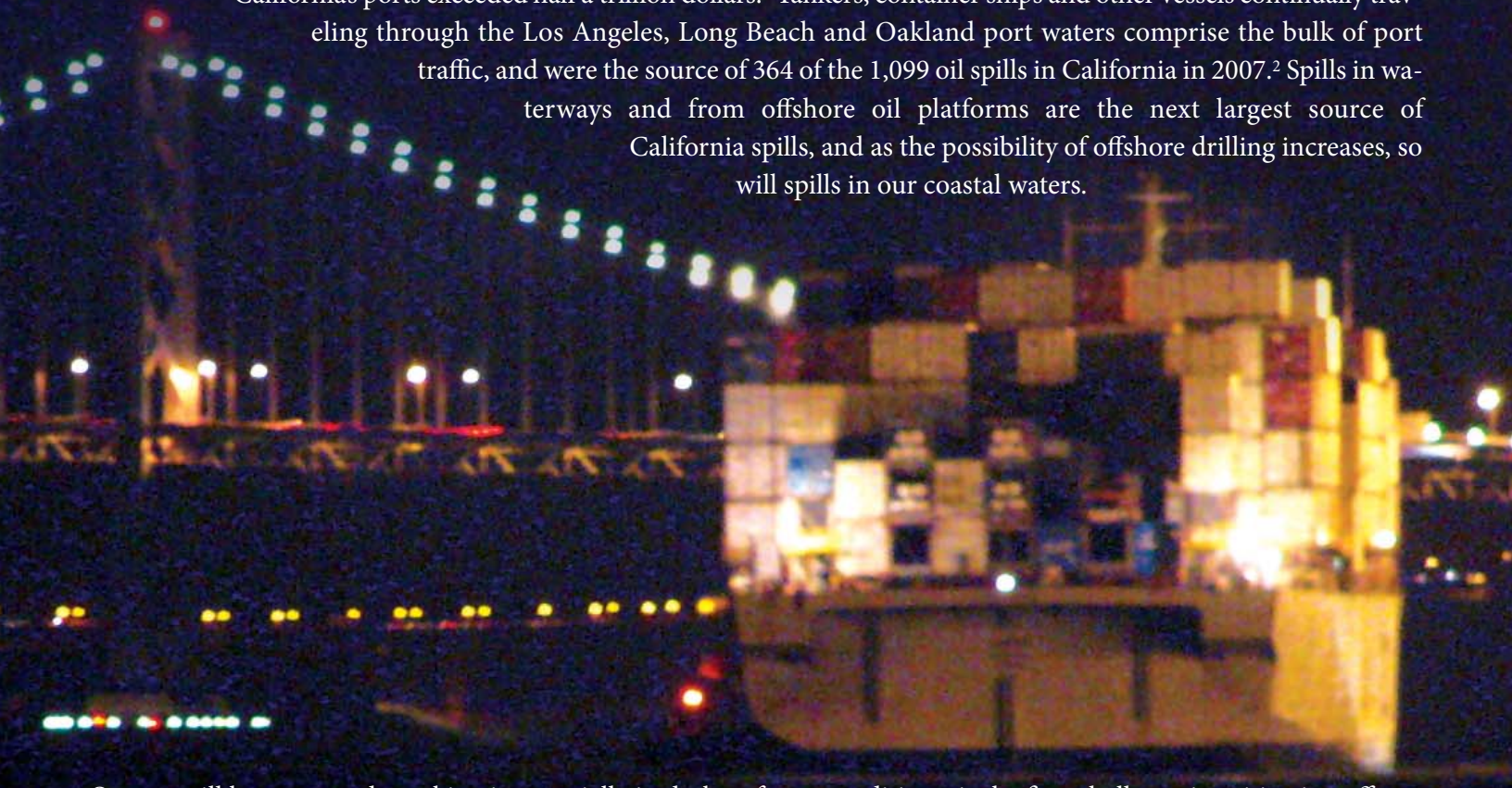
CALIFORNIA COASTAL OCEAN CURRENTS MONITORING PROGRAM (COCMP)

IMPROVING OIL SPILL RESPONSE

California is home to three of the five busiest ports in the country; in 2007, imports and exports through California's ports exceeded half a trillion dollars.[1] Tankers, container ships and other vessels continually traveling through the Los Angeles, Long Beach and Oakland port waters comprise the bulk of port traffic, and were the source of 364 of the 1,099 oil spills in California in 2007.[2] Spills in waterways and from offshore oil platforms are the next largest source of California spills, and as the possibility of offshore drilling increases, so will spills in our coastal waters.



Once a spill has occurred, tracking it, especially in dark or foggy conditions, is the first challenge in mitigation efforts. The California Coastal Ocean Currents Monitoring Program (COCMP) uses a suite of technologies—high-frequency radar in particular—to track ocean surface currents in near-real-time. Initiated in 2005 when the State Coastal Conservancy and the State Water Resources Control Board invested $21 million from voter-approved Propositions 40 and 50 funds to build the infrastructure to map ocean surface currents, COCMP is currently nearing completion. This 55-station, land-based system allows managers to track surface currents via the Internet 7/24/365—including at night, in fog, or when conditions don't allow for direct observation of the spill.

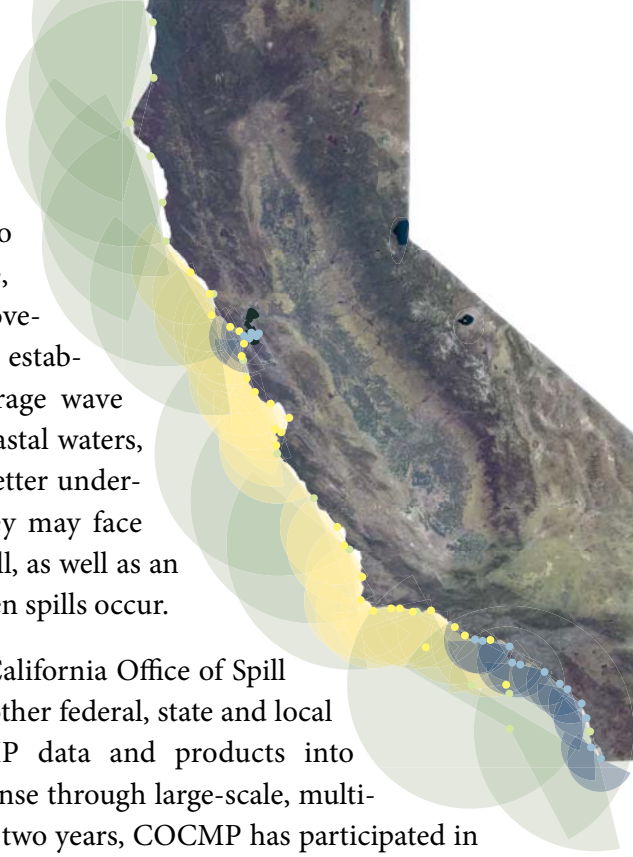
When the container vessel *Cosco Busan* collided with the base of the Bay Bridge in San Francisco Bay in November of 2007, spilling over 53,000 gallons of fuel oil, managers used surface current maps from HF radar data to monitor the spill trajectory, predicting movement as far north as Angel Island and westward along the San Francisco waterfront. This closely matched visual reports of oil on the shorelines of Alcatraz, Angel Island, San Francisco, and on a map produced by the National Oceanographic and Atmospheric Administration (NOAA) Office of Response and Restoration. Once the oil moved into the Gulf of the Farallones, the HF radar data accurately predicted that the oil would not beach there. As COCMP capabilities are integrated into California oil spill response, spills like the *Cosco Busan*'s (which occurred in dense fog) can be more effectively tracked, with mitigation efforts unimpeded by lack of visual data.

.[1]Los Angeles, Long Beach and Oakland. American Association of Port Authorities, 2007.

.[2]California Office of Spill Prevention and Response.

HOW HF RADAR IS USED TO TRACK OCEAN SURFACE CURRENTS

High-frequency radar systems measure reflecting radio waves off the surface of the ocean. Each HF radar site has two antennas: the first transmits a radio signal out across the ocean surface, and the second listens for the reflected radio signal after it has bounced off the ocean's waves. By measuring the change in frequency of the radio signal that returns, the system determines how fast the water is moving toward or away from the antenna. This phenomenon is known as the Doppler shift. Data from neighboring antennas are processed and displayed to the user as surface current maps in near-real-time.



COCMP data are also integrated with circulation models to forecast coastal currents, allowing managers not only to track a spill in near-real-time, but to anticipate its future movement. The data are also used to establish an understanding of average wave conditions for our bays and coastal waters, so that managers will have a better understanding of the challenges they may face prior to the occurrence of a spill, as well as an additional reference source when spills occur.

COCMP is working with the California Office of Spill Prevention and Response and other federal, state and local agencies to integrate COCMP data and products into statewide prevention and response through large-scale, multi-agency simulations. In the past two years, COCMP has participated in Safe Seas '06—a NOAA-led multi-agency simulated spill off the San Francisco coast, and a National Preparedness for Response Exercise Program simulation involving 200 agencies off the coast of San Diego in the summer of 2008. These simulations allow the many state and federal regulatory agencies involved in oil spill response to practice working together in the event of an actual spill, and demonstrate the value of real-time surface current maps and forecasts in response management and decision making. An oceanographer with the Minerals Management Service writes that COCMP "greatly enhances our ability to calculate oil spill trajectories."[3]

Technologies like HF radar, combined with online delivery of data, are transforming management of California's priceless bays and coastal waters. Thanks to its farsighted and early investment in these technologies, California leads the nation in implementing and integrating surface current mapping for improved management of our bays and coastal oceans.

[3]David Panzer, Minerals Management Service letter of support to SCCOOS, October 2007.

Surface current data are available via COCMP consortia partners.

Central and Northern California Ocean Observing System (CeNCOOS): www.cencoos.org/currents

Southern California Coastal Ocean Observing System (SCCOOS): sccoos.org/data/hfrnet

Image Captions. Reverse: Large container ship departs the Port of Oakland, soon to pass under the Bay and Golden Gate Bridges—courtesy of pbo31 via flickr creative commons. Above left: Damage apparent to the Cosco *Busan* from its collision with the Bay Bridge on 7 November 2007—courtesy of the Coast Guard. Bottom Left: HF radar antenna in San Francisco. Above right: COCMP radar locations (dots) and their coverage areas (semi-circles); surface current direction and velocities are collected over the entire continental shelf.