

Proposed Sampling Plan / Vehicle Tasking for the WHOI Glider Fleet during AOSN-II/MB03

D.M. Fratantoni, WHOI

May 27, 2003

Sampling Goals

The WHOI glider fleet will attempt to satisfy two primary observational goals during MB03.

Goal 1: Collect regional-scale, contextual measurements of physical and bio-optical properties for model assimilation/validation and to motivate and guide detailed measurements of fronts, filaments, eddies, etc.

Goal 2: Investigate the 4-D physical and bio-optical structure of the wind-forced upwelling plume and associated mesoscale features south of Pt. Ano Nuevo.

Available Assets

- Ten gliders with Sea-Bird CTD, Wet Labs eco-bb2f fluorometer, WHOI PAR.
- Two additional gliders with CTD -- working to add fluorometer, PAR, biolum.

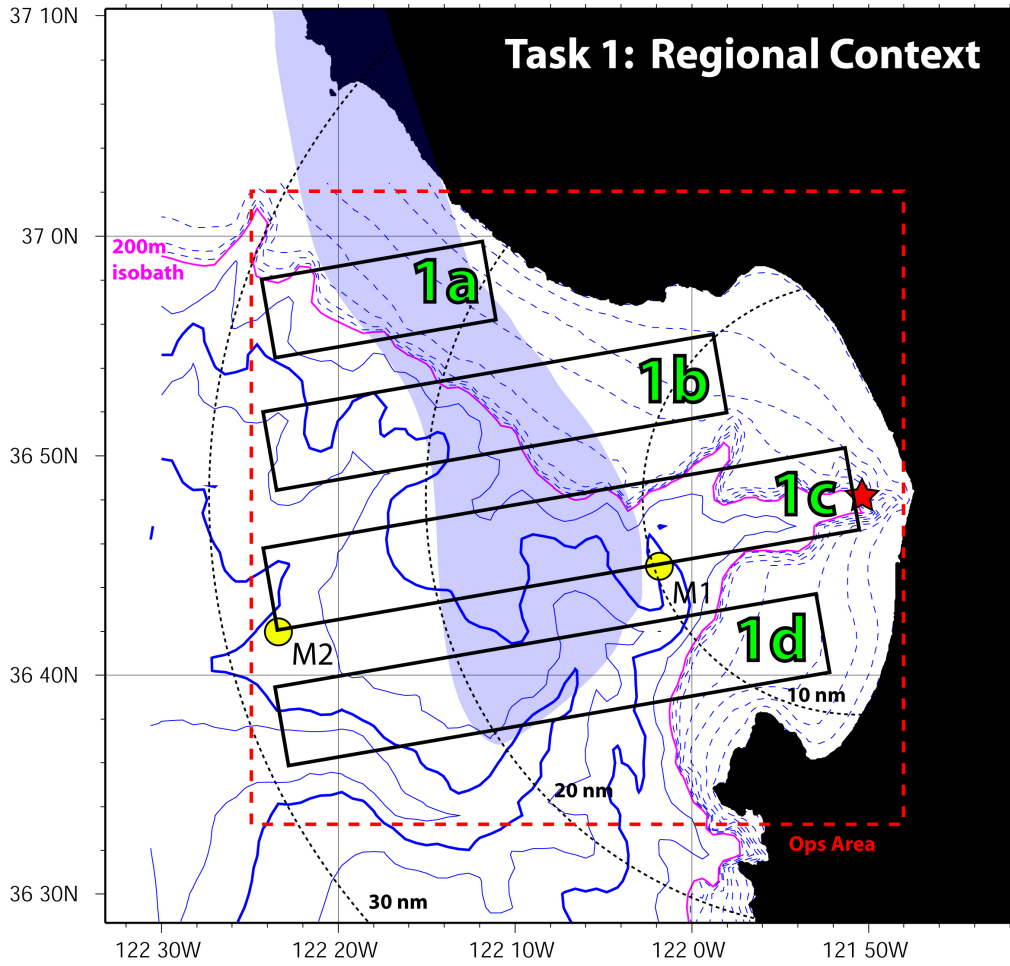
Operational Parameters

For the purposes of the MB03 experiment the WHOI glider operating area is bounded on the west by mooring M2, on the south by Pt. Pinos, on the north by Pt. Ano Nuevo, and on the east by the 25 m isobath. Maximum vertical profiling capability for these vehicles is 200m. The effective forward speed is approximately 1 km/hour, or 14 nm/day. The horizontal distance between successive profiles (“resolution”) is approximately four times the profiling depth (i.e. 800m for 200m profiles; 200m for 50m profiles). The gliders will surface at least four times each day to obtain GPS position fixes, to transmit collected data, and to receive new survey parameters. Typical surfacing interval will be 1-3 hours depending on mission objective. Gliders will be recovered occasionally (nominally 20 days) for re-powering and sensor maintenance. Telemetered data will consist of quasi-vertical profiles (downcast only) of all scientific sensor data. Full engineering data and time-series representations of science data will be available following vehicle recovery.

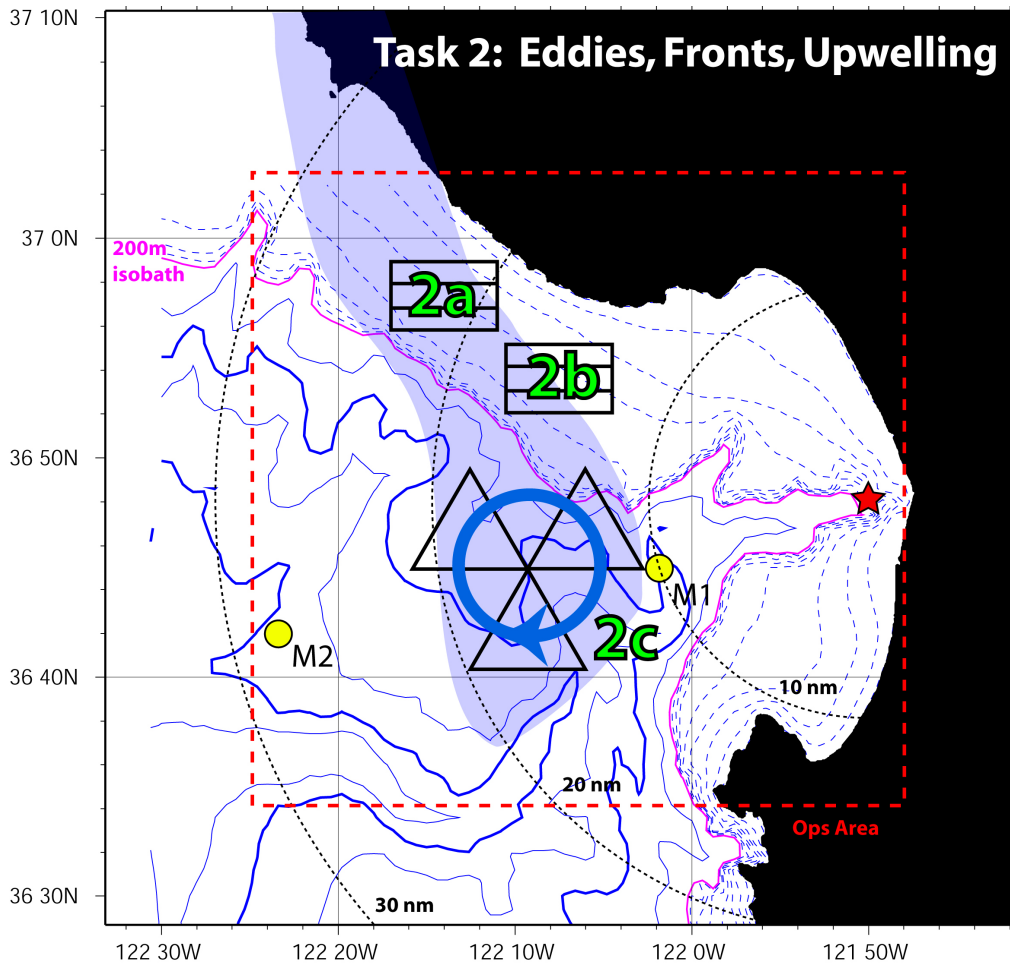
Vehicle Tasking

A fleet of ten gliders will be maintained during the course of the MB03 experiment. The fleet will be divided into three virtual subgroups to address the goals stated above. A combination of static (pre-programmed) and dynamic (adaptive) survey methodologies will be utilized. *Note that individual vehicles will not be permanently assigned to any*

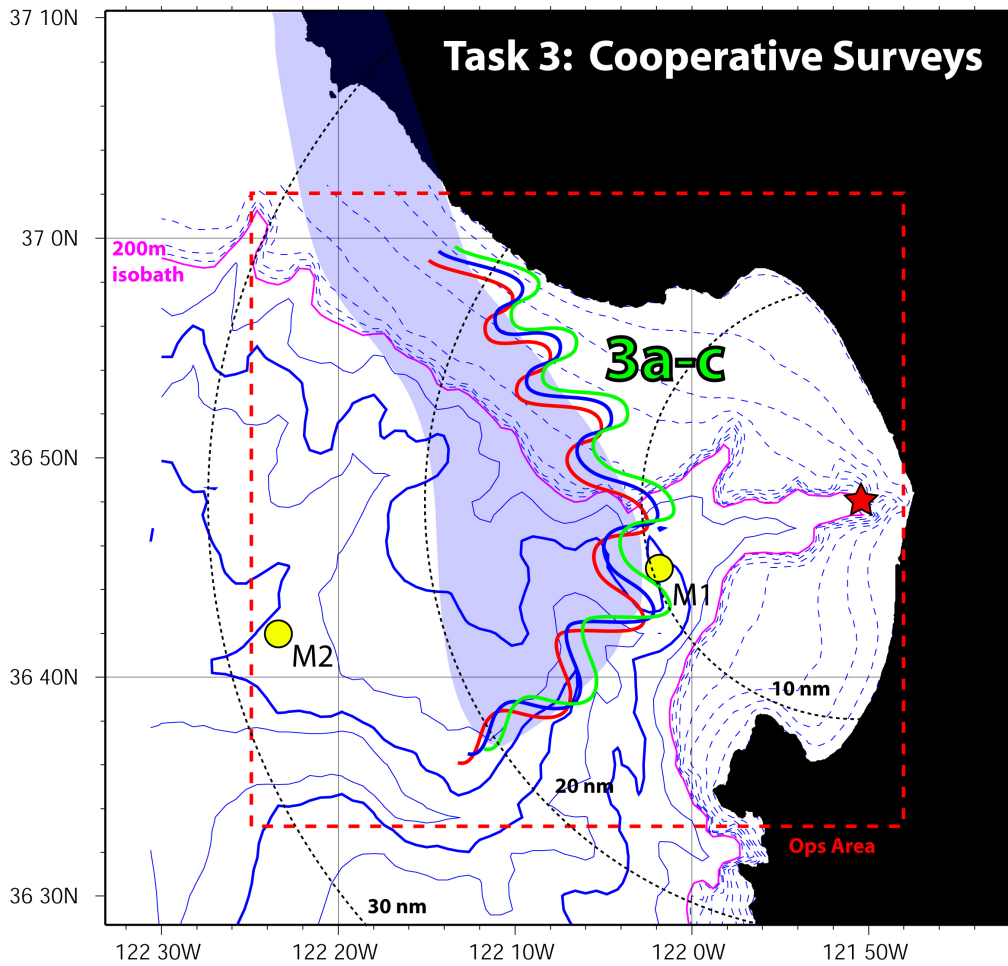
particular task. The ten primary vehicles are intended to be fully interchangeable. Hence any number of vehicles may be simultaneously re-tasked to respond to new observational opportunities. Four vehicles will operate on pre-programmed survey patterns while six are adaptively repositioned on varying timescales. A summary of the tasks required are illustrated below. In each figure the locations of M1, M2, and a schematized upwelling plume (blue region) are shown. The red star depicts a likely deployment/recovery location.



Task 1: Observe temperature, salinity, chlorophyll fluorescence, and PAR in Monterey Bay and the immediate offshore environment. Sample with a horizontal resolution of about 5 nm (9 km) in the alongshore direction and 200-800 m resolution in the cross-shore / cross-front direction. At all times during the experiment a group of vehicles will occupy these survey patterns. No adaptation, other than perhaps a wholesale shift or reorientation of the proposed sections, is anticipated during the course of the experiment. Reoccupation times for these sections range from 2-4 days.



Task 2: Observe the detailed physical and bio-optical structure of the upwelling plume, fronts, eddies, etc. The locations of detailed surveys and the specific survey pattern to be performed will be determined by the operations committee using guidance from all available models and observations. Survey patterns will be manually generated and/or chosen from a pre-determined menu. It is anticipated that a vehicle operating under this task may receive new instructions every 24-72 hours. In this cartoon, two vehicles are performing detailed surveys of the upwelling plume and the inshore upwelling front while a third is surveying a (totally contrived) eddy. Reoccupation times for these intensive surveys will vary depending on configuration but will generally be O(2 days).



Task 3: Observe the upwelling plume and associated fronts using cooperative multi-vehicle behaviors. The location and scientific objective of such surveys will be determined by the operations committee as in Task 2, above. Detailed vehicle trajectories will be automatically generated by a computer program incorporating observed and simulated environmental fields. It is anticipated that a vehicle operating under this task will receive new directions every 2-3 hours. In this cartoon three vehicles are mapping a front located along the inshore edge of the upwelling plume by alternately climbing and descending a near-surface temperature gradient.

Availability of Data and Fleet Status Information

A fleet status report consisting of the last known position and anticipated remaining endurance of each vehicle will be published to both a web page and an ftp site every 5 minutes. All fleet status reports will be archived on the ftp site. Scientific data collected by the gliders will be processed, quality-controlled, and made available via ftp approximately 15 minutes after transmission of data concludes. The real-time QC processing includes range, spike, and gradient checks on all profile data.