MEETINGS

Ocean and Climate Studies: Linking Physical, Biogeochemical, and Ecosystems Research

Climate Driving of Marine Ecosystem Changes (CLIMECO): Training for Young Marine Scientists; Brest, France, 21–24 April 2008

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Earth system science has inherent interdisciplinary aspects. In the marine environment, biogeochemical, ecological, and physical climate science processes interact strongly. Examples of these interactions are feedbacks between variations in the marine carbon cycle and radiative forcing in the atmosphere, variations in the distribution of tuna related to El Niño–Southern Oscillation, and the distribution of nutrients in ventilated water masses that are subject to climate variability.

International research programs recognize the importance of these interactions but are organized primarily along disciplinary sciences. The Climate Variability and Predictability (CLIVAR) project of the World Climate Research Program has a focus on the physical aspects of the climate system, and the Integrated Marine Biogeochemistry and Ecosystem Research (IMBER) and Global Ocean Ecosystems Dynamics (GLOBEC) projects of the International Geosphere-Biosphere Programme focus on both biogeochemistry and ecosystems research. In an attempt to link research on physical climate variability with marine environmental research, IMBER, GLOBEC, and CLIVAR organized training for young marine scientists in Brest, France.

The training focused on physical climate variability changes and their impact on the marine environment. Young marine scientists were introduced to climate processes and climate data sets that can be used for analyzing the coupling between the marine environment and climate. Three main aspects of the training included hands-on sessions, lectures, and live broadcasts.

Gridded data sets of ocean and climate data are widely available on the Internet. The use of these data requires knowledge of their background. In the training, a variety of data sets were used ranging from gridded ocean observations (expandable bathymetric and thermographic data, altimetry, etc.), ocean reanalysis data that combine ocean model and observational data (Simple Ocean Data Assimilation (SODA)), ocean general circulation output, and coupled ocean-atmosphere model output (using Intergovernmental Panel on Climate Change Fourth Assessment Report models). Also, climate analysis tools (see http://climexp.knmi.nl) and individual-based marine ecosystem models were used to analyze the climate variability and its impact on marine ecosystems. The participants worked in small groups with the data and software, primarily on regions of their own interest.

The lectures provided background to hands-on sessions by delving into the intricacies of climate data and models. These lectures introduced, among other things, physical processes, patterns of climate variability, modeling aspects of the ocean and climate, statistical analysis techniques, and the link between climate and marine ecosystems. Speakers highlighted the advantages and disadvantages of data sets, as well as analysis techniques and their pitfalls.

Thirty Ph.D. students and young postdocs out of 190 applicants were selected for the training. The hands-on sessions required a relatively small attendance. However, a Web conference tool provided by the European network of excellence for Ocean Ecosystems Analysis (Euroceans) allowed others to follow all lectures live on the Internet. The system also provides a question-and-answer tool. On average, 40 users logged on to follow the lectures from elsewhere. The recorded lectures will be available at the CLIMECO Web site.

With this training, a new generation of marine scientists got acquainted with climate data and analysis techniques for processing climate data. This will help them carry out novel research on the coupling between the marine environment and climate variability and change. For more information, presentations, sponsors, and background documents, see http://www.imber.info/CLIMECO_home.html.

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Beyond Brainstorming: Exploring Climate Change Adaptation Strategies

Climate Change Adaptation for Water Managers; Oracle, Arizona, 4–5 February 2008

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The most visible manifestation of climate change in the American Southwest is its effects on water resources. Since 1999, the region's water supplies and major rivers have been tested by burgeoning population growth and drought. Model projections suggest increasing drought severity and duration due to rising temperatures, increased evapotranspiration, and enhanced atmospheric circulation from the tropics (Hadley circulation).

The Arizona Water Institute, Arizona State University, and University of Arizona convened a "knowledge network" of local, state, tribal, and federal water resources managers and scientists to identify climate change adaptation and response strategies. Participants noted the increasingly widespread use of hydrologic data derived from tree rings, which improves understanding of past streamflow variability and sequences of low-flow years. Water managers from federal, municipal, and private agencies cited use of these data to inform planning decisions regarding supply reserves, worst-case scenarios, and purchasing alternative supplies. Managers said they need better estimates of annual high flows and separate estimates of average summer and winter flows.

In monitoring and prediction sessions, participants strongly recommended comprehensive water-balance monitoring to anticipate hydrologic cycle changes. Such monitoring efforts include continuous observations of demand-side variables, such as consumptive water use and evapotranspiration; hydrologic monitoring and research in mountainous regions to better understand connections between snow, soil moisture, and changing likelihoods of warm winter and spring storms that dump rain on top of the snowpack and produce rapid runoff and flooding; and expanding the U.S. Geological Survey streamflow network. Managers expressed concern about the implications of changes in hydrologic variability, including mean and extreme flows, rates of evapotranspiration, and characteristics of snowmelt runoff, by natural (multidecadal) and anthropogenic (human-caused) climate changes. Such alterations to the climate system require water managers and engineers to identify nonstationary probabilistic models and other methods to deal with shortcomings in existing prediction methods used in planning and infrastructure design. Their strategic science priorities included improved understanding of how warming will change the accuracy of water cycle and climate predictions, and extend hydrologic forecasts to provide