# NOAA Science Update to the Science Advisory Board

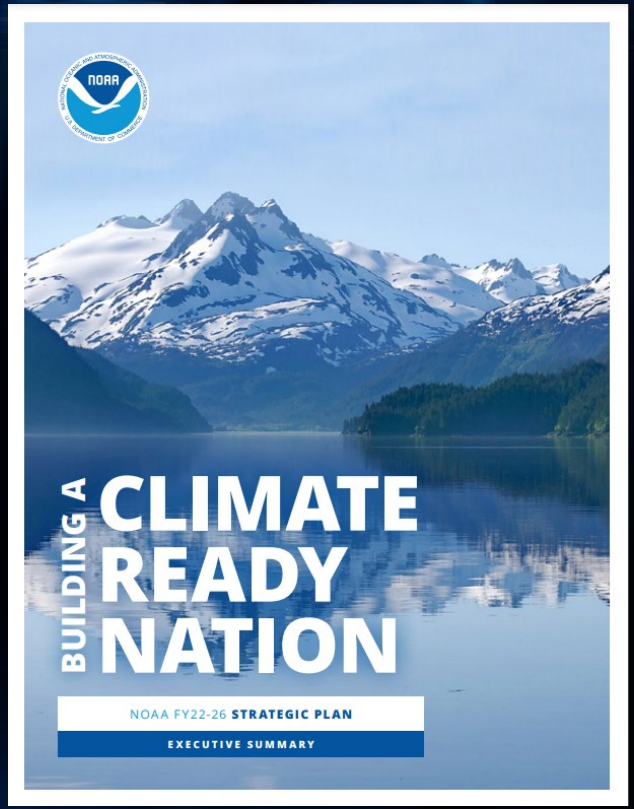
Sarah Kapnick, Ph.D.
NOAA Chief Scientist

August 31st, 2022

# NOAA Releases Strategic Plan

**The most recent NOAA Strategic Plan was released in July 2022**

1. Building a Climate Ready Nation
2. Integrating Equity into Core Operations
3. Advancing the New Blue Economy



# Heat.gov is now available


**Developed in partnership between the CPO, NWS and the CDC**

# NOAA Research and Development Vision Areas: 2020 - 2026

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

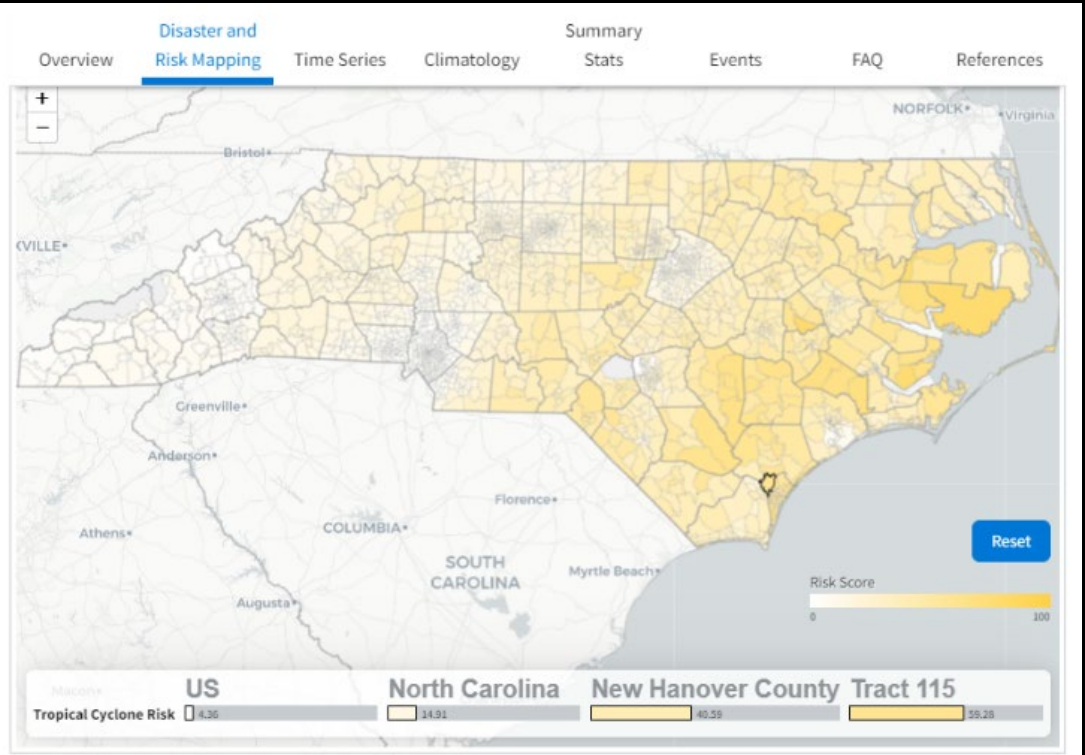
**Vision Area 2:** Sustainable use and stewardship of ocean and coastal resources

**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*

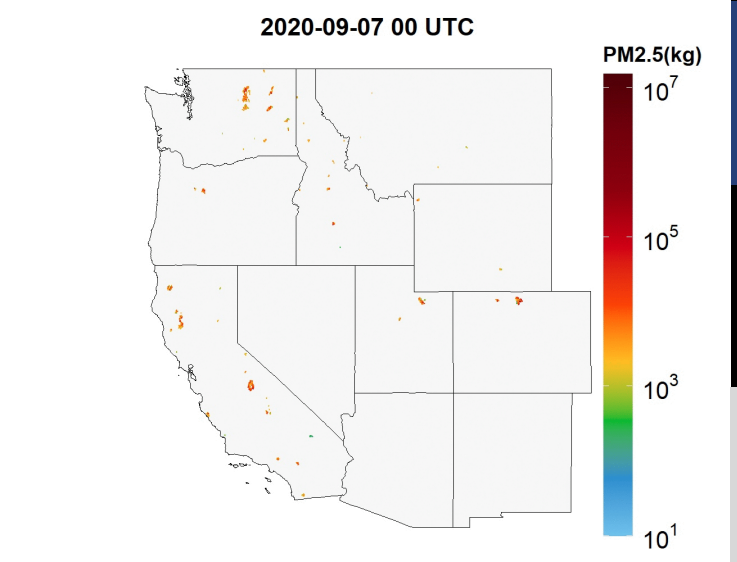
# An update to NOAA's Billion Dollar Disasters mapping tool



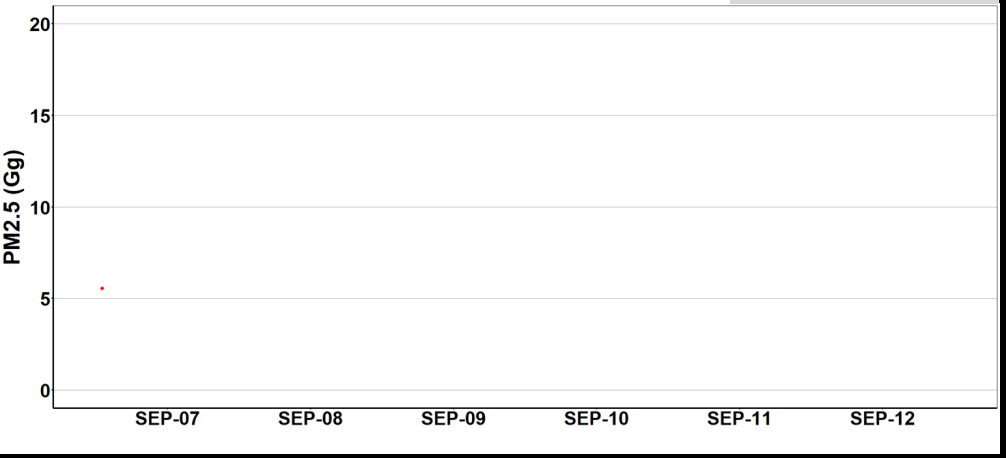

Tropical Cyclone Risk mapped for North Carolina counties in the Billion-Dollar Disasters dashboard from NOAA NCEI.

- The Billion Dollar Disasters mapping tool now includes U.S. census tract data which provides users with community-level awareness of hazard risk, exposure and vulnerability across more than 100 combinations of weather and climate hazards.
- Users can now visualize a community's combined physical exposure, socioeconomic vulnerability and markers of resilience to natural hazards on a finer scale than ever before.

# NOAA Satellite Observations of Rapid Changes in Fire Emissions Feed NWS Operational Air Quality Forecasting Models




Extreme Fires of 2020: Spatial and Temporal Variations




- NESDIS developed a new Regional hourly Advanced Baseline Imager (ABI) and Visible infrared Imaging Radiometer Suite (VIIRS) Emissions (RAVE) algorithm that generates hourly fire emissions.
- RAVE captures rapidly changing fires and their emissions on hourly time scale that are ingested into the NWS Community Multiscale Air Quality Model (CMAQ) that predicts $PM_{2.5}$ and ozone as part of its National Air Quality Forecasting Capability.
- Simulations from the prototype online CMAQ model for August 2019 showed that surface $PM_{2.5}$ predictions were much closer to the true values, including a significantly more accurate estimate of the number of times the National Ambient Air Quality Standard for $PM_{2.5}$ at 35 micrograms per cubic meter of air (35 µg/m3) had been exceeded.



*F. Li, X. Zhang, S. Kondragunta, X. Liu, I. Csiszar, C. Schmidt, Hourly biomass burning emissions product from blended geostationary and polar-orbiting satellites for air quality forecasting applications, RSE, in review, 2022*

# High Resolution Rapid Refresh model critical in decision-making during Marshall Fire

Marshall Fire

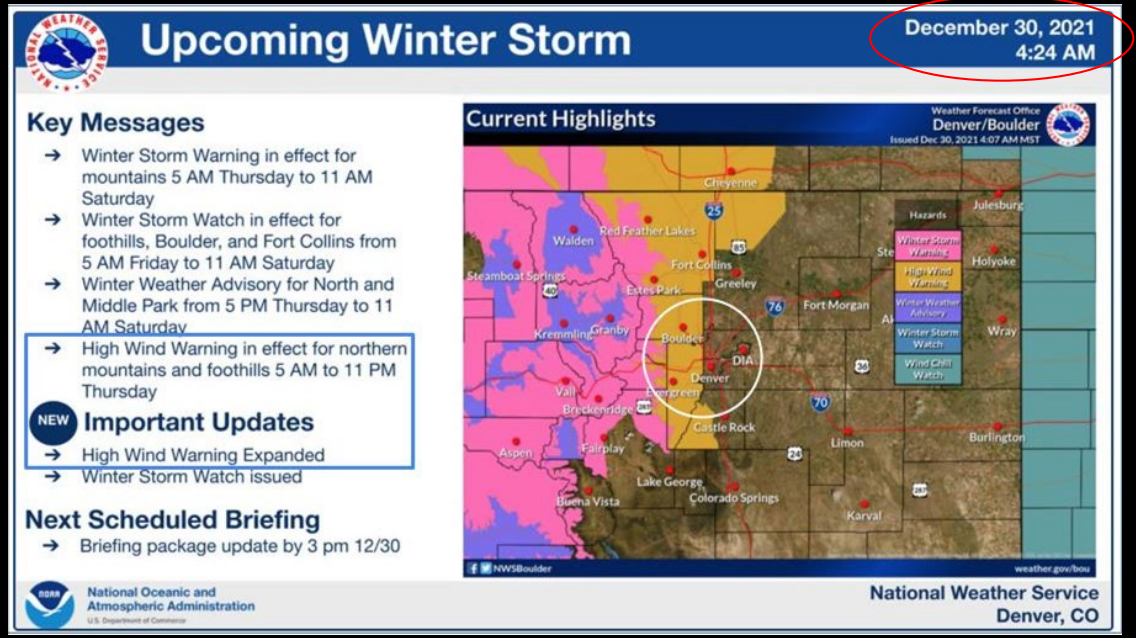
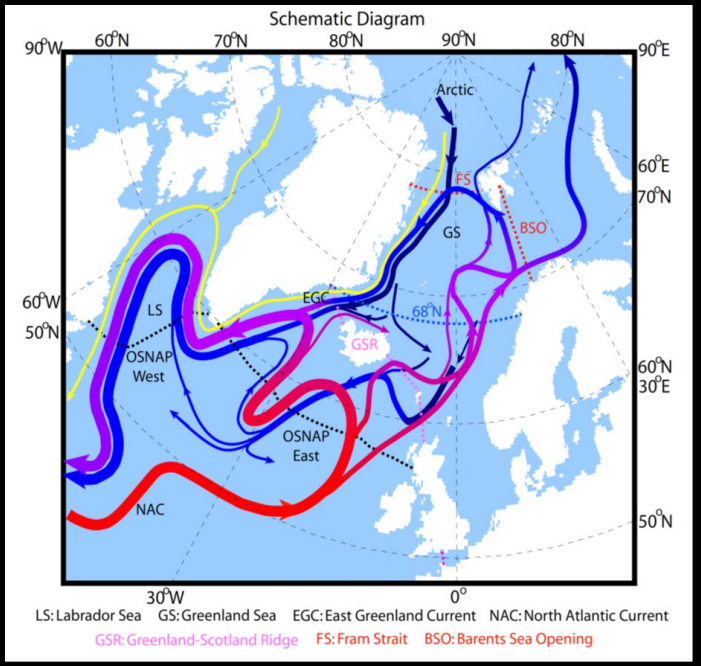



Image from the briefing provided to Emergency Managers the morning of the Marshall Fire

New NOAA wildfire Portal: **https://www.noaa.gov/noaa-wildfire**

# A Revision in the View of the Long-term Mean AMOC Structure

Using a high-resolution GFDL global coupled climate model constrained by observed hydrographic climatology to reveal a holistic picture of the long-term mean AMOC structure at Northern high latitudes over the past several decades.



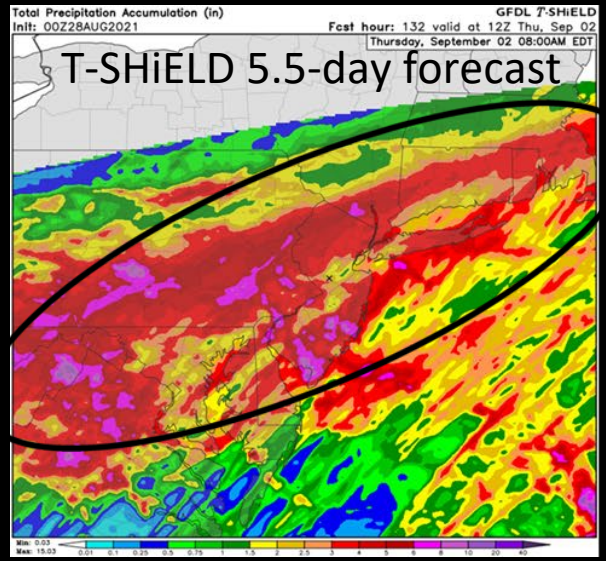

In contrast to the TRADITIONAL view, the results suggest that:

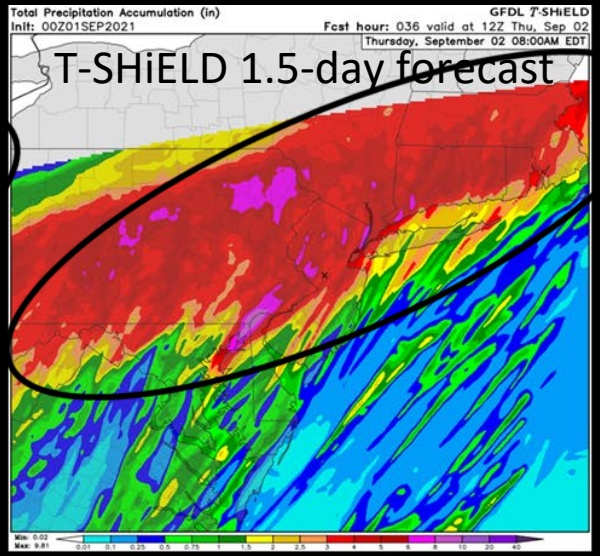
- The deep AMOC branch across the Fram Strait and Barents Sea Opening (i.e. the Arctic outflow) provides the densest water to the mean AMOC
- The Arctic Ocean, not the Greenland Sea, is the northern terminus of the mean AMOC and expected to play a key role in future AMOC changes
- The RDC-estimated long-term mean AMOC structure is valuable to interpret future observed AMOC changes, guide modeling/observational efforts, and calibrate AMOC state in model prediction capabilities

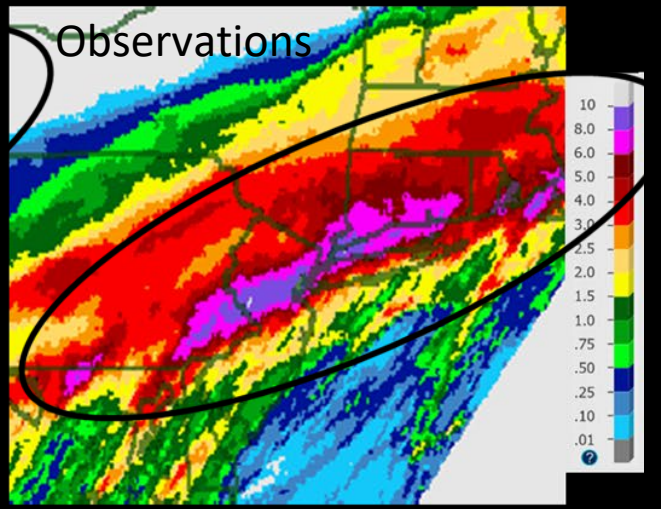
 *Zhang and Thomas, 2021, https://www.nature.com/articles/s43247-021-00182-y*

# Hurricane Ida T-SHiELD Precipitation

High-resolution T-SHiELD (13 km global; 3.5-km tropical Atlantic nest) predicted **heavy** and **extreme** rain up to 5 days in advance



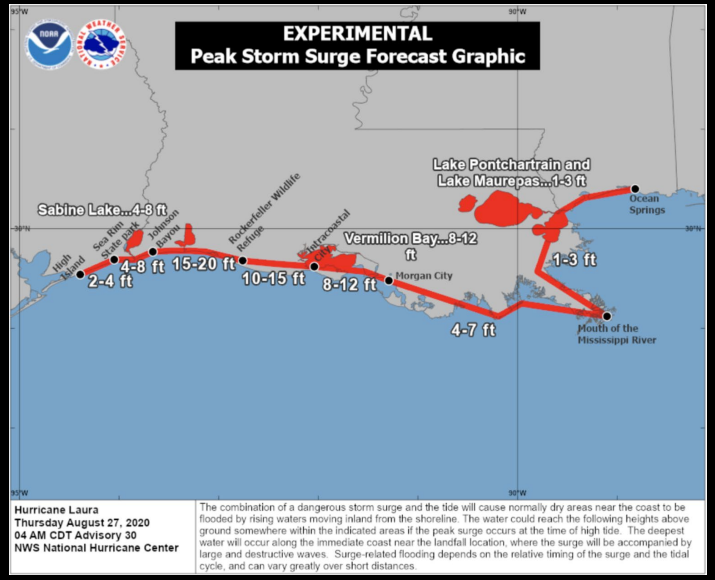

NOAA AHPS 1-day precip
Valid 12Z 2 Sep 2021

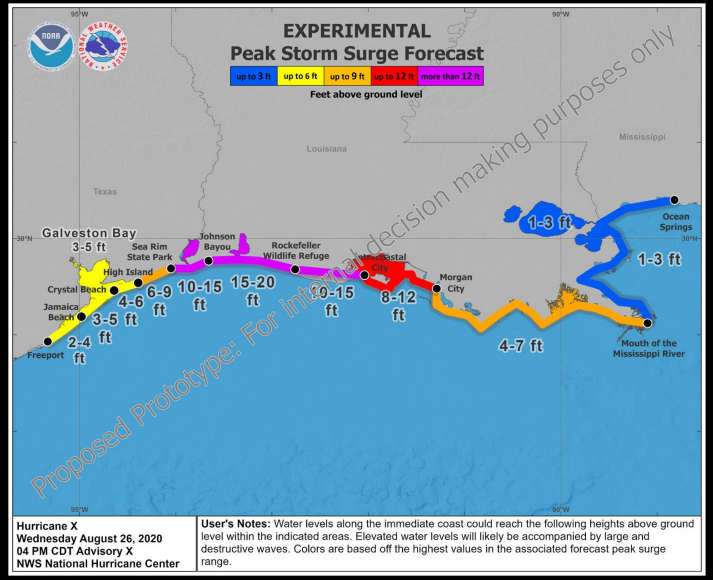


*Real-time T-SHiELD 2021 courtesy Kun Gao & Matt Morin, FV3 Team, W-Division, GFDL*

# Improved Peak Storm Surge Forecast Graphic

- The NWS graphic to depict Peak Storm Surge has been modified for the 2022 season to include an updated disclaimer and color coding for the peak storm surge inundation forecast.
- Improved messaging should provide better storm surge information for Impact-based Decision Support Services for evacuations to help protect life and property.

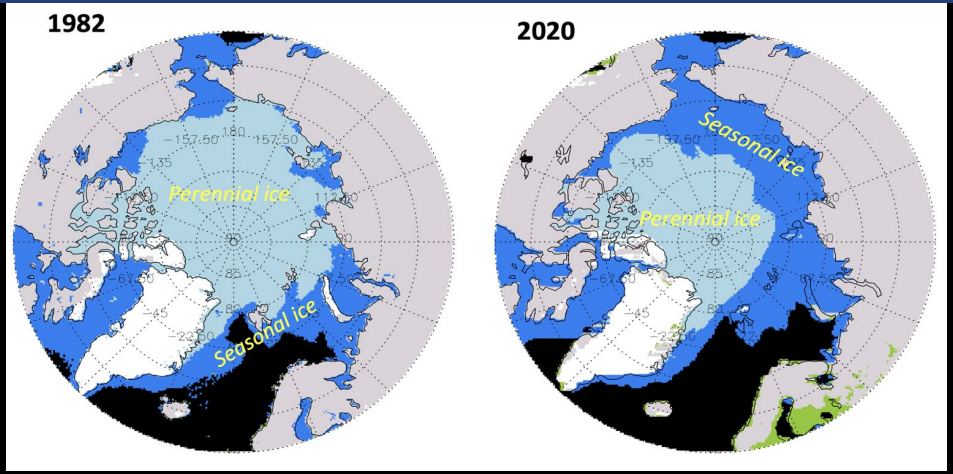


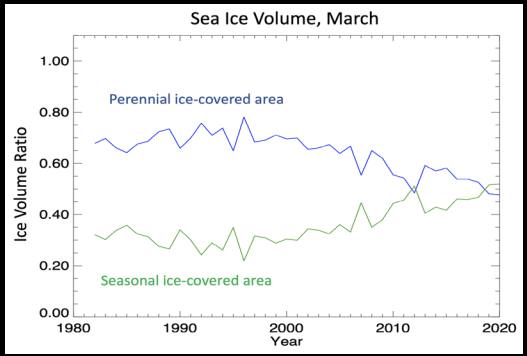
# **Vision Area 2:** Sustainable use and stewardship of ocean and coastal resources

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

# A New Perspective on Four Decades of Arctic Sea Ice Decline

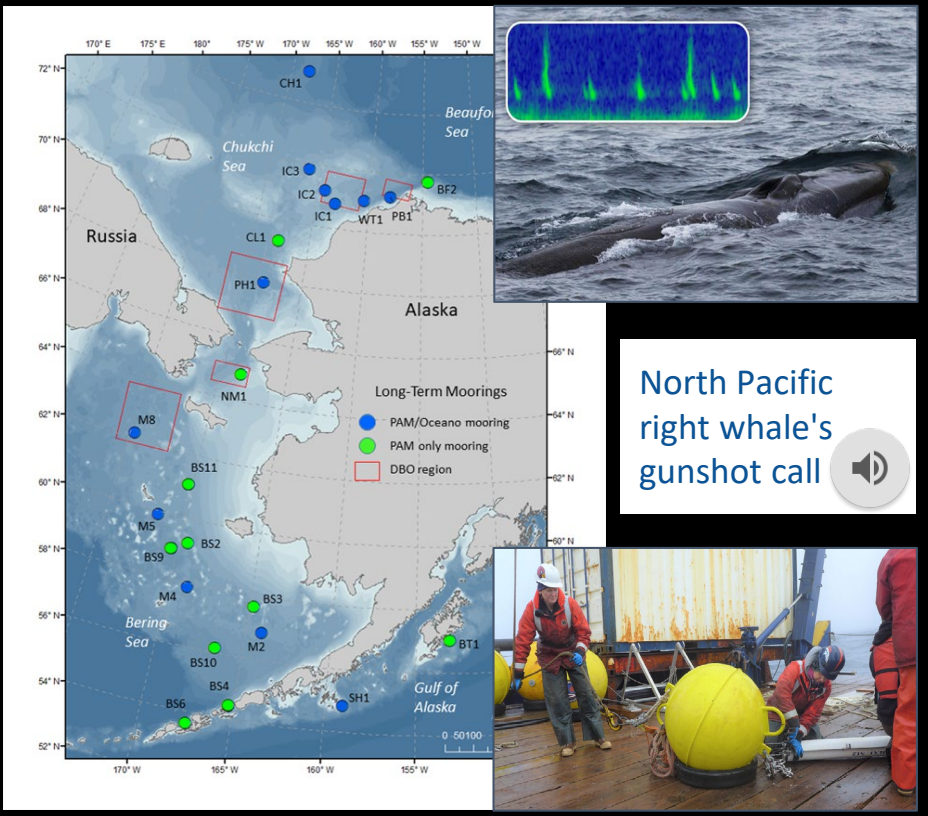



*Above*: Spatial distribution of Arctic sea ice in 1982 (left) and 2020 (right) for perennial and seasonal sea ice. *Right*: Trends in Arctic sea-ice volume of perennial (blue) and seasonal (green) sea-ice-covered areas.




- Research with NOAA's satellite climate data records has produced new information on dramatic, multi-decadal changes in Arctic sea ice area, sea ice thickness and volume.
- It provides a new perspective based on ice **longevity**: the persistence of ice at each point determines if it is seasonally or perennially ice-covered.
- Results indicate a 52% decrease in sea ice from 1982 to 2020.
- If the current rates of changes in sea ice extent, concentration, and thickness continue, the Arctic is expected to have ice-free summers by the early 2060s.

# Artificial Intelligence Speeds Delivery of Information Critical for Whale Conservation in Alaska






North Pacific right whale's gunshot call



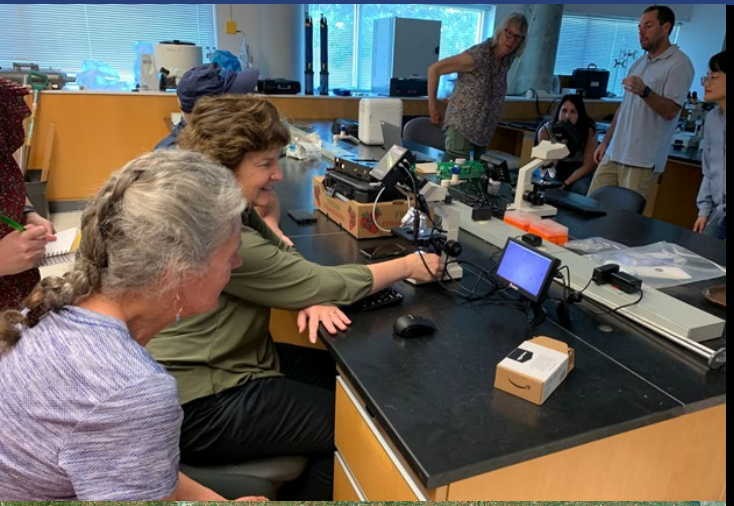
- NOAA Fisheries scientists and private partners developed the AI program, Infrastructure for Noise and Soundscape Tolerant Investigation of Nonspecific Call Types (INSTINCT)
- INSTINCT was trained to identify marine mammal calls from underwater acoustic recordings taken from more than 20 sites over 14 years in AK
- This AI tool:
  - Has made information rapidly available to scientists and managers
  - Is adaptable for use across various areas and species
  - Is open source

# NOAA proposes new vessel speed regulations to protect North Atlantic right whales

Snow Cone (#3560) entangled in fishing gear, sighted off the coast of Georgia with her second calf in December 2021. Her first known calf died from a vessel strike off the coast of New Jersey in June 2020. (Georgia Department of Natural Resources taken under NOAA permit 20556)

- In July 2022, NOAA Fisheries announced proposed changes to vessel speed regulations to further protect North Atlantic right whales from death and serious injuries resulting from collisions
- NOAA is releasing a draft “roadmap” for public comment about “ropeless” fishing gear that outlines possible ways to increase the use of this technology in commercial fisheries off the East Coast of the United States.

# Expansion of HABscope and A.I. HAB Detection to Protect Human Health and Local Economies




- Developed in 2019, “HABscope” is a portable microscope that is allowing citizen scientists to quantify red tide (*Karenia brevis*) cell concentrations in the Gulf of Mexico.
- NCCOS is expanding HABscope capacity to other “red tide” forming species in Florida and Chesapeake Bay.
- This work is allowing for improved detection & enumeration of HABs (together with A.I. technologies) to provide quick results, improve forecasts, and mitigate impacts.

# Characterizing the extent of deep-sea coral habitat in the Papahānaumokuākea Marine National Monument (PMNM)


- The PMNM was expanded in 2016. Information about vulnerable/ecologically significant deep-sea coral habitat was identified as a critical management need.
- NCCOS and partners completed predictive habitat models that mapped potential spatial distributions of 22 genera of deep-sea corals & sponges across the monument.
- The predictions leverage existing observations to address ONMS management/designation needs.

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

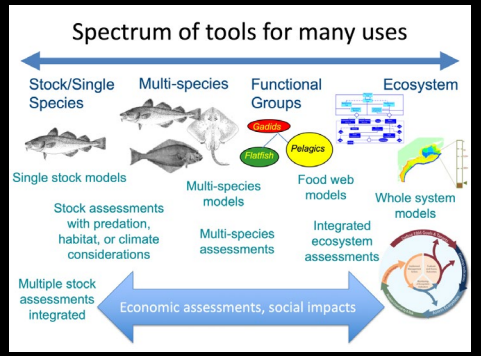
*The GOES-17 satellite above the thermal vacuum chamber.*
*Photo credit: Lockheed Martin.*

# NMFS launches FIMS: Fisheries Integrated Modeling System

- FIMS is a fisheries stock assessment modelling software planned and designed to be more modern and redirect existing regional efforts into one platform.
- Comprises a suite of software tools that connect ecosystem, climate, and economic models/data with stock assessment at the core.
- Flexible and designed for use in innovative modeling work of the future.
- Bridge to next generation models designed to smooth the R2O pipeline.

The NOAA Fisheries Integrated Modeling System GitHub Organization

In this organization you can find repositories associated with the NOAA Fisheries Integrated Modeling System (FIMS). For a high-level overview of what FIMS is, please refer to our official announcement



# Live-stream event hosted by NOAA ship *Nancy Foster* shares the excitement of ocean discovery

Sand tigers inspect Monitor's bow on an expedition with Monitor National Marine Sanctuary and the Global Foundation For Ocean Exploration. (Credit: NOAA/GFOE)

- The NOAA ship *Nancy Foster* hosted the 2022 Valor in the Atlantic Telepresence Expedition showcasing the excitement of ocean discovery and research in real-time.
- The Live-stream webcast showcased these nationally significant historic sites and the surprisingly diverse biological communities and abundance of fish occupying the reef and wreck sites while bringing the excitement of exploration

# NWS Wet Bulb Globe Temperature Forecasts Transition to Operational Status

| Comparing WBGT and Heat Index | | |
|---|---|---|
| | WBGT | Heat Index |
| Measured in the sun | ✓ | ✗ |
| Measured in the shade | ✗ | ✓ |
| Uses temperature | ✓ | ✓ |
| Uses relative humidity | ✓ | ✓ |
| Uses wind | ✓ | ✗ |
| Uses cloud cover | ✓ | ✗ |
| Uses sun angle | ✓ | ✗ |

- The Wet Bulb Globe Temperature (WBGT) is designed for active, outdoor populations (such as outdoor workers) as a measure of heat stress
- It is currently used by several NWS Partners such as collegiate and high school athletic departments, marathon and triathlon organizers, and the military.
- The NWS WBGT forecast allows NWS to meet Impact-based Decision Support Services (IDSS) needs for partners that use this particular heat tool.

# Questions?