## Appendix B

# CFC MEASUREMENTS ON STUD97

### *B.1 Overview*

| | |
|---|---|
| Cruise Dates: | November 1–23, 1997 |
| Ports of Call: | Seattle (Washington) to Honolulu (Hawaii) |
| Ship: | R/V *Thomas G. Thompson* |
| Journey Code: | TTN072 |
| Acronym: | STUD97 (Student Cruise 1997) |
| Chief Scientists: | Steve Emerson and Paul Quay (University of Washington) |
| CFC Analyst: | Sabine Mecking (University of Washington) |

STUD97 was a student cruise organized by the School of Oceanography at the University of Washington. The objective of this cruise was to study ventilation processes and biogeochemical cycling in the upper thermocline of the eastern subtropical North Pacific. The cruise track followed a nominal longitude of 152°W between 45°N and Hawaii, and a nominal longitude of 158°W between Hawaii and 10°N (Figure B.1). Three test stations were occupied on the transit from Seattle to the 152°W meridian. Along the main section of the cruise, hydrographic casts with a CTD rosette (24 Niskin bottles) were taken about every degree between 45°N and 35°N and about every two degrees to the south of 35°N. The target depth of the casts was usually 1000 m. Six casts as deep as 2500 m were taken along the main section to calibrate the salinity data and to determine the CFC blank in presumably CFC-free water. At a few locations additional high-resolution casts of the upper 200 m were performed, but CFCs were only sampled on the deeper casts.

Because there was only one CFC analyst on board, the collection of CFC samples was limited to 25 out of the 29 stations and to about 2/3 of the 24 Niskin bottles for each sampled cast. The collection and processing of these data are subject of this data

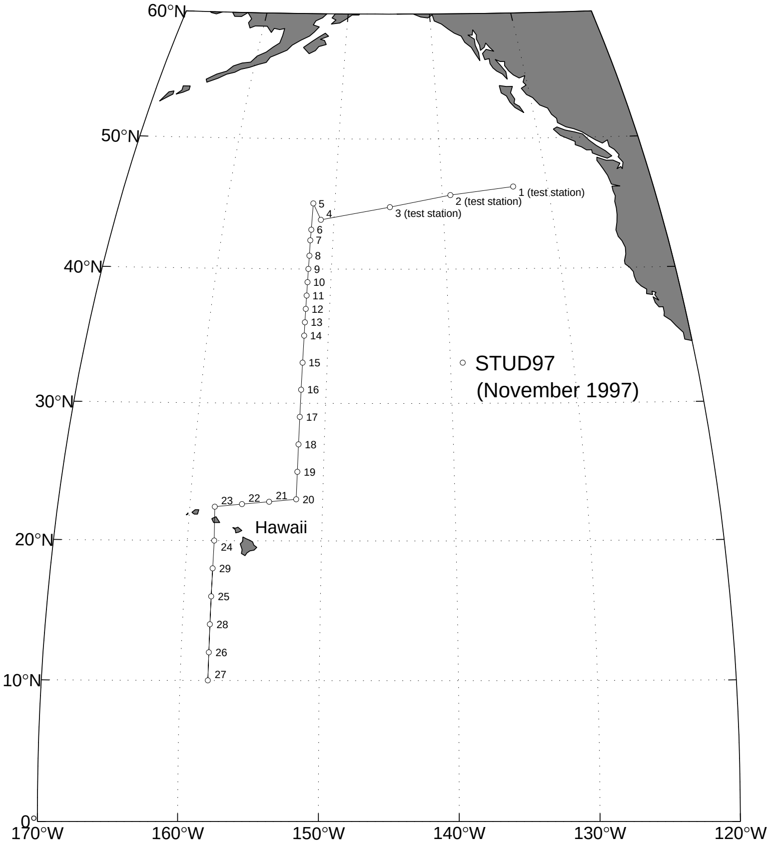

Figure B.1: Cruise track of STUD97.

report. In a separate data report, *Stump and Emerson* [1998] describe the collection, calibration, and analysis of the CTD, dissolved oxygen, and salinity data. However since a comparison of the CFC and oxygen data to earlier data is anticipated, an additional check of the oxygen and salinity data is performed in this data report.

## *B.2 CFC measurements*

### *B.2.1 Data collection*

**Sample collection and analysis** Water samples for CFC analysis were drawn from the 10-liter Niskin bottles into 100-cc ground glass syringes fitted with metal stopcocks. These samples were either the first samples drawn from the Niskins, or they were drawn immediately after the syringes for methyl bromide and methyl chloride analysis were filled. The delayed sampling in the latter case did not cause any noticeable contamination of the CFC samples. Air samples were collected with syringes approximately every two days on the foredeck of ship where no contamination from the ship was expected.

The samples were analyzed using the CFC extraction and analysis system of Dr. Mark Warner at the University of Washington. The analytical procedure is based on that described by *Bullister and Weiss* [1988]. The system was set up in the main lab of the R/V *Thomas G. Thompson*. To ensure that the instruments were working properly, blank and standard gas runs were performed in port. In addition, CFC samples were taken at the three test stations at the beginning of the cruise.

**Calibration** A working standard, calibrated on the Scripps Institute of Oceanography 1993 scale was used to calibrate the response of the electron capture detector of the gas chromatograph (Hewlett Packard 5890 Series II) to the CFCs. This standard, Airco cylinder 39765, contained gas with CFC-11 and CFC-12 concentrations of 262.21 parts per trillion (ppt) and 532.85 ppt, respectively. A drift in the response of the detector toward more counts per loop of standard gas was observed for both CFC-11 and CFC-12 during the time of the cruise. Four calibration curves were performed in intervals of about a week (one at the beginning, two during the occupation of the main section, and and one at the end). The data are reported on the Scripps Institution of Oceanography 1993 calibration scale [*Cunnold et al.*, 1994].

**Stripping efficiency** To strip the CFC gas out of the water sample, carrier gas (95% argon, 5% methane) is bubbled through the water samples while the samples reside in the stripping chamber. Because the solubility of CFCs decreases with temperature and CFCs are hence more easily stripped out of warmer water, the stripping chamber was also heated to 30°–50°C during the stripping process. The stripping efficiency is determined by restripping at water sample after it has been analyzed once and by comparing the remaining CFC concentrations to the concentrations of the first analysis. A total of 18 restrips were performed during the cruise. As a result, the stripping efficiency at stations 4–8 is estimated to be 98.6% for CFC-11 and 99.0% for CFC-12. For the last two samples analyzed at station 8 and for stations 9–29, the flow rate of the carrier gas during the stripping process was increased from 76 to 85 ml min$^{-1}$ which resulted in improved stripping efficiencies of 99.4% for CFC-11 and 99.5% for CFC-12.

**Precision** Replicate samples collected at the same Niskin bottles are used to determine the precision of the CFC measurements. Based on 15 replicates, the precision of the CFC-11 measurements is 0.22% or 0.0057 pmol kg$^{-1}$ whichever is greater. The precision of the CFC-12 measurements is 0.18% or 0.0017 pmol kg$^{-1}$ whichever is greater.

**Sampling blanks** A small amount of contamination with regard to CFCs is always present during the collection and analysis of water samples. The level of background contamination, the so-called blank concentration, is normally estimated by taking the mode of the CFC concentrations measured in samples that are expected to be CFC-free. Since the detection limit for CFCs during an earlier cruise along 152°W in 1991 (WOCEP16N) had been $\sim$900 m and it seemed unlikely that CFCs had penetrated more than 100 m further downward between 1991 and 1997, water at depth $>$1000 m was expected to be CFC-free during STUD97. To be safe only samples collected at depths $\geq$1500 m were used to estimate the sampling blanks.

As it was the goal of the cruise to sample the upper water column of the North Pacific, the collection of the deep, CFC-free samples was limited to the few deep casts. A total of 18 CFC samples was collected at depth$\geq$1500 m along the main section. Because only the first and sometimes the second Niskin bottle of the rosette could be spared to collect deep samples during the deep casts, no thorough investigation of the possible CFC contamination in single bottles could be undertaken. However to reduce the risk of contamination, the O-rings in the bottles and at the stopcocks and vents on the outside of the bottles were exchanged against bute-N O-rings (vacuum baked at 90°C to drive out any absorbed CFCs) before the cruise.

The contamination of CFC-12 samples from 1500 m and below was very low. The mode of the blank samples is 0.002 pmol kg$^{-1}$ which is in agreement with the quality standards aimed for during the WOCE program (CFC-11 and CFC-12 blanks $<$0.005 pmol kg$^{-1}$). Problems arose when trying to determine the level of contamination of the CFC-11 samples. During the three test stations at the beginning of the cruise, CFC-11 concentrations in the deep samples (2000 m) ranged from

0.015 pmol kg$^{-1}$ to 0.08 pmol kg$^{-1}$. Examination of the ship board air showed that CFC-11 concentrations in the main lab were as much as 9 times higher than in the clean air collected at the bow of the ship. Therefore, it was decided to store the water bath with the CFC samples outside in the covered CTD area where CFC-11 concentrations were less than 1.5 times higher than in clean air. The water samples were carried inside only just before they were analyzed. For the main part of the cruise CFC-11 blank concentrations were reduced but remained slightly above the WOCE standards. No relationship between increased CFC-11 concentrations and syringe or bottle number could be identified. Because the statistical distribution of CFC-11 blank concentrations is spread out and no value stands out as the mode, it seemed more appropriate in this case to use the mean of the ensemble as the best estimate for the CFC-11 blank. The corresponding blank amounts to 0.016 pmol kg$^{-1}$.

**Air measurements** Air samples were usually collected by drawing air into glass syringes. Only toward the end of the cruise, air was pumped into a portable metal container because of problems with the flushing of the air syringes. This air container could be directly connected to the air input line of the CFC extraction system. At least 3 samples were analyzed during each series of air measurements to check the consistency of the samples.

Figure B.2 shows the measured air concentrations against latitude. While there is some indication of a northward gradient in CFC to the south of 40°N, air concentrations at 44°–46.5°N are as low as at 10°N or even lower and a trend cannot be identified for certain. The mean of all air measurements is 267.4 ppt for CFC-11 and 540.7 ppt for CFC-12 (solid lines) which is 1.6% and 0.4% greater than the Northern Hemisphere Advanced Global Atmospheric Gas Experiment (AGAGE) values [*Walker et al.*, 2000] interpolated to November 1997 (dashed line), respectively. Differences between the cruise values and the long-term AGAGE record may indicate an offset in the calibration, contamination of the air measurements at sea, or true variability in the air masses passing by. Since the manual air sampling employed during STUD97 is known to be less accurate (on research expeditions like the WOCE cruises a gas line from the CFC lab to the bow of the ship is installed and the air is pumped directly into the CFC gas extraction system), small amounts of contamination are a likely cause

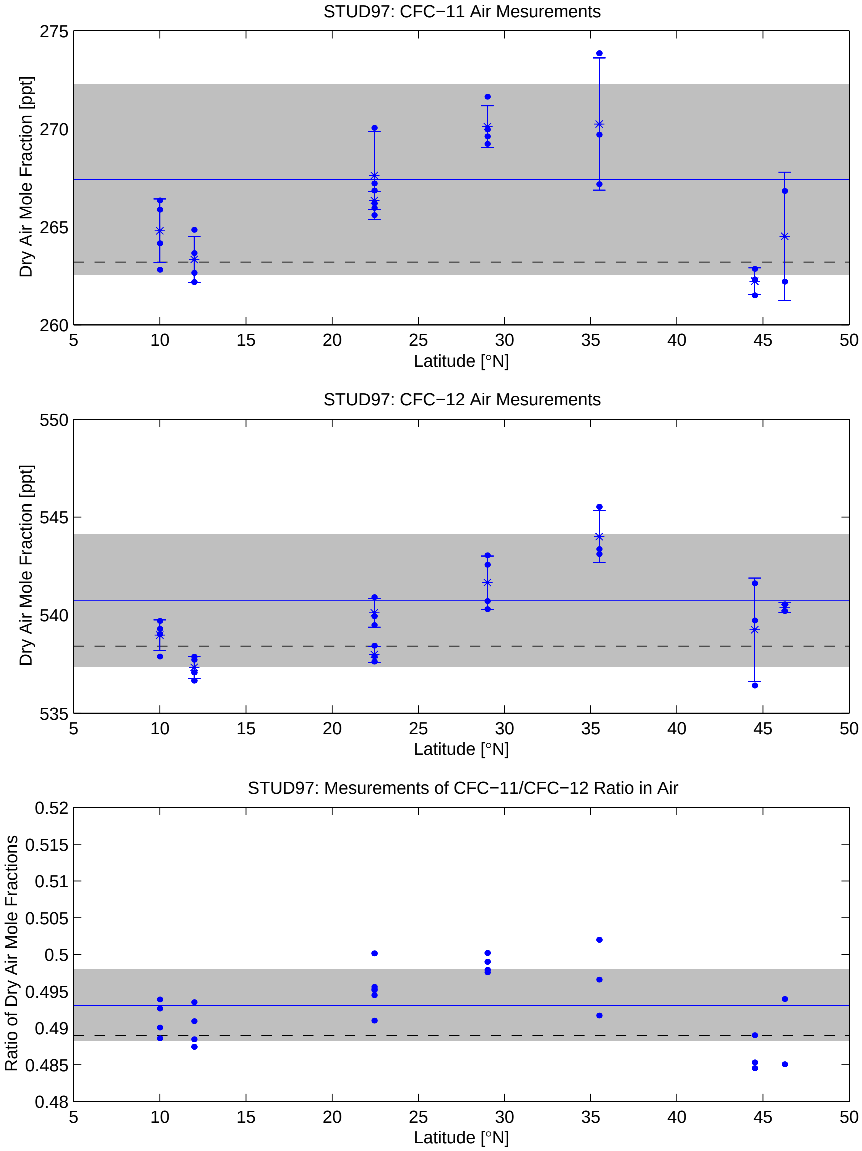

Figure B.2: STUD97 air values. For each set of measurements the mean value is indicated by an asterisk and the corresponding standard deviation is drawn as an error bar. Solid black lines marks the mean of all measurements, and gray shaded area marks the values within one standard deviation of the mean. Dashed line indicates the air values from *Walker et al.* [2000] interpolated to November 1997.

for the higher CFC air values during the cruise. Therefore air concentrations based on the AGAGE data are used when calculating the saturation of the water samples in the mixed layer. Also, the equilibration time scale of CFC concentrations in the mixed layer is on the order of 1 month, and an average atmospheric value is probably a better representation of the air, with which the mixed layer water has equilibrated, than the measurements at individual locations during the cruise interpolated to the station locations.

### *B.2.2 Quality control*

CFC data were flagged bad during the cruise when there was an error in the analytical or the sampling procedure that obviously led to an incorrect measurement. Data were marked questionable if it was not certain that the erroneous procedure affected the measurement. An additional post-cruise quality check was performed to assure that the CFC-11 and CFC-12 data are consistent with each other and with the other hydrographic data. Based on property-property plots and station profiles of CFC concentration, saturation, and ratio, three CFC samples were labeled questionable during this check. Examination of CFC-11 and CFC-12 saturations in the mixed layer (~50 m deep during STUD97) shows that the CFC measurements were usually $100 \pm 2\%$ saturated and that their saturation ratio was close to 1 (Figure B.3). Since neither CFC under- nor CFC oversaturation was expected in the mixed layer for November, these results are in agreement with the a-priori expectation and indicate that the calibration of the CFC measurements is satisfactory. The one sample at ~35°N where both CFCs were only ~90% saturated could be questionable. However since other properties such as DOC also showed unexpected values, this data point was not flagged. Comparison of the CFC saturations with the oxygen saturation in the mixed layer shows that oxygen was more consistenly supersaturated by 1–2% than the CFCs (Figure B.4). Since oxygen is biologically produced in the mixed layer, it is reasonable that oxygen is somewhat more saturated than CFCs. Oxygen can also be measured more accurately than CFCs which makes the oxygen data less scattered.

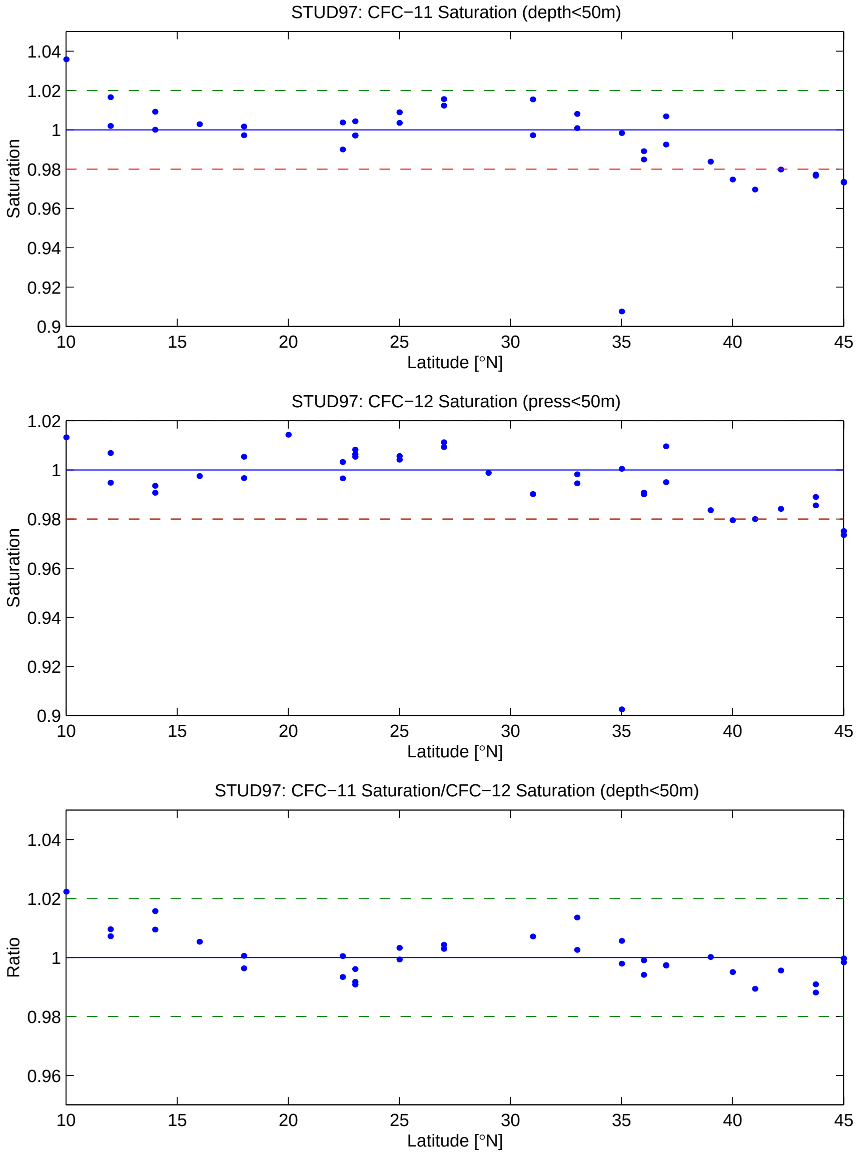

Figure B.3: STUD97 CFC-11 and CFC-12 saturation in mixed layer and CFC-11/CFC-12 saturation ratio.

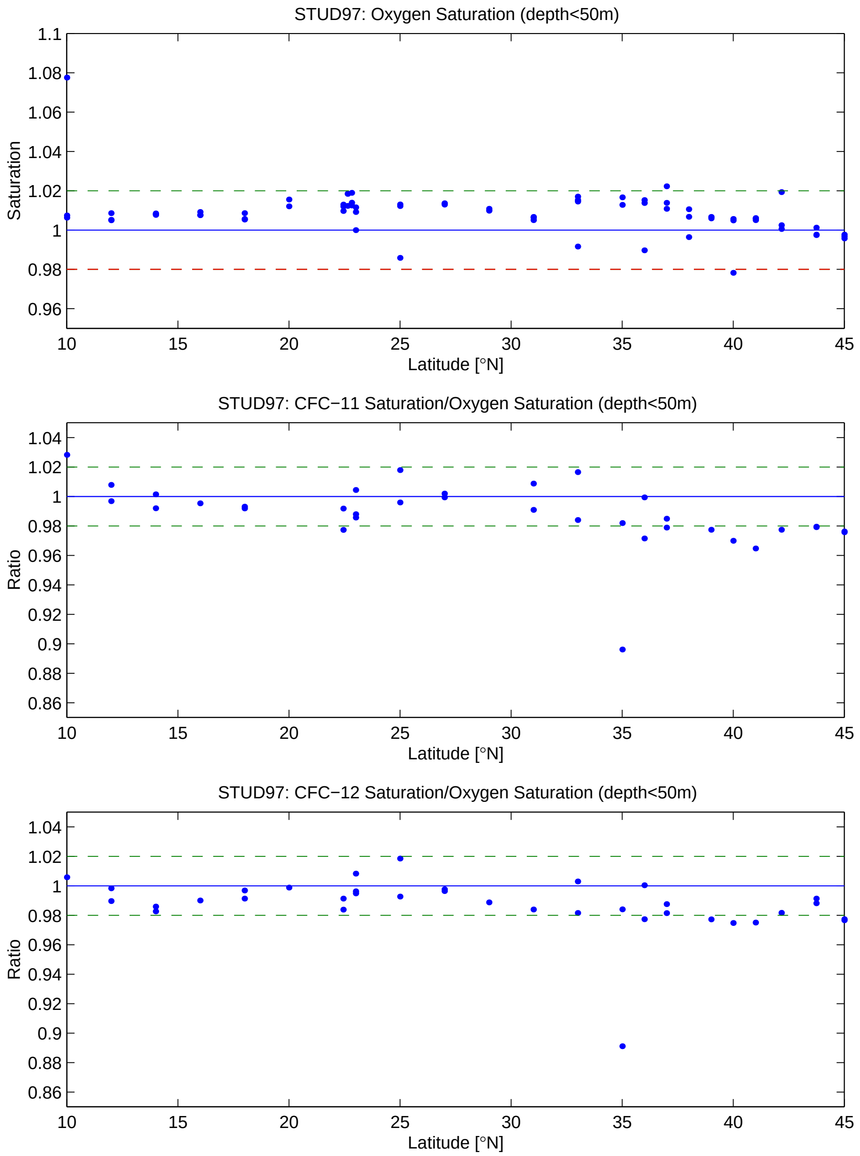

Figure B.4: STUD97 oxygen saturation in mixed layer and CFC/oxygen saturation ratios.

### *B.3 Salinity and oxygen data*

**Internal consistency check** To ensure that the hydrographic data do not provide any source of error, the bottle data reported by *Stump and Emerson* [1998] were also examined for any inconsistencies or outliers before merging them with the CFC data. It appeared that for some samples depth and temperature were entered incorrectly during the finalizing of the hydrographic data report (e.g., CTD pressure entered instead of depth; digits of temperature values transposed). Therefore, the reported depths and temperatures were substituted with those from the shipboard CTD log (.LAC files). In addition, three oxygen samples were flagged questionable or bad because they produced seemingly unreasonable spikes in the oxygen profiles (station 8, sample 17; station 15, sample 6; station 21, sample 13).

There are many samples, especially at the beginning of the cruise, where the autosalinometer/bottle salinity is more than 0.01 different from the CTD salinity [*Stump and Emerson*, 1998]. In most cases the difference presumably arises because the undergraduate students operating the autosalinometer still needed to gain experience with the instrument. While the CTD salinity should be substituted in these cases (and in general), the possibility remains that the bottles were fired at an incorrect depth. Therefore, the whole bottle could be considered questionable. However many data would be lost this way, and it is suggested that maps and calculations based on the STUD97 data are made twice, without and with the bottles with the questionable salinity samples. In the STUD97 data listing (Table B.1), CTD salinity and depth are not flagged questionable if the difference between bottle salinity and CTD salinity is $>0.01$ unless the bottle was obviously misfired according to *Stump and Emerson* [1998].

**Comparison with WOCEP16N** To determine whether the calibration of the salinity and oxygen data from STUD97 is consistent with an earlier cruise (WOCEP16N), the deep salinity and oxygen values of the two cruises are compared. WOCEP16N is one of the North Pacific WOCE cruises and was occupied in March 1991. It followed the 152°W meridian from Hawaii to Alaska. Comparison of the salinity data for depths $\geq$1500 m shows that the CTD salinity from WOCEP16N is slightly saltier (by $\sim$0.001)

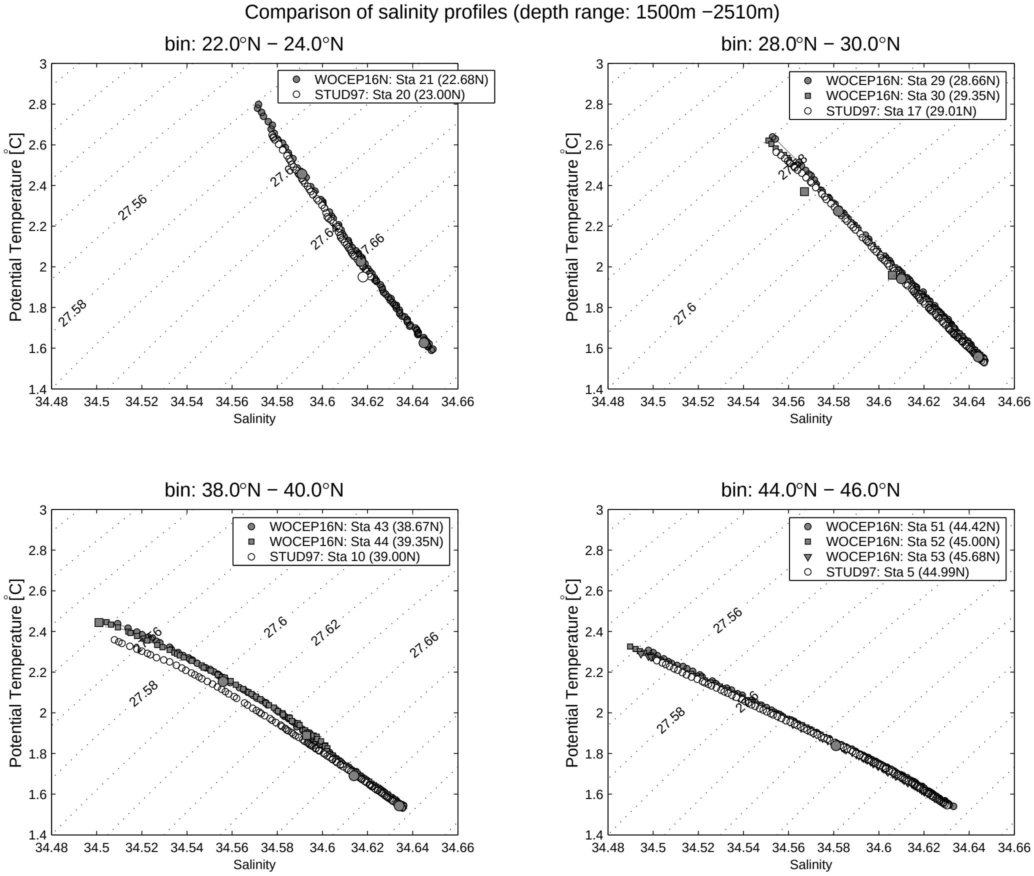

Figure B.5: Comparison of STUD97 and WOCEP16N salinity values at deep STUD97 stations. Large circles indicate bottle samples; small symbols indicate CTD data which were filtered and subsampled every 10 db. Bin size is 2° of latitude and bins are centered around the deep casts of STUD97. Depth range is 1500–2510 m. Dotted lines mark potential density.

than the CTD salinity from STUD97 in the 22°–24°N, the 28°–30°N, and the 44°–46°N bins (Figure B.5). In the 38°–40°N bin, the difference is also ∼0.001 for $\theta < 1.8$°C. For water warmer than 1.8°C, however, the salinity curves deviate and the WOCEP16N salinity becomes greater than the STUD97 salinity by ∼0.004. Assuming that there is not temporal variability in salinity in this depth range, a conservative estimate for the accuracy of the CTD salinity data between the two cruises is 0.004.

It is also apparent from Figure B.5 that the bottle salinity (large symbols) is on average less than the CTD salinity (small symbols) for both cruises. Considering all mea-

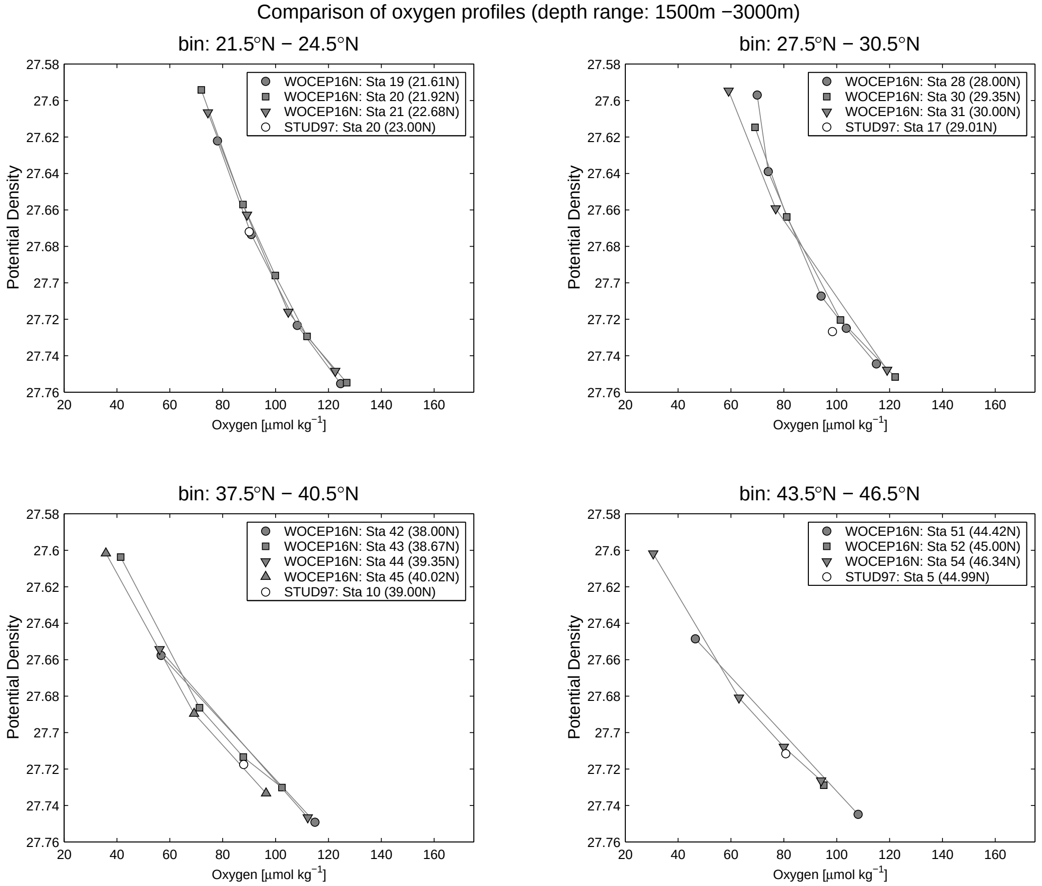

Figure B.6: Comparison of STUD97 and WOCEP16N oxygen values at deep STUD97 stations. Bin size is 3° of latitude and bins are centered around the deep casts of STUD97. Depth range is 1500–3000 m.

surements, the bottle salinity is fresher than the CTD salinity in 311 out of 511 cases for STUD97 and in 648 out of 888 cases for WOCEP16. The average differences (bottle – CTD salinity) are -0.001 ± 0.003 and -0.002±0.005, respectively, and are rather small.

Comparisons of the oxygen data below 1500 m at the same 4 locations are shown in Figure B.6. Since there is less data (the oxygen data is from the bottle data) the bin size is increased from 2° to 3°. In every bin, there is only one oxygen sample from STUD97 since only one bottle was usually closed below 1000 m during the deep casts on STUD97. Within a density interval of 0.02–0.03 surrounding the STUD97 oxygen samples, the oxygen concentrations (in $\mu$mol kg$^{-1}$) are the following:

| Bin | WOCEP16N (1991) | STUD97 (1997) | Difference |
|---|---|---|---|
| 21.5–24.5°N | $90.0 \pm 0.8$ | 90.0 | 0.0 (0.0%) |
| $\sigma_\theta = 27.66$–$27.68$ | (n=2) | (n=1) | |
| 27.5–30.5°N | $102.5 \pm 1.1$ | 98.4 | 4.1 (4.1%) |
| $\sigma_\theta = 27.71$–$27.74$ | (n=2) | (n=1) | |
| 37.5–40.5°N | 87.8 | 87.9 | 0.1 (0.1%) |
| $\sigma_\theta = 27.71$–$27.73$ | (n=1) | (n=1) | |
| 43.5–46.5°N | 80.0 | 80.7 | 0.7 (0.9%) |
| $\sigma_\theta = 27.70$–$27.72$ | (n=1) | (n=1) | |

Based on the average difference of the deep values, the oxygen measurements of WOCEP16N are $1.2 \pm 1.9\,\mu\mathrm{mol\,kg}^{-1}$ or $1.3 \pm 1.9\%$ greater than during STUD97. The absolute or the relative difference whichever is greater should be considered as a possible systematic offset when comparing the shallower data of the two cruises.

## *B.4 Data table*

The CFC data together with the hydrographic data for all stations from the main section of STUD97 are listed in Table B.1. Data from the test stations are omitted. Quality flags have been assigned for the columns underlined by asterisk which are depth (DEPTH), bottle salinity (SALNTY), CTD salinity (CTDSAL), oxygen concentration (OXYGEN) and CFC concentrations (CFC-11 and CFC-12). The flags are shown in the last column (titled QFLAG) in order of the respective columns. The flagging has been done using the protocol set by *Stump and Emerson* [1998] and based on the quality control procedures described above. Following the WOCE specifications the meaning of the flags is as follows:

2 = Acceptable measurement.
3 = Questionable measurement.
4 = Bad measurement.
6 = Mean of replicate measurements (only acceptable data included).
9 = Sample not drawn from Niskin bottle.

## Table B.1: Data listing of STUD97

**stud97.dat**

```
STUD97 bot_all_data

Sta: 4   Cast: 1   Date: 07/11/97 16:18   Pos: 43.735 N  151.192 W   Bot:   NaN m   CFC-11 air: 263.3 ppt   CFC-12 air: 538.3 ppt

SAMPNO    DEPTH   SALNTY   CTDSAL    THETA   PDNSTY   OXYGEN   OXYSAT   CFC-11   CFC-12   F11SAT   F12SAT   ORATIO   ARATIO   QFLAG
         ******   ******   ******                     ******            ******   ******
    24      2.2   33.104   33.096   12.066   25.099   265.72     1.00    3.418    1.869    0.977    0.986     1.83    0.485  222222
    23     21.1   33.107   33.096   12.071   25.098   265.75     1.00    3.419    1.875    0.977    0.989     1.82    0.483  232222
    22     41.1   33.108   33.096   12.071   25.098   266.71     1.00      NaN      NaN      NaN      NaN      NaN      NaN  232299
    21     60.9   33.113   33.096   12.070   25.098   265.66     1.00    3.420    1.882    0.977    0.993     1.82    0.482  232222
    20     80.8   33.242   33.277    9.388   25.708   269.69     0.96    3.930    2.132    0.974    0.991     1.84    0.480  232222
    19     99.6   33.365   33.355    8.472   25.912   268.69     0.93      NaN      NaN      NaN      NaN      NaN      NaN  232299
    18    120.9   33.599   33.593    8.395   26.110   253.83     0.88    3.990    2.143    0.938    0.952     1.86    0.482  222222
    17    138.7   33.873   33.868    8.509   26.309   238.68     0.83      NaN      NaN      NaN      NaN      NaN      NaN  222299
    16    159.5   33.949   33.941    8.434   26.377   231.78     0.81    3.757    1.983    0.889    0.885     1.89    0.491  222222
    15    178.6   33.973   33.963    8.242   26.424   222.76     0.77    3.668    1.915    0.858    0.847     1.92    0.496  232222
    14    199.0   33.984   33.973    8.007   26.467   214.68     0.74    3.464    1.824    0.800    0.798     1.90    0.491  232222
    13    225.9   33.984   33.975    7.670   26.517   198.09     0.68    3.264    1.686    0.740    0.725     1.94    0.499  222222
    12    251.9   33.978   33.967    7.246   26.571   178.57     0.61    2.979    1.541    0.659    0.648     1.93    0.497  232222
    11    275.4      NaN      NaN      NaN      NaN      NaN      NaN      NaN      NaN      NaN      NaN      NaN      NaN  299999
    10    299.9   33.977   33.969    6.486   26.676   153.90     0.51    2.494    1.255    0.528    0.508     1.99    0.508  222222
     9    346.6   33.967   33.957    5.810   26.752   129.79     0.43    2.202    1.088    0.448    0.425     2.02    0.515  232222
     8    401.0      NaN      NaN      NaN      NaN      NaN      NaN      NaN      NaN      NaN      NaN      NaN      NaN  299999
     7    450.5   33.995   33.986    4.836   26.890    95.85     0.31    1.471    0.723    0.282    0.269     2.03    0.514  222222
     6    502.9      NaN      NaN      NaN      NaN      NaN      NaN      NaN      NaN      NaN      NaN      NaN      NaN  299999
     5    598.8   34.113   34.103    4.129   27.059    48.01     0.15    0.573    0.285    0.106    0.102     2.01    0.506  232222
     4    698.7   34.193   34.184    3.772   27.160    29.72     0.09    0.219    0.110    0.040    0.039     1.99    0.500  222222
     3    796.2   34.254   34.243    3.500   27.234    23.05     0.07      NaN      NaN      NaN      NaN      NaN      NaN  232299
     2    893.6   34.305   34.295    3.249   27.299    15.89     0.05    0.086    0.041    0.015    0.014     2.10    0.524  232222
     1    996.4   34.351   34.341    3.029   27.356    10.49     0.03    0.062    0.022    0.011    0.007     2.82    0.704  232222
```

```
STUD97 bot_all_data

Sta: 5   Cast: 2   Date: 08/11/97 02:40   Pos: 44.994 N  152.001 W   Bot: 5337.8 m   CFC-11 air: 263.3 ppt   CFC-12 air: 538.3 ppt

SAMPNO    DEPTH   SALNTY   CTDSAL    THETA   PDNSTY   OXYGEN   OXYSAT   CFC-11   CFC-12   F11SAT   F12SAT   ORATIO   ARATIO   QFLAG
         ******   ******   ******                     ******            ******   ******
    24      2.4   33.048   33.048   11.621   25.144   268.38     1.00    3.490    1.889    0.974    0.975     1.85    0.488  222222
    23     21.4   33.049   33.048   11.622   25.144   267.85     1.00      NaN      NaN      NaN      NaN      NaN      NaN  222299
    22     41.0   33.049   33.048   11.619   25.145   268.15     1.00    3.489    1.886    0.973    0.973     1.85    0.489  222222
    21     63.9   33.050   33.049   11.578   25.153   267.66     0.99    3.489    1.888    0.971    0.973     1.85    0.488  222222
    20     81.9   33.224   33.226    8.061   25.872   279.12     0.96    4.273    2.267    0.982    0.986     1.88    0.487  222222
    19    100.4   33.291   33.293    7.729   25.973   270.97     0.93    4.265    2.274    0.963    0.974     1.88    0.484  222222
    18    119.4   33.584   33.590    7.666   26.215   246.42     0.84    4.105    2.160    0.926    0.925     1.90    0.490  222222
    17    139.2   33.817   33.821    7.589   26.408   226.56     0.78    3.925    2.041    0.884    0.873     1.92    0.495  222222
    16    159.7   33.889   33.891    7.513   26.474   214.61     0.73      NaN      NaN      NaN      NaN      NaN      NaN  222299
    15    181.7   33.907   33.908    7.225   26.528   199.83     0.68    3.479    1.782    0.768    0.749     1.95    0.502  222222
    14    200.3   33.915   33.917    7.027   26.562   184.08     0.62      NaN      NaN      NaN      NaN      NaN      NaN  222299
    13    223.9   33.927   33.928    6.730   26.611   173.76     0.58    3.053    1.539    0.655    0.631     1.98    0.508  222222
    12    249.8   33.933   33.936    6.379   26.664   157.73     0.53      NaN      NaN      NaN      NaN      NaN      NaN  222299
    11    274.6   33.935   33.938    6.097   26.701   144.55     0.48      NaN      NaN      NaN      NaN      NaN      NaN  222299
    10    298.5   33.936   33.938    5.818   26.736   130.50     0.43    2.400    1.175    0.488    0.459     2.04    0.520  222222
     9    351.1   33.942   33.944    5.177   26.818   108.91     0.35      NaN      NaN      NaN      NaN      NaN      NaN  222299
     8    400.4      NaN      NaN      NaN      NaN      NaN      NaN      NaN      NaN      NaN      NaN      NaN      NaN  299999
     7    452.2   34.004   34.009    4.441   26.952    75.93     0.24      NaN      NaN      NaN      NaN      NaN      NaN  222299
     6    502.9   34.051   34.054    4.232   27.010    60.21     0.19    0.921    0.438    0.171    0.158     2.10    0.529  222222
     5    601.3   34.131   34.133    3.931   27.104    41.12     0.13      NaN      NaN      NaN      NaN      NaN      NaN  222299
     4    704.5   34.203   34.206    3.633   27.192    29.68     0.09    0.244    0.125    0.044    0.044     1.95    0.489  222222
     3    799.4   34.259   34.262    3.384   27.260    22.92     0.07      NaN      NaN      NaN      NaN      NaN      NaN  222299
     2    901.0   34.315   34.317    3.139   27.327    15.63     0.05    0.034    0.017    0.006    0.006     2.00    0.500  222222
     1   2499.2   34.627   34.631    1.534   27.712    80.71     0.24    0.004    0.001    0.001    0.000     4.00    0.988  222266
```

```
STUD97 bot_all_data

Sta: 6   Cast: 2   Date: 08/11/97 16:59   Pos: 42.979 N  151.995 W   Bot: 5122.9 m   CFC-11 air: 263.3 ppt   CFC-12 air: 538.3 ppt

SAMPNO    DEPTH   SALNTY   CTDSAL    THETA   PDNSTY   OXYGEN   OXYSAT   CFC-11   CFC-12   F11SAT   F12SAT   ORATIO   ARATIO   QFLAG
         ******   ******   ******                     ******            ******   ******
    15    182.9   33.976   33.966    8.121   26.444   217.88     0.76      NaN      NaN      NaN      NaN      NaN      NaN  232299
    14    201.7   33.780   33.981    7.946   26.482   236.32     0.82      NaN      NaN      NaN      NaN      NaN      NaN  444499
    13    227.7   33.978   33.979    7.663   26.522   191.60     0.66      NaN      NaN      NaN      NaN      NaN      NaN  222299
    12    250.3   33.976   33.975    7.385   26.558   194.16     0.66      NaN      NaN      NaN      NaN      NaN      NaN  222299
    11    273.8   33.965   33.967    7.004   26.605   169.86     0.57      NaN      NaN      NaN      NaN      NaN      NaN  222299
    10    298.8   33.964   33.966    6.666   26.650   155.50     0.52      NaN      NaN      NaN      NaN      NaN      NaN  222299
     9    352.0      NaN      NaN      NaN      NaN      NaN      NaN      NaN      NaN      NaN      NaN      NaN      NaN  299999
     8    404.3      NaN      NaN      NaN      NaN      NaN      NaN      NaN      NaN      NaN      NaN      NaN      NaN  299999
     7    454.4   33.983   33.986    4.818   26.892    93.47     0.30      NaN      NaN      NaN      NaN      NaN      NaN  222299
     6    504.4   34.018   34.022    4.565   26.949    77.32     0.25      NaN      NaN      NaN      NaN      NaN      NaN  222299
     5    596.5   34.100   34.102    4.140   27.057    47.22     0.15      NaN      NaN      NaN      NaN      NaN      NaN  222299
     4    700.9   34.177   34.180    3.809   27.153    32.51     0.10      NaN      NaN      NaN      NaN      NaN      NaN  222299
     3    799.1   34.239   34.242    3.540   27.229    24.76     0.08      NaN      NaN      NaN      NaN      NaN      NaN  222299
     2    902.9   34.297   34.300    3.236   27.305    16.63     0.05      NaN      NaN      NaN      NaN      NaN      NaN  222299
     1   1006.4   34.345   34.348    2.995   27.365    14.72     0.05      NaN      NaN      NaN      NaN      NaN      NaN  222299
```

```
STUD97 bot_all_data

Sta: 7   Cast: 1   Date: 09/11/97 01:40   Pos: 42.168 N  152.017 W   Bot: 5114.2 m   CFC-11 air: 263.3 ppt   CFC-12 air: 538.3 ppt
```

## Table B.1 continued

**stud97.dat**

```
SAMPNO   DEPTH  SALNTY  CTDSAL   THETA  PDNSTY  OXYGEN  OXYSAT  CFC-11  CFC-12  F11SAT  F12SAT  ORATIO  ARATIO  QFLAG
        ******  ******  ******                  ******          ******  ******
    24    15.1  33.154  33.153  13.537  24.856  258.96    1.00   3.174   1.743   0.980   0.984    1.82   0.487 222222
    23    21.7  33.153  33.153  13.534  24.856  263.34    1.02     NaN     NaN     NaN     NaN     NaN     NaN 222299
    22    42.3  33.153  33.153  13.529  24.857  258.52    1.00     NaN     NaN     NaN     NaN     NaN     NaN 222299
    21    60.9  33.154  33.147  13.497  24.859  259.94    1.01   3.186   1.739   0.981   0.980    1.83   0.490 222222
    20    78.8  33.304  33.309   9.537  25.709  271.71    0.97   4.003   2.129   1.000   0.997    1.88   0.490 222222
    19    99.7     NaN     NaN     NaN     NaN     NaN     NaN     NaN     NaN     NaN     NaN     NaN     NaN 299999
    18   122.5  33.635  33.650   8.805  26.092  245.33    0.86   3.980   2.102   0.958   0.953    1.89   0.492 232222
    17   143.8  33.828  33.839   8.571  26.276  232.19    0.81   3.946   2.070   0.939   0.930    1.91   0.494 232222
    16   161.7  33.908  33.911   8.418  26.356  228.47    0.80   3.891   2.016   0.919   0.899    1.93   0.500 222222
    15   183.2  33.945  33.946   8.254  26.408  224.05    0.78   3.796   1.966   0.889   0.870    1.93   0.500 222222
    14   199.9  33.610  33.957   8.051  26.447  229.79    0.80     NaN     NaN     NaN     NaN     NaN     NaN 444499
    13   225.2  33.968  33.970   7.790  26.496  201.89    0.69   3.429   1.746   0.782   0.755    1.96   0.507 222266
    12   252.6  33.984  33.984   7.518  26.546  184.97    0.63   3.145   1.574   0.707   0.672    2.00   0.514 222222
    11   277.0  33.979  33.980   7.236  26.583  170.75    0.58   2.898   1.444   0.641   0.607    2.01   0.516 222222
    10   305.0  33.974  33.976   6.761  26.645  155.41    0.52     NaN     NaN     NaN     NaN     NaN     NaN 222299
     9   353.1  33.962  33.964   5.934  26.742  130.00    0.43   2.218   1.082   0.454   0.426    2.05   0.522 222222
     8   396.9     NaN     NaN     NaN     NaN     NaN     NaN     NaN     NaN     NaN     NaN     NaN     NaN 299999
     7   450.9     NaN     NaN     NaN     NaN     NaN     NaN     NaN     NaN     NaN     NaN     NaN     NaN 299999
     6   501.1  34.026  34.032   4.601  26.953   75.26    0.24   0.955   0.465   0.181   0.171    2.05   0.518 222222
     5   604.9  34.098  34.103   4.203  27.052   47.76    0.15   0.488   0.239   0.090   0.086    2.04   0.514 222222
     4   701.3  34.180  34.183   3.826  27.154   31.92    0.10     NaN     NaN     NaN     NaN     NaN     NaN 222299
     3   802.9  34.248  34.250   3.490  27.241   21.93    0.07   0.089   0.045   0.016   0.016    1.98   0.495 222222
     2   902.2  34.298  34.301   3.231  27.306   15.23    0.05     NaN     NaN     NaN     NaN     NaN     NaN 222299
     1  1004.1  34.342  34.345   3.015  27.361   11.22    0.03   0.017   0.011   0.003   0.004    1.55   0.386 222222
```

```
STUD97 bot_all_data

Sta: 8   Cast: 1   Date: 09/11/97 17:50   Pos: 41.002 N  152.004 W   Bot:   NaN m   CFC-11 air: 263.3 ppt   CFC-12 air: 538.3 ppt

SAMPNO   DEPTH  SALNTY  CTDSAL   THETA  PDNSTY  OXYGEN  OXYSAT  CFC-11  CFC-12  F11SAT  F12SAT  ORATIO  ARATIO  QFLAG
        ******  ******  ******                  ******          ******  ******
    24    17.2  33.457  33.458  14.611  24.868  253.72    1.01     NaN     NaN     NaN     NaN     NaN     NaN 222299
    23    31.1  33.458  33.458  14.607  24.869  253.55    1.01   2.965   1.649   0.970   0.980    1.80   0.484 222222
    22    46.7  33.457  33.457  14.606  24.868  253.81    1.01     NaN     NaN     NaN     NaN     NaN     NaN 222299
    21    67.3  33.451  33.487  11.367  25.532  282.20    1.05   3.712   1.978   1.026   1.013    1.88   0.495 232222
    20    87.3  33.571  33.561  10.062  25.818  269.73    0.97   3.863   2.052   0.996   0.988    1.88   0.493 232222
    19   106.6  33.526  33.566   9.735  25.877  261.37    0.94   3.917   2.092   0.992   0.992    1.87   0.489 232222
    18   127.2  33.656  33.670   9.668  25.969  259.77    0.93   3.885   2.072   0.981   0.980    1.87   0.490 232222
    17   146.7  33.787  33.788   9.372  26.110  219.73    0.78     NaN     NaN     NaN     NaN     NaN     NaN 222399
    16   165.1  33.910  33.901   9.241  26.219  240.76    0.86   3.825   2.014   0.946   0.935    1.90   0.495 222222
    15   186.8  33.985  33.988   9.136  26.304  235.04    0.83     NaN     NaN     NaN     NaN     NaN     NaN 222299
    14   205.7  34.019  34.019   8.971  26.355  226.85    0.80   3.677   1.920   0.897   0.881    1.92   0.498 222222
    13   229.0  34.018  34.020   8.770  26.387  222.51    0.78     NaN     NaN     NaN     NaN     NaN     NaN 222299
    12   257.6  33.994  33.998   8.300  26.442  214.38    0.75   3.545   1.831   0.833   0.813    1.94   0.501 222222
    11   304.8     NaN     NaN     NaN     NaN     NaN     NaN     NaN     NaN     NaN     NaN     NaN     NaN 299999
    10   353.4  33.985  33.985   6.823  26.643  153.66    0.52   2.614   1.283   0.564   0.528    2.04   0.522 222222
     9   402.8     NaN     NaN     NaN     NaN     NaN     NaN     NaN     NaN     NaN     NaN     NaN     NaN 299999
     8   402.5     NaN     NaN     NaN     NaN     NaN     NaN     NaN     NaN     NaN     NaN     NaN     NaN 299999
     7   453.0  33.968  33.971   5.464  26.805  115.10    0.38     NaN     NaN     NaN     NaN     NaN     NaN 222299
     6   501.5  33.981  33.985   5.026  26.868  101.63    0.33   1.508   0.729   0.293   0.274    2.07   0.524 222222
     5   595.1  34.066  34.068   4.418  27.001   64.01    0.20   0.778   0.374   0.146   0.136    2.08   0.524 222222
     4   695.1  34.150  34.154   3.981  27.115   37.14    0.12   0.290   0.145   0.053   0.052    2.00   0.503 222222
     3   796.2  34.220  34.224   3.642  27.205   26.18    0.08   0.109   0.057   0.020   0.020    1.91   0.479 222222
     2   895.0  34.325  34.277   3.360  27.275   28.34    0.09     NaN     NaN     NaN     NaN     NaN     NaN 232299
     1   992.7  34.325  34.328   3.110  27.339   14.99    0.05   0.018   0.012   0.003   0.004    1.50   0.375 222222
```

```
STUD97 bot_all_data

Sta: 9   Cast: 1   Date: 10/11/97 00:37   Pos: 39.999 N  151.999 W   Bot: 5249.7 m   CFC-11 air: 263.3 ppt   CFC-12 air: 538.3 ppt

SAMPNO   DEPTH  SALNTY  CTDSAL   THETA  PDNSTY  OXYGEN  OXYSAT  CFC-11  CFC-12  F11SAT  F12SAT  ORATIO  ARATIO  QFLAG
        ******  ******  ******                  ******          ******  ******
    24     6.9  33.577  33.576  15.783  24.702  247.49    1.00   2.807   1.563   0.975   0.980    1.80   0.487 222222
    23    20.1  33.576  33.576  15.786  24.702  247.66    1.01     NaN     NaN     NaN     NaN     NaN     NaN 222299
    22    39.5  33.576  33.576  15.783  24.702  240.92    0.98     NaN     NaN     NaN     NaN     NaN     NaN 222299
    21    61.4  33.574  33.571  15.772  24.701  247.76    1.01   2.804   1.570   0.973   0.983    1.79   0.484 222222
    20    78.7  33.584  33.598  12.570  25.392  271.41    1.03     NaN     NaN     NaN     NaN     NaN     NaN 232299
    19   101.8  33.649  33.655  10.857  25.754  258.76    0.95   3.681   1.984   0.992   0.994    1.86   0.488 222222
    18   121.4  33.725  33.720  10.375  25.889  250.65    0.91     NaN     NaN     NaN     NaN     NaN     NaN 222299
    17   142.1  33.894  33.872  10.034  26.066  232.58    0.84   3.707   1.978   0.957   0.955    1.87   0.490 232266
    16   161.6  34.014  34.008   9.838  26.205  231.22    0.83     NaN     NaN     NaN     NaN     NaN     NaN 222299
    15   180.6  34.066  34.065   9.715  26.270  225.69    0.81   3.626   1.909   0.922   0.909    1.90   0.496 222222
    14   201.3  34.075  34.079   9.437  26.327  223.51    0.80     NaN     NaN     NaN     NaN     NaN     NaN 222299
    13   226.2  34.068  34.070   9.207  26.357  218.40    0.78   3.539   1.825   0.875   0.848    1.94   0.505 222222
    12   251.1  34.056  34.058   8.942  26.390  212.69    0.75   3.462   1.774   0.843   0.813    1.95   0.507 222222
    11   300.3  34.037  34.039   8.293  26.476  194.85    0.68     NaN     NaN     NaN     NaN     NaN     NaN 222299
    10   352.6  34.020  34.022   7.530  26.574  172.26    0.59     NaN     NaN     NaN     NaN     NaN     NaN 222299
     9   402.7  33.999  34.000   6.815  26.656  148.72    0.50   2.404   1.177   0.519   0.485    2.04   0.523 222222
     8   403.2     NaN     NaN     NaN     NaN     NaN     NaN     NaN     NaN     NaN     NaN     NaN     NaN 299999
     7   451.1  33.981  33.983   6.126  26.733  133.92    0.44   2.077   1.005   0.431   0.399    2.07   0.527 222222
     6   500.1  33.978  33.979   5.444  26.814  118.56    0.39   1.636   0.785   0.326   0.301    2.08   0.529 222222
     5   601.8  34.042  34.045   4.629  26.960   72.80    0.23   0.776   0.383   0.147   0.141    2.03   0.512 222222
     4   702.0  34.131  34.132   4.108  27.085   41.52    0.13   0.257   0.130   0.047   0.047    1.98   0.497 222222
     3   803.6  34.199  34.202   3.732  27.179   26.42    0.08   0.111   0.054   0.020   0.019    2.06   0.516 222222
     2   899.9  34.261  34.266   3.414  27.261   16.11    0.05   0.031   0.022   0.005   0.008    1.41   0.353 222222
```

## Table B.1 continued

**stud97.dat**

```
     1  1003.9  34.318  34.320   3.156  27.328    9.43    0.03   0.003   0.005   0.001   0.002    0.60   0.150 222222


STUD97 bot_all_data

Sta: 10   Cast: 1   Date: 10/11/97 06:46   Pos: 39.003 N  152.004 W   Bot: 5348.8 m   CFC-11 air: 263.3 ppt   CFC-12 air: 538.3 ppt


SAMPNO   DEPTH  SALNTY  CTDSAL   THETA  PDNSTY  OXYGEN  OXYSAT  CFC-11  CFC-12  F11SAT  F12SAT  ORATIO  ARATIO  QFLAG
        ******  ******  ******                  ******          ******  ******
    24    11.0  33.513  33.513  16.580  24.472  244.18    1.01   2.726   1.517   0.984   0.984    1.80   0.489 222222
    23    23.6  33.513  33.512  16.577  24.472  244.24    1.01     NaN     NaN     NaN     NaN     NaN     NaN 222299
    22    43.8  33.513  33.512  16.579  24.472  244.05    1.01     NaN     NaN     NaN     NaN     NaN     NaN 222299
    21    64.2  33.586  33.584  16.314  24.588  248.10    1.02   2.789   1.555   0.994   0.997    1.79   0.487 222222
    20    82.8  33.491  33.491  12.371  25.347  277.15    1.05   3.560   1.903   1.038   1.022    1.87   0.497 222222
    19   102.4  33.560  33.564  11.544  25.559  274.10    1.02     NaN     NaN     NaN     NaN     NaN     NaN 222299
    18   120.8  33.590  33.592  10.968  25.685  260.07    0.96   3.686   1.978   0.999   0.995    1.86   0.491 222222
    17   140.2  33.708  33.728  10.532  25.868  248.19    0.91     NaN     NaN     NaN     NaN     NaN     NaN 232299
    16   159.2  33.819  33.825  10.228  25.996  239.84    0.87   3.708   1.983   0.967   0.965    1.87   0.490 222222
    15   179.2  33.953  33.958   9.876  26.160  230.14    0.83     NaN     NaN     NaN     NaN     NaN     NaN 222299
    14   203.1  34.063  34.064   9.715  26.269  222.71    0.80   3.639   1.902   0.925   0.906    1.91   0.500 222222
    13   228.8  34.085  34.087   9.440  26.333  217.75    0.78     NaN     NaN     NaN     NaN     NaN     NaN 222299
    12   253.7  34.081  34.079   9.221  26.362  215.68    0.77   3.510   1.811   0.869   0.842    1.94   0.505 222222
    11   302.3     NaN     NaN     NaN     NaN     NaN     NaN     NaN     NaN     NaN     NaN     NaN     NaN 299999
    10   349.9  34.040  34.043   8.021  26.519  196.31    0.68   3.107   1.535   0.719   0.672    2.02   0.523 222222
     9   399.2     NaN     NaN     NaN     NaN     NaN     NaN     NaN     NaN     NaN     NaN     NaN     NaN 299999
     8   398.3     NaN     NaN     NaN     NaN     NaN     NaN     NaN     NaN     NaN     NaN     NaN     NaN 299999
     7   449.0  33.987  33.989   6.497  26.690  141.70    0.47     NaN     NaN     NaN     NaN     NaN     NaN 222299
     6   495.6  33.972  33.975   5.733  26.776  123.30    0.40     NaN     NaN     NaN     NaN     NaN     NaN 222299
     5   598.5  34.029  34.032   4.733  26.938   76.86    0.25   0.851   0.413   0.163   0.153    2.06   0.521 222222
     4   702.1  34.105  34.113   4.209  27.059   47.55    0.15     NaN     NaN     NaN     NaN     NaN     NaN 222299
     3   801.3  34.193  34.197   3.762  27.172   26.56    0.08     NaN     NaN     NaN     NaN     NaN     NaN 222299
     2   898.1  34.257  34.262   3.430  27.256   13.81    0.04   0.029   0.016   0.005   0.006    1.81   0.454 222222
     1  2491.0  34.638  34.637   1.519  27.717   87.92    0.26   0.002   0.002   0.000   0.001    1.00   0.247 222266


STUD97 bot_all_data

Sta: 11   Cast: 1   Date: 10/11/97 15:01   Pos: 38.001 N  151.998 W   Bot: 4254.9 m   CFC-11 air: 263.3 ppt   CFC-12 air: 538.3 ppt


SAMPNO   DEPTH  SALNTY  CTDSAL   THETA  PDNSTY  OXYGEN  OXYSAT  CFC-11  CFC-12  F11SAT  F12SAT  ORATIO  ARATIO  QFLAG
        ******  ******  ******                  ******          ******  ******
    24     3.1  33.777  33.775  17.325  24.498  240.34    1.01     NaN     NaN     NaN     NaN     NaN     NaN 222299
    23    22.4  33.779  33.779  17.339  24.498  241.19    1.01     NaN     NaN     NaN     NaN     NaN     NaN 222299
    22    43.4  33.780  33.779  17.337  24.498  237.81    1.00     NaN     NaN     NaN     NaN     NaN     NaN 222299
    21    61.5  33.911  33.908  14.137  25.315  273.96    1.08     NaN     NaN     NaN     NaN     NaN     NaN 222299
    20    82.8  33.872  33.854  11.349  25.821  251.72    0.94     NaN     NaN     NaN     NaN     NaN     NaN 232299
    19   103.0  33.819  33.814  10.588  25.925  255.54    0.93     NaN     NaN     NaN     NaN     NaN     NaN 222299
    18   123.1  33.890  33.900  10.508  26.006  253.10    0.92     NaN     NaN     NaN     NaN     NaN     NaN 232299
    17   142.6  33.992  33.996  10.436  26.094  242.57    0.89     NaN     NaN     NaN     NaN     NaN     NaN 222299
    16   162.3  34.027  34.034  10.212  26.162  232.54    0.84     NaN     NaN     NaN     NaN     NaN     NaN 222299
    15   180.9  34.129  34.126  10.278  26.222  230.67    0.84     NaN     NaN     NaN     NaN     NaN     NaN 222299
    14   202.5  34.123  34.123  10.050  26.259  228.09    0.83     NaN     NaN     NaN     NaN     NaN     NaN 222299
    13   226.7  34.152  34.152   9.940  26.300  223.46    0.81     NaN     NaN     NaN     NaN     NaN     NaN 222299
    12   252.8  34.153  34.133   9.643  26.335  223.33    0.80     NaN     NaN     NaN     NaN     NaN     NaN 232299
    11   301.7  34.076  34.074   8.957  26.400  211.07    0.75     NaN     NaN     NaN     NaN     NaN     NaN 222299
    10   351.0  34.050  34.052   8.303  26.484  190.43    0.66     NaN     NaN     NaN     NaN     NaN     NaN 222299
     9   400.8     NaN     NaN     NaN     NaN     NaN     NaN     NaN     NaN     NaN     NaN     NaN     NaN 299999
     8   400.9     NaN     NaN     NaN     NaN     NaN     NaN     NaN     NaN     NaN     NaN     NaN     NaN 299999
     7   452.4  34.001  34.003   6.746  26.668  148.49    0.50     NaN     NaN     NaN     NaN     NaN     NaN 222299
     6   502.1     NaN     NaN     NaN     NaN     NaN     NaN     NaN     NaN     NaN     NaN     NaN     NaN 299999
     5   598.6  34.028  34.031   4.787  26.931   81.98    0.26     NaN     NaN     NaN     NaN     NaN     NaN 222299
     4   699.1  34.067  34.109   4.268  27.050   49.45    0.16     NaN     NaN     NaN     NaN     NaN     NaN 232299
     3   797.5  34.185  34.189   3.796  27.162   28.56    0.09     NaN     NaN     NaN     NaN     NaN     NaN 222299
     2   897.8  34.261  34.262   3.435  27.255   12.02    0.04     NaN     NaN     NaN     NaN     NaN     NaN 222299
     1   998.4  34.313  34.315   3.191  27.321    9.86    0.03     NaN     NaN     NaN     NaN     NaN     NaN 222299


STUD97 bot_all_data

Sta: 12   Cast: 2   Date: 11/11/97 00:23   Pos: 37.001 N  151.998 W   Bot: 5460.2 m   CFC-11 air: 263.3 ppt   CFC-12 air: 538.3 ppt


SAMPNO   DEPTH  SALNTY  CTDSAL   THETA  PDNSTY  OXYGEN  OXYSAT  CFC-11  CFC-12  F11SAT  F12SAT  ORATIO  ARATIO  QFLAG
        ******  ******  ******                  ******          ******  ******
    24     3.0  34.051  34.050  18.500  24.422  236.30    1.01   2.494   1.407   0.992   0.995    1.77   0.488 222222
    23    21.1  34.061  34.063  18.494  24.433  235.60    1.01     NaN     NaN     NaN     NaN     NaN     NaN 222299
    22    41.1  34.073  34.078  18.504  24.443  238.21    1.02   2.529   1.427   1.007   1.010    1.77   0.488 222222
    21    61.8  33.882  33.865  13.464  25.421  275.93    1.07     NaN     NaN     NaN     NaN     NaN     NaN 232299
    20    81.3  33.957  33.940  12.660  25.639  260.72    1.00   2.741   1.523   0.815   0.833    1.80   0.479 232233
    19   101.9  34.073  34.078  12.363  25.804  244.92    0.93   3.394   1.842   0.995   0.994    1.84   0.489 222222
    18   121.3  34.008  34.017  11.536  25.913  240.77    0.90   3.503   1.884   0.982   0.978    1.86   0.491 222222
    17   142.3  34.027  34.019  10.871  26.035  239.64    0.88     NaN     NaN     NaN     NaN     NaN     NaN 222299
    16   161.7  34.109  34.109  10.841  26.110  232.27    0.86   3.523   1.882   0.953   0.946    1.87   0.492 222222
    15   182.4  34.177  34.177  10.614  26.204  226.53    0.83     NaN     NaN     NaN     NaN     NaN     NaN 222299
    14   204.0  34.191  34.193  10.448  26.245  222.58    0.81   3.482   1.847   0.923   0.912    1.89   0.495 222222
    13   227.8  34.185  34.180  10.148  26.287  221.91    0.81     NaN     NaN     NaN     NaN     NaN     NaN 222299
    12   252.7  34.177  34.157   9.904  26.310  227.56    0.82   3.431   1.805   0.882   0.868    1.90   0.497 444422
    11   301.6  34.089  34.090   9.092  26.391  212.42    0.75   3.365   1.737   0.827   0.802    1.94   0.504 222222
```

## Table B.1 continued

**stud97.dat**

```
    10   352.5  34.062  34.062   8.383  26.480  190.48    0.66   3.019   1.525   0.713   0.680    1.98   0.513  222222
     9   402.9     NaN     NaN     NaN     NaN     NaN     NaN     NaN     NaN     NaN     NaN     NaN     NaN  299999
     8   453.2     NaN     NaN     NaN     NaN     NaN     NaN     NaN     NaN     NaN     NaN     NaN     NaN  299999
     7   450.7  34.002  34.001   6.674  26.676  147.25    0.49   2.243   1.104   0.480   0.451    2.03   0.520  222222
     6   502.7  33.985  33.986   5.891  26.765  129.05    0.43   1.796   0.875   0.367   0.344    2.05   0.523  222222
     5   602.8  34.022  34.023   4.880  26.914   84.79    0.27   0.895   0.447   0.172   0.166    2.00   0.506  222222
     4   703.7  34.083  34.104   4.279  27.044  133.05    0.42     NaN     NaN     NaN     NaN     NaN     NaN  444499
     3   804.1  34.175  34.176   3.855  27.146   27.07    0.09   0.087   0.049   0.016   0.017    1.78   0.446  222222
     2   902.6  34.248  34.247   3.509  27.236   13.10    0.04     NaN     NaN     NaN     NaN     NaN     NaN  222299
     1  1005.8  34.311  34.312   3.241  27.314    7.66    0.02   0.009   0.008   0.002   0.003    1.12   0.281  222222


STUD97 bot_all_data

Sta: 13   Cast: 1   Date: 11/11/97 07:05   Pos: 36.000 N  152.007 W   Bot: 5517.3 m   CFC-11 air: 263.3 ppt   CFC-12 air: 538.3 ppt


SAMPNO   DEPTH  SALNTY  CTDSAL   THETA  PDNSTY  OXYGEN  OXYSAT  CFC-11  CFC-12  F11SAT  F12SAT  ORATIO  ARATIO   QFLAG
        ******  ******  ******                  ******          ******  ******
    24     3.0  34.329  34.328  19.238  24.448  227.11    0.99   2.394   1.354   0.989   0.990    1.77   0.489  222222
    23    21.1  34.328  34.327  19.235  24.448  233.00    1.02     NaN     NaN     NaN     NaN     NaN     NaN  222299
    22    39.6  34.330  34.326  19.238  24.447  232.64    1.01   2.384   1.355   0.985   0.991    1.76   0.486  222222
    21    61.1  34.344  34.336  18.932  24.532  234.83    1.02   2.422   1.368   0.986   0.988    1.77   0.488  222222
    20    81.3  34.103  34.132  14.286  25.457  271.84    1.08     NaN     NaN     NaN     NaN     NaN     NaN  232299
    19   100.8  34.080  34.087  12.929  25.700  251.39    0.97     NaN     NaN     NaN     NaN     NaN     NaN  222299
    18   120.3  34.092  34.084  12.221  25.836  240.08    0.91     NaN     NaN     NaN     NaN     NaN     NaN  222299
    17   143.4  34.152  34.154  11.967  25.939  238.64    0.90   3.320   1.806   0.954   0.958    1.84   0.487  222222
    16   161.4  34.183  34.178  11.588  26.028  235.06    0.88     NaN     NaN     NaN     NaN     NaN     NaN  222299
    15   180.2  34.243  34.242  11.508  26.093  226.61    0.85   3.304   1.773   0.927   0.921    1.86   0.492  222222
    14   201.4  34.252  34.250  11.280  26.141  225.02    0.84   3.311   1.760   0.918   0.905    1.88   0.496  222222
    13   227.3  34.210  34.209  10.838  26.189  222.16    0.82   3.357   1.821   0.909   0.916    1.84   0.485  222223
    12   250.8  34.194  34.193  10.494  26.237  220.86    0.81   3.390   1.772   0.901   0.877    1.91   0.502  222222
    11   274.4  34.181  34.180  10.211  26.276  220.37    0.80     NaN     NaN     NaN     NaN     NaN     NaN  222299
    10   299.2  34.164  34.160   9.917  26.310  218.41    0.79   3.317   1.724   0.854   0.830    1.92   0.503  222222
     9   347.8  34.120  34.120   9.211  26.396  203.55    0.72     NaN     NaN     NaN     NaN     NaN     NaN  222299
     8   348.8  34.120  34.119   9.203  26.396  203.72    0.72     NaN     NaN     NaN     NaN     NaN     NaN  222299
     7   401.5  34.072  34.071   8.294  26.500  181.50    0.63   2.773   1.402   0.652   0.622    1.98   0.512  222222
     6   500.3  33.992  33.992   6.400  26.705  143.54    0.48   3.281   1.798   0.691   0.725    1.82   0.466  222244
     5   603.6  34.001  34.005   5.145  26.870   94.41    0.31     NaN     NaN     NaN     NaN     NaN     NaN  222299
     4   702.3  34.075  34.078   4.431  27.008   55.65    0.18   0.324   0.174   0.061   0.063    1.86   0.469  222266
     3   806.0     NaN     NaN     NaN     NaN     NaN     NaN     NaN     NaN     NaN     NaN     NaN     NaN  299999
     2   898.3  34.231  34.233   3.599  27.216   14.52    0.05   0.020   0.022   0.004   0.008    0.91   0.228  222222
     1  1000.9  34.308  34.307   3.308  27.303    8.99    0.03   0.001   0.008   0.000   0.003    0.12   0.031  222222


STUD97 bot_all_data

Sta: 14   Cast: 1   Date: 11/11/97 15:03   Pos: 35.005 N  151.995 W   Bot: 4110.5 m   CFC-11 air: 263.3 ppt   CFC-12 air: 538.3 ppt


SAMPNO   DEPTH  SALNTY  CTDSAL   THETA  PDNSTY  OXYGEN  OXYSAT  CFC-11  CFC-12  F11SAT  F12SAT  ORATIO  ARATIO   QFLAG
        ******  ******  ******                  ******          ******  ******
    23    20.1  34.309  34.309  19.446  24.380  231.56    1.01   2.176   1.224   0.908   0.903    1.78   0.492  222222
    22    40.3  34.308  34.307  19.443  24.379  232.46    1.02   2.394   1.357   0.998   1.000    1.76   0.488  222222
    21    58.5  34.357  34.347  19.043  24.512  242.99    1.06     NaN     NaN     NaN     NaN     NaN     NaN  232299
    20    80.0  34.182  34.177  14.455  25.456  276.24    1.10   3.191   1.739   1.043   1.034    1.83   0.493  222222
    19    99.1  34.183  34.178  13.377  25.681  255.19    0.99     NaN     NaN     NaN     NaN     NaN     NaN  222299
    18   118.4  34.166  34.167  12.728  25.802  240.65    0.92   3.280   1.783   0.981   0.980    1.84   0.490  222222
    17   137.1  34.166  34.161  12.309  25.879  236.63    0.90     NaN     NaN     NaN     NaN     NaN     NaN  222299
    16   158.6  34.188  34.188  11.834  25.990  232.61    0.88   3.346   1.806   0.955   0.952    1.85   0.490  222222
    15   179.3  34.256  34.255  11.586  26.089  225.02    0.84     NaN     NaN     NaN     NaN     NaN     NaN  222299
    14   198.5  34.247  34.247  11.264  26.142  225.27    0.84   3.335   1.777   0.924   0.913    1.88   0.495  222222
    13   225.6  34.244  34.245  10.960  26.195  224.44    0.83     NaN     NaN     NaN     NaN     NaN     NaN  222299
    12   251.3  34.233  34.233  10.715  26.229  222.35    0.82   3.333   1.755   0.897   0.878    1.90   0.499  222222
    11   272.4  34.207  34.206  10.364  26.270  220.80    0.81   3.346   1.746   0.883   0.859    1.92   0.503  222222
    10   297.1     NaN     NaN     NaN     NaN     NaN     NaN     NaN     NaN     NaN     NaN     NaN     NaN  299999
     9   350.0  33.998  34.122   9.252  26.391   97.52    0.35     NaN     NaN     NaN     NaN     NaN     NaN  444499
     8   399.0  34.079  34.078   8.402  26.490  186.55    0.65   2.824   1.422   0.668   0.635    1.99   0.514  222222
     7   498.7  34.003  34.002   6.581  26.689  147.04    0.49     NaN     NaN     NaN     NaN     NaN     NaN  222299
     6   600.9  33.999  34.000   5.232  26.856  100.40    0.33   0.986   0.486   0.194   0.184    2.03   0.514  222222
     5   699.6  34.072  34.074   4.455  27.002   58.29    0.19     NaN     NaN     NaN     NaN     NaN     NaN  222299
     4   796.8  34.150  34.153   3.962  27.116   29.59    0.09   0.166   0.087   0.030   0.031    1.91   0.479  222222
     3   795.5     NaN     NaN     NaN     NaN     NaN     NaN     NaN     NaN     NaN     NaN     NaN     NaN  299999
     2   900.6  34.235  34.235   3.582  27.220   13.88    0.04     NaN     NaN     NaN     NaN     NaN     NaN  222299
     1  1000.0  34.310  34.313   3.331  27.306    7.53    0.02   0.011   0.009   0.002   0.003    1.22   0.306  222222


STUD97 bot_all_data

Sta: 15   Cast: 2   Date: 12/11/97 05:04   Pos: 33.000 N  152.001 W   Bot: 5409.2 m   CFC-11 air: 263.3 ppt   CFC-12 air: 538.3 ppt


SAMPNO   DEPTH  SALNTY  CTDSAL   THETA  PDNSTY  OXYGEN  OXYSAT  CFC-11  CFC-12  F11SAT  F12SAT  ORATIO  ARATIO   QFLAG
        ******  ******  ******                  ******          ******  ******
    24     3.5  34.852  34.852  20.500  24.517  227.29    1.02   2.273   1.290   1.001   0.998    1.76   0.490  222222
    23    21.5  34.851  34.852  20.503  24.517  226.72    1.01     NaN     NaN     NaN     NaN     NaN     NaN  222299
    22    21.4  34.852  34.851  20.505  24.515  221.60    0.99   2.289   1.285   1.008   0.995    1.78   0.496  222222
    21    40.7  34.852  34.851  20.505  24.515  226.88    1.02     NaN     NaN     NaN     NaN     NaN     NaN  222299
    20    61.4  34.723  34.701  19.284  24.721  236.78    1.04   2.477   1.382   1.029   1.016    1.79   0.495  232222
    19    81.5  34.459  34.458  16.407  25.238  255.98    1.06     NaN     NaN     NaN     NaN     NaN     NaN  222299
```

# Table B.1 continued

**stud97.dat**

```
    18    100.8   34.407   34.406   15.052   25.503   247.21     1.00    2.955    1.605    0.998    0.982     1.84    0.497  222222
    17    119.8   34.374   34.379   14.269   25.651   233.55     0.93      NaN      NaN      NaN      NaN      NaN      NaN  222299
    16    139.7   34.350   34.347   13.678   25.750   224.50     0.88    3.058    1.653    0.963    0.950     1.85    0.495  222222
    15    162.1   34.340   34.339   13.129   25.856   215.23     0.83    3.087    1.638    0.944    0.918     1.88    0.503  222222
    14    179.8   34.309   34.305   12.517   25.950   211.73     0.81    3.114    1.641    0.923    0.894     1.90    0.504  222222
    13    199.6   34.292   34.291   12.107   26.019   213.01     0.81    3.136    1.642    0.909    0.878     1.91    0.506  222266
    12    223.9   34.285   34.285   11.693   26.092   209.11     0.79      NaN      NaN      NaN      NaN      NaN      NaN  222299
    11    249.1   34.256   34.256   11.284   26.145   215.04     0.80    3.174    1.643    0.880    0.845     1.93    0.510  222222
    10    276.0   34.238   34.233   10.897   26.197   217.73     0.80      NaN      NaN      NaN      NaN      NaN      NaN  222299
     9    301.1   34.204   34.205   10.506   26.244   212.77     0.78    3.178    1.628    0.845    0.806     1.95    0.512  222222
     8    350.0   34.156   34.157    9.742   26.337   207.81     0.75      NaN      NaN      NaN      NaN      NaN      NaN  222299
     7    399.6   34.108   34.109    8.923   26.433   193.26     0.68    2.807    1.410    0.684    0.646     1.99    0.517  222222
     6    500.0   34.018   34.020    7.161   26.625   271.94     0.92    2.181    1.075    0.480    0.451     2.03    0.521  222422
     5    600.8   33.992   33.993    5.498   26.819   108.65     0.35    1.161    0.562    0.232    0.216     2.07    0.525  222222
     4    700.4   34.063   34.064    4.561   26.982    58.39     0.19      NaN      NaN      NaN      NaN      NaN      NaN  222299
     3    800.0   34.143   34.145    4.013   27.105    29.77     0.09    0.080    0.048    0.015    0.017     1.67    0.419  222222
     2    903.5   34.244   34.246    3.646   27.222    12.65     0.04      NaN      NaN      NaN      NaN      NaN      NaN  222299
     1   1001.4   34.320   34.323    3.415   27.306     7.83     0.02    0.006    0.003    0.001    0.001     2.00    0.501  222222


STUD97 bot_all_data

Sta: 16   Cast: 1   Date: 12/11/97 18:17   Pos: 31.006 N  151.998 W   Bot:   NaN m   CFC-11 air: 263.3 ppt   CFC-12 air: 538.3 ppt

SAMPNO    DEPTH   SALNTY   CTDSAL    THETA   PDNSTY   OXYGEN   OXYSAT   CFC-11   CFC-12   F11SAT   F12SAT   ORATIO   ARATIO   QFLAG
         ******   ******   ******                     ******            ******   ******
    24      3.5   35.209   35.209   22.193   24.324   217.81     1.01    2.129    1.182    1.015    0.982     1.80    0.506  222223
    23     21.6   35.209   35.209   22.194   24.324   217.46     1.01      NaN      NaN      NaN      NaN      NaN      NaN  222299
    22     40.8   35.209   35.209   22.191   24.324   217.75     1.01    2.091    1.192    0.997    0.990     1.75    0.492  222222
    21     61.9   35.200   35.207   22.187   24.324   218.22     1.01      NaN      NaN      NaN      NaN      NaN      NaN  222299
    20     82.7   34.606   34.580   17.692   25.027   253.36     1.07    2.778    1.508    1.070    1.036     1.84    0.505  232222
    19    100.2   34.621   34.621   16.964   25.233   242.29     1.01    2.731    1.518    1.016    1.012     1.80    0.491  222222
    18    120.4   34.446   34.445   15.550   25.423   241.11     0.98      NaN      NaN      NaN      NaN      NaN      NaN  222299
    17    139.0   34.632   34.436   14.748   25.593   225.57     0.90    2.926    1.599    0.973    0.966     1.83    0.493  444422
    16    161.8   34.333   34.326   13.694   25.730   221.64     0.87      NaN      NaN      NaN      NaN      NaN      NaN  222299
    15    182.3   34.319   34.315   13.016   25.860   215.58     0.83    3.101    1.661    0.943    0.926     1.87    0.498  222222
    14    198.4   34.302   34.301   12.681   25.915   211.24     0.81      NaN      NaN      NaN      NaN      NaN      NaN  222299
    13    229.2   34.283   34.284   12.057   26.023   212.09     0.80    3.128    1.629    0.904    0.869     1.92    0.509  222222
    12    254.7   34.280   34.272   11.722   26.077   214.23     0.81      NaN      NaN      NaN      NaN      NaN      NaN  222299
    11    278.0   34.245   34.244   11.239   26.144   215.23     0.80    3.162    1.638    0.875    0.840     1.93    0.509  222222
    10    301.2   34.217   34.217   10.886   26.187   215.67     0.80    3.170    1.627    0.860    0.821     1.95    0.513  222222
     9    350.5   34.156   34.157    9.941   26.304   208.74     0.75    3.083    1.557    0.795    0.750     1.98    0.518  222222
     8    398.2   34.104   34.105    9.189   26.387   197.47     0.70    2.824    1.417    0.698    0.658     1.99    0.519  222222
     7    450.3   34.043   34.046    8.148   26.503   179.04     0.62      NaN      NaN      NaN      NaN      NaN      NaN  222299
     6    495.9   34.005   34.006    7.252   26.601   162.63     0.55    2.175    1.055    0.481    0.444     2.06    0.530  222222
     5    596.4   34.274   33.983    5.613   26.797    11.13     0.04    0.027    0.002    0.005    0.001    13.50    3.431  444444
     4    699.4   34.061   34.067    4.629   26.977    52.48     0.17    0.323    0.164    0.061    0.060     1.97    0.497  222222
     3    798.3   34.169   34.173    4.098   27.118    22.65     0.07    0.052    0.018    0.010    0.006     2.89    0.727  222222
     2    900.3   34.274   34.279    3.796   27.233    11.96     0.04    0.056    0.020    0.010    0.007     2.80    0.703  222222
     1   1001.0   34.365   34.368    3.547   27.329     9.89     0.03      NaN      NaN      NaN      NaN      NaN      NaN  222299


STUD97 bot_all_data

Sta: 17   Cast: 1   Date: 13/11/97 07:51   Pos: 29.008 N  151.991 W   Bot: 5417.9 m   CFC-11 air: 263.2 ppt   CFC-12 air: 538.3 ppt


SAMPNO    DEPTH   SALNTY   CTDSAL    THETA   PDNSTY   OXYGEN   OXYSAT   CFC-11   CFC-12   F11SAT   F12SAT   ORATIO   ARATIO   QFLAG
         ******   ******   ******                     ******            ******   ******
    24      5.3   35.319   35.321   23.579   24.010   213.23     1.01    1.947    1.138    0.988    0.999     1.71    0.484  222232
    23     19.8   35.319   35.320   23.585   24.008   213.35     1.01      NaN      NaN      NaN      NaN      NaN      NaN  222299
    22     40.5   35.315   35.317   23.474   24.038   213.56     1.01      NaN      NaN      NaN      NaN      NaN      NaN  222299
    21     60.1   35.132   35.132   21.723   24.397   227.08     1.04    2.242    1.277    1.046    1.041     1.76    0.492  222232
    20     79.8   34.908   34.912   19.285   24.882   233.53     1.02      NaN      NaN      NaN      NaN      NaN      NaN  222299
    19    101.2   34.840   34.835   18.316   25.068   223.49     0.96    2.543    1.410    1.011    0.997     1.80    0.496  222232
    18    119.7   34.759   34.757   17.455   25.220   220.82     0.93      NaN      NaN      NaN      NaN      NaN      NaN  222299
    17    140.0   34.680   34.680   16.621   25.359   214.41     0.89      NaN      NaN      NaN      NaN      NaN      NaN  222299
    16    160.1   34.596   34.598   15.872   25.468   213.03     0.87    2.749    1.517    0.969    0.964     1.81    0.491  222232
    15    180.6   34.539   34.536   15.206   25.570   211.21     0.85      NaN      NaN      NaN      NaN      NaN      NaN  222299
    14    202.2   34.484   34.482   14.639   25.652   207.51     0.83    2.866    1.542    0.949    0.927     1.86    0.500  222222
    13    227.2   34.359   34.368   13.433   25.816   206.33     0.80      NaN      NaN      NaN      NaN      NaN      NaN  222299
    12    251.7   34.322   34.326   12.704   25.930   208.69     0.80    3.020    1.599    0.904    0.879     1.89    0.503  222232
    11    277.7   34.294   34.287   11.929   26.049   212.54     0.80      NaN      NaN      NaN      NaN      NaN      NaN  222299
    10    299.8   34.264   34.263   11.480   26.115   213.48     0.80    3.110    1.638    0.872    0.850     1.90    0.501  222222
     9    351.5   34.172   34.181   10.375   26.249   209.05     0.76      NaN      NaN      NaN      NaN      NaN      NaN  222299
     8    400.5   34.114   34.118    9.353   26.371   196.71     0.70    2.829    1.418    0.706    0.664     2.00    0.520  222222
     7    450.2   34.062   34.064    8.394   26.480   183.59     0.64      NaN      NaN      NaN      NaN      NaN      NaN  222299
     6    502.3   34.020   34.018    7.342   26.598   165.37     0.56    2.182    1.087    0.485    0.460     2.01    0.516  222232
     5    599.4   34.369   34.000    5.773   26.791    12.91     0.04    0.002    0.004    0.000    0.002     0.50    0.127  444444
     4    701.2   34.069   34.078    4.694   26.979    55.27     0.18    0.248    0.141    0.047    0.052     1.76    0.444  222222
     3    801.1   34.187   34.189    4.118   27.129    23.02     0.07    0.053    0.024    0.010    0.009     2.21    0.556  222232
     2   1002.1   34.368   34.372    3.526   27.334    14.63     0.05    0.007    0.003    0.001    0.001     2.33    0.585  222222
     1   2505.7   34.647   34.648    1.514   27.727    98.37     0.29    0.013    0.003    0.002    0.001     4.33    1.070  222266


STUD97 bot_all_data

Sta: 18   Cast: 1   Date: 13/11/97 21:40   Pos: 27.003 N  152.000 W   Bot: 5353.4 m   CFC-11 air: 263.2 ppt   CFC-12 air: 538.3 ppt
```

# Table B.1 continued

**stud97.dat**

```
SAMPNO     DEPTH    SALNTY    CTDSAL     THETA    PDNSTY    OXYGEN    OXYSAT    CFC-11    CFC-12    F11SAT    F12SAT    ORATIO    ARATIO   QFLAG
          ******    ******    ******                        ******              ******    ******
    24       3.3    35.416    35.416    24.203    23.898    211.58      1.01     1.946     1.124     1.016     1.011      1.73     0.491  222222
    23      21.0    35.414    35.415    24.201    23.898    211.52      1.01       NaN       NaN       NaN       NaN       NaN       NaN  222299
    22      39.8    35.412    35.415    24.200    23.898    211.45      1.01     1.940     1.122     1.012     1.009      1.73     0.490  222222
    21      58.8    35.413    35.415    24.199    23.898    211.15      1.01       NaN       NaN       NaN       NaN       NaN       NaN  222299
    20      80.8    35.413    35.415    24.198    23.898    211.62      1.01     1.940     1.116     1.012     1.004      1.74     0.493  222222
    19      99.1    35.374    35.399    24.108    23.913    213.89      1.02       NaN       NaN       NaN       NaN       NaN       NaN  232299
    18     120.7    35.143    35.145    21.442    24.485    224.76      1.02     2.242     1.280     1.033     1.032      1.75     0.490  222222
    17     140.7    35.139    35.140    20.750    24.670    219.46      0.99       NaN       NaN       NaN       NaN       NaN       NaN  222299
    16     159.7    35.094    35.092    20.170    24.788    213.09      0.95     2.310     1.312     1.004     1.004      1.76     0.489  222222
    15     180.2    34.997    35.000    19.475    24.900    207.23      0.91       NaN       NaN       NaN       NaN       NaN       NaN  222299
    14     199.8    34.820    34.820    17.973    25.142    204.74      0.87     2.528     1.407     0.989     0.981      1.80     0.493  222222
    13     226.5    34.661    34.671    16.620    25.352    206.04      0.86       NaN       NaN       NaN       NaN       NaN       NaN  232299
    12     251.3    34.530    34.530    15.161    25.575    207.20      0.84     2.812     1.521     0.956     0.936      1.85     0.499  222222
    11     276.0    34.415    34.407    13.809    25.769    205.10      0.81     2.937     1.570     0.931     0.909      1.87     0.501  222222
    10     300.6    34.328    34.326    12.918    25.888    216.73      0.84       NaN       NaN       NaN       NaN       NaN       NaN  222299
     9     350.3    34.185    34.193    11.239    26.104    211.46      0.79       NaN       NaN       NaN       NaN       NaN       NaN  222299
     8     401.8    34.033    34.038     9.696    26.252    197.51      0.71     3.022     1.527     0.767     0.726      1.98     0.517  222222
     7     451.3    34.020    34.019     8.457    26.435    186.06      0.65       NaN       NaN       NaN       NaN       NaN       NaN  222299
     6     500.7    34.005    34.007     7.507    26.566    163.25      0.56     2.128     1.048     0.478     0.447      2.03     0.523  222222
     5     599.9    34.325    34.016     5.745    26.807     15.89      0.05     0.011     0.006     0.002     0.002      1.83     0.466  444444
     4     700.4    34.101    34.105     4.910    26.976     43.39      0.14     0.194     0.108     0.037     0.040      1.80     0.454  222222
     3     801.8    34.216    34.218     4.229    27.140     20.08      0.06       NaN       NaN       NaN       NaN       NaN       NaN  222299
     2     900.4    34.326    34.331     4.097    27.244     16.85      0.05     0.001     0.009     0.000     0.003      0.11     0.028  222222
     1    1001.8    34.408    34.410     3.819    27.335     22.51      0.07     0.003     0.006     0.001     0.002      0.50     0.126  222222


STUD97 bot_all_data

Sta: 19   Cast: 1   Date: 14/11/97 12:09   Pos: 24.999 N  152.001 W   Bot: 5386.0 m   CFC-11 air: 263.2 ppt   CFC-12 air: 538.4 ppt


SAMPNO     DEPTH    SALNTY    CTDSAL     THETA    PDNSTY    OXYGEN    OXYSAT    CFC-11    CFC-12    F11SAT    F12SAT    ORATIO    ARATIO   QFLAG
          ******    ******    ******                        ******              ******    ******
    24       3.1    35.350    35.353    24.450    23.776    210.66      1.01     1.914     1.108     1.009     1.006      1.73     0.491  222222
    23      18.8    35.350    35.353    24.459    23.773    204.98      0.99     1.903     1.106     1.004     1.004      1.72     0.489  222222
    22      40.2    35.350    35.352    24.452    23.775    210.48      1.01       NaN       NaN       NaN       NaN       NaN       NaN  222299
    21      59.4    35.348    35.351    24.443    23.777    209.78      1.01       NaN       NaN       NaN       NaN       NaN       NaN  222299
    20      79.6    35.274    35.295    24.013    23.863    220.39      1.05     2.029     1.160     1.049     1.035      1.75     0.496  232222
    19      99.7    35.147    35.148    21.373    24.506    225.13      1.03     2.257     1.273     1.037     1.023      1.77     0.496  222222
    18     119.0    35.130    35.138    20.801    24.654    219.36      0.99       NaN       NaN       NaN       NaN       NaN       NaN  222299
    17     140.7    35.059    35.061    20.107    24.781    214.11      0.95     2.319     1.316     1.005     1.004      1.76     0.489  222222
    16     159.7    34.878    34.883    18.814    24.980    205.74      0.89       NaN       NaN       NaN       NaN       NaN       NaN  222299
    15     179.1    34.737    34.744    17.716    25.146    202.80      0.86     2.549     1.415     0.984     0.975      1.80     0.494  222222
    14     198.8    34.572    34.583    16.393    25.337    203.71      0.84       NaN       NaN       NaN       NaN       NaN       NaN  232299
    13     225.1    34.343    34.342    14.484    25.577    203.13      0.81     2.919     1.568     0.957     0.935      1.86     0.501  222222
    12     249.4    34.181    34.181    12.658    25.827    203.79      0.78     3.041     1.605     0.906     0.879      1.89     0.504  222222
    11     299.6    34.116    34.115    10.945    26.097    206.94      0.76     3.181     1.638     0.865     0.828      1.94     0.511  222222
    10     349.2    34.066    34.059     9.681    26.271    201.80      0.72     3.074     1.558     0.780     0.740      1.97     0.515  222222
     9     398.9    34.003    34.006     8.295    26.449    178.89      0.62     2.620     1.300     0.615     0.577      2.02     0.522  222222
     8     448.7    33.997    34.001     7.290    26.592    159.66      0.54     2.085     1.034     0.462     0.436      2.02     0.518  222222
     7     497.4    34.011    34.017     6.385    26.727    108.27      0.36       NaN       NaN       NaN       NaN       NaN       NaN  222299
     6     598.7    34.075    34.078     5.252    26.915     57.10      0.19     0.318     0.173     0.063     0.066      1.84     0.466  222222
     5     598.9    34.407    34.078     5.251    26.915     33.55      0.11       NaN       NaN       NaN       NaN       NaN       NaN  444499
     4     698.5    34.185    34.189     4.509    27.087     27.17      0.09     0.074     0.040     0.014     0.015      1.85     0.467  222222
     3     797.0    34.311    34.318     4.230    27.220     23.41      0.07       NaN       NaN       NaN       NaN       NaN       NaN  222299
     2     897.6    34.405    34.410     3.884    27.329     32.72      0.10     0.041     0.028     0.007     0.010      1.46     0.368  222222
     1    1999.1    34.370    34.619     1.901    27.674     85.88      0.26     0.000     0.005     0.000     0.002      0.00     0.000  444466


STUD97 bot_all_data

Sta: 20   Cast: 1   Date: 15/11/97 02:03   Pos: 23.005 N  152.001 W   Bot: 5441.6 m   CFC-11 air: 263.2 ppt   CFC-12 air: 538.4 ppt


SAMPNO     DEPTH    SALNTY    CTDSAL     THETA    PDNSTY    OXYGEN    OXYSAT    CFC-11    CFC-12    F11SAT    F12SAT    ORATIO    ARATIO   QFLAG
          ******    ******    ******                        ******              ******    ******
    24       2.6    35.094    35.093    25.591    23.232    204.35      1.00     1.820     1.067     1.004     1.008      1.71     0.487  222222
    23      21.7    35.092    35.093    25.589    23.233    206.24      1.01     1.807     1.064     0.997     1.005      1.70     0.485  222222
    22      41.7    35.094    35.093    25.591    23.232    206.72      1.01     1.807     1.065     0.997     1.006      1.70     0.484  222222
    21      61.4    35.094    35.093    25.590    23.233    205.68      1.01     0.013     0.009     0.007     0.009      1.44     0.412  222244
    20      80.9    35.093    35.091    25.592    23.230    205.26      1.00     1.818     1.063     1.003     1.005      1.71     0.488  222222
    19     101.2    35.034    35.032    23.033    23.950    214.67      1.01     2.075     1.201     1.025     1.029      1.73     0.487  222222
    18     121.6    35.107    35.108    22.115    24.269    204.72      0.94     2.122     1.226     1.008     1.014      1.73     0.486  222222
    17     141.4    35.083    35.081    21.382    24.452    201.86      0.92     2.160     1.244     0.992     1.000      1.74     0.485  222222
    16     161.6    34.934    34.930    19.836    24.753    188.62      0.83     2.280     1.306     0.975     0.984      1.75     0.484  222222
    15     180.5    34.832    34.828    18.586    24.996    185.55      0.80     2.394     1.346     0.964     0.963      1.78     0.490  222222
    14     201.5    34.727    34.727    17.470    25.193    185.75      0.79     2.501     1.382     0.954     0.942      1.81     0.495  222222
    13     226.7    34.473    34.498    15.940    25.376    174.73      0.72     2.562     1.395     0.905     0.888      1.84     0.498  232266
    12     251.6    34.319    34.331    14.067    25.657    175.49      0.69     2.684     1.419     0.862     0.830      1.89     0.508  232222
    11     276.9    34.201    34.211    12.612    25.859    179.77      0.69     2.765     1.444     0.822     0.790      1.91     0.509  232222
    10     302.6    34.117    34.113    11.103    26.067    173.34      0.64     2.668     1.368     0.732     0.696      1.95     0.514  222222
     9     351.8    34.066    34.066     9.458    26.313    190.53      0.68     2.744     1.384     0.688     0.651      1.98     0.517  222222
     8     399.6    34.038    34.038     8.182    26.492    159.39      0.55     2.052     1.036     0.479     0.457      1.98     0.512  222222
     7     500.2    34.046    34.047     6.237    26.770     88.14      0.29     0.722     0.376     0.151     0.150      1.92     0.490  222222
     6     601.9    34.140    34.141     5.029    26.991     38.77      0.13     0.123     0.077     0.024     0.029      1.60     0.404  222222
     5     701.4    34.488    34.272     4.602    27.143     42.12      0.13     0.002     0.004     0.000     0.001      0.50     0.126  444444
     4     800.9    34.362    34.367     4.324    27.249     23.28      0.07     0.005     0.007     0.001     0.003      0.71     0.180  222222
     3     902.1    34.444    34.448     3.989    27.348     35.87      0.11     0.002     0.002     0.000     0.001      1.00     0.251  222222
```

## Table B.1 continued

**stud97.dat**

```
     2   1004.8   34.491   34.491    3.766   27.405    43.91     0.14    0.005    0.003    0.001    0.001     1.67    0.418  222222
     1   2001.3   34.618   34.621    1.950   27.672    90.04     0.27    0.000    0.002    0.000    0.001     0.00    0.000  222266

STUD97 bot_all_data

Sta: 21   Cast: 1   Date: 15/11/97 16:02   Pos: 22.824 N  154.032 W   Bot: 4838.4 m   CFC-11 air: 263.2 ppt   CFC-12 air: 538.4 ppt

SAMPNO    DEPTH   SALNTY   CTDSAL    THETA   PDNSTY   OXYGEN   OXYSAT   CFC-11   CFC-12   F11SAT   F12SAT   ORATIO   ARATIO   QFLAG
         ******   ******   ******                     ******            ******   ******
    24      3.6   35.140   35.141   25.393   23.329   207.83     1.01      NaN      NaN      NaN      NaN      NaN      NaN  222299
    23     21.8   35.140   35.140   25.384   23.331   207.57     1.01      NaN      NaN      NaN      NaN      NaN      NaN  222299
    22     41.2   35.157   35.177   25.330   23.376   209.02     1.02      NaN      NaN      NaN      NaN      NaN      NaN  232299
    21     61.5   35.253   35.247   25.212   23.465   193.80     0.94      NaN      NaN      NaN      NaN      NaN      NaN  222299
    20     81.3   35.242   35.212   24.110   23.771   216.38     1.03      NaN      NaN      NaN      NaN      NaN      NaN  232299
    19    101.3   35.121   35.119   21.835   24.356   221.78     1.02      NaN      NaN      NaN      NaN      NaN      NaN  222299
    18    120.8   35.080   35.086   20.699   24.642   217.06     0.98      NaN      NaN      NaN      NaN      NaN      NaN  222299
    17    140.8   35.039   35.034   19.897   24.816   209.70     0.93      NaN      NaN      NaN      NaN      NaN      NaN  222299
    16    160.0   34.957   34.956   18.953   25.001   196.89     0.86      NaN      NaN      NaN      NaN      NaN      NaN  222299
    15    181.0   34.847   34.845   17.867   25.187   196.03     0.84      NaN      NaN      NaN      NaN      NaN      NaN  222299
    14    201.3   34.737   34.741   16.892   25.342   199.57     0.83      NaN      NaN      NaN      NaN      NaN      NaN  222299
    13    226.2   34.605   34.594   15.522   25.544   176.91     0.72      NaN      NaN      NaN      NaN      NaN      NaN  232399
    12    250.3   34.473   34.482   14.540   25.673   206.56     0.82      NaN      NaN      NaN      NaN      NaN      NaN  222299
    11    275.7   34.343   34.344   13.313   25.822   207.60     0.81      NaN      NaN      NaN      NaN      NaN      NaN  222299
    10    301.1   34.240   34.234   11.883   26.017   211.32     0.80      NaN      NaN      NaN      NaN      NaN      NaN  222299
     9    350.8   34.108   34.110    9.948   26.266   202.50     0.73      NaN      NaN      NaN      NaN      NaN      NaN  222299
     8    398.6   34.073   34.075    8.584   26.459   153.01     0.54      NaN      NaN      NaN      NaN      NaN      NaN  222299
     7    499.6   34.089   34.092    6.936   26.713    94.67     0.32      NaN      NaN      NaN      NaN      NaN      NaN  222299
     6    599.5   34.111   34.112    5.433   26.921    53.75     0.18      NaN      NaN      NaN      NaN      NaN      NaN  222299
     5    599.2   34.461   34.112    5.433   26.921    35.73     0.12      NaN      NaN      NaN      NaN      NaN      NaN  444499
     4    699.3   34.249   34.252    4.758   27.110    24.09     0.08      NaN      NaN      NaN      NaN      NaN      NaN  222299
     3    799.9   34.391   34.395    4.440   27.258    23.80     0.08      NaN      NaN      NaN      NaN      NaN      NaN  222299
     2    899.6   34.458   34.460    4.173   27.339    35.54     0.11      NaN      NaN      NaN      NaN      NaN      NaN  222299
     1   1001.0   34.494   34.496    3.900   27.396    42.18     0.13      NaN      NaN      NaN      NaN      NaN      NaN  222299

STUD97 bot_all_data

Sta: 22   Cast: 1   Date: 16/11/97 05:53   Pos: 22.644 N  156.078 W   Bot: 4392.0 m   CFC-11 air: 263.2 ppt   CFC-12 air: 538.4 ppt

SAMPNO    DEPTH   SALNTY   CTDSAL    THETA   PDNSTY   OXYGEN   OXYSAT   CFC-11   CFC-12   F11SAT   F12SAT   ORATIO   ARATIO   QFLAG
         ******   ******   ******                     ******            ******   ******
    24      3.1   35.114   35.116   25.503   23.277   208.41     1.02      NaN      NaN      NaN      NaN      NaN      NaN  222299
    23     21.1   35.114   35.116   25.504   23.276   208.40     1.02      NaN      NaN      NaN      NaN      NaN      NaN  222299
    22     40.9   35.110   35.112   25.464   23.286   207.28     1.01      NaN      NaN      NaN      NaN      NaN      NaN  222299
    21     61.2   35.111   35.112   25.440   23.293   208.21     1.02      NaN      NaN      NaN      NaN      NaN      NaN  222299
    20     80.9   35.127   35.129   25.274   23.357   210.35     1.02      NaN      NaN      NaN      NaN      NaN      NaN  222299
    19    100.9   35.083   35.081   23.104   23.967   217.39     1.02      NaN      NaN      NaN      NaN      NaN      NaN  222299
    18    120.9   35.089   35.090   21.712   24.368   205.56     0.94      NaN      NaN      NaN      NaN      NaN      NaN  222299
    17    139.9   35.086   35.088   21.108   24.533   203.05     0.92      NaN      NaN      NaN      NaN      NaN      NaN  222299
    16    161.2   35.054   35.060   20.429   24.695   195.34     0.87      NaN      NaN      NaN      NaN      NaN      NaN  222299
    15    180.3   34.987   34.984   19.412   24.904   190.70     0.84      NaN      NaN      NaN      NaN      NaN      NaN  222299
    14    200.7   34.924   34.934   18.710   25.045   192.70     0.83      NaN      NaN      NaN      NaN      NaN      NaN  232299
    13    226.9   34.766   34.775   17.458   25.233   192.17     0.81      NaN      NaN      NaN      NaN      NaN      NaN  222299
    12    252.5   34.643   34.650   16.221   25.429   196.41     0.81      NaN      NaN      NaN      NaN      NaN      NaN  222299
    11    276.6   34.415   34.419   14.325   25.670   194.56     0.77      NaN      NaN      NaN      NaN      NaN      NaN  222299
    10    301.8   34.245   34.242   12.531   25.899   197.40     0.75      NaN      NaN      NaN      NaN      NaN      NaN  222299
     9    352.8   34.103   34.108   10.296   26.205   186.96     0.68      NaN      NaN      NaN      NaN      NaN      NaN  222299
     8    402.5   34.067   34.069    9.026   26.385   169.35     0.60      NaN      NaN      NaN      NaN      NaN      NaN  222299
     7    452.2   34.044   34.046    7.703   26.568   152.55     0.52      NaN      NaN      NaN      NaN      NaN      NaN  222299
     6    500.7   34.020   34.022    6.576   26.706   118.38     0.40      NaN      NaN      NaN      NaN      NaN      NaN  222299
     5    601.4   34.463   34.125    5.146   26.965    36.64     0.12      NaN      NaN      NaN      NaN      NaN      NaN  444499
     4    701.5   34.276   34.278    4.622   27.146    23.83     0.08      NaN      NaN      NaN      NaN      NaN      NaN  222299
     3    801.2   34.409   34.412    4.475   27.268    30.11     0.10      NaN      NaN      NaN      NaN      NaN      NaN  222299
     2    903.3   34.463   34.467    4.163   27.345    37.44     0.12      NaN      NaN      NaN      NaN      NaN      NaN  222299
     1   1996.8   34.618   34.619    1.961   27.670    74.02     0.22      NaN      NaN      NaN      NaN      NaN      NaN  222299

STUD97 bot_all_data

Sta: 23   Cast: 1   Date: 16/11/97 20:06   Pos: 22.445 N  158.118 W   Bot: 4835.0 m   CFC-11 air: 263.2 ppt   CFC-12 air: 538.4 ppt

SAMPNO    DEPTH   SALNTY   CTDSAL    THETA   PDNSTY   OXYGEN   OXYSAT   CFC-11   CFC-12   F11SAT   F12SAT   ORATIO   ARATIO   QFLAG
         ******   ******   ******                     ******            ******   ******
    24      3.6   35.136   35.137   25.775   23.209   206.12     1.01    1.804    1.054    1.004    1.003     1.71    0.489  222266
    23     20.3   35.133   35.136   25.694   23.233   205.93     1.01      NaN      NaN      NaN      NaN      NaN      NaN  222299
    22     40.9   35.134   35.135   25.673   23.239   206.67     1.01    1.787    1.051    0.990    0.997     1.70    0.486  222222
    21     50.8   35.135   35.136   25.659   23.244   206.09     1.01      NaN      NaN      NaN      NaN      NaN      NaN  222299
    20     60.4   35.136   35.138   25.651   23.248   205.80     1.01    1.779    1.052    0.985    0.997     1.69    0.483  222222
    19     80.2   35.126   35.126   25.355   23.330   208.01     1.01      NaN      NaN      NaN      NaN      NaN      NaN  222299
    18    100.0   35.091   35.088   21.889   24.317   212.24     0.97    2.143    1.237    1.007    1.014     1.73    0.486  222222
    17    121.3   35.053   35.054   20.370   24.706   196.55     0.88    2.242    1.279    0.983    0.986     1.75    0.487  222222
    16    141.2   35.010   35.011   19.565   24.885   193.15     0.85      NaN      NaN      NaN      NaN      NaN      NaN  222299
    15    160.7   34.902   34.907   18.520   25.073   192.47     0.83    2.413    1.362    0.970    0.972     1.77    0.488  222222
    14    181.0   34.806   34.808   17.579   25.229   193.35     0.82    2.503    1.393    0.961    0.955     1.80    0.492  222222
    13    201.0   34.806   34.708   16.387   25.435   198.21     0.82    2.594    1.431    0.939    0.931     1.81    0.493  232222
    12    225.3   34.585   34.586   15.337   25.579   196.53     0.80    2.665    1.454    0.915    0.902     1.83    0.496  222222
```

# Table B.1 continued

**stud97.dat**

```
    11    250.8   34.505   34.505   14.454   25.709   201.30     0.80    2.769    1.491    0.908    0.889     1.86    0.499  222222
    10    275.6   34.368   34.371   12.966   25.913   202.49     0.78      NaN      NaN      NaN      NaN      NaN      NaN  222299
     9    300.6   34.303   34.302   12.039   26.040   203.88     0.77    2.923    1.517    0.845    0.809     1.93    0.511  222222
     8    350.3   34.163   34.162   10.063   26.287   196.36     0.71    2.708    1.376    0.703    0.667     1.97    0.515  222222
     7    399.9   34.095   34.097    8.866   26.433   180.02     0.64    2.346    1.179    0.569    0.539     1.99    0.517  222222
     6    500.5   34.056   34.057    6.970   26.680   125.97     0.43    1.295    0.649    0.282    0.270     2.00    0.512  222222
     5    601.3   34.438   34.079    5.362   26.903    36.48     0.12      NaN      NaN      NaN      NaN      NaN      NaN  444499
     4    702.0   34.248   34.247    4.793   27.102    36.33     0.12    0.093    0.058    0.018    0.022     1.60    0.405  222222
     3    800.4   34.385   34.389    4.505   27.247    31.24     0.10      NaN      NaN      NaN      NaN      NaN      NaN  222299
     2    899.5   34.438   34.443    4.238   27.318    34.85     0.11    0.013    0.008    0.002    0.003     1.62    0.409  222222
     1    998.8   34.485   34.489    3.877   27.392    43.01     0.14    0.007    0.005    0.001    0.002     1.40    0.352  222222


STUD97 bot_all_data

Sta: 24   Cast: 1   Date: 18/11/97 01:06   Pos: 20.000 N  157.998 W   Bot: 3000.1 m   CFC-11 air: 263.2 ppt   CFC-12 air: 538.4 ppt


SAMPNO    DEPTH   SALNTY   CTDSAL    THETA   PDNSTY   OXYGEN   OXYSAT   CFC-11   CFC-12   F11SAT   F12SAT   ORATIO   ARATIO   QFLAG
         ******   ******   ******                     ******            ******   ******
    24      3.0   34.895   34.890   27.006   22.635   203.03     1.02    1.771    1.021    1.034    1.014     1.73    0.499  222232
    23     20.8   34.891   34.892   26.755   22.716   203.16     1.01      NaN      NaN      NaN      NaN      NaN      NaN  222299
    22     40.6   34.689   34.969   26.434   22.876    98.32     0.49    0.639    0.365    0.365    0.355     1.75    0.502  444444
    21     60.6   35.029   35.032   26.321   22.959   204.66     1.01      NaN      NaN      NaN      NaN      NaN      NaN  222299
    20     80.4   35.037   35.038   25.784   23.131   209.25     1.03    1.844    1.078    1.025    1.025     1.71    0.489  222222
    19    100.3   35.021   34.973   23.533   23.760   211.97     1.00      NaN      NaN      NaN      NaN      NaN      NaN  232299
    18    121.1   35.018   35.005   21.545   24.350   198.71     0.91    2.168    1.238    1.003    1.000     1.75    0.490  232222
    17    139.8   35.035   35.035   20.831   24.568   195.36     0.88      NaN      NaN      NaN      NaN      NaN      NaN  222299
    16    159.8   34.993   35.004   20.216   24.709   190.31     0.85    2.283    1.292    0.994    0.990     1.77    0.491  232222
    15    180.2   34.894   34.897   18.777   25.000   187.86     0.81      NaN      NaN      NaN      NaN      NaN      NaN  222299
    14    200.3   34.730   34.743   17.577   25.180   183.43     0.78    2.499    1.373    0.959    0.940     1.82    0.498  232222
    13    225.2   34.593   34.591   15.841   25.470   190.25     0.78      NaN      NaN      NaN      NaN      NaN      NaN  222299
    12    249.3   34.507   34.512   14.747   25.651   196.05     0.79    2.730    1.474    0.909    0.891     1.85    0.499  222222
    11    275.8   34.376   34.378   13.383   25.834   197.73     0.77      NaN      NaN      NaN      NaN      NaN      NaN  222299
    10    300.4   34.250   34.250   11.843   26.037   207.71     0.78    2.917    1.512    0.834    0.798     1.93    0.511  222222
     9    350.1   34.140   34.140   10.270   26.235   195.67     0.71    2.778    1.416    0.729    0.693     1.96    0.514  222222
     8    399.1   34.063   34.063    8.496   26.463   153.22     0.54    1.923    0.955    0.457    0.428     2.01    0.522  222222
     7    499.3   34.071   34.071    6.328   26.777    85.19     0.28    0.662    0.338    0.139    0.136     1.96    0.500  222222
     6    599.9   34.312   34.311    5.672   27.049    33.42     0.11    0.077    0.042    0.016    0.016     1.83    0.466  222222
     5    699.3   34.394   34.397    5.214   27.172    30.20     0.10      NaN      NaN      NaN      NaN      NaN      NaN  222299
     4    798.7   34.447   34.448    4.856   27.254    34.62     0.11    0.001    0.003    0.000    0.001     0.33    0.084  222222
     3    998.5   34.504   34.504    4.171   27.374    44.32     0.14    0.000    0.001    0.000    0.000     0.00    0.000  222222
     2   1498.9   34.578   34.581    2.666   27.581    69.27     0.21    0.000    0.001    0.000    0.000     0.00    0.000  222222
     1   2001.3   34.627   34.627    1.926   27.679    93.81     0.28    0.004    0.000    0.001    0.000      Inf      Inf  222266


STUD97 bot_all_data

Sta: 25   Cast: 1   Date: 18/11/97 22:59   Pos: 16.000 N  158.000 W   Bot: 5252.5 m   CFC-11 air: 263.2 ppt   CFC-12 air: 538.4 ppt


SAMPNO    DEPTH   SALNTY   CTDSAL    THETA   PDNSTY   OXYGEN   OXYSAT   CFC-11   CFC-12   F11SAT   F12SAT   ORATIO   ARATIO   QFLAG
         ******   ******   ******                     ******            ******   ******
    24      2.9   34.774   34.771   26.768   22.621   202.37     1.01    1.736    1.014    1.003    0.998     1.71    0.492  222222
    23     19.6   34.772   34.770   26.767   22.621   202.71     1.01      NaN      NaN      NaN      NaN      NaN      NaN  222299
    22     40.3   34.784   34.783   26.746   22.637   202.44     1.01      NaN      NaN      NaN      NaN      NaN      NaN  222299
    21     59.4   34.803   34.802   26.688   22.670   202.70     1.01    1.729    1.009    0.996    0.990     1.71    0.492  222222
    20     80.4   34.916   34.927   24.534   23.429   217.84     1.05    1.982    1.133    1.044    1.027     1.75    0.497  222222
    19    100.5   35.012   35.008   23.591   23.770   213.66     1.01    2.016    1.163    1.020    1.018     1.73    0.490  222222
    18    119.4   35.056   35.053   22.559   24.102   197.34     0.92    2.095    1.196    1.014    1.006     1.75    0.493  222222
    17    139.8   35.016   35.011   20.899   24.531   193.95     0.87    2.201    1.257    0.989    0.990     1.75    0.488  222222
    16    159.6   34.905   34.917   19.425   24.850   183.45     0.81      NaN      NaN      NaN      NaN      NaN      NaN  232299
    15    180.2   34.757   34.766   17.641   25.182   181.20     0.77    2.468    1.362    0.950    0.935     1.81    0.496  222222
    14    199.4   34.538   34.547   15.653   25.479   166.49     0.68      NaN      NaN      NaN      NaN      NaN      NaN  222299
    13    227.1   34.316   34.320   12.849   25.897   137.95     0.53    2.215    1.156    0.668    0.640     1.92    0.510  222222
    12    251.2   34.247   34.248   11.074   26.177   130.63     0.48    1.950    0.995    0.535    0.507     1.96    0.516  222222
    11    277.2   34.230   34.234    9.782   26.391   115.48     0.42    1.531    0.776    0.391    0.371     1.97    0.516  222222
    10    298.3   34.253   34.270    9.299   26.499    96.42     0.34    1.187    0.597    0.296    0.279     1.99    0.518  232222
     9    348.9   34.357   34.359    8.789   26.650    49.95     0.18    0.463    0.247    0.112    0.113     1.87    0.487  222222
     8    399.8   34.397   34.396    8.113   26.783    31.78     0.11    0.169    0.092    0.039    0.041     1.84    0.475  222222
     7    449.7   34.431   34.434    7.453   26.909    23.31     0.08      NaN      NaN      NaN      NaN      NaN      NaN  222299
     6    500.3   34.431   34.432    6.756   27.005    23.95     0.08    0.022    0.015    0.005    0.006     1.47    0.376  222222
     5    598.6   34.460   34.462    6.050   27.121    28.66     0.10      NaN      NaN      NaN      NaN      NaN      NaN  222299
     4    700.0   34.486   34.489    5.346   27.230    34.25     0.11    0.000    0.001    0.000    0.000     0.00    0.000  222266
     3    800.6   34.506   34.507    4.924   27.293    34.10     0.11      NaN      NaN      NaN      NaN      NaN      NaN  222299
     2    900.3   34.523   34.524    4.462   27.358    35.83     0.11    0.005    0.000    0.001    0.000      Inf      Inf  222222
     1   1000.4   34.538   34.539    4.142   27.405    41.68     0.13    0.013    0.004    0.002    0.001     3.25    0.818  222222


STUD97 bot_all_data

Sta: 26   Cast: 1   Date: 19/11/97 20:32   Pos: 11.999 N  158.000 W   Bot: 5342.4 m   CFC-11 air: 263.2 ppt   CFC-12 air: 538.4 ppt


SAMPNO    DEPTH   SALNTY   CTDSAL    THETA   PDNSTY   OXYGEN   OXYSAT   CFC-11   CFC-12   F11SAT   F12SAT   ORATIO   ARATIO   QFLAG
         ******   ******   ******                     ******            ******   ******
    24      3.7   34.621   34.622   27.925   22.137   199.01     1.01    1.681    0.983    1.017    1.007     1.71    0.494  222222
    23     19.6   34.617   34.618   27.731   22.197   198.96     1.01    1.670    0.978    1.002    0.995     1.71    0.492  222222
    22     39.4   34.636   34.633   27.637   22.239   199.20     1.00      NaN      NaN      NaN      NaN      NaN      NaN  222299
    21     60.0   34.697   34.699   26.884   22.530   204.60     1.02    1.737    1.018    1.008    1.005     1.71    0.490  222222
```

## Table B.1 continued

**stud97.dat**

```
    20    79.4  34.756  34.784  24.605  23.299  222.78    1.07   2.021   1.148   1.066   1.042    1.76   0.500  232266
    19    99.5  35.012  34.989  22.747  24.000  212.26    0.99   2.079   1.197   1.014   1.014    1.74   0.489  232222
    18   119.3  34.922  34.922  20.443  24.586  191.34    0.86   2.272   1.274   0.999   0.984    1.78   0.496  222222
    17   139.6  34.593  34.592  16.811  25.247  173.08    0.72   2.475   1.342   0.913   0.888    1.84   0.503  222222
    16   158.6  34.431  34.431  13.264  25.900   69.34    0.27   1.517   0.787   0.468   0.444    1.93   0.515  222222
    15   179.7  34.576  34.584  12.175  26.233   29.72    0.11     NaN     NaN     NaN     NaN     NaN     NaN  222299
    14   199.7  34.589  34.590  11.825  26.304   29.04    0.11   0.660   0.351   0.189   0.186    1.88   0.498  222222
    13   225.0  34.679  34.674  11.299  26.468   10.86    0.04     NaN     NaN     NaN     NaN     NaN     NaN  222299
    12   250.1  34.674  34.674  10.838  26.551   15.01    0.06   0.220   0.135   0.060   0.068    1.63   0.429  222222
    11   275.0  34.680  34.681  10.433  26.628   16.34    0.06     NaN     NaN     NaN     NaN     NaN     NaN  222299
    10   300.5  34.677  34.678  10.189  26.668   16.83    0.06   0.124   0.078   0.033   0.038    1.59   0.417  222222
     9   350.3  34.667  34.669   9.822  26.724   17.52    0.06     NaN     NaN     NaN     NaN     NaN     NaN  222299
     8   398.2  34.646  34.648   9.408  26.777   14.76    0.05   0.054   0.040   0.014   0.019    1.35   0.352  222222
     7   449.5  34.627  34.629   9.067  26.817   14.68    0.05     NaN     NaN     NaN     NaN     NaN     NaN  222299
     6   499.2  34.595  34.598   8.509  26.881   16.12    0.06   0.020   0.017   0.005   0.008    1.18   0.305  222222
     5   598.5  34.546  34.548   7.466  26.997   21.04    0.07     NaN     NaN     NaN     NaN     NaN     NaN  222299
     4   700.4  34.523  34.524   6.340  27.133   25.07    0.08   0.001   0.001   0.000   0.000    1.00   0.255  222222
     3   799.5  34.526  34.528   5.732  27.214   22.55    0.07   0.004   0.001   0.001   0.000    4.00   1.018  222222
     2   900.2  34.531  34.533   5.264  27.274   32.15    0.10   0.003   0.000   0.001   0.000     Inf     Inf  222222
     1  1000.8  34.536  34.542   4.736  27.342   31.06    0.10   0.002   0.001   0.000   0.000    2.00   0.505  222222


STUD97 bot_all_data

Sta: 27   Cast: 1   Date: 20/11/97 08:44   Pos: 10.005 N  158.004 W   Bot: 4957.3 m   CFC-11 air: 263.2 ppt   CFC-12 air: 538.4 ppt


SAMPNO   DEPTH  SALNTY  CTDSAL   THETA  PDNSTY  OXYGEN  OXYSAT  CFC-11  CFC-12  F11SAT  F12SAT  ORATIO  ARATIO   QFLAG
        ******  ******  ******                  ******          ******  ******
    24     2.6  34.177  34.175  28.110  21.741  198.75    1.01   1.708   0.987   1.036   1.013    1.73   0.500  222222
    23    21.5  34.173  34.170  27.954  21.788  199.03    1.01     NaN     NaN     NaN     NaN     NaN     NaN  222299
    22    40.5  34.594  34.587  24.808  23.089  223.84    1.08     NaN     NaN     NaN     NaN     NaN     NaN  222299
    21    61.4  34.950  34.980  22.994  23.922  215.82    1.01   2.066   1.181   1.019   1.010    1.75   0.493  232222
    20    81.0  34.794  34.755  20.401  24.470  200.05    0.89   2.238   1.253   0.980   0.965    1.79   0.497  232222
    19   101.0  35.012  34.521  16.343  25.301  161.24    0.67   2.375   1.285   0.856   0.833    1.85   0.503  232222
    18   120.5  34.436  34.440  14.126  25.728   89.67    0.35   1.815   0.947   0.585   0.556    1.92   0.514  222222
    17   140.4  34.663  34.665  12.845  26.165   13.08    0.05   0.712   0.386   0.215   0.214    1.84   0.491  222222
    16   160.7  34.695  34.696  11.986  26.356    9.72    0.04   0.385   0.218   0.111   0.116    1.77   0.468  222222
    15   180.6  34.705  34.706  11.215  26.508   18.13    0.07   0.270   0.162   0.075   0.083    1.67   0.440  222222
    14   200.5  34.716  34.718  10.984  26.559   19.34    0.07   0.245   0.140   0.067   0.071    1.75   0.461  222222
    13   225.8  34.699  34.701  10.628  26.610   25.99    0.10   0.223   0.126   0.060   0.063    1.77   0.465  222222
    12   250.1  34.687  34.688  10.350  26.648   29.73    0.11   0.203   0.115   0.054   0.057    1.77   0.463  222222
    11   275.2  34.684  34.686  10.079  26.694   23.61    0.09   0.130   0.079   0.034   0.039    1.65   0.431  222222
    10   302.2  34.670  34.671   9.793  26.731   36.05    0.13   0.164   0.094   0.042   0.045    1.74   0.456  222222
     9   405.2  34.649  34.651   9.110  26.828   16.64    0.06   0.043   0.030   0.011   0.014    1.43   0.373  222222
     8   499.4  34.585  34.586   8.111  26.932   16.80    0.06   0.004   0.006   0.001   0.003    0.67   0.172  222222
     7   602.9  34.554  34.555   7.189  27.042   19.98    0.07   0.001   0.004   0.000   0.002    0.25   0.064  222222
     6   698.6  34.531  34.532   6.242  27.152   29.26    0.10   0.002   0.002   0.000   0.001    1.00   0.255  222222
     5   797.3  34.529  34.532   5.598  27.233   31.67    0.10     NaN     NaN     NaN     NaN     NaN     NaN  222299
     4   797.3  34.528  34.532   5.597  27.233   30.89    0.10   0.005   0.001   0.001   0.000    5.00   1.271  222222
     3   999.6  34.548  34.550   4.438  27.382   36.86    0.12   0.003   0.001   0.001   0.000    3.00   0.756  222222
     2  1497.3  34.596  34.599   2.931  27.571   74.67    0.23   0.008   0.000   0.001   0.000     Inf     Inf  222222
     1  2002.9  34.637  34.640   2.017  27.682   96.27    0.29   0.007   0.000   0.001   0.000     Inf     Inf  222222


STUD97 bot_all_data

Sta: 28   Cast: 1   Date: 21/11/97 07:09   Pos: 14.002 N  158.000 W   Bot: 5516.2 m   CFC-11 air: 263.2 ppt   CFC-12 air: 538.4 ppt


SAMPNO   DEPTH  SALNTY  CTDSAL   THETA  PDNSTY  OXYGEN  OXYSAT  CFC-11  CFC-12  F11SAT  F12SAT  ORATIO  ARATIO   QFLAG
        ******  ******  ******                  ******          ******  ******
    24     3.1  34.177  34.408  27.726  22.041  199.74    1.01   1.686   0.979   1.009   0.994    1.72   0.497  232222
    23    22.1  34.416  34.418  27.608  22.087  200.26    1.01     NaN     NaN     NaN     NaN     NaN     NaN  222299
    22    42.0  34.507  34.506  27.478  22.195  200.50    1.01   1.686   0.984   1.000   0.991    1.71   0.494  222222
    21    62.4  34.546  34.547  27.112  22.343  204.43    1.02     NaN     NaN     NaN     NaN     NaN     NaN  222299
    20    82.3  34.636  34.640  24.051  23.356  209.22    0.99   2.050   1.164   1.055   1.033    1.76   0.499  222222
    19   101.6  35.012  34.984  22.759  23.992  209.52    0.98   2.082   1.193   1.016   1.011    1.75   0.491  232222
    18   121.9  34.981  34.982  20.922  24.503  193.27    0.87   2.215   1.251   0.996   0.986    1.77   0.494  222222
    17   142.5  34.895  34.886  19.047  24.923  182.37    0.79   2.347   1.313   0.967   0.958    1.79   0.493  222222
    16   162.1  34.813  34.811  18.042  25.118  181.09    0.77   2.441   1.331   0.958   0.930    1.83   0.504  222222
    15   182.0  34.650  34.657  16.056  25.472  189.85    0.78   2.566   1.383   0.913   0.886    1.86   0.504  222222
    14   203.2  34.364  34.366  13.528  25.795  149.40    0.58   2.352   1.229   0.735   0.702    1.91   0.512  222222
    13   227.7  34.227  34.226  11.313  26.116  165.44    0.62   2.421   1.226   0.673   0.631    1.97   0.521  222222
    12   253.1  34.174  34.173   9.743  26.350  146.24    0.53     NaN     NaN     NaN     NaN     NaN     NaN  222299
    11   278.4  34.179  34.181   8.988  26.479  121.10    0.43   1.448   0.729   0.354   0.335    1.99   0.516  222222
    10   302.0  34.309  34.311   9.034  26.574   74.26    0.26     NaN     NaN     NaN     NaN     NaN     NaN  222299
     9   352.8  34.398  34.430   8.454  26.758   40.31    0.14   0.266   0.140   0.063   0.063    1.90   0.492  232222
     8   401.8  34.457  34.458   7.954  26.855   27.56    0.10     NaN     NaN     NaN     NaN     NaN     NaN  222299
     7   500.0  34.481  34.481   7.171  26.986   20.51    0.07   0.019   0.014   0.004   0.006    1.36   0.349  222266
     6   598.4  34.486  34.489   6.354  27.103   18.53    0.06   0.010   0.002   0.002   0.001    5.00   1.277  222222
     5   598.0  34.487  34.489   6.357  27.103   18.84    0.06     NaN     NaN     NaN     NaN     NaN     NaN  222299
     4   696.8  34.497  34.499   5.642  27.202   20.04    0.07   0.006   0.002   0.001   0.001    3.00   0.763  222222
     3   799.9  34.512  34.514   5.049  27.284   33.28    0.11     NaN     NaN     NaN     NaN     NaN     NaN  222299
     2   901.7  34.527  34.528   4.549  27.352   32.71    0.10   0.004   0.003   0.001   0.001    1.33   0.336  222222
     1  1002.5  34.539  34.541   4.179  27.402   38.58    0.12   0.003   0.004   0.001   0.001    0.75   0.189  222222


STUD97 bot_all_data
```

## Table B.1 continued

**stud97.dat**

Sta: 29   Cast: 1   Date: 22/11/97 05:22   Pos: 18.004 N  158.001 W   Bot: 4758.1 m   CFC-11 air: 263.2 ppt   CFC-12 air: 538.4 ppt

| SAMPNO | DEPTH | SALNTY | CTDSAL | THETA | PDNSTY | OXYGEN | OXYSAT | CFC-11 | CFC-12 | F11SAT | F12SAT | ORATIO | ARATIO | QFLAG |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | ****** | ****** | ****** | | | ****** | | ****** | ****** | | | | | |
| 24 | 3.4 | 34.883 | 34.881 | 26.766 | 22.705 | 202.44 | 1.01 | 1.732 | 1.021 | 1.002 | 1.005 | 1.70 | 0.487 | 222222 |
| 23 | 21.3 | 34.887 | 34.886 | 26.769 | 22.707 | 201.78 | 1.01 | 1.724 | 1.012 | 0.997 | 0.997 | 1.70 | 0.489 | 222222 |
| 22 | 41.7 | 34.888 | 34.888 | 26.743 | 22.717 | 201.92 | 1.01 | NaN | NaN | NaN | NaN | NaN | NaN | 222299 |
| 21 | 61.4 | 34.888 | 34.888 | 26.729 | 22.722 | 202.12 | 1.01 | 1.727 | 1.014 | 0.997 | 0.997 | 1.70 | 0.489 | 222222 |
| 20 | 81.4 | 34.888 | 34.887 | 26.717 | 22.725 | 201.37 | 1.00 | NaN | NaN | NaN | NaN | NaN | NaN | 222299 |
| 19 | 101.0 | 34.888 | 34.887 | 26.705 | 22.729 | 201.15 | 1.00 | NaN | NaN | NaN | NaN | NaN | NaN | 222299 |
| 18 | 120.8 | 34.900 | 34.900 | 25.882 | 22.997 | 204.91 | 1.01 | 1.832 | 1.060 | 1.021 | 1.011 | 1.73 | 0.494 | 222222 |
| 17 | 141.1 | 35.025 | 35.021 | 23.576 | 23.784 | 208.88 | 0.99 | NaN | NaN | NaN | NaN | NaN | NaN | 222299 |
| 16 | 160.4 | 35.092 | 35.088 | 22.528 | 24.137 | 205.83 | 0.96 | NaN | NaN | NaN | NaN | NaN | NaN | 222299 |
| 15 | 180.1 | 35.015 | 35.013 | 20.647 | 24.601 | 192.43 | 0.86 | 2.221 | 1.259 | 0.986 | 0.981 | 1.76 | 0.491 | 222222 |
| 14 | 200.9 | 34.960 | 34.960 | 19.599 | 24.837 | 188.78 | 0.83 | 2.303 | 1.296 | 0.974 | 0.968 | 1.78 | 0.492 | 222222 |
| 13 | 227.3 | 34.808 | 34.803 | 17.823 | 25.166 | 188.01 | 0.80 | 2.469 | 1.362 | 0.959 | 0.943 | 1.81 | 0.497 | 222222 |
| 12 | 252.2 | 34.701 | 34.674 | 16.618 | 25.355 | 187.89 | 0.78 | NaN | NaN | NaN | NaN | NaN | NaN | 232299 |
| 11 | 275.6 | 34.306 | 34.470 | 14.885 | 25.589 | 165.29 | 0.66 | 2.223 | 1.166 | 0.745 | 0.709 | 1.91 | 0.514 | 444422 |
| 10 | 303.6 | 34.292 | 34.283 | 12.795 | 25.879 | 187.66 | 0.72 | NaN | NaN | NaN | NaN | NaN | NaN | 222299 |
| 9 | 353.0 | 34.175 | 34.172 | 9.962 | 26.312 | 143.09 | 0.52 | 2.032 | 1.025 | 0.524 | 0.494 | 1.98 | 0.519 | 222222 |
| 8 | 405.7 | 34.123 | 34.126 | 8.154 | 26.565 | 117.88 | 0.41 | NaN | NaN | NaN | NaN | NaN | NaN | 222299 |
| 7 | 499.5 | 34.270 | 34.273 | 6.888 | 26.862 | 41.85 | 0.14 | 0.191 | 0.113 | 0.042 | 0.047 | 1.69 | 0.433 | 222222 |
| 6 | 604.6 | 34.362 | 34.368 | 6.023 | 27.051 | 27.34 | 0.09 | NaN | NaN | NaN | NaN | NaN | NaN | 222299 |
| 5 | 604.4 | 34.511 | 34.368 | 6.025 | 27.050 | 43.31 | 0.14 | NaN | NaN | NaN | NaN | NaN | NaN | 444499 |
| 4 | 704.6 | 34.440 | 34.443 | 5.448 | 27.181 | 30.66 | 0.10 | 0.001 | 0.013 | 0.000 | 0.005 | 0.08 | 0.020 | 222222 |
| 3 | 804.3 | 34.489 | 34.491 | 5.091 | 27.261 | 43.16 | 0.14 | NaN | NaN | NaN | NaN | NaN | NaN | 222299 |
| 2 | 904.1 | 34.511 | 34.513 | 4.657 | 27.328 | 43.89 | 0.14 | NaN | NaN | NaN | NaN | NaN | NaN | 222299 |
| 1 | 1001.4 | 34.524 | 34.525 | 4.293 | 27.378 | 49.09 | 0.16 | 0.010 | 0.004 | 0.002 | 0.001 | 2.50 | 0.630 | 222222 |