



National
Oceanographic
Partnership
Program

NOPP FORUM: TECHNOLOGICAL
INNOVATION TO MAP, EXPLORE, AND
CHARACTERIZE THE U.S. EEZ

An OCEANS23 Conference Town Hall

September 26, 2023

Biloxi, MS

OPENING REMARKS

Alan Leonardi (Director, National Oceanographic Partnership Program (NOPP) Office) welcomed all speakers, panelists, and audience members to the 2023 NOPP Technological Innovation to Map, Explore, and Characterize the United States EEZ Forum and gave a background of NOPP. Written into law in 1997 as part of the Defense Authorization Act¹ and reauthorized and strengthened in 2021², NOPP’s purpose is “to promote the national goals of assuring national security, advancing economic development, protecting quality of life, ensuring environmental stewardship, and strengthening science education and communication through improved knowledge of the ocean...by creating and carrying out partnerships among Federal agencies, academia, industry, and other members of the oceanographic community in the areas of science, data, technology development, resources, education, and communication.”² The NOPP Office hosts topical and sectoral forums to engage the broader ocean community on specific topics directly and to benefit from an expanded partnership network that involves non-federal and non-traditional partners.

ADMINISTRATION OVERVIEW

Deerin Babb-Brott (Assistant Director for Ocean Policy, White House Office of Science and Technology Policy (OSTP)) gave an overview of the Biden-Harris Administration’s support for Mapping and Exploring the United States EEZ and highlighted the relevant urgency of the Ocean Climate Action Plan (OCAP). He explained that the National Ocean Mapping, Exploration, and Characterization (NOMECE) Council is a federal body that was founded to implement the national strategy to map our nation’s entire EEZ by 2040. NOMECE and OCAP recognize the need for new science and technology, and the public-private partnerships that programs like NOPP are able to foster are crucial to accomplishing these goals. OCAP supports ocean research and data synthesis, which are supported by mapping exploration. Babb-Brott stressed that OCAP is a policy priority and that the White House’s 2025 R&D budget provides funding specifically to get the work done. There is strong administrative support on these efforts, and he encouraged forum participants to have big ideas on how to get there, and in relation to the OCAP, he particularly pushed industry partners to move in new ways that could reduce the carbon footprint.

NOAA AGENCY OVERVIEW

Steve Thur (Assistant Administrator, NOAA Research) highlighted the work the research arm of NOAA is doing on ocean mapping and technology. He said that NOAA researches the technologies that will help meet their mapping goals and communicate results to society, but they cannot do that without engaging with the ocean community. This will involve catalyzing other sectors, including philanthropy, in early and frequent communications to create new partnerships. Some of the solutions to NOAA’s mapping needs might have risks, but Thur emphasized they should have a greater appetite for risk tolerance. He encouraged forum participants to raise questions both during the event and throughout the conference week.

¹ Public Law 104-201

² Public Law 116-283

PANEL DISCUSSION

Rodney Cluck (Chief, Bureau of Ocean Energy Management (BOEM)'s Environmental Studies Program) described the work BOEM has done to map the United States EEZ, such as mapping more than 16,000 km² of the Aleutian Islands' seafloor using Sailandrone Surveyor. Cluck noted that technical innovation cannot occur in the EEZ without having the science and understanding of what is out there because it is easy to make the wrong decisions. We need information to map and explore the EEZ, to find natural resources and characterize the environmental impacts of extracting those resources. In 1973, test mining for critical minerals like those used in cell phones and electric vehicles was conducted on the Blake Plateau, and 50 years later, seafloor mapping revealed that the benthic topography has not recovered from the dredging work done previously. BOEM also conducted spatial suitability modeling, such as in the Gulf of Maine, as well as historical sea level modeling to discover cultural Tribal connections to river valleys submerged thousands of years ago.

Isabel Houghton (Scientist, Sofar Ocean) spoke about Sofar's technological innovations and the role of public-private partnerships in its operations. Sofar is a small private company based out of San Francisco, CA that builds hardware, data platforms, and software to close the ocean data gap, improve weather forecasting, and route ships more effectively. Sofar provides larger wave buoys in addition to its smaller Datawell Wavespotter and Sofar Spotter devices operating at the air-sea interface. Deploying its smaller products massively downscales the major cost of deployment and maintenance, because once researchers reduce the overhead cost they can maximize the data outputs. Sofar's products have a capacity to capture and characterize the ocean over a long time scale, and the solar panels allow them to operate for an indefinite period of time. Houghton highlighted Sofar's successful public-private partnership it has contributed to as part of the NOPP Hurricane Coastal Impacts (NHCI) project. NHCI, operating between 2021 and 2024, is a collaborative effort across private industry, academia, and federal agencies. It's improving predictions of landfalling hurricane coastal impacts via observational and numerical approaches. Sofar primarily contributes to NHCI's task to collect in situ observations of waves and water levels for validation and assimilation. To meet this task, Sofar Spotters were rapidly deployed in the Gulf of Mexico in advance of hurricanes Ian (2022), Idalia (2023), and Lee (2023). Houghton emphasized that while Sofar is able to bring its technology and data access to the project, its public-private partnership with the U.S. Navy's Office of Naval Research (ONR) is critical to mission success because ONR provides the ability to deploy out of airplanes. Deployed Sofar Spotters connect with NOAA's National Weather Service (NWS) within hours, transmitting hourly operations of the ocean state, quickly becoming a passive mapping network. She noted that partnerships at Sofar work well to gain access to unique resources, such as planes, where Sofar can help accelerate the pace and reduce the costs. Houghton concluded that partnerships are challenging when transitioning programs beyond research or to a sustained activity. There is a big question of what happens beyond the first few years of research to sustain operations.

Hailey Bathurst (Program Manager, SeaAhead's Gulf Navigator Program) discussed how public benefit corporations like SeaAhead can assist industry and federal agency partners in collaborating on shared missions. SeaAhead's ecosystem catalyzes innovation, builds new companies, and invests to scale them. Their platform supports, de-risks and accelerates startup projects, which enables them to aggregate equity positions for venture-scale returns to their investors. Bathurst explained that startups need early-stage reliability testing, which SeaAhead provides through access to in-water testing, real-time feedback from potential customers, insight into market needs, creating pathways to purchase or partnerships, and making funding available for paid pilots. SeaAhead works across public, private, and government sectors to understand industry challenges, trends, and capitalize on emerging technology, connecting solutions to ocean problems. Bathurst suggested that federal agencies could use SeaAhead for market intelligence,

informing SeaAhead and other public-private sector industries during quarterly update calls of emerging priorities, needs, and challenges. As an example, the Army Corps of Engineers is looking for a better use for dredged material, so SeaAhead is working with bio concrete producers for coastal resiliency solutions to reduce erosion and add to carbon capture of living shorelines.

Jeremy Weirich (Director, NOAA Ocean Exploration; Co-Chair, NOMECE Council; Co-Chair, IWG-NOPP) highlighted NOMECE's progress and the challenges they are facing in having all of the U.S. EEZ's seafloor mapped by 2030. Weirich shared the geographic priorities for mapping, including the marine resources, benthic ecology, and seafloor hazard regions of interest. He reported the January 2023 analysis that 50% of U.S. coastal, ocean, and Great Lakes waters are unmapped to 100m resolution, and revealed that based on 2017-2022 progress trends, the baseline mapping goals will not be completed until around 2041. Weirich described two ways to increase their mapping rate: one would be to continue to mine archived datasets that haven't been exhausted yet or to incentivize industry partners to share their datasets, and the other was to create new ways to work with industry and non-federal partners to acquire new data. NOMECE's recent reauthorization specifies coordinating more with other federal and non-federal groups, so Weirich invited ideas and success stories from forum attendees.

MODERATED AUDIENCE Q&A

Leonardi kicked off the Q&A portion of the forum by asking the panelists to comment on what current obstacles might hinder federal agencies from forging successful partnerships with other sectors. Weirich mentioned that while there's good investment on the front end of field operations, not enough attention is paid to data acquisition and the data pipeline. Cluck said that a lot of data is needed on the same region by different use groups (offshore wind projects, benthic ecology, seafloor mapping, megafauna migration, etc.), and it's challenging to bring use groups together and standardize data metrics so they can be archived and analyzed to inform decisions. Bathurst noted that use groups like in the fishing community might be gathering data already, but it might not translate to other use groups or integrate with new database systems, and there's little incentive to sell data to NOAA. Houghton mentioned that it's really challenging for small companies to partner with federal agencies when the timeline between proposals and funding pay out is 12 months or more.

The panelists discussed the NOAA R&D Readiness Levels funnel (**Figure 1**) in response to a question from Bill Nader (National Data Buoy Center). Nader said that he has seen a lot of effort go into Readiness Levels (RL) 1-5 but trickle off by 6-9, to which Thur explained that the funnel is more of a sieve because most lines of research inquiry aren't going to be viable projects for development. Weirich mentioned that the graphic represents the R&D process for Notice of Funding

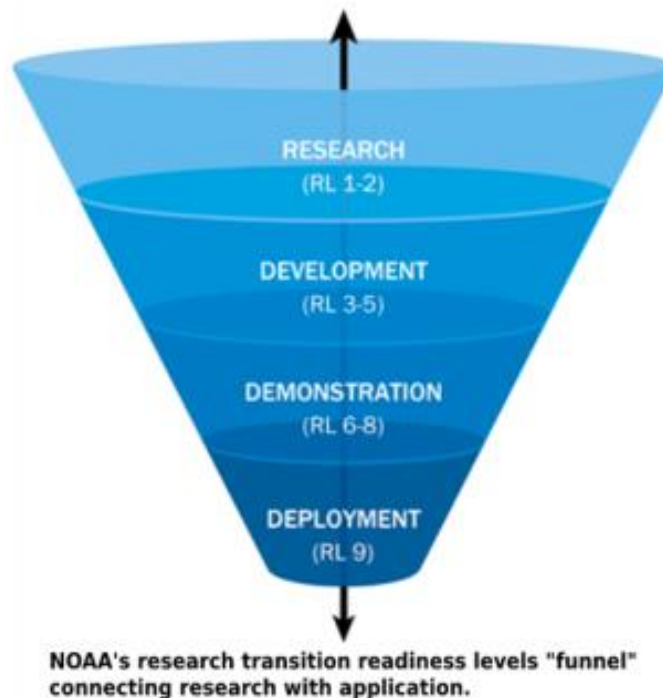


Figure 1. Identifying & Funding Research Transition with NOAA Readiness Levels (Source: <https://wpo.noaa.gov/research-transitions/>).

Opportunities (NOFO's) for NOAA Ocean Exploration, but it is only one funding tool that federal agencies use to speed up government funding timelines. Brathurst agreed that the graphic doesn't completely capture the process, but it is a common language that those involved in the process can use to coordinate effort.

Brian Connon (VP Ocean Mapping, Saildrone) said that when considering the age of NOAA's fleet and being operationally limited to doing 1-2% of ocean exploration a year, more than 2% coverage could be conducted annually if proven AUV technology was leveraged. Weirich mentioned efforts working on getting AUV mapping through the R&D funnel to be operational, including those at BOEM, the U.S. Navy, and the University of New Hampshire. When incorporating unshipped systems into NOAA mapping operations, it will need to be in addition to the shipped systems already out there. He said that to create a systematic network of devices that are mapping 100% of the time, NOAA needs to be strategic and is trying a campaign approach in the Central Pacific. Weirich concluded that working with uncrewed systems to acquire data is not an "either/or" proposition; it's "and". This is the same for working with non-federal partners. He emphasized that the only way the U.S. can improve its progress trajectory is if it finds more ways to work with industry and other non-federal partners and, in doing so, there is no discrimination towards crewed or uncrewed systems—there's a clear need for all.

Tosca Lichtenheld (Government Business Development Lead, Sofar Ocean) asked Cluck for solutions to navigating around and speeding up the long timelines associated with congressional funding. Cluck admitted that it is an ongoing challenge, as there's a slightly different process for proposals requesting funding on a monthly basis, annually, or for a continual resolution. He advised advanced planning so federal and nonfederal partners understand the type of funding being requested and how this funding will be used, such as for graduate students incorporating this research into their PhD.

Dennis Shelton (Project Engineer, U.S. Navy) asked Weirich who he could talk to about data collection from datasets of various classification, and Weirich said he'd put Shelton in contact with someone at NOAA. For the forum participants, Weirich noted that NOAA's National Environmental Satellite, Data, and Information Service (NESDIS) is making the data portal more accessible. There is also an interagency group and those at NOMECS which federal agencies like ONR can utilize to determine which datasets can be shared.

Weirich took a moment to ask his fellow panelists for their thoughts on what the federal government should be investing in (technology development, data platforms, hardware, etc.). In response, Houghton highlighted the importance of standardizing data across platforms in the ocean observation community. There are some irregularities in older buoy data, but when strategizing a global monitoring program, Houghton said the community could determine which are too divergent and which are comparable enough to new systems to integrate into the global mosaic of systems. Houghton noted that while Sofar didn't have a strong incentive to standardize data inputs being submitted to NOAA, Sofar is currently using open source solutions to standardize its policies, hardware, and firmware across its buoy suite. Brathurst emphasized communicating challenges and specs for operations with startup companies so they are incentivized and better equipped to meet the federal government's needs.

To close out the Q&A, Thur asked Houghton and Brathurst to characterize the successful partnerships their organizations have had with the federal government. Houghton said that partnerships have been successful when industry has played to the strengths of each agency. Small companies bring agility and innovation to the table, while government has larger scale solutions; in the case of NHCI, Sofar was able to design a device that could be deployed out of an airplane without breaking, and ONR was able to provide airplane operations. Brathurst mentioned that although there is an assumption that the private sector is not interested in the public good, industry generates important data that could be used for climate policy and disaster relief efforts if given the proper support to scale startup operations. She noted that

venture capital is very interested in helping the U.S. meet its climate goals, for instance. Cluck mentioned that partnerships have been successful when both sides benefit, and Houghton added that small companies will share their valuable data when they can still use their data to make a profit rather than just giving it away to the government. Weirich concluded that OCAP, which Babb-Brott introduced at the beginning of the forum, includes many challenge priorities which federal and nonfederal partners can collaborate on together. He added that some sectors in Europe have created funding incentives and resource allocations to help industry partner with government which the U.S. could adapt for our purposes.

CLOSING REMARKS

The 2023 NOPP Technological Innovation to Map, Explore, and Characterize the United States EEZ Forum emphasized the critical importance of collaborative partnerships, technological innovation, and sustained funding in advancing ocean exploration and mapping efforts. The forum highlighted the role of public-private collaborations in leveraging industry expertise and resources to achieve common goals while addressing challenges such as data standardization, funding timelines, and environmental stewardship. Overall, there is a necessity surrounding strategic investments, collaborative approaches, and mutual benefits in partnerships between government, non-government, and industry groups to advance ocean exploration and stewardship initiatives effectively.

ACKNOWLEDGEMENTS

The 2023 NOPP Technological Innovation to Map, Explore, and Characterize the United States EEZ Forum was sponsored by NOAA³. See Appendix I for a full Agenda of the event, with a special thanks to the speakers and panelists. This Forum was a Town Hall event associated with the OCEANS23 Conference in Biloxi, MS.

³ Support for this project was provided by the National Oceanic and Atmospheric Administration via contract to Integrated Systems Solutions, Inc. (Contract/Task Order#1305M419DNCNA0016/1305M322FNRMA0216).

Appendix I. 2023 NOPP Technological Innovation to Map, Explore, and Characterize the United States EEZ Forum Agenda

| OCEANS23 Conference Town Hall Forum event September 26th, 2023 Mississippi Coast Coliseum and Convention Center Room D7-8 | | |
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| 3:30 | Opening Remarks | Alan Leonardi, NOPP Office |
| 3:35 | Administration Overview | Deerin Babb-Brott, OSTP |
| 3:45 | NOAA Agency Overview | Steve Thur, NOAA |
| 3:50 | Panel Discussion | Alan Leonardi, NOPP Office Rodney Cluck, BOEM Isabel Houghton, Sofar Ocean Hailey Bathurst, Sea Ahead Jeremy Weirich, NOAA |
| 4:20 | Moderated Audience Q&A | Alan Leonardi, NOPP Office |
| 4:55 | Closing Remarks | Alan Leonardi, NOPP Office |