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## Introduction:

The BEST (Benguela Source and Transport) project was designed to investigate the transport of the Benguela Current and the ratio of the Agulhas Current and South Atlantic source water masses. The transport of the Benguela Current and its variability is measured using a moored array of instruments, analysis of the TOPEX/POSEIDON satellite altimeter data, and CTD density observations. The source of the water is determined by analysis of the water mass properties measured with a CTD.

To accomplish the BEST objectives, an extensive field program was carried out between June 1992 and November 1993. The field work consisted of three hydrographic surveys, and a moored array of inverted echo sounders (IES), inverted echo sounders with pressure gauges (PIES) and current meter moorings (CMM). The array was deployed in June 1992. During October and November 1993, 4 PIES and 4 current meter moorings (CMM) were recovered. See Garzoli et al. (1995c) and Pillsbury et al. (1995) for details of the IES and current meter programs. A more detailed description of the BEST program can be found in Garzoli et al. (1995a).

This report presents CTD and hydrographic data from the second hydrographic survey aboard RRS DISCOVERY, Voyage 202 (Cape Town to Cape Town, 7 May to 3 June 1993. A. L. Gordon, Chief Scientist). This cruise is the primary CTD component of the BEST project. There were two basic objectives of the hydrographic work. One, obtain CTD stations above the BEST moorings. These CTD stations provide a "snap-shot" view of the thermohaline and oxygen stratification to help interpret the moored array time series data. Two, gather hydrographic and dynamic data, and survey Agulhas eddies.

## Data Collection and Processing:

Three instruments were used for data collection. A Sea-Bird Electronics Seacat 19-02, which will be referred to as SBE, and two Neil Brown Mark III instruments which will be referred to as 2052 and 2809. Table 1.1 shows which instruments were used for each station.

The instrument 2809 pressure sensor was calibrated in March 1993. The temperature sensor was calibrated in March 1993 and in November 1993. A temperature calibration value was calculated for each station by interpolating between the two calibrations. Instrument 2052 was calibrated in March 1993.

Instrument 2052 failed, so instrument 2809 was used for the majority of the cruise. The data collected with each instrument were calibrated independently. A pressure bias for 2809 was based on the pressure when the instrument entered the water. The calculated bias, 1.1 dbar, was added to the raw CTD pressure.

The conductivity was lagged to account for the time constant mismatch using a phase-lagging filter:

$$Coi = (1.0 - e(-1/i))COi + e(-1/i)COi-1$$

TABLE 1.1:

| SBE, | 2052, | 2809 |
|---|---|---|
| 001, | _ , | - |

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002,   _ ,   -
003,  003,   -
 - ,  004,   -
005,  005,   -
006,  006,   -
 - ,  007,   -
 - ,  008,   -
 - ,  009,   -
 - ,  010,   -
 - ,  011,   -
 - ,  012,   -
 - ,  013,   -
 - ,  014,   -
 - ,  015,   -
016,   _ ,   -
017,  017,   -
018,   - ,   -
019,   - ,   -
020,   - ,  020
021,   - ,  021
022,   - ,  022
023,   - ,  023
024,   - ,  024
 - ,   - ,  025 to 074
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A second order fit of the Delta Conductivity (DC)* versus Conductivity (CO) was used to correct the data. This was done using three sets of stations [21 - 29], [30 - 40], [41 - 72]. The station sets were chosen to minimize temporal effects.

[* DC = CTD data - bottle data conductivity. The conductivity bottle data measurements were made using a guildline 8400A and ISO standard water from Ocean Scientific: batch number P120.]

After the resulting calibration coefficients were applied to the station sets, a bias was calculated for each station and applied to the raw CTD conductivity data. The CTD data within the bottle files was corrected and a new DC was calculated.

A second order fit of the bias corrected DC versus the bias corrected CO was obtained for stations [20-74]. The resulting coefficients were then applied to the data. Finally, a first order pressure component of conductivity was corrected for using a first order calibration fit of DC versus pressure. Figure 1.1 (Not included) is a histogram of the final CTD conductivity and rosette conductivity differences.

The data for stations 01-19, instrument 2052, were calibrated using the same methods as outlined above. The SBE data was then calibrated using the calibrated data from 2809. The calibrated SBE data was then compared to the calibrated data of the 2052 instrument. This was done to confirm the accuracy of instrument 2052 calibration. The difference between the SBE and 2052 is within the error of the instruments.

The oxygen data were calibrated after all other calibrations were applied. This was done implementing the methods outlined by Millard (1991).

Personnel involved in the collection of these data were:

| | | |
|---|---|---|
| Arnold L. Gordon | Principle Investigator | LDEO |
| Bruce Huber | Snr. Research Associate | LDEO |
| Philip Mele | Research Associate | LDEO |

| | | |
|---|---|---|
| Marcela Stern | Electronic Technician | LDEO |
| Stewart Sutherland | Staff Scientist | LDEO |
| Anthony Martino | Research Assistant | LDEO |
| Deirdre Byrne | Graduate Research Assistant | LDEO |
| Paul Marchese | Graduate Research Assistant | LDEO |
| Steve Rock | Graduate Research Assistant | LDEO |
| Chris Duncombe Rae | Graduate Research Assistant | UCT;SFRI |
| Christine Illert | Technician | SFRI |
| Andrew N. Cormack | Computer Technician | NERC/RVS |
| Jeff L. Jones | Mechanic Technician | NERC/RVS |
| Richard A. Phipps | Mechanic Technician | NERC/RVS |
| Chris Rymer | Mechanic Technician | NERC/RVS |
| C. W. Woodley | Electronics Technician | NERC/RVS |

LDEO - Lamont-Doherty Earth Observatory of Columbia University
UCT - University of Cape Town
SFRI - Sea Fisheries Research Institute, Cape Town
NERC/RVS NERC Research Vessel Services

Acknowledgments:

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These data have been submitted to National Oceanographic data Center (NODC). There are also plans to make the data available via the Lamont-Doherty Earth Observatory Physical Oceanography Website. The LDEO URL is: http://www.ldgo.columbia.edu.

References and related publications of interest:

Clement, A. and A. L. Gordon, 1995, Velocity structure of the Benguela current. J. Geophys. Res. 100(C11):22,591-22,602

Smythe-Wright, D., A. L. Gordon, and P. Chapman, 1996, CFC-113 shows Brazil eddy crossing the South Atlantic to the Agulhas Retroflection region J. Geophys. Res. 101(C1):885-896.

Kamenkovich, V. L. et al., 1995, On the influence of bottom topography on the Agulhas Eddy. J. Geophys. Res. (submitted)

Garzoli, S. and A. L. Gordon, 1996, Origins and variability of the Benguela current. J. Geophys. Res. 101(C1):897-906

Duncombe Rae, et al., 1995, The eddy field of the south-east Atlantic ocean: a statistical census from the BEST project. J. Geophys. Res. (submitted)

Garzoli, S., et al., 1995a, Initial results from BEST cruises. WOCE Notes, vol. 6 No. 1, 10-11

Garzoli, S., et al, 1995b, Benguela Current sources and transports, 1995, WOCE Report July 1995.

Garzoli, et al., 1995c, BEST data report: IES/PIES/XBT data. LDEO Technical Report LDEO-94-1.

Millard, R. C., 1991. CTD Oxygen Calibration Procedure. WHP

Operations and Methods, July 1991

Pillsbury, D. et al., 1995, Benguela Sources and Transport Project (BEST): Current measurements off the coast of South Africa. Data Report 157 reference 94-3 College of Oceanic and Atmospheric Science, Oregon State University.

Report Format:

Header record:

SHIP NODC Country/Ship code (74DS)
CRUISE Originator's cruise number (202)
STA Originator's station number
CAST Originator's cast number
LAT latitude in decimal degrees (minus = south)
LONG longitude in decimal degrees (minus = west)
DATE date reported as Year (YY), Month (MM) and Day (DD) GMT
YDAY year day GMT
TIME time reported as hour (HH), minute (MM) GMT
DEPTH corrected depth to bottom (meters)

Data record:

PRESS CTD Pressure (dbar)
CTDTEMP CTD Temperature (Celcius, IPTS-68)
CTDSAL CTD Salinity (pss78)
BOT Bottle Number
BOTSAL Rosette Bottle Salinity (pss-78)
BOT_O2 Rosette Bottle Oxygen (ml/l