



NOAA Science Update to the Science Advisory Board

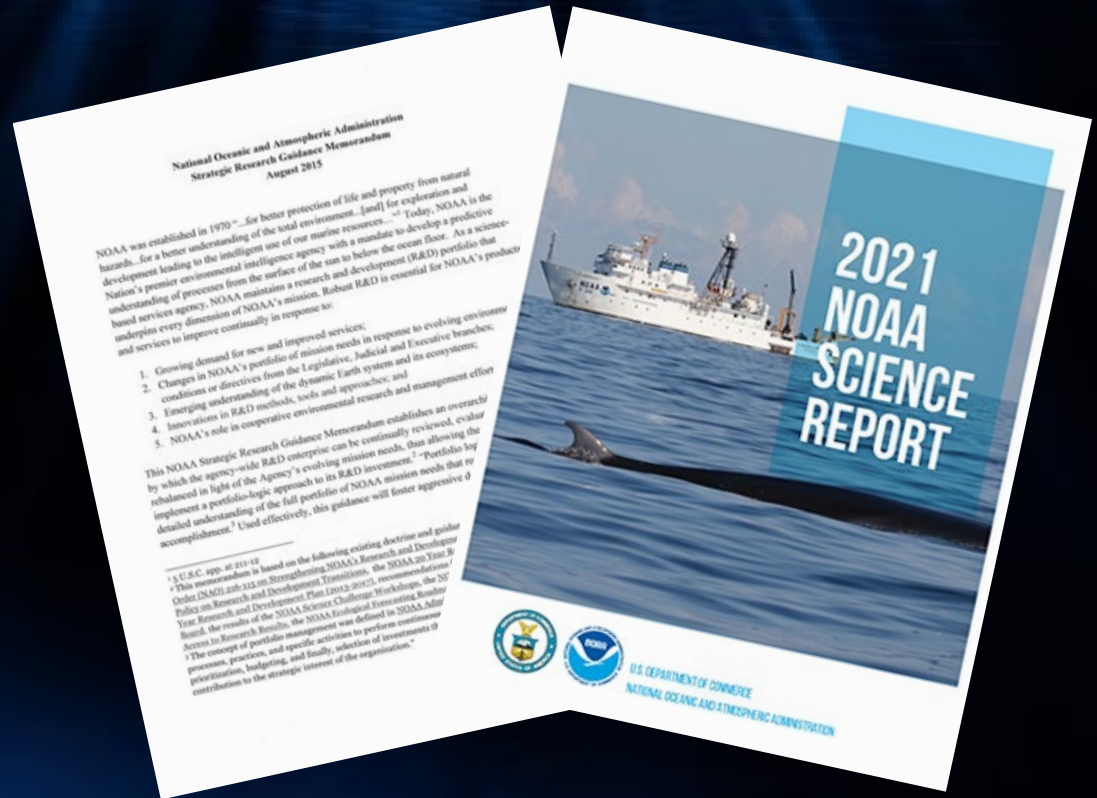
Cisco Werner
Performing the Duties of the
NOAA Chief Scientist

April 27, 2022

Strategic Research Guidance Memorandum & 2021 NOAA Science Report

The NOAA Science Council developed a SRGM for FY 24.

The 2021 NOAA Science Report was released in March 2022.



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

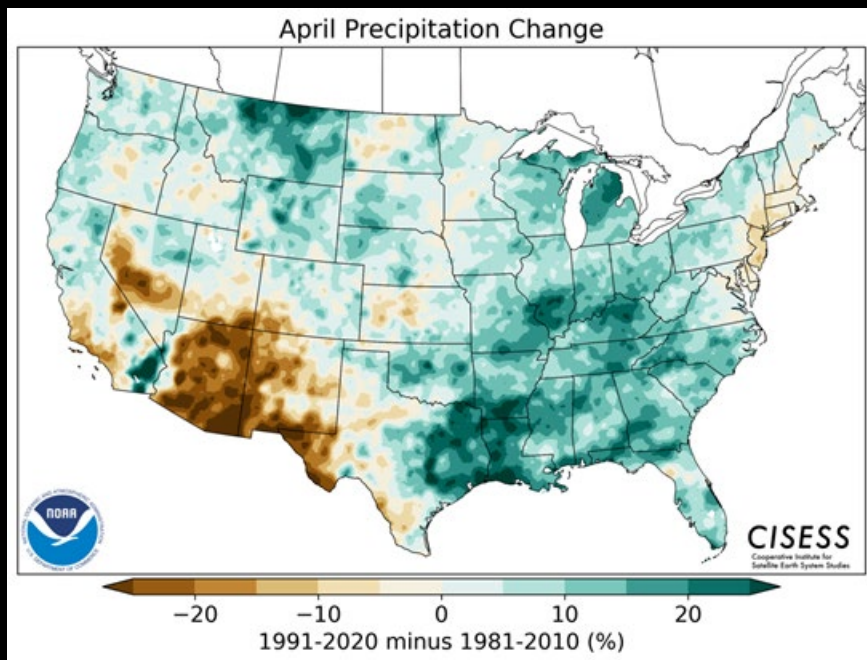
Vision Area 1:

Reducing societal impacts from hazardous weather and other environmental phenomena



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

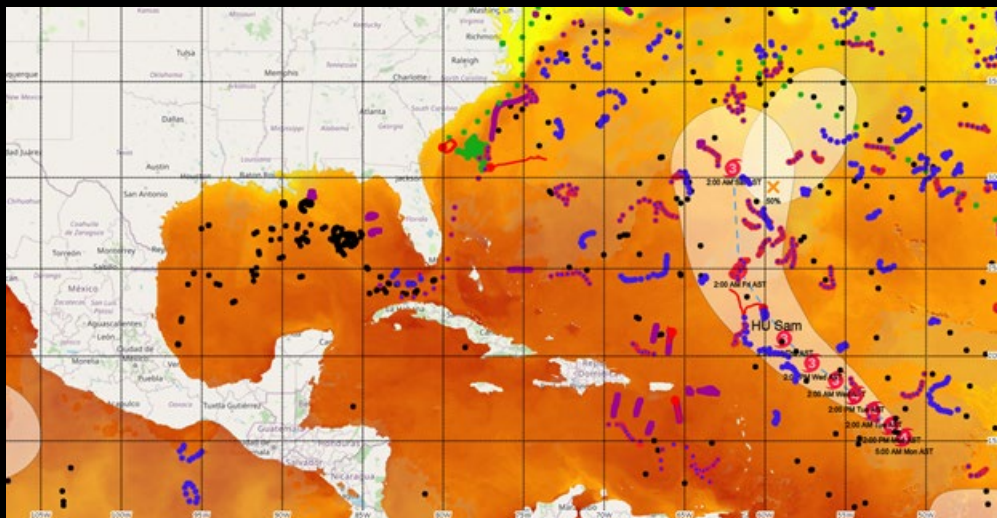
New 1991-2020 U.S. Climate Normals from NESDIS/NCEI



Change map ("new normals" versus prior normals) depicting dramatic decade-over-decade changes in April precipitation.

- The new 1991-2020 temperature-, precipitation-, and snow-related climate normals were released.
- This was done with new stations and updated methods, and new delivery mechanisms.
- New user needs were met through deep engagement with core public and private stakeholders.
- The rollout strategy proactively addressed inevitable questions about climate change.

Integrated Ocean Observing for the Atlantic Hurricane Season

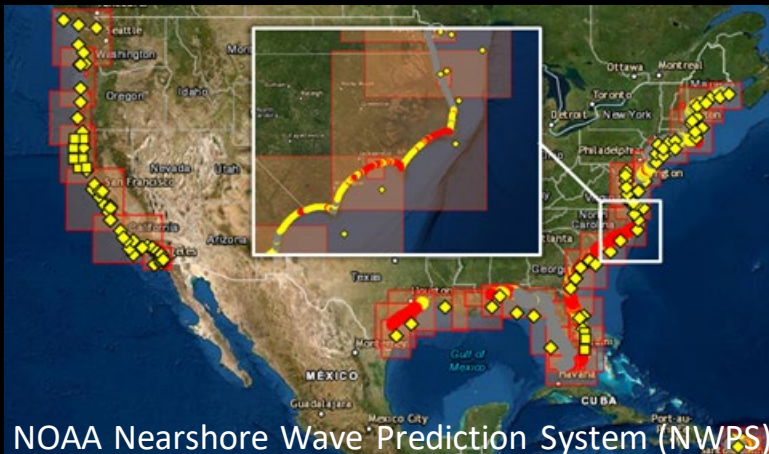


An example map from OAR/AOML and NESDIS's Hurricane OceanViewer showing locations of gliders, Argo floats, Saildrones, XBTs, and drifter observations that were coordinated ahead of and during Hurricane Sam in the 2021.

Image credit: NOAA

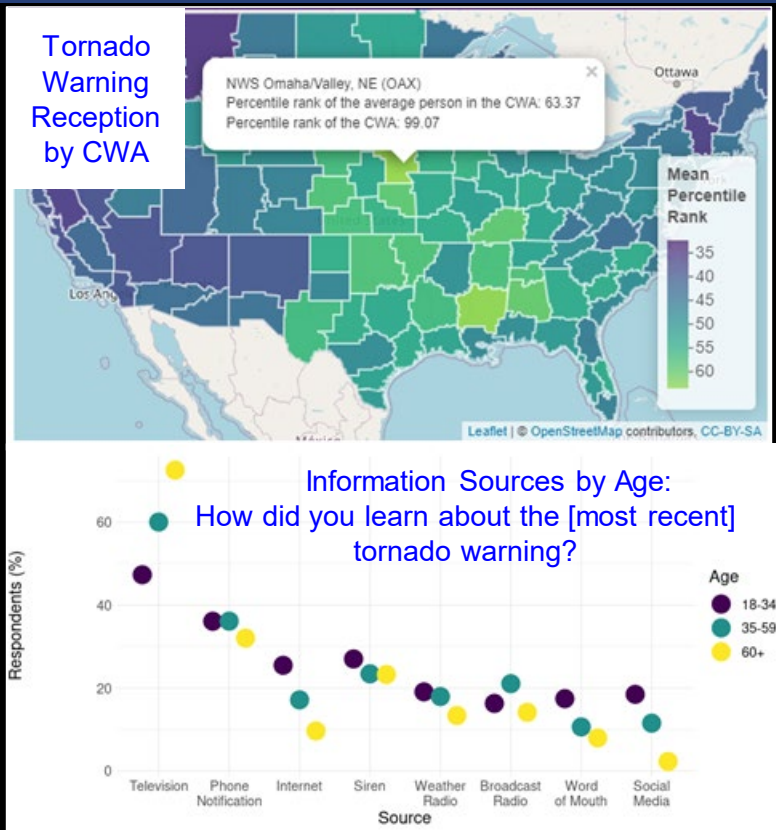
- NOAA formed the first integrated ocean observations tool to coordinate the use of different in situ ocean observing platforms during the Atlantic hurricane season named OceanView.
- OceanView gives access to multiple data types to assess changes in water bodies from both a general view and an event-scale perspective.
- These data will help understand storm intensification supporting improved hurricane forecast models.

Operational NOAA Rip Current Forecast Model



- Rip currents are powerful, narrow channels of fast-moving water that are prevalent along US coasts.
- CO-OPS and NWS launched the first ever national rip current forecast model.
 - The model is a component of the NWPS and predicts the likelihood of hazardous rip currents every kilometer along the coast, every hour up to six days out.
- The model's improved accuracy, resolution and lead-time has the potential to reduce drownings and save lives.

Expanding Social and Behavioral Data Availability to Improve Communication of Forecast Uncertainty and Probabilistic Information



- The Weather and Society Dashboard (Wx Dashboard) is a dynamic interface and database of survey information reflecting the public's perception, response, and readiness to severe and tornadic events.
- The Wx Dashboard will enable forecasters to better understand public perception and the nuances associated with demographics so that they can **best message and prepare the public to respond to severe weather events.**
- It will support the development of a baseline and performance metrics for messaging associated with severe and tornadic events for improved **Impact-based Decision Support Services (IDSS) in saving lives and property.**

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

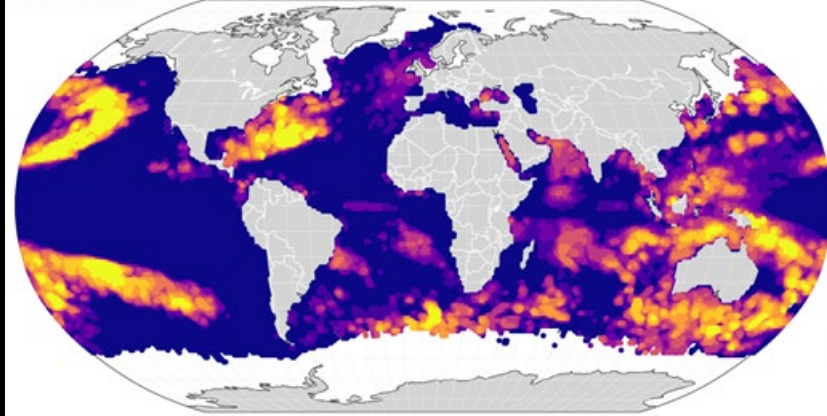


South entrance of Detroit River to the right and northeast corner of Lake Erie to the left. Photo credit: NOAA/OAR/GLERL

Global Seasonal Forecasts of Marine Heatwaves

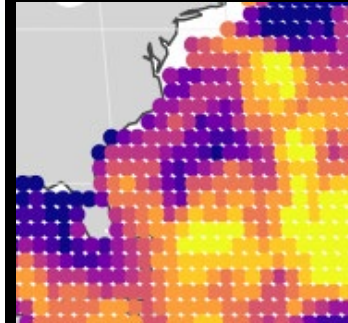
- NOAA researchers have developed global forecasts that can provide up to a year of advance warning for Marine Heatwaves (MHW).
- MHW cause sudden and pronounced changes in ocean ecosystems around the world and forecasts provide an early warning system to improve climate adaptation and resilience for marine-dependent communities and industries.
- The forecasts could help fishing fleets, ocean managers, and coastal communities anticipate MHW effects.
- These forecasts will be available online through NOAA's Physical Sciences Laboratory

Marine Heatwave (MHW) Forecast
Derived from : [NMME](#)



MHW probability

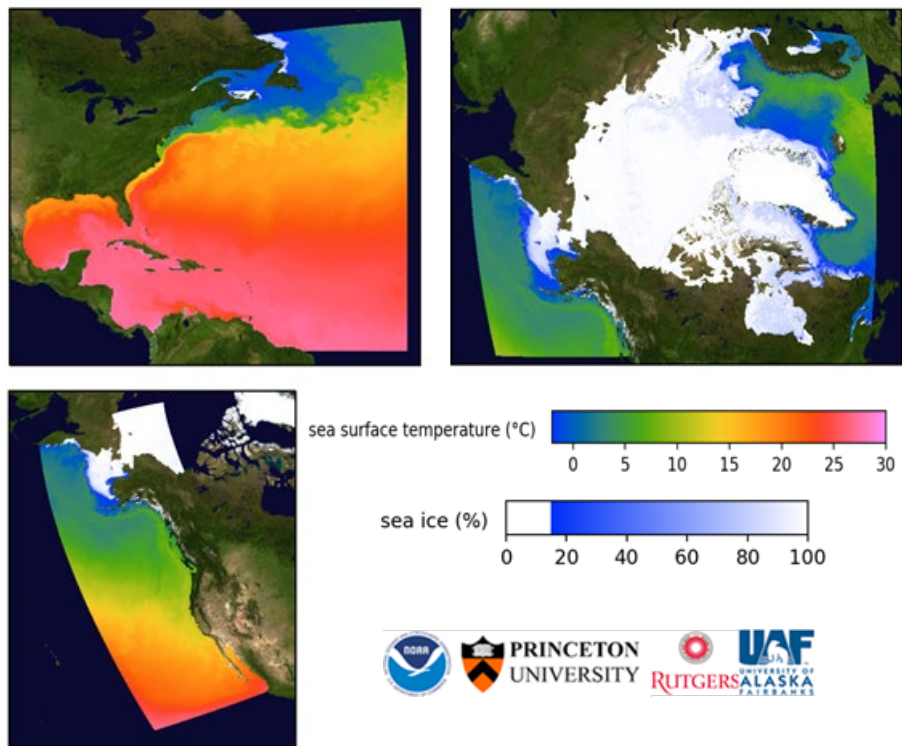
- 0-10%
- 10-20%
- 20-30%
- 30-40%
- 40-50%
- 50-60%
- 60-70%
- 70-80%
- 80-90%
- 90-100%



NOAA
FISHERIES

National High-Resolution Seasonal to Multi-Decadal Ocean and Biogeochemical Prediction for Marine Resources

Simulated April SST and Sea Ice from Prototype Model



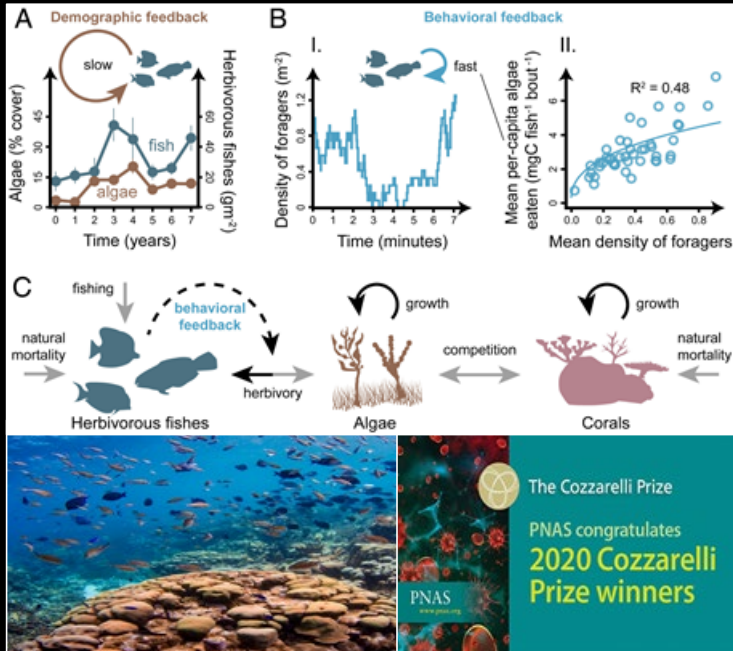
- The development of a nationally integrated coastal/ocean and biogeochemical modeling system will advance NOAA's regional modeling capabilities relevant for fisheries management from weather to climate timescales.
- Such capabilities are critical to the US blue economy and fishing industry because it enables robust stock assessments, harvest quotas, and recovery plans.
- This work is ongoing and supports NOAA's Climate-Fisheries Initiative.

The Impact of the Pace of Change of Human Activities on Marine Ecosystems



NOAA
FISHERIES

UC SANTA CRUZ



- NOAA Fisheries scientists and partners paired herbivorous fish behavior and demographic data in a coral reef ecosystem to study how changing human activities (e.g. fishing) can affect an ecosystem.
 - Interactions between harvested and unharvested species affect ecosystem recovery related to how quickly fishing policies change affects.
 - Feedback between observed foraging behavior and density of herbivorous fish affected coral populations.
 - Due to behavioral and population density feedback, the pace of fishing can also affect ecosystem recovery, not just fishing rate.
- The study team included NOAA Fisheries Scientists from the SWFSC and won the 2020 Cozzarelli Prize.

Local Communities Continue Key Fisheries Surveys During Pandemic

- NOAA Fisheries regularly depends on community partners to assist with sampling and survey efforts. These partnerships took on additional importance during the COVID-19 pandemic as they allowed important sampling/survey efforts to continue.



Some examples include:

- Pacific Islands: A 10-year partnership with the local Hawaiian fishing community allowed for the continuation of the Main Hawaiian Islands Deep 7 Bottomfish Stock Assessment.
- Alaska: Partnership with the Yukon Delta Fisheries Development Association ensured a 14 year data collection effort for Chinook salmon continued.



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.*

Machine Learning Autonomous Surface Vessels & Uncrewed Aircraft Systems



- NOAA OCS, JHC, and the Center for Coastal & Ocean Mapping ASV team are improving machine learning for ASV operations.
- The team developed a software framework based on the Robotics Operating System, integrating cameras, swath mapping echo-sounders, marine radar, lidar, AIS, and NMEA-based sensors for engine monitoring and vehicle health.
- NOAA is developing an Uncrewed Aircraft System that is capable of carrying up to 15 lb scientific payload to collect aerosol and flux measurements in the marine environment.
- A total of 11 flights were conducted in March 2022 to complete atmospheric measurements.

Economic Assessment of Future GeoXO Satellites

- The GeoXO Series Satellites will replace GOES Series Satellites, extend and enhance GOES Capabilities, and are scheduled to begin operations in early 2030s.
- There are 150+ societal benefits identified, showing linkages between: observations, NOAA products using observations, users and uses of GeoXO-enhanced products, and others.
- The Benefit-Cost Comparison analysis makes a business economic case for GeoXO as a whole even though it covers only a small fraction of the beneficial use cases; current studies are looking at the business case for each of the five instruments included in GeoXO.



The U.S. First Official Marine Economy Satellite Account (MESA)

- NOAA and the Bureau of Economic Analysis jointly released the U.S. first official Marine Economy Satellite Account (MESA).



- U.S. marine economy contributed about \$397 billion to the nation's GDP in 2019 and businesses included in the report also generated a total of \$665.7 billion in sales and supported 2.4 million jobs in 2019.
- MESA emphasizes how dependent our nation's economy is on the ocean, coasts, and major water bodies, which NOAA continues to support through science, service, and stewardship, and provides data to decision makers about how to plan for the future.

Questions?

