

NOAA Science Update to the Science Advisory Board

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Acting NOAA Chief Scientist

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NOAA Research and Development Vision Areas: 2020 - 2026

Vision Area 1:
Reducing
societal impacts
from hazardous
weather and
other
environmental
phenomena

Vision Area 2:
Sustainable use
and stewardship
of ocean and
coastal resources

Vision Area 3:
A robust and
effective
research
development,
and transition
enterprise

Recent Executive Orders

EO 14008: Tackling the Climate Crisis at Home and Abroad

**EO13990: Protecting Public Health and the Environment
and Restoring Science to Tackle the Climate Crisis**

**Memorandum on Restoring Trust in Government Through
Scientific Integrity and Evidence-Based Policymaking**

The NOAA Science Council will develop an SRGM for FY 23-24.

As of 7/05/17

Vision Area 1:

Reducing societal impacts from hazardous weather and other environmental phenomena



*A radar monitoring severe storms.
Photo credit: Robin Tanamachi, NOAA/OAR/NSSL*

NOAA Upgrades Its Flagship Global Forecast System

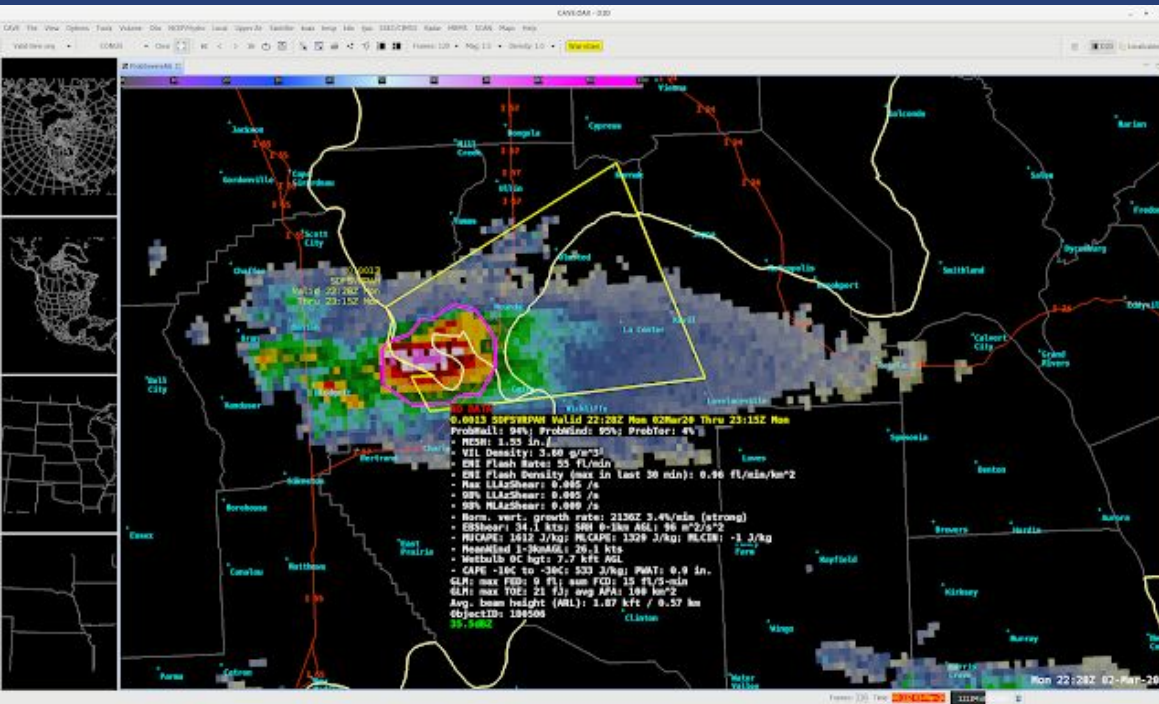


- The Global Forecast System (GFS) weather model was updated to boost US weather forecasting capabilities.
- These advancements will improve hurricane genesis forecasting, modeling for snowfall location, heavy rainfall forecasts, and overall model performance.
- The GFS is now coupled with a global wave model which will extend current wave forecasts from 10 days out to 16 days and improve the prediction of ocean waves forced by the atmosphere.

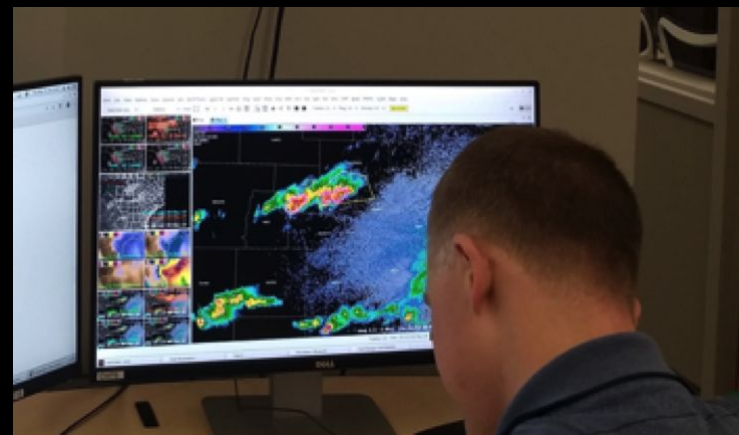
Image by [Free-Photos](#) from [Pixabay](#)

ProbSevere – Artificial Intelligence for Identifying Severe Storms

NESDIS, OAR, & NWS joint project



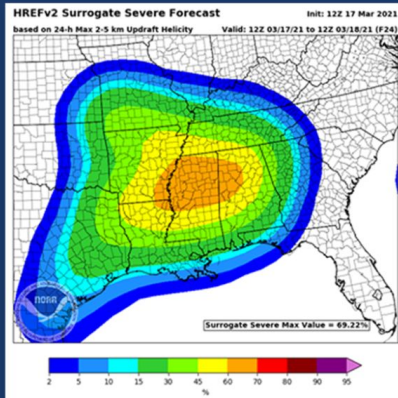
A NWS forecaster using ProbSevere to monitor for possible severe weather



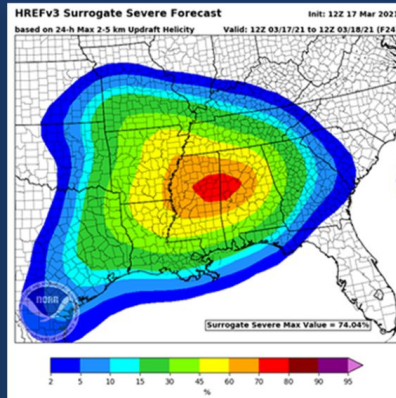
ProbSevere integration with the Advanced Weather Interactive Processing System (AWIPS)

Weather Upgrades

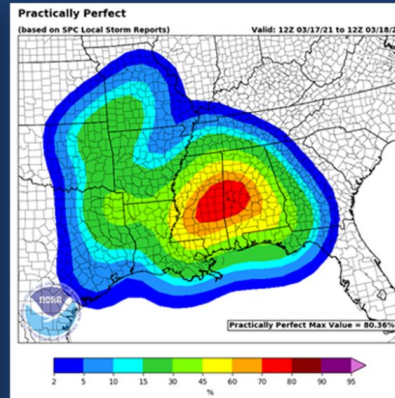
High Resolution Ensemble Forecast March 17, 2021 severe weather outbreak comparison



Current HREF system forecast



Upgraded HREF system forecast



Actual conditions observed

- The High Resolution Ensemble Forecast (HREF) gains 12 Hours: from 36 to 48 hours.
- HRRR Model Advances: higher resolution, HRRR Smoke, public health and extreme weather.
- Unified Forecast System growth.
- EPIC and Numerical Weather Prediction

Credit: NOAA/EMC and SPC

Empowering Communities to Map and Understand Urban Heat Islands

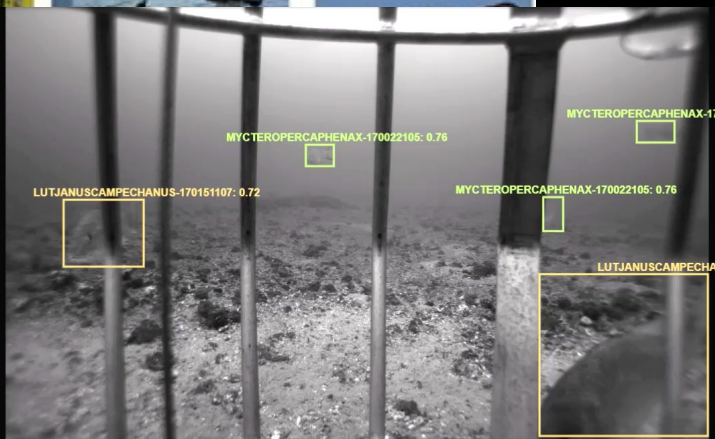


Vision Area 2: Sustainable use and stewardship of ocean and coastal resources



South entrance of Detroit River to the right and northeast corner of Lake Erie to the left. Photo credit: NOAA/OAR/GLERL

Cooperative Research, Alternative Technologies, Machine Learning, and Stock Assessments



Video and Image Analytics for Marine Environments (**VIAME**) software has allowed NOAA's Southeast Fisheries Science Center to develop a model for:

- identification and tracking of > 100 fish species** through survey videos, and
- produce count information within hours** of video collection on the 2021 SEAMAP

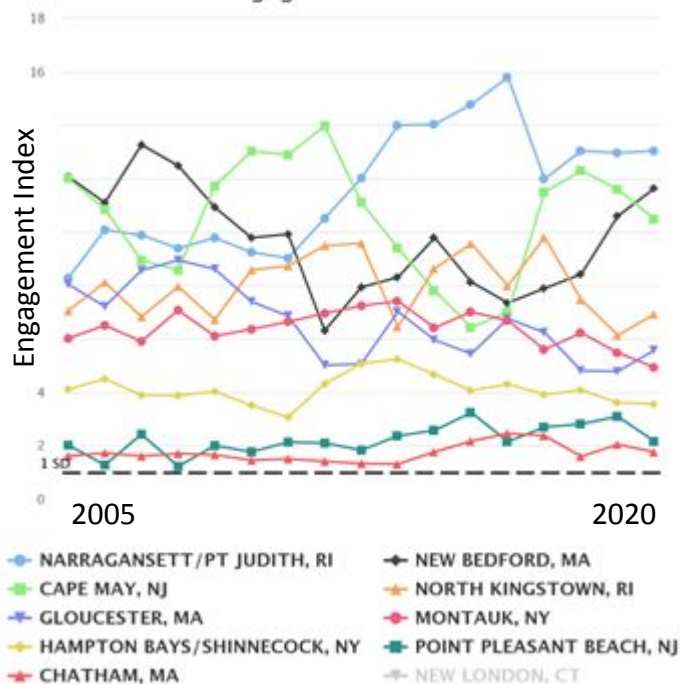
Initial goal was to provide integration platform for different analytics (image correction, detection, tracking) but this undertaking has since evolved into a DIY-AI toolkit for biologists to train up models themselves, with multiple applications in aerial image processing, on-board ship process, and benthic image analysis.

Reef Fish Video Survey

- This approach will increase the availability and **timeliness of data to support fisheries stock assessments**
- The team continues to build and improve an annotation library of over 230,000 images across 135 species in the Gulf of Mexico

New Tool For Understanding Fishing Community Well Being

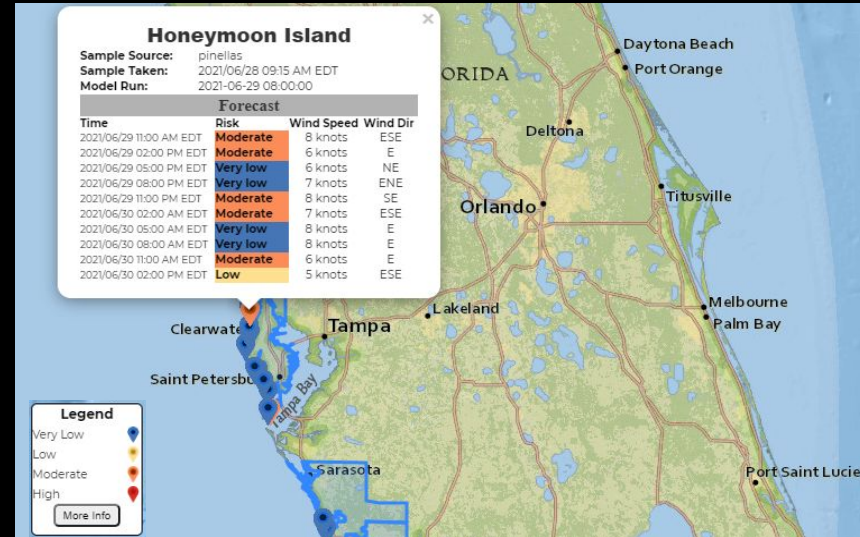
Fishing Engagement Index Scores of Communities Highly Engaged for All Years



- Achieving **Environmental Justice** requires social indicators to determine labor force characteristics such as poverty and gentrification pressure.
- NMFS social scientists have developed a site* to easily assess how well a **fishery and the human communities** that depend on it are doing.
- In addition to economic data, the site provides an index of **“community engagement”**, measuring the importance of fishing to the local economy, and reflecting **community vulnerability and resilience**.
- The tool provides information about changes in key drivers of social well-being of fishing communities as well as the economic well-being of fishing fleets.

Gulf of Mexico Red Tide Respiratory Forecasts

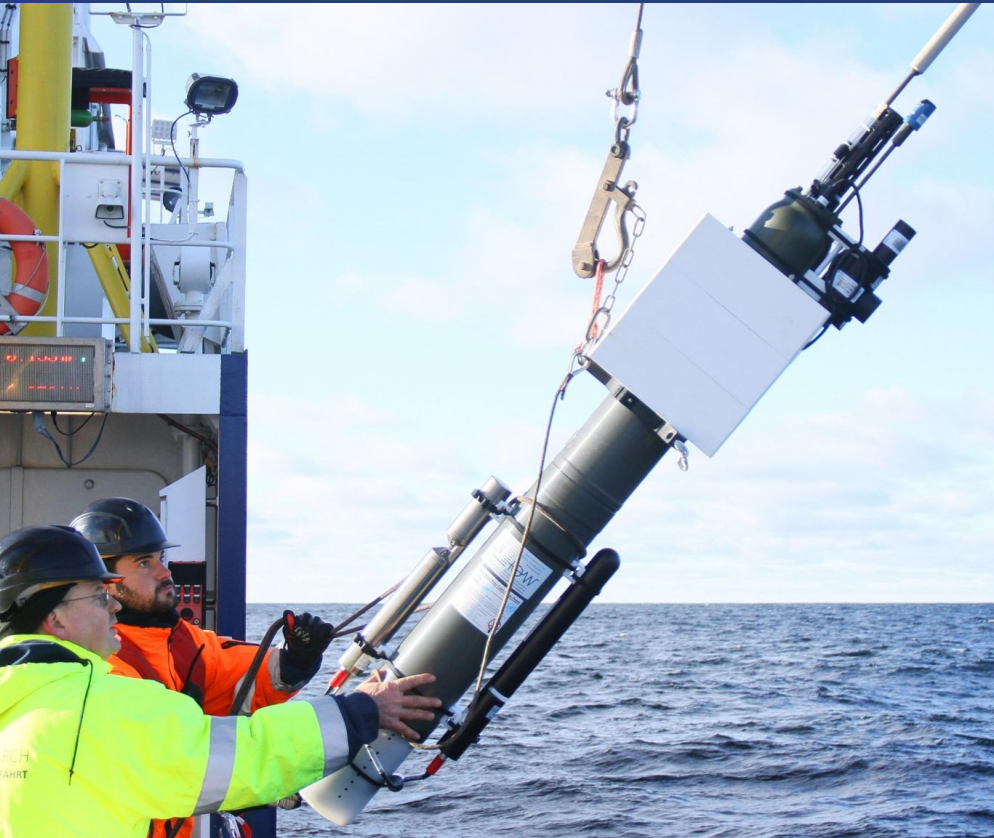
- Red tide blooms produce a toxin, which can cause respiratory infection.
 - Blooms also cause economic impacts to beach tourism and businesses.
- Blooms are patchy; high resolution information is needed on where/when respiratory irritation may occur.
- Improved resolution for FL red tide forecasts
 - NCCOS/GCOOS produce/post respiratory forecasts (every 3 hours experimental vs. daily) at specific parks/beaches in each FL county.



3-hour experimental red tide forecast for Honeymoon Island, FL

<https://habforecast.gcoos.org/>

State of the Global Ocean Observing System in 2021 – recovering from the pandemic



“This year the global ocean observing system has continued to progress and evolve despite the significant challenges of responding to a global pandemic. Looking ahead, we must continue to increase cooperation and coordination across the international community, engage more fully with the private sector, and integrate more the local communities in ocean observing.” - Dr. David Legler, Chair of the GOOS Observations Coordination Group.

- 10% Real Time, Global
- 15 to 20% Maintenance, Global
- + 70 Oxygen Sensors N. Atlantic
- + 100 BGC Argo Floats Launched

Photo credit: IOC UNESCO

Vision Area 3:

A robust and effective research development, and transition enterprise



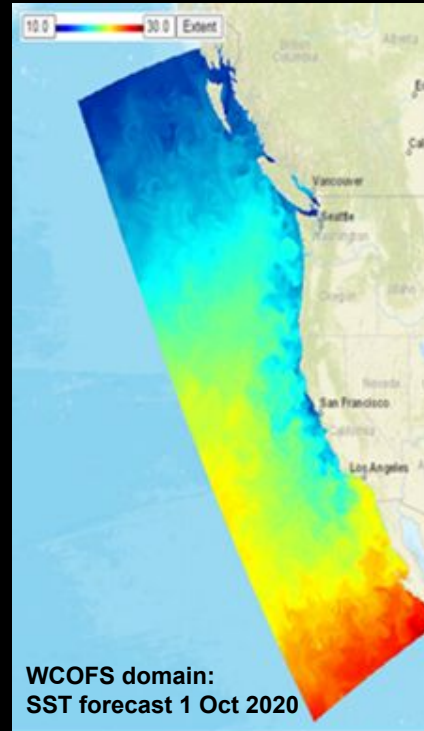
*The GOES-17 satellite above the thermal vacuum chamber.
Photo credit: Lockheed Martin.*

West Coast Operational Forecast System (WCOFS): A cross-NOAA partnership

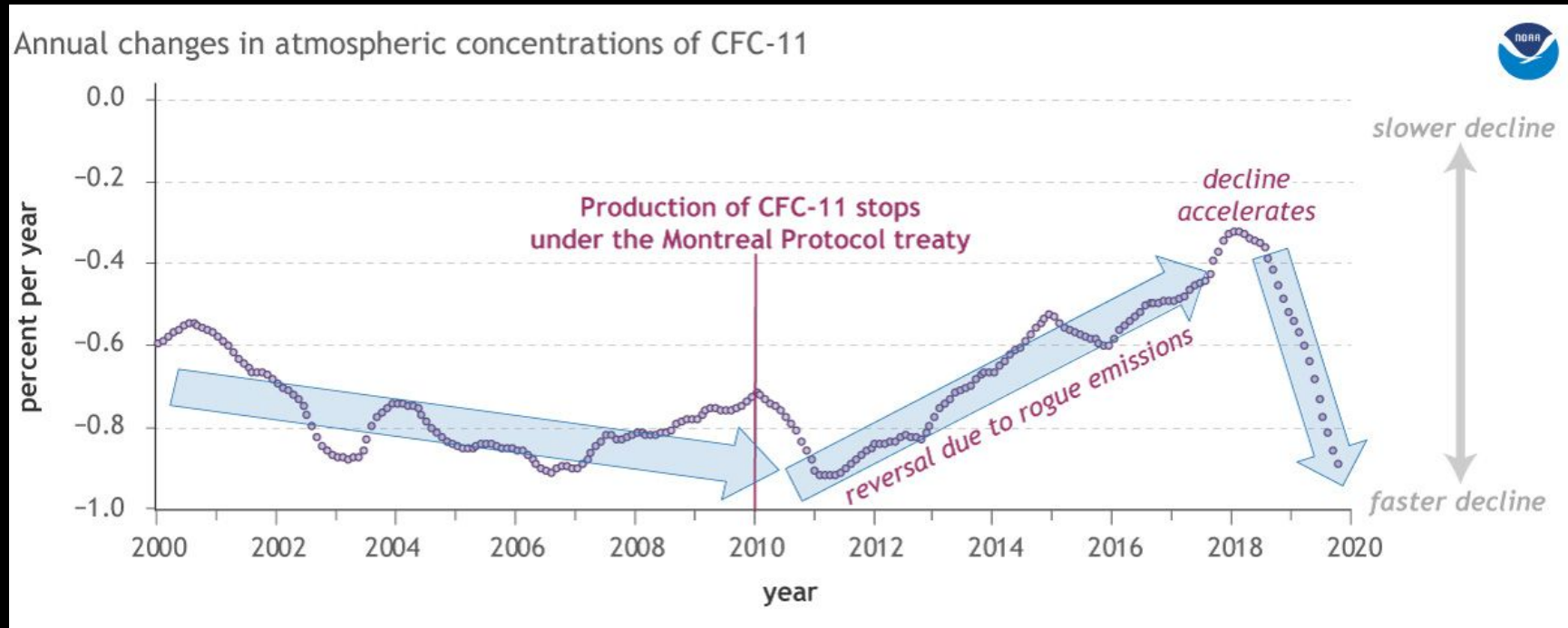
OPERATIONAL: 22 March 2021

Applications:

- **NOAA's first regional ocean model for the U.S. West Coast**
 - Foundational model for developing West Coast biogeochemical modeling
- **Coastal navigation**
 - Optimizing fuel efficiency
- **Fishing**
 - Identifying relevant/optimal locations for targeted species
 - Identifying current direction and speed for deploying fishing gear
 - Identifying areas for excluding fishing due to protected species
- **Marine environmental hazard response**
- **Marine habitat characterization**
 - Monitoring transient phenomena, e.g., marine heat wave
 - Providing alerts to sensitive Blue Economy efforts
- **Marine spatial planning**
 - Characterizing conditions for different use cases, e.g., marine engineering, fishing, recreation, etc.



Emissions of CFC-11 are back on the decline



NOAA R&D During the COVID-19 Pandemic



Image of NOAA CSL instruments measuring during OVID-19 "safer-at-home" orders. Credit: Jessica Gilman, NOAA/CSL

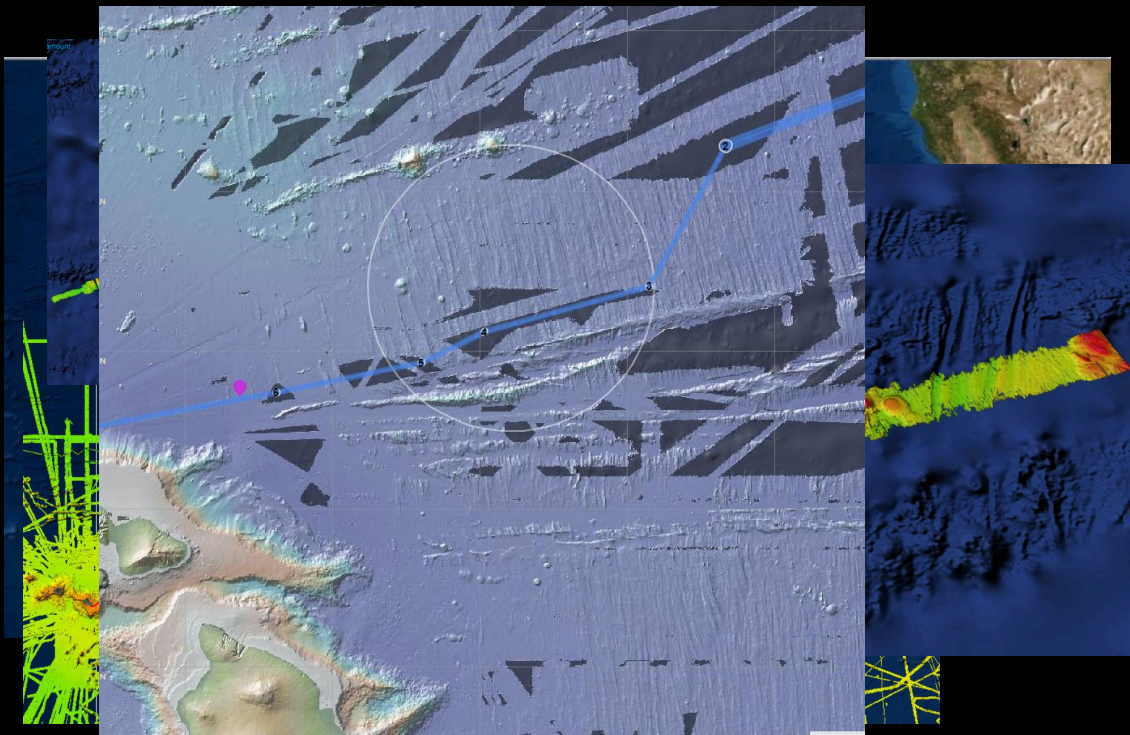
Saildrone



Photo credit: Saildrone

NOAA Ocean Exploration Cooperative Institute - University of New Hampshire

SAILDRONE SURVEYOR



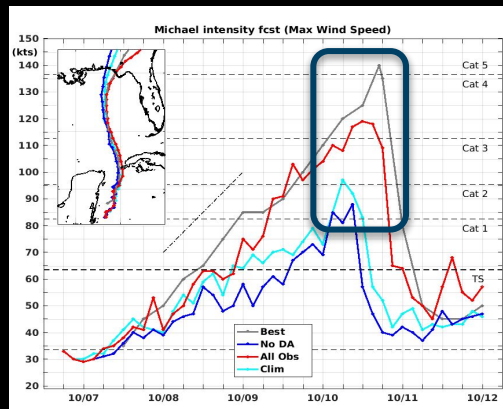
NOPP/OER grant with Saildrone and MBARI for further development and implementation of 72ft autonomous Saildrone with EM304 deep-water MBES and environmental sensor suite including eDNA sampler

Hurricane Gliders



NOAA hurricane glider

- Essential ocean features are linked to rapid intensity changes of hurricanes. Gliders provide ocean profiles that are key to properly initialize ocean models for hurricane forecasts.
- Ocean glider array is accomplished via partnerships between AOML, NOS, NWS, Navy, TAMU, USM, Rutgers, SECOORA, ANAMAR, WHOI, CIMAS, CEI, and IOOS RAs.
- 2021: gliders will operate alongside Saildrones, providing first co-located/simultaneous ocean-atmospheric observations



Hurricane Michael (2018): Forecast intensity without (blue) and with (red) ocean observations assimilated, vs. actual (grey). Ocean obs are needed to forecast the rapid intensification.

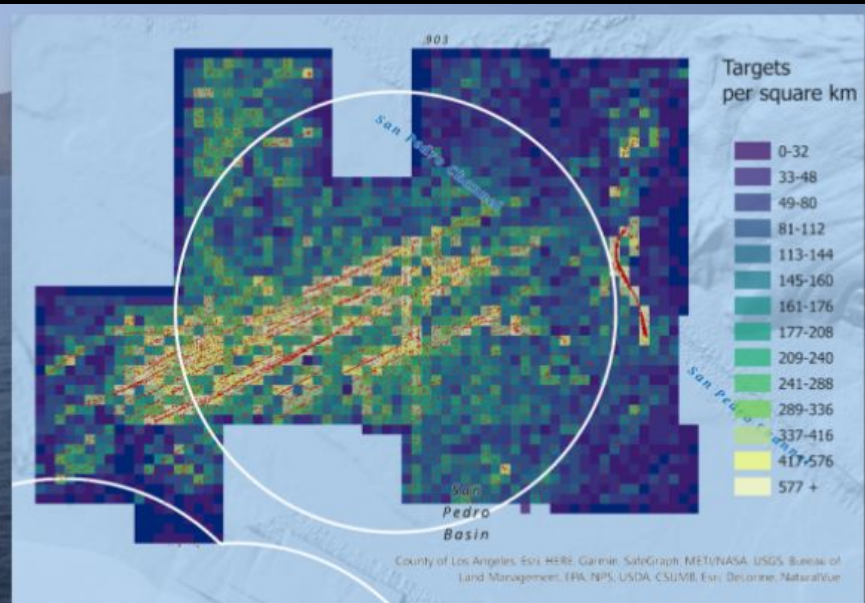
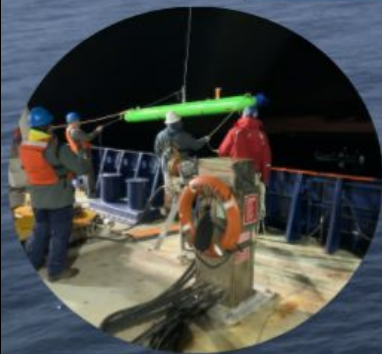
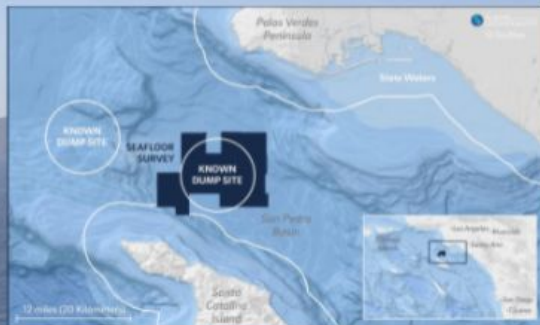
Le Henaff et al, 2021

Uncrewed Platforms for Spills in Ice Environments



- **ORR scientists, with support from USCG, EPA, and other partners are using UAS and ROVs to detect and characterize surface oil in icy waters.**
- **Fly a quadcopter carrying multispectral sensors over various configurations of oil/ice, and use underwater ROV mounted acoustic sensors to simultaneously characterize the oil from beneath.**
- **Able to characterize eight oil thickness categories in combination with various ice cover regimes.**
 - **Nine successful in-situ burns conducted/monitored using fresh and weathered AK N Slope crude oil**

NOAA/OMAO and Scripps Institute of Oceanography Partner to further UxS technology and applications



NOAA Partners with University of Southern Mississippi on UxS



Crew members aboard NOAA Ship
Ferdinand Hassler operate a UxS

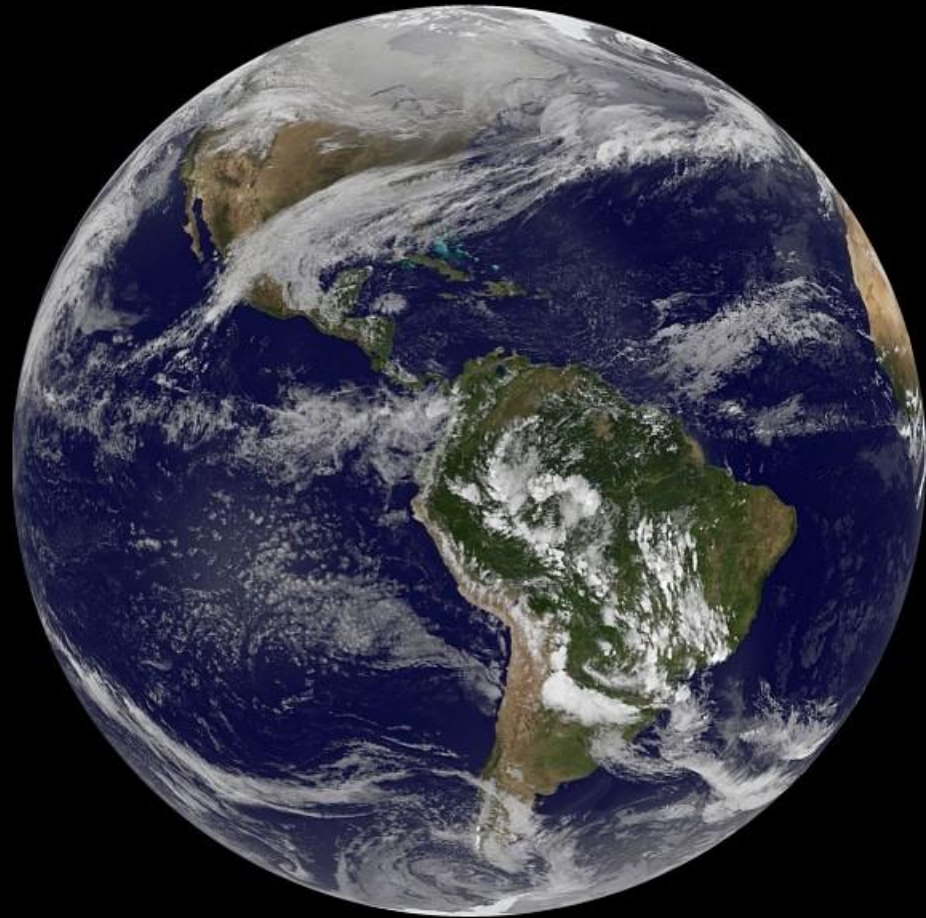
Future Roger F. Wicker Center



UN Decade of Ocean Science for Sustainable Development



Questions?



BACKUP SLIDES

The figure displays six NOAA Strategy documents arranged in a 2x3 grid. Each document features a distinct color background and a central graphic representing its theme. The top row includes 'NOAA Citizen Science Strategy' (green background, showing people using a smartphone), 'NOAA Data Strategy' (red background, showing Earth from space), and 'NOAA Cloud Strategy' (orange background, showing a cloud on a circuit board). The bottom row includes 'NOAA Uncrewed Systems Strategy' (teal background, showing a boat and a drone), 'NOAA Artificial Intelligence Strategy' (purple background, showing data points and a globe), and 'NOAA 'Omics Strategy' (yellow background, showing a DNA helix). Each document also includes the NOAA logo and the text 'National Oceanic and Atmospheric Administration' and 'Department of Commerce'. At the bottom of each document, it states 'NOAA Science & Technology Focus Areas' and lists the authors: 'Bernard Bolger • Artificial Intelligence • Boer • Dool • Ellen Sweeney • Ray • January 2020'.