



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: 07/01/2022 – 12/31/2022

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
GOVERNANCE SUBSYSTEM	
Maintain the SECOORA governance and operational structure through implementation of SECOORA bylaws and Strategic Plan.	
Accomplishments: <ul style="list-style-type: none"> SECOORA is planning the May 2023 Board of Directors and Members meeting. The meeting will be hosted in Jacksonville, FL at the University of Jacksonville, May 10-11. At the December Board of Directors Meeting, the SECOORA Board voted to increase the number of Public Sector Seats from 1 to 3 to foster more diversity on the Board. This would be a change to the SECOORA by-laws which requires a vote from the full SECOORA membership. This vote to change to the Public Sector Seats from 1 to 3 will be conducted during the May 2023 Board of Directors and Members meeting. SECOORA continues with Diversity, Equity, and Inclusion (DEI) efforts. SECOORA is partnering with Savannah State University (a Historically Black College and University) to form a coastal ocean observing internship opportunity in 2023. 	On-track
Maintain SECOORA’s certification as a RICE	
The Certification renewal package was submitted to the IOOS office on 5/18/2022. The	Complete



<p>RCOS MOA between SECOORA and NOAA was executed on 8/22/2022. All documents submitted for certification are found here: https://secoora.org/certification/. 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 Georgia Tech Water Level Station plan and the Glider data sharing plan. A new data sharing plan was added for UGA Skidaway Institute of Oceanography’s Harmful Algal Bloom (HAB) project.</p>	
<p>Update the SECOORA RCOOS Plan</p>	
<p>SECOORA Modeling Framework: Dr. Greg Dusek, Chief Scientist NOAA CO-OPS, joined SECOORA for a four-month detail from March – June 2022 as a part of NOAA’s Leadership Competencies Development Program. While with SECOORA, Greg worked with SECOORA contractor Megan Trembl to draft the SECOORA Modeling Strategy. The Strategy was reviewed by NOAA modeling experts, regional modelers, the SECOORA Science Committee, and SECOORA PIs. During this reporting period the Modeling Framework was finalized and is now available online: http://secoora.org/wp-content/uploads/2023/01/SECOORA-Modeling-Framework-FINAL.pdf. This document is an addendum to the overall SECOORA RCOOS Plan.</p>	<p>On-track</p>
<p>OBSERVING SUBSYSTEM</p>	
<p>HF Radar Operations & Maintenance</p>	
<p>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.</p> <p>Hurricane Ian made landfall in Florida on 9/28/22. Two HFR operated by the University of South Florida (USF) were damaged: the Naples HFR was destroyed, and the Venice HFR sustained damages. The storm made a second U.S. landfall in South Carolina. Storm surge and erosion caused damage to the Georgetown HFR (operated by the University of South Carolina, UofSC). HFR damage assessments for USF and UofSC were included with the overall damage report submitted by SECOORA to the IOOS office on 12/20/22.</p> <p>The St. Catherines, GA (CAT) HFR was destroyed by a wildfire 6/21/22. UGA’s Skidaway Institute of Oceanography (SkIO) is still working with the university insurance agent to determine if they will receive any funding to replace the system. Additionally, SkIO has been unable to deploy the HFR at Kennedy Space Center (KSC) due to dune erosion related to Hurricane Ian. KSC personnel are working with SkIO to reposition the location of the HFR, shed, and power supply for the system to an area that is more stable. The SkIO team and Brain Zelenke, IOOS Surface Currents Program Manager, have a call</p>	<p>On-track</p>

scheduled for early January with KSC personnel to determine the new path forward. Finally, ECU's Coastal Studies Institute (CSI) is planning to move the HFR located in Duck, NC to Jennette's Pier in Nag's Head, NC. SECCORA submitted NEPA documents to the IOOS program office related to this move. CSI must apply for a Coastal Area Management Act (CAMA) permit from the NC Department of Environmental Quality before the system can be moved. The permit application is underway.

- The HFR report that details HFR operators, system status, and IT infrastructure needs by site are available here: https://docs.google.com/spreadsheets/d/1L1w00TPG1K7xXyh_iXXw6T7JaGT8rLZwnZMWfrnIXOI/edit?usp=sharing
- The 2022 HFR Annual Staffing Report is found here: <https://docs.google.com/spreadsheets/d/1dC4Tgh7x1BRLcFL62urO3sbWwp6FEUteO-c0J5OgwEw/edit?usp=sharing>
- The 2022 Annual Expenditures Report is found here: <https://docs.google.com/spreadsheets/d/1o72wuTtcAqYz0uVewoxmcwn14rqqBwzxUJHTpkzVYqY/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 Navy glider support.

On-track

Accomplishments:

- 3 missions were completed during the reporting period (see table below), for a total of 58 days at sea. All data are submitted to the National Glider DAC and the glider data can be found on the SECOORA Data Portal.
- PI Edwards (SkIO) continued a successful collaboration with NOAA AOML/PMEL scientists to coordinate glider missions with 7 Saildrones during hurricane season, including 2 Saildrones in the South Atlantic Bight. Edwards assisted with design and implementation of the Saildrone missions, including coordination of Saildrones with gliders, multiple NDBC and CDIP buoys, and one NOAA research cruise at Grays Reef National Marine Sanctuary. One of the 7 Saildrones captured meteorological and ocean conditions from within the eye of Hurricane Ian in the Gulf of Mexico, and a Saildrone in the South Atlantic Bight captured reformation of the eye of Hurricane Ian as it reorganized and strengthened after crossing the Florida Peninsula. See SECOORA news story here: <https://secoora.org/franklin-the-glider-is-on-coordinated-mission-to-improve-tropical-storm-intensity-forecasting/>

Team Lead	Glider Name	Deployment Date	Recovery Date	Days in Water
SkIO	Franklin	10/08/2022	11/01/2022	24
USF	Sam	09/01/2022	09/10/2022	9
SkIO	Franklin	08/03/2022	08/28/2022	25

SkIO technicians K. Dreger and J. Bird have been working to create electronic versions of service reports and maintenance records for all gliders housed at Skidaway. These electronic copies allow for quicker referencing or looking up service dates. These maintenance logs will help routine maintenance timelines for the gliders.



GENIoS anomaly detection algorithms developed by Georgia Tech in Year 1 were field-tested during the 2022 deployments. Student R. Yang submitted a conference paper that showed that in-flight anomalies (lost wing, shark strike) were successfully detected from position information and estimates of forward speed. GENIoS is all python-based and no longer MATLAB-dependent. A manuscript is in development for publication on the python version of the code.

Issues:

- Pelagia continues to have equipment malfunctions and has been returned to the manufacturer for evaluation and repair.
- Sam suffered a lost wing during the September deployment, causing it to lose its ability to continue profiling. The lost wing could have been related to interaction with fishing gear or some other surface borne structure.
- Franklin suffered a severe shark strike during his August mission and several parts had to be repaired or replaced, including the tie-rod, wings, and wing rails and hulls.

Sustain the SECOORA Real-Time and Non-Real-Time Mooring Network

All real-time moorings/instrumentation have a targeted up-time of 85%.

UNCW-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) LEJ3 swapped in August; 2) SUN2 swapped in December; 3). Several buoys were visited post-lan to assess storm damage. Damage assessments were submitted to SECOORA.
- 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.
- Second Creek Consulting, data management partner for UNCW, added HTML code to the CORMP [website](#) that allows users to set up an iframe to embed CORMP data into their own websites. This is a result of local pier operators wanting to display nearby buoy data on their websites.

UNCW up-time statistics for 7/1/22-12/31/22 for real-time moorings:

	ILM2	ILM3	LEJ3	SUN2	CAP2	FRP2	CHR60
Air Temperature	96%	100%	66%	97%	88%	98%	100%
Air Pressure	96%	100%	66%	97%	88%	98%	100%
Wind Speed, Gust, Direction	96%	100%	66%	97%	88%	98%	100%
Salinity	96%	96%	63%	97%	51%	98%	100%
Surface Water Temperature	96%	96%	63%	97%	88%	91%	100%
Waves	77%	N/A	79%	100%	100%	N/A	100%
ILM2, LEJ3, SUN2, CAP2, & CHR60 have two buoys on site: a met buoy and a wave buoy							

Issues:

On-track

- ILM2WAVE broke free of its mooring on 10/12/22. The buoy was recovered, CDIP shipped a new mooring, and the buoy was re-deployed on 11/17/22. The buoy also experienced an internal sensor failure on 12/26/22 and has been recovered. CDIP will ship a replacement buoy in early 2023.
- LEJ3 experienced two power system failures during this reporting period. The first one began on 8/28/22. Due to weather and ship availability the buoy was not replaced until 10/3/22. A second power system failure occurred on 11/30/22. The buoy is reporting intermittently. A site visit is planned for 1/3/23 and a PV panel and the battery will be replaced to see if that solves the problem.
- LEJ3WAVE was struck by a vessel on 6/15/22 (last reporting period). CDIP shipped a replacement buoy, and it was deployed on 8/17/22.
- CAP2's CTD experienced a salinity sensor malfunction on 8/1/22. Personnel availability, operational and weather complications delayed repair until 10/25/22.

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: Two research mooring cruises were executed in this reporting period. The first research cruise on Florida Institute of Oceanography's R/V Weatherbird II was executed from 8/16 – 8/18/2022 servicing SECOORA funded station C10 for Relative Humidity/Air Temperature sensor replacement and GMX500 swapping (bad compass). C13 and C22 were recovered on this cruise and new systems were deployed safely. All data has been recovered with all instruments having full and complete data records.

Issues: Stations C13 and C22 leverage SECOORA funding with other funding to maintain the two buoys. Both buoys were in the path of Category 4 Hurricane Ian during 9/27-29/2022 and poor data transmission and sensor damage are a result of storm damage. Station C22 recorded the initial approach of Ian while station C13 recorded both the approach and the departure of the storm. Ultimately both stations lost data transmissions due to damaged antennas. In an example of a 'bend but don't break' design, both buoys were moved off of their positions significantly in response to strong winds and extreme waves but they did not break free. Damage assessments were provided to SECOORA for real-time and non-real-time systems that were in the path of Ian.

USF up-time statistics for 7/1/22-12/31/22 for real-time buoys supported solely by SECOORA (C10 and C12) and real-time buoys that leverage SECOORA funding (C13 and C22) are provided in the below table. Lower stats for C13 and C22 reflect down time of sensors due to Hurricane Ian damages.

USF	C10	C12	C13	C22
Wind	99%	99%	61%	46%
Air Pressure	99%	99%	61%	46%

Water Temperature	99%	99%	61%	22%	
Salinity (Surface)	99%	99%	61%	22%	
Air Temperature	95%	99%	61%	46%	
Relative Humidity	95%	99%	61%	46%	
Longwave Radiation	99%	N/A	N/A	N/A	
Shortwave Radiation	99%	N/A	N/A	N/A	
Currents	96%	96%	58%	43%	
Expand the SECOORA Real-time Observing Network					
UNCW sited and deployed 1 SoFar wave buoy, CAP2Wave , near the existing CAP2 met buoy on 7/5/2021. Data from this buoy are flowing to SECOORA and NOAA NDBC. CAP2Wave buoy statistics are included in the UNCW statistics in the above section.					Complete
UNCW sited and deployed Charleston Harbor, SC buoys (1 met buoy and 1 wave buoy) on 3/17/2022. Data from these buoys are flowing to SECOORA and NOAA NDBC. CHR60 and CHR60Wave buoy statistics are included in the UNCW statistics in the above section.					Complete
<p>RD Sea International identified two sites for new buoys off the east coast of Florida, offshore of Ft. Pierce, FL and offshore of the Ponce de Leon Inlet, FL. Locations for the moorings were discussed with the NWS Melbourne, FL forecast office and shared with the South Atlantic Fishery Management Council. These locations will fill critical gaps in marine weather and oceanographic data.</p> <p>Accomplishments:</p> <ul style="list-style-type: none"> • The NEPA Environmental Compliance documents for both buoys were submitted to the IOOS Environmental Compliance Coordinator on 5/2/2022. The NEPA process was completed with final determination letter received 8/12/2022. • The USACE permit application (under NWP #5) for the two buoys was submitted to the Jacksonville, FL USACE district office on 5/10/2022 with USACE approval provided 7/13/2022. • The deployment, maintenance, and operation of these two moorings will be funded through the Bipartisan Infrastructure Law award to SECOORA, Award number NA23NOS0120081. 					Complete
<p>Water Level Initiative: The SECOORA water level team includes partners from the American Shore and Beach Preservation Association (ASBPA)/Hohonu, Coastal Carolina University (CCU)-Florida Atlantic University (FAU), Georgia Tech, and Florida International University (FIU). The teams have 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.</p> <p>Accomplishments:</p> <ul style="list-style-type: none"> • Project teams are working with Axiom to standardize the sharing of water level data and creation of consistent metadata. • Water Level Advisory committee quarterly meetings are on-going. • SECOORA has drafted standard operating procedures (SOPs), with guidance from NOAA CO-OPS, for Sensor Surveys and Sensor Siting. A Sensor Installation SOP will be 					On-track

<p>developed in February. Project team member will have an in-person meeting in March to finalize the SOPs.</p> <ul style="list-style-type: none"> • Georgia Tech is working in close collaboration with governmental and community stakeholders along the Georgia coast, extending their work from Savannah to installation targets in Camden and Glynn counties. 27 water level sensors have been installed (4 new this reporting period) and maintenance (cleaning and battery replacements) was performed on 25 sensors this reporting period. There have been technical challenges this period including the loss of several LoRaWAN gateway units to lightning strikes and the continued supply chain issues that have slowed replacement and expansion of water level sensors. In particular, the sensors around Tybee Island have been offline for several months while Georgia Tech awaits replacements for these units. • FIU has installed 7 of 8 water level and salinity stations in south Florida – 3 sensors in Coral Gables, 1 in Miami, 1 in Hollywood, and 2 in Monroe County. The team has been working with Axiom to share the data via the HyrdoVu API that FIU uses. This API is not user friendly, so it is taking longer than expected for SECOORA to access the FIU data. One citizen science flood monitoring event was conducted during the October King Tide event (40 participants in each event). Citizen scientists received kits to monitor salinity and water quality of flood waters near water level stations. • ASPBP/Hohonu has installed 30 water level sensors in NC, SC, and FL. Siting for three sensors is underway in Beaufort, NC, Hampstead, NC and North Topsail Island, NC. ASBPA is working with town personnel to determine the best location for the sensors. ASBPA has created a website for communities interested in getting involved in the water level network. • CCU-FAU hosted a virtual stakeholder workshop on 12/1/22. This workshop was used to engage partners in SC and FL and expand participation in the project with additional state agencies and local interests. The team has installed 19 of 20 water level sensors in FL and SC. <p>Issues:</p> <ul style="list-style-type: none"> • SECOORA worked with NOAA CO-OPS, National Geodetic Survey, and the funded project teams to develop baseline survey SOPs. All stations will need to be surveyed to NAVD88 so that standardized datums can also be acquired. SECOORA hosted a Survey RFQ and only received one response. SECOORA staff will host a call with the respondent in January 2023 to discuss cost per survey and survey sites/locations. Once the surveys for each site are completed, SECOORA can compute a datum for each station and then release the data via the websites: https://wl.secoora.org and the SECOORA data portal. 	
SECOORA Biological Data Collection	
<p>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).</p> <ul style="list-style-type: none"> • Continued routine cleaning of sensors/stations and swapping passive acoustic recorders at regular intervals. 	On-track

<ul style="list-style-type: none"> • Acoustic receivers capture 2-minute recordings every hour. The project team manually reviewed 6,528 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 36,213 wav files during this project period. • Caroline Tribble, graduate student in Marine Biology, College of Charleston, is using soundscape data from this project to correlate bottlenose dolphin vocalizations, dolphin sightings, and the abundance of their prey in Charleston Harbor to understand how noise affects acoustic behavior. Caroline’s thesis should be finalized in May 2023. • The project team worked with the Port Royal Sound Foundation videographers to create a research video highlighting the UCSB soundscape research and bottlenose dolphin survey program. The video can be found here: https://www.youtube.com/watch?v=wEyhcoql0Ss • The USCB team provided edits the SECOORA webpage, “Explore Estuarine Soundscapes”, prepared by Axiom to showcase soundscape work - https://sound.secoora.org/. 	
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DMAC AND MODELING & ANALYSIS SUBSYSTEMS

SECOORA DMAC subsystem

<p>Axiom Data Science is the SECOORA data management team. Axiom provides the following support on an on-going, annual basis:</p> <ul style="list-style-type: none"> • Maintain, operate, and develop SECOORA cyberinfrastructure to sustain long-term data stewardship for our partners and stakeholders. • Maintain IOOS compliant services and applications for integration with national products. <ul style="list-style-type: none"> ○ THREDDS 4.6.15 - https://thredds.secoora.org ○ ERDDAP 2.02 - https://erddap.secoora.org ○ SECOORA ISO WAF - https://thredds.secoora.org/iso ○ 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 and setting up data transfer pathways (e.g., APIs). • 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. • Promote data discovery and public access through the SECOORA data catalog and data portal. • Strengthen data stewardship within SECOORA to improve data quality, access, attribution, exchange, delivery, and storage. During this reporting period, Axiom has continued working with NOAA NDBC to transfer real-time data from the SECOORA 	On-track
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<p>region to NDBC via ERDDAP services. This process has encountered some issues regarding data latency (i.e., SECOORA data not being received at NDBC in a timely manner) and data drops. In December, Axiom set up a federated ERDDAP server that only pulls in real-time data for sharing with NDBC. This approach seems to have alleviated much of the data latency and data drops.</p> <ul style="list-style-type: none"> • Implement real-time sensor QARTOD compliant quality control systems. • Annually archive physical oceanographic, biogeochemical, and meteorological data with NOAA’s NCEI. <p>Required Annual Reports:</p> <ul style="list-style-type: none"> • SECOORA/Axiom DMAC Annual Report is found in Appendix A. • SECOORA Asset Inventory is available here: https://docs.google.com/spreadsheets/d/1OKGa8Ky-lly0vj17aLrvY32YKgoKoRjCJkM8KirSViw/edit?usp=sharing 	
CNAPS Model	
<p>The CNAPS model is operated and maintained by NC State University (NCSU) and Fathom Science. The project team added two more years (2021 & 2022) to the modeling reanalysis this reporting period. They completed a 30-year (1993-2022) ocean reanalysis using the ensemble data assimilation (ENDA) method that assimilates historical data from satellites (SST, SSH) and in situ observations (temperature, salinity from ship survey, gliders, floats, moorings). This high resolution (4-km, 50 vertical layers) output was used to perform multi-decade marine environment ENDA hindcasts to generate regional ocean reanalysis and climatology (i.e., the baseline) on which to quantify climate impact and its variability in the southern U.S. marine environment. A peer-review journal publication documenting this research effort is being prepared, and the reanalysis data set will be made available to the public before the end of Feb 2023. This 30-year reanalysis dataset is huge (on the order of 10TB), the team is currently investigating a long-term data archiving, sharing, and maintaining approach.</p> <p>The CNAPS team is working with Axiom Data Science so that Axiom can host the CNAPS Nowcast/Forecast model output since NCSU servers cannot handle the requests for the output. This work will continue into spring 2023 as Axiom tests the data exchange, archiving, and web hosting systems.</p>	On-Track
WFS Model	
<p>The West Florida Coastal Ocean Model (WFCOM) and the Tampa Bay Coastal Ocean Model (TBCOM) daily nowcast/forecast systems have been maintained consistently by USF during the reporting period, producing simulated currents, sea surface temperature, and sea surface height fields with an “up time” of 100%. Model output is available for WFCOM, and USF maintains a THREDDS server with access to netCDF files for TBCOM output.</p>	On-track
AI Portal	
<p>Florida Wildlife Research Institute (FWRI) and Axiom Data Science are building an artificial intelligence annotation data portal (AI portal). The project team held eleven meetings</p>	On-track

<p>with different industry (i.e., Google), academia, non-profit (i.e., CoralNet), and government (i.e., NOAA NCEI, Florida Keys National Marine Sanctuary, BOEM, USFWS) AI stakeholders and domain experts. They hosted two machine learning workshops for Florida Fish and Wildlife Conservation (FWC) staff. Workshop 1 - Python Training in Tallahassee and Workshop 2 - Computer Vision for Ecology in St. Petersburg. These trainings consisted of machine learning lectures, example code development, and tutorial sessions. The team also participated in the NOAA AI Workshop held in September 2022.</p> <p>The team is advancing their video, acoustic, and imagery use cases. The video use case now has a live stream from the Florida Aquarium (http://stage-coral-spawning.srv.axds.co/) to an Axiom hosted staging site that is running an anomaly detection algorithm to detect coral spawning. However, the dashboard summarizing anomalous events is still in development. To advance the acoustics use case, the team is planning a regional workshop in February 2023 to merge acoustic data from disparate sources and develop machine learning derived indicators for management applications. To advance the imagery use case, they continue to meet with CoralNet colleagues to identify back-end solutions to integrate the AI Portal with CoralNet’s annotation database.</p>	
<p>SEAMAP-SA Data and Analysis</p>	
<p>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. SCDNR staff provided the structure and data for the turtle datasets and code tables to Axiom staff. During discussions of the turtle data, the group identified ways to streamline integration of the turtle-specific data into existing data tables, simplifying this objective. This includes converting table headers into DarwinCore format. Also, Axiom updated libraries containing SEAMAP data for compatibility and deployed a refreshed codebase to the staging server, making significant progress to bring archived data up to date. These improvements will allow users to search for and access the new data types more easily.</p>	<p>On-track</p>
<p>OUTREACH, ENGAGEMENT, PRODUCT DESIGN SUBSYSTEM</p>	
<p>Support Community Driven Networks</p>	
<p>See “NOAA, IOOS, Other Agency Funding” table</p>	
<p>SECOORA Outreach and Engagement</p>	
<ul style="list-style-type: none"> • The SECOORA section of the IOOS outreach document was updated on 1/17/22. • Details on media engagement and outreach for SECOORA staff and project PIs are found here on the tab labeled 7/1/2022-12/31/2022: https://docs.google.com/spreadsheets/d/189a6FgoOAJMvGxDxmYuf0QnEoHuPXgpNqjMWn5YFv94/edit?usp=sharing • SECOORA was a sponsor of the MTS Buoy Workshop which was hosted in Wilmington, NC, 9/19-22/2022. SECOORA funded PIs from UNCW provided tours of the UNCW Center for Marine Science and SECOORA PIs ((Dorton (SECOORA), Leonard 	<p>On-track</p>

<p>and LaClair (UNCW), Law (USF)) presented on buoy operations within the SECOORA region during the workshop.</p>	
<p>Product Development</p>	
<p>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 operator, and users can toggle on USGS River Gauges and NC FIMAN stations to compare locations of other sensors in the SE. At present, the station pages only display the location of the water level sensor, reporting frequency, and operator name. Once the stations have been surveyed for vertical elevations, we can begin displaying water level data on this webpage.</p>	<p>On-track</p>
<p>SECOORA developed data products and websites:</p> <ul style="list-style-type: none"> • 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/ • The SECOORA Marine Weather Portal (https://mwp.secoora.org) was updated during hurricane season so that new NWS threat/impact products are available. <p>Product usage statistics for each reporting period can be found here: https://docs.google.com/spreadsheets/d/1swbEQzCVsAL9VtPbeJslQV8K9nMfVX_hp-exEAYryGI/edit?usp=sharing</p>	<p>On-Track</p>
<p>The How’s the Beach (HTB) project team is comprised of representative from three existing products: HTB (UofSC), ShellCast (NC State University), and Beach Condition Reporting System (BCRS, Mote Marine Laboratory). Specific accomplishments this period include:</p> <ul style="list-style-type: none"> • Evaluating and implementing new modeling techniques, including using Machine Learning (ML), to improve HTB nowcast accuracy. Current nowcast models use Catboost, a gradient boosting ML library. When building testing and training datasets for the models, data are stratified assuring the same percentage of exceedances occur in the training and testing data. When training, a weighting factor is used to address the imbalanced data set. Multiple models are created using different combinations of the observation data. The team is evaluating the ML techniques for improved prediction accuracy at nowcasting locations where frequency of bacterial standard exceedance is low (i.e., good water quality) and where data availability for predictors was limited (i.e., gaps in real-time monitoring data). Training datasets were “balanced,” such that the number of dates when exceedances were observed and not observed was similar. Employing new ML techniques and balancing datasets improved prediction accuracy over previous methods but developing exceedance predictions where the frequency of observed exceedances is low remains problematic. • Expanding engagement with local environmental, public health, and beach management officials to identify and assimilate environmental datasets on bacteria, 	<p>On-track</p>

<p>water quality, sea state conditions, and weather into the model. The team has engaged regulators with SC Dept of Health and Environmental Control (DHEC) and SC Department of Natural Resources (DNR) to understand their management processes and geospatial data organization. The HTB team is now restructuring the SC data from DHEC and SCDNR to integrate with existing ShellCast algorithms as part of the ShellCast expansion into SC.</p> <ul style="list-style-type: none"> • In preparation for the future expansion into FL, the ShellCast team is working with the FL Dept. of Agriculture and Consumer Services to better understand the data sources they manage for shellfish harvest areas. • In support of expanding the HTB to additional FL swimming beaches, a Data Sharing Agreement was executed between the UofSC and the FL Department of Health to allow the sharing of the FL Healthy Beaches Program’s enterococci bacteria monitoring data for ingest into the HTB nowcast system. 	
<p>The Situational Awareness Tool (UNCW) is now a functional prototype. Registered users may create an infinite number of custom alerts on cormp.org based on any combination of CORMP assets and user-defined parameter thresholds. Custom alerts are triggered in real-time and users receive notifications via email. Notifications include the name(s) of the triggered alert(s) and links back to respective time series graphs on cormp.org. Alerts are also triggered when an alert is no longer active, i.e., the threshold is no longer breached. Users continue to be added to the beta testing program.</p>	On-track

IOOS, NOAA, Other Agency Funding	
Funding Area/Recipient	Task and status update – See Appendix A for ASAP draws by funding line
<p>Restoration/ CETACEAN, Lead PI Lauren Showalter, Axiom Data Science</p>	<p>Status: Complete</p> <p>Accomplishments:</p> <ul style="list-style-type: none"> • Phase II proof of concept is complete. This includes a CETACEAN data portal delivered with an updated landing page and portal visualizations (https://cetacean.portal.axds.co/?ls=CA_9q24t# (password protected with access provided to the CETACEAN Executive and Steering Committee members). The data portal and catalog make data available to users with custom tags and visualizations for marine mammal survey data that can be viewed with several environmental factors that have been binned at various time scales as requested by the CETACEAN Executive Committee. • Axiom completed all requested changes to the data visualization tools for the ship based and aerial survey data that Axiom ingested into the system as provided by the GoMMAPPS team. The CETACEAN catalog has been updated based on requests by the CETACEAN Steering Committee; all updates are documented in the Axiom project management system. • Most of the data incorporated into the system is already publicly available through NCEI or other open data systems and will therefore not require archive by the Axiom team. Axiom has set up a Research Workspace site for this project with an organized folder structure for any data that we may receive in the future. The CETACEAN pathway for data

	<p>curation and archival is developed and Axiom was prepared for work with potential data providers to get data into Research Workspace, develop metadata, and understand archival options for their datasets.</p> <ul style="list-style-type: none"> • Axiom developed several planning products for the CETACEAN management team for review and comment, but never received feedback.
<p>Regional Ocean Data Sharing Initiative, Lead PI Debra Hernandez, SECOORA</p>	<p>Status: On-track</p> <p>Accomplishments:</p> <ul style="list-style-type: none"> • 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 1 year. • Community engagement – SECOORA is actively working with our Water Level Network teams and three Sea Grant offices to identify and fill gaps in water level observations. South Carolina Sea Grant hired Ke’Ziyah Williamson in October 2022. She engaged with 5 communities (Marlboro, Marion, Lee, Florence, and Lancaster) who are interested and ready for water level sensor deployment. Ke’Ziyah has communicated with community leaders to identify suitable locations for sensors and conduct on-site visits. Ke’Ziyah has communicated with Dr. Gayes and SECOORA to coordinate installation of sensors. All sensor locations are on SC bridges. As of December 2022, the five identified locations have been submitted to SCDOT for approval, and we are waiting on this approval before installation. North Carolina Sea Grant has hosted an internal kick-off meeting. The team (Lopez, Cothron, and Spiegler) has begun collection of data and information to develop a preliminary list of NC communities that need water level data. The team is reviewing existing/planned stream gauge locations from various networks in coastal NC, lessons learned from ongoing NCSG resilience extension programming, and engaging with stakeholders. Georgia Sea Grant is communicating with several community partners in Brunswick, GA, Glynn County, Sapelo Island, and Camden County to determine sensor placement and user needs. They are also meeting with community partners weekly and attending weekly steering committee meetings for the smart sea level sensor project, led by Georgia Tech. Georgia Sea Grant is also assessing the effectiveness of an existing water level sensor dashboard in Chatham County. This assessment will identify strengths and opportunities to improve dashboard performance. This information can then be applied to dashboards developed for other communities and by SECOORA.

	<ul style="list-style-type: none"> SECOORA hosted an RFQ to select a contractor to conduct surveys for water level stations. Unfortunately, only one company submitted a quote and the cost was above what was budgeted. SECOORA is meeting with the company in January to negotiate pricing.
SECOORA/OMAO funding to support Navy glider missions, Lead PI Catherine Edwards, UGA SkIO	<p>Status: Complete</p> <p>Accomplishments:</p> <ul style="list-style-type: none"> SkIO coordinated the deployment, track design, piloting, and logistics for 2 Navy gliders (deep gliders ng427 and ng665). The team coordinated deep glider sampling with nearby Saildrones operating in the Sargasso Sea. SkIO/UGA student F. McQuarrie deployed ng427 and ng665 175 miles from shore and PI Edwards coordinated a successful recovery on the SC DNR vessel R/V Lady Lisa after both gliders reached 139 days at sea. PI Edwards participated on team briefings with NOAA and Navy personnel and gave a regional briefing during the Navy Hotwash held in December 2022.
UNC-Chapel Hill, Lead PIs Brian Blanton & Rick Leuttich	<p>Status: On-track</p> <p>Accomplishments: The project team is computing a long-term reanalysis of coastal water levels for the US eastern and Gulf of Mexico coasts. A recent data assimilation scheme for the ADCIRC model allows for corrections to model predictions based on errors between a prior solution and observations of water levels. Using NOAA/NOS gauge observations, time-series of prior errors are processed to compute a daily sequence of dynamic water level correction surfaces on the ADCIRC grid. The long-term simulation is then rerun by incorporating the error information. In the previous reporting period, the team completed the full 43-year prior and posterior simulations. In this reporting period the team carried out three primary activities:</p> <ol style="list-style-type: none"> 1) Demonstration of python notebook to access the very large datasets for developing "downstream" coastal analyses. 2) Detailed analysis of the posterior results. 3) Outreach to NOAA end-users and collaborators <p>Details for all activities, including links to project documentation, can be found in Appendix B.</p>
SECOORA – SECART support for: 1) SCDRP Coordinator, PI Meredith Hovis 2) SE Shellfish workshop, PIs AK Leight & John Schmidt	<ol style="list-style-type: none"> 1) Status SCDRP: On-Track <p>Accomplishments</p> <ul style="list-style-type: none"> Heather McCarthy was hired as the Executive Director for SCDRP. The SCDRP Annual Meeting will be hosted 1/24-25/2023 in Miami, FL. Planning efforts have been led by SCDRP staff. Details about the meeting, including the agenda, can be found here: https://www.scdrp.secoora.org/23meeting <ol style="list-style-type: none"> 2) Status Shellfish Workshop: Complete
Filipe Fernandes	Status: On-Track

	Accomplishments: See Appendix C for a list of tasks completed during this reporting period. This information has already been shared with the IOOS program office, specifically with Kathy Bailey, Micah Wengren, and Mathew Biddle.
Ocean Acidification, Lead PI Scott Noakes, UGA	Status: On-Track Accomplishments: The MAPCO2 SAMI-pH sensor and the Seabird CTD mounted under the Gray's Reef buoy were swapped on 8/4/2022. The MAPCO2 system was restarted after the sensor swaps; however, it crashed later that day. PMEL sent a new MAPCO2 and electronics package and the system was again swapped on 9/5/2022. The system has been working since 9/5. Water samples were collected in September and December and the samples sent to University of Delaware for analysis. The water samples are used to validate the MAPCO2 data.
Ocean Acidification, SOCAN Network, Lead PIs Emily Hall (Mote Marine Lab) and Janet Reimer	Status: On-track Accomplishments: <ul style="list-style-type: none"> • The Executive Team (comprised of Emily Hall and Janet Reimer) meets monthly and the SOCAN Science and Stakeholder working groups meet every other month (alternating with each other). • The Executive team participated in frequent collaboration meetings with the other CANs (including quarterly all-CAN meetings hosted by NOAA OAP) to assess research and monitoring gaps and social and economic vulnerabilities. • The SOCAN team is actively collaborating with the Gulf of Mexico CAN (GCAN) to collect information on social and environmental vulnerabilities in the US Southeast and GoM. This work is in response to the Intergovernmental Working Group on Ocean Acidification's (IWGOA) request for CAN engagement in identifying Ocean Acidification vulnerabilities and research and monitoring priorities. • SOCAN maintains social media posts on Twitter and Facebook and the SOCAN website was redesigned in October (https://www.socan.secoora.org/). All updates for SOCAN are also posted on the Ocean Acidification Information Exchange (OAIE). • SOCAN hosted a Town Hall on 9/7/22 with over 50 attendees. The agenda focused on an introduction to SOCAN; general Southeast state of knowledge and research efforts; and two talks from researchers on the connection between coastal acidification and mangroves. The speakers were Tyler Cyronak, Nova Southeastern University, and Gloria Reithmaier, University of Gothenburg. You can access the talks here: https://www.socan.secoora.org/webinars
Florida Atlantic University (FAU), HFR support, lead PI Bill Baxley	Status: Complete Accomplishments: Funding was used to purchase supply items required for the HAUL and HILL CODAR HFR.
SECOORA/ROWG Meeting support, Lead PI Mike Muglia,	Status: Complete

<p>ECU Coastal Studies Institute</p>	<p>Accomplishments: The 12th Radiowave Operators Working Group meeting was hosted by ECU Coastal Studies Institute in Wanchese, NC, 11/2-3/2022. A Radar Manufacturer Day was also hosted on 11/4. There were 28 in person attendees and 60 virtual attendees on day 1 and 70 virtual attendees on day 2. There were 11 countries represented at the meeting. Presentations from the meeting can be found here: http://rowg.org/bin/view/Meetings/ROWG12. An action item from the meeting is to form an HFR group to update HFR best practices documentation and add to the ROWG website as well as the Ocean Best Practices site.</p>
<p>Fill the Gaps – Glider one-time support for hurricane missions, Lead PI Catherine Edwards, UGA SkIO</p>	<p>Status: On-track</p> <p>Accomplishments: See Page 3 – SECOORA Glider network. The two hurricane glider missions flown by Franklin were supported with Fill the Gaps – hurricane mission funding.</p>
<p>Harmful Algal Blooms (HABs), Lead PI Chuanmin Hu, USF</p> <p>and</p> <p>HAB RFP hosted by SECOORA.</p>	<p>Status: On-track</p> <p>Monitoring and Forecasting pelagic Sargassum in the South Atlantic Bight, Dr. Hu, USF.</p> <p>Accomplishments: Continued progress has been made on developing algorithms to use high-resolution satellite imagery collected from PlanetScope CubeSat constellations for the purpose of mapping and monitoring Sargassum. Dr. Hu further tested the published ML algorithm to extract Sargassum features from both Sentinel-2 and PlanetScope satellites. The team established the framework to download, process, and make available high-resolution data from Sentinel-2 sensors. The team is making sure the workflow works smoothly, using a remote region (Barbados) as a test case, to avoid misinterpretation by Floridians or other residents around the Gulf of Mexico. The next step is to customize the data products that will be delivered online in near real-time.</p> <p>HAB RFP</p> <p>SECOORA hosted a HAB RFP in fall 2022. 10 proposals were submitted and two proposals were funded:</p> <ul style="list-style-type: none"> • Dr. Michael Parsons, Florida Gulf Coast University, for the proposal Expansion of the Estero Bay HAB Water Quality Monitoring Network • Dr. Natalie Cohen, University of Georgia Skidaway Institute of Oceanography, for the proposal Establishing a Monitoring Program and Identifying Environmental Drivers of Periodic HABs in a Model Estuary of Coastal Georgia <p>Projects begin in January 2023. NEPA analysis is required for the project led by Dr. Michael Parsons. SECOORA submitted the environmental compliance documentation to the temporary IOOS Environmental Compliance Coordinator (Rosa Gonzalez) on 11/17/2022.</p> <p>You can meet the HAB proposal winners and learn more about their projects here: https://secoora.org/meet-the-winners-of-the-harmful-algal-bloom-request-for-proposals/</p>



<p>Marine Biodiversity Observations Network, Lead PI Neil Hammerschlag, University of Miami</p>	<p>Status: On-track</p> <p>Accomplishments:</p> <ul style="list-style-type: none"> • Conducted a series of meetings with MBON-ATN and network leaders (including FACT, ACT, iTAG, OTN) and identified the existing network directories and data pipelines for the BioTrack project. On 6/16/22, members of each network were contacted with an open invitation for data contributions. By 8/8/22, 44 principal investigators from 38 institutions (~50 acoustic telemetry projects) committed to the project. • Considering that the project involves multiple and diverse collaborators, ATN and BioTrack leaders agreed to offer varied options of data archiving within ATN-DAC. The goal is to avoid discouraging contributors that are not ready to archive their data with ATN yet (e.g., due to ongoing projects, sensitive relationships with local stakeholders, and future publication plans). In the data sharing & use agreement, contributors can decide which option of data archiving fits better with their projects. Nearly 40% of the principal investigators want to have their data archived with ATN during the execution of this project, and additional 47% said they may be open for 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. • Thiago Couto (Postdoc at University of Miami) and Megan McKinzie (ATN) met in Monterey (CA) in November to discuss an action plan for data archiving, which will be implemented between March and April of 2023 when the final analytical products are expected to be available. • The project team worked with the telemetry network leaders (OTN, ACT, FACT, iTAG) and directly with principal investigators to conclude the acquisition of the full datasets. This process took place in August and was later updated in December 2022, following the integration of new data (2022 matched detections) conducted by OTN in October. The full dataset available for BioTrack includes tracking data for 71 species that sum more than 39 million detections along the east coast of USA and Canada, Caribbean Sea, and Gulf of Mexico –teleost fishes (36 species), sharks (24), rays (5), turtles (3), sturgeons (2) and crustaceans (1). Now, species distribution models (SDMs) are being fit for each species, which will be later integrated in multi-species indicators like spatially explicit species richness. This step is expected to be concluded by February.
<p>SECOORA/FACT Data Wrangler, Lead PI Joy Young, Fisheries Data Solutions</p>	<p>Status: On-track</p> <p>Accomplishments:</p> <ul style="list-style-type: none"> • Conducted the second major (i.e., inter-network matching) telemetry data processing event for the year (completed 11/15/22). Collected and uploaded environmental data from array owners in conjunction with the data processing event. • The data processing event resulted in 604 new or updated detection extracts for 143 different telemetry projects. Data were provided to projects conducted by state and federal governments, universities, not-for profit organizations, and private companies.

	<ul style="list-style-type: none"> Created two new Jupyter notebooks to extract temperature data from sensor receivers and external sensors and pair with location data. This is an improvement over previous iterations because: 1) the format for sensor receiver and external receivers are now unified, and 2) this simplifies the file sharing with Axiom by including location data in line with temperature data. FACT hosted their bi-annual meeting 12/13-14/2022 in Jensen Beach, FL. There were approximately 55 attendees. The agenda and meeting materials are available here: https://secoora.org/fact/upcoming-fact-meetings/
<p>Georgia Department of Natural Resources (GA DNR), Lead PI Chris Kalinowsky</p>	<p>GA DNR is unable to accept 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 (UH) to establish the PIRAT (Pacific Islands Regional Acoustic Telemetry) Network, and 2) the FACT network to continue development of the DaViT tool.</p> <p>University of Hawaii PIRAT support Status: Complete</p> <p>SECOORA established a subaward with the UH for \$27,300 on 1/12/22. All funds have been expensed and the PIRAT network has been established.</p> <p>FACT Network – Data Visualization Tool (DaViT) Status: On-track</p> <p>Accomplishments: The DaViT site is live: https://secoora.org/fact/data-visualization-tool/. Joy Young provided a demo of DaViT at the 2022 SECOORA Annual meeting (6/9/22) and asked for suggestions for improvements. During this reporting period, suggested modifications have been implemented. These modifications include: updated explanations of range and distribution to illustrate metrics are calculated within the network, a depiction of the network, allowing the selection of multiple months instead of one month, make the data disclaimers more pronounced, change numerical months to written out months (e.g., change 11 to November), and include pictures for all species.</p> <p>Issues: The primary contactor at Axiom Data Science who is assisting with the development of DaViT recently took a new position. We are working with Axiom staff to secure someone else to continue working on this project.</p>
<p>SECOORA/HFR system wide support for retuning/testing/ additional work by SECOORA HFR operators</p>	<p>Status: Complete</p> <p>Accomplishments: Funding was used by SECOORA to purchase IT infrastructure needed by the UofSC to support continued operation of their 3 WERA HFR. Funding was also used to support the purchase of supplies and equipment required by SkIO for the CNS and JEK WERA HFR. All items for UofSC and SkIO were purchased from Helzel and were delivered in November 2022.</p>
<p>SECOORA/Vembu Scholarship</p>	<p>Status: Complete</p>

	<p>Accomplishments: Anna Finch, 2021/22 Hollings Scholar worked with Dr. Frank Muller-Karger, USF Institute for Marine Remote Sensing Lab. SECOORA assisted with summer housing costs for Anna as housing costs in the St. Petersburg, FL area are more than the Hollings Scholar housing allowance. Anna worked with Dr. Muller-Karger and members of his lab to analyze the distribution and abundance of phytoplankton functional types in the Florida Keys and how they change throughout the seasons.</p> <p>Anna participated in a poster session at the December 2022 AGU conference. Her poster presentation was title: <i>Seasonal pigment based characterization of phytoplankton functional types in the Florida Keys National Marine Sanctuary, 2016-2021.</i></p>
<p>Integration and evaluation of models to couple with NWM (PI Liu, University of South Florida)</p>	<p>Status: On-track</p> <p>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. USF is working as a tester to configure and test Finite Volume Community Model (FVCOM) on the NSF funded Texas Advanced Computing Center (TACC).</p> <p>Accomplishments:</p> <ul style="list-style-type: none"> • Participated in monthly UFS CAT Water Quantity model evaluation online meetings and discussions for FVCOM application in New York Harbor and Cook-Inlet region. • Attended the online training for unstructured model grid generation. • Successfully set up user accounts in TACC, and linked user accounts to UFS CAT project allocations with the help from NOAA colleague (Dr. Saeed Moghimi). • Successfully downloaded bathymetry data files from the TACC/Frontera and visualized bathymetry data in SMS software. • Generated a preliminary unstructured model grid for the New York Harbor – Cook Inlet region.
<p>Integration and evaluation of models to couple with NWM (PI DiLorenzo, Brown University)</p>	<p>Status: On-track</p> <p>A SCHISM model application for the region of New York Harbor has been completed. The model is available as part of the NOAA UFS CAT project. The model application is currently only being used by the benchmarking team, which includes personnel from Brown University, Georgia Tech, and Virginia Institute for Marine Science. The project team has developed a new grid mesh for New York Harbor and implemented a NOAA CAT DEM. The team has completed the following tasks:</p> <ul style="list-style-type: none"> • Ran test simulations of the SCHISM model • Ran 2D tides simulations and compared them with available station observations provided by NOAA • Ran sensitivity experiments with different tidal model TPXO, ADCRIC, and FES2014, and different tidal constituents • Ran sensitivity to different mesh resolutions

	<ul style="list-style-type: none"> • A comprehensive set of figures and tables documenting the results of the first benchmark of the project focused on comparing the SCHISM tides with point observations around the New York Harbor area is available here: https://docs.google.com/document/d/1YDcbZ15u3V1uT2L5xKQz_E6X8G9gvLRZ_XL4djGwWkk/edit <p>The following tasks will be continued into the next reporting period:</p> <ul style="list-style-type: none"> • Corrections to Open Boundary Conditions • Run 3D tides simulations and compare with available station observations provided by NOAA
<p>Funds to support the Project: St. John's River Transition (PI He, NC State University & Fathom Science)</p>	<p>Year 2 non-core funding was provided for one year of development on the St. John's River model. This one year of funding is to finalize work that began on a previous project related to modeling the St. John's River. The project team met with NOAA personnel on 11/18/2022. During the call, NOAA staff noted that they will not be able to transition the model in the timeline of this project. Tasks that NOAA requests to be completed within the year include:</p> <ul style="list-style-type: none"> • A model skill assessment and compare model hindcast results against NOS metrics. • Model Documentation to include model settings • Peer reviewed publication that details model performance <p>Due to the inability to meet with NOAA modelers until 11/18/2022, work will begin in January 2023.</p>

III. PROJECT CHALLENGES/MODIFICATIONS:

- Equipment and supply costs are increasing due to inflation and continued supply chain shortages. Many SECOORA PIs placed orders for supplies and equipment before the end of the calendar year to secure items at 2022 costs versus 2023 costs. Multiple vendors are quoting 10%-15% price increases for 2023. 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 than normal costs for the upcoming year.

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_u7oITH24HyqNxFI7bpb73gYMubSpDJeD6J2XaPo/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 D**.
- 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.
- 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.
 - Laura Korman Nunnamaker was hired as a full time SECOORA employee as of 6/1/2022; however, she resigned from SECOORA in October 2022. This does not impact certification as key personnel have not changed.
- Include changes to the organizational structure such as: changes in status or partners organizations and points of contact. As a reminder, a change to the award’s Principal Investigator and a change in an award’s Key Person Specified in the Application requires NOAA approval through Grants Online. Guidance for both these Award Action Requests is available on Grants Online at http://www.corporateservices.noaa.gov/grantsonline/Documents/AAR_Assistance/Recipient_AAR_Help.htm
 - No changes to organizational structure.
- Provide an update about travel completed during the reporting period.
 - SECOORA is starting to travel under this award. Examples of travel during this reporting period include: 1) Jennifer Dorton participated in the FL MBON meeting in Miami, FL, 9/14-15/2022; 2) Jennifer Dorton participated in the ROWG meeting, 11/1-3/2022; 3) Debra Hernandez, Jennifer Dorton, and Abbey Wakely attended the IOOS Association Meeting hosted in Puerto Rico, 11/7-12/2022.
- Are there any plans to initiate a new partnership (contract or subaward) during the next reporting period?
 - Possibly. SECOORA is working with a survey company to negotiate pricing for conducting vertical elevation surveys at water level sites.

VII. SUCCESS STORIES

Success Story	Brief Description	Contact
Port Royal Sound Foundation Research Video	Eric Montie (USC Beaufort) worked with Port Royal Sound Foundation and videographers to create a research video highlighting the soundscape research and bottlenose dolphin survey program. Watch video at: https://www.youtube.com/watch?v=wEyhcoql0Ss	Eric Montie - EMONTIE@uscb.edu
Grant Award Between SECOORA PIs	Eric Montie and Dr. Lynn Leonard (UNCW) were awarded a grant from the Maritime Administration, U.S. Department of Transportation (2022 – 2024) for “Testing a Novel Strategy to Measure Underwater Radiated Noise of Vessels in	Eric Montie - EMONTIE@uscb.edu ; Lynn Leonard - lynnl@uncw.edu

	Shallow Coastal Oceans.” The team leveraged the SECOORA award for this funding by highlighting Estuarine Soundscape Observatory Network.	
Girls Who Code Games Camp Visit SECOORA Glider Network Operators	7/11-15/22. Twenty (20) 5th – 8th girls learned about gliders and spent the day at SkIO before working on coding games related to gliders at Armstrong University. SECOORA PI Catherine Edwards and the SkIO Glider team taught the students how gliders work, what sensors they carry and the data they collect, about piloting the glider and how to ballast them; students then designed and coded a computer game related to gliders and the science they enable.	Catherine Edwards - catherine.edwards@skio.uga.edu
Franklin the Glider is on a Coordinated Mission to Improve Tropical Storm Intensity Forecasting	PI Edwards represented the IOOS Hurricane Glider effort for a large media day at Saildrone's facilities in St. Petersburg, FL, 8/2/22. Interviews with The Weather Channel's Jim Cantore, Accuweather, and Hearst media appeared nation-wide in August and rebroadcast in September during Hurricane Ian. The glider Franklin's deployment 8/3/22 was organized to complement this media effort and highlight the role of Hurricane Gliders and their pairing with Saildrones. Vessel time was donated by Gray's Reef National Marine Sanctuary. Interviews and footage were shared with national outlets to pair with Saildrone coverage nationwide. https://secoora.org/franklin-the-glider-is-on-coordinated-mission-to-improve-tropical-storm-intensity-forecasting/	Catherine Edwards - catherine.edwards@skio.uga.edu
Youth Advocacy for Resilience to Disasters	The SECOORA water level sensor work formed the basis for the successful NSF CVIC program led by Dr Allen Hyde of Georgia Tech. This project developed the Youth Advocacy for Resilience to Disasters (YARDs) that was successfully piloted this fall at Mercer Middle School in Savannah, GA. Students learned about resiliency and how to advocate for change in their own communities.	Russ Clark - russ.clark@gatech.edu
USF Models support Hurricane Ian forecasting	USF developed WFCOM and TBCOM models gained a lot of interest from NOAA and local FL communities during Hurricane Ian. On 9/26/2022, NOAA (Tim Osborn and Nicolas Alvarado) requested TBCOM forecast results. TBCOM correctly predicted negative storm surge in Tampa Bay three days in advance of the storm making	Yonggang Liu - yliu@usf.edu ; Tim Osborn - tim.osborn@noaa.gov ; Nicolas Alvarado - nicolas.alvarado@noaa.gov ; Aijun Zhang -

	<p>landfall. WFCOM also correctly predicted a southern landfall location near Ft. Meyers three days in advance. On 9/28/2022, USF received further requests from NOAA (Aijun Zhang and Tim Osborn) for sea level contour animations from WFCOM. Such a product was not available at that time, but USF developed a new one within hours (http://ocgweb.marine.usf.edu/~liu/sl.html).</p>	<p>aijun.zhang@noaa.gov</p>
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End Report



Appendix A: 2022 SECOORA DMAC Annual Progress Report

DMAC ACTIVITIES DURING THE REPORTING PERIOD

Provide a summary of any DMAC implementation activities undertaken over the previous year.

Task 1: Base DMAC Services

Objective 1. Core Cyberinfrastructure Support- Ongoing

- The Axiom data system is the back-bone of the cyber infrastructure that is leveraged to acquire, archive and share SECOORA data and information products. The open-source interoperability and data stewardship systems of the SECOORA infrastructure were maintained to provide full-lifecycle data management services.
- Throughout this performance period project, Axiom ensured that the SECOORA Data System was healthy, secure, and monitored; provided technical support to system problems; and mapped out future upgrade strategies.
- During this performance period, Axiom maintained ongoing continuous performance of the SECOORA data system following IOOS DMAC guidelines. Additionally, Axiom operationalized an on-demand Kubernetes cluster infrastructure; deployed Kubernetes based on demand Dask cluster for data analysis support; and deployed ~130TB S3-compatible storage appliance.

Objective 2. Cyberinfrastructure Enhancements - Completed

- Maintained IOOS compliant services and applications for integration with national products.
 - THREDDS 4.6.15 - <https://thredds.secoora.org>
 - ERDDAP 2.02 - <https://erddap.secoora.org>
 - SECOORA ISO WAF - <https://thredds.secoora.org/iso>
 - NCEI Archive - <https://ncei.axiomdatascience.com/secoora/>
- Released version 2.14 of the SECOORA portal. This work includes: introduction of print charts and data views as jpg image, tabular view panel for latest observations of real-time sensors, user-selected feature to show latitude and longitude grid on a map, introduction of in-map spatial, tag, and result type search filters, prototype of dashboards for custom configurations of spatially-enabled time series data layers, beta release of glider dashboard for comparing real-time glider observations to World Ocean Atlas climatology, backend integration of Avalanche system for ingestion and visualization of high-resolution data, and bug fixes.
- During this performance period, basic QARTOD tests were applied for 517 [real-time and historical timeseries datasets](#) that are accessible through the SECOORA data portal. Quality flags are summarized on both the [station](#) and [sensor](#) pages within the data portal for visual exploration. In addition, the documentation of the test code and thresholds are displayed on sensor pages ([example](#)) with links available to the v 1.0 version [QARTOD GitHub library](#) accessible through the portal.
- Expanded SECOORA data portal holdings to include:
 - [Treasure shores HFR](#)

Appendix A: 2022 SECOORA DMAC Annual Progress Report

- [FAU CODAR](#)
- Delivered grouper detection model [documentation](#)
- Water level [stations](#) for Southeast Water Level Network
- [AOML cruise data](#)
- various updates and fixes to COMPS
- [CDIP station 250](#)
- Marine mammal sightings data from the GoMMAPPS project
 - [Aerial transects](#)
 - [Ship based transects](#)
- [Sea surface height monthly models](#)
- MODIS Chlorophyl concentrations [daily](#), [monthly](#) and [8-day](#) averages
- [MUR and G1SST SST product in the Gulf of Mexico](#) - Daily sea surface temperature
- [HYCOM + NCODA Gulf of Mexico 1/25° Analysis, Hourly](#)
- [HYCOM + NCODA Gulf of Mexico 1/25° Analysis, Daily Mean](#)
- [HYCOM + NCODA Gulf of Mexico 1/25° Analysis, Weekly Mean](#)
- [JPL SMAP Level 3 CAP Sea Surface Salinity Standard Mapped Image 8-Day Running Mean in the Gulf of Mexico](#)
- Maintained the [SECOORA Glider System](#) for the management of SECOORA glider assets (Bass, Modena, Pelagia, Ramses, Salacia, Saltdawg, Angus, and Franklin). The SECOORA glider data was updated for visualization in the portal ([here](#)), as well as submitted to the DAC. Progress was made in improving collaboration with the DAC on running QC on glider data.
- Maintained submission of 30 sensor feeds to NCEI for long-term preservation.

Objective 3. DMAC Support to Existing Programs- Completed

- Maintained bi-monthly DMAC progress calls with SECOORA staff.
- Participated in all SECOORA regularly scheduled PI calls.
- Maintained the Jira SECOORA DMAC task board to track all data management work progress.
- Maintained the Trello SECOORA DMAC feedback board to track and manage portal feedback.
- Maintained, documented, and improved upon the existing SECOORA Glider System.

Objective 4. Develop New Products and Capabilities- Completed

- Continued the redesign changes for SECOORA home webpage. This task is ongoing relative to additional requested changes from SECOORA.
- Maintained technical support for the Florida Atlantic Coast Telemetry Project (FACT) group, including:
 - Supported the OTN FACT Node at SECOORA, which included progress towards making the FACT data discoverable through the IOOS Animal Telemetry Network data portal.
 - Maintained and began updates to a visualization tool for species diversity and distribution that will be used to inform the general public and fisheries managers

Appendix A: 2022 SECOORA DMAC Annual Progress Report

- Worked with NDBC to move all data transfer from FTP to ERDDAP. To increase reliability and timely presentation of sensor data for ingestion by NDBC, Axiom implemented an operational ERDDAP deployment for high priority data sets. The new operational deployment will help ensure that important data sets remain accessible to downstream consumers and are insulated from ERDDAP performance and stability issues.

Objective 5. External/Special Projects

Task 1: SEAMAP Continuous; Ongoing

- In coordination with the SEAMAP team assisted in implementing Darwin Core standards across all data providers to better standardize incoming data
- Updated all existing libraries to modern versions
- Deployed a refreshed codebase to our staging server to continue build out of reporting tool

Task 2: FWRI Continuous; Ongoing

- Developed machine learning algorithms for detecting spawning coral in aquaria
- Maintained codebase and documentation for development of future AI/ML projects
- Axiom staff engaged in various training courses to increase overall knowledge of AI/ML work among more staff.

Task 3: Water Level Continuous; Ongoing

- Developed data ingestion pathway for all PIs including metadata development for all sensor feeds
- Maintained all sensor feeds in the SECORA data portal and developed tagging for the [Southeast Water Level Network](#)

UPCOMING/PLANNED ACTIVITIES

Upcoming SECOORA DMAC activities include:

- Development of v2.15 SECOORA Data portal in 2023.
- Ingest and visualize CNAPS model data.
- Reassessment of the QARTOD tests and parameter thresholds that are being applied to SECOORA assets.
- Ingest new datasets, as identified and prioritized by SECOORA.
- Support data submission, visualization, and metadata generation for SECOORA funded projects.
- Participate on behalf of SECOORA in state and regional groups as determined by SECOORA, as well as national IOOS and IOOS Association data management committees and working groups and international organizations.
- Support existing products, as identified by SECOORA and its partners.

Appendix A: 2022 SECOORA DMAC Annual Progress Report

- Technical discussion, scoping, documentation, and build-out of model testbed approach, including assessing the performance of existing coastal and ocean models in the SECOORA region.

SUCCESSSES OR CHALLENGES

SECOORA continues to persist a robust system for continuous integration of real-time observation stations ([LINK](#)). Below are metrics for the past two reporting periods.

SECOORA data portal metrics (February 1, 2022 - January 1, 2023):

- Sensor Stations
 - Total number of sensor stations: 1,964
 - Number of sensor types: 92
 - Number of affiliates: 72
 - Total stations with data from the past year: 1,561
- Moving Platforms
 - Total number of moving platforms: 69
 - Number of affiliates: 3
 - Total platforms with data from the past year: 7
- Data Layers
 - Total number of data layers: 708
 - Number of affiliates: 23
 - Total datasets with data from the past year: 144

For comparison- SECOORA data portal metrics (July 1, 2021 - January 31, 2022):

- Sensor Stations
 - Total number of sensor stations: 1,796
 - Number of sensor types: 87
 - Number of affiliates: 64
 - Total stations with data from the past year: 1,441
- Moving Platforms
 - Total number of moving platforms: 62
 - Number of affiliates: 3
 - Total platforms with data from the past year: 7
- Data Layers
 - Total number of data layers: 626
 - Number of affiliates: 20
 - Total datasets with data from the past year: 118

Appendix B – Multi-decadal reanalysis of coastal water level to support NOAA sea level and flood risk products

Multi-decadal reanalyses of coastal water level to support NOAA sea level and flood risk products – Drs. Brian Blanton and Rick Leutlich, UNC Chapel Hill

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 are processed to compute a daily sequence of dynamic water level correction surfaces on the ADCIRC grid. The long-term simulation is then rerun by incorporating the error information into a posterior prediction of coastal water levels and waves. The atmospheric forcing for the 43-year period (1979-2019) is from the ECMWF's ERA5 reanalysis (Hersbach et al, 2022). In the previous reporting period, we completed the full 43-year prior and posterior simulations, including the wind-wave model SWAN.

In this reporting period (1 July - 31 Dec 2022), we have carried out three primary activities:

1) Demonstration python notebook for how to access the very large datasets for developing "downstream" coastal analyses. To help users of the coastal water level datasets, we developed a small python package and accompanying Jupyter Notebook that demonstrates how to extract timeseries from the 43-yr simulation at specific geospatial locations within the model domain. The notebook itself wraps the python code in UI components, thus requiring no knowledge of python to use the functionality. The primary reasons for doing this are to accelerate usage of the datasets for end-usage in coastal analyses and to encourage users not to download the entire (many terra-bytes) model output. The python package provides point-level extraction tools that interpolate within the ADCIRC finite element grid. The code and accesses the datasets that are hosted on RENCIs main THREDDS Data Server (TDS). These tools can be used to develop more comprehensive data downloads, and they are also used directly in the demonstration notebook. The notebook itself has been deployed to a public server called <https://MyBinder.org>. Note that the Binder-hosted notebook is not meant for large data extractions due to the limited resources in which MyBinder runs.

The URLs to these objects are:

- TDS: <http://tds.renci.org/thredds/catalog/Reanalysis/ADCIRC/ERA5/hsofs/catalog.html>
- Python Package: <https://github.com/RENCI/EDSReanalysis.git>
- Binder Notebook: <https://tinyurl.com/RenciReanalysis>
- Project Documentation: <https://renci.github.io/edsreanalysisdoc/>

One aspect of accessing the large datasets concerns the time it takes to extract timeseries (at ADCIRC grid nodes). Initial experiments on the direct ADCIRC output files indicated that the time required, for each year, was 10s of minutes, making multiyear and many-point extractions impractical. The reason is that the layout of the netCDF files on disk is essentially "space" first such that temporal extractions require

Appendix B – Multi-decadal reanalysis of coastal water level to support NOAA sea level and flood risk products

striding through large spatial chunks to get to the next time level. To make temporal extractions more efficient, we rewrote the native netCDF files by transposing the time and space dimensions and putting the data chunks into more effective arrangement, reducing access times (per node and per year) to several seconds. We thus have two versions of the dataset, one optimal for time series access, and the other (native) better suited for getting the model output for the entire spatial grid at a single time. The python package above accesses the re-organized files, and both sets are posted on the RENCITDS.

2) Detailed analysis of the posterior results. The purpose of using data assimilation (for any problem) is to improve predictions by incorporating errors from a prior solution into a posterior (assimilated) solution. It is thus important to demonstrate that the posterior solution is indeed "better" (in an error reduction) sense than the prior. We have reported on this analysis in several presentations at AGU and AMS in prior reporting periods. Additionally, NOAA post-doc Dr. Taylor Asher has been working on this analysis, taking a deeper look into the posterior prediction skill. In his analysis, he has been accessing the data through the Jupyter Notebook in MyBinder, which has helped substantially to vet and improve the access methods. He is engaged in several forms of basic and deeper analysis of the reanalysis data. He is helping validate the runs and the methods, while also finding means through which they can be improved, such as by better lowpass filtering of the water level correction. He is also studying the model error structure and how it correlates with other patterns/processes. The primary aim of this is to provide information on model accuracy away from gaged locations, though it may also serve several other purposes, such as avenues to improve methods.

3) Outreach to NOAA end-users and collaborators. We hope that the main products from this project will be useful to a much larger audience than just the "academic" side. While there are certainly key research goals, the broader use is also critical in helping to meet NOAA goals and objectives toward a more comprehensive understanding of the current (and future) state of coastal water level hazards. To this end, Audra Luscher-Aissaoui (NOAA/NOS) organizes bi-monthly virtual meetings where progress toward the overall objectives of the reanalysis project are presented to groups within NOAA that plan to use the results for several different types of analyses and applications, including nuisance flood analysis, and current and future coastal flood impacts. In this reporting period, we have shown some preliminary analysis results, discussed in detail some of the access efficiencies, and discussed how to access and leverage the data for downstream analyses. Dr. Taylor Asher has engaged with government agencies (FEMA, USACE, and NOAA) and with the broader research community through conferences, presentations, meetings, and one-on-one interactions. Specifically, Dr. Asher has enabled NOAA to have regular access to and engagement with the data, particularly Audra Luscher's team and Billy Sweet. Most recently, he presented the simulation dataset and initial work with it at the AGU annual conference in December.

AGU Project Presentation:

Asher, T., B. Blanton, R. Luettich, W. Sweet, G. Dusek, and A. Luscher-Aissaoui. 2022. Patterns in Observed and Modeled Water Levels and Waves from a U.S. Coastal

Appendix B – Multi-decadal reanalysis of coastal water level to support NOAA sea level and flood risk products

Ocean 40-Year Reanalysis. AGU 2022 Fall Meeting, Chicago, Friday, 16 December 2022, Session H56B-05.

https://files.renci.org/outgoing/blanton/2022AguReanalysisTgaV1_presented.pdf

Appendix C – Python Data Analysis Tools for Oceanographers

Python Data Analysis Tools for Oceanographers – Filipe Fernandes

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.

During this term there was one new notebook (*zarr* format example ([ioos/ioos_code_lab #98](#)), and one update (Sensor Map [ioos/ioos_code_lab #97](#)) for the IOOS Code lab.

The following PRs are maintenance only and environment updates only ([ioos/ioos_code_lab #101](#), [#112](#), [#114](#), [#119](#), [#121](#), [#96](#)).

IOOS participated in the Oceanhackweek again during 2022. The list of tasks comprises updating tutorials, the webpage, and the jupyter image used at the event.

([oceanhackweek/jupyter-image #52](#), [#57](#), [oceanhackweek/oceanhackweek.github.io #155](#), [#179](#), [#187](#), [#188](#), [#196](#), [#209](#), [oceanhackweek/ohw-tutorials #100](#), [#101](#), [#103](#), [#76](#), [#81](#), [#88](#))

IOOS also participated in Google Summer of Code 2022. The ideas page and a final progress report for all projects can be found in [ioos/gsoc #22](#).

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

This activity can be divided into three-sections:

a) Packages from the IOOS GitHub organization:

- Modernized *ciso* infrastructure and fixed failing tests ([ioos/ciso #15](#), [#16](#), [#17](#), [#18](#), and [#19](#));
- Use *netcdf4* $\geq 1.6.0$ to avoid bad wheel in [ioos/compliance-checker-web #118](#);
- Bugfixes in *erddapy* ([ioos/erddapy #269](#), [#274](#), [#275](#), [#292](#), and [#283](#));
- Added docs and modernized *ioos-python-skeleton* ([ioos/ioos-python-package-skeleton #14](#), [#15](#), [#16](#), and [#17](#));
- Modernize, fix some standing bugs, build docs, and modify *ioos_qc* to run on WASM ([ioos/ioos_qc #70](#), [#71](#), [#73](#), [#74](#), [#75](#), [#78](#), [#79](#), [#81](#), [#82](#), [#83](#), [#84](#), [#85](#), [#87](#), and [#88](#));
- Added *dependabot* and update GHA to [ioos/odvc #39](#);
- Added IOOS docker install Gold Standard in [IrishMarineInstitute/awesome-erddap #36](#).

b) packages from third party organizations that are important for IOOS

- Build *netcdf4-python* wheels for Windows ([ocefpaf/netcdf4-win-wheels #3](#), and [#4](#));

Appendix C – Python Data Analysis Tools for Oceanographers

- Packaging updates for *netcdf4-python* ([Unidata/netcdf4-python #1187](#), [#1191](#), and [#1203](#));
 - add pyproject.toml to ensure build deps are present at build time [Unidata/netcdf4-python #1208](#)
 - Build wheels for *cf_time* ([Unidata/cftime #280](#), [#282](#), and [#290](#));
 - Automatically publish docs and releases for *pyobis* ([iobis/pyobis #118](#), [#43](#), [#44](#), [#87](#), and [#89](#));
 - Avoid segfaults in CubicSpline with zero-sized input arrays in [scipy/scipy #17245](#);
 - Add Github Actions and fixed infinity loop bug in *pygc* ([axiom-data-science/pygc #6](#) and [#7](#));
 - Add pressure tests and updated CI for *ctd* ([pyoceans/python-ctd #161](#), [#162](#), and [#165](#));
 - Complete revamp of *windrose* with new features, tests, packaging, and bugfixes ([python-windrose/windrose #146](#), [#185](#), [#191](#), [#192](#), [#193](#), [#196](#), [#200](#), [#202](#), and [#211](#));
 - Both *branca* and *folium* received important updates during *closember* ([python-visualization/branca #119](#), [#120](#), [#121](#), [#123](#), [python-visualization/folium #1622](#), [#1623](#), [#1629](#), [#1630](#), and [#1679](#));
 - Fixed *pyproj* docs ([pyproj4/pyproj #1153](#)), build docs for *pocean* ([pyoceans/pocean-core #69](#)), and updated *windrose* info in [matplotlib/mpl-third-party #136](#);
 - Update *cftime* and *gsw* in [pyodide/pyodide #3181](#);
 - Fixed dependencies list in [oscarbranson/cbsyst #32](#);
 - Added Python 3.10 support for [ericdill/depfinder #74](#);
 - Bugfixes for *grayskull* ([conda-incubator/grayskull #392](#) and [#397](#)).
- c) pangeo/cloud support.
- Make *xbitinfo* installable via conda ([observingClouds/xbitinfo #131](#), [#132](#), and [#147](#));
 - Read from URLs or OPeNDAP endpoints instead of just files in [UXARRAY/uxarray #68](#);
 - Fix tarball and wheel in [hainegroup/oceanspy #295](#);
 - Fixed projection bug in *parcels* ([OceanParcels/parcels #1182](#));
 - Fix Specific volume second derivative mistake *gsw-c* and updated CIs ([TEOS-10/GSW #53](#) and [#57](#));
 - Add GitHub Actions testing and remove unused functions in *gsw-matlab* ([TEOS-10/GSW-Matlab #16](#) and [#18](#));
 - Modernize CIs, packaging, docs, and wheels for *gsw-python* ([TEOS-10/GSW-Python #100](#), [#101](#), [#102](#), [#104](#), [#105](#), [#106](#), [#108](#), [#110](#), [#112](#), and [#113](#)) and fixed array slice bug in [TEOS-10/GSW-Python #114](#);
 - Clean up and fix release bug in *multitaper* ([gaprieto/multitaper #6](#) and [#7](#));

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

This effort can be divided into three-sections:

Appendix C – Python Data Analysis Tools for Oceanographers

- a) Infrastructure maintenance - Most maintenance tasks focused on removal of bad packages from the conda-forge index ([conda-forge/admin-requests #470](#), [#485](#), [#490](#), and [#513](#)).
- b) New packages to conda-forge: *UGrid* [c-lib #19455](#), *gdptools* [#19995](#), *humre* [#19996](#), *h5pyd* [#20213](#), *delvewheel* [#20269](#), *pymyami* and *kgen* [#20310](#), *pyobis* [#20313](#), *noaa-coops* [#20330](#), *kbatch* [#20331](#), *xstac* [#20332](#), *numbagg* [#20401](#), *cplot* [#20488](#), *distinctipy* [#20489](#), *figpager* [#20490](#), *flexitext* [#20491](#), *gif* [#20492](#), *grplot* [#20494](#), *highlight_text* [#20495](#), *hockey_rink* [#20496](#), *matplotlibview* [#20497](#), *mpldatacursor* [#20498](#), *mpl-gui* [#20499](#), *mpl-multitab* [#20500](#), *mpl-qthread* [#20501](#), *mpl_table* [#20502](#), *mpl-template* [#20503](#), *numpngw* [#20504](#), *pyCircos* [#20505](#), *pymatviz* [#20507](#), *pypistats* [#20624](#), *csvinsight* [#20626](#), *echopy* [#20631](#), *face-recognition* [#20633](#), *meteoserver* [#20662](#), *plottable* [#21075](#), *specialist* [#21076](#), *pygeofilter* [#21167](#), and *pykube* [#21365](#).

Added *cf_units* to [emscripten-forge/recipes #205](#).

- c) Package updates
- [conda-forge/antlr-python-runtime-feedstock #40](#)
 - [conda-forge/branca-feedstock #14](#)
 - [conda-forge/cachy-feedstock #2](#)
 - [conda-forge/cf_units-feedstock #49](#)
 - [conda-forge/cfdm-feedstock #16](#)
 - [conda-forge/cftime-feedstock #47](#)
 - [conda-forge/click-feedstock #44](#)
 - [conda-forge/conda-forge-pinning-feedstock #3385](#)
 - [conda-forge/conda-forge-pinning-feedstock #3568](#)
 - [conda-forge/dask-kubernetes-feedstock #26](#)
 - [conda-forge/datacube-feedstock #38](#)
 - [conda-forge/dateparser-feedstock #20](#)
 - [conda-forge/depfinder-feedstock #28](#)
 - [conda-forge/fabric-feedstock #19](#)
 - [conda-forge/fiona-feedstock #200](#)
 - [conda-forge/future-feedstock #28](#)
 - [conda-forge/gdptools-feedstock #10](#)
 - [conda-forge/gdptools-feedstock #15](#)
 - [conda-forge/hdf4-feedstock #44](#)
 - [conda-forge/ioos_qc-feedstock #8](#)
 - [conda-forge/libnetcdf-feedstock #140](#)
 - [conda-forge/lime-feedstock #17](#)
 - [conda-forge/manimpango-feedstock #22](#)
 - [conda-forge/mock-feedstock #38](#)
 - [conda-forge/netcdf4-feedstock #142](#)
 - [conda-forge/numcodecs-feedstock #88](#)
 - [conda-forge/pydensecrf-feedstock #10](#)
 - [conda-forge/pyresample-feedstock #81](#)
 - [conda-forge/pystac-feedstock #21](#)

Appendix C – Python Data Analysis Tools for Oceanographers

- [conda-forge/python-blosc-feedstock #46](#)
- [conda-forge/qhub-dask-feedstock #16](#)
- [conda-forge/r-rgdal-feedstock #61](#)
- [conda-forge/rasterio-feedstock #256](#)
- [conda-forge/segregation-feedstock #18](#)
- [conda-forge/setuptools-feedstock #275](#)
- [conda-forge/xarray-feedstock #76](#)
- [conda-forge/xesmf-feedstock #26](#)



Account Detail Profile Inquiry

Date: 01/19/2023
Time: 12:25 PM**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:

NOACOOPNOS

Available Balance:

\$5,587,780.30

Total Cumulative Draw Limit:

\$9,157,694.00

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	- \$53,054.15
FY21OCM021-T-000-006	OPEN	\$244,444.00	- \$65,214.07
FY21OMAO021-T-000-008	OPEN	\$10,000.00	- \$1,773.50
FY21REG021-T-000-003	OPEN	\$3,576,136.00	- \$2,325,181.03
FY21SECART021-T-000-004	OPEN	\$10,500.00	- \$9,538.39
FY22 COOPS NCDIS022-T-002-001	OPEN	\$357,500.00	- \$67,529.71
FY22 OAP 022-T-002-003	OPEN	\$76,915.00	- \$1,223.60
FY22 OCM WATER 022-T-002-005	OPEN	\$197,144.00	- \$97,500.00
FY22 OCMROP022-T-002-006	OPEN	\$244,400.00	- \$0.00
FY22 OMAOBATTERY022-T-002-007	OPEN	\$30,000.00	- \$0.00
FY22 SECART022-T-002-002	OPEN	\$4,800.00	- \$0.00
FY22F4DISCRETION022-T-002-009	OPEN	\$150,000.00	- \$51,666.32
FY22NATDMAC022-T-002-004	OPEN	\$159,153.00	- \$21,875.00
FY22REG022-T-001-001	OPEN	\$3,061,136.00	- \$198,668.07
FY22REG022-T-002-008	OPEN	\$324,201.00	- \$36,689.86