Progress Report

Project Title: Southeast Coastal Ocean Observing Regional Association (SECOORA):
Delivering actionable coastal and ocean information from high-quality science and observations for the Southeast

Award number: #NA21NOS0120097
Period of Activity: 01/01/2023 – 06/30/2023
Principal Investigator(s): Debra Hernandez, SECOORA Executive Director

I. PROJECT MILESTONES:
Milestone Table. Milestones from the SECOORA Year 2 Descope table are identified by SECOORA subsystem in Section II Progress and Accomplishments. High-level milestones/deliverables, accomplishments and any issues are included for each project. Status of each milestone/deliverable is reported as complete, on-track, or delayed. If the milestone is delayed, a justification for the delay and description of activities employed or to be employed to mitigate the delay are provided.

II. Progress and Accomplishments

Project and Task(s)	Status
GOVERANCE SUBSYSTEM	
Maintain the SECOORA governance and operational structure through implementation of SECOORA bylaws and Strategic Plan.	
Accomplishments: • SECOORA hosted the May 2023 Board of Directors and Members meeting. The meeting was held in Jacksonville, FL at the University of Jacksonville, May 10-11. Meeting materials can be found here: https://secoora.org/2023-annual-meeting/ o By-laws changes were approved by the Board on 3/30/23, and the full membership via online voting. Results were announced on 5/11/23 at the Members Business meeting. Revisions included expanding the number of public seats from 1 to 3 to encourage active recruitment of more diverse voices, changing quorum of the Board from 70% to 50%, deleting the requirement for standing committees that are not needed, and adding a Financial Policy and Procedures section to the by-laws. o Revised By-laws found here https://secoora.org/resources/by-laws/ • Diversity, Equity, and Inclusion (DEI) efforts: o During the Annual Meeting (5/10/23), SECOORA partnered with Mote Marine Laboratory, to host a Mentor Development Workshop. The workshop was led by Jasmin Graham, Aly Busse, and Keiondra Marshall. The three-hour interactive workshop provided effective methods and strategies to help mentors develop	On-track

productive and culturally-responsive mentoring relationships with their mentees.
• SECOORA has partnered with Savannah State University (a Historically Black College and University) to form a coastal ocean observing internship opportunity in 2023. Two interns were selected for the summer:
   ○ Makiah Mooney (Jr. Marine Science major): Fluctuations in water properties due to the transition between tropical storm Matthew and Hurricane Matthew
   ○ Brandon Williams (Sr. Biology major): Global greenhouse gas emissions and its effect on our planet's water systems	

Maintain SECOORA's Certification as a RICE	
The RCOS MOA between SECOORA and NOAA was executed on 8/22/22. All documents submitted for certification are found here: https://secoora.org/certification/. The SECOORA By-Laws are available here: https://secoora.org/resources/by-laws/ SECOORA works with funded data providers to review Data Sharing Plans annually as part of our RICE certification. The data sharing plans are located in Appendix F of the SECOORA DMAC plan and can be found here: http://secoora.org/wp-content/uploads/2022/05/0-APPENDIX_F_FundedDataStreamsInventory.pdf. Updates were made to the following data sharing plans: • Florida Gulf Coast University (FGCU) HAB monitoring stations • University of North Carolina Wilmington (UNCW) buoys non real-time stations • University of South Florida (USF) buoys and non real-time stations • HFR Data Sharing Plan (covers all HFR operators) • Glider Data Sharing Plan (covers all glider team members) • University of Georgia (UGA) Gray's Reef Ocean Acidification Buoy (reviewed by PI but no updates were required)	Complete
Update the SECOORA RCOOS Plan	
The SECOORA Harmful Algal Bloom Plan was revised by the SECOORA Science Committee. Version 2 was posted on the SECOORA website on May 25. http://secoora.org/wp-content/uploads/2023/05/SECOORA-Harmful-Algal-Bloom-Plan-Version-2.0.pdf	On-track
OBSERVING SUBSYSTEM	
HF Radar Operations & Maintenance	
SECOORA HF Radar (HFR) operators provide surface current data in near real-time from 20 HFRs with a targeted up-time of 85%. Hourly data is provided to SECOORA and to the HFR National Network. Operational and quality metrics are routinely checked. These include assessment of daily variations in coverage and uptime using metrics such as database latency, range of coverage, and number of solutions as implemented by the National HFR Network. The SECOORA HFR network supports both operational and research communities by providing high quality, ocean surface current data in near real-time. PIs in the SECOORA region operate CODAR and WERA systems.	On-track

HFR sites that are destroyed or damaged include:

- Venice CODAR (sand erosion exposed cables and conduit)
  - NEPA review conducted for sand replacement. USF is waiting for the US Coast Guard to give them the approval to begin working, hopefully in August 2023
- Naples CODAR (destroyed during Hurricane Ian)
- Georgetown, SC WERA (severely damaged during Hurricane Ian)
  - Use of spare parts has the station operational, but replacement supplies and equipment are needed
- St Catherines, GA WERA (destroyed by wildfire)

Additionally, the UGA Skidaway Institute of Oceanography (SkIO) is still unable to deploy the new WERA HFR at Kennedy Space Center (KSC). The SkIO team and Brain Zelenke, IOOS Surface Currents Program Manager, are working with KSC personnel on the new land use agreement.

Finally, ECU's Coastal Studies Institute (CSI) has moved the CODAR HFR originally located in Duck, NC to Jennette's Pier in Nag's Head, NC. The new site is operational.

- The HFR report that details HFR operators, system status, and IT infrastructure needs by site is available here: https://docs.google.com/spreadsheets/d/1L1w00TPG1K7xXyh_iXXw6T7JaGT8rLZwnZMWfrnlXOI/edit?usp=sharing

SECOORA Glider Network	

The SECOORA glider team includes SkIO, USF, UNC-Chapel Hill (UNC-CH), and Georgia Tech. See table **IOOS, NOAA, Other Agency Funding** for details on Navy glider support.	On-track

Accomplishments:
- 2 missions were completed during the reporting period (see table below), for a total of 54 days at sea. All data are submitted to the National Glider DAC and the glider data can be found on the SECOORA Data Portal.
- The spare forward section for the SkIO glider Angus was repaired after mission-ending failure at sea. USF-Bass and USF-Sam were sent to the factory for refurbishment of ballast pumps. USF-Bass science sensors were also calibrated.
- USF technician G. Miller completed glider training at Teledyne Webb Research, in April 2023.

Team Lead	Glider Name	Deployment Date	Recovery Date	Days in Water
USF	Bass	6/11/2023	7/6/2023	24
USF	Sam	2/24/2023	3/26/2023	30

Issues:
- New batteries purchased by SECOORA for the glider observatory were found to be faulty after installation into a USF G1 glider. The likelihood of damage to the pump and pitch motor is unclear. USF and SkIO remain in continued discussion with the manufacturer regarding repairs.
- Teledyne Webb Research is no longer willing to repair G1 gliders. Until this reporting period Teledyne had been willing to repair G1s on an ad hoc basis but they are no longer willing to do so. The lack of repair capacity will endanger the SECOORA fleet,

since 5 of its current vehicles are G1s, and funding is not in place/planned for additional replacements.		
Sustain the SECOORA Real-Time and Non-Real-Time Mooring Network		
All real-time moorings/instrumentation have a targeted up-time of 85%.	On-track	

UNC-Wilmington (UNCW) maintains 12 real-time moorings and 1 non-real-time mooring (OB27M) along the coasts of NC and SC. OB27M data is provided to SECOORA via Research Workspace twice a year. Real-time quality-controlled (QC) data is provided to SECOORA and Axiom Data Science makes the data available to NDBC via ERDDAP server.

Accomplishments:
- Buoy turnaround cruises were completed this reporting period as follows: 1) FRP2, CHR60, CHR60Wave, CAP2, and CAP2Wave swapped from R/V Savannah, March 2023. A temporary wave sensor was added at FRP2 to support NWS Charleston Weather Forecast Office for the Hurricane Season; 2) ILM2 swapped from R/V Cape Fear, June 2023.
- UNCW supports the FACT Network (ATN) by deploying acoustic receivers on 4 existing Onslow Bay, NC moorings (ILM2, ILM3, LEJ3, OB27M) to record tagged fish passage near the receivers. These receivers operate in non-real-time and receivers are recovered during buoy turnarounds and data uploaded to the FACT node.
- Providing an applied learning experience during spring 2023 semester for 1 Cape Fear Community College MARTECH student. The student is working on buoy outfitting, instrument setup and water level sensor development.

UNCW up-time statistics for 1/1/23-6/30/23 for real-time moorings:

	ILM2	ILM3	LEJ3	SUN2	CAP2	FRP2	CHR60
Air Temperature	95%	100%	98%	100%	58%	100%	100%
Air Pressure	95%	100%	98%	100%	58%	100%	100%
Wind Speed, Gust, Direction	95%	100%	98%	100%	58%	100%	100%
Salinity	91%	99%	98%	100%	45%	100%	100%
Surface Water Temperature	90%	99%	98%	100%	16%	100%	100%
Waves	79%	N/A	100%	100%	64%	99%	96%
ILM2, LEJ3, SUN2, CAP2, & CHR60 have two buoys on site: a met buoy and a wave buoy							

Issues:
- CAP2 experienced a power system failure on 12/23/23. Due to staffing, weather, and other operational considerations, maintenance was deferred and the buoy was swapped on the turnaround cruise 3/16/23. The CTD then had a malfunction in the conductivity cell on 3/26/23. The CTD was replaced on 6/9/23.
- CAP2WAVE experienced a power system failure on 1/30/23. It was replaced during the turnaround cruise on 3/16/23. On 5/23/23 the buoy broke loose from its mooring. A new buoy/mooring was placed at CAP2WAVE on 6/9/23. The drifting buoy was recovered by the R/V Savannah on 6/14/23 during a student training cruise and has been returned to UNCW and is in good condition.
- ILM2WAVE experienced an internal sensor failure on 12/26/22 and has been recovered. CDIP shipped a replacement buoy that was deployed on 2/7/23.

USF maintains 2 real-time buoys (C10 & C12) and 2 non-real-time moorings (C11 & C15) with SECOORA funding. USF also leverages SECOORA funding with other grants to maintain 2 additional real-time buoys (C13 & C22). All systems are located on the West Florida Shelf (WFS) and, together with modeling efforts, help describe and understand the circulation of the WFS and the role that the circulation plays in shelf ecology and other matters of societal concern (e.g., HAB bloom dynamics). QC flags based on QARTOD standards are provided to SECOORA with real-time data from all four buoys. Real-time data flows to SECOORA and Axiom makes the data available to NDBC via ERDDAP server. Non-real-time data are shared via Research Workspace annually.

Accomplishments: One research mooring cruise was executed onboard the R/V Weatherbird II, 6/28/23 – 6/30/23 to service C10, C11, C12, and C15. Data from sensors on non-real-time moorings are being downloaded and quality controlled. Additionally, three service trips using small vessels were completed to successfully resolve multiple data transmission issues for C13 and C22, which is the cause for the lower statistics reported in the below table. Of note, C13 and C22 were most impacted by Hurricane Ian, with multiple sensors (i.e., CTDs, ADCPs) in need of repair and met stations in need of replacement.

USF up-time statistics for 1/1/23-6/30/23 for real-time buoys:

USF	C10	C12	C13	C22
Wind	99%	99%	68%	64%
Air Pressure	99%	99%	68%	64%
Water Temperature	99%	99%	68%	64%
Salinity (Surface)	99%	99%	68%	64%
Air Temperature	95%	99%	68%	64%
Relative Humidity	95%	99%	68%	64%
Longwave Radiation	99%	N/A	N/A	N/A
Shortwave Radiation	99%	N/A	N/A	N/A
Currents (ADCP)	97%	96%	67%	58%

Expand the SECOORA Real-time Observing Network

Water Level Initiative: The SECOORA water level team members funded through the IOOS Core award includes partners from the American Shore and Beach Preservation Association (ASBPA)/Hohonu and Georgia Tech. Partners from Coastal Carolina University, Florida Atlantic University, and Florida International University are funded through the SECOORA BIL award.

ASBPA and Georgia Tech sited and deployed water level sensors within the SECOORA region. Water level sensor locations by operator can be viewed here: https://wl.secoora.org. Note that the IOOS Environmental Compliance Coordinator has evaluated all installation sites identified in Years 1 and 2 of this award.

Accomplishments:
- Water Level Advisory committee quarterly meetings are on-going.
- SECOORA staff and water level team members met in Charleston, SC, 3/7-8/23 to

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discuss Water Level sensor installation standards and surveys. During the meeting, the team went to an ASBPA/Hohonu site on Sullivan's Island with staff from the surveying company McKim & Creed to discuss site installations and survey procedures. After this meeting, SECOORA has finalized three standard operating procedures (SOPs), with guidance from NOAA CO-OPS. The documents can be found on the SECOORA [Documents](#) page and at the bottom of the [Water Level Network](#) page. The SOPS include:

- o Water Level Site Reconnaissance – Desktop and Field Procedures
- o Water Level Station Installation, Maintenance, and Removal
- o Acquiring Vertical Elevation of Water Level Sensors

- Georgia Tech is working in close collaboration with government and community stakeholders along the Georgia coast, extending their work from Savannah to installation targets in Camden and Glynn counties. The previously reported technical challenges with the LoRaWAN gateway have been addressed; however, current issues include widely varying battery life (some batteries have failed after only 3 months) and the need for more frequent cleaning of ultrasonic sensors due to insects and spider webs inside the sensor cone. The stations where battery and insects caused stations to not meet the SECOORA 85% uptime requirement are listed in the below table. To address the battery life issues, the Georgia Tech team will be adding solar panels to power sensors instead of solely relying on batteries. The team is also experimenting with coating on the sensor cone to discourage insects. The team participated on field surveys with the SECOORA survey contractor, McKim & Creed, to understand survey requirements and learn best practices for future vertical elevation surveys.
- ASBPA/Hohonu - PI Elko is leading the preparation of a proof-of-concept paper on the of accuracy of low-cost water level sensors using observations from the project team's test site at Fernandina Beach, FL. Hohonu implemented a significant hardware upgrade during this reporting period to shift cellular transmissions from 2G to LTE in anticipation of T-Moblie shutting down its 2G network 4/2/24. Several of the lower reporting stations (under 85%) were due to problems with cellular communication.

Stations that <u>did not</u> meet the SECOORA up-time requirement of 85% during the 6-month reporting period.

Station Name	Operator	Uptime
Coastal Studies Institute (NC)	Hohonu	39%
Folly River Bridge (SC)	Hohonu	65%
Georgetown – Hwy 701 Bridge (SC)	Hohonu	64%
Hwy 64 (NC)	Hohonu	48%
Oyster Landing (SC)	Hohonu	56%
Surf City (SC)	Hohonu	61%
Faye Drive Burnside Island (GA)	GT	79%
Hwy 80 Tybee Island (GA)	GT	72%
Kilkenny Creek (GA)	GT	63%
Solomon Bridge (GA)	GT	84%
Wilmington Park Canal (GA)	GT	77%

Issues:
- The community approach used by ASBPA has caused some issues as sensors, when

swapped by community members, are not re-installed at the original elevations. This causes shifts in datums and inaccurate water level data. SECOORA is discussing the use of standard mounting hardware that can easily be re-installed without changing the sensor elevation. Additionally, SECOORA plans to hire a water level manager in year 3 of this award to help the project teams and communities implement best practices so that the sensors remain stable.	

SECOORA Biological Data Collection

University of South Carolina Beaufort (USCB) - Operate and maintain the SC estuarine soundscape observatory using 9 passive acoustic recorders located in the May River (3 stations), Charleston Harbor (3 stations), Chechessee Creek (1 station), Colleton River (1 station), and North Inlet-Winyah Bay NERR (1 station). Each platform consists of a passive acoustic recorder, water level logger, and a water temperature logger. - Continued routine cleaning of sensors/stations and swapping passive acoustic recorders at regular intervals. - Acoustic receivers capture 2-minute recordings every hour. The project team manually reviewed 9,196 sound (or wav) files for biological sounds and noise occurrences during this project period. For manual review, the team subsamples and analyzes wav files every two hours, which equates to 12 wav files/day at each station. - The team performed sound pressure level (SPL) analysis on 42,933 wav files during this project period. - Caroline Tribble, graduate student in Marine Biology, College of Charleston, successfully defended her thesis, titled "Enhancing interpretation of cetacean acoustic monitoring: investigating factors that influence vocalization patterns of Atlantic bottlenose dolphins (Tursiops truncatus) in an urbanized estuary, Charleston Harbor, South Carolina, USA" in March 2023. - Passive acoustic monitoring, visual surveys, and prey sampling were conducted to assess the relationships and multivariate interactions that may influence dolphin vocalization patterns. Vocalizations varied spatially and temporally, peaking in fall and winter months coinciding with decreases in water temperature and daylight hours, following patterns previously reported in other SC estuaries. Dolphin prey and total fish abundance decreased with water temperature, which may indicate that dolphins echolocate and whistle more frequently in the winter months, when prey are scarce and sound-producing species are less soniferous. - All soundscape observatory data have been uploaded to Research Workspace. This includes water temperature, water depth, sound pressure levels, and manually reviewed endpoints. Figures for each data endpoint for all stations were also provided. - Sound pressure level script written in MATLAB for easy analysis of broadband (1 Hz – 40 kHz), low (50 – 1200 Hz), and high (7 kHz – 40 kHz) frequency SPLs and data export. - Soundscape data was provided to support an undergraduate research project for Makiah Mooney and Dr. Amanda Kaltenberg (PI) at Savannah State University.	On-track

DMAC AND MODELING & ANALYSIS SUBSYSTEMS

SECOORA DMAC subsystem

Axiom Data Science is the SECOORA data management team. Axiom provides the following support on an on-going, annual basis:
- Maintain, operate, and develop SECOORA cyberinfrastructure to sustain long-term data stewardship for partners and stakeholders.
- Maintain IOOS compliant services and applications for integration with national products.
     o THREDDS 4.6.15 - https://thredds.secoora.org
     o ERDDAP 2.02 - https://erddap.secoora.org
     o SECOORA ISO WAF - https://thredds.secoora.org/iso
     o NCEI Archive - https://ncei.axiomdatascience.com/secoora/
- Maintain the Glider System for the management SECOORA glider assets. The SECOORA glider data is available for visualization in the portal (here), and data is submitted to the National Glider DAC (GDAC) during glider missions.
- Support data ingestion and data standardization for the Water Level Network. This includes continued work with PIs create metadata for each station. Data are flowing from PIs to Axiom via transfer pathways (e.g., APIs) and are then ingested into the ERDDAP server and displayed on the SECOORA website.
- Promote data standardization and automation through Research Workspace (RW) and standardized data ingestion processes for SECOORA-operated and non-SECOORA data assets, including moored sensors, ship-based sensors, gliders, HFR, models, and historical legacy time series data sets.
    o Axiom worked closely with Dr. Eric Montie (USCB) to ingest and store passive acoustic data files. Axiom is sharing files with the NOAA Sound Co-op (Dr. Carrie Wall-Bell) as a use case for Passive Packer, Manta, and Pypam.
- Promote data discovery and public access through the SECOORA data catalog and data portal.
    o Axiom is working with Biscayne Bay National Park Service (NPS) staff to access and archive non real-time water quality data for Biscayne Bay so that it can be shared via the SECOORA data portal and web services. There is a need for this data from the MBON community so this will promote data sharing across IOOS communities.
    o NC State University and Fathom personnel are working with Axiom to share CNAPS model data so that the model output can once again be shared via the IOOS Model Viewer. It is anticipated that model output will be available in the next reporting period.
- Strengthen data stewardship within SECOORA to improve data quality, access, attribution, exchange, delivery, and storage.
    o Axiom continues working with NOAA NDBC to transfer real-time data from the SECOORA region to NDBC via ERDDAP services. Axiom set up a federated ERDDAP server in December that only pulls in real-time data for sharing with NDBC. This approach seems has alleviated much of the data latency and data drops; however, some issues do still arise with ERDDAP where data is delayed in reaching NDBC.
- Implement real-time sensor QARTOD compliant quality control systems.
- Annually archive physical oceanographic, biogeochemical, and meteorological data with NOAA's NCEI.
	On-track

CNAPS Model	
The [CNAPS](#) model is operated and maintained by NC State University (NCSU) and Fathom Science. Specific accomplishes include: • The project team has been in discussions with the Axiom to establish a feasible pathway for hosting CNAPS Nowcast/Forecast model output. NCSU/Fathom has provided Axiom with a comprehensive understanding of the data structures, sizes, and metadata information requirements involved in the project. Moving forward, the Axiom will take the lead in implementing the CNAPS model, testing the archiving, and web hosting systems. This endeavor will facilitate widespread access to the valuable data generated by the model. • The project team implemented the Ensemble Data Assimilation (ENDA) capability to assimilate regional observations from satellites (SST, SSH), moorings, glider and ship surveys into the CNAPS model. The project team successfully conducted a comprehensive 30-year ocean reanalysis (1993-2022) using the ENDA method. The resulting ENDA ocean hindcast is characterized by its high precision and high resolution, featuring a 4-km spatial resolution and 50 vertical layers. To ensure the widespread accessibility of the dataset, the team securely transferred the data to Axiom for both archiving and sharing purposes. Axiom is now working to make the data available on the SECOORA data portal. • NCSU/Fathom has an AWS version of CNAPS running in an on-demand status. Unfortunately, AWS is not as cost-effective as initially anticipated. The cost associated with running AWS CNAPS routinely amount to approximately $10,000/month, totaling $120,000 per year which exceeds the budget for this project. NCSU/Fathom is using AWS as a backup system for specific weather and ocean events, such as hurricanes or storm surges. For scenarios requiring rapid and stable nowcast/forecast operations and data delivery, AWS remains a reliable option. By employing AWS as a backup system for specific events, this lowers the total cost while the project team can still benefit from its dependable performance during urgent and high-priority scenarios. This strategic approach allows NCSU/Fathom to strike a balance between budget constraints and the need for reliable operational support when faced with significant weather or ocean-related events.	On-Track
WFS Model	
The USF buoys provide data for the West Florida Coastal Ocean Model (WFCOM) and the Tampa Bay Coastal Ocean Model (TBCOM) daily nowcast/forecast systems operated by USF. These models produce simulated currents, water temperature, and sea surface height fields. USF had to switch WFCOM open boundary forcing from Gulf of Mexico HYCOM to Global HYCOM, because the HYCOM Consortium stopped serving the Gulf of Mexico HYCOM output starting from 1/15/2023. The transition to Global HYCOM was a huge effort, as Global HYCOM does not have tides in the model. USF had to fit a barotropic tidal model to generate tides and add the tides to the WFCOM. The other variables (velocity, temperature, and salinity) are relatively easier to switch to a new model. After fixing the open boundary in WFCOM, TBCOM automatically restored its nesting within WFCOM.	On-track

AI Portal	

Florida Wildlife Research Institute (FWRI) and Axiom Data Science are building an artificial intelligence annotation data portal (AI portal). Accomplishments for the reporting period:
 	
• Based on project team and stakeholder meeting, updated the AI Workflows and Resources document (https://drive.google.com/file/d/187WIJA1pq1CsO8toUX3iGcqK98ms75cN/view?usp=drive_link) to include Appendix F, Acoustic Pipeline Documentation and Appendix G, Video Pipeline Documentation.
• Consulted with domain experts and end-users to scope AI portal requirements,
    o FWRI held a regional workshop in February to merge acoustic data from disparate sources and develop machine learning derived indicators for management applications. To advance the imagery use case, the team continues to meet with CoralNet colleagues to identify back-end solutions to integrate the AI Portal with CoralNet's annotation database.
    o FWRI held an Acoustic Anthropogenic-Biological Indicators Workshop on 5/24/23. Workshop participants identified clear challenges to developing acoustic metrics based on ML tools, including annotation resolution and sound file lengths. This demonstrates a clear pathway to address future issues through standardization. Second, the pipeline, from data to model to an index, is in place for further study, collaboration, and outreach. Participants established a Google Group to encourage discussions, promote new opportunities, and to schedule future meetings. Workshop summary: https://drive.google.com/file/d/1-JujZcJ6lraLtSs3FOZrUkkVUgV659hI/view?usp=sharing
• Finalized content for our video use case Dashboard that is livestreaming from the Florida Aquarium: http://stage-coral-spawning.srv.axds.co/
	On-track

SEAMAP-SA Data and Analysis	
The SC Department of Natural Resources (SCDNR) SEAMAP-SA staff and Axiom Data Science are converting fishery and turtle data into DarwinCore format for ingestion into the SECOORA data portal and sharing on the MBON data portal. Accomplishments: • SCDNR staff provided the most recent year of data and code tables to Axiom staff to test the importation process. This round of testing allowed Axiom staff to identify outstanding opportunities for DarwinCore standard migration within the dataset. Axiom provided SCDNR staff with a detailed report related to the latest importation test, with areas of improvement categorized by urgency. SEAMAP-SA determined that all areas of improvement recommended by Axiom could quickly be remedied. These were largely related to removal of blanks within data tables through code creation. • SCDNR staff continue to work with Axiom on data accuracy and accessibility. Work on this objective will continue through project completion. • Axiom staff are linking catalog entries for the new data types that will allow users to search for and access the data types. Axiom has created the back-end connections for SEAMAP-SA data types in preparation for roll-out following testing. Links are only for testing currently. • SEAMAP-SA data users who repeatedly have downloaded data were polled via email in	On-track

Spring 2023 on visualizations, summarizations, and tools across data sources that would be desired. As anticipated, SEAMAP-SA data users look forward to mining the SECOORA portal and are highly anticipating the summarizations they can develop across data sources. Some specific interests described by users include:
    ○ Tools to pair the existing hydrographic and oceanographic data housed in the SECOORA portal with biological abundance data and mapping biological abundance data.
    ○ The ability to download data for multiple species in one download, compared to the current system in which only one species' data can be downloaded at a time to correctly calculate zero abundances for each species.
    ○ Interest in visualizing, summarizing, and downloading data from multiple biological surveys simultaneously or in fewer steps than the current system requires. These tools will streamline users needing to download many data files to even decide if the data will be useful to their studies.	

OUTREACH, ENGAGEMENT, PRODUCT DESIGN SUBSYSTEM

Support Community Driven Networks

See "NOAA, IOOS, Other Agency Funding" table	

SECOORA Outreach and Engagement

• The SECOORA section of the IOOS outreach document was updated on 7/24/23. • Details on media engagement and outreach for SECOORA staff and project PIs are found here (on the tab labeled 1/1/23-6/30/23): https://docs.google.com/spreadsheets/d/189a6FgoOAjMvGxDxmYuf0QnEoHuPXgpNqjMWn5YFv94/edit?usp=sharing • SECOORA and NOAA CO-OPS planned and executed the Water Levels in the Southeast Workshop, hosted June 15-17 in Jacksonville, NC. There we over 60 meeting participants, representing federal, state, and local government, academia, and private industry. Information on the workshop, including the purpose, links to presentations, and resources is found here: https://secoora.org/workshop-water-levels-in-the-southeast/. The planning committee will draft the meeting report in August and make it available on this website. NOTE: Regional Ocean Data Sharing funds were used to convene the workshop. • Jennifer Dorton, Abbey Wakely, and Lauren Showalter (Axiom Data Science) virtually presented on coastal ocean observing systems and the SECOORA data portal to a Big Data undergraduate class at Savannah State University on 2/16/2023. SECOORA data was packaged for students to use for their midterm project. • GCOOS and SECOORA continued their tradition of collaborating at the St. Petersburg Florida Science Festival, hosting a joint exhibit with hands-on ocean observing activities. On 2/17/2023, fourth and fifth grade students participated in lessons on animal tracking (developed by GCOOS and partners). More than 12,000 people attended the 2/18/2023 public day of the festival.	On-track

Product Development

Water Level Network User Interface (SECOORA): As an initial design, Second Creek Consulting, developed https://wl.secoora.org. This site provides locations where water level sensors are deployed by SECOORA operator, and users can toggle on USGS Stream Gauges, National Park Service, NOAA CO-OPS, and NC FIMAN water level stations. At present, the station pages only display the location of the water level sensor, reporting frequency, and operator name. Vertical elevations surveys for the SECOORA sensors have begun and as the sensors are tied to a NAVD88 elevation, we will begin displaying water level data on this webpage.	On-track
SECOORA developed data products and websites: - SECOORA Marine Life page highlights the importance of collecting biological data and SECOORA supported activities: https://secoora.org/marine-life/ - Updates were made to the Explore Estuarine Soundscapes webpage to include revised text and new fish species: https://sound.secoora.org/. - SECOORA's Text a Buoy system provides quick access to your favorite buoy. Click on the link to sign up: https://secoora.org/text-a-buoy/ Product usage statistics for each reporting period can be found here: https://docs.google.com/spreadsheets/d/1swbEQzCVsAL9VtPbeJslQV8K9nMfVX_hp-exEAYryGI/edit?usp=sharing	On-Track
The How's the Beach (HTB) project team is comprised of representative from three existing products: HTB (University of South Carolina (UofSC)), ShellCast (NCSU), and Beach Condition Reporting System (BCRS, Mote Marine Laboratory). Specific accomplishments this period include: - Evaluating and implementing new modeling techniques, including using Machine Learning (ML), to improve HTB nowcast accuracy. In an effort to improve site specific nowcast accuracy, a combination of categorical and regressor ML models have been integrated to the ensemble model for the Radio Island, NC site. - Increasing the beach conditions information available for the HTB nowcasting site, including information on rip currents (example here: https://howsthebeach.org/follybeach/map/stationinfo/TRI-062). - Exploring a potential partnership with the Institute for Water and Health (IWH) at Georgia Southern University to expand HTB into coastal GA. A doctoral candidate at IWH is working with the HTB team to identify data sources near Tybee Island, GA that could support nowcasts and swimming beach water quality conditions. - ShellCast expansion into SC shellfish harvesting waters is complete and can be accessed at https://go.ncsu.edu/shellcast - FL Department of Agriculture shared their geospatial and shellfish lease data with the project team to facilitate the expansion of ShellCast to FL. Extending ShellCast to FL is complicated by the state's current rainfall thresholds for lease area opening and closures, which span multiple days in some areas. This will require that the team not only consider forecasted rain, but also observed/antecedent rain, requiring major changes to the ShellCast algorithms. The team is moving forward with the expansion but does expect to encounter challenges.	On-track
The UNCW developed Situational Awareness Tool (SAST) is a functional prototype product. Registered users can create an infinite number of custom alerts on cormp.org	On-track

based on any combination of CORMP assets and user-defined parameter thresholds. NWS Staff continue to create alerts based off real-time data to forecast rip current and flooding events. Other key users include Fripp Island Sea Rescue and Wilmington U.S. Power Squadron members. Subscription access has been given to Wrightsville Beach Ocean Rescue. CORMP staff are tracking alert delivery and compiling statistics related to frequency/# of alerts delivered. During this reporting period 4 additional users were added and the SAST delivered 1,100 outgoing alerts. Most alerts are being delivered to NWS subscribers. Of the sent alerts 484 were Small Craft Advisory alerts, 279 Wave Rip Event alerts, and 116 Cape Fear River minor flood stage alerts. Additional triggered alert types included Gale Watch alerts and unique alerts (i.e., alerts customized by end users for specific conditions and geographic locations).

IOOS, NOAA, Other Agency Funding	
Funding Area/Recipient	**Task and status update – See Appendix J for ASAP draws by funding line**
Regional Ocean Data Sharing Initiative, Lead PI Debra Hernandez, SECOORA	Status: On-track Accomplishments: • SECOORA contracted Second Creek Consulting to set up a QARTOD interface specific to the water level initiative. The QARTOD system sends the SECOORA Deputy Director and water level PIs daily updates on sensor performance, including an analysis of tests passed/failed. The QARTOD system also tracks the up time for each water level sensor so that SECOORA staff can query the system to determine if stations are reporting at or below our 85% target threshold. The QARTOD tests included are Timing, Syntax, Range, Spike, Change Rate, and Flatline. The Climatology test will be included after the water level sensors are in place for over 1 year. • SECOORA CO-OPS Water Level Meeting – See updates in SECOORA Outreach and Engagement, page 11. • Community engagement – SECOORA is actively working with Water Level Network teams and four Sea Grant offices to identify and fill gaps in water level observations. ○ SC Sea Grant – PI Willamson engaged with community members from Florence, Marion, Marlboro, and Williamsburg Counties and the Town of McClellanville to identify suitable locations for water levels sensors. One sensor was installed on a bridge in Marlboro County in February after coordination with SC Department of Transportation and a second was installed in McClellanville on a county owned dock in April. Other sites are still in progress. PIs Finegan and Williamson are currently working with Gary Thompson, North Carolina Emergency Management, to draft sensor mounting plans that will increase efficiency when coordinating with SCDOT for sensor installation on SC bridges. SCSG has also put together a project webpage they can share with community members:

	  ○ NC Sea Grant – PI Cothron developed a matrix of potential communities that may benefit from water level sensor installations. Development of the matrix included engaging stakeholders and partners in NC, compiling existing/planned stream gauge locations from various federal, state, and regional water level networks, review of demographic datasets such as the U.S. Census Bureau American Community Survey, and compiling information from local and regional documents including documents from the NC Resilient Coastal Communities Program (RCCP), Regions Innovating for Strong Economies and Environment (RISE) products, and county Hurricane Matthew Resilient Redevelopment Plans. An NCSG internal working group vetted the matrix and identified recommendations for initial communities to engage for sensor installation. Cothron is meeting with SECOORA PI Dorton, Gary Thompson, NC Emergency Management, and NOAA NWS staff in July to prioritize 2-3 locations for sensors installations. ○ GA Sea Grant – There have been six community/partner meetings during the report period and four already planned during the next that raise awareness, develop relationships and increase use of SECOORA and Southeast Water Level Network resources. PI Brown has continued communication with three underserved communities in coastal Georgia (Brunswick, Sapelo Island, and Camden County) to determine needs and sensor placement. The recently completed Rethinking Runoff plan (Brunswick) and Resilience Implementation plan (Camden County) have been used to identify flooding hotspots that have been confirmed by residents and municipal resource managers. Two priority locations have been determined in Brunswick and more are being discussed with municipal staff and residents. Work from two other grant-funded projects is being leveraged for outreach and communication and youth engagement. Priority locations in Camden County were determined and initial field site visits have been completed. ○ FL Sea Grant – SECOORA issued a subaward to FLSG on 6/11/23. The FLSG team will work with partners at Florida Atlantic University to identify locations for water level sensor placement. • SECOORA issued a contract to McKim & Creed to conduct water level vertical elevation surveys. Surveys began in May, starting in NC and will finish in July in FL. NOAA CO-OPS staff are assisting with using the vertical elevation surveys to create datums for each water level site.
SECOORA/OMAO funding to support Navy glider missions, Lead PI Catherine Edwards, UGA SkIO	Status: Complete Accomplishments: • PI Edwards coordinated the return shipment of the two Navy Gliders that SkIO recovered during the 2022 hurricane season.

	• Planning for support of two additional Navy gliders during the 2023 hurricane season is underway. Funding for 2023 will be provided in the Year 3 IOOS Supplemental award to continue working with the Navy.
UNC-Chapel Hill, Lead PIs Brian Blanton & Rick Leuttich	See Appendix A
SECOORA – SECART support for SCDRP Coordinator, Heather McCarthy	Status SCDRP: Complete Accomplishments: • The SCDRP Annual Meeting was hosted 1/24-25/2023 in Miami, FL. Details about the meeting, including the agenda, can be found here: https://www.scdrp.secoora.org/23meeting
Filipe Fernandes	See Appendix B
Ocean Acidification, Grey's Reef, Lead PI Scott Noakes, UGA	See Appendix C
Ocean Acidification, SOCAN Network, Lead PIs Emily Hall (Mote Marine Lab) and Janet Reimer	See Appendix D
Fill the Gaps – Glider one-time support for deployments & recoveries, Lead PI Catherine Edwards, UGA SkIO	Status: Complete
SECOORA/HFR system wide support for retuning/testing/ additional work by SECOORA HFR operators	Status: Complete Accomplishments: Funding was used by SECOORA to purchase infrastructure needed by the UofSC and SkIO operators.
Harmful Algal Blooms (HABs): 1) Lead PI Chuanmin Hu, USF 2) Lead PI Michael Parsons, Florida Gulf Coast University (FGCU) 3) Natalie Cohen, UGA SkIO	Status: On-track **Monitoring and Forecasting pelagic Sargassum in the South Atlantic Bight**, Dr. Hu, USF. Accomplishments: The project team further tested the published ML algorithm to extract Sargassum features from medium-resolution satellite data (MODIS), with results published in Hu et al. (2023). Furthermore, the team implemented the ML algorithm to replace the former AFAI-based algorithm in the Sargassum Watch System, and generated and shared the new data products. The monthly Sargassum Outlook Bulletins (example in Appendix E) are based on this new algorithm. All of the historical bulletins can be found at the SaWS page: https://optics.marine.usf.edu/projects/saws.htlm. A new framework to download, process, and make available high-resolution data from Sentinel-2 sensors was established. During this reporting period the team also

| | developed computer codes to download PlanetScope/SuperDove data automatically and make quicklook images in near real-time. Currently, the codes are being tested to assure smooth operations before publishing the quicklook images online.

Expansion of the Estero Bay HAB Water Quality Monitoring Network, Dr. Parsons, FGCU
Accomplishments: Two small buoys with YSI EXO2 sondes will be deployed during HAB events when they are forecast to impact Estero Bay. The team ordered and received two YSI sondes during this reporting period. The NEPA analysis for this project was finalized on 6/21/23. No buoy deployments occurred during this reporting period. FGCU has two fixed coastal stations (funded through the State of Florida) that already monitor water quality in the Bay. The project team is working with Axiom Data Science to share the data for both sites via the SECOORA data catalog and data portal. The team is drafting ISO-compliant metadata for the two sites.

Establishing a monitoring program and identifying environmental drivers of periodic harmful algal blooms in a model estuary of coastal GA, Dr. Cohen, UGA SkIO
This project builds upon NOAA's existing citizen science-based initiative, Plankton Monitoring Network, by incorporating research-quality HAB monitoring in the Skidaway River Estuary (SRE). The overarching goal is to determine environmental conditions conducive to HAB formation in Georgia estuaries. Water quality samples are collected at the SkIO dock and samples are processed in the lab, specifically to identify Akashiwo sanguinea which has previously been documented in the late summer in the SRE. The sampling design for this project will allow the team to capture pre-bloom and post-bloom events, which have typically occurred in late August. NEPA analysis was not required for this project since water quality analyses are lab based.
Accomplishments during the reporting period include:
- Weekly SRE water sampling began in January 2023. Daily SRE sampling began May 17 as water temperatures began to rise. Daily sampling will continue through Fall.
- Monthly uploads of cell counts and basic water quality data (e.g., water temperature, pH, conductivity) to SECOORA via Axiom's Research Workspace have been initiated.

The team is designing a cell count bulletin that can be shared with the public. SECOORA will host the bulletin on the new HAB page (part of website redesign, launch late summer 2023). |
|---|---|
| Marine Biodiversity Observations Network, Lead PI Neil Hammerschlag, University of Miami | - See Appendix F |

SECOORA/FACT Data Wrangler, Lead PI Joy Young, Fisheries Data Solutions	• See Appendix G
Georgia Department of Natural Resources (GA DNR), Lead PI Chris Kalinowsky	GA DNR was unable to accept Year 1 funding to maintain the GA receiver array. Bill Woodward, U.S. IOOS, requested that the funding be used to support: 1) the University of Hawaii to establish the PIRAT (Pacific Islands Regional Acoustic Telemetry) Network (COMPLETE), and 2) the FACT network to continue development of the DaViT tool (see Appendix G – included in FACT Data Wrangler update – On Track)
SECOORA/Vembu Scholarship	Status: Complete Accomplishments: Anna Finch, 2021/22 Hollings Scholar worked with Dr. Frank Muller-Karger, USF Institute for Marine Remote Sensing Lab.
Integration and evaluation of models to couple with NWM (PI Liu, University of South Florida)	• See Appendix H
Integration and evaluation of models to couple with NWM (PI DiLorenzo, Brown University)	• See Appendix I
Funds to support the Project: St. John's River Transition (PI He, Fathom Science)	Status: Complete See final project presentation provided to Tracy Fanara and NOAA modelers on 3/31/23 - https://drive.google.com/file/d/1J27hZ4YzOXRSWlVqlNNmHy-WTABiSFhx/view?usp=sharing

III. PROJECT CHALLENGES/MODIFICATIONS:
- Equipment and supply costs are increasing due to inflation and continued supply chain shortages. Multiple vendors are quoting 10%-15% price increases over 2022 pricing. SECOORA anticipates continued higher than normal costs for the upcoming year.
- Labor costs are also increasing given the ~10% cost of living increase. SECOORA anticipates continued higher costs for the remainder of the award.

IV. PUBLICATIONS:
See Google Drive links for a Peer Reviewed Publications. There are two worksheets found in this file. The 2021-2022 worksheet lists Year 1 publications and the 2022-2023 worksheet lists publications for Year 2. https://docs.google.com/spreadsheets/d/1k1Z_u7olTH24HyqNxFI7bpb73gYMubSpDJeD6J2XaPo/edit?usp=sharing

V. BUDGET SUMMARY:
- Were the oldest ASAP TAS BETC accounting lines invoiced first?
  - This is Year 2 of the award. SECOORA is spending Year 1 ASAP TAS BETC lines first. See **Appendix J**.
- Give details on any delays with initiating a contract/subaward. Note any issues with the previous

year funds or other issues that occurred during the reporting period. Will this result with a work stoppage or cause significant problems with the partnership?
- ○ SECOORA has issued all subawards and subcontracts related to this award.
- Give a brief update on project invoicing for the reporting period. Were there any delays with invoicing or payment?
  - ○ SECOORA continues to receive Year 1 and Year 2 invoices. There is always a delay between when a subawardee conducts work and when SECOORA is given an invoice for that work. SECOORA regularly monitors invoicing frequencies with subawardees/subcontractors. Most subawardees invoice quarterly.
- Provide details on any property or equipment charged directly to the award having a useful life of more than one year and an acquisition cost of $5,000 or more per unit during the period.
  - ○ No property was purchased during this reporting period.
- Include changes in key scientific, technical or management personnel, not included in certification.
  - ○ SECOORA hired Megan Shaw as the Office and Events Manager. Megan started as a full-time employee on 1/16/23.
- Include changes to the organizational structure such as: changes in status or partners organizations and points of contact.
  - ○ No changes to organizational structure.
- Provide an update about travel completed during the reporting period.
  - ○ Examples of travel completed during the reporting period include:
    - ■ SECOORA water level team members and SECOORA staff met in Charleston, SC, 3/7-8/23 to discuss Water Level sensor installation standards and surveys.
    - ■ Hernandez participated in NOAA SECART meeting in St. Petersburg, FL, 3/27-30/23.
    - ■ Hernandez and Dorton went to Seattle for a shared Axiom users meeting with other RA teams 4/25-26/23.
    - ■ SECOORA hosted our 2023 Annual Meeting in Jacksonville, FL, 5/10-11. All SECOORA staff and Board members participated in the event.
    - ■ SECOORA and NOAA CO-OPS hosted the NOAA Water Level Workshop, 6/13-15/23, in Jacksonville, FL. SECOORA staff participated in the meeting.
- Are there any plans to initiate a new partnership (contract or subaward) during the next reporting period?
  - ○ Based on the Year 3 supplemental funding information, SECOORA will initiate a new subaward to Florida Atlantic University, PI Bill Baxley, to support two FAU CODAR HFR installations.

VII. SUCCESS STORIES

Success Story	Brief Description	Contact
SECOORA in the News	[Sargassum news story](#) was picked up by media outlets and over 15,504 pageviews were recorded for the Sargassum news story on the SECOORA website in March 2023.	communications@secoora.org
SCDRP in the White House	Vice President Harris's [FACT SHEET](#) called out the Southeast and Caribbean Disaster Resilience Partnership and the Department of State meeting that brought together Caribbean disaster risk reduction practitioners that fostered knowledge	heather@secoora.org

	exchange among U.S. and international Caribbean resilience and recovery professionals.	
WebCOOS in Washington Post	The [Washington Post](#) highlighted SECOORA's WebCOOS project that is using AI to detect rip currents in webcam imagery.	debra@secoora.org
Southeast Water Level Workshop	[Southeast Water Level workshop](#) was a huge success with over 60 participants in attendance. Feedback includes: "Top 5 of any workshop I've ever attended. Thank you!!" AND "Really, really great workshop! All the right people were in the room. Good mix of presentations, discussions and tech showcases."	communications@secoora.org
U.S. Coast Guard Utilizing SECOORA Supported Models	U.S. Coast Guard has officially adopted USF CMS's West Florida Coastal Ocean Model (WFCOM) to their pool of models and data for search and rescue operations, effective October 2022 (after Hurricane Ian). Monthly usage ranged from 20 to 45 sessions during the last 8 months. The model sharing is through a third-party company (RPS North America). Contact info: Tim Giguere (Time.Giguere@rpsgroup.com). NOAA OR&R also routinely uses our WFCOM as a source of model information. Contact info: Dr. Amy MacFadyen (amy.macfayden@noaa.gov).	yliu@usf.edu

End Report

SECOORA PROGRESS REPORT: JANUARY 1 - JUNE 30, 2023 REPORT

Project Title: Multi-decadal reanalyses of coastal water level to support NOAA sea level and flood risk products

2021-2026 SECOORA PROGRESS REPORT

PROGRESS TOWARDS OBJECTIVES

① Provide a summary of progress towards meeting your project objectives for the six month reporting period. Pay special attention to the six month reporting period accomplishments and the broader impacts related to those findings. Indicate if you anticipate any substantive changes to the project Scope of Work (SOW) as you complete the information below. List each objective and text that describes progress towards meeting the objectives. For each objective provide one of the following indicators: "Complete" and date of completion "On-Track" "Delayed" and anticipated date of completion If an objective is delayed, a justification for the delay (e.g., COVID travel restrictions, late receipt of contract) must be provided along with a new completion date and description of activities employed or to be employed to mitigate the delay.

This SECOORA/IOOS/NOAA project is computing a long-term reanalysis of coastal water levels for the US eastern and Gulf of Mexico coasts, using a data assimilation (DA) scheme for the ADCIRC model (Asher et al, 2019). This DA approach corrects model predictions based on errors between a prior solution and observations of water levels. Using NOAA/NOS gauge observations, time-series of prior errors (prediction - observations) are determined and used to compute a sequence of dynamic water level correction surfaces on the ADCIRC grid. The long-term simulation is then rerun by incorporating the error surfaces into a new posterior (posterior) prediction of coastal water levels. The atmospheric forcing is from the ECMWF's ERA5 reanalysis (Hersbach et al, 2022). In the previous reporting period, we completed the prior and posterior simulations, including the wind-wave model SWAN, over the period 1979-2021. In this performance period (1 Jan - 30 Jun 2023), we have carried out three primary activities, focused primarily on a "version 2" of the eastern US and Gulf of Mexico coasts.

The UNC research group has continued to engage with Audra Luscher-Aissaoui (NOAA/NOS) through the bi-monthly virtual meetings where progress and status toward the overall objectives of the reanalysis project are presented. Post-doc T Asher continues to engage with government agencies (FEMA, USACE, and NOAA) and with the broader research community through conferences, presentations, meetings, and one-on-one interactions. He is also very involved in a more frequently held "technical team" meeting that discusses various scenarios and use cases for the datasets, access to the datasets, and related topics.

Task Progress:

1. Incorporate tropical cyclones. Blend ADCIRC GAHM vortex winds and pressures into the ERA5 reanalysis. 0% complete. Delayed. We have not started this task in this reporting period. Other priorities (such as more detailed error analysis and surface generation) have pushed this specific goal into Year 3. See below.

2. Recompute the prior, error, and posterior. Rerun the multi-decadal simulation. 70% complete. Originally scoped with using the improved wind fields (task 1), we have instead been implementing a more robust error analysis. In scrutinizing the "version 1" prior, we noted two main issues with the water level predictions that needed to be corrected. a) Primarily in the Gulf of Mexico, low-frequency artificial oscillations in water levels were found and traced back to the way that the open boundary elevation was specified. b) Several localized "hot spots" were found with high-frequency oscillations in water levels on land. This was attributed to settings in ADCIRC's wetting / drying algorithm. Both of these issues have been addressed in version 2, by using a different boundary condition on the open boundary and by updating to the most recent ADCIRC version, which contains a new wetting / drying method.

During analysis of the posterior "version 1", we noticed some issues that were tracked back to how missing station data was handled. Data gaps are present in all stations used in the reanalysis. Small gaps are not problematic, but large gaps (multi-month and year) were effectively treated as "no error". In this reporting period we have implemented a new error analysis approach, where the errors are split into sea level rise (SLR), monthly-to-daily, and sub-monthly partitions. Data gaps in the sub-monthly are filled with nearby monthly means from stations with relatively high correlation. Gaps in the SLR component are filled with estimates using the NOAA-published SLR data. Gaps in the monthly-to-daily band are set to 0. Each partition has a separate

error surface that are added together for the final error surface. This new error analysis has been implemented in this period and tested on the year 2018.

Based on the above considerations, the prior solution was recomputed for 1979-2022, resulting in a revised, version 2 of the dataset. Looking forward, the next step is to compute the errors between the V2 prior and the observations, compute the error surfaces for each of the 3 partitions, and then to compute the V2 posterior. This is the primary activity in the first part of Y3.

3. Data access and post-processing. This is an ongoing and on-track task. In this period, we have maintained the THREDDS Data Servers that host the datasets for both direct end-user access and for upload by the RPS team.

4. Documentation: Develop and maintain project documentation for end-users of the datasets. Ongoing and on-track.

5. Great Lakes feasibility. 50% complete. In this period, discussions of Great Lakes feasibility have not advanced significantly. However, there has been substantial discussion on a similar reanalysis for the Pacific Ocean. A. Luscher-Aissaoui (NOAA/NOS) has convened a "working group" to scope out the resources needed, ADCIRC grid requirements, and time frame. Both PI Blanton and PD Asher have been significantly involved in those discussions. Details of the Pacific reanalysis will be further developed in early Y3.

PUBLICATIONS & CONFERENCE PRESENTATIONS

2

Please list any published scientific papers, conference papers, or notable presentations given within the reporting period related to this award. This may include presentations at non-traditional venues. Do not include publications outside of the six month reporting period. For presentations, include the title, name(s) of the presenter(s), date the presentation was made, and the venue (e.g., CERF, AGU). Also note whether the materials presented (e.g., PowerPoint® slides) remain available to SECOORA and IOOS and, if so, how they may be accessed (i.e., list the website address or online file sharing link such as Google Drive).

Asher, T.G., B. Blanton, R. Luettich, W. Sweet, G. Dusek, A. Luscher, 2023. Assessing a Multidecadal Coastal Water Level Reanalysis. 2023 ADCIRC Users Group Meeting. Baton Rouge, LA.

Asher, T.G., B. Blanton, R. Luettich, W. Sweet, G. Dusek, A. Luscher, 2023. A Multidecade NOAA Reanalysis of Coastal Water Levels and Waves. 20th Annual Climate Prediction Applications Science Workshop. Asheville, NC.

MEDIA ENGAGEMENT, EDUCATION, AND OUTREACH

3

Please list any media coverage related to this award and include links to news stories and media coverage. Only include media coverage conducted within this six month reporting period.

None in this reporting period.

4

Describe education or outreach materials related to this award that have been developed within this six month reporting period.

None in this reporting period.

5

Upload outreach and education materials developed during the reporting period. Please combine multiple outreach/education materials into one document.

PRODUCT DEVELOPMENT & DELIVERY

6

Please provide a brief description of the status of all products or tools (or major upgrades to existing products) currently available or under development as part of this award. Include weblinks where available. Use this section to report instances in which IOOS-funded science related to this project has been transitioned to support products developed by your organization or even beyond your organization. For example, this might include models, apps, mapping tools, etc. that are being used by state or federal agencies to assist with decision support. Also describe who is using the products and the number of users. Only report on work conducted within the six month reporting cycle.

The primary product/deliverable of this project is the multi-decadal posterior simulation of water levels and waves for the US east coast and Gulf of Mexico. The ADCIRC model output files, in native netCDF and reorganized netCDF files for more efficient time series extraction, are posted on the primary RENCI THREDDS Data Server. This is primarily to support end-users who are developing analysis and applications in a preliminary form (since we expect the first version to be superseded in the near

future) and to provide a dataset for RPS to develop more customized access methods and approaches for longer-term access. The Jupyter/Python notebook (previously described) continues to be used for time-series extraction. The data that the notebook accesses will be replaced with V2 in the near future. The python code is hosted in a GitHub repository at https://github.com/RENCI/EDSReanalysis.git and in an interactive Binder notebook at https://tinyurl.com/RenciReanalysis.

SUCCESS STORIES

7   Briefly describe any success stories that help convey either the value of your project and/or the impact that it has made. Success stories should include how your project has benefited local/regional stakeholders. These stories may be used by SECOORA and the IOOS Office to respond to data calls, support presentations, or used as independent stories.   Provide contact details (email addresses) for the PI and stakeholder(s) impacted.

None in this reporting period.

LEVERAGED FUNDING

8   Provide a brief summary on project leveraging (i.e., how you leveraged your SECOORA award to receive other funding). Also include the proposal/project title, funding agency, amount of funding received, project start date and duration of the project. Only report on leveraging activities within the six month reporting cycle.

None in this reporting period.

Python Data Analysis Tools for Oceanographers

Progress and Accomplishments during the reporting period (1/1/23 – 6/30/23)

The tasks were divided into:

1. Assist in the development of the IOOS.us Documentation and Demonstration sub pages;
2. Support current and continue developing important software packages to the IOOS enterprise;
3. Ensure software deployment via conda-forge packages and updates.

1) Assist in the development of the IOOS.us Documentation and Demonstration sub pages

Added a *zarr* notebook example (ioos/ioos_code_lab #131) to the code lab and several bug fixes and documentation updates were made (ioos/ioos_code_lab #128, #129, #130, #134, #135, #142, #143, and #144).

Updated the package skeleton to reflect latest Python packaging techniques (ioos/ioos-python-package-skeleton #20, #21, #22, #24, and #25).

Updated the GSoC ideas page and some minor PRs to help with documentation in various repositories (ioos/gsoc #28, #29, MathewBiddle/ioos_by_the_numbers #11, #12, NOAA-PSL/CEFI-info-hub-list #49, #51, #52, marinebon/map-of-activities #10).

2) Support current and continue developing important software packages to the IOOS enterprise

This activity can be divided into two three-sections: (a) packages from the IOOS GitHub organization, (b) packages from third party organizations that are important for IOOS, and (c) pangeo/cloud support.

a) The micromamba GitHub Action used in all IOOS and related projects required an update to the new *micromamba-setup* (ioos/odvc #54, ioos/ioos_qc #102, ioos/ciso #21, ioos/gliderpy #65, ioos/compliance-checker #1033, ioos/erddapy #309, OceanParcels/parcels #1373, TEOS-10/GSW-Python #139, pyoceans/pocean-core #79, pyoceans/python-ctd #187, pyoceans/python-oceans #93, python-visualization/branca #132, wafo-project/pywafo #60, euroargodev/argopy #273, iobis/pyobis #135, python-windrose/windrose #246, xpublish-community/xpublish-edr #14, xpublish-community/xpublish-opendap #16, xpublish-community/xpublish-wms #13, Unidata/netcdf4-python #1259 and mamba-org/mamba #2542);

We started publishing *compliance-checker* documentation (ioos/compliance-checker #1007, #1008, and #1027), and improved how we run tests, linter, and packaging (#980, #1010, #1013, #1020, #1024, and #979). Several bug fixes, from removing the memory leak in *MemoizedDataset* (ioos/compliance-checker #1029), to *numpy* and *urllib3* deprecations, and *bugbear* compliance (#1009, #1026, #1028, and #1031).

The documentation in *erddapy* was re-written to use more reliable servers in the examples and test (ioos/erddapy #295, and #298), updated packaging (#297, and #310). Added *pandas* 2.0 support, improved Windows experience, and fixed a bug in *griddap_initialize* (#300, #302, and #311).

Finally we improved the packaging in *gliderpy* and fixed a bug in *ioos_qc* documentation (ioos/gliderpy #63, and ioos/ioos_qc #100).

b) There were many contributions to OSS projects in multiple repositories the ones that are worth mentioning in this report are:

- Added to new function signatures to *gsw-c gibbs* and *infunnel* (TEOS-10/GSW-C #59, and #60), and improved the documentation in *gsw-python* (TEOS-10/GSW-Python #126, #127, and #133);

- Implement *lru_cache* in *get_variables_by_attributes* for *netcdf4-python*, and improved the testing (Unidata/netcdf4-python #1252, #1253, and #1260). Also updated the Windows wheel to v1.6.3 (ocefpaf/netcdf4-win-wheels #8);

- Fixed several bugs in *pocean-core* that prevent us from upgrading it to the latest dependencies (pyoceans/pocean-core #70, #71, #72, and #76).

- Fixed *pywafo* installation bugs (wafo-project/pywafo #57, and #58);

- Improved caching in *python-oceans* and fixed minor packaging issues (pyoceans/python-oceans #85, #86, #87, and #89);

- Added auto-publish and documentation to *depfinder* (ericdill/depfinder #79, and #82);

- Fixed *pandas* deprecation errors in *goes2go* (blaylockbk/goes2go #49);

- Many packaging, Continuous Integration, and linter checks updates to several packages (ajdawson/eofs #136, #137, callumrollo/cmcrameri #15, #16, #18, euroargodev/argopy #276, obidam/pyxpcm #39, geopython/geolinks #11, #12, pyoceans/python-ctd #177, python-visualization/folium #1728, #1729, python-windrose/windrose #247, #248, wesleybowman/UTide #115, #116).

We also created the ERDDAP_VER_CHECK app to monitor the deployed versions of several ERDDAP servers of interest. With this tool we can observe closely the upgrade rate and if users are hitting any issues with them.

c) In the pangeo/cloud effort we performed packaging and Continuous Integration updates (pangeo-data/rechunker #138, pangeo-data/xESMF #248, #252, and #253).

3) Ensure software deployment via conda-forge packages and updates

This effort can be separated into (a) infrastructure maintenance, (b) new packages, and (c) packages updates.

a) Reset tokens, and remove bad packages (conda-forge/admin-requests #584, #666, #681, #687);

b) New packages to conda-forge: urllib3_secure_extr, pyxpcm, gmpacket, echopy, streamlit-aggri, mdutils, numpydoc_decorator, afscgap, pangeapy, ipytablewidgets, geomcompare, usgs-strec, and bitbat.

c) See the list of updated feedstocks (pull request links) below

Pull Requests links

- conda-forge/ciso-feedstock #24

- conda-forge/conda-forge-pinning-feedstock #4530
- conda-forge/conda-forge-repodata-patches-feedstock #426
- conda-forge/conda-forge-repodata-patches-feedstock #432
- conda-forge/erddapy-feedstock #38
- conda-forge/erddapy-feedstock #39
- conda-forge/geocube-feedstock #34
- conda-forge/geopandas-feedstock #107
- conda-forge/gidgethub-feedstock #18
- conda-forge/gmprocess-feedstock #80
- conda-forge/libxml2-feedstock #81
- conda-forge/libxml2-feedstock #88
- conda-forge/oceans-feedstock #18
- conda-forge/parcels-feedstock #96
- conda-forge/planet-feedstock #43
- conda-forge/pystac-feedstock #27
- conda-forge/pytablewriter-feedstock #17
- conda-forge/r-obistools-feedstock #15
- conda-forge/sat-stac-feedstock #10
- conda-forge/sphinx-autodoc-typehints-feedstock #40
- conda-forge/statsmodels-feedstock #62
- conda-forge/swmm-feedstock #8
- conda-forge/xbitinfo-feedstock #4
- conda-forge/xbitinfo-feedstock #5
- conda-forge/xbitinfo-feedstock #6
- conda-forge/xesmf-feedstock #29

Appendix C: Scott Noakes, Grey's Reef OA mooring

SECOORA PROGRESS REPORT: JANUARY 1 - JUNE 30, 2023 REPORT

Project Title: Grey's Reef OA mooring

2021-2026 MOORINGS AND WATER LEVEL STATIONS PROGRESS REPORT

ACCOMPLISHSMENTS TOWARDS OBJECTIVES

1 Provide a summary of progress towards meeting your project objectives for the six month reporting period. Indicate if you anticipate any substantive changes to the project Scope of Work (SOW) as you complete the information below. List each objective and describe progress towards meeting the objectives. For each objective provide one of the following indicators: "Complete" and date of completion "On-Track" "Delayed" and anticipated date of completion If the milestone is delayed, a justification for the delay (e.g., COVID travel delays, manufacture turnaround times for repairs, NEPA compliance taking longer than anticipated) must be provided along with a new completion date and description of activities employed to mitigate the delay.

The MAPCO2 system abruptly stopped transmitting data at midnight on December 30, 2022. Analysis of the data that had been transmitted just prior to going dead showed no signs of potential failure (low battery power, intermittent data,...). The Gray's Reef sanctuary vessel was doing dive operations in early January so made a pass by the buoy to take photos to see if any damage had occurred to the MAPCO2 or buoy. Analysis of the photos showed no apparent damage to cables or the antennae. During this time, PMEL had several additional reports of systems failing to report data. Over the course of three weeks, at least 10 systems were no longer reporting data. This led the search to the Router-Based Unrestricted Digital Internetworking Connectivity (RUDICS) company that provides the satellite communications for the MAPCO2 systems. It was discovered that RUDICS had failed to renew the serial numbers for the PMEL owned iridium antennas which the system saw as inactive and disabled. Once this was identified, RUDICS updated the serial numbers in their database and on January 23, 2023, the Gray's Reef MAPCO2 started transmitting once again. The data not transmitted was stored internally so not actually lost. This data can be added to the database at a later date.

Since the Gray's Reef buoy belongs to NDBC and is used as a dual weather and ocean acidification monitoring station, it is NDBC's call on when to change out the buoy with a reconditioned buoy. For this exchange, NDBC deployed a new SCOOP design which is lower profile than the old Gray's Reef buoy. The hull is the same but the tower containing much of the weather system is shorter than the original buoy with the hopes that the buoy will fair better during hurricanes. The buoy exchange was originally scheduled to happen in May, but was pushed to early June and then finally June 15. On June 15, NDBC employed a commercial vessel to deploy the new buoy and recover the old Gray's Reef (41008) buoy. Normally, the MAPCO2 system would be set up at the dock prior to loading the buoy onto the buoy tender, but this time, scheduling conflicts dictated that the MAPCO2 would need to be set up offshore in the same manner as the usual annual servicing. Blank out plates were installed on the mounting tubes of the new buoy to keep water from filling the chambers where the instrumentation normally mounts. On June 25, sea conditions were finally conducive to go offshore and install the MAPCO2 system on the new buoy. A private charter (Triton's Grace) out of Richmond Hill, GA was employed for the operation. The MAPCO2 instrumentation was installed as usual and the iridium antenna was mounted on the new mast (new configuration due to the SCOOP design). The Seabird was installed on one of the buoy bridle legs but unfortunately, NDBC had installed a temperature data logger on the bridle leg where the SAMI-pH normally is mounted. As a result, the SAMI-pH was not installed and a new longer data cable was ordered. In addition, the SAMI-pH experienced a battery issue. The new battery pack that had been installed by Sunburst Sensors during reconditioning had been drained to 3.5 volts which meant that the sensor could not be deployed.

The SAMI-pH will need to be returned to Sunburst for trouble shooting. At this time, no replacement SAMI-pH sensors are available for deployment. It is estimated that a sensor should be ready sometime over the month of July. At that time, the new cable should be ready so the SAMI-pH can be mounted on the third bridle leg which is the furthest from the thru hull port.

In addition to installing the MAPCO2 in June, four water samples were collected while the system was operating in FAST mode. The samples will be sent off to the University of Delaware for analysis.

(2) Up-time statistics for each sensor/station should be uploaded as a Word or Excel document

Grays_Reef_OA_Operational_Stats_2023.xlsx

(3) Describe any problems/delays related to low (below 85%) up-time and provide a description of activities employed to mitigate the problem/delays.

Below are the issues that came up during the past six months of operation. Details were discussed previously in this report.

RUDICS failed to update the iridium antenna serial number effectively stopping data transmission. The data that didn't get reported in real time was not lost. It was stored internally and can be added to the database at a later time.

SAMI-pH needed a new longer cable in order to mount it on the third bridle leg

SAMI-pH had a battery issue which caused the battery to drain to 3.5 v which is below operating parameters.

PUBLICATIONS & CONFERENCE PRESENTATIONS

(4) Please list any published scientific papers, conference papers, or notable presentations given within this six month reporting period related to this award. This may include presentations provided at at non-traditional venues. Do not include publications outside of the six month reporting period.   For presentations, include the title, name(s) of the presenter(s), date the presentation was made, and the venue (e.g., CERF, AGU). Also note whether the materials presented (e.g., PowerPoint® slides) remain available to SECOORA and IOOS and, if so, how they may be accessed (i.e., list the website address or online file sharing link such as Google Drive).

No publications during this period.

MEDIA ENGAGEMENT, EDUCATION, AND OUTREACH

(5) Please list any media coverage related to this award conducted within this six month reporting period. Include links to news stories and media coverage.

Data from the MAPCO2 system was utilized by several University of Georgia students studying marine science. This data allowed them to plot real data and help give an understanding of how the water chemistry is changing.

(6) Describe educational or outreach materials related to this award that have been developed within this six month reporting period.

None during this reporting period.

(7) Upload outreach and education materials developed during the reporting period. Please combine multiple outreach/education materials into one document.

PRODUCT DEVEOPMENT & DELIVERY

(8) Please provide a brief description of the status of all products or tools (or major upgrades to existing products) currently available or under development as part of your award. Only report on work conducted within the six month reporting cycle. Include weblinks where available. Use this section to report instances in which IOOS-funded science related to this project has been transitioned to support products developed by your organization or even beyond your organization. For example, this might include models, apps, mapping tools, etc. that are being used by state or federal agencies to assist with decision support. Also describe who is using the product(s) and the number of users. Only report on work conducted within the six month reporting cycle.

None during this reporting period.

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SUCCESS STORIES

9 Briefly note any success stories that help convey either the value of your project and/or the impact that it has made. An example could be how you work with stakeholders during emergency events to provide them with data or products for decision support. These stories may be used by SECOORA and the IOOS Office to respond to data calls, support presentations, or independent stories. Provide contact details (email addresses) for the PI and stakeholder(s) impacted.

None during this reporting period.

LEVERAGED FUNDING

10 Provide a brief summary on project leveraging (i.e., how you leveraged your SECOORA award to receive other funding). Also include the proposal/project title, funding agency, amount of funding received, project start date, and duration of the project. Only report on leveraging activities within the six month reporting cycle.

None during this reporting period.

SECOORA PROGRESS REPORT: JANUARY 1 - JUNE 30, 2023 REPORT

Project Title: Southeast Ocean and Coastal Acidification Network

2021-2026 SECOORA PROGRESS REPORT

PROGRESS TOWARDS OBJECTIVES

1   Provide a summary of progress towards meeting your project objectives for the six month reporting period. Pay special attention to the six month reporting period accomplishments and the broader impacts related to those findings. Indicate if you anticipate any substantive changes to the project Scope of Work (SOW) as you complete the information below. List each objective and text that describes progress towards meeting the objectives. For each objective provide one of the following indicators: "Complete" and date of completion "On-Track" "Delayed" and anticipated date of completion If an objective is delayed, a justification for the delay (e.g., COVID travel restrictions, late receipt of contract) must be provided along with a new completion date and description of activities employed or to be employed to mitigate the delay.

TASK 1. SOCAN Coordination

1. The SOCAN working groups continue to meet every other month (alternating each other). Emily Hall continues to lead the science working group, focusing on proposal development, information sharing, and gathering information on monitoring priorities in the Southeast. Janet Reimer continues to lead the stakeholder working group, developing the OA webinar series, and determining stakeholder needs in the southeast. Complete

2. SOCAN continues to update and revise the website with new material and references lists: www.socan.secoora.org. Complete

3. One pre-proposal was submitted that included proposed funds for SOCAN (Georgia SeaGrant). Complete

4. Presented update on SOCAN activities at SECOORA Annual Meeting in Jacksonville, FL. Complete (May 10-11, 2023)

5. A second SOCAN virtual Town Hall was presented in partnership with GCAN. There were over 30 attendees. The agenda focused on an introduction to SOCAN and three talks from researchers on mCDR (by Tyler Cyronak [Georgia Southern University], Grace Andrews [Project Vesta] and Alison Tune [Running Tide]). Complete (June 1, 2023)

6. SOCAN continues to work with researchers from Coastal Carolina University on the project entitled "Coastal and Estuarine Acidification in Long Bay, South Carolina" funded by South Carolina Sea Grant. On-Track

TASK 2. GCAN/SOCAN Stakeholder Survey Project

1. The google drive questionnaire was completed and a final push was sent to NERRS, NEPs, and other colleagues. Complete (January- March 2023)

2. SOCAN and GCAN disseminated final questionnaires via email, webpage posts, and in person and virtual seminars with a number of National Estuary Program Technical and Citizen's Advisory Councils. Complete (TBEP TAC: January 18, 2023; APNEP TAC: January 23, 2023; SBEP TAC: March 10, 2023)

3. SOCAN and GCAN aggregated data from all questionnaires. Complete (June 2023)

4. Presented data from the project as invited speakers to CHNEP Watershed Summit Complete (June 21, 2023)

5. SOCAN and GCAN (along with CHNEP) are in the process of finalizing a final report to NOAA OAP. On-Track

6. SOCAN, GCAN and CHNEP are developing a peer-reviewed manuscript. On-Track

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PUBLICATIONS & CONFERENCE PRESENTATIONS

2 Please list any published scientific papers, conference papers, or notable presentations given within the reporting period related to this award. This may include presentations at non-traditional venues. Do not include publications outside of the six month reporting period. For presentations, include the title, name(s) of the presenter(s), date the presentation was made, and the venue (e.g., CERF, AGU). Also note whether the materials presented (e.g., PowerPoint® slides) remain available to SECOORA and IOOS and, if so, how they may be accessed (i.e., list the website address or online file sharing link such as Google Drive).

1. Southeast Ocean and Coastal Acidification Network (SOCAN) and OA Monitoring in the FL Keys. ER Hall (presenter) and JJ Reimer. May 10, 2023, SECOORA Annual Meeting. PowerPoint is with SECOORA.

2. Coastal Acidification Network Stakeholder Feedback Project. ER Hall (presenter), JJ Reimer, J Vreeland. June 21, 2023, CHNEP Watershed Summit. PowerPoint is available to SECOORA upon request.

3. Stakeholder newsletters were produced and distributed approximately monthly.

MEDIA ENGAGEMENT, EDUCATION, AND OUTREACH

3 Please list any media coverage related to this award and include links to news stories and media coverage. Only include media coverage conducted within this six month reporting period.

There has been no media coverage related to this award to date.

4 Describe education or outreach materials related to this award that have been developed within this six month reporting period.

Meetings have been held and plans have been made to create and to present education materials for teachers/educators as part of the South Carolina Sea Grant Project. This includes partnering with the (Teachers on the Estuary) TOTE Program for the ACE Basin.

5 Upload outreach and education materials developed during the reporting period. Please combine multiple outreach/education materials into one document.

PRODUCT DEVELOPMENT & DELIVERY

6 Please provide a brief description of the status of all products or tools (or major upgrades to existing products) currently available or under development as part of this award. Include weblinks where available. Use this section to report instances in which IOOS-funded science related to this project has been transitioned to support products developed by your organization or even beyond your organization. For example, this might include models, apps, mapping tools, etc. that are being used by state or federal agencies to assist with decision support. Also describe who is using the products and the number of users. Only report on work conducted within the six month reporting cycle.

The SOCAN team (along with Coastal Carolina University) is currently developing an education tool/package for Teachers on the Estuary. This will be complete by late summer 2023

SUCCESS STORIES

7 Briefly describe any success stories that help convey either the value of your project and/or the impact that it has made. Success stories should include how your project has benefited local/regional stakeholders. These stories may be used by SECOORA and the IOOS Office to respond to data calls, support presentations, or used as independent stories. Provide contact details (email addresses) for the PI and stakeholder(s) impacted.

The Coastal Acidification Network Stakeholder Feedback Project continues to be incredibly successful. Creating a poll for stakeholders to fill out has provided us with feedback from stakeholders who we might not have reached otherwise. The results of this poll were presented at the CHNEP Watershed Summit and feedback showed that stakeholders were pleased to see the results of the surveys they participated in. The Proceedings of the CHNEP Watershed Summit are available here: https://www.chnep.org/_files/ugd/252fd8_16672ac2ffae4e1294f65acde5368270.pdf.

LEVERAGED FUNDING

8   Provide a brief summary on project leveraging (i.e., how you leveraged your SECOORA award to receive other funding). Also include the proposal/project title, funding agency, amount of funding received, project start date and duration of the project. Only report on leveraging activities within the six month reporting cycle.

The SOCAN funding was leveraged as support for the South Carolina Sea Grant award. Hannides A, D Viso, S Libes, JJ Reimer, ER Hall. Coastal Acidification in Long Bay, South Carolina. Proposal to South Carolina Sea Grant. Total Funding = $102,109.78. Total to SOCAN = $14,900. Match from SOCAN = $1,600. Project duration = February 2021 – January 2024.
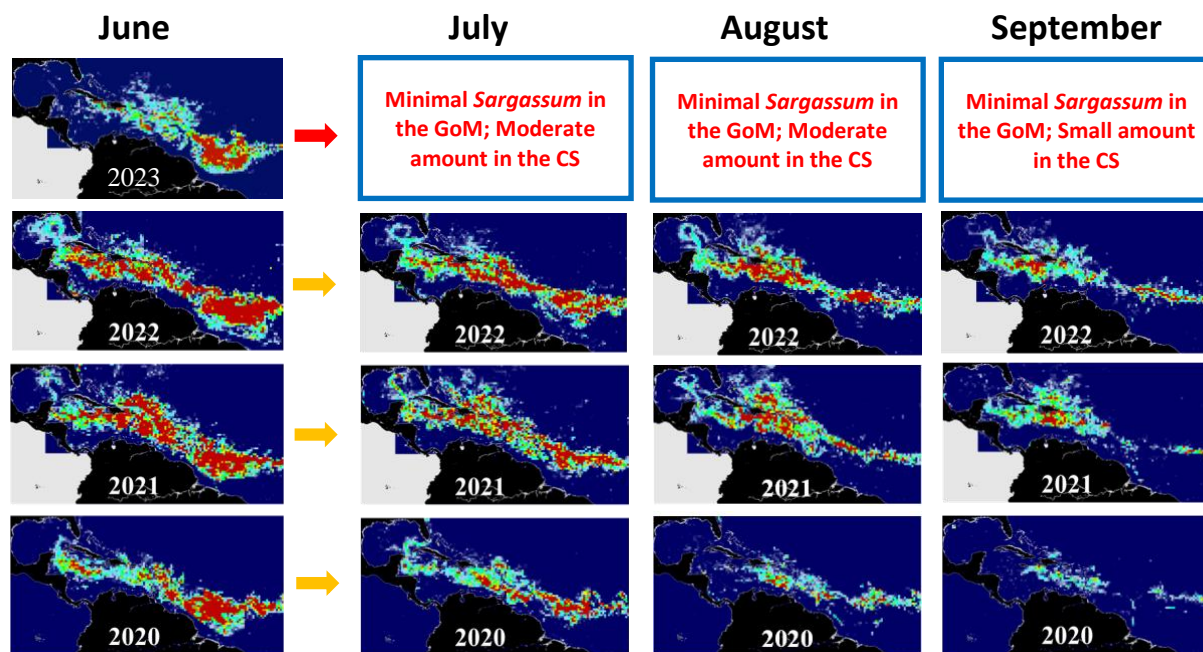
Appendix E: Sargassum Outlook Bulletin

Outlook of 2023 *Sargassum* blooms in the Caribbean Sea and Gulf of Mexico*
June 30, 2023, by University of South Florida Optical Oceanography Lab
(bbarnes4@usf.edu, yuyuan@usf.edu, huc@usf.edu)

The maps below show *Sargassum* abundance, with warm colors representing higher values. Overall, the *Sargassum* quantity in the Great Atlantic *Sargassum* Belt (extending from west Africa to the Gulf of Mexico) during the month of June 2023 decreased slightly (by a few %) from May 2023, with a total wet weight of about 9 million metric tons. Such a slight decrease is a result of substantial decreases in the Gulf of Mexico (GoM) and Caribbean Sea (CS), balanced by increases in the Central West Atlantic (CWA). In particular, although last month we predicted a decrease in the GoM in June, the magnitude of the decrease (75%) was beyond expectation. Compared to the same month of 2011 – 2022, the quantity in the GoM dropped to the lower 25% percentile but in the CS (about 2 million metric tons) still remained in the top 50% percentile.

The *Sargassum* aggregations in the CWA have continued to move westward with prevailing currents and winds. In the CS, most *Sargassum* was around the Lesser Antilles and along the southern coasts of Hispanola, Jamaica, and Puerto Rico. Minimal *Sargassum* amount was found in the western CS, including waters along the Mexico's Caribbean coast. Very little *Sargassum* was found by the end of June in the Straits of Florida and along the east coast of Florida.

Looking ahead, because of the continued decreases of *Sargassum* in the GoM and CS and because the increases in the CWA appeared to have slowed down, we predict that the *Sargassum* amount in the GoM will remain minimal, and in the CS will either decrease or remain stable. This trend may continue in the next 2-3 months, which should be good news to the residents living in the Florida Keys and east coast of Florida as well as in the west coast of the CS. Nevertheless, impacts of *Sargassum* beaching events will continue to be felt throughout some of the eastern CS and possibly western CS regions, although it is difficult to predict exact timing and location for individual beaching events.

We will continue to closely monitor and track *Sargassum* in each region, with more summary updates provided by the end of July 2023. Meanwhile, daily updates through near real-time imagery can be found under the *Sargassum* Watch System (SaWS, https://optics.marine.usf.edu/projects/saws.html).

June	July	August	September
2023	**Minimal *Sargassum* in the GoM; Moderate amount in the CS**	**Minimal *Sargassum* in the GoM; Moderate amount in the CS**	**Minimal *Sargassum* in the GoM; Small amount in the CS**
2022	2022	2022	2022
2021	2021	2021	2021
2020	2020	2020	2020

Appendix F: Neil Hammerschalg, MBON/ATN joint BioTrack project

SECOORA PROGRESS REPORT: JANUARY 1 - JUNE 30, 2023 REPORT

Project Title: MBON/ATN Joint BioTrack project

2021-2026 SECOORA PROGRESS REPORT

PROGRESS TOWARDS OBJECTIVES

(1) Provide a summary of progress towards meeting your project objectives for the six month reporting period. Pay special attention to the six month reporting period accomplishments and the broader impacts related to those findings. Indicate if you anticipate any substantive changes to the project Scope of Work (SOW) as you complete the information below. List each objective and text that describes progress towards meeting the objectives. For each objective provide one of the following indicators: "Complete" and date of completion "On-Track" "Delayed" and anticipated date of completion If an objective is delayed, a justification for the delay (e.g., COVID travel restrictions, late receipt of contract) must be provided along with a new completion date and description of activities employed or to be employed to mitigate the delay.

• Objective 1 (Complete 08/08/2022): Reach out to the marine acoustic tracking research community to solicit data sharing contributions to this joint MBON-ATN project.

After a series of meetings with MBON-ATN and network leaders (including FACT, ACT, iTAG, OTN), we identified the existent network directories and data pipelines as the primary target for this objective. By June 16th, members of all these networks were first contacted by email with an open invitation for data contributions. New invitations and reminders of the open call were sent via email and social media platforms (Twitter, Facebook and Instagram) until the deadline of July 30th, which was later extended to August 8th. In the end, 44 principal investigators from 38 institutions (~50 acoustic telemetry projects) committed to the project, and their data is now available for the BioTrack team for data processing and analysis.

• Objective 2 (Complete 05/17/2022): Develop a data management plan with the ATN.

Together with ATN leaders we developed a data management plan that was formalized in a data sharing & use agreement sent to all potential collaborators. This document describes the project objectives, expected products, data sharing steps, and data archiving options.

• Objective 3 (On-Track): Work to integrate these data in the BioTrack project of the ATN Data Assembly Center (DAC).

Considering that the project involves multiple and diverse collaborators, ATN and BioTrack leaders agreed to offer varied options of data archiving within ATN-DAC. Nearly 40% of the principal investigators agreed to have their data archived with ATN during the execution of this project, and an additional 47% said they may be open to that in the future. Individual contributors that want their data to be archived in ATN-DAC will receive a specific data archiving agreement from the ATN data manager.

• Objective 4 (On-Track): Analyze shared data to create and map shared multi-species hot spots as a metric of biodiversity.

After concluding the data acquisition process that includes more than 39 million detections of 71 species from 3,509 unique receiver locations, the full dataset was combined and went through a systematic process of standardization and quality control. Potential false detections – inherent from acoustic telemetry sampling – were flagged and removed from the final analysis. We then balanced the pros and cons of different species distribution modeling (SDM) approaches according to their suitability to particular characteristics of telemetry data (e.g., species detections are limited to tagged individuals). We opted to implement a set of integrated spatial occupancy models that allow the combination of multiple sources of data to generate more refined distribution estimates (Doser et al. 2022), which was considered the best approach to overcome the intrinsic biases associated to acoustic telemetry sampling. A set of Integrated spatial occupancy models were fit for the Floridian marine ecoregion combining acoustic telemetry data and the open-access database from Ocean Biodiversity Information System (OBIS). Our predictions, based on a set of spatial and environmental variables, produced distribution maps with 10-km resolution (hexagonal grid cells). By overlapping latent occurrence parameters from outputs generated for eight species of sharks, we were able to produce preliminary species richness maps and demonstrate the suitability of our approach to generate a wide range of spatially explicit biodiversity indicators. Now we are in the final stages of adjusting the models to all the 71 species across the full study area (this

step is expected to be fully concluded in July).

• Objective 5 (Delayed): Generate data visualizations of the resulting biodiversity maps linked among MBON, ATN and SECOORA.

This objective is being developed in parallel with objective 4. However, the adoption of the integrated spatial occupancy approach added more complexity into the analysis (although it was an important decision to improve the predictive power of the SDMs) and resulted in delays in this objective. Before sharing the biodiversity maps online, we are opting to consult first the opinions of our expert collaborators that contributed with telemetry data. Their inputs will be used to make the necessary adjustments over our predictive maps prior to their publication online. Our expectation is to have this objective concluded in September, which is a month after sharing the visualizations with our collaborators. Right after concluding this validation step, visualizations of biodiversity hotspots can be made available to MBON, ATN and SECOORA. This will be completed within the coming year.

PUBLICATIONS & CONFERENCE PRESENTATIONS

2 Please list any published scientific papers, conference papers, or notable presentations given within the reporting period related to this award. This may include presentations at non-traditional venues. Do not include publications outside of the six month reporting period. For presentations, include the title, name(s) of the presenter(s), date the presentation was made, and the venue (e.g., CERF, AGU). Also note whether the materials presented (e.g., PowerPoint® slides) remain available to SECOORA and IOOS and, if so, how they may be accessed (i.e., list the website address or online file sharing link such as Google Drive).

• Thiago B. A. Couto & Neil Hammerschlag. A-BioTrack: Generating broad-scale biodiversity indicators from acoustic telemetry data. ACT Network Hybrid Meeting & Workshop: Jan 31st, 2023 (Edgewater, MD). Slides: https://docs.google.com/pr esentation/d/1fdc59b0nMYZg1X1bIOtAiG6tfsDg_Bt4/edit?usp=sharing&ouid=114797030080097639942&rtpof=true&sd=true

• Thiago B. A. Couto & Neil Hammerschlag. A-BioTrack: Generating broad-scale biodiversity indicators from acoustic telemetry data. X-MBON BioTrack Working Group Meeting: Jun 23rd, 2023 (Miami, FL).. Slides: https://docs.google.com/prese ntation/d/1F9pUoeCWU3iQCz_LUK-c6d9Szfj6TLiq/edit?usp=sharing&ouid=114797030080097639942&rtpof=true&sd=true

MEDIA ENGAGEMENT, EDUCATION, AND OUTREACH

3 Please list any media coverage related to this award and include links to news stories and media coverage. Only include media coverage conducted within this six month reporting period.

NA

4 Describe education or outreach materials related to this award that have been developed within this six month reporting period.

NA

5 Upload outreach and education materials developed during the reporting period. Please combine multiple outreach/education materials into one document.

PRODUCT DEVELOPMENT & DELIVERY

6 Please provide a brief description of the status of all products or tools (or major upgrades to existing products) currently available or under development as part of this award. Include weblinks where available. Use this section to report instances in which IOOS-funded science related to this project has been transitioned to support products developed by your organization or even beyond your organization. For example, this might include models, apps, mapping tools, etc. that are being used by state or federal agencies to assist with decision support. Also describe who is using the products and the number of users. Only report on work conducted within the six month reporting cycle.

Per objective 5, we are creating maps visualizing biodiversity hotspots based on telemetry data. This is underway.

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SUCCESS STORIES

7 Briefly describe any success stories that help convey either the value of your project and/or the impact that it has made. Success stories should include how your project has benefited local/regional stakeholders. These stories may be used by SECOORA and the IOOS Office to respond to data calls, support presentations, or used as independent stories.   Provide contact details (email addresses) for the PI and stakeholder(s) impacted.

We are thrilled that we have been able to engage such a large community of researchers to contribute data as well as network the networks. Policy makers and sanctuary managers are very excited about this project.

LEVERAGED FUNDING

8 Provide a brief summary on project leveraging (i.e., how you leveraged your SECOORA award to receive other funding). Also include the proposal/project title, funding agency, amount of funding received, project start date and duration of the project. Only report on leveraging activities within the six month reporting cycle.

We are thrilled to announce that this project has laid the groundwork that served as a basis of notification of a grant from NOPP, which will include SECOORA as a partner.

Appendix G: Joy Young, FACT Data Wrangler

SECOORA PROGRESS REPORT: JANUARY 1 - JUNE 30, 2023 REPORT

Project Title: FACT Data Wrangler

2021-2026 SECOORA PROGRESS REPORT

PROGRESS TOWARDS OBJECTIVES

1 Provide a summary of progress towards meeting your project objectives for the six month reporting period. Pay special attention to the six month reporting period accomplishments and the broader impacts related to those findings. Indicate if you anticipate any substantive changes to the project Scope of Work (SOW) as you complete the information below. List each objective and text that describes progress towards meeting the objectives. For each objective provide one of the following indicators: "Complete" and date of completion "On-Track" "Delayed" and anticipated date of completion If an objective is delayed, a justification for the delay (e.g., COVID travel restrictions, late receipt of contract) must be provided along with a new completion date and description of activities employed or to be employed to mitigate the delay.

Data Wrangler

Priority 1:

- Completed 30 June 2023: Conduct two major (i.e. inter-network matching) telemetry data processing events. Two major data matching events were completed in February and June 2023.

Fast FACTS for the June data push:

Fact Issues June push: 98

Total Detections: 287,439,207

New and Update Detections June Push: 44,379,126

Total tags: Active Tags: 3211 Total Tags: 9595

New and updated Tags June Push: 375

Project count: 191

Contributor count:288

Institution count: 60

Species count: 130

- Completed 30 June 2023: Collect and upload environmental data from array owners in conjunction with data processing. Collection and processing of temperature data was conducted in June 2023.

Priority 2:

- Completed 15 June 2023: Work with PIs to resolve incomplete telemetry datasets (based on process under priority 1). During the two data push events, approximately 25% of issues were classified as data fixes. An issue is a specific task for a project, for example loading tag metadata for project ABCD.

- Delayed. Produce one manuscript using data derived from the FACT/SECOORA node. Two manuscripts are in progress. The first is being written but lead by a graduate student who was delayed writing his dissertation. The second manuscript was submitted but is currently in revision stage. Expected resubmission September 2023.

- Completed 12 June 2023: Present results of the collaborative manuscript at a national scientific conference. Results on a collaborative paper on cobia movements was presented at the International Conference of Fish Telemetry. See conference presentations for details.

DaViT Mini-proposal

Priority 1: Augment researchers' detection extracts with species level QC flags

- On-track: Identify machine readable sources for home range and maximum swim velocity for species within the FACT

Network. A student was engaged to evaluate and integrate external authorities on species home range, and analyzed the species coverage of OBIS/GBIF, IUCN, and AquaMaps' predictive mapping tool. OBIS's coverage of FACT species was found to be the most robust and a workflow in R to produce concave polygons from OBIS occurrence data was delivered.

- On-track: Identify appropriate QC filters from the remora toolkit. Remora's QC process was refactored to allow each of the tests to run independently and aggregate only selected QC tests toward a cumulative QC score. This is important to do since some of the QC testing done by Remora's default configuration was redundant to OTN and FACT data QC processes and was inflating the final aggregate scores.

- On-track: Include coding for the QC flags as a step-in processing detection extracts.

The tailored QC tests and the OBIS-derived homerange dataset allow a 5-point QC test to be run against each individual detection recorded across the FACT network and the resulting QC columns to be included in detection extract files, creating a reliable subset of the data to feed the visualization tool. Still to come - deploying this workflow into the detection extract process in order to create QC flag columns on Research Workspace that can be read by the DaViT visualization process for filtering purposes, and amending DaViT's data ingestion step to act on these QC flags when creating species polygons for the DaViT tool.

Priority 2: Improve the accuracy of visuals on the DaViT tool.

- On-track*: Adapt the DaViT to ingest detections based on QC flags to reduce false detections used to calculate range and distribution.

- On-track*: Change the algorithm used to calculate range and distribution to stay within the confines of the acoustic networks.

*The primary contactor at Axiom Data Science that worked with the DaVit recently took a new position. They have been contracted back. Project staff delivered a new to-do list to Axiom.

Priority 3: Improve the effectiveness of the DaViT in communicating animal movement information to the public.

- On-track: Incorporate suggestions from the 2022 annual SECOORA meeting including (but not limited to): updated explanations of range and distribution to illustrate metrics are calculated within the network, include a depiction of the network, allow selection of multiple months, make disclaimers more pronounced, change numbers to worlds for months, and include pictures for all species.

- On-track: Create and link additional web pages for projects depicted in the DaViT tool. Three project pages were updated. Florida Manta Project (MMFT) https://secoora.org/fact/projects/florida-manta-project/, American Eel Migration from Inland Rivers to the Gulf of Mexico (AMEELT) https://secoora.org/fact/projects/american-eel-migration-from-inland-rivers-to-the-gulf-of-mexico/, and How Fish are using Florida Bay: Impacts and Effects of Seagrass Distribution (CELASE) https://secoora.org/fact/projects/how-are-fish-using-florida-bay-impacts-and-effects-of-seagrass-distribution/

PUBLICATIONS & CONFERENCE PRESENTATIONS

2   Please list any published scientific papers, conference papers, or notable presentations given within the reporting period related to this award. This may include presentations at non-traditional venues. Do not include publications outside of the six month reporting period. For presentations, include the title, name(s) of the presenter(s), date the presentation was made, and the venue (e.g., CERF, AGU). Also note whether the materials presented (e.g., PowerPoint® slides) remain available to SECOORA and IOOS and, if so, how they may be accessed (i.e., list the website address or online file sharing link such as Google Drive).

The FACT Network. Joy Young. 31 January 2023. Atlantic Coast Telemetry meeting (virtual).

The FACT Network and the DaViT. 10 May 2023. SECOORA Annual meeting, Jacksonville, Florida. Slides provided to SECOORA.

Large-scale collaborative telemetry networks reveal stock structure and seasonal site fidelity of cobia on the U.S. east coast. 12 June 2023. Joy Young. International Conference on Fish Telemetry.

FACT Network updates. Joy Young. 29 June 2023. FACT Network summer meeting virtual.

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MEDIA ENGAGEMENT, EDUCATION, AND OUTREACH

3 Please list any media coverage related to this award and include links to news stories and media coverage. Only include media coverage conducted within this six month reporting period.

Number instragram, facebook, and twitter posts promoting data submission deadlines, voting for a new steering committee member, and conference presentations. Social media handles: Instagram

@FACT_Network, Twitter @FACT_Network

4 Describe education or outreach materials related to this award that have been developed within this six month reporting period.

Also included in progress: Two new project pages on the FACT website.

5 Upload outreach and education materials developed during the reporting period. Please combine multiple outreach/education materials into one document.

PRODUCT DEVELOPMENT & DELIVERY

6 Please provide a brief description of the status of all products or tools (or major upgrades to existing products) currently available or under development as part of this award. Include weblinks where available. Use this section to report instances in which IOOS-funded science related to this project has been transitioned to support products developed by your organization or even beyond your organization. For example, this might include models, apps, mapping tools, etc. that are being used by state or federal agencies to assist with decision support. Also describe who is using the products and the number of users. Only report on work conducted within the six month reporting cycle.

Data Wrangler

Data processed:

The detection data processing events were completed in February and June 2023 resulting in 1,011 new or updated detection extracts for 129 different telemetry projects. The temperature data processing event was completed in June 2023 resulting in 106 new or updated temperature extracts for 28 projects. Project staff are currently working with Axiom to revive the pipeline for ingestion into the SECOORA data portal. Temperature and Detection extracts were provided to projects conducted by state and federal governments, universities, not-for profit organizations, and private companies.

Processing tools:

Created two new Jupyter notebooks to 1) create tag deployment and receiver graphics for the FACT website (https://secoora.org/fact/the-facts/about-us/) and 2) create a dataset and visual display of receiver coverage over time in response to multiple data requests for such information for general knowledge, grant writing, and publications. Notebooks may be used by any data manager working with node-derived data.

Website development:

The FACT website (hosted by SECOORA) was updated with agendas and notes from the June 2023 meeting, and a biosketch of the new Steering Committee member.

DaViT mini-proposal

The QAQC flags have performed well using some test datasets. It has successfully flagged known false detections. Next step is to 1) update the DaViT with new and existing projects and 2) update the DaViT with a dataset with the QAQC flags.

SUCCESS STORIES

7 Briefly describe any success stories that help convey either the value of your project and/or the impact that it has made. Success stories should include how your project has benefited local/regional stakeholders. These stories may be used by SECOORA and the IOOS Office to respond to data calls, support presentations, or used as independent stories. Provide contact details (email addresses) for the PI and stakeholder(s) impacted.

Data Wrangler

One project published data in OBIS, an open source platform, making their data available to the public. The FACT Steering Committee began discussion on offering guidance how best to publish telemetry data with the goal of encouraging more

members to do so.

Project MANGA. PI: Katelyn Herman, kherman@georgiaaquarium.org

Facilitated the publication of several manuscripts by providing detection data.

Reyier, E., et al. (2023). Sharks associated with a large sand shoal complex: Community insights from longline and acoustic telemetry surveys. Plos one, 18(6).

Boucek, R., et al (2023). A decade-long connectivity study of Permit (Trachinotus falcatus) in Florida supports a spatial management approach. Environmental Biology of Fishes, 106(2), 181-192.

Cahill, B., et al. (2023). Visitation patterns of two ray mesopredators at shellfish aquaculture leases in the Indian River Lagoon, Florida. Plos one, 18(5).

Baker, S., et al. (2023). Assessing the Effects of Physical Barriers and Hypoxia on Red Drum Movement Patterns to Develop More Effective Management Strategies. Fishes, 8(4), 171.

Kahn, J. E., et al. (2023). Population and sex-specific survival estimates for Atlantic sturgeon: addressing detection probability and tag loss. Aquatic Biology, 32, 1-12.

DaViT Mini Proposal

The DaViT tool has grown to display data on 68 species of fish and marine reptiles reflecting 52 tag projects. We anticipate this to increase after the DaViT is updated after the June data push.

We received an excellent student applicant pool consisting of national and international students, most of who responded to the call because of social media versus traditional email.

LEVERAGED FUNDING

8   Provide a brief summary on project leveraging (i.e., how you leveraged your SECOORA award to receive other funding). Also include the proposal/project title, funding agency, amount of funding received, project start date and duration of the project. Only report on leveraging activities within the six month reporting cycle.

None at this time.

Appendix H: Yonggang Liu, New York Harbor - Cook Inlet Model Testing

Project Title: New York Harbor - Cook Inlet Model Testing

2021-2026 SECOORA PROGRESS REPORT

PROGRESS TOWARDS OBJECTIVES

1   Provide a summary of progress towards meeting your project objectives for the six month reporting period. Pay special attention to the six month reporting period accomplishments and the broader impacts related to those findings. Indicate if you anticipate any substantive changes to the project Scope of Work (SOW) as you complete the information below. List each objective and text that describes progress towards meeting the objectives. For each objective provide one of the following indicators: "Complete" and date of completion "On-Track" "Delayed" and anticipated date of completion If an objective is delayed, a justification for the delay (e.g., COVID travel restrictions, late receipt of contract) must be provided along with a new completion date and description of activities employed or to be employed to mitigate the delay.

The National Water Initiative is funding a coastal model evaluation in response to a series of white papers that were written by the NOAA Unified Forecast System Coastal Application Team (UFS CAT) focused on total water level, navigation, and risk reduction. The USF will work as a tester to configure and test Finite Volume Community Model (FVCOM) on NSF funded Texas Advanced Computing Center (TACC).

Object in Year 1: USF will configure an FVCOM application for the New York Harbor/ Cook Inlet region for tidal simulation (dominant tidal constituents), and evaluation against available water level observations. The outcome is providing skill assessment documentation and evaluating the model in the context of operations (stability, code management, ease of operation, etc.)

Here is a list of activities performed during this reporting period:

• Participated in monthly UFS CAT Water Quantity model evaluation online meetings and discussions for FVCOM application in New York Harbor and Cook-Inlet region.

• Participated in monthly PI meetings online.

• Refined unstructured model grid for the New York Harbor – Cook Inlet region.

• Completed 2D barotropic model simulation for three months in July – September 2021 with tides from TPXO product.

• Quantitatively compared the model simulated tides with tide gauge records for all the 21 stations provided by the model evaluation team.

• Submitted a comprehensive progress report to NOAA USF CAT for Phase I of the project.

• Repeated the 2D barotropic model simulation for three winter months in 2022.

• Additional model/data comparison was performed for 2022 and additional report was submitted to NOAA UFS CAT directly.

• Successfully recruited a new graduate student who will learn coastal ocean modeling using FVCOM.

This project is on-track towards meeting the objectives.

PUBLICATIONS & CONFERENCE PRESENTATIONS

2   Please list any published scientific papers, conference papers, or notable presentations given within the reporting period related to this award. This may include presentations at non-traditional venues. Do not include publications outside of the six month reporting period. For presentations, include the title, name(s) of the presenter(s), date the presentation was made, and the venue (e.g., CERF, AGU). Also note whether the materials presented (e.g., PowerPoint® slides) remain available to SECOORA and IOOS and, if so, how they may be accessed (i.e., list the website address or online file sharing link such as Google Drive).

MEDIA ENGAGEMENT, EDUCATION, AND OUTREACH

3 Please list any media coverage related to this award and include links to news stories and media coverage. Only include media coverage conducted within this six month reporting period.

4 Describe education or outreach materials related to this award that have been developed within this six month reporting period.

As an experienced coastal ocean modeling group, University of South Florida Ocean Circulation Lab provided valuable guidance and help to the other groups working on this FVCOM evaluation project.

5 Upload outreach and education materials developed during the reporting period. Please combine multiple outreach/education materials into one document.

PRODUCT DEVELOPMENT & DELIVERY

6 Please provide a brief description of the status of all products or tools (or major upgrades to existing products) currently available or under development as part of this award. Include weblinks where available. Use this section to report instances in which IOOS-funded science related to this project has been transitioned to support products developed by your organization or even beyond your organization. For example, this might include models, apps, mapping tools, etc. that are being used by state or federal agencies to assist with decision support. Also describe who is using the products and the number of users. Only report on work conducted within the six month reporting cycle.

SUCCESS STORIES

7 Briefly describe any success stories that help convey either the value of your project and/or the impact that it has made. Success stories should include how your project has benefited local/regional stakeholders. These stories may be used by SECOORA and the IOOS Office to respond to data calls, support presentations, or used as independent stories. Provide contact details (email addresses) for the PI and stakeholder(s) impacted.

One of the purposes of this project is to train more coastal ocean modelers, as there are not many qualified modelers available in the U.S. University of South Florida Ocean Circulation Lab successfully recruited a new graduate student who will learn coastal ocean modeling using FVCOM.

LEVERAGED FUNDING

8 Provide a brief summary on project leveraging (i.e., how you leveraged your SECOORA award to receive other funding). Also include the proposal/project title, funding agency, amount of funding received, project start date and duration of the project. Only report on leveraging activities within the six month reporting cycle.

Appendix I: Emanuele Di Lorenzo, Evaluation of the Semi-implicit Cross-scale Hydroscience Integrated System Model (SCHISM) for NOAA Unified Forecasting System (UFS)

SECOORA PROGRESS REPORT: JANUARY 1 - JUNE 30, 2023 REPORT

Project Title: Evaluation of the Semi-implicit Cross-scale Hydroscience Integrated System Model (SCHISM) for NOAA Unified Forecasting System (UFS)

2021-2026 SECOORA PROGRESS REPORT

PROGRESS TOWARDS OBJECTIVES

1. Provide a summary of progress towards meeting your project objectives for the six month reporting period. Pay special attention to the six month reporting period accomplishments and the broader impacts related to those findings. Indicate if you anticipate any substantive changes to the project Scope of Work (SOW) as you complete the information below. List each objective and text that describes progress towards meeting the objectives. For each objective provide one of the following indicators: "Complete" and date of completion "On-Track" "Delayed" and anticipated date of completion If an objective is delayed, a justification for the delay (e.g., COVID travel restrictions, late receipt of contract) must be provided along with a new completion date and description of activities employed or to be employed to mitigate the delay.

Complete, May 31, 2023 - Evaluation of metrics for the Semi-implicit Cross-scale Hydroscience Integrated System Model (SHISM) for New York Harbor Application

Below is a break down of the report submitted also to NOAA:

a. Relevant files: mesh, output files

Mesh:

/scratch3/projects/CATUFS/KyungminPark/pre-proc/grid/02

Inputs and outputs:

2021- /scratch3/projects/CATUFS/KyungminPark/run/RUN02a

2022- /scratch3/projects/CATUFS/KyungminPark/run/RUN02b

b. A short summary on mesh details

The mesh is generated based on the DEMs provided by the NOAA team (4 m to 100 m resolution). The main focus of the mesh generation is to capture geographical features (channels, jetties, etc) properly around areas of interest (e.g., observations). Because SCHISM has high stability and forgiveness, original bathymetries from the DEMs are utilized without smoothing, which leads to higher fidelity/accuracy and realistic simulations. Some issues with the first version of the DEM (mostly blocked channels in Arthur Kill and other smaller rivers) were identified by us, which was promptly rectified by the improved DEMs from the NOAA/OCS team. The first version of the mesh was then revised to conform to the new DEMs. SCHISM's accuracy was found to rely critically on this accurate capturing of the underlying topobathymetry. This iterative exercise and findings on the interaction among DEM, mesh and model accuracy provide educational materials for coastal ocean modeling and will be described in detail in upcoming papers in a Special Issue of Ocean Modelling dedicated to SCHISM. The interpolated bathymetry on the mesh is presented in Figure 1.

The mesh consists of the triangle and quad elements. The quad elements effectively and efficiently reproduce the main rivers while the triangle elements are useful for representing complex coastlines. Figure 2 shows the detailed mesh with zoom-in views. The resulting mesh has 65,800 nodes and 113,215 elements. The horizontal resolution ranges from 3.5 km (open boundary) to 5 m (inland river). The average resolution is about 550 m.

c. A short summary on model configuration

Model version v5.10 Boundary condition FES 2014

Compiler flags Intel compiler

TVD: VL Spin up period 10 days

Model setup 2D barotropic

Emanuele Di Lorenzo, Evaluation of the Semi-implicit Cross-scale Hydroscience Integrated System Model (SCHISM) for NOAA Unified Forecasting System (UFS)

SECOORA Progress Report: January 1 - June 30, 2023

Time step: 150 s

Thetai: 0.6

Manning's n: 0.028

d. A short summary on the computation

Used machine = Frontera.

Total simulation period = 120 days

1 node (56 cores) -> runtime = 01:07:12 (hours:minutes:seconds)

2 node (112 cores) -> runtime = 00:43:46

5 node (280 cores) -> runtime = 00:37:00

e. Skill assessment results.

The skill assessment uses hourly model results with the python library 't_tide'.

The script calculating the error statistical parameter can be found here:

/scratch3/projects/CATUFS/KyungminPark/run/

Table format (we cannot upload table, so here is our best attempt)

M2 S2 N2 K1

2021 RMSE for amplitude (cm) 3.84 1.23 1.05 1.44

RMSE for phase (deg) 4.42 8.32 4.29 26.11

Complex RMSE (cm) 4.88 1.49 1.01 3.23

2022 RMSE for amplitude (cm) 4.01 1.37 1.12 1.34

RMSE for phase (deg) 4.32 8.91 5.01 25.31

Complex RMSE (cm) 4.91 1.64 1.21 3.13

PUBLICATIONS & CONFERENCE PRESENTATIONS

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Kyungmin Park

April 2023, NOAA Team PI Call

The SHISM model mesh and applications for New York Harbor (Report)

https://www.dropbox.com/scl/fi/45jk7njtf91fiff2ya4gx/UFS_Report_Round1_edl.docx?rlkey=8fjf0a1cplwry4mc6nvlce2la&dl=0

MEDIA ENGAGEMENT, EDUCATION, AND OUTREACH

3 Please list any media coverage related to this award and include links to news stories and media coverage. Only include media coverage conducted within this six month reporting period.

Nothing to report

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4 Describe education or outreach materials related to this award that have been developed within this six month reporting period.

The project has provided support to train graduate student Spenser Wipperfurth

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5 Upload outreach and education materials developed during the reporting period.   Please combine multiple outreach/education materials into one document.

Emanuele Di Lorenzo, Evaluation of the Semi-implicit Cross-scale Hydroscience Integrated System Model (SCHISM) for NOAA Unified Forecasting System (UFS)

SECOORA Progress Report: January 1 - June 30, 2023

PRODUCT DEVELOPMENT & DELIVERY

6 Please provide a brief description of the status of all products or tools (or major upgrades to existing products) currently available or under development as part of this award. Include weblinks where available. Use this section to report instances in which IOOS-funded science related to this project has been transitioned to support products developed by your organization or even beyond your organization. For example, this might include models, apps, mapping tools, etc. that are being used by state or federal agencies to assist with decision support. Also describe who is using the products and the number of users. Only report on work conducted within the six month reporting cycle.

Nothing to report

SUCCESS STORIES

7 Briefly describe any success stories that help convey either the value of your project and/or the impact that it has made. Success stories should include how your project has benefited local/regional stakeholders. These stories may be used by SECOORA and the IOOS Office to respond to data calls, support presentations, or used as independent stories. Provide contact details (email addresses) for the PI and stakeholder(s) impacted.

Nothing to report

LEVERAGED FUNDING

8 Provide a brief summary on project leveraging (i.e., how you leveraged your SECOORA award to receive other funding). Also include the proposal/project title, funding agency, amount of funding received, project start date and duration of the project. Only report on leveraging activities within the six month reporting cycle.

Nothing to report

ASAP.gov
Automated Standard Application for Payments
BUREAU OF THE FISCAL SERVICE

APPENDIX J
Account Detail Profile Inquiry

Date: 07/20/2023
Time: 9:20 AM

ALC/Region:
13140001

Agency Short Name:
NOAA

Account ID:
FNA21NOS0120097

Recipient ID:
4530798

Recipient Short Name:
SECOORA

Inquiry Results:

Account Type:
Control Account

Account ID:
FNA21NOS0120097

Description:
NOAACOOPNOS

Available Balance:
$6,894,738.24

Total Cumulative Draw Limit:
$12,222,630.00

Account Detail ID	Account Status	Cumulative Draw Limit	Draws/RP/BE To Date
FY21CETACEAN2021-X-000-005	CLOSED	$350,000.00	- $350,000.00
FY21NATDMAC021-T-000-002	CLOSED	$90,000.00	- $90,000.00
FY21NCDIS021-T-000-009	CLOSED	$190,000.00	- $190,000.00
FY21NOSHQ021-X-000-001	CLOSED	$10,000.00	- $10,000.00
FY21OAP021-T-000-007	OPEN	$71,365.00	- $65,605.37
FY21OCM021-T-000-006	OPEN	$244,444.00	- $135,685.91
FY21OMAO021-T-000-008	CLOSED	$10,000.00	- $10,000.00
FY21REG021-T-000-003	OPEN	$3,576,136.00	- $2,994,431.94
FY21SECART021-T-000-004	OPEN	$10,500.00	- $9,538.39
FY22 COOPS NCDIS022-T-002-001	OPEN	$357,500.00	- $218,040.49
FY22 OAP 022-T-002-003	OPEN	$76,915.00	- $10,296.01
FY22 OCM WATER 022-T-002-005	OPEN	$197,144.00	- $106,085.50
FY22 OCMROP022-T-002-006	OPEN	$244,400.00	- $15,967.00
FY22 OMAOBATTERY022-T-002-007	OPEN	$30,000.00	- $12,322.57
FY22 SECART022-T-002-002	OPEN	$4,800.00	- $92.57
FY22F4DISCRETION022-T-002-009	OPEN	$150,000.00	- $112,783.14
FY22NATDMAC022-T-002-004	OPEN	$159,153.00	- $65,625.00
FY22REG022-T-001-001	OPEN	$3,061,136.00	- $894,728.01
FY22REG022-T-002-008	OPEN	$324,201.00	- $36,689.86
FY23 REGIONAL023-T-003-002	OPEN	$3,061,136.00	- $0.00
FY23 SEACART023-T-003-001	OPEN	$3,800.00	- $0.00