GP7-00-KA
NOAA Ship Ronald H. Brown
San Diego, CA - Rodman, Panama
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ACQUISITION:

Forty-nine CTD profiles were collected on this cruise. Twenty-one profiles were collected along 110W from 8N to 8S, and 27 profiles were collected along 95W from 8S to 12N. One test cast was performed prior to reaching the 110W line where 24 bottles were fired at depth but no samples were drawn for salinity analysis and the profile data were not processed. The majority of casts were to 1000 m, 16 were deep (>2900 m). Four additional casts were made for the purpose of calibrating the TC modules from the TAO moorings (0212, 0292, 0412, and 0481). These data were processed and used by Brian Lake, and are not part of this data set.

PMEL's Sea-Bird 9plus CTD s/n 09P8431-0315 measuring pressure (s/n 53960), temperature sensors (s/n 1370, 1455), and conductivity sensors (s/n 1180, 1177) were used for all casts (TAO2.CON).
The CTD was mounted in a custom 24-bottle frame with Sea-Bird rosette sampler s/n 163. The CTD data stream was passed through Sea-Bird 11plus deck unit s/n 314 with factory settings. An analog signal was recorded onto the audio portion of VCR tape as a backup. Digitized data were sent to the ship's Gateway G6-200 personal computer equipped with Sea-Bird's SEASAVE for Windows acquisition software (Win32 v1.10) where calibrated data were displayed in graphical form in real-time, as well as stored in raw form onto hard disk. Backups of the raw data were made on Zip disks and CD-ROM and returned to PMEL for post-cruise processing.

Termination problems were evident at the start of the cruise. The sea cable was reterminated twice, after casts 12 and 13, by the ship's ET. Spiking problems continued intermittently throughout the cruise. Ship suspects a problem in the sea cable at around 3000 meters. They may chose to cut off 3000 meters of cable during the winter inport, leaving 7000 meters for future cruises.

SALINITIES:

Seawater was collected at 12 depths each cast and salinity samples drawn. Two salinity samples were taken from the deepest Nisken. Duplicate samples were analyzed on a subsequent day from the rest. Salinity analysis was performed using a Guildline Autosal 8400B salinometer s/n 60.843. IAPSO standard seawater batch #P136 dated April, 1999, was used for all casts.

OXYGENS:

A SBE 43 prototype oxygen sensor was mounted on the primary underwater package and plumbed with the primary TC pair. Sample oxygen concentrations were made using the Winkler titration method by Melissa Hendricks of Princeton University.

POST-CRUISE CONDUCTIVITY CALIBRATIONS:

GP700S.CAL of primary (s/n 1370, 1180) sensor data (not including any duplicate salts) was created at the lab post-cruise.

Final pressure and temperature (s/n 1370) calibrations were pre-cruise. A drift correction of 0.000319 C and a viscous correction of -0.0006 C were applied to temperature. Conductivity fit coefficients were determined using Matlab program CALCOP0:

```
                number of points used   322
                total number of points  393
                % of points used in fit 81.93
                fit standard deviation  0.001516
                fit bias                1.1184738e-002
          fit co pressure fudge   7.2296087e-007
                min fit slope           1.0004229
                max fit slope           1.0004229
```

Slope, bias, and pressure correction values were applied to CTD data and converted directly into netCDF format using GP7_CNV_EPS; and to bottle file data using GP7_CALMSTR and GP7_CLB_EPS.

POST-CRUISE OXYGEN CALIBRATIONS:

Ninety-one sample oxygen values and associated upcast CTD burst data from .BTL files made up the oxygen calibration file (.CLO). OXFITMR was used to determine coefficients for slope, bias, and lag. Because this new sensor is temperature compensated, tcor and weight were fixed. And because there were no sample data below 1000 m, pcor was also fixed. After four iterations, the following were the result of fitting 85 points:

```
          bias  0.007
           slope    0.5056e-03
          Pcor  0.1500e-03
          Tcor   -0.1000e-03
            Wt    0.0000
           Lag   -0.1174e+01
```

Oxygen coefficients were applied to burst data using GP7_CALMSTR and GP7_CLB_EPS, and to profile data using GP7_CNV_EPS. Data were truncated at 1000 dbar as the fit did not appear reliable beyond that. Up/down profiles with bottle oxygens overlaid were examined. Co-located profiles with P18 stations showed the goodness of the fit.

FINAL PROCESSING:

The following are the standard SEASOFT processing modules used to reduce Sea-Bird CTD data:

DATCNV converts raw data to engineering units and creates a bottle file (.ROS) where scans marked with a bottle confirm bit are averaged over the following 2 second interval.

ALIGNCTD advances secondary conductivity relative to temperature by 0.73 seconds. This is the typical net advance of ducted temperature and conductivity sensors with a 3000 rpm pump. The SBE 11plus deck unit automatically advances primary conductivity. ALIGNCTD also advances oxygen for this cruise by 8 seconds, according to Jim Carlson of Sea-Bird regarding their prototype SBE-43 oxygen sensor.

ROSSUM averages the bottle data specified in the DATCNV output and derives salinity, theta, sigma-th, and oxygen.

WILDEDIT makes two passes through the data in 100 scan bins. The first pass flags points greater than 2 standard deviations; the seond pass removes points greater than 20 standard deviations from the mean with the flagged points excluded.

FILTER applies a low pass filter to pressure with a time constant of 0.15 seconds. In order to produce zero phase (no time shift) the filter is first run forward through the file and then run backwards through the file.

CELLTM uses a recursive filter to remove conductivity cell thermal mass effects from the measured conductivity. In areas with steep temperature gradients the thermal mass correction is on the order of 0.005 psu. In other areas the correction is negligible. The value used for the thermal anomaly amplitude (alpha) is 0.03. The value used for the thermal anomaly time constant (1/beta) is 7.0.

FILTER applies a low pass filter to pressure with a time constant of 0.15 seconds, and to conductivity with a time constant of 0.03 seconds. In order to produce zero phase (no time shift) the filter is first run forward through the file and then run backwards through the file.

DERIVE1 is used here to compute doxc/dt and oxygen (umol/kg).

LOOPEDIT removes scans associated with pressure slowdowns and reversals. If the CTD velocity is less than 0.25 m/s or the pressure is not greater than the previous maximum scan, the scan is omitted.

BINAVG averages the data into 1 db bins. Each bin is centered around a whole pressure value, e.g. the 1 db bin averages scans where pressure is between 0.5 db and 1.5 db.

DERIVE2 uses 1 db averaged pressure, temperature, and conductivity to compute salinity.

TRANS converts the data file from binary to ASCII format.

Program GP7_CNV_EPS applies post-cruise temperature corrections and conductivity calibration coefficients, recomputes the derived variables in DERIVE, and converts the ASCII data files to netCDF format. GP7_CNV_EPS skips bad records near the surface (typically the top 3 m) as well as any records containing -9.990e-29, and copies back raw data to the surface (0 db) within 10 db. Because the SBE module LOOPEDIT does not handle package slowdowns and reversals well in the thermocline where gradients are large, CNV_EPS removes raw data records where a sigma-theta inversion is greater than -0.01 kg/m3. Data are linearly interpolated such that a record exists for every 1 db. When data are copied back to the surface, the WOCE quality word is '8888'; when interpolated over greater than 2 db, the WOCE quality word is '6666'. The WOCE quality word consists of a 1-digit flag for pressure, temperature (ITS-90), salinity and oxygen.

Program GP7_CALMSTR applies post-cruise temperature corrections and conductivity calibration coefficients and recomputes the derived variables in ROSSUM. GP7_CLB_EPS converts the ASCII bottle data file into individual cast netCDF data files. Station 4 sample 104, station 9 sample 102, and stations 32, 43, 47 all sample 113 were flagged as bad.

Final CTD and bottle files were moved to DISK$EPIC1:[HAYES.DATA.GP700.CTD] and included in the MySQL data management tables on December 27, 2000.

CTD oxygen values and bottle oxygen values were converted from umol/l to

umol/kg using programs gp7_fix.f and gp7_fixb.f respectively, on May 21, 2001.