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

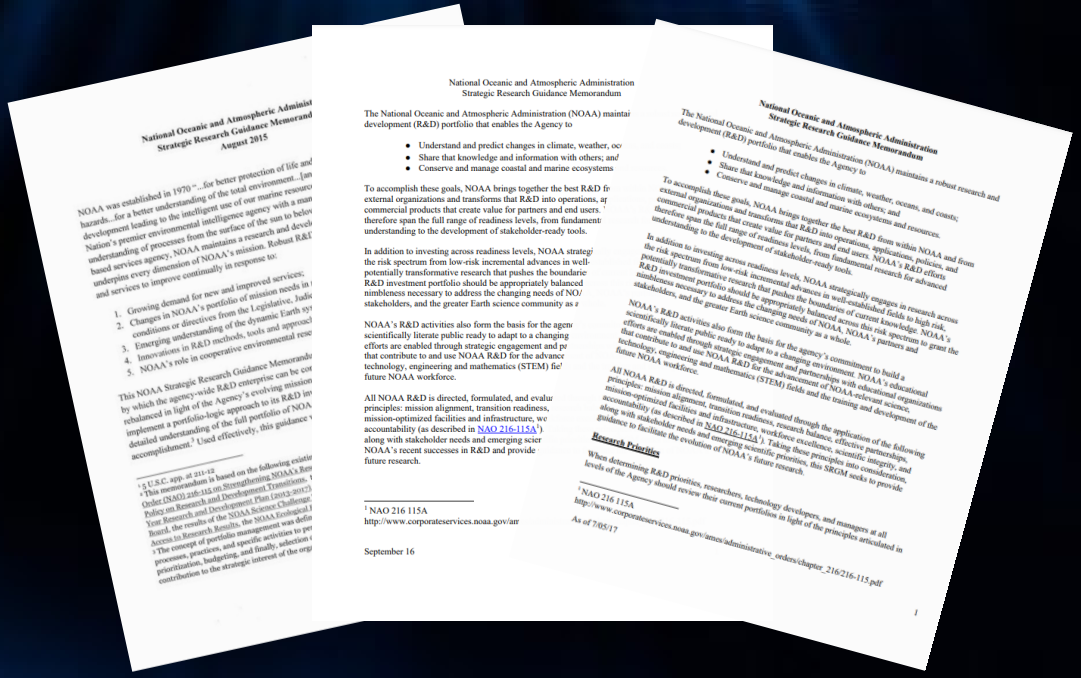
EO 14008: Tackling the Climate Crisis at Home and Abroad

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

Strategic Research Guidance Memorandum

The NOAA Science Council is developing an SRGM for FY 24.



Nobel Prize in Physics: Syukuro Manabe

Photo: Courtesy (Princeton University)

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 Boosts Marine Forecast Capabilities

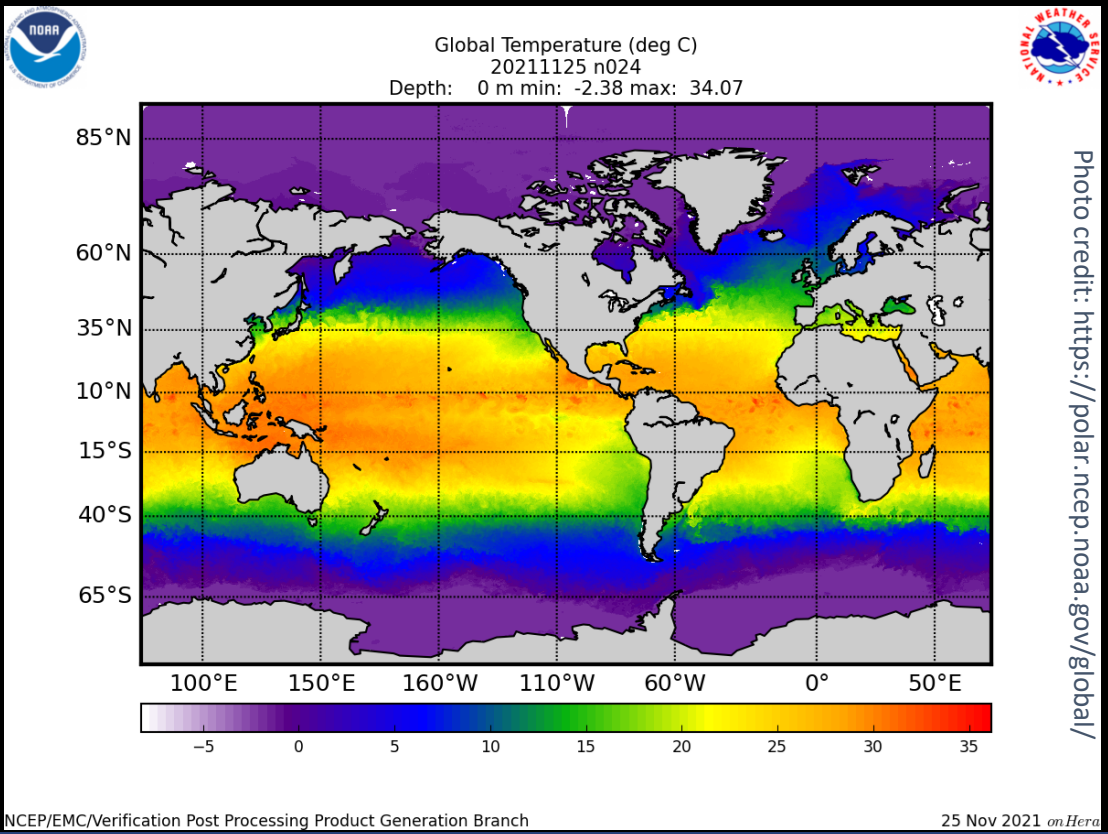


Photo credit: https://polar.ncep.noaa.gov/global/

- NOAA upgraded the NWS flagship ocean forecasting system, the Global Real-Time Ocean Forecast System (RTOFS)
- This will now include ocean and sea ice data assimilation performed at NOAA's National Center for Environmental Prediction, replacing the use of the US Navy's Fleet Numerical Meteorology and Oceanography Center.
- This upgrade is the first ever Operational Global Mesoscale Ocean Data Assimilation at NOAA

NOAA Streamflow and Storm Surge Model Upgrades

NOAA upgraded two models related to streamflow and storm surge to improve flood forecasting. These are the NOAA **Water Model** and the Probabilistic Tropical Cyclone Storm Surge models.

The National Water Model (NWM)

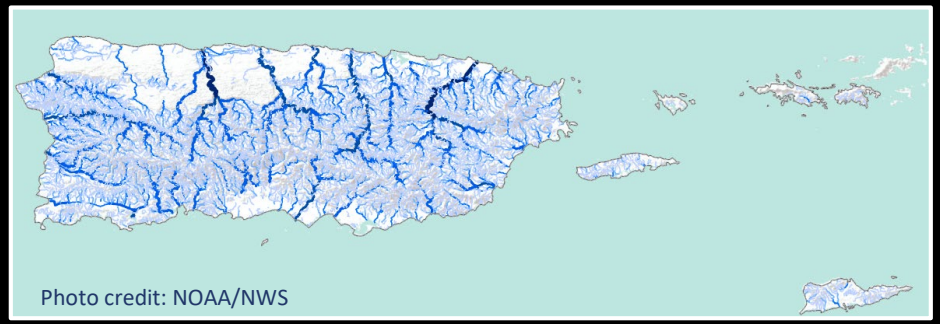


Photo credit: NOAA/NWS

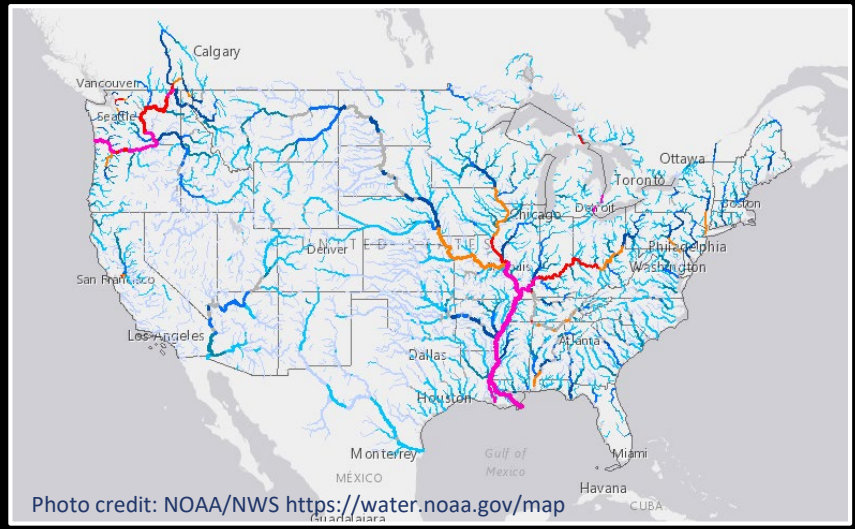


Photo credit: NOAA/NWS https://water.noaa.gov/map

The NWM simulates observed and forecast streamflow over the United States, taking into consideration the water cycle, its different processes, and how they fit together.

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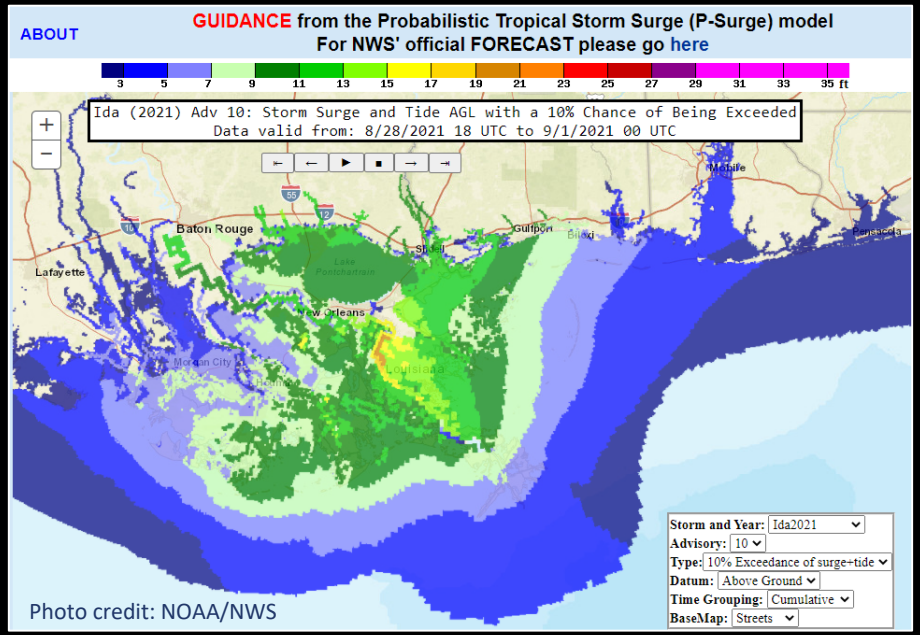
The Probabilistic Tropical Cyclone Storm Surge (P-Surge) Model

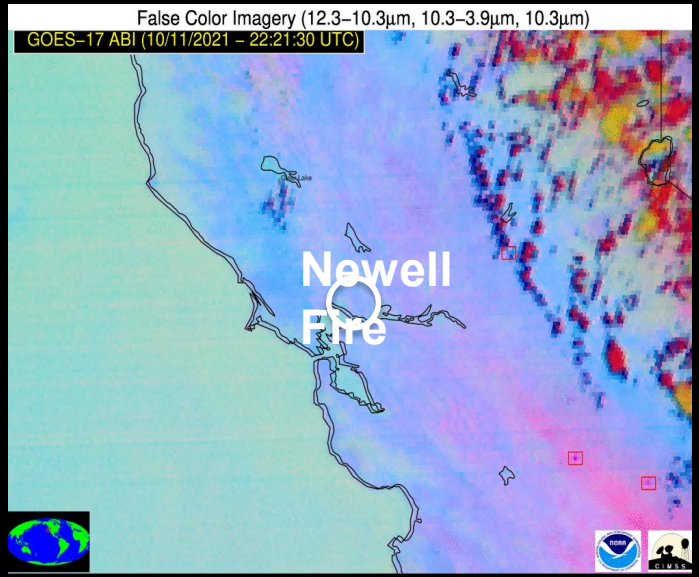
- P-Surge is based on an ensemble of Sea, Lake, and Overland Surges from Hurricanes (SLOSH) model runs which are derived from the National Hurricane Center official advisory along with historic errors in its track, size, and intensity.
- The improvements to P-Surge are most pronounced between 36-60 hours prior to tropical system landfall, resulting in better overall forecasts of storm surge in the critical 48-60-hour lead times.



New NOAA Experimental Automatic Fire Alerting System

- User configurable web dashboard displays newly detected fire events as a function of NWS fire weather products (e.g., red flag warnings, fire weather watches & outlook, etc.)
- Powered by an improved satellite fire detection algorithm

The Newell Fire in Napa, County, CA was detected by the automated NESDIS detection algorithm at 6:12pm PDT on 11 Oct 2021 (fire was first reported at 6:30pm PDT)



Red boxes: highlight automated fire detections

NOAA Increasingly Seen as Authoritative Source for Mission Agnostic Climate Information.

- Redesign of climate.gov
- Scientific contributions to IPCC WG1 report
- Presence at COP26

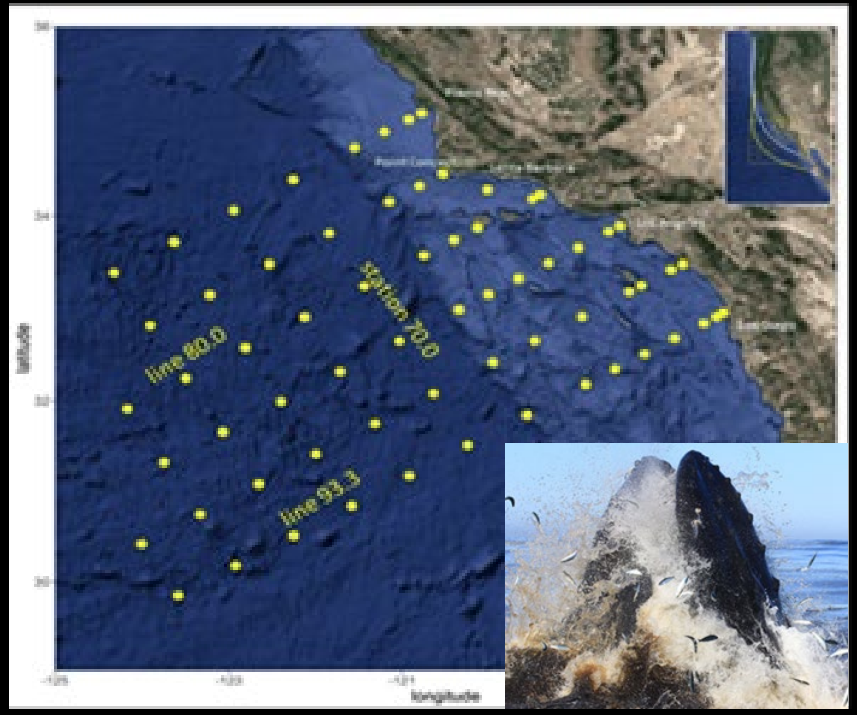
Vision Area 2: Sustainable use and stewardship of ocean and coastal resources

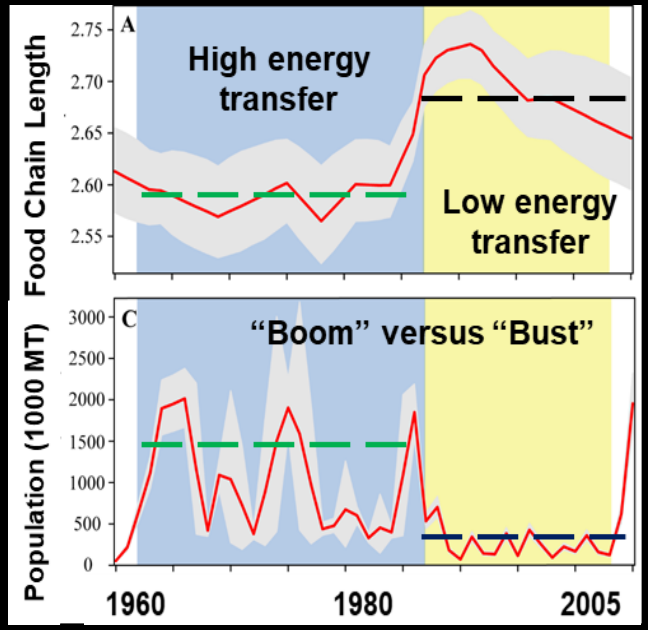
South entrance of Detroit River to the right and northeast corner of Lake Erie to the left. Photo credit: NOAA/OAR/GLERL

Ecosystem Shifts and the West Coast Anchovy "Boom-Busts": Combining the Old (CalCOFI) and the New (isotopic analyses)

NOAA FISHERIES

SCRIPPS INSTITUTION OF OCEANOGRAPHY

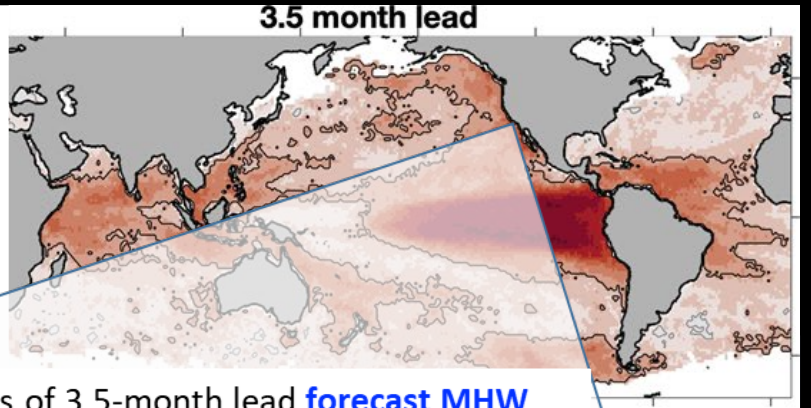




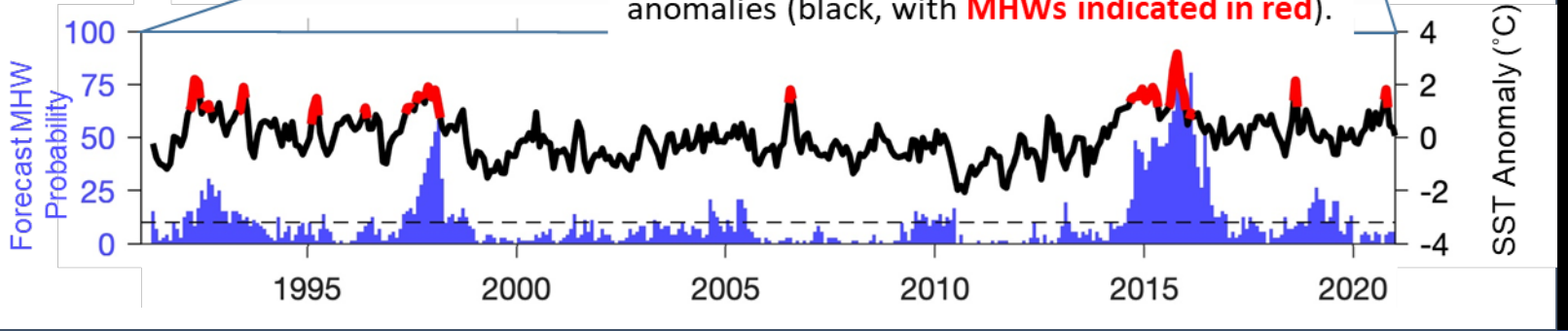
- **NOAA Fisheries and Scripps** has **identified a mechanism** related to trophic efficiency and food chain length (FCL)
- The shorter the FCL, the more efficient the energy transfer, and the better the chance for a "boom" anchovy phase.

Forecasts of Marine Heatwaves (MHWs) and Impact on Living Marine Resources

- Using a multi-model ensemble of coupled global climate forecasts, Jacox et al. (NMFS/OAR) developed and assessed MHW forecasts that cover the world's oceans with lead times of up to a year.
- Using 30 years of retrospective forecasts, the onset, intensity, and duration of MHWs are often predictable, with skillful forecasts possible from 1 to 12 months in advance depending on region, season, and the state of climate modes such as the ENSO.

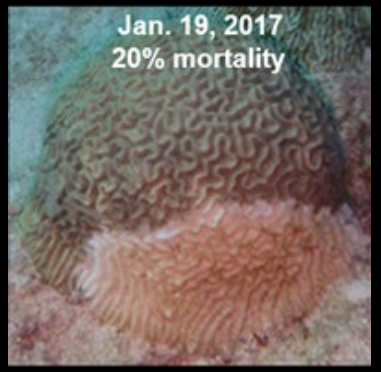


Time series of 3.5-month lead **forecast MHW probability** (blue bars) and observed SST anomalies (black, with **MHWs indicated in red**).

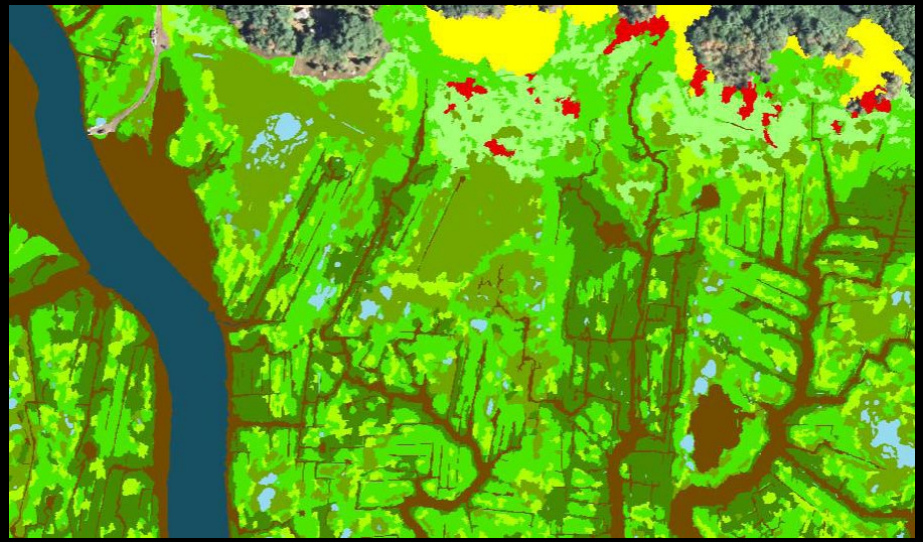


Stony Coral Tissue Loss Disease (SCTLD): Preparedness and Response

- SCTLD is currently ravaging reefs of Florida and the greater Caribbean.
- NOAA is leading efforts with federal and state partners to investigate and respond to SCTLD outbreaks on U.S. coral reefs and to facilitate surveillance, information sharing and capacity building throughout the Wider Caribbean region.
- NOAA's Strategy for SCTLD Response and Prevention provides a framework for efforts to slow its spread throughout the western Atlantic and to prevent/prepare for possible spread to the Indo-Pacific region.



Advancing Coastal Mapping & Management through A.I.



Saltmarsh habitat data (2013) for New Hampshire. High-resolution data from NOAA's Coastal Change Analysis Program (C-CAP) makes it possible to assess marsh resilience at the parcel scale.

- NOAA NOS is developing the next generation of land cover data for the coastal U.S.
- Applying AI / ML algorithms has resulted in high spatial detail land cover & habitat datasets to inform regional & local coastal management decisions.
- New Hampshire is using these data to better inform saltmarsh resilience assessments and the state's comprehensive marsh management planning.

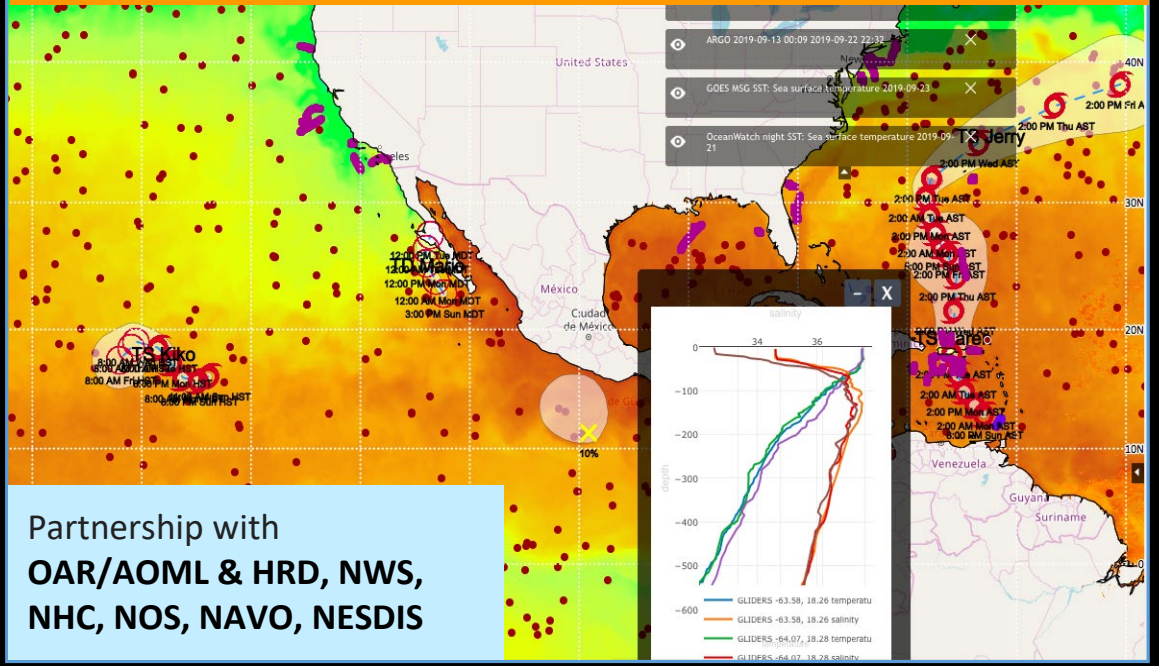
Vision Area 3:
A robust and effective research development, and transition enterprise

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

Ocean Observations Viewer Provides Critical Support to the Atlantic Hurricane Field Program.

- Tool to visualize ocean observations including satellite remotely sensed oceanographic data and products to help coordinate observational assets in support of hurricane research and forecasts.
- The Ocean Observations Viewer is used to guide and coordinate ocean observations, including air deployments, autonomous vehicles and other assets of the sustained ocean observing system.
- This tool provides easy and usable access to ocean and atmospheric observations prior, during and after tropical cyclones.

https://cwcgom.aoml.noaa.gov/cgom/OceanViewer/index_phod.html



Partnership with
OAR/AOML & HRD, NWS, NHC, NOS, NAVO, NESDIS

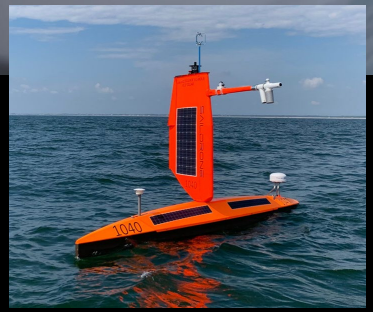
Developed and maintained by Caribbean, Gulf of Mexico, Atlantic OceanWatch Node (CGM-AOW) of NOAA CoastWatch. CGM-AOW is housed in OAR/AOML/PhOD.

Courtesy of Joaquin Trinanes and *Gustavo Goni.*

Uncrewed Systems expand observations into new territory

Upper Stratosphere

Inside Hurricane Sam

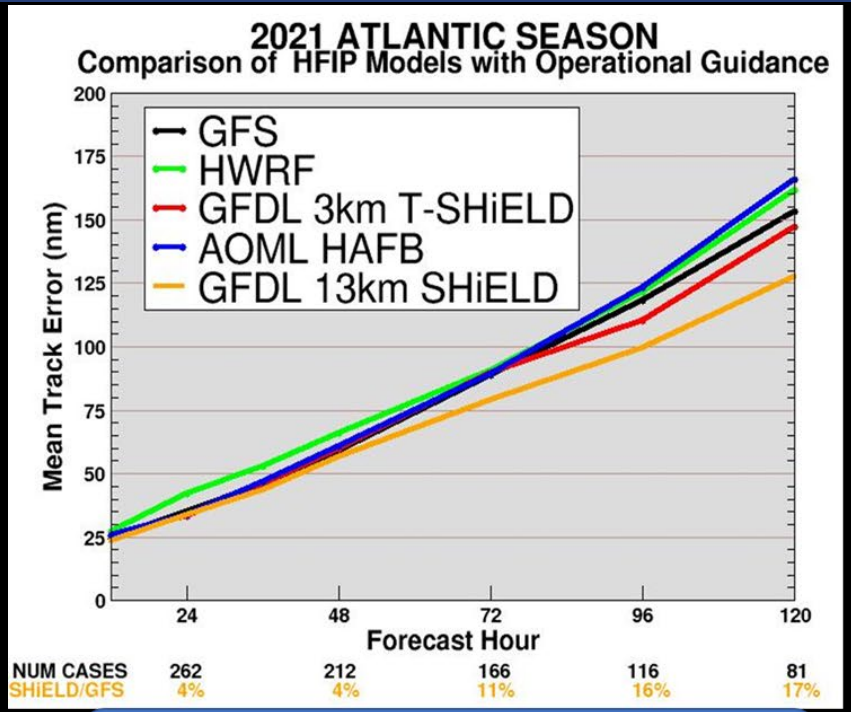


SAILDRONE

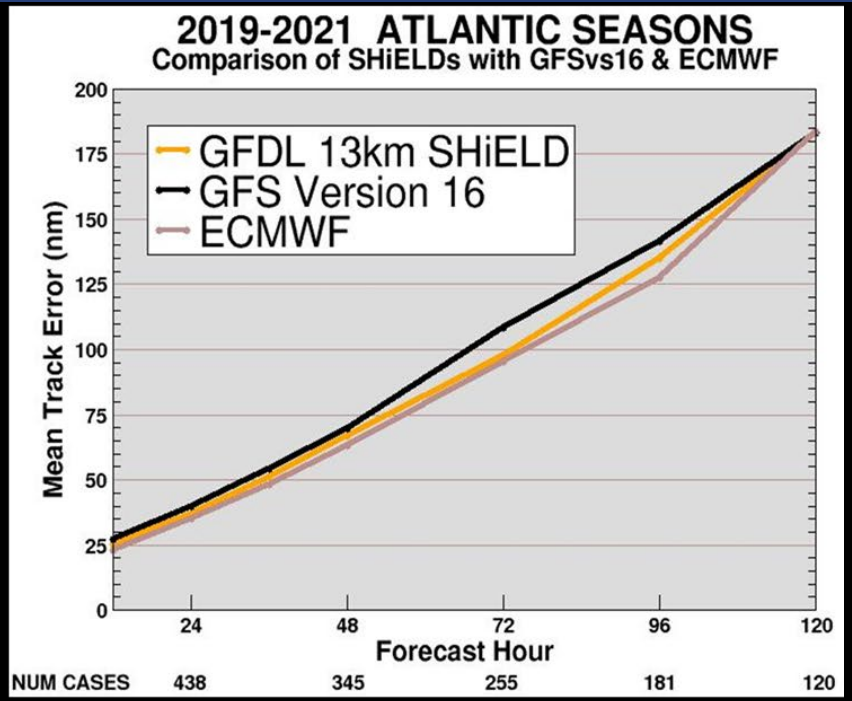
Questions?

BACKUP SLIDES

Atlantic Hurricane Track Prediction



Achievement: GFDL SHiELD reduces track error vs. operational models at days 3–5

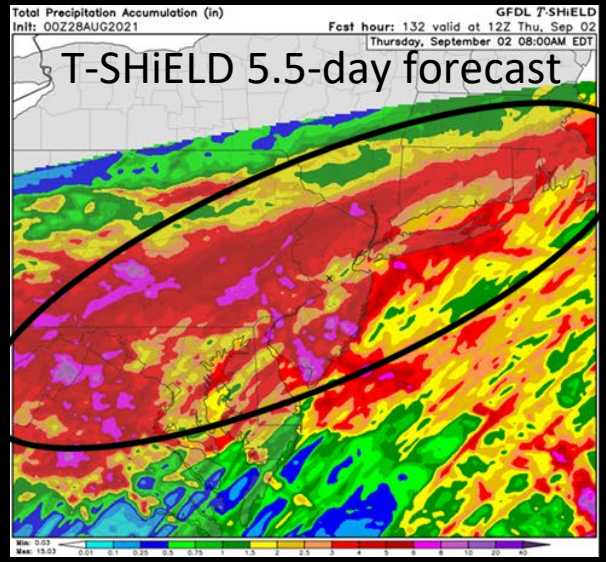


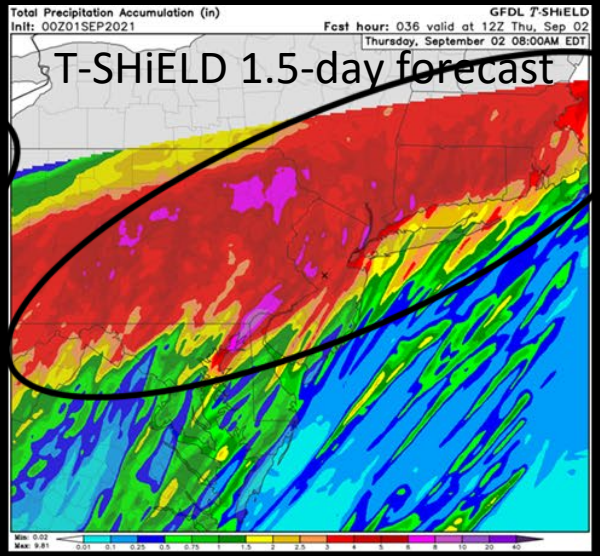
Achievement: GFSv16 + SHiELD have closed the gap with the European model.

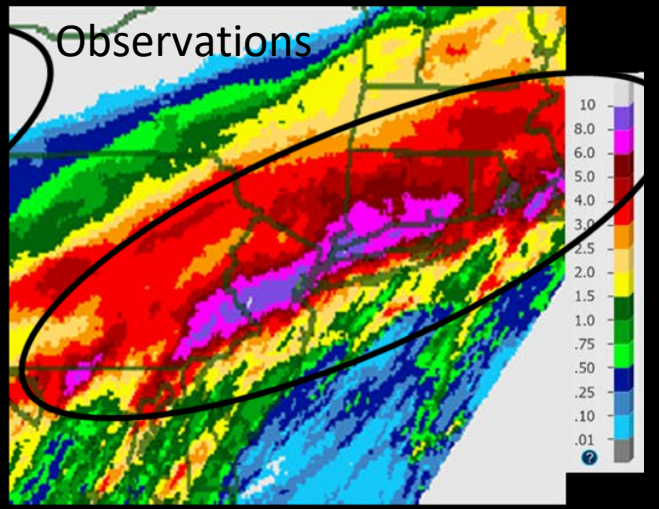
Courtesy Linjiong Zhou, Kun Gao, and Morris Bender, FV3 Team, W-Division, GFDL

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





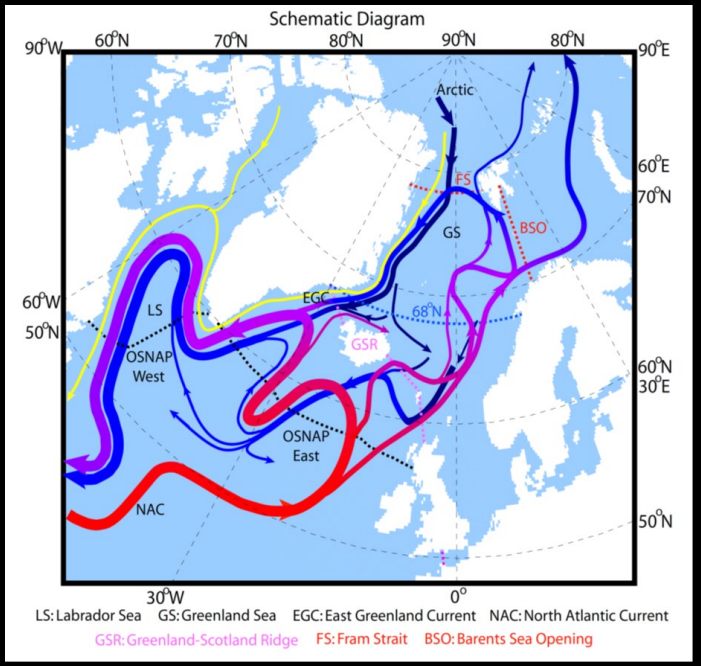


NOAA AHPS 1-day precip
Valid 12Z 2 Sep 2021

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

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.



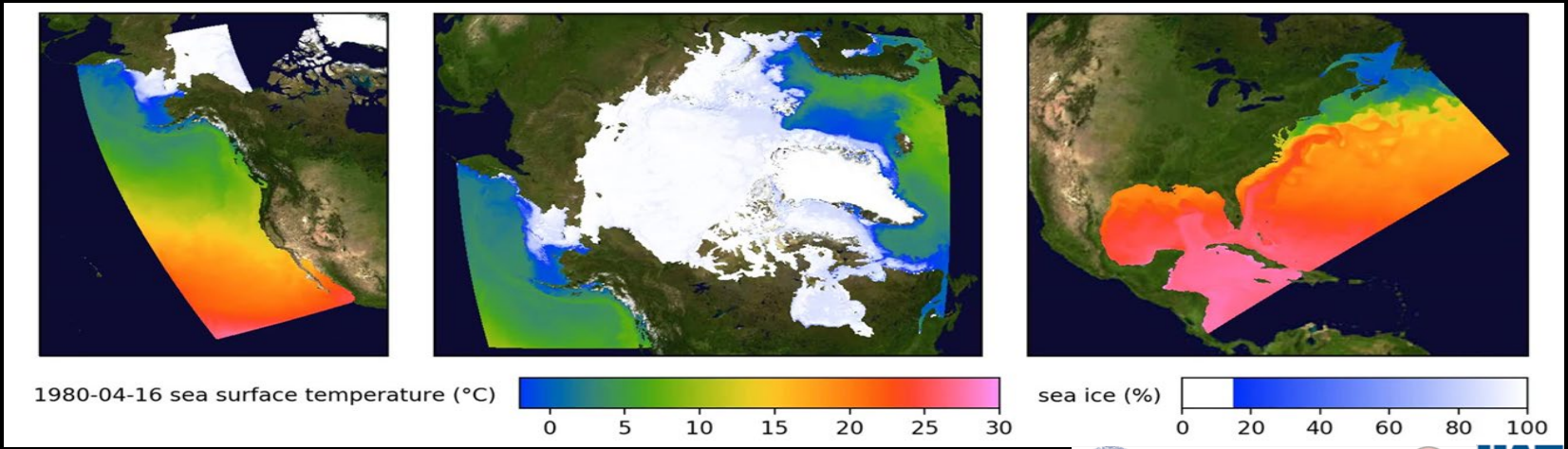
In contrast to the TRADITIONAL view, the results suggest that:

- 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 [illegible] 2021, https://www.nature.com/articles/s43247-021-00182-y

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

High-resolution regional ocean and biogeochemical models reliably deliver seasonal to multi-decadal predictions at a national scale in support of NOAA's Climate-Fisheries Initiative



https://www.fisheries.noaa.gov/topic/climate-change#noaa-climate-and-fisheries-initiative

Science and Technology Focus Areas