DRIFTER DATA SET FROM THE SANTA BARBARA CHANNEL–SANTA MARIA BASIN COASTAL CIRCULATION STUDY

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ABSTRACT

The drifter data from the Santa Barbara Channel - Santa Maria Basin Coastal Circulation Study (SBC-SMB CCS) is accessible via the Internet on the Center for Coastal Studies web and gopher sites. The drifter section of the web site also contains information on the instrumentation used, deployment dates, processing methods, and analysis. Users can map drifter track trajectories interactively using a web browser. Information on data set availability and format, and instructions for access are presented. Future plans for the web site interface are also discussed.

Keywords: Drifters, Santa Barbara Channel, Santa Maria Basin, circulation, currents, temperature, instrumentation.

INTRODUCTION

In this paper, drifter data collected since 1992 as part of the SBC-SMB CCS sponsored by the Minerals Management Service (MMS) are presented. The collection, processing, and archiving methods are explained, and access to the data sets is discussed.

Regional Coverage

Drifter deployments are primarily made within the Santa Barbara Channel (SBC) and Santa Maria Basin (SMB). There are 24 permanent sites used for drifter releases (Figure 1). In the early stages of this project (through 1995) only the 12 sites (red dots) in the SBC were used. Twelve additional sites (blue dots) in the SMB were added in 1996. The SBC-SMB CCS also includes a large component of moored instrumentation. Most of the drifter deployment sites coincide with current or historical mooring sites. Additionally, a few drifter pairs have been deployed during oil spill events to aid spill containment efforts.

DRIFTER INSTRUMENTATION

Overview

Drifter data have been collected in the SBC as part of this study since April of 1992, and in the SMB since 1996. A group of drifters is deployed every few months. The time it takes to release all the drifters in a group over the study area ranges from a few hours to just over a day depending on the means of deployment. The electronics package used in the drifters is programmed to transmit data for 40 days. A complete list of the deployments to date is listed in Table 1.

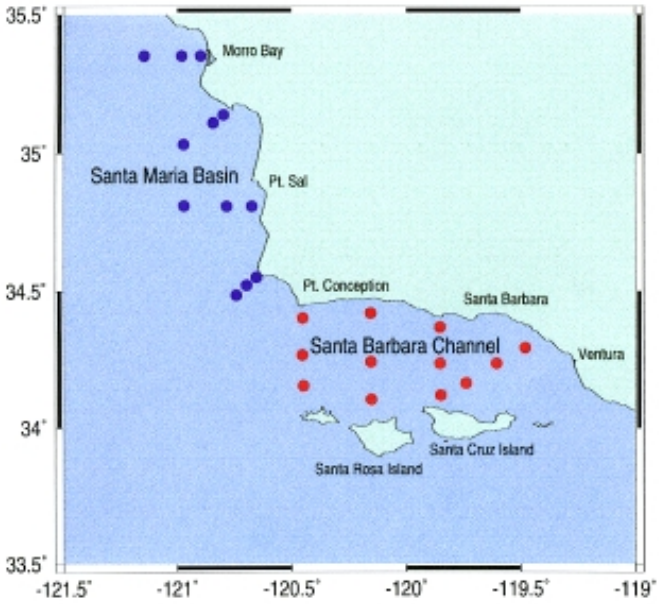

Figure 1. Map of the drifter deployment sites. Locations noted in red have been used since 1992, those in blue since 1996.

Instrumentation

The drifters used in this study are similar to those used by Davis (1985). The electronics and battery are housed in a submerged vertical tube approximately 1 m in length (Figure 2). An antenna protrudes from the top of the tube and extends upward through the surface of the water. A temperature sensor is installed in the top of the tube adjacent to the antenna. Four cloth vanes of total area 1.8 m^2 are supported on rods that extend radially from the top and bottom of the tube. Four floatation elements are attached at the end of each rod by short lengths of nylon line. During deployment the top of the vertical tube is suspended 30 cm below the surface of the water. The drifter rod and vane assemblies can be collapsed for air deployment, although, the most common method of deployment has been from boats.

Table 1. Drifter deployment dates.

Deployment Number	Date	Release Numbers
2	May-93	34-48
3	Jul-93	49-64
4	Oct-93	65-76
5	Dec-93	77-92
6	Feb-94	93-104
7	Apr-94	105-116
8	Jun-94	119-131
9	Sep-94	132-148
10	Nov-94	149-161
11	Jan-95	162-180
12	Mar-95	181-193
13	May-95	194-205
14	Jul-95	206-217
15	Aug-95	218-240
16	Oct-95	241-252
17	Jan-96	253-273
18	May-96	274-295
19	Aug-96	296-319
20	Sep-96	320-340
21	Dec-96	341-364
22	Mar-97	365-392
23	Jul-97	395-420
24	Nov-97	421-444
25	Apr-98	445-459
26	Jul-98	460-484
27	Oct-98	485-506

The electronics consist of a controller with temperature circuit and transmitter. The drifter measures hourly averages of the sea surface temperature (SST) using a one-minute sample rate. Temperature samples have an accuracy of 0.01°C. Twelve hourly averages of SST are included in the data stream transmitted by the drifter. The transmitter in the drifter interfaces with ARGOS, a satellite-based location and data collection system. ARGOS satellites locate the drifters several times each day to within 150 to 1000 m, and collect drifter data. The drifters are programmed to operate for 40 days after deployment.

Most of the deployments have been from small boats. In particular, the vessels and personnel of the University of California, Santa Barbara Marine Sciences Department have been instrumental to the success of the drifter program. A few of the deployments have been made from the R/V *Sproul* during mooring recovery and deployment cruises. Some of the more recent deployments have been from the air by helicopter.

Data Processing

Raw position and temperature data are collected using ARGOS. The raw data are processed in a series of steps that results in two time series: position and temperature.

Position data files are created from locations as determined by ARGOS. The position data is not sampled at regular intervals in time due the orbit paths of the satellites. Satellites measure the Doppler shift in frequency of drifter transmissions as the satellites pass overhead. The Doppler shift

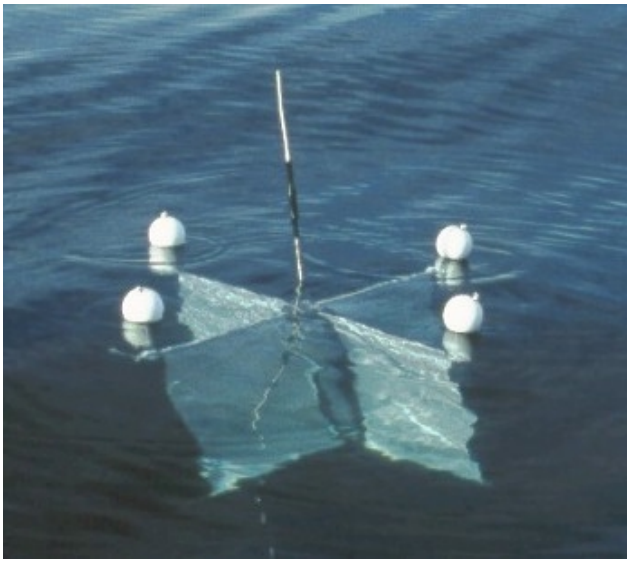

Figure 2. Photograph of a drifter in the water.

and a few other parameters are then used to determine the drifter location and assign an accuracy class to the position. Position data accuracy is classified by ARGOS in one of three categories: class 1 (350 to 1000 m), class 2 (150 to 350 m), and class 3 (±150 m). During processing, the drifter position data files are checked for the beaching of the drifter or removal of the drifter from the water; the data time series is truncated should one of these events occur.

Temperature data processing results in a time series of hourly averages of SST in °C. All drifter temperature circuits are calibrated prior to deployment. The calibration coefficients are applied to the data after transmission through ARGOS.

ANALYSIS

The SBC-SMB CCS is a multi-year program sponsored by the MMS to describe the flow, provide inputs to aid in the development of numerical models, and create general summaries of the flow for oil spill analysis. The drifters supplement the eulerian observations acquired from the moored array with a langragian component and provide insights into the near-surface circulation in the SBC and SMB. Several papers have been written with the drifter data.

Dever et al. (1998) provides a statistical analysis of the drifter data including comparisons to near-surface current meter data. Winant et al. (1998) develops synoptic descriptions of the SBC circulation. Dever et al. (1999) focuses on circulation around the Point Conception area.

Since the drifter data has been made available over the Internet, other scientists outside the SBC-SMB CCS program are using it in their research. Hobday (1998a, b) used the data to describe faunal patterns and dispersal on kelp rafts in southern California. Schroeder of the Marine Science Institute at the University of California Santa Barbara is using the data to correlate rockfish recruitment to kelp beds with various mesoscale oceanographic features.

INTERNET DATA ACCESS

The drifter data set is available via the Internet and can be accessed using a web browser or a Gopher client. A web browser is a software application such as Lynx, Microsoft Internet Explorer, Mosaic, or Netscape Navigator that is used to locate and display web pages. The URL for web browser access is:

www-ccs.ucsd.edu/research/sbcsmb/drifters

In addition to the data, the drifter web site provides information about the instrumentation used, deployment dates, processing methods, and analysis. It also has an interactive section that enables the user to create a map of drifter trajectories from any deployment.

Another method for accessing the data is via a Gopher client. Gopher is a document retrieval system developed by the University of Minnesota that pre-dates the World Wide Web. Gopher clients can access the data using the following address:

gopher-ccs.ucsd.edu/11/zoo/lbight/drifters

The gopher site only provides access to the processed data.

The drifter data from this project are archived in an ASCII format called CSA. This is a columnar format, with five lines of header information (Figure 3). In the near future all the data will be converted to netCDF, a binary format. Only drifter position data files are available at this time. Temperature time-series data files should be on-line sometime in the coming months.

```
start_time     npts   depth   release#
yymmddhhmmss   #_pts  meters
950824193800   3      1       227
time           latitude   longitude   location
yymmddhhmmss   deg        deg         quality
950824193800  34.100 -120.148   3
950825011854  34.098 -120.112   1
950825165851  34.071 -119.923   1
```

Figure 3. Sample of CSA-format file. This is the standard archive format for all drifter position data files.

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