California Current: dynamic, multiscale assessment of biodiversity and ecosystem function to support emerging science and management needs	https://nopp.org/projects/marine-biodiversity-observation-network-in-the-northern-california-current-dynamic-multiscale-assessment-of-biodiversity-and-ecosystem-function-to-support-emerging-science-and-management-needs/	Oregon State University, NMFS, ONMS/Olympic Coast, NANOOS	Kavanaugh, Maria	Oregon State University	5	2024
Dynamics of biodiversity across lakescapes in North America's inland seas	https://nopp.org/projects/dynamics-of-biodiversity-across-lakescapes-in-north-americas-inland-seas/	University of Michigan, NOAA Great Lakes Environmental Research Laboratory, Michigan	Godwin, Casey	University of Michigan	5	2024

Title	Project Web Link	Partners	Lead Principal Investigator(s)	Lead Institution(s)	Duration (years)	Start (FY)
		State University, University of Windsor, Oregon State University, Great Lakes Fisheries Commission				
An opportunity to study ocean alkalinity enhancement, CDR, and ecosystem impacts through coastal liming	https://nopp.org/projects/an-opportunity-to-study-ocean-alkalinity-enhancement-cdr-and-ecosystem-impacts-through-coastal-liming/	NOAA, EPA, University of Rhode Island, University of Connecticut, University of Hawai'i at Manoa, Weekapaug Golf Course	Palter, Jaime	University of Rhode Island	3	2023
Tidal wetlands as a low pH environment for accelerated and scalable olivine dissolution	https://nopp.org/projects/tidal-wetlands-as-a-low-ph-environment-for-accelerated-and-scalable-olivine-dissolution/	USGS Woods Hole Coastal & Marine Science Center, WHOI, Vesta Corporation, NOAA NMFS, NPS	Kroeger, Kevin	USGS	4	2023
Assessing carbon dioxide removal and ecosystem response for an ocean alkalinity enhancement field trial	https://nopp.org/projects/assessing-carbon-dioxide-removal-and-ecosystem-response-for-an-ocean-alkalinity-enhancement-field-trial/	WHOI, Monterey Bay Aquarium Research Institute, Marine Robotic Vehicle Systems	Nicholson, David	WHOI	3	2023
Assessing efficacy of electrochemical ocean alkalinity enhancement at an existing outfall using tracer release experiments and oceanographic models	https://nopp.org/projects/assessing-efficacy-of-electrochemical-ocean-alkalinity-enhancement-at-an-existing-outfall-using-tracer-release-experiments-and-oceanographic-models/	University of Hawai'i at Manoa, [C]worthy Convergent Research LLC, University of California Los Angeles, Ebb Carbon Inc, American University	Ho, David	University of Hawai'i at Manoa	3	2023
Assessing the laboratory and field responses of diatoms and coccolithophores to ocean	https://nopp.org/projects/assessing-the-laboratory-and-field-responses-of-diatoms-and-coccolithophores-to-ocean	WHOI, Rutgers University	Subhas, Adam	WHOI	3	2023

Title	Project Web Link	Partners	Lead Principal Investigator(s)	Lead Institution(s)	Duration (years)	Start (FY)
alkalinity enhancement	ores-to-ocean-alkalinity-enhancement/					
Developing a coupled benthic-pelagic biogeochemical model to evaluate the effectiveness of mCDR interventions	https://nopp.org/projects/developing-a-coupled-benthic-pelagic-biogeochemical-model-to-evaluate-the-effectiveness-of-mcdr-interventions/	Northeastern University, NOAA GFDL, University of Maine Walpole, Rutgers University, University of Connecticut, UMCES	Schultz, Christina; Luo, Jessica	Northeastern University	4	2023
Carbon capture and ocean acidification mitigation potential by seaweed farms in tropical and subtropical coastal environments	https://nopp.org/projects/carbon-capture-and-ocean-acidification-mitigation-potential-by-seaweed-farms-in-tropical-and-subtropical-coastal-environments/	Scripps Institution of Oceanography University of California San Diego, Okinawa Institute of Science and Technology, Marine Biological Laboratory, Sunburst Sensors, NOAA PMEL	Andersson, Andreas	UC San Diego	3	2023
Determining the Influence of ocean alkalinity enhancement on <i>Foraminifera</i> calcification, distribution, and CaCO ₃ production	https://nopp.org/projects/determining-the-influence-of-ocean-alkalinity-enhancement-on-foraminifera-calcification-distribution-and-ca-co3-production/	Vassar College, NOAA OAP AOML, Oregon State University	Haynes, Laura	Vassar College	3	2023
Biotic calcification impacts on mCDR additionality	https://nopp.org/projects/biotic-calcification-impacts-on-marine-carbon-dioxide-removal-additionality/	University of Washington CICOES, NCAR	Kearney, Kelly	University of Washington CICOES	4	2023
Assessing chemical and biological implications of alkalinity enhancement using carbonate salts obtained from	https://nopp.org/projects/assessing-chemical-and-biological-implications-of-alkalinity-enhancement-using-carbonate-salts-obtained-fr	Scripps Institution of Oceanography, University of California San Diego, Pacific Rim Design and	Dickson, Andrew	UC San Diego	3	2023

Title	Project Web Link	Partners	Lead Principal Investigator(s)	Lead Institution(s)	Duration (years)	Start (FY)
captured CO ₂ to mitigate negative effects of ocean acidification and enable mCDR	om-captured-co2-to-mitigate-negative-effects-of-ocean-acidification-and-enable-mcdr/	Development, Oregon State University, NOAA PMEL				
Quantifying the efficacy of wastewater alkalinity enhancement on mCDR and acidification mitigation in a large estuary	https://nopp.org/projects/quantifying-the-efficacy-of-wastewater-alkalinity-enhancement-on-mcdr-and-acidification-mitigation-in-a-large-estuary/	UMCES, University of Delaware, Planetary Technologies, Inc.	Testa, Jeremy	UMCES	3	2023
Multiscale observing system simulation experiments for iron fertilization in the Southern Ocean, Equatorial Pacific, and Northeast Pacific	https://nopp.org/projects/multiscale-observing-system-simulation-experiments-for-iron-fertilization-in-the-southern-ocean-equatorial-pacific-and-northeast-pacific/	WHOI, NCAR, NOAA GFDL, NSF	McGillicuddy, Dennis	WHOI	3	2023
Data requirements for quantifying natural variability and the background ocean carbon sink in mCDR models	https://nopp.org/projects/data-requirements-for-quantifying-natural-variability-and-the-background-ocean-carbon-sink-in-mcdr-models/	Columbia University, NOAA PMEL, NSF	McKinley, Galen	Columbia University	3	2023
Electrolysis-driven weathering of basic minerals for long-term ocean buffering and CO ₂ reduction	https://nopp.org/projects/electrolysis-driven-weathering-of-basic-minerals-for-long-term-ocean-buffering-and-co2-reduction/	Oregon State University, NOAA PMEL	Hales, Burke	Oregon State University	3	2023
Assessing the effects and risks of ocean alkalinity enhancement on the physiology, functionality, calcification, and mineralogy of corals and crustose coralline algae in the Pacific	https://nopp.org/projects/assessing-the-effects-and-risks-of-ocean-alkalinity-enhancement-on-the-physiology-functionality-calcification-and-mineralogy-of-corals-and-crustose-coralline-algae-in-the-pacific/	University of Hawai'i, Manoa, Texas A&M Corpus Christi, NOAA Pacific Islands Fisheries Science Center	Meléndez, Melissa	University of Hawai'i, Manoa	4	2023

Title	Project Web Link	Partners	Lead Principal Investigator(s)	Lead Institution(s)	Duration (years)	Start (FY)
A Gulf of Maine ambient sound network	https://nopp.org/projects/a-gulf-of-maine-ambient-sound-network/	NOAA NOS & NMFS	Gadamke, Jason	NOAA NMFS Office of Science and Technology	3	2023
Internal wave energy challenge: a distributed network of internal wave resolving moored arrays for assessing tide-resolving model fields and improving forecasts in the coastal ocean	https://nopp.org/projects/internal-wave-energy-challenge-a-distributed-network-of-internal-wave-resolving-moored-arrays-for-assessing-tide-resolving-model-fields-and-improving-forecasts-in-the-coastal-ocean/	NASA JPL, WHOI	Wang, Jinbo	UC San Diego Scripps Institution of Oceanography	3	2023
Offshore analysis of seafloor instability and sediments (OASIS partnership) with applications to offshore safety and marine archaeology	https://nopp.org/projects/offshore-analysis-of-seafloor-instability-and-sediments-oasis-partnership-with-applications-to-offshore-safety-and-marine-archaeology/	BOEM, USGS, Louisiana State University, The Water Institute of the Gulf, SEARCH	Bentley, Samuel (Louisiana State University); Chaytor, Jason (USGS)	Louisiana State University and USGS	5	2022
Quantifying marine biodiversity through movements and feeding: assessing coastal marine ecosystem dynamics near estuary mouths	https://nopp.org/projects/quantifying-marine-biodiversity-through-movements-and-feeding-assessing-coastal-marine-ecosystem-dynamics-near-estuary-mouths/	NOAA, University of New Hampshire, Gulf of Maine Research Institute, NERACOOS	Furey, Nathan	University of New Hampshire	5	2022
Louisiana deltaic estuaries MBON: sea level rise sentinels	https://nopp.org/projects/louisiana-deltaic-estuaries-mbon-sea-level-rise-sentinels/	NASA, Louisiana Universities Marine Consortium, Louisiana State University, NOAA Fisheries Southeast Regional Office, Texas A&M, GCOOS, Imagine Water Works, Jillian Tupitza (eDNA)	Glaspie, Cassie	Louisiana State University	5	2022
AMBON (Arctic MBON) - linking biodiversity observations in the Arctic	https://nopp.org/projects/ambon-arctic-mbon-linking-biodiversity-observations-in-the-arctic/	NASA, U.S. Fish and Wildlife Service, BOEM, University of Alaska	Iken, Katrin	University of Alaska Fairbanks	5	2022

Title	Project Web Link	Partners	Lead Principal Investigator(s)	Lead Institution(s)	Duration (years)	Start (FY)
		Fairbanks, UMCES, Oregon State University, University of Washington, Alaska Ocean Observing System, Native Village of Kotzebue				
The Southeast US Marine Biodiversity Observation Network (MBON): toward operational marine life data for conservation and sustainability	https://nopp.org/projects/the-southeast-us-marine-biodiversity-observation-network-mbon-toward-operational-marine-life-data-for-conservation-and-sustainability/	NASA, NOAA, University of South Florida, Oregon State University, Texas A&M University, University of Miami, GCOOS, Southeast Coastal Ocean Observing System, Florida Fish and Wildlife Research Institute, EcoQuants	Muller-Karger, Frank	University of South Florida	5	2022
Diagnosis and validation of the time and spatial variability of remotely generated internal waves in global ocean simulations	https://nopp.org/projects/diagnosis-and-validation-of-the-time-and-spatial-variability-of-remotely-generated-internal-waves-in-global-ocean-simulations/	NRL Stennis Space Center, University of Michigan	Buijsman, Maarten	University of Southern Mississippi	3	2022
Improving the representation of internal waves in the Navy and NOAA data assimilative forecasting systems	https://nopp.org/projects/improving-the-representation-of-internal-waves-in-the-navy-and-noaa-data-assimilative-forecasting-systems/	NRL Stennis Space Center, NOAA/NCEP, U. of Southern Mississippi, U. of Michigan, Tendral, LLC.	Chassignet, Eric	Florida State University	3	2022
A global distributed observing program for shear, energy flux, and mixing by internal waves	https://nopp.org/projects/a-global-distributed-observing-program-for-shear-energy-flux-and-mixing-by-internal-waves/	University of Washington, NOAA, NSF, Teledyne Webb Research	Girton, James	WHOI	3	2022

Title	Project Web Link	Partners	Lead Principal Investigator(s)	Lead Institution(s)	Duration (years)	Start (FY)
The internal wave spectrum and boundary mixing in the sub-tropical south Atlantic	https://nopp.org/projects/the-internal-wave-spectrum-and-boundary-mixing-in-the-sub-tropical-south-atlantic/	University of Delaware, University of Maryland, Georgia Institute of Technology, NRL, NSF	Polzin, Kurt	WHOI	3	2022
A distributed network of internal wave resolving moored arrays for assessing tide-resolving model fields and improving forecasts in the coastal ocean	https://nopp.org/projects/a-distributed-network-of-internal-wave-resolving-moored-arrays-for-assessing-tide-resolving-model-fields-and-improving-forecasts-in-the-coastal-ocean/	Scripps Institution of Oceanography, University of California San Diego, WHOI, NASA JPL	Waterhouse, Amy	University of California, San Diego	3	2022
Wildlife and offshore wind (WOW): a systems approach to research and risk assessment for offshore wind development from Maine to North Carolina	https://nopp.org/projects/wildlife-and-offshore-wind-wow-a-systems-approach-to-research-and-risk-assessment-for-offshore-wind-development-from-maine-to-north-carolina/	DOE, BOEM, Duke University, Cornell University, Florida State University, Rutgers University, Scientific Innovations, Southall Environmental Associates, SUNY Stony Brook, Syracuse University, Tetra Tech, University of St. Andrews, Wildlife Conservation Society, WHOI, New England Aquarium	Nowacek, Douglas P.	Duke University	5	2022
Cost-effective environmental monitoring of offshore wind installations with automated marine robotics	https://nopp.org/projects/cost-effective-environmental-monitoring-of-offshore-wind-installations-with-automated-marine-robotics/	DOE, WHOI, Australian Centre for Field Robotics, Marine Advanced Robotics	Camilli, Richard	WHOI	3*	2022
Baseline data collection on cetaceans and seabirds in the outer continental shelf and slope of Northern California	https://nopp.org/projects/baseline-data-collection-on-cetaceans-and-seabirds-in-the-outer-continental-shelf-and-slope-of-northern-california/	DOE, BOEM, Oregon State University, Cascadia Research Collective, ManTech	Ballance, Lisa T.	Oregon State University	4*	2022

Title	Project Web Link	Partners	Lead Principal Investigator(s)	Lead Institution(s)	Duration (years)	Start (FY)
and Oregon to inform offshore wind energy development	rn-california-and-oregon-to-inform-offshore-wind-energy-development/	International Corporation				
Surveying commercial fish species and habitat in wind farm areas using a suite of non-lethal survey methods	https://nopp.org/projects/surveying-commercial-fish-species-and-habitat-in-wind-farm-areas-using-a-suite-of-non-lethal-survey-methods/	DOE, BOEM, Coonamesett Farm Foundation, University of Massachusetts Dartmouth, Kitware, Inc., Atlantic Capes Fisheries, Viking Village, Empire Fisheries, Eastern Fisheries, Quinn Fisheries, Nordic Inc, Arnie's Fisheries	Siemann, Liese; O'Hara, Tasha; Davis, Farrell; and Garcia, Luisa	Coonamesett Farm Foundation	5*	2022
Establishing baseline data on bat activity in the offshore environment: developing tools and models to quantify risk of offshore wind energy development	https://nopp.org/projects/establishing-baseline-data-on-bat-activity-in-the-offshore-environment-developing-tools-and-models-to-quantify-risk-of-offshore-wind-energy-development/	DOE, BOEM, Electrical Power Research Institute, Bat Conservation International, Stantec, USGS, Woods Hole Group	Newman, Christian	Electrical Power Research Institute	4.25*	2022
COAMPS-TC deterministic, ensemble, and nowcast model support of the ONR NOPP project: predicting hurricane coastal impacts	https://nopp.org/projects/coamps-tc-deterministic-ensemble-and-nowcast-model-support-of-the-onr-nopp-project-predicting-hurricane-coastal-impacts/	NRL Monterey	Komaromi, William	NRL Monterey	4	2021
Coastal elevation models and land surface variables for use in forecasting hurricane impacts	https://nopp.org/projects/coastal-elevation-models-and-land-surface-variables-for-use-in-forecasting-hurricane-impacts/	USGS, NOAA, University of Colorado Boulder, Marda Science LLC, University of North Carolina Greensboro	Gesch, Dean	USGS	4	2021
Remote sensing of the U.S. coastline impacted by land-falling hurricanes	https://nopp.org/projects/remote-sensing-of-the-u-s-coastline-impacted-by-land-falling-hurricanes/	National Geospatial Intelligence Agency, University of Miami,	Romeiser, Roland	University of Miami	4	2021

Title	Project Web Link	Partners	Lead Principal Investigator(s)	Lead Institution(s)	Duration (years)	Start (FY)
	mpacted-by-land-falling-hurricanes/	Airbus USA, University of Massachusetts Amherst, Capella Space				
In-situ measurements of ocean waves from air-deployed Directional Wave Spectra Drifters (DWSD) and Alamo Floats	https://nopp.org/projects/in-situ-measurements-of-ocean-surface-waves-from-air-deployed-directional-wave-spectra-drifters-dw-sd-and-air-launched-autonomous-micro-observer-alamo-floats/	NOAA, University of California San Diego, University of Miami, WHOI, U.S. Naval Academy, MRV Systems LLC	Centurioni, Luca	Scripps Institution of Oceanography	4	2021
Air-deployed wave buoys for hurricane forecast improvements	https://nopp.org/projects/air-deployed-wave-buoys-for-hurricane-forecast-improvements/	NOAA, University of Washington, Sofar Ocean Technologies, University of Colorado Boulder	Thomson, Jim	University of Washington	4	2021
Real-time and observed measurements of hurricane-induced hydrodynamics and flooding	https://nopp.org/projects/real-time-and-observed-measurements-of-hurricane-induced-hydrodynamics-and-flooding/	USGS, NOAA, Sofar Ocean Technologies	Brown, Jenna	USGS	4	2021
Forecasting coastal impacts from tropical cyclones along the U.S. East and Gulf Coasts using the ADCIRC Prediction System	https://nopp.org/projects/forecasting-coastal-impacts-from-tropical-cyclones-along-the-us-east-and-gulf-coasts-using-the-adcirc-prediction-system/	NOAA, University of Georgia, Renaissance Computing Institute, University of North Carolina Chapel Hill, The Water Institute of the Gulf, Oregon State University, North Carolina State University, Seahorse Coastal Consulting, University of Rhode Island	Luetlich, Richard	University of North Carolina Chapel Hill	4	2021
Forecasting hurricane impacts on CoastS - FHICS	https://nopp.org/projects/forecasting-hurricane-impacts-on-coasts-fhics/	USGS, Deltares, University of Central Florida, NRL, IHE Delft	Nederhoff, Kees	Deltares USA	4	2021

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		Institute for Water Education				
Coupled ocean atmosphere waves sediment transport (COAWST) - waves, sediment, surge and structure response (WSSSR) forecasting system	https://nopp.org/projects/coawst-wsssr-coupled-ocean-atmosphere-waves-sediment-transport-waves-sediment-surge-and-structure-response-forecasting-system/	USGS, University of Florida, Fathom Science LLC, Louisiana State University	Olabarrieta Lizaso, Maitane	University of Florida	4	2021
Satellite hosting atmospheric and littoral ocean water sensors (SHALLOWS) project: phase A 2 (continuation from 2018 start)	https://nopp.org/projects/satellite-hosting-atmospheric-and-littoral-ocean-water-sensors-shallows-project-phase-a-2/	NASA, NOAA, U.S. Army Corps of Engineers, University of Cincinnati, Air Force Institute of Technology, University of Alabama	Tolbert, Carol	NASA Glenn Research Center	1**	2026 (from 2018 start)
Bichromatic littoral temperature observer (BLTO) instrument (continuation from 2018 start)	https://nopp.org/projects/bichromatic-littoral-temperature-observer-blto-instrument/	Sierra Lobo Inc., University of Cincinnati	Putman, Philip	Sierra Lobo Inc.	2	2024 (from 2018 start)
SOAR cellular ocean altimetry / scatterometry technology (COAST), phase A-2 (continuation from 2018 start)	https://nopp.org/projects/soar-cellular-ocean-altimetry-scatterometry-technology-coast-phase-a-2/	GeoOptics, University of Colorado	Yunck, Thomas	GeoOptics	1	2024 (from 2018 start)

* - These projects were paused in FY25 due to funding constraints in the federal government.

** - These projects received no cost extension due to unforeseen COVID circumstances.

Acronyms

AMBON	Arctic MBON
AOML	Atlantic Oceanographic & Meteorological Laboratory
BAA	Broad Agency Announcement
BOEM	Bureau of Ocean Energy Management
BSEE	Bureau of Safety and Environmental Enforcement
CICOES	Cooperative Institute for Climate, Ocean, & Ecosystem Studies
CPIES	Current-and pressure-sensor equipped inverted echo sounder
CTD	Conductivity, Temperature, and Depth
DOC	Department of Commerce
DOE	Department of Energy
DOW	Department of War
EPA	Environmental Protection Agency
EiP	Excellence in Partnership
FY	Fiscal Year
GEM	Geostrophic empirical mode
GCOOS	Gulf of America Coastal Ocean Observing System
GFDL	Geophysical Fluid Dynamics Laboratory
HYCOM	Hybrid Coordinate Ocean Model
IOOS	Integrated Ocean Observing System
IRA	Inflation Reduction Act
IWG	Interagency Working Group
JPL	Jet Propulsion Laboratory
LCP	Low-cost profiler
LRM	Low-resolution mode
MARACOOS	Mid-Atlantic Regional Association Coastal Ocean Observing System
MTS	Marine Technology Society
MBON	Marine Biodiversity Observation Network
mCDR	marine Carbon Dioxide Removal
NANOOS	Northwest Association of Networked Ocean Observing Systems
NASA	National Aeronautics and Space Administration
NCAR	National Center for Atmospheric Research
NCEP	National Centers for Environmental Prediction
NERACOOS	Northeastern Regional Association of Coastal Ocean Observing Systems
NGE OHC	Next Generation Enterprise Ocean Heat Content
NHCI	NOPP Hurricane Coastal Impacts
NISAR	NASA-ISRO Synthetic Aperture Radar
NRL	Naval Research Laboratory
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NOPP	National Oceanographic Partnership Program
NOS	National Ocean Service
NPS	National Park Service
NSF	National Science Foundation
NSTC	National Science and Technology Council
OAP	Ocean Acidification Program
OASIS	Offshore Analysis of Seafloor Instability and Sediments
ONMS	Office of National Marine Sanctuaries

ONR	Office of Naval Research
OSTST	Ocean Surface Topography Science Team
PI	Principal Investigator
PMEL	Pacific Marine Environmental Laboratory
PSI	Parametric Subharmonic Instabilities
RFP	Request for Proposal
ROSES	Research Opportunities in Space and Earth Science
SAR	Synthetic aperture radar
SECOORA	Southeast Coastal Ocean Observing Regional Association
SOST	Subcommittee on Ocean Science and Technology
SSH	Sea surface height
SWH	Significant wave height
SWOT	Surface Water and Ocean Topography
UMCES	University of Maryland Center for Environmental Science
USGS	United States Geological Survey
USGS EROS	United States Geological Survey Earth Resources Observation and Science
WHOI	Woods Hole Oceanographic Institution