SeaSoar Data

Introduction

SeaSoar profiling was attempted on two SES cruises, Challenger CH125A and CH125B. In both cases, the success was limited by the problems of operating an undulator in an area of complex topography. In the case of CH125B, no usable data were returned before the instrument was put out of action by a collision with the seafloor.

On CH123A, three sections that were mainly parallel to the shelf break were completed before the work was curtailed by a collision with the seafloor. These data are presented here.

The data are 1 Hz time series in ASCII files containing one section each. The files are located in the SEASOAR directory on the CD-ROM and have the following filenames.

B0507587.LST	Section SST1	Run parallel to 1000m contour and back along the 500m contour.
B0507599.LST	Section SST2	Run parallel to the 170m contour.
B0507606.LST	Section SST3	Run from 1600m onto the shelf.

The data are in simple ASCII format, termed BODC Request Format Version 1.0. This format will be familiar to users who have received data from the BODC National Oceanographic Database.

Instrument Description

The SeaSoar is a hydrodynamic fish towed behind the ship travelling at 8-9 knots linked by a faired cable. The usual cable length is 800m, which allows the fish to oscillate between the surface and a depth of 500m.

The unit has two stub wings whose angle of attack may be set by hydraulic servo motors. Thus the fish is able to climb or dive under the control of command signals from the ship or, more usually, by automatic command signals driven by the on-board pressure sensor. The wavelength and amplitude of the locus of the fish through the water depend upon the cable length, the ship's speed and the angle of attack selected for the wings.

The fish can carry a range of sensors. Invariably, a CTD is fitted but fluorometers, transmissometers, light sensors and plankton counters may also be included.

The instrument was developed by the Institute of Oceanographic Sciences, Wormley (now Southampton Oceanographic Centre) and was subsequently made available commercially.

SeaSoar Data Processing for RRS Challenger Cruise CH123A

The SeaSoar for this cruise was fitted with a Neil Brown MkIIIB CTD and a Chelsea Instruments Aquatracka fluorometer. Although the CTD unit included a Beckmann dissolved oxygen sensor the data have not been included in the final data set as no calibration samples were taken.

The data were logged by a Research Vessel Services Level 'A' microcomputer that dynamically reduced the sampling frequency to 1Hz and applied a time stamp from the ship's master clock. The reduced data were logged on the Level 'C' (a Sun workstation) via the Level 'B' disk buffer. Initial calibrations were applied to convert the raw counts into engineering units.

Further processing of the data was undertaken at BODC. Pressure was calibrated by considering the mean pressure logged in air (detected by salinity values <1 PSU). The following corrections were applied:

Series BSR507587 (SST1)	1.9 decibars
Series BSR507599 (SST2)	2.4 decibars
Series BSR507606 (SST3)	2.1 decibars

Temperature was checked by comparing SeaSoar data from the depth range 3-6 decibars with calibrated, contemporaneous thermosalinograph data. There was no significant difference between the two data sets and consequently the SeaSoar temperature data were left unchanged.

Salinity was calibrated using three water samples collected from the ship's non-toxic seawater supply to coincide with the fish reaching the surface. The samples were analysed on a Guildline Autosal bench salinometer calibrated against OSI standard seawater. A correction of +0.015 PSU was applied to the data. The calibrated SeaSoar data from the depth range of 3-6 decibars was compared with calibrated, contemporaneous thermosalinograph data to check for instrument drift. No significant drift was detected.

The underway fluorometer malfunctioned on this cruise. Consequently, the only calibration data that were available were four fluorometric extracted chlorophyll values taken from the non-toxic seawater supply. These were sampled over a voltage range from 1.26 to 1.35 volts whereas the good SeaSoar fluorometer data spanned the range 0.23 to 1.81 volts. Using the four calibration points available gave a very unusual calibration with a slope over 11 (1-3 is what one would expect). When applied to the SeaSoar data this gave the totally ridiculous answer of 63 mg/m^3 for the maximum SeaSoar chlorophyll.

To overcome this problem, an extra 'calibration' data point was added. This was based on the assumption that the highest extracted chlorophyll value from the entire cruise was responsible for the highest SeaSoar fluorometer voltage. This assumption may be defended for a cruise working in a limited geographic area (the SES box) at a time of relatively low biological activity (November).

This produced a modified calibration of:

$Chl = \exp(V*2.18 - 4.53)$ (R^2=68%, n=5)

Adopting this calibration reduced the maximum chlorophyll measured by SeaSoar to 0.55 mg/m^3. The calibration has been applied to the data. Note that this 'calibration' will cause the SeaSoar to underestimate chlorophyll if the assumption used to derive the extra calibration point is invalid.

Navigation was added to the calibrated SeaSoar data by matching on time. Both data sets were logged using a common clock. Consequently, timing errors were not a problem. The navigation data were logged with a sampling interval of 30 seconds. Consequently, only one SeaSoar data point in thirty could be matched to a position. The remaining positions were determined by linear interpolation.

The calibrated data were screened using the BODC SERPLO interactive graphical editor. All suspect data were flagged by setting the quality control byte to 'M'. The limits of the individual profiles contained in the data set were marked by setting the pressure channel flag to 'B' and 'E' to signify 'beginning' and 'end' respectively.

The data series were 'topped and tailed' to eliminate corrupt data collected during deployment and recovery of the fish.

BODC Request Format
Version 1.0

This is a generalised output format to handle most types of data held in the BODC National Oceanographic Database.

The following is an example of a file listed in the format:

```
BODC Request Format Std. V1.0           Headers=  15 Data Cycles=   1247 BODC QC (a)
Series:   12050 Inv: CMD  1008           Produced:1993/07/07                     (b)
Id:   048/0           United Kingdom    Scottish Office Agric. & Fisheries Dept. (c)
 57d18.1mN001d54.6mW                     Start:19700831095800 End:19701022075800 (d)
Depth: floor  22.0  sensor  18.0         Nom. sample int.:   3600        secs    (e)
    2 Parameters included:                                                      (f)
Parameter  f  P  Q     Absent Data Value  Minimum Value  Maximum Value     Units
LCDAEL01   Y 30 37                 -1.00           0.00         359.70     deg T (g)
Horizontal Current Direction             Eulerian method
LCSAEL01   Y 40 47                 -1.00           0.14          72.07    cm/sec
Horizontal Current Speed                 Eulerian method
    1 FORTRAN format record:                                                    (h)
(I7,A20,A1,1X,F8.2,A1,1X,F8.2,A1)
  Cycle    Date      Time    LCDAEL01  LCSAEL01                                 (i)
 Number yyyy mm dd hh mi ssf         f         f
      1 1970/08/31 09.58.00    228.26     18.63                                (j)
      2 1970/08/31 10.58.00    209.69     36.14
      3 1970/08/31 11.58.00    206.74     44.23
      4 1970/08/31 12.58.00    204.33     40.06
      5 1970/08/31 13.58.00    207.48     27.95
```

Notes:

(a) The first record contains general information regarding the file. Std. indicates Standard format and V1.0 indicates version 1.0 of the format. Headers and Data Cycles are counts of the number of header records and data cycles in the file. BODC QC indicates that the data has been through BODC quality control procedures; this field is blank if this is not the case.

(b) Record two indicates the BODC series reference number and any inventory reference numbers by which the series is also known (in this case the inventory is the Moored Time Series Inventory that was originally known as the Current Meter Inventory: hence the mnemonic). A reference to a second inventory may occur on this line. If a series has not yet been allocated a BODC reference number this record will start with 'File:' followed by the full BODC file name. This record also indicates the date on which the output was produced (yyyy/mm/dd).

(c) Record three gives the data originator's identifier for the series, the source country and the source laboratory. If this information is not available the record will state 'Series header information not available' and the next two records will be blank.

(d) This record specifies one or two geographic positions; if a second position is given its purpose will be described in the accompanying documentation. Start date and end

date (if available) are given in the format yyyymmddhhmiss (24 hour clock and GMT). If time is unavailable hhmiss will be blank.

(e) This record gives the sea floor depth and the sensor depth. If a second (greater) sensor depth is given the two sensor depths specify the range of depths over which measurements were made. The second half of this record gives the nominal sampling interval and units.

(f) This record and the following title record start the parameter section. There are two records per parameter present.

(g) The parameter information record gives the BODC parameter name, whether the channel has been flagged with quality control indicators (Y/N), byte pointers (P and Q) to the start and end of the parameter within each datacycle record, the absent data value, minimum and maximum values of the parameter within the series and parameter storage units. The next record gives the full parameter name and the sampling method.

(h) This line indicates the number of following records which together form the FORTRAN format used to write each data cycle record.

(i) This and the next record are the data cycle title lines. 'f' indicates a flag channel.

(j) Data cycles are listed one per line. The first seven characters are always a data cycle count. One of the following quality control flags may appear against an individual data value (if the remark 'BODC QC' is present in record 1, then a blank flag indicates that the value is good):

Flag	Description
	Unqualified
<	Below detection limit
>	In excess of quoted value
B	Beginning of CTD cast or SeaSoar segment
D	Thermometric depth
E	End of CTD cast or SeaSoar segment
K	Uncertain/suspect value
L	Improbable value - originator's quality control
M	Improbable value - BODC quality control
N	Null value
P	Trace/calm
Q	Indeterminate
R	Replacement value
S	Estimated value
T	Interpolated value
W	Control value
X	Excessive difference