GP4-97-KA
NOAA Ship Ka'imimoana
Kwajalein - Honolulu, HI
June 8 - July 3, 1997

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ACQUISITION:

Thirty-three CTD profiles were collected on this cruise. A deep test cast was made enroute to the first station along 165E. Then seventeen CTD casts were made along 165E from 8N to 8S. Fifteen profiles were collected along 180W from 5S to 8N. The majority of CTD casts were to 1000 m; one was to 500 m, one to 1300 m, and three were deep (>3000 db).

The ship's Sea-Bird 9plus CTD s/n 09P10493-0405 measuring pressure (s/n 61183), temperature (s/n 1708, 2027), and conductivity (s/n 1536, 1537) (PMC8.CON same as PMC7.CON) was used throughout the cruise.

The CTD was mounted in a custom 24-bottle frame with a Sea-Bird rosette sampler (s/n 88). The CTD data stream was passed through a Sea-Bird 11plus deck unit (s/n 392) with factory settings. An analog signal was recorded onto the audio portion of VCR tape as a backup. Digitized data were sent to a Dell 4100 personal computer equipped with Sea-Bird's SEASOFT acquisition software (version 4.216) 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 QIC-80 1/4" cartridge tapes and returned to PMEL for post-cruise processing.

Stations 1-4 were originally acquired using the wrong configuration file (PMC6.CON). These casts were reprocessed through the Seasoft modules with the correct conductivity calibration coefficients (SPECIAL>CON) at the lab post-cruise before calibrations. There were no raw data files for KA40241, and the VCR recording was errorneously incomplete. So there is no cast KA40241 in the final data set. Final data for station 30 were truncated at 460 db on the downcast due to noisy data in all channels as a result of cable damage.

SALINITIES:

For calibration purposes, bottle samples were usually taken at 6 depths on 1000 m or shallower casts and at 10 depths during deep casts. Two bottle samples were taken at the deepest depth. Duplicate samples were analyzed on a subsequent day from the rest. Salinity analysis was performed using Guildline Autosal 8400B salinometer s/n 61.383 (last calibrated at NRCC February 13, 1996). IAPSO standard seawater batch #P130 was used for all casts. NRCC calibrations were not applied to this data set, only a drift-during-run linear interpolation correction in ship program DISAL. Standard operating temperature was 27 degrees Celsius.

POST-CRUISE CONDUCTIVITY CALIBRATIONS:

GP497S.CAL, not including duplicate salts, was created at sea using batch routine MAKECAL. Anomalous differences between CTD and bottle salinities were scrutinized. Station 30 bottle data were removed from the .CAL file because CTD values were bad. Samples from bottle number 5 tripped at 200 db were often compromised. These bottle salinities are flagged as bad and questionable.

Final pressure and temperature calibrations were pre-cruise. Conductivity fit coefficients were determined for all casts as one group, stations 1-29. These were best determined using a third order station-dependent fitting routine, CALCOS3, written by Greg Johnson in MATLAB. NOTE: conductivity calibrations were redone on January 6, 1999. See below.

```
number of points used   171
total number of points  197
% of points used in fit  86.8
fit standard deviation  0.001163
fit bias -0.0074280895 mS/cm
min fit slope 1.0004942
max fit slope 1.0005485
```

Slope and bias values were applied to CTD data using PMEL Fortran program GP497_EPIC; and to bottle files using CALMSTR4.

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 GP497_EPIC applies post-cruise conductivity calibration coefficients, recomputes the derived variables in DERIVE, and converts the ASCII data files to EPIC format. GP497_EPIC skips bad records near the surface (typically the top 5 m) as well as any records containing -9.990e-29, and 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, GP497_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 extrapolated to the surface, the WOCE quality word is '888'; when interpolated over greater than 2 db, the WOCE quality word is '666'. The WOCE quality word consists of a 1-digit flag for pressure, temperature (ITS-90), and salinity.

PMEL program CALMSTR4 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. There are no .BOT files for station 0281 and 0301.

Final CTD and bottle files were moved to DISK$EPIC1:[HAYES.DATA] and included in the RIM data management tables on July 17, 1997.

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January 6, 1999: While generating the 1997-1998 NOAA CTD data report, it was decided to redo the conductivity cals of GP497, splitting them into two groups, stations 1-17 and 18-30. A 5 day transit occurred between these two stations and a .002 jump in conductivity residuals was evident. Calcop3 was used to determine the best fit for each group:

```
stations 1-17:  number of points used   101
             total number of points  122
             % of points used in fit 82.79
             fit standard deviation  0.0008134
             fit bias                -0.0087830648
             fit co pressure fudge   4.1647099e-007
             min fit slope           1.0004982
             max fit slope           1.0005514

stations 18-30:  number of points used   64
             total number of points  75
             % of points used in fit 85.33
             fit standard deviation  0.0007616
             fit bias                -0.012301793
             fit co pressure fudge   2.2680421e-006
             min fit slope           1.0006075
             max fit slope           1.0007091
```

Programs were modified to apply these new coefficients. Bad bottles were flagged in GP497S.CLB and excluded from the EPIC .bot files: station 1 sample 102 and 106, station 2 sample 103, station 10, 11, 15, 17, and 22 all sample 105. DISK$EPIC1:[HAYES.DATA.GP497.CTD] was updated. There was no need to update the RIM/INGRES tables.

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