UCSB helps develop massive coastal radar network

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Radar, which helped neutralize German bombing attacks on London during World War II, is experiencing a green resurgence in a massive mapping network of computerized systems that can save the lives of those overboard at sea, track oil spills and follow the complex migration patterns of coastal marine organisms.

After five years of development by UCSB and a multi-institution research consortium, the largest oceanographic radar mapping system in the world is now in operation on the West Coast.

The system of 78 high-frequency radar transmitters, receivers and antennas covers 1,500 miles of shoreline from Astoria, Wash., to Tijuana, Mexico. UCSB and other member institutions of the Southern California Coastal Ocean Observing System operate the Southern California portion of the project.

Similar systems are online on the East Coast, Gulf Coast, around Hawaii, and in Europe and Asia, said UCSB oceanographer and geography professor Libe Washburn.

"These systems will eventually combine to save lives and help answer ocean circulation questions about climate change," Dr. Washburn said.

"Radar measurements of current flow can aid in locating overboard boaters," Dr. Washburn told the News-Press. "If it is known when and where a person went overboard, ocean current data can help predict the person's location. Together with wind observations, the data can reduce the area that needs to be searched and shorten the time the person is in the water.

"By mapping ocean currents continually in space and time, the system will allow the Coast Guard and other responders to not only track these victims, but to put equipment in place to mitigate the affects of oil spills."

"We now have the capability to access ongoing current data from the West Coast and combine it in real time with our own search and rescue optimal planning system," said Arthur Allen, the Coast Guard's chief search and rescue oceanographer. "In concert with other online (National Oceanic and Atmospheric Administration) data, this capability will allow us to more accurately calculate where overboard victims should be by the time
rescue helicopters arrive."

The system propagates radio signals at low transmission levels reaching as far as 80 miles offshore. That has allowed researchers at UCSB and other institutions to look at processes of ocean circulation such as wind, tides, wave phenomena, and eddies.

The scientists also monitored more local targets, observing coastal waves that, unlike ocean swells, are trapped along coastlines and have circulation periods of several days to a few weeks.

Dr. Washburn and other project members recently published a paper on their near-shore studies in the Journal of Geophysical Research-Oceans.

The study provided detailed coastal surface circulation and ocean dynamic measurements at a resolution -- kilometers in space and hourly in time -- never before resolved, said to Sung Yong Kim, a postdoctoral researcher at the Scripps Institution of Oceanography, UC San Diego, and lead author of the paper.

The multi-year study relied on data provided through a centralized data center designed and operated by Scripps in support of the NOAA's integrated ocean observing system.

"We are now able to examine large-scale movements of water in the California current, including the Southern California bight, to learn how currents affect ocean ecosystems," Dr. Washburn said.

"For example, we're beginning to see how plankton, larvae and small reef fish are influenced by the coastal currents. Many larvae of marine animals have multiple life stages when they freely drift in the plankton, some for periods of many months. To develop into adults, these animals need to find their way back to shallow water near shore or to tide pools."

The general drift of the California current is north to south, but it contains many flows such as eddies that cause chaotic movement of water and organisms. Measuring the resulting flow patterns can improve the understanding and evaluation of marine reserves, Dr. Washburn said.

The Marine Life Protection Act limits fishing to certain coastal areas from the Mexican border northward. Ocean current data from the radar monitoring system, along with new ocean circulation models, should provide new insights on the connection of those reserves.

In addition to the NOAA and the state of California, other project funders included the National Science Foundation, the Bureau of Ocean Energy Management, the Office of Naval Research and several private foundations.
Dr. Washburn's research group at UCSB included Brian Emery, programmer analyst; Chris Gotschalk, staff research associate; Cyril Johnson, engineer; David Salazar, marine technician, and Nick Dellaripa, a marine science graduate student.

Dr. Melanie Fewings, another oceanographer at UCSB, also worked with Dr. Washburn's research group and used data from the radar system in her research.

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UCSB professor Libe Washburn studies Southern California currents using a new radar mapping system. A network of radar transmitters will aid Coast Guard search and rescue operations, help track oil spills and follow complex migration patterns of marine life.

THOMAS KELSEY/NEWS-PRESS PHOTOS

Black arrows in the chart show complex ocean current flowing around Point Conception as measured by the West Coast radar mapping system. Image colors represent ocean surface temperatures measured by a National Oceanic and Atmospheric Administration satellite with red shades indicating warmer water. White arrows depict currents measured from moored instrument buoys while red arrows show wind buoys operated by NOAA.

Pictured is the UCSB radar mapping team, from left, Brian Emery, David Salazar, Cyril Johnson, Melanie Fewings, Libe Washburn, and Nick Dellaripa. The scientists helped develop the world’s largest oceanographic radar mapping system covering 1,500 miles of shoreline from Astoria, Wash., to Tijuana, Mexico.
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