GP4-95-DI
NOAA Ship Discoverer
Kwajalein, Marshall Islands - Honolulu, Hawaii
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ACQUISITION:

Seventeen CTD profiles were collected during this cruise covering two meridionals. Nine profiles were collected along 165E from 8N to 5S, and 8 profiles were collected along 180W from 8S to 5N. The majority of casts were to 1000 m; 1 cast was deep (>3000 db).

All casts used TAO's Sea-Bird 9plus CTD s/n 09P10881-0390 measuring pressure (s/n 58950), temperature (s/n 1708), and conductivity (s/n 1467). The CTD was mounted in a custom 24-bottle frame with a Sea-Bird rosette sampler. The CTD data stream was passed through a Sea-Bird 11plus deck unit (s/n 376) with factory settings. An analog signal was recorded onto the audio portion of VCR tape as a backup. Digitized data were sent to a Zenith personal
computer equipped with Sea-Bird's SEASOFT acquisition software (version 4.207) where calibrated data were displayed in graphical form in real-time, as well as stored in raw form onto the hard disk. Backups of the raw data were made on 40 Mbyte 1/4" cartridge tapes and returned to PMEL for post-cruise processing.

SALINITIES:

Salinity analysis was performed using Guildline Autosal salinometers s/n 56.119 (last calibrated at NRCC January 25, 1995). IAPSO standard seawater batch #P114 was used for all casts. NRCC calibrations were not applied to the bottle salinities used to calibrate this data set, only a drift-during-run linear interpolation correction. Standard operating temperature was 24 degrees Celsius.

Several autosal runs jumped in conductivity by approximately 0.003 mS/cm owing to poor Autosal standardization and fluctuating ambient temperature in the Autosal lab space of 3-6 C. Sample salinities from a run of GP295 stations 26-30 (SPR95A.CAL stations 59-63) were bad and not included in the calibration file.

POST-CRUISE CONDUCTIVITY CALIBRATIONS:

SPR95A.CAL was created at PMEL using program SBECAL. Anomalous differences between CTD and bottle salinities were scrutinized. Bottle salinities were checked against their original log sheets for typos. GP395 stations 17-22 (SPR95A.CAL stations 82-87) used PMC's CTD package and this group was calibrated separately.

Final pressure and temperature calibrations were pre-cruise. Conductivity calibration coefficients were best determined for PMEL's CTD using a station-dependent second-order fitting routine, CALCOS2, written by Greg Johnson in MATLAB on the following groups. Stations

82-87 used PMC's CTD and conductivity calibration coefficients were determined using CALCOS1, station-dependent linear fitting routine.

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     Stations 1-18:  number of points used   169
               total number of points  196
               % of points used in fit 86.22
               fit standard deviation  0.001077
               fit bias                -0.0014831927 mS/cm
               min fit slope (sta 1)   1.0002803
               max fit slope (sta 18)  1.0003865

   Stations 19-50:  number of points used   344
                total number of points  378
                % of points used in fit 91.01
                fit standard deviation  0.001792
                fit bias                -0.011024989 mS/cm
                min fit slope (sta 50)  1.0005484
                max fit slope (sta 19)  1.0007496

   Stations 51-65:  number of points used   95
                total number of points  117
                % of points used in fit 81.2
                fit standard deviation  0.001161
                fit bias                -0.0088542832 mS/cm
                min fit slope (sta 51)  1.0004157
                max fit slope (sta 65)  1.000484

   Stations 66-81:  number of points used   161
                total number of points  192
                % of points used in fit 83.85
                fit standard deviation  0.00197
                fit bias                -0.012371588 mS/cm
                min fit slope (sta 81)  1.0005701
                max fit slope (sta 66)  1.0007338

   Stations 82-87:  number of points used   58
                total number of points  72
                % of points used in fit 80.56
                fit standard deviation  0.00104
                fit bias                -0.012591445 mS/cm
                min fit slope (sta 82)  1.0005433
                max fit slope (sta 87)  1.0005563

   Stations 88-104:  number of points used   167
                 total number of points  204
                 % of points used in fit 81.86
                 fit standard deviation  0.00147
                 fit bias                -0.013652733 mS/cm
                 min fit slope (sta 88)  1.0006917
                 max fit slope (sta 104) 1.0007495
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Slope and bias values were applied to CTD data using PMEL Fortran program SPR95_EPIC; and to bottle files using CALMSTR.

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 if a Sea-Bird rosette sampler was used. (MARKSCAN creates a bottle file if a General Oceanics rosette was used.)

ROSSUM averages the bottle data specified in the DATCNV or MARKSCAN output and derives salinity, theta, sigma-t, and sigma-th. These bottle files are transfered to the PMEL VAX where post-cruise calibrations are computed.

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.

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 9.0.

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.

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.

DERIVE uses 1 db averaged pressure, temperature, and conductivity to compute salinity, theta, sigma-t, sigma-th, and dynamic height.

SPLIT removes decreasing pressure records and keeps only the downcast data.

TRANS converts the data file from binary to ASCII format. These data are transfered to the PMEL VAX.

PMEL program SPR95_EPIC applies post-cruise conductivity calibration coefficients, recomputes the derived variables in DERIVE, and converts the ASCII data files to EPIC format. Sea-Bird .CNV files are editted to remove bad records near the surface (typically the top 4 m) and any causing spikes in the deeper water column before running SPR95_EPIC. SPR95_EPIC extrapolates 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, SPR95_EPIC 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 interpolated over greater than 2 db, the WOCE quality word is '666'.

PMEL program CALMSTR applies post-cruise conductivity calibration coefficients and recomputes the derived variables in ROSSUM. EPICBOMSTR converts the ASCII bottle data file into individual cast EPIC data files.

Final CTD and bottle files were moved to DISK$EPIC1:[HAYES.DATA] and included in the RIM data management tables on September 23, 1996.