**Mid-Atlantic Regional Association Coastal Ocean Observing System (MARACOOS): Preparing for a Changing Mid-Atlantic**

**Funding Agency:** NOAA Integrated Ocean Observing System (IOOS)

**Partners**: MARACOOS, University of Massachusetts Dartmouth, University of Delaware, RPS, University of Connecticut, University of Rhode Island, Caribbean Wind LLC, Virginia Institute of Marine Sciences/William and Mary, Old Dominion University, University of Maryland, Woods Hole Oceanographic Institute

**Period of Performance:** June 2016 – May 2021

**Total Budget:** $20,000,000

**Project Summary:**

***Diverse Regional Needs on a Changing Planet:*** The **Mid-Atlantic Bight** (**MAB**) extends 1000 km alongshore, from Cape Cod, MA to Cape Hatteras, NC. It includes five major estuarine systems and a wide continental shelf cut by a deep cross-shelf valley and multiple shelf-break canyons. The region encompasses 10 states, the District of Columbia, 107 congressional districts and ~78M people (25% of US population). The nation’s highest coastal population density makes increasingly competing demands for marine and coastal resources. Ports in the region handle 25% of the total U.S. waterborne commerce, and include the nation’s largest petroleum product hub and the world’s largest Naval base. The MAB is a dynamic boundary between the less variable waters to our north and south, with complex seasonal physical dynamics resulting in a highly variable 3-D thermal structure. These dynamics structure shellfish and migratory fish habitats that support both commercial and recreational fisheries, and directly impact our weather. Developed watersheds and urban estuaries, impacted by a century of industrialization and growing coastal populations, degrade coastal water quality and diminish recreational economies. Inundation driven by tropical storms and northeasters are year-round threats to the large populations that live on the broad coastal plain. While the region’s electrical power grid is the most congested in the nation, the high population density, reliable winds, and wide continental shelf combine to support the nation’s nascent offshore wind energy development projects.

But *warming of the climate system is unequivocal (IPCC, AR5, 2015).* Present and future generations will be challenged by its accelerating global impacts, including melting of land and sea ice, rising sea levels, ocean acidification (OA), and deoxygenation (hypoxia), and more frequent extreme weather. Improved knowledge of the trends and variability of our changing environment is required to address the challenges of energy, food, water and economic security and resiliency on regional, national and international scales. In the Mid-Atlantic, global sea level rise, along with coastal subsidence from the last glacial retreat, combine to produce a regional hot-spot for rising sea levels, creating a higher baseline for land falling hurricanes and devastating northeasters. Climatic warming and OA are altering MAB fish and shellfish habitats. The Mid-Atlantic’s dense population further increases the region’s economic sensitivity to climate change, where, for example, new rainfall patterns and more frequent extreme weather conditions are impacting homes, businesses, farms and reservoirs.

***A Decade of Progress:*** MARACOOS was established in 2004 as the U.S. IOOS Regional Association (RA) for the MAB. Since then MARACOOS, a 501(c)(3) Non-Profit Corporation, created the framework in which the Mid-Atlantic’s coastal ocean user community identified its five highest priority regional themes: *(1) Maritime Safety, (2) Ecosystem Decision Support, (3) Water Quality, (4) Coastal Inundation,* and *(5) Offshore Energy*. To support these user themes, MARACOOS formed a NOPP-style academic-industry-government-NGO partnership-based Regional Coastal Ocean Observing System (RCOOS) that leveraged the region’s extensive expertise and capabilities. Operation of the integrated, regional scale observation, data management and prediction network is sustained in real-time and gap fills national capabilities. It includes an outreach, stakeholder engagement and education network that engages users, identifies opportunities, and educates citizens. Working in 5-year segments, our first 5 years focused on the development of our regional scale observing capabilities. Our second 5-year effort maintained the successful regional observation components and focused new development on the evaluation of an ensemble of prediction models for different applications. Theme area successes include the first regional-scale network to be declared operational for USCG Search And Rescue (SAR), the successful use of MARACOOS data and models by the MA Fisheries Management Council to open new fisheries, DHS Impact Awards for aiding oil spill response, discovery of coastal processes that feedback on hurricane intensities and impact inundation, and the expansion of the observing network to enhance support for offshore wind development.

***A Plan for the Future:*** Continuing to build on accomplishments and lessons learned, MARACOOS will again bring together over 30 investigators from over 12 institutions for our third 5-year maintenance and development cycle with a focus on products. We propose to: (a) enhance the RA management team to better support the requirements of certification; (b) maintain our existing observing infrastructure, with a surge capacity capable of responding to extreme events, while continuing to expand our ability to deliver data quality consistent with QARTOD; (c) expand our data management and curating activities to entrain even more external data providers into the common operating picture provided by our Data Explorer technologies; (d) focus on implementing the results of a metric-informed user-driven prioritization of data-assimilative prediction models for specific purposes; (e) integrate and grow the outreach, engagement and education team to enhance new product development, awareness, and use with targeted user communities; and (f) establish entrepreneurial innovation teams to grow future cross-cutting activities that broaden support for and enhance responsiveness to our 5 user themes. This will continue to foster the MARACOOS mission—to seek, integrate, share and apply new knowledge and understanding of our coastal ocean—and will enable us to maintain our long-standing commitment to providing integrated ocean information for a changing world.

