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: 07/01/2025 – 12/31/2025
Principal Investigator(s): Debra Hernandez, SECOORA Executive Director

I. PROJECT MILESTONES:
Milestone Table. Milestones from the SECOORA Year 5 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.

Environmental Compliance: SECOORA is installing a water level sensor in Bluffton, SC on 1/20/26. The information on the station is found in our EC tracking worksheet found here: https://docs.google.com/spreadsheets/d/10KN3sdkzaUR-Kf_TbC-YI0d1mcCqWH6pvWowcQVbB8o/edit?usp=sharing. See "SECOORA" tab, line 8 for the station information. Additionally, the approval letter from the Town Manager to install the water level sensor on the Town dock is in **Appendix A.**

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: • The Executive committee met monthly to discuss SECOORA operational/business needs, congressional updates, and the SECOORA LOI process to select projects for the next 5-year NOAA IOOS award. • The SECOORA Board met in person October 27-28 to develop and approve the plan for the SECOORA proposal to the 2026-2031 IOOS NOFO. • SECOORA is in the process of planning the 2026 Annual Meeting which will be held in Atlantic Beach, NC.	On-track

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/. The audit for Years 2023 and 2024 is available here: https://secoora.org/wp-content/uploads/2024/07/Audit-FINAL-2023-Southeast-Coastal-FS-2023-Final.pdf.	On-track

Update the SECOORA RCOOS Plan

The 2026-2030 RCOOS Plan can be found here: https://secoora.org/wp-content/uploads/2025/02/Complete-RCOOS-Plan-2026-2030.pdf	Complete

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. Progress report details are found in the following google drive worksheets:

- The HFR report that details HFR operators, system status, and IT infrastructure needs by site is available here – review the worksheet titled "7 - 12 2025": https://docs.google.com/spreadsheets/d/1L1w00TPG1K7xXyh_iXXw6T7JaGT8rLZwnZMWfrnlXOI/edit?usp=sharing
- The HFR report that provides an overview of staffing by each SECOORA HFR operator is found here on the worksheet titled "2025": https://docs.google.com/spreadsheets/d/1dC4Tgh7x1BRLcFL62urO3sbWwp6FEUteO-c0J5OgwEw/edit?usp=sharing
- The 2025 HFR expenditures report is found here: https://docs.google.com/spreadsheets/d/1o72wuTtcAqYz0uVewoxmcwn14rqqBwzxUJHTpkzVYqY/edit?usp=sharing

On-track

SECOORA Glider Network

The SECOORA glider team includes SkIO, the University of South Florida (USF), UNC-Chapel Hill (UNC-CH), and Georgia Tech. See table **IOOS, NOAA, Other Agency Funding** for summaries on Navy glider support, Hurricane glider support, and the OMAO Saildrone-Glider project.

Accomplishments:

- The SECOORA glider observatory supported 5 glider deployments for 144 glider-days at sea.

Team Lead	Glider Name	Deployment Date	Recovery Date	Days in Water
SkIO/SECOORA	Franklin	7/15/25	8/15/25	31

On-track

USF	Sam	8/17/25	9/18/25	32
SkIO/SECOORA	Unit 1091	8/25/25	9/16/25	22
SkIO/SECOORA	Franklin	9/16/25	10/21/25	35
SkIO/SECOORA	Unit 1091	10/21/25	11/14/25	24

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

On-track

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

UNCW maintains 12 real-time moorings and 1 non-real-time mooring (OB27M) offshore 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 Tetra Tech makes the data available to NDBC via ERDDAP server.

Accomplishments:

- UNCW mooring technicians (LaClair and Faircloth) participated in the UNCW Marine Cybersecurity Hackathon December 15-18. Technicians provided a buoy and data/telemetry system for students to investigate security vulnerabilities and participated in a challenge event to explore exploiting those vulnerabilities. The buoy team gained increased insight into cyber security protocols and additional ways to safeguard the data produced by buoy sensors.
- UNCW up-time statistics for 07/01/25 – 12/31/25 for real-time moorings:

	ILM2	ILM3	LEJ3	SUN2	CAP2	FRP2	CHR60
Air Temperature	100%	93%	94%	100%	94%	53%	94%
Air Pressure	90%	93%	94%	100%	94%	94%	94%
Wind Speed, Gust, Direction	98%	93%	94%	100%	94%	94%	94%
Salinity	80%	53%	92%	88%	94%	94%	68%
Surface Water Temperature	80%	53%	92%	88%	94%	94%	69%
Waves	99%	N/A	100%	90%	86%	93%	89%
ILM2, LEJ3, SUN2, CAP2, & CHR60 have two buoys on site: a met buoy and a wave buoy							

Issues:

- ILM3 CTD failed on 10/17/25. Weather and personnel availability have hindered maintenance. CTD will be replaced ASAP, or entire buoy system will be replaced during the spring turnaround cruise.
- FRP2 Air Temperature failed on both the primary and backup sensors during the 2024-2025 deployment. Air Temperature data was restored when the buoy was replaced on 9/16/25. Lack of spare sensors and funding uncertainty resulted in a longer than average downtime.
- CHR60 CTD lost comms on 8/13/25, data was restored on 9/16/25 when entire buoy was replaced. CTD lost comms again on 12/16/25 and will be serviced ASAP.

USF maintains 2 real-time buoys (C10 & C12) and 2 non-real time moorings (C11 & C15) with SECOORA funding and leverages SECOORA funding with other grants to maintain 2 additional real-time buoys (C13 and 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 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 the real-time data. Real-time data flows to

SECOORA and Tetra Tech makes the data available to NDBC via ERDDAP server. Non-real-time data are shared via Research Workspace annually.

Accomplishments:

- USF partners with Eckerd College for undergraduate experiential educational programs to train interns via field and laboratory work. Five interns participated in lab work, sea-going activities, and data analysis. Two inters were supported with SECOORA funding.
- The project PI (Liu) participates in the USF High Tech Corridor program which supports one intern each Spring semester. The application, interview and selection process occurred during Fall 2025 with one highly qualified intern selected to assist in Spring 2026 with maintenance, fieldwork, and data analysis for SECOORA supported buoys.
- USF up-time statistics for 7/1/25 – 12-31/25 for real-time buoys:

USF	C10	C12	C13	C22
Wind	93%	73%	99%	99%
Air Pressure	93%	73%	99%	99%
Surface Water Temperature	93%	73%	95%	96%
Salinity (Surface)	93%	76%	95%	96%
Air Temperature	93%	76%	99%	99%
Relative Humidity	93%	73%	99%	99%
Longwave Radiation	93%	N/A	N/A	N/A
Shortwave Radiation	93%	N/A	N/A	N/A
Currents (ADCP)	91%	74%	97%	96%
Sub-Surface Temperature	N/A	N/A	94%	N/A

Issues:

- Lower data returns from C12 have been traced to issues with corrosion on bulkhead connectors in the telemetry cans. USF is now cycling these connectors out as cans are recovered; however, delays are being encountered due to a lack of spare telemetry systems. There are also delays related to two retirements in the machine shop, causing a lack of machinist to assist with fabrication of new telemetry cans.

Expand the SECOORA Real-time Observing Network

Water Level Initiative: The SECOORA water level team includes partners from the American Shore and Beach Preservation Association (ASBPA)/Hohonu and Georgia Tech.

On-track

Water level sensor locations can be viewed here: https://wl.secoora.org.

- SECOORA operates 4 water level stations in NC. All four have uptime stats greater than 85%. SECOORA plans to install a water level sensor in Bluffton, SC in Januray 2026. Approval from the City for the water level sensor installation is in **Appendix A**.
- Georgia Tech previously operated 17 water level stations in GA; however, 6 stations are being removed from service as the LoRaWAN coverage is not sufficient for continued operation (see previous progress report), leaving a total of 11 stations within the SECOORA network. Overall, the GT statistics this reporting period are very low due to the deployed sensors reaching the end of their lifespan. GT is in the process of replacing all the deployed sensors with new sensors so up-time metrics

will improve during the next reporting period.

- Hohonu operates 31 water level stations across the SECOORA region. The Snow's Cut station (Carolina Beach, NC) was removed from service as it was vandalized repeatedly. For stations that reported under 85%, the primary issue was the need to swap sensors which resulted in downtime between shipping the sensor to the operator and the operator getting it installed. However, Cape Lookout, NC and Fort Raleigh, NC have been down for close to a year. Hohonu has now shipped them new sensors the data should start reporting in 2026.

Uptime stats by operator and station are listed below:

Station Name	Owner	Uptime (%)
Belhaven, NC	SECOORA	98%
Bayside (Chocowinity, NC)	SECOORA	99%
Love Grove Bridge (Wilmington, NC)	SECOORA	87%
Alligator, NC	SECOORA	99%
St Mary's Waterfront Pavilion, GA	GT	80%
Tybee Island 4 H Center Dock, GA	GT	20%
Hunt Drive at Burnside Island, GA	GT	90%
Shipyard Road, Savannah, GA	GT	40%
Solomon Bridge, Savannah, GA	GT	50%
Hwy 80 at Chimney Creek, GA	GT	30%
Turner Creek Boat Ramp, GA	GT	30%
Walthour Road, Savannah, GA	GT	40%
Lazaretto Creek Fishing Pier, Savannah, GA	GT	50%
Catalina Drive, Savannah, GA	GT	50%
UGA Marine Extension, GA	GT	80%
Fernandina 1, FL	Hohonu	0%
Fort Raleigh National Historic Site, NC	Hohonu	2%
Bald Head Island, NC	Hohonu	42%
Cape Lookout National Seashore, NC	Hohonu	54%
Colington Creek Inn Dock, Kill Devil Hills, NC	Hohonu	71%
Emerald Isle, NC Boat Launch	Hohonu	75%
John's Pass, FL	Hohonu	96%
Fernandina 2, FL	Hohonu	97%
City of Beaufort, SC	Hohonu	99%
The Citadel, Ashley River, SC	Hohonu	99%
Ocean Isle Beach, NC	Hohonu	100%
Georgetown County Hwy 701 Bridge, SC	Hohonu	100%
Duck, NC	Hohonu	100%
Holden Beach, Brunswick County, NC	Hohonu	100%
Captiva Island, FL	Hohonu	100%
Surf City, NC	Hohonu	100%
Mexico Beach, FL	Hohonu	100%
Isle of Palms, SC	Hohonu	100%
Oyster Landing (N Inlet Estuary), SC	Hohonu	100%
Washington Acres Boat Ramp, NC	Hohonu	100%

Marine Corp Recruit Depot Parris Island, SC	Hohonu	100%	
New Bern, NC	Hohonu	100%	
Port Royal Sound Foundation SC	Hohonu	100%	
Georgetown, SC	Hohonu	100%	
North Myrtle Beach, Cherry Grove, SC	Hohonu	100%	
Currituck Co, NC	Hohonu	100%	
Hilton Head, SC	Hohonu	100%	
Hammocks Beach State Park, NC	Hohonu	100%	
Topsail Beach, NC	Hohonu	100%	
Sanibel, FL	Hohonu	100%	
Fripp Island, SC	Hohonu	100%	

SECOORA Biological Data Collection

University of South Carolina Beaufort (USCB) operates and maintains the SC estuarine soundscape observatory (https://sound.secoora.org/). All work under this award is complete.	Complete

DMAC AND MODELING & ANALYSIS SUBSYSTEMS

SECOORA DMAC subsystem

As the data management team, Tetra Tech provides support to SECOORA by maintaining the data cyberinfrastructure, providing data visualization and analytical tools, and ensuring data services are available and accessible to SECOORA stakeholders.
 	
Tetra Tech 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.
  ○ Conducted code reviews, implemented bug fixes, and deployed infrastructure upgrades.
• Maintain 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/
• Maintain the Glider System for the management of 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. Data are flowing from PIs to Tetra Tech 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 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.
	On-track

• Promote data discovery and public access through the SECOORA data catalog and data portal (https://portal.secoora.org). ○ Support other priority data sources by ingesting updates, such as the FACT and USC Beaufort subsurface water temperature dataset. • Implement real-time sensor QARTOD compliant quality control systems. • Annually archive physical oceanographic, biogeochemical, and meteorological data with NOAA's NCEI. • Resolve bugs or issues, such as implementing fixes for the CO-OPS collector in ERDDAP, resolving issues causing routine gaps in ERDDAP collectors, and fixing the hurricane portal ingest pipeline. • See **Appendix B** for the 2025 SECOORA DMAC Annual Progress Report. • See **Appendix C** (attached separately within eRA Commons) for the Asset Inventory. Of note, the asset inventory now includes FACT temperature sensor data and the SECOORA WebCOOS cameras.	
CNAPS Model	
The CNAPS model is operated and maintained by NC State University (NCSU) and Fathom Science. Due to technical issues with maintaining the CNAPS model and the cost of AWS for cloud computing, the project team decided to no longer continue operating CNAPS.	Complete
WFS Model	
The USF team continues to provide the West Florida Coastal Ocean Model (WFCOM) and the Tampa Bay Coastal Ocean Model (TBCOM) daily nowcast/forecast systems. These models produce simulated currents, water temperature, and sea surface height fields. Both WFCOM and TBCOM are available here: http://ocgweb.marine.usf.edu as well as being transmitted via THREDDS server to NOAA GOODS. Specific accomplishments include: • The WFCOM and TBCOM daily nowcast/forecast systems produce simulated currents, temperature, and sea surface height fields. Model simulation results (including currents, temperature, and salinity, sea level, and particle trajectories) are made publicly available on the web as maps and figures (https://ocl.marine.usf.edu). The model static images and movies for Tampa Bay and WFS sub-regions are updated daily and can be used for quick reference of the circulation patterns. • The red tide short-term trajectory forecast system delivers timely HAB forecasts to governmental agencies and the public during major bloom events. (http://ocgweb.marine.usf.edu/Models/TBCOM/HAB_tracking).	On-track
AI Portal	
Florida Wildlife Research Institute (FWRI) and Tetra Tech are building an artificial intelligence annotation data portal (AI portal). The FWRI team worked with SECOORA communications staff to update the main landing page, interactive tree, and use case pages. The updated site then underwent a standard security review by Tetra Tech. The development site (https://secoora-ai.sites.axds.co/) will be pushed to a live url on the	On-track

SECOORA website in January 2026.	
SEAMAP-SA Data and Analysis	
SCDNR staff have updated survey data for all four survey types. They have converted the data tables to the data portal structure and DarwinCore naming conventions in preparation for portal completion. SEAMAP website updates have been drafted also in preparation for portal completion. The SCDNR SEAMAP-SA staff and Tetra Tech spent much of the reporting period identifying the remaining tasks required to ingest the fisheries data to the SECOORA data system and describe the administrative uses of the data within the portal as required by SCDNR staff. The Tetra Tech scope of work for outstanding needs was finalized in December. There have been challenges as the cost for completing the project were above what SCDNR anticipated. SECOORA, Tetra Tech, and SCDNR have now agreed to the final tasks and costs per task so development will be completed.	Delayed
OUTREACH, ENGAGEMENT, PRODUCT DESIGN SUBSYSTEM	
Support Community Driven Networks	
See "NOAA, IOOS, Other Agency Funding" table, starting on page 13	
SECOORA Outreach and Engagement	
• SECOORA released 5 news stories on the website: https://secoora.org/news/ • SECOORA hosted 3 webinars for the Coastal Observing in Your Community Webinar Series: https://secoora.org/webinar-series-index/ • Details on media engagement and outreach for SECOORA staff and project PIs are found here (on the tab labeled 7/1/25-12/31/25): https://docs.google.com/spreadsheets/d/189a6FgoOAjMvGxDxmYuf0QnEoHuPXgpNqjMWn5YFv94/edit?usp=sharing	On-track
Product Development	
Water Level Network User Interface (SECOORA): Second Creek Consulting maintains the SECOORA water level website: https://wl.secoora.org. The site is continually updated as new water level stations are installed.	On-track
SECOORA developed data products and websites: • The SECOORA Hurricane Resources page was updated for the 2025 hurricane season (https://secoora.org/hurricane-resources/.	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: • ShellCast completed 10DLC registration with Bandwidth, which will allow text	On-track

notifications to be restored. To comply with registration requirements, several changes had to be made to the application, such as the language used when presenting account holders with notification preference options. Registration required multiple iterations with Bandwidth. • A HTB bacteria nowcasting layer was integrated into the BCRS mobile apps. Additionally, the addition of a WebCOOS camera and BleachWatch layer are currently in the beta testing phase for integration into the BCRS mobile apps.	

IOOS, NOAA, Other Agency Funding	
Funding Area/Recipient	**Progress**
Modeling/UNC-Chapel Hill	PIs Brian Blanton & Rick Leuttich ○ Status: Delayed ○ The Year 5 project funding for this effort was reduced. The PI and CO-OPS are drafting the SOW to revise priorities based on the funding available. Once the SOW is finalized, SECOORA will be able to issue the subaward to UNC-Chapel Hill.
Modeling/UNC-Chapel Hill	PI Shintaro Bunya ○ Status: On Track ○ See **Appendix D**
Modeling/Fathom-NC State University	PI Ruoying He ○ Status: Complete ○ The Ocean.AI project developed and demonstrated a Retrieval-Augmented Generation (RAG) + Large Language Model (LLM) system to improve accessibility, usability, and equity in interacting with NOAA oceanographic data. The proof-of-concept focuses on two pilot data products: 1) NOAA Coastal Ocean ReAnalysis (CORA) and 2) NOAA National Water Level Observation Network (NWLON) historical sea-level records. Accomplishments by task include: ○ Operational Ocean.AI System (Cloud-Deployed MVP) – Complete: The deployed system (https://oceanai.ai4ocean.xyz/) provides end-to-end ingestion, organization, and cloud-optimized access to CORA and NWLON datasets; an integrated retrieval engine for both structured (CORA) and unstructured data; and a fine-tuned LLM that generates NOAA-aligned text summaries, graphics, comparisons, and quantitative analyses. ○ Performance Testing and Evaluation Report — Complete: The report - submitted for journal publication https://arxiv.org/abs/2511.01019 - presents accuracy, relevance, and response-time metrics for the RAG-LLM system; validates NOAA data queries, visualizations, and statistical summaries; summarizes structured user-testing results from NOAA partners; and provides recommendations for refinement and scaling in NOAA operational contexts. Overall, the findings confirm that Ocean.AI meets all predefined testing criteria and performs reliably across diverse user prompts and data requests.

	○ Continuous Improvement Plan – Complete: The project team developed a path forward for expanding to additional NOAA datasets, along with a user-engagement and feedback-integration strategy implemented through incremental agile cycles.
Modeling/University of Florida	PIs Maitane Olabarrieta and Zhe Jiang ○ Status: On Track ○ See **Appendix E**
DMAC	PI Filipe Fernandes ○ Status: On Track ○ See **Appendix F**
Gliders/SECOORA	Lead PI: Catherine Edwards, UGA SkIO to support glider deployments and recoveries during 2026 Atlantic hurricane season ○ Status: On-track ○ ng412/ng738 were deployed on 7/22/25. ng412 suffered a leak and was lost at sea. ng288 was deployed off the GA coast in August as a replacement to ng412. ○ In December, SkIO coordinated with the GOC for recovery of ng738 and ng288 out of Port Canaveral, FL. A charter vessel with a 200 nm range was used to retrieve up ng738 and ng288 on 12/12/25.
Harmful Algal Blooms (HABS)	PI Michael Parson, Florida Gulf Coast University, Maintain and enhance the network of long-term water quality and HAB monitoring stations in southwest Florida. ○ Status: On-track ○ The project has made strong progress toward developing an early warning system for harmful algal blooms (HABs) and acute water quality events. A long-term augmented sensor network is now fully operational, with YSI EXO2 sondes deployed at five fixed, live-streaming stations in southwest Florida, collecting water quality data every ten minutes. Efforts to detect HABs using complementary tools are also on track. Over a six-month period, 120 samples were collected for Imaging FlowCytoBot (IFCB) analysis to establish baseline, site-specific phytoplankton communities. Although processing is time-intensive due to high detritus levels and the lack of an existing regional IFCB database, this work addresses a critical knowledge gap. Additional hourly autosampler deployments support chlorophyll a, IFCB, and microscopy analyses. PI Natalie Cohen, UGA Marine Extension, Identification of environmental conditions that are conducive to HAB formation in Georgia estuaries. ○ Status: On-track ○ Objectives remain on track, with substantial progress made over the past six months synthesizing three years of high-resolution monitoring of a coastal Georgia estuarine system. Historical records of atypical oyster larvae were aligned with community-collected observations of *Akashiwo sanguinea*, revealing repeated summer co-occurrences and suggesting a potential harmful role for this species. Expanded timelines, including summer 2023, highlight environmental

	conditions associated with oyster die-off events. Long-term data show *A. sanguinea* blooms consistently occur in late summer under high temperatures, low inorganic nutrients, and elevated chlorophyll a, and persist across a wide salinity range. Interannual variability observed in 2025 underscores the value of sustained monitoring. Beyond correlations, random forest modeling identified ammonium and pH as key bloom predictors. Additional advances include validating a low-cost Planktoscope for bloom tracking and bioinformatic analyses ruling out common oyster pathogens during die-off events, supporting continued investigation into Akashiwo's ecological and molecular dynamics.
HFR retuning/testing/ additional work and/or recap HFR station	Status: On-track Accomplishments: SECOORA is using funding for repairs to CODAR infrastructure owned by USF and CSI. Additionally, in the next reporting period, SECOORA will use some of the funds to identify partners/stakeholders that use or need surface current data.
Marine Life/SECOORA	Data Wrangler for the FACT Network ○ Status: On-track ○ See **Appendix G**
OA/University of Georgia	OAP allotment to support the NOAA Ocean Acidification Observing Network (NOA-ON) Gray's Reef (PI Scott Noakes, UGA) ○ Status: On-track ○ Discrete water samples continue to be collected near the Grays Reef National Marine Sanctuary buoy. These samples are processed and compared to the data collected by the SAMI-pH and MAPCO2 sensors deployed under the buoy. ○ The project team swapped out the deployed CTD, SAMI-pH, and MAPCO2 sensors on 12/12/25.
OA/SECOORA	OAP allotment of project resources in support of the Southeast Ocean and Coastal Acidification Network (SOCAN) for FY24 and FY25 (PI Emily Hall) ○ Status: On-track ○ SOCAN continues to participate in collaboration among the CANs to assess research and monitoring gaps as well as overall social and economic vulnerabilities. SOCAN and GCAN have initiated development of a comprehensive list of cultural groups who might be affected by acidification throughout the Southeast and Gulf region. ○ SOCAN hosted a virtual webinar in August 2025 on communication of OA through zoos and aquariums. ○ SOCAN will partner with MACAN to host an underrepresented community listening session in either southern Virginia or northeastern North Carolina (where there is regional overlap) with financial support from MACAN. The in-person meeting is planned for May 2026. ○ SOCAN continues its social media presence on Facebook Ocean Acidification Information Exchange, and email updates to members.
Regional Ocean Data Sharing Initiative,	SECOORA Regional Ocean Data Sharing Initiative - OCM to IOOS funding for Regional Ocean Partnerships

Lead PI Debra Hernandez, SECOORA	○ Status: On-track Accomplishments: • Southeast and Caribbean Disaster Resilience Partnership (SCDRP) – Note that SCDRP is funded through ROP and SECART funding. ○ Status: On-track ○ The 2026 SCDRP Annual Meeting planning efforts are underway. The meeting will be hosted in Charleston, SC March 4-5. ○ Agenda: https://www.scdrp.secoora.org/annual-meeting-2026 ○ As of 12/31/25 there are 54 registrants and 6 meeting sponsors. ○ This is the 10th anniversary of SCDRP and there will be a special networking reception during the meeting with live virtual reality (VR) demonstrations by the Clemson VR and Nature Lab. Also, there is a field trip in conjunction with the City of Charleston to highlight the Charleston Comprehensive Water Plan and other projects. • Marine Heat: SECOORA is working with CARICOOS, GCOOS, and FACT to analyze surface and subsurface water temperature data across regions to evaluate marine heatwaves and their impacts on key ecosystems. ○ A post doc at USF, Alex Nickerson, leads the data analysis efforts and works collaboratively with the other RAs. ○ Data mining for bottom, mid-water, and surface water temperature data is complete. All available data were downloaded from the NDBC (https://www.ndbc.noaa.gov/) website and the IOOS ERDDAP server (https://erddap.sensors.ioos.us/erddap/info/index.html). ○ Quality control was performed on subsets of data extracted from the IOOS ERDDAP server and NDBC which provided data files containing QC'd data. QC included identifying outliers, instrumentation failures, spikes, and temperatures outside seasonal, temporal, and local ranges. Spikes included temperatures which are more than 3°C (low threshold) or 8°C (high threshold) greater than the average of the points on either side of the measurement. Instrumentation failure, because often months of erroneous measurements accumulate before the problem is rectified, were manually identified. Each of these measurements were assigned a value in accordance with the QARTOD flagging procedures. ○ Data were binned into means on an hourly, daily, monthly, and annual basis. Additionally, created statistics showing the locations of sensors and the number of stations maintained by organizations. ○ Figures were generated to show the distribution of the data, statistics concerning the number of stations available, and the length of the available time series.
SECART 1 &2/support for SCDRP	SCDRP –Note that SCDRP is funded through ROP funds as well as SECART funding. ○ Status: On-track ○ See Regional Ocean Partnership section above for updates.
OA	OAP: ECOA IV Lead (Investment in the ECOA IV- The East Coast Ocean Acidification Cruise 2026 Level 1. PI Jake Kritzer (NERACOOS) ○ Status: On-track

	○ Initial planning for summer 2026 ECOA cruise has commenced but no major steps have been taken or expenses incurred. Most of the work on this project will take place in calendar year 2026 in collaboration with the University of New Hampshire and NOAA-OAP.
Prior year table 2 projects that are still ongoing	
Modeling/University of North Florida	NOTE – the project team changed and the subaward was issued to PI Tejeda with the University of South Florida. ○ Status: On-track ○ See **Appendix H**
Modeling/ University of South Florida)	PI Yonggang Liu ○ Status: On-track ○ See **Appendix I**

III. PROJECT CHALLENGES/MODIFICATIONS:

- Tariffs have impacted cost for sensor replacements. Some PIs have indicated that they cannot afford to purchase as many sensors as needed for adequate sparing.

IV. PUBLICATIONS:

See Google Drive links for a list of Peer Reviewed Publications. See the 2024 Publications tab: 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 5 of the award. SECOORA is spending down Years 1-5 ASAP TAS BETC lines.
  - All spending is on target.
- 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?
  - The Year 5 project funding for the Brian Blanton table 2 project was reduced by NOAA CO-OPS. The PI and CO-OPS are revising the SOW to reflect priorities based on the funding available. Once the SOW is finalized, SECOORA will be able to issue the subaward to UNC-Chapel Hill.
- 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 equipment was purchased by SECOORA during this reporting period.

VII. SUCCESS STORIES

- Success stories can be found on this spreadsheet on the "7/1/2025-12/31/2025" tab: https://docs.google.com/spreadsheets/d/189a6FgoOAjMvGxDxmYuf0QnEoHuPXgpNqjMWn5YFv94/edit?usp=sharing

End Report

Larry C. Toomer
Mayor
Dan Wood
Mayor Pro Tempore
Stephen Steese
Town Manager

Fred Hamilton
Bridgette Frazier
Emily Burden
Council Members
Marcia Hunter
Town Clerk

December 1, 2025
Stephen Steese, Town Manager
20 Bridge Street
Bluffton, SC 29910

Ms. Jennifer Dorton,

The Town of Bluffton has approved installing a SECOORA water level sensor on the Calhoun Street dock, which is Town-owned. This gauge will provide transparent, publicly accessible tidal elevation data for citizens and visitors alike. While the Calhoun Street dock is located at the edge of the Bluffton Historic District boundary, it is not considered a historic structure. The dock was completed in 2021 as part of a Town Capital Improvement Program (CIP) project.

Sincerely,

Stephen Steese
Town Manager

Theodore D. Washington Municipal Building
20 Bridge Street P.O. Box 386 Bluffton, South Carolina 29910
Telephone (843) 706-4500 Fax (843) 757-6720
www.townofbluffton.sc.gov

APPENDIX B: 2025 SECOORA DMAC Annual Progress Report

ACTIVITIES DURING THE REPORTING PERIOD

REPORTING PERIOD: January 1, 2025 - December 31, 2025

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

Objective 1. Core Cyberinfrastructure Support- Continuous, Ongoing

- The Axiom data system is the backbone of the cyber infrastructure 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, Axiom:
    - ensured that the SECOORA Data System was healthy, secure, and monitored; provided technical support to resolve system issues; and planned strategies for future upgrades.
    - maintained ongoing continuous performance of the SECOORA data system following IOOS DMAC guidelines, such as by maintaining data ingestion and processing services and ensuring the SECOORA Data System maintains IT security best practices.
    - Responded to user requests for data or information and user feedback.
    - Hosted, maintained, and provided operational support for the SECOORA.org website.

Objective 2. Cyberinfrastructure Enhancements - Completed

- Maintained IOOS-compliant services and applications for integration with national products.
    - THREDDS 5.8 - https://thredds.secoora.org
    - ERDDAP 2.28.1- https://erddap.secoora.org
    - SECOORA ISO WAF - https://thredds.secoora.org/iso
    - NCEI Archive - https://ncei.axiomdatascience.com/secoora/
- Began updating SECOORA station datum offsets to prepare for integration of the datum converter tool. This has included filling in data gaps and testing the process, writing scripts to calculate datums, testing conversions, implementing feedback from SECOORA, and working towards process automation. Integration of the datum converter tool is planned for early 2026.
- Updated the Research Workspace to ERDDAP metadata pathways and deployed metadata updates for UNCW and USF.
- Updated database to improve HF radar ingests and prevent vulnerabilities.
- Continued development of the new public Sensor Service API that provides access to Axiom's sensor data in a format similar to ERDDAP, particularly for water level sensors. This API offers a solution to individuals or organizations (e.g., NWS, NOAA, USF, etc.) who manually and programmatically access and download oceanographic sensor data with easy access to both near real-time and historical measurements. The API has been shared with SECOORA

stakeholders for use and testing, and Axiom has implemented changes base on their feedback and updated documentation accordingly.

- Supported data ingestion and data standardization for the Water Level Network, including data ingest for FAU/CCU (SenseStream), Green Stream, Clemson, and FIU.
- Supported data ingestion and data standardization for SECOORA PIs, such as by adding new COMPS buoys, ingesting updated FACT temperature datasets, and engaging with Georgia Tech to provide QARTOD documentation and plan for upcoming dataset ingests.
- Resolved bugs or issues, such as implementing fixes for the CO-OPS collector in ERDDAP, resolving issues causing routine gaps in ERDDAP collecting, and fixing the hurricane portal ingest pipeline.
- Updated the water level sensor pipeline to leverage updated Hohonu QC processes and documentation.
- Expanded SECOORA data portal holdings to include:
    - Water level stations for Southeast Water Level Network, including the McClellanville water level sensor at NWS request.
    - Water temperature data from UCSB.
    - New COMPS buoys.
    - Updated FACT Temperature Dataset.
- Maintained the SECOORA Glider System for the management of SECOORA glider assets (USF-Bass, Franklin, SAM, Unit_1091, Angus). The SECOORA glider data was updated for visualization in the portal (here), as well as submitted to the GliderDAC.
- Continued working to improve and update the delayed-mode glider mission pipeline.
- Promoted 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 timeseries datasets.
- Promoted data discovery and public access through the SECOORA data catalog and portal by programmatically monitoring the health of THREDDS-served datasets to access possibilities for improvements.
- Debugged and maintained sensor ingestion pipelines, including FACT temperature sensors and SECOORA water level stations, to ensure accessibility.
- Investigated and updated metadata where necessary for the Research Workspace and ERDDAP systems.
- Implemented real-time sensor QARTOD-compliant quality-control systems.
- Annually archive physical oceanographic, biogeochemical, and meteorological data with NOAA's NCEI.

Objective 3. DMAC Support to Existing Programs- Continuous, Ongoing

- Maintained bi-monthly DMAC progress calls with SECOORA staff.
- Participated in all SECOORA regularly scheduled PI calls.
- Conducted outreach and engaged with stakeholders and community members, such as through the community webinar on SECOORA portals, the IOOS Annual

DMAC Meeting, and other technical meetings (e.g., monthly IOOS DMAC meetings, where appropriate and topics are relevant to SECOORA DMAC).
- Participated in IOOS-related workgroups, including the IOOS IRA Metadata Working Group and IOOS IRA Data Pipeline Working Group.
- Provided technical assistance to SECOORA PIs to ensure smooth access to Research Workspace.
- Maintained the Jira SECOORA DMAC task board to track all data management work progress.
- Maintained the Jira 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- Continuous, Ongoing *(as Resources allow)*

- Monitored use of SECOORA data and health of the data ecosystem. This included providing a report of metrics to SECOORA Staff and initial planning to improve the monitoring strategy in future years.

Objective 5. External/Special Projects

Task 1: FWRI AI, Continuous; Ongoing

- Maintained machine learning algorithms for detecting spawning coral in aquaria.
- Maintained codebase and documentation for development of future AI/ML projects.
- Continued development of AI/ML informational webpage to showcase data use cases.
- Developed and updated the site decision tree and WordPress plugin.
- Deployed AI/ML informational webpage to staging for review and feedback, and planned for launch to production.

UPCOMING/PLANNED ACTIVITIES

Upcoming SECOORA DMAC activities include:

- Complete updates to SECOORA water level station datum offsets.
- Implementation of the station datum converter.
- Ingest new datasets, as identified and prioritized by SECOORA.
- Support data submission, visualization, and metadata generation for SECOORA-funded projects.
- Deploy the AI/ML website to production URL, as determined by SECOORA.
- 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, working groups, and international organizations.

- Support existing products, as identified and prioritized by SECOORA and its partners.

SUCCESSES OR CHALLENGES

SECOORA continues to persist a robust system for continuous integration of real-time observation stations (LINK). Below are metrics for 2025:

For comparison - SECOORA data portal metrics (January 1, 2025 – December 31, 2025):

- Sensor Stations
  - Total number of sensor stations: 1,968
  - Number of sensor types: 89
  - Number of affiliates: 99
  - Total stations with data from the past year: 1,076
- Moving Platforms
  - Total number of moving platforms: 97
  - Number of affiliates: 3
  - Total platforms with data from the past year: 9
- Data Layers
  - Total number of data layers: 840
  - Number of affiliates: 28
  - Total datasets with data from the past year: 78

For comparison - SECOORA data portal metrics (January 1, 2024 – December 31, 2024):

- Sensor Stations
  - Total number of sensor stations: 1,789
  - Number of sensor types: 90
  - Number of affiliates: 96
  - Total stations with data from the past year: 1,002
- Moving Platforms
  - Total number of moving platforms: 89
  - Number of affiliates: 3
  - Total platforms with data from the past year: 12
- Data Layers
  - Total number of data layers: 781
  - Number of affiliates: 25
  - Total datasets with data from the past year: 109

Appendix D: Advancements to NOAA's Storm and Tide Operational Forecast System (STOFS) 2D Global water level model

SECOORA PROGRESS REPORT: JULY 1 - DECEMBER 31, 2025

PI: Shintaro Bunya

Project Title: Advancements to NOAA's Storm and Tide Operational Forecast System (STOFS) 2D Global water level model

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 and note if the objective is Complete, On-Track, or Delayed. If an objective is delayed, a justification for the delay (e.g., travel restrictions, late receipt of contract) must be provided along with a new completion date and description of activities employed to mitigate the delay.

Overview: During this reporting period, the project successfully implemented rain-on-mesh capabilities within the Discontinuous Galerkin (DG) subgrid code. Initial validation runs for Hurricane Harvey were completed, showing very good agreement between numerical solutions and observations. We are currently extending the numerical domain to include all watersheds contributing runoff to the Galveston Bay and Houston area. This work contributes to preparedness for natural disasters such as storm surge and compound flooding. Ultimately, these advancements are essential for the protection of human lives, properties, and critical infrastructure of national interest by providing actionable, high-fidelity flood data.

Technical challenges identified during this expansion include numerical instabilities in areas with higher topographic elevations and steep gradients. We suspect these instabilities originate in the numerical flux calculation along edges; identifying and resolving these specific scenarios is a primary focus for the next period. Additionally, we achieved a 20% reduction in computation time through numerical integration optimizations. Performance profiling revealed that subgrid model lookup table referencing accounts for approximately one-third of calculation time, providing a clear target for further optimization. Finally, setup for Hurricane Ian validation is underway, focusing on implementing infiltration processes to account for Florida's specific soil properties.

Broader Impacts: The project continues to support the development of the next generation of scientists through a collaboration with the University of Notre Dame, advising a PhD candidate on the implementation of these advanced hydrodynamic features. The efficiency gains (20% speedup) directly improve the feasibility of using high-fidelity subgrid models in real-time operational environments.

Task 1: Complete and Integrate the DG Subgrid Model with Rain-on-Mesh Capability.
Status: On-Track
Progress: Rain-on-mesh is fully implemented. Numerical integration optimizations have yielded a 20% speedup. Next steps include reducing lookup table call frequency to address the current 33% computational bottleneck.

Task 2: Validate the Subgrid Model for Extreme Events.
Status: On-Track
Progress: Hurricane Harvey validation is complete with excellent results. We are currently troubleshooting instability issues in the expanded Houston domain, specifically investigating the numerical flux calculations along mesh edges in high-gradient areas. For Hurricane Ian, we are developing an infiltration modeling approach to better capture West Florida's hydrological response.

Appendix D: Advancements to NOAA's Storm and Tide Operational Forecast System (STOFS) 2D Global water level model

Task 3: Develop and Operationalize Regional Models.
Status: On-Track
Progress: Work on the Houston regional domain is progressing via watershed-inclusive mesh expansion. In the coming period, we will begin evaluating specific approaches for coupling these high-resolution regional models with the STOFS 2D+ Global model. We are leaning toward a one-way coupling strategy while simultaneously evaluating the sensitivity of the solution to the placement of coupling interface boundaries compared to a two-way approach.

PRODUCT DEVELOPMENT & DELIVERY

2 Please provide a brief description of the status of all products or tools currently available or under development as part of this award. Include weblinks where available.
Product: Optimized ADCIRC DG-Subgrid Solver (with Rain-on-Mesh and Infiltration).
Status: Under Development.
Description: The solver now includes a 20% faster numerical integration scheme. We are currently adding an infiltration module and evaluating one-way vs. two-way coupling interfaces.
Transition: These advancements facilitate the transition of high-fidelity regional forecasts into the STOFS 2D+ Global operational framework, allowing for better decision support during compound flooding events.

SUCCESS STORIES

3 Briefly describe any success stories that help convey the value of your project and 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.
Hurricane Harvey Validation Success: The subgrid DG model's ability to replicate Harvey's complex flooding validates the "rain-on-mesh" approach. This accuracy is a major step toward providing reliable total water level (TWL) forecasts for the Houston/Galveston region.

Computational Efficiency Gains: Through targeted profiling and optimization, we reduced total calculation time by 20%. By isolating the lookup table bottleneck, we have a clear path toward the performance levels required for real-time forecasting.

Contact: Shintaro Bunya, PI (sbunya@unc.edu).

Appendix E: Laying the Foundation for AI-Powered Coastal Modeling: Operational Infrastructure and a Surrogate Storm-Surge Pilot

SECOORA PROGRESS REPORT: JULY 1 - DECEMBER 31, 2025

PIs: Maitane Olabarrieta and Zhe Jiang, UF

Project Title: Laying the Foundation for AI-Powered Coastal Modeling: Operational Infrastructure and a Surrogate Storm-Surge Pilot

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 and note if the objective is Complete, On-Track, or Delayed. If an objective is delayed, a justification for the delay (e.g., travel restrictions, late receipt of contract) must be provided along with a new completion date and description of activities employed to mitigate the delay.

Project Overview: This project explores the use of adaptive machine learning (ML) methods, in combination with water level and wave observations and oceanic and atmospheric reanalysis data, to improve storm surge and Total Water Level (TWL) forecasting. Accurate prediction of storm surge and TWL is essential for effective emergency response, evacuation planning, and coastal hazard mitigation during extreme weather events. TWL integrates multiple physical processes—including astronomical tides, storm surge, seasonal mean sea level variability, and wave-driven contributions—each of which introduces uncertainty into forecasts. By developing a probabilistic ML-based forecasting framework that continuously assimilates new data, this project seeks to reduce uncertainty and improve forecast reliability for coastal communities. The long-term vision of the project is to develop an adaptive forecasting system that complements traditional numerical models and can be integrated into an ensemble framework. Through probabilistic outputs and continuous learning, the ML system is intended to improve over time as additional observations and reanalysis data become available.

Project Objectives and Scope: The objective of the project is to develop and evaluate an adaptive ML-based framework for storm surge and TWL forecasting that is suitable for NOAA research and operational environments. During the first year, the focus is on the storm surge component of water levels, including the isolation of storm-driven signals and the explicit consideration of atmospheric forcing uncertainty. In the second year, the scope will expand to full TWL forecasting through the inclusion of seasonal mean sea level variability and wind–wave contributions. A key element of the project is the use of agile, iterative development. Rather than attempting to build a fully operational system from the outset, the project emphasizes incremental progress through clearly defined prototypes, regular evaluation, and refinement based on performance and feasibility. Since the team received the project funding, we have been meeting on a weekly basis. We have created the data infrastructure needed in HiPerGator and we have created a code repository for the research project located in GitHub: https://github.com/spatialdatasciencegroup/StormSurgeAI

Definition of Prototype Region: A region of interest has been defined to serve as the initial prototype for model development and evaluation. The selection of this region was guided by data availability, data quality, and relevance to coastal hazard exposure. We selected the US East Coast because, although storm surge events are relevant in this region, the effects of tropical cyclones are less usual than in the south. Focusing on a well-defined prototype region allows for rapid iteration, controlled testing of model architectures, and detailed evaluation of forecast skill before expanding to broader geographic domains. This prototype region will continue to serve as the primary testbed throughout Year 1 and will support comparisons between ML-based forecasts and traditional modeling approaches.

Appendix E: Laying the Foundation for AI-Powered Coastal Modeling: Operational Infrastructure and a Surrogate Storm-Surge Pilot

Data Acquisition and Preparation: Significant progress has been made in assembling and preparing the datasets required for model development and testing. Historical water level data from the CORA dataset has been successfully downloaded and ingested, providing a long and consistent record of coastal water level observations. In addition, atmospheric forcing data from the ERA reanalysis have been obtained to support storm surge modeling and uncertainty analysis.

A critical early step in the project has been the decomposition of observed water level time series into their principal physical components. The water level records have been separated into long-term trends, seasonal variability, astronomical tides, and storm surge residuals. This decomposition is fundamental to the project's methodology, as it allows the ML models to be trained on physically meaningful signals rather than on aggregated water level data that combines multiple processes with different temporal scales.

Development of a Preliminary Storm Surge AI Model: Using processed CORA and ERA datasets and the decomposed storm surge signal, a preliminary AI-based storm surge prediction model has been developed. This model represents the project's first Minimum Viable Product and demonstrates the feasibility of using ML techniques to predict storm-driven water level variability. The initial model development focused on establishing a robust data pipeline, defining appropriate input features, and implementing baseline ML architectures suitable for spatiotemporal prediction. While the current model is preliminary, it provides a critical foundation for subsequent refinement in coordination with NOAA collaborators, including the incorporation of probabilistic outputs and adaptive learning capabilities. This early-stage model also serves as a platform for evaluating computational performance and testing GPU-accelerated training and inference workflows.

Computing Infrastructure and GPU Evaluation: The project has begun evaluating the use of GPU-enabled computing for AI model development and operations. Initial testing on relevant problems indicates that GPUs offer substantial advantages for accelerating model training and enabling rapid iteration during the development process. These early evaluations inform decisions about model architecture, data handling strategies, and workflow design, with the goal of ensuring compatibility with NOAA research and operational platforms. Further benchmarking and optimization will be conducted as the models mature.

Planned Activities for the Next Reporting Period: The next reporting period will focus on advancing the storm surge prediction framework through an iterative, infrastructure-aware development process aligned with NOAA research and operational needs. A central objective will be to progressively incorporate atmospheric forcing uncertainty into the modeling framework while simultaneously refining data requirements, workflows, and performance on NOAA platforms. A key activity will be the continuous definition and refinement of data and metadata requirements, including HPC resource needs, compliance with NOAA Unified Forecast System (UFS) conventions, and the selection of target oceanographic variables such as water levels, waves, and currents. These requirements will be revisited throughout the project lifecycle to ensure compatibility with NOAA research and operational environments and to support scalable model development.

In parallel, the scope of the foundation model will be iteratively refined, including the selection of prototype regions, training and validation datasets, and skill assessment metrics. This iterative process will allow the model design and evaluation strategy to evolve in response to early results, stakeholder feedback, and emerging technical constraints. During this period, a clear Minimum Viable Product (MVP) will be defined for the first operationally relevant iteration of the system. The MVP will prioritize essential capabilities, including ingestion of atmospheric forcings, baseline storm surge prediction skill, and preliminary uncertainty characterization, enabling early testing on NOAA infrastructure and rapid feedback from users and collaborators.

A model development and testing pipeline will be established with regular update cycles, allowing successive versions of the model to be deployed and evaluated on NOAA platforms. Each iteration will emphasize

improvements in training efficiency, validation of rigor, and operational robustness, with workflows streamlined to support repeatable execution on HPC systems.

Within this iterative framework, a dedicated workflow will be developed to ingest both deterministic and ensemble atmospheric forcings and to quantify how uncertainty in wind and pressure fields propagates into water level and storm surge forecast uncertainty. This will include the evaluation of probabilistic model outputs, assessment of forecast reliability and spread, and comparison with deterministic predictions and traditional modeling approaches. Collectively, these activities will lay out the groundwork for a scalable, uncertainty-aware storm surge forecasting system that supports continuous improvement, early operational testing, and eventual integration into NOAA ensemble forecasting environments.

PRODUCT DEVELOPMENT & DELIVERY

2 Please provide a brief description of the status of all products or tools 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.
1. Data Processing and Analysis Pipelines (Under Development)

The project team has developed and documented automated data processing pipelines for assembling and preparing coastal water level observations (CORA) and atmospheric reanalysis data (ERA). These pipelines include quality control, spatial/temporal alignment, and decomposition of total water level into physical components (e.g., tides, surge). Code repositories are actively hosted on the project's private GitHub repository for internal development and collaboration. The plan is to publish selected code modules publicly once interfaces and documentation are stabilized. Internal project researchers and collaborators are actively using these pipelines for model development and evaluation.

2. Preliminary Machine Learning Model for Storm Surge Prediction (Under Development)

A preliminary ML model designed to predict storm surge from decomposed coastal water level residuals and atmospheric forcing features has been developed as an initial prototype. The model demonstrates feasibility and establishes baseline workflows for feature engineering, model training, and evaluation. Hosted at UF Hipergator and in the internal GitHub repository. Not yet deployed publicly or as an operational forecasting product. Project team members are currently using the model for testing, refinement, and performance benchmarking.

3. Computing Infrastructure with GPU Acceleration (Under Development)

GPU-enabled computing workflows have been configured and tested to accelerate ML model training on NOAA-relevant high-performance computing (HPC) resources (HiPerGator). This infrastructure evaluation supports future scalability of the forecasting models. This is not a user-facing tool but foundational for continued development.

Python Data Analysis Tools for Oceanographers

PI Filipe Fernandes

Progress and Accomplishments from 7/1/25 – 12/31/25

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

The IOOS Code Lab site requires constant maintenance to keep running. We had to switch the deployment to only on releases ioos/ioos_code_lab #286, remove a second publication that should not be active (#287) and added one test to *zizmor* ignore list due to its scope on Windows command line (#299).

We supported OHW25 in the form of improving the image used in the tutorials and (oceanhackweek/jupyter-image #130, and #137) and the Data Access Tutorial (#147) and revamped the ugrid conventions webpage for its Climate and Forecast inclusion in version 1.11 (ugrid-conventions/ugrid-conventions #77, #79, #80, and #81).

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.

In this quarter we started a new WASM based tool for checking Darwin Core compliance (MathewBiddle/DarwinCore_quickCheck #2, #3, #4, and #6). This tool is not ready for production yet, it is only functional in a pure Python environment at the moment. We are also developing *atn-to-obis* in tandem with the checker (MathewBiddle/atn-to-obis #2).

a) *Compliance-checker and plugins*:

- Added Python 3.14 support in compliance-checker and all plugins (cc-plugin-glider #80, cc-plugin-ncei #67, cc-plugin-sgrid #16, cc-plugin-ugrid #39 and compliance-checker #1259);
- Added *pyudunits2* support compliance-checker #1218, a GitHub Action to update the CF table (#1224, and #1227);
- Several bug fixes and small updates ranging from zarr issues to Python version support, and HTML test parsing (#1228, #1235, #1239, #1241, #1242, #1247, and #1257);
- Minor plugins update: cc-plugin-sgrid #5 and cc-plugin-ugrid #40;

Ioos_qc:

- Fixed continuous integration failures, and add Python 3.14 support (ioos_qc #157, #158, #178, #182 and #179);

Erddapy and gliderpy:

- Added Python 3.14 support (erddapy #427, andgliderpy #168);
- Fixed missing default OPeNDAP engine in latest *xarray* release (erddapy #421);
- Multiple maintenance PRs hardening security and fixing CI failures: (erddapy #409, #411, #418, #425, and gliderpy #153, gliderpy #160, #166);

Multiple Maintenance PRs:

- Fixed CI failures, harding GitHub Actions security, implemented trusted publishers, and added Python 3.14 support to *ciso*, *odvc* and *xarray-subset*: ciso #70, #71, #72, #76, #91, ioos_metrics #139, odvc #83, #96, #98, xarray-subset-grid #92, and #93).

b) This effort consisted mostly on fixing bugs and future proofing libraries, with the exceptions highlighted below.

- Added GitHub as an alternative docker image provider for ERDDAP/erddap #331;
- Build cf-units wheels with ABI3 for better compatibility (SciTools/cf-units #627);
- Improve CI speed in Unidata/netcdf4-python #1415;
- Modernize pyoceans/gridgeo #55;
- Remove End-of-Life Python in python-visualization/folium #2169;
- Bring wesleybowman/UTide #150 up to date with the latest Python packaging and CI techniques.
- Bump *cibuildwheel* and *manylinux* for *gsw* (TEOS-10/GSW-Python #199, and #202);
- Update *ctd* with the latest Python packaging and CI techniques (pyoceans/python-ctd #228, #236, and #243).

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)

i) Archive *cykdtree* and *django-uuidfield* conda-forge/admin-requests #1654;

ii) Remove *rpy2* bad version string conda-forge/admin-requests #1682;

iii) Reset token for *r-dmfiller* conda-forge/admin-requests #1735.

b) New packages to conda-forge: pyror, prefligit, planet-auth and pyqrcode, geom, eo-tides, linear-inverse-model, seabirdfilehandler, ooi-data-explorations, ndbcrealtime, cc-q, erddapcfg, and roman-numerals.

c) See the list of updated feedstocks in the appendix.

Stakeholder engagement and outreach efforts during the reporting period: Mentored Chiara Monforte's "Build web UI versions for IOOS tools" project during Google Summer of code 2025. This project resulted in two web apps: compliance-checker web and ioos-qc-web.

Pull Requests links

- conda-forge/blackjax-feedstock #22
- conda-forge/datalad-feedstock #138
- conda-forge/icechunk-feedstock #91
- conda-forge/melodies-monet-feedstock #10
- conda-forge/nco-feedstock #209
- conda-forge/netcdf4-feedstock #176
- conda-forge/numcodecs-feedstock #123
- conda-forge/pyhdf-feedstock #58
- conda-forge/python-cdo-feedstock #29
- conda-forge/toolz-feedstock #27
- conda-forge/xbitinfo-feedstock #11

Appendix G: Young Joy, FACT Data Wrangler

SECOORA PROGRESS REPORT: JULY 1 - DECEMBER 31, 2025

PI: Joy Young
Project Title: FACT Data Wrangler

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 and note if the objective is Complete, On-Track, or Delayed. If an objective is delayed, a justification for the delay (e.g., travel restrictions, late receipt of contract) must be provided along with a new completion date and description of activities employed to mitigate the delay.
Priority 1: Conduct two major (i.e. inter-network matching) telemetry data processing events.

October push: 120 issues were processed as part of the push with nearly a quarter classified as fixing. This is common but highlights the fluid nature of telemetry datasets and the importance of sustaining a system that errors may be fixed and applied retroactively to datasets. The Oct push included over 40 million new and updated detections, 369 tagged animals, detection data from 1,820 downloads from 222 stations. Thirty-five projects participated in the push, benefiting 133 projects within the FACT Network. Overall, the FACT node currently has 224 projects (increase by 10), 380 contributors, 136 species, 3,945 active tags, over 411 million detections and is using 550 GBs for database storage.

Oct push: Temperature data from sensor- enabled receivers and external temperature sensors were uploaded to Research Workspace on 9/21/25. The dataset included over 11.9 million observations – an increase of 16% since June 2054. That brings the entire dataset to 707 unique sites – a 16% increase from June 2025.

Priority 2: Work with PIs to resolve incomplete telemetry datasets (based on process under priority 1).
During the Oct push, 25% of issues were related to 'fixing' already submitted data. Fixes included updating the database to change past coordinates, changing the code of a sentinel tag, removing duplicate downloads for many projects, changing the reported lengths of animals, and changing animal harvest dates.

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 supported the following publication by providing data:

Livernois, Mariah C., et al. "Tracking animal movements via collaborative acoustic telemetry networks: Multiscale habitat use, phenology, and management insights." Journal of Fish Biology 106.5 (2025): 1619-1638.

Whoriskey, Frederick G. "BUILDING OCEAN BIODIVERSITY MONITORING CAPACITY." Oceanography 38.1 (2025): 44-46.

Welch, Rebecca J., et al. "The role of acoustic telemetry in assessing fish connectivity within marine seascapes: A global review." Journal of Fish Biology 106.5 (2025): 1285-1304.

Nolan, Joseph D., et al. "Longest documented coastal migrations of shortnose sturgeon." Journal of Fish Biology (2025).

Bowers, M. E., and S. M. Kajiura. "Seasonal distribution and environmental predictors of the movement of male blacktip sharks Carcharhinus limbatus off the US East Coast." Marine Ecology Progress Series 753 (2025): 119-135.

Reyier, Eric, et al. "An unmanned surface vehicle for acoustic telemetry surveys of coastal fishes: range testing, real world performance, and comparison with a stationary tracking array." Frontiers in Marine Science in review.

PRODUCT DEVELOPMENT & DELIVERY

3 Please provide a brief description of the status of all products or tools currently available or under development as part of this award. Include weblinks where available.
Continued support of the RWSC receiver deployment map (https://rwsc.org/map).

SUCCESS STORIES

4 Briefly describe any success stories that help convey the value of your project and 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.
In summer 2025, researchers in the Florida Keys used acoustic telemetry to track permit during the spawning season. The study revealed detailed patterns of movement and habitat use, shedding new light on how these fish interact with predators. Findings from the telemetry data are directly informing management strategies to protect key spawning sites. This work highlights how cutting-edge science is helping Florida safeguard its marine resources.

LEVERAGED FUNDING

5 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.
Ten receivers (10 x $1400 = $140,000) were provided to the FACT Network to be deployed by FACT members and supplement existing arrays.

Appendix H: Andres Tejada Modeling

SECOORA PROGRESS REPORT: JULY 1 - DECEMBER 31, 2025

PI: Andres Tejada

Project Title: Evaluation of Coastal Models in NOAA Operational Environments

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 and note if the objective is Complete, On-Track, or Delayed. If an objective is delayed, a justification for the delay (e.g., travel restrictions, late receipt of contract) must be provided along with a new completion date and description of activities employed to mitigate the delay.
Objective 1: Complete Round 1 Tide-Only SCHISM Simulations and Skill Assessment

Status: Complete
Objective 2: Validate Model Configuration, Mesh, and Performance for Transition to Round 2

Status: On-Track
Following completion of Round 1, the SCHISM configuration, mesh, and workflows were reviewed and validated for readiness to advance to Round 2. This included confirming consistency of horizontal and vertical datums, and ensuring compatibility with required atmospheric, open-ocean, and river forcing datasets. Identified bathymetry and preprocessing issues documented in the UFS CAT guidance were reviewed and addressed as needed, ensuring a strong foundation for subsequent hindcast simulations.

This objective positions the project to smoothly transition from tide-only simulations to fully forced, three-dimensional hindcast runs required in Round 2.

Objective 3: Initiate Round 2 SCHISM Hindcast Simulations (Atmospheric, Sub-Tidal, and River Forcing)
Status: On-Track

During this reporting period, work began on Round 2 activities, including assembly and testing of atmospheric forcing, open-ocean boundary conditions, and river inputs consistent with the UFS CAT evaluation plan. Initial model setup and test runs for the selected hindcast periods are underway. These efforts mark the formal transition into Round 2, which will emphasize time-series validation of water levels and quality-controlled currents, as well as additional optional assessments of temperature and salinity.

Full Round 2 simulations and comprehensive skill assessments will be completed in the next reporting period.

Objective 4: Documentation and Contribution to UFS CAT Evaluation Effort
Status: On-Track

Throughout the reporting period, the project team maintained alignment with UFS CAT documentation. Model configurations, runtime information, and evaluation results from Round 1 were organized for submission and future reference. Engagement with UFS CAT resources, documentation, and community guidance continues to ensure consistency with broader NOAA evaluation efforts and to facilitate reproducibility by other testing teams.

Anticipated Work for the Next Reporting Period:

Appendix H: Andres Tejada Modeling

The next six-month period will focus on completing Round 2 SCHISM hindcast simulations, performing required and optional skill assessments (water levels, QC-ed currents, and selected thermohaline variables), and documenting results for submission to the UFS CAT evaluation framework. Pending successful completion, subsequent evaluation rounds will begin as outlined in the original Scope of Work with the aim of completion by Summer 2026.

SECOORA PROGRESS REPORT: JULY 1 - DECEMBER 31, 2025

PI: Yonggang Liu, USF
Project Title: New York Harbor - Cook Inlet Model Testing

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 and note if the objective is Complete, On-Track, or Delayed. If an objective is delayed, a justification for the delay (e.g., travel restrictions, late receipt of contract) must be provided along with a new completion date and description of activities 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 Ocean Circulation Lab works as a tester to configure and test Finite Volume Community Model (FVCOM) on NSF funded Texas Advanced Computing Center (TACC). They have successfully completed the required work in Rounds 1 and 2.

Round 3: Testers will evaluate the model skill using the 3-D configuration coupled with wave processes. Testers will utilize UFS-Coastal in their Round 3 configurations in one way or another. There are various approaches for integrating wave processes and utilizing UFS-Coastal, and testers are encouraged to explore and select the approach that suits them best.

Round 4: Testers will consider inclusion of National Water Model data into the model configuration, and evaluate the model performance.

Here is a list of activities performed by USF Ocean Circulation Lab during this reporting period:

- The entire USF team attended monthly UFS CAT Water Quantity model evaluation online meetings and participated in discussions for FVCOM application in New York Harbor and Cook-Inlet region.
- Dr. Yonggang Liu participated in the monthly PI meetings online and made appropriate comments and suggestions for the project.
- USF team implemented two sets of ocean wave modeling of the New York Harbor – Cook Inlet region by using FVCOM-SWAVE module, one in high resolution and the other in low resolution. The high-resolution grid comprises 124,465 nodes and 235,931 elements with 21 vertical sigma levels. The horizontal resolution of the triangular grid gradually increases from approximately 3 km along the open boundary to about 200 m near the coast. Within the New York Harbor (NYH) area (Manhattan, Brooklyn, Queens, Kill Van Kull, etc.) and the Hudson River, the resolution is further refined to 20-30 m. The coarse grid comprises 52,896 nodes and 98,192 elements with 21 vertical sigma levels. The horizontal resolution of the triangular grid progressively increases from approximately 3 km along the open boundary to about 200 m near the coast. Compared with the high-resolution mesh, the coarse mesh exhibits significantly reduced spatial detail in the NYH islands region. Specifically, the grid resolution is approximately 250 m around Manhattan, 80 m in the Kill Van Kull area, and about 200 m along the Hudson River. In the main shipping channel, the resolution varies between 60 and 70 m. We then performed model evaluations against the available

observations using both required and suggested metrics. We also documented the challenges in FVCOM-SWAVE modeling in our Round 4 project report to NOAA.

- The team performed a regression test to evaluate the relationship between atmospheric forcing and wave dynamics, utilizing the DATM component integrated with the WaveWatch III (WW3) model within the UFS-Coastal framework, focused on the Shinnecock Indian Nation in Long Island, New York.
- We implemented the nesting of National Water Model (NWM) into the FVCOM model. Documented the challenges and lessons learned in the Round 4 project report to NOAA.
- We updated the FVCOM testing team on the Round 4 modeling by giving a PPT presentation on September 29, 2025. We also participated the project discussions in the following months.

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).
Publications:

• Kelly, J.G.W., G. Seroka, A. Fujisaki-Manome, S. Pe'eri, J. Sienkiewicz, J., Feyen, O. Doty, K. Ide, B. Gramp, F. Ogden, T. Fanara, E. Myers, S. Moghimi, T. Cockerill, W. Wu., E. Anderson, K. Huelse, S. Memari, C. Forbes, Y. Liu, S. John, S.-C. San, H. Xu, O. Witmer, E. Di Lorenzo, K. Park, S. Wipperfurth, N. Sannikova, V. Titov, Y. Wei, C. Moore, C. Akan, A. Tejada, C. Chen, J. Zhang, S. Mani, Y. Chen, C. Lindley, C. Seaton, A. Allen, K.A. Haas, D. Toman, N. Weston, D. Titze, I. Rivin (2026), Advancement of NOAA's operational coastal ocean component of the Unified Forecast System by academia-government collaboration, Bulletin of the American Meteorological Society, (to be submitted)

• San, S.-C., Y. Liu, H. Xu, R.H. Weisberg, S. John, K. Qiao, J. Law, L. Zheng, S.A. Murawski, S. Gilbert, G.T. Mitchum, T.K. Frazer, S. Peeri (2026), Impact of wave-current interaction on storm surge simulation for Hurricane Ian, Ocean Modelling (revised)

• Drevillon, M., E. Chassignet, P.-Y. Le Traon, E. Bayler, F. Davidson, G. Smith, P.N. Vinayachandran, A. Schiller, E. A. Fanjul, K. Wilmer-Becker, S. Akella, S. Cuven, P. Bahurel, G. Brassington, D.-S. Byun, J.-B. Calewaert, F. Campuzano, Y.-K. Cho, B.-J. Choi, K.H. Christensen, S. Ciavatta, S. Ciliberti, E. Clementi, A. Conchon, G. Cossarini, J. Crespin, L. Cucurull, P. De Mey-Frémaux, C. Derval, Y. Drillet, M. Entel, Y. Faugère, I. Federico, K. Fennel, Y. Fujii, G. Garric, S. Guinehut, C. Harris, A. Hasson, F. Hernandez, E. Heslop, K. Hill, D. Horemans, M. Juza, C. Kerry, V. Kourafalou, A. Kurapov, J.-M. Lellouche, B. Levier, Y. Liu, G. Liu, N. Makrygianni, M. Martin, G. M. Balbontin, S. Masina, K Mogensen, A. Moore, L. Nerger, J.-P. Paquin, A. Paul, F. Pavanathara, J. Pearlman, C. Pelletier, J. Post, M.P. Buil, H. Regan, E. Remy, P.G. Remya, G. Ruggiero, A. Samuelsen, J. Skakala, A.K. Sperrevik, J. Staneva, A. Storto, C.A.S. Tanajura, A. Teruzzi, S. Thur, M. Tonani, J. Veitch, and L. Yu (2025), OceanPredict'24 symposium: Advancing ocean prediction science for societal benefit, Bulletin of the American Meteorological Society, 106(2), E2479-E2489, https://doi.org/10.1175/BAMS-D-25-0130.1

Conference presentation:

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1. Liu, Y., Xu, H., Qiao, K., John, S., San, S.-C., Weisberg, R.H., Chen, J., Zheng, L., Gilbert, S., Murawski, S.A., Mitchum, G.T., Frazer, T.K. (2025), Storm surge and coastal inundation nowcasts/forecasts during Hurricanes Helene and Milton. Abstract OS22A-06 presented at the 2025 AGU Fall Meeting, New Orleans, LA, 12/11-19/2025 (talk).

2. San, S.-C., Liu, Y., John, S., Xu, H., Qiao, K. (2025), Impact of wave-current interaction on storm surge simulation for Hurricane Ian. Abstract OS21A-06 presented at the 2025 AGU Fall Meeting, New Orleans, LA, 12/11-19/2025 (talk).

3. Liu, Y., Xu, H., Qiao, K., John, S., San, S.-C., Weisberg, R.H., Chen, J., Zheng, L., Gilbert, S., Murawski, S.A., Mitchum, G.T., Frazer, T.K. (2025), Storm surge and coastal inundation nowcasts/forecasts during Hurricanes Helene and Milton. The 2025 CERF Conference, Richmond, VA, 11/9-13/2025 (talk).

4. Liu, Y., Xu, H., Qiao, K., John, S., San, S.-C., Weisberg, R.H., Chen, J., Zheng, L., Gilbert, S., Murawski, S.A., Mitchum, G.T., Frazer, T.K. (2025), Storm surge and coastal inundation nowcasts/forecasts during Hurricanes Helene and Milton. The 2025 Unifying Innovations in Forecasting Capabilities Workshop (UIFCW25). Boulder, CO, 9/8-12/2025 (Virtual presentation).