



SEA GRANT CONTRIBUTIONS TO THE NATION IN

# THE DIGITAL OCEAN: OUR OCEANS ON A MICROCHIP

The mission of the Digital Ocean Program is to build on work pioneered by Sea Grant to develop methods for creating digital representations, or models, of ocean resources and phenomena. By gathering, analyzing and making data widely available, we can help provide essential tools for ensuring the healthy sustenance of our economic and marine resources.

## Sea Grant Produces National Benefits

Recent investment in Sea Grant's Digital Ocean programming has resulted in the following outcomes:

- **Wave forecasting.** Sea Grant was instrumental in establishing the first near real-time wave forecasting model for Southern California. Because of the sophistication and accuracy of the model, the Navy selected Southern California as a test bed for coupling numerical algorithms for wave generation and propagation with other mathematical techniques — a project that illustrates the tactical significance of high-resolution wave forecasting as well as the importance of forecasting for boater safety. Today, the Coastal Data Information Program maintains wave-monitoring stations in 100 locations along California, Oregon, Washington, Hawaii, Georgia, Minnesota, Virginia and North Carolina coasts. The program and its nine staff members have major support from the U.S. Army Corps of Engineers and the California Department of Boating and Waterways. Since 1996, the program's surf forecast maps, posted throughout the day on the Web, have received nearly 61 million hits.
- **Fleetlink: Partnering fishermen with scientists.** Fishermen are a valuable source of information on fish populations and the marine ecosystem. By including fishermen in developing scientific hypotheses, designing experiments and collecting data, scientists can achieve better and more useful results on which to base stock assessments and population estimates. Sea Grant is a partner in Fleetlink, a National Oceanographic Partnership Program to develop a system to collect, telemeter and distribute environmental and fisheries data collected on commercial fishing vessels. Along with several research and private partners, Sea Grant has equipped several vessels with this technology and has demonstrated the ability to provide real-time data to scientists and managers.
- **Applying passive acoustics in fisheries.** Sea Grant is engaged in critical work in the area of passive acoustics in fisheries, which offers a unique tool not only to study fish, but also to simultaneously monitor sources of noise pollution and study the impact of man's activities on marine communities. In April 2002, Sea Grant convened an international conference on the applications of passive acoustics in fisheries; the proceedings of that conference are forthcoming. Sea Grant is currently focusing on research that will achieve these goals while also improving management of commercially exploited species, improving techniques for identifying Essential Fish Habitat, and providing non-invasive methods for stock assessment.
- **Improving hurricane forecasting.** Sea Grant is at the forefront of developing ocean-based hurricane observation systems that could greatly increase forecasting abilities and significantly decrease the number of deaths and economic loss from hurricanes. The research currently underway with autonomous underwater vehicles and acoustic systems could also be implemented in other aspects of extreme events, such as earthquake monitoring and underwater volcanic activity.
- **Helping the offshore oil industry.** Sea Grant funded and produced a detailed, three-dimensional bathymetric map, in both CD and printed forms, for the Gulf of Mexico. These maps are providing oil and gas producers with highly detailed information on where to lay pipelines and locate platforms. Revenues from these commercial sales are paying for smaller, much less expensive maps for use in schools.
- **Remote sensing in wetlands.** Wetlands are a valuable public and ecological resource. They filter pollutants from water, provide wildlife habitat, and protect inland areas from flooding during storms. Sea Grant researchers have employed remote sensing and Geographic Information Systems (GIS) to detect changes in land cover and wetland trends in Delaware's coastal watersheds, to demonstrate the capabilities and benefits of these techniques in aiding resource managers. This research successfully integrates land-cover data gathered by satellites into a GIS for monitoring wetlands health.
- **Computer modeling for better beach management.**

Shoreline change is an unceasing reality. Sea Grant research has expanded the capability to predict the effects of water waves in navigational channels and bays. The models predict the temporal and spatial variations of the water depth and velocities under various wave fields. This computer modeling work has direct application to the planning of navigable inlets and the development of present-day and future beach management options for policy makers. The numerical models have also been used to predict wave runup and overtopping on beaches and coastal structures by coastal engineers worldwide.

- **Improving lake access.** People who plan to use Lake Independence and Lake Minnetonka in Minnesota only need turn on their computers to help them decide how deep to fish or when to swim or to see the impacts from storm events and urban runoff. Remote underwater sampling station units placed in the lakes are gathering data through Sea Grant's participation in the EPA's Environmental Monitoring for Public Access and Community Tracking program. The project is a collaboration with several partners and could serve as a nation-wide model for making lake and marine data more publicly available.

## Building the Future on Successes of the Past

Sea Grant will join with federal and state agencies, coastal communities and the private sector to accurately assess the nation's needs and generate and modify technologies to ensure the health and sustainability of our ocean and coastal resources. Sea Grant is committed to developing education and public awareness initiatives and transferring research information from the nation's universities to the public.



For more information:

Chrys Chrysostomidis, Chair  
Digital Ocean Theme Team  
MIT Sea Grant College  
Program  
(617) 253-7131  
chrys@mit.edu

Jennifer Greenamoyer  
Sea Grant Association  
(202) 448-1240  
jgreenamoyer@sga.seagrant.org

<http://web.mit.edu/seagrant/digitalocean>