SOUTHERN CALIFORNIA COASTAL OCEAN OBSERVING SYSTEM

COASTAL TRANSPORT STUDY

San Pedro Shelf Region

The Southern California Coastal Ocean Observing System (SCCOOS) has received state funding for implementing an extensive set of physical observations in the San Pedro Bay area, a region selected because of its chronic water-quality problems and availability of historic data. A primary objective of the SCCOOS effort (planned for summer/early fall 2006) is to improve the predictive capability for transport and mixing in the nearshore region, which will allow for the generation of a variety of products for a wide audience of coastal users. Coastal waters, from the surf zone to the shoreline, are central to life in Southern California. SCCOOS aims to provide a better understanding of nearshore water quality and pollutants transport in the San Pedro Bay region.

Observation design and location(s) have yet to be finalized. Input and participation from stakeholders, as well as scientists and engineers not yet associated with SCCOOS, are sought, and will be key in defining the most effective observation parameters. Observations will be concentrated between the shoreline and about 2 km offshore (roughly 30 m water depth), a region that includes the surf zone (where waves actively break) and the transition zone between the surf zone and shelf. Surface currents farther than 2 km offshore will be monitored with HF radar. A month-long intensive period of observation will be supported by the broader regional observations that will be operated on a continual basis throughout Southern California.

Transition zone/seaward of surf zone

Two moorings will be deployed for three months centered on the month-long intensive observation period (Figure 1a). Each mooring will include a surface buoy holding a downward-looking ADCP *(acoustic doppler current profiler, which allows measurement of currents at different depths throughout the water column)*, a thermistor chain, and a bottom pressure sensor. Velocity and temperature data will be telemetered to shore in real-time for distribution through the SCCOOS data management system. For five three-day stretches during the month, 20 drifters will be repeatedly deployed in a grid spanning the transition zone. Drifter trajectories and surface current maps will be generated on an hourly basis and made available to the SCCOOS data management system.

AUV surveys will be obtained daily throughout the month. Current technology allows 12-hour deployments once per day. The survey pattern will be designed to cover the focus area within three hours in order to adequately resolve tidal motions. AUVs will be equipped with CTDs *(conductivity, temperature, depth sensors, which allow measurement of the temperature, salinity, and stratification of the water column)*, and upward- and downward-looking ADCPs. Data will be provided each day to the SCCOOS data management system for distribution on the Web.

The drifters, AUVs, and moorings will provide distinct and complementary velocity products, all of which will be useful for model validation. The fundamental contribution of the drifters will be a series of surface velocity maps. AUV ADCP data will yield subsurface maps every day. Moored ADCPs will give velocity data with fine resolution in both depth and time. With experience and knowledge of the relevant length and time scales, researchers may combine these velocity fields to produce full 3D maps of velocity in the transition zone.

Very nearshore/surf zone

A cross-shore transect of seven bottom-mounted pressure sensors and acoustic doppler velocimeters will be deployed on a cross-shore transect between the shoreline and about 5 m depth (Figure 1b). Four additional locations, displaced in the along-shore direction, will be instrumented to estimate the along-shore variability of waves and currents. During the month-long surf zone deployment, approximately 15 drifters will be repeatedly released/retrieved/reseeded along several kilometers of beach for ten days. Bathymetry will be measured with a GPS-equipped jet ski, and the surf zone and transition region drifter deployments will be coordinated. An interactive point-and-click Web page with a real-time "nowcast" of nearshore waves and (vertically and surf zone-averaged) along-shore currents, will be developed for San Pedro Bay (Figure 2). Modeling will include simulation of pollutant dispersal (Figure 3).

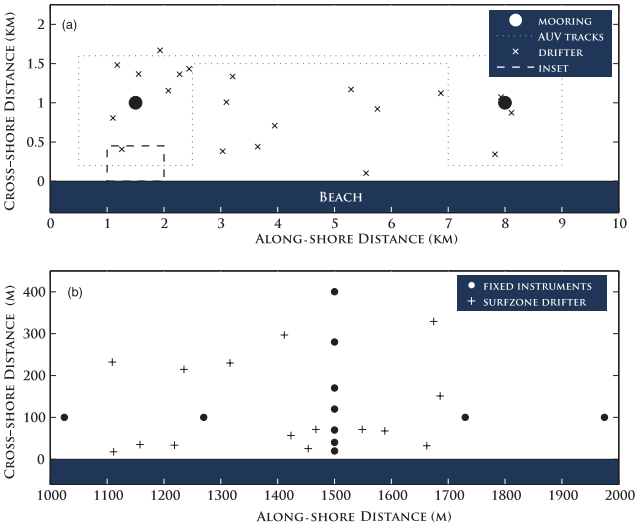


Figure 1: Schematic of anticipated nearshore instrument deployment: (a) entire nearshore region with two moorings located 1 km from shore in about 15 m water depth, AUV tracks and 20 example drifter locations. Bold, dashed lines indicate surf zone region expanded in panel b. (b) Surf zone region (spans 1 km along-shore and 450 m cross-shore) with locations of fixed instruments, and example surf zone drifter locations. The AUV tracks intersect the surf zone observations, and one of the moorings continues the surf zone transect.

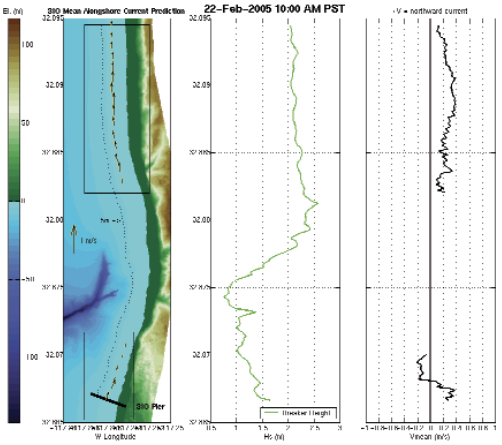


Figure 2: High along-shore resolution "nowcasts" (along-shore resolution of 200 m) of wave height at the seaward edge of the surf zone (middle) and surf zone-averaged along-shore currents (left and right) near Scripps Canyon (San Diego). Similar "nowcasts" will be produced for San Pedro Bay.

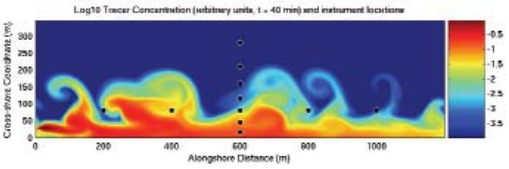
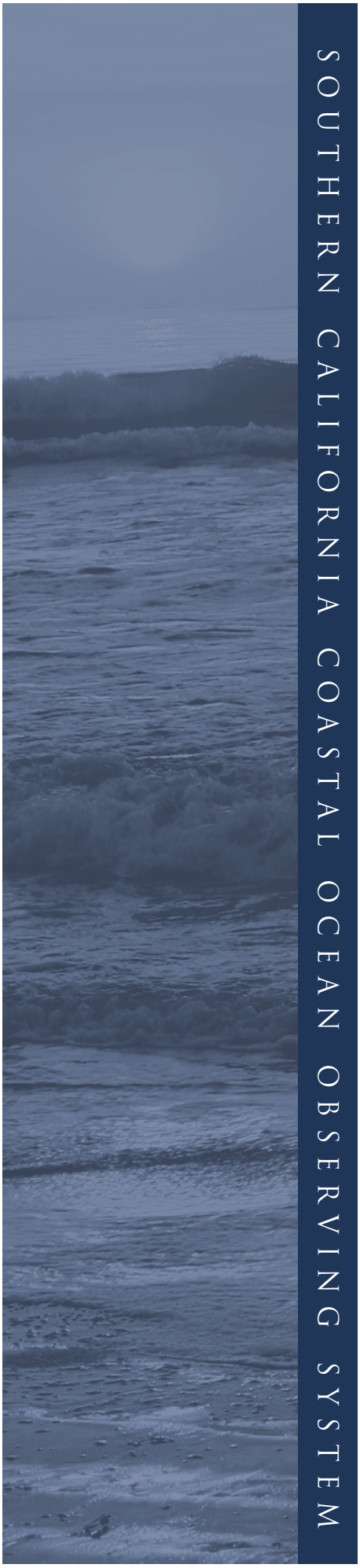


Figure 3: Sophisticated numerical modeling provides predictions for the dilution and residence time of constituents introduced at the coastline (e.g., stormwater). This figure shows numerical simulation of pollutant dispersal in the nearshore. Pollutant, continuously released at coordinate (0,0) (lower left-hand corner) for 40 minutes, has been advected to the right by the breaking wave-driven along-shore current and mixed seaward by instabilities of the along-shore current.



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