Coastal ocean surface currents carry a number of substances including anthropogenic materials such as pollutants, oil and sewage, sediment from rivers and coastal erosion, freshwater from runoff and discharges, and marine organisms including larvae and harmful algal bloom species (HABs). The fate and effect of these substances are determined in part by coastal circulation. Surface currents also impact navigation, search and rescue activities and maritime operations. The ability to track surface currents and to accurately predict trajectories is critical in managing coastal ecosystems, mitigating environmental hazards, and facilitating safe and efficient marine operations.

In 2002, California voters approved two initiatives that included funds for the establishment of a state-wide integrated system to monitor and map coastal ocean circulation in near real-time. In central and northern California, the state funded Coastal Ocean Currents Monitoring Program (COCMP) is responsible for developing and operating this system. The ultimate goal is to provide products relevant to the movement and distribution of coastal waters and the substances they carry – this information is essential to agencies responsible for managing the coastal zone, products are distributed through CeNCOOS.

Ocean current information and data is collected using shore-based high frequency mapping station technology. This technology is non-invasive, real-time, and provides coverage over large areas, making it ideally suited to a statewide monitoring program. Examples of other technologies used, though to a lesser degree, include GPS-tracked drifters, autonomous underwater vehicles, and gliders to understand surface currents.

To track surface currents radio waves are transmitted from shore-based stations and reflect back off the ocean’s surface. By measuring reflected radio waves at two near-by locations, surface current speed and direction are determined.
THE RADIO WAVE TECHNOLOGY PRODUCES A SIGNAL WITH ONLY THE AMOUNT OF POWER NECESSARY TO LIGHT A HOUSEHOLD LIGHT BULB.

Value

Surface current data provide the foundation for products designed to improve the understanding and management of our oceans and coasts, and save lives, money and resources. Surface current maps and products can be used to:

- Manage coastal ecosystems and fisheries
- Enhance water quality monitoring
- Design and monitor marine protected areas
- Track and predict trajectories of hazardous spills
- Ensure safe and efficient marine operations
- Improve search and rescue operations
- Mitigate environmental hazards
- Assess the impacts of climate change on coastal habitats
- Increase weather and climate forecast precision
- Provide surface wave forecasts for recreational boating and surfing.

Success

- Surface current and trajectory information were provided in both the 2006 NOAA-sponsored oil spill simulation exercise off the coast of California and the real 2007 San Francisco Bay oil spill event. In both instances, the data accurately predicted the trajectories of simulated and actual oil.
- A graduate student with the tagging of Pacific predators (TOPP) program, was able to locate a lost tag that had popped off from a tagged animal, using surface current information from various current mapping stations.

More Info

For more information about surface currents and CeNCOOS, please visit: http://www.cencoos.org/currents

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Surface current mapping stations and their ranges for central California. Longer range systems have a lower resolution, but are able to measure out to approximately 160KM offshore. (COCMP)