

GP5-97-KA
NOAA Ship Ka'imimoana
Manzanillo, Mexico - San Diego, CA
July 31 - August 29, 1997

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ACQUISITION:

Thirty-three CTD profiles were collected on this cruise. A 1000 m test cast was made during the transit from Honolulu to Manzanillo. This test cast was not processed. Seventeen CTD casts were made along 95W from 8N to 8S. One cast was taken at 8S, 102W. Fifteen profiles were collected along 110W from 8S to 11N. The majority of CTD casts were to 1000 m; four were to 500 m, and only one was 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) was used for casts 1 and 2. Primary conductivity sensor s/n 1467 (PMC9.CON) was substituted for casts 3-5. PMEL Sea-Bird CTD s/n 09P10881-390 with pressure s/n 58950 and same TC pairs (PMEL2.CON) was used for casts 6-13. Secondary conductivity sensor s/n 1469 (PMEL3.CON) was substituted for casts 14-32.

The CTD was mounted in a custom 24-bottle frame with a Sea-Bird rosette sampler (s/n 88 for casts 1-10 and s/n 54 for casts 11-32). The CTD data stream was passed through a Sea-Bird 11plus deck unit (s/n 392 for casts 1-7 and s/n 396 for casts 8-32) 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.

Data were problematic during this entire cruise. Noise in all channels led to 300 m of winch cable being cut off and reterminated. (NOTE: cable was damaged at 500 m at the end of GP497; ship was advised by the lab to cut off at least 500 m of cable.) Noise persisted in the primary (CTD s/n 405) and then the secondary (CTD s/n 390) conductivity and sometimes temperature channels. Some rosette positions were consistently not firing, likely owing to the use of WD-40 (even though the ship was advised by Sea-Bird and the lab not to use anything but fresh water on the carousel). All three pumps were damaged, likely owing to the deck units being left on between casts running the pumps on deck as the Triton-X storage solution had become contaminated with salt water.

Both 9plus CTDs, both rosette carousels, all three pumps, and two conductivity sensors were sent to Sea-Bird after this cruise for inspection repair, and calibration.

SALINITIES:

For calibration purposes, bottle samples were usually taken at at least 6 depths on 1000 m or shallower casts and at at least 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 Autosol 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 around 25.5 degrees Celsius.

POST-CRUISE CONDUCTIVITY CALIBRATIONS:

GP5972S.cal of secondary sensor data for casts 1-5 and GP5971S.CAL of primary sensor data for casts 6-32 (not including any duplicate salts) was created post-cruise using modified program SBECAL. Anomalous differences between CTD and bottle salinities were scrutinized.

Final pressure and temperature calibrations were pre-cruise. Conductivity fit coefficients were determined for each .CAL file using Matlab programs. For GP5972S.CAL, the best fit was determined using a second order station-dependent fitting routine, CALCOS2.

```
number of points used    28
total number of points  33
% of points used in fit  84.85
fit standard deviation   0.002317
fit bias -0.031347916 mS/cm
min fit slope 1.0012617
max fit slope 1.0015644
```

For GP5971S.CAL, the best fit was determined using a third order station-dependent fitting routine, CALCOS3.

```
number of points used    125
total number of points  143
% of points used in fit  87.41
fit standard deviation   0.001983
fit bias -0.0048694115 mS/cm
min fit slope 0.99989947
max fit slope 0.999997
```

Slope and bias values were applied to CTD data using PMEL Fortran programs GP5972_EPIC and GP5971_EPIC; and to bottle files using CALMSTR5.

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 (α) 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 GP597n_EPIC applies post-cruise conductivity calibration coefficients, recomputes the derived variables in DERIVE, and converts the ASCII data files to EPIC format. GP597n_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, GP597n_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.

Data from station 12 did not come back to the lab. The following casts were truncated: 0011 at 3338 db, 0091 at 916 db, 0181 at 168 db, 0191 at 338 db. A 5-point spike was removed from cast 0291 at 839-843 db.

PMEL program CALMSTR5 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. Station 0011 samples 109 and 112, and station 0141 sample 103 were flagged as bad and removed from the EPIC bottle files. There are no .BOT files for stations 0121 and 0221.

Final CTD and bottle files were moved to DISK\$EPIC1:[HAYES.DATA] and included in the RIM data management tables on September 22, 1997.