GP1-97-KA
NOAA Ship Ka'imimoana
Manzanillo, Mexico - San Diego, CA
February 3 - March 5, 1997

Chief Scientist: Ms. Margie McCarty
Survey Department: CST Jim Davis, GVA Leslie Ross (in training)
CTD Personnel: J. Davis, L. Ross, M. McCarty
Final Processing: K. McTaggart

ACQUISITION:

Thirty-four CTD casts were proposed in the final project instructions.
Due to time restraints owing to mooring operations, CTDs at non-mooring
sites were omitted and a couple 1000 m casts were shortened to 500 m.
Therefore fourteen CTD profiles were collected during this cruise. Six
profiles were collected along 95W from 8N to 8S, and 8 profiles were
collected along 110W from 8S to 8N. The majority of casts were to 1000 m
but two were to 500 m and three were deep (>3000 db).

All casts used 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
1467, 1537). 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.

SALINITIES:

For calibration purposes, bottle samples were 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 #P127 was used for all
casts. NRCC calibrations were removed from the bottle salinities post-
cruise and not used to calibrate 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:

GP197S.CAL, including duplicate salts, was created at sea using batch
routine MAKECAL. Anomalous differences between CTD and bottle salinities
were scrutinized. Bottle salinities were checked against their original
log sheets for typos. Another version of GP197S.CAL was created at the
lab. It differs from the original in that the NRCC calibration correction
has been removed from the bottle salinities and a misfire appeared at
station 8.

Final pressure and temperature calibrations were pre-cruise. There

appeared to be a calibration shift in the pre-cruise conductivity residual plots between lines 95W and 110W during 3 1/2 days of transit. Therefore fit coefficients were determined for two groups: stations 1-6 and 7-14. Conductivity calibration coefficients were best determined for stations 1-6 using a first order station-dependent fitting routine, CALCOS1, written by Greg Johnson in MATLAB. Conductivity calibration coefficients were best determined for stations 7-14 using a second order station-dependent fitting routine, CALCOS2.

```
Stations 1-6:      number of points used   39
           total number of points  40
           % of points used in fit 97.5
           fit standard deviation  0.002087
           fit bias -0.025678563 mS/cm
           min fit slope 1.0009262
           max fit slope 1.0009638

Stations 7-14:     number of points used   56
           total number of points  59
           % of points used in fit 94.92
           fit standard deviation  0.001931
           fit bias -0.023852768 mS/cm
           min fit slope 1.0009401
           max fit slope 1.0010155
```

Slope and bias values were applied to CTD data using PMEL Fortran program GP197_EPIC; and to bottle files 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 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 GP197_EPIC applies post-cruise conductivity calibration coefficients, recomputes the derived variables in DERIVE, and converts the ASCII data files to EPIC format. GP197_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, GP197_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 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. The following bad bottle data were omitted: station 7 cast 1 bottle 6.

Final CTD and bottle files were moved to DISK$EPIC1:[HAYES.DATA] and included in the RIM data management tables on June 11, 1997.