

*The National
Academies of*

SCIENCES
ENGINEERING
MEDICINE



Ocean-Shot Submission Template

Name: Prof. Jaime Palter

Affiliation: University of Rhode Island, Graduate School of Oceanography

Email: jpalter@uri.edu

Title of Ocean-Shot Concept: A global network of surface platforms for the Observing Air-Sea Interactions Strategy (OASIS)

Vision and potential transformative impact (200 word limit; count 198):

The near surface ocean stores and delivers fuel for the atmospheric engine, provides a home to productive ecosystems, and mediates the ocean uptake and release of greenhouse gases. Exchanges of heat, moisture, momentum, greenhouse gases, aerosol precursor gases, and aerosols at the air-sea interface modulate the Earth's weather, climate, ecosystems, and the fate of marine debris. It is therefore imperative that a global Observing Air-Sea Interactions Strategy (OASIS) network be initiated for monitoring these exchange processes. This network would observe biogeochemical and physical processes that couple the oceanic and atmospheric boundary layers. The improved understanding of air-sea interaction and the coupled boundary layer response would be marshalled to improve forecasts of severe weather, ecosystem health, and the carbon budget, all needed to guide societal decision making.

The OASIS network will comprise drifters, moored buoys, uncrewed surface vehicles (USVs) and other types of piloted drones, research vessels, and volunteer observing ships. The network would routinely monitor at broad geographic scales, while also observing economically, dynamically, and biogeochemically important focal areas with higher resolution. The program would coordinate the network's growth, promote/enforce interoperability and best practices, and create/maintain a publicly accessible data hub for wide scale data dissemination.

Realizable, with connections to existing U.S. scientific infrastructure, technology development, and public-private partnerships (150 word limit; count 150):

The OASIS global network will build from a robust base of existing scientific infrastructure, including observations collected from operational moored weather buoys, water-following

drifters from the Global Drifter Program, the network of moored buoy OceanSITES reference stations and U.S. coastal Integrated Ocean Observing System (IOOS) surface observations, buoys and cabled infrastructure supported by the NSF Ocean Observing Initiative (OOI), underway observational systems aboard Research Vessels and merchant marine fleet, and from the nascent network of Uncrewed Surface Vehicles (USV). The network will tap into the technological solutions provided by public-private partnerships, such as those that helped create the expendable spar buoy prototype and the USV-ready sensor systems jointly developed by NOAA and Saildrone Inc. The network will add value to the Argo program, especially the newly-funded fleet of biogeochemical-Argo floats, by measuring complementary variables at the ocean's surface that will provide opportunities for calibration and validation to improve accuracy.

Scientific/technological sectors engaged outside of traditional ocean sciences (100 word limit; count 100):

Technology from sectors outside of traditional ocean sciences will contribute to the OASIS network. This will help fuel an exciting and diversified blue economy, with entry points for established academic and commercial players, as well as smaller entrepreneurial endeavors.

The network data will be made freely available and be uploaded to the World Meteorological Organization's Global Telecommunications System, which improves numerical weather prediction and ocean/atmosphere reanalysis products. We envision that the network will create and host both secondary and post-secondary educational materials and value-added data products to improve modeling and management of the ocean-climate system and marine food resources.

Opportunities for international participation and collaboration (100 word limit; count 100):

The OASIS global network was conceived through OceanObs19 Community Strategy papers with over one hundred world experts from all oceanographic disciplines, united in their focus on observing property exchanges across the air-sea interface. The network concept is being integrated by the OASIS SCOR Working Group (airseaobs.org), which has ties to international Surface Ocean Lower Atmosphere (SOLAS) program, Global Ocean Observing System (GOOS) panels (OOPC, IOCCP, Bio/Eco), CLIVAR, World Climate Research Program Data Advisory Council (WCRP WDAC), Marine Biodiversity Observation Network (MBON), and other international organizations. A recent telecon discussing this Ocean Shot included 47 scientists from 12 countries.

Builds global capacity and encourages the development of the next generation of ocean scientists (100 word limit; count 100):

The OASIS SCOR Working Group has an extensive capacity building plan. The network's operation requires expertise ranging from engineering to database design and every oceanographic discipline. Given this need for broad swaths of STEM expertise, the OASIS team

will be proactive at inclusivity - engaging individuals across career stages and from groups historically excluded from oceanography. The global nature of the array, including the first ever opportunity to fill large Southern Hemisphere observing gaps using platforms that do not rely on ships (e.g. USVs), depends on international ties and the training of scientists, engineers, and technicians from around the world.

Relevant Ocean Decade Challenge(s)

This submission responds directly and with high impact to Challenges 5&7:

Challenge 5: Enhance understanding of the ocean-climate nexus and generate knowledge and solutions to mitigate, adapt and build resilience to the effects of climate change across all geographies and at all scales, and to improve services including predictions for the ocean, climate and weather.

Challenge 7: Ensure a sustainable ocean observing system across all ocean basins that delivers accessible, timely, and actionable data and information to all users.

It can also directly address aspects of Challenges 1, 2 and 8:

Challenge 1: Understand and map land and sea-based sources of pollutants and contaminants and their potential impacts on human health and ocean ecosystems, and develop solutions to remove or mitigate them.

Challenge 2: Understand the effects of multiple stressors on ocean ecosystems, and develop solutions to monitor, protect, manage and restore ecosystems and their biodiversity under changing environmental, social and climate conditions.

Challenge 8: Through multi-stakeholder collaboration, develop a comprehensive digital representation of the ocean, including a dynamic ocean map, which provides free and open access for exploring, discovering, and visualizing past, current, and future ocean conditions in a manner relevant to diverse stakeholders.