

Testing Sequoia's *LISST-Holo* on an Autonomous Underwater Vehicle

Summary

The Monterey Bay Aquarium Research Institute (MBARI) tested Sequoia's *LISST-Holo* sensor in April 2011, during a coastal oceanography study in Monterey Bay, California. The experiment was part of a project that is advancing ocean observing systems, of which autonomous underwater vehicles (AUVs) are an essential component. MBARI's AUV advancements — contributing to observing system capabilities — include longer endurance, enhanced onboard decision making, intelligent sample acquisition and return, autonomous coordination of multiple AUVs, and augmented sensing for interdisciplinary research. The April experiment provided an opportunity to test how *LISST-Holo* may augment sensing capabilities for interdisciplinary research with AUVs.

Experiment Description

The study region is strongly influenced by wind-driven coastal upwelling, which supplies cold, nutrient-rich waters to the bay and promotes the growth of microscopic algae (Figure 1).

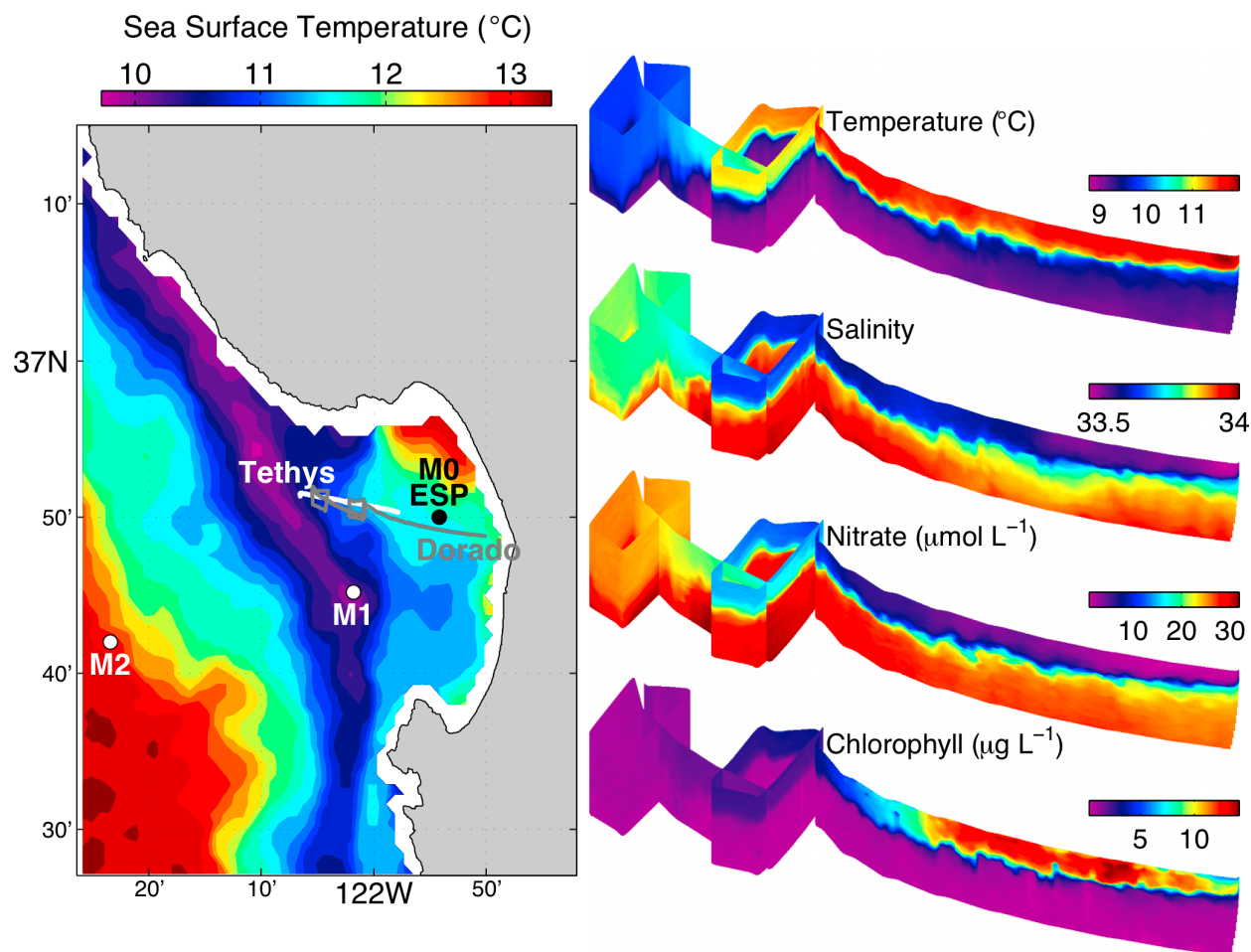


Figure 1. Experiment description. The map (left) shows a filament of upwelled water extending across the mouth of Monterey Bay. The boxes in the track of AUV *Dorado* indicate frontal locations identified by AUV *Tethys* (frontal position changed with time). Vertical sections of water column properties (right) are shown for the upper 40 m along the *Dorado* survey track.

The April experiment utilized two AUVs in efforts to map and sample the different water types and the boundary (front) between them. AUV *Tethys*, a long-endurance AUV, autonomously monitored frontal locations and provided this information to AUV *Dorado*, which was equipped with a water sample acquisition system and a larger sensor payload, including *LISST-Holo*. The AUVs described environmental and biological changes influencing the detection of microscopic life by a moored autonomous molecular analytical device, the Environmental Sample Processor (ESP, see map in Figure 1).

LISST-Holo was deployed on AUV *Dorado*. Plankton diversity imaged by *LISST-Holo* during the survey shown in Figure 1 is illustrated in Figure 2. A key research goal of the experiment synthesis is to understand the different plankton populations that develop in different water types as well as the frontal zones between them. For this purpose, information from *LISST-Holo* images is being integrated with data from other AUV sensors (Figure 1), as well as results of molecular analysis of water samples acquired by the AUV.

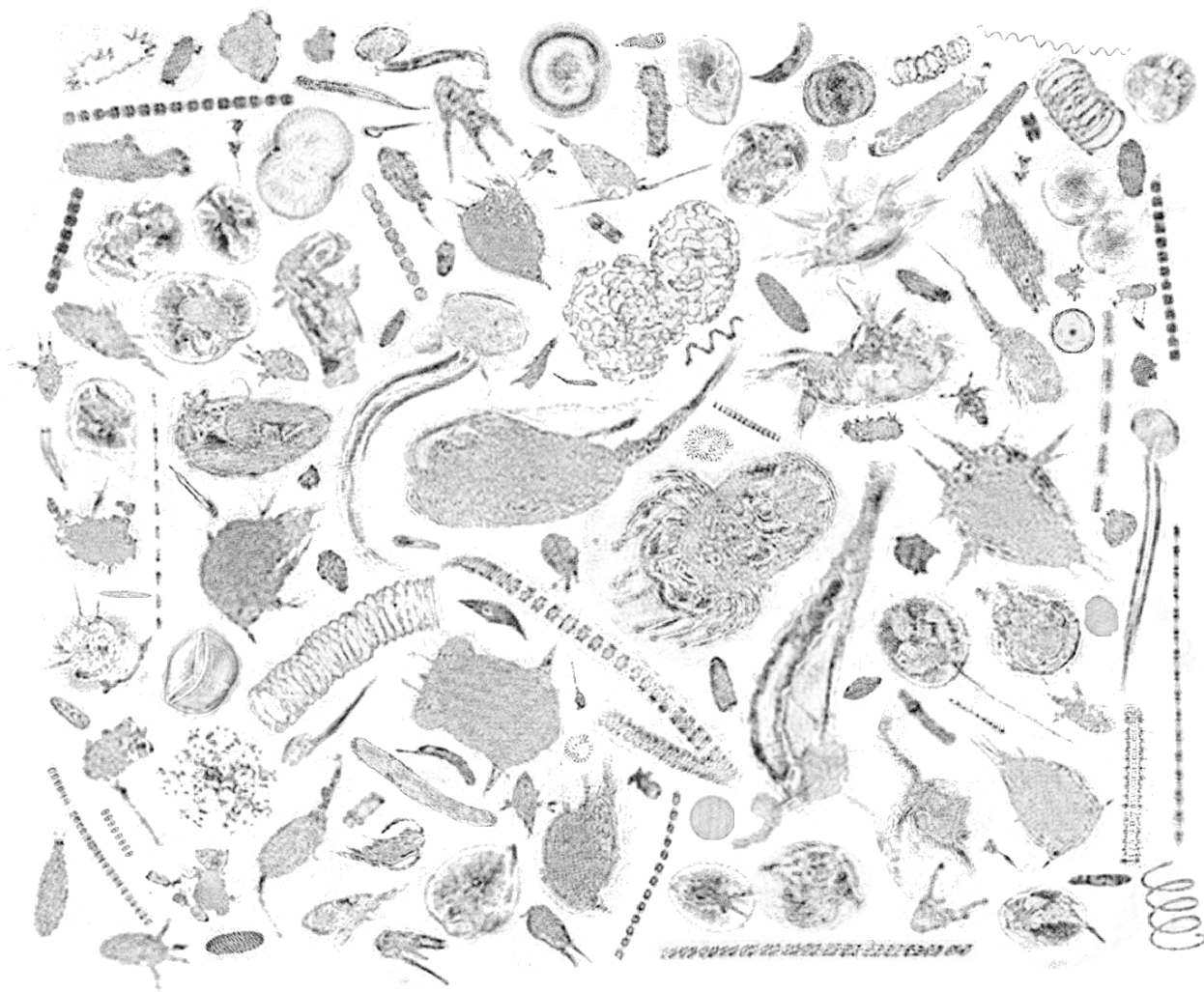


Figure 2. A *LISST-Holo* diversity montage from the *Dorado* AUV survey shown in Figure 1.