NOAA Science Update to the Science Advisory Board

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July 20th, 2021
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

**EO 13990**: 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.
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

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

a) **identification and tracking of > 100 fish species** through survey videos, and

b) **produce count information within hours** of video collection on the 2021 SEAMAP

Initial goal was to provide an 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

- 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.

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/
“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.
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.

WCOFS domain: SST forecast 1 Oct 2020
Emissions of CFC-11 are back on the decline
NOAA R&D During the COVID-19 Pandemic
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

- 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

The Science We Need for the Ocean We Want

Clean
Healthy
Productive
Predicted
Safe
Accessible
Inspiring
Questions?
Science and Technology Focus Areas