Cruise Plan

R/V MELVILLE, Cruise MV1405
CCE-P1408, CCE Process Cruise #6

Depart: 1 August 2014
Return: 30 August 2014, mid-cruise port stop is unlikely

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Operating Area:
Southern California, Offshore of Pt. Conception
33-35°N, 120-123°W (exclusive of land masses)
Depth Range: 0-1000 m

Funding: NSF 1026607, California Current Ecosystem LTER Program
(Mark D. Ohman, P.I.)

SCIENTIFIC OBJECTIVES

The general objectives of the CCE LTER Program are to understand the coupling of physical, chemical and biological dynamics in the California Current ecosystem and, ultimately, the system responses to long-term climate variability. On this cruise, we will investigate the effects of physical frontal systems off of Point Conception on nutrient fluxes, food-web structure (bacteria to fish), production, predator-prey interactions, and carbon export from the euphotic zone.

GENERAL OVERVIEW OF THE SCIENCE PLAN

The science plan will involve three major components. 1) Seasoar surveys will be done to assess broad-scale hydrography and circulation characteristics of the study area. 2) Detailed experimental studies will be done between these surveys to characterize chemical and biological concentrations and rate relationships at comparative sites/stations in the front axis and in water masses to the east and west of the front. 3) Periodic rapid sampling transects will be conducted through the front to get detailed, semi-synoptic sections of physical, chemical and biological parameter fields.

Survey mapping with Seasoar will be conducted in a radiator pattern 4-5 day runs on 2 occasions – beginning and end of the cruise. We will use faired cable to reach depths of ~300 m, and will aim for 10-12 east-west crossings of the California Current system at approximately 10-km spacing.

Experimental studies of 2-3 days duration will be Lagrangian style, following a mixed-layer drogued, satellite-tracked drifter. Initial and daily CTD sampling at

approximately 0200 will be conducted at the drifter position to assess daily changes in water mass characteristics. The same water collection will also used for experimental incubations on the drift array (i.e., daily predawn recovery and redeployment of the drift array). A second drifter will also be deployed with attached sediment traps to measure particle fluxes over the 2-3 day experiments (initial deployment and final recovery only). Using the drift array as a moving frame of reference, additional CTD sampling will be conducted at mid-day for bio-optical studies and shipboard assessments of primary production, and typically in the evening for additional shipboard experimental studies. We will also have a full round-the-clock schedule of other sampling activities including:

a) Net sampling of zooplankon and mesopelagic fish with various net systems;

b) Wire deployment of various pumps and profiling systems for sampling suspended particles and video observations of aggregates and organisms

c) Sampling for iron (Fe) analyses and experiments (trace metal rosette).

Rapid sampling transects across the front will be done on 2-3 occasions, with the aim of completing a full transect of stations in 24-36 h, with concentrated sampling in the main frontal gradient mainly during one night (~20:30 - 05:00). The main sampling will be done by shallow CTD, vertical net tows and likely the trace metal rosette. We anticipate some pump sampling at select stations as well.

FACILITIES REQUESTED

Systems and Equipment:

CTD Rosette with 24 10-L Niskins, with transmissometer, fluorometer, PAR, and oxygen sensors, plus additional port for ISUS nitrate sensor, we may need pre-cruise technical help to assess compatibility of connectors and data streams, including attachment/integration of UVP (Underwater Video Profiler). Benthos altimeter would also be desirable for shallow water stations.

Data Acquisition System with standard IMET (including PAR) measurements

ADCP System with real time data processing and vector averaging

MOCNESS sampling system, 1 m^2, with black, 202-µm nets and 202-µm cod ends; fully configured system with CTD, dissolved oxygen, Chl*a* fluorescence, and beam transmission with spare (back-up) main controller and options module. We have also requested dedicated Tech support for this system.

Radio-isotope van with working fume hood, with storage space for isotope waste (or separate van for waste). Radio-isotope use will be coordinated by Ralf Goericke.

HighSeas Net with high-speed web accessibility, satellite tracking of drifter positions will be a major ongoing activity

"Clean" van for iron sampling (K. Barbeau) - Barbeau plans to borrow a TM van from Jim Moffett at USC. This is the same van that was on the Melville during cruise (MV1107).

Milli-Q (or equivalent DI) water system

Uncontaminated seawater lines: one or more flow-through systems

Fume hood (essential to have the hood in the analytical lab functional).

Scientific freezers: -20 (at least one) and -70/-80°C (two)

Refrigerators: at least one for "live" reagents, one for preservatives

Over-the-side operations:

1) **SeaSoar** – ~9-10 cruise days will be devoted to underway SeaSoar surveys (runs of 4-5 days each). This will utilize a dedicated winch with faired cable and will run through the stern A-frame.
2) **CTD/rosette casts** – stbrd A-frame. The **Underwater Video Profiler (UVP)**, a self-contained, battery operated video system, will be attached to the rosette frame and used on CTD hydrocasts (as on previous MV1107 cruise, July 2011).
3) **Trace metal sampling** - rosette with 1500 m of ¼' new coated wire rope. K. Barbeau will provide a large counterweighted non-metalic block. Possibilities of using a portable winch for this are being discussed.
4) **Deployment and recovery of drift arrays for in situ experiments** – Each operation will be done during predawn hours about 9-12 times during the cruise. For back-to-back operations, the array is grabbed with a boat hook, hand recovered and laid out (~70-m of wire and floats) on deck. Attachment bags are then switched and the array is redeployed by hand. Retrieval/deployment on stbrd side forward of the CTD.
5) **Deployment and recovery of sediment traps** (approx 3-4 times per cruise, ~3-day deployments) is a stern A-frame operation, using capstan (rope line). Needs a block on the A-frame and a removable, deck-attached block for the operation.
6) **Bongo and ring-net tows** (2 to several times daily) – these should be run off of stbrd hydrowire
7) **MOCNESS net tows** – this will need to occupy one of the ship's winches with E-M cable and will likely need a dedicated block on the starboard boom. This system will be used approximately twice daily when SeaSoar is not in the water.
8) **Oozeki midwater trawl** – this is a large net (6 m^2) with a multiple open-closing cod end that does not require a conducting cable (stern A-frame). It will be used for occasional long tows (2-3 h) approx 24 times during the cruise.
9) **Pump sampling** (every 1-2 days) – self-contained, battery powered McLane pumps, stbrd hydrowire. Additional over-the-side pump sampling (bringing water from depth to deck) is being discussed.
10) **Moving Vessel Profiler** – has it's own winch. The optimal place to put this (deck mounting) will be on the aft port side, so as not to interfere with trace metal sampling and array operations. We have 250 ft of cable that can make it to the CTD area of the main lab for a monitor and control station. A video monitor needs

to be trained on the MVP winch. This equipment also will need access to serial output of NMEA string (position, bottom depth, ship speed) transmitted once per second. On deck requires a connection to 440 volt, 3 phase, 50 amp circuit.

11) **Multi-frequency acoustics** – Simrad EK60 transducers & transceivers with four frequencies (38, 70, 120 & 200 kHz). We will use Tony Koslow's pole-mounted transducers attachment forward on the port side aft, as on previous CCE cruise MV1107.

Additional **operations/requests**:

1) We would like to request 3 benches set-up in the aft hangar with a drainage sink if possible for processing of MOCNESS & net samples.
2) Several experimental incubators will also have to go on the fantail.