

GP1-98-KA  
NOAA Ship Ka'imimoana  
San Diego, CA - San Diego, CA  
February 5 - March 13, 1998

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#### ACQUISITION:

Thirty-five CTD profiles were collected on this cruise. Seventeen CTD profiles were collected along 95W from 8N to 8S; seventeen along 110W from 8N to 8S; and one test cast enroute to the first station (not processed). The majority of CTD casts were to 1000 m; 2 were to 500 m, and 4 were to 3500 m.

The ship's Sea-Bird 9plus CTD s/n 09P10493-0405 measuring pressure (s/n 61183), temperature (s/n 2026, 2027), and conductivity (s/n 1536, 1537) (PMC10.CON) was used for all casts.

The CTD was mounted in a custom 24-bottle frame with Sea-Bird rosette sampler s/n 88. The CTD data stream was passed through 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 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 hard disk. Backups of the raw data were made on QIC-80 1/4" cartridge tapes and returned to PMEL for post-cruise processing.

Station 5 was shortened to a depth of 845 m due to the close proximity of another vessel. Seven bottles were closed during the upcast. Stations 6 and 10 downcast data were generated from VCR backup. The replay of station 6 was unuseable. There are no bottle salts for station 13 because the bottles were inadvertently reused before the samples were analyzed. No Niskin samples were collected during station 31 owing to vent caps left open.

#### SALINITIES:

MBARI requested 8 bottles be tripped between 200 m and the surface. The remaining 4 bottles were used for calibration purposes. Two salinity samples were taken from the deepest Niskin. Duplicate samples were analyzed on a subsequent day from the rest. Salinity analysis was performed using Guildline Autosol 8400B salinometer s/n 61.383 (last calibrated at NRCC February 13, 1996). IAPSO standard seawater batch #P127 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 laboratory operating temperature was approx 26 degrees Celsius.

#### POST-CRUISE CONDUCTIVITY CALIBRATIONS:

GP198S.CAL of primary sensor data (not including any duplicate salts) was created at sea. It's completeness and correctness were scrutinized and

ammended where needed. All data were used in the fit as one group.

Final pressure and temperature calibrations were pre-cruise. Conductivity fit coefficients were determined using Matlab programs. Station-dependent fits (CALCOSn) were tried using all the bottles. Residuals verses pressure showed a non-linear trend. CALCOPn programs helped but didn't correct the problem. Also, none of the fitting routines used more than 70% of the data.

It was suggested that the TC pairs be recalibrated at Sea-Bird before the next cruise. CALCOP2 gave these final results:

|                                      |                |
|--------------------------------------|----------------|
| Stations 1-34: number of points used | 260            |
| total number of points               | 376            |
| % of points used in fit              | 69.15          |
| fit standard deviation               | 0.001494       |
| fit bias                             | -0.02168033    |
| fit co pressure fudge                | 9.0721519e-007 |
| min fit slope                        | 1.0007042      |
| max fit slope                        | 1.0007459      |

Slope, bias, and pressure correction values were applied to CTD data using PMEL Fortran program GP198\_EPIC; and to bottle file data using CALMSTR1.

#### 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 transferred 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 second 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 transferred to the PMEL VAX.

PMEL programs GP198\_EPIC applies post-cruise conductivity calibration coefficients, recomputes the derived variables in DERIVE, and converts the ASCII data files to EPIC format. GP198\_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, GP198\_EPIC removes raw data records where a sigma-theta inversion is greater than  $-0.01$  kg/m<sup>3</sup>. 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 CALMSTR1 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. Bad bottle salts were flagged in GP198S.CLB and removed from their .BOT files for station 8 sample 107, station 10 sample 104, station 12 sample 110, station 17 sample 102, station 18 sample 103, and station 28 samples 107 and 108.

Final CTD and bottle files were moved to DISK\$EPIC1:[HAYES.DATA.GP198.CTD] and included in the RIM data management tables on March 25, 1998.