CICOR

The Cooperative Institute for Climate and Ocean Research (CICOR) at the Woods Hole Oceanographic Institution is strategically situated to fulfill its explicit mission of harnessing the depth of leadership and research excellence at WHOI in service of NOAA's mission and goals. CICOR strengthens the relationships between the two institutions that have been forged over decades by many scientists and technicians from WHOI and across NOAA line offices. CICOR is a catalyst for collaborative work within the region and within the fields of Climate, Coastal and Ecosystems research and its scientists play leadership roles in national and international forums including the Northeastern Regional Association of Coastal Ocean Observing Systems, (NERACOOS), which serves the interest of NOAA and the Integrated Ocean Observing System (IOOS).

NOAA Partners for Climate, Coastal, and Ecosystems Research

Summer Student Fellow Amy Koid, and CICOR Postdoctoral Scholar Jeremiah Hackett working in the culture lab.

Left: Tom Kleindinst, WHOI; Right: Amy Nevala, WHOI

Working from the coastal research vessel Tioga, Fred Wenzel and Mark Baumgartner attempt to tag right whales near Georges Bank.

Chris Linder, WHOI

A thin layer of snow coats melt ponds in the Beaufort Sea, being sampled for a wide range of water properties.

Climate Research

CICOR Theme: The Ocean's Participation in Climate and Climate Variability

The past decade has brought rapid scientific progress in understanding the role of the ocean in climate and climate change. Together, NOAA and WHOI have contributed significantly to this progress. Through technological developments in observations and modeling, the NOAA/WHOI partnership through CICOR has forged advances in meeting NOAA goals:

- CICOR contributions to major elements of the global ocean climate observing system, including profiling ocean floats (ARGO), ocean gliders, ocean reference stations, and collection of high quality surface meteorology from Volunteer Observing Ships (VOS) ***improve the quality and quantity of climate observations;***

- In 2006 CICOR's Andrey Proshutinsky partnered with NOAA and others to produce the consensus document: The State of the Arctic Report. The report was one example of how CICOR helps NOAA ***develop and contribute to routine state-of-the-science assessments of the climate system;***

- Dr. Lisan Yu's new, improved air-sea flux product for the Atlantic Ocean is one of several ***climate information products developed for NOAA*** through the CICOR partnership;

- Studies of the wind forcing of the ocean wind-driven circulation as well as studies of air-sea carbon exchange and of the transport and storage of carbon within the ocean are examples of how CICOR PIs have helped NOAA meet its goal to: ***Improve the quantification and understanding of the forces bringing about climate change.***

Coastal and Ecosystems Research

CICOR Themes: The Coastal Ocean and Near Shore Processes & Marine Ecosystem Processes Analysis

Coastal waters are important for reasons that include weather, national defense, shipping, fishing, human health, shoreline hazards, and mineral extraction. NOAA's mandate to bring its resources to bear on the protection and management of these waters and related ecosystems has never been more important. For years scientists at WHOI have partnered with NOAA scientists and managers to share their expertise in nearshore oceanography, coastal and estuarine processes, physical and physical/biological numerical models, moored, drifting and autonomous observing systems, biological sensors, coastal ecosystems, and marine policy. WHOI also provides research facilities such as the Martha's Vineyard Coastal Observatory, the R/Vs *Tioga* and *Oceanus,* and laboratories.

One example of a NOAA/WHOI partnership in coastal and ecosystem research has been the work conducted in the area of Harmful Algal Blooms. HAB blooms have significant human and commercial ramifications and by partnering with WHOI, NOAA has had access to timely observations from the R/V *Tioga* as well as analyses from the lab of WHOI Senior Scientist Don Anderson. These have been combined with physical oceanographic data by researchers Dennis McGillicuddy and Ruoing He who produced a computer-modeled simulation of the spread of toxic algae along the north east coast. This work has ***improved the reliability, lead-time and effectiveness of water information to NOAA managers.*** The National Office for Harmful Algal Blooms, also hosted at WHOI through CICOR, ***coordinates regional and national outreach and education efforts.***

Through CICOR, WHOI researchers will build upon the history of ocean-related ecosystem research and continue to provide NOAA with tools and resources to promote its transition to an ecosystem approach to management (EAM).

CICOR provides the science-based decision support necessary to:

- Improve regional ecosystem health;
- Develop sound observations, assessments and research findings;
- Improve resource management;
- Coordinate regional and national outreach and education efforts;
- Engage in technological and scientific exchange with our domestic and international partners.

CICOR Education

WHOI's long heritage of excellence in ocean research and engineering, combined with the resources of the Woods Hole scientific community, including the MBL/WHOI library and NEFSC/NMFS, make it an ideal training ground for NOAA employees. Through CICOR, participants in the following programs are introduced to NOAA and its mission.

Post-Doctoral Scholars
The Institution's Post-Doctoral Scholars program is a highly competitive program in which the Scholars are selected by an Institution-wide Fellowship Committee.

Graduate Student Research
CICOR also supports a Graduate Student Research Assistant in the MIT/WHOI Joint Program. Since 1968 this cooperative academic program has developed leaders in oceanography and in oceanographic engineering. CICOR-sponsored GRAs work on NOAA-related research.

Summer Student Fellows
CICOR supports three Summer Student Fellowships each year. These advanced undergraduate students are selected from a very competitive pool to study and work with a WHOI oceanographer for the summer.

CICOR Workshops

Fostering Regional, National, and International Leadership
Recent CICOR sponsored or organized workshops include:

- Planning Coordinated Research on Ecosystems, Climate, and Policy in the Northeast 2005)
- QARTOD (Quality Assurance and Real-Time Oceanographic Data (2006)
- Indian Ocean Seminar Series (2005)
- OceanSITES Data Management and Science Team Meeting (2006)
- Skills Assessment and Planning for Regional Testbed Projects (2006)

CICOR Fellows are researchers who have established national or international standing. The Fellows are organized into three groups, each focussing on a CICOR theme:

CLIMATE:
Dr. Terry Joyce, WHOI
Dr. Yochanan Kushnir, LDEO/CICAR
Dr. Breck Owens, WHOI
Dr. Andrey Proshutinsky, WHOI
Dr. Jorge Sarmiento, Princeton Univ./CICS
Dr. Mary-Louise Timmermans, WHOI

COASTAL:
Dr. Bob Beardsley, WHOI
Dr. David Johnson, NOAA Beaufort Lab
Dr. Steve Lentz, WHOI
Dr. Dave Schwab, NOAA/GLERL
Dr. Phyllis Stabeno, NOAA/PMEL
Dr. Beth Turner, NOAA Coastal Ocean

ECOSYSTEMS:
Dr. Carin Ashjian, WHOI
Dr. Mark Baumgartner, WHOI
Dr. Mike Fogarty, NOAA/NMFS/NEFSC
Dr. Jon Hare, NOAA Narragansett Laboratory
Dr. Rubao JI, WHOI
Dr. Doran Mason, NOAA/GLERL
Dr. Simon Thorrold, WHOI

CICOR NOAA Partners include:

NOAA Office of Oceanic and Atmospheric Research (OAR)
NOAA Climate Program Office
NOAA Arctic Programs
The Atlantic Oceanographic and Meteorological Laboratory (AOML)
National Center for Environmental Protection (NCEP)
National Data Buoy Center (NDBC)
New England Fisheries Science Center (NMFS/NEFSC)
Natinal Marine Fisheries Service
National Ocean Service (NOS)
Office of Climate Observation (OCO)
Office of Global Programs (OGP)
Pacific Marine Environmental Laboratory (PMEL)

Academic Partners:

Center for Ocean-Atmospheric Prediction Studies at Florida State University (COAPS/FSU)
Cold Regions Research and Engineering Laboratory and Geophysical Institute at the University of Alaska Fairbanks (CRREL/UA)
Gulf of Maine Ocean Observing System (GOMOOS)
Marine Biological Laboratory (MBL)
Massachusetts Institute of Technology (MIT)
Woods Hole Research Center (WHRC)

Robert A. Weller, Director
Kenneth Brink, Associate Director - Coastal
Jesús Pineda, Associate Director - Ecosystems
Patricia White, Administrator

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