

## CTD data series for cruise Pelagia PE136 (29 March to 9 April 1999)

### Cruise Principal Scientist and Data Originator

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### Content of data series

Parameter	Unit	Parameter code	Number of casts	Comments
Pressure	db	PRESPR01	130	none
Temperature (ITS-90)	deg. C	TEMPST01	130	caution (see text)
Potential Temperature	deg. C	POTMVC01	130	caution (see text)
Salinity	PSU-78	PSALST01	130	caution (see text)
Sigma-theta	kg m <sup>-3</sup>	SIGTPR01	130	caution (see text)
Chlorophyll a	µg l <sup>-1</sup>	CPHLPR01	130	calibrated from fluorescence
Optical attenuation	m <sup>-1</sup>	ATTNMR01	130	caution (see text)
Total suspended sediment	mg l <sup>-1</sup>	TSEDTR01	130	calibrated from attenuation
Downwelling irradiance	µE m <sup>-2</sup> s <sup>-1</sup>	IRRDUV01	130	none

### Instrumentation and data processing by originator

#### **CTD unit and auxiliary sensors:**

Sea-Bird Electronics 911 Plus system fitted with the following additional sensors: 25 cm pathlength transmissometer (SeaTech SN160), Aquatracka III fluorometer (Chelsea Instrument SN028) and PAR sensor (K-meter SN4410) for downwelling irradiance.

Changes of sensors during the cruise:

Casts	Pressure sensor	Conductivity sensor	Temperature sensor
CTD001-061	SN43517	SN1204	SN1219
CTD063-095	SN43517	SN995	SN1197
CTD096-133	SN50461	SN1204	SN1219

Data were logged on a PC running Seabird Seasave data acquisition software v. 4.224 and manufacturer's calibration coefficients were applied to the raw data.

Data were supplied to BODC as individual Seabird ASCII files for each CTD cast with downcast and upcast in separate files. The profiles were binned to 0.5 db. Bottle files created by the Seabird software for each CTD-rosette sampling cast were also provided.

#### **Sampling device:**

Rosette sampling system equipped with 24 x 12L NOEX sampling bottles. The pressure sensor was located close to the base of the bottles, at a distance of 1m from the top aperture of the bottles. The calculation of bottle sampling depth by BODC takes into account the geometry of the CTD frame.

No reversible thermometer was used.

### BODC post-cruise processing and screening

#### **Reformatting:**

The data were converted into BODC internal format (PXF) to allow use of in-house software tools notably the workstation graphics editor SERPLO. In addition to reformatting, the transfer program applied a conversion to transmissometer readings from percent transmission to attenuation using the algorithm:

$$\text{attenuance (m}^{-1}\text{)} = -1/\text{PL} * \log_e (\% \text{ transmission}/100)$$

where PL is the transmissometer pathlength in m (0.25 m).

**Screening:**

Reformatted CTD data were transferred onto a high-speed graphics workstation. Downcast channels were screened graphically using custom in-house graphics editors. If present, spikes and suspicious values were manually flagged. No data values were edited or deleted; flagging was achieved by modification of the associated quality control flag to 'M' for suspicious values and 'N' for null.

**Banking:**

Once screened on the workstation, the CTD downcasts were loaded into a database under the ORACLE Relational Database Management System.

**Calibration:**

- Fluorescence: chlorophyll fluorescence ( $\mu\text{g Chl } a \text{ l}^{-1}$ ) was calibrated against extracted chlorophyll concentrations measured on samples collected during the cruise using the following equation determined by K. Wild-Allen (Napier University, Edinburgh, UK):

$$\text{Chl } a (\mu\text{g l}^{-1}) = 3.883 \text{ Fluor} + 5.795, \quad R^2=0.544, \quad n=105$$

The calibration was based on the chlorophyll concentration of samples filtered through GF/F filters, extracted in 90% acetone and determined by spectrophotometry using the trichromatic method. 'Fluor' is the chlorophyll concentration ( $\mu\text{g l}^{-1}$ ) from the CTD fluorometer output based on the manufacturer's calibration coefficients and measured at the time of the water sample collection (on the upcast).

Comparison of the chlorophyll concentration values from the CTD fluorometer in the upper 5 m with calibrated values from the underway fluorometer suggested that the CTD calibration overestimated the chlorophyll concentration in the surface layer. Based on average chlorophyll concentrations in upper 5 m from 16 CTD casts for which variability was small in the upper 5 m ( $\text{SD}<0.5 \mu\text{g l}^{-1}$ ) the difference between the two fluorometers averaged  $2.17 \pm 0.66 \mu\text{g l}^{-1}$  (median= $2.19 \mu\text{g l}^{-1}$ ).

- Total suspended particulate matter concentration (TSED) was estimated at the University of Wales, Bangor, by linear regression of the concentration of total suspended particulate matter as measured on water samples by gravimetry and attenuation (ATTN) as measured by the CTD transmissometer at the time of sample collection (on the upcast). The resulting calibration equation is:

$$\text{TSED (mg l}^{-1}\text{)} = (\text{ATTN} - 0.148) / 0.435, \quad R^2=0.734, \quad n=69$$

- Data from the other channels had already been calibrated by the data originator and no further calibration/correction was applied.

**Comments on data quality**

- Severe fouling of the tubing and electronic leads of the CTD unit resulted in its malfunctioning during the cruise. Although problems were noted early during the cruise, the cause of the malfunctioning was only discovered and solved more than half way through the cruise. Of all the channels, salinity appears to be the most affected. From casts 001 to 097, the upper 5 to 10 m of most salinity profiles had to be flagged as suspect. Salinity profiles from casts 013 to 017 were particularly bad and were almost entirely flagged as suspect. Judging the quality of the salinity data (and of the other parameter channels) is particularly difficult considering that a large amount of inherent hydrographic variability may be expected at this southern North Sea site. As a result flagging was kept to a minimum and users are advised to use data from casts 001 to 097 with caution. From casts 098 to 133, the CTD unit seems to have functioned well.

- Casts CTD062 and CTD083 were not loaded into Oracle (files contained less than 2 records).