

AUV Surveys of Bioluminescence and Coastal Processes in the Monterey Bay

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Abstract: The Monterey Bay Aquarium Research Institute (MBARI), in conjunction with California Polytechnic Institute in San Luis Obispo and UCSB, have conducted two in a series of multi-parameter oceanographic surveys designed to measure coastal upwelling, frontal processes, and bioluminescence in the Monterey Bay. The surveys have consisted of one to two weeks of continuous, round the clock operations in August 2000 and August 2002, allowing repeat mapping of biological and physical features as well as synoptic mapping of bioluminescence at multiple points in the Bay. These surveys have utilized autonomous underwater vehicles, autonomous vertical profilers and moorings to achieve the necessary spatial and temporal scales and resolutions, as well as a variety of shipboard instruments and cast samplers to provide baseline data and quality control.

A unique aspect of our survey program is its use of multiple AUVs to increase the observation capacity of a conventional research vessel. Our surveys have

utilized the MBARI Dorado AUV and the CalPoly REMUS AUV, which were both equipped with a comparable suite of hydrographic instruments for measuring basic water column parameters (C, T, D, Fluorometer) and vertical current structure, as well as specific instruments for measuring bioluminescence and particle size. These vehicles conducted a total of 18 missions over the course of our August 2002 survey. Daytime surveys focused on repeat mapping of known upwelling regions located within the bay. Nighttime surveys were designed to understand the spatial distribution, community composition, relative abundance, and migration of bioluminescent plankton both inside and outside the bay.

In this paper, we will describe and motivate our survey design, as well as describe the instrument configuration of the REMUS and Dorado AUVs for this particular survey. We will also present an overview of joint AUV/ship operations and data collected. In particular, we will discuss the

integration and present data from two unique instruments carried by the AUVs: a particle size analyzer for measuring suspended sediments in upwelling regions, and a bathyphotometer for measuring emitted light from plankton. We will close with a discussion of the operational and scientific lessons we have learned through our intensive survey operations, and the integration of these surveys into a broader coastal observation and prediction system.