CTD observation

(1) Personnel

Takahiro Iida (NIPR)
Nobue Takasawa (TUMSAT)
Keishi Shimada (TUMSAT)
Takashi Iwata (TUMSAT)
Kenichiro Sato (MWJ)
Kenichi Katayama (MWJ)

(2) Objective

Investigation of oceanic structure and water sampling along 110°E line.

(3) Parameters

Temperature (Primary only)
Conductivity (Primary only)
Pressure
Dissolved Oxygen (Primary only)

(4) Instruments and Methods

CTD/Carousel Water Sampling System, which is a 24-position Carousel water sampler (CWS) with Sea-Bird Electronics, Inc. CTD (SBE9plus), was used during this cruise. 2.5-liter Niskin Bottles were used for sampling seawater. The sensors attached on the CTD were temperature (Primary), conductivity (Primary), pressure, dissolved oxygen (Primary), dissolved oxygen sensor, altimeter. Salinity was calculated by measured values of pressure, conductivity and temperature. The CTD/CWS was deployed from starboard on working deck.

The CTD raw data were acquired on real time using the Seasave-Win32 (ver.7.21d) provided by Sea-Bird Electronics, Inc. and stored in the hard disk of the personal computer. Seawater was sampled during the up cast by sending fire commands from the personal computer. At each sampling layer, the operator waited for 30 seconds to stabilize then sent a fire command.

11 casts of CTD measurements were conducted (see Appendix 6.2.1.). No major problems were encountered during the operation but spike noises along with modulo error counts were sometimes observed.

Data processing procedures and used utilities of SBE Data Processing-Win32 (ver.7.21d) and SEASOFT were as follows:

(The process in order)

DATCNV: Convert the binary raw data to engineering unit data. DATCNV also extracts bottle information where scans were marked with the bottle confirm bit during acquisition. The duration was set to 2.0 seconds, and the offset was set to 0.0 seconds.

WILDEDIT: Mark extreme outliers in the data files. The first pass of WILDEDIT obtained an accurate estimate of the true standard deviation of the data. The data were read in blocks of 100 scans.

Data greater than 2 standard deviations were flagged. The second pass computed a standard deviation over the same 20 scans excluding the flagged values. Values greater than 20 standard deviations were marked bad. This process was applied to pressure, depth, temperature, conductivity and dissolved oxygen voltage.

FILTER: Perform a low pass filter on pressure with a time constant of 0.15 second. In order to produce zero phase lag (no time shift) the filter runs forward first then backward.

ALIGNCTD: Convert the time-sequence of sensor outputs into the pressure sequence to ensure that all calculations were made using measurements from the same parcel of water. Dissolved oxygen data are systematically delayed with respect to depth mainly because of the long time constant of the dissolved oxygen sensor and of an additional delay from the transit time of water in the pumped pluming line. This delay was compensated by 6 seconds advancing dissolved oxygen sensor output (dissolved oxygen voltage) relative to the temperature data.

CELLTM: Remove conductivity cell thermal mass effects from the measured conductivity. Typical values used were thermal anomaly amplitude alpha = 0.03 and the time constant 1/beta = 7.0.

LOOPEDIT: Mark scans where the CTD was moving less than the minimum velocity of 0.2 m/s (traveling backwards due to ship roll).

DERIVE: Compute salinity, dissolved oxygen, potential temperature, and sigma-theta.

BINAVG: Average the data into 1-dbar pressure bins.

BOTTLESUM: Create a summary of the bottle data. The data were averaged over 2.0 seconds.

Configuration file: 9P-0590.xmlcon

Specifications of the sensors are listed below.

CTD: SBE911plus CTD system

Under water unit:

SBE09plus (S/N 09P22763-0590, Sea-Bird Electronics, Inc.)

Pressure sensor: Digiquartz pressure sensor (S/N 77509)

Calibrated Date: 21 May. 2012

Temperature sensors:

Primary: SBE03Plus (S/N 03P2863, Sea-Bird Electronics, Inc.)

Calibrated Date: 08 May. 2012

Conductivity sensors:

Primary: SBE04C (S/N 042415, Sea-Bird Electronics, Inc.)

Calibrated Date: 08 May. 2012

Dissolved Oxygen sensors:

Primary: SBE43 (S/N 431471, Sea-Bird Electronics, Inc.)

Calibrated Date: 22 May. 2012

Pump:

SBE05T(S/N 052783, Sea-Bird Electronics, Inc.)

Altimeter:

PSA-900 (S/N 760, Datasonics, Inc.)

Carousel water sampler:

SBE32 (S/N 3222763-0296, Sea-Bird Electronics, Inc.)

Deck unit: SBE11plus (S/N 11P22763-0544, Sea-Bird Electronics, Inc.)