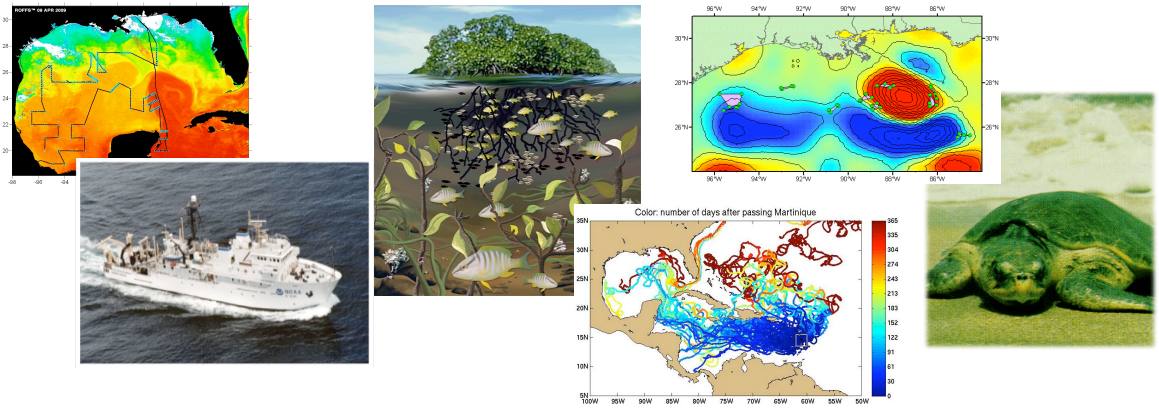
NOAA/AOML-SEFSC Workshop on observations, data and products from the Global Ocean Observing System for ecosystem studies

June 1, 2009

South East Fisheries Science Center

Miami, Florida



NOAA/AOML-SEFSC Workshop on observations, data and products from the Global Ocean Observing System for ecosystem studies

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SEFSC conference room

Organizers: Gustavo J. Goni, NOAA/AOML/PHOD and John Lamkin, NOAA/SEFSC

The objective of this workshop was geared to 1) present to the South East Fisheries Science Center (SEFSC) different types of ocean data and products that are already available to the community, particularly those in which the Atlantic Oceanographic and Meteorological Laboratory (AOML) is involved; and 2) present to AOML the projects in which the SEFSC is involved and discuss their needs of ocean data and products.

As SEFSC and AOML work towards building new collaborative research endeavors in the coming years, we looked towards existing mutual programs between them as examples for future scientific relationships. Libby Johns and Ryan Smith (AOML/PHOD) have been working together with John Lamkin and Trika Gerard (SEFSC/ELH) since 2002 on multiple interdisciplinary research projects in the western Caribbean and south Florida, and more recently in the northeastern Caribbean. Their two major collaborative projects include the Meso-American System Transport and Ecology Research program (MASTER), and the Coral Reef Ecosystem Research program (CRER). Combining traditional oceanographic sampling methodology with biological sampling protocols, AOML and SEFSC are now producing assessments of regional connectivity in terms of larval transport, recruitment, and life-history patterns.

The present ocean observing system has mainly been formed by components established through consensus within the international oceanographic community to satisfy the collective needs for research and operational applications. The range of ocean observations collected addresses many fields of study, including climate, weather, ocean currents, fisheries, and the environment. At the heart of this system there is a vision that observations need to be part of integrated networks providing global, sustained, and high-quality data in a cost-effective manner that can be distributed either in real- or delayed-time. During the workshop an introduction to the systematic global ocean observations made from ship-based, autonomous *in situ*, and remote sensing platforms, was presented.

Emphasis was given to data and products derived from several key components of the ocean observing system that are available and are of interest to those involved in fisheries research. Some of these observations and products may be of particular interest to those studying processes with short periods and small spatial scales, while others are related to longer scale variability.

The presentations on ocean observations were focused specifically on:

- *Satellite and drifter observations to monitor and study surface currents and fronts:* Observations from satellite altimetry provide global sea height data every ten days, which

can be used to, among other things, estimate geostrophic surface currents. A CoastWatch/AOML web-based tool was presented to illustrate how global surface currents can be visualized in real- and in delayed-time modes with data from 1993 to the present. Also available in this tool are surface current observations collected by autonomous surface drifters that can be used to validate satellite-based estimates of surface currents. Examples were presented to discuss various methodologies to determine ocean fronts, mainly in the Gulf of Mexico and in the Gulf Stream region, and regions of upwelling.

- *Ocean and Climate Indices:* Some observations, such as sea surface temperature and sea surface height, are used to compute ocean and climate indices. For example, the Western Hemisphere Warm Pool, the region determined by SSTs larger than 28.5°C, has been linked to hurricane genesis and rainfall from South America to North America, and may be linked to environmental dynamics. AOML/PHOD also creates other long-term indices, such as the global warming index and the index for the Atlantic Multidecadal Oscillation, a fluctuating climate mode wherein the sea surface temperature of the North Atlantic can vary on multidecadal timescales of 30-80 years. These and other indices that are routinely posted in AOML or other web pages were discussed.

- *EXpendable BathyThermograph (XBT) and profiling float observations to monitor the vertical temperature structure:* These observations provide vertical temperature profiles at different spatial and temporal scales. Time series of these data, some of which extend over several decades, allow for the identification of long term signals that are potentially related to some observed long term trends in fish stock abundance. XBT deployments performed along repeated transects allow for monitoring of the variability of surface currents and undercurrents within the upper 800m. Several examples were presented to illustrate how the vertical temperature structure can be monitored with these and other systems.

- *ThermoSalinoGraph (TSG) observations to monitor sea surface salinity (SSS):* Observations from TSGs helps identifying of frontal regions defined by large SSS gradients. One vessel providing TSG data is the M/V Oleander, which crosses the Gulf Stream twice a week between Boston and Bermuda. This vessel provides a good example of how the differing programs in the ocean observing system interconnect, as XBTs are also deployed along this transect providing simultaneous observations of the upper ocean vertical temperature structure.

Other observational platforms were also briefly presented, such as moorings, cable measurements, and surface winds.

Presentations

Presentations were solicited from a broad range of speakers covering both observational physical oceanography, numerical and theoretical modeling, to stock assessments and ongoing fisheries programs and collaborations. The full agenda can be found at: http://www.aoml.noaa.gov/phod/goos/meetings/2009/AOML-SEFSC/#Agenda. The presentations were:

- Observations, data, and products from the Global Ocean Observing System (G. Goni).
- SEFSC priorities, research programs, and needs (J. Lamkin).
- Current AOML-SEFSC collaboration (R. Smith).
- SEFSC-AOML collaboration in South Florida Ecosystem Restoration (C. Kelble).
- Larval billfish research: development and testing of the CANON (Continuous Access Neuston Observation Net) (J. Serafy).
- Preliminary results of use of satellite data for stock assessment in the GOM (F. Bringas).
- Linking western bluefin tuna (Thunnus Thynnus) incidental catches with oceanographic conditions in the Gulf of Mexico (C. Rivero).
- Monitoring ocean currents with surface drifters (R. Lumpkin).
- Investigation of the link between ocean dynamics, HABs and fisheries (M. Olascoaga).
- Presentation by ROFFS (M. Roffer).
- CoastWatch and ocean observations and products (J. Trinanes).
- Using models to understand ocean current variability and fisheries links (V. Kourafalou).

These presentations were followed by discussions on how ocean observations and products in which AOML has expertise could help with SEFSC goals.

Summary of Discussions

The discussions included topics closely related to the presentations, such as identification of ocean indexes for ecosystems and fishery studies, evaluation of ocean dynamics conditions using satellite altimetry observations for stock assessment of bluefin tuna and swordfish, analysis of ocean conditions for larvae recruitment, monitoring of fronts and eddies using satellite observations for passive larvae displacements, and ocean measurements from tagged turtles. In addition possible mechanisms to fund collaborative work were discussed.

Based on the discussions held during the workshop, the participants identified the following projects as feasible collaboration projects that could be carried by NOAA/AOML and SEFSC:

1) There was a lengthy exchange on the work by Guillermo Diaz, Francis Bringas, Carlos Rivero and Gustavo Goni on the use of satellite altimetry in the Gulf of Mexico to identify ocean parameters based on the dynamics characteristics of the

region (Loop Current, cyclonic eddies, anticyclonic eddies, and common waters) as indices to evaluate the recruitment of blue fin tuna and sword fish.

Action Item: Publication of a manuscript with current work by Guillermo Diaz, Gustavo Goni, Carlos Rivero and Francis Bringas, on the assessment of bluefin tuna and swordfish in the Gulf of Mexico using satellite altimetry observations. (Diaz, Bringas, Rivero, Goni).

2) There was discussion on new methodologies used to identify frontal regions and eddies using Lagrangian Coherent Structures and how these structures can be visualized from satellite-derived color and altimetry fields.

   Action Item: Explore collaboration between Dr. Mitch Roffer and Dr. Josefina Olascoaga in the comparison of the location of frontal regions in the Gulf of Mexico using satellite sea surface temperature and Lagrangian Coherent Structures derived from satellite altimetry (Roffer, Olascoaga).

3) There was discussion on the importance of the monitoring of some species, such as red snapper, in the Campeche Banks, and how to quantify possible larval transport into the northern Gulf of Mexico.

   Action Item:
   Identification of methods to monitor the mass transport in the Campeche Banks for red snapper studies, using output from HYCOM and from satellite-derived estimates. Investigate the possibility of submitting a proposal to the Fisheries and the Environment Program (FATE) this fall (Schirripa, Bringas, Kourafalou, Lumpkin, Goni).

4) There was discussion on how temperature and location data are obtained from sea turtle tagging.

   Action Item: Evaluate samples of temperature and depth data obtained from turtle tagging and, if valuable, explore iwhether they may be placed into the GTS (Sasso, Baringer, Goni).

   Action Item: Explore if the use of Argo and XBT observations as ancillary observations to those obtained from turtle tagging could be used to enhance the investigation of the sea turtle environment (Sasso, Schmid).

5) There was discussion on the biological and oceanographic data obtained from the larval bluefin cruises in fixed grid points every April/May since early 1990's. These data include observations made from CTD, TSG and ADCP.

   Action Item: Collaborate in the interpretation and analysis of the ocean dynamics in the region during these cruises (Lamkin, Smith, Baringer, Lumpkin, Johns, Goni).

6) There was discussion that studies of bluefin tuna reveal that their catch is linked to the location and strength of the Loop Current. Satellite observations reveal that the

LC exhibits very large year-to-year variability, and that it does not have a clear annual motion. Altimetry observations have shown that the LC intrusion has increased during the last 15 years.

Action Item: The creation of an index for the Loop Current was proposed, based on its location, intrusion, width, and transport, that may aid in this type of study. It was also proposed that a computer program be created that automatically detects the location of the Loop Current and of cyclonic and anticyclonic rings (Goni, Bringas, Kourafalou).

7) The availability of passive larvae data in the North Atlantic and Caribbean Sea was discussed.

   Action Item: Using biological data from 2005-2008, it was proposed to utilize altimetry data to estimate the location of spawning grounds of passive larvae (Paris-Limouzi, Olascoasga, Goni).

8) The attendees discussed the different continued research cruises done by both laboratories. The sections done at 27°N as part of the repeat hydrography cruises were identified as having potential for collaboration.

   Action Item: The participants proposed to collect neuston samples at each CTD station. The sample would consist of one 10 minute neuston tow, preserved in 95% ethanol, for a total of approximately nine samples. By taking advantage of this collaborative opportunity the SEFSC/AOML can begin to build a time series of abundance and distribution across the Gulf Stream of several important species such as billfish and tuna. Because of the large suite of physical data collected, it will be possible to develop physical/biological relationships for the neuston species assemblages (Baringer, Lamkin).

9) The attendees discussed the need for new funding and a framework to promote collaborative work. Joint proposals are needed to integrate research efforts between the two labs.

   Action Item: The participants noted that a post doc position funded jointly by SEFSC and AOML would most immediately address the need to further the collaborative efforts. The consensus among participants in the discussion was that this position would be a physical oceanographer supervised by AOML, but would work jointly with the SEFSC to integrate ocean observation systems into the programs at the SEFSC. This position would also serve as a focal point to develop new collaborative efforts.

10) It was expressed that immediately after the end of this workshop, scientists from AOML and SEFSC will engage in further discussions regarding these potential collaboration projects.

SEFSC Participants:
Bonnie Ponwith, John Lamkin, Carlos Rivero, Barbara Muhling, Trika Gerard, Samantha Withcraft, Sheryan Epperly, Joseph Serafy, Michael Schirripa, John Walter, Todd Gedamke, Margaret Miller, Christopher Sasso.

AOML participants:
Robert Atlas, Silvia Garzoli, Gustavo Goni, Molly Baringer, Elizabeth Johns, Rick Lumkpin, Ryan Smith, Francis Bringas, Nelson Melo, Robert Molinari, Christopher Meinen, Joaquin Trinanes (OAR and NESDIS), Chris Kelble, Pedro DiNezio.

Non-AOML-SEFSC participants:
Maria Josefina Olascoaga (RSMAS), Villy Kourafalou (RSMAS), Claire Paris-Limouzi (RSMAS), Guillermo Diaz (NOAA HQ), Mitch Roffer (ROFFS).