

Continuous underway data series for cruise AMT12 (12th May – 17th June, 2003)

Chief Scientist

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Content of data series

Parameter	Column heading	Units	Comments
Latitude (Trimble navigation)	ALATTR01	Degrees +ve N	Selected as best quality navigation channel
Longitude (Trimble navigation)	ALONTR01	Degrees +ve E	Selected as best quality navigation channel
Ship's heading (Glonass compass)	HEADCM01	Degrees true	
Ship's N-S velocity over the ground	APNSTR01	cm s ⁻¹	Computed from ship's heading and Trimble navigation
Ship's E-W velocity over the ground	APEWTR01	cm s ⁻¹	Computed from ship's heading and Trimble navigation
Bathymetric depth (uncorrected for density effects)	MBANUA01	m	
Salinity (calibrated)	PSALSG01	PSU	Calibrated against CTD data
Sea temperature (calibrated)	TEMPSG01	Degrees C	Calibrated against CTD data
Chlorophyll from through-flow fluorometer output – manufacturer's calibrations only	CPHLUMTF	Nominal mg m ⁻³	To be calibrated against sample data
Calibrated chlorophyll	CPHLUT01	mg m ⁻³	Calibrated against sample data
Atmospheric pressure	CAPHSL01	mbar	
Dry bulb air temperature	CDTASS01	Degrees C	
Relative wind speed	ERWSSS01	m s ⁻¹	
Relative wind direction	ERWDSS01	Degrees true	
Absolute wind speed	EWSBSS01	m s ⁻¹	Corrected for ship's motion
Absolute wind direction	EWDASS01	Degrees true	Corrected for ship's motion
Downwelling surface scalar PAR irradiance	IRRDSS01	μEinstein m ⁻² s ⁻¹	
Solar radiation (300 – 3000 nm)	CSLRR101	W m ⁻²	

Note: each data channel has a flag column 'f': rows containing an N indicate that no data were available for that time interval. An M flag indicates suspect data from BODC's quality control procedures.

Additional channels available on request

The channels listed above are a subset of the channels that have been processed from AMT12. The following additional channels can also be listed if required – please contact Alison at BODC (ajfa@bodc.ac.uk) if you would like data from the list.

Latitude and Longitude from the Glonass satellite navigation system
Latitude and longitude from the Ashtec GPS
Pitch angle (degrees)
Roll angle (degrees)
Uncalibrated temperature (°C)
Uncalibrated salinity (PSU)
Dry bulb temperature from second sensor (°C)
Relative humidity from second sensor (%)
PAR irradiance from second sensor ($\mu\text{E m}^{-2} \text{s}^{-1}$)
Solar radiation from second sensor (W m^{-2})
Atmospheric pressure from second sensor (mbar)
Conductivity (Mhos m^{-1})
Temperature of thermosalinograph conductivity measurement (°C)
Temperature from fluorometer sensor (°C)
Flow rate through thermosalinograph and fluorometer (l m^{-1})

The following data have been received from BAS but not included in the BODC data set. Please contact Alison at BODC if you would like these data to be included.

- Shipboard three-component magnetometer (STCM) – use Bartington sensors mounted in housings on the deck of the ship. X, Y and Z component values are measured.
- EA500 bathymetric echo sounder (SIMRAD fisheries research) operating at 12 kHz
- Doppler Log and EM Log measuring the speed of the vessel relative to the water.
- Winch Log measuring wireout distance, rate, angle and tension.
- “PML box” including temperature, conductivity, transmission and chlorophyll in counts. BODC have no documentation to aid processing of these data.

Instrumentation and data processing by originator

Underway instruments and methodology

Navigation was recorded using a 3D-GPS Trimble Surveyor system using Marine Star differential corrections. Bathymetry was measured using EA500 bathymetric echo

The following information about the instruments was obtained from BAS:

Sensor	Quantity	Make	Model	Range
Temperature/ Humidity	2	Rotronic AG	MP103A-CG030-W4W	Temp-40 +60 Humidity:0 to 100%RH
PAR	2	Kipp & Zonen	ParLite 0348900	(400-700nm)
TIR/ Pyranometer	2	Kipp & Zonen	SP Lite 0339-900	1500 W/m ² (0.4 - 1.1mm)
Barometer	2	Vaisala	Pressure Transmitter PTB210B1A2B	500 - 1100 hPa abs.
Flow	1	Litre metre	PMDQRCIL Transmitter 45SNVCE	0.04 – 6.3 litres/ Minute
Thermo- salinograph	1	Sea-Bird	SBE45	Temperature –5 – 35 deg C Conductivity 0 - 7 s/m Salinity psu Sound velocity m/s
Sea temperature	1	Rosemount		-200 – 800 deg C
Fluorometer	1	Turners Instruments	10AU-005-CE	Chlorophyll ug/l

Where two sensors are used, they are physically mounted in close proximity to each other.

The meteorological instruments were all located high up on the ship's foremast (at approximately 22m above sea level).

Data acquisition and on-board data processing

Raw data were logged every second and written to the ship's main data logging system (SCS)

The data were submitted to BODC in ASCII output from the BAS SCS system for post-cruise

Data processing, correction and calibration

- **Navigation**

Navigational data were available from three different systems on the JCR. These were screened in order to select the best quality data for the primary navigation channels. The data from the Trimble GPS system were consistently good and showed no spikes.

A program was run which located any null values in the latitude and longitude channels and checked to ensure that the ship's speed did not exceed 15 knots. There were no gaps or speed check failures in the Trimble navigation data.

- **Meteorology**

Relative wind speed and direction were logged from the meteorological package during the cruise. The anemometer was positioned with 0 degrees at the ship's bow. The ship's speed relative to the ground was calculated at BODC using the ship's navigational information and the ship's heading. The speed and heading were then used to correct the wind data for the effect of the ship's movement. Absolute wind speed and direction channels were created.

- **Temperature**

The underway sea temperature channel (TEMPSU01) was compared with averaged surface values extracted from CTD profiles to 6 metres depth. CTD samples with high standard deviations (>0.01 °C) were removed from the dataset. The 59 samples showed the following relationship, which has been used to produce a calibrated temperature channel (TEMPSG01).

$$\text{TEMPSG01}(\text{°C}) = 1.0027 * \text{TEMPSU01} - 0.0474 \quad (\text{BODC calibration 2803, } R^2 = 1)$$

- **Salinity**

The underway salinity channel (PSALSU01) was compared with averaged surface values extracted from CTD profiles (sensor 2) to 6 metres depth. A regression was carried out and the residuals showed clear shifts over time. The data set was divided into three time periods, and a regression was carried out on each section. The following calibrations were applied:

$$\begin{array}{l} 12/05/2003 \ 12:24 \ \text{to} \ 25/05/2003 \ 02:12:00 \\ \text{PSALSG01} = 1.0019 * \text{PSALSU01} + 0.0388 \end{array} \quad (\text{BODC cal 2903, } N= 23, R^2 = 0.9996)$$

$$\begin{array}{l} 25/05/2003 \ 02:13 \ \text{to} \ 09/06/2003 \\ \text{PSALSG01} = 0.9980 * \text{PSALSU01} + 0.1365 \end{array} \quad (\text{BODC cal 2904, } N= 34, R^2 = 0.9997)$$

$$\begin{array}{l} 09/06/2003 \ 10:06 \ \text{to} \ 15/06/2003 \ 10:54 \\ \text{PSALSG01} = 1.0430 * \text{PSALSU01} - 1.4041 \end{array} \quad (\text{BODC cal 2905, } N= 9, R^2 = 0.9909)$$

The corrected data were compared with 11 salinity samples taken from the non-toxic supply. The average offset between corrected underway data and salinometer data was <0.01 PSU. (Note - the offset between uncorrected underway data and salinometer data ranged from -0.05 and -0.15 PSU)

- **Chlorophyll-a**

The underway chlorophyll-a channel (CPHLUMTF) was calibrated against chlorophyll-a sample measurements.

$$\text{Underway chlorophyll-a(calibrated)} = (\text{CPHLUMTF} - 0.113057) / 0.855530$$