Progress Report

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

Award number: #NA21NOS0120097
Period of Activity: 01/01/2026 – 06/30/2026
Principal Investigator(s): Debra Hernandez, SECOORA Executive Director

I. SUCCESS STORIES

- Yes, I have submitted one or more Success Stories from this award's reporting period via the Google Form. (see information marked with an asterisk below)

II. PROJECT MILESTONES:

Milestone Table (see next page)

Brief Project Desc. (5 words)	Milestones	Reporting Period												Status Update	Explanation of Delay or Change from Original Milestone
		7/21 – 12/21	1/22 – 6/22	7/22 – 12/22	1/23 – 6/23	7/23 – 12/23	1/24 – 6/24	7/24 – 12/24	1/25 – 6/25	7/25 – 12/25	1/26 – 6/26	7/26 - 12/26	1/27 - 6/27		
GOVERNANCE & MANAGEMENT															
Maintain SECOORA governance	Maintain the SECOORA governance and operational structure	X	X	X	X	X	X	X	X	X	X			On Track	
Maintain SECOORA's certification	Maintain SECOORA's certification as a RICE	X	X	X	X	X	X	X	X	X	X			On Track	
Annually update SECOORA's Strategic Operational Plan	Update the SECOORA RCOOS Plan	X	X	X	X	X	X	X	X	X	--	--	--	Completed	
OBSERVING															
Maintain existing long-term coastal and ocean observing operations	Operate and maintain existing real-time moorings offshore of NC, SC, and FL	X	X	X	X	X	X	X	X	X	X			On Track	
	Operate and maintain 20 HFRs regionwide	X	X	X	X	X	X	X	X	X	X	--	--	On Track	
	Conduct SAB glider missions	X	X	X	X	X	X	X	X	X				Completed	
	Maintain acoustic telemetry receivers on 6 stations in NC and FL	X	X	X	X	X	X	X	X	X	X			On Track	
	Maintain the soundscape observatory	X	X	X	X	X	X	X	X	X	--	--	--	Completed	
	Operate and maintain 3 non-real time moorings offshore of NC and FL	X	X	X	X	X	X	X	X	X	X			On Track	
Expand observing subsystem to address regional needs	Deploy and maintain Charleston Harbor, SC buoys (met and wave buoys)	X	X	X	X	X	X	X	X	X	X			On Track	
	Deploy and maintain 3 SoFar wave buoys off southeastern NC	--	--	X	X	X	X	X	X	X	X			On Track	Activity began in Year 2
	Deploy and maintain 2 buoys off the FL east coast	--	--	X	X	--	--	--	--	--	--			Completed	Activity began in Year 2, but project was moved to BIL funding
	Establish and maintain a regional network of water level sensors	X	X	X	X	X	X	X	X	X	X			On Track	
	Maintain the C22 pressure point mooring on WFS	X	X	X	X	X	X	X	X	X	X			On Track	
DMAC AND MODELING															
Maintain and enhance the DMAC subsystem	Maintain and enhance the SECOORA DMAC subsystem	X	X	X	X	X	X	X	X	X	X			On Track	
Maintain and enhance the Modeling and Analysis (MA) subsystem	Maintain the CNAPS model, move system to Cloud	X	X	X	X	X	X	X	X		--	--	--	Completed	
	Maintain the WFCOM and TBCOM models	X	X	X	X	X	X	X	X	X	X			On Track	
	Develop and maintain the pelagic Sargassum tracking model	X	X	X	X	X	X	X	X		--	--	--	Completed	
	Develop biological data analysis tools through integrations of SEAMAP-SA fish survey data	X	X	X	X	X	X	X	X	X	X			On Track	
	Construct an interactive AI portal	X	X	X	X	X	X	X	X	X	X			Completed	
ENGAGEMENT															
Engage with stakeholders	Support community networks (IOOS Association, SECART, regional data sharing, and community flooding network)	X	X	X	X	X	X	X	X	X	X			On Track	
	Support community driven networks (SOCAN, SCDRP, FACT)	X	X	X	X	X	X	X	X	X	X			On Track	
	Maintain and enhance the SECOORA outreach and engagement subsystem	X	X	X	X	X	X	X	X	X	X			On Track	
	Engage students through SECOORA scholarship and funding opportunities	X	X	X	X	X	X	X	X	X	X			Completed	
Product Development	Develop a situational awareness tool for weather forecasters and ocean rescue	X	X	X	X	X	X	X	X	X	--			Completed	
	Maintain & enhance products for shellfish & recreational swimming water advisories	X	X	X	X	X	X	X	X	X	X			On Track	
	Leverage Alaska water level portal to create a water level portal for the SE	X	X	X	X	X	X	X	X	X	X			On Track	

Environmental Compliance: No updates this reporting period

III. Progress and Accomplishments

SECOORA

Project and Task(s)	Status
GOVERNANCE SUBSYSTEM: Continue successful operation of the SECOORA governance and management subsystem	
Objective 1.A: 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 proposal for the next 5-year NOAA IOOS award. ● The 2026 SECOORA Annual Board and Members meeting was hosted in Atlantic Beach, NC May 20-21 with 65 people attending the event. The Annual Meeting recap can be found here: https://secoora.org/2026-secoora-annual-meeting/ ● 2026 Board Elections were held prior to the Annual meeting and the new Board members announced at the Meeting. New Board members include: Tom Frazer, University of South Florida (Academic/Research/Education), Christy Swann, RCOAST (Industry / Private Sector), and Erin Hague, Tetra Tech (At Large – FL). The Board recognized outgoing Board members Gary Mitchum and Bryan Franks for their service and contributions to the organization.	On-track
Objective 1.B: Maintain SECOORA's Certification as a Regional Association	
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 2024 and 2025 is available here: https://secoora.org/wp-content/uploads/2026/06/0-FINAL-SECOORA-FS-6.30.25-Final.pdf SECOORA is planning for the 2027 recertification process and has started assembling documentation. Our plan is to work with Tetra Tech to update the DMAC plan and reach out to NCEI to learn more about data sharing agreements and submit new agreements.	On-track
Objective 1.C: 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
Goal 2: Maintain and augment the SECOORA observing subsystem	
Objective 2.A: Maintain existing long-term coastal and ocean observing operations.	
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	On-track

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 HFR report that details HFR operators, system status, and IT infrastructure needs by site is available here – review the worksheet titled "1 - 6 2026": https://docs.google.com/spreadsheets/d/1n7JTPbX8MviTL-8SFblqSVPqdQAZTbjp/edit?usp=sharing&ouid=100282988206330317228&rtpof=true&sd=true	
SECOORA Glider Network	
The SECOORA glider team includes SkIO, the University of South Florida (USF), and UNC-Chapel Hill (UNC-CH). See table **IOOS, NOAA, Other Agency Funding** for summaries on Navy glider support and the OMAO Saildrone-Glider project. Accomplishments: ● USF was the host institution for the 2026 Underwater Glider User Group (UG2) Workshop despite a fire (described below) occurring several weeks prior. Due to the fire, a lab tour was impossible, but all other UG2 events were held as planned. ● The SECOORA Glider Network did not deploy any missions during the reporting period; all planned missions were completed previously. Challenges: ● The USF Marine Science Lab (MSL) suffered a major fire on 5/2/26 destroying the labs housing the gliders and supporting infrastructure. Fortunately, two of USF's gliders were deployed at the time of the fire and were recovered the following week. The four gliders within the MLS were recovered. Testing on the functionality of those gliders is ongoing at the time of this report. So far, none of these gliders have been deemed a complete loss. The USF glider group has been allocated lab space at the Maritime and Defense Technology Hub nearby, co-locating there with the SECOORA funded USF buoy team. ● While USF has developed a procedure for in-house service of the G1 glider forward ballast pumps, the capability to continue this maintenance is on hold due to the fire at USF. Test missions for two G1 gliders, UNCW Pelagia and NCSU Salacia, are planned for the 2026 hurricane season to evaluate the feasibility of their use going forward.	On-track
Sustain the SECOORA Real-Time and Non-Real-Time Mooring Network	
All real-time moorings/instrumentation have a targeted up-time of 85%. UNCW maintains 13 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:	On-track

- UNCW up-time statistics for 01/01/26 – 06/30/26 for real-time moorings:

	ILM2	ILM3	LEJ3	SUN2	CAP2	FRP2	CHR60
Air Temperature	100%	89%	92%	100%	95%	95%	95%
Air Pressure	100%	89%	92%	100%	95%	95%	95%
Wind Speed, Gust, Direction	100%	89%	92%	100%	95%	95%	95%
Salinity	98%	0%	81%	95%	95%	95%	16%
Surface Water Temperature	98%	0%	81%	95%	95%	95%	16%
Waves	95%	N/A	100%	100%	96%	92%	100%

Challenges:

- The ILM3 CTD failed on 10/17/25. Weather and personnel availability have hindered maintenance. The buoy is due for replacement and will be serviced in September. The CTD is independently powered and internally logs data. The CTD data will be shared via Research Workspace once it is recovered.
- The CHR60 CTD lost communications on 12/16/25. UNCW conducted a site visit on 06/9/26 and the CTD, cable, and data/telemetry system were replaced; however, the CTD lost communications again on 6/25/26. The buoy is due for replacement and will be serviced during the Fall 2026 turnaround cruise.
- The LEJ3 CTD had a period of lost communications from 03/06/26 to 03/22/26, and several short windows of poor communications. The buoy will be replaced on the same turnaround cruise with ILM3.

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 up-time statistics for 01/01/26 – 06-30/26 for real-time buoys:

USF	C10	C12	C13	C22
Wind	98%	92%	94%	97%
Air Pressure	98%	92%	94%	97%
Surface Water Temperature	98%	92%	94%	97%
Salinity (Surface)	98%	92%	94%	97%
Air Temperature	98%	92%	94%	97%
Relative Humidity	98%	92%	94%	97%
Longwave Radiation	98%	N/A	N/A	N/A
Shortwave Radiation	98%	N/A	N/A	N/A
Currents (ADCP)	51%	59%	97%	78%
Sub-Surface Temperature	N/A	N/A	N/A	N/A

Challenges:

• The fire at the USF MSL made field activities difficult during the reporting period; however, even with disruptions the team was able to continue buoy operations and maintenance. • Station C10 and C22 ADCP up-time fell to less than 85% due to sensor-bulkhead-cable communication issues to the data logger. • The C12 ADCP fell below 85%, due to a server issue following the MSL building fire. Data was transmitted continuously but not inserted into the database. The team is working on backfilling this data.	
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. Water level sensor data can be viewed here: https://wl.secoora.org. SECOORA operates 6 water level stations: 4 in NC and 2 in SC. All 6 have uptime stats greater than 85%. SECOORA Accomplishments: • The Bluffton, SC water level sensor was installed on 1/20/26 at the Calhoun Town Dock. • The Dorchester County water level sensor was installed on the Hwy 78 bridge on 2/12/26. Georgia Tech (GT) previously operated 17 water level stations in GA; however, LoRaWAN based sensor architecture turned out to be a poor fit for sustained deployment along the Georgia coast (see previous progress reports). GT is in the process of replacing all the originally deployed sensors with new sensors purchased from Green Stream. The new sensors will use cellular telemetry, improving communications, and increasing up-time statistics. GT Accomplishments: • On 4/29/26, 3 new Green Stream water level sensors were deployed in Chatham County, GA, replacing the older GT sensors installed in these locations: Hunt Drive at Burnside Island, Solomon Bridge, and Savannah State University. These stations are now reporting above 85%. ASBPA/Hohonu currently operates 31 water level stations across the SECOORA region. While 34 were originally deployed, 3 stations were decommissioned as the partners were no longer interested in helping maintain them (Colington Creek and Cape Lookout National Seashore) or repeated vandalism required the station to the removed (Snows Cut at Carolina Beach, NC). All work for ASPBA/Hohonu is complete as of this report. ASBPA/Hohonu Challenges: • The Emerald Isle, NC sensor went down on 4/9/26 and a new sensor was sent in	On-track

June. It should be replaced by town staff during the next reporting period.

- The Topsail, NC station went offline mid-February due to being taken down mistakenly by a contractor and lost. A new sensor was shipped to the town, and it went online in mid-May.
- The Hilton Head, SC water level sensor when offline in November 2025 due to corrosion. A new gauge was installed 6/1/26.
- The old water level sensor in Sanibel, FL was removed in October 2025 and a new sensor re-installed mid-February, 2026.

Uptime stats by operator and station are listed below:

Station Name	Owner	Uptime (%)
Belhaven, NC	SECOORA	99%
Bayside (Chocowinity, NC)	SECOORA	100%
Love Grove Bridge (Wilmington, NC)	SECOORA	99%
Alligator, NC	SECOORA	99%
Hwy 78 Dorchester County, SC	SECOORA	100%
Bluffton, SC	SECOORA	99%
Hunt Drive at Burnside Island, GA	GT	90%
Solomon Bridge, Savannah, GA	GT	90%
Savannah State University Dock	GT	90%
St Mary's Waterfront Pavilion, GA	GT	40%
Noth River Causeway, GA	GT	0%
Meeting Street Boat Ramp, GA	GT	0%
Montgomery Cross Road at Vernon River	GT	0%
Tybee Island 4 H Center Dock, GA	GT	80%
Shipyard Road, Savannah, GA	GT	0%
Hwy 80 at Chimney Creek, GA	GT	0%
Turner Creek Boat Ramp, GA	GT	0%
Walthour Road, Savannah, GA	GT	0%
Lazaretto Creek Fishing Pier, Savannah, GA	GT	0%
Catalina Drive, Savannah, GA	GT	0%
SkIO Dock	GT	60%
Hwy 17 at Salt Creek	GT	0%
UGA Marine Extension Dock	GT	80%
Oyster Landing (N Inlet Estuary), SC	Hohonu	99%
The Citadel, Ashley River, SC	Hohonu	100%
Marine Corp Recruit Depot Parris Island, SC	Hohonu	100%
Georgetown County Hwy 701 Bridge, SC	Hohonu	100%
Georgetown, SC	Hohonu	100%
Hilton Head, SC	Hohonu	16%
Port Royal Sound Foundation, SC	Hohonu	92%
Fripp Island, SC	Hohonu	100%
City of Beaufort, SC	Hohonu	100%

Isle of Palms, SC	Hohonu	100%	
North Myrtle Beach, Cherry Grove, SC	Hohonu	100%	
Folly Beach, SC	Hohonu	100%	
Sullivan's Island, SC	Hohonu	100%	
Washington Acres Boat Ramp, NC	Hohonu	100%	
Hammocks Beach State Park, NC	Hohonu	99%	
New Bern, NC	Hohonu	100%	
Fort Raleigh National Historic Site, NC	Hohonu	96%	
Emerald Isle, NC	Hohonu	50%	
Duck, NC	Hohonu	100%	
Holden Beach, NC	Hohonu	100%	
Topsail Beach, NC	Hohonu	51%	
Surf City, NC	Hohonu	100%	
Bald Head Island, NC	Hohonu	100%	
Ocean Isle Beach, NC	Hohonu	88%	
Captiva Island, FL	Hohonu	100%	
Mexico Beach, FL	Hohonu	100%	
John's Pass, FL	Hohonu	100%	
Fernandina 2, FL	Hohonu	94%	
Sanibel, FL	Hohonu	73%	
Fernandina 1, FL	Hohonu	100%	

SECOORA Biological Data Collection

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

Goal 3: Implement, integrate, and expand the Data Management Cyberinfrastructure, and Modeling and Analysis subsystems

Objective 3. A: Maintain and enhance the DMAC 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, specifically upgrading THREDDS to version 5.8.	On-track

• Maintain IOOS compliant services and applications for integration with national products.
  ○ THREDDS 5.8- https://thredds.secoora.org
  ○ ERDDAP 2.30 - https://erddap.secoora.org
  ○ SECOORA ISO WAF - https://thredds.secoora.org/iso
• 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. A water level datum converter was completed and integrated into the SECOORA data portal.
• 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. Updated datasets include:
  ○ FACT Temperature updates
  ○ ESONS soundscape data
  ○ Looe Key, FL OA sensor (SeapHOx)
  ○ UGA HABS data
  ○ Water level stations (Hohonu, FAU, Clemson, Green Stream, and UNCW)
• Completed updates to NDBC for buoy data feeds
• Promote data discovery and public access through the SECOORA data catalog and data portal (https://portal.secoora.org).
• Implement real-time sensor QARTOD compliant quality control systems. Updated Water Level QC frequency to hourly where possible.
• Resolve bugs or issues, such as implementing fixes for the Hohonu API, debugging the FWRI AI gateway, and correcting minor issues with the data feed for the Sebastian Inlet State Park ADCP (operated by FIT).	

Objective 3.B: Maintain and enhance the Modeling and Analysis subsystem	
CNAPS Model: The CNAPS model is operated and maintained by NC State University (NCSU) and Fathom Science. All work for CNAPs has been completed.	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. Accomplishments: • 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	On-track

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 project team maintained WFCOM- and TBCOM based water level projection product for the entire west Florida coast and expanded to the east Florida coast by adding the output from the new East Florida Coastal Ocean Model (EFCOM). This Unified Water Level (Storm Surge) Forecast Guidance Product is set to run daily and is ready for this hurricane season. https://ocl.marine.usf.edu/Models/WFCOM4/SeaLevel/ ● Maintenance of the red tide short-term tracking and forecast product is also ongoing. https://ocl.marine.usf.edu/Models/WFCOM4/HAB_tracking/ Challenges: ● The USF MSL fire on 5/2/26 impacted modeling hardware/infrastructure. Computers for the pre- and post-processing of the daily automated model runs and the data servers were recovered as quickly as possible; however, the computers sustained extensive smoke damage that is likely to require replacement in coming months.	
3.B2. Integrate improvements in the analysis components of the modeling and analysis subsystem to speed transformation of data into information required by users.	
AI Portal: Florida Wildlife Research Institute (FWRI) and Tetra Tech completed work on an artificial intelligence annotation data portal (AI portal) by collecting feedback on the portal from stakeholders. In addition, the data portal was launched in January, and can be accessed at https://ai-gateway.secoora.org/ Accomplishments: ● The machine-learning powered boat detector that was built using data from the west coast of Florida was expanded and applied to preliminary data from the Florida Keys. FWRI researchers monitor fisheries populations at Western Dry Rocks, an important spawning ground for recreationally and commercially important species several miles offshore of Key West. Western Dry Rocks has recently become subject to a seasonal closure to protect these species during the critical spawning periods. As part of the monitoring effort, researchers have installed hydrophones to listen to fish noises and detect boating in the area. Using the model, the boat detector was able to detect boat noise in a preliminary sample of data with 85-90% accuracy. This result shows that the boat detector is very promising to provide information about boat use of the area both during the closed and open seasons.* ● Collaborators from University of South Carolina Beaufort and Florida International University received technical assistance to start annotating and using the boat detector data. ● University of Miami staff updated python scripts and associated Github repositories of products featured on the AI Gateway.	Complete

SEAMAP-SA Data and Analysis: During this reporting period, primary goals were to 1) finalize the Administrator interface to allow the upload of survey data directly from there (Tetra Tech), 2) update the front-end data visualization interface to test visualization products and data downloads (Tetra Tech), 3) provide corrected data based on Administrator interface uploads (SCDNR), and 4) provide new data from surveys as it became available (SCDNR). Tetra Tech developed the Administrator interface to the point that it successfully uploaded all surveys and data types into the system. The interface also provides error details, although some additional finesse of the error formatting is desired by both Tetra Tech and SCDNR to identify why uploads failed and to what extent (multiple or single records). The front-end interface was demonstrated by Tetra Tech during this reporting period and comments were provided by SCDNR on filtering capabilities and raw data downloads. Additional data were made available for Coastal Longline Surveys and the Pamlico Sound Survey. Monthly calls between Tetra Tech and SCDNR continue to move progress forward.	On-track
Goal 4: Effectively implement the engagement subsystem to support product co-design and delivery	
Objective 4.A. Engage with stakeholders to identify and respond to their needs	
4.A1. Support community-driven networks focused on priority societal issues aligned with SECOORA's mission and Strategic Plan See "NOAA, IOOS, Other Agency Funding" table, starting on page 12	On-track
4.A2. Maintain and enhance the SECOORA outreach and engagement subsystem to address priority issues in the region ∉ SECOORA hosted the 2026 Vembu Ocean Scholars awards. The scholars joined SECOORA at our 2026 SECOORA Annual Meeting in Atlantic Beach, NC. During the meeting, they were paired with mentors from the SECOORA membership who supported networking, career conversations, and connections within our community. The awards were made to: ○ Hayden Dunning, USC Beaufort ○ Marcus Cote, Florida Institute of Technology ○ Linda Hargrove, NC State University ∉ SECOORA released 16 news stories on the website: https://secoora.org/news/. Of these, 7 stories were in partnership with the Marine Biodiversity Network (MBON). SECOORA started an Instagram account this reporting period as well. 86 posts were made to LinkedIn, Instagram, and Facebook: ○ LinkedIn: 35,902 Impressions with 394 new followers ○ Instagram: 9,061 Impressions, 66 new followers ○ Facebook: 6,562 Impressions, 35 new followers ∉ SECOORA hosted 2 webinars for the Coastal Observing in Your Community Webinar Series: https://secoora.org/webinar-series-index/ ∉ SECOORA showcased 2 Web camera story maps:	On-track

○ https://secoora.org/charleston-coastal-flood-monitoring-camera-network/ ○ https://secoora.org/real-time-shoreline-monitoring-in-north-carolina/	
Objective 4.B: 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. Recent updates include a datum converter so that people can change between datums at tidally influenced sites (e.g. change between NAVD88 and MHHW).	On-track
SECOORA developed data products and websites: ∉ The SECOORA Hurricane Resources page was updated for the 2026 hurricane season (https://secoora.org/hurricane-resources/. ∉ A USF post doc was hired to analyze subsurface and surface water temperature data for a Marine Heat project (see ROP section in the IOOS, NOAA, Other Agency Funding section). During the next reporting period, SECOORA will begin work to transform the post doc's results into a Marine Heat product.	On-Track
The How's the Beach (HTB) project team is comprised of representatives from three existing products: HTB (University of South Carolina (UofSC)), ShellCast (NCSU), and Beach Condition Reporting System (BCRS, Mote Marine Laboratory). Accomplishments: ● Following successful 10DLC registration in the last reporting period, the project team updated the front- and back-ends of ShellCast to ensure compliance with text and email notification requirements and then conducted a series of tests to ensure notification subscription and delivery processes were properly implemented. ● The HTB layer was integrated into the BCRS mobile apps, and updated mobile apps for iOS and Android were pushed to production and are live to the public. ● Internal review of Spanish translations of the BCRS website and mobile app were conducted, and implementation plans are under development.	On-track

IOOS, NOAA, Other Agency Funding	
Funding Area/Recipient	**Progress**
Modeling/UNC-Chapel Hill	PIs Brian Blanton & Rick Leuttich • Status: On-track • **Appendix A**
Modeling/UNC-Chapel Hill	PI Shintaro Bunya • Status: On Track • See **Appendix B**
Modeling/University of Florida	PIs Maitane Olabarrieta and Zhe Jiang • Status: Complete

	• See **Appendix C**
DMAC	PI Filipe Fernandes • Status: Complete • See **Appendix D**
Gliders/SECOORA	Lead PI: Catherine Edwards, UGA SkIO to support Navy glider deployments and recoveries during 2026 Atlantic hurricane season • Status: On-track • SkIO coordinated the logistics to receive ship 2 Navy gliders for the 2026 season. The gliders were received in June and are expected to be deployed in mid-July 2026. • PI Edwards participated in pre-season briefings with Naval Oceanographic Office (NAVO) Glider Operations Center (GOC) personnel to discuss piloting strategies in the Gulf Stream.
Harmful Algal Blooms (HABS)	PI Michael Parson, Florida Gulf Coast University (FGCU), Maintain and enhance the network of long-term water quality and HAB monitoring stations in southwest Florida. • Status: On-track • FGCU has established a long-term water quality sensor network as an early warning system for potential HABs and acute water quality events (e.g., run-off). There are YSI EXO2 sondes deployed at 6 live streaming fixed stations collecting water quality data every ten minutes at: Vester Field Station (Bonita Springs, FL), Gulf Star Marina (Fort Myers Beach, FL), New Pass Bridge (Fort Myers Beach, FL), Sanibel Island's city dock (Sanibel Island, FL), Mound House Museum (Fort Myers Beach, FL), and Cocohatchee River Park (Naples, FL). • FGCU is also using other tools to determine HABs, such as an Imaging FlowCytoBot (IFCB). Currently, the IFCB is still running archived samples as was down due to the need for numerous repairs and maintenance during the reporting period. • FGCU has been using YSI ProSample P autosamplers at Vester Field Station, Gulf Star Marina, New Pass Bridge, and Sanibel Island to collect water samples every hour for 24 hours at each site. A total of 5 deployments were completed since January 2026. All twenty-four sample bottles of water will be analyzed using a Turner Trilogy fluorometer for extracted chlorophyll a (EPA Method 445.0). Samples from each hour were preserved for IFCB analysis. PI Natalie Cohen, UGA Marine Extension, Identification of environmental conditions that are conducive to HAB formation in Georgia estuaries. • Status: On-track • UGA is performing statistical analyses on 3+ years of high resolution HAB monitoring data for the Skidaway River Estuary. A random forest machine learning-based approach was used to determine variables predictive of HAB accumulation, with tidal range being a highly ranked feature. Observations support blooms occurring during

	periods of high temperature, low nitrogen concentrations, and low tidal range, when cells are compressed in volume at low tide. Ongoing statistical analyses are being explored to further determine combinations of variables associated with HAB accumulation. Notably this year, the 4th year into HAB monitoring, Akashiwo cells were observed to accumulate for the first time in the spring, likely reflecting a colder-water ecotype as found in other ecosystems. An uptick in cells almost reaching bloom levels (~70 cells/mL) was observed this year in late June, which is the earliest in the 3+ year timeseries record. UGA is in progress of carrying out a fluid imaging methods intercomparison between the FlowCam and Planktoscope, with early results showing both methods reflect similar Akashiwo cell densities and supporting interchanging these quantitative instruments going forward.
HFR retuning/testing/ additional work and/or recap HFR station	Status: On-track Accomplishments: • SECOORA has used funds to pay for repairs to CODAR HFR equipment owned and operated by USF and CSI. • SECOORA is working with Dusek Coastal Science & Consulting which is leading a review of the SECOORA HFR system. The HFR program faces persistent operational and utility questions: uptime has fallen short of targets (well below the overall SECOORA goal of 85% up-time), the current user base is not well documented, and decisions on station siting, technology (WERA vs. CODAR), and build-out priorities need a clearer evidence base. Dusek Coastal Science & Consulting will address these issues by: ○ Identifying existing and potential users of SECOORA HFR data and characterize how they use (or would use) it. ○ Assessing user requirements, including whether the primary need is near real-time quality-controlled radial data or derived products. ○ Defining geographic priorities for HFR coverage in the SECOORA region. ○ Establishing operational requirements and success criteria (including uptime and product quality) for future HFR operations. ○ Recommending how SECOORA can better allocate HFR resources to maximize value. • A draft report will be provided to SECOORA and the IOOS program office by August 2026 with a final report due in September.
Marine Life/SECOORA	Data Wrangler for the FACT Network • Status: On-track • See **Appendix E**
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

	• The MAPCO2 electronics package, iridium antenna, SAMI and Seabird were replaced at the Grays Reef buoy in December 2025, but the system only operated for a brief period before shutting down. It was determined that the battery voltage suddenly decreased, causing the MAPCO2 not operate. The team was able to change out the battery pack, equilibrator and associated cables in January. In addition, sensors were replaced at Grays Reef buoy research site in May. • 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.
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 collaborate with the CANs to assess research and monitoring gaps, overall social and economic vulnerabilities, and impacts to tribal and cultural groups in the regions. SOCAN, GCAN and MACAN completed a comprehensive list of groups who might be affected by acidification throughout the Southeast, Gulf of Mexico, and the Mid-Atlantic. • SOCAN hosted a virtual webinar in January on the OA Day of Action. Each SOCAN virtual meeting is available on the SOCAN website. • SOCAN partnered with MACAN to plan and host a community listening session in Washington, DC in June 2026. • SOCAN continues collaborating with Mote Marine Laboratory to synthesize the Looe Key, FL SeapHOx data. Co-PI Reimer submitted some of the synthesized data to Research Workspace for inclusion in the SECOORA data portal and continues add new data. SOCAN also secured a small award from NOAA's Ocean Acidification Program to conduct data synthesis. The Looe Key data that has been synthesized to date was presented at the NOAA OAP Meeting in May 2026. • SOCAN continues its social media presence on Facebook Ocean Acidification Information Exchange, and email updates to members.
Regional Ocean Data Sharing Initiative, Lead PI Debra Hernandez, SECOORA	SECOORA Regional Ocean Data Sharing Initiative - OCM to IOOS funding for Regional Ocean Partnerships **Southeast and Caribbean Disaster Resilience Partnership (SCDRP)** – Note that SCDRP is funded through ROP and SECART funding. • Status: Complete • The SCDRP 10th Annual Meeting was held in Charleston, SC, March 4-5, 2026. The meeting theme was “Navigating Extreme Events: Doing More With Less, Together.” The meeting highlighted proactive, collaborative strategies for navigating disasters in a future where state and local entities must continue to lead disaster preparedness, response, and recovery with potentially fewer resources. The meeting convened 140

	practitioners and stakeholders from across sectors and fields to identify and share innovative approaches that enhance state, territorial, tribal and local emergency management capacity and disaster preparedness, response, and recovery. The meeting featured expert panel discussions, a demonstration field trip, interactive activities, and networking opportunities. The meeting was planned by a 15-member Steering Committee, which met monthly. This was the most highly attended Annual Meeting that SCDRP has held thus far. All sessions were recorded and posted on the SCDRP Youtube Channel. The Meeting Program, Lunch and Learn Summaries, meeting photos, and Session/Speaker resources were posted on the SCDRP website: https://www.scdrp.secoora.org/annual-meeting-2026 • In addition to the annual meeting, five Advisory Board Meetings and four virtual monthly member meetings were held during the reporting period. **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, led the SECOORA data analysis efforts and works collaboratively with the other RAs. During the reporting period, all remaining activities were completed. Nickerson successfully rewrote code to pull environmental data from ERDDAP servers after major modifications to the server broke the original code. Nickerson also finished generation of sea surface and subsurface climatologies, completed sea temperature trend analyses, and conducted a marine heatwave (MHW) analysis. Nickerson also consolidated data workflow to be more efficient and finished the code library. A GitHub repository was created and published: https://github.com/SECOORA/marine-heat
SECART 1 &2/support for SCDRP	SCDRP –Note that SCDRP is funded through ROP funds as well as SECART funding. • Status: Complete • 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 • Final planning and preparation for the 2026 ECOA cruise took place during the reporting period. The first leg of ECOA was successfully executed (6/8/26-6/29/26), sampling waters in the Gulf of Maine, Long Island Sound, the Gulf of St. Lawrence and adjacent offshore regions. • The second leg ECOA begins in July. It will sample in the Mid and South Atlantic Bights, and adjacent offshore regions.
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: Complete

	• See **Appendix F**
Modeling, University of South Florida	PI Yonggang Liu • Status: Complete • See **Appendix G**
Saildrone/Glider Project, SkIO	PI Catherine Edwads • Status: Complete • See **Appendix H**

IV. CERTIFICATION UPDATES:

- No executive staff changes have occurred that would impact certification; however, the Water Level Manager and the SECOORA WebCOOS manager are no longer working with SECOORA.
- SECOORA advertised for an Ocean Observing System Lead in June, interviewed candidates in late June, and offered the role to someone who will start 9/1/26.

V. ADMINISTRATIVE UPDATES:

- Were the oldest ASAP TAS BETC accounting lines invoiced first?

  Yes

  No
- 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 $10,000 or more per unit during the period.
  - No equipment was purchased by SECOORA during this reporting period.
- Were any funds re-budgeted into cost categories different than indicated in the proposal/descope? If so, please indicate what changed by referencing your approved budget or descope documentation. Please include a description of the new item of cost and a justification. *REMINDER: Re-budgeting may require prior approval (e.g., equipment). You must obtain prior approval for those actions listed in 2 CFR 200.308(f) (see Question #5).*
  - Funds were not re-budgeted into different cost categories; however, the mechanism for the expenditure of supplemental Navy Glider funds has changed. These funds are budgeted in the "Other Cost" category and originally were going to be issued as a sub-award to USF or SkIO for their Navy Glider work. Based on conversations with PIs at USF and SkIO, SECOORA is holding the funds in the "Other Cost" category and SECOORA will use the funds to pay for ship time for the deployment and recovery of the Navy gliders. SkIO will coordinate with vessels and arrange glider deployment/recovery and SECOORA will pay for the ship cost which are an allowable "other cost".
- Is spending on target and all funds plan to be expended by the end of the award?

  Yes

  No (If no, explain below)
- Review the list of eRA Revision Request options.

None of the Revision Requests apply to this reporting period.

Revision Requests option applies to this reporting period; we will submit an official Revision Request.

End Report

SECOORA PROGRESS REPORT: JANUARY 1 - JUNE 30, 2026

PI: Brian Blanton

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

2021-2026 SECOORA PROGRESS REPORT

PROGRESS TOWARDS OBJECTIVES

1 Provide a summary of progress towards meeting your project objectives for the six-month reporting period. Pay special attention to the six-month reporting period accomplishments and the broader impacts related to those findings. Indicate if you anticipate any substantive changes to the project Scope of Work (SOW) as you complete the information below. List each objective and text that describes progress towards meeting the objectives 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.

This phase of the SECOORA/IOOS/NOAA project is computing a long-term reanalysis of coastal water levels for parts of the Pacific Ocean. The initial focus has been on US waters in the "eastern" Pacific (EPAC), from California to the lower Alaskan coastline (equator ward of the Aleutian Islands. The same modeling and data analysis techniques are used as in the previously described GEC version (Atlantic and Gulf of Mexico coasts). The approach uses meteorological forcing from ECMWF's ERA5 reanalysis (Hersbach et al, 2022), observed water levels from the NOAA/NOS NWLON gauge collection, and water level predictions from the ADCIRC model. A prior prediction is computed using ADCIRC and ERA5 (and astronomical tides) and compared to observed water levels. This prior error is then ingested back ADCIRC using a data assimilation (DA) approach described in Asher et al (2019) and results in an improved prediction. The reanalysis simulation period is 1979-2025, and the simulations include wind-waves from the SWAN model. In previous reports, the progress and results from the Gulf and East Coast (GEC) were described.

In the previous reporting period, we described the progress and status of four key topics: development of the EPAC ADCIRC grid; acquisition of input datasets from ERA5; implementation of wind-wave spectra on the ADCIRC grid's open boundary; and gathering / processing of the NWLON water level data.

For this reporting period, the four aspects above came together by computing the complete prior simulation, resulting in the prior water level dataset for the 47-year period. The simulations included tides, meteorology, Columbia River discharges, and bulk wave spectra from ERA5 (a notable extension of the GEC simulations). We note that the simulations were carried out by J. Ratcliff on NOAA HPC resources, using a model scheduling framework developed by UNC for the Reanalysis project, representing a substantial “handoff” of modeling capability to NOAA. UNC worked extensively with Ratcliff to set up the scheduling software, ensure all the needed input data was transferred, and to vet the simulations. Several iterations were needed to address model stability issues that arose for specific simulated years (a typical issue when working with a new ADCIRC grid). In preparation for error analysis, the observations were processed into monthly mean and "residual" components, and the latter was 36-hour low-pass filtered, the same process used for the GEC.

Significant progress has been made on the development of an enhanced version of ERA5 meteorology that includes more energetic and higher-resolution hurricanes. This entailed re-writing the asymmetric wind model (GAHM), development of a method to remove the representation of a hurricane in a coarse meteorological model (in this case, ERA5) and blending the GAHM-generated vortex back into the ERA5 larger-scale fields. These components were tied together in this reporting period and includes a MATLAB code that builds the netCDF file that ADCIRC needs to seamlessly merge the high-resolution hurricanes with the larger-scale atmosphere. [Preliminary versions of this workflow were presented at the January 2025 AMS meeting.]

Lastly, we have extended the GEC reanalysis period through 2025. In this period, the prior solution (2023-2025) was computed and analyzed. The posterior was not completed in this period.

The UNC group continues to engage with the NOAA team through twice-monthly meetings where progress and status toward the overall objectives of the reanalysis project are described and discussed. Additional, more detailed technical discussions have been held on an as-needed basis to address specific modeling objectives and issues, such as the Columbia River outflow and SWAN wind-wave model performance.

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.

- Luettich, Rick, et al. "Enhancing Global Meteorological Reanalysis with a Parametric Model of Tropical Cyclone Wind and Pressure Fields for Extreme Water Level Prediction." 106th AMS Annual Meeting. AMS, 2026.

SECOORA PROGRESS REPORT: JANUARY 1 - JUNE 30, 2026

PI: Shintaro Bunya

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

2021-2026 SECOORA PROGRESS REPORT

PROGRESS TOWARDS OBJECTIVES

1 Provide a summary of progress towards meeting your project objectives for the six-month reporting period. Pay special attention to the six-month reporting period accomplishments and the broader impacts related to those findings. Indicate if you anticipate any substantive changes to the project Scope of Work (SOW) as you complete the information below. List each objective and text that describes progress towards meeting the objectives 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 advanced the implementation of sub-grid methods within a Discontinuous Galerkin (DG) framework using P0/P0 (constant/constant over the element) and P0/P1 (constant/linear over the element) finite elements for elevation and velocity. We systematically refined wet/dry implementations and integrated necessary Riemann solvers to resolve the high-gradient numerical instabilities along mesh edges identified in the previous period. The addition of a rain-on-mesh capability has substantially advanced total water level (TWL) computational skill. The code is now thoroughly verified; we have proven its well-balanced property (a water body at rest will stay at rest) and successfully replicated both one-dimensional river channel flow across a floodplain and the historic Iwagaki (1955) benchmark for rainfall runoff on a variably sloped floodplain.

The STOFS 2D Global mesh was extended to the boundaries of the Houston/Galveston regional hydrologic basins, ensuring that inflows are cleanly constrained to control points at the San Jacinto River (Lake Houston) and the Trinity River. We completed interior remeshing to align raised infrastructure with mesh edges and improve subgrid solution accuracy. Validation efforts are actively underway using USGS and NOAA hydrographs alongside Hurricane Harvey high-water marks, while a new rainfall infiltration module is being tested with both Hurricanes Harvey and Ian. No substantive changes to the project Scope of Work (SOW) are anticipated.

Broader Impacts:
* Academic Development: The project continues to support the development of the next generation of coastal scientists through our ongoing collaboration with the University of Notre Dame, providing technical guidance to a PhD candidate focusing on these advanced hydrodynamic features.
* Operational Feasibility: Resolving localized edge instabilities and completing strategic mesh alignments brings high-fidelity, compound-flood subgrid models significantly closer to real-time operational deployment, enhancing disaster preparedness and infrastructure protection.

Task 1: Complete and Integrate the DG Subgrid Model with Rain-on-Mesh Capability.
* Status: On-Track.
* Progress: Advanced the core sub-grid architecture within the DG framework using P0/P0 and P0/P1

element formulations. Wet/dry handling and Riemann solvers were systematically refined. The framework's rain-on-mesh capability is fully operational. Mathematical verification was achieved by proving the well-balanced property and replicating the 1D river channel and Iwagaki (1955) experimental flood benchmarks.

Task 2: Validate the Subgrid Model for Extreme Events.
* Status: On-Track.
* Progress: A rainfall infiltration module has been implemented and is undergoing hindcast testing against Hurricanes Harvey and Ian. Discrepancies and spatial variability among precipitation datasets (NOAA's MRMS, HRRR, and the Harris County FWS) were extensively analyzed. To quantify exact rainfall product accuracy, sensitivity testing is being conducted on the enclosed western reaches of the regional domain. Model outputs are being validated against USGS gauges, NOAA hydrographs, and Hurricane Harvey high-water marks.

Task 3: Develop and Operationalize Regional Models.
* Status: On-Track.
* Progress: The high-resolution regional domain was successfully expanded to the hydrologic boundaries of the Houston/Galveston basins. Interior remeshing is progressing, ensuring that raised roads align with mesh edges and elements accurately straddle channels to optimize subgrid physics. Current work targets correcting bathymetric profiles in high-elevation channels where DEM-based LiDAR extracts only water surface heights, alongside setting appropriate Manning n bottom roughness coefficients for these channels.

Prioritized Tasks Over the Next 6 Months:
Work during this period focused on implementing rain-on-mesh capabilities , advancing the subgrid framework, and initiating the setup for validation with a focus on infiltration processes. To ensure successful project completion, activities over the next six months will prioritize two key tracks:

Validation: Finalize high-fidelity hindcast simulations for Hurricanes Harvey and Ian. These steps will be validated against observed high water marks and hydrographs to accurately assess total water level predictions. A primary focus will be finalizing the infiltration modeling approach required to capture West Florida's specific soil properties and hydrological response during Hurricane Ian.

Regional Model Deployment: Develop and operationalize the regional models for key areas in West Coast Florida, including Tampa and Fort Myers. This deployment will focus on utilizing the refined subgrid features to accurately capture the intricate hydrodynamics of urban and suburban channels.

2 Describe education or outreach materials related to this award that have been developed within this six month reporting period.
Mentorship and Academic Outreach:

- PI Shintaro Bunya continues to provide technical guidance, algorithmic review, and research advice to a PhD candidate at the University of Notre Dame within the research group of Prof. Joannes Westerink. This collaboration supports educational development and knowledge transfer regarding the implementation of advanced hydrodynamic features within the operational sub-grid modeling framework.

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. 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.

Product: Optimized ADCIRC DG-Subgrid Solver (with Rain-on-Mesh and Infiltration)
Status: Under Development.

Description:
The hydrodynamic solver now features an advanced DG sub-grid framework (P0/P0 and P0/P1 elements), robust Riemann solvers for high-gradient stabilization, integrated rain-on-mesh capabilities, and a newly implemented rainfall infiltration module. The solver's core code has been formally verified against established physical benchmarks (1D channel flow and Iwagaki 1955).

Transition:
These structural and algorithmic upgrades directly accelerate the transition of high-fidelity regional frameworks into NOAA's STOFS 2D Global operational forecast architecture, ultimately providing superior decision support during severe compound flooding events.

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.
Rigorous Code Verification Success:
Proving the well-balanced property of the solver and successfully replicating the historic Iwagaki (1955) variably-sloped floodplain benchmark establishes a highly stable, verified mathematical baseline. This ensures that the code handles real-world coastal hydrology accurately without introducing numerical artifacts.

Precision Interior Remeshing Success:
Conducting the interior remeshing to align grid boundaries perfectly with raised road features and channel geometries represents a breakthrough for regional modeling accuracy. This targeted mesh refinement mitigates the subgrid solution errors typically caused by complex, steep-gradient urban topography in the Houston/Galveston region.

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

SECOORA PROGRESS REPORT: JANUARY 1 - JUNE 30, 2026

PI: Maitane Olabarrieta

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

2021-2026 SECOORA PROGRESS REPORT

PROGRESS TOWARDS OBJECTIVES

1 Provide a summary of progress towards meeting your project objectives for the six-month reporting period. Pay special attention to the six-month reporting period accomplishments and the broader impacts related to those findings. Indicate if you anticipate any substantive changes to the project Scope of Work (SOW) as you complete the information below. List each objective and text that describes progress towards meeting the objectives 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.

This final report summarizes progress toward completion of the project objectives (listed below). During the project, the team developed and evaluated CoastCast, an AI-based surrogate modeling framework for rapid coastal storm surge and water-level prediction. The work resulted in an AI-ready coastal water-level dataset, two trained surrogate models, a multi-day forecast workflow, quantitative model skill assessment, and a scientific manuscript documenting the methodology and results. No substantive changes to the project Scope of Work are anticipated or requested at project closeout.

- Objective 1: Develop an AI-ready coastal water-level dataset for training and evaluation. — Complete
This objective was completed. The project assembled and processed a large-scale coastal forecasting dataset using NOAA Coastal Ocean Reanalysis (CORA) water levels, ERA5 atmospheric forcing, astronomical tidal forcing, static bathymetry, and open-boundary information. The dataset spans 44 years, from 1979 to 2022, with hourly temporal resolution and an approximately 2-km spatial grid over the U.S. East Coast from Cape Hatteras to the Gulf of Maine. A key outcome was the decomposition of total water level into astronomical tide and non-tidal surge anomaly using harmonic analysis and Lanczos filtering. This step provided separate targets for surge anomaly and total water level and supported training strategies that account for the rarity of high-surge events. The final processed dataset provides a foundation for AI-based coastal water-level prediction and future scenario analysis.

- Objective 2: Develop and train AI surrogate models for storm surge and total water-level prediction. — Complete
This objective was completed. The team developed CoastCast, a deep-learning surrogate for multi-day coastal storm surge and water-level forecasting. The model uses a spatiotemporal transformer architecture that incorporates the initial ocean state, future atmospheric forcing, astronomical forcing, static bathymetry, and open-boundary conditions. Two complementary models were trained: one for non-tidal storm-surge anomaly and one for total water level. The training strategy used the long-term CORA-based record, with 1979-2018 used for training, 2019-2020 for validation, and 2021-2022 reserved for independent testing. The model architecture was designed to capture both local coastal variability and longer-range spatial and temporal dependencies that are important for surge propagation, tide-surge interaction, and multi-day (~5 day) water-level evolution.

- Objective 3: Evaluate model skills for multi-day coastal water-level forecasting. — Complete
This objective was completed. The team conducted a comprehensive evaluation of CoastCast using the held-out 2021-2022 test period and selected event-based case studies. The model achieved strong accuracy in hindcast mode, with overall RMSE values of 0.008 m for storm surge and 0.019 m for total water level in the short-window evaluation. In longer autoregressive rollout experiments, CoastCast produced 132-hour forecasts and maintained strong water-level skills out to five days. Case studies included storm-driven and tide-dominated events, and model results were compared with the NOAA CO-OPS gauge locations within the study area (~10 tide gauges). The evaluation showed that the model can reproduce spatial surge patterns and gauge time series across the domain while retaining useful skills for multi-day forecasts.

- Objective 4: Assess computational efficiency and potential for operational or scenario-based use. — Complete
This objective was completed. A major project outcome was demonstrating that CoastCast can generate a full 132-hour forecast over the study domain in approximately 4.5 seconds on a single NVIDIA B200 GPU. The neural-network forward passes alone require substantially less than one second for the full rollout. This computational speed is a major advantage relative to traditional hydrodynamic models, which can require large high-performance computing allocations for multi-day forecasts. These results demonstrate the potential of AI surrogates to support rapid ensemble forecasting, scenario testing, uncertainty analysis, and coastal hazard decision-support workflows.

- Objective 5: Disseminate results and prepare community-facing project outputs. — Complete
The team prepared a scientific manuscript describing the CoastCast dataset, model architecture, training approach, evaluation results, ablation experiments, computational performance, and potential applications. The manuscript documents the scientific and technical outcomes of the project and provides a basis for broader dissemination to the coastal research and operational forecasting communities. The project also produced figures, workflow diagrams, model schematics, and case-study visualizations that can be reused in future outreach, education, and stakeholder communication materials. The trained model weights and code are being prepared for broader community use following final review, documentation, and any required approval procedures.

Broader impacts: The completed work advances the use of NOAA data products for AI-enabled coastal hazard prediction. By transforming long-term CORA reanalysis data into an AI-ready dataset and demonstrating rapid multi-day water-level forecasts, the project provides a pathway toward lower-cost ensemble prediction and rapid scenario analysis. These capabilities can improve the support of coastal flood preparedness, emergency management, infrastructure planning, and research on compound coastal hazards.

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 For example, this might include models, apps, mapping tools, etc. that are being used by state or federal agencies to assist with decision support. Also describe who is using the products and the number of users. Only report on work conducted within the six-month reporting cycle.

The primary product developed through this project is CoastCast, an AI surrogate framework for rapid storm surge and total water-level forecasting. The product has been developed as a research prototype and evaluated in hindcast and forecast modes over the northeastern U.S. coast using NOAA CORA and NOAA CO-OPS gauge locations. CoastCast ingests initial water-level conditions, atmospheric forcing,

astronomical tidal forcing, bathymetry, and open-boundary information to generate hourly 5-day forecasts. The project produced two trained models: one for non-tidal storm-surge anomaly and one for total water level.

At project closeout, the research prototype has demonstrated the ability to generate 132-hour forecasts at approximately 2-km spatial resolution in approximately 4.5 seconds on a single GPU. This speed makes CoastCast promising for future ensemble forecasting, scenario analysis, and rapid coastal hazard assessment. During the project period, the product was used internally by the University of Florida project team for model development, evaluation, manuscript preparation, and assessment of potential operational use cases. No public web application has been released during this reporting period. The trained model weights, code, and documentation have been transferred to NOAA.

Users during the project period: University of Florida project team members and NOAA NOS Storm Surge Modeling Team.

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.

A key project success was demonstrating that an AI surrogate trained on long-term NOAA coastal reanalysis can reproduce storm surge and total water-level evolution over multi-day forecast horizons at a fraction of the computational cost of traditional numerical models. CoastCast generated a full 132-hour forecast in seconds while maintaining strong skill across storm-driven and tide-dominated events. This capability has direct value for coastal hazard preparedness because it opens the possibility of rapid ensembles and “what-if” scenarios that would otherwise be too computationally expensive for many applications.

The project also highlights the value of NOAA reanalysis products for AI-based coastal prediction. By transforming CORA water levels into an AI-ready dataset with separated tide and surge components, the project created a reusable framework that can support future forecasting research, coastal risk analysis, and decision-support tools.

PI: Filipe Fernandes

Progress and Accomplishments during the reporting period (Jan 1 - June 30, 2026)

Python Data Analysis Tools for Oceanographers

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

Using ERDDAP with *xarray* has been a pain point for many users and, while there are many ways to implement code that fetches from ERDDAP, we did not have proper documentation in ERDDAP documentation itself. We. updated the *xarray* guidelines (ERDDAP/erddap.github.io #58) to use *erddapy*'s engine and simplify the instructions.

IOOS is participating in Google Summer of code again and we updated our contributor guidance, "AI" policies (gsoc #117), and packaging instructions/best practices (ioos-python-package-skeleton #37).

Most of IOOS documentation pages required GitHub Actions updates to harden security and ensure the proper theme is in sync, some were updated manually to ensure proper hashes were used and ensure that *dependabot* will handle the future updates properly (atn-docs #26, erddap-gold-standard #102, ioos-atn-data #113, ioos-documentation-jekyll-skeleton #31, ioos.github.io #23, mbon-docs #75, ncei-archiving-cookbook #33, passive-acoustics #9, conventions-for-observing-asset-identifiers #13, ioos-metadata #65, erddap-gold-standard #95, erddap-gold-standard #104, BioData-Training-Workshop #35, atn-docs #23, and ioos-python-package-skeleton #47).

The IOOS Code Lab notebooks were bumped to latest *Python* and two extra packages were added to the environment (ioos_code_lab #305, #321, and #325). We also fixed the broken notebooks, the documentation deployment, and refreshed the HF-Radar and Pyobis ones (#306, #320, #312, #311, and 318).

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

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

a) *Compliance-checker and plugins*:

- Fix metadata test status ioos/compliance-checker #1262;

- Use cf-units ABI3 wheel ioos/compliance-checker #1263;
- Fix table test ioos/compliance-checker #1270;
- Reduce the test matrix ioos/compliance-checker #1271;
- Add a deprecation warning for the *ioos_sos* checker ioos/compliance-checker #1277;
- Remove EoL *Python* 3.5 ioos/compliance-checker #1278;
- Remove unused *Python* 3.3 hack ioos/compliance-checker #1279;
- Remove duplicated entry ioos/compliance-checker #1280;
- Run blackdoc formatter ioos/compliance-checker #1282;
- Move to ruff format ioos/compliance-checker #1283;
- Remove entry for "latest" and use *natsort* on the checker keys ioos/compliance-checker #1286;
- Change the table download ource ioos/compliance-checker #1289;
- Add poper timeouts ioos/compliance-checker #1295;
- Debug *check_cell_boundaries_interval* issues ioos/compliance-checker #1299;
- Remove unnecessary *shebang* ioos/compliance-checker #1302;
- Properly list all available modules ioos/compliance-checker #1303;
- Various documentation fixes and change web-app to the WASM site ioos/compliance-checker #1307;
- Fix failing test due to unresponsive server ioos/compliance-checker #1310;
- Remove deprecated *ioos_sos* ioos/compliance-checker #1312;
- Fix linkcheck ioos/compliance-checker #1325;
- Add *dependabot* and *pre-commits* ioos/compliance-checker-wasm-web #11, #12, #13, and #14);
- Sort checkers in the page ioos/compliance-checker-wasm-web #15;
- Install all plugins in the WASM app ioos/compliance-checker-wasm-web #17, #23, #8);
- Fix *netcdf4* for latest *pyodide* ioos/compliance-checker-wasm-web #9;
- Point page to the new webapp ioos/compliance-checker-web #145;
- Use the *Units* class from *compliance-checker* for WASM compatibility (cc-plugin-glider #84, and cc-plugin-ncei #70);
- Ensure the CF-10 version of *compliance-checker* is installed ioos/cc-plugin-og #6;
- Fix *cf* module imports ioos/cc-plugin-glider #87;
- Fix leftover debug code ioos/cc-plugin-og #10;
- Fix/update dependencies ioos/cc-plugin-og #11;
- Add pypi auto-publish via trusted publishers ioos/cc-plugin-og #9;
- Add *pre-commits* and fix all lints and format issues ioos/cc-plugin-og #7.

Ioos_qc: Fix *pyparsing* deprecation, removed *Python* 3.9 support, and several minor fixes (ioos_qc #188, #189, #203, and #220);

Erddapy and gliderpy:

- Restore extension cleanup ioos/erddapy #429;

- Make quote optional ioos/erddapy #432;
- Add *xarray-erddap* entry-point ioos/erddapy #434;
- Add *pandas* 3.0 support ioos/erddapy #437;
- Revert ubuntu-slim support ioos/erddapy #438;
- Replace pytest-vcr with pytest-recording ioos/erddapy #439;
- Fix *dependabot* configuration ioos/erddapy #445;
- Do not cache *check_url_response* results ioos/erddapy #455;
- Move back to *requests* ioos/erddapy #457;
- Ignore *cassettes* when commiting ioos/erddapy #458
- Drop *pytz* dependency ioos/erddapy #459;
- Drop *Python* 3.10 support ioos/erddapy #460;
- Fix failing test due to unresponsive server ioos/erddapy #464;
- Update file formats based on ERDDAP 2.30.0 ioos/erddapy #468;
- Update JSON server list ioos/erddapy #470;
- Fix *typing* in the code and test it with *mypy* ioos/erddapy #474;
- Speed up *_griddap_get_constraints* default ioos/erddapy #475;
- Switch to a stable source ioos/erddapy #476 and #481;
- Fix testing framework for latest pytest ioos/erddapy #485 and gliderpy #189;
- Skip false positives ioos/gliderpy #176;
- Add the *ax kwargs* option for the *plot_track* method. ioos/gliderpy #182;
- Remove the unsded *DatasetList* class ioos/gliderpy #184;

Xarray-subset-grid:

- Split tests and data ioos/xarray-subset-grid #107;
- Separate *pixi* configuration from *pyproject.toml* ioos/xarray-subset-grid #112;
- Lockfile auto-update ioos/xarray-subset-grid #132;
- Use *dependabot* ioos/xarray-subset-grid #142;
- Add *pre-commit* pixi task for devs ioos/xarray-subset-grid #143;
- Update lockfile from v6 to v7 ioos/xarray-subset-grid #145;
- Implement *coverage* tests ioos/xarray-subset-grid #99*;*

Hfr-net:

- Add an instructions section and script to download external data ioos/hfrnet-rtv #1;
- Fix typos using *codespell* ioos/hfrnet-rtv #3;
- Add extra clarifications in the README ioos/hfrnet-rtv #4;

Maintenance PRs:

- Update *pixi* configuration, CIs, and ABI3 wheel (ciso #106, #94, and #95);
- Fix regional platform metric and add *dependabot* updates (ioos_metrics #154, and #162);
- Fix GitHub Actions and harden security (glider-dac #524, #579, and #586);
- Add *pixi* config and task IRA-water-levels #1;
- Use location to find the station match (ioos-asset-inventory #48);

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

- Build ABI3 and Pyodide wheels (TEOS-10/GSW-Python #216, #227, and #240);
- Convert *np.datetime64* to *pydatetime* automatically, build ABI3 wheel, fix GitHub security flaws, fix netcdf4 version comparison bug, and update HDF5 in the *manylinux* image (Unidata/cftime #392, #395, #398, #404, Unidata/netcdf4-python #1462, #1474, and ocefpaf/netcdf-manylinux #3);
- Implemented *zizmor* security checks, fix lints, clean notebooks, and update CIs for latest *pytest* (iobis/pyobis #213, #214, and #229);
- Maintenance for *pyoceans* packages: Fix *pixi* configuration (gridgeo #73), update for *pandas* 3.0, *Python* 3.14 support, and *zizmor* checks (pocean-core #194, #195, #211, python-ctd #247, #252, #107, python-oceans #108, python-seawater #41);
- Add the missing dependency to the WASM app MathewBiddle/DarwinCore_quickCheck #8;
- Implement ABI3 wheels NOAA-ORR-ERD/geometry_utils #9;
- Simplify configuration SciTools/cf-units #644;
- Implement *zizmor* security checks python-windrose/windrose #316;
- Use hashes in GitHub Actions ocefpaf/glider_metrics #36;

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) Mark *proj* 9.8 and all *pygamma_n* but version 1.1.1 as broken (conda-forge/admin-requests #1989 and #2141).
b) New packages to conda-forge: *obspec-utils, xarray-erddap, cc-plugin-og, python-discovery, pyseas, canyonbpy, pylibCZIrw, cc-plugin-sgri, markdown-grid-tables, tadc, pyhydrophone, scikit-maad, noisereduce, lifewatch-pypam,* and *mbari-pbp*
c) See the list of updated feedstocks in the appendix.

Stakeholder engagement and outreach efforts during the reporting period

IOOS is participating in Google Summer of Code 2026 and we are mentoring Aaron Mau for the "Filling the gaps within the IOOS quality control schema for ocean glider data" project.

Pull Requests links

- conda-forge/allantools-feedstock #8
- conda-forge/coastseg-feedstock #83
- conda-forge/esi-core-feedstock #10
- conda-forge/gsw-feedstock #51
- conda-forge/lifewatch-pypam-feedstock #1

- conda-forge/netcdf4-feedstock #186
- conda-forge/netcdf4-feedstock #187
- conda-forge/netcdf4-feedstock #193
- conda-forge/noisereduce-feedstock #1
- conda-forge/pocean-core-feedstock #34
- conda-forge/pygamma_n-feedstock #8
- conda-forge/pyhydrophone-feedstock #1
- conda-forge/pylibczirw-feedstock #2
- conda-forge/rioxarray-feedstock #94
- conda-forge/vcs_versioning-feedstock #6

SECOORA PROGRESS REPORT: JANUARY 1 - JUNE 30, 2026

PI: Joy Young
Project Title: FACT Data Wrangler

2021-2026 SECOORA PROGRESS REPORT

PROGRESS TOWARDS OBJECTIVES

1 Provide a summary of progress towards meeting your project objectives for the six-month reporting period. Pay special attention to the six-month reporting period accomplishments and the broader impacts related to those findings. Indicate if you anticipate any substantive changes to the project Scope of Work (SOW) as you complete the information below. List each objective and text that describes progress towards meeting the objectives 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.

- February Data Push: Sixty-six issues were processed as part of the push with six issues classified as fixing. The Feb push included 244 tagged animals, detection data from 371 downloads from 62 stations. Twenty-five projects participated in the push, benefiting 133 projects.
- June Data Push: One hundred and five issues were processed as part of this push with eight issues classified as fixing. The June push included 823 tagged animals, detection data from 1,424 downloads from 33 stations. Thirty-eight projects participated in the push, benefiting 141 projects. Overall, the FACT node currently has 234 projects (increase by 10), 399 contributors from 127 organizations, 137 species, 4,115 active tags, over 409 million detections (198.9 million animal detections) and is using 550 GBs for database storage.
- Collected and uploaded environmental data (e.g. water temperature data) from array owners in conjunction with data processing events. Environmental data will be updated after detection extracts are provided to project PIs in July.

Priority 2: Work with PIs to resolve incomplete telemetry datasets (based on process under priority 1).

- During the Feb and June pushes, 14 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.
- The Data Team also received a request to roll over several projects from iTAG into FACT. The projects will be moved after the June push is completed.

PUBLICATIONS & CONFERENCE PRESENTATIONS

2 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).
The FACT Network supported the following publications by providing data:

Goldner, Victoria S., et al. "Gone but not forgotten: Collaborative telemetry network provides insight into out-of-system movements of Common Snook." Marine and Coastal Fisheries 18.1 (2026): vtaf050.

Aoki, Derek M., et al. "Evaluating the viability and animal welfare of acoustic telemetry for the long-term monitoring of leatherback sea turtles (Dermochelys coriacea)." Animal Biotelemetry (2026).

Boucek, Ross E., et al. "High Site Fidelity and Elevated δ¹?N in Bonefish (Albula vulpes) Suggest Localized Wastewater Stress in a Marine National Park." Estuaries and Coasts 49.5 (2026): 149.

Robichaud, Jessica, et al. "Locomotor activity patterns of permit Trachinotus falcatus as an indicator of habitat function in the Florida Keys, USA." Marine Ecology Progress Series 783 (2026): 1-15.

Benavides, Martin T., et al. "Seasonal Residency and Movement Patterns of Bonnetheads (Sphyrna tiburo) in Two Subtropical Estuaries and Coastal Waters of the South Atlantic Bight." Estuaries and Coasts 49.2 (2026): 41.

Nolan, Joseph D., et al. "Beyond migrants and residents: complex partial migrations in differentially migrating shortnose sturgeon." Movement Ecology (2026).

Ahmadian, Mahshid, et al. "A new perspective to fish trajectory imputation: a spatiotemporal probability model for simulating acoustically tagged fish movement." Journal of Applied Statistics: Environmental Statistics and Data Science 2.1 (2026): 2623273.

MEDIA ENGAGEMENT, EDUCATION, AND OUTREACH

3 Describe education or outreach materials related to this award that have been developed within this six-month reporting period.
Posted eight social media posts pertaining to data pushes, meeting registration, and fish FACT Friday. During this period, our social media coordinator stepped down. We are in the process of finding a new person to fulfill that role.

PRODUCT DEVELOPMENT & DELIVERY

4 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.
Cleaned and commented on the DaViT code in GitHub. The DaViT is slated to be updated including removing the OTN project pages and linking projects to project pages generated from the FACT GeoServer.

Continued support of the RWSC map. https://rwsc.org/research-data/map/

SUCCESS STORIES

5 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.

This year, the FACT Network made significant progress toward advancing open data by bringing together researchers, resource managers, and partner organizations to develop a shared vision for future data sharing. Through collaborative discussions, participants identified a balanced approach that expands public access to telemetry information while respecting the needs of data contributors.

A strong consensus emerged that summarized and aggregated telemetry products should be openly available by default, increasing the visibility, accessibility, and scientific impact of acoustic telemetry data. Participants recognized that these products support collaboration, foster new research opportunities, and provide valuable information for resource management while minimizing risks associated with releasing detailed detection data.

The discussions also established a clear path forward for responsible data sharing. Participants supported maintaining flexible embargo options, including time-delayed release and additional protections for sensitive species or active research projects. There was broad agreement that open data should be supported by clear governance, including standardized data use guidelines, attribution requirements, and citation practices that recognize the contributions of data providers.

Perhaps the greatest accomplishment was the collaborative process itself. By engaging a diverse community of stakeholders, the FACT Network built consensus around a practical framework that balances transparency with responsible data stewardship. This shared vision provides a strong foundation for future policy updates and advances the network's mission to increase access to biological observing information while promoting collaboration, recognizing data contributors, and supporting the long-term sustainability of the telemetry community.

SECOORA PROGRESS REPORT: JANUARY 1 - JUNE 30, 2026

PI: Andres Tejada

Project Title: Evaluation of Coastal Models in NOAA Operational Environments

2021-2026 SECOORA PROGRESS REPORT

PROGRESS TOWARDS OBJECTIVES

1 Provide a summary of progress towards meeting your project objectives for the six month reporting period. Pay special attention to the six month reporting period accomplishments and the broader impacts related to those findings. Indicate if you anticipate any substantive changes to the project Scope of Work (SOW) as you complete the information below. List each objective and text that describes progress towards meeting the objectives 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 project made substantial progress toward the UFS Coastal Applications Testing objectives for SCHISM model evaluation in the Long Island Sound/New York Bight region. We completed the required SCHISM evaluation workflow using the developer-provided reference configurations, including Round 1 tide-only simulations, Round 2 meteorologically forced 3D simulations, Round 3 ERA5 3D simulations, and a Round 3 summer WWM wave-coupled sensitivity case. Round 1 was run independently on the University of South Florida CIRCE cluster and post-processed for the required tidal constituents M2, S2, N2, and K1. The two Round 1 cases produced nearly identical total complex RMSE values of 6.48 cm and 6.49 cm, indicating consistent tide-only harmonic skill for the summer and winter evaluation windows. Round 2 2021 and 2022 simulations were post-processed for required water-level and Kill Van Kull current metrics, including correlation, RMSE, and bias for water level, current speed, and current direction. Round 3 ERA5 summer and winter cases were also completed and evaluated using the same required metrics. In addition, a Round 3 summer WWM wave-coupled case was run, producing comparable skill to the non-wave Round 3 summer ERA5 case, with small changes in water-level and current metrics.

In parallel with the reference-configuration testing, we made progress toward the independent-mesh objective. We created our own 2D SCHISM mesh and successfully ran the Round 1 tide-only case with that mesh. A follow-on report will compare results from the independent mesh against the developer-provided mesh, and the independent-mesh workflow will be extended to the 3D Round 2/Round 3 cases. Although the formal project period has ended, remaining Frontera service units have been extended through the end of 2026, and we plan to continue using those resources to complete the independent-mesh comparisons and additional 3D testing. A subsequent report on the independent-mesh results will be submitted directly to project coordinators Ayumi Fujisaki Manome and Greg Seroka.

For context, the testing guidance defined the required hindcast periods, encouraged independent mesh generation while allowing developer-provided “blessed” meshes as backup.

SECOORA PROGRESS REPORT: JANUARY 1 - JUNE 30, 2026

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

2021-2026 SECOORA PROGRESS REPORT

PROGRESS TOWARDS OBJECTIVES

1 Provide a summary of progress towards meeting your project objectives for the six-month reporting period. Pay special attention to the six-month reporting period accomplishments and the broader impacts related to those findings. Indicate if you anticipate any substantive changes to the project Scope of Work (SOW) as you complete the information below. List each objective and text that describes progress towards meeting the objectives 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). The team have successfully completed the required work in Rounds 1 – 4.

During this reporting time period, the following activities have been performed:

- USF PI, Dr. Yonggang Liu, participated in the monthly PI meetings online and made appropriate comments and suggestions for the future of the project.
- All USF team members in this project participated in revising the manuscript that summarize the efforts and outcomes of the entire CAT model testing project, which has been submitted to Bulletin of the American Meteorological Society for consideration of publication (Kelly et al., 2026).

  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 (submitted)

This project is complete.

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).
Peer-reviewed publication:

San, S.-C., Liu, Y., Xu, H., Weisberg, R.H., John, S., Qiao, K., Law, J.A., Zheng, L., Murawski, S.A., Mitchum, G.T., Frazer, T.K. (2026a), Impact of wave-current interaction on Hurricane Ian storm surge simulation, Ocean Modelling, 202, 102734, https://doi.org/10.1016/j.ocemod.2026.102734

Conference presentation:

Scharton-Witmer, O., Liu, Y., Xu, H., John, S., Qiao, K. (2026), Development and validation of the East Florida Coastal Ocean Model (EFCOM): An automated nowcast/forecast system. Abstract CP51A-04D presented at the 2026 Ocean Sciences Meeting, Glasgow, UK, 2/22-27/2026 (talk)

Project Report
Skidaway Institute of Oceanography, University of Georgia, Catherine Edwards

A coordinated observing strategy for saildrones and gliders during the Atlantic hurricane season and advancement of data assimilation for the coupled hurricane forecast system

Statement of work (contains text from original and extension): SkIO will support Saildrone/glider coordination efforts by using past and future data from both platforms. PI Edwards will work with the NOAA AOML/PMEL Saildrone team to coordinate deployments in hurricane season 2024, explore spatial and regional trends in colocated data, and leverage this insight for to develop strategies for colocation and data assimilation in future hurricane seasons. SkIO will continue analysis of co-located glider and Saildrone missions from 2021-2024. Glider data from these hurricane seasons will be post-processed and shared with collaborators. These data, together with data collected in 2021-2024 Saildrone missions, will be analyzed to determine the regional ocean-atmosphere conditions (i.e., ocean currents, near-surface winds) that are conducive to successful colocation of the vehicles. PI Edwards will extend analysis conducted to date to other co-located missions, explore spatial and temporal variability in co-located data, and leverage this insight for recommendations for colocation and data assimilation in future hurricane seasons.

The project contained two components of work: 1) saildrone/glider coordination during hurricane seasons 2023 and 2024, and 2) analysis of data from gliders and Saildrones to describe the effectiveness of colocation and suggest strategies for increased performance in future hurricane seasons. Accomplishments in each of the components are described below.

Saildrone/glider coordination: Glider data PI Edwards worked closely with the NOAA AOML/PMEL Saildrone team to coordinate glider and Saildrone deployments in hurricane seasons 2023 and 2024. Edwards participated in weekly meetings in and out of hurricane season, meeting with the piloting team more frequently and even daily as needed to provide regional insight to support Saildrone piloting, storm interceptions, and colocation with gliders, buoys, and other platforms. She also participated in planning and strategy sessions to determine the operational areas for maximum impact of the data, identifying opportunities for cross-calibration with NDBC buoys, SECOORA- and externally-funded gliders, floats, and ships of opportunity (primarily the UNOLS vessel based at SkIO, the R/V Savannah). Finally, Edwards participated in post-mission shakedown sessions to compile lessons learned from each hurricane season and prepare for the next.

Data analysis: The larger component of work for the project involved analysis of data from gliders and Saildrones from hurricane seasons 2021-2024, with the goal of identifying trends that could be used to improve impact of the data and future colocation. Flight and science data collected from glider missions conducted during hurricane season during these seasons was shared in near-real time to the NOAA IOOS National Glider Data Assembly Center with support from SECOORA data

management. To reduce potential delays and support real time decision-making and path planning of the gliders and Saildrones, SkIO technician A. Vincent created a secondary data stream, with scripts to automatically process glider position and waypoints, publishing them to a freely accessible website. Plots of glider science and flight data were also published to this website in near-real time to further aid in decision-making. These data streams were pushed to the data portal in real time to be used by the Saildrone piloting team to aid in navigation and colocation. Post-mission, the glider flight and science data were contributed to the NGDAC through the SECOORA data portal. The data were QA/QC post-processed to remove duplicate data, erroneous measurements, and concatenate flight and science data into MATLAB mat-files for scientific analysis.

Colocations of 16 different glider missions were examined. Data from 10 SECOORA-funded glider missions were postprocessed with a basic level of quality control. Flight and science variables were processed separately and output into binaries with self-describing structure format for all ~3000 variables and a subset of the ~60 most useful flight and science variables. Data were sorted, removing duplicate time stamps, data when the glider was out of water, and nonphysical outliers in scientific data (e.g., nonphysical salinity or 0-value fluorometer triples). An additional 6 deployments of SECOORA-led Navy glider deployments were processed using data from the IOOS NGDAC via ERDDAP/gliders.ioos.us.

Position and science data for all 16 deployments were interpolated to a common time stamp (glider science data). Given the shallow depths of sampling (usually <50m and often <30m), SECOORA-funded missions collect profiles every 3-30 minutes, and data are retained as time series of flight/science data rather than separating into individual profiles. The temperature, salinity, density, and other scientific data were then bin-averaged to 1-hour temporal and 1m vertical resolution in the upper 175m. The glider does not often sample the upper meter of the water column, so near-surface water properties are represented by the bin-average over the upper 3m. Near-surface temperature and salinity data from the Saildrone SBE37 was interpolated to the bins. Distance between the vehicles was calculated by first converting both glider and Saildrone data to x-y space from latitude and longitude, using the mean glider position as a common reference position.

Year	Dates	Glider	Saildrone	Hours <25km	Hours <10km	Hours <2.5km	Hours <1km
2021	July	franklin	sd1040	179.2	48.7	4.8	1.7
	July	usf-sam	sd1040	0	0	0	0
	September	salacia	sd1040	626.0	227.1	8.5	1.6
2022	August	franklin	sd1059	460.1	235.1	26.3	4.6
	September	usf-sam	sd1059	0	0	0	0
2023	August	franklin	sd1045	183.3	159.4	34.1	5.6
	August	unit_1091	sd1045	31.6	16.0	3.7	0
	September	unit_1091	sd1045	296.0	231.2	26.8	3.9
	October	usf-bass	sd1045	273.0	159.7	27.2	1.3

2024	October	franklin	sd1045	0	0	0	0

Year	Dates	Glider(s)	Saildrone	Hours <25km	Hours <10km	Hours <2.5km	Hours <1km
2021	October-November	ng222, ng252	sd1031	57.2	19.7	3.0	1.3
2023	August-November	ng291, ng296	sd1057	585.4	248.3	22.8	2.0
2024	July-October	ng289, ng778	sd1045	0	0	0	0

The longest and most successful colocation of gliders and Saildrones for the study period (2021-2024) was a mission conducted in 2021, in which SD-1040 was tasked to follow the SECOORA-funded gliders along the Gulf Stream edge in the South Atlantic Bight (Fig. 1). SD-1040 captured the passage of Tropical Storm Mindy through the SAB in September 2021, with maximum stained winds of 60 mph, and was tasked to follow the glider Salacia through its deployment September 25- November 4. Figure 2 shows the position of the SD-1040, Salacia, as well as SD-1031, which was tasked to follow the Navy gliders occupying a section near NDBC buoy 41001 located 150 nm off Cape Hatteras.

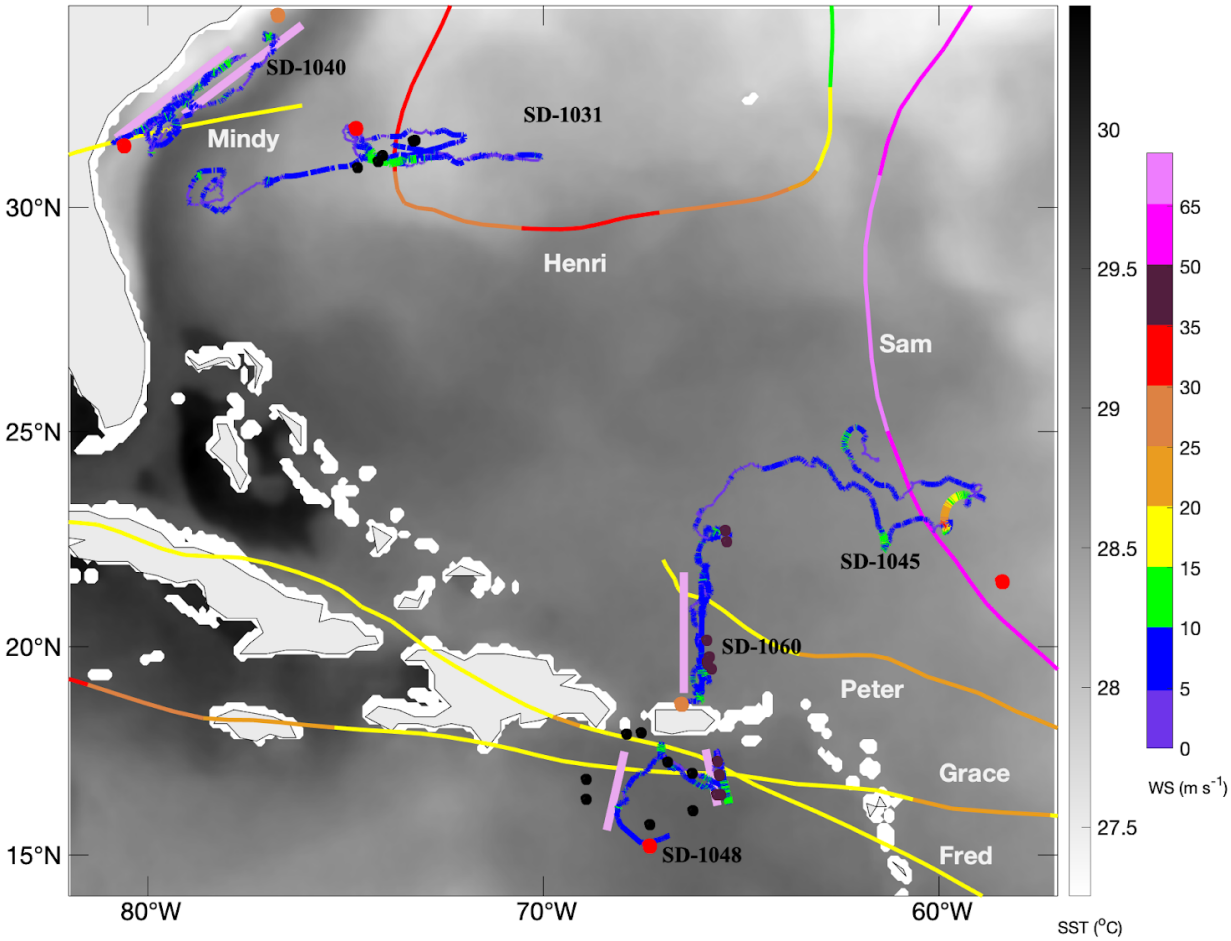


Figure 1: Map of the path of SD-1040 over SST (grayscale), with paths and wind speed of named storms (color axis).

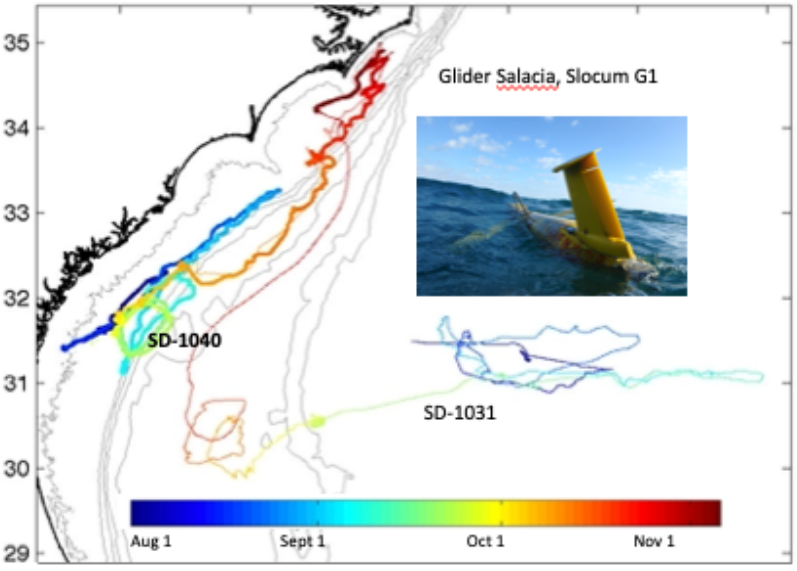


Figure 2: Colocation of SD-1040 and glider Salacia

Figure 3 shows a comparison of glider- and Saildrone-measured temperature and salinity, along with distance between the two vehicles. Temperature and salinity are in close agreement over much of the time series, with larger departures toward the end of the time series as both vehicles moved northward through Long Bay and onto the North Carolina shelf. Analysis conducted as part of this project suggests that error is not a function of distance between the platforms or position with respect to bathymetry but rather is more closely tied to distance with respect to the Gulf Stream features.

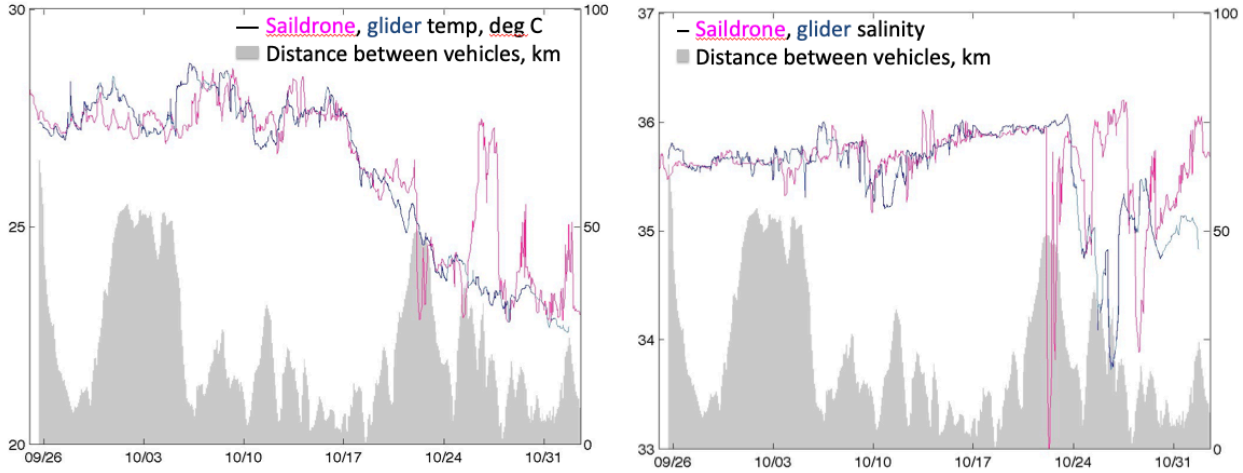


Figure 3: Glider- and Saildrone-measured near-surface temperature (left) and salinity (right), with distance between the vehicles shown as gray shading.

Other notable combinations include Franklin/SD1040 in 2021, Franklin/SD1059 in 2022, unit_1091/SD1045 and usf-bass/SD1045 in 2023, and Navy gliders ng291 and ng296, each of which were co-located with SD1057 for more than 12 days over their deployments. Cross-platform comparison of near-surface temperature and salinity, plotted as in Fig. 3, is given in the Appendix for all SECOORA glider/Saildrone pairs except for Franklin/SD1045 in 2024, which did not successfully colocate.

One of the strongest determinants of colocation success is the prevailing winds, which change seasonally in the South Atlantic Bight. The westward shift of the Bermuda High in summer results in strong upwelling-favorable (northward alongshore) winds through summer until so-called “mariner’s fall” (Weber and Blanton, 1980), when prevailing winds reverse and strengthen southward alongshore.

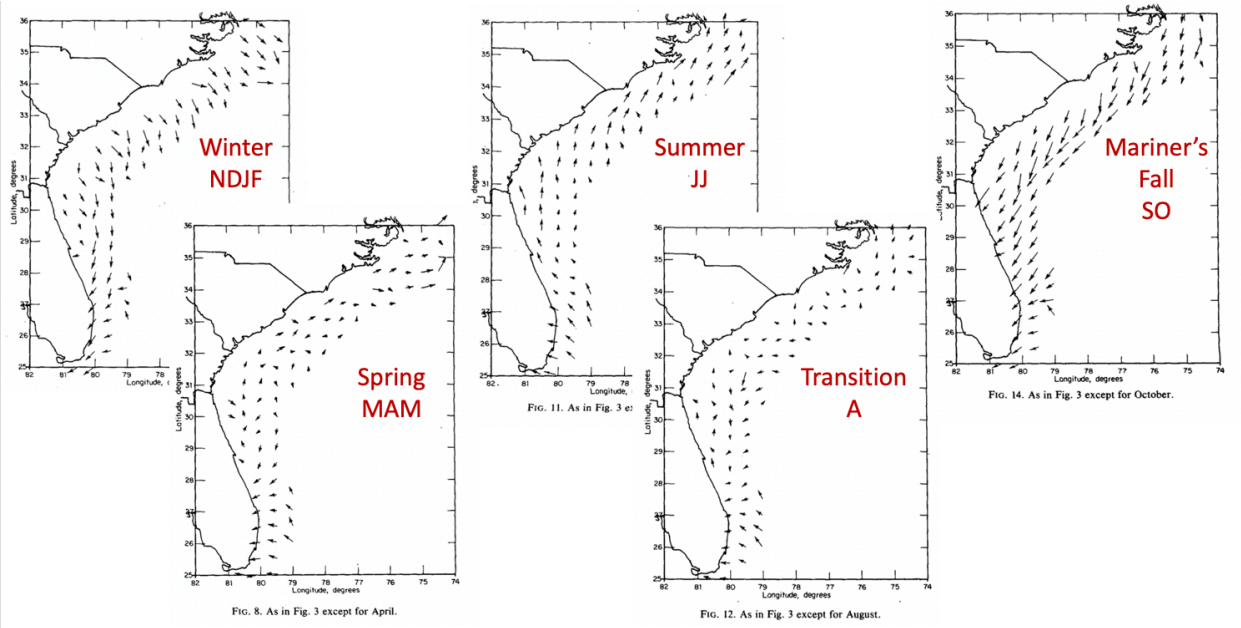


Figure 4: Wind climatology of the South Atlantic Bight, adapted from Weber and Blanton, 1980, who defined 5 seasons (winter=NDJF, spring=MAM, summer=JJ, transition=A, mariner's fall=SO). Here mean seasonal fields are represented by a single month – December, April, July, August, and October.

The most successful colocations occurred when the Saildrone could be positioned toward the south of the region at the start of summer, so as not to have to fight the wind to collocate with the gliders, which are typically deployed from FL and GA. Gliders move much more slowly than Uncrewed Surface Vehicles (USVs), with maximum horizontal speeds of 0.20-0.30 m/s, and significant uncertainty in the position of the Gulf Stream northward of Long Bay, SC, can result in large and unpredictable displacements of the gliders offshore and northward, necessitating difficult and costly recoveries. Strategically, the glider team has chosen to concentrate glider operations in the southern/central section of the SAB, focusing some effort on a repeat cross-shore transect established in 2022 to maximize the scientific value of the data collected. The Gulf Stream and northward alongshore winds provide the means to move northward as needed, but until the wind shifts later in the season, it is difficult for gliders or USVs to move southward alongshore.

Given the mismatch in vehicle speeds, the colocation strategy that worked best operationally was to consider the glider as a moving target as it transited cross-shore or alongshore. From a navigational point of view, one of the greatest challenges of operating gliders in the South Atlantic Bight is the strong temporal and spatial variability of currents due to tides and the Gulf Stream. While tidal currents are predictable, their effect is largest on the inner shelf, where water depth reduces speed and increases power usage of glider flight, compounding inefficiency of glider flight. On the outer shelf, the passage of frontal eddies along the Gulf Stream edge pushes meander crests as shallow as 40m water depth every 6-10 days, with strong (>40 cm/s) currents that displace the glider northward. Sampling through the troughs of these frontal eddies with gliders often reveals frontal eddy upwelling, which is thought to be responsible for

regular input of cold, nutrient-rich water onto the otherwise nutrient-constrained SAB shelf. Upwelling-favorable winds of summer serve to strengthen frontal eddy upwelling, sustaining longer periods of nutrient input that regularly drive phytoplankton blooms (Lee et al., 1991), as well as cascades of higher trophic levels (Paffenhofer et al., 1987, Hofmann and Ambler, 1998).

Regional operational forecast models do not always represent Gulf Stream frontal eddy variability well, particularly in Long Bay, where the Charleston Bump induces an offshore deflection with a bimodal distribution between deflected and strongly deflected states (Bane and Dewar, 1988). Strong air-sea interaction across the Gulf Stream front often obscures its representation in satellite data, but the USV could potentially be used as a “scout”, flying a cross-shore transect ahead of the glider’s position so that the near-surface and ADCP data can be leveraged operationally for glider navigation. Initially, there has been some hesitation flying USVs into Gulf Stream waters, but the operations to date have not resulted in a loss of control. The USV can be flown onshore perpendicular to currents, which are usually aligned with or opposite of the wind, depending on season, and thus a “safe” direction for effective point of sail.

When vehicle colocation is not possible, the alongshore orientation of bathymetry, winds, and the Gulf Stream can permit the assumption of self-similarity in the alongshore direction, as long as the vehicles maintain cross-shore bearings. The cross-shore orientation of the tide in the SAB, perpendicular to the alongshore axis of wind- and density-driven flow, sets up a natural coordinate system driven by the dynamics (Edwards and Seim, 2007). Ignoring (for now) frontal-scale variability and offshore deflection in Long Bay, we hypothesize that positioning the vehicles to the same cross-shore position relative to the Gulf Stream will be the next best option to colocation. To test the hypothesis of that cross-platform error was anisotropic with respect to the cross- and alongshore directions, we transformed cross-platform distance into along- and cross-shore coordinates with respect to the local cross-shore and 50m isobath.

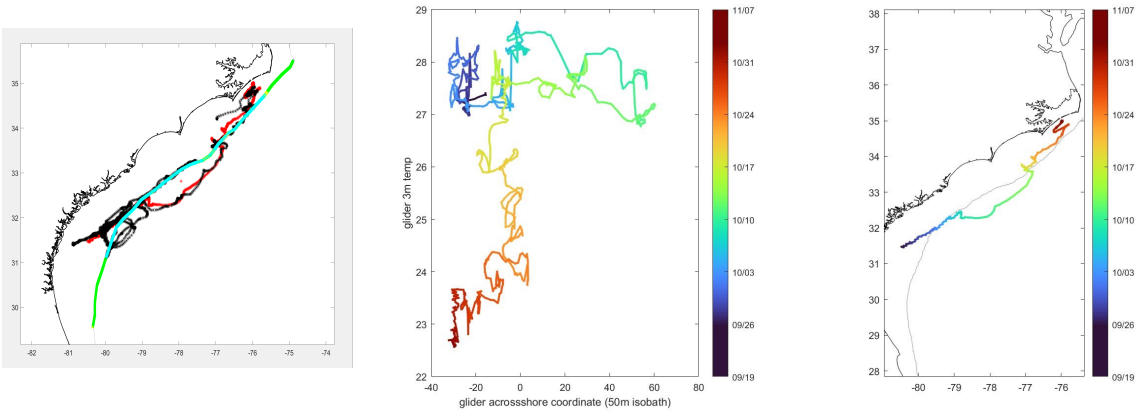


Figure 5: Left: paths of vehicles with respect to the 50m isobath (green). Glider path in transformed (center) and geographical (right) coordinates.

Satellite data from the 2021 colocations was accessed through NOAA CoastWatch's East Coast Node for the Carolinas (CL), Florida/Georgia (FG), and Southeast (SE) products. Data from July 1 to mid-November were processed from HDF, and missing data were replaced with NaN values. Data quality is generally poor due to the presence of clouds along the edge of the Gulf Stream. Glider (Franklin, Salacia, Sam) and Saildrone tracks were overlaid on SST in a regional view and a zoom in on NC/SC area where Salacia and SD-1040 ended the season. Figure 6 shows an example of vehicle tracks overlying a remarkably clear image of SST. For reference, over the period July 29-November 5, there were only 25 images that could be used to identify at least some portion of the Gulf Stream edge in the operating area. Figure 7 shows the tracks of SD-1031 and all three SECOORA gliders relative to a much more representative snapshot of daily averaged SST.

Single-pass SST data available from Rutgers University's RU-COOL lab supplement these limited views of the state of the Gulf Stream near the gliders and USVs. Single-pass imagery was downloaded for the East Coast, Georgia Coast, Florida Coast, and Cape Hatteras regions and used as context in the analysis that follows.

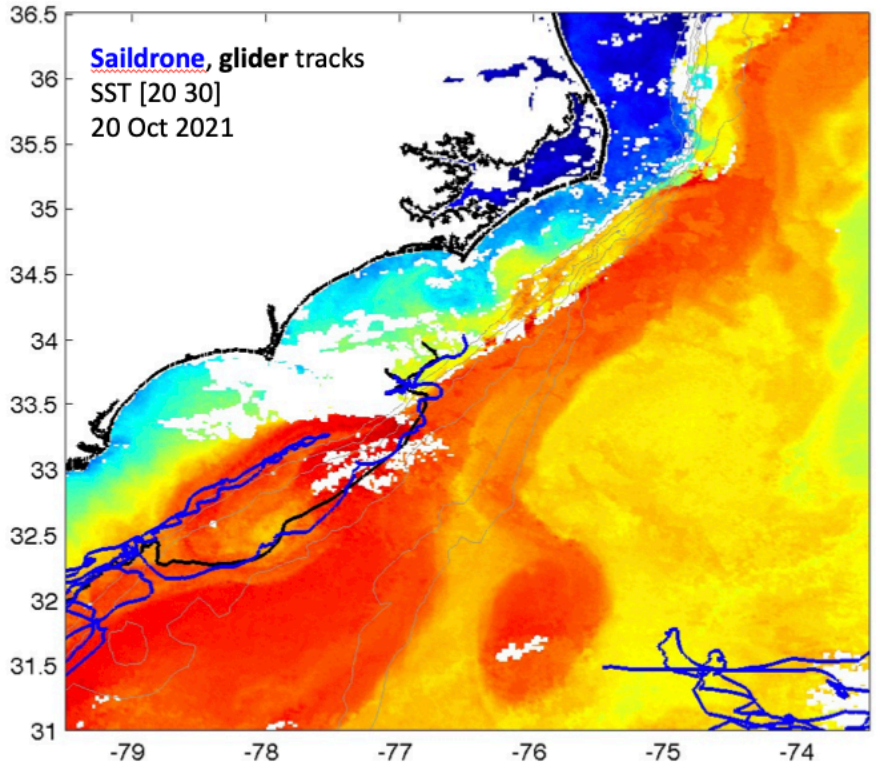


Figure 6: Satellite SST showing the fine scale variability of the Gulf Stream near the end of the deployments. Saildrone and glider tracks are given in blue and black, respectively.

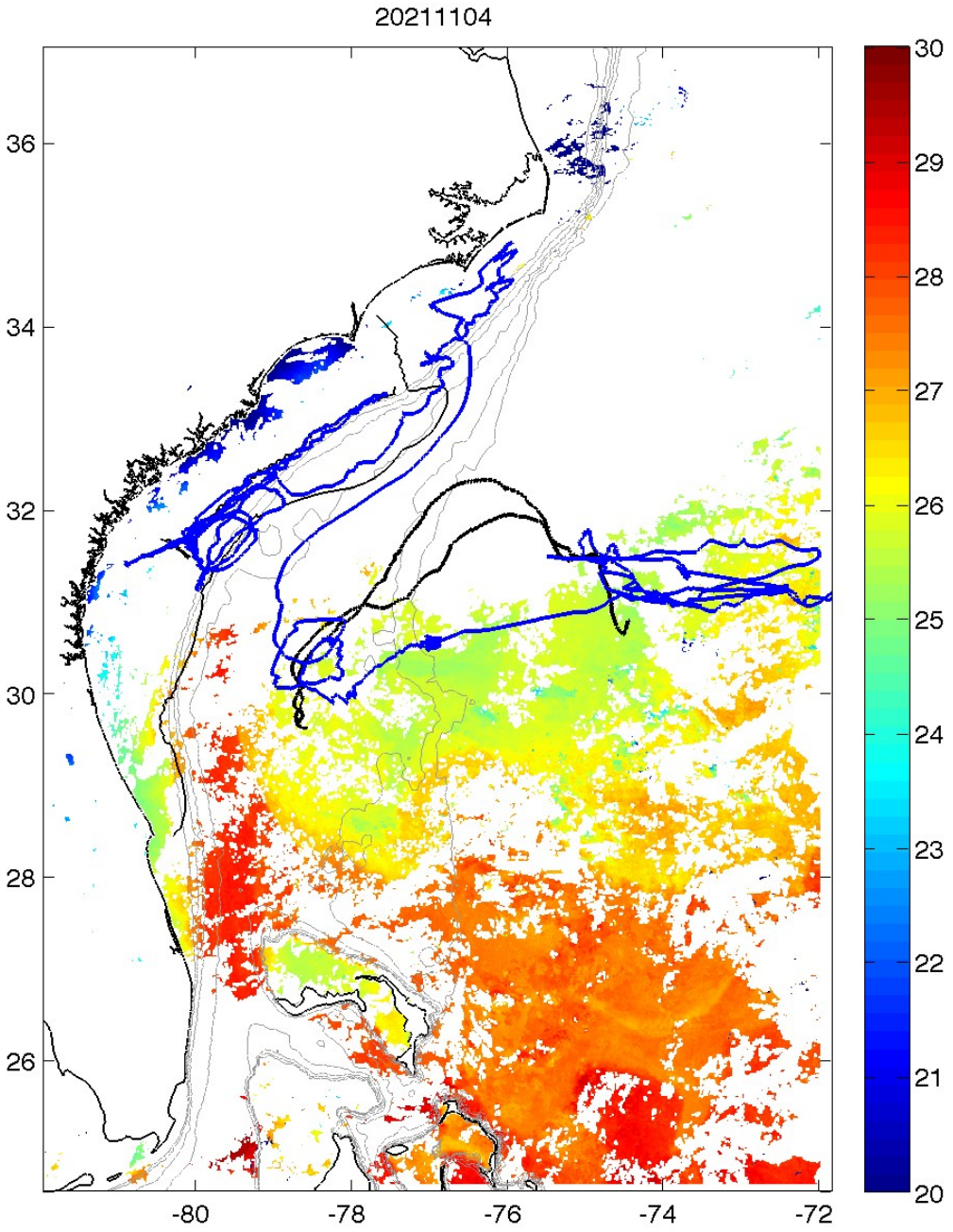
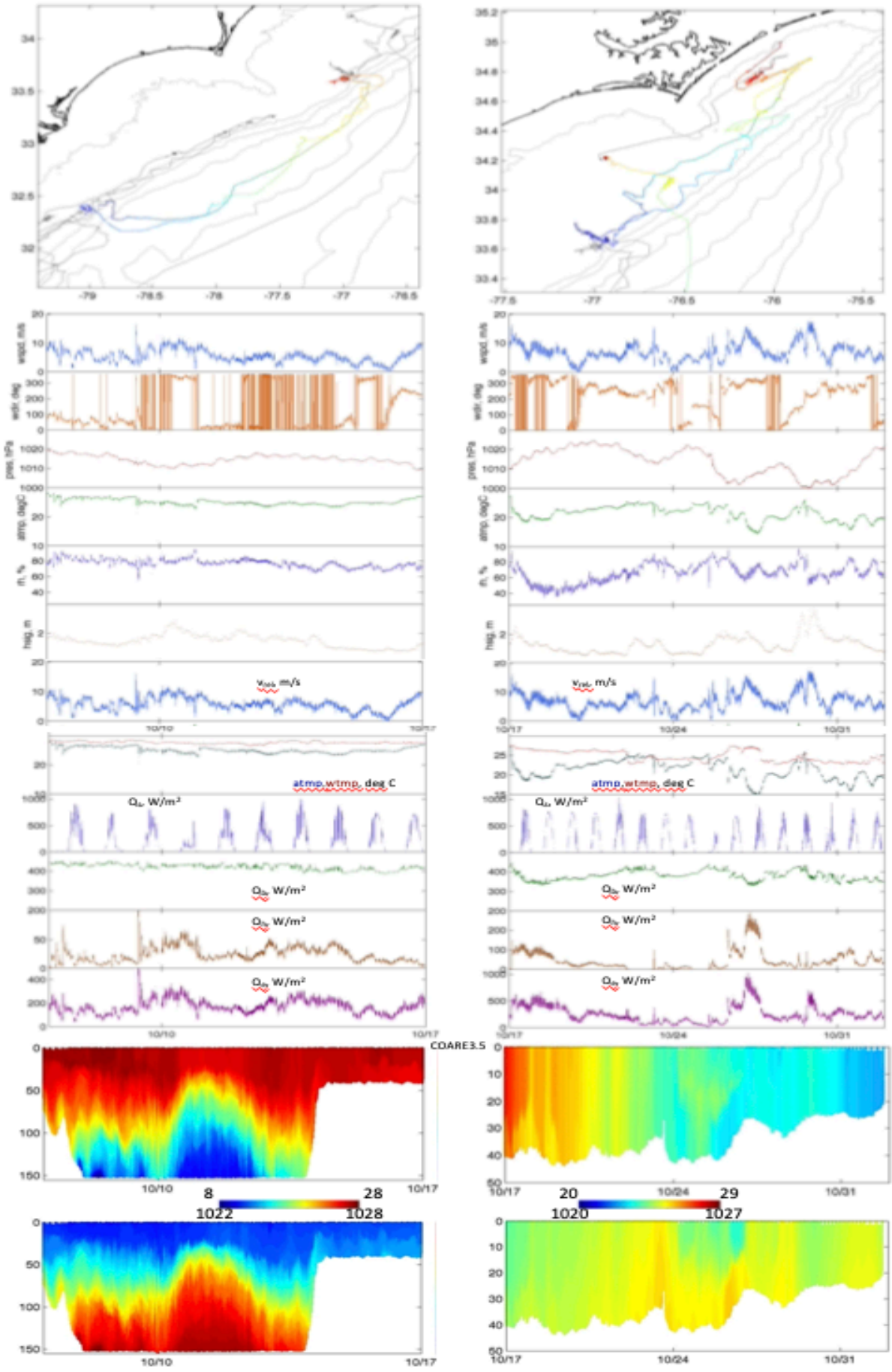


Figure 7: Satellite SST over the SAB for November 11, 2021, with a representative amount of cloud coverage for the season. All available Saildrone and glider tracksfor the season are plotted in blue and black, respectively.

Analysis of air-sea interaction data. The SD-1031 and SD-1040/Salacia colocation data are used to estimate exchange of heat between the ocean and the atmosphere. The Saildrone directly measures air temperature, water temperature, humidity, wind, currents, and short and long wave radiation (SW and LW Pyranometers). Sensible and latent heat flux are calculated using measured variables and derived relative velocities using the COARE3.5 algorithm (Edson et al., 2013). While in Long Bay and outside of meterological forcing, the Gulf Stream drives the variability in heat flux, with latent+sensible heat flux on the order of 300-400 W/m2. The first cold air outbreak of the season occurs in the last week of October, driving increased wind speed, decreased air temperature, and humidities below 50%, leading to air-sea temperature gradients greater than 10 deg C and latent+sensible heat flux on the order of 1000-1100 W/m2.

The time scale and magnitude of this exchange is comparable to that underneath a strong hurricane, and given the spatial extent of the cold air outbreak event over nearly the entire Gulf Stream, the integrated heat budget of the single event could be comparable in magnitude to that of a hurricane. The Gulf Stream front is thus a ripe area for air-sea interaction research during cold air outbreaks, offering a large swath of area to “intercept” during their passage, especially compared to the operational realities of hurricane intercepts.

Appendix H: Edwards Glider/Saildrone



Appendix

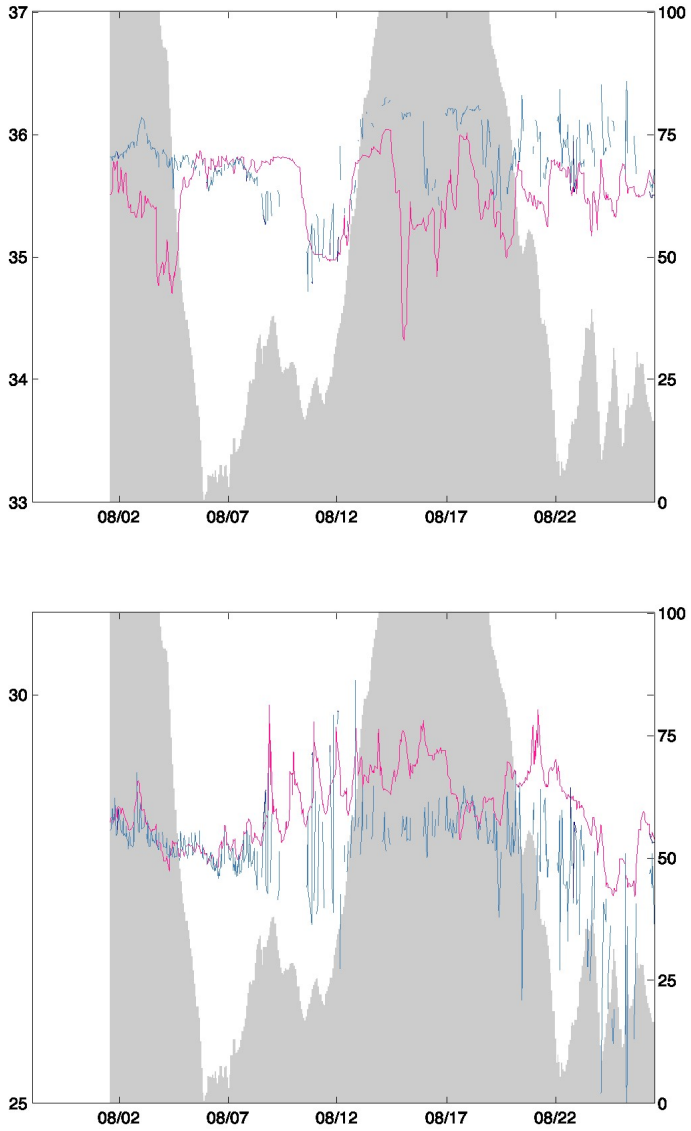


Figure A1: Franklin/SD1040 2021. Glider- and Saildrone-measured near-surface salinity (upper) and temperature (lower), with distance between the vehicles shown as gray shading. Full vertical shading indicates a separation distance >100km.

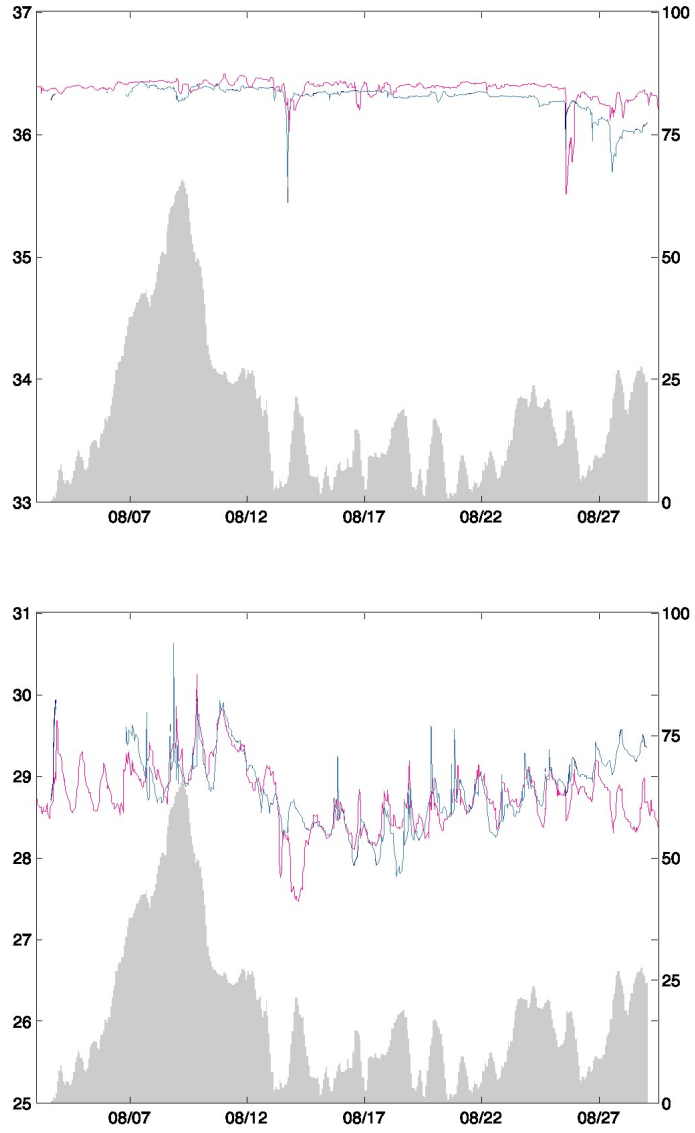


Figure A2: Franklin/SD1059 2022. Glider- and Saildrone-measured near-surface salinity (upper) and temperature (lower), with distance between the vehicles shown as gray shading. Full vertical shading indicates a separation distance >100km.

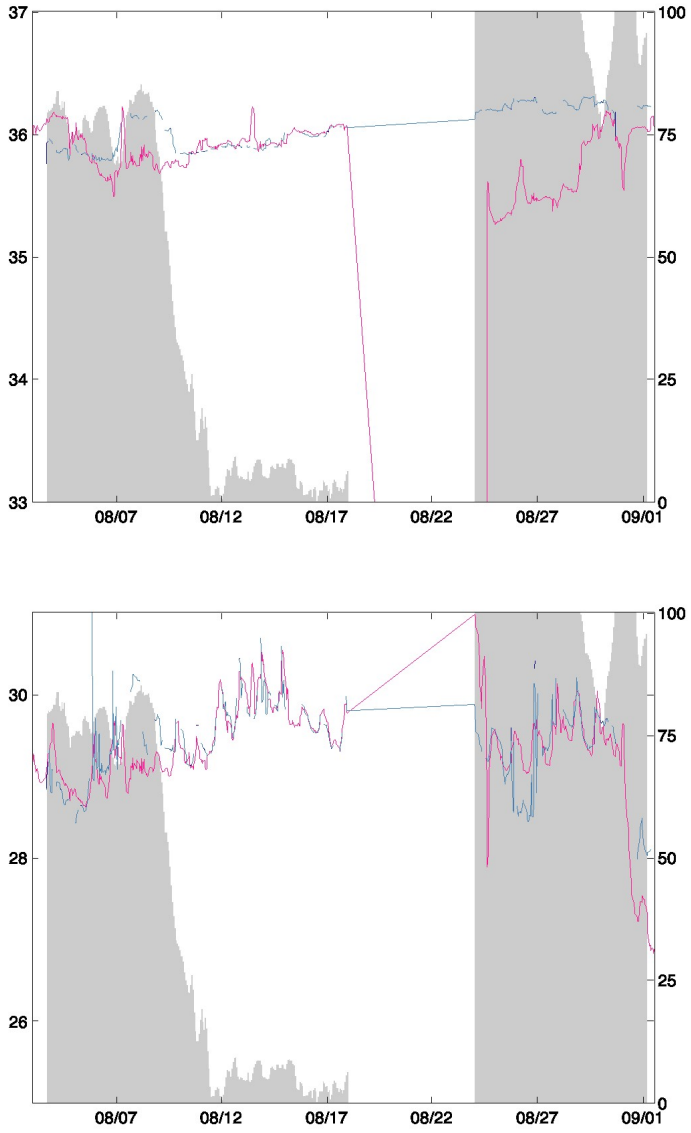


Figure A3: Franklin/SD1045 2023. Glider- and Saildrone-measured near-surface salinity (upper) and temperature (lower), with distance between the vehicles shown as gray shading. Full vertical shading indicates a separation distance >100km.

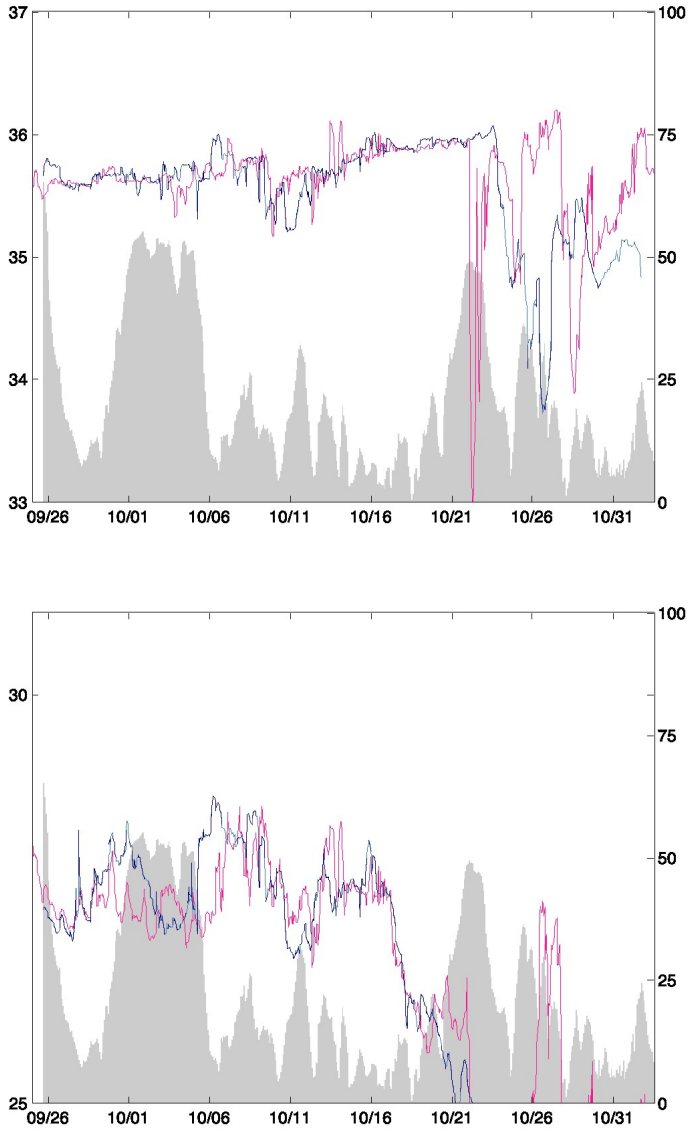


Figure A4: Salacia/SD1040 2021. Glider- and Saildrone-measured near-surface salinity (upper) and temperature (lower), with distance between the vehicles shown as gray shading. Full vertical shading indicates a separation distance >100km.

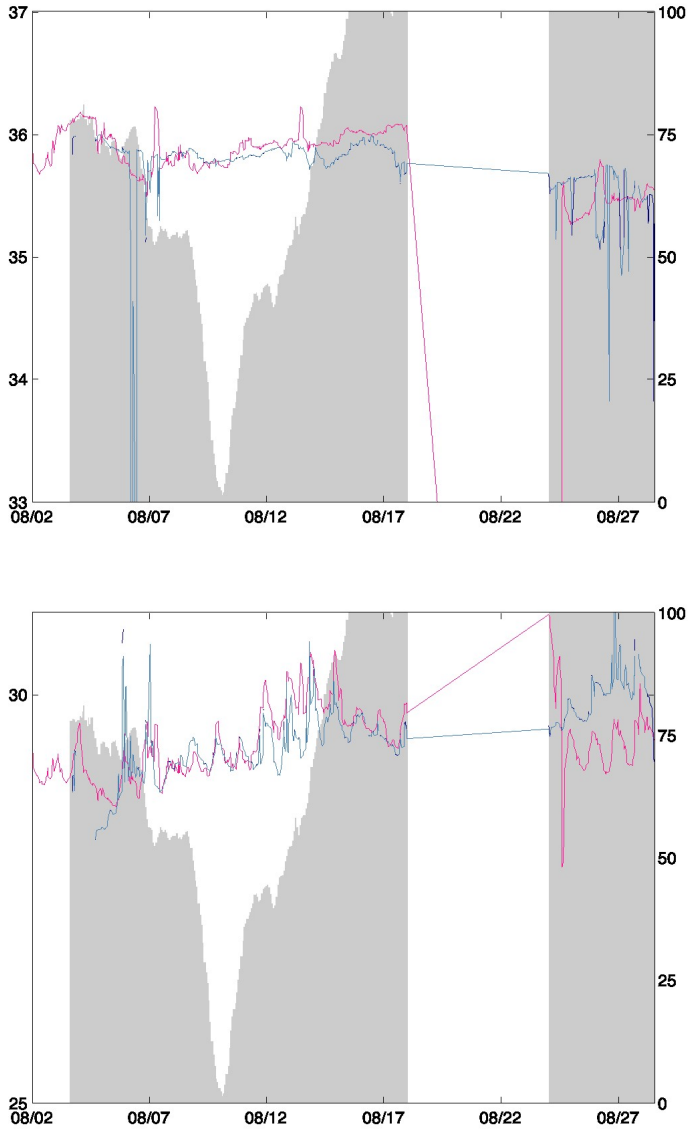


Figure A5: unit_1091/SD1045 2023. Glider- and Saildrone-measured near-surface salinity (upper) and temperature (lower), with distance between the vehicles shown as gray shading. Full vertical shading indicates a separation distance >100km.

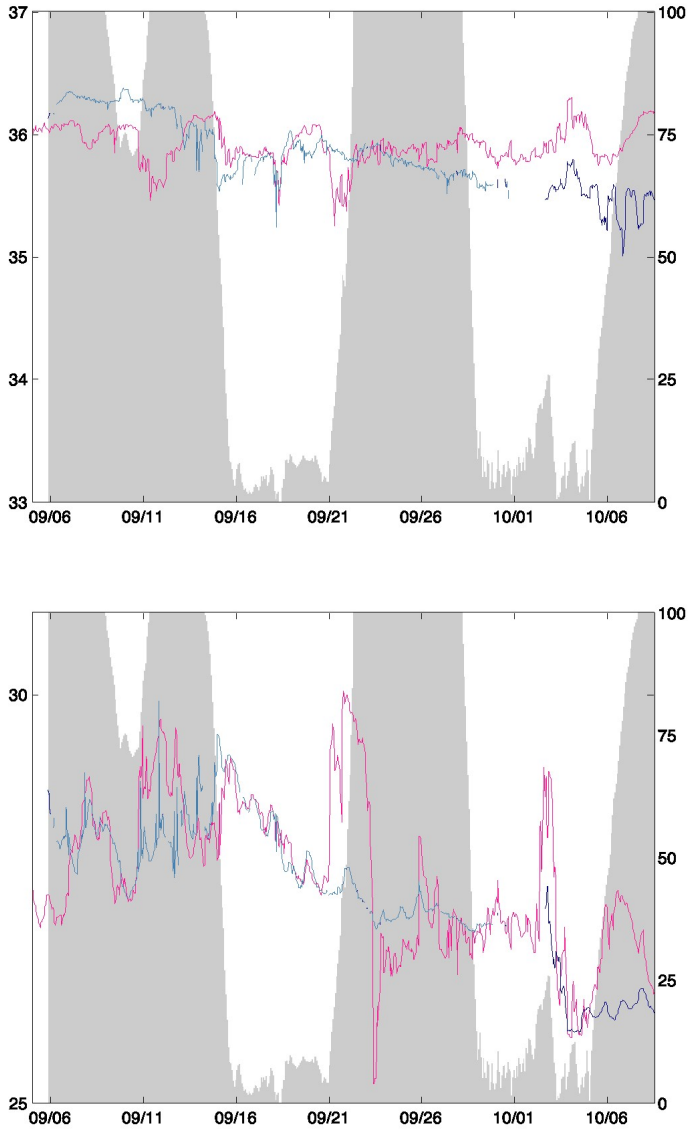


Figure A6: unit_1091/SD1045 2023. Glider- and Saildrone-measured near-surface salinity (upper) and temperature (lower), with distance between the vehicles shown as gray shading. Full vertical shading indicates a separation distance >100km.

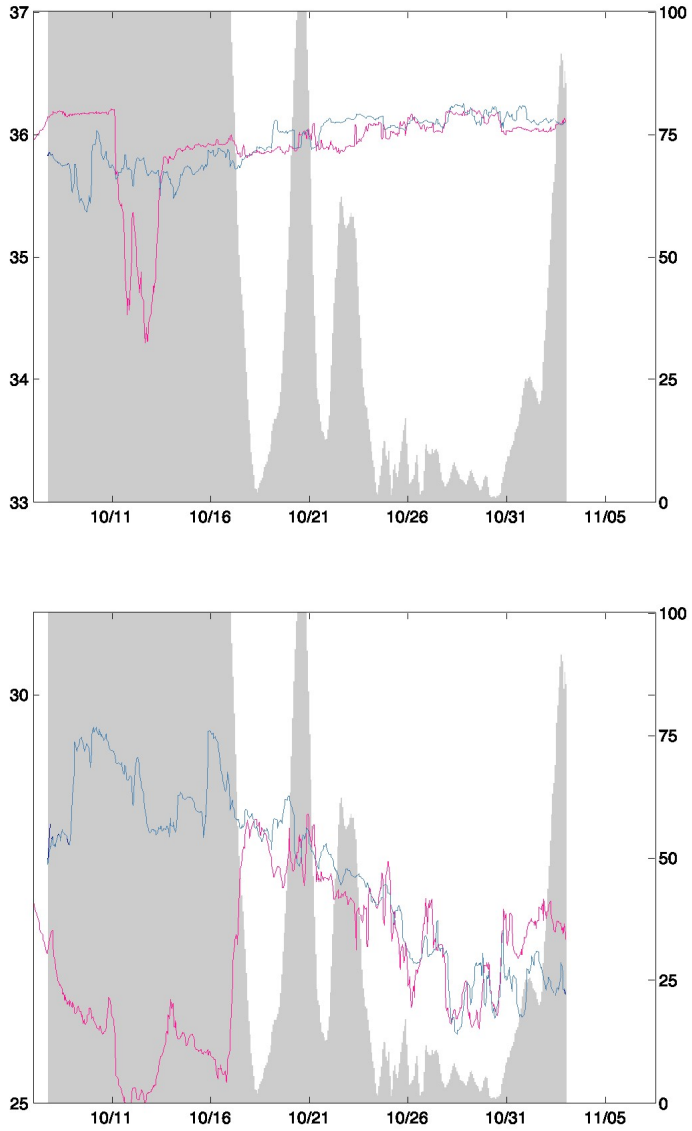


Figure A7: usf-bass/SD1045 2023. Glider- and Saildrone-measured near-surface salinity (upper) and temperature (lower), with distance between the vehicles shown as gray shading. Full vertical shading indicates a separation distance >100km.

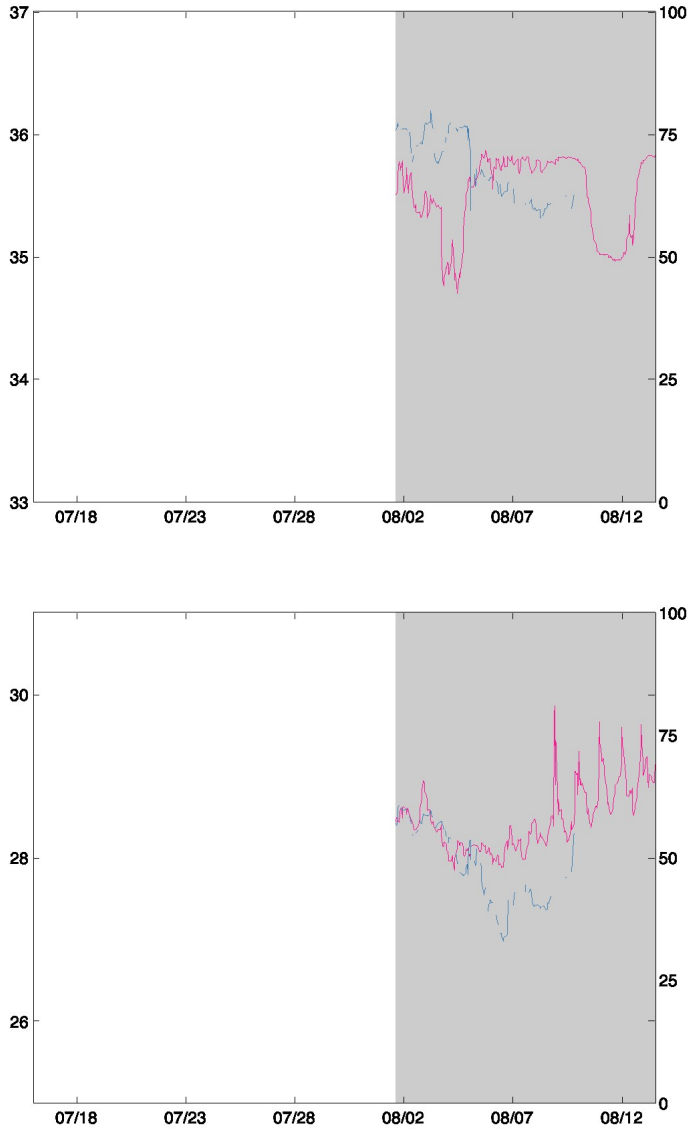


Figure A8: usf-sam/SD1040 2021. Glider- and Saildrone-measured near-surface salinity (upper) and temperature (lower), with distance between the vehicles shown as gray shading. Full vertical shading indicates a separation distance >100km.

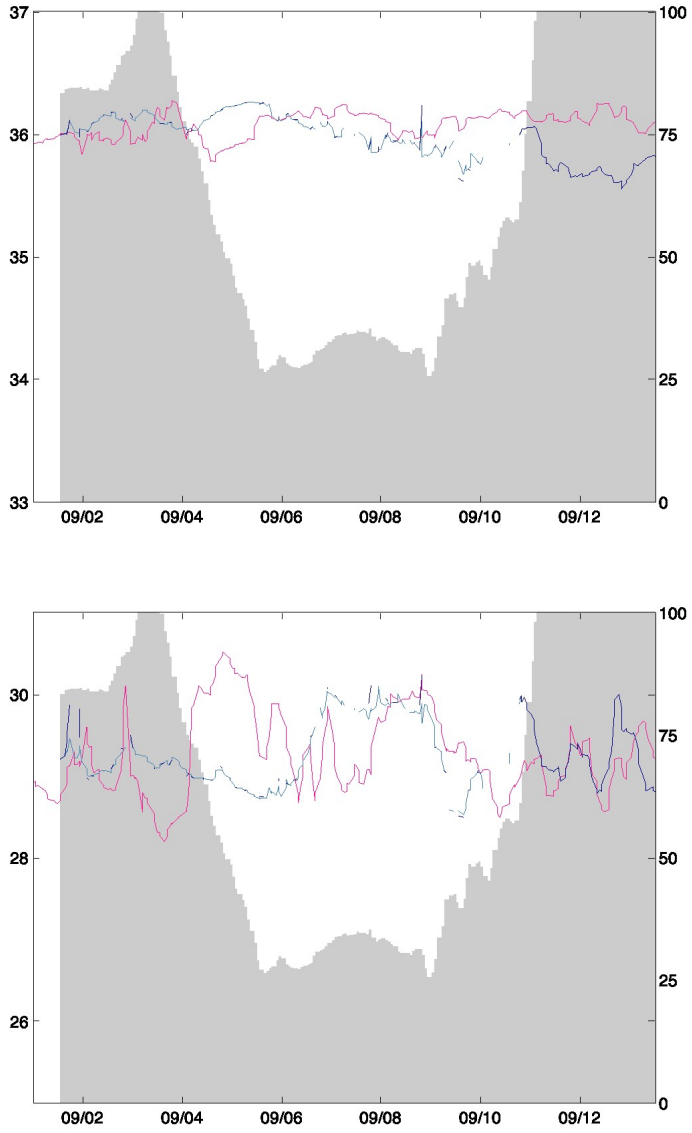


Figure A9: usf-sam/SD1059 2022. Glider- and Saildrone-measured near-surface salinity (upper) and temperature (lower), with distance between the vehicles shown as gray shading. Full vertical shading indicates a separation distance >100km.