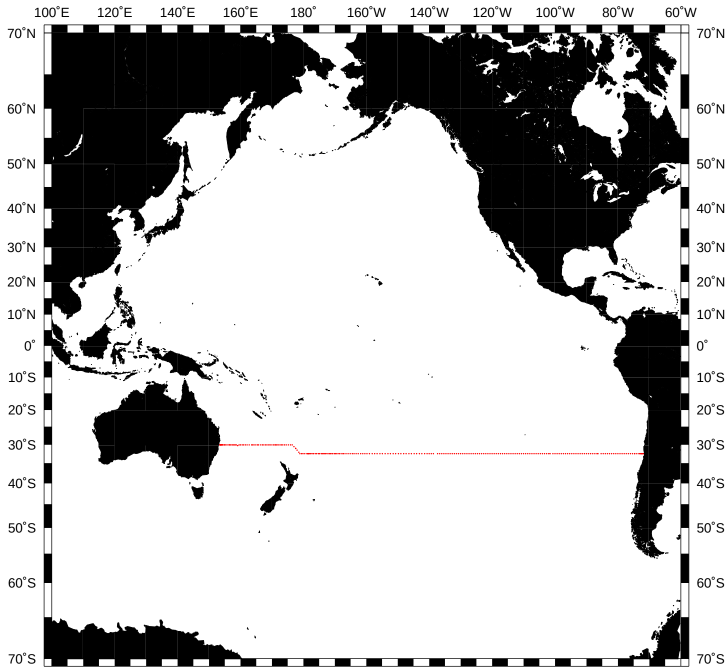
A. Cruise Narrative: South Pacific Description Zonal section at 32 S (P06)



A.1. Highlights

WHP Cruise Summary Information

WOCE section designation	**Leg3: P06E Leg4: P06C Leg5: P06W**
Expedition designation (EXPOCODE)	**316N138_3-5**
Chief Scientist(s) and their affiliation	**H. Bryden, M. McCartney, J. Toole**
Dates	1992.05.02 - 1992.07.30
Ship	R/V Knorr
Ports of call	Leg3: Valpariso to Easter Island Leg4: Easter Island to Auckland, New Zealand Leg5: Auckland to Sydney, NSW, Australia
Number of stations	Leg3: 68 CTD/rosette Leg4: 113 CTD/rosette Leg5: 78 CTD/rosette
Geographic boundaries of the stations	30° 4.01’ S 153° 28.75’ E 71° 1.22 W 32° 39.35’ S
Floats and drifters deployed	Eighteen ALACE floats
Moorings deployed or recovered	none
Contributing Authors	John Toole, Charles Corry, Margaret Cook, George Knapp, Joe Jennings, Sarah Zimmermann, Arnold Mantyla,

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Appendix D: Summary of fits to the CTD laboratory temperature data
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Appendix F: CTD conductivity fitting applied to the final data
Appendix G: Fits for CTD oxygen
Appendix H: CTD processing: Station by station
WOCE Data Processing Notes

Chief scientist on Leg 3: Harry Bryden
James Rennell Centre for Ocean Research
Chilworth Research Centre
Gamma House
Chilworth, Southampton SO1 7NS
United Kingdom
Telephone: +44-703-766184
Telefax: +44-703-767507
Internet: hlb@nso.ac.uk

Chief scientist on Leg 4: Mike McCartney
Dept. of Physical Oceanography
Woods Hole Oceanographic Institution
Woods Hole, MA 02543, USA
Telephone: 508-457-2000 ext. 2797
Telefax: 508-457-2181
Internet: mmccartney@whoi.edu

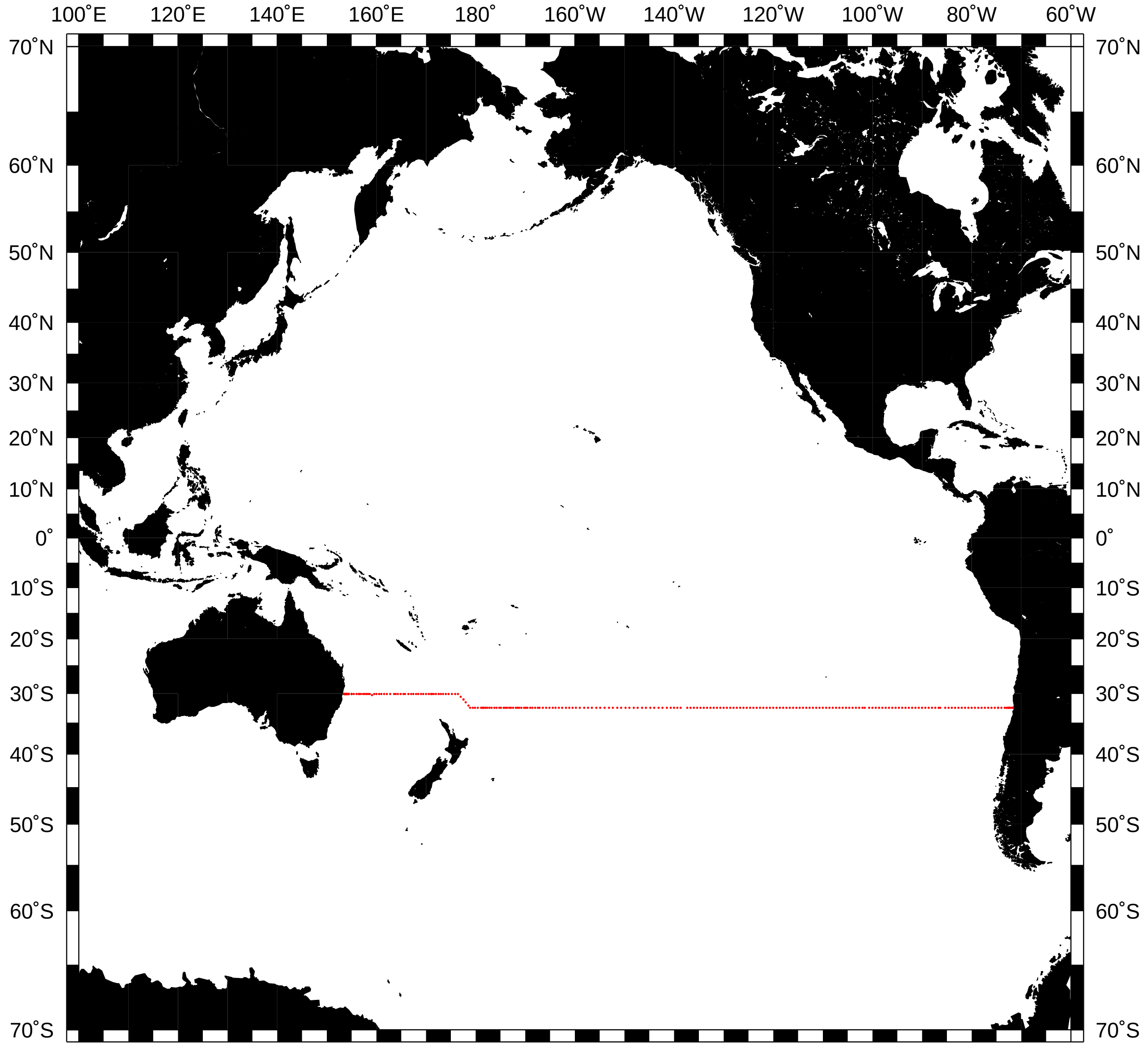
Chief scientist on Leg 5: John Toole
Dept. of Physical Oceanography
Woods Hole Oceanographic Institution
Woods Hole, MA 02543, USA
Telephone: 508-457-2000 ext. 2531
Telefax: 508-457-2181
Internet: jtoole@whoi.edu

A.2. Cruise Summary Information

A.2.a. Geographic boundaries:

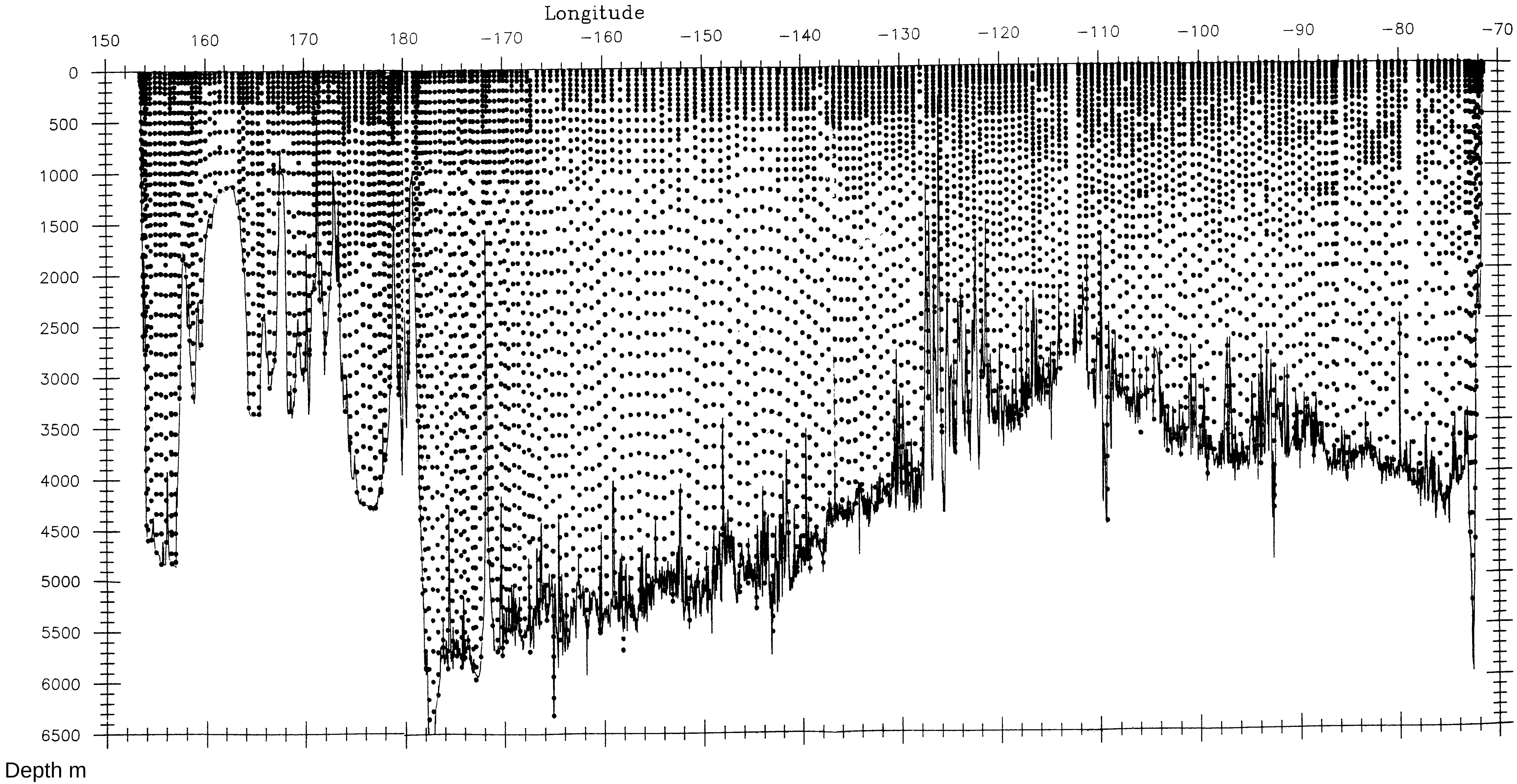
Leg 3 occupied stations along 32°30' S from 71°30' W to 112°40' W.
Leg 4 continued along 32°30' S from 112°40' W to 178°55' E at station 184. After station 184 the section was angled northward, and Leg 4 finished up at 31°5' S, 177°32' 30 E.

Station Locations for P06 (all legs)



Produced from .sum file by WHPO-SIO

Figure 2


Longitude
150
160
170
180
−170
−160
−150
−140
−130
−120
−110
−100
−90
−80
−70
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
6000
6500
Depth m

Leg 5 picked up where Leg 4 ended and continued the line northward to 30°5' S, 176°30' E. From 176°30' E the section continued along 30°5' S to the Australian coast, finishing at 153°29' E.

A.2.b. Stations occupied:

Leg3: 68 CTD/rosette
Leg4: 113 CTD/rosette
Leg5: 78 CTD/rosette

A trackline of P06 (containing all three legs) is shown in Figure 1. The bottle depth diagram is shown in Figure 2.

A.2.c. Floats and drifters deployed:

Eighteen ALACE floats were deployed along section P6.

A.2.d. Moorings deployed or recovered:

No moorings were deployed or recovered during this cruise, but moored current meter measurements were being maintained in the East Australian Current and the Deep Western Boundary Current east of the Tonga Kermadac Ridge at the time of our cruise.

A.3. List of Principal Investigators

TABLE 1: List of Princiapl Investigators and Measurements on all 3 legs

Measurement	Principal Investigator	Institution*
Salinity, oxygen, CTD/O2	John Toole	WHOI
Nutrients	Lou Gordon	OSU
Chlorofluorocarbons	Ray Weiss	SIO
Helium/tritium	Bill Jenkins	WHOI
AMS C-14	Bob Key	Princeton
TCO2	Doug Wallace	Brookhaven
Transmissometer	Wilf Gardner	TAMU
Underway fluorometer	John Marra	LDEO
Meteorology (IMET)	Barrie Walden	WHOI
Air chemistry	Ray Weiss	SIO
ADCP	Mike Kosro	OSU
Bathymetry	John Toole	WHOI
ALACE floats	Russ Davis	SIO
Drifters	Peter Niiler	SIO
Surface Ra-228	Bob Key	Princeton
Thermosalinograph	Bob Millard	WHOI

*See Table 2 for list of Institutions

Table 2: list of Institutions

NOAA/PMEL	NOAA Pacific Marine Environmental Laboratory 7600 Sand Point Way NE Seattle, WA 98115-0700
SIO	Scripps Institution of Oceanography University of California of San Diego 9500 Gilman Drive La Jolla, CA 92093
U. Hawaii	University of Hawaii 1000 Pope Rd Honolulu, HI 96822
TAMU	Texas A&M University Department of Oceanography College Station, TX 77843
OSU	Oregon State University Corvallis, OR
WHOI	Woods Hole Oceanographic Institute Woods Hole, Ma 02543
Princeton	Princeton University Princeton, NJ 08540
LDEO	Lamont-Doherty Earth Observatory Columbia University Palisades, NY 10964
U. Washington	University of Washington School of Oceanography Seattle, WA 98195

A.4. Scientific Programme and Methods

(by John Toole - November 1994)

WHP P6 was carried out from the R/V Knorr in May- July 1992. This quasi-zonal section spanned the subtropical South Pacific Ocean at 30 S 32 30 S. As such, it was defined as the WOCE Heat Flux line for this ocean basin. In addition to the hydrographic section, moored current meter measurements were being maintained in the East Australian Current and the Deep Western Boundary Current east of the Tonga Kermadac Ridge at the time of our cruise.

P6 represented the first WHP leg aboard the recently re-engined and jumbo-ized R/V Knorr. Perhaps not unexpectedly, numerous start-up problems were experienced on P6, as problems with the vessel's systems became apparant. Frequent power black-outs were experienced, as well as more subtle instrument problems related to the line voltage. Complicating matters, the break-down of the facility at Easter Island meant that no fuel was available at Easter Island. Extreme conservation requirements dictated reduced ship speed for the first two legs of the program. CTDs and water sample rosettes also presented their share of problems during the expedition. Significant credit must be given to the Knorr's personnel, and the seagoing scientific teams for carrying on with the work despite the difficulties.

The expedition was broken into three legs. Leg3, with Harry Bryden as chief scientist (Knorr cruise 138 leg3), departed Valpariso, Chile on May 2 and occupied 72 stations, 68 of which were along 32 30 S working west from the South American Coast to 109 20 W. On May 24, work was suspended and the Knorr transited north to Easter Island for a personnel change. Leg4 (Mike McCartney, chief scientist) departed Easter Island on May 30 and resumed station work on the 32 30 S line at 109 20 W on June 1st. This, the longest of the three legs, experienced the worst weather and the most problems with instrumentation. Nevertheless, a total of 113 stations were successfully occupied on the leg, extending the section across the Tonga-Kermadac Ridge to 177 32 E. Work was completed on July 4th, whereupon the Knorr transited to Auckland, New Zealand for supplies and another personnel change. The third leg, with John Toole as chief scientist, departed Auckland on July 13 and resumed station work with a reoccupation of the last station taken on Leg4. The ship track was subsequently angled northwest to 30 S and then extended west to the Australian coast at that latitude. The section was completed with a station on the Australian shelf on July 25. Having some extra time at the end of the main section occupation, two repeats of the western most 100 km of the line (that bit across the East Australian Current) were made. The Knorr then headed for port, arriving in Sydney on July 30.

Primary responsibility for the basic hydrographic observations fell to the Woods Hole Oceanographic Institutuion's CTD/Hydrography Group. They were responsible for acquiring temperature, salinity and dissolved oxygen data, and cooridinating with other groups analyzing dissolved nutrients and tracer concentrations. This report documents the measurement systems, analysis/processing techniques, uncertainties and residual problems with the reduced data set. Separate sections are included from each of the major groups on the cruise. Specifically, this submission to the WHPO encompasses the CTD observations, water sample salinity, oxygen, nutrients, and underway bathymetry. Underway meteorological measurements have earlier been submitted to the NCAR data center. Access to those measurements is described below. A separate document will be submitted by Kevin Maillet (RSMAS) on the CFC program.

During the three-leg expedition, a number of test stations were carried out to assess instrument performance and/or intercomparability of data. Those are not reported here. In the majority of cases, these test stations were duplicates of stations along the main section line that are reported here, but with different CTD instruments. Thus, technically according to WHP guidelines, they should have been labeled as different casts not different stations. In this group are Stations 73 (CTD No.7) and 74 (CTD No.9), collocated with station 72, 141 (CTD No.9 collocated with station 142), 187 and 189 (CTD No.9, collocated with stations 188 and 190) and 247, (repeat of sta 233 for additional CO2 sampling) (CTD No.9, collocated with station 248). Stations 1, 2 and 3 were made with different CTD instruments at the start of the cruise to assess instrument performance and allow specification of the primary for the cruise. They were not along the main section line and so are not reported here. Thus the P6 line begins in the east with Station 4. Station 112 with CTD 9 experienced significant instrumentation failures making the acquired data of very questionable accuracy. It was deemed unrecoverable during processing.

The western most station of the main P6 line was number 246. In addition to the main occupation, two repeat sections were made across the East Australian Current of stations 237- 246. They consist of stations 248-257 and 258-267. Primary attention was paid in the post-cruise calibration of these stations to the CTD salinity data; the CTD oxygen data were not scrutinized to the same degree as the data along the main line.

A.4.1 Leg 5 Overview
(Toole, chief scientist)

R/V Knorr cruise 138 - Leg 5 is the third and final segment of the transpacific WOCE Hydrographic Program section P6. Segments 1 and 2 obtained measurements along latitude 32d 30’S between South America and the Tonga-Kermadec Ridge (approximately at the date line). Our segment was planned to extend the measurements to the Australian coast. The selection of 32d 30’S for P6 Segments 1 and 2 was dictated by the WOCE deep western boundary current meter array deployed at this latitude east of the Kermadec Ridge; stations were obtained between each current meter mooring of the array. A second WOCE moored array, this one off the Australian coast just poleward of 30d S, was deployed by CSIRO (Australia) investigators to measure the East Australian Current (EAC). Sampling on Segment 3 was designed to survey along this array. Thus, the P6 sampling plan called for a northward deflection of the cruise track from 32d 30'S to 32d 05'S. This was planned for the longitude range 179 - 176 30'E, within the South Fiji Basin.

The sampling plan for P6 called for an average station separation of 30 nmi, with tighter spacing where the bathymetry changed rapidly. A total of about 50 stations was envisioned for Segment 3. Casts were to be done using the Scripps ODF 36-position x 10-liter rosette system and CTD instrumentation from the WHOI Group. Water samples were to be spaced no greater than 200 m in the vertical. The WHOI Hydrographic Group was responsible for analyzing water samples for salinity and dissolved oxygen; sampling for tritium and helium was planned for subsequent shoreside analysis in the WHOI facility. Both groups were to utilize their self-contained portable laboratories. The OSU group was tasked with analyzing water samples for dissolved nutrient concentration. These activities were planned for the climate-controlled laboratory aboard the Knorr. The P6 CFC sampling was divided up by several U.S. investigators working in collaboration. Collection of samples for C-14 analysis were planned for the Princeton and Australian groups. In addition, a CO2 program was planned in association with JGOFS. M. Kosro undertook responsibility for underway ocean velocity measurements using an Acoustic Doppler Current Profiler (ADCP). Complementing these observations were a number of meteorological and ocean surface measurements planned from the vessel. Finally, deployment of WOCE ALACE floats along the cruise track was scheduled roughly every 2.5 degrees of longitude.

If additional time was available after the completion of the primary sampling line, repeated sampling of the EAC was planned to better define the boundary current transport at the time of the section. What was envisioned were repeats of the last 100-150 km of the P6 section in combination with a series of ADCP transects.

Cruise Personnel

The major groups involved in WHP observation program were the CTD/Hydrography/nutrient team, the CFC group, a transient tracer contingent, and an underway sampling group. The leg had a true international feel as the science party included folks from CSIRO Australia, led by my co-investigator John Church, and a NZOI, New Zealand scientist. As in the case of the first two legs, a CO2 program was aboard under the direction of the Brookhaven National Laboratory (BNL), Upton, NY. The CO2 group consisted of two BNL employees (K. M. Johnson and V. Coles) and an Australian scientist, B. Tilbrook, of CSIRO.

Cruise Narrative

Staging for Kn 138-5 was minimal as all equipment was in use on the preceding two legs. The Knorr arrived in Auckland on July 6, one day ahead of schedule. On the 7th, a small group met to debrief the previous leg participants and clarify cruise-specific procedures. Cruise Leg 4 had achieved its planned sampling to 177d 30'E; no extra station work was therefore required of Leg 5. One of the WHOI salinometers had developed an intermittent fault during Leg 4; a back-up instrument was airshipped to Auckland as replacement. As well, the phosphate channel of the nutrient autoanalyzer failed on the preceding leg (and its back-up). Spare parts for this instrument also met the ship in Auckland.

Poor quality ship electrical power was implicated in both of these failures, but not conclusively demonstrated. In any event, a harmonic filter, a replacement for the original unit which had failed on Leg 1 (?), was delivered to the Knorr in Auckland and installed on the "clean power" supply. Also, additional components were fitted to the controller of the Markey winch while in port. This unit was serviceable on the preceding leg, but because of poor slow-speed control (resulting in rough recoveries of the CTD package back on deck) was not employed regularly. The winch used as primary on the preceding leg (the Almon-Johnson) required manual application of a brake when stopping to acquire water samples. It was my understanding that repair components for the Almon-Johnson brake were also to be installed in Auckland, but that turned out not to be the case.

In mid-week, when most of the scientific party had yet to arrive, it was discovered that the software licenses for the WHOI CTD Group data acquisition and processing computers had expired. Renewal is usually carried out under contract with WHOI's computer support facility. In this case, the stand-alone operating systems on the sea-going computers had been generated just prior to updating the WHOI-wide licenses. In this state, data acquisition software would not work, and the systems were next to useless. Thanks to long hours by Ellyn Montgomery (the CTD Data Manager for Leg 5) and Tom Bolmer back at WHOI, the problem was identified and solved, leaving the chief scientist slightly frazzled but in business.

At 0800 on our scheduled departure date of July 13 the Knorr moved to the fuel pier and commenced bunkering. At 1600 we departed Auckland and headed north to our first station. The ship track for Kn 138 Legs 3,4,5 is presented in figure 1. The transit out from New Zealand was a bit rough (particularly for just starting out) but not bad. We held a cruise meeting with the science party on the 14th while in transit, and assigned watches (Attachment A).

We arrived at the first work site (31 5'S 177d 32'E) on July 14 at 2000Z, where Leg 4 investigators completed their work with lowerings of the primary (Sta. 188) and principle back-up (Sta. 189) CTD instruments. We began by doing the same; Sta. 189 was with the back-up (CTD #9), Sta 190 with the primary (CTD

#10.) Potential temperature-salinity curves for the deep water from Stas. 187-190 show both primary and back-up CTDs did not change calibration during the Auckland port stop. Furthermore, examination of the deep temperature records from CTD #10 and the secondary temperature sensor integrated into the instrument (a stand- alone platinum thermometer) showed the temperature calibration of instrument 10 remained stable during the repair work conduced during Leg 4. (The temperature difference between the two sensors changed less than 0.5 mC, essentially unmeasurable.)

Station work then proceeded west as planned, pretty much uneventfully. At the request of ship's personnel, we moved operations to the Markey winch. With its repaired controller, the winch performed acceptably. On Sta. 201, the CTD package was inadvertently lowered into the bottom at full lowering speed (60 m/min). The shock broke the mounting brackets holding the CTD in the underwater package, but the unit was recovered. On Sta. 213 the underwater package struck the ship's bulwark on deployment rather severely. Comparison of the two temperature records showed no change in temperature difference resulting from these impacts. As it is unlikely that both sensors would shift the same amount, we conclude the shock of hitting the bottom and the ship did not measurably change the temperature calibration. A small shift of the conductivity channel did result from the bottom contact, however (but is correctable using the salinity water samples).

Much of Leg 5 crossed shallow bathymetric features. Over these features, water sampling was reduced to 24 or at times fewer bottles (but still retaining minimum 200 m vertical resolution.) Watch standing duties were much reduced at these times as the ODF rosette did not have to be disassembled and reassembled at each cast.

On Sta. 215 a bearing failed in one of the turning sheeves used to fairlead the wire overboard from the Markey winch. The cast was recovered successfully and operations shifted back over to the Almon Johnson winch (requiring a second hand to operate the brake). Ship's personnel were unable to locate a replacement bearing, effectively putting the Markey winch out of operation after about 30 lowerings. The station work was successfully completed using the Almon-Johnson winch with manual braking. In general, both winches, when operable, performed well: level winding properly, raising and lowering the CTD/rosette as fast as the package size allowed.

ALACE deployments occurred at regular intervals during the cruise. Peter Landry, (CTD Technician for the leg) took responsibility for assembling and checking out the units. Deployments were uniformly uneventful.

At longitude 159E the cruise track was diverted south 15 miles to avoid the Elizabeth Reef. Sta. 226, the only site off the 30d 5' S line west of 176dE was taken at 30d 20'S 159d 5'E.

At longitude 156d 30'E, two CTD casts were made (denoted Stas. 233,234). The second cast provided water for an intercomparison of small volume C-14 facilities (U.S. and Australia). Bronte Tilbrook is the point of contact for this study. Several in the scientific party and crew took advantage of the good weather and time between casts (when samples were being drawn) for a quick swim call.

Approaching the Australian coast, station spacing was reduced to as little as 5 nmi crossing the East Australian Current. The bottom profile approaching the continental shelf at latitude 30d 5'S is quite complicated, with very steep sections. Station positions were adjusted in an attempt to sample between each current mooring of the EAC array, while avoiding large cast to cast changes in bottom depth. Turn-around time between stations was lengthened at this time to allow those running water samples aboard ship to keep up. Sta. 246, marking the end of the P6 section, was occupied on July 25 in 90 m of water on the Australian shelf.

Upon completion of the primary section, the ship reversed course and returned to position 30d 5'S 155d E, site of Sta. 237. The run east provided a synoptic map of the EAC current field using the ship mounted ADCP system. Having the time, we proceeded to make two repeat sections across the EAC using a small (24 position x 1.2 liter) rosette system. Installation of the CTD in this rosette necessitated a 90d rotation of the sensor head on the instrument. Cast 247 was conducted with CTD instrument 9 in the large rosette. Then, we rotated the head to its normal vertical position, and took Sta. 248 in the same location with the small rosette. This was done to document any sensor calibration change resulting from the head rotation. Work then proceeded west, reoccupying stations made on the primary crossing. On Sta. 252 the CTD package again hit the bottom. The cable was badly kinked within 30 m of the CTD as a result, requiring us to re-terminate. Stations 248--257 constitute the first repeat section, Stas. 258--267 the second.

After completing the repeat EAC sections, the ship headed southeast to make an ADCP section at latitude 32d 15'S. The section ran from 155d E into the coast (153 xxE). Then we transited south in deep water while performing tests of the ADCP instrumentation while the scientific party began packing equipment. We picked up the Sydney pilot early on July 30, and docked shortly thereafter.

Overall the leg was very successful and generally uneventful. Unlike the previous legs, weather was moderate much of the time keeping spirits high. Again in contrast to the previous legs, we did not experience significant difficulties with electrical power in the labs. Some mix of the crew's ongoing upgrade of ship's systems, installation of the harmonic filter, and the science team's increased ability to cope with less than perfect power is probably responsible for the improvement. Following Marshall Swartz's lead from Leg 3, an informal study of electrical power was begun on Leg 5, but this was terminated when it was deemed it too intrusive to ship operations. As sea conditions were quite moderate, we did not experience excessive stern slamming as on the earlier legs. When it did occur however, the feeling was quite disconcerting, both for the amplitude of the flexing and its duration. However, at no time during Leg 5 were operations affected by stern slamming. Having two working winch systems proved very valuable. Wire re-terminations could be done with no loss of work time. As expected, electronic communication via the ATS satellite was not possible for most of the leg because we were too far west. Although effort was made, we were unable to make the system function through Inmarsat. Communications were limited to Telex traffic and the occasional FAX. Finally, and perhaps most importantly, we found the crew and officers to be highly knowledgeable, helpful and friendly. Their efforts to bring the Knorr back to fully operational status are to be commended. I also found everyone in the science party to be good shipmates, and fun to work with.

Summary of observations

Table 1 contains a list of hydrographic stations which make up the P6 section. For completeness, the listing includes all of the stations which make up the P6 line. A total of 79 CTD stations were obtained on Kn 138 Leg 5, 56 contributing to the one-time P6 section, 20 making up the repeated surveys of the EAC, one intercomparison lowering and 2 test lowerings. Approximately 1400 water samples were obtained along the one-time section on Leg 5 (7700 on the full section, fig 2). All samples were analyzed for salinity, dissolved oxygen and nutrient (silica, phosphate, nitrate, and nitrite) concentrations.

The measurements of the dissolved chlorofluorocarbons (CFCs) along this section were carried out by Dr. Mark Warner and Matthew Trunnell, both from the University of Washington, using the SIO analytical system. This system had been used on the previous two expeditions, so all of the analytical problems had been eliminated. Approximately 690 samples from 38 stations were analyzed for F-11 and F-12. Approximately 30 of these were duplicate samples from the same 10-liter bottle. No CFC samples were drawn after station 247 due to the use of the smaller rosette package with 1.2-liter bottles due to both the lack of sufficient amounts of water and the higher contamination levels in these bottles. These preliminary data have been included in the cruise hydrographic data files (.sea files) without many of the necessary corrections and elimination of questionable data points. The CFC concentrations in the overlying air were also measured at least once per day during the expedition.

Dr. Warner also continued to run the underway system of Dr. Ray Weiss. This system measures the partial pressures of carbon dioxide, nitrous oxide, and methane in surface water and the atmosphere. These measurements are each made twice per hour. Dr. Bronte Tilbrook of CSIRO operated a similar system for intercalibration purposes on this expedition. Samples were extracted at 19 stations for shoreside determination of helium and tritium concentrations, and 12 stations for C-14, Table 2. Continuous logs of underway meteorology (via the IMET system) and surface ocean properties were obtained, as well as bathymetric data every 5 minutes while underway between stations. A total of 11 ALACE floats were deployed on the leg, Table 3.

Samples were collected by the CO2 group from 22 stations at approximately 2 degree spacing. Eighteen of these stations were sampled concurrently with freons and other tracers. Some 549 samples were analyzed for total dissolved carbon dioxide (Ct), and of these 256 were also analyzed for the partial pressure of CO2 (pCO2). The Ct analyses were made on an automated instrument (SOMMA) designed by K. M. Johnson with coulometric detection, while the pCO2 analyses were made using a static equilibration technique under development at BNL utilizing a gas chromatograph for detection of CO2 after conversion to CH4. In addition, the SOMMA instrument was equipped with a Seabird SBE-4 conductance cell for the determination of salinity.

The precision of the Ct determination (estimated from the average difference between duplicate bottles collected from the same Niskin bottle (n = 45 pairs) is 0.60 mol/kg. Using an average Ct concentration of 2150 mol/kg on this leg yields a precision of 0.028%. Accuracy is estimated from the analyses of two certified reference standards (CRM) having values of 1960.67 and 2188.77 mol/kg, respectively. Our mean result for these CRM on leg 3 are 1959.21 (n=15) and 2187.17 (n=23), respectively.

In aggregate, the BNL groups analyzed more than 3000 samples for Ct, and nearly 1000 samples for pCO2 during the P6 section. The Ct data appears to be of high quality, and Ct will be contoured for the P6 section. The quality of the pCO2 data is not yet known because phase volume corrections are still to be made. Also encouraging is the preliminary finding that our salinity determinations agree with the salinometer result to better than 0.01 ppt.

ADCP data was collected throughout the cruise, along with navigation data from the ship's Magnavox GPS 200 receiver and heading from the ship's gyrocompass. In addition, independent heading measurements were collected using an Ashtech 3DF GPS receiver, which also provided 1 Hz measurements of pitch and roll.

Data files containing the preliminary hydrographic observations were shared among the cruise participants at the completion of the cruise.

Table 3: Deployment Log for ALACE Drifters Kn 138 Leg 5 P6 West

Instrument	Deployment time	Position	
158	920715 1202 Z	30 3.17' S	175 31.10' E
160	920716 1150	30 5.65	173 29.58
159	920717 1215	30 4.86	171 00.51
143	920718 0559	30 3.94	168 59.77
146	920719 0219	30 3.55	166 28.80
157	920720 0226	30 5.03	163 55.04
152	920720 1357	30 5.04	162 48.94
153	920721 2040	30 19.71	159 05.31
145	920723 0924	30 5.17	156 30.57
147	920724 0115	30 4.22	154 59.23
156	920724 2014	30 6.58	153 53.93

Nominal watch list for CTD Operations

0400 -- 1200	1200 -- 2000	2000 -- 0400
John Church	Steve Chiswell	John Toole
Neil White	Peter Landry	Chuck Corry
Dave Wellwood*	Ellyn Montgomery**	Bernadette Heaney
Sue Wijffels	George Knapp*	Dave Hollaway

*Hydrographers
**Data Processor

0000 -- 1200	1200 -- 0000
CFC	
Mark Warner	Matt Trunnell
Nutrients	
Consuelo Carbonell	Joe Jennings

A.5. Major Problems and Goals Not Achieved

None

A.6. Other Incidents of Note

None

A.7. List of Cruise Participants

Cruise participants and their responsibilities are listed in Table 4 for each leg.

TABLE 4: List of cruise participants

Responsibility	Individual	Institution
Leg 3:		
CTD Software Tech:	Carol MacMurray	WHOI
CTD Hardware Tech:	Gary Bond	WHOI
Data Quality Expert and thermosalinograph:	Bob Millard	WHOI
Rosette salinity samples	Theresa Turner	
Rosette oxygen samples	George Knapp	WHOI
Rosette nutrient samples	Hernan Garcia	OSU
	Andy Ross	OSU
Rosette Freon samples	Kevin Sullivan	UM RSMAS
	Kevin Maillet	UM RSMAS
Rosette Tritium/Helium	Mike Mathewson	WHOI
CO2	Ken Johnson	Brookhaven
	Kevin Wills	Brookhaven
	Craig Neil	Brookhaven
C-14	Rich Rotter	Princeton
ADCP	Michael Kosro	OSU
Watch Standers:	Marshall Swartz	WHOI
	Susan Hautala	
	Paul Robbins	
	Phil Morgan	
	Alistair Adcroft	
	Carmen Jara	
	Sergio Salinas	
SSG Techs:	Harold Rochat	WHOI
	Earl Young	WHOI
Leg 4		
CTD Software Tech:	Carol MacMurray	WHOI
CTD Data Asst:	Sarah Zimmermann	WHOI
CTD Hardware Tech:	Peter Landry	WHOI
Hydrography:		
Rosette salinity samples	Firuse Stalcup	WHOI
Rosette oxygen samples	Marv Stalcup	WHOI
Rosette nutrient samples	Joe Jennings	OSU
	Dennis Guffy	Texas A&M
Rosette Freon samples	Rick VanWoy	SIO
	Peter Salameh	SIO
Rosette Tritium/Helium	Scot Birdwhistell	
CO2	Richard Wilke	Brookhaven
	David Hunter	Brookhaven
	Meredith Anderson	Brookhaven
C-14	Gerry McDonald	Princeton
ADCP:	Stephen Pierce	OSU
Watch Standers:	Jeff Kinder	
	Elise Ralph	
	Molly Baringer	

TABLE 4: List of cruise participants (continued)

Responsibility	Individual	Institution
Leg 4 (continued):		
	Bernadette Sloyan	
	David Vaudrey	WHOI
SSG Tech:	Lenny Boutin	WHOI
Leg 5		
CTD Software Tech:	Ellyn Montgomery	WHOI
CTD Hardware Tech:	Peter Landry	WHOI
Hydrography:		
Rosette salinity samples	Dave Wellwood	WHOI
Rosette oxygen samples	George Knapp	WHOI
Rosette nutrient samples	Joe Jennings	OSU
	Consuelo Carbonell-Moore	OSU
Rosette Freon samples	Mark Warner	UW
	Matt Trunnell	UW
Rosette Tritium/Helium	Mike Mathewson	WHOI
CO2	Ken Johnson	Brookhaven
	Victoria Coles	RSMAS
	Bronte Tilbrook	CSIRO
C-14	Gerry McDonald	Princeton
ADCP:	Mike Kosro	OSU
Watch Standers:	John Church	WHOI
	Steve Chiswell	NZOI
	Chuck Corry	WHOI
	Bernadette Heaney	CSIRO
	David Hollaway	
	Neil White	CSIRO
	Susan Wijffles	WHOI
SSG Tech:	Lenny Boutin	WHOI

B. Underway Measurements

B.1. Navigation and bathymetry
(John Toole)

Manual logging of ocean depth was conducted on all 3 legs of P6. This work utilized the 12 kHz sounding system installed on the Knorr. Following WHPO guidlines, depths were noted every 10 minutes along track between stations. Position data for each depth measurement was extracted from the GPS fix record taken by the shipboard ADCP system (M. Kosro, lead scientist). Three ASCII files are submitted: LEG3.FNL, LEG4.FNL, LEG5.FNL formatted with one line per measurement of: time, latitude, longitude, depth.

Time is in decimal day in 1992; the position data are in decimal degrees (negative being south and west respectively). The depth data in meters are uncorrected for speed of sound. Time gaps in the record correspond to periods on station when the ship's pinger was turned off to facilitate tracking the CTD package.

B.2. Acoustic Doppler Current Profiler (ADCP)
(Mike Kosro)

This section not available as of December 7, 1994

B.3. Thermosalinograph and underway dissolved gasses
(Charles Corry)

A Falmouth Scientific Instruments (FSI) thermosalinograph (TSG) was mounted on the bow of the Knorr approximately 3 m below the surface and operated on all legs except the latter part of Leg4 , where corrosion of the anodized aluminum housing rendered it inoperable. The instrument was replaced in Auckland and operated satisfactorily throughout Leg5.

Comparisons between the surface water samples and the thermosalinograph were
done on Leg3 and the results are given in Table 5.

TABLE 5: P6E (Leg3) thermosalinograph calibrations

Sta	Bottle No.	CTD Pres-sure Dbar	TSG Surface Temp Celcius	CTD Temp. Celcius	TSG Surface Conduc-tivity	Conduc-tivity water Samples	Salinity water Sample	Oxygen water Sample
1	24	3.6	16.921	16.8676	41.154	44.0982	34.412	5.575
4	9	3.2	15.657	15.1002	39.88	42.2152	34.2679	5.636
5	23	3.4	15.505	15.4778	39.725	42.6065	34.2983	5.793
6	23	3.7	15.896	15.7668	40.107	42.9128	34.3115	5.83
7	23	3	16.413	16.2657	40.658	43.4536	34.3584	5.648
8	24	3.9	16.627	16.6198	40.652	43.843	34.4031	5.568
9	36	3.2	16.825	16.8368	41.086	44.071	34.4151	5.551
10	36	3.8	16.466	16.4458	40.634	43.5569	34.3007	5.631
11	36	3.6	16.949	16.9308	41.163	44.138	34.3949	5.474
12	36	3.7	17.018	16.9859	41.048	43.9771	34.2103	5.558
13	36	3.3	17.188	16.9373	41.197	44.0141	34.2825	5.586
14	36	3.5	17.54	17.5279	41.598	44.5977	34.2879	5.57
15	36	3.6	18.134	18.1194	42.199	45.2395	34.3392	5.444
16	36	3.8	17.881	17.9159	41.731	44.7912	34.1279	5.506
17	36	3.1	17.863	17.8484	41.664	44.6602	34.0711	5.497
18	36	3.3	18.246	18.2384	42.172	45.2144	34.2154	5.394
19	36	3.8	18.195	18.1949	42.117	45.1623	34.2081	5.404
20	36	3.6	17.89	17.8889	41.733	44.7431	34.107	5.477
22	11	3.5	18.981	18.968	43.303	46.4166	34.6168	5.343
23	36	3.8	18.523	18.5169	42.78	45.848	34.5201	5.406
24	36	3.8	18.708	18.7111	43.032	46.1329	34.5961	5.386
25	36	3.5	18.548	18.5373	42.863	45.9279	34.5669	5.407
26	36	3.8	18.229	18.2198	42.575	45.6196	34.5751	5.387
28	36	3.8	19.041	19.029	43.563	46.6785	34.7885	5.33
29	36	3	18.707	18.7029	43.177	46.2741	34.719	5.37
30	36	3.4	18.478	18.4838	42.929	46.0323	34.7038	5.398
31	36	3.8	18.6	18.6178	42.957	46.0977	34.6423	5.418
32	36	3.4	18.745	18.1649	43.256	45.4802	34.4964	5.416
33	36	3.1	19.266	19.2605	43.924	47.0806	34.9268	5.305
35	36	3.7	18.245	18.2087	42.499	45.5235	34.5054	5.536
37	36	3.4	18.568	18.55	42.984	46.0117	34.6295	5.381
38	24	3.6	18.732	18.7188	43.251	46.2996	34.7302	5.372
39	36	3.5	19.111	19.1112	43.815	46.8941	34.8967	5.29
40	36	3	19.266	19.329	44.13	99.999	-9	-9
41	35	3.8	18.549	18.5469	42.946	45.9859	34.6091	5.356
42	36	3.4	18.381	18.3779	42.81	45.7396	34.5459	5.395
45	36	3.4	19.4127	19.4127	47.0882	47.3859	35.0492	5.282
46	36	3.9	19.3225	19.3225	46.9727	47.2675	35.0276	5.261
47	36	3.6	19.215	19.215	46.6401	46.9345	34.8428	5.288
48	36	3.8	19.013	19.0049	43.664	46.6123	34.7465	5.31
49	36	3.5	19.124	19.1072	43.846	46.7771	34.8043	5.282

Sta	Bottle No.	CTD Pres-sure Dbar	TSG Surface Temp Celcius	CTD Temp. Celcius	TSG Surface Conduc-tivity	Conduc-tivity water Samples	Salinity water Sample	Oxygen water Sample
50	36	3.3	19.545	19.5349	44.034	47.4647	35.0155	5.247
51	36	3.9	19.048	19.0389	43.764	46.7582	34.8424	5.303
52	36	3.2	18.749	18.7511	43.35	46.2481	34.6588	5.322
53	36	3.3	18.702	18.6973	43.43	46.3047	34.7545	5.326
54	36	3.7	19.678	19.6455	44.85	47.766	35.1713	5.228
55	36	3	19.478	19.4736	44.44	47.3814	34.997	5.253
56	36	3.4	19.817	19.802	45.041	47.9979	35.2333	5.2
57	36	3.1	19.748	19.7337	44.942	47.8831	35.1922	5.224
58	36	4	20.115	20.0827	45.278	48.2633	35.2164	5.168
59	36	3.9	20.351	20.3434	45.645	48.6291	35.2948	5.139
60	36	3	19.774	19.7675	44.186	47.758	35.0644	5.206
61	36	3.9	19.671	19.663	44.626	47.5504	34.9785	5.223
62	36	3.3	19.163	19.1574	43.923	46.7966	34.7789	5.274
63	36	3.8	18.665	18.6549	43.265	46.0931	34.6101	5.328
64	36	3	19.854	19.848	45.096	48.0579	35.242	5.185
65	36	3.7	19.819	19.7969	45.049	47.985	35.2272	5.185
66	36	3.8	19.936	19.936	45.158	48.1204	35.2189	5.188
67	36	3.3	19.624	19.6173	44.654	47.5814	35.0415	5.221
68	36	3.7	19.24	19.5314	44.654	47.4961	35.0443	5.238
69	36	3	19.071	18.9706	43.756	46.5752	34.7486	5.302
70	36	3.3	19.795	19.7996	44.989	47.955	35.1971	5.194
71	36	3.8	19.542	19.5385	44.593	47.521	35.0589	5.221
72	36	3.1	19.777	19.7295	44.856	47.7479	35.0886	5.212

Note: I think such calibrations were done on the other legs and that data should be obtained CEC 12/5/94.

An underway fluorometer was operated on Legs 3 and 4 but failed before the end of Leg 4. John Marra, LDEO, was the principal investigator for that measurement.

A number of underway measurements of the atmospheric chemistry were made by Ray Weiss group.

B.4. Expendable bathythermograph and salinity measurements

No XBT or XCTD casts were done on any leg of this cruise.

B.5. Meteorological observations

(Margaret Cook)

Data from the IMET system aboard R/V Knorr was reduced by Ken Prada (WHOI) and submitted to NCAR. The P6 data in NetCDF format are available via the network from Steve Worley at NCAR. His network address for email is worley@ncar.ncar.edu He can also be reached by telephone at (303) 497-1248.

To access these data, Steve Worley should be contacted at NCAR. He will set up an anonymous FTP for you. The address of the machine we extracted data from was ncardata.ucar.edu. He will enable you to receive UNIX TAR files across the network. Most of these contain data files. There is a file, imet_asc.tar, which contains the full software package for reading the NetCDF files. Program imet_asc is used to access the binary NetCDF files and output ascii files for subsequent analysis. There are a few things we learned about this data which will be of interest to whomever is using it.

1. Wind direction is logged in oceanogrpahic rather than meteorlogical terms. That is, where the wind is going, rather than where it is coming from.

2. Corrections were supposedly being made automatically to the data based upon a compass installed in the wind sensor. Unfortunately, the compass was not always working correctly. The theory is that when it was not working, no corrections were made. We understand that during P6 the compass was probably disconnected and so the data does need to be corrected for ship's speed and direction.

3. The files contained in the TAR files are not always chronological. Many files contain two or more nonconsecutive time periods, and one time period may be split between two or more nonsequential files. There are also many time periods which seem to be missing altogether.

C. Hydrographic Measurements

C.1. General Information

The Woods Hole Oceanographic Institution's CTD/Hydrography Group was responsible for the basic hydrography on the P6 cruise. We employed A 36-bottle-position underwater frame and 10-litre sample bottles designed and constructed by the Ocean Data Facility at the Scripps Institution of Oceanography. Modified MkIII Conductivity-Temperature- Depth (CTD) instruments mounted on the frame were supplied by the WHOI Group, as were the data acquisition and processing computer systems.

Three CTD instruments (WHOI ID's #7, 9 and 10) were available during the cruise. Instrument #10 was used on the bulk of the stations; #9 was pressed into service briefly during the middle leg when #10 suffered an electronic failure. Details of which instrument was used when are given in Water sample nutrient data

The following was excerpted from the at-sea log kept by the CTD data processor on each leg (Carol MacMurray: Legs 3, 4; Ellyn Montgomery: Leg 5). The log details the major difficulties experienced on P6. In general, operations on stations not discussed below went more-or-less normally.
CTD 10 was the primary instrument on the cruise, No.9 was called into service for some 10 stations during leg 3 when No. 10 failed. CTD No. 9 also failed on that leg, but by that time CTD No. 10 had been repaired. Details of which CTD was used on which stations are given in Table 6.

TABLE 6: CTD instrument and station numbers

CTD Number	Cruise Leg	Station Numbers
CTD 10	Leg 3:	1, 4-72
	Leg 4:	74, 75, 86-111, 113-140,142-186, 188
	Leg 5:	190-212
CTD 9	Leg 3:	3
	Leg 4:	76-85, 112, 141, 187
	Leg 5:	189
CTD 7	Leg 3:	2
	Leg 4:	73
	Leg 5:	None

Ctds 9 and 10 were equipped with a second temperature channel (using an FSI Ocean Temperature Module). Data from these sensors were used to assess when during the cruise shifts in the primary temperature sensor occurred. CTD No. 10 was also equipped with a pump, designed to make uniform the flow of seawater past the dissolved oxygen sensor. The oxygen pump was used throughout leg3. Careful examination of the Leg3 data after the cruise suggested the pump did not function as well as was hoped (or tested on earlier expeditions). The oxygen current data are quite noisy in the top several hundred meters from Leg3. (Possibly the pump was cavitating on air not bled from the supply tube.) In any event, the final P6 data from Leg3 have quite noisy oxygens in the upper ocean. Users may wish to do some vertical averaging/filtering prior to using these data. The oxygen pump was removed from the system at the start of Leg4 and not used for the rest of the expedition.

Shorebased processor:

MicroVAX Data subdirectory: R2D2:<CTD.KN138P003

NOTE: The ship departed Valparaiso as Knorr 138 Leg3. We will keep the directory KN138 throughout all three legs and increment the station numbers.

NOTE: There was an FSI CTD and scripps logger attached to the package for selected stations on Leg5 to obtain comparison data to test this new instrument.

Data Acquisition

MICROVAX II CTD03 with WHOI AQUI89 acquisition package (Version 1.0+)

Logging data to: Vhs vcr tape recorder 9T Microvax disk file (No.No.No.ANo.No.No..RAW) in CTD78 format (*.WRW,*.WSC,*.HED,*.ERR) in ASCII format

CTD 10

AT SEA COMMON USED FOR DATA ACQUISITION CTD No.10. The laboratory derived calibration constants used in the real-time display of data during the cruise are given in Table 7.

TABLE 7: CTD No. 10 calibration constants

vNo	attribute 1	attribute 2	slope	bias	sensor lag
1	-0.294565E-08	0.000000E+00	0.100352E+00	-0.246449E+00	0.000000E+00
2	0.225955E-11	0.000000E+00	0.499864E-03	0.186416E-02	0.250000E+00
3	-0.650000E-05	0.150000E-07	0.100631E-02	-0.177214E-02	0.000000E+00
4	0.280000E+01	0.300000E+04	0.100000E+01	0.000000E+00	0.000000E+00
5	-0.360000E-01	0.115000E-03	0.123300E-02	0.000000E+00	0.000000E+00
6	0.750000E+00	0.000000E+00	0.128000E+00	0.000000E+00	0.000000E+00
7	-0.707350E+02	0.246810E+01	-0.909828E-02	0.362914E+02	0.000000E+00
8	0.000000E+00	0.000000E+00	0.100000E+01	0.000000E+01	0.000000E+00
9	0.000000E+00	0.000000E+00	0.500000E-03	-0.200000E+01	0.000000E+00
10	0.543326E-01	-0.413000E-05	0.100000E+01	0.218000E+02	0.000000E+00
TP cals changed station 60: S1=+2.71E-6 S2=-0.054 Pressure Bias set to -0.8 station 60.					

CTD 9

AT SEA COMMONLY USED FOR DATA ACQUISITION CTD No.9

TABLE 8: CTD No. 9 calibration constants

vNo	attribute 1	attribute 2	slope	bias	sensor lag
1	0.297377E-09	0.000000E+00	0.100557E+00	0.450652E+00	0.000000E+00
2	0.197920E-11	0.000000E+00	0.500248E-03	-0.361583E-01	0.250000E+00
3	-0.650000E-05	0.150000E-07	0.997986E-03	-0.231510E-01	0.000000E+00
4	0.280000E+01	0.300000E+04	0.100000E+01	0.000000E+00	0.000000E+00
5	-0.360000E-01	0.115000E-03	0.148000E-02	0.000000E+00	0.000000E+00
6	0.750000E+00	0.000000E+00	0.128000E+00	0.000000E+00	0.000000E+00
7	-0.227549E+03	0.126625E+02	-0.904813E-02	0.379786E+02	0.000000E+00
8	0.000000E+00	0.000000E+00	0.100000E+01	0.000000E+01	0.000000E+00
9	0.000000E+00	0.000000E+00	0.500000E-03	-0.200000E+01	0.000000E+00
10	-0.141909E-01	-0.353000E-05	0.100000E+01	0.218000E+02	0.000000E+00
TP cals changed leg 4: S1=+3.39E—6 S2=+.015					

CTD 7

AT SEA COMMONLY USED FOR DATA ACQUISITION CTD No. 7

TABLE 9: CTD No. 7 calibration constants

vNo	attribute 1	attribute 2	slope	bias	sens lag
1	-0.802577E-09	0.000000E+00	0.999165E-01	0.366930E+00	0.000000E+00
2	0.131918E-11	0.000000E+00	0.499886E-03	0.627969E-03	0.250000E+00
3	-0.650000E-05	0.150000E-07	0.984760E-03	0.380964E-01	0.000000E+00
4	0.280000E+01	0.300000E+04	0.100000E+01	0.000000E+00	0.000000E+00
5	-0.360000E-01	0.115000E-03	0.240500E-02	0.000000E+00	0.000000E+00
6	0.750000E+00	0.000000E+00	0.128000E+00	0.000000E+00	0.000000E+00
7	0.000000E+00	0.000000E+00	0.100000E+01	0.000000E+00	0.000000E+00
8	0.000000E+00	0.000000E+00	0.100000E+01	0.000000E+00	0.000000E+00
9	0.000000E+00	0.000000E+00	0.500000E-03	-0.200000E+01	0.000000E+00
10	0.000000E+00	0.000000E+00	0.100000E+01	0.000000E+00	0.000000E+00
TP cals changed leg 4: S1=-2.54E-6 S2=-0.40					

Shipboard Processing

Description of computer system used:

CTDED78 run on MicroVAX Acquisition CTD78 format raw data 9T files. output to MicroVAX disk files
[CTD.KN138P003.CTDED78]No.No.No.No.DNo.No.No..EDT

error identification downtrace ***discovered bug in editor at sea: given true pressure limits, program will truncate CTD data by 7-13110011dbar depending on the depth. Deeper the station, more severe the truncation. Noticed in Chilean trench. Workaround: add 20 dbars to max pressure limit observed by CTD (on station log). Record limits do not seem to override this discrepancy.

***discovered similar flakyness on Leg5. Sometimes the record min for processing is ignored, when processing from disk files. Using the AQUI 9tracks allowed correct processing in these cases.

Water sample Programs: BTLFMTVX, WOCTMPV2* (to produce WOCE template) BTLMRGV2, SEAMERG2 (to merge sa,ox,nuts data) CONVERT, HYDOUTV (to create .dyn file)

*woctmpv2 was revised at sea to encorporate new PRESSC.for code
Water sample corrections: [ctd.kn138p003.john]fixtp.com modifies .wrw files to include a compensation for tp.

Water sample filenames: Salinity and Oxygen Rosette Samples for overplotting ctd and bottle data
KN138.WSD - all stations KN138.DYN - all stations for overplotting Merged CTD, SA, OX, Nutrient water sample filename:

KN138.SEA - Woce template, all stations appended together

C.2. Water sample salinity and oxygen data
(George Knapp)

Water sample analysis for salinity and dissolved oxygen was conducted in a WHOI portable laboratory secured to the deck of the ship. The portable laboratory is capable of maintaining a constant environmental temperature within q 1xC. The nominal laboratory temperature was 22xC. Two Guildline Autosal Model 8400A salinometers were utilized to determine water sample salinities (WHOI instrument numbers 10 and 11). Water sample analysis for dissolved oxygen was also performed in the constant temperature laboratory using a modified Winkler titration technique. The measurements were conducted on 50 ml aliquots of the samples.

A complete description of the dissolved oxygen and salinity measurement techniques used during this cruise are presented by Knapp, et al. (1990).

Oxygen

Each oxygen bottle was rinsed twice with sample water and then carefully filled to avoid aeration. Approximately 300 ml of the sample was permitted to overflow the bottle. One ml each of the MnCl2 and NaI-NaOH reagents was immediately added to the seawater and the sample bottle was capped and shaken vigorously. When all of the oxygen samples had been collected, they were placed in the constant temperature portable lab to thermally equilibrate and await analysis. About an hour after the oxygen samples were collected, they were shaken a second time to ensure complete oxidation of the precipitant.

Just before the oxygen samples were to be titrated, one ml of H2SO4 was added to each sample, followed by a second vigorous shaking to dissolve the precipitate and release iodine proportional to the dissolved oxygen originally in the sample. A 50 ml aliquot of the iodine solution from each bottle was titrated with 0.01 N sodium thiosulphate using an automated amperometric end-point detection method controlled by a computer. The normality of the thiosulphate was determined regularly by comparison with a biiodate standard solution which has a normality of exactly 0.0100. The reagent blank value was also determined periodically.

Salinity

Salinity samples were collected from the rosette after most other samples had been drawn. Bottles and caps were rinsed twice, and then the bottles were filled to within one half inch of the neck, leaving air space to allow for expansion as the samples warmed.

Analysis of the salinity samples was not conducted until samples achieved laboratory temperature, generally about 5-6 hours after collection. Before each salinity bottle was opened it was thoroughly shaken to remove gradients. Both the filling tube and the sealing cork on the salinometer were carefully dried before each sample was measured to avoid contamination from the previous sample. The rate at which the air pump fills the conductivity cell with seawater was adjusted to ensure that the sample reached bath temperature before the conductivity ratio was measured. The salinometer was standardized daily with IAPSO Standard Sea Water (SSW) Batch P116 during the entire cruise and the zero reference and heater lamps were checked daily.

On June 18th, during the second leg, salinometer no. 11 began showing a tendency of displaying salinities that were offset on the high side by about .006 psu. This would occur apparently randomly, and would last from 5-15 minutes. Very difficult to detect during normal operation, it was only noticed during a standardization. Therefore, analysis was switched to the backup Autosal, no. 10 for the remainder of the cruise. It is now believed this problem was caused by either radio frequency noise, or power line noise, and that no. 10 was more immune to the noise than no. 11.

TABLE 10: Salinity standardization data for the WOCE P6 cruise

	Batch	Sal No	Oper-ator	Temp. C	Zero	Sby	Date	Time
STDZE	P116	11	TT	24	-0.00002	24+5966	05-01-1992	16:27:21
STDZE	P116	11	TT	24	-0.00002	24+5969	05-02-1992	10:21:26
STDZE	P116	11	TT	24	-0.00002	24+5970	05-03-1992	14:44:10
STDZE	P116	11	TT	24	-0.00002	24+5970	05-04-1992	13:24:38
STDZE	P116	11	TT	24	-0.00002	24+5962	05-05-1992	12:43:57
STDZE	P116	11	TT	24	-0.00002	24+5963	05-06-1992	12:58:31
STDZE	P116	11	TT	24	-0.00002	24+5963	05-07-1992	13:20:51
STDZE	P116	11	TT	24	-0.00002	24+5963	05-08-1992	13:02:33
STDZE	P116	11	TT	24	-0.00002	24+5959	05-09-1992	16:17:39
STDZE	P116	11	TT	24	-0.00002	24+5958	05-10-1992	14:04:17
STDZE	P116	11	TT	24	-0.00002	24+5958	05-11-1992	13:50:40
STDZE	P116	11	TT	24	-0.00002	24+5958	05-12-1992	13:29:16
STDZE	P116	11	TT	24	-0.00002	24+5958	05-13-1992	15:47:29
STDZE	P116	11	TT	24	-0.00002	24+5958	05-14-1992	08:56:13
STDZE	P116	11	TT	24	-0.00002	24+5959	05-15-1992	14:03:03
STDZE	P116	11	TT	24	-0.00001	24+5961	05-16-1992	15:15:07
STDZE	P116	11	TT	24	-0.00001	24+5961	05-17-1992	15:13:52
STDZE	P116	11	TT	24	-0.00001	24+5961	05-18-1992	18:33:48
STDZE	P116	11	TT	24	-0.00001	24+5961	05-19-1992	11:54:46
STDZE	P116	11	TT	24	-0.00001	24+5961	05-20-1992	14:22:33
STDZE	P116	11	TT	24	-0.00001	24+5960	05-21-1992	14:27:12
STDZE	P116	11	TT	24	-0.00001	24+5963	05-22-1992	13:32:34
STDZE	P116	11	TT	24	-0.00001	24+5961	05-23-1992	14:23:32
STDZE	P116	11	TT	24	-0.00001	24+5962	05-24-1992	14:36:32
STDZE	P116	11	FS	24	-0.00001	24+5962	05-31-1992	14:25:44
STDZE	P116	11	FS	24	0.00000	24+5961	06-01-1992	15:50:26
STDZE	P116	11	FS	24	-0.00001	24+5962	06-02-1992	15:46:47
STDZE	P116	11	FS	24	-0.00001	24+5967	06-03-1992	15:52:50
STDZE	P116	11	FS	24	-0.00001	24+5961	06-04-1992	16:56:11
STDZE	P116	11	FS	24	-0.00001	24+5962	06-05-1992	17:26:43
STDZE	P116	11	FS	24	-0.00001	24+5962	06-06-1992	17:04:25
STDZE	P116	11	FS	24	-0.00001	24+5961	06-08-1992	17:02:35
STDZE	P116	11	FS	24	-0.00002	24+5961	06-09-1992	04:51:37
STDZE	P116	11	FS	24	-0.00001	24+5961	06-09-1992	16:54:46
STDZE	P116	11	FS	24	-0.00001	24+5961	06-10-1992	22:39:52
STDZE	P116	11	FS	24	-0.00001	24+5967	06-11-1992	17:40:53
STDZE	P116	11	FS	24	-0.00001	24+5962	06-11-1992	20:36:21
STDZE	P116	11	FS	24	-0.00001	24+5961	06-12-1992	16:58:19
STDZE	P116	11	FS	24	-0.00001	24+5961	06-3-1992	18:08:16
STDZE	P116	11	FS	24	-0.00001	24+5961	06-14-1992	21:11:59
STDZE	P116	11	FS	24	-0.00001	24+5961	06-15-1992	18:23:58
STDZE	P116	11	FS	24	-0.00001	24+5962	06-16-1992	03:25:03

TABLE 10: Salinity standardization data for the WOCE P6 cruise (contd)

	Batch	Sal No	Oper-ator	Temp. C	Zero	Sby	Date	Time
STDZE	P116	11	FS	24	-0.00001	24+5962	06-16-1992	17:10:53
STDZE	P116	11	FS	24	-0.00001	24+5955	06-18-1992	00:38:21
STDZE	P116	11	FS	24	-0.00001	24+5962	06-18-1992	17:50:09
STDZE	P116	10	FS	24	-0.00004	24+5710	06-18-1992	22:20:55
STDZE	P116	10	FS	24	-0.00004	24+5711	06-18-1992	23:59:50
STDZE	P116	10	FS	24	-0.00002	24+5711	06-19-1992	18:02:03
STDZE	P116	10	FS	24	-0.00002	24+5711	06-19-1992	20:28:36
STDZE	P116	10	FS	24	-0.00002	24+5711	06-20-1992	04:22:29
STDZE	P116	10	FS	24	0.00000	24+5711	06-20-1992	18:36:16
STDZE	P116	10	FS	24	0.00000	24+5710	06-21-1992	17:29:18
STDZE	P116	10	FS	24	0.00000	24+5709	06-22-1992	05:34:32
STDZE	P116	10	FS	24	0.00000	24+5709	06-22-1992	18:24:00
STDZE	P116	10	FS	24	0.00000	24+5703	06-23-1992	18:38:43
STDZE	P116	10	FS	24	0.00000	24+5708	06-24-1992	19:12:47
STDZE	P116	10	MS	24	0.00000	24+5709	06-26-1992	19:13:05
STDZE	P116	10	MS	24	0.00000	24+5710	06-26-1992	19:13:51
STDZE	P116	10	MS	24	0.00000	24+5710	06-26-1992	19:14:07
STDZE	P116	10	MS	24	0.00000	24+5708	06-27-1992	19:13:08
STDZE	P116	10	MS	24	0.00000	24+5708	06-28-1992	19:10:51
STDZE	P116	10	MS	24	-0.00002	24+5708	06-29-1992	02:36:54
STDZE	P116	10	MS	24	-0.00001	24+5707	06-30-1992	06:00:16
STDZE	P116	10	MS	24	-0.00002	24+5707	07-03-1992	20:25:47
STDZE	P116	10	MS	24	-0.00002	24+5707	07-04-1992	21:54:17
STDZE	P116	10	DW	24	0.00000	24+5707	07-14-1992	02:25:13
STDZE	P116	10	DW	24	-0.00001	24+5707	07-15-1992	02:40:02
STDZE	P116	10	DW	24	-0.00001	24+5707	07-16-1992	15:57:25
STDZE	P116	10	DW	24	-0.00002	24+5706	07-17-1992	15:49:23
STDZE	P116	10	DW	24	-0.00002	24+5706	07-18-1992	16:43:51
STDZE	P116	10	DW	24	-0.00002	24+5706	07-19-1992	16:38:04
STDZE	P116	10	DW	24	-0.00002	24+5711	07-20-1992	17:28:33
STDZE	P116	10	GK	24	-0.00002	24+5709	07-21-1992	19:59:34
STDZE	P116	10	GK	24	-0.00001	24+5710	07-22-1992	20:09:16
STDZE	P116	10	GK	24	-0.00002	24+5710	07-23-1992	19:41:17
STDZE	P116	10	GK	24	-0.00002	24+5709	07-24-1992	20:51:10
STDZE	P116	10	GK	24	-0.00002	24+5708	07-25-1992	20:48:36
STDZE	P116	10	GK	24	-0.00002	24+5708	07-26-1992	20:56:50
STDZE	P116	10	GK	24	-0.00002	24+5708	07-27-1992	20:22:51

Table 11 contains all of the dissolved oxygen standardization and blank determinations made during WOCE cruise P6.

TABLE 11: Dissolved oxygen standardization and blank determinations

Mode	Burette Volumes			End Volt	Thio-sulfate	Date	Time
Leg 3							
STDZE	15.000	49.971	149.6	0.0210	4.469	05-02-1992	16:06:55
STDZE	15.000	49.971	149.6	0.0210	4.491	05-02-1992	16:06:55
STDZE	15.000	49.971	149.6	0.0210	4.467	05-02-1992	16:06:55
STDZE	15.000	49.971	149.6	0.0210	4.460	05-02-1992	16:06:55
BLANK	15.000	49.971	0.999	0.987	0.0060	05-02-1992	16:18:03
STDZE	15.000	49.971	149.6	0.0140	4.462	05-06-1992	12:14:37
STDZE	15.000	49.971	149.6	0.0210	4.466	05-06-1992	12:14:37
STDZE	15.000	49.971	149.6	0.0140	4.499	05-06-1992	12:14:37
STDZE	15.000	49.971	149.6	0.0140	4.496	05-06-1992	12:14:37
STDZE	15.000	49.971	149.6	0.0140	4.478	05-06-1992	12:14:37
STDZE	15.000	49.971	149.6	0.0140	4.471	05-06-1992	12:14:37
STDZE	15.000	49.971	149.6	0.0210	4.482	05-06-1992	12:14:37
STDZE	15.000	49.971	149.6	0.0140	4.473	05-06-1992	12:14:37
STDZE	15.000	49.971	149.6	0.0230	4.420	05-08-1992	12:46:59
STDZE	15.000	49.971	149.6	0.0230	4.418	05-08-1992	12:46:59
STDZE	15.000	49.971	149.6	0.0230	4.426	05-08-1992	12:46:59
STDZE	15.000	49.971	149.6	0.0230	4.415	05-08-1992	12:46:59
STDZE	15.000	49.971	149.6	0.0230	4.443	05-11-1992	12:22:28
STDZE	15.000	49.971	149.6	0.0230	4.437	05-11-1992	12:22:28
STDZE	15.000	49.971	149.6	0.0150	4.444	05-11-1992	12:22:28
STDZE	15.000	49.971	149.6	0.0230	4.433	05-11-1992	12:22:28
STDZE	15.000	49.971	149.6	0.0310	4.469	05-13-1992	13:01:40
STDZE	15.000	49.971	149.6	0.0230	4.466	05-13-1992	13:01:40
STDZE	15.000	49.971	149.6	0.0230	4.472	05-13-1992	13:01:40
STDZE	15.000	49.971	149.6	0.0230	4.465	05-13-1992	13:01:40
BLANK	15.000	49.971	1.002	0.992	0.0040	05-13-1992	13:13:05
STDZE	15.000	49.971	149.6	0.0230	4.493	05-15-1992	12:41:53
STDZE	15.000	49.971	149.6	0.0230	4.480	05-15-1992	12:41:53
STDZE	15.000	49.971	149.6	0.0230	4.492	05-15-1992	12:41:53
STDZE	15.000	49.971	149.6	0.0230	4.482	05-15-1992	12:41:53
STDZE	15.000	49.971	149.6	0.0150	4.519	05-17-1992	01:40:05
STDZE	15.000	49.971	149.6	0.0150	4.508	05-17-1992	01:40:05
STDZE	15.000	49.971	149.6	0.0310	4.237	05-17-1992	14:10:07
STDZE	15.000	49.971	149.6	0.0230	4.255	05-17-1992	14:10:07
STDZE	15.000	49.971	149.6	0.0160	4.262	05-17-1992	14:10:07
STDZE	15.000	49.971	149.6	0.0160	4.256	05-17-1992	14:10:07
STDZE	15.000	49.971	149.6	0.0160	4.273	05-18-1992	17:16:51
STDZE	15.000	49.971	149.6	0.0160	4.263	05-18-1992	17:16:51
STDZE	15.000	49.971	149.6	0.0230	4.274	05-19-1992	14:46:39
STDZE	15.000	49.971	149.6	0.0160	4.268	05-19-1992	14:46:39
STDZE	15.000	49.971	149.6	0.0160	4.272	05-19-1992	14:46:39

TABLE 11: Dissolved oxygen standardization and blank determinations, (contd)

Mode	Burette Volumes			End Volt	Thio-sulfate	Date	Time
Leg 3							
STDZE	15.000	49.971	149.6	0.0160	4.263	05-19-1992	14:46:39
STDZE	15.000	49.971	149.6	0.0160	4.280	05-20-1992	13:06:13
STDZE	15.000	49.971	149.6	0.0160	4.277	05-20-1992	13:06:13
STDZE	15.000	49.971	149.6	0.0230	4.473	05-21-1992	12:59:29
STDZE	15.000	49.971	149.6	0.0160	4.463	05-21-1992	12:59:29
STDZE	15.000	49.971	149.6	0.0160	4.480	05-21-1992	12:59:29
STDZE	15.000	49.971	149.6	0.0160	4.474	05-21-1992	12:59:29
STDZE	15.000	49.971	149.6	0.0230	4.483	05-22-1992	13:14:14
STDZE	15.000	49.971	149.6	0.0230	4.473	05-22-1992	13:14:14
STDZE	15.000	49.971	149.6	0.0230	4.482	05-23-1992	12:55:44
STDZE	15.000	49.971	149.6	0.0160	4.483	05-23-1992	12:55:44
STDZE	15.000	49.971	149.6	0.0160	4.491	05-23-1992	12:55:44
STDZE	15.000	49.971	149.6	0.0160	4.479	05-23-1992	12:55:44
STDZE	15.000	49.971	149.6	0.0160	4.510	05-24-1992	14:10:14
STDZE	15.000	49.971	149.6	0.0160	4.511	05-24-1992	14:10:14
STDZE	15.000	49.971	149.6	0.0160	4.454	05-24-1992	23:12:28
STDZE	15.000	49.971	149.6	0.0230	4.448	05-24-1992	23:12:28
STDZE	15.000	49.971	149.6	0.0160	4.461	05-24-1992	23:12:28
STDZE	15.000	49.971	149.6	0.0230	4.429	05-24-1992	23:12:28
STDZE	15.000	49.971	149.6	0.0160	4.498	06-01-1992	15:42:34
STDZE	15.000	49.971	149.6	0.0160	4.502	06-01-1992	15:42:34
STDZE	15.000	49.971	149.6	0.0160	4.548	06-01-1992	16:00:46
STDZE	15.000	49.971	149.6	0.0160	4.542	06-01-1992	16:00:46
STDZE	15.000	49.971	149.6	0.0160	4.526	06-01-1992	16:00:46
STDZE	15.000	49.971	149.6	0.0160	4.519	06-01-1992	16:00:46
STDZE	15.000	49.971	149.6	0.0160	4.555	06-02-1992	15:21:12
STDZE	15.000	49.971	149.6	0.0160	4.560	06-02-1992	15:21:12
STDZE	15.000	49.971	149.6	0.0160	4.557	06-02-1992	15:21:12
STDZE	15.000	49.971	149.6	0.0160	4.556	06-02-1992	15:21:12
STDZE	15.000	49.971	149.6	0.0160	4.555	06-03-1992	15:16:12
STDZE	15.000	49.971	149.6	0.0160	4.554	06-03-1992	15:16:12
STDZE	15.000	49.971	149.6	0.0160	4.562	06-03-1992	15:16:12
STDZE	15.000	49.971	149.6	0.0160	4.557	06-03-1992	15:16:12
STDZE	15.000	49.971	149.6	0.0230	4.430	06-04-1992	15:29:11
STDZE	15.000	49.971	149.6	0.0160	4.447	06-04-1992	15:29:11
STDZE	15.000	49.971	149.6	0.0160	4.441	06-04-1992	15:29:11
STDZE	15.000	49.971	149.6	0.0160	4.435	06-04-1992	15:29:11
STDZE	15.000	49.971	149.6	0.0160	4.471	06-04-1992	15:29:11
STDZE	15.000	49.971	149.6	0.0160	4.467	06-04-1992	15:29:11
STDZE	15.000	49.971	149.6	0.0160	4.470	06-05-1992	15:59:38
STDZE	15.000	49.971	149.6	0.0160	4.485	06-05-1992	15:59:38
STDZE	15.000	49.971	149.6	0.0160	4.474	06-05-1992	15:59:38
STDZE	15.000	49.971	149.6	0.0160	4.470	06-05-1992	15:59:38
STDZE	15.000	49.971	149.6	0.0160	4.470	06-06-1992	15:55:12

Mode	Burette Volumes			End Volt	Thio-sulfate	Date	Time
Leg 3							
STDZE	15.000	49.971	149.6	0.0160	4.475	06-06-1992	15:55:12
STDZE	15.000	49.971	149.6	0.0160	4.482	06-06-1992	15:55:12
STDZE	15.000	49.971	149.6	0.0160	4.480	06-06-1992	15:55:12
STDZE	15.000	49.971	149.6	0.0160	4.298	06-06-1992	22:34:37
STDZE	15.000	49.971	149.6	0.0230	4.303	06-06-1992	22:34:37
STDZE	15.000	49.971	149.6	0.0160	4.312	06-07-1992	15:54:19
STDZE	15.000	49.971	149.6	0.0160	4.304	06-07-1992	15:54:19
STDZE	15.000	49.971	149.6	0.0160	4.315	06-07-1992	15:54:19
STDZE	15.000	49.971	149.6	0.0160	4.304	06-07-1992	15:54:19
STDZE	15.000	49.971	149.6	0.0160	4.322	06-08-1992	16:25:04
STDZE	15.000	49.971	149.6	0.0160	4.309	06-08-1992	16:25:04
STDZE	15.000	49.971	149.6	0.0160	4.320	06-08-1992	16:25:04
STDZE	15.000	49.971	149.6	0.0160	4.318	06-08-1992	16:25:04
STDZE	15.000	49.971	149.6	0.0160	4.367	06-09-1992	16:12:58
STDZE	15.000	49.971	149.6	0.0160	4.354	06-09-1992	16:12:58
STDZE	15.000	49.971	149.6	0.0160	4.361	06-09-1992	16:12:58
STDZE	15.000	49.971	149.6	0.0160	4.355	06-09-1992	16:12:58
Leg 4							
STDZE	15.000	49.971	149.6	0.0160	4.295	06-11-1992	00:29:30
STDZE	15.000	49.971	149.6	0.0160	4.344	06-11-1992	00:29:30
STDZE	15.000	49.971	149.6	0.0160	4.349	06-11-1992	00:29:30
STDZE	15.000	49.971	149.6	0.0160	4.343	06-11-1992	00:29:30
STDZE	15.000	49.971	149.6	0.0080	4.348	06-11-1992	17:13:07
STDZE	15.000	49.971	149.6	0.0160	4.345	06-11-1992	17:13:07
STDZE	15.000	49.971	149.6	0.0160	4.374	06-11-1992	17:13:07
STDZE	15.000	49.971	149.6	0.0160	4.367	06-11-1992	17:13:07
STDZE	15.000	49.971	149.6	0.0160	4.349	06-12-1992	16:58:25
STDZE	15.000	49.971	149.6	0.0160	4.339	06-12-1992	16:58:25
STDZE	15.000	49.971	149.6	0.0160	4.349	06-12-1992	16:58:25
STDZE	15.000	49.971	149.6	0.0160	4.325	06-12-1992	16:58:25
STDZE	15.000	49.971	149.6	0.0160	4.329	06-13-1992	17:04:21
STDZE	15.000	49.971	149.6	0.0160	4.341	06-13-1992	17:04:21
STDZE	15.000	49.971	149.6	0.0160	4.373	06-13-1992	17:04:21
STDZE	15.000	49.971	149.6	0.0160	4.359	06-13-1992	17:04:21
STDZE	15.000	49.971	149.6	0.0160	4.339	06-15-1992	17:54:48
STDZE	15.000	49.971	149.6	0.0160	4.339	06-15-1992	17:54:48
STDZE	15.000	49.971	149.6	0.0160	4.346	06-15-1992	17:54:48
STDZE	15.000	49.971	149.6	0.0160	4.340	06-15-1992	17:54:48
STDZE	15.000	49.971	149.6	0.0080	4.380	06-16-1992	21:18:41
STDZE	15.000	49.971	149.6	0.0160	4.369	06-16-1992	21:18:41
STDZE	15.000	49.971	149.6	0.0160	4.390	06-16-1992	21:18:41
STDZE	15.000	49.971	149.6	0.0160	4.370	06-16-1992	21:18:41
STDZE	15.000	49.971	149.6	0.0160	4.414	06-17-1992	17:58:38
STDZE	15.000	49.971	149.6	0.0160	4.400	06-17-1992	17:58:38
STDZE	15.000	49.971	149.6	0.0160	4.425	06-17-1992	17:58:38
STDZE	15.000	49.971	149.6	0.0160	4.414	06-17-1992	17:58:38

Mode	Burette Volumes			End Volt	Thio-sulfate	Date	Time
Leg 4							
STDZE	15.000	49.971	149.6	0.0160	4.414	06-18-1992	18:21:00
STDZE	15.000	49.971	149.6	0.0160	4.424	06-18-1992	18:21:00
STDZE	15.000	49.971	149.6	0.0080	4.433	06-18-1992	18:21:00
STDZE	15.000	49.971	149.6	0.0160	4.425	06-18-1992	18:21:00
STDZE	15.000	49.971	149.6	0.0160	4.434	06-19-1992	18:37:07
STDZE	15.000	49.971	149.6	0.0160	4.425	06-19-1992	18:37:07
STDZE	15.000	49.971	149.6	0.0160	4.432	06-19-1992	18:37:07
STDZE	15.000	49.971	149.6	0.0160	4.425	06-19-1992	18:37:07
STDZE	15.000	49.971	149.6	0.0160	4.417	06-20-1992	19:00:19
STDZE	15.000	49.971	149.6	0.0160	4.422	06-20-1992	19:00:19
STDZE	15.000	49.971	149.6	0.0160	4.412	06-20-1992	19:00:19
STDZE	15.000	49.971	149.6	0.0160	4.419	06-21-1992	13:19:35
STDZE	15.000	49.971	149.6	0.0160	4.426	06-21-1992	13:19:35
STDZE	15.000	49.971	149.6	0.0160	4.416	06-21-1992	13:19:35
STDZE	15.000	49.971	149.6	0.0160	4.411	06-21-1992	13:19:35
STDZE	15.000	49.971	149.6	0.0160	4.388	06-22-1992	04:15:35
STDZE	15.000	49.971	149.6	0.0160	4.374	06-22-1992	04:15:35
STDZE	15.000	49.971	149.6	0.0160	4.396	06-22-1992	04:15:35
STDZE	15.000	49.971	149.6	0.0160	4.386	06-22-1992	04:15:35
STDZE	15.000	49.971	149.6	0.0160	4.393	06-23-1992	18:52:20
STDZE	15.000	49.971	149.6	0.0160	4.385	06-23-1992	18:52:20
STDZE	15.000	49.971	149.6	0.0160	4.392	06-23-1992	18:52:20
STDZE	15.000	49.971	149.6	0.0160	4.386	06-23-1992	18:52:20
BLANK	15.000	49.971	0.991	0.975	0.0110	06-24-1992	05:32:46
BLANK	15.000	49.971	0.987	0.973	0.0080	06-24-1992	05:49:07
BLANK	15.000	49.971	0.984	0.973	0.0060	06-24-1992	05:52:10
STDZE	15.000	49.971	149.6	0.0160	4.407	06-24-1992	19:37:05
STDZE	15.000	49.971	149.6	0.0160	4.398	06-24-1992	19:37:05
STDZE	15.000	49.971	149.6	0.0160	4.404	06-24-1992	19:37:05
STDZE	15.000	49.971	149.6	0.0160	4.397	06-24-1992	19:37:05
STDZE	15.000	49.971	149.6	0.0160	4.399	06-25-1992	18:54:15
STDZE	15.000	49.971	149.6	0.0080	4.393	06-25-1992	18:54:15
STDZE	15.000	49.971	149.6	0.0080	4.404	06-25-1992	18:54:15
STDZE	15.000	49.971	149.6	0.0080	4.393	06-25-1992	18:54:15
STDZE	15.000	49.971	149.6	0.0160	4.396	06-26-1992	19:15:55
STDZE	15.000	49.971	149.6	0.0160	4.389	06-26-1992	19:15:55
STDZE	15.000	49.971	149.6	0.0160	4.401	06-26-1992	19:15:55
STDZE	15.000	49.971	149.6	0.0160	4.391	06-26-1992	19:15:55
STDZE	15.000	49.971	149.6	0.0160	4.336	06-27-1992	17:23:44
STDZE	15.000	49.971	149.6	0.0160	4.328	06-27-1992	17:23:44
STDZE	15.000	49.971	149.6	0.0160	4.338	06-27-1992	17:23:44
STDZE	15.000	49.971	149.6	0.0160	4.331	06-27-1992	17:23:44
STDZE	15.000	49.971	149.6	0.0160	4.319	06-28-1992	19:18:13
STDZE	15.000	49.971	149.6	0.0160	4.314	06-28-1992	19:18:13
STDZE	15.000	49.971	149.6	0.0160	4.324	06-28-1992	19:18:13
STDZE	15.000	49.971	149.6	0.0160	4.318	06-28-1992	19:18:13

TABLE 11: Dissolved oxygen standardization and blank determinations (contd)

Mode	Burette Volumes			End Volt	Thio-sulfate	Date	Time
Leg 4							
STDZE	15.000	49.971	149.6	0.0160	4.307	06-30-1992	06:09:46
STDZE	15.000	49.971	149.6	0.0160	4.313	06-30-1992	06:09:46
STDZE	15.000	49.971	149.6	0.0160	4.315	06-30-1992	06:09:46
STDZE	15.000	49.971	149.6	0.0160	4.354	07-01-1992	00:56:40
STDZE	15.000	49.971	149.6	0.0160	4.342	07-01-1992	00:56:40
STDZE	15.000	49.971	149.6	0.0160	4.350	07-01-1992	00:56:40
STDZE	15.000	49.971	149.6	0.0160	4.346	07-01-1992	00:56:40
STDZE	15.000	49.971	149.6	0.0160	4.369	07-01-1992	21:23:49
STDZE	15.000	49.971	149.6	0.0160	4.361	07-01-1992	21:23:49
STDZE	15.000	49.971	149.6	0.0160	4.376	07-01-1992	21:23:49
STDZE	15.000	49.971	149.6	0.0160	4.373	07-01-1992	21:23:49
STDZE	15.000	49.971	149.6	0.0080	4.382	07-01-1992	21:23:49
STDZE	15.000	49.971	149.6	0.0160	4.368	07-01-1992	21:23:49
STDZE	15.000	49.971	149.6	0.0160	4.382	07-01-1992	21:23:49
STDZE	15.000	49.971	149.6	0.0160	4.373	07-01-1992	21:23:49
STDZE	15.000	49.971	149.6	0.0230	4.393	07-02-1992	21:08:24
STDZE	15.000	49.971	149.6	0.0230	4.256	07-02-1992	21:08:24
STDZE	15.000	49.971	149.6	0.0160	4.385	07-02-1992	21:08:24
STDZE	15.000	49.971	149.6	0.0230	4.381	07-02-1992	21:08:24
STDZE	15.000	49.971	149.6	0.0230	4.388	07-02-1992	21:08:24
STDZE	15.000	49.971	149.6	0.0230	4.384	07-02-1992	21:08:24
STDZE	15.000	49.971	149.6	0.0230	4.441	07-03-1992	21:33:59
STDZE	15.000	49.971	149.6	0.0230	4.427	07-03-1992	21:33:59
STDZE	15.000	49.971	149.6	0.0230	4.441	07-03-1992	21:33:59
STDZE	15.000	49.971	149.6	0.0230	4.438	07-03-1992	21:33:59
STDZE	15.000	49.971	149.6	0.0230	4.445	07-03-1992	21:33:59
STDZE	15.000	49.971	149.6	0.0160	4.439	07-03-1992	21:33:59
STDZE	15.000	49.971	149.6	0.0230	4.439	07-04-1992	21:21:19
STDZE	15.000	49.971	149.6	0.0230	4.445	07-04-1992	21:21:19
STDZE	15.000	49.971	149.6	0.0230	4.458	07-04-1992	21:21:19
STDZE	15.000	49.971	149.6	0.0230	4.447	07-04-1992	21:21:19
Leg 5							
STDZE	15.000	49.971	149.6	0.0160	4.456	07-04-1992	21:21:19
STDZE	15.000	49.971	149.6	0.0230	4.445	07-04-1992	21:21:19
STDZE	15.000	49.971	149.6	0.0230	4.476	07-15-1992	02:40:49
STDZE	15.000	49.971	149.6	0.0230	4.477	07-15-1992	02:40:49
STDZE	15.000	49.971	149.6	0.0230	4.480	07-15-1992	02:40:49
STDZE	15.000	49.971	149.6	0.0230	4.471	07-15-1992	02:40:49
STDZE	15.000	49.971	149.6	0.0310	4.481	07-15-1992	19:18:51
STDZE	15.000	49.971	149.6	0.0310	4.480	07-15-1992	19:18:51
STDZE	15.000	49.971	149.6	0.0230	4.485	07-15-1992	19:18:51
STDZE	15.000	49.971	149.6	0.0230	4.479	07-15-1992	19:18:51
STDZE	15.000	49.971	149.6	0.0390	4.431	07-16-1992	07:54:28
STDZE	15.000	49.971	149.6	0.0310	4.429	07-16-1992	07:54:28

TABLE 11: Dissolved oxygen standardization and blank determinations (contd)

Mode	Burette Volumes			End Volt	Thio-sulfate	Date	Time
Leg 5							
STDZE	15.000	49.971	149.6	0.0230	4.442	07-16-1992	07:54:28
STDZE	15.000	49.971	149.6	0.0230	4.430	07-16-1992	07:54:28
STDZE	15.000	49.971	149.6	0.0310	4.438	07-16-1992	18:51:31
STDZE	15.000	49.971	149.6	0.0230	4.437	07-16-1992	18:51:31
STDZE	15.000	49.971	149.6	0.0230	4.436	07-16-1992	18:51:31
STDZE	15.000	49.971	149.6	0.0310	4.428	07-16-1992	18:51:31
STDZE	15.000	49.971	149.6	0.0230	4.434	07-17-1992	19:34:54
STDZE	15.000	49.971	149.6	0.0230	4.433	07-17-1992	19:34:54
BLANK	15.000	49.971	0.993	0.981	0.0050	07-17-1992	19:42:18
STDZE	15.000	49.971	149.6	0.0230	4.433	07-18-1992	04:00:41
STDZE	15.000	49.971	149.6	0.0230	4.431	07-18-1992	04:00:41
STDZE	15.000	49.971	149.6	0.0160	4.439	07-18-1992	04:00:41
STDZE	15.000	49.971	149.6	0.0230	4.432	07-18-1992	04:00:41
STDZE	15.000	49.971	149.6	0.0310	4.435	07-19-1992	19:59:27
STDZE	15.000	49.971	149.6	0.0230	4.437	07-19-1992	19:59:27
STDZE	15.000	49.971	149.6	0.0230	4.451	07-19-1992	19:59:27
STDZE	15.000	49.971	149.6	0.0230	4.438	07-19-1992	19:59:27
STDZE	15.000	49.971	149.6	0.0230	4.448	07-19-1992	19:59:27
STDZE	15.000	49.971	149.6	0.0230	4.438	07-19-1992	19:59:27
STDZE	15.000	49.971	149.6	0.0390	4.436	07-20-1992	20:26:32
STDZE	15.000	49.971	149.6	0.0310	4.434	07-20-1992	20:26:32
STDZE	15.000	49.971	149.6	0.0390	4.448	07-20-1992	20:26:32
STDZE	15.000	49.971	149.6	0.0230	4.440	07-20-1992	20:26:32
STDZE	15.000	49.971	149.6	0.0230	4.448	07-20-1992	20:26:32
STDZE	15.000	49.971	149.6	0.0230	4.439	07-20-1992	20:26:32
STDZE	15.000	49.971	149.6	0.0270	4.431	07-21-1992	17:56:58
STDZE	15.000	49.971	149.6	0.0200	4.425	07-21-1992	17:56:58
STDZE	15.000	49.971	149.6	0.0200	4.438	07-21-1992	17:56:58
STDZE	15.000	49.971	149.6	0.0200	4.426	07-21-1992	17:56:58
STDZE	15.000	49.971	149.6	0.0200	4.435	07-21-1992	17:56:58
STDZE	15.000	49.971	149.6	0.0200	4.424	07-21-1992	17:56:58
STDZE	15.000	49.971	149.6	0.0200	4.435	07-22-1992	17:42:02
STDZE	15.000	49.971	149.6	0.0200	4.431	07-22-1992	17:42:02
STDZE	15.000	49.971	149.6	0.0140	4.439	07-22-1992	17:42:02
STDZE	15.000	49.971	149.6	0.0200	4.434	07-22-1992	17:42:02
STDZE	15.000	49.971	149.6	0.0200	4.437	07-23-1992	18:00:09
STDZE	15.000	49.971	149.6	0.0200	4.427	07-23-1992	18:00:09
STDZE	15.000	49.971	149.6	0.0140	4.445	07-23-1992	18:00:09
STDZE	15.000	49.971	149.6	0.0140	4.433	07-23-1992	18:00:09
STDZE	15.000	49.971	149.6	0.0140	4.444	07-23-1992	18:00:09
STDZE	15.000	49.971	149.6	0.0140	4.434	07-23-1992	18:00:09
STDZE	15.000	49.971	149.6	0.0140	4.439	07-24-1992	18:07:43
STDZE	15.000	49.971	149.6	0.0140	4.438	07-24-1992	18:07:43
STDZE	15.000	49.971	149.6	0.0140	4.441	07-24-1992	18:07:43

TABLE 11: Dissolved oxygen standardization and blank determinations (contd)

Mode	Burette Volumes			End Volt	Thio-sulfate	Date	Time
Leg 5							
STDZE	15.000	49.971	149.6	0.0140	4.438	07-24-1992	18:07:43
STDZE	15.000	49.971	149.6	0.0140	3.698	07-25-1992	18:24:21
STDZE	15.000	49.971	149.6	0.0270	4.435	07-25-1992	19:20:39
STDZE	15.000	49.971	149.6	0.0270	4.433	07-25-1992	19:20:39
STDZE	15.000	49.971	149.6	0.0200	4.440	07-25-1992	19:20:39
STDZE	15.000	49.971	149.6	0.0200	4.430	07-25-1992	19:20:39
STDZE	15.000	49.971	149.6	0.0140	4.351	07-26-1992	18:12:41
STDZE	15.000	49.971	149.6	0.0140	4.352	07-26-1992	18:12:41
STDZE	15.000	49.971	149.6	0.0140	4.362	07-26-1992	18:12:41
STDZE	15.000	49.971	149.6	0.0140	4.357	07-26-1992	18:12:41
STDZE	15.000	49.971	149.6	0.0140	4.364	07-26-1992	18:12:41
STDZE	15.000	49.971	149.6	0.0140	4.353	07-26-1992	18:12:41
STDZE	15.000	49.971	149.6	0.0140	4.356	07-27-1992	18:28:46
STDZE	15.000	49.971	149.6	0.0140	4.349	07-27-1992	18:28:46
STDZE	15.000	49.971	149.6	0.0140	4.357	07-27-1992	18:28:46
STDZE	15.000	49.971	149.6	0.0140	4.352	07-27-1992	18:28:46

C.3. Water sample nutrient data
(Joe Jennings)

Analysts, Equipment and Techniques

Nutrient analyses were performed by:

P6E: Andrew A. Ross and Hernan Garcia from the College of Oceanic and Atmospheric Sciences at Oregon State University

P6C: Joe C. Jennings, Jr. from Oregon State University and Dennis Guffy of Texas A&M University

P6W: Consuelo Carbonell-Moore and Joe C. Jennings, Jr. from Oregon State University

The continuous flow analyzer used on all three legs of P6 was the Alpkem Rapid Flow Analyzer (RFA), model 300. A Keithley data acquisition system was used in parallel with analog stripchart recorders to acquire the absorbance data. The software used to process the nutrient data was developed by OSU. All of the reagent and standard materials were provided by OSU. The methods are described in Anonymous (1985) and in Gordon et. al. (in preparation, a & b).

Sampling Procedures:
Nutrient samples were drawn from all CTD/rosette casts at stations 003 through 072 leg3, 073 through 188 Leg4 and 189 through 257 Leg5. High density polyethylene (HDPE) bottles of approximately 30 ml volume were used as sample containers, and these same bottles were positioned directly in the autosampler tray. These sample tubes were routinely rinsed at least 3 times with one third to one half of their volume of sample before filling.

The nutrient samples were drawn following those for gases: Helium, tritium, dissolved oxygen and carbon dioxide. In some instances, the nutrient sampling procedure was not completed for almost 2 hours after the CTD arrived on deck. At most stations, the RFA was started before sampling was completed to reduce the delay and minimize possible changes in nutrient concentration due to biological processes. All analyses were accomplished within a few hours of the end of the CTD/rosette casts.

Calibration and Standardization:
The volumetric flasks and pipettors used to prepare standards were gravimetrically calibrated prior to the cruise. The Eppindorf Maxipettor adjustable pipettors used to prepare mixed standards typically have a standard deviation of less than 0.002 ml on repeated deliveries of 10 ml volumes. High concentration mixed standards containing nitrate, phosphate, and silicic acid were prepared at intervals of 4 to 7 days and kept refrigerated in HDPE bottles. For almost every station, a fresh "working standard" was prepared by precise dilutions of 20 ml of the high concentration mixed standard to low nutrient seawater. This working standard has nutrient concentrations similar to those found in Deep and Bottom

waters. A separate nitrite standard solution was also added to these working standards. Corrections for the actual volumes of the flasks and pipettors were included in the preliminary data.

The WOCE Operations Manual calls for nutrient concentrations to be reported in units of micromoles per kilogram (~M kg-1). Because the salinity information required to compute density is not usually available at the time of initial computation of the nutrient concentrations, our concentrations are always originally computed as micromoles per liter. This unit conversion will be made using the corrected salinity data when it is available.

Equipment and analytical problems:
During the course of leg3, four series of standards with concentrations ranging from near zero to higher than any observed in the water column were run to check the linearity of the system response. On examining the results of these linearity checks, it became apparent that there was a significant nonlinearity present in the nitrate + nitrite channel. This nonlinearity arose from the inadvertent plumbing of the N + N channel according to the Alpkem manual and not according to the WOCE nutrient manual (Gordon et al., in preparation, a). The data from the P6E linearity checks allowed us to apply a post cruise correction to the reported nitrate data of the form,

$$Ccor = K1 * Crep + K2 * Crep2,$$

where Ccor is the corrected concentration and Crep is the concentration reported during the cruise. K1 and K2 are constants determined by fitting the first derivatives of the concentration versus absorbance curves and from the absorbances of the standards run at each station. The derivation of this formula depends upon the observation that a quadratic equation adequately fits the concentration vs. absorbance data for all of the nonlinear cases during P6E and the first two weeks of P6C.

This correction has been applied only to the nitrate + nitrite data. It does not apply to any of the remaining analyses, including silicic acid, which have been shown to be linear to within ca. 0.1% of full-scale concentration with the methods used on P6E (cf. below and Gordon et al., in preparation, b).

At the start of P6C, the analysts ran additional standard curves to further document the extent of non-linearity, then made changes in the relative volumes of sample and buffer reagent used in the nitrate analysis to attempt to reduce this non-linearity. The first change to the nitrate pump tube configuration was made just prior to station 94. Standard curves were run to see how this change affected the linearity of the system response. The deviations from a linear response (residuals) were found to be smaller after the change in pump tubes, but still significant. A second change in pump tube sizes was made prior to station 112. Standard curves run with this configuration had residuals which were within the

WOCE specifications for precision and accuracy, so this configuration was used for the remainder of the cruise. The pump tube configuration used on P6W was tested during and after the cruise and exhibited a linear response within WOCE specifications for precision and accuracy. No corrections to the reported nitrate data from P6W are necessary.

Phosphate phasing board failure: Starting at about station 150, the phosphate analytical channel began to experience increasing and irregular noise which resulted to decreased precision. This seemed to be electrical in origin, as routine replacement of the reagent chemicals and pump tubing did not resolve the problem. The major boards and components of the RFA used for the phosphate channel were systematically replaced wherever possible with limited and temporary success. During this period there were shipboard power failures which may have contributed to the RFA's electrical problem. Following station 171, the phosphate noise problems became so severe as to render the data unusable and no phosphate values were reported for the final 18 stations of this leg.

Because the phosphate analysis uses a flow cell with an optical path length 2 to 3 times longer than the other analyses, it is particularly sensitive to any irregularities in the spacing of flow segmenting bubbles. Thus the air injection phasing board was the chief suspect. A replacement board was hand carried to Auckland, and it's installation fixed the problem on the following leg.

Measurement of Precision and Bias:

Short Term Precision and Bias:
Throughout the cruise, replicate samples drawn in different sample tubes from the same Niskin bottle were analyzed to assess the precision of the RFA analyses. These replicate samples were analyzed both as adjacent samples (one after the other) and also at the beginning and end of sample runs to monitor deterioration in the samples or uncompensated instrumental drift. Except for phosphate, there was no significant difference between the precisions determined for adjacent samples and samples run at the beginning and ending of a sample run. The mean drift for phosphate was 0.014 micromol/l per hour (Leg3), 0.030 micromol/l per hour (Leg4) and -0.021 micromol/l per hour (Leg5). That for nitrate on Leg4 was 0.12 micromol/l per hour. These drifts represent an estimate of part of the systematic error in that method.

For the other measurements there was no significant difference in the analysis of replicates as adjacent sample s and those run at approximately one hour intervals. The mean standard deviations found for the replicate analyses provide a measure of short term, intra-station precision, in micromol/l:

Leg 3

Phosphate: 0.005	Nitrate + Nitrite : 0.04
Silicic acid: 0.13	Nitrite: 0.01

Leg 4

Phosphate: 0.013 Nitrate + Nitrite : 0.05
Silicic acid: 0.20 Nitrite: 0.004

Leg 5

Phosphate: 0.016 Nitrate + Nitrite : 0.06
Silicic acid: 0.16 Nitrite: 0.022

Longer Term Precision:

On most of the sample runs during P6E, an "old" working standard from the previous station was run with the "new" working standard which had been freshly prepared. The "old" standards were kept refrigerated in plastic bottles. The average age of the "old" standards when reanalyzed was eight hours.

We calculated the difference in absorbance (peak height) between the last of the three new standards and the old standard which was run immediately after it. This difference, with regard to sign (new - old), was tabulated and a statistical analysis was done. The results were converted to concentration units by multiplying the difference by the mean sensitivity factor for each nutrient (Table 10). It appears that the phosphate and nitrate standard concentrations increased slightly over the eight hour storage period on Leg5. This may be equipment related rather than a function of storage. The silicic acid and nitrite standards appear to have stored well. On Leg4 the phosphate standard concentrations appear to have increased slightly over the eight hour storage period. This may be equipment related rather than a function of storage; as the silicic acid, nitrate, and nitrite standards appear to have stored well.

Leg 3 differences between working standards at adjacent stations are shown in Table 12. Differences are expressed as "new" standard minus "old", and are given in concen-tration units (~M).

TABLE 12: Differences between working standards at adjacent stations for Leg3

Phosphate	Nitrate	Silicic Acid	Nitrite	Mean, (~M) wrt sign
-0.006	-0.01	-0.0014	-0.001	RMS Dev (~M)
0.016	0.065	0.18	0.007	n
59	66	66	66	

Leg 4 Differences between working standards at adjacent stations are shown in

Table 13. Differences are expressed as "new" standard minus "old", and are given in concen-tration units (~M).

TABLE 13: Differences between working standards at adjacent stations for Leg4

Phosphate	Nitrate	Silicic Acid	Nitrite	Mean, (~M) wrt sign
-0.015	-0.0005	-0.09	-0.002	RMS Dev (~M)
0.015	0.098	0.23	0.020	n
91	109	109	108	

Leg 5 Comparisons between stored and fresh working standards are shown in Table 14. Differences are expressed as "new" standard minus "old", and are given in concen-tration units (~M).

TABLE 14: Comparisons between stored and fresh working standards for Leg5

Phosphate	Nitrate	Silicic Acid	Nitrite	Mean, (~M) wrt sign
-0.015	-0.0005	-0.09	-0.002	RMS Dev (~M)
0.015	0.098	0.23	0.020	n
91	109	109	108	

Comparison with other data, long term precision and bias.

P6E/P6C:

P6E ended with station 072, and P6C commenced with station 073. We plotted the nutrients from stations 070 - 075 to check for consistency of the data from leg to leg. The phosphate values at the first station of P6C (Station 073) are somewhat higher than at the other stations, but there is no indication of a systematic shift in any of the nutrients and the agreement between the two legs is good.

P6E/P19C:

During the post-cruise QC work, additional preliminary data have become available from the WOCE P19C cruise. A comparison of several stations nearest the point where these two tracks cross indicates that the phosphate and nitrate data agree well (using final P6E nitrate data), but that there is an offset in the silicic acid data between the two cruises (see also Talley, 1993). Silicic acid concentrations reported for the P6E stations are lower than those for P19C by roughly 1 ~M in the deep water (theta < 2.0~C). This is approximately the magnitude of the correction term applied to the P19C data to account for nonlinearity in the silicic acid response. However, for the RFA procedure used on P6E, the maximum departure from a linear response in the concentration range of interest is <0.1 ~M. We conclude that nonlinearity of system response in the RFA cannot account for the discrepancy in the silicic acid data.

P6E/P6C:

P6E ended with station 072, and P6C commenced with station 073. We plotted the nutrients from stations 070 - 075 to check for consistency of the data from leg to leg. The phosphate values at the first station of P6C (Stn 073) are somewhat higher than at the other stations, but there is no indication of a systematic shift in any of the nutrients and the agreement between the two legs is good.

P6C/P6W:

P6C ended with station 188, and P6W commenced with station 189. We compared the nutrients from stations 180 through 198 to check for consistency of the data from leg to leg. There are no phosphate values for the P6C stations, but there is no indication of a systematic shift in the nutrient standards. The first three stations of P6W agree with the final stations of P6C to within less than 1% of the deep nitrate and silicic acid concentrations. There is a greater total range of nitrate concentrations in the nitrate/theta relationship in the first 10 stations of P6W (1.2 micromol/l) than in the final stations of P6C (0.5 micromol/l), but the mean values agree to within 0.2 micromol/l. The agreement of the deep water silicic acid/theta relationship between the two legs is s 1.0 micromol/lwhere theta is less than 2xC.

Nutrient Quality Control Notes

During the cruise, a first pass quality control check on the nutrient data, primarily by comparing vertical profiles and nutrient/theta relationships. Following the cruise, all nutrient data were rechecked using log notes and the analog stripchart recordings made at sea and by examining parameter/parameter plots for outliers. Some correctable errors were found and the appropriate corrections made. The nitrate data were corrected for nonlinearity as described above. At this time, the data quality flags were edited to conform to the definitions in the WOCE Operations Manual (WOCE Report No. 67/91). Data quality flags were assigned as follows:

Quality byte Definition

2 Acceptable measurement
3 Questionable measurement; no obvious problems found, but data somewhat out of trend.
4 Bad measurement; known analytical problems or data seriously out of trend.
5 Not reported.
9 Sample not drawn, usually due to Niskin bottle failure

At several stations, the bottle tripping order was deliberately (or accidentally) different from 1-36.

C.4. CTD/O2 data

(Sarah Zimmermann)

Pressure

Both CTD 9 and 10's pressure sensors, experienced a minor shift in bias between pre and post cruise calibrations. For each CTD, the pre and post cruise calibration data were combined and fit together to derive the final terms used to scale the cruise data. When the data was combined for the final fit, the CTD pressure bias of each calibration run was adjusted so that the initial reading at zero pressure matched the standard. This was done to be consistent with the processing of the at sea data where a station-dependent bias is applied.

The pressure bias at the sea surface at the beginning of each station was recorded and subtracted from the pressure bias term in each station's calibration file. This insures that the starting pressure value of each CTD time series begins at zero decibars when the instrument is on deck.

New pressure temperature S1 and S2 terms were calculated out at sea during Leg3 for both CTDs 9 and 10. (These terms correct for the pressure sensor's bias and slope variations with temperature. See Millard et al., 1992). These terms were applied to all of the stations of P6.

The uptrace water sample file had incorrect pressure temperature data for Legs3 and 4 due to a problem with the acquistion software. This problem was recognized and corrected on Leg3. In post-cruise processing, the incorrect pressure temperatures from Legs3 and 4 were replaced with the CTD uptrace temperature lagged by 20,000 scans (close to 13 minutes). This lag mimics the response behavior of the CTD's pressure temperature channel. In the calibration files for these stations, pressure temperature scaling parameters were replaced with temperature scaling parameters.

Summary of laboratory calibration for CTD 10 AND 9

A quadratic relationship is used to convert raw CTD pressure data to engineering units:

P=bias + slope * Praw + quad * Praw2

TABLE 15: Laboratory pressure calibrations for CTD 9 and 10

	BIAS	SLOPE	QUADRATIC
PRE-CRUISE			
CTD10	-0.246449E0	0.100352E0	-0.294565E-8
CTD9	0.450652E0	0.100557E0	0.297377E-9
POST-CRUISE			
CTD10	-0.139633E+01	0.100309E+00	-0.251698E-08
CTD9	0.365801E+01	0.100568E+00	0.405269E-09
PRE+POST COMBINED FOR FINAL TERMS			
CTD10	-0.436677E+00	0.100333E+00	-0.276775E-08
CTD9	-0.338764E+00	0.100564E+00	0.338159E-09

Following Millard et al. (1992) the slope and bias terms were adjusted for variation with temperature (static and dynamic). The coefficients used are given in Table 16.

TABLE 16: New pressure terms for CTD 9 and 10

CTD TEMP.	S1	S2	T0	D1	D2	D3
CTD 10	+2.71E-6	-0.054	21.8	-7.07E+1	2.468	0
CTD 9	+3.39E-6	+0.015	21.8	-2.28E-6	12.66	0

Compared: Pressure computed with d1, and d2 set to the above terms or to zero. The two derived pressures were 1 dbar different; conclusion was it didn't really matter if the dynamic terms were applied or not. A summary of fits to the laboratory data for pressure are tabulated in Appendix C.

Temperature
Both CTD 9 and 10 have pre- and post-cruise temperature calibrations that show a shift has occurred in the sensors. With each CTD having been opened and sensor arms rotated to fit in a specific frame, the shift is not surprising. The fits look good although CTD 10's post cruise calibration fit has a higher standard deviation than it's pre cruise cal.

CTD10:
Temperature data scaled with the CTD 10 pre cruise calibration terms matches quite closely the redundent temperature data scaled with its post cruise calibration.

Stations 64 to 75: CTD - Red. Temperature = 3.3466E-04
Stations 86 to 94: CTD - Red. Temperature = 6.8729E-04

The difference changes by 0.0003 degrees. CTD10 failed and was opened to effect repair after station 75 which could account for the change. The change however is small enough to ignore. This relative consistency supports CTD10's pre cruise calibration being applied to the all of CTD10's stations.

CTD9:
CTD9, the backup CTD was called into service at two different times. The first time was for stations 76 through 85. Temperature data scaled with the CTD9 pre cruise calibration terms compared to the neighboring CTD10 data with its pre cruise calibrataion differ by 6.0131E-3, CTD9 is colder. For CTD9 data to match CTD10 and the redundant temperature data, the bias in CTD9's scaling terms was adjusted by this amount.

In the second group, stations 248 through 267, CTD9 differs from the redundant temperature by 1.77767E-02, CTD colder. The difference between CTD9's pre and post cruise cal is 1.77E-02, CTD drifting colder. The difference between CTD9 being scaled with the corrected terms for stations 76 through 85, and the postcruise cal is 1.2012E-02. This indicates that the post cruise cal will be a good one to use on the second set, stations 248 to 267, and that a bias adjustment of 6E-3 to the pre cruise calibrations to scale the first set, is appropriate.

TABLE 17: Quadratic terms used to fit temperature calibartions

		BIAS	SLOPE	QUADRATIC
PRE-CRUISE	**CTD 10**	0.186416E-2	0.499864E-3	0.225955E-11
	CTD 9	-0.361583E-1	0.500248E-3	0.197920E-11
POST-CRUISE	**CTD 10**	-0.803350E-03	0.499708E-03	0.310515E-11
	CTD 9	-0.189004E-01	0.500366E-03	0.160650E-11
SCALING TERMS USED				
ALL STA	**CTD 10**	0.186416E-2	0.499864E-3	0.225955E-11
STA 76-85	**CTD 9**	-0.30145E-1	0.500248E-3	0.197920E-11
STA 248-267	**CTD 9**	-0.188737E-01	0.500365E-3	0.162401E-11
CTD 9,10= temperature time lag of .25 seconds				

Temperature lag checked for each CTD by plotting theta v. salinity and looking for consistent looping in the high gradient areas of the thermocline. Consistent looping, indicating density inversions, would be caused by an incorrect temperature lag. Minimal looping was found. Station plots that did show looping also had non uniform descent rates. The non uniform descent rate, probably due to the sea state, could have caused density inversions through changing the rate at which the large rosette package is pushing on the water below it. If the package is pushing a 'plug' of water below it, for the package to slow or stop then speed up again, the result may be that the package initally goes through the water it had been pushing before it, mesuring water that would be less dense then the surrounding water, thus truly measureing a density inversion although it was created by the package. A summary of the temperature fits to the CTD laboratory data are given in Appendix D.

Conductivity
The WHOI CTD Group conducts laboratory conductivity calibrations to check instrument functionality and to obtain initial scaling factors to relate instrument output to ocean conductivity. These are updated/refined/replaced with scalings based on water sample data and are tabulated in Appendix E.

Procedure for fitting CTD salinities to water sample salinities
Basic fitting procedures followed that of Millard (1982) and Millard and Yang (1993). The process was initiated by taking a subset of stations having high-quality water sample salinity data, 137 to 175, and refit comparing

(a) fitting for slope and bias, full depth

(b) fitting for slope using avg of pre and post cruise bias, full depth

(c) fitting for slope using bias found in (a), with observations >1100 dbar

(d) fitting for slope using bias from (b), with observations >1100 dbar (a) and (b) gave similar enough slopes and (c) and (d) were similar to both (a) and (b).

As a result, we decided use the averaged pre and post cruise laboratory bias and fit throughout the cruise for conductivity slope using the water sample data. We further concluded that the nominal coefficient for conductivity cell distortion under pressure of beta=1.5E-8 gave acceptable results in the deep ocean (where this term has the most noticeable effect). Final fits are tabulated in
Appendix F.

However, careful examination of the CTD - water sample conductivity data from the thermocline revealed several irregularities e.g., curvature of the CTD-water sample residuals in pressure and temperature. Several non-standard procedures were implemented in order that the final calibrated CTD salinity downcasts were consistent with the water sample salinity data. In addition to altering alpha, the coefficient of thermal expansion of conductivity cell, from its nominal value of -6.5E-6, an empirical correction to the conductivities in the upper third of the ocean was implemented in order that the derived CTD salinity data agreed with the water samples. The correction was, as stated, done to the raw CTD conductivity data, although it may have been equivalently applied to the CTD temperature. The small magnitude of the shift (around 0.002 psu) was such that we could not distinguish. It is suspicious that the empirical correction was needed for CTD stations collected with instrument No. 10 after it had failed on Leg4 and been opened for repair. This hints that it may have been a temperature shift. However, as the error signal was detected in salinity, we decided to alter conductivity.

Summary of non-standard corrections to conductivity:

CTD No.10

Station 1 to 75, 86 to 247

reduced alpha by half in conductivity to increase surface CTD salt by 0.002 psu at 0 db. This was done to straighten out hooked profile of salinity residuals plotted against pressure. Changed alpha for all CTD 10 stations so that alpha was consistent for CTD 10 throughout cruise. Alpha = -3.25E-6 for all CTD 10 stations.

Station 86 to 246

added an empirically determined conductivity offset (which was a function of pressure) to the downcast CTD conductivity profile data and the upcast data collected at the time of water bottle tripping. The offset C-off was of the form:

C-off = 1.47781E-8 *{P**2} * exp{-[P/500]}

The offset was thus zero at the surface, approached zero exponentially at depth and had a maximum effect of 0.002 mmho at 1000 dbars.

Station 76 to 85

CTD 9 alpha was increased above the nominal value to reduce surface CTD salt. Alpha set to -16.25E-6.

Station 249 to 267

CTD9 the nominal alpha of -6.5E-6 was employed successfully for these data. It is not known why a different value from the earlier station group worked.

Given these shaping parameters, conductivity slope factors were derived by regression against the water sample data following standard procedures. Conductivity fits applied to the final CTD data are tabulated in Appendix F.

CTD Oxygen Measurements

Leg3, stations 4 to 72, CTD 10 used a pump in conjunction with the oxygen sensor. As noted above in C.1 General Information, the data collected with the pump was difficult to process. Specifically, the top 500 meters of oxygen current were very noisy and very difficult to fit. A nonstandard method of fitting the top water (0 to 1000db) and bottom water (1000db to bottom) seperately was used. The resulting deep CTD oxygen has a good fit, similar to the following legs. An advantage of using the pump was the station bottoms lacked the typical oxygen tail seen in legs 4 and 5, where the oxygen drifted low due, most likely, to the slowing of the package as it neared the bottom. The pump might have kept the water flow rate past the oxygen sensor constant, thus not artificially lowering the oxygen current. As well there were the usual difficulties processing data from this sensor. See Owens and Millard (1985) for details to the algorithm.

Quality control of 2-dbar CTD data

QC Salts:
Salinity spikes on or near sea surface were not uncommon. Guideline for quality marking: If the spike is greater than .2 mark the quality word as bad. For spikes smaller than .2 mark quality word as questionable. Don't mark if spike is substantiated by water samples (see station 55). The spike might not be marked questionable if it looks real such as a small spiketo the fresh side, that changes with temperature as well as salinity. Causes: As package enters water it is possible the pressure averaging for the first three dbrs. is incorporating conductivity data from above and below the watersurface causing large salt spikes.

Oxygens:
Surface spikes, were the norm for the entire cruise. These were neither individualy identified nor the quality word labeled.

Noisy data in top 500 dbar for all CTD10 stations on Leg3 associated with use of oxygen pump. Leg3 variability on the order of =/-0.2 ml/l. Leg4 and 5 variability on the order of =/-0.05 ml/l. Bottom tails, where oxygen is drifts off low are common in Legs 4 and 5. Likely due to the slowing descent rate of the CTD as it approaches the bottom. The reduced flow past the oxygen sensor results in a lower oxygen current and thus lower oxygen value.

P6
Final Report
for AMS ^{14}C Samples

Robert M. Key

July 9, 1996

1.0 General Information

WOCE P6 was a zonal section consisting of three cruise legs which are treated collectively here. The legs were carried out on R/V Knorr and have the cruise designation 316N138/3, /4 and /5 or P6E, P6C and P6W. Dates, port stops, chief scientists and station numbers are summarized in Table 1. This report covers details of the small volume radiocarbon samples. The reader is referred to cruise documentation provided by the individual chief scientists as the primary source for cruise information. Of 267 stations, 30 were sampled for radiocarbon. Unfortunately, station 3, which was sampled and has had ^{14}C analysis completed, has yet to be reported in any hydrographic data report. Consequently, that station is omitted from this report. The AMS station locations are shown in Figure 1 and

Table 1: P6 Leg Summary

Leg	WOCE ID	Chief Scientist	Dates	Ports	Stations
P6E	316N138/3	H. Bryden	5/2-5/26/92	Valparaiso - Easter Island	1-72
P6C	316N138/4	M. McCartney	5/30-7/7/92	Easter Island - Papeete	73-188
P6W	316N138/5	J. Toole	7/13-7/30/92	Papeete - Sydney	189-267

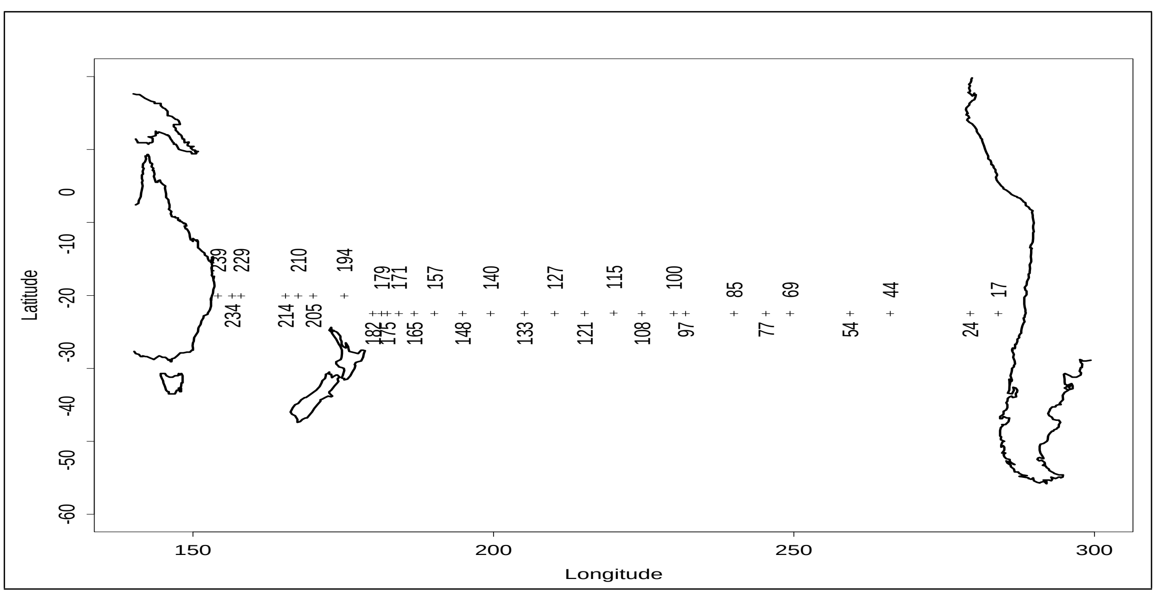


Figure 1: ^{14}C station locations for WOCE P6. All ^{14}C sampling was carried out using the AMS technique with sample distribution somewhat sparser than used on meridional WOCE lines.

summarized in Table 2.

Table 2: P6 AMS Station Data

Station	Date 1992	Latitude	Longitude	Bottom Depth (m)
17	5-7	-32.500	-76.002	4170
24	5/10	-32.500	-80.665	3920
44	5/16	-32.503	-94.001	3935
54	5/19	-32.499	-100.666	3523
69	5/23	-32.500	-110.667	3005
77	6/2	-32.500	-114.668	2925
85	6/4	-32.501	-119.992	3161
97	6/7	-32.501	-128.001	4020
100	6/8	-32.501	-130.001	4086
108	6/11	-32.501	-135.335	4330
115	6/14	-32.433	-139.997	4733
121	6/16	-32.506	-144.831	5289
127	6/19	-32.501	-149.827	5088
133	6/20	-32.503	-154.842	5007
140	6/23	-32.495	-160.494	5521
148	6/25	-32.500	-165.166	6329
157	6/27	-32.492	-169.845	5601
165	6/29	-32.499	-173.173	5827
171	7/1	-32.501	-175.750	5868
175	7/2	-32.500	-177.667	7310
179	7/3	-32.499	-178.648	3455
182	7/3	-32.500	-180.082	2914
194	7/15	-30.081	-184.832	4136
205	7/17	-30.080	-190.003	2945
210	7/18	-30.082	-192.502	1305
214	7/19	-30.077	-194.592	3374
229	7/22	-30.085	-201.999	2015
234	7/23	-30.083	-203.470	4821
239	7/24	-30.085	-205.837	4590

Unlike most of the Pacific meridional sections, on which AMS sampling was used for the upper thermocline and large volume sampling for the deep and bottom waters, all sampling was *via* AMS with approximately every third station being full water column and the others being upper thermocline only.

2.0 Personnel

^{14}C sampling for this cruise was carried out by R. Rotter (P6E) and G. McDonald (P6C & P6W), both from Princeton U. ^{14}C analyses were performed at the National Ocean Sciences AMS Facility (NOSAMS) at Woods Hole Oceanographic Institution. Salinities and nutrients were analyzed by the WHOI CTD group and the Oregon State Univ. group respectively. R. Key (Princeton) collected the data from the originators, merged the files, assigned quality control flags to the ^{14}C and submitted the data files to the WOCE office (7/96). Key is PI for these ^{14}C data.

3.0 Results

This ^{14}C data set and any changes or additions supersedes any prior release.

3.1 Hydrography

Hydrography from these legs (with the exception noted above) have been submitted to the WOCE office by the chief scientists and described in the final hydrographic reports.

3.2 ^{14}C

Most of the $\Delta^{14}C$ values reported here have been distributed in a data report (NOSAMS, 1994, 1995). That report included preliminary hydrographic data and ^{14}C results which had not been through the WOCE quality control procedures. This report supersedes those data distributions.

At this time 649 of 1089 samples have been measured and reported. Replicate measurements have been made on 17 of the water samples. These replicate analyses are tabulated in Table 3. The table shows the mean and standard deviation for each set of rep-

Table 3: Summary of Replicate Analyses

Sta-Cast-Bottle	$\Delta^{14}C$	Err	Mean[a]	Standard Deviation[b]
97-1-9	-205.9	3.2	-208.7	2.2
	-208.4	5.1		
	-211.1	3.9		
	-209.4	5.1		
97-1-13	-224.1	5.5	-220.5	9.2
	-208.2	3.2		
	-229.8	4.9		
	-219.7	4.2		

Table 3: Summary of Replicate Analyses

Sta-Cast-Bottle	$\Delta^{14}C$	Err	Mean[a]	Standard Deviation[b]
97-1-14	-214.9	3.5	-213.3	6.2
	-214.3	4.2		
	-204.7	4.4		
	-219.4	7.8		
97-1-31	130.7	3.2	131.4	1.9
	133.6	6.0		
	130.0	6.6		
97-1-32	116.5	3.9	123.8	6.4
	128.3	5.2		
	126.7	5.2		
97-1-33	129.5	3.2	126.5	3.0
	123.6	4.4		
	126.5	7.5		
127-1-13	-235.6	5.5	-231.7	5.5
	-227.8	4.5		
127-1-17	-189.2	3.1	-211.0	30.8
	-232.8	7.0		
127-1-20	-147.8	2.8	-150.2	3.4
	-152.6	4.2		
127-1-23	-83.5	3.1	-88.5	7.1
	-93.5	9.7		
127-1-24	-56.5	3.9	-57.3	1.1
	-58.0	4.2		
148-1-16	-199.3	2.6	-198.6	1.0
	-197.9	4.9		
148-1-21	-223.6	3.3	-227.4	5.4
	-231.2	9.0		
148-1-27[c]	-79.3	2.9	-89.7	14.6
	-100.0	3.6		
157-1-28	-17.3	6.5	-22.5	7.4
	-27.7	8.5		
182-1-31	65.1	3.6	68.0	4.0
	70.8	5.5		
210-1-1	-149.2	2.9	-148.7	0.7
	-148.2	3.6		

a. Error weighted mean reported with data set

b. Error weighted standard deviation of the mean reported with data set.

c. Only first value reported in final data set

licates. For these few samples, the average standard deviation is 6.8‰. This precision estimate is approximately correct for the time frame over which these samples were measured. For a summary of the improvement in precision with time at NOSAMS, see Key, *et al*. (1996). Note that the errors given in Table 3 and in the final data report include only counting errors, and errors due to blanks and backgrounds. The 5-7‰ error obtained for replicate analysis is an estimate of the true error which includes errors due to sample collection, sample degassing, *etc*. In the final data reported to the WOCE office, the error weighted mean and error weighted standard deviation of the mean are given for replicate analyses.

4.0 Quality Control Flag Assignment

Quality flag values were assigned to all ^{14}C measurements using the code defined in Table 0.2 of WHP Office Report WHPO 91-1 Rev. 2 section 4.5.2. Measurement flags values of 2, 3, 4, 6 and 9 have been assigned to date. Approximately 400 samples remain to be measured. With a few exceptions, these samples will be completed. Currently, the unmeasured samples are incorrectly coded with a flag value of 9 (no sample collected) rather than 1 (sample collected) or 5 (no result reported). The choice between values 2 (good), 3 (questionable) or 4 (bad) is involves some interpretation. There is very little overlap between this data set and any existing ^{14}C data, so that type of comparison was difficult. In general the lack of other data for comparison led to a more lenient grading on the ^{14}C data.

When using this data set for scientific application, any ^{14}C datum which is flagged with a “3” should be carefully considered. My subjective opinion is that any datum flagged “4” should be disregarded. When flagging ^{14}C data, the measurement error was taken into consideration. That is, approximately one-third of the ^{14}C measurements are expected to deviate from the true value by more than the measurement precision. No measured values have been removed from this data set.

Table 4 summarizes the quality control flags assigned thus far to this data set. For a detailed description of the flagging procedure see Key, *et al*. (1996). As more of the Pacific data set becomes available, it is possible that some of these flag values may be modified. Any additional data received for this leg will be reported to the WOCE office as they become available.

Table 4: Summary of Assigned Quality Control Flags

Flag	Number
2	646
3	10
4	6
6	17

5.0 Data Summary

Figures 2-5 summarize the AMS ^{14}C data collected on this leg. Only $\Delta^{14}C$ measurements with a quality flag value of 2 or 6 are included in each figure. Figure 2 shows the $\Delta^{14}C$ values with 2σ error bars plotted as a function of pressure. The data density in

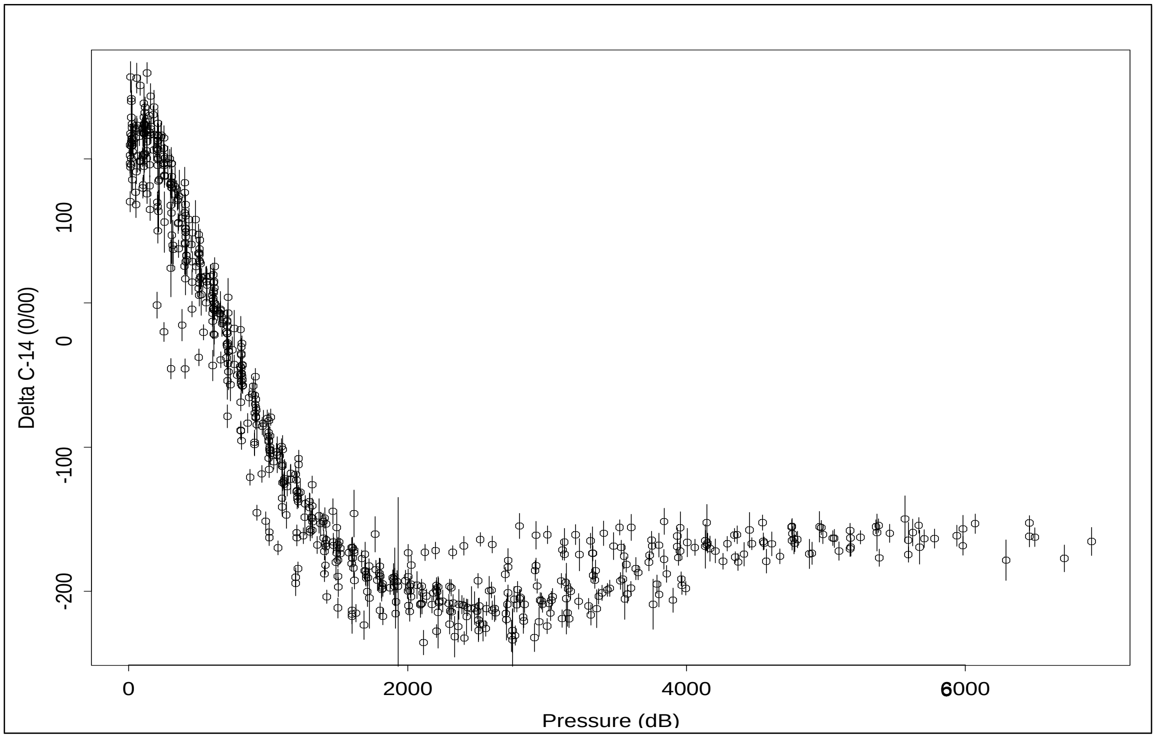


Figure 2: AMS $\Delta^{14}C$ results for P6 stations shown with 2σ error bars.Only those measurements having a quality control flag value of 2 are plotted.

this figure is representative for these legs: approximately 3 times as many samples were collected in the thermocline as in deep and bottom waters. The mid-depth $\Delta^{14}C$ minimum at approximately 2500 meters is clearly evident. Figure 3 shows the $\Delta^{14}C$ values plotted against silicate.The straight line shown in the figure is the least squares regression relationship derived by Broecker *et al.* (1995) based on the GEOSECS global data set. According to their analysis, this line ($\Delta^{14}C$ = -70 - Si) represents the relationship between naturally occurring radiocarbon and silicate for most of the ocean. They interpret deviations in $\Delta^{14}C$ above this line to be due to input of bomb-produced radiocarbon. Clearly, this relationship is not ideal for the P6 data set. The data points having silicate values greater than or equal to 60 µmol/kg almost certainly have no bomb-radiocarbon component and should therefore lie on, rather than below, the line as seen in Figure 3. For these data the slope of the line needs to be steeper or/and the intercept needs to be lower. Also strongly diverging from the trend are one group of points having silicate concentrations between 105 - 125µmol/kg. These data are from the near-bottom water at stations between approximately 160°W and 180°W; that is, some form of northward flowing circumpolar bottom water. For silicate values greater than approximately 40µmol/kg the shape of the $\Delta^{14}C$ *vs.* Si trend is better described as a backward “J” which is rotated counter-clockwise.

Essentially all of the deep and bottom waters in the South Pacific examined during WOCE shown this same shape. The shape is, of course due to the fact that the $\Delta^{14}C$ and Si

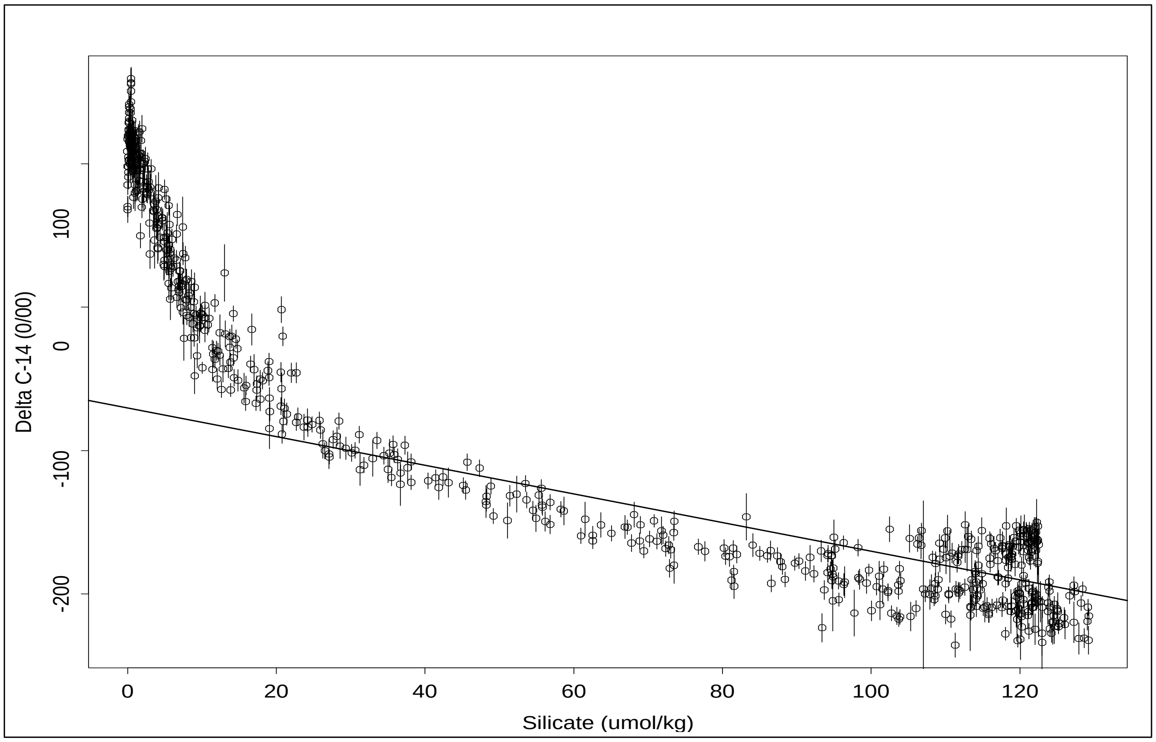


Figure 3: $\Delta^{14}C$ as a function of silicate for P6 AMS samples. The straight line shows the relationship proposed by Broecker, *et al.*, 1995 ($\Delta^{14}C$ = -70 - Si with radiocarbon in ‰ and silicate in µmol/kg).

extreme fall at different depths and have similar, but different ratios on either side of the extrema. If one follows Broecker's argument, but modifies it so that only data which have no tritium *and* are above the shallower of the Si and $\Delta^{14}C$ extrema, one should still be able to get an estimate of the pre-bomb radiocarbon. To that end (and erring on the safe side), a least squares fit of the data from samples between 1 and 2 km depth (n=141; R^2=.91) gives an intercept of -63±3 and an intercept value of -1.34±.03 both of which are significantly different than the -70, -1 which Broecker calculated for the GEOSECS global data set.

Figure 4 is an objectively contoured section (LeTraon, 1990) of the $\Delta^{14}C$ distribution for the upper 1.5 kilometer of the water column The most prominent features of this section are the general upward tilt of the isopleths eastward of 120°W and the sharp upturn of the isopleths in the 250-750 meter depth range just off South America. This second trait is probably due to upwelling and is reflected in the low surface concentrations on the east end of the section. At this point, the upward slope of the deeper isopleths is interpreted as a shallow indication of the deeper southward flow at the eastern side of the section. Figure 5 shows the entire section contoured. Both Figure 4 and Figure 5 were gridded using the method of LeTraon (1990), however, the horizontal correlation length scale used for Figure 5 was 2.5 times that used for Figure 4 to compensate for the sparser sampling in the deep and bottom water (*i.e.*, the full water column section was significantly smoothed relative to the first) The $\Delta^{14}C$ minimum centered around 2500m depth is definitely not continuous across the section. The break in the minimum at 260° (100°W) is reflected in other tracers and is indicative of northward flow along the east side of the ridge.. .

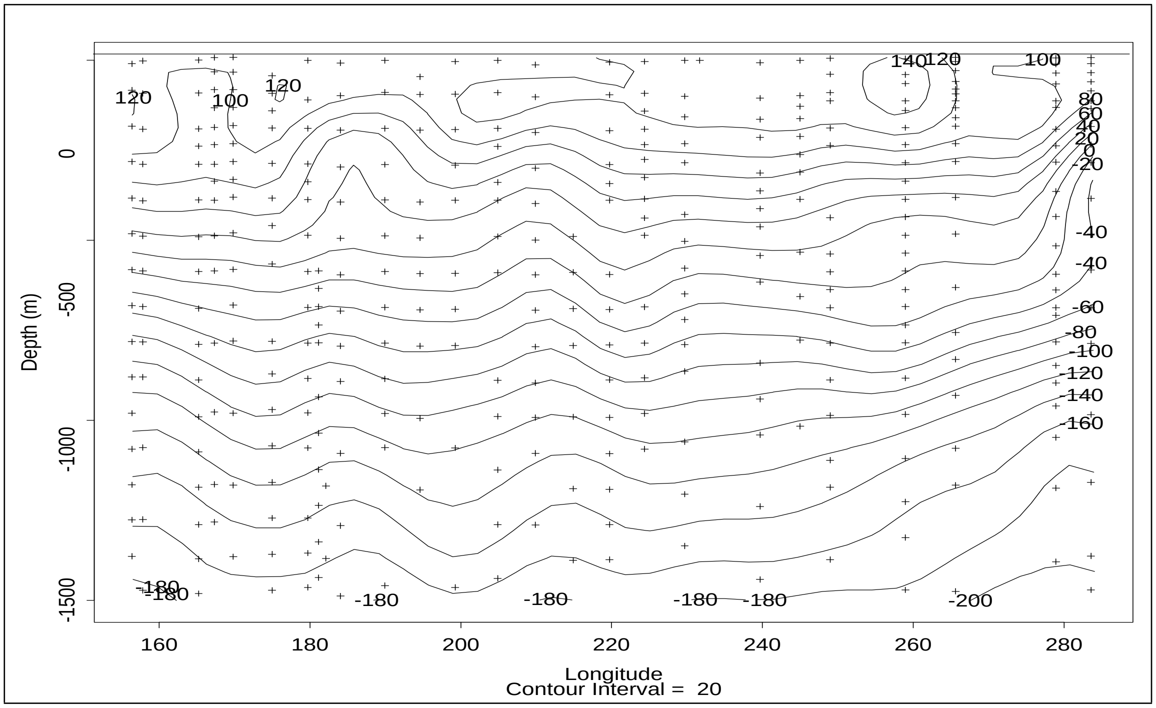


Figure 4: $\Delta^{14}C$ concentration in the upper kilometer of TUNES leg 3; WOCE line P6) along 155°W. Gridding done using the method of Letraon (1990); all samples measured using the AMS technique (Key, 1996a,b; Key, *et al*., 1996). For most of the section the maximum concentration is found below the surface.

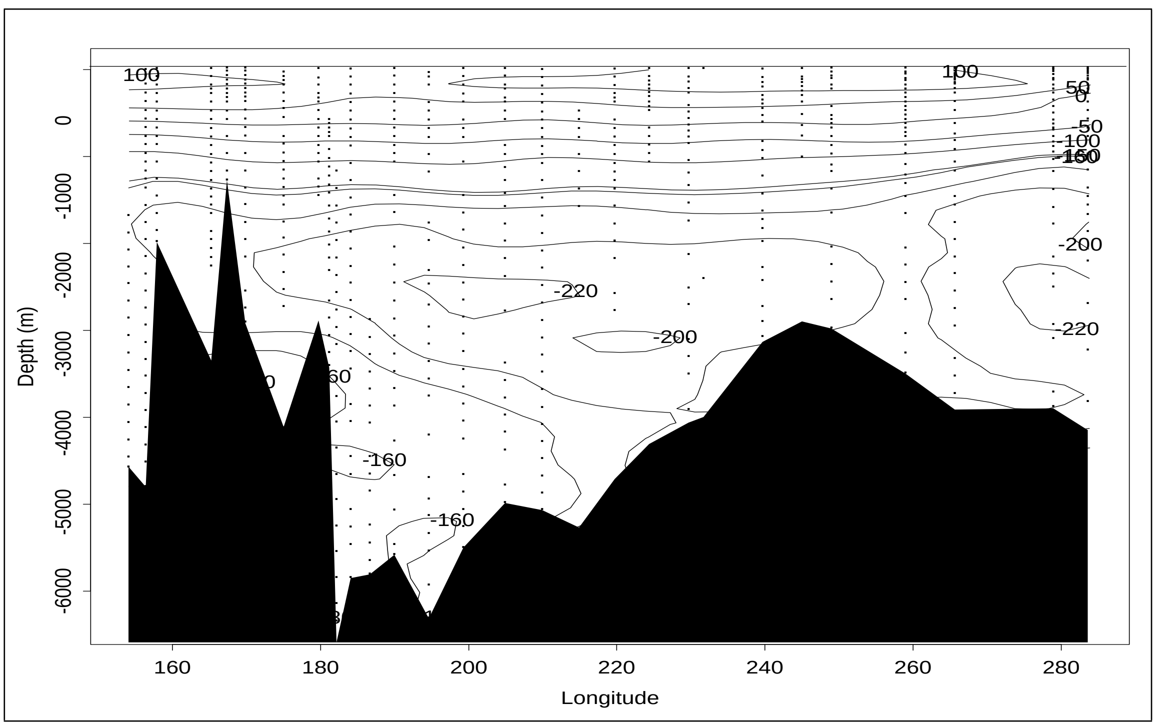


Figure 5: $\Delta^{14}C$ contour of WOCE section P6 at approximately 32°S. Longitudes are east of Greenich. Objective gridding done using the LeTraon (1990) method with a relative long horizontal correlation length scale. The samples in the near bottom water mass centered on 190° and having relatively low $\Delta^{14}C$ are those which fall above the general deep water trend in Figure 3.

The minimum layer has 2 cores centered on 210° and 280°. Both are interpreted as southward flow of “old” water from farther north. The core which is against South America was completely missed by GEOSECS due to lack of coverage during that program. At this point it is not clear whether the eastern core represents a return flow from the North Pacific or simply return flow of waters which have remained in the South Pacific.

5.1 References and Supporting Documentation

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C.6. Station Log

Leg3:

Aqui89 troubles from the start of leg3. Code got corrupted and was scrambling the last three parameters (TP,TR,RT). Plotting of extra variables and derived parameters was demonic. Test station 999 and 998, and station 1 were acquired with this corrupt code. A backup AQUI89 tape from July 1991 was restored to the microvax and station 2 was acquired with this code.

Data clean. Plotting spikes for TE variable. Station 1 was replayed from audio tape with this old code.

Logging in parallel to PC, stations 999,998,1-3,5-7,9-12.E.

D. Acknowledgements

E. References

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F WHPO Summary

Several data files are associated with this report. They are the p6c.sum/ p6w.sum/p6e.sum, p6c.hyd/p6w.hyd/p6e.hyd, p6.csl and *.wct files. The p6c.sum/ p6w.sum/p6e.sum files contains a summary of the location, time, type of parameters sampled, and other pertient information regarding each hydrographic station. The p6c.hyd/p6w.hyd/p6e.hyd file contains the bottle data. The *.wct files are the ctd data for each station. The *.wct files are zipped into one file called p6awct.zip/p6bwct.zip/p6cwct.zip /p6dwct.zip/p6ewct.zip . The p6.csl file is a listing of ctd and calculated values at standard levels.

The following is a description of how the standard levels and calculated values were derived for the p6.csl file:

Salinity, Temperature and Pressure:
These three values were smoothed using the following binomial filter-

$$t(j) = 0.25ti(j-1) + 0.5ti(j) + 0.25ti(j+1) \quad j=2....N-1$$

When a pressure level is represented in the *.csl file that is not contained within the ctd values, the value was linearly interpolated to the desired level after applying the binomial filtering.

Sigma-theta(SIG-TH:KG/M3), Sigma-2 (SIG-2: KG/M3), and Sigma-4(SIG-4: KG/M3):
These values are calculated using the practical salinity scale (PSS-78) and the international equation of state for seawater (EOS-80) as described in the Unesco publication 44 at reference pressures of the surface for SIG-TH; 2000 dbars for Sigma-2; and 4000 dbars for Sigma-4.

Gradient Potential Temperature (GRD-PT: C/DB 10-3)
is calculated as the least squares slope between two levels, where the standard level is the center of the interval. The interval being the smallest of the two differences between the standard level and the two closest values. The slope is first determined using CTD temperature and then the adiabatic lapse rate is subtracted to obtain the gradient potential temperature. Equations and Fortran routines are described in Unesco publication 44.

Gradient Salinity (GRD-S: 1/DB 10-3)
is calculated as the least squares slope between two levels, where the standard level is the center of the standard level and the two closes values. Equations and Fortran routines are described in Unesco publication 44.

Potential Vorticity (POT-V: 1/ms 10-11)
is calculated as the vertical component ignoring contributions due to relative vorticity, i.e. pv=fN2/g, where f is the coriolius parameter, N is the bouyancy

frequency (data expressed as radius/sec), and g is the local acceleration of gravity.

Bouyancy Frequency (B-V: cph)
is calculated using the adiabatic leveling method, Fofonoff (1985) and Millard, Owens and Fofonoff (1990). Equations and Fortran routines are described in Unesco publication 44.

Potential Energy (PE: J/M2: 10-5) and Dynamic Height (DYN-HT: M)
are calculated by integrating from 0 to the level of interest. A constant value of specific volume anomaly is assumed. equations and fortran routines are described in Unesco publication, Processing of Oceanographic station data.

Neutral Density (GAMMA-N: KG/M3)
is calculated with the program GAMMA-N (Jackett and McDougall) version 1.3 Nov. 94.

G. Data Quality Evaluation

G.1. DQE of WOCE P6C Hydrographic Data

(A. Mantyla)
6 March 1995

WOCE P6C is the second leg of three done along about 32S in the South Pacific. The cruise crossed the Southwest Pacific Basins occupying stations from the East Pacific Rise ridgecrest to the Kermadec Islands. Comparisons with nearby high resolution stations from GEOSECS, TUNES and JUNO were reasonably good. Overall, this cruise will be a very nice addition to the Pacific deep data set array. However, there is room for some improvement.

Many of the problem areas noted on the P6E leg persisted into this one (see general comments from the P6E DQE report for more detailed remarks). Rosette trip errors were less frequent on this leg, but sampling errors appeared to happen fairly often. Much of the oxygen or salinity data that was flagged as questionable appeared to be samples that were drawn a depth or two off (according to the CTD trace). Those mostly were not rosette trip errors because they occurred in isolated parameters, rather than in all of the samples listed for a specific bottle. A couple of examples are mentioned below, but most have been properly flagged as doubtful data. The nutrient data set suffered by the loss of the phosphate for the last 17 stations. Given a choice, I would have preferred to have lost the nitrite channel.

There were a number of unintended double trips, as shown by the wider than normal depth spacing adjacent to the double trips and by the lack of actual CTDO data for the second data listing (ditto marks could have been used). The double trips are fairly obvious and are easy to sort out, but the mis-trips often start at a bottle or two earlier than the obvious pair. I've pointed out some possible cases below that need to be resolved. Those mis-trips would be easier to determine if the CTD information at each intended trip depth were retained in the .sea files, it would also improve the profiles if some data were listed for the depth gaps.

The .sum files were more complete on this leg and I didn't see any obvious goofs. However, they need to have position data added for the down and up times, if for no other reason than to show how meaningless the second decimal place is. Bottom soundings are also needed, preferably for the cast down time.

Comments on specific stations:

Stations 73 and 74: Data not provided, stations apparently a re-occupation of station 72 from the previous leg. Might have been useful to assess measurement consistency between the two legs.

Station 79, 1964db: Salinity sample apparently not drawn. It is important to draw salts from all rosette bottles, as salinity compared to the CTD is the most sensitive verification available on the correct tripping of the rosette bottles. Oxygen samples can help, but at this depth, the CTD O2 value was flagged doubtful. Although the other water sample data appears to be ok, there is no actual verification of that assumption.

Station 80, btl. 24: Oxygen close to 1.00 ml/l too high. Could it be a typo or transposition of the first 2 figures? Would be ok if so, otherwise flag it questionable.

Station 81, btls. 7 and 8: From comparison with the adjacent station profiles, the nutrient samples appear to have been reversed. Most obvious is silicate, phosphate and nitrate gradient is small and there- fore inconclusive. Only bottle 7 flagged doubtful, but bottle 8 should be also.

Station 89, btl. 20: A good example of an obvious leaker where the oxygen appears to be ok, compared to the CTD O2 profile (offset to the adjacent bottle). However, the mean of the overlaying O2 samples happens to be essentially the same as the O2 at this level, 5.22 vs 5.23 ml/., about the value expected. The O2 should be flagged doubtful also.

This station is only about 2300m deep in a region uncharted by GEBCO, but expected to be generally deeper. The unexpected bathymetry could have odd effects on the water above, as suggested by the wavy temperature profile and bumpy O2 and silica profiles. Four of the silicas were flagged doubtful, but unless there is some analytical reason for doing so, I would prefer to accept them as ok.

Station 90, btls. 35 and 36: The two surface salinity samples are obviously listed in reverse order, most likely due to a sample collection error. They are unstable as listed, and the CTD values are correct. An increase in salinity in the top 2 depths is required to balance the temperature inversion. Unless a reason can be found to reverse the bottle salts, I recommend calling the CTD salts ok, and the bottle salts doubtful. Should have a little more faith in the CTD data.

Several other salts on this station seem to be poorly collected, and the O2's at 1420 and 1520db could be reversed, but can't be sure. Deeper one flagged.

Station 95: Obvious trip problems (and possible sampling errors). As indicated by bottle 1 listed between 24 and 25; 3 samples listed at 1880db; and 4 depth gaps: near 800, 1420, 1800, and 2290db. The salinity data appear to confirm the present trip levels, but the oxygen and silicate data do not confirm 3 trips at 1880db. Therefore the most likely scenario suggests that bottle 8 and 9 salts were collected from bottle 7; the O2 and nutrient data would match the adjacent station profiles if samples 8-13 were moved up one level, including the missing depths at about 1800 and 1420 db also. Finally, the O2's at bottle 14 and 15 appear to belong one depth deeper. Considering all of the uncertainty above, I have flagged the O2's for bottles 8-15 and all of the nutrients for bottles 8-13 questionable.

Station 97, btl. 29: Looks like a typo on the bottle salt, should be 35., not 34. CTD salt was flagged questionable, but both are OK if typo is corrected. If not, accept CTD salt and flag bottle salt as uncertain (or even "bad"). The wide spread in the oxygen data for the six surface trips and the six at 2400db indicate some sort of analytical problem. It's not likely a sampling error, because it is hard to mess up near-surface samples that are close to full saturation. Could be a pickling problem though. Oxygens in general this cruise are not as sharp as they could be.

Station 101, btl. 22 at 90m: O2 and salt unlikely at this depth, but would be ok at 60m where only ctd data listed, no water sample data. If left as is, should flag nutrients doubtful also.

Station 104, btls. 10 and 11: Both salts high where listed, would be ok one depth down. Other data ok as listed, so not mis-trips. Most likely sample drawing errors.

Station 113, btl. 19: All data unlikely at second trip at 307db, but would be ok at unlisted depth of about 250db (where bottle 19 was tripped on the last station). Suggest examine original records to see if 250db was a planned sampling depth. If so, list the data there as ok.

Station 143, btl. 8: O2 clearly poor where listed, but would be ok at the unlisted depth between 3762 and 4172db; as would all of the other water sample parameters. If moved, accept data as ok.

Station 145, btl. 13: Data questionable at listed pressure, would be ok if moved up one depth. Bottle 13 and 14 double tripped on stations 142 and 147, most likely here also.

Station 147, btl. 8: Data flagged doubtful, but would be ok if listed at the unlisted pressure of about 4035db. Probably was start of mis-trip that led to two trips at 3831db.

Station 148, btls. 11 and 12: Salt, O2, and silica all indicate bottle tripped one depth deeper. If moved, accept data as ok.

Station 149, btl. 13: Data unlikely at this depth, would be ok listed one depth shallower. Looks like another 13 and 14 double-trip.

G.2. DQE of WOCE P6E Hydrographic Data

(A. Mantyla)
27 February 1994

The three legs of WOCE line P6 (E, C, and W) at about 32S in the Pacific, will be a very valuable data set to help fill in the most barren strip of Marsden Squares in the Pacific. The P6 data is generally quite good, but there are a couple of areas that could stand improvement (see below). The PI's have done a thorough job in sorting out rosette-trip problems, but there may be a few more that might be resolved upon re-examination, tabulated below. The data originators probably went overboard in flagging slightly anomalous data points as "bad" data, while the "questionable" data code might have been more appropriate. I've softened or changed some of those flags, but for the most part, the originators codes have been left as is.

There were a number of instances where "leaky" bottle were identified to have bad water samples by the salinity check sample, but only the salt and nutrients were flagged, while the oxygen was accepted as ok because it fortuitously appeared to fit in the profile. In the case of verified leakers, all water samples should be flagged doubtful. The oxygen precision in general, while better than many historical data sets was not up to WOCE expectations. The poor precision was seen in the duplicate trip data, mixed layer data, and numerous "bumps" in the deep profiles that were not supported by the CTD O2 data. Although some of the errors were likely due to sampling errors, the rest must be due to the specific analytical techniques used on the cruise. As an example of the excellent precision achieved elsewhere, the CalCOFI cruises, using the Carpenter whole bottle titration method, routinely report mixed layer oxygens that differ by no more than 0.01 ml/l. P6 mixed layer oxygens commonly had a spread of several times that value. I would urge that the analysts seriously reconsider their methodology and give the Carpenter system a try.

Salinity results also were not as sharp as WOCE expects, but in this case, I believe the source of the problem lies in the sample drawing stage, rather than in the analyses. According to the cruise report, salinity bottles were only rinsed twice, while nutrients, a part per hundred number, were given 3 rinses. Two salinity rinses is ok if the historical salinity precision of .003 to .005 is the goal, but 3 rinses are a must to reach the WOCE goal of .001. Comparisons with nearby JUNO stations show that the desired WOCE targets are possible, the deep O2 and salt profiles are distinctly smoother (like the CTD profiles on both cruises) on JUNO. That doesn't mean that the P6 data is bad, just that it is possible to do a little better. My impression was that the bumpiest profiles were from stations that started within a few hours of midnight, GMT.

The nutrient data looked quiet good, in spite of noticeable offsets from crossing WOCE lines, particularly in the silicate data. I think the cruise to cruise nutrient differences are an indication that the current nutrient methodology is not yet up to

WOCE expectations, but both cruise results are as good as any that I've seen. The nutrient data appear to have been evaluated independently from the other data. Some nutrient bumps were flagged doubtful, but had supporting consistent oxygen inflections that were in turn verified by the CTD O2 probe, confirming that the nutrient anomalies were probably real. A few flags have been changed on that basis, but for the most part, I've gone along with the original flags.

The ".sum" files are incomplete and should be finished. This format is not very popular to outside groups; coming from the source at WHOI, one would expect to see a model example of how it should be done! Only the cast start time positions are tabulated. The WOCE guidelines expect a position for the cast down time (which is when the water sampling begins) and a cast end time position. A bottom depth and depth above the bottom should also be tabulated A few obvious goofs are tabulated below but the table needs to be fleshed out and proofed carefully.

The following are some specific problems that should be looked at:

Station 8, btl. 2: Data listed at 2038db unlikely, but would probably be ok at assumed unlisted trip depth between 2038 and 1588db, perhaps near 1888db. Bottles 3 and 4 both listed at 1588db, suspect rosette hang-up started with bottle 2. Recommend data originators check to see if the data listed at a shallower depth would be ok and then change data flags.

Station 9: Numerous trip errors, not all resolved. O2's not listed below 869db; they should be with appropriate quality codes. The data from bottles 2 and 9 are listed at odd pressure intervals, data would look ok if listed at pressures midway between bracketing bottles. Data from bottles 20 and 21 are essentially the same, suggesting both tripped at the same depth, perhaps near 815db according to the salinity gradient. If trip depth can't be resolved, recommend flag all water samples from bottle 20 uncertain also.

Station 10, btl. 17: Salt, silica and O2 suggests data would be ok if listed at pressure about half way down to next reported pressure. If done, change quality flag to ok.

Station 11, btl. 1: Increase in trench bottom O2 probably is real, see SCORPIO stas. 83 and 90. The trench is the main conduit to the bottom Eastern Pacific basins.

Station 13: Suspect sample drawing errors: salts from bottles 6 and 7 flagged poor, would be ok in reverse order. No salt listed from deepest bottle. O2 from 20 was probably drawn from bottle 21. O2's from 6 and 7 clearly would fit better deeper in the water column. On second thought, salt, O2, and silica from bottle 7 would be fine one depth deeper; if that were done, the quality flags could be changed to ok.

Station 16, btls. 8 and 9: Both salt and O2 indicate they tripped one depth deeper; nutrients ok at either depth. If moved accept data as ok. O2 from bottle 3 probably drawn from bottle 2, must "u" it at present depth.

Station 17, btl. 8: Salt, O2 and nuts indicate bottle probably tripped at unlisted depth about half way down to next depth. Data ok if moved; if left as is, flag nutrients doubtful also.

Station 19, btls. 5 and 6: Salt, O2, silica would fit better with adjacent station and CTD O2 if water data moved up one depth. If done, change flags to ok.

Station 31, btl. 6: Nutrients originally flagged bad, probably because they look a little high. However, O2 inflection agrees with nutrient profile, and the bottle O2 is confirmed ok by the CTD O2, so I've flagged all of the data as ok.

Station 32 salts: All appear high compared to adjacent stations THETA - S curves and the CTD, suspect faulty salinometer run. Recommend all be flagged questionable (not done yet).

Station 41, btls. 3 and 4: Comparison of salinities with the CTD suggests samples were reversed in sampling. However, O2 was also bad on bottle 4, so only that depth was flagged, but bottle 3 salt could be also.

Station 55, btl. 32: Is the reported oxygen of 14.120 ml/l a typo or the actual measurement? Seems unlikely to titrate a factor of 3 times too high.

Station 64, btl. 21 O2: Clearly too high, but would agree with CTD O2 if a transposition error had occurred: 5.93 ml/l recorded instead of 5.39 ml/l. Should check with the original sources.

.sum file, sta. 14: Probably on the 7th, rather than 6th.

.sum file, sta 17: BO 8th, not 7th.

.sum.file, stas. 21 and 22: Must have been on the 9th.

.sum file, sta. 32: bottom date wrong, must be 13.

.sum file, sta. 69: Longitude seems unlikely, 9 deg. off?

G.3. DQE of WOCE P6W Hydrographic Data

(A. Mantyla)
7 March 1995

The P6W leg is the third and final leg of the WOCE section near 30S across the entire Pacific. All three legs were done using essentially the same equipment and methodology, so the DQE reports for the first two legs should be referred to for comments that are relevant to all three legs.

The salinity and oxygen precision in the deeper layers was better than on the previous two legs, but there was still a surprising and unlikely range in the mixed layer at times. Rosette trip malfunctions also occurred less often, but bottle 31 was often involved in mis-fires.

Phosphates were back on line this leg, with the exception of two stations (see below), the data looks quite good.

The last 20 stations consisted of two repeat segments of the end of the P6 line ascending the Australian slope. The hydrographic data consisted of essentially just 12 CTD calibration samples, they have no value as hydrographic profiles and I recommend that stations 248 to 267 be omitted from the P6 data set.

This section is a very nice improvement over the SCORPIO lines at 28 and 43S, I look forward to seeing the contoured sections.

Comments on specific stations:

Station 191, .sum: The position appears to be one degree too far south to be part of the section. Needs to be verified, or corrected.

Station 195, btl. 31: Bottle malfunctioned on the last station and appears to have delay-tripped at the next depth up from its listed depth on this station. As tabulated, all of the bottle 31 water samples should be considered doubtful; but they would be ok if moved up a depth.

Station 229, PO4's: Deeper phosphates are higher than adjacent stations, relative to the cruise NO3/PO4 relationship. Suggest data originators recheck the phosphate end standard factors and baselines to see if the data can be corrected. If not, flag data below 900db uncertain.

Station 236, btls. 30 and 31 at 400 and 301db: Water sample data nearly identical, most likely both tripped at 400db. If bottle 31 moved to 400db, accept the data as ok; otherwise, flag all water samples questionable.

Station 238, PO4's: Similar to station 229, deeper ones flagged questionable. Suggest re-check end standard factor and baseline to see if the PO4 data can be salvaged.

Stations 248-267: The WOCE P6 section ends with station 246. The remaining 20 stations were two repeat sections of the last 1 deg 30 min. longitude done with a different CTD and a highly malfunctioning 12-place rosette. The hydrographic data from those stations have some slight value for calibration of the CTD, but are of no value as hydrographic profiles. I recommend they not be reported. The P6 section is complete with station 246, so the remaining stations are not needed anyway.

G.4. DQE of WOCE P6 CFC Data

(D. Wisegarver)
1 December 2000

Final CFC Data Quality Evaluation (DQE) Comments on P06E.

The final CFC DQE review was completed in Dec 2000 by David Wisegarver.

Based on the data quality evaluation, this data set meets the relaxed WOCE standard (3% or 0.015 pmol/kg overall precision) for CFC's. Detailed omments on the DQE process have been sent to the PI and to the WHPO.

The CFC concentrations have been adjusted to the SIO98 calibration Scale (Prinn et al. 2000) so that all of the Pacific WOCE CFC data will be on a common calibration scale.

For further information, comments or questions, please, contact the CFC PI for this section (Dr. R. Fine, rana@rsmas.miami.edu) or David Wisegarver (wise@pmel.noaa.gov).

More information may be available at www.pmel.noaa.gov/cfc.

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Prinn, R. G., R. F. Weiss, P. J. Fraser, P. G. Simmonds, D. M. Cunnold, F. N. Alyea, S. O'Doherty, P. Salameh, B. R. Miller, J. Huang, R. H. J. Wang, D. E. Hartley, C. Harth, L. P. Steele, G. Sturrock, P. M. Midgley, and A. McCulloch, A history of chemically and radiatively important gases in air deduced from ALE/GAGE/AGAGE J. Geophys. Res., 105, 17,751-17,792, 2000.

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Final CFC Data Quality Evaluation (DQE) Comments on P06C

The final CFC DQE review was completed in Dec 2000 by David Wisegarver.

During the initial DQE review of the CFC data, a small number of samples were given QUALT2 flags which differed from the initial QUALT1 flags assigned by the PI. After discussion, the PI concurred with the DQE assigned flags and updated the QUAL1 flags for these samples.

The CFC concentrations have been adjusted to the SIO98 calibration Scale (Prinn et al. 2000) so that all of the Pacific WOCE CFC data will be on a common calibration scale.

For further information, comments or questions, please, contact the CFC PI for this section (R. Weiss, rfw@gaslab.ucsd.edu) or David Wisegarver (wise@pmel.noaa.gov).

Additional information on WOCE CFC synthesis may be available at: http://www.pmel.noaa.gov/cfc.

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Prinn, R. G., R. F. Weiss, P. J. Fraser, P. G. Simmonds, D. M. Cunnold, F. N. Alyea, S. O'Doherty, P. Salameh, B. R. Miller, J. Huang, R. H. J. Wang, D. E. Hartley, C. Harth, L. P. Steele, G. Sturrock, P. M. Midgley, and A. McCulloch, A history of chemically and radiatively important gases in air deduced from ALE/GAGE/AGAGE. Journal of Geophysical Research, 105, 17,751-17,792, 2000.

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Final CFC Data Quality Evaluation (DQE) Comments on P06W

The final CFC DQE review was completed in Dec 2000 by David Wisegarver.

During the initial DQE review of the CFC data, a small number of samples were given QUALT2 flags which differed from the initial QUALT1 flags assigned by the PI. After discussion, the PI concurred with the DQE assigned flags and updated the QUAL1 flags for these samples.

The CFC concentrations have been adjusted to the SIO98 calibration Scale (Prinn et al. 2000) so that all of the Pacific WOCE CFC data will be on a common calibration scale.

For further information, comments or questions, please, contact the CFC PI for this section (mwarner@ocean.washington.edu) or David Wisegarver (wise@pmel.noaa.gov).

Additional information on WOCE CFC synthesis may be available at: http://www.pmel.noaa.gov/cfc.

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Prinn, R. G., R. F. Weiss, P. J. Fraser, P. G. Simmonds, D. M. Cunnold, F. N. Alyea, S. O'Doherty, P. Salameh, B. R. Miller, J. Huang, R. H. J. Wang, D. E. Hartley, C. Harth, L. P. Steele, G. Sturrock, P. M. Midgley, and A. McCulloch, A history of chemically and radiatively important gases in air deduced from ALE/GAGE/AGAGE. Journal of Geophysical Research, 105, 17,751-17,792, 2000.

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G.5. DQE of WOCE P6 CTD Data

(Niel White)
3 Apr. 1995

On the whole the processors have done a good job with this cruise and this data set is a big improvement on the P16C data which I was sent last year.

I do, however, have a few complaints. The principal one is the question of units t68 for temperature and ml/l for oxygen). I gather that the WHP office has taken this issue up, so I will not labour it here. The other main complaint is that I feel that the noisy oxygen data in the top part of the water column on leg 3 should have been flagged as questionable. The report states that investigators may need to average or filter the data to make it useable (p 11) 1. This sounds like a fairly good definition of 'questionable data' to me.

Temperature Calibration

The temperature calibrations are described on pp 30-31 and appendix D. I would still like to see an accuracy estimate based on a comprehensive error budget of the calibration procedure. I suspect that the difference between the pre- and post-cruise calibrations of CTD 9 are more a statement about the accuracy of the calibration lab than about drift in the CTD.

Salinity and Dissolved Oxygen Calibration

On the whole the data processors have done a good job of calibrating the CM salinity and dissolved oxygen channels. I was pleased to see that the processors had not used unphysical values for some of the calibration parameters (which they had used at times when processing the P16C cruise).

For salinity (figure 1) and oxygen (figure 2) 1 have plotted profiles of scaled offsets between bottles and *downcast* CTD values. Deep offsets are plotted at a larger scale than shallow ones - the scale is shown by the two lines on the left hand side of each frame. At any depth the width of the wedge represents an offset (bottle - CTD) of .01 psu (figure 1) or 4 micromoles (figure 2).

Note that only samples flagged as good data (quality byte = 2) are considered in this report.

D= salinity fits

In general, deep salinity fits are good, except for the following stations:

Station	Where in group	Problem
32	middle	approximately .004psu fresher than bottles from 2,000m down
44	middle	approximately .003psu fresher than bottles from 3,000m down
101	end	approximately .002psu fresher than bottles from 2,500m down
114	middle	approximately .003psu saltier than bottles from 3,500m down
120	end	fairly poor fit from about 1,000m down - saltier for part of the water column and fresher deeper down
121-122	whole group	both stations in the group seem to be on the salty side!!

While these differences must, to some extent, be due to the tendency of the CTD data (fitted in groups) to smooth out variations in the bottle data, I think that these sections should be looked at again.

Presumably the very short group of stations 121 - 122 was chosen because of difficulties fitting larger groups, but difficulties still remain. The deep CTD data for station 121 is a little salty compared to the bottles, but for station 122 it is substantially saltier. I find this intriguing! The report (p56 in appendix F) refers to a manual adjustment for station 122. Has this manual adjustment been done correctly?

Deep Oxygen Fits

I have used a scaling factor of 44.6595 to convert ml/l to molar units. I dare say that this is not the 'correct' way to do this conversion, but it will do for the purpose of this report.

The processors seem to have done a generally good job of calibrating the deep oxygen profiles. Apart from some obviously bad bottles (e.g. station 106 at 4,001 decibars). The stations I would like to see looked at again are:

Stations	Problem
17 & 18	consistent deep offset (~2 micromoles) for both stations
81 & 83	offset at the bottom
116	poor fit from -3,300 decibars down (bad bottle data?)
119	poor fit at the bottom - out by 2 - 3 micromoles
126	deep fit would be improved by removing the bottle at 4,571 decibars
131	poor fit from 3,600 decibars down
137-149	generally poor fits in deep water (deeper than 3,000 decibars)
155-161	the bottom section of most of these stations is offset
164-170	the bottom section of most of these stations is offset
173-178	fairly poor fits in deep water
234-237	fairly poor fits from about 2,000 decibars down

I realise that, given the vagaries of the instrument, it may not be possible to do much with some of these. I feel, however, that they should be looked out again to see if some improvement can be made.

Shallow (0 - 1,000m) fits

Shallow salinity fits

Figure 3 is a plot of comparisons of upcast CTD salinities with the bottles from 1 to 1,000 decibars and figure 4 is a plot of comparisons of downcast CTD salinities with the bottles over the same depth range. The scale is fixed through the depth range and is shown by the bars on the left of each figure. Most of the smaller offsets in figure 3 can be attributed to gradients, etc.

The CTD salinity values referred to in this section are the burst values from the hydrology files except where stated otherwise.

Fits are, in general, good, with the following exceptions:

Station	Problem
9	the CTD value at 66 decibars seems to be grossly wrong (= 31.368psu) and, apart from this, the fit is poor
88	surprisingly, salinities from the downcast fit the bottles better than the values from the upcast. I suspect that this is the result of a sampling or analysis problem and that these bottles should be discarded
90	the samples at 23 and 62 decibars seemed to have been interchanged - the fit is quite good if you swap them over!
97	the bottle at 156 decibars is clearly wrong
142	the bottle at 160 decibars seems to have a wrong depth - both downcast and upcast CTD values are offset from it by the same amount, and it looks like it would fit much better at a shallower depth. This is corroborated by the oxygen data.
155	similar comments to those for station 142 apply to the bottle at 111 decibars
174	similar again except that the bottle at 110 decibars looks like the depth is too shallow
177	similar again - the bottle at 159 decibars looks too shallow
222	the bottle at 305 decibars looks wrong - the downcast value fits better!
226	the bottle at 297 decibars looks wrong - the downcast value fits better
241	the downcast values fit better from about 200 - 500 decibars, suggesting a sampling or analysis problem

Shallow oxygen fits

As stated earlier, my main problem with the shallow oxygen data is the use of the noisy data on leg 3. This data is clearly of questionable value. It is stated on p32 that this data is very difficult to fit. This is not surprising and I would suggest that the following steps be taken:

either

the noisy data be filtered and, where believable profiles could be obtained the calibration calculations re-done

or

the data be removed or flagged as questionable and not be used in the calibration calculations.

The statement that surface spikes were common, but were not flagged is made on p32. Why weren't they flagged? This is, surely, questionable data and should be flagged appropriately.

Figure 5 is a plot of comparisons of downcast CTD oxygens with the bottles from 0 to 1,000 decibars. The scale is fixed through the depth range and is shown by the bars on the left of each panel. It is hard to say anything sensible about the leg 3 data because of the above problems. The data for legs 4 and 5 looks quite good, given the limitations of the instrument. A number of the samples which look bad on these plots have, in fact, been fitted as well as can reasonably be expected -the offsets are due to downcast/upcast variability rather than poor fitting. However, I would like the following apparent problem areas to be looked at:

Station	Problem
80	bottle at 634 decibars looks quite wrong
119	bottle at 60 decibars looks quite wrong
160	bottle at 160 decibars is offset, but could be due to upcast/downcast variability
171-177	all generally poor fits
186	bottle at 207 decibars looks odd
232	poor fit in top 200 decibars
236	bottle at 202 decibars looks wrong
238	poor fit in top 400 deciba

Minor problems

There are a few minor problems and/or annoyances with this data set:

- the record counts in some CTD fides are incorrect - for example, the header for station 9 says that there are 1,767 data records in the file. This would be correct if the data started at 1 decibar, but, as the data starts at 17 decibars it is not. In fact there are 1,759 data records (17 -> 3,533 decibars).

- there are some bad interpolations. For example, the 'interpolated' salinity for station 12 at 38 1 decibars is .05 psu different from the salinities on either side (which are very nearly equal). The salinities for 379, 381 and 383 decibars are 34.4500, 34.4004 and 34.4508! Station 147, 1,909 -1,911 decibars is another example. How are these interpolations done? If they are being done manually they should be checked more carefully. In addition, the interpolated salinity at 1,931 decibars in station 147 is (a) badly interpolated and (b) not flagged as an interpolated value (flag = 2, not 6). Other bad interpolations or interpolations that have not been flagged correctly are station 151 at the surface, station 157 at 4,409 and 4,411 decibars, station 159 from 2,333 to 2,353 decibars. The flagging and the documentation are inconsistent for station 79. In addition, some of the end points that have been chosen for the interpolation seem odd. For example, the salinity interpolation from 4,565 to 4,603 decibars in station 164 seems to be between points where the salinity has already departed from the 'true' value. This is the second cruise I have seen where there have been a number of poor interpolations. If the WHOI CTD group are going to continue to provide interpolated data I think that they need to have a careful look at their method for doing this. I make no guarantee that I have found all instances of these problems.

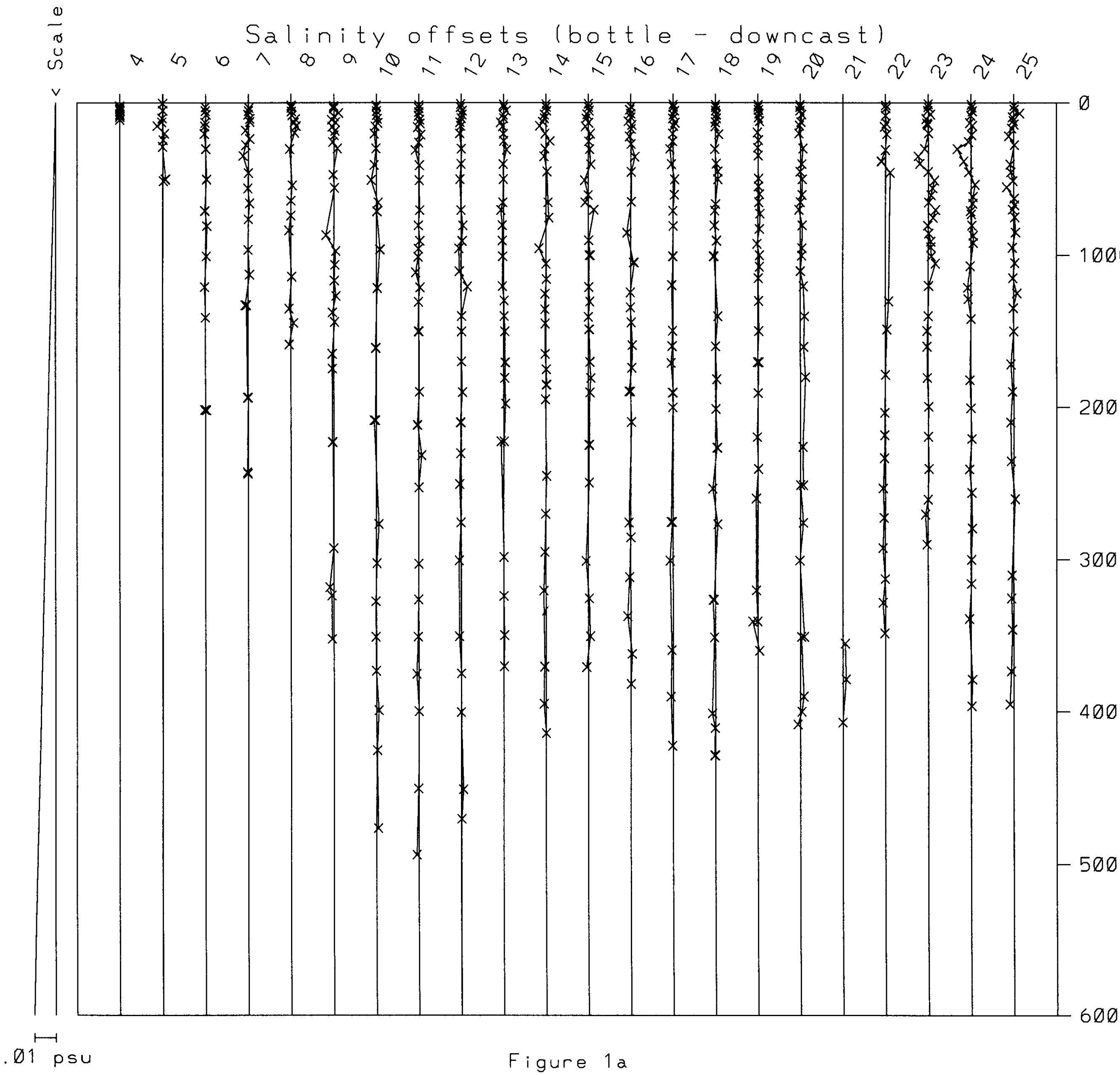

Figure 1a

A cross to the right of the line means that the CTD < bottle

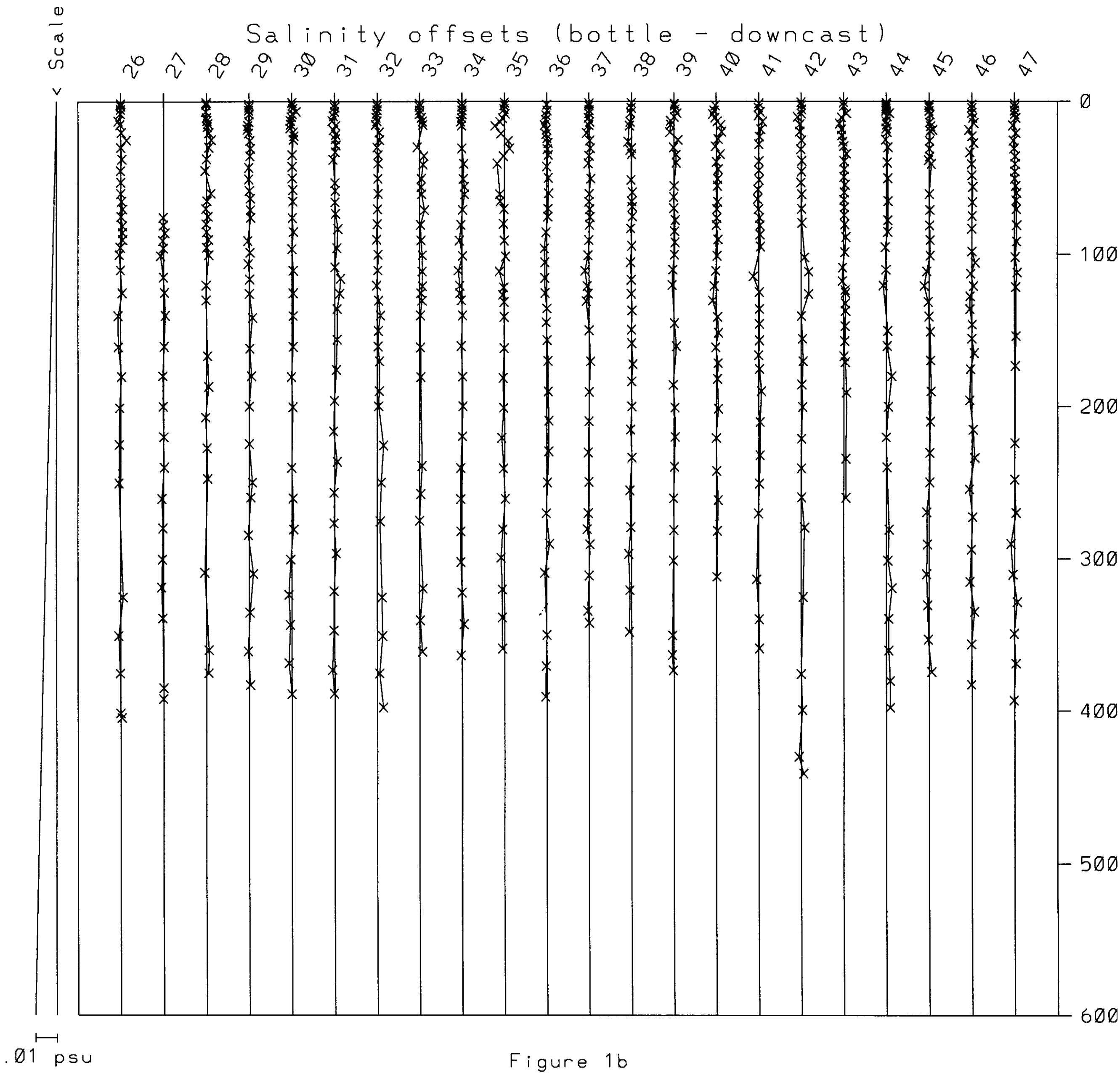

Figure 1b

A cross to the right of the line means that the CTD < bottle

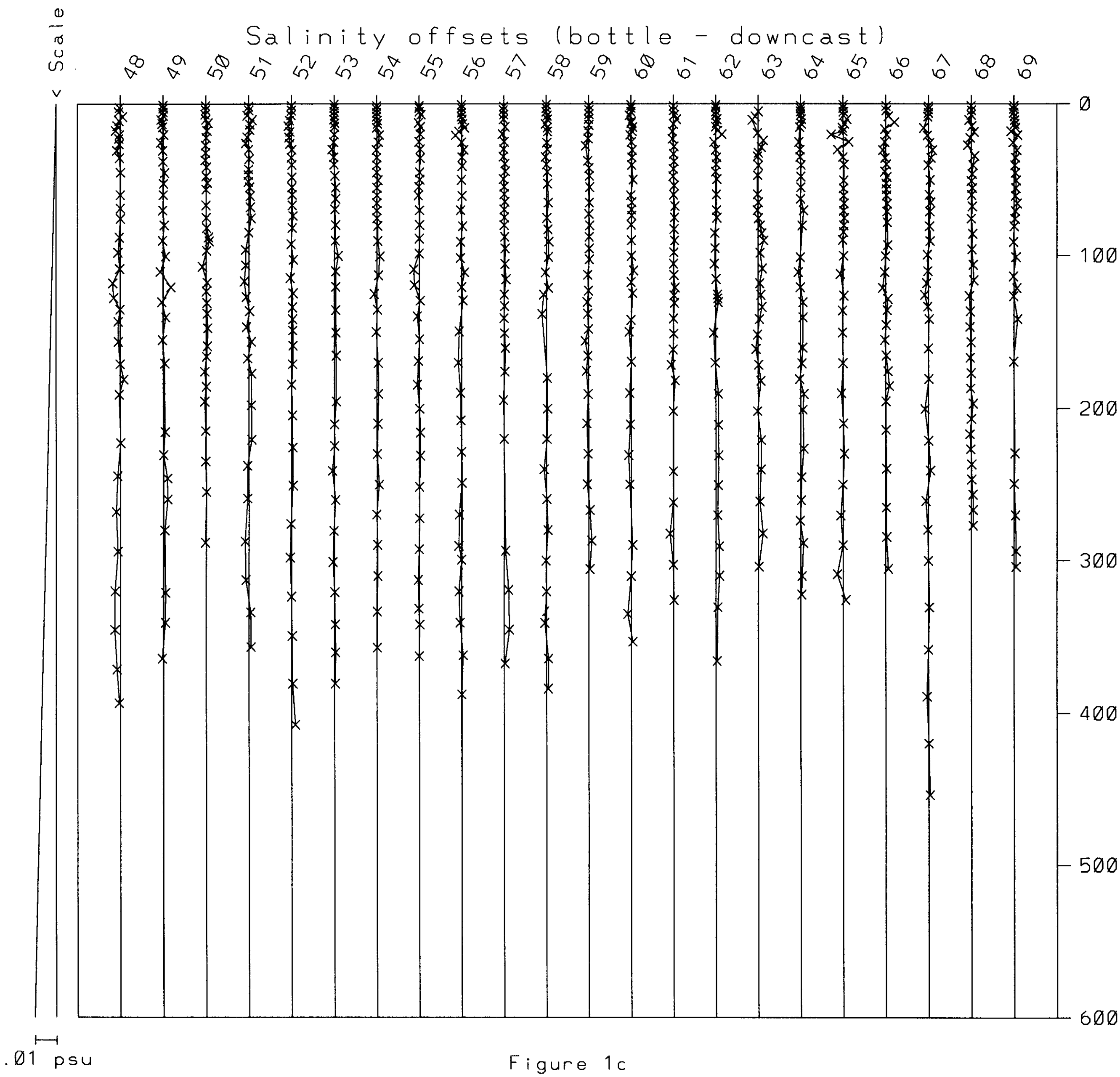

Figure 1c

A cross to the right of the line means that the CTD < bottle

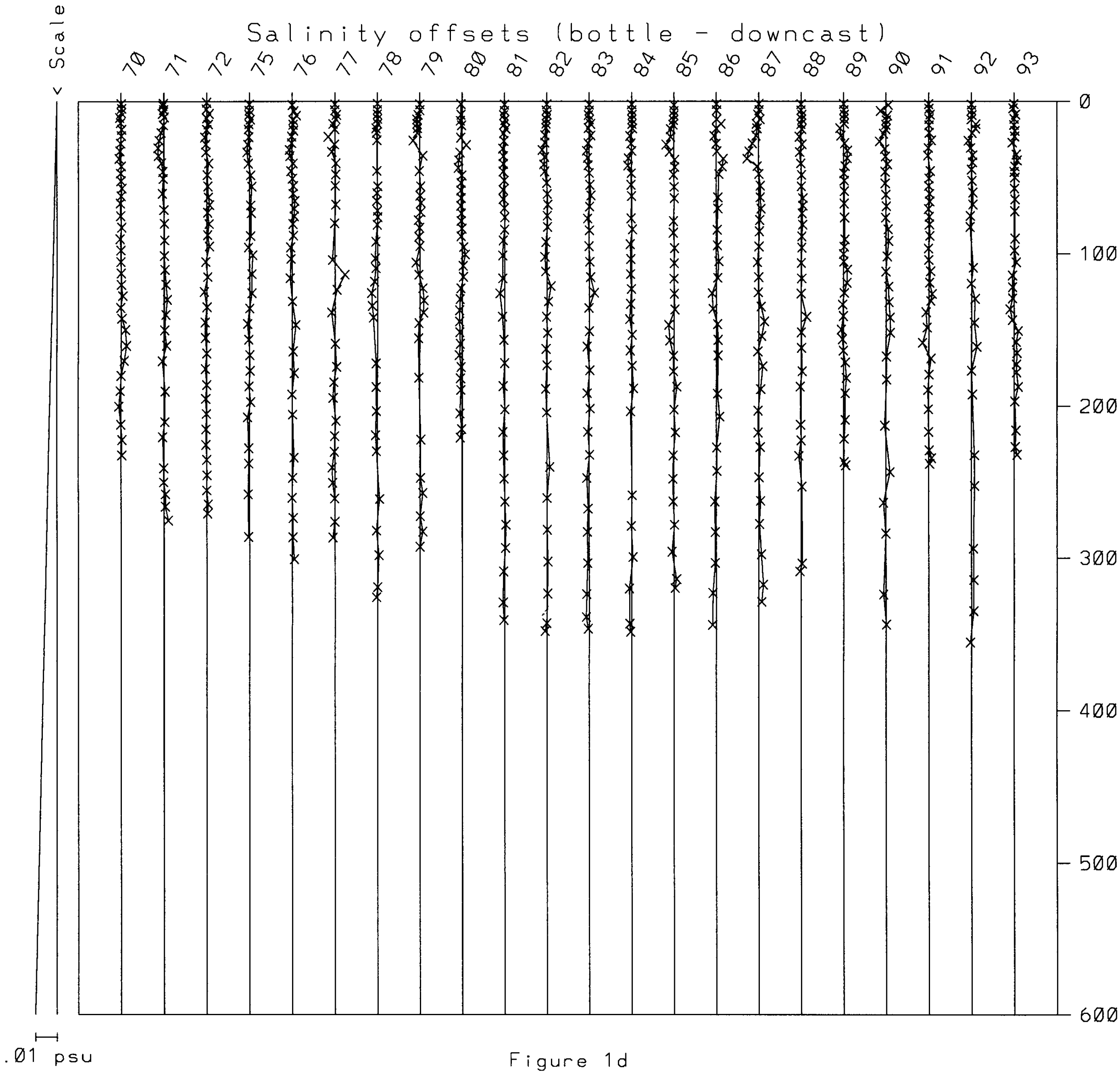

Figure 1d

A cross to the right of the line means that the CTD < bottle

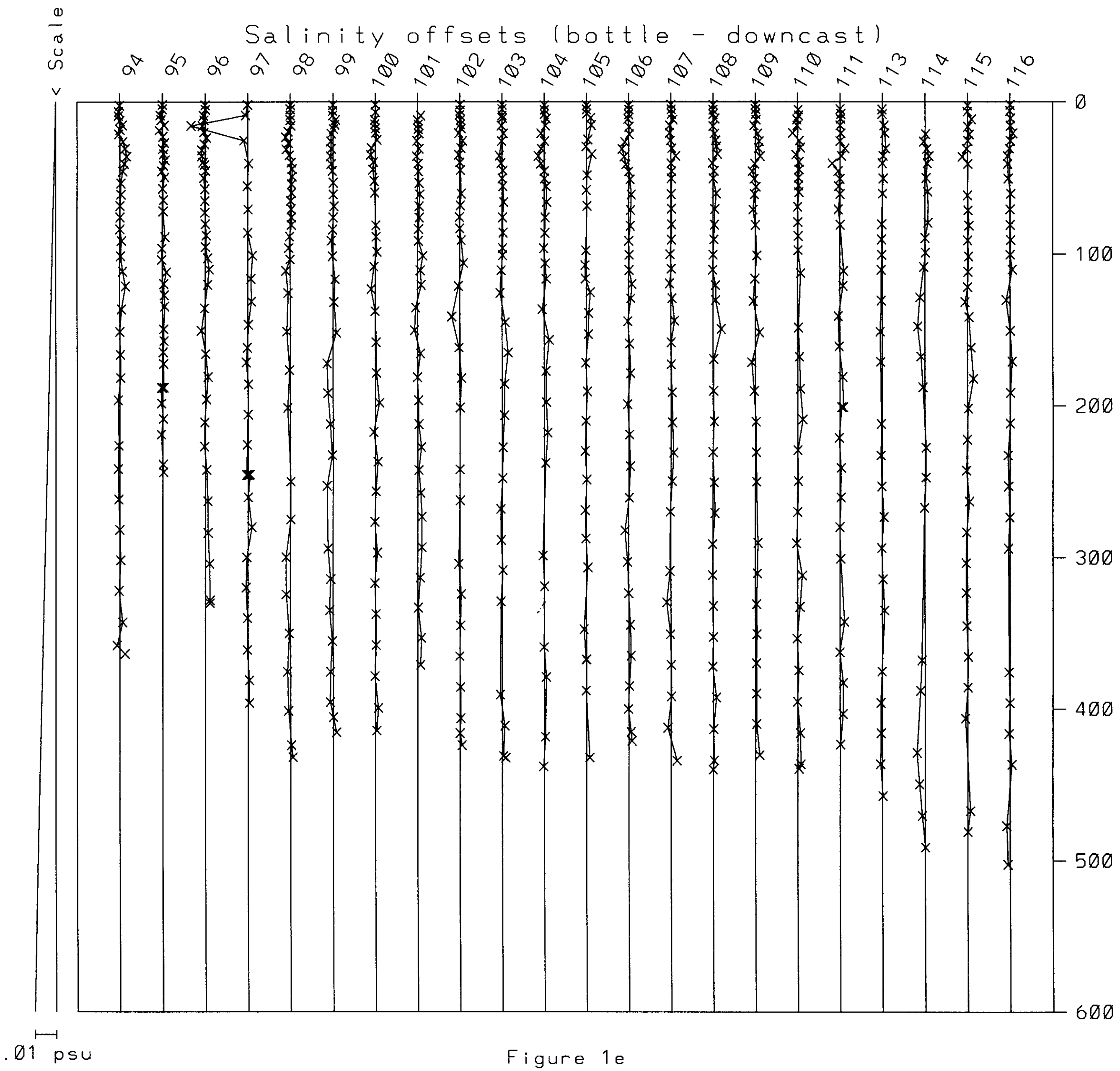

Figure 1e

A cross to the right of the line means that the CTD < bottle

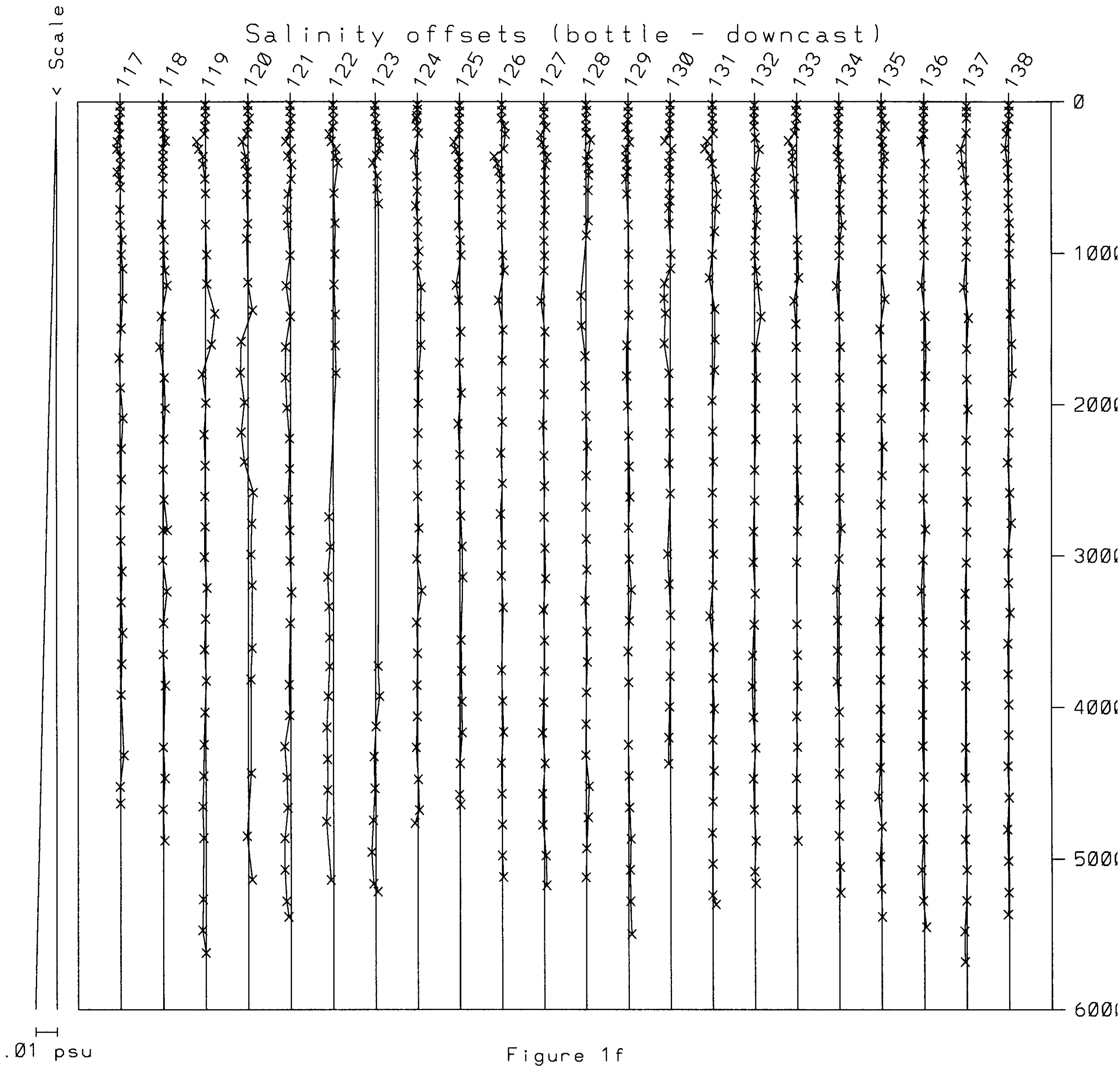

Figure 1f

A cross to the right of the line means that the CTD < bottle

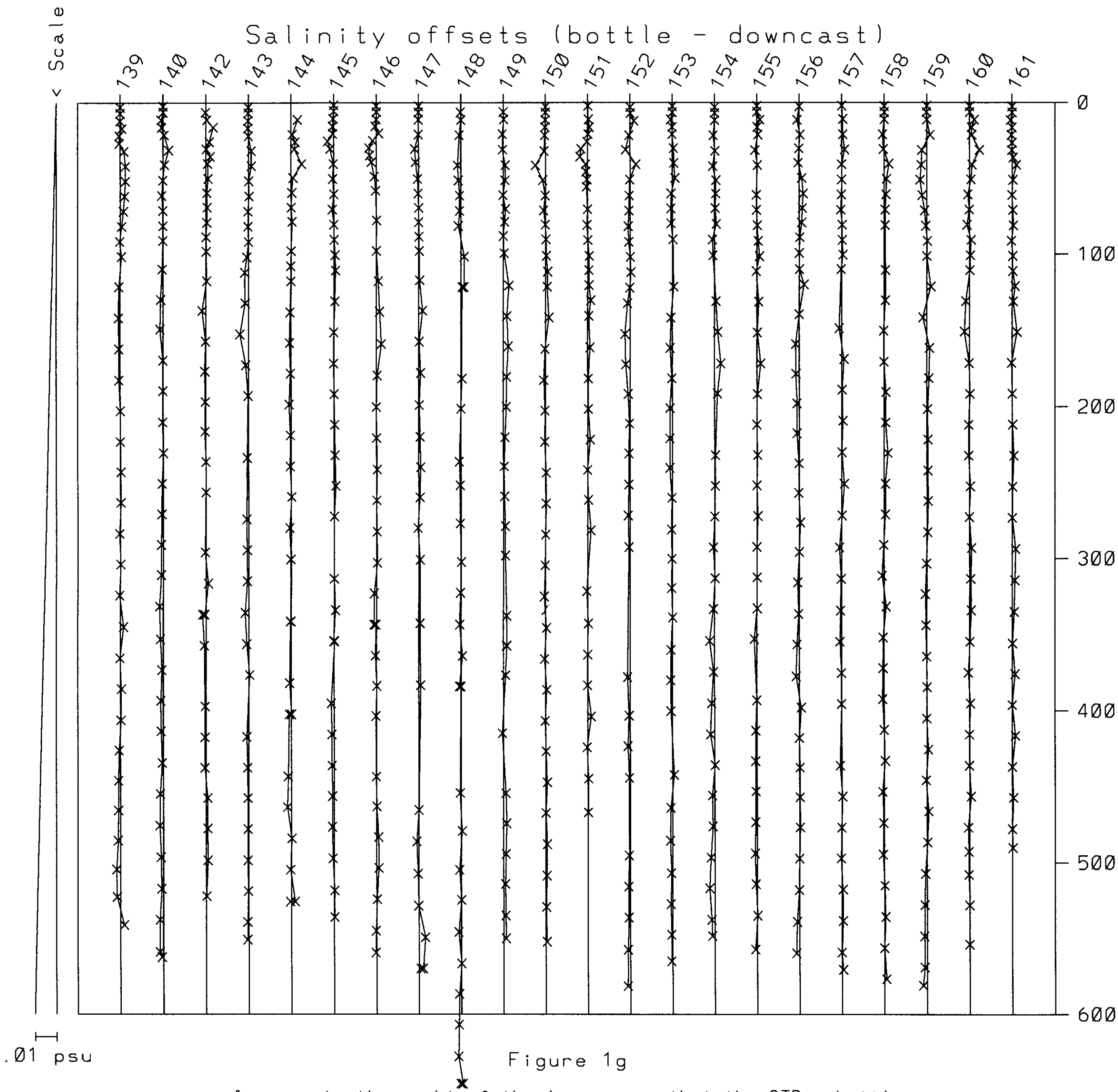

Figure 1g

A cross to the right of the line means that the CTD < bottle

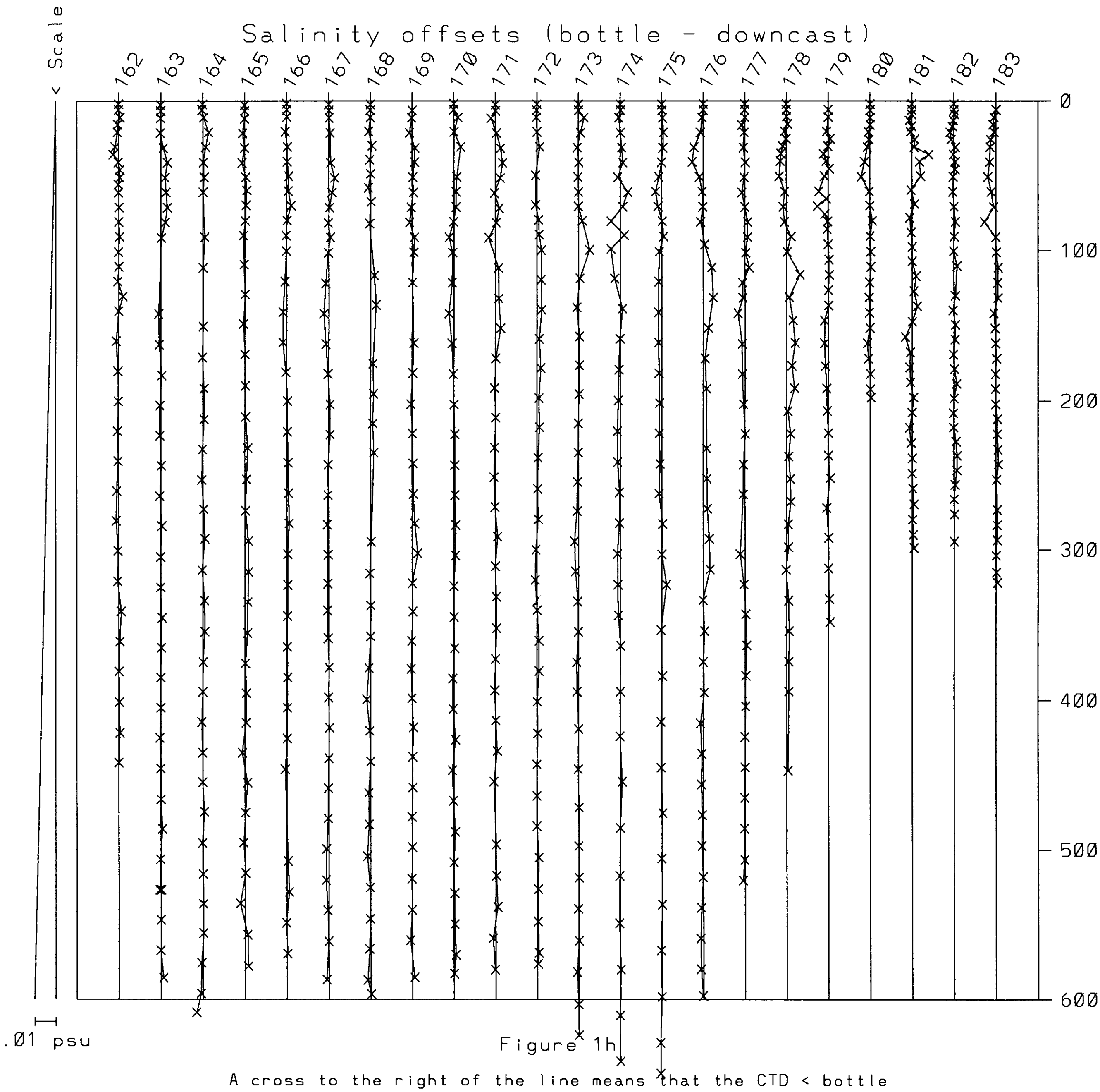

Figure 1h

A cross to the right of the line means that the CTD < bottle

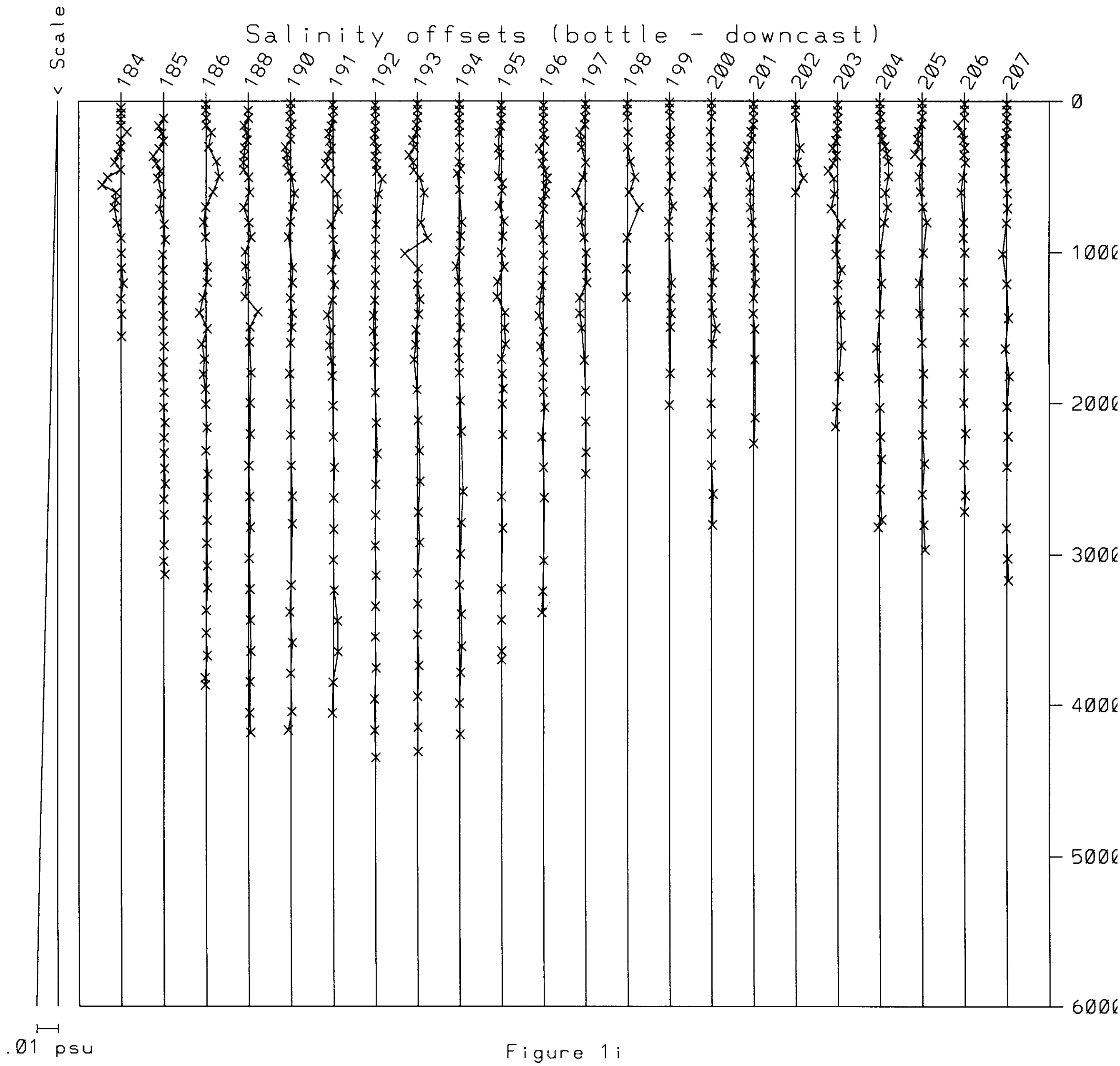

Figure 1i

A cross to the right of the line means that the CTD < bottle

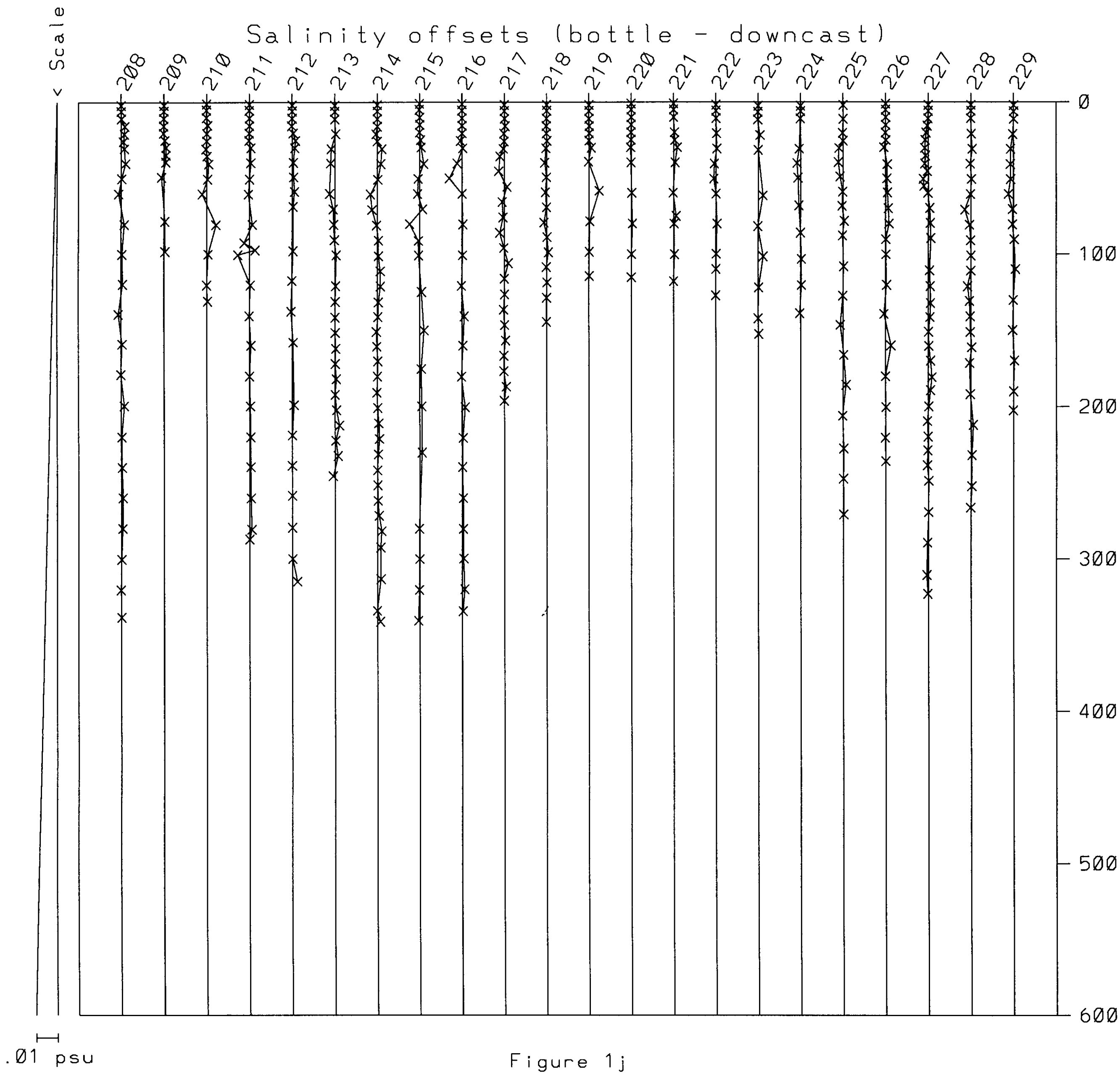

Figure 1j

A cross to the right of the line means that the CTD < bottle

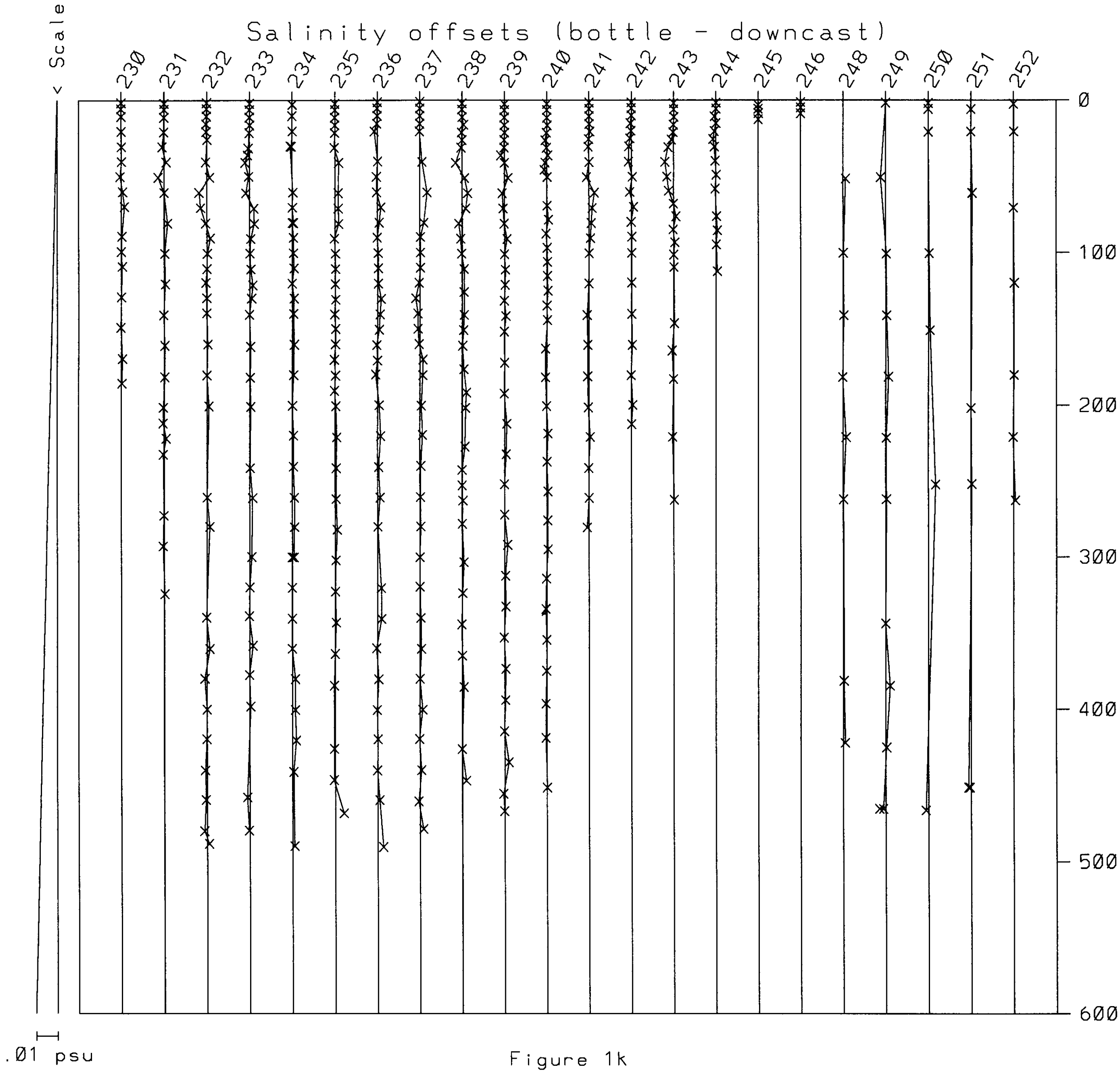

Figure 1k

A cross to the right of the line means that the CTD < bottle

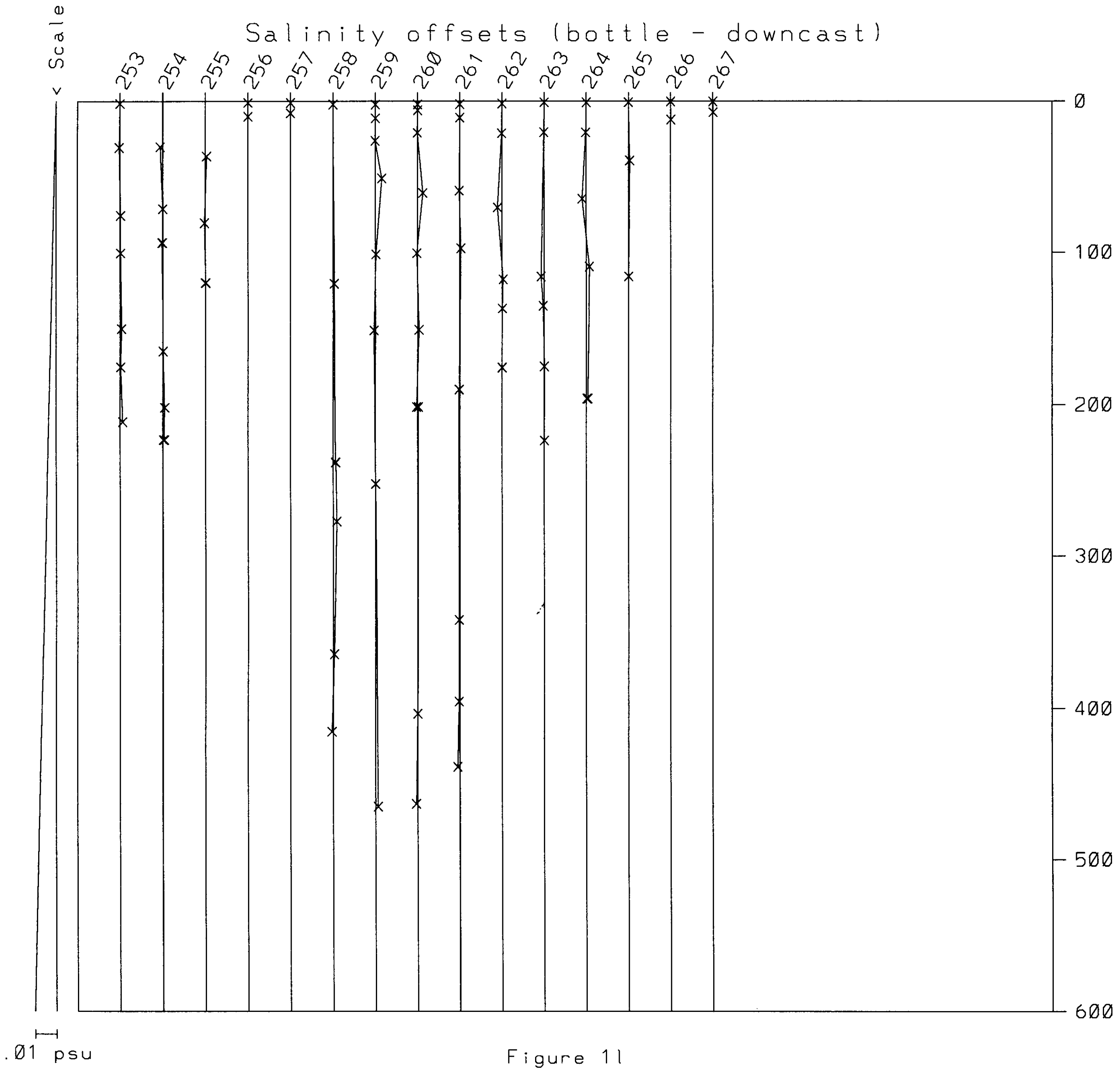

Figure 11

A cross to the right of the line means that the CTD < bottle

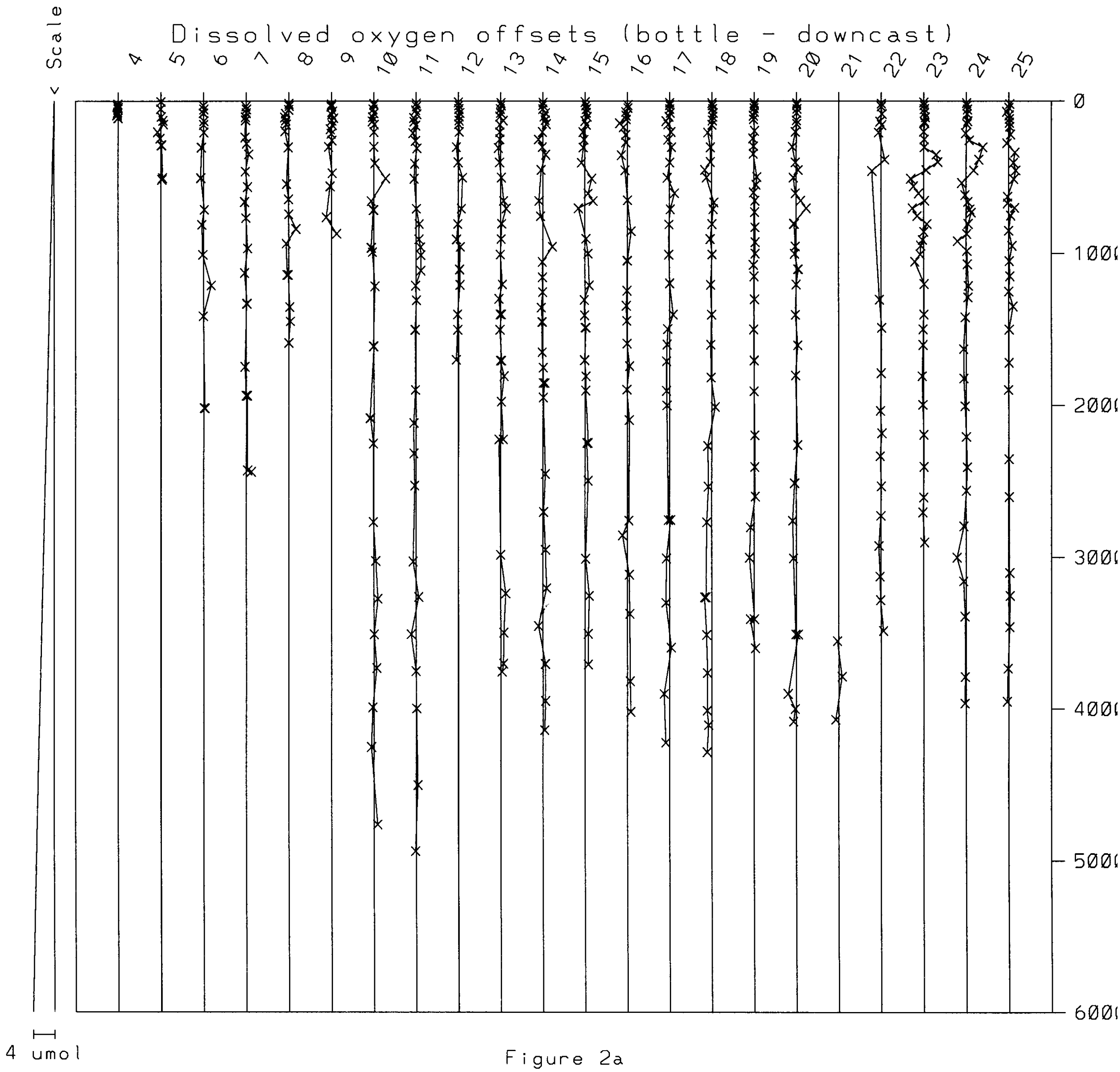

Figure 2a

A cross to the right of the line means that the CTD < bottle

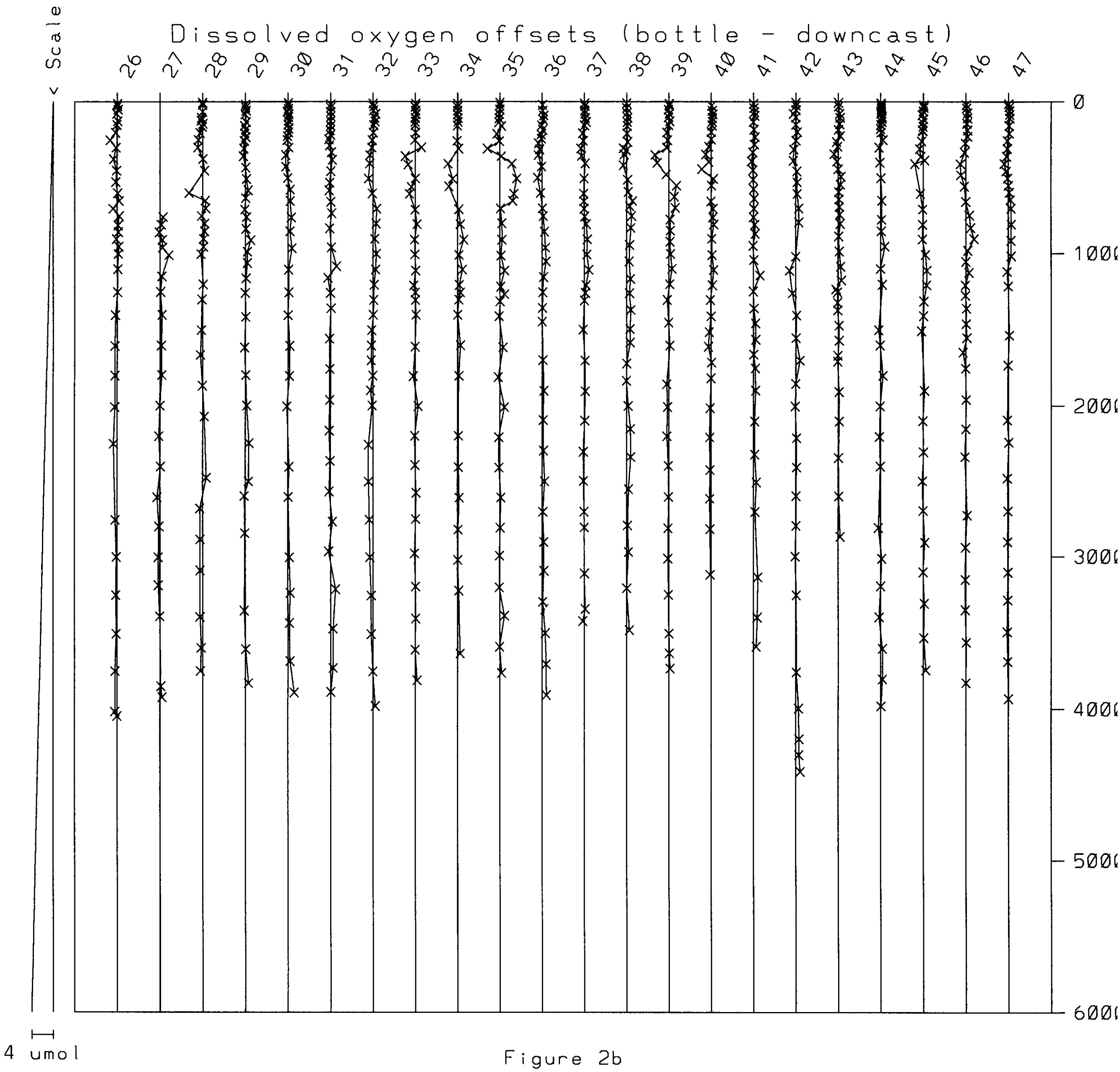

Figure 2b

A cross to the right of the line means that the CTD < bottle

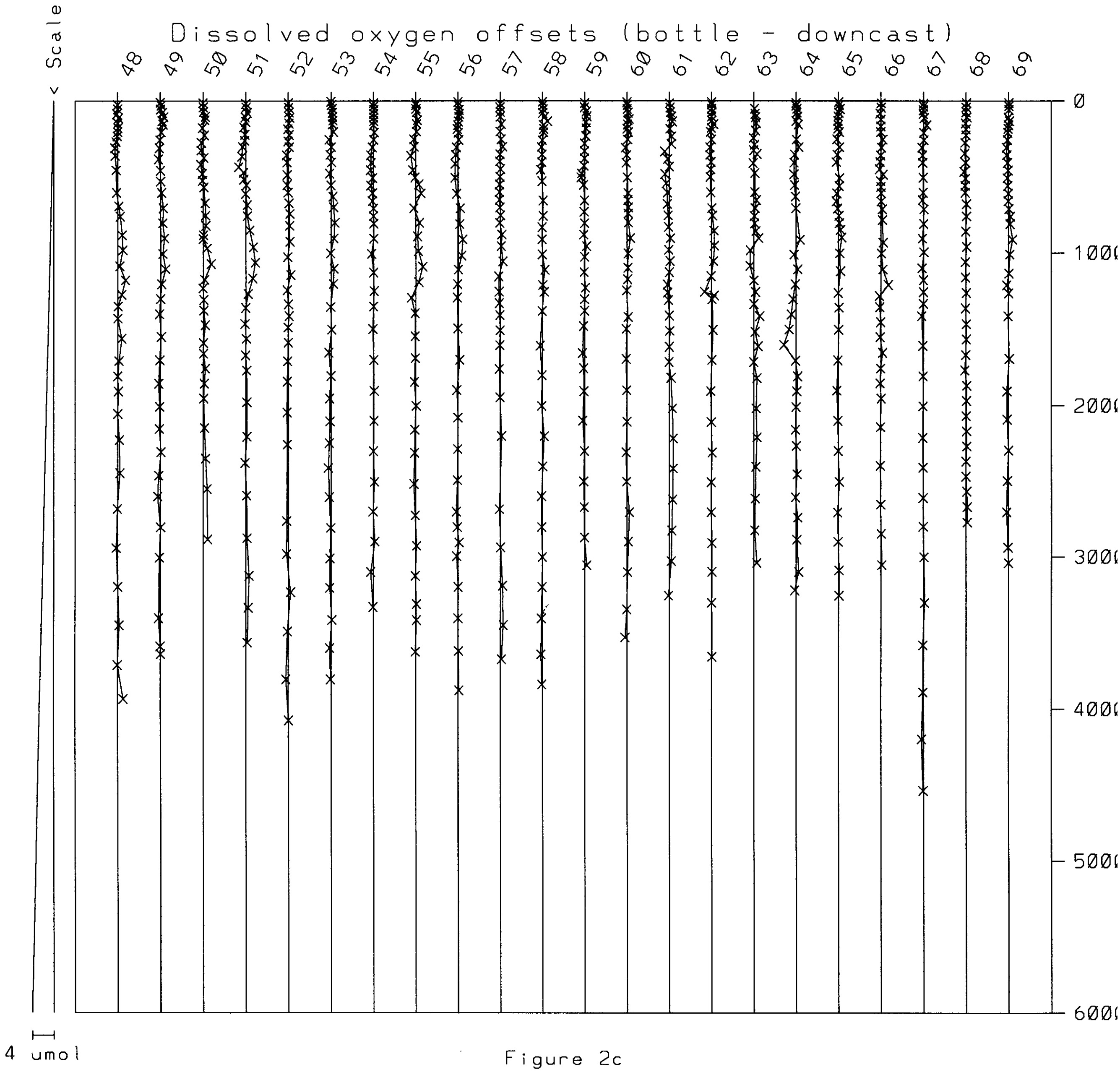

Figure 2c

A cross to the right of the line means that the CTD < bottle

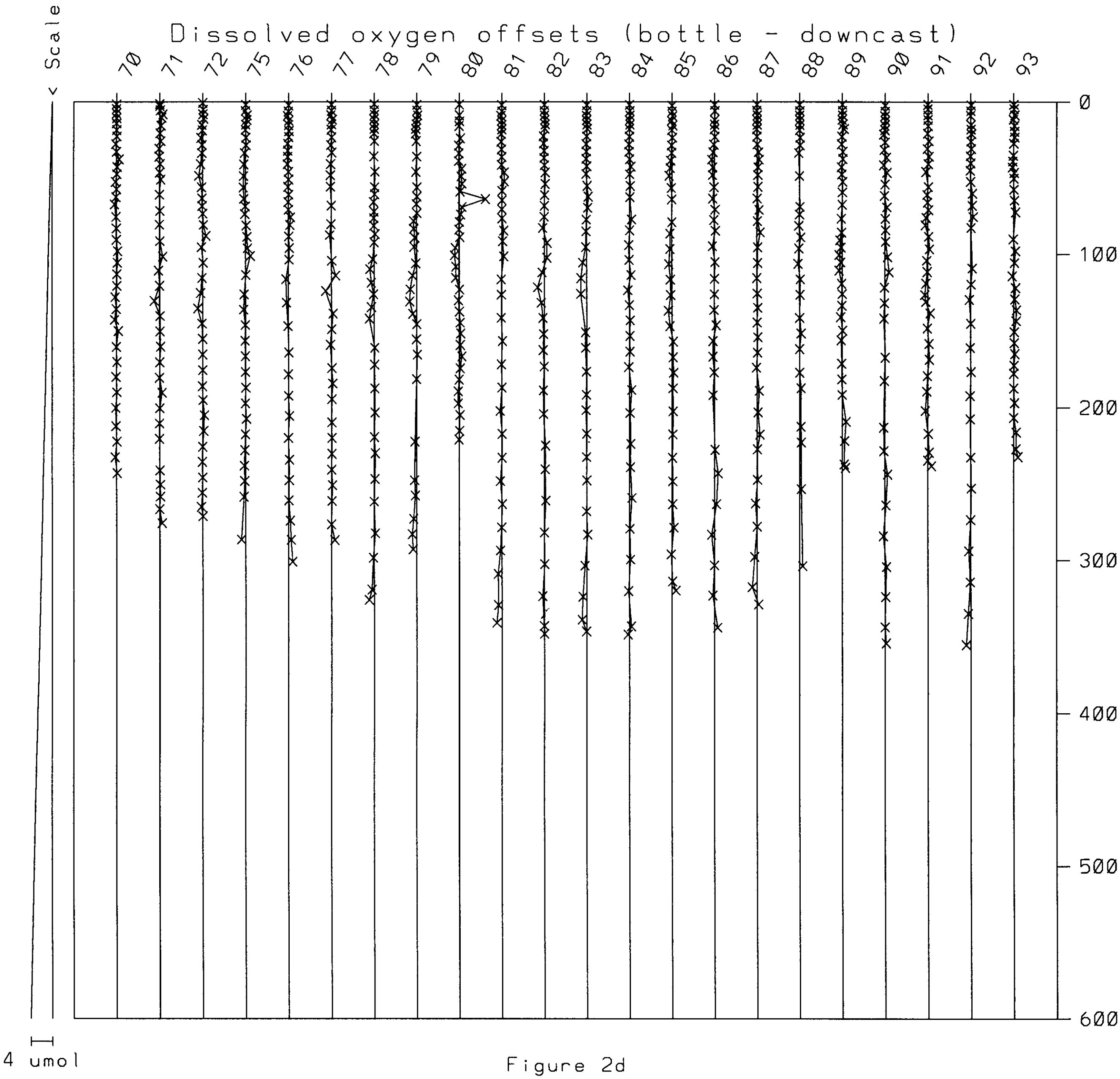

Figure 2d

A cross to the right of the line means that the CTD < bottle

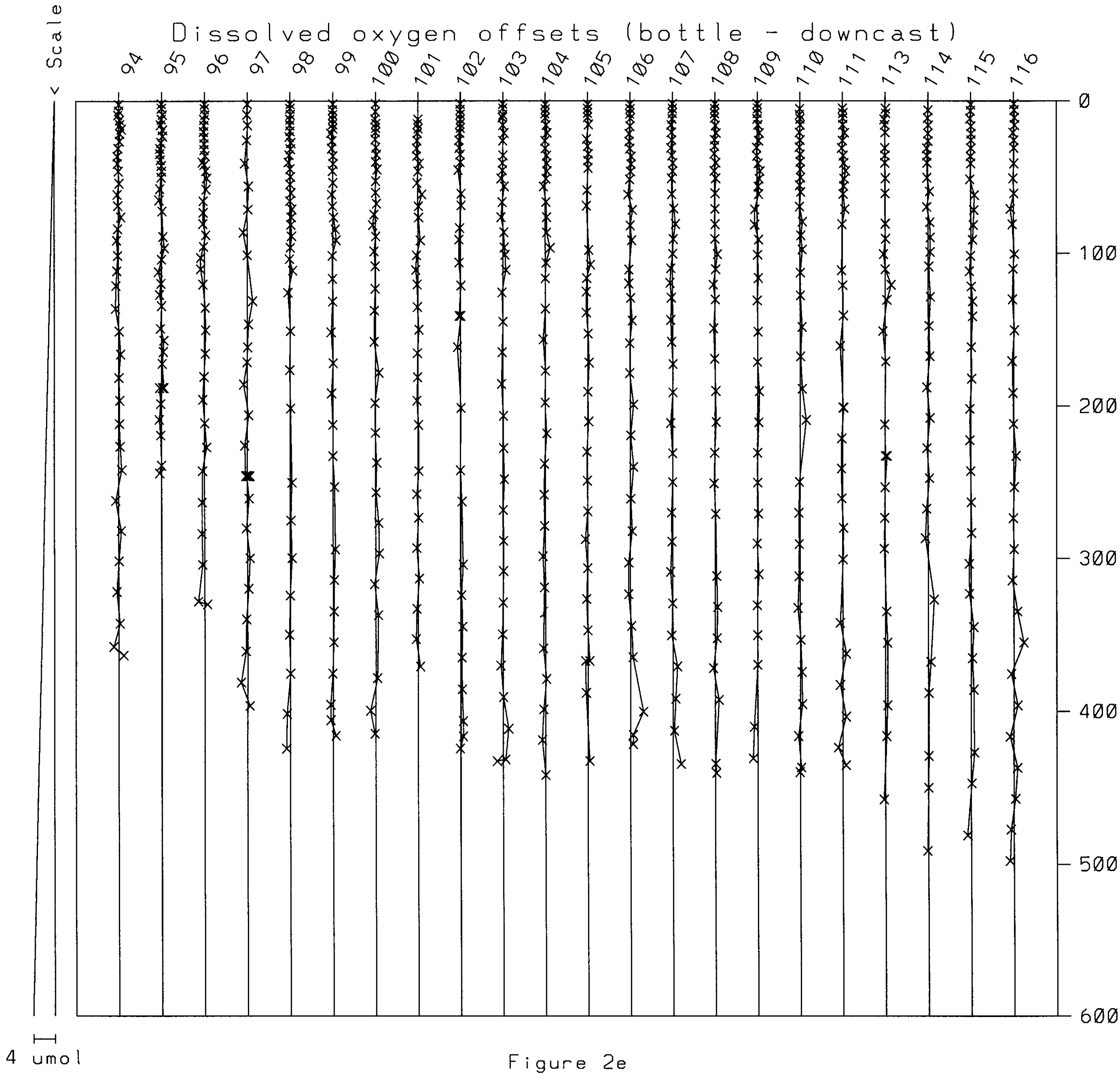

Figure 2e

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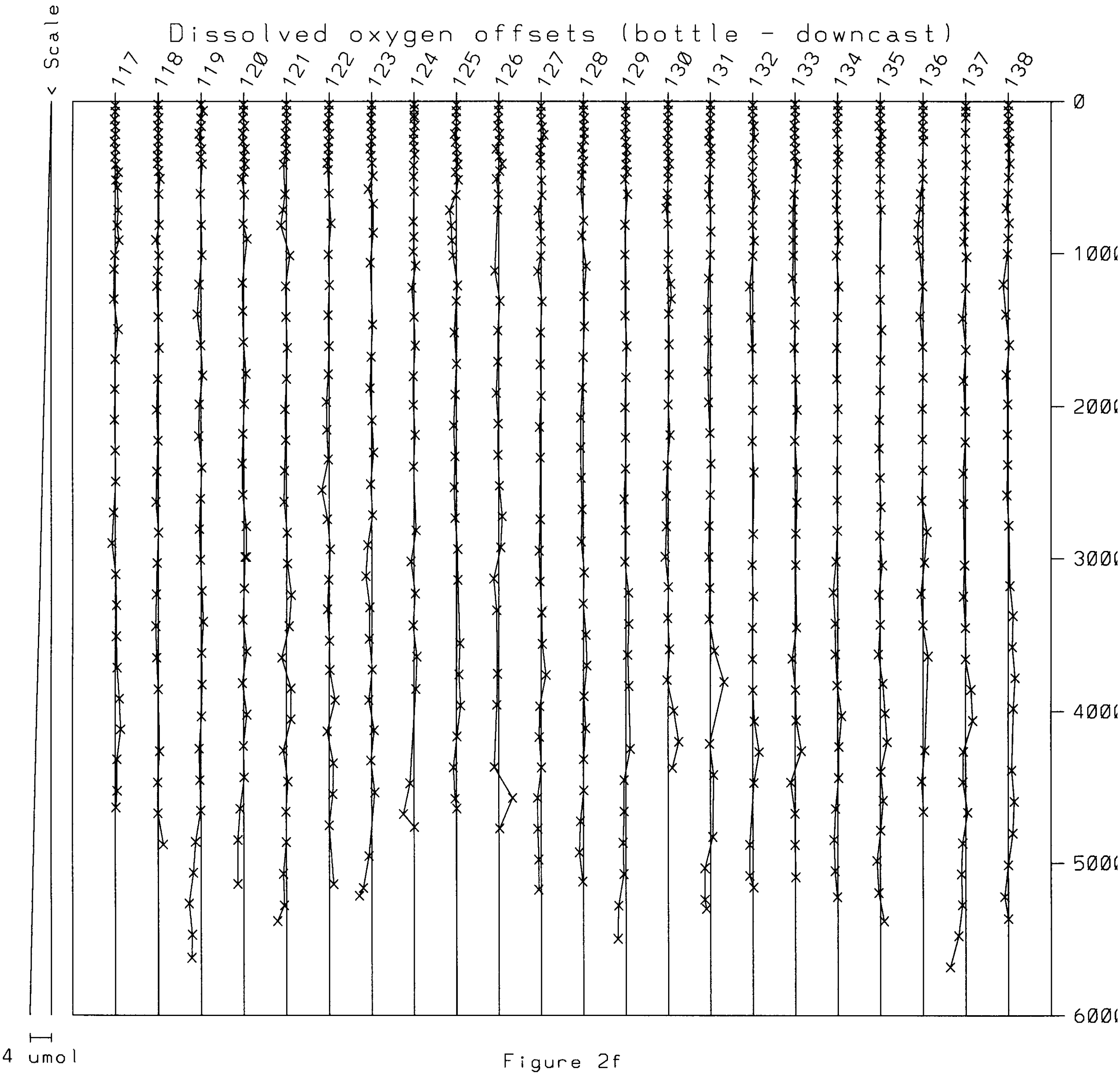

Figure 2f

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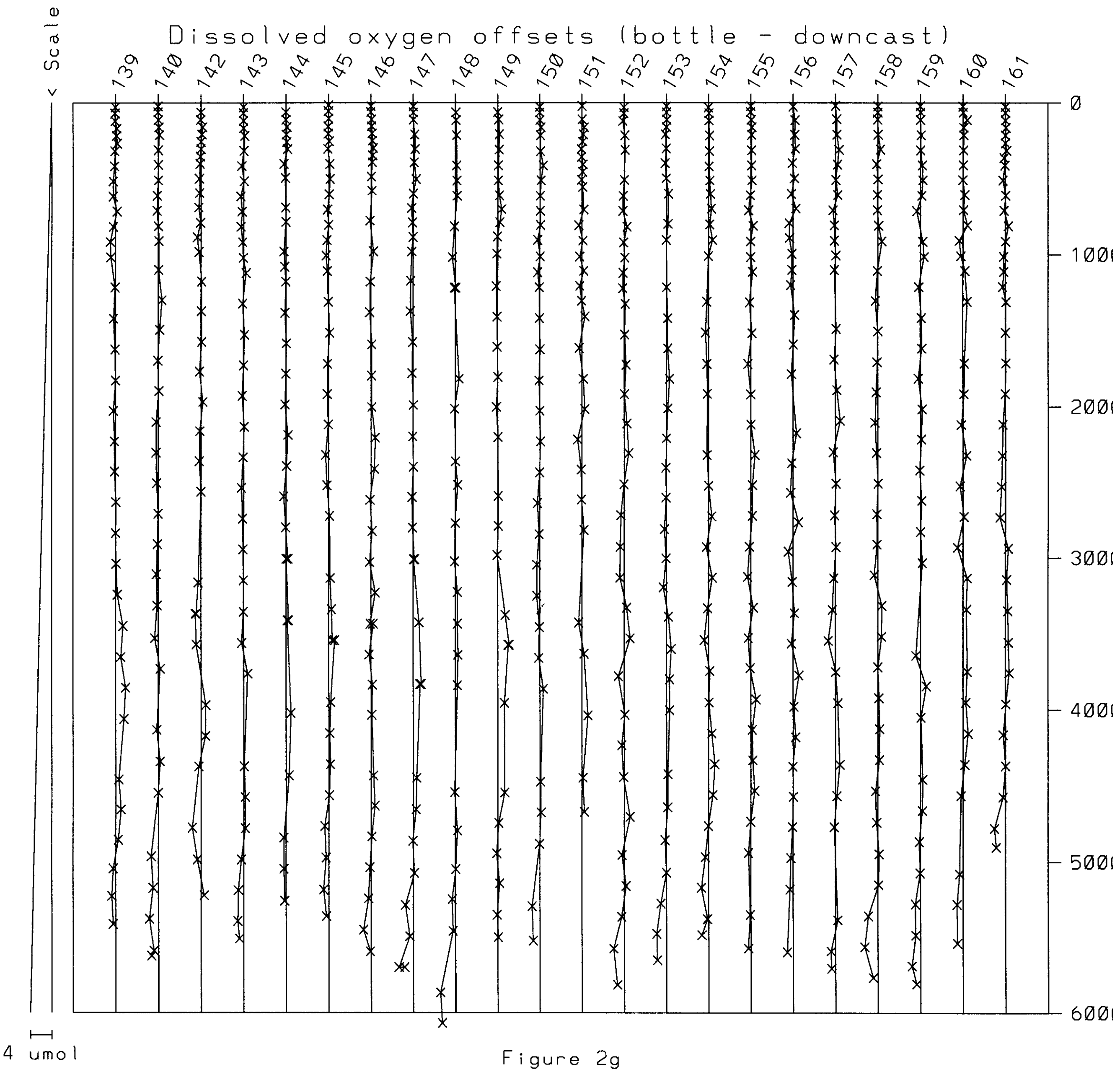

Figure 2g

A cross to the right of the line means that the CTD < bottle

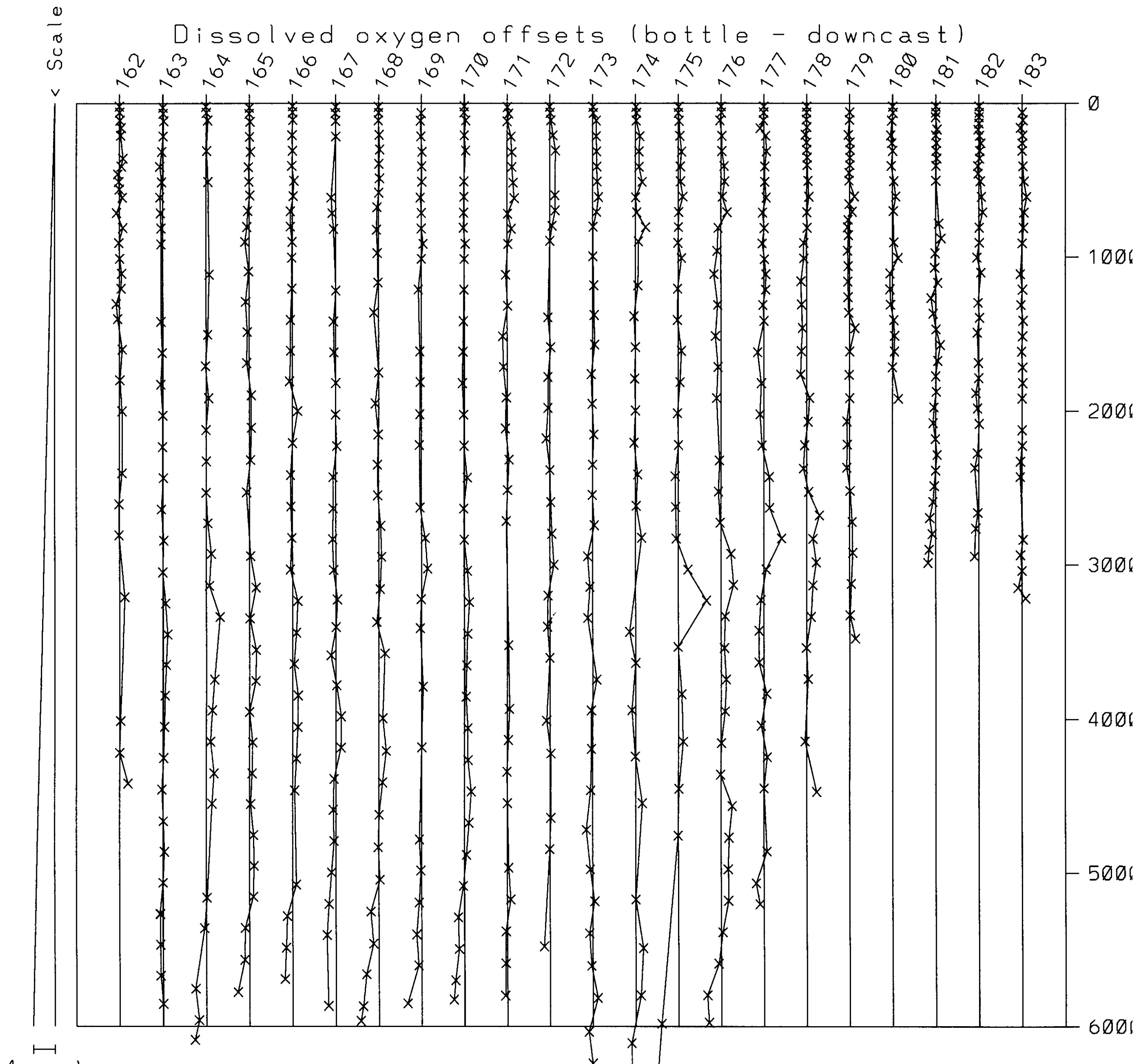

Figure 2h

A cross to the right of the line means that the CTD < bottle

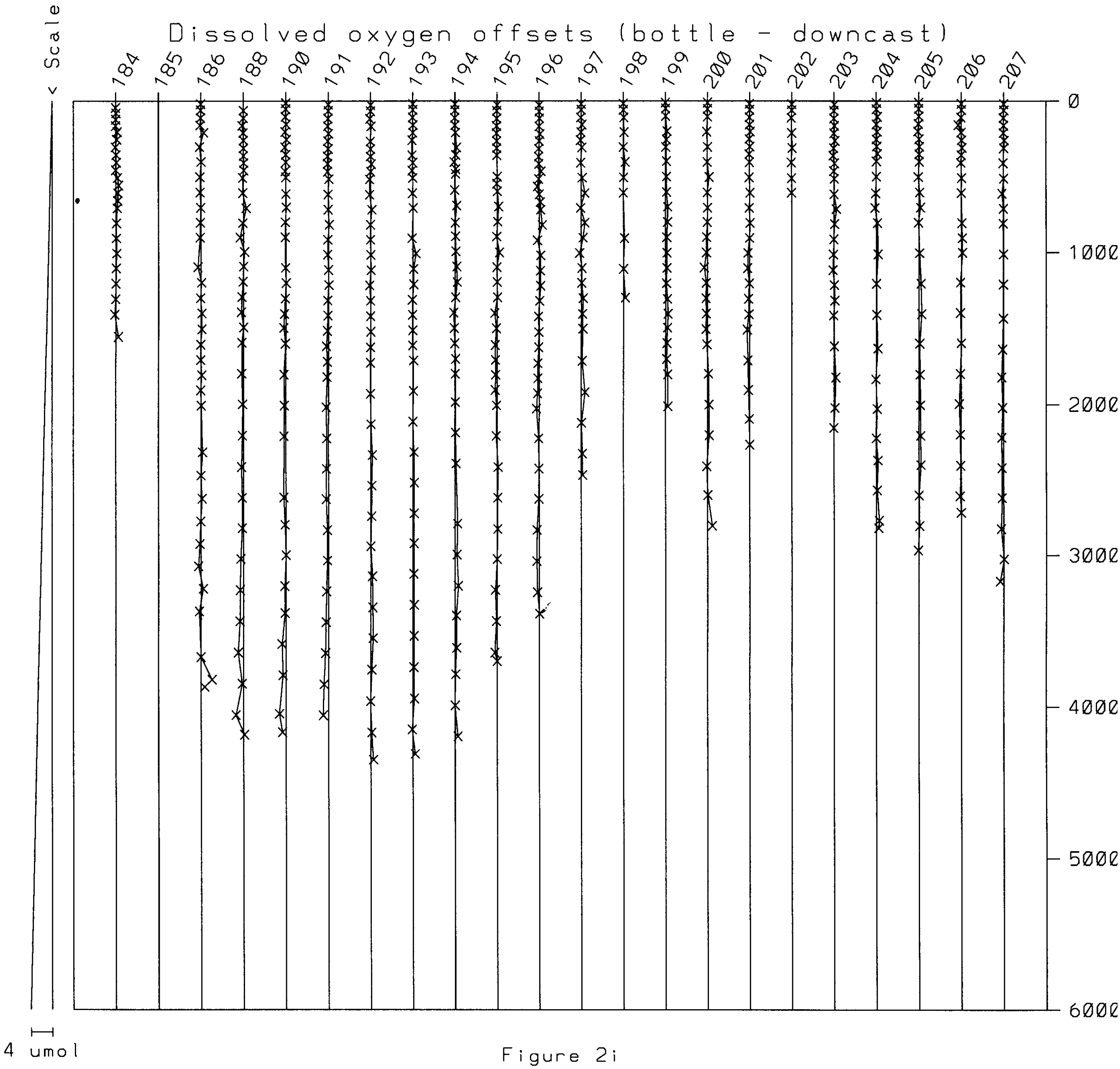

Figure 2i

A cross to the right of the line means that the CTD < bottle

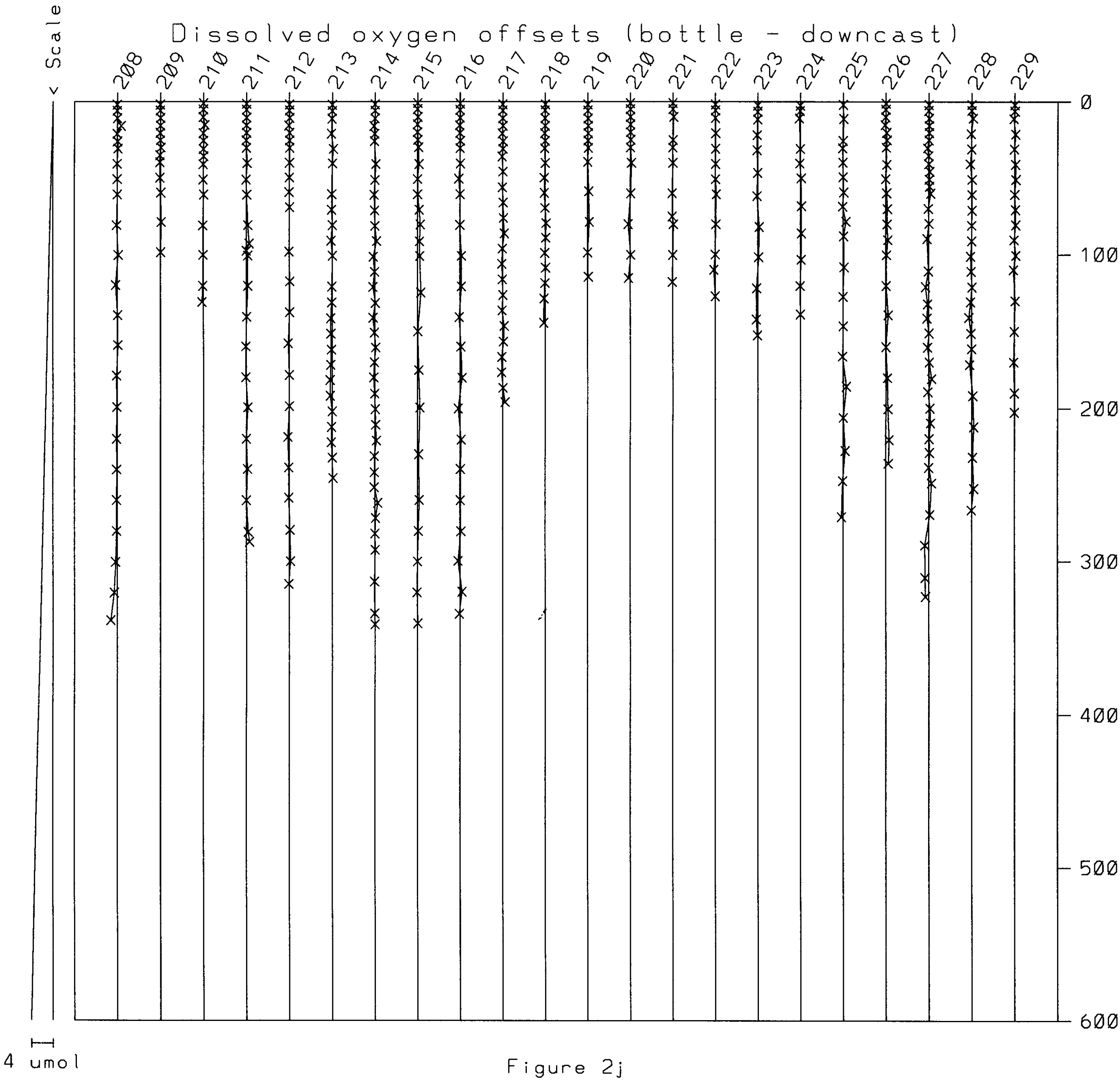

Figure 2j

A cross to the right of the line means that the CTD < bottle

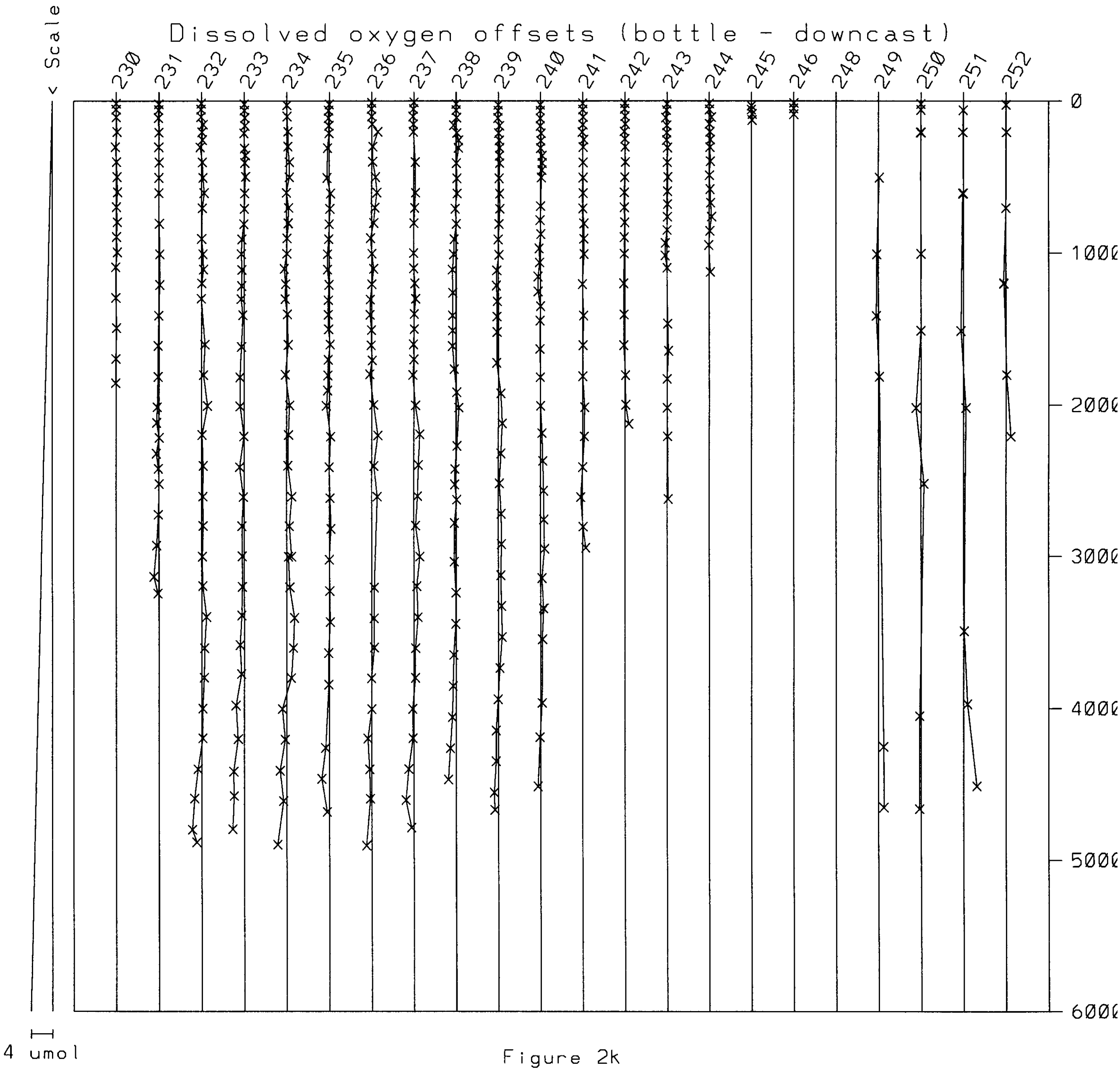

Figure 2k

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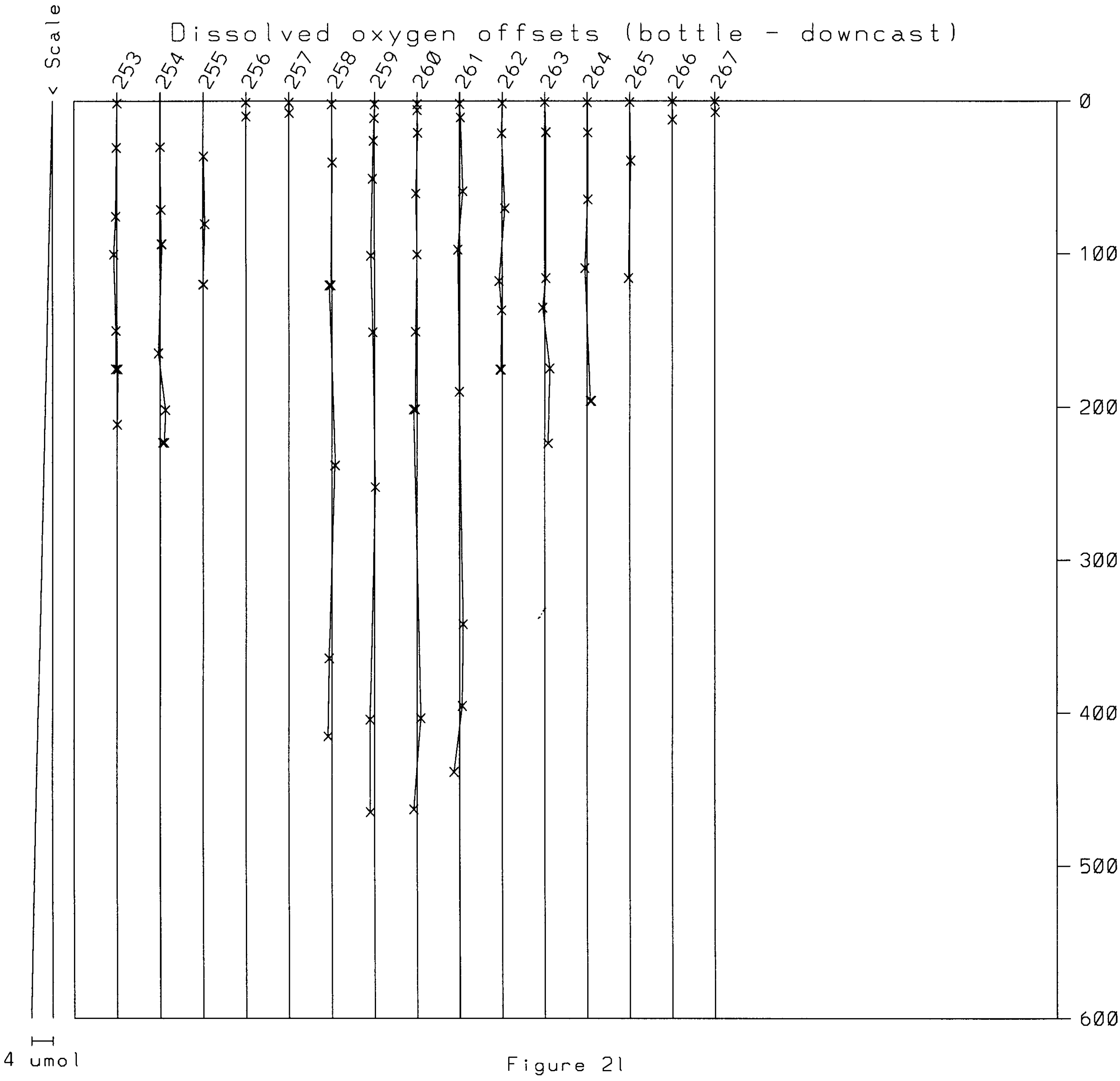

Figure 21

A cross to the right of the line means that the CTD < bottle

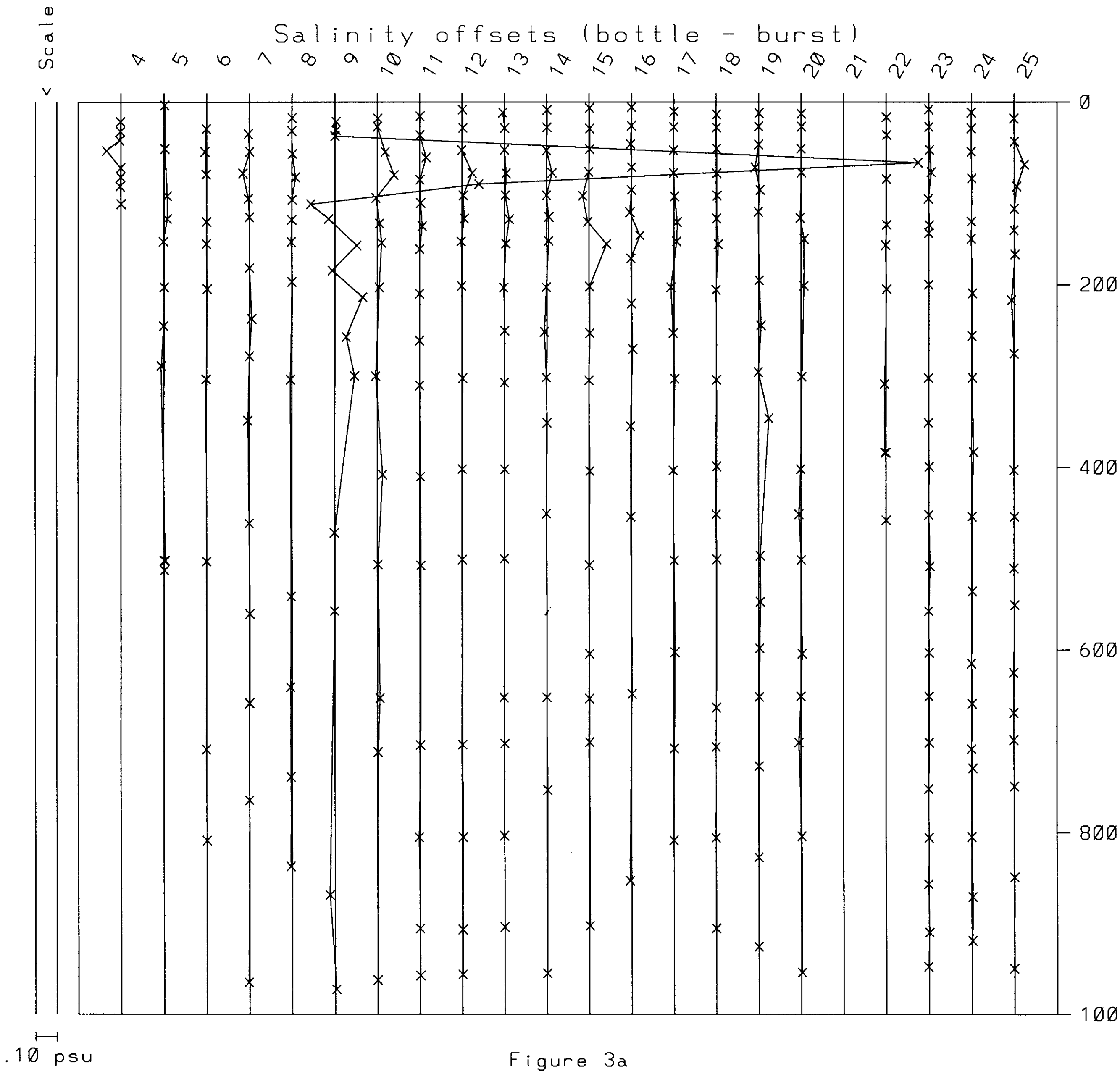

Figure 3a

A cross to the right of the line means that the CTD < bottle

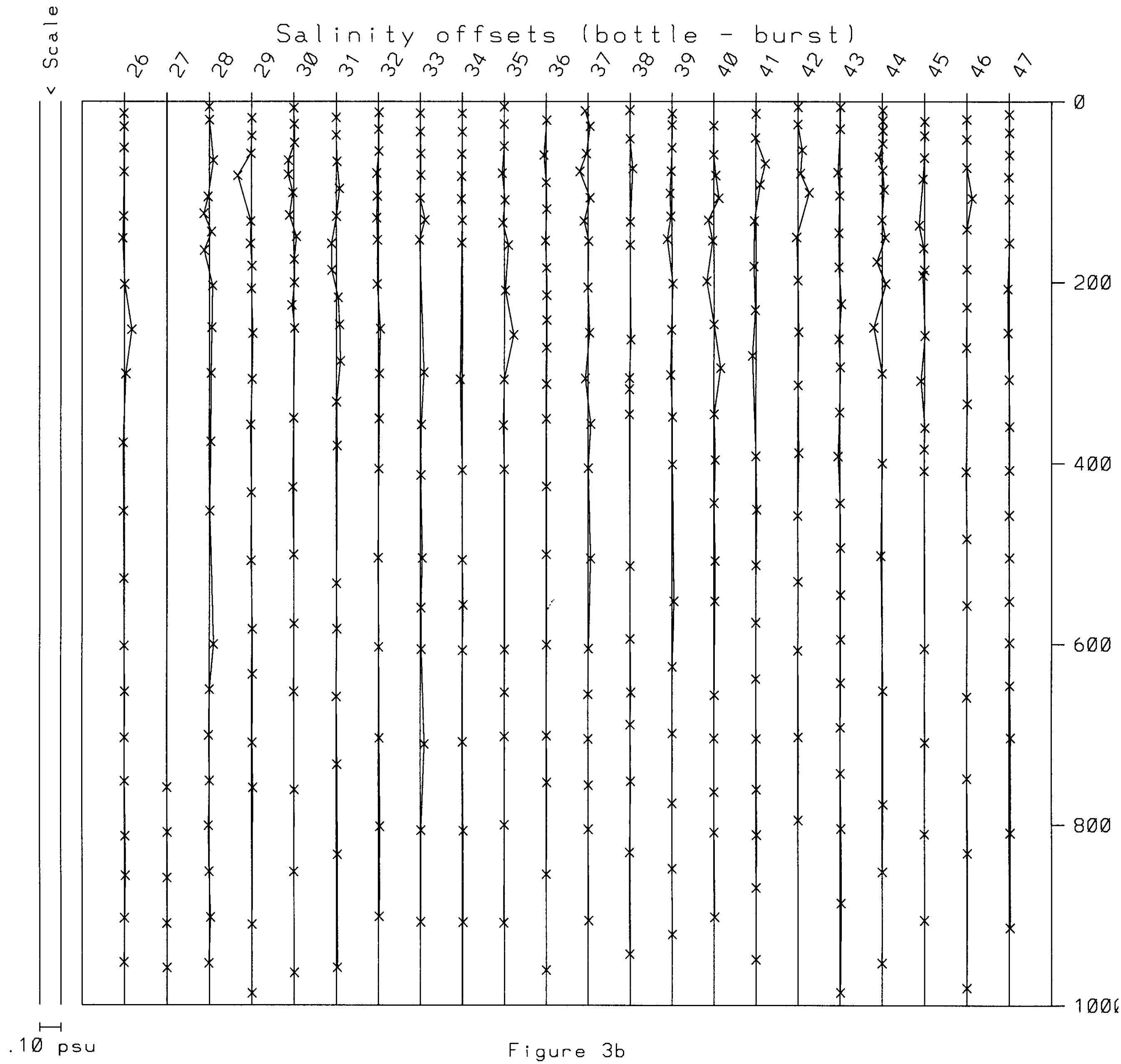

Figure 3b

A cross to the right of the line means that the CTD < bottle

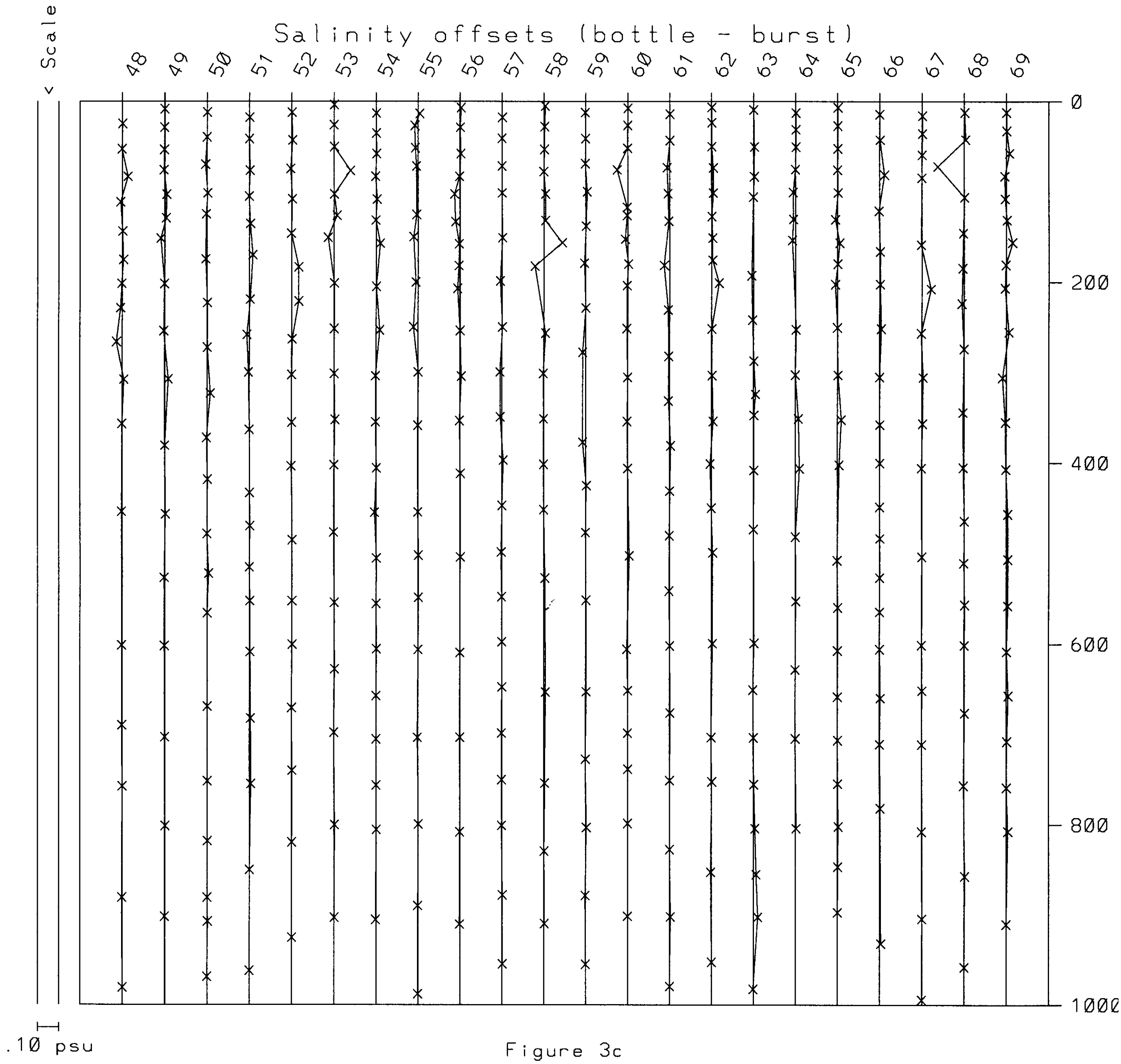

Figure 3c

A cross to the right of the line means that the CTD < bottle

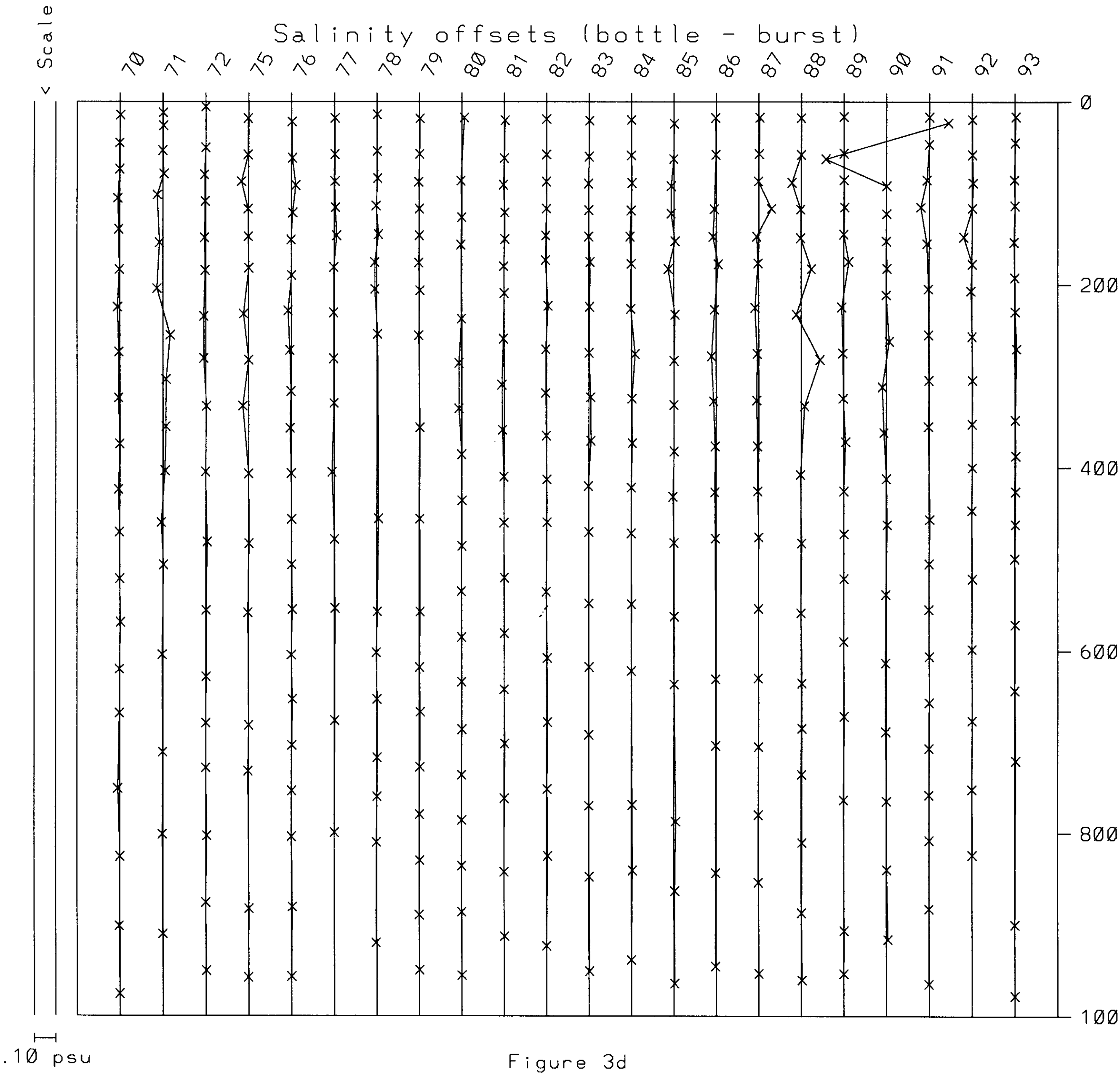

Figure 3d

A cross to the right of the line means that the CTD < bottle

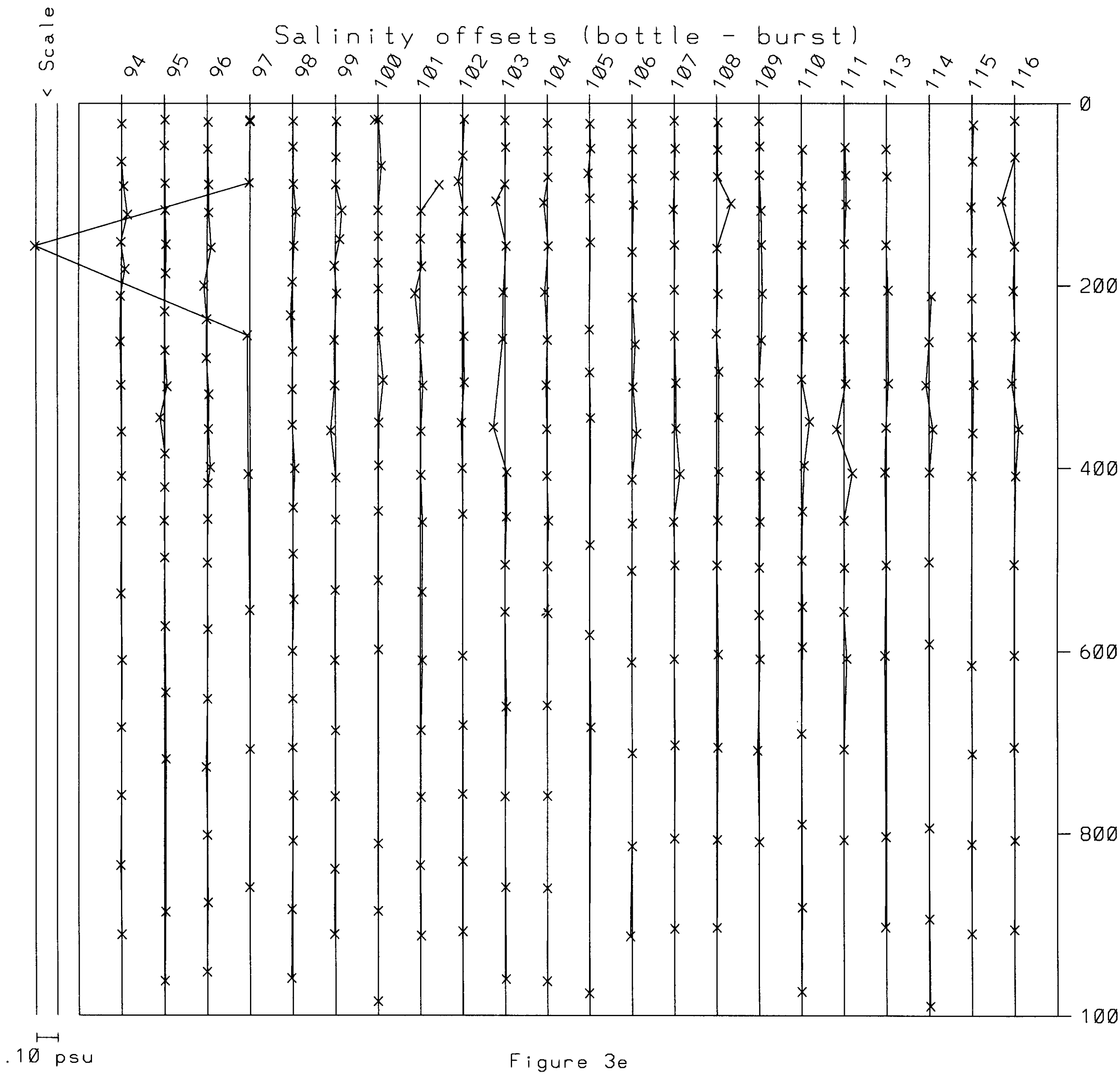

Figure 3e

A cross to the right of the line means that the CTD < bottle

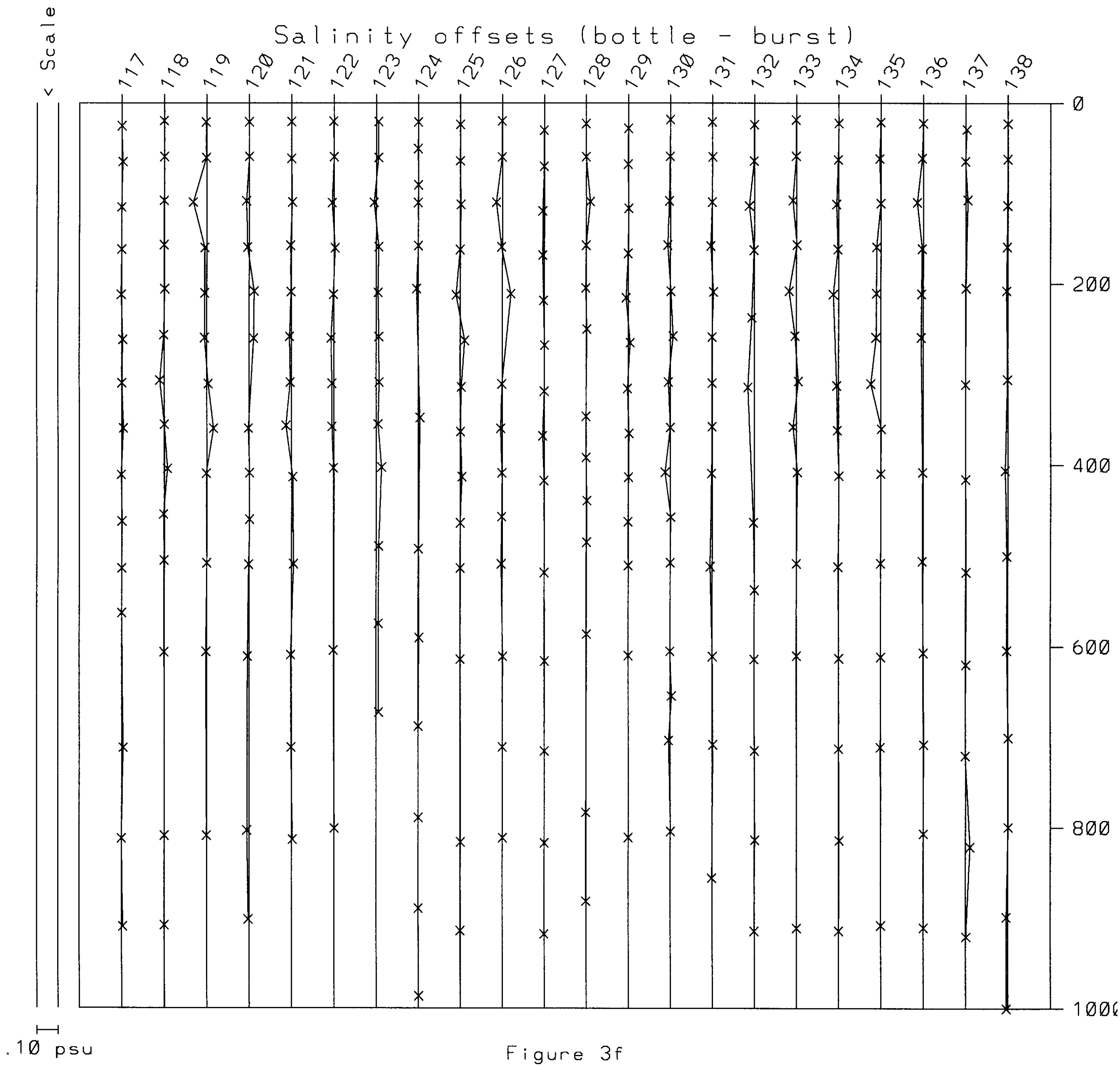

Figure 3f

A cross to the right of the line means that the CTD < bottle

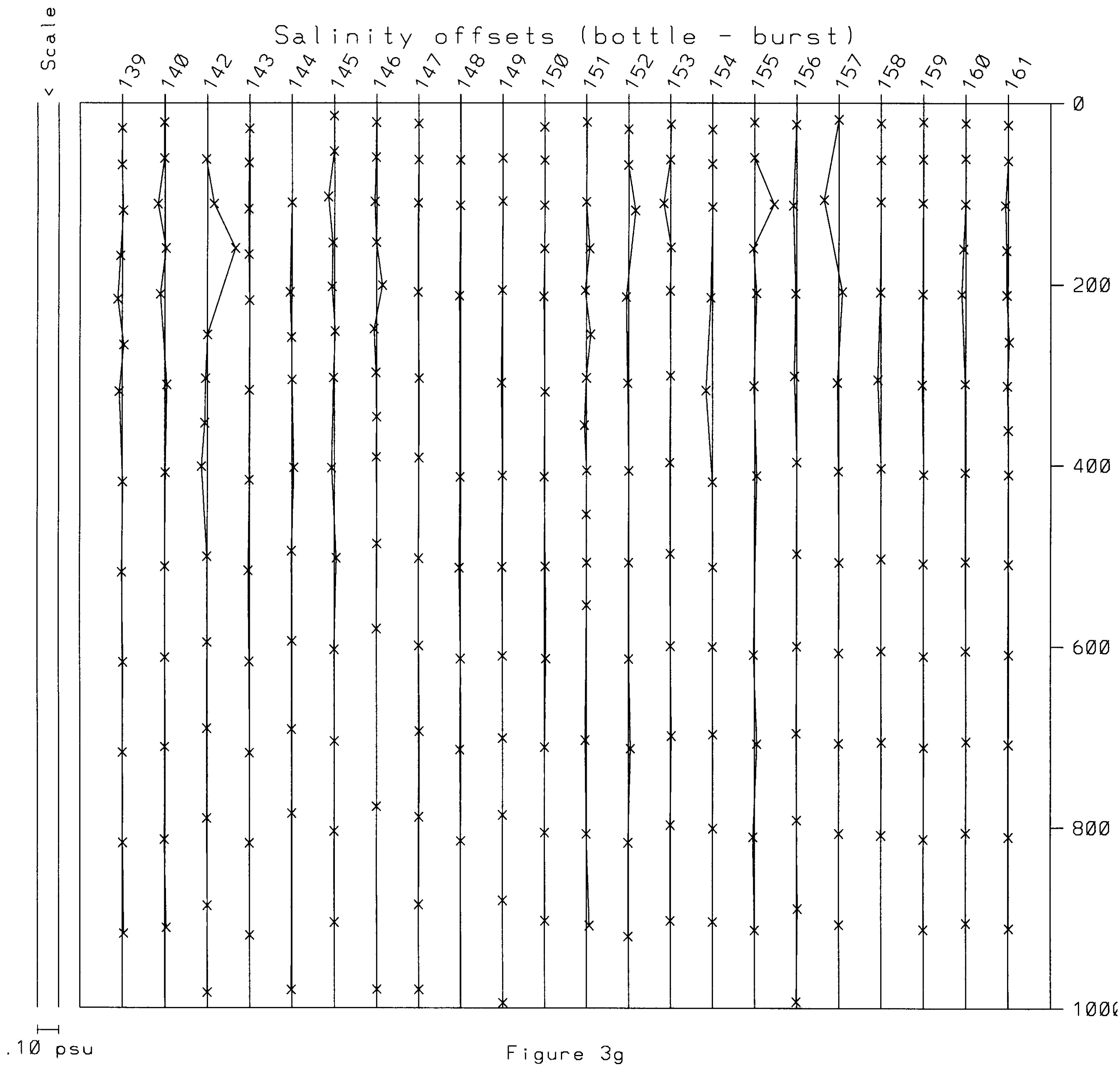

Figure 3g

A cross to the right of the line means that the CTD < bottle

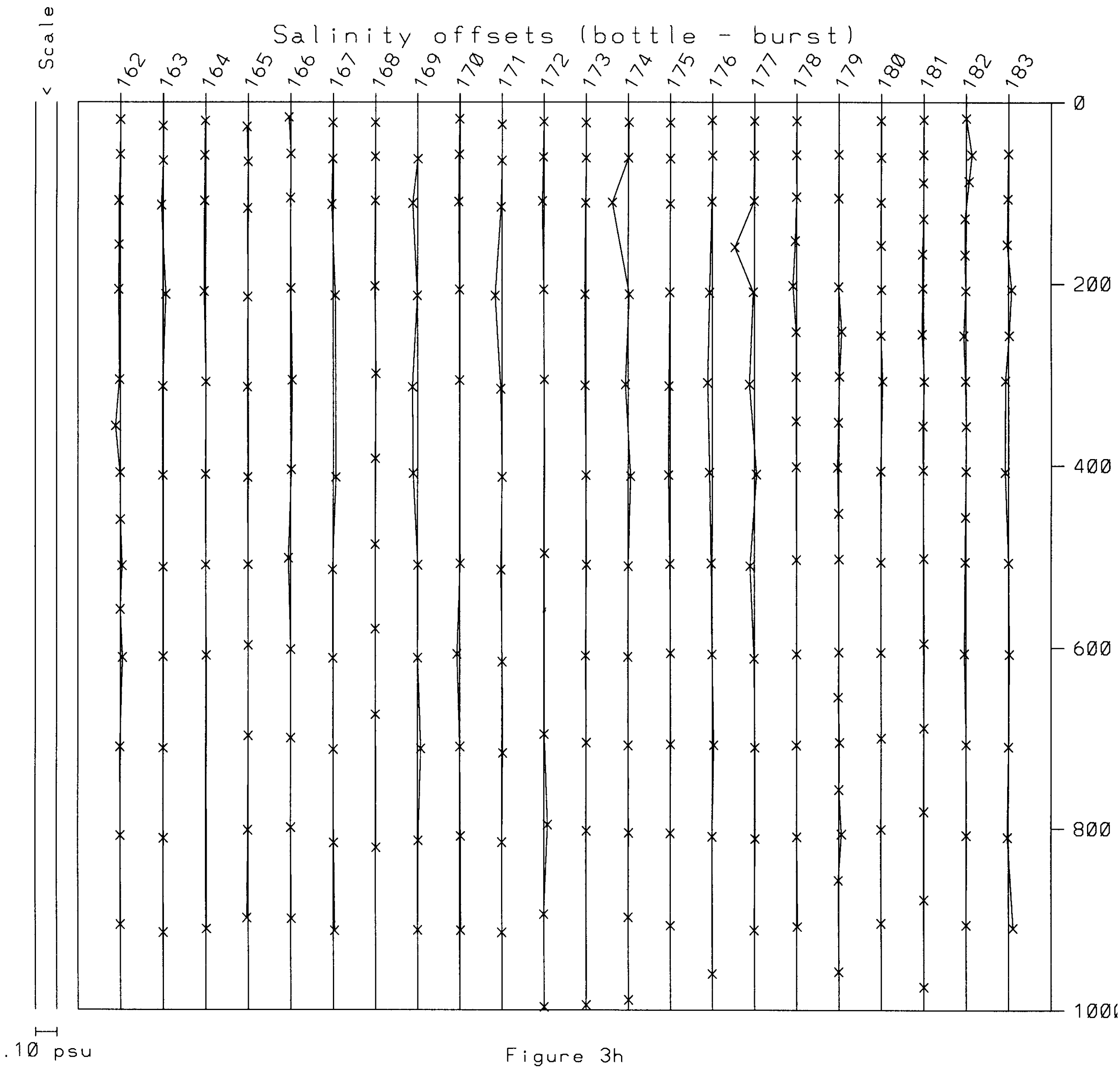

Figure 3h

A cross to the right of the line means that the CTD < bottle

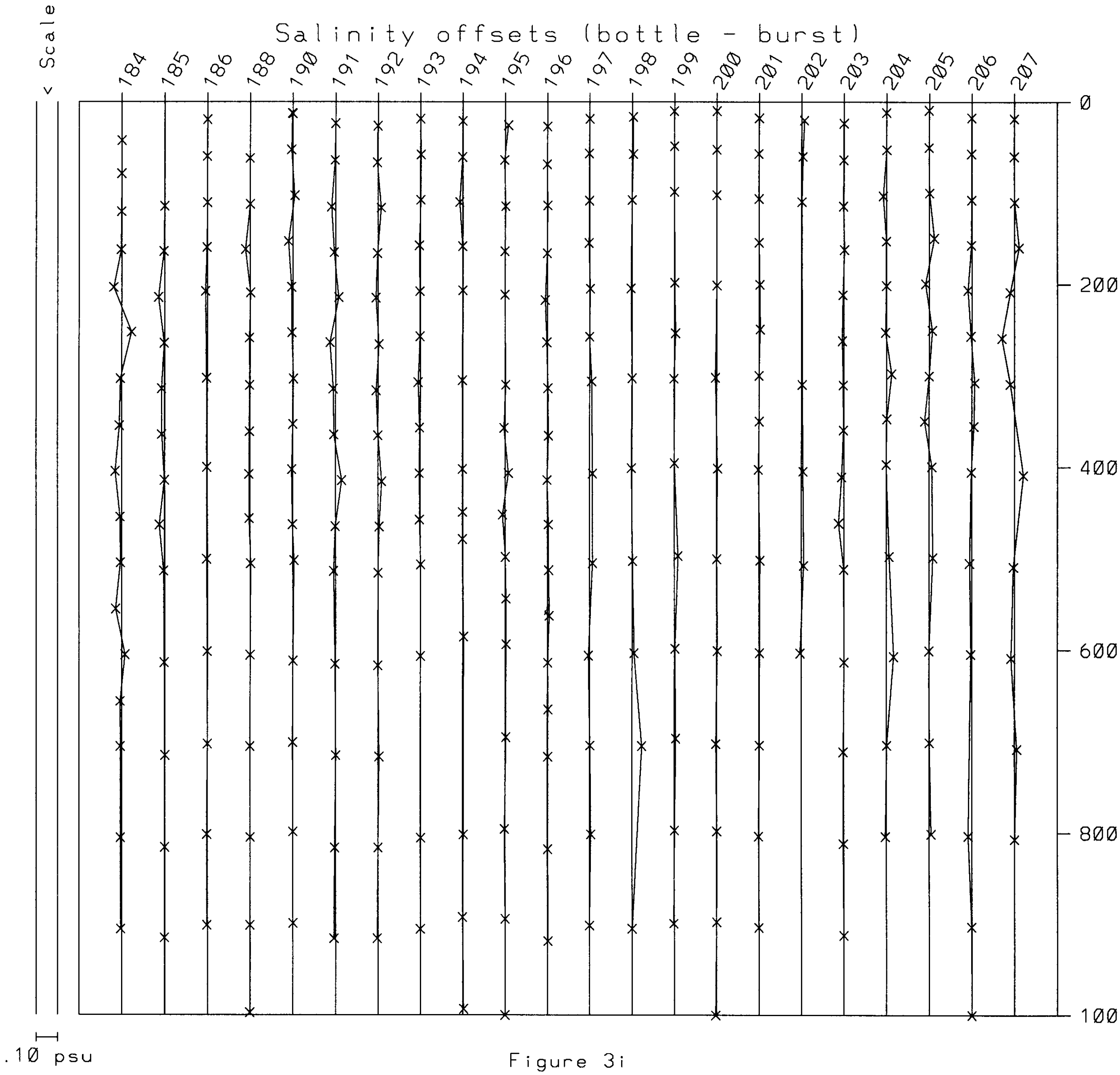

Figure 3i

A cross to the right of the line means that the CTD < bottle

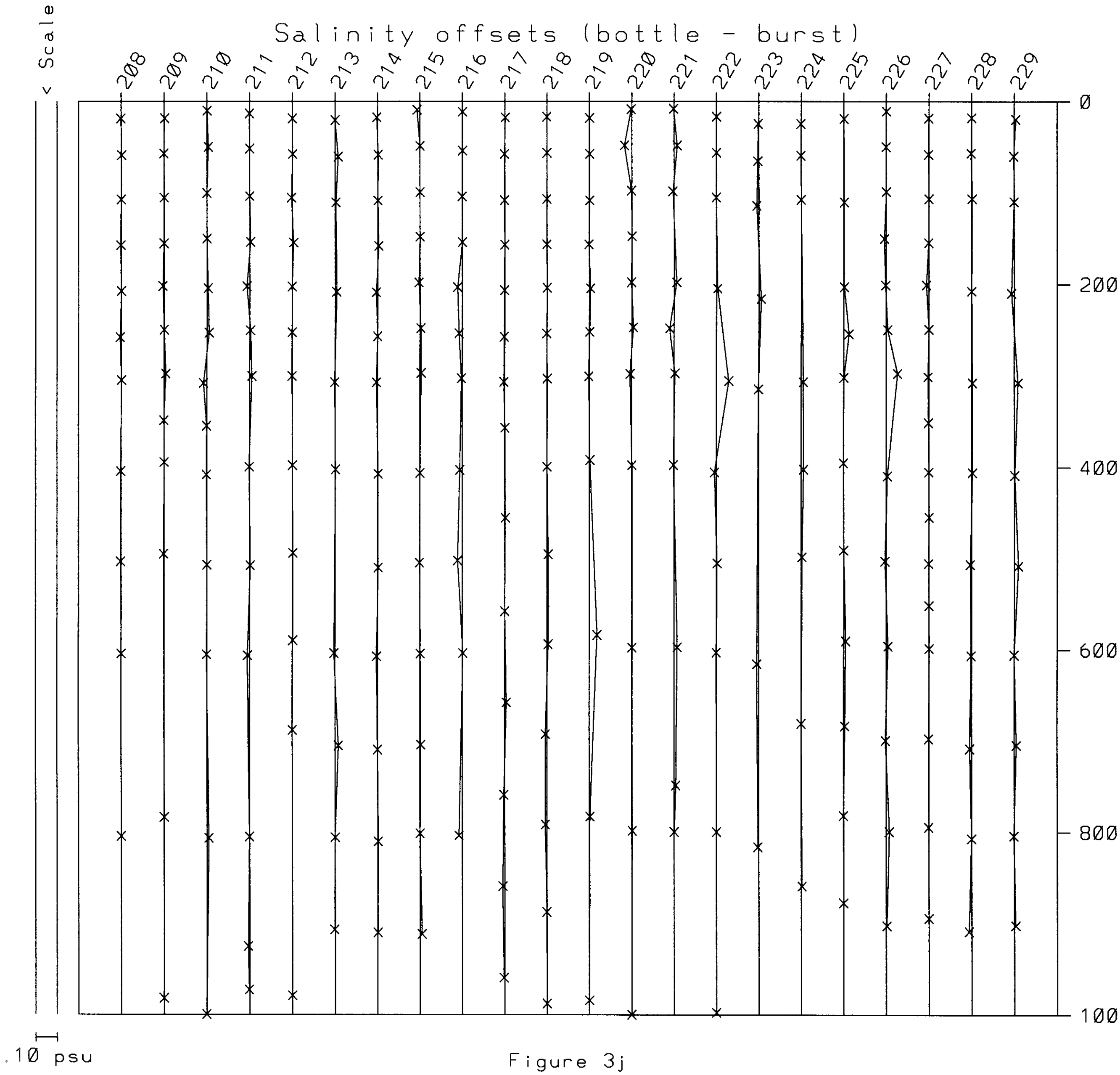

Figure 3j

A cross to the right of the line means that the CTD < bottle

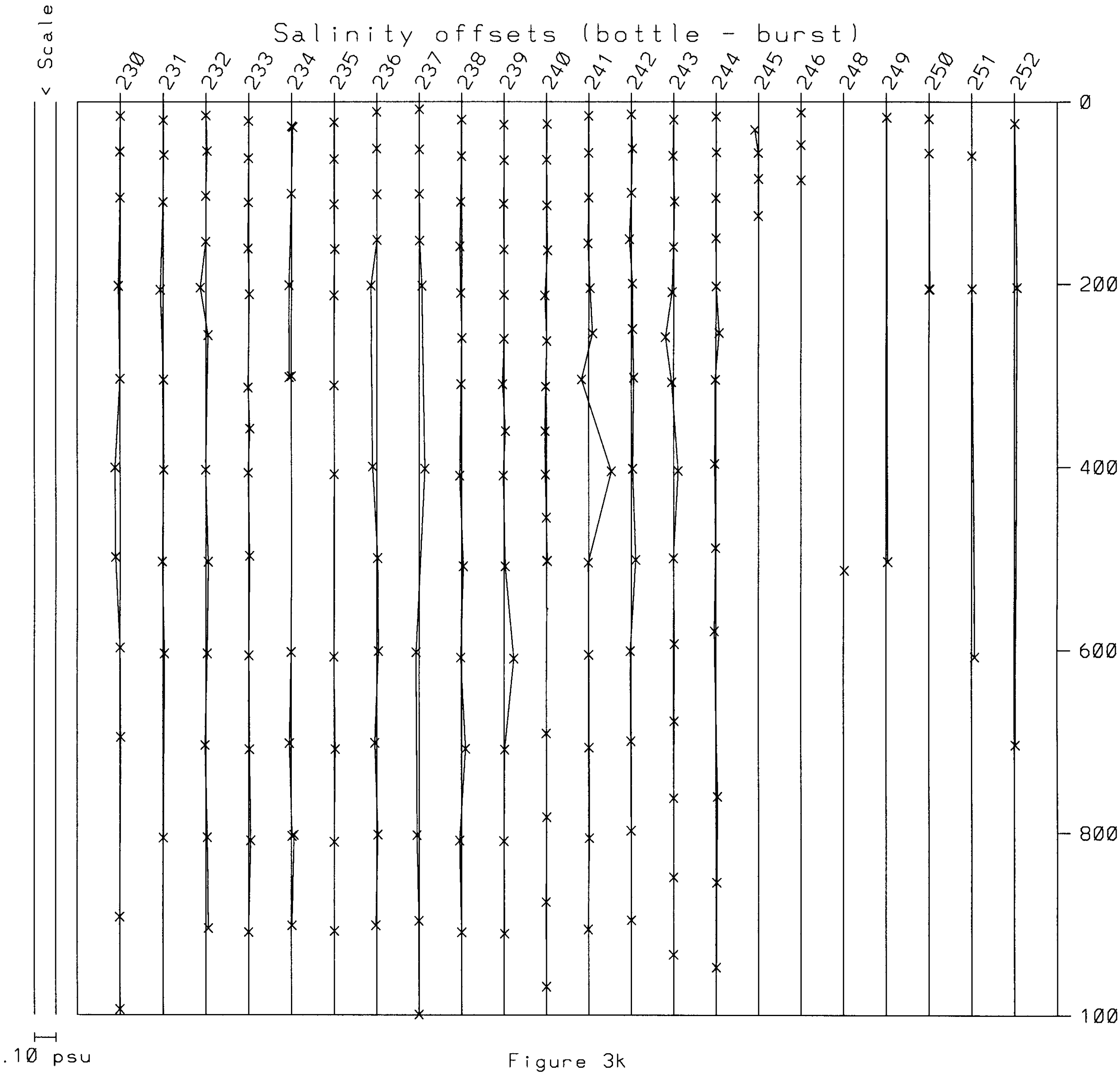

Figure 3k

A cross to the right of the line means that the CTD < bottle

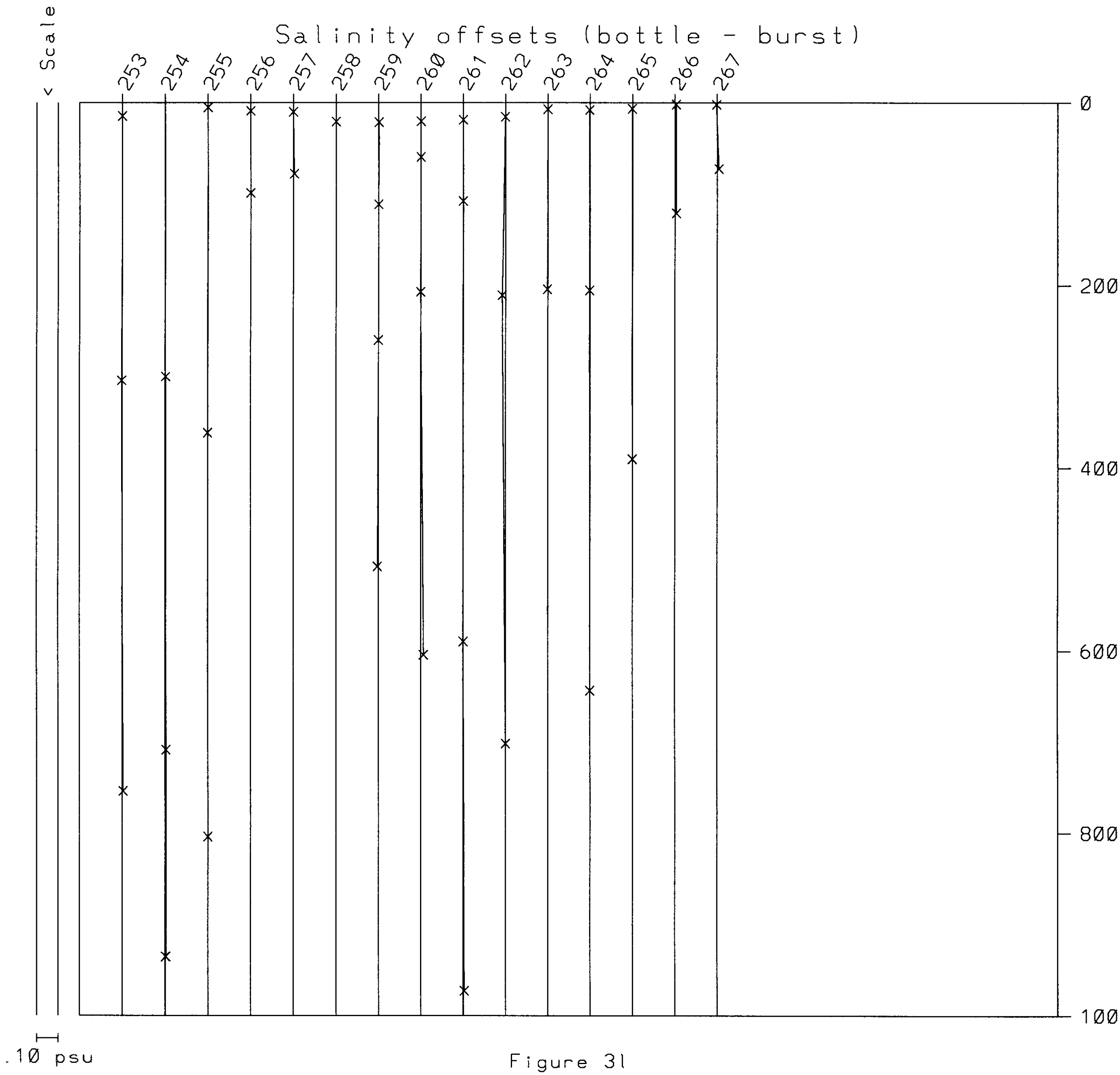

Figure 31

A cross to the right of the line means that the CTD < bottle

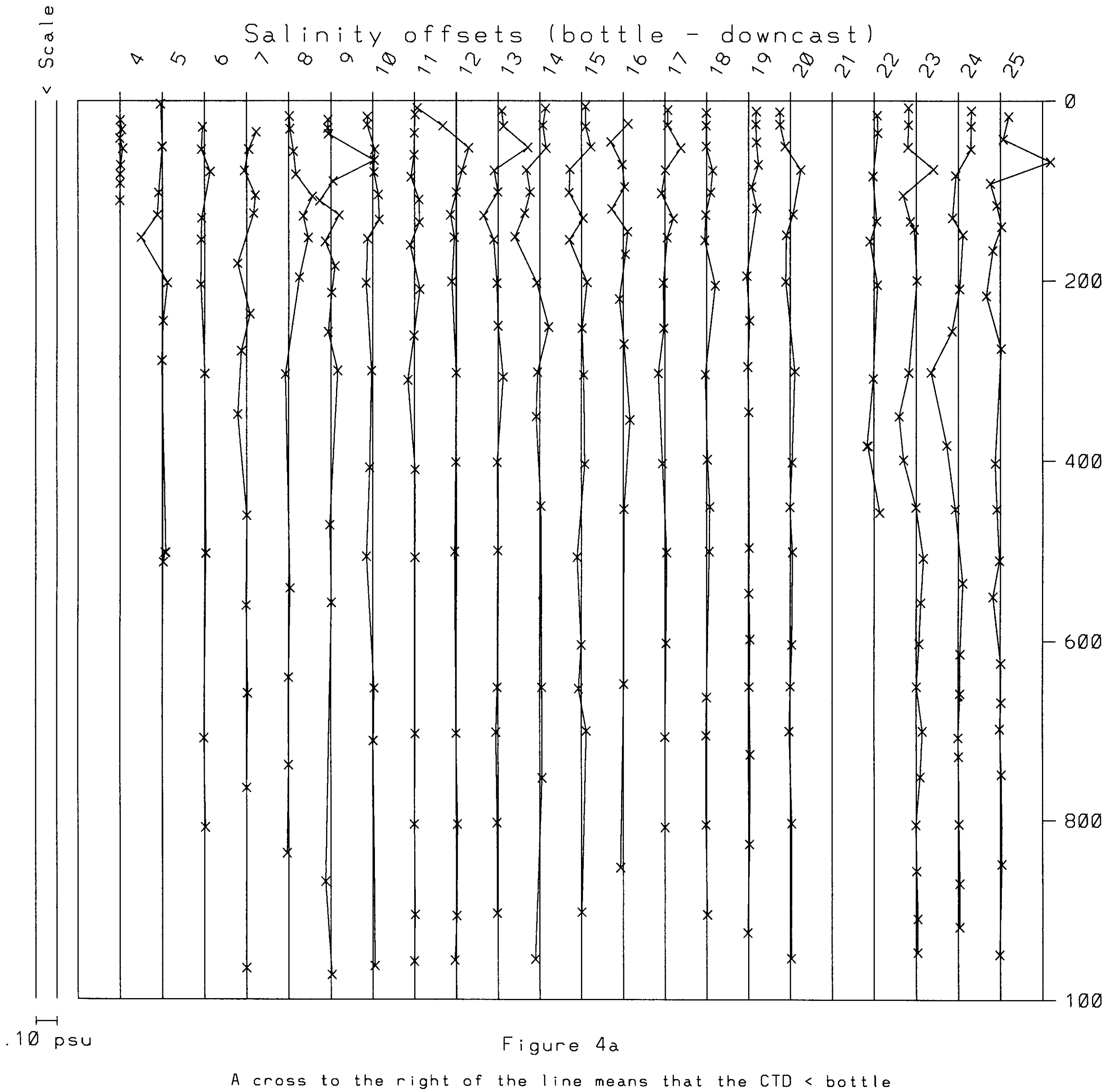

Figure 4a

A cross to the right of the line means that the CTD < bottle

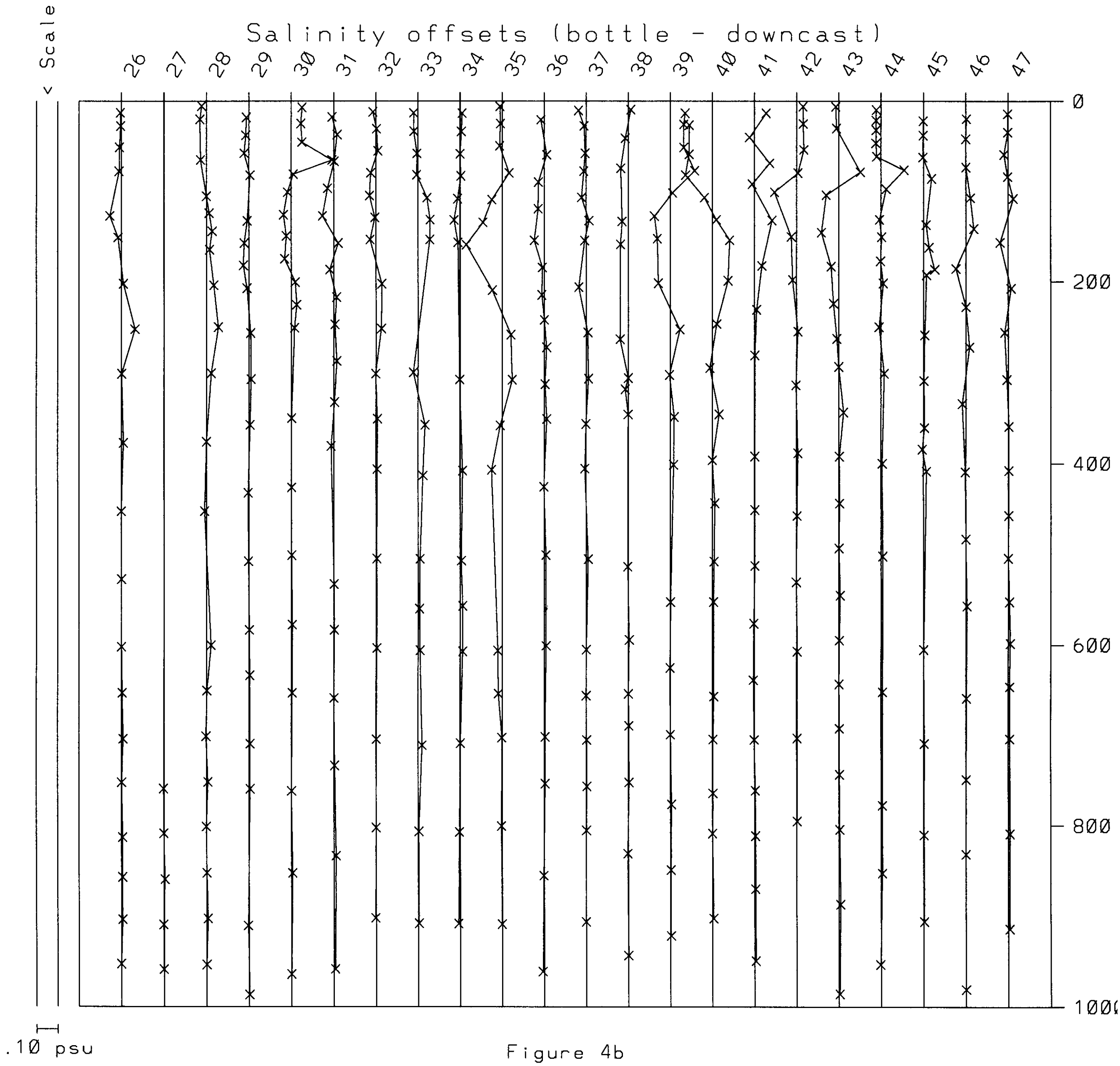

Figure 4b

A cross to the right of the line means that the CTD < bottle

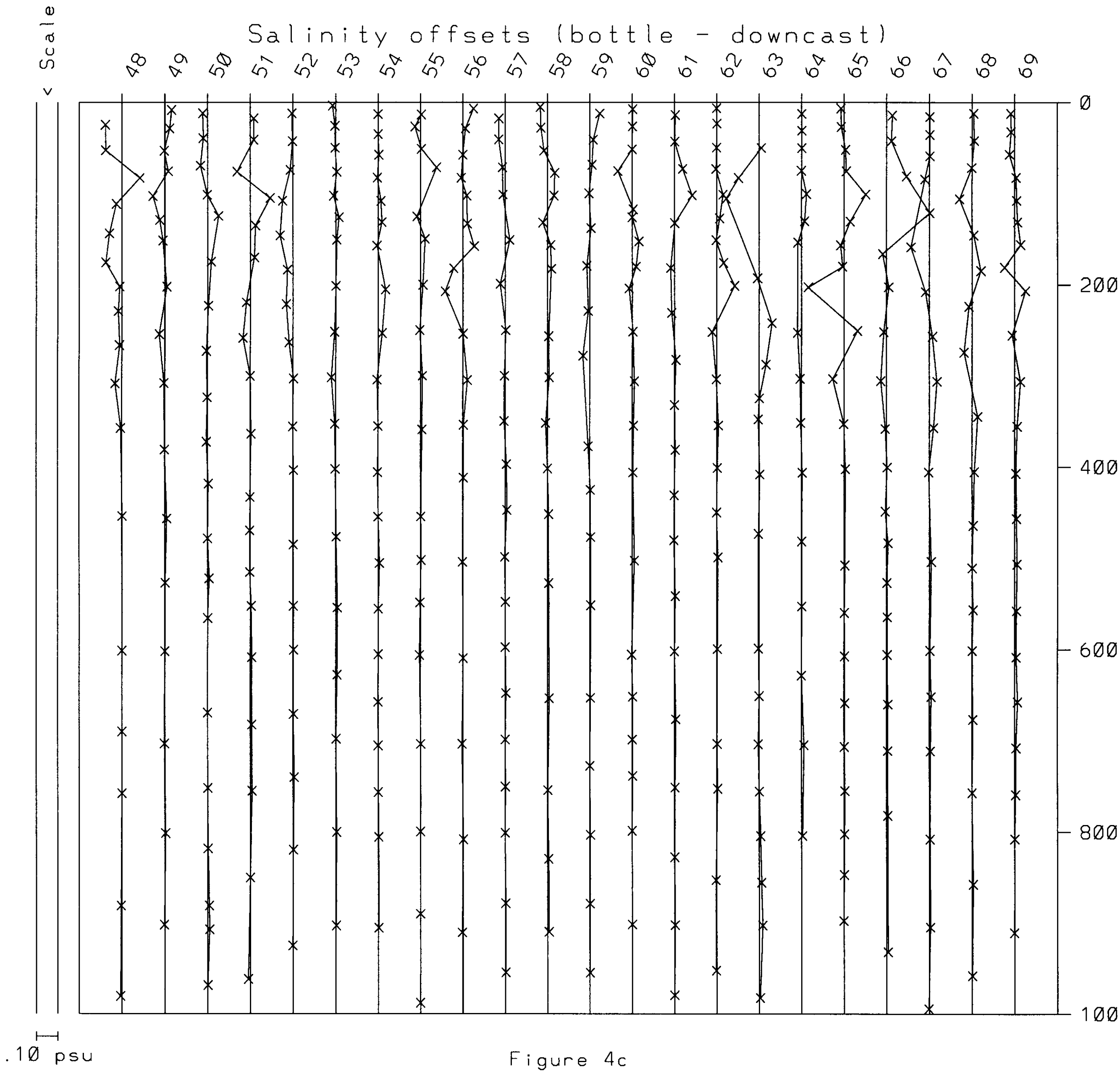

Figure 4c

A cross to the right of the line means that the CTD < bottle

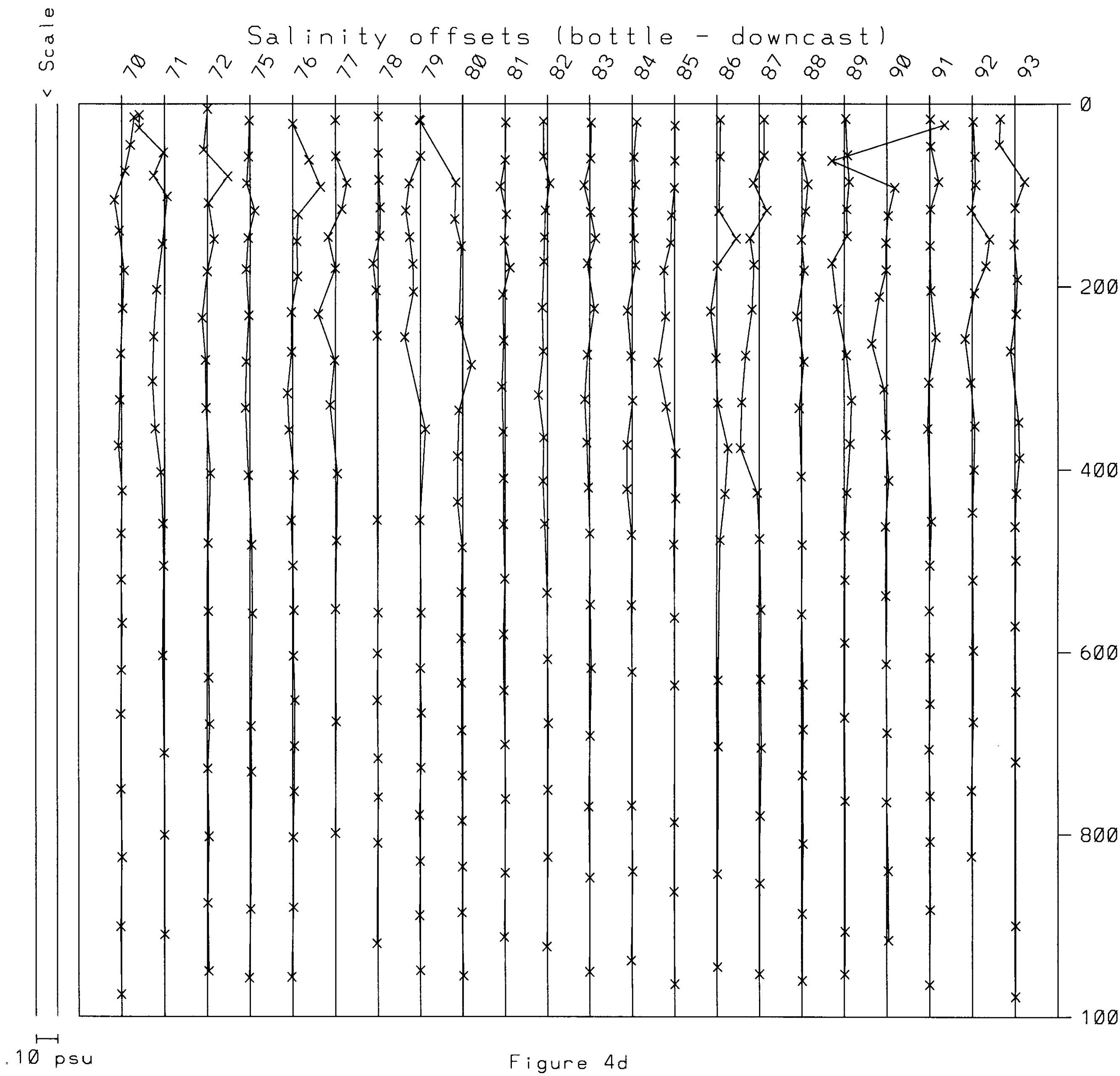

Figure 4d

A cross to the right of the line means that the CTD < bottle

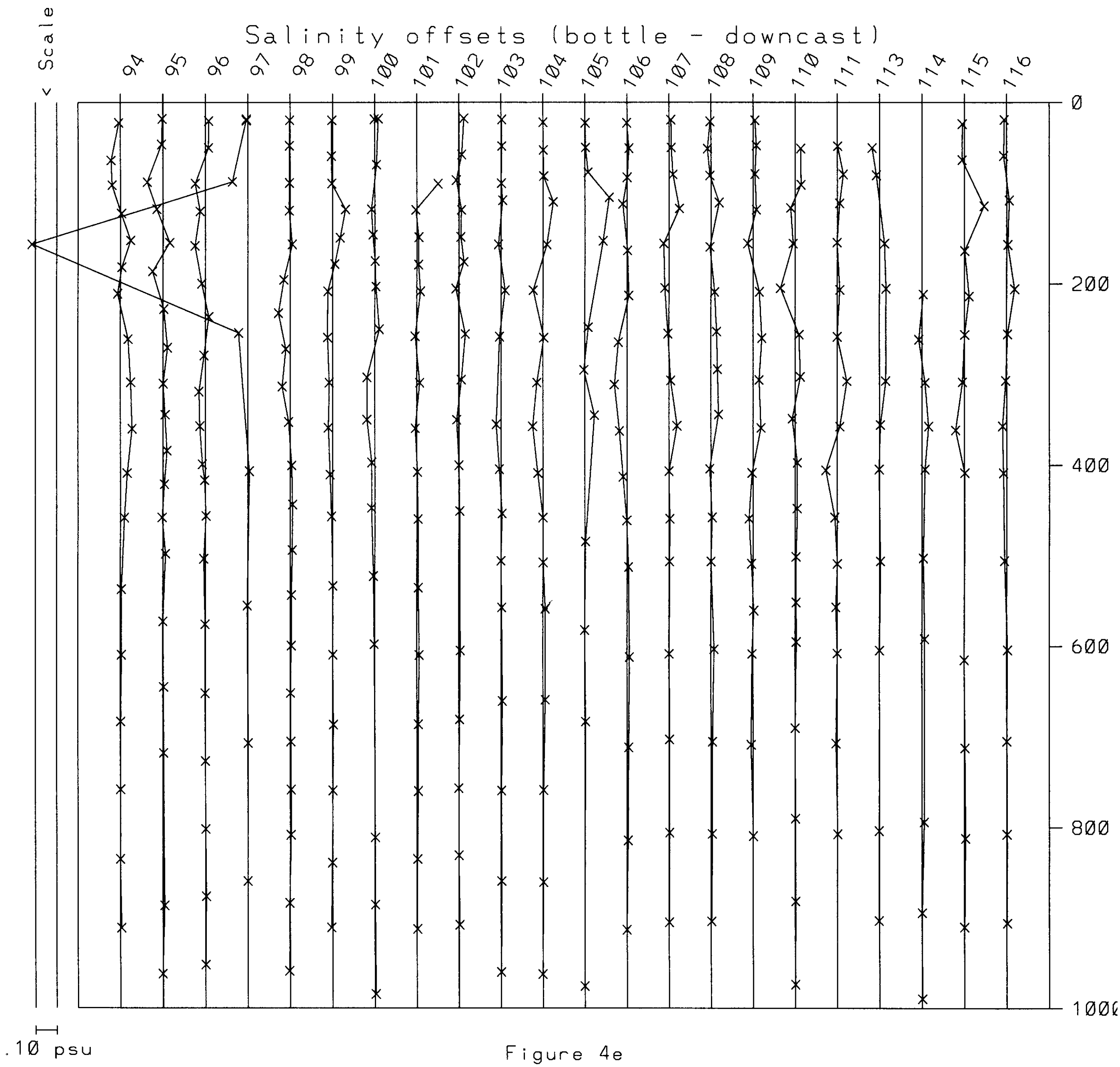

Figure 4e

A cross to the right of the line means that the CTD < bottle

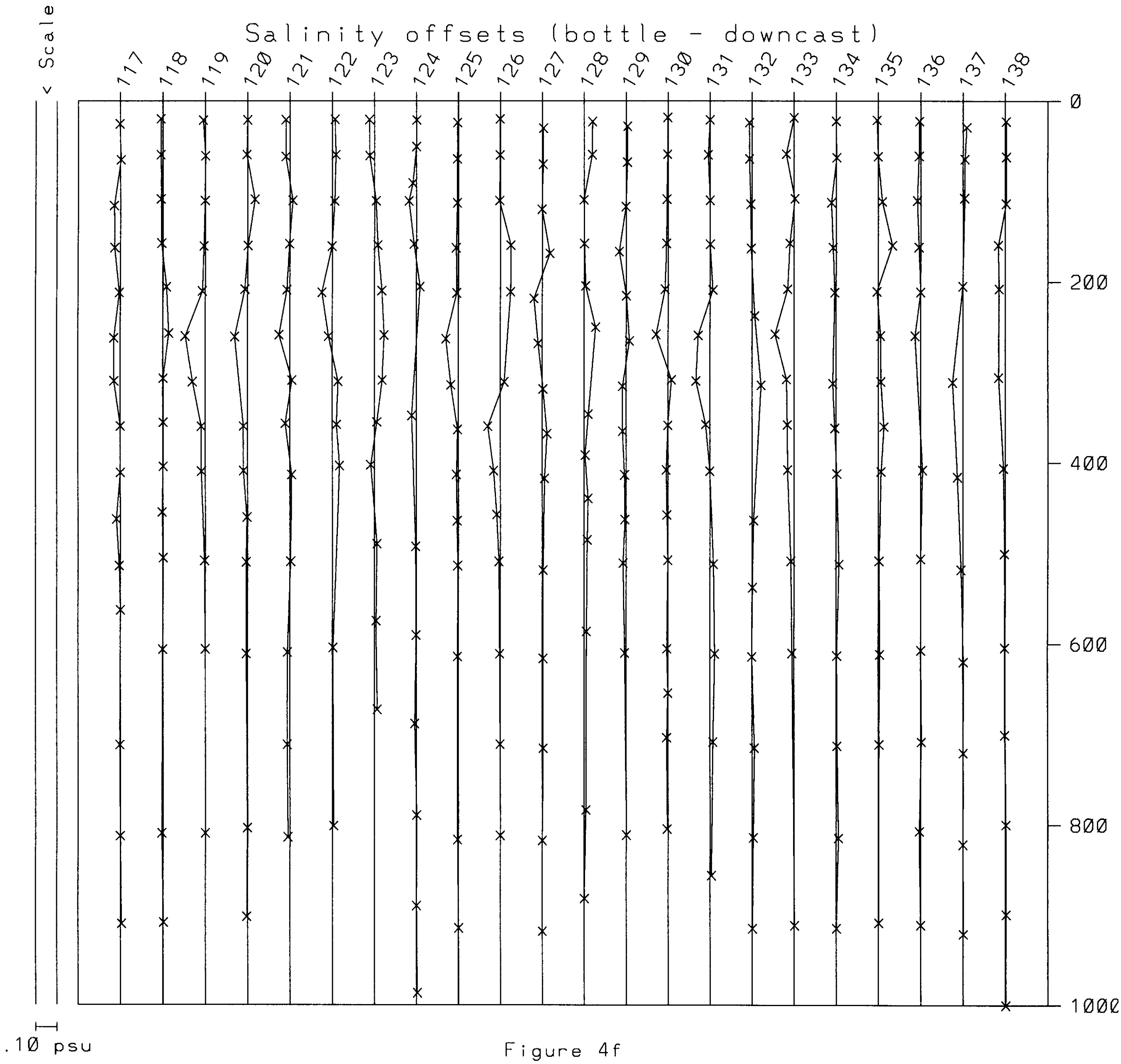

Figure 4f

A cross to the right of the line means that the CTD < bottle

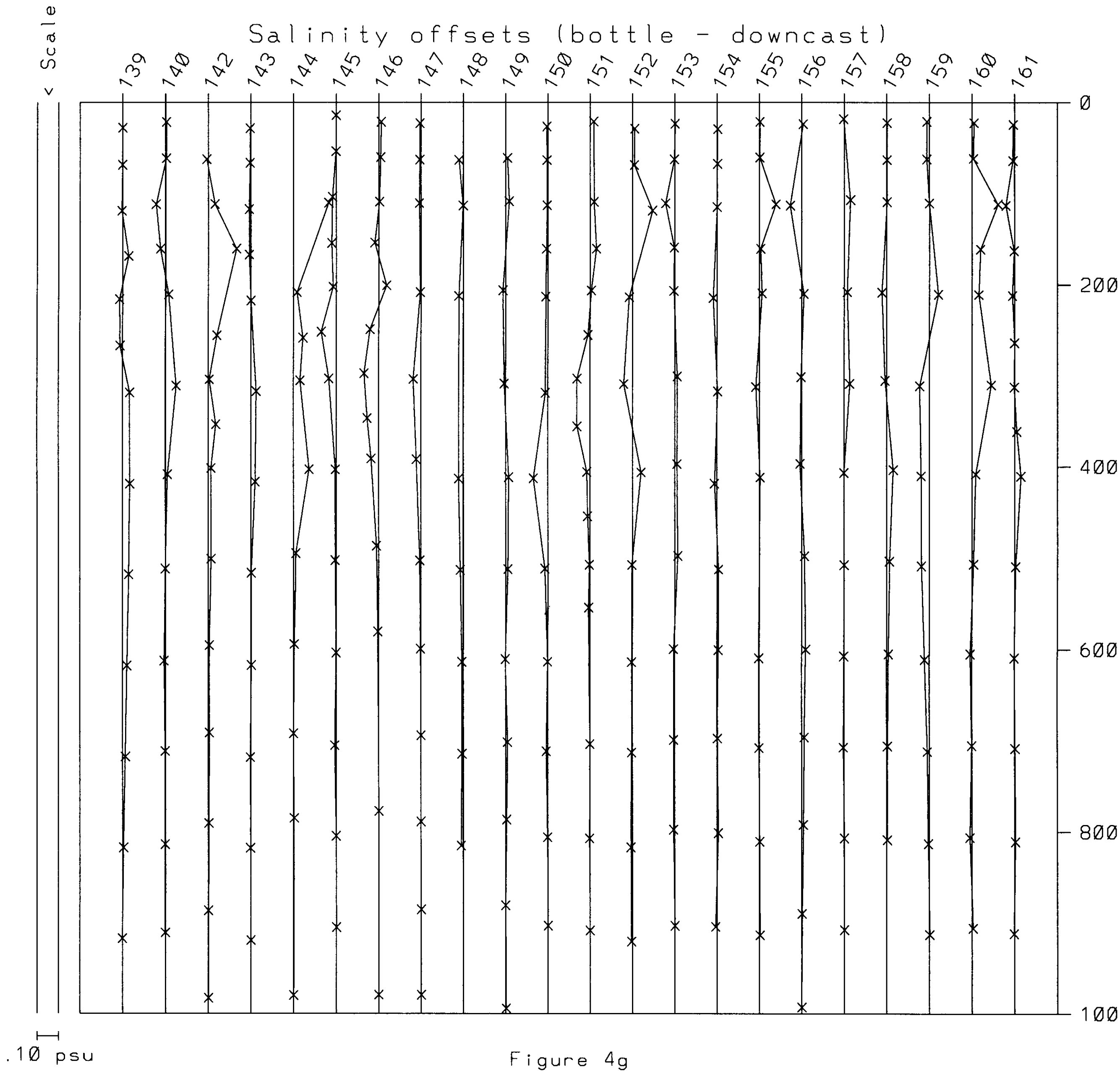

Figure 4g

A cross to the right of the line means that the CTD < bottle

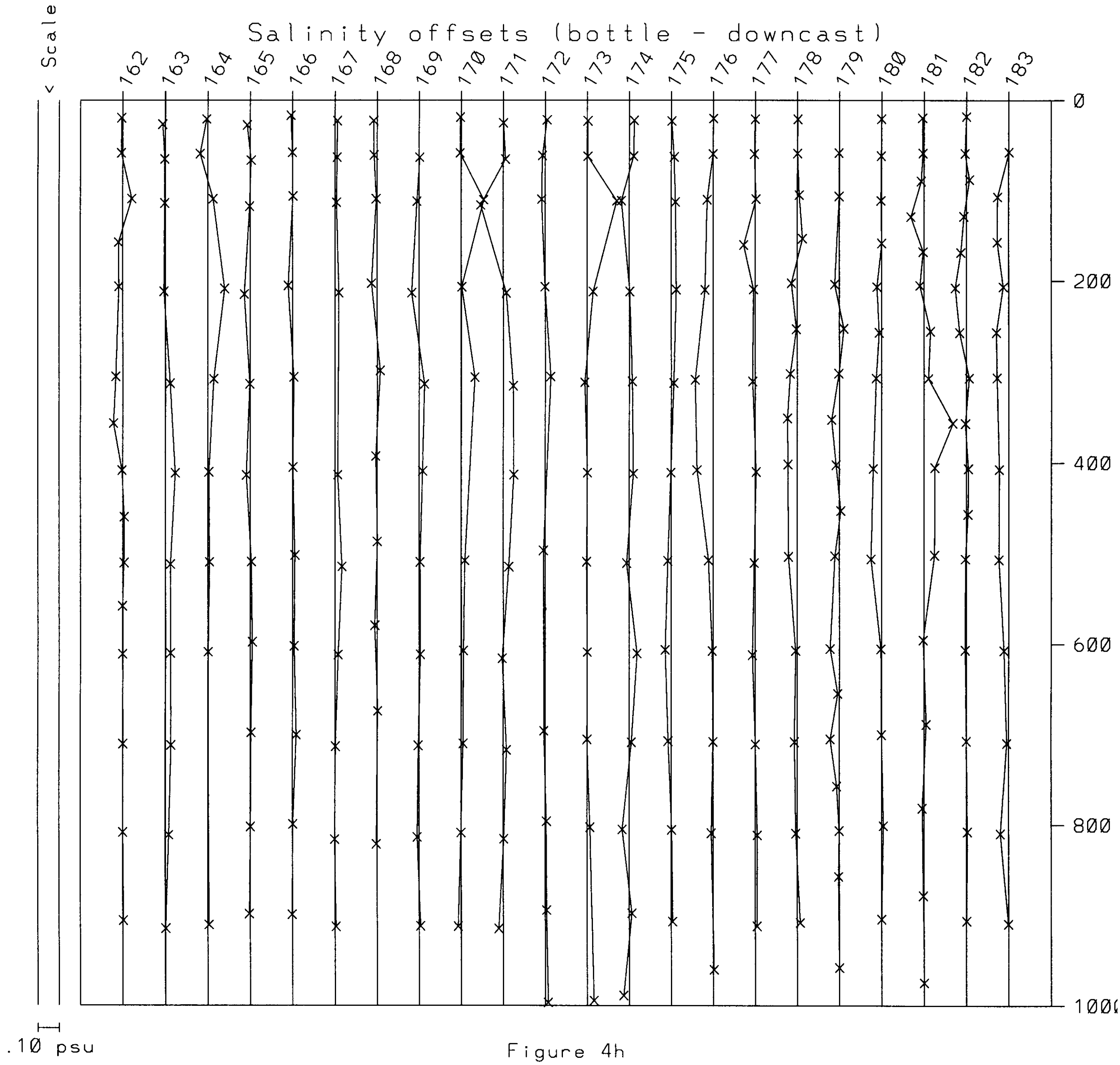

Figure 4h

A cross to the right of the line means that the CTD < bottle

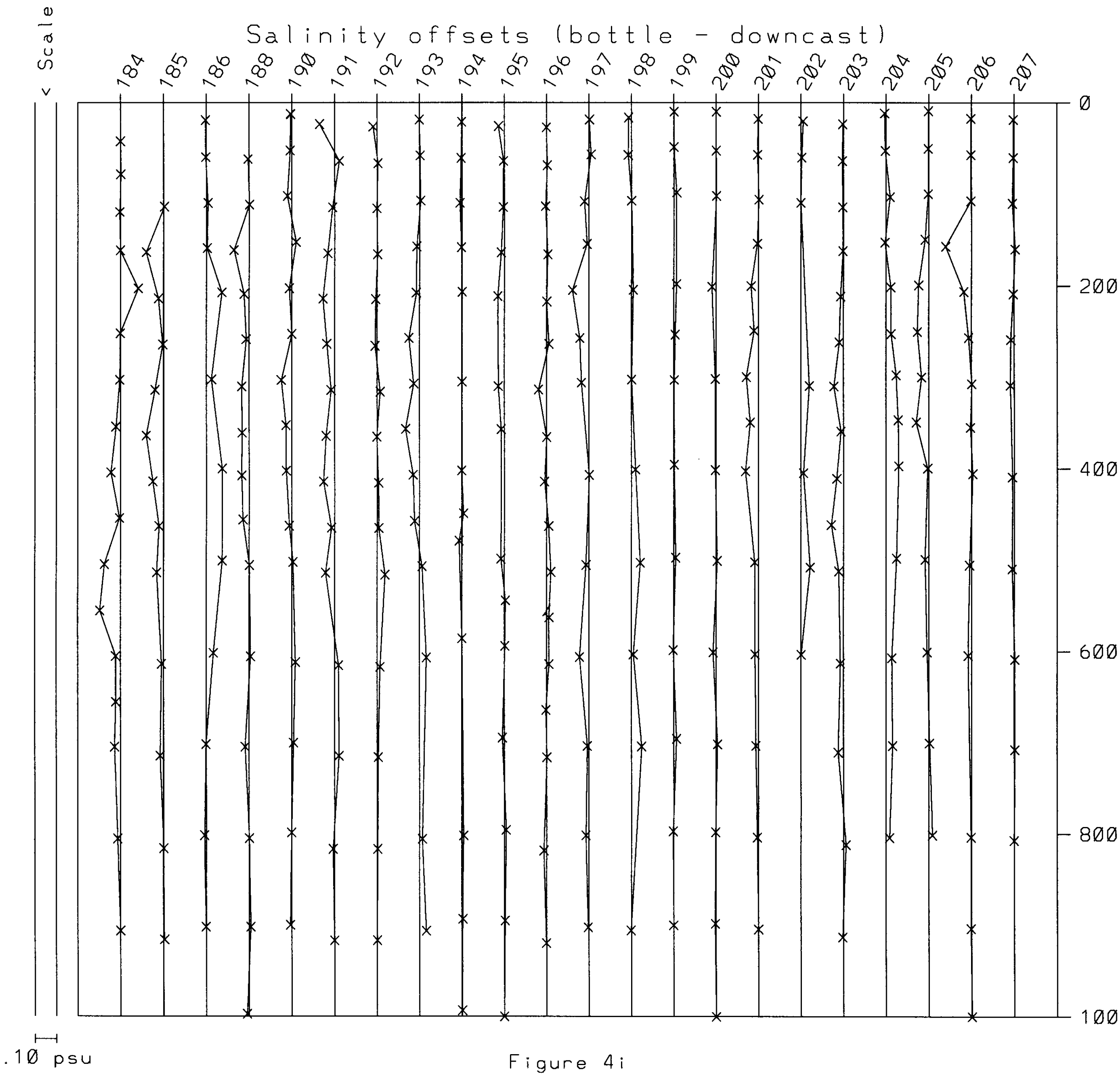

Figure 4i

A cross to the right of the line means that the CTD < bottle

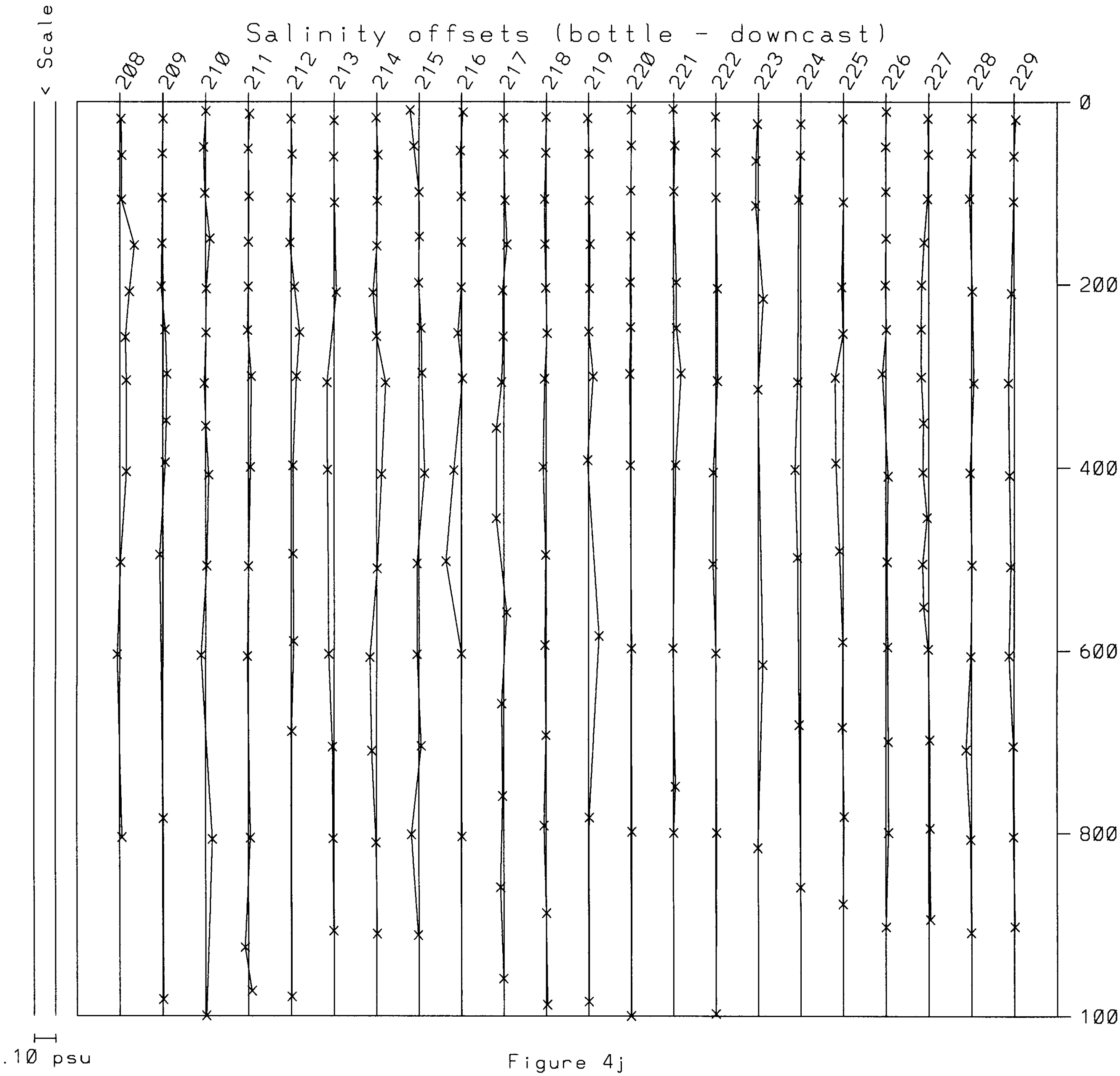

Figure 4j

A cross to the right of the line means that the CTD < bottle

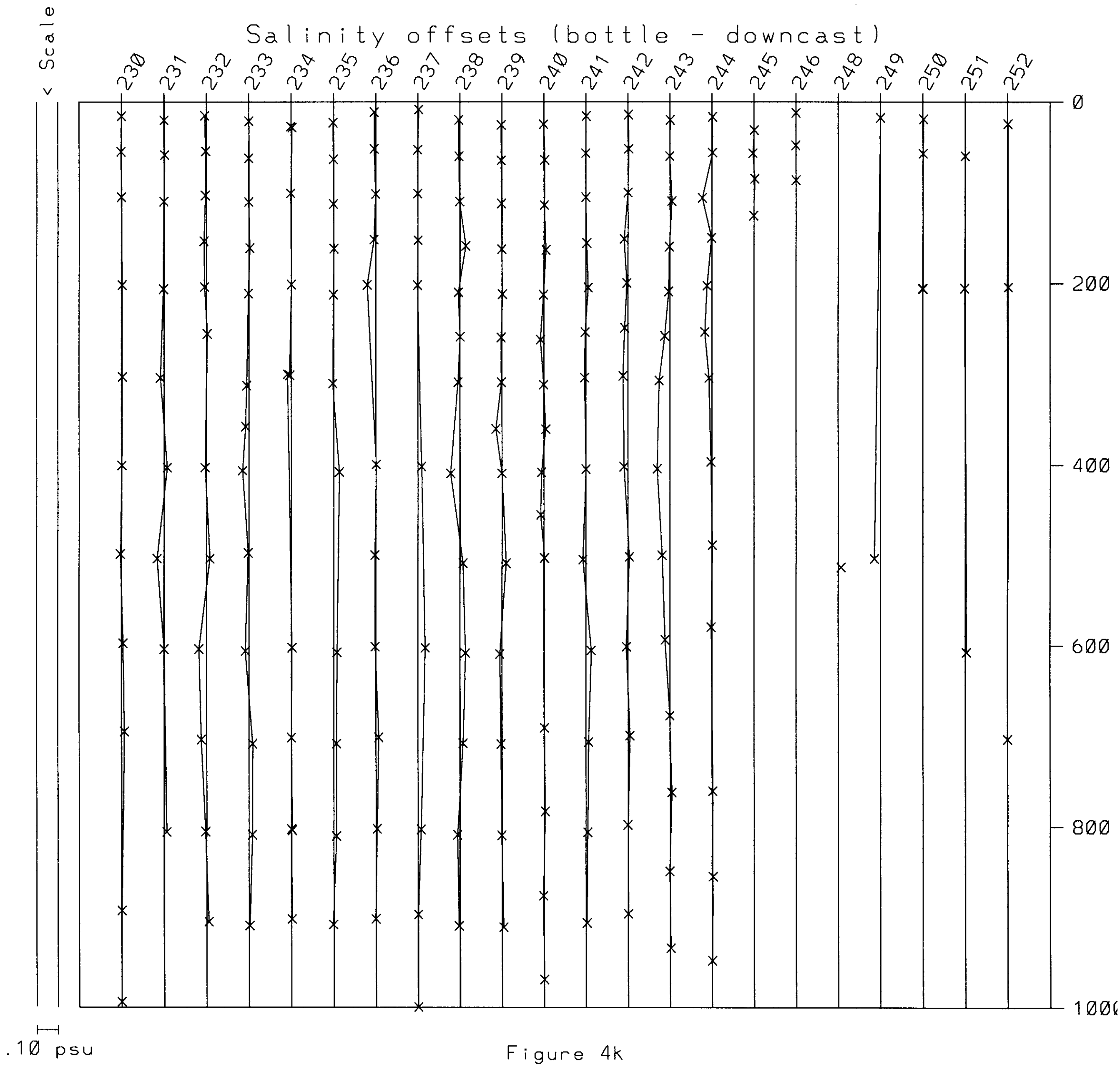

Figure 4k

A cross to the right of the line means that the CTD < bottle

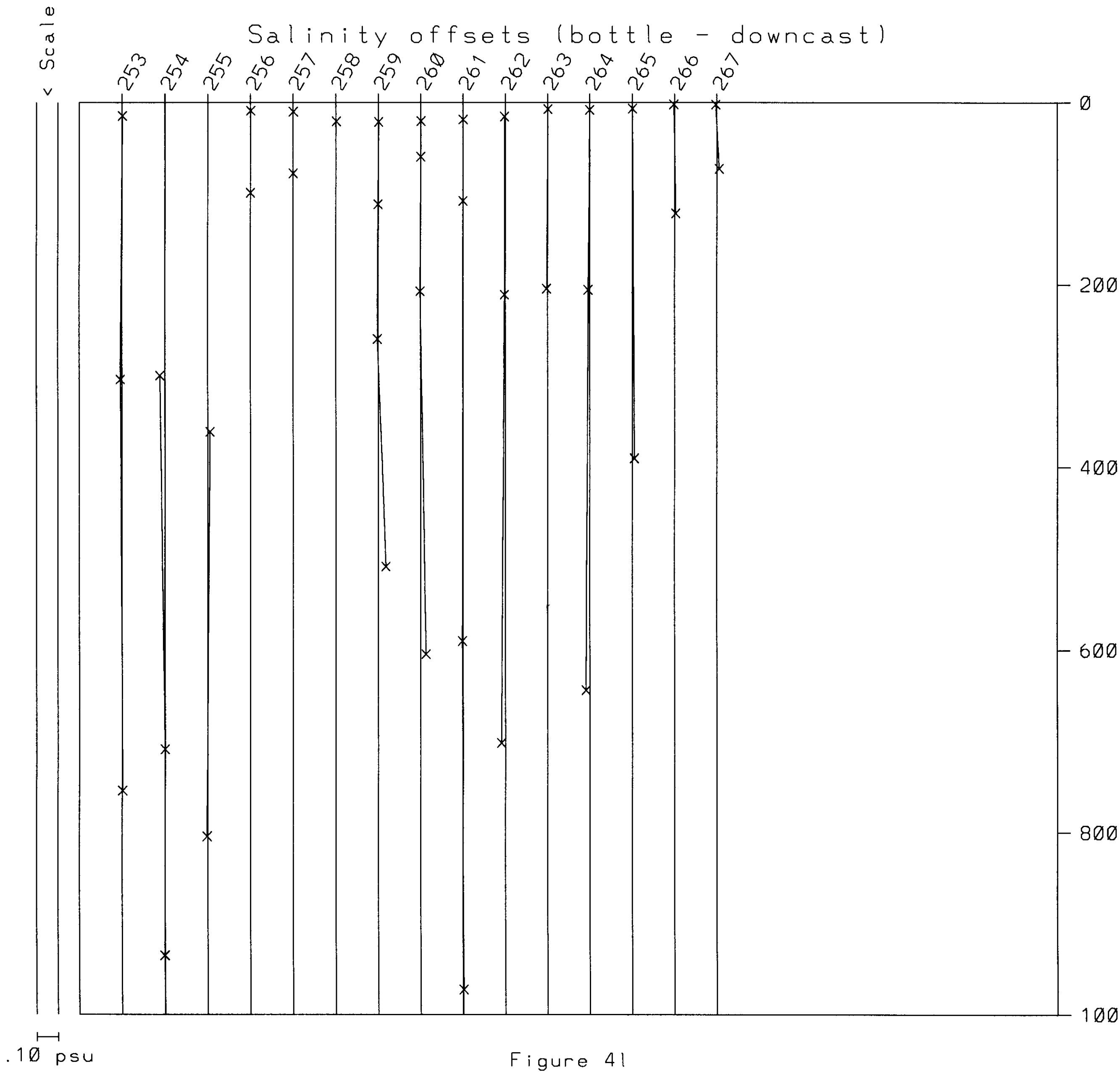

Figure 41

A cross to the right of the line means that the CTD < bottle

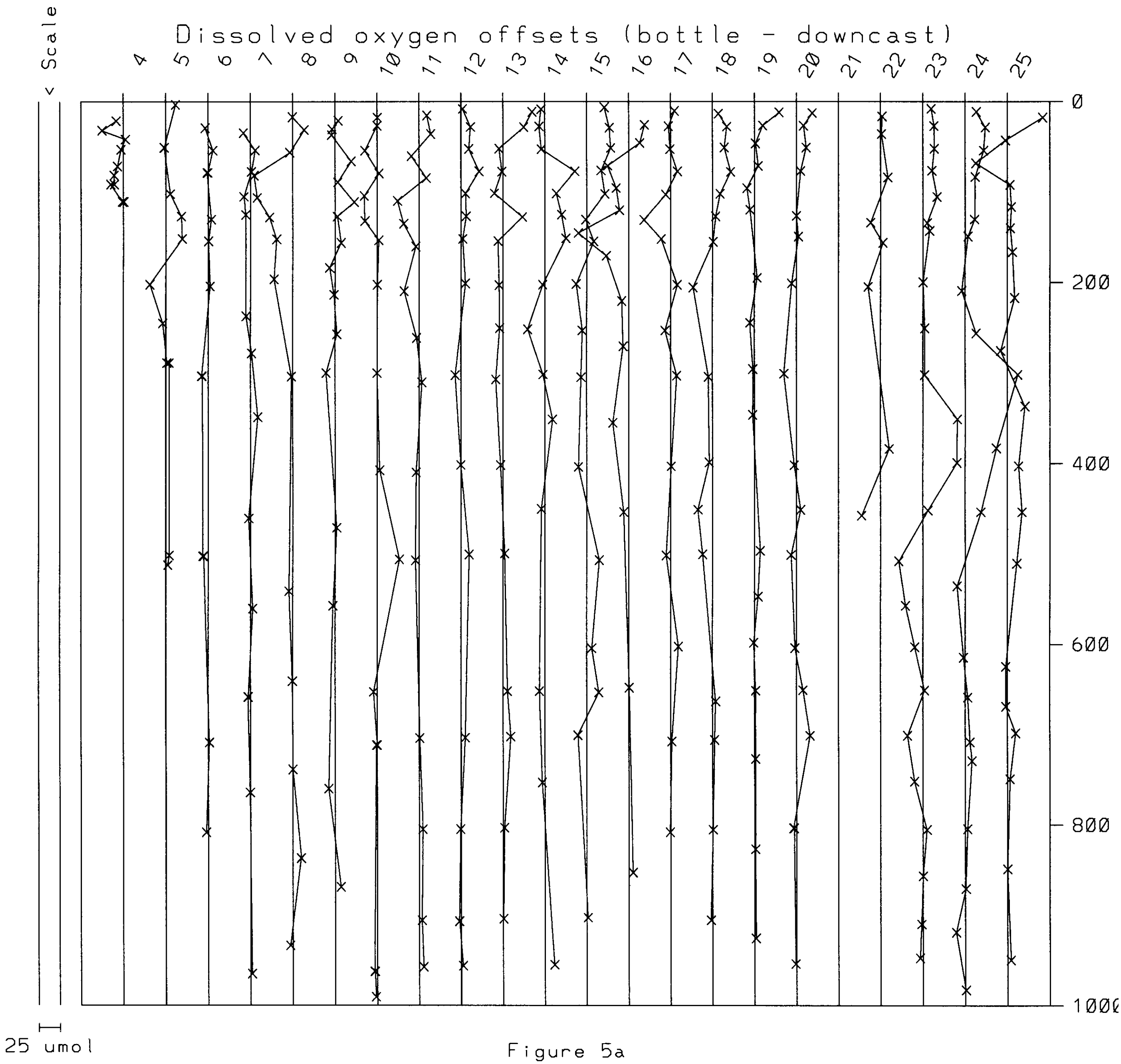

Figure 5a

A cross to the right of the line means that the CTD < bottle

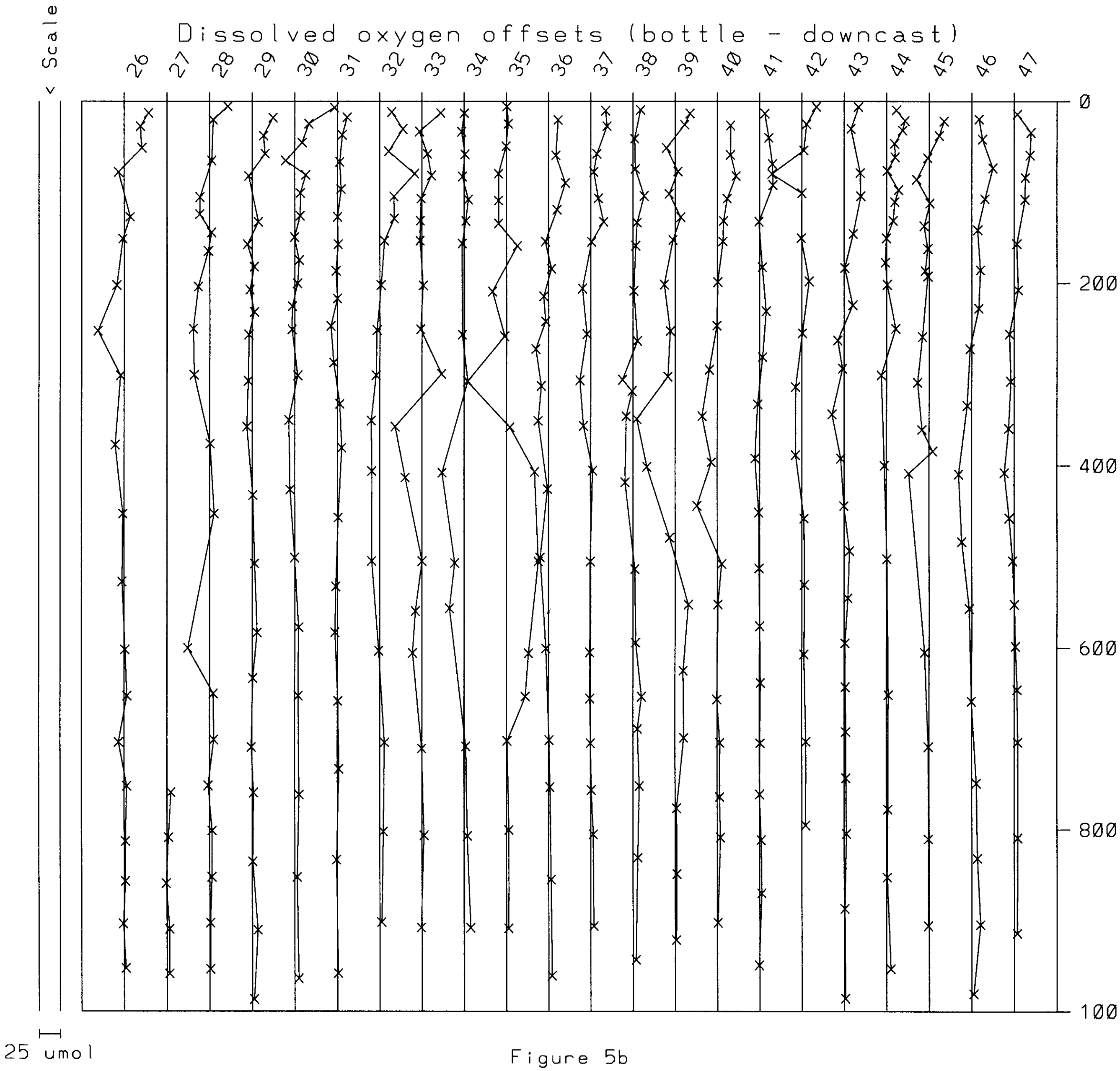

Figure 5b

A cross to the right of the line means that the CTD < bottle

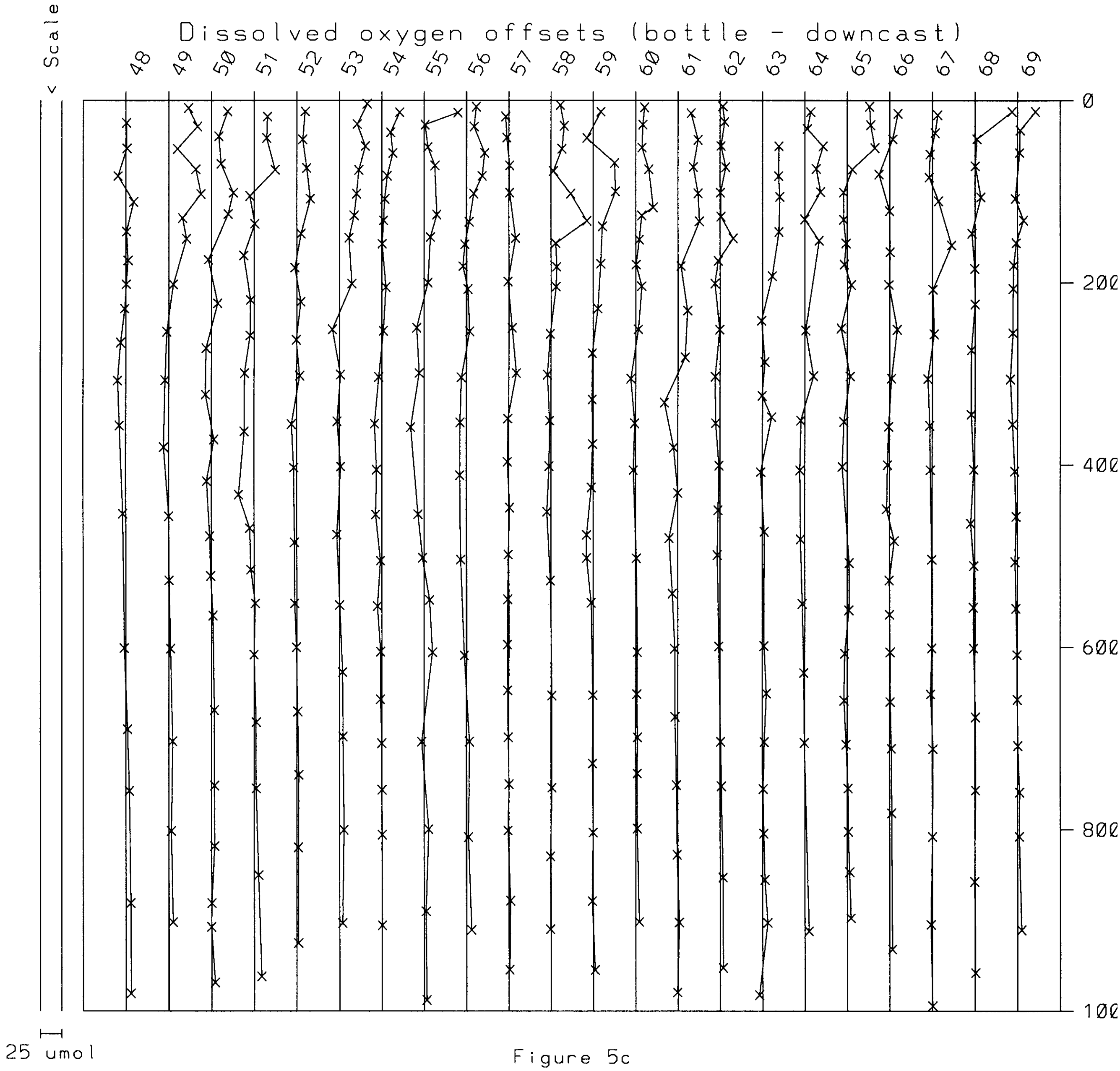

Figure 5c

A cross to the right of the line means that the CTD < bottle

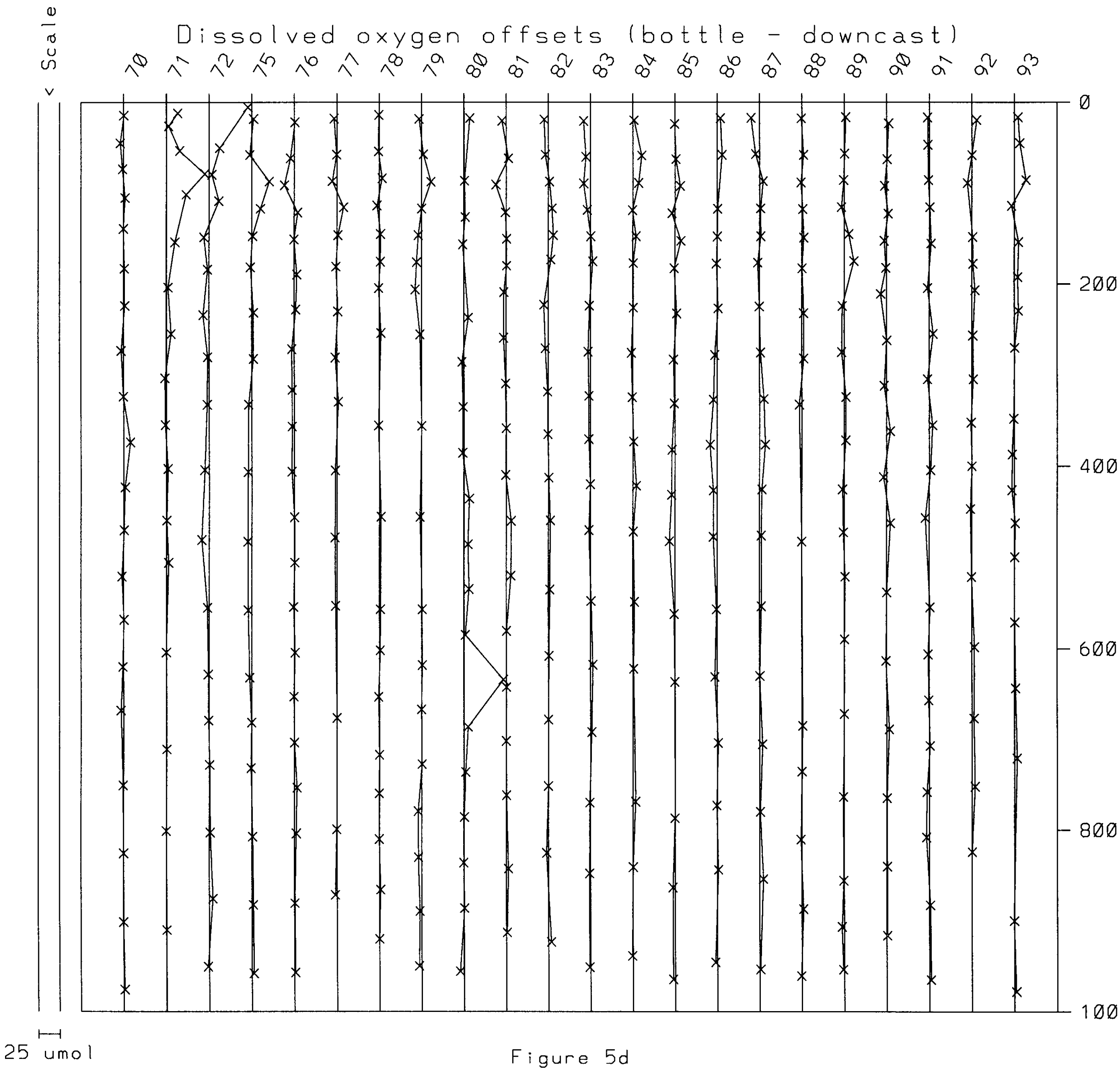

Figure 5d

A cross to the right of the line means that the CTD < bottle

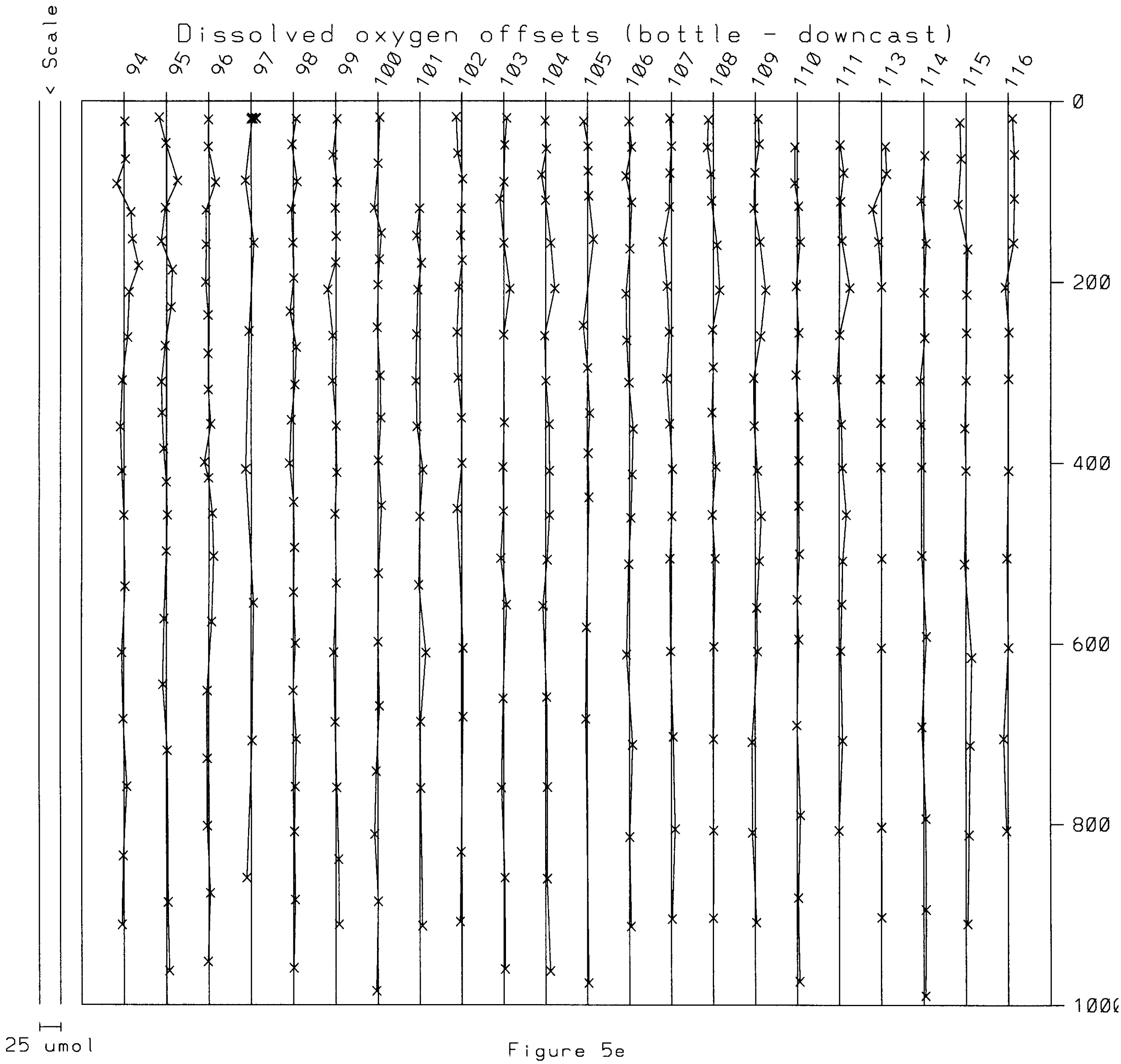

Figure 5e

A cross to the right of the line means that the CTD < bottle

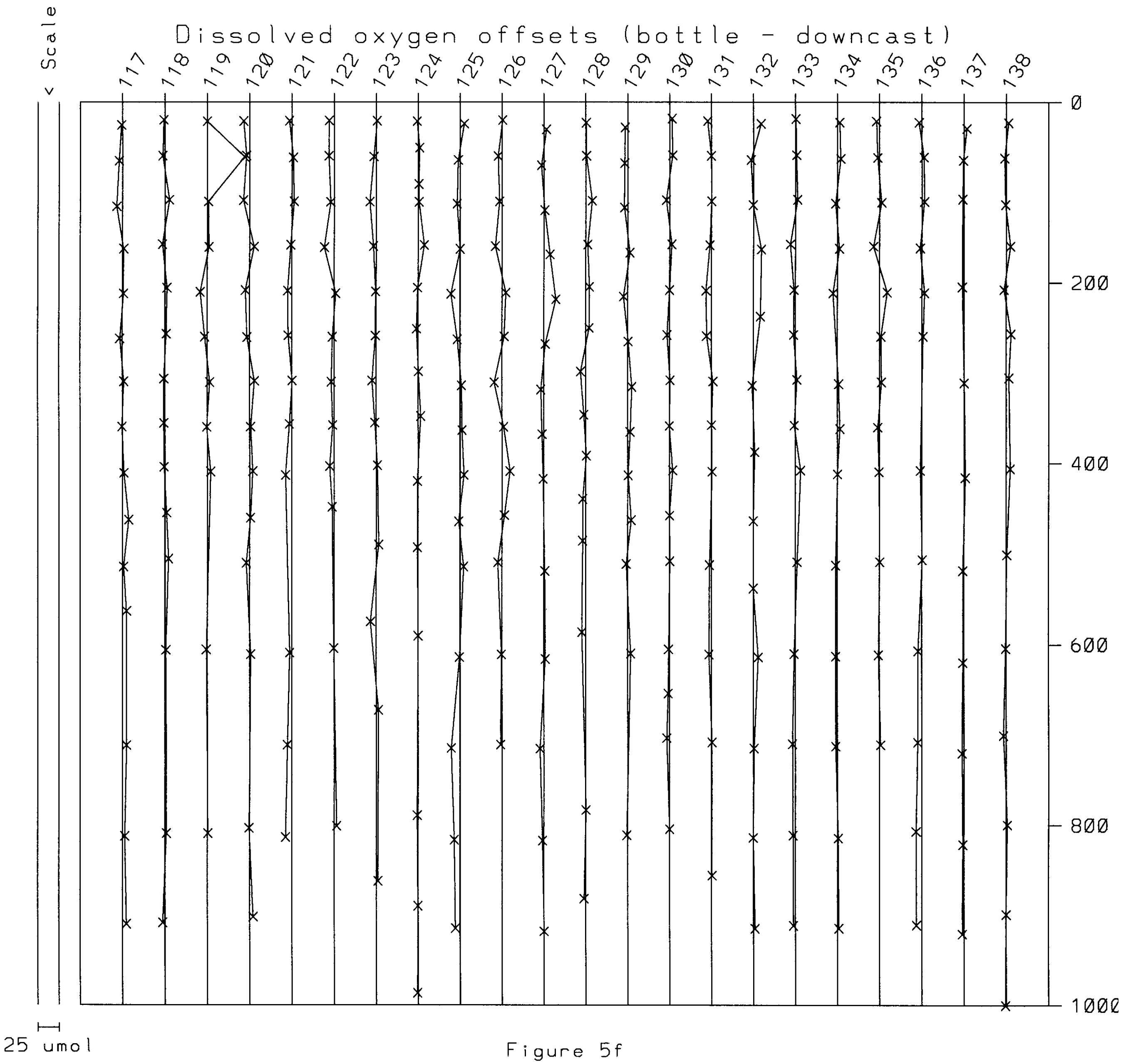

Figure 5f

A cross to the right of the line means that the CTD < bottle

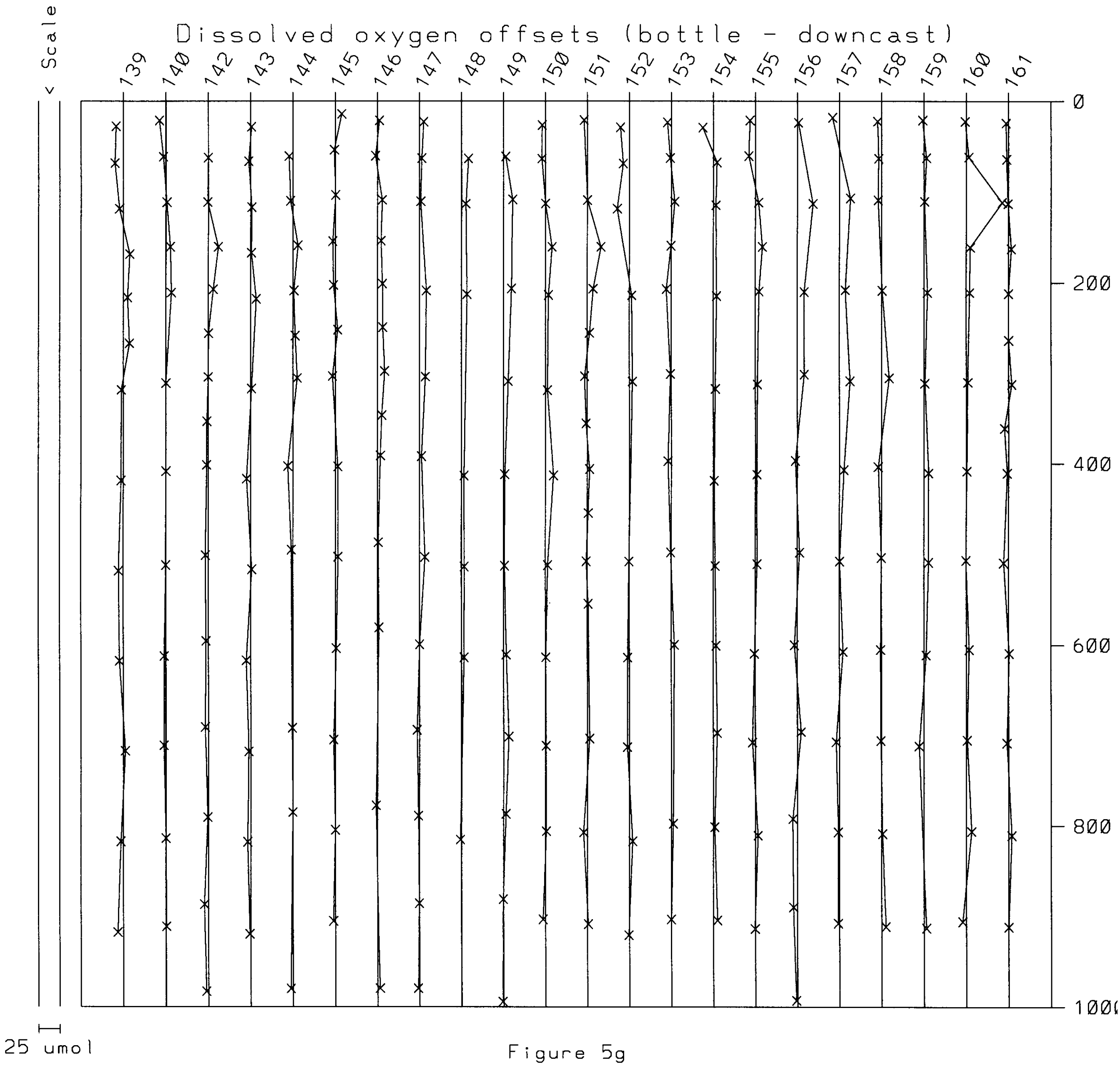

Figure 5g

A cross to the right of the line means that the CTD < bottle

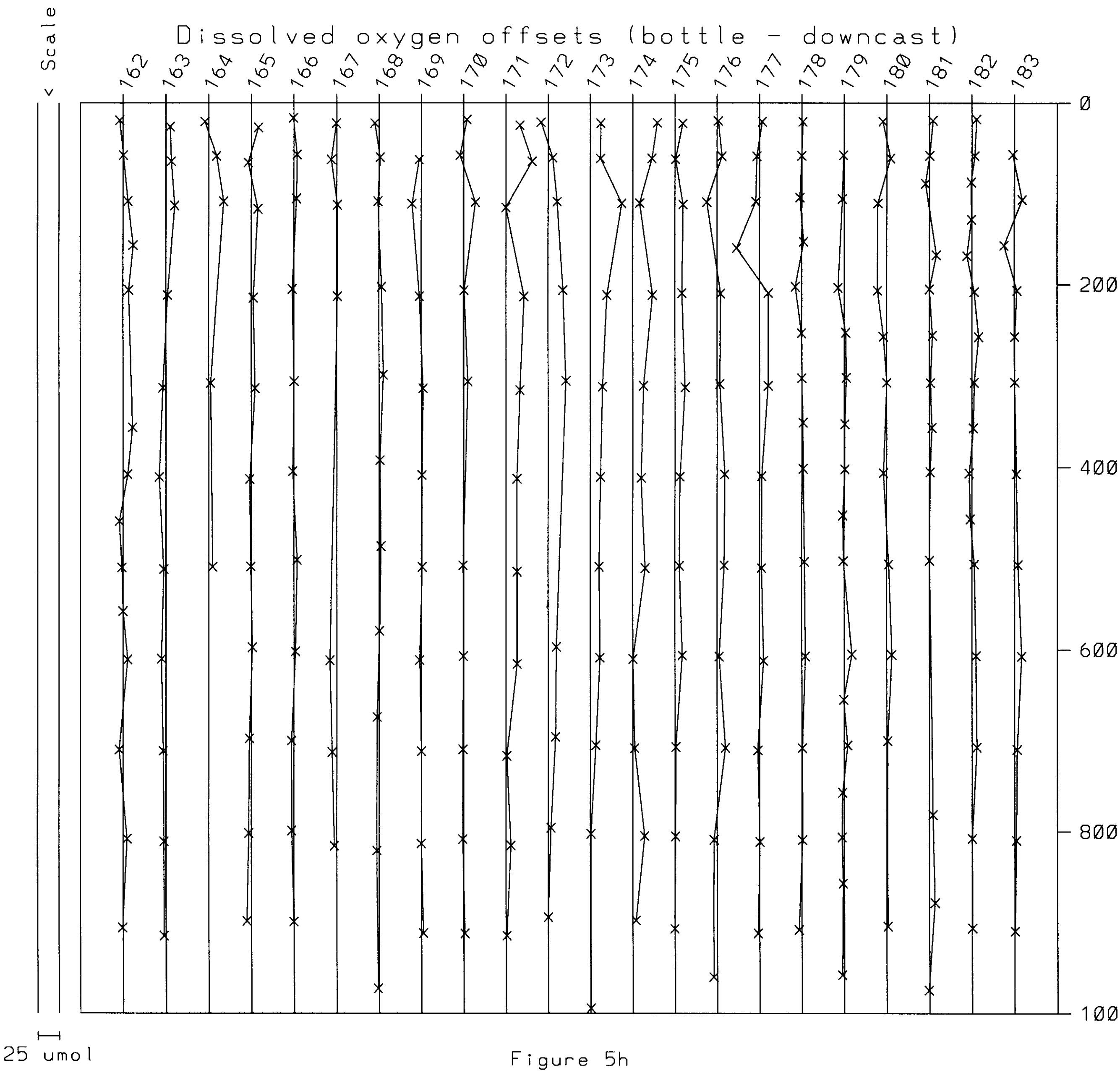

Figure 5h

A cross to the right of the line means that the CTD < bottle

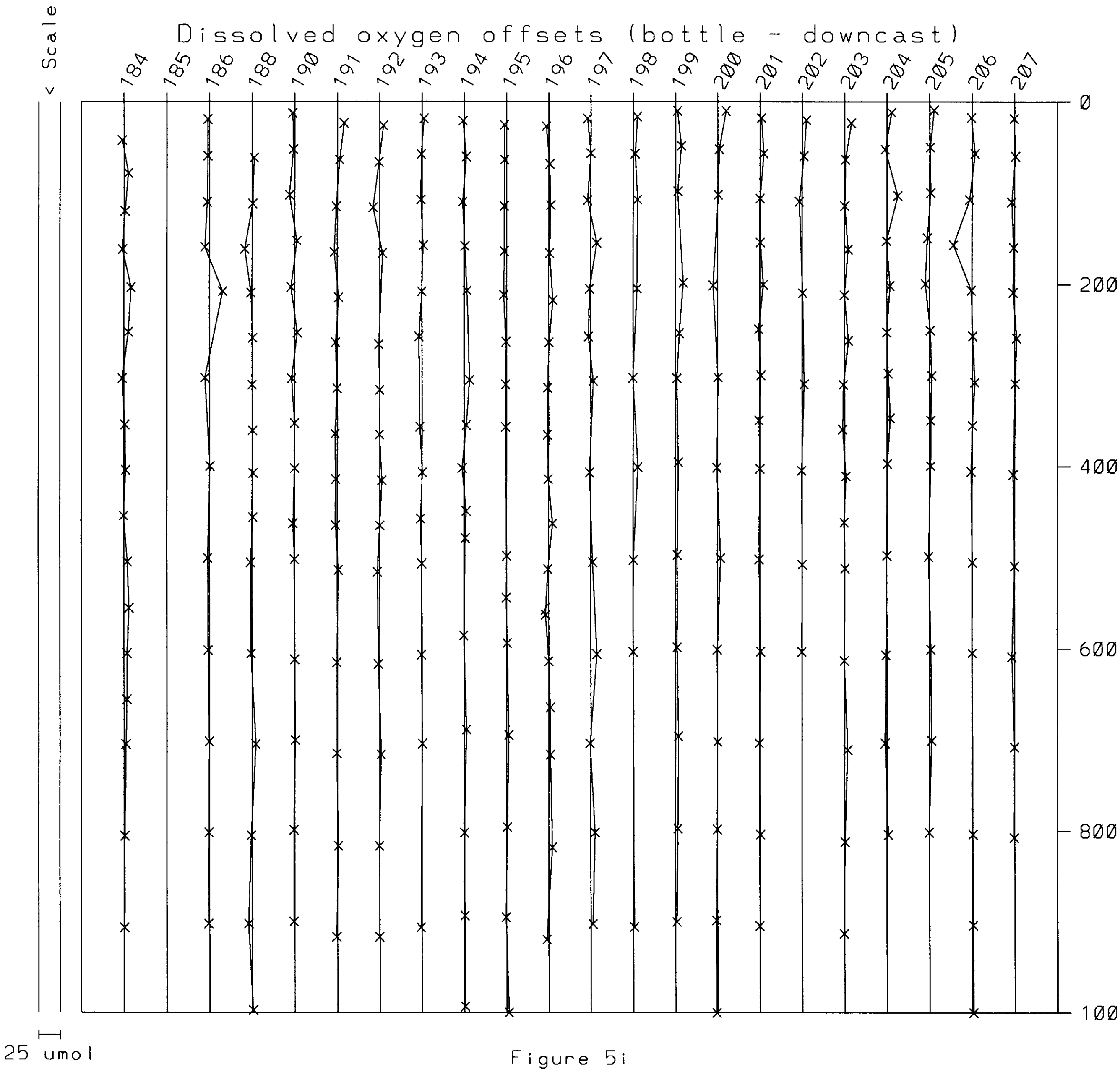

Figure 5i

A cross to the right of the line means that the CTD < bottle

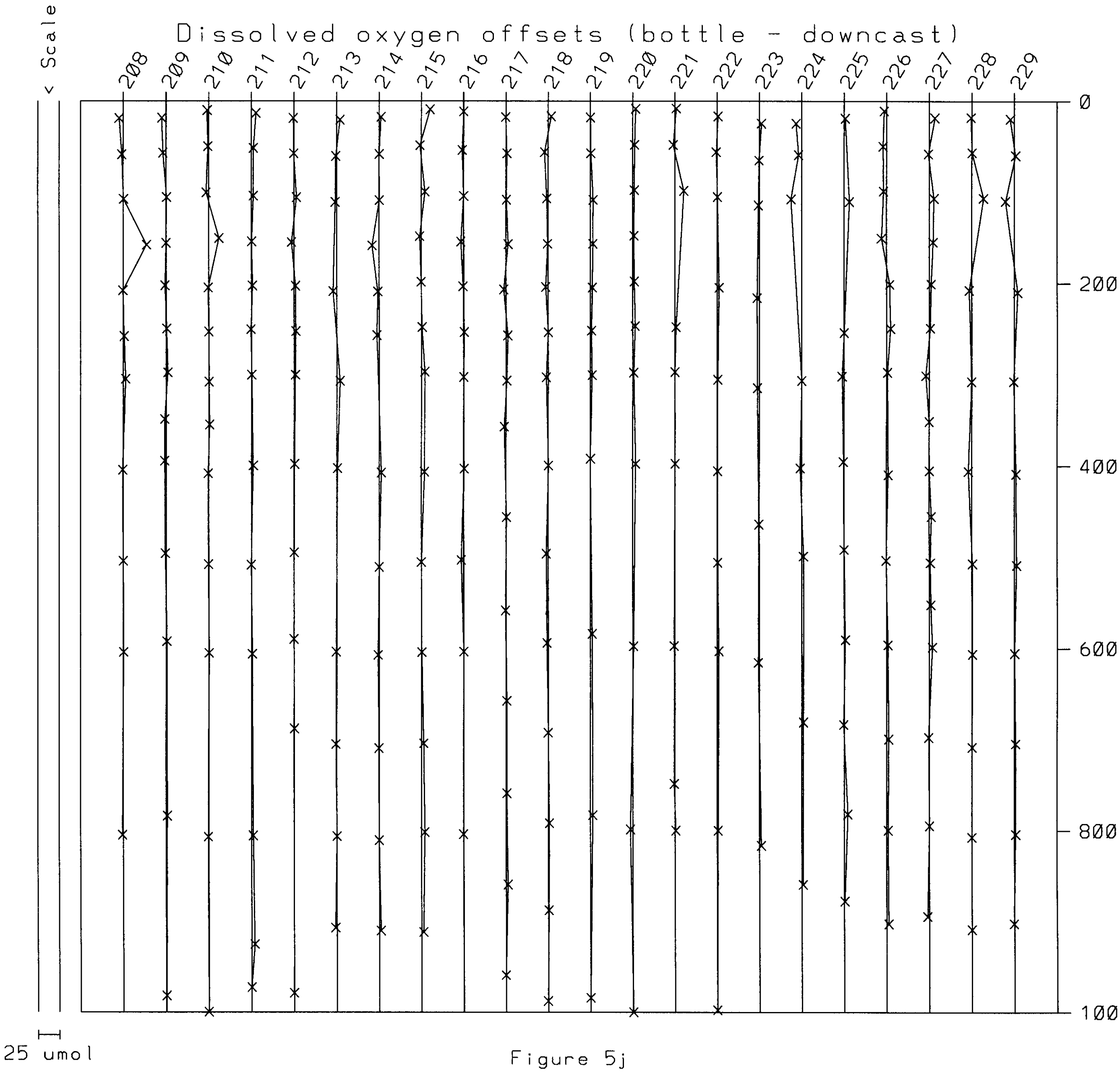

Figure 5j

A cross to the right of the line means that the CTD < bottle

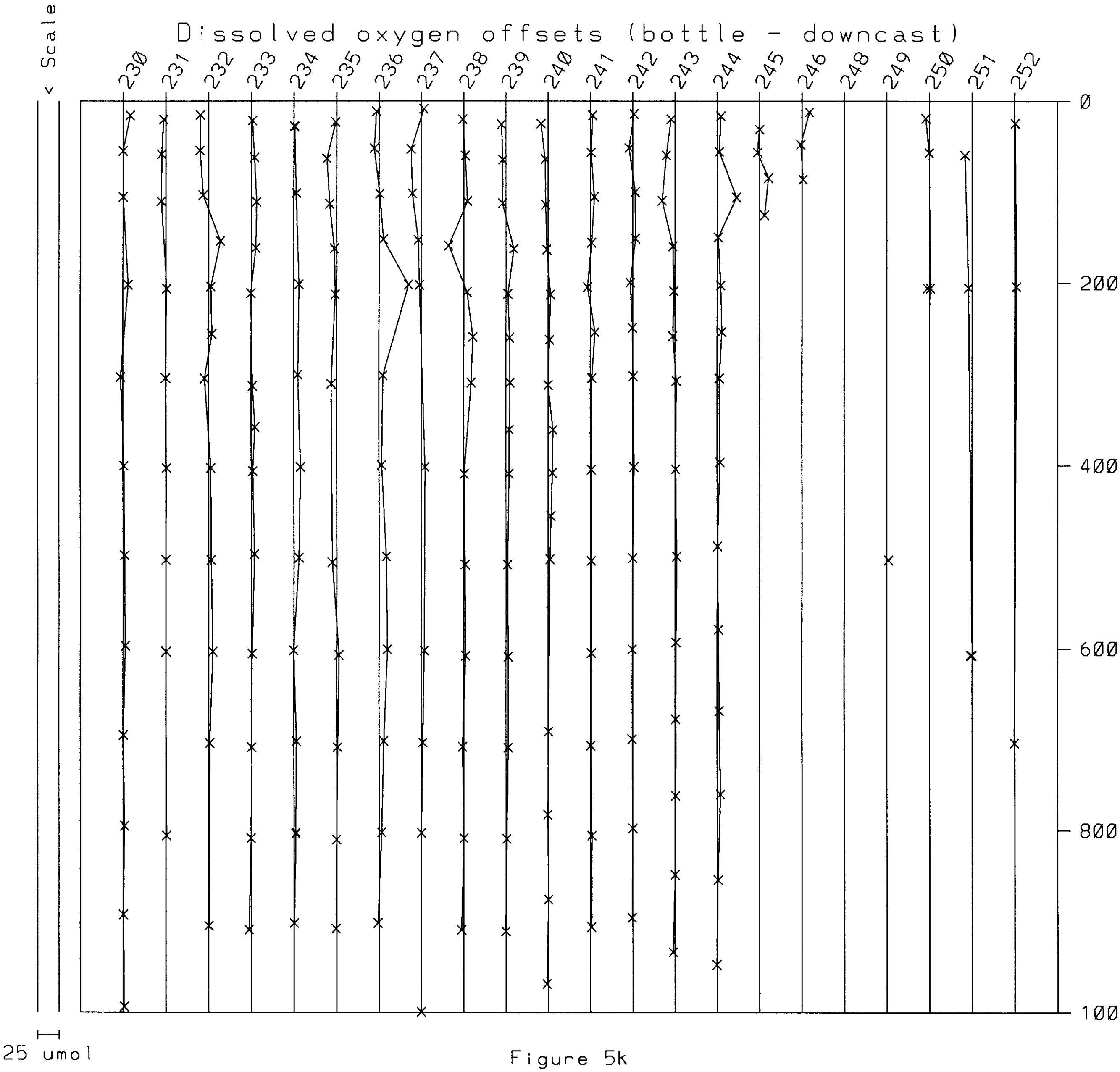

Figure 5k

A cross to the right of the line means that the CTD < bottle

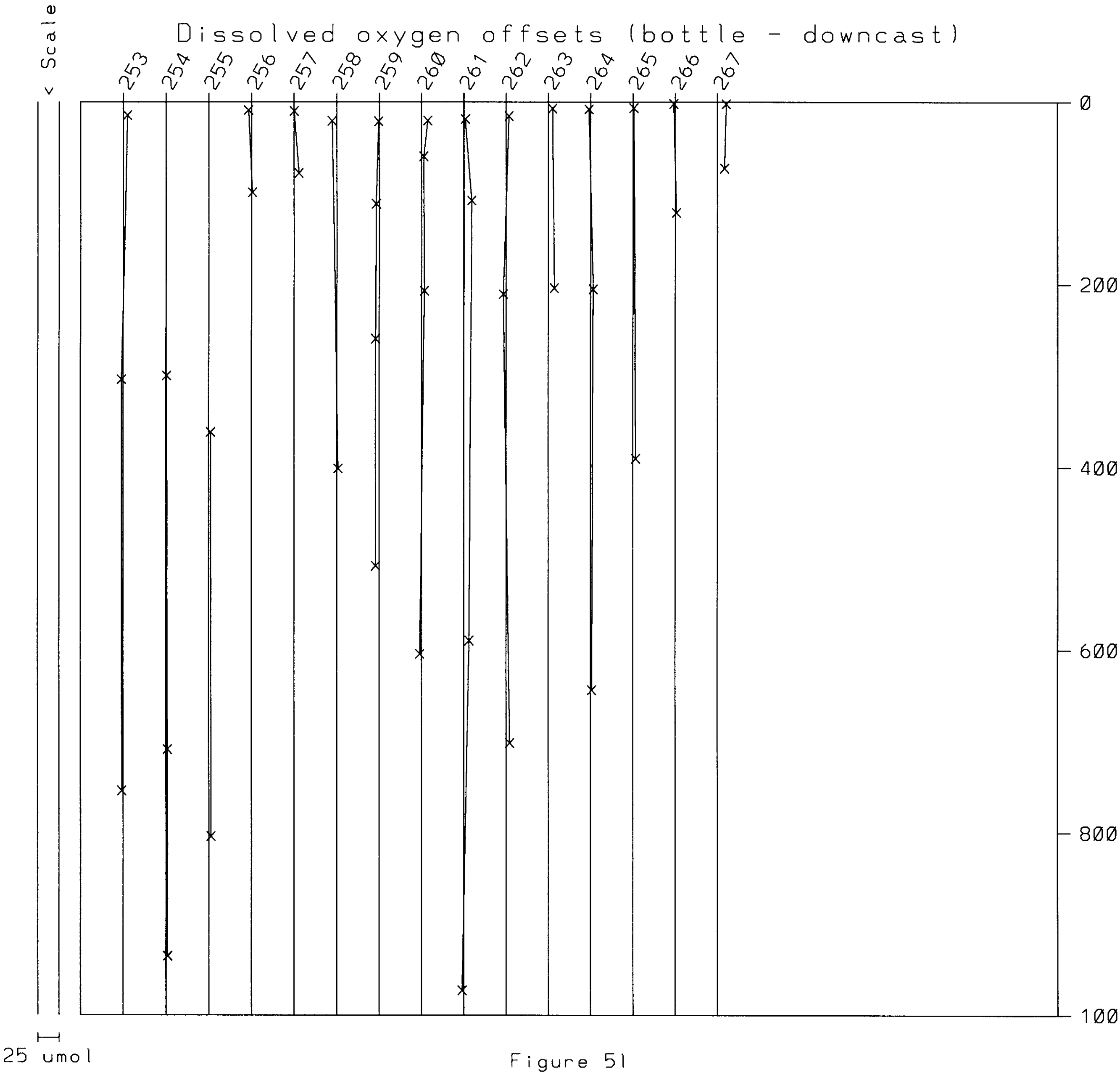

Figure 51

A cross to the right of the line means that the CTD < bottle

G.6. PI Response to Hydrographic DQE

(DQE Arnold Mantyla reviewed the Hydrographic Data)

SUM file:

Bottom time and position added. Maximum pressure corrected.
Corrected errors in stations 14, 17, 21, 32, 69, 191

Double trips:

A common problem with double trips is that although the CTD pressure and temperature were identical, for some reason the CTD salinity and CTD oxygen were not (probably due to the program that overwrites the old file with new data). These double trips were identified and the CTD salinity and CTD oxygen checked for accuracy.

CTD, Salinity and Oxygen quality code changed:
Agree almost entirely with DQE's suggested changes.

Specific problems:

Station 8, bottle 2	Station log revealed no indication of a problem. Decided not to make up a new depth. If bottle did close at shallower depth then the bottle must have been closed while package was moving, which would also produce questionable results.
Station 9	Changed trip depth of bottle 11 to indicate bottle 11 and 12 double tripped at bottle 12's depth. Changed quality word to good. Station log depths for bottles 2 and 9 agree with depths in water sample file (*.hy2). Oxygen water samples were not reported below 869db (lost in analyses?) thus 5 was used as the quality code. Trip depth not resolved, water samples (salt, oxygen and nutrients) marked questionable.
Station 10, btl. 17	Did not change trip depth. Bottle was a leaker, water sample data left as question-able.
Station 11, btl. 1	Oxygen looks too high in comparison to following stations that were also in the trench. Left oxygen quality code as questionable.
Station 13	Changed trip depth of bottle 7 to reflect bottle 7 double tripped with bottle 6 at bottle 6's depth. Bottle 6 is a leaker, water sample data is questionable. Bottle 20 oxygen probably was mistakenly drawn from bottle 21 but left quality code as bad.
Station 16, btls. 3, 8 and 9	Changed trip depths of bottles 8 and 9 to reflect bottle 8 double tripped with bottle 7, bottle 9 tripped at bottle 8's former depth and no bottle tripped at bottle 9's former depth. Changed bottle 8 and 9's quality code to good.

Station 16, btls. 3, 8 and 9	Changed trip depth of bottle 3 to reflect bottle 3 double tripped with bottle 2 and no bottle tripped at bottle 3's former depth. Changed bottle 3's quality code to good.
Station 17, btl. 8	Trip depth unresolved, flagged quality code of salt, oxygen and nutrients as questionable.
Station 19, btls. 5 and 6	Changed trip depths of bottles 5 and 6 to reflect no bottle tripped at bottle 5's former depth, bottle 5 tripped at bottle 6's former depth and bottle 6 double tripped with bottle 7 at bottle 7's depth. Changed bottle 5 and 6's quality code to good.
Station 31, btl. 6	Changed nutrient data quality code to good. Nutrient data analyzer, Joe Jennings will review change.
Station 32	All salinity quality codes changed to questionable. Salinity analyzer, George Knapp did not find any reason to explain bad station data. There was no shift in the salinometer standby number.
Station 41, btls. 3 and 4	Bottle 3 salinity flagged as questionable. Bottle 4 salinity and oxygen flagged as bad.
Station 55, btl. 32	Oxygen analyzer, George Knapp remembers bottle 32 did indeed have an extremely high oxygen measurement. One wild guess is perhaps the iodine measured in the titration had been increased due to the ink of a squid?!
Station 64, btl. 21	Coincidence perhaps, probably not a typo, in any case bottle 21 quality code left as bad.
Stations 73 and 74	Instrument test stations only, not included in data set.
Station 79, 1964db	Sample lost in analyses, quality code changed to 5 (not reported).
Station 80, btl. 24	No mix-up found and unlikely a typo. Bottle 24 quality code left as bad.
Station 81, btls. 7 and 8	Quality code of all nutrients for bottles 7 and 8 were changed to questionable. Nutrient analyzer, Joe Jennings will review this change.
Station 89, btl. 20:	Oxygen quality code changed to questionable. Quality code of deep silica's were changed to good. Nutrient analyzer, Joe Jennings will review this change.
Station 90, btls. 35 and 36:	Agree, that likely two surface salinity samples had been interchanged. No explanation found, so samples were not swapped, quality code was changed to questionable and CTD salinity quality code was changed to good.
Station 95:	Left trip depths as they were and changed quality code of oxygen and nutrient data to questionable.
Station 97, btl.29:	Salinity typo corrected, both salinity and CTD salinity quality codes were set as good.

Station 101, btl.22 at 90m:	Changed trip depth to reflect bottle 22 double tripped with bottle 23 at bottle 23's depth. Changed quality code to good.
Station 104, btls. 10, 11:	Changed bottle 10 and 11's quality code to bad.
Station 113, btl. 19:	Original records show bottle was meant to trip at a depth near 250db. Changed trip depth, temperature, theta, CTD salt and CTD oxygen, to match original trip depth data. Changed quality code to good.
Station 143, btl. 8:	Original records show bottle was meant to trip at a depth 3967db. Changed trip depth, temperature, theta, CTD salt and CTD oxygen, to match original trip depth data. Changed quality code to good.
Station 145, btl. 13:	Changed bottle 13 trip depth to reflect bottle 13 and 14 double tripped at bottle 14's depth. Changed quality code to good.
Station 147, btl. 8:	Original records show bottle was meant to trip at a depth 4039db. Changed trip depth, temperature, theta, CTD salt and CTD oxygen, to match original trip depth data. Changed quality code to good.
Station 148, btls. 11 and 12:	Changed trip depth of bottles 11 and 12 to reflect bottle 11 double tripped with bottle 10 at bottle 10's depth and bottle 12 tripped at bottle 11's former depth. Changed quality code to good.
Station 149, btl. 13:	Changed trip depth of bottle 13 to reflect bottle 13 double tripped with bottle 14 at bottle 14's depth. Changed quality code of salinity to good but oxygen quality code left as questionable.
Station 195, btl. 31:	Changed trip depth of bottle 31 to reflect bottle 31 double tripped with bottle 32 at bottle 32's depth. Changed quality code to good.
Station 229, PO4s:	Changed PO4s quality code to questionable for all observations below 900db. Nutrient analyzer, Joe Jennings will review this change.
Station 236, btls. 30 and 31 at 400 and 301db:	Changed trip depth of bottle 31 to reflect bottle 31 double tripped with bottle 30 at bottle 30's depth. Changed quality code to good.
Station 238, PO4s:	Nutrient analyzer, Joe Jennings will review.
Stations 248 thru 267:	Stations are along cruise track and are considered part of the data set.

G.7. PI Response to CTD DQE

(DQE Neil White reviewed the CTD calibrations)

Units:
The proper temperature and oxygen units have been converted by the WOCE office.

Leg 3 shallow oxygen:
Did not filter nor flag as questionable. The problem with the CTD oxygen and the surface spikes are described in the notes.

Temperature calibration:
Information about the temperature standard's accuracy used in the calibration has been added.

Deep Salinity Fits	
Station 32	Discrepancy due to bottles that were questionable, did not change the CTD data.
Station 44	CTD data theta-salinity plots overlaid stations 41, 42 and was only .001psu fresher than station 45. Did not change CTD data.
Station 101	Changed CTD salinity by +.001psu. Desired good match at 2łC theta with surrounding stations.
Station 114	Discrepancy due to bottles that were questionable, did not change the CTD data.
Station 120	Discrepancy due to bottles that were questionable, did not change the CTD data.
Station 121	Discrepancy due to bottles that were questionable, did not change the CTD data.
Station 122	Changed CTD salinity by -.002psu. Original fix of +.004psu had been too much.
Deep Oxygen Fits	
Stations 17 and 18	Refit the CTD oxygen below 1500 db.
Stations 81 and 83	Bottom CTD oxygen quality code changed to questionable or bad.
Station 116	Discrepancy due to bottles that were questionable, did not change the CTD data.
Station 119	Refit the CTD oxygen below 3000 db.
Station 126	Bottle flagged as questionable. CTD oxygen was not changed.
Stations 131, 137- 149, 155- 161, 164-170, 173-178, 234-237	All of these stations had problems with deep oxygen fits. Refit the CTD oxygen below 3000 db for not just these stations but the whole group from 131 through 178 and 232 through 240. The CTD oxygen data from the new fit was put into the existing file replacing the existing deep CTD oxygen. The new and old oxygen were blended +/- 50 db around the transition point

	(usually 3000 db) to keep the profile smooth as it changed from the existing oxygen to the new oxygen. The new fits look good. Even after this second fit though, station 175 CTD oxygen below 5500 db did not look good, so its quality code below 5500db was changed to bad.
Shallow Salinity Fits	
Station 9	CTD salinity at 66db and next observation deeper quality codes changed to bad.
Station 88	CTD salinity quality code changed to questionable.
Station 90	Did not interchange bottle samples, left quality code as questionable.
Station 97	Changed quality code of bottle salinity at 156 db to questionable.
Station 142	CTD trip depths changed. Bottle 33 changed from closing at 160 db to closing at 111db. Bottle 34 changed from closing at 111db to 62db. Bottle 35 changed from closing at 62 db to 22 db. Bottle 36 did not close.
Station 155	Changed quality code of CTD salinity at 111 db to questionable.
Station 174	Changed quality code of bottle salinity and oxygen at 110 db to questionable.
Station 177	Changed quality code of CTD salinity at 159 db to bad.
Station 222	Changed quality code of CTD salinity at 305 db to questionable.
Station 226	Changed quality code of CTD salinity at 297 db to questionable.
Station 241	Changed quality code of CTD salinity to questionable and bad for observa-tions at bottles 17, 18 and 19.
Shallow Oxygen Fits	
Leg 3 shallow oxygen:	
Did not filter nor flag as questionable. The problem with the CTD oxygen and the surface spikes are described in the notes.	
Station 80	Changed quality code of bottle oxygen at 634 db to questionable.
Station 119	Changed quality code of bottle oxygen at 60 db to questionable.
Station 160	Changed quality code of CTD oxygen at 160 db to questionable and at 111 db to bad.
Station 171 through 177	For stations 171 through 174, CTD oxygen was refit for better fit 0 to 3000 db. Used separate deep water fit for scaling data 3000 db to bottom. For stations 175 through 178, corrected typo in oxygen current bias scaling term and rescaled data.
Station 186	Changed quality code of CTD oxygen at 207 db to questionable.
Station 232	Changed quality code of CTD oxygen at 15 db to bad. Did not change fit.
Station 238	Changed quality code of CTD oxygen at 20 db and 160 db to questionable. Did not change fit.

Minor Problems

Record counts in *.CTD file headers were changed to accurately state how many records were in the file.

Interpolations corrected.

Main problem appeared to be the discrepancy of what interpolationswere recorded in the station by station notes and what wasactually done, recorded in the list of interpolations madeto CTD data. Problems the DQE noted were corrected andfurther discrepancies found were corrected.

H. Notes on the KNORR analytical lab

1. Temperature stability: There is a separate thermostat for the analytical lab and it does work; however the tolerance seems too wide. We recorded the temperature continuously for several days and the thermostat cycle has an amplitude of about 3 degrees C with a period of about 30 minutes. Closing the after door to the lab did not noticeably change the period or amplitude. (There is a plastic draft barrier on the after door which has been in place continuously). The mean temperature for the past two months has been around 23 C, but there have been brief periods when the temperature has climbed to 27 degrees.

2. Power: There were several complete power failures on the "clean power" circuit during P6 legs 1 and 2. We also suspect, but cannot verify, that power fluctuations contributed to the failure of two DC boards in the RFA during leg 2. I would strongly recommend the use of UPS systems and/or line conditioners for all computers and other sensitive equipment.

3. Water quality: The ship's tap water is frequently discolored, presumably by iron. We compared the tap water with water directly from the evaporators and directly from the RO system. The tap water had almost 0.4 micromolar phosphate, about 7 micromolar silicate, and negligible nitrate and nitrite. The RO water was better than tap, but still had measurable phosphate and silicate. The evaporator product was almost indistinguishable from our demonized water (DIW), so we decided to use it as our feed water for the deionizer. This has meant filling several 5 gallon carboys at the rear of the main lab every few days and pumping these through the deionizer as required to fill our 10 liter DIW reservoir. If a clean water line were run directly into the analytical lab, it would be much more convenient. This should be a simple matter as there is a supply of evaporator water to the main lab already. There is a small deionizer installed in the after corner of the main lab. It does not seem to be connected to a water supply, and I don't know which institution it belongs to. I would not rely on it for demonized water.

4. Space: We have used the forward bench for the nutrient analyzer, stripchart recorders, and a small data acquisition computer. The forward inboard bench has our data processing computer, printer, and plotter. The fold-down after inboard bench is desk height and has been great for reading stripcharts and general paperwork. I don't know how much weight it will bear. The after bench has a space 44 inches wide and about 30 inches deep next to the fume hood which could accommodate additional equipment. We have used the entire outboard bench with it's sink for sample handling and reagent preparation, but this area could easily be shared.

Joe Jennings, R/V KNORR, 7/25/92

Appendices

Appendix A: Station positions and summary
(not available at time of last update)

Appendix B: Comments regarding CTD data acquisition:

Leg3:

Aqui89 troubles from the start of leg3. Code got corrupted and was scrambling the last three parameters (TP,TR,RT). Plotting of extra variables and derived parameters was demonic. Test station 999 and 998, and station 1 were acquired with this corrupt code. A backup AQUI89 tape from July 1991 was restored to the microvax and station 2 was acquired with this code. Data clean. Plotting spikes for TE variable. Station 1 was replayed from microvax rental, stations 11-17.

Test station 999 supplied too much power to fish, noise at bottom when firing. Switched to battery, powered off lambda. Pressure spikes apparent test station 998. Believed to be from pinger. Station 1 and 2 were deployed with no pinger to test this hypothesis. Verified. Pinger moved on rosette frame prior to station3, no spikes.

Triple cast in Chilean trench. Station 1-ctd No. 10, station 2-ctd No. 7, station 3-ctd No. 9. Decided to go with ctd 10. Ctd 7 bad oxy sensor, cond noisy deep water. Ctd 9 equally as good as 10 but consensus was to use 10 because of oxy pump. Ctd 10 showed some cond hysteresis at theta of 2.3-2.8 deg on co vs te plots but t/s showed no up/down differences. Bob said diff in co attributed to diff in pressure. Up/down different by 30dbar.

Replaced Oxygen sensor on ctd10 prior to station 4.

Power outages and total blackout prior to station 8. CTD02 and CTD03 both crashed. Early on, CTD03 had repeated crashes, at start of cruise and in port in Jacksonville. Thought to be UPS, power or ethernet related, one user logged off "mike" ship's ethernet at the same time during one crash. Cause indeterminant. Noticed aqui record tags off by 50 dbars from deck unit readout on station logs. Changed average number of scans in template file from 5 to 1 station 9 to no avail. Aqui tags were always higher than deck unit readouts, indicating that the system was somewhat slow, lagging behind the current scan. Quick fix: tagged 1 min after firing. Worked okay. Logged to CTD04 (latest version of P6 code that was corrupt on CTD03) stations 11-17 to compare bottle tag files. CTD04 tag files were right on the mark, and furthermore, the last 3 channels were not scrambled.

CTD03 crashed stations 12, cast 1. Restarted aqui cast 2. CTD03 crashed again station 13, but logging to CTD04 so didn't restart CTD03 again. Crashes seemed to indicate ethernet problems. User logged out from "mike" on ctd02 station 12 at exactly same time ctd03 lost connection. Coincidence? Tagging offset also suggested that ethernet was perhaps slowing the system down. Decided to disconnect from ship's ethernet and create own ctd network.

Restored P6 AQUI89 code on CTD03 on 6 May and acquired station 14 with the same code. Ctd04 logging in tandem as backup still. Station 14 was clean and tag files were right on the mark. Aqui plotting code relinked and recompiled May 8. Seemed last fix to software had bug in it, so went back to plotting code just prior to last fix. Aqui89 code modified May 12 to add extra column in redt temp field in .WRW tag file to avoid integer overflow.

Station 17, CTD03 crashed again. Likely culprits: HE/TRitium van or NUTS ethernet cables, or UPS/ship power problem. He/Tr van was not working when hooked up through hydrovan to ctd network to ships network. Disconnected He/Tr cable, wired directly to ship and ethernet working fine. Thought He/Tr and hydrovan had an interrupt or board conflict.

Winch failed station 21 3500 m on upcast. Only 3 bottles fired. Brake froze.

CTD sat 500 m off bottom for 5-6 hours before got working again. Switched over to markey winch station 22.

After record tags editted manually and templates distributed, discovered numerous double tripping of bottles. Just about every station through station 22. Changed pylons prior to station 23 which proved successful.

Station 27 new co slope. Markey winch failed 700 m upcast station 27. Cast aborted. CTD had to be brought on deck manually. Switched back to first winch. Required second person to manually operate brake.

After recovery on station 28, CTD endcap opened. Seacon 4 pin bulkhead connectors replaced. Aqui locked up station 30 for about 2 minutes, no data written to tape. Station 31 CTD03 threatened to lose connection to cluster (ctd02) again. Immediately disconnected Nuts ethernet cable and regained instantaneous connection. Decided to disconnect NUTs cable and hook up only during steaming. Days later, replaced Nuts cable with a different cable. Hydrovan could not log in when this cable was connected. NUTS ethernet address in conflict with one on ship in SSG group. Changed name and address. Should not have been the cause of crashes since no conflict with ctd network. Days later, can have both nuts and hydrovan on net with no conflicts. It was believed at end of leg3 that He/Tr van had a bad cable.

New pinger station 36.

Swapped redt temp modules station 59.

New pressure temperature cals ctd 10. Revised aqui template station 60. Also cleaned conductivity cell with HCl prior to station 60.

Watch forgot to increase seacableI to 470ma on downcast start station 61 until approx 500 m down. Oxygen erroneous and erratic first 500 m. entire cast. Winch troubles again station 63. Flipped circuit breaker, power restored. Restart cast 2 at 10m. Lost power one more time before cast completed.

Error writing to 9-track station 65. Did a stop_watch, logger hung. Tried to force and restart several times with no success. Killed grabber, rexecuted sysmgr commands and restarted aqui, cast 2. Tape and disk okay, but no header file on disk. Same error to 9-track station 69. CTD_LOG in RWMBX state, can't force or stop_aqui, only stop/id works.

Test rebuilt markey winch station 69. Turn off oxygen pump station 70. Pump flow facing up on last two station 71 & 72. Oxygen noisy, as on station 70. Rotate back to face down on Leg4.

Bottom (PDR) depth vs pressure discrepancies: station 11,23,36,38, 43,45,47,56, 57,67. 56 & 57 drifting over slope, false bottom readings? Trouble with 9-track last two stations. End of leg3, during swim call, UPS's went on alarm, all 3 systems crashed. Believe 9-track troubles might have to do with power.

Leg4:

Surge supressor on aqui 9-track. CTD02 and CTD03 on UPS on clean power. Repacked hard disk dua4 for acquisition.

Reoriented oxygen pump outtake on ctd10 to face down.

Double cast station 73 (ctd 7) and 74 (ctd 10) in same position as station 72 on leg3. Attempted to first deploy ctd 9 at station 73, fatal failure. Troubleshot to power supply board. CTD 7 deployed with old oxy sensor (bad). Conductivity still looks noisy as compared to ctd 10 and ctd 9. Slight hysteresis in deep water t/s plot. CTD 10, station 74, lowered with not enough current to fish. Data noisy. Cond appears to be offset, oxygen looks offset and has different shape. Omit these two station 73 & 74 from final ctd data set. Record tag data erroneous scans station 74.

Became apparent ctd 10, 9, and 7 wired differently. Transmiss ometer cable different for each instrument.

Fatal failure ctd 10 prior to station 76. Switched over to ctd 9 with new power supply board and no oxy pump. Scot touched case and got zapped, ctd underwater cable bunged up. Replaced with new one. Signal still noisy. Ground lug on termination broke off (corrosion), and had to be replaced. Finally deployed ctd 9. Interference on upcast when firing bottles. PHANTOM problem -comes and goes.

Upon examination, sea cable bulkhead connector corroded ctd 10. Salt deposits found at both end caps. Battery pack shot with salt and corrosion. High voltage pin had corroded from getting wet because non-watertight plug was used for charging between stations on leg3. Epoxy connector broke down and water wicked in thru the pin. Had been going on for a while on leg3. Just got lucky that ctd 10 lasted through leg3. Took out battery pack and dc-dc regulator. Removed battery fuse (not needed anyway because separate conductors for ctd and rosette). Oxy pump board burnt. Power converter died. Need replacement. Jeff rigged up transistor circuit to replace orginal power converter, but 10 was rushed back into service before he could get the pump board fully checked and installed.

Station 78, switched over to battery for power supply to fish to try and eliminate interference problem (ctd 9) but battery died on upcast. As a result, upcast poor data quality esp last 12 bottles, ie 600 m.

Winch died 1880m downcast station 79. Gap in data. Need to ctlog CU mode back at clark 1880-2100m.

Switch over to markey winch station 86. Upon recabling to second termination, ctd 9 redt temp out. Disconnected and when plugged back in, oxy sensor failed. Deployed CTD 10 in its place. Later, when ctd 9 powered up in wet lab, all checked okay. DIED again a few days later. Further examination revealed inept wiring, poor soldering (shoddy workmanship). Replaced sign gen and adaptive sampling boards. Power still flaky. Checked voltages and found that sometimes the 6V from ctd power supply was drooping because of excessive loading effects. Both the 2 channel digitizer and the otm board use this 6V along with the ctd comparator and adaptive sampling. Since this regulator current limited to 40 mA, it really doesn’t have enough poke to handle the load. Fix was to take the 5V regulator on the OTM board (which uses the 6V as input) and run it from the 12V regulator located on the same (otm) board, instead of the ctd 6V power supply. Now ctd 9 running like a champ. Ctds seem to be right on the margin of being overloaded in terms of power. If put ctd 7’s otm card in place of 9’s (before the fix), ctd 9 would work. Implies juice marginally available, ctd highly sensitive to minor fluctuations.

CTD 10 looking better Leg4 than leg3. Conductivity more consistent. Oxygens fitting much better without pump. Leg3, oxygen noisy 1st 400 m with pump. Also, hard to fit oxygens at oxy mins and maxes and in deep water on leg3. Not sure whether problems related to ctd going south, or problem with pumping mechanism, or simply because gradients much sharper on leg3 than

Leg4

Vaxes crashed station 91, last record tag. Open data files aqui. Replay from audio. Engineer checked clean power with scope, believes one of lines has contaminated ground.

STA 95,97-99 offset bottle data. Changed pylons and rosette firing units prior to station 102. Cond shift ctd between station 102 and 103.

Inner rosette fired first station 108-111,113-114.

Upon recovery station 110 (rough seas), package hit hull before top ring on package finally hooked with pole. As package brought on deck, air tugger bent frame (top ring) and deformed it. Vertical bars a nightmare.

Station 112 deployed with ctd No. 9 using 24 bottle rosette. No transmissometer, no room for it on package. Oxygen failure on downcast. Conductivity noisy bottom of downcast, failure after 1st bottle on upcast. Numerous leakers. Salts poor, oxygens horrendous. Overall, station almost a complete loss. Upon examination, ctd 9 showed sensor head flooded with water. Sensor head rotated prior to deployment to accomodate new package. Further examination revealed that No. 9 tty fsk board wired to wrong pin. Couldn’t just swap out boards between instruments. Miracle any data was ever collected with this instrument! CTD 9 back on line 6/17/1992.

Upon recovery station 113, ship took roll at 40 m on upcast. Tow line got caught in propeller. Blocks hit boom and broke off. Vertical bars now almost impossible to put in place. Wire also came up with a kink in it. New termination prior to station 114. Upon recovery of station 114, cable came up with new kink.

Vertical bars taken off rosette package station 115. Replaced with 2 horizontal bars at bottom of package.

New top plate on pylon prior to station 116.

Due to inclement weather and decreased ship speed (40-45 knot winds, ship cruising speed of 3 knots) and down time for hardware problems, spacing between stations increased from 40-50 nm after station 116.

Swapped back in 36 bottle rosette deck unit prior to station 120. Previous unit (scripps) had message on grate saying problems with firing.

Power outage, vaxes brought down 6/16/92 for one hour. Back on line for station 121.
Co shift ctd station 121.

New termination prior to station 122. 3rd horizontal bar also put on package.

CTD02 CRASHED 6/17/92, after recovery station 122.

6/17/92- ship on two engines, speed to station increased to 11 to 12 knots.

6/17/92 discovered that just 15 min prior to previous day's power outage, hydrovan got shift in salts (fresh) while running autosal. Reran afterwards, same samples now saltier. Apparently, autosal hooked up on 440 transformer (unreg power) with no UPS or surge protection. Will hook up to clean power and run off BEST UPS in helium van. Accounts for repeated shifts in salts and scatter for both legs3 and 4. STA 124 SWAPPED OUT AUTOSALS. Using autosal No. 10. Bath was leaking, had to be taken apart and reglued before using.

T/S anomoly starting at station 128. Saltier in deep water. Markey winch station 133. Lost power to winch during cast 3-4 times.

Switched back to AB Johnson winch station 134.

Vaxes crashed on downcast 700m off bottom station 136. Plugged terminal into UPS on aqui, powered off and completely shut off UPS and power to ctd03. Minutes later, ctd02 crashed. Rebooted systems, logged rest of station as cast 2. Replayed downcast from VCR tape. 9-track went offline, error msg, manually put online and logging resumed.

Touched bottom station 137. Muddy water seeped out of frame upon recovery. Wire came up with two kinks. Cond shifted station 138.

Winch failed at bottom of downcast station 139. CTD package dragged on bottom until ship increased speed to increase wire angle.

Increased ship speed (12-13 knots) and increased speed at haulback of ctd (80 m/min) warranted changing station spacing to 40 nm again after station 139, until mooring line.

Station 141 (ctd No. 9) and 142 (ctd No. 10) double cast. Test resurrected ctd No.9. Performed like a champ. Funny oxy blip. New 24 bottle pylon station 141 to try and alleviate non-confirmations for bottles 11 & 12.

Kinks in wire warranted new termination station 145.

Took vaxes off UPS to reset from home to generator mode. Widened frequency window. Systems back on UPS station 148.

Hangar hoist repaired prior to station 150. Upon recovery of station 149, control handle cable pulled out, lead disconnected. Had to Reengage strain release boot. After switching pylons at station 141, became evident 24 bottle rosette double tripping. Swapped out 24 bottle pylon back to original. Replaced bulkhead connector. No more double trips.

Station 156, error logging to 9-track. Log upcast as cast 2. Upon recovery, found cable between ctd and rosette caught in bottle 35. Ok.

Disable transmissometer station 156-179, spec'd out to only 5500 m.

Power failure prior to station 157. Ctd lifted off deck. 9-track offline. Brought ctd back to deck. Stopped aqui. Power outage. Systems stayed up on UPS. Power came back on, restarted station. Believe power to have been cause of problem (9-track going offline) on station 156. 9-track has narrower window of frequency operation than UPS's.

Spikes at 2100,4400,5500 dbars station 156-167 on down and up cast. Erroneous tags in .wrw file. Cable appears to be cause.

Prior to station 168, swapped ctd signal and 12 bottle pylon conductors. No more spikes, data clean.

Kermadec Trench station 174-175. CTD taken down to approx 6900 dbars. CTD pressure transducer maxed out at 6553.5 dbars. Spike in co, te, and ox at bottom. Pressure for last two rec tags estimated from wire out. Could be off by 15 dbars.

Prior to station 179, took out large air bubble in ctd 10 oxy sensor. Refilled with oil.

Transmissometer on again station 180.

Station 182 EAST longitude.

Fired inner rosette first station 183,185,188.

AQUI89 mag tapes recorded on low density (800 bpi) station 185 & 186.

Double cast station 187 (ctd 9) and station 188 (ctd 10). Station 187 had another funny oxy blip similar to 141. Could not fit ctd oxygen to bottle oxygen station 187. Recommend new oxy sensor if ctd 9 used on leg5. Conductivity looks fine.

At end of leg4, rosette troubles. Getting confirmed firings but pins not releasing because sticking due to salt deposit buildup. Pylon was not being lubricated regularly. Sprayed liberally with CRC station 185. Bottles 23 & 24 not confirming. Believe cause is harness plug. Pete will replace prior to leg5.

Realigned motor housing on two backup pylons, now ready to go if need be.

Leg5:

At dock in Aukland, the DEC software Licenses expired. This killed things like mail (critically necessary for AQUI), fortran compilers, and communications (ftp and telnet). Appearantly the microvaxes were shipped before the current license upgrade got to WHOI, so were not upgraded.... Tom B. Warren and Cyndy all assisted with sending along the appropriate fixes. thank god for Fax & telex. Necessary operations were back up before leaving Aukland at 1600 July 13 (but it was close). Stations 189 & 190 were repeats ot 187 & 188 at the end of leg4. 187 and 189 were with ctd 9, 188 and] 190 were with ctd10. Ctd10 still looks fine, so will continue to use with no modifications.

Stn 201 Crashed CTD (60m/min) because missed a wrap on the pdr. The only obvious problem was that the bolts securing the ctd to the frame had sheared, and the ctd itself was loose on recovery. Swapped to the other winch while reterminating, but just as got the fish in the water the power went off on the winch, and so had to wait for Peter to reterminate. Post crash nums look pretty good. There's a slight salinity shift in the deep water, that John thinks is due to conductivity shift, not temperature. (the FSI ctd's temp offset is what is was precrash)

BOTTOM CONTACT:
Station 137,139 : 201,252 PROBLEM STATIONS: Tag files station 74, 78 & 112. Power low, erroneous tags. Recreated from raw downcast data. Downcast 1800-2100 station 79 due to winch failure. Need to ctlog cu mode cut and paste. Station 112- no oxy downcast. Cond noisy end of downcast, failed on upcast. Sensor head flooded. No bottle data station 141 test ctd 9. Could not calibrate oxygens. Test ctd 9 again station 187. Could not fit ctd oxy to bottle oxygens.

193 - has a very spiky 1st record that cannot be removed with ctded78. tried upping the pmin, and recmin, and in both cases the 1st recore remained, and the second record changed.

215 & 228 HAD SAM SPIKE AT THE BEGINNING AS 193. all were fixed by using ctlog to copy records X to Y of the file to 9-track, then ctded-ing 1,y-x from the 9-track.

246 had an GNXTR error and would not read at all in plt78, so couldn't even find the record limits. Reprocessed to disk from audio, and then worked OK.

Appendix C: Summary of fits to the CTD laboratory pressure data

CTD 10
PRESSURE
PRECRUISE FIT CTD10

LABFIT: FHBIAS,Pslope
0.00000000E-01 0.10000000
MEAN CCR= ???????????? PRS ROOM TEMP= 22.70
PROGRAM VERSION RUSCAL 910316
DISK FILE = 10mr92pr.cal
VARIABLE=PRESSURE
19 DATA POINTS ORDER OF POLY 2
POLY COEF =-.246449E+00 0.100352E+00 -.294565E-08

	INSTRUMENT	OBSERVED	CALCULATED	DIFFERENCE
1	1.80000	0.120000	-0.065816	0.185816
2	7283.40	730.609985	730.498962	0.111012
3	14156.4	1419.780030	1419.782230	-0.002208
4	21029.4	2109.010010	2108.787110	0.223012
5	27905.8	2798.260010	2797.854740	0.405385
6	34783.2	3487.540040	3486.743410	0.796742
7	41668.4	4176.810060	4176.134280	0.675649
8	48559.6	4866.129880	4865.846190	0.283559
9	55450.4	5555.439940	5555.238770	0.201039
10	62343.6	6244.799800	6244.591310	0.208363
11	55457.6	5555.439940	5555.958980	-0.519176
12	48568.6	4866.129880	4866.747070	-0.617320
13	41680.2	4176.810060	4177.315430	-0.505504
14	34793.0	3487.540040	3487.724850	-0.184703
15	27912.2	2798.260010	2798.495850	-0.235728
16	21037.0	2109.010010	2109.549070	-0.538951
17	14159.6	1419.780030	1420.103030	-0.323009
18	7287.00	730.609985	730.860046	-0.250072
19	2.80000	0.120000	0.034535	0.085465
MEAN DEVIATION = -0.329794E-04				
STANDARD DEVIATION = 0.406677E+00				

PRESSURE
POSTCRUISE FIT CTD10

LABFIT: FHBIAS,Pslope
0.00000000E-01 0.10000000
MEAN CCR= ???????????? PRS ROOM TEMP= 21.40
PROGRAM VERSION RUSCAL 910316
DISK FILE = 10se92pr.cal
VARIABLE=PRESSURE
21 DATA POINTS ORDER OF POLY 2
POLY COEF =-.139633E+01 0.100309E+00 -.251698E-08

	INSTRUMENT	OBSERVED	CALCULATED	DIFFERENCE
1	8.80000	0.060000	-0.513614	0.573614
2	3859.40	385.940002	385.697021	0.242978
3	7298.40	730.559998	730.561646	-0.001620
4	14171.8	1419.729980	1419.651000	0.078946
5	21047.0	2108.969970	2108.683110	0.286954
6	27925.0	2798.239990	2797.757570	0.482510
7	34805.0	3487.520020	3486.794190	0.725919
8	41692.0	4176.799800	4176.292970	0.506680
9	48582.8	4866.120120	4865.933110	0.186856
10	55473.4	5555.450200	5555.314940	0.135098
11	62368.0	6244.810060	6244.856930	-0.047031
12	55474.6	5555.450200	5555.434570	0.015469
13	48590.2	4866.120120	4866.673830	-0.553867
14	41702.6	4176.799800	4177.353520	-0.553867
15	34814.4	3487.520020	3487.735350	-0.215243
16	27932.8	2798.239990	2798.538820	-0.298740
17	21053.0	2108.969970	2109.284180	-0.314120
18	14176.2	1419.729980	1420.092040	-0.362094
19	7303.00	730.559998	731.022888	-0.462863
20	3865.80	385.940002	386.338867	-0.398868
21	14.8000	0.060000	0.088237	-0.028237
MEAN DEVIATION = -0.726130E-04				
STANDARD DEVIATION = 0.380907E+00				

PRESSURE
COMBINATION FIT CTD10 (FINAL FIT)

LABFIT: FHBIAS,Pslope
0.00000000E-01 0.10000000
MEAN CCR= ???????????? PRS ROOM TEMP= 22.70
PROGRAM VERSION RUSCAL 910316
DISK FILE = pr10bc.cal
VARIABLE=PRESSURE
40 DATA POINTS ORDER OF POLY 2
POLY COEF =-.436677E+00 0.100333E+00 -.276775E-08

	INSTRUMENT	OBSERVED	CALCULATED	DIFFERENCE
1	1.20000	0.120000	-0.316277	0.436277
2	7282.80	730.609985	730.122681	0.487275
3	14155.8	1419.780030	1419.304570	0.475495
4	21028.8	2109.010010	2108.224610	0.785309
5	27905.2	2798.260010	2797.224120	1.035798
6	34782.6	3487.540040	3486.062010	1.477937
7	41667.8	4176.810060	4175.418950	1.391267
8	48559.0	4866.129880	4865.114260	1.015778
9	55449.8	5555.439940	5554.506350	0.933747
10	62343.0	6244.799800	6243.874510	0.925446
11	55457.0	5555.439940	5555.226070	0.214020
12	48568.0	4866.129880	4866.014160	0.115876
13	41679.6	4176.810060	4176.600100	0.210114
14	34792.4	3487.540040	3487.043460	0.496491
15	27911.6	2798.260010	2797.865480	0.394440
16	21036.4	2109.010010	2108.986330	0.023591
17	14159.0	1419.780030	1419.625370	0.154694
18	7286.40	730.609985	730.483704	0.126252
19	2.20000	0.120000	-0.215944	0.335944
20	0.600000	0.060000	-0.376477	0.436477
21	3851.20	385.940002	385.925262	0.014741
22	7290.20	730.559998	730.864868	-0.304900
23	14163.6	1419.729980	1420.086550	-0.356536
24	21038.8	2108.969970	2109.226810	-0.256927
25	27916.8	2798.239990	2798.386230	-0.146331
26	34796.8	3487.520020	3487.483890	0.036042
27	41683.8	4176.799800	4177.020510	-0.220550
28	48574.6	4866.120120	4866.674800	-0.554534
29	55465.2	5555.450200	5556.046390	-0.596038
30	62359.8	6244.810060	6245.555180	-0.744964
31	55466.4	5555.450200	5556.166500	-0.716155
32	48582.0	4866.120120	4867.415530	-1.295257

33	41694.4	4176.799800	4178.082030	-1.282073
34	34806.2	3487.520020	3488.425540	-0.905608
35	27924.6	2798.239990	2799.167720	-0.927825
36	21044.8	2108.969970	2109.828120	-0.858245
37	14168.0	1419.729980	1420.527710	-0.797698
38	7294.80	730.559998	731.326172	-0.766204
39	3857.60	385.940002	386.567261	-0.627258
40	6.60000	0.060000	0.225522	-0.165522
MEAN DEVIATION = 0.957400E-05				
STANDARD DEVIATION = 0.707909E+00				

CTD 9
PRESSURE
PRECRUISE FIT CTD9

LABFIT: FHBIAS,Pslope
0.00000000E-01 0.10000000
MEAN CCR= 0.000000E+00 PRS ROOM TEMP= 20.80
PROGRAM VERSION RUSCAL 910316
DISK FILE = 9MR92PR.cal
VARIABLE=PRESSURE
19 DATA POINTS ORDER OF POLY 2
POLY COEF =0.450652E+00 0.100557E+00 0.297377E-09

	INSTRUMENT	OBSERVED	CALCULATED	DIFFERENCE
1	-6.00000	0.090000	-0.152691	0.242691
2	7256.00	730.590027	730.108582	0.481416
3	14108.8	1419.770020	1419.249880	0.520173
4	20962.0	2109.010010	2108.459470	0.550569
5	27815.0	2798.280030	2797.676510	0.603547
6	34668.4	3487.570070	3486.961910	0.608186
7	41521.4	4176.850100	4176.235350	0.614778
8	48378.6	4866.189940	4865.958500	0.231477
9	55231.2	5555.509770	5555.247070	0.262727
10	62088.4	6244.879880	6245.026370	-0.146453
11	55236.2	5555.509770	5555.750000	-0.240203
12	48382.6	4866.189940	4866.360840	-0.170867
13	41531.0	4176.850100	4177.200680	-0.350554
14	34680.4	3487.570070	3488.168700	-0.598601
15	27825.6	2798.280030	2798.742680	-0.462615
16	20977.8	2109.010010	2110.048340	-1.038299
17	14119.8	1419.770020	1420.356200	-0.586150
18	7264.40	730.590027	730.953308	-0.363311
19	-2.00000	0.090000	0.249538	-0.159538
MEAN DEVIATION = -0.541398E-04				
STANDARD DEVIATION = 0.498984E+00				

PRESSURE
POSTCRUISE FIT CTD9

LABFIT: FHBIAS,Pslope
0.00000000E-01 0.10000000
MEAN CCR= ???????????? PRS ROOM TEMP= 22.00
PROGRAM VERSION RUSCAL 910316
DISK FILE = C9SE92PR.cal
VARIABLE=PRESSURE
21 DATA POINTS ORDER OF POLY 2
POLY COEF =0.365801E+01 0.100568E+00 0.405269E-09

	INSTRUMENT	OBSERVED	CALCULATED	DIFFERENCE
1	-40.0000	0.040000	-0.364729	0.404729
2	3797.60	385.920013	385.582794	0.337229
3	7225.00	730.539978	730.286560	0.253428
4	14076.4	1419.709960	1419.380620	0.329295
5	20927.2	2108.949950	2108.452390	0.497508
6	27778.2	2798.209960	2797.582520	0.627390
7	34630.0	3487.489990	3486.831050	0.658885
8	41480.6	4176.770020	4175.997070	0.773142
9	48337.2	4866.100100	4865.804690	0.295603
10	55190.8	5555.419920	5555.348630	0.071482
11	62044.0	6244.779790	6244.890140	-0.110158
12	55192.2	5555.419920	5555.489750	-0.069631
13	48343.6	4866.100100	4866.448240	-0.347951
14	41493.2	4176.770020	4177.264650	-0.494436
15	34641.6	3487.489990	3487.997560	-0.507619
16	27791.4	2798.209960	2798.910160	-0.700246
17	20937.0	2108.949950	2109.438230	-0.488332
18	14085.8	1419.709960	1420.326050	-0.616140
19	7232.40	730.539978	731.030823	-0.490835
20	3804.20	385.920013	386.246582	-0.326559
21	-35.0000	0.040000	0.138113	-0.098113
MEAN DEVIATION = -0.633136E-04				
STANDARD DEVIATION = 0.464840E+00				

PRESSURE
COMBINATION FIT CTD9 (FINAL FIT)

LABFIT: FHBIAS,Pslope
0.00000000E-01 0.10000000
MEAN CCR= ???????????? PRS ROOM TEMP= 20.80
PROGRAM VERSION RUSCAL 910316
DISK FILE = pr9bc.cal
VARIABLE=PRESSURE
40 DATA POINTS ORDER OF POLY 2
POLY COEF =-.338764E+00 0.100564E+00 0.338159E-09

	INSTRUMENT	OBSERVED	CALCULATED	DIFFERENCE
1	0.900000	0.090000	-0.248257	0.338257
2	7262.90	730.590027	730.064148	0.525898
3	14115.7	1419.770020	1419.257450	0.512592
4	20968.9	2109.010010	2108.522710	0.487202
5	27821.9	2798.280030	2797.799560	0.480366
6	34675.3	3487.570070	3487.148930	0.421039
7	41527.3	4176.850100	4176.388670	0.461323
8	48385.5	4866.189940	4866.283690	-0.093853
9	55238.1	5555.509770	5555.647950	-0.138287
10	62095.3	6244.879880	6245.505860	-0.626080
11	55243.1	5555.509770	5556.150880	-0.641216
12	48389.5	4866.189940	4866.686520	-0.496685
13	41537.9	4176.850100	4177.454590	-0.604595
14	34687.3	3487.570070	3488.355960	-0.785992
15	27832.5	2798.280030	2798.865970	-0.586041
16	20984.7	2109.010010	2110.111820	-1.101910
17	14126.7	1419.770020	1420.363890	-0.593853
18	7271.30	730.590027	730.908875	-0.318829
19	4.90000	0.090000	0.153999	-0.063999
20	0.400000	0.040000	-0.298539	0.338538
21	3838.00	385.920013	385.630157	0.289844
22	7265.40	730.539978	730.315552	0.224445
23	14116.8	1419.709960	1419.368160	0.341816
24	20967.6	2108.949950	2108.391850	0.558002
25	27818.6	2798.209960	2797.468020	0.741840
26	34670.4	3487.489990	3486.655760	0.834125
27	41521.0	4176.770020	4175.754880	1.015034
28	48377.6	4866.100100	4865.489260	0.610737
29	55231.2	5555.419920	5554.953610	0.466205
30	62084.4	6244.779790	6244.409670	0.370014
31	55232.6	5555.419920	5555.094240	0.325580
32	48384.0	4866.100100	4866.133300	-0.033306

33	41533.6	4176.770020	4177.021970	-0.252056
34	34682.0	3487.489990	3487.822750	-0.332867
35	27831.8	2798.209960	2798.795410	-0.585552
36	20977.4	2108.949950	2109.377690	-0.427838
37	14126.2	1419.709960	1420.313600	-0.603619
38	7272.80	730.539978	731.059814	-0.519817
39	3844.60	385.920013	386.293915	-0.373913
40	5.40000	0.040000	0.204281	-0.164281
MEAN DEVIATION = -0.432690E-04				
STANDARD DEVIATION = 0.528148E+00				

Appendix D: Summary of fits to the CTD laboratory temperature data

TEMPERATURE
PRE CRUISE CTD10

PROGRAM VERSION RUSCAL 910316
DISK FILE = 10mr92te.cal
VARIABLE=TEMPERATURE
5 DATA POINTS ORDER OF POLY 2
POLY COEF =0.186416E-02 0.499864E-03 0.225955E-11

	INSTRUMENT	OBSERVED	CALCULATED	DIFFERENCE
1	60034.8	30.019218	30.019215	0.000003
2	45060.4	22.530518	22.530500	0.000016
3	30038.4	15.018928	15.019004	-0.000076
4	15429.6	7.715182	7.715096	0.000086
5	1086.00	0.544688	0.544719	-0.000031
MEAN DEVIATION = -0.274321E-06				
STANDARD DEVIATION = 0.598524E-04				

TEMPERATURE
POST CRUISE CTD10

PROGRAM VERSION RUSCAL 910316
DISK FILE = C10E92TE.cal
VARIABLE=TEMPERATURE
7 DATA POINTS ORDER OF POLY 2
POLY COEF =-.803350E-03 0.499708E-03 0.310515E-11

	INSTRUMENT	OBSERVED	CALCULATED	DIFFERENCE
1	60224.0	30.104589	30.104853	-0.000263
2	48914.0	24.449780	24.449326	0.000454
3	39992.0	19.989140	19.988472	0.000668
4	30096.0	15.040070	15.041211	-0.001141
5	19990.0	9.988570	9.989594	-0.001023
6	10696.0	5.346520	5.344425	0.002095
7	952.000	0.474130	0.474921	-0.000791
MEAN DEVIATION = -0.111917E-06				
STANDARD DEVIATION = 0.116087E-02				

TEMPERATURE
PRECRUISE CTD9

PROGRAM VERSION RUSCAL 910316
DISK FILE = C9AP92TE.cal
VARIABLE=TEMPERATURE
5 DATA POINTS ORDER OF POLY 2
POLY COEF =-.361583E-01 0.500248E-03 0.197920E-11

	INSTRUMENT	OBSERVED	CALCULATED	DIFFERENCE
1	60039.6	30.005600	30.005671	-0.000070
2	45048.4	22.503328	22.503235	0.000094
3	30064.0	15.005210	15.005088	0.000122
4	15066.0	7.500756	7.501028	-0.000272
5	1181.60	0.555058	0.554938	0.000120
MEAN DEVIATION = -0.106618E-05				
STANDARD DEVIATION = 0.171104E-03				

TEMPERATURE
POST CRUISE CTD9

PROGRAM VERSION RUSCAL 910316
DISK FILE = C9SE92TE.cal
VARIABLE=TEMPERATURE
7 DATA POINTS ORDER OF POLY 2
POLY COEF =-.189004E-01 0.500366E-03 0.160650E-11

	INSTRUMENT	OBSERVED	CALCULATED	DIFFERENCE
1	59366.0	29.691441	29.691519	-0.000078
2	49798.0	24.902460	24.902334	0.000126
3	40212.0	20.104509	20.104435	0.000075
4	30183.0	15.084920	15.085126	-0.000206
5	19074.0	9.525800	9.525675	0.000125
6	9922.00	4.945820	4.945894	-0.000074
7	2734.00	1.349150	1.349114	0.000036
MEAN DEVIATION = 0.755170E-06				
STANDARD DEVIATION = 0.124119E-03				

Appendix E: Summary of fits to the CTD conductivity laboratory data

		BIAS	SLOPE
PRE-CRUISE	CTD10	-.177214E-2	.100631E-2
	CTD9	-.231510E-1	.997986E-3
POST-CRUISE	CTD10	-.163660E-02	0.100915E-02
	CTD9	-.119142E-01	0.100050E-02

CONDUCTIVITY
PRE CRUISE CTD10

LABFIT: FHBIAS,Pslope
0.00000000E-01 0.10000000
MEAN CCR= 0.100626E-02 PRS ROOM TEMP= 19.99
PROGRAM VERSION RUSCAL 910316
DISK FILE = 10mr92co.cal
VARIABLE=CONDUCTIVITY
5 DATA POINTS ORDER OF POLY 1
POLY COEF =-.177214E-02 0.100631E-02

	INSTRUMENT	OBSERVED	CALCULATED	DIFFERENCE
1	57872.2	58.235512	58.235428	0.000082
2	46892.1	47.185162	47.186073	-0.000913
3	41586.0	41.848011	41.846500	0.001509
4	33214.6	33.421310	33.422283	-0.000974
5	25064.2	25.220819	25.220535	0.000284
MEAN DEVIATION = -0.245608E-05				
STANDARD DEVIATION = 0.101838E-02				

CONDUCTIVITY
POST CRUISE CTD10

PROGRAM VERSION RUSCAL 910316
DISK FILE = 10se92co.cal
VARIABLE=CONDUCTIVITY
5 DATA POINTS ORDER OF POLY 1
POLY COEF =-.163660E-02 0.100915E-02

	INSTRUMENT	OBSERVED	CALCULATED	DIFFERENCE
1	62200.1	62.767502	62.767540	-0.000038
2	54831.1	55.331310	55.331127	0.000183
3	41825.4	42.206329	42.206493	-0.000164
4	34402.9	34.715900	34.716015	-0.000114
5	25132.9	25.361401	25.361259	0.000141
MEAN DEVIATION = 0.161610E-05				
STANDARD DEVIATION = 0.154037E-03				

CONDUCTIVITY
PRE CRUISE CTD9

LABFIT: FHBIAS,Pslope
0.00000000E-01 0.10000000
MEAN CCR= 0.997355E-03 PRS ROOM TEMP= 19.99
PROGRAM VERSION RUSCAL 910316
DISK FILE = C9AP92CO.cal
VARIABLE=CONDUCTIVITY
5 DATA POINTS ORDER OF POLY 1
POLY COEF =-.231510E-01 0.997986E-03

	INSTRUMENT	OBSERVED	CALCULATED	DIFFERENCE
1	55291.9	55.158146	55.157375	0.000770
2	45172.9	45.058846	45.058811	0.000034
3	40757.0	40.650867	40.651749	-0.000882
4	32971.0	32.880333	32.881477	-0.001145
5	23982.6	23.912357	23.911146	0.001211
MEAN DEVIATION = -0.228733E-05				
STANDARD DEVIATION = 0.101834E-02				

CONDUCTIVITY
POST CRUISE CTD9

LABFIT: FHBIAS,Pslope
0.00000000E-01 0.10000000
MEAN CCR= 0.100018E-02 PRS ROOM TEMP= 19.99
PROGRAM VERSION RUSCAL 910316
DISK FILE = C9SE92CO.cal
VARIABLE=CONDUCTIVITY
5 DATA POINTS ORDER OF POLY 1
POLY COEF =-.119142E-01 0.100050E-02

	INSTRUMENT	OBSERVED	CALCULATED	DIFFERENCE
1	58219.4	58.237228	58.236534	0.000695
2	48291.3	48.303188	48.303532	-0.000342
3	39531.9	39.539108	39.539745	-0.000636
4	32529.1	32.532810	32.533413	-0.000602
5	23647.8	23.648640	23.647747	0.000894
MEAN DEVIATION = 0.162441E-05				
STANDARD DEVIATION = 0.735835E-03				

Appendix F: CTD conductivity fitting applied to the final data

KN138 Conductivity scalings applied to the final P6 data
(fitting groups and fit statistics)

CTD10

Leg3 **CTD10**
CHILE TO EASTER ISLAND
STATIONS 4-72

Stations 4,5,9 to 19 Use fit of stations 6 to 19
number of data points read in: 212
STATIONS 6. 19. PRES. BOUNDS 1100.0 6500.0 edit= 2.8
Applied cond. bias: -0.0016
PASS No. = 8

	St.No.	P,	T,	C,	COEFF.	GOOD
1	0.00	0.00	0.00	1.00	0.10062730E-02	0.935E+05
2	1.00	0.00	0.00	1.00	-.19822450E-08	2.59

N = 175 AVE = -0.85378E-06 STD. DEV. = 0.11202E-02

STATION	COND. SLOPE	STATION	COND. SLOPE
6.	0.10062611E-02	13.	0.10062472E-02
7.	0.10062591E-02	14.	0.10062453E-02
8.	0.10062572E-02	15.	0.10062433E-02
9.	0.10062552E-02	16.	0.10062413E-02
10.	0.10062532E-02	17.	0.10062393E-02
11.	0.10062512E-02	18.	0.10062373E-02
12.	0.10062492E-02	19.	0.10062354E-02

Station 6 Manually adjusted slope from above fit (Stations 6 ot 19) to match water sample data and CTD traces. new slope: 0.100624E-2

Station 7 Manually adjusted slope from above fit (Stations 6 to 19) to match water sample and CTD traces. new slope: 0.100624E-2

Station 8 Manually adjusted slope from above fit (Stations 6 to 19) to match water sample data and CTD traces. new slope: 0.100624E-2

Stations 22,23,24,28,29,31 to 40 Use fit of stations 20 to 40 number of data points read in: 309

STATIONS 20. 40. PRES. BOUNDS 1100.0 6500.0 edit= 2.8

Applied cond. bias: -0.0016

PASS No. = 5

St.No. , P, T, C, COEFF. GOOD

1 0.00 0.00 0.00 1.00 0.10062870E-02 0.312E+06

N = 292 AVE = -0.89956E-06 STD. DEV.= 0.17366E-02

Station 20 Manually adjusted slope from above fit (Stations 20 to 40) to match water sample data and CTD traces. new slope: 0.100631E-2

Station 21 Manually adjusted slope from above fit (Stations 20 to 40) to match water sample data and CTD traces. new slope: 0.100631E-2

Station 25 Manually adjusted slope from above fit (Stations 20 to 40) to match water sample data and CTD traces. new slope: 0.100627E-2

Station 26 Manually adjusted slope from above fit (Stations 20 to 40) to match water sample data and CTD traces. new slope: 0.100627E-2

Station 27 Manually adjusted slope from above fit (Stations 20 to 40) to match water sample data and CTD traces. new slope: 0.100627E-2

Station 30 Manually adjusted slope from above fit (Stations 20 to 40) to match water sample data and CTD traces. new slope: 0.100624E-2

Stations 41 to 55

number of data points read in: 242
STATIONS 41. 55. PRES. BOUNDS 1100.0 6500.0 edit= 2.8
Applied cond. bias: -0.0016
PASS No. = 5
St.No. , P, T, C, COEFF. GOOD
1 0.00 0.00 0.00 1.00 0.10063006E-02 0.297E+06
N = 230 AVE = 0.84329E-06 STD. DEV.= 0.16192E-02

Stations 56 to 58,60 to 68 Use fit of stations 56 to 68

number of data points read in: 203
STATIONS 56. 68. PRES. BOUNDS 1100.0 6500.0 edit= 2.8
Applied cond. bias: -0.0016
PASS No. = 4

St.No.,	P,	T,	C,	COEFF.	GOOD
1	0.00	0.00	0.00	1.00	0.10066862E-02	0.143E+05
2	1.00	0.00	0.00	1.00	-.74668625E-08	6.59

N = 200 AVE = 0.61313E-06 STD. DEV.= 0.19213E-02

STATION	COND. SLOPE
56.	0.10062680E-02
57.	0.10062606E-02
58.	0.10062531E-02
59.	0.10062456E-02
60.	0.10062382E-02
61.	0.10062307E-02
62.	0.10062232E-02
63.	0.10062157E-02
64.	0.10062083E-02
65.	0.10062008E-02
66.	0.10061933E-02
67.	0.10061859E-02
68.	0.10061784E-02

Station 59 Manually adjusted slope from above fit (Stations 56 to 68) to match water sample data and CTD traces.

new slope: 0.100635e-2

Stations 69 to 75

number of data points read in: 79
STATIONS 69. 75. PRES. BOUNDS 1100.0 6500.0 edit= 2.8
Applied cond. bias: -0.0016
PASS No. = 4

St.No. ,	P,	T,	C,	COEFF.	GOOD
1	0.00	0.00	0.00	1.00	0.10062813E-02	0.127E+06

N = 76 AVE = 0.14307E-05 STD. DEV.= 0.21687E-02

Leg4 CTD10
EASTER ISLAND TO NEW ZEALAND
STATIONS 75 TO 188 (EXCEPT 76 TO 85, 112, 141, AND 187)

Stations 87 to 101 Use fit of stations 86 to 101
number of data points read in: 259
STATIONS 86. 101. PRES. BOUNDS 1100.0 6500.0 edit= 2.8
Applied cond. bias: -0.0016
PASS No. = 7

St.No. , P,	T,	C,	COEFF.	GOOD
1 0.00	0.00	0.00 1.00	0.10070056E-02	0.143E+05
2 1.00	0.00	0.00 1.00	-.79787251E-08	10.6

N = 243 AVE = 0.13312E-05 STD. DEV.= 0.17053E-02

STATION	COND. SLOPE
86.	0.10063194E-02
87.	0.10063114E-02
88.	0.10063035E-02
89.	0.10062955E-02
90.	0.10062875E-02
91.	0.10062795E-02
92.	0.10062715E-02
93.	0.10062636E-02
94.	0.10062556E-02
95.	0.10062476E-02
96.	0.10062396E-02
97.	0.10062317E-02
98.	0.10062237E-02
99.	0.10062157E-02
100.	0.10062077E-02
101.	0.10061997E-02

Station 86 Manually adjusted slope from above fit (Stations 86 to 101) to match water sample data and CTD traces.
new slope: 0.100640e-2

Stations 103 to 120 Use fit of stations 102 to 120
number of data points read in: 324
STATIONS 102. 120. PRES. BOUNDS 1100.0 6500.0 edit= 2.8
Applied cond. bias: -0.0016
PASS No. = 9

St.No. , P,	T,	C,	COEFF.	GOOD
1 0.00	0.00	0.00 1.00	0.10063121E-02	0.325E+06

N = 287 AVE = 0.93993E-06 STD. DEV.= 0.16520E-02

Station 102 Manually adjusted slope from above fit (Stations 102 to 120) to match water sample data and CTD traces.
new slope: 0.100626e-2

Stations 121 Use fit of stations 121 to 122
number of data points read in: 43
STATIONS 121. 122. PRES. BOUNDS 1100.0 6500.0 edit= 2.8
Applied cond. bias: -0.0016
PASS No. = 5

St.No. ,	P,	T,	C,	COEFF.	GOOD
1	0.00	0.00	0.00	1.00	0.10062360E-02	0.730E+05

N = 39 AVE = -0.14327E-05 STD. DEV.= 0.27091E-02

Station 122 Manually adjusted slope from above fit (Stations 121 to 122) to match water sample data and CTD traces.
new slope: 0.100634e-2

Stations 123 to 136
number of data points read in: 293
STATIONS 123. 136. PRES. BOUNDS 1100.0 6500.0 edit= 2.8
Applied cond. bias: -0.0016
PASS No. = 8

St.No. ,	P,	T,	C,	COEFF.	GOOD
1	0.00	0.00	0.00	1.00	0.10063488E-02	0.688E+06

N = 263 AVE = 0.56917E-06 STD. DEV.= 0.74673E-03

Stations 138 to 175 Use fit of stations 137 to 175
number of data points read in: 880
STATIONS 137. 175. PRES. BOUNDS 1100.0 6500.0 edit= 2.8
Applied cond. bias: -0.0016
PASS No. = 8

St.No.	P,	T,	C,	COEFF.	GOOD
1	0.00	0.00	0.00	1.00	0.10064198E-02	0.115E+07

N = 803 AVE = 0.70922E-07 STD. DEV.= 0.78187E-03

Station 137 Manually adjusted slope from above fit (Stations 137 to 175) to match water sample data and CTD traces.
new slope: 0.100635e-2

Stations 176 to 188

number of data points read in: 219
STATIONS 176. 188. PRES. BOUNDS 1100.0 6500.0 edit= 2.8
Applied cond. bias: -0.0016
PASS No. = 7

St.No. ,	P,	T,	C,	COEFF.	GOOD
1	0.00	0.00	0.00	1.00	0.10061674E-02	0.107E+05
2	1.00	0.00	0.00	1.00	0.15838572E-08	3.05

N = 200 AVE = 0.18406E-05 STD. DEV.= 0.88455E-03

STATION	COND. SLOPE
176.	0.10064462E-02
177.	0.10064477E-02
178.	0.10064493E-02
179.	0.10064509E-02
180.	0.10064525E-02
181.	0.10064541E-02
182.	0.10064557E-02
183.	0.10064573E-02
184.	0.10064588E-02
185.	0.10064604E-02
186.	0.10064620E-02
187.	0.10064636E-02
188.	0.10064652E-02

Leg5 CTD10
NEW ZEALAND TO AUSTRALIA
STATIONS 190 TO 246

Stations 190 to 200

number of data points read in: 165
STATIONS 190. 200. PRES. BOUNDS 1100.0 6500.0 edit= 2.8
Applied cond. bias: -0.0016
PASS No. = 4

St.No. ,	P,	T,	C,		COEFF.	GOOD
1	0.00	0.00	0.00	1.00	0.10084371E-02	0.426E+04
2	1.00	0.00	0.00	1.00	-.10094641E-07	8.26

N = 156 AVE = 0.14242E-05 STD. DEV.= 0.14036E-02

STATION	COND. SLOPE	STATION	COND. SLOPE
190.	0.10065191E-02	196.	0.10064585E-02
191.	0.10065090E-02	197.	0.10064484E-02
192.	0.10064989E-02	198.	0.10064383E-02
193.	0.10064888E-02	199.	0.10064282E-02
194.	0.10064787E-02	200.	0.10064181E-02
195.	0.10064686E-02		

Stations 201 to 219

number of data points read in: 163
STATIONS 201. 219. PRES. BOUNDS 1100.0 6500.0 edit= 2.8
Applied cond. bias: -0.0016
PASS No. = 5

St.No. ,	P,	T,	C,	COEFF.	GOOD
1	0.00	0.00	0.00	1.00	0.10064438E-02	0.306E+06

N = 152 AVE = 0.79471E-05 STD. DEV.= 0.12917E-02

Station 220 to 246

number of data points read in: 299
STATIONS 220. 244. PRES. BOUNDS 1100.0 6500.0 edit= 2.8
Applied cond. bias: -0.0016
PASS No. = 8

St.No. ,	P,	T,	C,	COEFF.	GOOD
1 0.00	0.00	0.00	1.00	0.10064778E-02	0.447E+06

N = 271 AVE = 0.50069E-05 STD. DEV.= 0.11725E-02

CTD9

LEG3 CTD9
CHILE TO EASTER ISLAND
NO STATIONS

LEG4 CTD9
EASTER ISLAND TO NEW ZEALAND
STATIONS 76 TO 85

Stations 76,78 to 85 Use fit of stations 76 to 85

number of data points read in: 162
STATIONS 76. 85. PRES. BOUNDS 1100.0 6500.0 edit= 2.8
Applied cond. bias: -0.0180
PASS No. = 5

St.No. ,	P,	T,	C,	COEFF.	GOOD
1 0.00	0.00	0.00	1.00	0.99750453E-03	0.104E+05
2 1.00	0.00	0.00	1.00	0.75034637E-08	6.34

N = 148 AVE = -0.15751E-05 STD. DEV.= 0.13061E-02

STATION	COND. SLOPE	STATION	COND. SLOPE
76.	0.99807480E-03	81.	0.99811231E-03
77.	0.99808230E-03	82.	0.99811982E-03
78.	0.99808980E-03	83.	0.99812732E-03
79.	0.99809731E-03	84.	0.99813482E-03
80.	0.99810481E-03	85.	0.99814233E-03

Station 77 Manually adjusted slope from above fit (Stations 76 to 85) to match water sample data and CTD traces.
new slope: 0.998002e-3

Leg5 CTD9
NEW ZEALAND TO AUSTRALIA
STATIONS 248 TO 267

Stations 249 to 257 Use fit of stations 248 to 257
number of data points read in: 35
STATIONS 248. 255. PRES. BOUNDS 1100.0 6500.0 edit= 2.8
Applied cond. bias: -0.0180
PASS No. = 5
St.No. , P, T, C, COEFF. GOOD
1 0.00 0.00 0.00 1.00 0.99814130E-03 0.163E+06
N = 30 AVE = 0.17127E-05 STD. DEV.= 0.10655E-02

Station 248 Manually adjusted slope from above fit (Stations 248 to 257) to match water sample data and CTD traces.
new slope: 0.998101e-3

Stations 258 to 267
number of data points read in: 34
STATIONS 258. 265. PRES. BOUNDS 1100.0 6500.0 edit= 2.8
Applied cond. bias: -0.0180
PASS No. = 4
St.No. , P, T, C, COEFF. GOOD
1 0.00 0.00 0.00 1.00 0.99818393E-03 0.921E+05
N = 31 AVE = -0.89016E-06 STD. DEV.= 0.19239E-02

Table of conductivity bias and slope versus station number used to reduce the P6 CTD data.

Sta	bias	slope
4	-.162216E-02	0.100626E-02
5	-.162216E-02	0.100626E-02
6	-.162216E-02	0.100624E-02
7	-.162216E-02	0.100624E-02
8	-.162216E-02	0.100624E-02
9	-.162216E-02	0.100626E-02
10	-.162216E-02	0.100625E-02
11	-.162216E-02	0.100625E-02

Sta	bias	slope
12	-.162216E-02	0.100625E-02
13	-.162216E-02	0.100625E-02
14	-.162216E-02	0.100625E-02
15	-.162216E-02	0.100624E-02
16	-.162216E-02	0.100624E-02
17	-.162216E-02	0.100624E-02
18	-.162216E-02	0.100624E-02
19	-.162216E-02	0.100624E-02

Sta	bias	slope
20	-.162216E-02	0.100631E-02
21	-.162216E-02	0.100631E-02
22	-.162216E-02	0.100629E-02
23	-.162216E-02	0.100629E-02
24	-.162216E-02	0.100629E-02
25	-.162216E-02	0.100627E-02
26	-.162216E-02	0.100627E-02
27	-.162216E-02	0.100627E-02
28	-.162216E-02	0.100629E-02
29	-.162216E-02	0.100629E-02
30	-.162216E-02	0.100624E-02
31	-.162216E-02	0.100629E-02
32	-.162216E-02	0.100629E-02
33	-.162216E-02	0.100629E-02
34	-.162216E-02	0.100629E-02
35	-.162216E-02	0.100629E-02
36	-.162216E-02	0.100629E-02
37	-.162216E-02	0.100629E-02
38	-.162216E-02	0.100629E-02
39	-.162216E-02	0.100629E-02
40	-.162216E-02	0.100629E-02
41	-.162216E-02	0.100630E-02
42	-.162216E-02	0.100630E-02
43	-.162216E-02	0.100630E-02
44	-.162216E-02	0.100630E-02
45	-.162216E-02	0.100630E-02
46	-.162216E-02	0.100630E-02
47	-.162216E-02	0.100630E-02
48	-.162216E-02	0.100630E-02
49	-.162216E-02	0.100630E-02
50	-.162216E-02	0.100630E-02
51	-.162216E-02	0.100630E-02
52	-.162216E-02	0.100630E-02
53	-.162216E-02	0.100630E-02
54	-.162216E-02	0.100630E-02
55	-.162216E-02	0.100630E-02
56	-.162216E-02	0.100627E-02
57	-.162216E-02	0.100626E-02
58	-.162216E-02	0.100625E-02
59	-.162216E-02	0.100635E-02
60	-.162216E-02	0.100624E-02
61	-.162216E-02	0.100623E-02
62	-.162216E-02	0.100622E-02

Sta	bias	slope
63	-.162216E-02	0.100622E-02
64	-.162216E-02	0.100621E-02
65	-.162216E-02	0.100620E-02
66	-.162216E-02	0.100619E-02
67	-.162216E-02	0.100619E-02
68	-.162216E-02	0.100618E-02
69	-.162216E-02	0.100628E-02
70	-.162216E-02	0.100628E-02
71	-.162216E-02	0.100628E-02
72	-.162216E-02	0.100628E-02
75	-.162216E-02	0.100628E-02
76	-.179552E-01	0.998075E-03
77	-.179552E-01	0.998002E-03
78	-.179552E-01	0.998090E-03
79	-.179552E-01	0.998097E-03
80	-.179552E-01	0.998105E-03
81	-.179552E-01	0.998112E-03
82	-.179552E-01	0.998120E-03
83	-.179552E-01	0.998127E-03
84	-.179552E-01	0.998135E-03
85	-.179552E-01	0.998142E-03
86	-.162216E-02	0.100640E-02
87	-.162216E-02	0.100631E-02
88	-.162216E-02	0.100630E-02
89	-.162216E-02	0.100630E-02
90	-.162216E-02	0.100629E-02
91	-.162216E-02	0.100628E-02
92	-.162216E-02	0.100627E-02
93	-.162216E-02	0.100626E-02
94	-.162216E-02	0.100626E-02
95	-.162216E-02	0.100625E-02
96	-.162216E-02	0.100624E-02
97	-.162216E-02	0.100623E-02
98	-.162216E-02	0.100622E-02
99	-.162216E-02	0.100622E-02
100	-.162216E-02	0.100621E-02
101	-.162216E-02	0.100620E-02
102	-.162216E-02	0.100626E-02
103	-.162216E-02	0.100631E-02
104	-.162216E-02	0.100631E-02
105	-.162216E-02	0.100631E-02
106	-.162216E-02	0.100631E-02
107	-.162216E-02	0.100631E-02

Sta	bias	slope
108	-.162216E-02	0.100631E-02
109	-.162216E-02	0.100631E-02
110	-.162216E-02	0.100631E-02
111	-.162216E-02	0.100631E-02
113	-.162216E-02	0.100631E-02
114	-.162216E-02	0.100631E-02
115	-.162216E-02	0.100631E-02
116	-.162216E-02	0.100631E-02
117	-.162216E-02	0.100631E-02
118	-.162216E-02	0.100631E-02
119	-.162216E-02	0.100631E-02
120	-.162216E-02	0.100631E-02
121	-.162216E-02	0.100626E-02
122	-.162216E-02	0.100634E-02
123	-.162216E-02	0.100635E-02
124	-.162216E-02	0.100635E-02
125	-.162216E-02	0.100635E-02
126	-.162216E-02	0.100635E-02
127	-.162216E-02	0.100635E-02
128	-.162216E-02	0.100635E-02
129	-.162216E-02	0.100635E-02
130	-.162216E-02	0.100635E-02
131	-.162216E-02	0.100635E-02
132	-.162216E-02	0.100635E-02
133	-.162216E-02	0.100635E-02
134	-.162216E-02	0.100635E-02
135	-.162216E-02	0.100635E-02
136	-.162216E-02	0.100635E-02
137	-.162216E-02	0.100635E-02
138	-.162216E-02	0.100642E-02
139	-.162216E-02	0.100642E-02
140	-.162216E-02	0.100642E-02
142	-.162216E-02	0.100642E-02
143	-.162216E-02	0.100642E-02
144	-.162216E-02	0.100642E-02
145	-.162216E-02	0.100642E-02
146	-.162216E-02	0.100642E-02
147	-.162216E-02	0.100642E-02
148	-.162216E-02	0.100642E-02
149	-.162216E-02	0.100642E-02
150	-.162216E-02	0.100642E-02
151	-.162216E-02	0.100642E-02
152	-.162216E-02	0.100642E-02

Sta	bias	slope
153	-.162216E-02	0.100642E-02
154	-.162216E-02	0.100642E-02
155	-.162216E-02	0.100642E-02
156	-.162216E-02	0.100642E-02
157	-.162216E-02	0.100642E-02
158	-.162216E-02	0.100642E-02
159	-.162216E-02	0.100642E-02
160	-.162216E-02	0.100642E-02
161	-.162216E-02	0.100642E-02
162	-.162216E-02	0.100642E-02
163	-.162216E-02	0.100642E-02
164	-.162216E-02	0.100642E-02
165	-.162216E-02	0.100642E-02
166	-.162216E-02	0.100642E-02
167	-.162216E-02	0.100642E-02
168	-.162216E-02	0.100642E-02
169	-.162216E-02	0.100642E-02
170	-.162216E-02	0.100642E-02
171	-.162216E-02	0.100642E-02
172	-.162216E-02	0.100642E-02
173	-.162216E-02	0.100642E-02
174	-.162216E-02	0.100642E-02
175	-.162216E-02	0.100642E-02
176	-.162216E-02	0.100645E-02
177	-.162216E-02	0.100645E-02
178	-.162216E-02	0.100645E-02
179	-.162216E-02	0.100645E-02
180	-.162216E-02	0.100645E-02
181	-.162216E-02	0.100645E-02
182	-.162216E-02	0.100646E-02
183	-.162216E-02	0.100646E-02
184	-.162216E-02	0.100646E-02
185	-.162216E-02	0.100646E-02
186	-.162216E-02	0.100646E-02
188	-.162216E-02	0.100647E-02
190	-.162216E-02	0.100652E-02
191	-.162216E-02	0.100651E-02
192	-.162216E-02	0.100650E-02
193	-.162216E-02	0.100649E-02
194	-.162216E-02	0.100648E-02
195	-.162216E-02	0.100647E-02
196	-.162216E-02	0.100646E-02
197	-.162216E-02	0.100645E-02

Sta	bias	slope
198	-.162216E-02	0.100644E-02
199	-.162216E-02	0.100643E-02
200	-.162216E-02	0.100642E-02
201	-.162216E-02	0.100644E-02
202	-.162216E-02	0.100644E-02
203	-.162216E-02	0.100644E-02
204	-.162216E-02	0.100644E-02
205	-.162216E-02	0.100644E-02
206	-.162216E-02	0.100644E-02
207	-.162216E-02	0.100644E-02
208	-.162216E-02	0.100644E-02
209	-.162216E-02	0.100644E-02
210	-.162216E-02	0.100644E-02
211	-.162216E-02	0.100644E-02
212	-.162216E-02	0.100644E-02
213	-.162216E-02	0.100644E-02
214	-.162216E-02	0.100644E-02
215	-.162216E-02	0.100644E-02
216	-.162216E-02	0.100644E-02
217	-.162216E-02	0.100644E-02
218	-.162216E-02	0.100644E-02
219	-.162216E-02	0.100644E-02
220	-.162216E-02	0.100648E-02
221	-.162216E-02	0.100648E-02
222	-.162216E-02	0.100648E-02
223	-.162216E-02	0.100648E-02
224	-.162216E-02	0.100648E-02
225	-.162216E-02	0.100648E-02
226	-.162216E-02	0.100648E-02
227	-.162216E-02	0.100648E-02
228	-.162216E-02	0.100648E-02
229	-.162216E-02	0.100648E-02
230	-.162216E-02	0.100648E-02
231	-.162216E-02	0.100648E-02
232	-.162216E-02	0.100648E-02
Sta	**bias**	**slope**
233	-.162216E-02	0.100648E-02
234	-.162216E-02	0.100648E-02
235	-.162216E-02	0.100648E-02
236	-.162216E-02	0.100648E-02
237	-.162216E-02	0.100648E-02
238	-.162216E-02	0.100648E-02
239	-.162216E-02	0.100648E-02
240	-.162216E-02	0.100648E-02
241	-.162216E-02	0.100648E-02
242	-.162216E-02	0.100648E-02
243	-.162216E-02	0.100648E-02
244	-.162216E-02	0.100648E-02
245	-.162216E-02	0.100648E-02
246	-.162216E-02	0.100648E-02
248	-.179552E-01	0.998101E-03
249	-.179552E-01	0.998141E-03
250	-.179552E-01	0.998141E-03
251	-.179552E-01	0.998141E-03
252	-.179552E-01	0.998141E-03
253	-.179552E-01	0.998141E-03
254	-.179552E-01	0.998141E-03
255	-.179552E-01	0.998141E-03
256	-.179552E-01	0.998141E-03
257	-.179552E-01	0.998141E-03
258	-.179552E-01	0.998184E-03
259	-.179552E-01	0.998184E-03
260	-.179552E-01	0.998184E-03
261	-.179552E-01	0.998184E-03
262	-.179552E-01	0.998184E-03
263	-.179552E-01	0.998184E-03
264	-.179552E-01	0.998184E-03
265	-.179552E-01	0.998184E-03
266	-.179552E-01	0.998184E-03
267	-.179552E-01	0.998184E-03

Appendix G: Fits for CTD oxygen

CTD10

Leg3 CHILE TO EASTER ISLAND
STATIONS 4-72

Leg3 had an oxygen water pump attached to CTD 10. The data was noisy, especially at the surface. More serious, fits to the water sample data using data over the full water column were left with significant depth dependance in the oxygen - water sample residuals. The pressure dependence in the fit was removed from the final data by fitting the top and bottom water seperately. All stations have one calibration for the top 1000 dbar and a second calibration for the data below 1000 dbar EXCEPT for stations 4,5,70,72-75. Stations 4 and 5 do not have data below 1000 dbar and stations 70, and 72-75 fit well with one calibration for the entire depth. Stations 72-75 and perhaps 70 did not use the oxygen pump. Operationally a full water column fit was performed and the derived parameters applied to the top 1000 m of the water column to obtain one estimate of the oxygen profile. Next a fit was done only to the data below 1000 db, and these parameters used to derive a second oxygen profile estimate. The reported profile is a blend of these with a linear overlap region within 100 dbar vertically of 1000 db.

Fit statistics:

Station 4
Edit Fact= 2.80 Histo Bin= 0.2500E-01 OcSlope= 0.1400E-02
ratio upper/deep variance , P_switch 0.00000000E-01 0.00000000E-01
1 Min/Max Sta: 4.-4. 1 StdDev: 0.1600E+00 No. Obs: 10 dOx: .448
1: Bias 2:Slope 3:Pcor 4:Tcor 5: Wt 6: Lag 7: bias/station
OX Parms: 0.073 0.1428E-02 -.6485E-02 -0.0324 0.75 8.00 0.0000E+00

Station 5 Use fit of stations 4 and 5
Edit Fact= 2.00 Histo Bin= 0.2500E-01 OcSlope= 0.1400E-02
ratio upper/deep variance , P_switch 0.00000000E-01 0.00000000E-01
2 Min/Max Sta: 4.-5. 1 StdDev: 0.2461E+00 No. Obs: 22 dOx: .492
1: Bias 2:Slope 3:Pcor 4:Tcor 5: Wt 6: Lag 7: bias/station
OX Parms: -0.154 0.1230E-02 0.3078E-03 -0.0319 0.75 8.00 0.0000E+00

Shallow Stations 6 to 11
Edit Fact= 2.50 Histo Bin= 0.2500E-01 OcSlope= 0.1400E-02
ratio upper/deep variance , P_switch 0.00000000E-01 0.00000000E-01
7 Min/Max Sta: 6.-11. 1 StdDev: 0.1015E+00 No. Obs: 122 dOx: 0.254
1: Bias 2:Slope 3:Pcor 4:Tcor 5: Wt 6: Lag 7: bias/station

OX Parms: -0.007 0.1089E-02 0.1761E-03 -0.0234 0.75 8.00 0.0000E+00

Deep Stations 6 to 11

Edit Fact= 2.80 Histo Bin= 0.2500E-01 OcSlope= 0.1400E-02
ratio upper/deep variance , P_switch 0.00000000E-01 0.00000000E-01
3 Min/Max Sta: 6.-11. 1 StdDev: 0.2525E-01 No. Obs: 49 dOx: 0.071
1: Bias 2:Slope 3:Pcor 4:Tcor 5: Wt 6: Lag 7: bias/station
OX Parms: -0.026 0.1245E-02 0.1487E-03 -0.0473 0.75 8.00 0.1721E-02

Station No. = 6 Bias = -.0157
Station No. = 7 Bias = -.0139
Station No. = 8 Bias = -.0122
Station No. = 9 Bias = -.0105
Station No. = 10 Bias = -.0088
Station No. = 11 Bias = -.0071

Station 6

Manually adjusted bias of calculated oxygen in CTD and SEA file by -.04 ml/l oxygen, to match water samlple data and CTD traces.

Shallow Stations 12 to 21

Edit Fact= 2.50 Histo Bin= 0.2500E-01 OcSlope= 0.1400E-02
ratio upper/deep variance , P_switch 0.00000000E-01 0.00000000E-01
13 Min/Max Sta: 12.-21. 1 StdDev: 0.4677E-01 No. Obs: 217 dOx: 0.117
1: Bias 2:Slope 3:Pcor 4:Tcor 5: Wt 6: Lag 7: bias/station
OX Parms: 0.019 0.1058E-02 0.1596E-03 -0.0222 0.95 3.80 0.0000E+00

Deep Staions 12 to 21

Edit Fact= 2.80 Histo Bin= 0.2500E-01 OcSlope= 0.1400E-02
ratio upper/deep variance , P_switch 0.00000000E-01 0.00000000E-01
4 Min/Max Sta: 12.-21. 1 StdDev: 0.2461E-01 No. Obs: 144 dOx: 0.069
1: Bias 2:Slope 3:Pcor 4:Tcor 5: Wt 6: Lag 7: bias/station
OX Parms: 0.018 0.1156E-02 0.1424E-03 -0.0412 0.95 4.00 0.0000E+00

Shallow Stations 22 to 25

Edit Fact= 2.50 Histo Bin= 0.2500E-01 OcSlope= 0.1400E-02
ratio upper/deep variance , P_switch 0.00000000E-01 0.00000000E-01
16 Min/Max Sta: 22.-25. 1 StdDev: 0.4481E-01 No. Obs: 87 dOx: 0.112
1: Bias 2:Slope 3:Pcor 4:Tcor 5: Wt 6: Lag 7: bias/station
OX Parms: 0.036 0.9957E-03 0.1607E-03 -0.0197 0.95 3.70 0.0000E+00

Deep Stations 22 to 25

Edit Fact= 2.80 Histo Bin= 0.2500E-01 OcSlope= 0.1400E-02
ratio upper/deep variance , P_switch 0.00000000E-01 0.00000000E-01
7 Min/Max Sta: 22.-25. 1 StdDev: 0.1040E-01 No. Obs: 46 dOx: 0.029

1: Bias 2:Slope 3:Pcor 4:Tcor 5: Wt 6: Lag 7: bias/station
OX Parms: 0.012 0.1204E-02 0.1404E-03 -0.0467 0.95 4.00 0.0000E+00

Shallow Stations 26 to 32
Edit Fact= 2.50 Histo Bin= 0.2500E-01 OcSlope= 0.1400E-02
ratio upper/deep variance , P_switch 0.00000000E-01 0.00000000E-01
9 Min/Max Sta: 26.-32. 1 StdDev: 0.6487E-01 No. Obs: 187 dOx: 0.162
1: Bias 2:Slope 3:Pcor 4:Tcor 5: Wt 6: Lag 7: bias/station
OX Parms: 0.027 0.1048E-02 0.1573E-03 -0.0251 0.75 8.00 0.0000E+00

Deep Stations 26 to 32
Edit Fact= 2.80 Histo Bin= 0.2500E-01 OcSlope= 0.1400E-02
ratio upper/deep variance , P_switch 0.00000000E-01 0.00000000E-01
5 Min/Max Sta: 26.-32. 1 StdDev: 0.2109E-01 No. Obs: 98 dOx: 0.059
1: Bias 2:Slope 3:Pcor 4:Tcor 5: Wt 6: Lag 7: bias/station
OX Parms: 0.015 0.1241E-02 0.1324E-03 -0.0557 0.75 8.00 0.0000E+00

Shallow Stations 33 to 38
Edit Fact= 2.50 Histo Bin= 0.2500E-01 OcSlope= 0.1400E-02
ratio upper/deep variance , P_switch 0.00000000E-01 0.00000000E-01
7 Min/Max Sta: 33.-38. 1 StdDev: 0.5781E-01 No. Obs: 165 dOx: 0.145
1: Bias 2:Slope 3:Pcor 4:Tcor 5: Wt 6: Lag 7: bias/station
OX Parms: 0.029 0.1032E-02 0.1603E-03 -0.0219 0.75 8.00 0.0000E+00

Deep Stations 33 to 38
Edit Fact= 2.50 Histo Bin= 0.2500E-01 OcSlope= 0.1400E-02
ratio upper/deep variance , P_switch 0.00000000E-01 0.00000000E-01
10 Min/Max Sta: 33.-38. 1 StdDev: 0.1144E-01 No. Obs: 80 dOx: 0.029
1: Bias 2:Slope 3:Pcor 4:Tcor 5: Wt 6: Lag 7: bias/station
OX Parms: 0.005 0.1241E-02 0.1384E-03 -0.0494 0.75 8.00 0.0000E+00

Shallow Stations 39 to 42
Edit Fact= 2.50 Histo Bin= 0.2500E-01 OcSlope= 0.1400E-02
ratio upper/deep variance , P_switch 0.00000000E-01 0.00000000E-01
11 Min/Max Sta: 39.-42. 1 StdDev: 0.6401E-01 No. Obs: 110 dOx: 0.160
1: Bias 2:Slope 3:Pcor 4:Tcor 5: Wt 6: Lag 7: bias/station
OX Parms: 0.044 0.1001E-02 0.1490E-03 -0.0207 0.95 6.40 0.0000E+00

Deep Stations 39 to 42
Edit Fact= 2.80 Histo Bin= 0.2500E-01 OcSlope= 0.1400E-02
ratio upper/deep variance , P_switch 0.00000000E-01 0.00000000E-01
4 Min/Max Sta: 39.-42. 1 StdDev: 0.2435E-01 No. Obs: 60 dOx: 0.068
1: Bias 2:Slope 3:Pcor 4:Tcor 5: Wt 6: Lag 7: bias/station

OX Parms: 0.016 0.1206E-02 0.1328E-03 -0.0475   0.95   6.50   0.0000E+00

Shallow   Stations 43 to 45
Edit Fact= 2.50 Histo Bin= 0.2500E-01 OcSlope= 0.1400E-02
ratio upper/deep variance , P_switch 0.00000000E-01   0.00000000E-01
9 Min/Max Sta: 43.-45. 1 StdDev: 0.4373E-01 No. Obs: 82 dOx: 0.109
1: Bias 2:Slope   3:Pcor   4:Tcor   5: Wt 6: Lag 7: bias/station
OX Parms: 0.036 0.1017E-02 0.1543E-03 -0.0202   0.95   4.40   0.0000E+00

Deep   Stations 43 to 45
Edit Fact= 2.50 Histo Bin= 0.2500E-01 OcSlope= 0.1400E-02
ratio upper/deep variance , P_switch 0.00000000E-01   0.00000000E-01
4 Min/Max Sta: 43.-45. 1 StdDev: 0.1951E-01 No. Obs: 42 dOx: 0.049
1: Bias 2:Slope   3:Pcor   4:Tcor   5: Wt 6: Lag 7: bias/station
OX Parms: 0.015 0.1205E-02 0.1337E-03 -0.0443   0.95   4.50   0.0000E+00

Shallow   Stations 46 to 56   Use fit of stations 46 to 57
Edit Fact= 2.50 Histo Bin= 0.2500E-01 OcSlope= 0.1400E-02
ratio upper/deep variance , P_switch 0.00000000E-01   0.00000000E-01
10 Min/Max Sta: 46.-57. 1 StdDev: 0.5963E-01 No. Obs: 343 dOx: 0.149
1: Bias 2:Slope   3:Pcor   4:Tcor   5: Wt 6: Lag 7: bias/station
OX Parms: 0.036 0.1024E-02 0.1534E-03 -0.0228   0.75   8.00   0.0000E+00

Shallow   Station 57
Edit Fact= 2.80 Histo Bin= 0.2500E-01 OcSlope= 0.1400E-02
ratio upper/deep variance , P_switch 0.00000000E-01   0.00000000E-01
5 Min/Max Sta: 57.-57. 1 StdDev: 0.3000E-01 No. Obs: 32 dOx: 0.084
1: Bias 2:Slope   3:Pcor   4:Tcor   5: Wt 6: Lag 7: bias/station
OX Parms: 0.016 0.1072E-02 0.1612E-03 -0.0247   1.00   8.56   0.0000E+00

Deep   Stations 46 to 57
Edit Fact= 2.80 Histo Bin= 0.2500E-01 OcSlope= 0.1400E-02
ratio upper/deep variance , P_switch 0.00000000E-01   0.00000000E-01
9 Min/Max Sta: 46.-57. 1 StdDev: 0.1570E-01 No. Obs: 176 dOx: 0.044
1: Bias 2:Slope   3:Pcor   4:Tcor   5: Wt 6: Lag 7: bias/station
OX Parms: 0.008 0.1206E-02 0.1418E-03 -0.0446   0.75   8.00   0.0000E+00

Shallow   Stations 58 to 61
Edit Fact= 2.50 Histo Bin= 0.2500E-01 OcSlope= 0.1400E-02
ratio upper/deep variance , P_switch 0.00000000E-01   0.00000000E-01
10 Min/Max Sta: 58.-61. 1 StdDev: 0.4268E-01 No. Obs: 111 dOx: 0.107
1: Bias 2:Slope   3:Pcor   4:Tcor   5: Wt 6: Lag 7: bias/station
OX Parms: 0.029 0.1045E-02 0.1551E-03 -0.0234   0.95 11.60   0.0000E+00

Deep Stations 58 to 61

```
  Edit Fact=  2.80 Histo Bin= 0.2500E-01 OcSlope= 0.1400E-02
   ratio upper/deep variance , P_switch  0.00000000E-01   0.00000000E-01
    3 Min/Max Sta: 58.-61.  1 StdDev: 0.1469E-01 No. Obs: 63  dOx: 0.041
         1: Bias  2:Slope     3:Pcor    4:Tcor   5: Wt  6: Lag  7: bias/station
  OX Parms: -0.004 0.1219E-02 0.1454E-03  -0.0394   0.95  11.60   0.0000E+00
```

Shallow Stations 62,64 to 68

```
  Edit Fact=  2.50 Histo Bin= 0.2500E-01 OcSlope= 0.1400E-02
   ratio upper/deep variance , P_switch  0.00000000E-01   0.00000000E-01
   11 Min/Max Sta: 62.-68.  1 StdDev: 0.3513E-01 No. Obs: 171  dOx: 0.088
         1: Bias  2:Slope     3:Pcor    4:Tcor   5: Wt  6: Lag  7: bias/station
  OX Parms:  0.043 0.1044E-02 0.1411E-03  -0.0236   0.95   5.60   0.0000E+00
```

Deep Stations 62 to 68 (63 included)

```
  Edit Fact=  2.80 Histo Bin= 0.2500E-01 OcSlope= 0.1400E-02
   ratio upper/deep variance , P_switch  0.00000000E-01   0.00000000E-01
    3 Min/Max Sta: 62.-68.  1 StdDev: 0.1604E-01 No. Obs: 103  dOx: 0.045
         1: Bias  2:Slope     3:Pcor    4:Tcor   5: Wt  6: Lag  7: bias/station
  OX Parms: -0.021 0.1251E-02 0.1544E-03  -0.0399   0.95   6.00   0.0000E+00
```

Shallow Station 63

```
  Edit Fact=  2.50 Histo Bin= 0.2500E-01 OcSlope= 0.1400E-02
   ratio upper/deep variance , P_switch  0.00000000E-01   0.00000000E-01
    5 Min/Max Sta: 63.-63.  1 StdDev: 0.5965E-01 No. Obs: 29  dOx: 0.149
         1: Bias  2:Slope     3:Pcor    4:Tcor   5: Wt  6: Lag  7: bias/station
  OX Parms:  0.043 0.1057E-02 0.1420E-03  -0.0241   0.95   7.50   0.0000E+00
```

Deep Station 62 to 68 (Station 63 included)

```
  Edit Fact=  2.80 Histo Bin= 0.2500E-01 OcSlope= 0.1400E-02
   ratio upper/deep variance , P_switch  0.00000000E-01   0.00000000E-01
    3 Min/Max Sta: 62.-68.  1 StdDev: 0.1604E-01 No. Obs: 103  dOx: 0.045
         1: Bias  2:Slope     3:Pcor    4:Tcor   5: Wt  6: Lag  7: bias/station
  OX Parms: -0.021 0.1251E-02 0.1544E-03  -0.0399   0.95   6.00   0.0000E+00
```

Shallow Stations 69 and 71

```
  Edit Fact=  2.50 Histo Bin= 0.2500E-01 OcSlope= 0.1400E-02
   ratio upper/deep variance , P_switch  0.00000000E-01   0.00000000E-01
    5 Min/Max Sta: 69.-71.  1 StdDev: 0.4604E-01 No. Obs: 62  dOx: 0.115
         1: Bias  2:Slope     3:Pcor    4:Tcor   5: Wt  6: Lag  7: bias/station
  OX Parms:  0.032 0.1058E-02 0.1494E-03  -0.0244   0.95   9.00   0.0000E+00
```

Deep Stations 69 to 71

```
  Edit Fact=  2.50 Histo Bin= 0.2500E-01 OcSlope= 0.1400E-02
   ratio upper/deep variance , P_switch  0.00000000E-01   0.00000000E-01
    3 Min/Max Sta: 69.-71.  1 StdDev: 0.1487E-01 No. Obs: 30  dOx: 0.037
           1: Bias  2:Slope     3:Pcor    4:Tcor   5: Wt  6: Lag  7: bias/station
  OX Parms: -0.034 0.1301E-02 0.1543E-03  -0.0446   0.95   9.00   0.0000E+00
```

Station 70

```
  Edit Fact=  2.50 Histo Bin= 0.2500E-01 OcSlope= 0.1400E-02
   ratio upper/deep variance , P_switch  0.00000000E-01   0.00000000E-01
    3 Min/Max Sta: 70.-70.  1 StdDev: 0.1582E-01 No. Obs: 33  dOx: 0.040
           1: Bias  2:Slope     3:Pcor    4:Tcor   5: Wt  6: Lag  7: bias/station
  OX Parms:  0.018 0.1114E-02 0.1572E-03  -0.0265   0.75   8.00   0.0000E+00
```

Stations 72 to 75

```
  Edit Fact=  2.50 Histo Bin= 0.2500E-01 OcSlope= 0.1400E-02
   ratio upper/deep variance , P_switch  0.00000000E-01   0.00000000E-01
    9 Min/Max Sta: 72.-75.  1 StdDev: 0.2478E-01 No. Obs: 54  dOx: 0.062
           1: Bias  2:Slope     3:Pcor    4:Tcor   5: Wt  6: Lag  7: bias/station
  OX Parms:  0.043 0.1032E-02 0.1469E-03  -0.0226   0.95   9.00   0.0000E+00
```

Leg4 EASTER ISLAND TO NEW ZEALAND
STATIONS 75 TO 188 (EXCEPT 76 TO 85, 112, 141, AND 187)

MISSING STATION 110 (files not present)

Station 86 to 92
Edit Fact= 2.80 Histo Bin= 0.2500E-01 OcSlope= 0.1400E-02
ratio upper/deep variance , P_switch 0.00000000E-01 0.00000000E-01
7 Min/Max Sta: 86.-92. 1 StdDev: 0.3403E-01 No. Obs: 225 dOx: .095
1: Bias 2:Slope 3:Pcor 4:Tcor 5: Wt 6: Lag 7: bias/station
OX Parms: 0.003 0.1109E-02 0.1495E-03 -0.0267 0.77 10.54 0.2013E-03

Station No. = 86 Bias = 0.0207
Station No. = 87 Bias = 0.0209
Station No. = 88 Bias = 0.0211
Station No. = 89 Bias = 0.0213
Station No. = 90 Bias = 0.0215
Station No. = 91 Bias = 0.0217
Station No. = 92 Bias = 0.0219

Station 93 to 97
Edit Fact= 2.50 Histo Bin= 0.2500E-01 OcSlope= 0.1400E-02
ratio upper/deep variance , P_switch 0.00000000E-01 0.00000000E-01
8 Min/Max Sta: 93.-97. 1 StdDev: 0.3510E-01 No. Obs: 157 dOx: 0.088
1: Bias 2:Slope 3:Pcor 4:Tcor 5: Wt 6: Lag 7: bias/station
OX Parms: 0.085 0.1102E-02 0.1484E-03 -0.0272 0.70 10.05 -.6505E-03

Station No. = 93 Bias = 0.0242
Station No. = 94 Bias = 0.0236
Station No. = 95 Bias = 0.0229
Station No. = 96 Bias = 0.0223
Station No. = 97 Bias = 0.0216

Station 93 to 103
Edit Fact= 2.80 Histo Bin= 0.2500E-01 OcSlope= 0.1400E-02
ratio upper/deep variance , P_switch 3.00000000 1000.00000000
17 Min/Max Sta: 98.-103. 1 StdDev: 0.2703E-01 No. Obs: 173 dOx: 0.076
1: Bias 2:Slope 3:Pcor 4:Tcor 5: Wt 6: Lag 7: bias/station
OX Parms: 0.009 0.1083E-02 0.1426E-03 -0.0271 0.63 4.90 0.2407E-03

Station No. = 98 Bias = 0.0326
Station No. = 99 Bias = 0.0328
Station No. = 100 Bias = 0.0330
Station No. = 101 Bias = 0.0333
Station No. = 102 Bias = 0.0335
Station No. = 103 Bias = 0.0338

Station 104 to 106

Edit Fact= 2.80 Histo Bin= 0.2500E-01 OcSlope= 0.1400E-02
ratio upper/deep variance , P_switch 3.00000000 1000.00000000
7 Min/Max Sta: 104.-106. 1 StdDev: 0.2727E-01 No. Obs: 93 dOx: 0.076
1: Bias 2:Slope 3:Pcor 4:Tcor 5: Wt 6: Lag 7: bias/station
OX Parms: -0.019 0.1115E-02 0.1486E-03 -0.0279 0.70 8.01 0.3648E-03

Station No. = 104 Bias = 0.0189
Station No. = 105 Bias = 0.0193
Station No. = 106 Bias = 0.0196

Station 107 to 109

Edit Fact= 2.80 Histo Bin= 0.2500E-01 OcSlope= 0.1400E-02
ratio upper/deep variance , P_switch 0.00000000E-01 0.00000000E-01
6 Min/Max Sta: 107.-109. 1 StdDev: 0.2736E-01 No. Obs: 93 dOx: 0.077
1: Bias 2:Slope 3:Pcor 4:Tcor 5: Wt 6: Lag 7: bias/station
OX Parms: -0.004 0.1112E-02 0.1457E-03 -0.0274 0.70 8.00 0.2605E-03

Station No. = 107 Bias = 0.0243
Station No. = 108 Bias = 0.0245
Station No. = 109 Bias = 0.0248

Station 110, 111 Use fit of Station 111

Edit Fact= 2.80 Histo Bin= 0.2500E-01 OcSlope= 0.1400E-02
ratio upper/deep variance , P_switch 3.00000000 1000.00000000
5 Min/Max Sta: 111.-111. 1 StdDev: 0.4520E-01 No. Obs: 26 dOx: 0.127
1: Bias 2:Slope 3:Pcor 4:Tcor 5: Wt 6: Lag 7: bias/station
OX Parms: 0.034 0.1071E-02 0.1452E-03 -0.0260 0.75 8.00 0.0000E+00

Station 113, 114 Use fit of stations 111,113,114

Edit Fact= 2.80 Histo Bin= 0.2500E-01 OcSlope= 0.1400E-02
ratio upper/deep variance , P_switch 3.00000000 1000.00000000
8 Min/Max Sta: 111.-114. 1 StdDev: 0.4247E-01 No. Obs: 85 dOx: 0.119
1: Bias 2:Slope 3:Pcor 4:Tcor 5: Wt 6: Lag 7: bias/station
OX Parms: 0.012 0.1087E-02 0.1402E-03 -0.0264 0.70 7.50 0.2076E-03

Station No. = 111 Bias = 0.0351
Station No. = 112 Bias = 0.0353
Station No. = 113 Bias = 0.0355
Station No. = 114 Bias = 0.0357

Station 115, 117 to 119

Edit Fact= 2.80 Histo Bin= 0.2500E-01 OcSlope= 0.1400E-02
ratio upper/deep variance , P_switch 3.00000000 1000.00000000
9 Min/Max Sta: 115.-119. 1 StdDev: 0.2686E-01 No. Obs: 123 dOx: 0.075
1: Bias 2:Slope 3:Pcor 4:Tcor 5: Wt 6: Lag 7: bias/station
OX Parms: 0.056 0.1080E-02 0.1421E-03 -0.0260 0.70 7.48 -.1708E-03

Station No. = 115 Bias = 0.0366
Station No. = 116 Bias = 0.0364
Station No. = 117 Bias = 0.0362
Station No. = 118 Bias = 0.0361
Station No. = 119 Bias = 0.0359

Station 116

Edit Fact= 2.80 Histo Bin= 0.2500E-01 OcSlope= 0.1400E-02
ratio upper/deep variance , P_switch 3.00000000 1000.00000000
5 Min/Max Sta: 116.-116. 1 StdDev: 0.2690E-01 No. Obs: 30 dOx: 0.075
1: Bias 2:Slope 3:Pcor 4:Tcor 5: Wt 6: Lag 7: bias/station
OX Parms: 0.012 0.1139E-02 0.1486E-03 -0.0301 0.70 7.00 0.0000E+00

Station 120 to 123 Use fit of stations 120 to 124

Edit Fact= 2.50 Histo Bin= 0.2500E-01 OcSlope= 0.1400E-02
ratio upper/deep variance , P_switch 3.00000000 1000.00000000
10 Min/Max Sta: 120.-124. 1 StdDev: 0.2269E-01 No. Obs: 138 dOx: 0.057
1: Bias 2:Slope 3:Pcor 4:Tcor 5: Wt 6: Lag 7: bias/station
OX Parms: 0.029 0.1116E-02 0.1465E-03 -0.0273 0.68 7.00 -.6418E-04

Station No. = 120 Bias = 0.0213
Station No. = 121 Bias = 0.0212
Station No. = 122 Bias = 0.0211
Station No. = 123 Bias = 0.0211
Station No. = 124 Bias = 0.0210

Station 124

Edit Fact= 2.80 Histo Bin= 0.2500E-01 OcSlope= 0.1400E-02
ratio upper/deep variance , P_switch 3.00000000 1000.00000000
3 Min/Max Sta: 124.-124. 1 StdDev: 0.1921E-01 No. Obs: 34 dOx: 0.054
1: Bias 2:Slope 3:Pcor 4:Tcor 5: Wt 6: Lag 7: bias/station
OX Parms: 0.017 0.1117E-02 0.1510E-03 -0.0272 0.64 6.86 0.0000E+00

Station 125 to 126

Edit Fact= 2.30 Histo Bin= 0.2500E-01 OcSlope= 0.1400E-02
ratio upper/deep variance , P_switch   3.00000000   1000.00000000
16 Min/Max Sta: 125.-126. 1 StdDev: 0.2032E-01 No. Obs: 40 dOx: 0.047
1: Bias 2:Slope   3:Pcor   4:Tcor   5: Wt 6: Lag 7: bias/station
OX Parms: 0.007 0.1167E-02 0.1500E-03 -0.0288   0.78   8.00   0.0000E+00

Station 127 to 130

Edit Fact= 2.80 Histo Bin= 0.2500E-01 OcSlope= 0.1400E-02
ratio upper/deep variance , P_switch   3.00000000   1000.00000000
5 Min/Max Sta: 127.-130. 1 StdDev: 0.2907E-01 No. Obs: 131 dOx: 0.081
1: Bias 2:Slope   3:Pcor   4:Tcor   5: Wt 6: Lag 7: bias/station
OX Parms: -0.006 0.1154E-02 0.1501E-03 -0.0287   0.75   8.00   0.1250E-03

Station No. =   127 Bias = 0.0094
Station No. =   128 Bias = 0.0095
Station No. =   129 Bias = 0.0097
Station No. =   130 Bias = 0.0098

Station 131 to 135

Edit Fact= 2.50 Histo Bin= 0.2500E-01 OcSlope= 0.1400E-02
ratio upper/deep variance , P_switch   3.00000000   1000.00000000
7 Min/Max Sta: 131.-135. 1 StdDev: 0.2351E-01 No. Obs: 146 dOx: 0.059
1: Bias 2:Slope   3:Pcor   4:Tcor   5: Wt 6: Lag 7: bias/station
OX Parms: -0.007 0.1161E-02 0.1497E-03 -0.0288   0.76   8.00   0.1174E-03

Station No. =   131 Bias = 0.0083
Station No. =   132 Bias = 0.0084
Station No. =   133 Bias = 0.0085
Station No. =   134 Bias = 0.0086
Station No. =   135 Bias = 0.0088

Station 136

Edit Fact= 2.00 Histo Bin= 0.2500E-01 OcSlope= 0.1400E-02
ratio upper/deep variance , P_switch   3.00000000   4000.00000000
8 Min/Max Sta: 136.-136. 1 StdDev: 0.1063E-01 No. Obs: 30 dOx: 0.021
1: Bias 2:Slope   3:Pcor   4:Tcor   5: Wt 6: Lag 7: bias/station
OX Parms: 0.003 0.1180E-02 0.1518E-03 -0.0299   0.64   8.00   0.0000E+00

Station 137 to 140, 142 to 144

Edit Fact= 2.80 Histo Bin= 0.2500E-01 OcSlope= 0.1400E-02
ratio upper/deep variance , P_switch   3.00000000   1000.00000000
6 Min/Max Sta: 137.-144. 1 StdDev: 0.3574E-01 No. Obs: 215 dOx: 0.100
1: Bias 2:Slope   3:Pcor   4:Tcor   5: Wt 6: Lag 7: bias/station
OX Parms: 0.000 0.1189E-02 0.1487E-03 -0.0299   0.81   8.68   0.1720E-04

Station No. =   137 Bias = 0.0028
Station No. =   138 Bias = 0.0028
Station No. =   139 Bias = 0.0028
Station No. =   140 Bias = 0.0028
Station No. =   141 Bias = 0.0029
Station No. =   142 Bias = 0.0029
Station No. =   143 Bias = 0.0029
Station No. =   144 Bias = 0.0029

Station 145 to 150

Edit Fact= 2.50 Histo Bin= 0.2500E-01 OcSlope= 0.1400E-02
ratio upper/deep variance , P_switch   3.00000000   1000.00000000
5 Min/Max Sta: 145.-150. 1 StdDev: 0.3730E-01 No. Obs: 225 dOx: 0.093
1: Bias 2:Slope   3:Pcor   4:Tcor   5: Wt 6: Lag 7: bias/station
OX Parms: 0.010 0.1172E-02 0.1470E-03 -0.0307   0.75   8.00   0.0000E+00

Station 151 to 155

Edit Fact= 2.80 Histo Bin= 0.2500E-01 OcSlope= 0.1400E-02
ratio upper/deep variance , P_switch   3.00000000   1000.00000000
8 Min/Max Sta: 151.-155. 1 StdDev: 0.2762E-01 No. Obs: 147 dOx: 0.077
1: Bias 2:Slope   3:Pcor   4:Tcor   5: Wt 6: Lag 7: bias/station
OX Parms: 0.001 0.1189E-02 0.1469E-03 -0.0297   0.79 15.15   0.4069E-04

Station No. =   151 Bias = 0.0075
Station No. =   152 Bias = 0.0076
Station No. =   153 Bias = 0.0076
Station No. =   154 Bias = 0.0077
Station No. =   155 Bias = 0.0077

Station 156

Edit Fact= 2.80 Histo Bin= 0.2500E-01 OcSlope= 0.1400E-02
ratio upper/deep variance , P_switch   3.00000000   1000.00000000
4 Min/Max Sta: 156.-156. 1 StdDev: 0.2703E-01 No. Obs: 30 dOx: 0.076
1: Bias 2:Slope   3:Pcor   4:Tcor   5: Wt 6: Lag 7: bias/station
OX Parms: 0.007 0.1195E-02 0.1458E-03 -0.0309   0.72 23.15   0.0000E+00

Station 157 to 159

```
  Edit Fact=  2.50 Histo Bin= 0.2500E-01 OcSlope= 0.1400E-02
   ratio upper/deep variance , P_switch      3.00000000    1000.00000000
    6 Min/Max Sta: 157.-159.  1 StdDev: 0.2792E-01 No. Obs: 85  dOx: 0.070
         1: Bias  2:Slope     3:Pcor    4:Tcor   5: Wt  6: Lag  7: bias/station
  OX Parms:  0.004 0.1207E-02 0.1467E-03  -0.0305   0.80  15.35   0.0000E+00
```

Station 160 to 162

```
  Edit Fact=  2.50 Histo Bin= 0.2500E-01 OcSlope= 0.1400E-02
   ratio upper/deep variance , P_switch      3.00000000    1000.00000000
    7 Min/Max Sta: 160.-162.  1 StdDev: 0.3854E-01 No. Obs: 105  dOx: 0.096
         1: Bias  2:Slope     3:Pcor    4:Tcor   5: Wt  6: Lag  7: bias/station
  OX Parms:  0.014 0.1183E-02 0.1445E-03  -0.0299   0.81   9.09   0.0000E+00
```

Station 163

```
  Edit Fact=  2.50 Histo Bin= 0.2500E-01 OcSlope= 0.1400E-02
   ratio upper/deep variance , P_switch      3.00000000    1000.00000000
    4 Min/Max Sta: 163.-163.  1 StdDev: 0.1831E-01 No. Obs: 29  dOx: 0.046
         1: Bias  2:Slope     3:Pcor    4:Tcor   5: Wt  6: Lag  7: bias/station
  OX Parms: -0.002 0.1224E-02 0.1471E-03  -0.0325   0.70   9.00   0.0000E+00
```

Station 164 to 167

```
  Edit Fact=  2.80 Histo Bin= 0.2500E-01 OcSlope= 0.1400E-02
   ratio upper/deep variance , P_switch  0.00000000E-01   0.00000000E-01
    7 Min/Max Sta: 164.-167.  1 StdDev: 0.3208E-01 No. Obs: 114  dOx: 0.090
         1: Bias  2:Slope     3:Pcor    4:Tcor   5: Wt  6: Lag  7: bias/station
  OX Parms:  0.031 0.1161E-02 0.1458E-03  -0.0290   0.74   4.68   -.9247E-04

        Station No. =   164  Bias = 0.0155
        Station No. =   165  Bias = 0.0154
        Station No. =   166  Bias = 0.0153
        Station No. =   167  Bias = 0.0152
```

Stations 168 to 170

```
  Edit Fact=  2.80 Histo Bin= 0.2500E-01 OcSlope= 0.1400E-02
   ratio upper/deep variance , P_switch  0.00000000E-01   0.00000000E-01
    5 Min/Max Sta: 168.-170.  1 StdDev: 0.3139E-01 No. Obs: 93  dOx: 0.088
         1: Bias  2:Slope     3:Pcor    4:Tcor   5: Wt  6: Lag  7: bias/station
  OX Parms: -0.003 0.1194E-02 0.1469E-03  -0.0303   0.82   3.00   0.4917E-04

        Station No. =   168  Bias = 0.0057
        Station No. =   169  Bias = 0.0058
        Station No. =   170  Bias = 0.0058
```

Stations 171 to 174

Edit Fact= 2.80 Histo Bin= 0.2500E-01 OcSlope= 0.1400E-02
ratio upper/deep variance , P_switch 3.00000000 1000.00000000
18 Min/Max Sta: 171.-174. 1 StdDev: 0.2560E-01 No. Obs: 90 dOx: 0.072
1: Bias 2:Slope 3:Pcor 4:Tcor 5: Wt 6: Lag 7: bias/station
OX Parms: -0.001 0.1270E-02 0.1453E-03 -0.0393 0.90 3.00 -.4661E-04

Station No. = 171 Bias = -.0091
Station No. = 172 Bias = -.0092
Station No. = 173 Bias = -.0092
Station No. = 174 Bias = -.0093

Stations 175 to 178

Edit Fact= 2.80 Histo Bin= 0.2500E-01 OcSlope= 0.1400E-02
ratio upper/deep variance , P_switch 3.00000000 1000.00000000
8 Min/Max Sta: 175.-178. 1 StdDev: 0.6433E-01 No. Obs: 127 dOx: 0.180
1: Bias 2:Slope 3:Pcor 4:Tcor 5: Wt 6: Lag 7: bias/station
OX Parms: 0.016 0.1175E-02 0.1447E-03 -0.0296 0.90 3.00 0.0000E+00

Station 179 to 182

Edit Fact= 2.80 Histo Bin= 0.2500E-01 OcSlope= 0.1400E-02
ratio upper/deep variance , P_switch 3.00000000 1000.00000000
5 Min/Max Sta: 179.-182. 1 StdDev: 0.6177E-01 No. Obs: 119 dOx: 0.173
1: Bias 2:Slope 3:Pcor 4:Tcor 5: Wt 6: Lag 7: bias/station
OX Parms: 0.016 0.1085E-02 0.1546E-03 -0.0244 0.84 3.00 0.5458E-04

Station No. = 179 Bias = 0.0258
Station No. = 180 Bias = 0.0259
Station No. = 181 Bias = 0.0260
Station No. = 182 Bias = 0.0260

Stations 183 to 184

Edit Fact= 2.80 Histo Bin= 0.2500E-01 OcSlope= 0.1400E-02
ratio upper/deep variance , P_switch 3.00000000 1000.00000000
4 Min/Max Sta: 183.-184. 1 StdDev: 0.3034E-01 No. Obs: 52 dOx: 0.085
1: Bias 2:Slope 3:Pcor 4:Tcor 5: Wt 6: Lag 7: bias/station
OX Parms: 0.040 0.1083E-02 0.1346E-03 -0.0249 0.95 8.00 0.0000E+00

Stations 185 to 188

Edit Fact= 2.50 Histo Bin= 0.2500E-01 OcSlope= 0.1400E-02
ratio upper/deep variance , P_switch 3.00000000 1000.00000000
9 Min/Max Sta: 185.-188. 1 StdDev: 0.3887E-01 No. Obs: 81 dOx: 0.097
1: Bias 2:Slope 3:Pcor 4:Tcor 5: Wt 6: Lag 7: bias/station
OX Parms: 0.112 0.1136E-02 0.1480E-03 -0.0269 0.87 8.00 -.5249E-03

Station No. = 185 Bias = 0.0150
Station No. = 186 Bias = 0.0145
Station No. = 187 Bias = 0.0140
Station No. = 188 Bias = 0.0135

Leg5 CTD 10
NEW ZEALAND TO AUSTRALIA
STATIONS 190 TO 246

Station 190 to 194

Edit Fact= 2.80 Histo Bin= 0.2500E-01 OcSlope= 0.1400E-02
ratio upper/deep variance , P_switch 3.00000000 1000.00000000
7 Min/Max Sta: 190.-194. 1 StdDev: 0.2064E-01 No. Obs: 152 dOx: 0.058
1: Bias 2:Slope 3:Pcor 4:Tcor 5: Wt 6: Lag 7: bias/station
OX Parms: -0.005 0.1071E-02 0.1290E-03 -0.0261 0.72 1.20 0.2826E-03

Station No. = 190 Bias = 0.0486
Station No. = 191 Bias = 0.0489
Station No. = 192 Bias = 0.0492
Station No. = 193 Bias = 0.0495
Station No. = 194 Bias = 0.0498

Stations 195 to 201 Use fit of stations 190 to 201

Edit Fact= 2.80 Histo Bin= 0.2500E-01 OcSlope= 0.1400E-02
ratio upper/deep variance , P_switch 3.00000000 1000.00000000
9 Min/Max Sta: 190.-201. 1 StdDev: 0.2944E-01 No. Obs: 317 dOx: 0.082
1: Bias 2:Slope 3:Pcor 4:Tcor 5: Wt 6: Lag 7: bias/station
OX Parms: 0.002 0.1100E-02 0.1347E-03 -0.0273 0.75 5.10 0.1808E-03

Station No. = 190 Bias = 0.0361
Station No. = 191 Bias = 0.0363
Station No. = 192 Bias = 0.0365
Station No. = 193 Bias = 0.0367
Station No. = 194 Bias = 0.0368
Station No. = 195 Bias = 0.0370
Station No. = 196 Bias = 0.0372
Station No. = 197 Bias = 0.0374
Station No. = 198 Bias = 0.0376
Station No. = 199 Bias = 0.0377
Station No. = 200 Bias = 0.0379
Station No. = 201 Bias = 0.0381

Stations 202 to 211

Edit Fact= 2.80 Histo Bin= 0.2500E-01 OcSlope= 0.1400E-02
ratio upper/deep variance , P_switch 3.00000000 1000.00000000
4 Min/Max Sta: 202.-211. 1 StdDev: 0.3065E-01 No. Obs: 189 dOx: 0.086
1: Bias 2:Slope 3:Pcor 4:Tcor 5: Wt 6: Lag 7: bias/station
OX Parms: 0.026 0.1063E-02 0.1307E-03 -0.0253 0.73 5.10 0.1343E-03

Station No. = 202 Bias = 0.0531
Station No. = 203 Bias = 0.0532
Station No. = 204 Bias = 0.0533
Station No. = 205 Bias = 0.0535
Station No. = 206 Bias = 0.0536
Station No. = 207 Bias = 0.0537
Station No. = 208 Bias = 0.0539
Station No. = 209 Bias = 0.0540
Station No. = 210 Bias = 0.0541
Station No. = 211 Bias = 0.0543

Station 212 to 221

Edit Fact= 2.80 Histo Bin= 0.2500E-01 OcSlope= 0.1400E-02
ratio upper/deep variance , P_switch 0.00000000E-01 0.00000000E-01
6 Min/Max Sta: 212.-221. 1 StdDev: 0.2997E-01 No. Obs: 198 dOx: 0.084
1: Bias 2:Slope 3:Pcor 4:Tcor 5: Wt 6: Lag 7: bias/station
OX Parms: 0.012 0.1076E-02 0.1388E-03 -0.0256 0.74 8.59 0.1357E-03

Station No. = 212 Bias = 0.0406
Station No. = 213 Bias = 0.0407
Station No. = 214 Bias = 0.0409
Station No. = 215 Bias = 0.0410
Station No. = 216 Bias = 0.0412
Station No. = 217 Bias = 0.0413
Station No. = 218 Bias = 0.0414
Station No. = 219 Bias = 0.0416
Station No. = 220 Bias = 0.0417
Station No. = 221 Bias = 0.0418

Station 222 to 231

Edit Fact= 2.80 Histo Bin= 0.2500E-01 OcSlope= 0.1400E-02
ratio upper/deep variance , P_switch 3.00000000 1000.00000000
8 Min/Max Sta: 222.-231. 1 StdDev: 0.2690E-01 No. Obs: 169 dOx: 0.075
1: Bias 2:Slope 3:Pcor 4:Tcor 5: Wt 6: Lag 7: bias/station
OX Parms: 0.025 0.1069E-02 0.1579E-03 -0.0249 0.82 9.18 0.1949E-04

Station No. = 222 Bias = 0.0290
Station No. = 223 Bias = 0.0290
Station No. = 224 Bias = 0.0291
Station No. = 225 Bias = 0.0291
Station No. = 226 Bias = 0.0291
Station No. = 227 Bias = 0.0291
Station No. = 228 Bias = 0.0291
Station No. = 229 Bias = 0.0292
Station No. = 230 Bias = 0.0292
Station No. = 231 Bias = 0.0292

Stations 232 to 240

Edit Fact= 2.80 Histo Bin= 0.2500E-01 OcSlope= 0.1400E-02
ratio upper/deep variance , P_switch 3.00000000 1000.00000000
6 Min/Max Sta: 232.-240. 1 StdDev: 0.4332E-01 No. Obs: 285 dOx: 0.121
1: Bias 2:Slope 3:Pcor 4:Tcor 5: Wt 6: Lag 7: bias/station
OX Parms: -0.005 0.1149E-02 0.1490E-03 -0.0284 0.90 10.00 0.7517E-04

Station No. = 232 Bias = 0.0127
Station No. = 233 Bias = 0.0128
Station No. = 234 Bias = 0.0128
Station No. = 235 Bias = 0.0129
Station No. = 236 Bias = 0.0130
Station No. = 237 Bias = 0.0131
Station No. = 238 Bias = 0.0131
Station No. = 239 Bias = 0.0132
Station No. = 240 Bias = 0.0133

Stations 241 to 246

Edit Fact= 2.80 Histo Bin= 0.2500E-01 OcSlope= 0.1400E-02
ratio upper/deep variance , P_switch 3.00000000 1000.00000000
6 Min/Max Sta: 241.-246. 1 StdDev: 0.3474E-01 No. Obs: 79 dOx: 0.097
1: Bias 2:Slope 3:Pcor 4:Tcor 5: Wt 6: Lag 7: bias/station
OX Parms: 0.015 0.1071E-02 0.1636E-03 -0.0250 0.85 3.17 0.4869E-04

Station No. = 241 Bias = 0.0264
Station No. = 242 Bias = 0.0264
Station No. = 243 Bias = 0.0265
Station No. = 244 Bias = 0.0265
Station No. = 245 Bias = 0.0266
Station No. = 246 Bias = 0.0266

Station 246

Manually adjusted bias of calculated oxygen in CTD and SEA file by
+0.1 ml/l oxygen, to match water samlple data and CTD traces.

CTD09

Leg3 CTD 09
CHILE TO EASTER ISLAND
STATION 3

Station 3

```
  Edit Fact=  2.00 Histo Bin= 0.2500E-01 OcSlope= 0.1400E-02
   ratio upper/deep variance , P_switch      3.00000000    1000.00000000
    8 Min/Max Sta: 3.-3.  1 StdDev: 0.3573E-01 No. Obs: 21  dOx: .071
         1: Bias  2:Slope     3:Pcor    4:Tcor   5: Wt  6: Lag  7: bias/station
  OX Parms: -0.007 0.9272E-03 0.1697E-03  -0.0285   0.90  10.00   0.0000E+00
```

Leg4 CTD 09
EASTER ISLAND TO NEW ZEALAND
STATIONS 76 TO 85, not including duplicate stations 112, 141, and 187

Stations 76 to 78

```
  Edit Fact=  2.30 Histo Bin= 0.2500E-01 OcSlope= 0.1400E-02
   ratio upper/deep variance , P_switch      3.00000000    1000.00000000
   16 Min/Max Sta: 76.-78.  1 StdDev: 0.1369E-01 No. Obs: 74  dOx: 0.031
         1: Bias  2:Slope     3:Pcor    4:Tcor   5: Wt  6: Lag  7: bias/station
  OX Parms:  0.011 0.8891E-03 0.1654E-03  -0.0284   0.60  10.00   0.0000E+00
```

Stations 79, 81 to 85 Use fit of stations 76 to 79, 81 to 85

```
  Edit Fact=  2.80 Histo Bin= 0.2500E-01 OcSlope= 0.1400E-02
   ratio upper/deep variance , P_switch      3.00000000    1500.00000000
    9 Min/Max Sta: 76.-85.  1 StdDev: 0.3899E-01 No. Obs: 286  dOx: .109
         1: Bias  2:Slope     3:Pcor    4:Tcor   5: Wt  6: Lag  7: bias/station
  OX Parms:  0.020 0.8835E-03 0.1597E-03  -0.0286   0.59   9.17   0.0000E+00
```

Station 80

```
  Edit Fact=  2.80 Histo Bin= 0.2500E-01 OcSlope= 0.1400E-02
   ratio upper/deep variance , P_switch  0.00000000E-01   0.00000000E-01
    2 Min/Max Sta: 80.-80.  1 StdDev: 0.6161E-01 No. Obs: 35  dOx: 0.172
         1: Bias  2:Slope     3:Pcor    4:Tcor   5: Wt  6: Lag  7: bias/station
  OX Parms:  0.004 0.8364E-03 0.2127E-03  -0.0247   0.48   9.20   0.0000E+00
```

Leg5 CTD 09
NEW ZEALAND TO AUSTRALIA
STATIONS 248 TO 267, not including duplicate stations 189, 247

Stations 248 to 257 Use fit of stations 249-255
Edit Fact= 2.50 Histo Bin= 0.2500E-01 OcSlope= 0.1400E-02
ratio upper/deep variance , P_switch 0.00000000E-01   0.00000000E-01
4 Min/Max Sta: 249.-255. 1 StdDev: 0.4877E-01 No. Obs: 49 dOx: .122
1: Bias 2:Slope   3:Pcor   4:Tcor   5: Wt 6: Lag 7: bias/station
OX Parms: 0.012 0.8430E-03 0.1556E-03 -0.0288   0.50   6.90   0.9029E-04

Station No. =   249 Bias = 0.0349
Station No. =   250 Bias = 0.0350
Station No. =   251 Bias = 0.0351
Station No. =   252 Bias = 0.0352
Station No. =   253 Bias = 0.0353
Station No. =   254 Bias = 0.0354
Station No. =   255 Bias = 0.0355

Stations 258 to 267 Use fit of stations 258-264
Edit Fact= 2.50 Histo Bin= 0.2500E-01 OcSlope= 0.1400E-02
ratio upper/deep variance , P_switch 0.00000000E-01   0.00000000E-01
4 Min/Max Sta: 258.-264. 1 StdDev: 0.6324E-01 No. Obs: 48 dOx: 0.158
1: Bias 2:Slope   3:Pcor   4:Tcor   5: Wt 6: Lag 7: bias/station
OX Parms: 0.003 0.8746E-03 0.1615E-03 -0.0293   0.55 10.67   0.7379E-04

Station No. =   258 Bias = 0.0220
Station No. =   259 Bias = 0.0221
Station No. =   260 Bias = 0.0221
Station No. =   261 Bias = 0.0222
Station No. =   262 Bias = 0.0223
Station No. =   263 Bias = 0.0223
Station No. =   264 Bias = 0.0224

Station 256
Manually adjusted bias of calculated oxygen in CTD and SEA file by
-0.1 ml/l oxygen, to match water samlple data and CTD traces.

Table 16: gives the calibration scaling factors used to derive CTD oxygen data on P6

sta	bias	slope	pcor	tcor	wt	lag
4	.730000E-01	.142800E-02	-.648500E-02	-.324000E-01	.750000E-01	.800000E+01
5	-.154000E+00	.123000E-02	.307800E-03	-.319000E-01	.750000E+00	.800000E+01
6	-.700000E-02	.108900E-02	.176100E-03	-.234000E-01	.750000E+00	.800000E+01
7	-.700000E-02	.108900E-02	.176100E-03	-.234000E-01	.750000E+00	.800000E+01
8	-.700000E-02	.108900E-02	.176100E-03	-.234000E-01	.750000E+00	.800000E+01
9	-.700000E-02	.108900E-02	.176100E-03	-.234000E-01	.750000E+00	.800000E+01
10	-.700000E-02	.108900E-02	.176100E-03	-.234000E-01	.750000E+00	.800000E+01
11	-.700000E-02	.108900E-02	.176100E-03	-.234000E-01	.750000E+00	.800000E+01
12	.190000E-01	.105800E-02	.159600E-03	-.222000E-01	.950000E+00	.380000E+01
13	.190000E-01	.105800E-02	.159600E-03	-.222000E-01	.950000E+00	.380000E+01
14	.190000E-01	.105800E-02	.159600E-03	-.222000E-01	.950000E+00	.380000E+01
15	.190000E-01	.105800E-02	.159600E-03	-.222000E-01	.950000E+00	.380000E+01
16	.190000E-01	.105800E-02	.159600E-03	-.222000E-01	.950000E+00	.380000E+01
17	.190000E-01	.105800E-02	.159600E-03	-.222000E-01	.950000E+00	.380000E+01
18	.190000E-01	.105800E-02	.159600E-03	-.222000E-01	.950000E+00	.380000E+01
19	.190000E-01	.105800E-02	.159600E-03	-.222000E-01	.950000E+00	.380000E+01
20	.190000E-01	.105800E-02	.159600E-03	-.222000E-01	.950000E+00	.380000E+01
21	.190000E-01	.105800E-02	.159600E-03	-.222000E-01	.950000E+00	.380000E+01
22	.360000E-01	.995700E-03	.160700E-03	-.197000E-01	.950000E+00	.370000E+01
23	.360000E-01	.995700E-03	.160700E-03	-.197000E-01	.950000E+00	.370000E+01
24	.360000E-01	.995700E-03	.160700E-03	-.197000E-01	.950000E+00	.370000E+01
25	.360000E-01	.995700E-03	.160700E-03	-.197000E-01	.950000E+00	.370000E+01
26	.270000E-01	.104800E-02	.157300E-03	-.251000E-01	.750000E+00	.800000E+01
27	.270000E-01	.104800E-02	.157300E-03	-.251000E-01	.750000E+00	.800000E+01
28	.270000E-01	.104800E-02	.157300E-03	-.251000E-01	.750000E+00	.800000E+01
29	.270000E-01	.104800E-02	.157300E-03	-.251000E-01	.750000E+00	.800000E+01
30	.270000E-01	.104800E-02	.157300E-03	-.251000E-01	.750000E+00	.800000E+01
31	.270000E-01	.104800E-02	.157300E-03	-.251000E-01	.750000E+00	.800000E+01
32	.270000E-01	.104800E-02	.157300E-03	-.251000E-01	.750000E+00	.800000E+01
33	.290000E-01	.103200E-02	.160300E-03	-.219000E-01	.750000E+00	.800000E+01
34	.290000E-01	.103200E-02	.160300E-03	-.219000E-01	.750000E+00	.800000E+01
35	.290000E-01	.103200E-02	.160300E-03	-.219000E-01	.750000E+00	.800000E+01
36	.290000E-01	.103200E-02	.160300E-03	-.219000E-01	.750000E+00	.800000E+01
37	.290000E-01	.103200E-02	.160300E-03	-.219000E-01	.750000E+00	.800000E+01
38	.290000E-01	.103200E-02	.160300E-03	-.219000E-01	.750000E+00	.800000E+01
39	.440000E-01	.100100E-02	.149000E-03	-.207000E-01	.950000E+00	.640000E+01
40	.440000E-01	.100100E-02	.149000E-03	-.207000E-01	.950000E+00	.640000E+01
41	.440000E-01	.100100E-02	.149000E-03	-.207000E-01	.950000E+00	.640000E+01
42	.440000E-01	.100100E-02	.149000E-03	-.207000E-01	.950000E+00	.640000E+01
43	.360000E-01	.101700E-02	.154300E-03	-.202000E-01	.950000E+00	.440000E+01
44	.360000E-01	.101700E-02	.154300E-03	-.202000E-01	.950000E+00	.440000E+01
45	.360000E-01	.101700E-02	.154300E-03	-.202000E-01	.950000E+00	.440000E+01
46	.360000E-01	.102400E-02	.153400E-03	-.228000E-01	.750000E+00	.800000E+01
47	.360000E-01	.102400E-02	.153400E-03	-.228000E-01	.750000E+00	.800000E+01

sta	bias	slope	pcor	tcor	wt	lag
48	.360000E-01	.102400E-02	.153400E-03	-.228000E-01	.750000E+00	.800000E+01
49	.360000E-01	.102400E-02	.153400E-03	-.228000E-01	.750000E+00	.800000E+01
50	.360000E-01	.102400E-02	.153400E-03	-.228000E-01	.750000E+00	.800000E+01
51	.360000E-01	.102400E-02	.153400E-03	-.228000E-01	.750000E+00	.800000E+01
52	.360000E-01	.102400E-02	.153400E-03	-.228000E-01	.750000E+00	.800000E+01
53	.360000E-01	.102400E-02	.153400E-03	-.228000E-01	.750000E+00	.800000E+01
54	.360000E-01	.102400E-02	.153400E-03	-.228000E-01	.750000E+00	.800000E+01
55	.360000E-01	.102400E-02	.153400E-03	-.228000E-01	.750000E+00	.800000E+01
56	.360000E-01	.102400E-02	.153400E-03	-.228000E-01	.750000E+00	.800000E+01
57	.160000E-01	.107200E-02	.161200E-03	-.247000E-01	.100000E+01	.856000E+01
58	.290000E-01	.104500E-02	.155100E-03	-.234000E-01	.950000E+00	.116000E+02
59	.290000E-01	.104500E-02	.155100E-03	-.234000E-01	.950000E+00	.116000E+02
60	.290000E-01	.104500E-02	.155100E-03	-.234000E-01	.950000E+00	.116000E+02
61	.290000E-01	.104500E-02	.155100E-03	-.234000E-01	.950000E+00	.116000E+02
62	.430000E-01	.104400E-02	.141100E-03	-.236000E-01	.950000E+00	.560000E+01
63	.430000E-01	.105700E-02	.142000E-03	-.241000E-01	.950000E+00	.750000E+01
64	.430000E-01	.104400E-02	.141100E-03	-.236000E-01	.950000E+00	.560000E+01
65	.430000E-01	.104400E-02	.141100E-03	-.236000E-01	.950000E+00	.560000E+01
66	.430000E-01	.104400E-02	.141100E-03	-.236000E-01	.950000E+00	.560000E+01
67	.430000E-01	.104400E-02	.141100E-03	-.236000E-01	.950000E+00	.560000E+01
68	.430000E-01	.104400E-02	.141100E-03	-.236000E-01	.950000E+00	.560000E+01
69	.320000E-01	.105800E-02	.149400E-03	-.244000E-01	.950000E+00	.900000E+01
70	.180000E-01	.111400E-02	.157200E-03	-.265000E-01	.750000E+00	.800000E+01
71	.320000E-01	.105800E-02	.149400E-03	-.244000E-01	.950000E+00	.900000E+01
72	.430000E-01	.103200E-02	.146900E-03	-.226000E-01	.950000E+00	.900000E+01
75	.430000E-01	.103200E-02	.146900E-03	-.226000E-01	.950000E+00	.900000E+01
76	.110000E-01	.889100E-03	.165400E-03	-.284000E-01	.600000E+00	.100000E+02
77	.110000E-01	.889100E-03	.165400E-03	-.284000E-01	.600000E+00	.100000E+02
78	.110000E-01	.889100E-03	.165400E-03	-.284000E-01	.600000E+00	.100000E+02
79	.200000E-01	.883500E-03	.159700E-03	-.286000E-01	.590000E+00	.917000E+01
80	.400000E-02	.836400E-03	.212700E-03	-.247000E-01	.480000E+00	.920000E+01
81	.200000E-01	.883500E-03	.159700E-03	-.286000E-01	.590000E+00	.917000E+01
82	.200000E-01	.883500E-03	.159700E-03	-.286000E-01	.590000E+00	.917000E+01
83	.200000E-01	.883500E-03	.159700E-03	-.286000E-01	.590000E+00	.917000E+01
84	.200000E-01	.883500E-03	.159700E-03	-.286000E-01	.590000E+00	.917000E+01
85	.200000E-01	.883500E-03	.159700E-03	-.286000E-01	.590000E+00	.917000E+01
86	.207000E-01	.110900E-02	.149500E-03	-.267000E-01	.770000E+00	.105400E+02
87	.209000E-01	.110900E-02	.149500E-03	-.267000E-01	.770000E+00	.105400E+02
88	.211000E-01	.110900E-02	.149500E-03	-.267000E-01	.770000E+00	.105400E+02
89	.213000E-01	.110900E-02	.149500E-03	-.267000E-01	.770000E+00	.105400E+02
90	.215000E-01	.110900E-02	.149500E-03	-.267000E-01	.770000E+00	.105400E+02
91	.217000E-01	.110900E-02	.149500E-03	-.267000E-01	.770000E+00	.105400E+02
92	.219000E-01	.110900E-02	.149500E-03	-.267000E-01	.770000E+00	.105400E+02
93	.242000E-01	.110200E-02	.148400E-03	-.272000E-01	.700000E+00	.100500E+02
94	.236000E-01	.110200E-02	.148400E-03	-.272000E-01	.700000E+00	.100500E+02
95	.229000E-01	.110200E-02	.148400E-03	-.272000E-01	.700000E+00	.100500E+02
96	.223000E-01	.110200E-02	.148400E-03	-.272000E-01	.700000E+00	.100500E+02

sta	bias	slope	pcor	tcor	wt	lag
97	.216000E-01	.110200E-02	.148400E-03	-.272000E-01	.700000E+00	.100500E+02
98	.326000E-01	.108300E-02	.142600E-03	-.271000E-01	.630000E+00	.490000E+01
99	.328000E-01	.108300E-02	.142600E-03	-.271000E-01	.630000E+00	.490000E+01
100	.330000E-01	.108300E-02	.142600E-03	-.271000E-01	.630000E+00	.490000E+01
101	.333000E-01	.108300E-02	.142600E-03	-.271000E-01	.630000E+00	.490000E+01
102	.335000E-01	.108300E-02	.142600E-03	-.271000E-01	.630000E+00	.490000E+01
103	.338000E-01	.108300E-02	.142600E-03	-.271000E-01	.630000E+00	.490000E+01
104	.189000E-01	.111500E-02	.148600E-03	-.279000E-01	.700000E+00	.801000E+01
105	.193000E-01	.111500E-02	.148600E-03	-.279000E-01	.700000E+00	.801000E+01
106	.196000E-01	.111500E-02	.148600E-03	-.279000E-01	.700000E+00	.801000E+01
107	.243000E-01	.111200E-02	.145700E-03	-.274000E-01	.700000E+00	.800000E+01
108	.245000E-01	.111200E-02	.145700E-03	-.274000E-01	.700000E+00	.800000E+01
109	.248000E-01	.111200E-02	.145700E-03	-.274000E-01	.700000E+00	.800000E+01
110	.340000E-01	.107100E-02	.145200E-03	-.260000E-01	.750000E+00	.800000E+01
111	.340000E-01	.107100E-02	.145200E-03	-.260000E-01	.750000E+00	.800000E+01
113	.355000E-01	.108700E-02	.140200E-03	-.264000E-01	.700000E+00	.750000E+01
114	.357000E-01	.108700E-02	.140200E-03	-.264000E-01	.700000E+00	.750000E+01
115	.366000E-01	.108000E-02	.142100E-03	-.260000E-01	.700000E+00	.748000E+01
116	.120000E-01	.113900E-02	.148600E-03	-.301000E-01	.700000E+00	.700000E+01
117	.362000E-01	.108000E-02	.142100E-03	-.260000E-01	.700000E+00	.748000E+01
118	.361000E-01	.108000E-02	.142100E-03	-.260000E-01	.700000E+00	.748000E+01
119	.359000E-01	.108000E-02	.142100E-03	-.260000E-01	.700000E+00	.748000E+01
120	.213000E-01	.111600E-02	.146500E-03	-.273000E-01	.680000E+00	.700000E+01
121	.212000E-01	.111600E-02	.146500E-03	-.273000E-01	.680000E+00	.700000E+01
122	.211000E-01	.111600E-02	.146500E-03	-.273000E-01	.680000E+00	.700000E+01
123	.211000E-01	.111600E-02	.146500E-03	-.273000E-01	.680000E+00	.700000E+01
124	.170000E-01	.111700E-02	.151000E-03	-.272000E-01	.640000E+00	.686000E+01
125	.700000E-02	.116700E-02	.150000E-03	-.288000E-01	.780000E+00	.800000E+01
126	.700000E-02	.116700E-02	.150000E-03	-.288000E-01	.780000E+00	.800000E+01
127	.940000E-02	.115400E-02	.150100E-03	-.287000E-01	.750000E+00	.800000E+01
128	.950000E-02	.115400E-02	.150100E-03	-.287000E-01	.750000E+00	.800000E+01
129	.970000E-02	.115400E-02	.150100E-03	-.287000E-01	.750000E+00	.800000E+01
130	.980000E-02	.115400E-02	.150100E-03	-.287000E-01	.750000E+00	.800000E+01
131	.830000E-02	.116100E-02	.149700E-03	-.288000E-01	.760000E+00	.800000E+01
132	.840000E-02	.116100E-02	.149700E-03	-.288000E-01	.760000E+00	.800000E+01
133	.850000E-02	.116100E-02	.149700E-03	-.288000E-01	.760000E+00	.800000E+01
134	.860000E-02	.116100E-02	.149700E-03	-.288000E-01	.760000E+00	.800000E+01
135	.880000E-02	.116100E-02	.149700E-03	-.288000E-01	.760000E+00	.800000E+01
136	.300000E-02	.118000E-02	.151800E-03	-.299000E-01	.640000E+00	.800000E+01
137	.280000E-02	.118900E-02	.148700E-03	-.299000E-01	.810000E+00	.868000E+01
138	.280000E-02	.118900E-02	.148700E-03	-.299000E-01	.810000E+00	.868000E+01
139	.280000E-02	.118900E-02	.148700E-03	-.299000E-01	.810000E+00	.868000E+01
140	.280000E-02	.118900E-02	.148700E-03	-.299000E-01	.810000E+00	.868000E+01
142	.290000E-02	.118900E-02	.148700E-03	-.299000E-01	.810000E+00	.868000E+01
143	.290000E-02	.118900E-02	.148700E-03	-.299000E-01	.810000E+00	.868000E+01
144	.290000E-02	.118900E-02	.148700E-03	-.299000E-01	.810000E+00	.868000E+01
145	.100000E-01	.117200E-02	.147000E-03	-.307000E-01	.750000E+00	.800000E+01

sta	bias	slope	pcor	tcor	wt	lag
146	.100000E-01	.117200E-02	.147000E-03	-.307000E-01	.750000E+00	.800000E+01
147	.100000E-01	.117200E-02	.147000E-03	-.307000E-01	.750000E+00	.800000E+01
148	.100000E-01	.117200E-02	.147000E-03	-.307000E-01	.750000E+00	.800000E+01
149	.100000E-01	.117200E-02	.147000E-03	-.307000E-01	.750000E+00	.800000E+01
150	.100000E-01	.117200E-02	.147000E-03	-.307000E-01	.750000E+00	.800000E+01
151	.750000E-02	.118900E-02	.146900E-03	-.297000E-01	.790000E+00	.151500E+02
152	.760000E-02	.118900E-02	.146900E-03	-.297000E-01	.790000E+00	.151500E+02
153	.760000E-02	.118900E-02	.146900E-03	-.297000E-01	.790000E+00	.151500E+02
154	.770000E-02	.118900E-02	.146900E-03	-.297000E-01	.790000E+00	.151500E+02
155	.770000E-02	.118900E-02	.146900E-03	-.297000E-01	.790000E+00	.151500E+02
156	.700000E-02	.119500E-02	.145800E-03	-.309000E-01	.720000E+00	.231500E+02
157	.400000E-02	.120700E-02	.146700E-03	-.305000E-01	.800000E+00	.153500E+02
158	.400000E-02	.120700E-02	.146700E-03	-.305000E-01	.800000E+00	.153500E+02
159	.400000E-02	.120700E-02	.146700E-03	-.305000E-01	.800000E+00	.153500E+02
160	.140000E-01	.118300E-02	.144500E-03	-.299000E-01	.810000E+00	.909000E+01
161	.140000E-01	.118300E-02	.144500E-03	-.299000E-01	.810000E+00	.909000E+01
162	.140000E-01	.118300E-02	.144500E-03	-.299000E-01	.810000E+00	.909000E+01
163	-.200000E-02	.122400E-02	.147100E-03	-.325000E-01	.700000E+00	.900000E+01
164	.155000E-01	.116100E-02	.145800E-03	-.290000E-01	.740000E+00	.468000E+01
165	.154000E-01	.116100E-02	.145800E-03	-.290000E-01	.740000E+00	.468000E+01
166	.153000E-01	.116100E-02	.145800E-03	-.290000E-01	.740000E+00	.468000E+01
167	.152000E-01	.116100E-02	.145800E-03	-.290000E-01	.740000E+00	.468000E+01
168	.570000E-02	.119400E-02	.146900E-03	-.303000E-01	.820000E+00	.300000E+01
169	.580000E-02	.119400E-02	.146900E-03	-.303000E-01	.820000E+00	.300000E+01
170	.580000E-02	.119400E-02	.146900E-03	-.303000E-01	.820000E+00	.300000E+01
171	-.910000E-02	.127000E-02	.145300E-03	-.393000E-01	.900000E+00	.300000E+01
172	-.920000E-02	.127000E-02	.145300E-03	-.393000E-01	.900000E+00	.300000E+01
173	-.920000E-02	.127000E-02	.145300E-03	-.393000E-01	.900000E+00	.300000E+01
174	-.930000E-02	.127000E-02	.145300E-03	-.393000E-01	.900000E+00	.300000E+01
175	.160000E-01	.117500E-02	.144700E-03	-.296000E-01	.900000E+00	.300000E+01
176	.160000E-01	.117500E-02	.144700E-03	-.296000E-01	.900000E+00	.300000E+01
177	.160000E-01	.117500E-02	.144700E-03	-.296000E-01	.900000E+00	.300000E+01
178	.160000E-01	.117500E-02	.144700E-03	-.296000E-01	.900000E+00	.300000E+01
179	.258000E-01	.108500E-02	.154600E-03	-.244000E-01	.840000E+00	.300000E+01
180	.259000E-01	.108500E-02	.154600E-03	-.244000E-01	.840000E+00	.300000E+01
181	.260000E-01	.108500E-02	.154600E-03	-.244000E-01	.840000E+00	.300000E+01
182	.260000E-01	.108500E-02	.154600E-03	-.244000E-01	.840000E+00	.300000E+01
183	.400000E-01	.108300E-02	.134600E-03	-.249000E-01	.950000E+00	.800000E+01
184	.400000E-01	.108300E-02	.134600E-03	-.249000E-01	.950000E+00	.800000E+01
185	.150000E-01	.113600E-02	.148000E-03	-.269000E-01	.870000E+00	.800000E+01
186	.145000E-01	.113600E-02	.148000E-03	-.269000E-01	.870000E+00	.800000E+01
188	.135000E-01	.113600E-02	.148000E-03	-.269000E-01	.870000E+00	.800000E+01
190	.486000E-01	.107100E-02	.129000E-03	-.261000E-01	.720000E+00	.120000E+01
191	.489000E-01	.107100E-02	.129000E-03	-.261000E-01	.720000E+00	.120000E+01
192	.492000E-01	.107100E-02	.129000E-03	-.261000E-01	.720000E+00	.120000E+01
193	.495000E-01	.107100E-02	.129000E-03	-.261000E-01	.720000E+00	.120000E+01
194	.498000E-01	.107100E-02	.129000E-03	-.261000E-01	.720000E+00	.120000E+01

sta	bias	slope	pcor	tcor	wt	lag
195	.370000E-01	.110000E-02	.134700E-03	-.273000E-01	.750000E+00	.510000E+01
196	.372000E-01	.110000E-02	.134700E-03	-.273000E-01	.750000E+00	.510000E+01
197	.374000E-01	.110000E-02	.134700E-03	-.273000E-01	.750000E+00	.510000E+01
198	.376000E-01	.110000E-02	.134700E-03	-.273000E-01	.750000E+00	.510000E+01
199	.377000E-01	.110000E-02	.134700E-03	-.273000E-01	.750000E+00	.510000E+01
200	.379000E-01	.110000E-02	.134700E-03	-.273000E-01	.750000E+00	.510000E+01
201	.381000E-01	.110000E-02	.134700E-03	-.273000E-01	.750000E+00	.510000E+01
202	.531000E-01	.106300E-02	.130700E-03	-.253000E-01	.730000E+00	.510000E+01
203	.532000E-01	.106300E-02	.130700E-03	-.253000E-01	.730000E+00	.510000E+01
204	.533000E-01	.106300E-02	.130700E-03	-.253000E-01	.730000E+00	.510000E+01
205	.535000E-01	.106300E-02	.130700E-03	-.253000E-01	.730000E+00	.510000E+01
206	.536000E-01	.106300E-02	.130700E-03	-.253000E-01	.730000E+00	.510000E+01
207	.537000E-01	.106300E-02	.130700E-03	-.253000E-01	.730000E+00	.510000E+01
208	.539000E-01	.106300E-02	.130700E-03	-.253000E-01	.730000E+00	.510000E+01
209	.540000E-01	.106300E-02	.130700E-03	-.253000E-01	.730000E+00	.510000E+01
210	.541000E-01	.106300E-02	.130700E-03	-.253000E-01	.730000E+00	.510000E+01
211	.543000E-01	.106300E-02	.130700E-03	-.253000E-01	.730000E+00	.510000E+01
212	.406000E-01	.107600E-02	.138800E-03	-.256000E-01	.740000E+00	.859000E+01
213	.407000E-01	.107600E-02	.138800E-03	-.256000E-01	.740000E+00	.859000E+01
214	.409000E-01	.107600E-02	.138800E-03	-.256000E-01	.740000E+00	.859000E+01
215	.410000E-01	.107600E-02	.138800E-03	-.256000E-01	.740000E+00	.859000E+01
216	.412000E-01	.107600E-02	.138800E-03	-.256000E-01	.740000E+00	.859000E+01
217	.413000E-01	.107600E-02	.138800E-03	-.256000E-01	.740000E+00	.859000E+01
218	.414000E-01	.107600E-02	.138800E-03	-.256000E-01	.740000E+00	.859000E+01
219	.416000E-01	.107600E-02	.138800E-03	-.256000E-01	.740000E+00	.859000E+01
220	.417000E-01	.107600E-02	.138800E-03	-.256000E-01	.740000E+00	.859000E+01
221	.418000E-01	.107600E-02	.138800E-03	-.256000E-01	.740000E+00	.859000E+01
222	.290000E-01	.106900E-02	.157900E-03	-.249000E-01	.820000E+00	.918000E+01
223	.290000E-01	.106900E-02	.157900E-03	-.249000E-01	.820000E+00	.918000E+01
224	.291000E-01	.106900E-02	.157900E-03	-.249000E-01	.820000E+00	.918000E+01
225	.291000E-01	.106900E-02	.157900E-03	-.249000E-01	.820000E+00	.918000E+01
226	.291000E-01	.106900E-02	.157900E-03	-.249000E-01	.820000E+00	.918000E+01
227	.291000E-01	.106900E-02	.157900E-03	-.249000E-01	.820000E+00	.918000E+01
228	.291000E-01	.106900E-02	.157900E-03	-.249000E-01	.820000E+00	.918000E+01
229	.292000E-01	.106900E-02	.157900E-03	-.249000E-01	.820000E+00	.918000E+01
230	.292000E-01	.106900E-02	.157900E-03	-.249000E-01	.820000E+00	.918000E+01
231	.292000E-01	.106900E-02	.157900E-03	-.249000E-01	.820000E+00	.918000E+01
232	.127000E-01	.114900E-02	.149000E-03	-.284000E-01	.900000E+00	.100000E+02
233	.128000E-01	.114900E-02	.149000E-03	-.284000E-01	.900000E+00	.100000E+02
234	.128000E-01	.114900E-02	.149000E-03	-.284000E-01	.900000E+00	.100000E+02
235	.129000E-01	.114900E-02	.149000E-03	-.284000E-01	.900000E+00	.100000E+02
236	.130000E-01	.114900E-02	.149000E-03	-.284000E-01	.900000E+00	.100000E+02
237	.131000E-01	.114900E-02	.149000E-03	-.284000E-01	.900000E+00	.100000E+02
238	.131000E-01	.114900E-02	.149000E-03	-.284000E-01	.900000E+00	.100000E+02
239	.132000E-01	.114900E-02	.149000E-03	-.284000E-01	.900000E+00	.100000E+02
240	.133000E-01	.114900E-02	.149000E-03	-.284000E-01	.900000E+00	.100000E+02
241	.264000E-01	.107100E-02	.163600E-03	-.250000E-01	.850000E+00	.317000E+01

sta	bias	slope	pcor	tcor	wt	lag
242	.264000E-01	.107100E-02	.163600E-03	-.250000E-01	.850000E+00	.317000E+01
243	.265000E-01	.107100E-02	.163600E-03	-.250000E-01	.850000E+00	.317000E+01
244	.265000E-01	.107100E-02	.163600E-03	-.250000E-01	.850000E+00	.317000E+01
245	.266000E-01	.107100E-02	.163600E-03	-.250000E-01	.850000E+00	.317000E+01
246	.266000E-01	.107100E-02	.163600E-03	-.250000E-01	.850000E+00	.317000E+01
248	.349000E-01	.843000E-03	.155600E-03	-.288000E-01	.500000E+00	.690000E+01
249	.349000E-01	.843000E-03	.155600E-03	-.288000E-01	.500000E+00	.690000E+01
250	.350000E-01	.843000E-03	.155600E-03	-.288000E-01	.500000E+00	.690000E+01
251	.351000E-01	.843000E-03	.155600E-03	-.288000E-01	.500000E+00	.690000E+01
252	.352000E-01	.843000E-03	.155600E-03	-.288000E-01	.500000E+00	.690000E+01
253	.353000E-01	.843000E-03	.155600E-03	-.288000E-01	.500000E+00	.690000E+01
254	.354000E-01	.843000E-03	.155600E-03	-.288000E-01	.500000E+00	.690000E+01
255	.355000E-01	.843000E-03	.155600E-03	-.288000E-01	.500000E+00	.690000E+01
256	.355000E-01	.843000E-03	.155600E-03	-.288000E-01	.500000E+00	.690000E+01
257	.355000E-01	.843000E-03	.155600E-03	-.288000E-01	.500000E+00	.690000E+01
258	.220000E-01	.874600E-03	.161500E-03	-.293000E-01	.550000E+00	.106700E+02
259	.221000E-01	.874600E-03	.161500E-03	-.293000E-01	.550000E+00	.106700E+02
260	.221000E-01	.874600E-03	.161500E-03	-.293000E-01	.550000E+00	.106700E+02
261	.222000E-01	.874600E-03	.161500E-03	-.293000E-01	.550000E+00	.106700E+02
262	.223000E-01	.874600E-03	.161500E-03	-.293000E-01	.550000E+00	.106700E+02
263	.223000E-01	.874600E-03	.161500E-03	-.293000E-01	.550000E+00	.106700E+02
264	.224000E-01	.874600E-03	.161500E-03	-.293000E-01	.550000E+00	.106700E+02
265	.224000E-01	.874600E-03	.161500E-03	-.293000E-01	.550000E+00	.106700E+02
266	.224000E-01	.874600E-03	.161500E-03	-.293000E-01	.550000E+00	.106700E+02
267	.224000E-01	.874600E-03	.161500E-03	-.293000E-01	.550000E+00	.106700E+02

Appendix H: CTD processing: Station by station
(notes on fitting, interpolations, spikes, etc.)

Sta #	Comments
1	Test station
2	Test station
3	Test station
4	Surface spike in salinity. 1,3 dbar salts marked bad. Refit station 4's oxygen data by itself. Formerly stations 4 and 5 fit together.
5	Surface spike in salinity. 1 dbar salt marked questionable.
6	Oxygen too high, adjusted by -.04ml/l in CTD and SEA file.
7	Deep water spike in salinity. Interpolate salinity 1233 to 1251db.
8	Spike in salinity. Interpolate salinity 171 to 185. Spike in salinity. Interpolate salinity 1825 to 1843. Spike in oxygen. Interpolate oxygen 1819 to 1847.
9	Jump in oxygen, -.04 from 1.55 to 1.65 deg.theta. Could be real, quality word left at 2.
10	Surface spike in salinity. 1,3 dbar salt marked bad.
11	
12	Initially missing top 400 meters of data due to beginning bad records in raw data being interpreted as beginning pressure by the pressure averaging program. Top 400 meters recovered. Spike in salinity. Interpolate 381db salt. CTD oxygen does not agree with bottles. Mark top 57 dbar as questionable.
13	
14	Surface spike in salinity. 1 dbar salt marked bad.
15	CTD oxygen does not agree with bottles. Mark top 79 dbs as questionable. CTD oxygen might be off around 5 degrees theta, unclear from bottles, CTD quality word left as good.
16	CTD oxygen does not agree with bottles. Mark top 57 dbar as questionable.
17	
18	Deep water spike in salinity due to incorrect data at end of file. The pressure averaging program interpolates all the 2db bins between last good point and first bad point adding ~200 dbar of bad information which goes below the ocean floor. The bad data at the bottom of the file were removed. CTD oxygen does not agree with bottles. Mark top 81db as questionable.
19	

Sta #	Comments
20	Spike in salinity. Interpolate salt 223 to 231db. CTD oxygen does not agree with bottles. Mark top 73 dbar as questionable.
21	
22	
23	Wayward salinity. Interpolate salt 67 to 73 db. CTD oxygen does not agree with bottles. Mark top 77 dbar as questionable.
24	Wayward salinity. Interpolate salt 63 to 71 db. CTD oxygen does not agree with bottles. Mark top 71 dbar as questionable.
25	Surface spike in salinity. Mark 1,3 dbar salts as bad.
26	CTD oxygen does not agree with bottles. Mark top 73 dbar as questionable. Tried to refit CTD to match deep bottles better. No better fit found so fit left as it was.
27	CTD oxygen does not agree with bottles. Mark top 93 dbar as questionable.
29	Deep water spike in salinity. Interpolate salt 1637 to 1761 dbar.
31	Deep water spike in salinity. Interpolate salt 2041 to 2059db. Deep water spike in oxygen. Interpolate oxygen 2045 to 2053 db.
32	Surface spike in salinity. Mark 1,3 dbar salts as bad. CTD oxygen does not agree with bottles. Mark top 83 dbar as questionable.
33	CTD oxygen does not agree with bottles. Mark top 67 dbar as questionable.
34	CTD oxygen lower than bottles at 2.6 deg.theta. Doesn't look quite right but quality word left as good.
36	CTD oxygen does not agree with bottles. Mark top 75 dbar as questionable.
37	CTD oxygen does not agree with bottles. Mark top 65 dbar as questionable.
39	CTD oxygen does not agree with bottles. Mark top 73 dbar as questionable.
40	CTD oxygen does not agree with bottles. Mark top 101 dbar as questionable.
41	CTD oxygen does not agree with bottles. Mark top 73 dbar as questionable.
42	Surface spike in salinity. Mark 1db salts as bad. Theta salinity plot shows looping. Changing water (fresher than 41 and 43) may add to variability?
44	CTD oxygen does not agree with bottles. Mark top 65 dbar as questionable.
46	CTD oxygen does not agree with bottles. Mark top 87 dbar as

	questionable.
Sta #	**Comments**
47	CTD oxygen does not agree with bottles. Mark top 189 dbar as questionable.
49	CTD oxygen does not agree with bottles. Mark top 87 dbar as questionable.
50	CTD oxygen does not agree with bottles. Mark top 123 dbar as questionable.
51	CTD oxygen does not agree with bottles. Mark top 79 dbar as questionable.
52	CTD oxygen does not agree with bottles. Mark top 52 dbar as questionable.
53	CTD oxygen does not agree with bottles. Mark top 113 dbar as questionable. Mark oxygens in deeper region for same reason, 555 to 799db.
54	Deep water spike in salinity. Interpolate salt 3177 to 3183db. CTD oxygen does not agree with bottles. Mark top 85 dbar as questionable.
56	CTD oxygen does not agree with bottles. Mark top 95 dbar as questionable.
57	Station 57 oxygen data refit by itself. Formerly fit with stations 46 to 57.
58	CTD oxygen does not agree with bottles. Mark top 159 dbar as questionable.
59	Small surface spike in salinity called ok- spike has changed theta which makes it much more likely to be real. CTD oxygen does not agree with bottles. Mark top 231 dbar as questionable.
60	CTD oxygen does not agree with bottles. Mark top 131 dbar as questionable.
61	CTD oxygen does not agree with bottles. Mark top 161 dbar as questionable and 423 to 775 as questionable.
62	Surface spike in salinity. Mark 1-5db salts as bad.
63	Spike in salinity. Interpolate salt 535 to 581db. Gap in data. Interpolate temperature, and salinity 535 to 581 dbar. Interpolate oxygen 531 to 589 CTD oxygen does not agree with bottles. Mark top 213 dbar as questionable. Stations 62, 64 and particularly 63 show more noise at depth than other stations in the oxygen profile. Could be due to non uniform lowering rate associated with poor sea state.
64	CTD oxygen does not agree with bottles. Mark top 251 dbar as questionable.
69	Spike in oxygen. Interpolate oxygen 81 to 105db.

Sta #	Comments
70 to 72	Oxygen is noisier than usual, especially station 72. Salinity profile also has more looping in it. Both salinity and oxygen showing noise and loops supports the thought that the noise is caused by nonuniform lowering rate due to bad weather or big seas. The lowering rate varies from .5m/s to 2m/s unlike station 69 where the lowering rate was fairly consistent at 1m/s.
71	CTD oxygen does not agree with bottles. Mark top 151 dbar as questionable.
72	Seeing loops in theta salinity plots.

Leg 4

75	Looks like it is on its own in theta salinity plot but it is consistent with station 71 which is moving between station 72 and 75.
76-78	refit. The bottom oxygens were not matching the bottles. The original fit was from a larger group 76 to 85.
78	Oxygen does not reach oxygen minimum defined by bottles at 3 degrees theta.
79	Large gap in data. Winch died near 1880 dbar. CTD stopped logging at this depth and was not started again until 2100db. Fix: Linear interpolation of temperature from 1879 to 2109 db. Salt and oxygen information copied from station 78 at matching theta intervals. Salt replaced from 1831 to 2401 dbar. Oxygen replaced from 1831 to the bottom. Oxygen does not reach oxygen minimum defined by bottles at 3 deg.
80	Oxygen lower than bottles at 7 deg. theta. Quality word not adjusted.
81	Bottom spike in oxygen spanning 3127 to 3393 dbar. This corresponds to the change in the rate of decent as the CTD approaches the bottom. This was checked and found true for Stations 84 through 87 as well.
93 - 97:	Variability in oxygen profile increase. Due to sea state?
101,102:	CTD oxygen appears high from 8 to 14 deg.theta by .1 ml/l in both stations 101 and 102
111	Refit oxygen in station 111 by itself. Formerly in group of stations 111,113, 114
118,119	CTD oxygen in 118 and 119 is marginal between good and questionable , low from 3 to 8deg.theta. Quality word left as good.
119	Bottom oxygen drifts high from bottom five bottles. Marked oxygens as questionable throughout the drift, 4661 to 5620 db.
124	Refit oxygen be itself. Formerly fit in group 120 through 124.
128	Abrupt change into new water.

Sta #	Comments
130	Deep water spike in salinity. Interpolate salt 4285 to 4301 dbar Deep oxygen has looping, jagged, noisier than the other stations.
131	Surface spike in salinity. Mark 1,3 dbar salts as bad.
132	Surface spike in salinity. Mark 1,3 dbar salts as questionable.
135	Surface spike in salinity. Mark 1,3 dbar salts as questionable.
136	Acquistion computers crashed 700 m off the bottom. Acquistion halted and resumed. When resumed, oxygen had changed to a lower oxygen by .04 ml/l. Marked oxygen quality word as bad from 4905 db, where the jump occured to the bottom.
137-142	bottle oxygens appear low, CTD oxygens are consistent with earlier stations.
137	Surface spike in salinity. Mark 1,3 dbar salts as questionable. Station +.002 psu than other stations. Salt slope reduced in calibrations files.
139	Spike in salinity at bottom of cast. Mark last data point as bad.
143	Surface spike in salinity. Mark 1,3 dbar salts as bad. Big surface spike in oxygen. Mark 1 dbar oxygen and temperature bad.
145-150	Refit oxygens in this group to get bottom oxygens to match bottles. Bottom oxygens now match better although top , near sea surface looks a little worse.
147	Data has gap where there were no observations 2259 to 2313db. Salinity spikes. Interpolate salt 1903,1909,1911,1931,1991, 2067-2085, 2093-2097, 2013-2027, 2157-2171, 2181-2189, 2257-2321db. Oxygen spikes. Interpolate oxygen 2073 to 2133 and 2257 to 2321db. Temperature was also interpolated over this range.
148	Bottom oxygen spike. Mark oxygen as questionable 6400db to bottom.
151	Surface spike in salinity. Mark 1,3 dbar salts as bad.
156-167	show two systematic spikes (small, around .002 psu) occuring near 2300db and 4400db. Interpolate over salt spike 5511 to 5545db.
156	Gap in data. Interpolate over gap for temperature, salt and oxygen from 5513 to 5547db. Surface spike in salinity. Mark 1,3 dbar salts as bad. Surface spike in oxygen. Mark 1 dbar bad.
157	Interpolate over salt spike 4409 to 4411db.
158	Gap in data. Interpolate over gap for temperature, salt and oxygen from 5521 to 5559db. Interpolate over additional salt spike 4415 to 4449db.
159	Interpolate over salt spike 2333 to 2353db.

Interpolate over oxygen spike 5525 to 5545.

Sta #	**Comments**
160-162	Refit oxygen because bottom of profile was too high (.04ml/l).
160	Interpolate over salt spike 4415 to 4433db.
161	Interpolate over salt spikes 2307 to 2323 and 4359 to 4361db.
162	Interpolate over salt spike 2357 to 2365db.
163	Interpolate over salt spikes 2363 to 2375 and 4327 to 4339db.
164	Gap in data, 4565 to 4603 dbar.Interpolate temperature, salt and oxygen. Surface spike in salinity. Mark 1 dbar salts as questionable.
165	Gap in data, 5593 to 5649 dbar.Interpolate temperatre, salt and oxygen.
166	Gap in data, 5617 to 5645 dbar.Interpolate temperature,salt and oxygen. Surface spike in salinity. Mark 1 dbar salts as bad.
167	Interpolate over salt spike 5613 to 5631db. Interpolate over oxygen spike 5611 to 5631 db.
171-174	CTD oxygen does not looked scaled correctly. CTD is .4 ml/l low from 8 deg. theta to surface. Close look at CTD below 2deg. theta looks fine. Bottle data used for fitting had not been corrected for bottles out of order. This may have caused a problem if bottles were subsequently reorderd.
171	Surface spike in salinity. Mark 1,3 dbar salts as bad. Interpolate over salt spike at 2501db.
173	Spike in salinity. Interpolate 103 db.
174	Interpolate over salt spike 6537 to 6549db.

Leg5

181	Bottom oxygen is high.
182-188	CTD is uniform but water sample salt high,.001psu, in deep water
185	Spike in salinity. Mark 1,3,5 dbar salts as bad.
195	Small spike in salinity with looping in theta v salt plot. Interpolate 405 to 461db.
197	Oxygen data noiser than usual.
198	Surface spike in salinity. Mark 1,3 dbar salts as bad. Small spike in salt, interpolate 849 db. Nice crossover from one water mass to the next through stations 197 to 199.
199	Bottom bottle is deeper than CTD downtrace by 7 dbar.
200	Surface spike in salinity. Mark 1,3 dbar salts as bad. Small spike, interpolate salt at 1063 db.
201	Surface spike in salinity. Mark 1,3 dbar salts as bad. Spikes/ density inversion, interpolate 453db and 457db. Salinity spike at bottom. Mark last salt record, 2275db., as bad.

Sta #	**Comments**
202	Surface spike in salinity. Mark 1 dbar salt as questionable. Spikes / density inversions, interpolate 453db and 459db.
207	Surface spike in salinity. Mark 1 dbar salt as bad.
209	Small spike in salinity, interpolate 375db.
210	Surface spike in salinity. Mark 1,3 dbar salts as questionable.
211	Surface spike in salinity. Mark 1,3 dbar salts as bad.
213	Spike in salinity. Interpolate salts 553 to 561db.
215	Surface spike in salintiy. Supported by water sample, accepted as good. Bottom spike in salinity. Mark last salt record, 3423 dbar.as bad.
219	Surface spike in salinity. Mark 1,3 dbar salts as questionable.
222	Salinity jumps low, stays low, then jumps back to where it was. Due to temporary contamination of the cell? Interpolate salts over jump from 547 to 567 dbar.
223	Surface spike in salinity. Mark 1 dbar salt as bad.
224	Surface spike in salinity. Mark 1,3 dbar salts as bad.
226	Surface spike in salinity. Mark 1db salt as questionable.
227	Surface spike in salinity. Mark 1 dbar salt as questionable. CTD oxygen low compared to bottles from 18 deg. theta to surface. Quality word left as good.
232	Oxygen is a litle high at bottom,.04
235	Odd structure in salt 14 to 16 deg theta. Left as is. Interpolate salinity spike 1087 to 1095db.
236	Surface spike in salinity. Mark 1 dbar salt as bad. Interpolate over salinity spike 1537 to 1553 db. CTD oxygen low compared to bottles by .04 ml/l. Quality word left as good.
240	Surface spike in salinity. Mark 1db salt as questionable. Interpolate over salinity spike at 23db.
242	Small salinity spike, interpolate salt from 383 to 401.
245	Very warm water at surface. Oxygen too low, a bias of .1 ml/l added to profile.
248	Station salt is+.002 psu than other stations. Salt slope reduced in calibrations files. Interpolate oxygens over 1741 to 1757
253	Interpolate over salinity spike 649 to 659 db.
256	Oxygen too high, a bias of .1ml/l subtracted from profile.

LIST OF INTERPOLATIONS MADE TO CTD DATA.

Any 2 dbar bin in the CTD file that had no observations automatically was assigned a "6" in all quality fields. Those bins with no observations have not been included in this list.

STA	St. Bad Pressure	Interpolated Parameter	End Bad Pressure
7,	1233,	3,	1251
8,	171,	3,	185
8,	1825,	3,	1843
8,	1819,	4,	1847
20,	223,	3,	231
23,	67,	3,	73
24,	63,	3,	71
29,	1637,	3,	1761
31,	2041,	3,	2059
31,	2045,	4,	2053
54,	3177,	3,	3183
63,	435,	2,	581
63,	535,	3,	581
63,	531,	4,	589
69,	81,	4,	105
95,	283,	3,	283
103,	9,	3,	9
105,	1057,	3,	1057
130,	4285,	3,	4301
147,	2259,	2,	2313
147,	1903,	3,	1903
147,	1909,	3,	1909
147,	1911,	3,	1911
147,	1991,	3,	1991
147,	2013,	3,	2027
147,	2067,	3,	2085
147,	2093,	3,	2097
147,	2157,	3,	2171
147,	2181,	3,	2189
147,	2257,	3,	2321
147,	2073,	4,	2133
147,	2255,	4,	2321
156,	5513,	2,	5547
156,	5511,	3,	5545
156,	5511,	4,	5547
157,	4409,	3,	4411
158,	5521,	2,	5559

STA	St. Bad Pressure	Interpolated Parameter	End Bad Pressure
158,	4415,	3,	4449
158,	5519,	3,	5559
158,	5521,	4,	5559
159,	2333,	3,	2253
159,	5525,	4,	5545
160,	4415,	3,	4433
161,	2307,	3,	2323
161,	4359,	3,	4361
162,	2357,	3,	2365
163,	2363,	3,	2375
163,	4327,	3,	4339
164,	4565,	2,	4603
164,	4563,	3,	4599
164,	4559,	4,	4601
165,	5595,	2,	5649
165,	5593,	3,	5649
165,	5591,	4,	5649
166,	5619,	2,	5645
166,	5619,	3,	5645
166,	5617,	4,	5645
167,	5613,	3,	5631
167,	5611,	4,	5631
171,	2501,	3,	2501
173,	103,	3,	103
174,	6537,	3,	6549
195,	405,	3,	461
198,	849,	3,	849
200,	1063,	3,	1063
201,	453,	3,	453
201,	457,	3,	457
202,	453,	3,	453
202,	459,	3,	459
209,	375,	3,	375
213,	553,	3,	561
222,	547,	3,	567
235,	1087,	3,	1095
236,	1537,	3,	1553
240,	23,	3,	23
242,	383,	3,	401
248,	1741,	4,	1757
248,	2217,	4,	2235
253,	649,	3,	659

Report of CTD/watersample data submission

General Information and CTD observation log

The following was excerpted from the at-sea log kept by the CTD data processor on each leg (Carol MacMurray: legs 1,2; Ellyn Montgomery: leg 3). The log details the major difficulties experienced on P6. In general, operations on stations not discussed below went more-or-less normally.

CTD instrument and station numbers:

CTD 10	**Stations**	LEG 3:	1,4-72
		LEG 4:	74,75,86-111,113-140, 142-186,188
		LEG 5:	190-212
CTD 9	**Stations**	LEG 3:	3
		LEG 4:	76-85,112,141,187
		LEG 5:	189
CTD 7	**Stations**	LEG 3:	2
		LEG 4:	73
		LEG 5:	

CTD 10 was the primary instrument on the cruise, #9 was called into service for some 10 stations during leg 3 when #10 failed. CTD #9 also failed on that leg, but by that time CTD #10 had been repaired.

CTDs 9 and 10 were equipped with a second temperature channel (using an FSI Ocean Temperature Module). Data from these sensors were used to assess when during the cruise shifts in the primary temperature sensor occurred. CTD #10 was also equipped with a pump, designed to make uniform the flow of seawater past the dissolved oxygen sensor. The oxygen pump was used throughout leg 3. Careful examination of the Leg 3 data after the cruise suggested the pump did not function as well as was hoped (or tested on earlier expeditions). The oxygen current data are quite noisy in the top several hundred meters from Leg 3. (Possibly the pump was cavatating on air not bled from the supply tube.) In any event, the final P6 data from Leg 3 have quite noisy oxygens in the upper ocean. Users may wish to do some vertical averaging/filtering prior to using these data. The oxygen pump was removed from the system at the start of Leg 4 and not used for the rest of the expedition.

Shorebased processor:

MicroVAX Data subdirectory: R2D2:<CTD.KN138P003

NOTE: The ship departed Valparaiso as Knorr 138 LEG 3. We will keep the directory KN138 throughout all three legs and increment the station numbers.

NOTE: There was an FSI CTD and scripps logger attached to the package for selected stations on Leg 5 to obtain comparison data to test this new instrument.

AT SEA DATA ACQUISITION

MICROVAX II
CTD03
with WHOI AQUI89 acquisition package (Version 1.0+)

Logging data to: Vhs vcr tape recorder
9T
Microvax disk file (###A###.RAW) in CTD78 format
(*.WRW,*.WSC,*.HED,*.ERR) in ASCII format

CTD 10
AT SEA COMMON USED FOR DATA ACQUISITION: CTD#10
These are the laboratory derived calibration constants used in the real-time display of data during the cruise

v#	attribute 1	attribute 2	slope	bias	sens lag
1	-0.294565E-08	0.000000E+00	0.100352E+00	-0.246449E+00	0.000000E+00
2	0.225955E-11	0.000000E+00	0.499864E-03	0.186416E-02	0.250000E+00
3	-0.650000E-05	0.150000E-07	0.100631E-02	-0.177214E-02	0.000000E+00
4	0.280000E+01	0.300000E+04	0.100000E+01	0.000000E+00	0.000000E+00
5	-0.360000E-01	0.115000E-03	0.123300E-02	0.000000E+00	0.000000E+00
6	0.750000E+00	0.000000E+00	0.128000E+00	0.000000E+00	0.000000E+00
7	-0.707350E+02	0.246810E+01	-0.909828E-02	0.362914E+02	0.000000E+00
8	0.000000E+00	0.000000E+00	0.100000E+01	0.000000E+01	0.000000E+00
9	0.000000E+00	0.000000E+00	0.500000E-03	-0.200000E+01	0.000000E+00
10	0.543326E-01	-0.413000E-05	0.100000E+01	0.218000E+02	0.000000E+00
TP cals changed sta 60: S1=+2.71E-6 S2=-.054 Pres Bias set to -0.8 sta 60					

CTD 9
AT SEA COMMON USED FOR DATA ACQUISITION: CTD#9

v#	attribute 1	attribute 2	slope	bias	sens lag
1	0.297377E-09	0.000000E+00	0.100557E+00	0.450652E+00	0.000000E+00
2	0.197920E-11	0.000000E+00	0.500248E-03	-0.361583E-01	0.250000E+00
3	-0.650000E-05	0.150000E-07	0.997986E-03	-0.231510E-01	0.000000E+00
4	0.280000E+01	0.300000E+04	0.100000E+01	0.000000E+00	0.000000E+00
5	-0.360000E-01	0.115000E-03	0.148000E-02	0.000000E+00	0.000000E+00
6	0.750000E+00	0.000000E+00	0.128000E+00	0.000000E+00	0.000000E+00
7	-0.227549E+03	0.126625E+02	-0.904813E-02	0.379786E+02	0.000000E+00
8	0.000000E+00	0.000000E+00	0.100000E+01	0.000000E+01	0.000000E+00
9	0.000000E+00	0.000000E+00	0.500000E-03	-0.200000E+01	0.000000E+00
10	-0.141909E-01	-0.353000E-05	0.100000E+01	0.218000E+02	0.000000E+00
TP cals changed leg 4: S1=+3.39E-6 S2=+.015					

CTD 7
AT SEA COMMON USED FOR DATA ACQUISITION: CTD#7

v#	attribute 1	attribute 2	slope	bias	sens lag
1	-0.802577E-09	0.000000E+00	0.999165E-01	0.366930E+00	0.000000E+00
2	0.131918E-11	0.000000E+00	0.499886E-03	0.627969E-03	0.250000E+00
3	-0.650000E-05	0.150000E-07	0.984760E-03	0.380964E-01	0.000000E+00
4	0.280000E+01	0.300000E+04	0.100000E+01	0.000000E+00	0.000000E+00
5	-0.360000E-01	0.115000E-03	0.240500E-02	0.000000E+00	0.000000E+00
6	0.750000E+00	0.000000E+00	0.128000E+00	0.000000E+00	0.000000E+00
7	0.000000E+00	0.000000E+00	0.100000E+01	0.000000E+00	0.000000E+00
8	0.000000E+00	0.000000E+00	0.100000E+01	0.000000E+00	0.000000E+00
9	0.000000E+00	0.000000E+00	0.500000E-03	-0.200000E+01	0.000000E+00
10	0.000000E+00	0.000000E+00	0.100000E+01	0.000000E+00	0.000000E+00
TP cals changed leg 4: S1=-2.54E-6 S2=-.40					

SHIPBOARD PROCESSING

DESCRIPTION OF COMPUTER SYSTEM USED:

CTDED78

run on MicroVAX Acquisition CTD78 format raw data 9T files.
output to MicroVAX disk files
[CTD.KN138P003.CTDED78]####D###.EDT

error identification downtrace

***discovered bug in editor at sea: given true pressure limits, program will truncate CTD data by 7-13 db depending on the depth. Deeper the station, more severe the truncation. Noticed in Chilean trench. Workaround: add 20 dbars to max pressure limit observed by CTD (on station log). Record limits do not seem to override this discrepancy.

***discovered similar flakyness on leg 5. Sometimes the record min for processing is ignored, when processing from disk files. Using the AQUI 9tracks allowed correct processing in these cases.

Water sample Programs:

BTLFMTVX, WOCTMPV2*(to produce WOCE template)
BTLMRGV2, SEAMERG2 (to merge sa,ox,nuts data)
CONVERT, HYDOUTV (to create .dyn file)

*woctmpv2 was revised at sea to incorporate new PRESSC.
for code

Water sample corrections: [ctd.kn138p003.john]fixtp.com
modifies .wrw files to include a compensation for tp.

Water sample filenames: Salinity and Oxygen Rosette Samples for overplotting ctd and bottle data

KN138.WSD - all stations
KN138.DYN - all stations for overplotting

Merged CTD, SA, OX, Nutrient water sample filename:

KN138.SEA - Woce template, all stations appended together

COMMENTS regarding data acquisition:

LEG 3:

Aqui89 troubles from the start of leg 3. Code got corrupted and was scrambling the last three parameters (TP,TR,RT). Plotting of extra variables and derived parameters was demonic. Test sta 999 and 998, and sta 1 were acquired with this corrupt code. A backup AQUI89 tape from July 1991 was restored to the microvax and sta 2 was acquired with this code. Data clean. Plotting spikes for TE variable. Station 1 was replayed from audio tape with this old code.

Logging in parallel to PC, stations 999,998,1-3,5-7,9-12. Logging to third microvax rental, stations 11-17.

Test sta 999 supplied too much power to fish, noise at bottom when firing. Switched to battery, powered off lambda. Pressure spikes apparent test sta 998. Believed to be from pinger. Sta 1 and 2 were deployed with no pinger to test this hypothesis. Verified. Pinger moved on rosette frame prior to sta 3, no spikes.

Triple cast in Chilean trench. Sta 1-ctd #10, sta 2-ctd #7, sta 3-ctd #9. Decided to go with ctd 10. Ctd 7 bad oxy sensor, cond noisy deep water. Ctd 9 equally as good as 10 but consensus was to use 10 because of oxy pump. Ctd 10 showed some cond hysteresis at theta of 2.3-2.8 deg on co vs te plots but t/s showed no up/down differences. Bob said diff in co attributed to diff in pressure. Up/down different by 30 db.

Replaced Oxygen sensor on ctd10 prior to sta 4.

Power outages and total blackout prior to sta 8. CTD02 and CTD03 both crashed. Early on, CTD03 had repeated crashes, at start of cruise and in port in Jacksonville. Thought to be UPS, power or ethernet related, one user logged off "mike" ship’s ethernet at the same time during one crash. Cause indeterminate.

Noticed aqui record tags off by 50 dbars from deck unit readout on station logs. Changed average number of scans in template file from 5 to 1 sta 9 to no avail. Aqui tags were always higher than deck unit readouts, indicating that the system was somewhat slow, lagging behind the current scan. Quick fix: tagged 1 min after firing. Worked okay.

Logged to CTD04 (latest version of P6 code that was corrupt on CTD03) stations 11-17 to compare bottle tag files. CTD04 tag files were right on the mark, and furthermore, the last 3 channels were not scrambled.

CTD03 crashed stations 12, cast 1. Restarted aqui cast 2. CTD03 crashed again sta 13, but logging to CTD04 so didn’t restart CTD03 again. Crashes seemed to indicate ethernet problems. User logged out from "mike" on ctd02 sta 12 at exactly same time ctd03 lost connection. Coincidence? Tagging offset also suggested that ethernet was perhaps slowing the system down. Decided to disconnect from ship's ethernet and create own ctd network.

Restored P6 AQUI89 code on CTD03 on 6 May and acquired sta 14 with the same code. Ctd04 logging in tandem as backup still. Sta 14 was clean and tag files were right on the mark.

Aqui plotting code relinked and recompiled May 8. Seemed last fix to software had bug in it, so went back to plotting code just prior to last fix. Aqui89 code modified May 12 to add extra column in redt temp field in .WRW tag file to avoid integer overflow.

Sta 17, CTD03 crashed again. Likely culprits: HE/TRitium van or NUTS ethernet cables, or UPS/ship power problem. He/Tr van was not working when hooked up through hydrovan to ctd network to ships network. Disconnected He/Tr cable, wired directly to ship and ethernet working fine. Thought He/Tr and hydrovan had an interrupt or board conflict.

Winch failed sta 21 3500 m on upcast. Only 3 bottles fired. Brake froze. CTD sat 500 m off bottom for 5-6 hours before got working again. Switched over to markey winch sta 22.

After record tags editted manually and templates distributed, discovered numerous double-tripping of bottles. Just about every station through sta 22. Changed pylons prior to sta 23 which proved successful.

Sta 27 new co slope. Markey winch failed 700 m upcast sta 27. Cast aborted. CTD had to be brought on deck manually. Switched back to first winch. Required second person to manually operate brake.

After recovery on sta 28, CTD endcap opened. Seacon 4 pin bulkhead connectors replaced.

Aqui locked up sta 30 for about 2 minutes, no data written to tape.

Station 31 CTD03 threatened to lose connection to cluster (ctd02) again. Immediately disconnected Nuts ethernet cable and regained instantaneous connection. Decided to disconnect NUTs cable and hook up only during steaming. Days later, replaced Nuts cable with a different cable. Hydrovan could not log in when this cable was connected. NUTS ethernet address in conflict with one on ship in SSG group. Changed name and address. Should not have been the cause of crashes since no conflict with ctd network. Days later, can have both nuts and hydrovan on net with no conflicts. It was believed at end of leg 3 that He/Tr van had a bad cable.

New pinger station 36.

Swapped redt temp modules sta 59.

New pressure temperature cals ctd 10. Revised aqui template sta 60. Also cleaned conductivity cell with HCL prior to sta 60.

Watch forgot to increase seacablel to 470ma on downcast start sta 61 until approx 500 m down. Oxygen erroneous and erratic first 500 m. No redt temp entire cast.

Winch troubles again sta 63. Flipped circuit breaker, power restored. Restart cast 2 at 10m. Lost power one more time before cast completed.

Error writing to 9-track sta 65. Did a stop_watch, logger hung. Tried to forcex and restart several times with no success. Killed grabber, re-executed sysmgr commands and restarted aqui, cast 2. Tape and disk okay, but no header file on disk. Same error to 9-track sta 69. CTD_LOG in RWMBX state, can't forcex or stop_aqui, only stop/id works.

Test rebuilt markey winch sta 69.

Turn off oxygen pump sta 70. Pump flow facing up on last two sta 71 & 72. Oxygen noisy, as on sta 70. Rotate back to face down on leg 4.

Bottom (PDR) depth vs pressure discrepancies: sta 11,23,36,38, 43,45,47,56,57,67. 56 & 57 drifting over slope, false bottom readings?

Trouble with 9-track last two stations. End of leg 3, during swim call, UPS's went on alarm, all 3 systems crashed. Believe 9-track troubles might have to do with power.

LEG 4:

Surge supressor on aqui 9-track. CTD02 and CTD03 on UPS on clean power. Repacked hard disk dua4 for acquisition.

Reoriented oxygen pump outtake on ctd10 to face down.

Double cast sta 73 (ctd 7) and 74 (ctd 10) in same position as sta 72 on leg 3. Attempted to first deploy ctd 9 at sta 73, fatal failure. Troubleshot to power supply board. CTD 7 deployed with old oxy sensor (bad). Conductivity still looks noisy as compared to ctd 10 and ctd 9. Slight hysteresis in deep water t/s plot. CTD 10, sta 74, lowered with not enough current to fish. Data noisy. Cond appears to be offset, oxygen looks offset and has different shape. Omit these two sta 73 & 74 from final ctd data set. Record tag data erroneous scans sta 74.

Became apparent ctd 10, 9, and 7 wired differently. Transmiss ometer cable different for each instrument.

Fatal failure ctd 10 prior to sta 76. Switched over to ctd 9 with new power supply board and no oxy pump. Scot touched case and got zapped, ctd underwater cable bunged up. Replaced with new one. Signal still noisy. Ground lug on termination broke off (corrosion), and had to be replaced. Finally deployed ctd 9. Interference on upcast when firing bottles. PHANTOM problem comes and goes.

Upon examination, sea cable bulkhead connector corroded ctd 10. Salt deposits found at both end caps. Battery pack shot with salt and corrosion. High voltage pin had corroded from getting wet because non-watertight plug was used for charging between stations on leg 3. Epoxy connector broke down and water wicked in thru the pin. Had been going on for a while on leg 3. Just got lucky that ctd 10 lasted through leg 3. Took out battery pack and dc-dc regulator. Removed battery fuse (not needed anyway because separate conductors for ctd and rosette). Oxy pump board burnt. Power converter died. Need replacement. Jeff rigged up transistor circuit to replace orginal power converter, but 10 was rushed back into service before he could get the pump board fully checked and installed.

Sta 78, switched over to battery for power supply to fish to try and eliminate interference problem (ctd 9) but battery died on upcast. As a result, upcast poor data quality esp last 12 bottles, ie 600 m.

Winch died 1880m downcast sta 79. Gap in data. Need to ctlog CU mode back at clark 1880-2100m.

Switch over to markey winch sta 86. Upon recabling to second termination, ctd 9 redt temp out. Disconnected and when plugged back in, oxy sensor failed. Deployed CTD 10 in its place. Later, when ctd 9 powered up in wet lab, all checked okay. DIED again a few days later. Further examination revealed inept wiring, poor soldering (shoddy workmanship). Replaced sign gen and adaptive sampling boards. Power still flaky. Checked voltages and found that sometimes the 6V from ctd power supply was drooping because of excessive loading effects. Both the 2 channel digitizer and the otm board use this 6V along with the ctd comparator and adaptive sampling. Since this regulator current limited to 40 mA, it really doesn't have enough poke to handle the load. Fix was to take the 5V regulator on the OTM board (which uses the 6V as input) and run it from the 12V regulator located on the same (otm) board, instead of the ctd 6V power supply. Now ctd 9 running like a champ. Ctds seem to be right on the margin of being overloaded in terms of power. If put ctd 7's otm card in place of 9's (before the fix), ctd 9 would work. Implies juice marginally available, ctd highly sensitive to minor fluctuations.

CTD 10 looking better leg 4 than leg 3. Conductivity more consistent. Oxygens fitting much better without pump. Leg 3, oxygen noisy 1st 400 m with pump. Also, hard to fit oxygens at oxy mins and maxes and in deep water on leg 3. Not sure whether problems related to ctd going south, or problem with pumping mechanism, or simply because gradients much sharper on leg 3 than leg 4.

Vaxes crashed sta 91, last record tag. Open data files aqui. Replay from audio. Engineer checked clean power with scope, believes one of lines has contaminated ground.

STA 95,97-99 offset bottle data. Changed pylons and rosette firing units prior to sta 102.

Cond shift ctd between sta 102 and 103.

Inner rosette fired first sta 108-111,113-114.

Upon recovery sta 110 (rough seas), package hit hull before top ring on package finally hooked with pole. As package brought on deck, air tugger bent frame (top ring) and deformed it. Vertical bars a nightmare.

Sta 112 deployed with ctd #9 using 24 bottle rosette. No transmissometer, no room for it on package. Oxygen failure on downcast. Conductivity noisy bottom of downcast, failure after 1st bottle on upcast. Numerous leakers. Salts poor, oxygens horrendous. Overall, sta almost a complete loss. Upon examination, ctd 9 showed sensor head flooded with water. Sensor head rotated prior to deployment to accommodate new package. Further examination revealed that # 9 tty fsk board wired to wrong pin. Couldn’t just swap out boards between instruments. Miracle any data was ever collected with this instrument! CTD 9 back on line 6/17/1992.

Upon recovery sta 113, ship took roll at 40 m on upcast. Tow line got caught in propeller. Blocks hit boom and broke off. Vertical bars now almost impossible to put in place. Wire also came up with a kink in it. New termination prior to sta 114. Upon recovery of sta 114, cable came up with new kink.

Vertical bars taken off rosette package sta 115. Replaced with 2 horizontal bars at bottom of package.

New top plate on pylon prior to sta 116.

Due to inclement weather and decreased ship speed (40-45 knot winds, ship cruising speed of 3 knots) and down time for hardware problems, spacing between stations increased from 40-50 nm after sta 116.

Swapped back in 36 bottle rosette deck unit prior to sta 120. Previous unit (scripps) had message on grate saying problems with firing.

Power outage, vaxes brought down 6/16/92 for one hour. Back on line for sta 121.

Co shift ctd sta 121.

New termination prior to sta 122. 3rd horizontal bar also put on package.

CTD02 CRASHED 6/17/92, after recovery sta 122.

6/17/92- ship on two engines, speed to station increased to 11 to 12 knots.

6/17/92 discovered that just 15 min prior to previous day's power outage, hydrovan got shift in salts (fresh) while running autosal. Reran afterwards, same samples now saltier. Apparently, autosal hooked up on 440 transformer (unreg power) with no UPS or surge protection. Will hook up to clean power and run off BEST UPS in helium van. Accounts for repeated shifts in salts and scatter for both legs 3 & 4. STA 124 SWAPPED OUT AUTOSALS. Using autosal #10. Bath was leaking, had to be taken apart and reglued before using.

T/S anomaly starting at sta 128. Saltier in deep water.

Markey winch sta 133. Lost power to winch during cast 3-4 times.

Switched back to AB Johnson winch sta 134.

Vaxes crashed on downcast 700m off bottom sta 136. Plugged terminal into UPS on aqui, powered off and completely shut off UPS and power to ctd03. Minutes later, ctd02 crashed. Rebooted systems, logged rest of station as cast 2. Replayed downcast from VCR tape. 9-track went offline, error msg, manually put online and logging resumed.

Touched bottom sta 137. Muddy water seeped out of frame upon recovery. Wire came up with two kinks. Cond shifted sta 138.

Winch failed at bottom of downcast sta 139. CTD package dragged on bottom until ship increased speed to increase wire angle.

Increased ship speed (12-13 knots) and increased speed at haulback of ctd (80 m/min) warranted changing sta spacing to 40 nm again after sta 139, until mooring line.

Station 141 (ctd #9) and 142 (ctd #10) double cast. Test resurrected ctd #9. Performed like a champ. Funny oxy blip. New 24 bottle pylon sta 141 to try and alleviate non-confirmations for bottles 11 & 12.

Kinks in wire warranted new termination sta 145.

Took vaxes off UPS to reset from home to generator mode. Widened frequency window. Systems back on UPS sta 148.

Hangar hoist repaired prior to sta 150. Upon recovery of sta 149, control handle cable pulled out, lead disconnected. Had to Reengage strain release boot. After switching pylons at sta 141, became evident 24 bottle rosette double tripping. Swapped out 24 bottle pylon back to original. Replaced bulkhead connector. No more double trips.

Sta 156, error logging to 9-track. Log upcast as cast 2. Upon recovery, found cable between ctd and rosette caught in bottle 35. Ok.

Disable transmissometer sta 156-179, spec'd out to only 5500 m.

Power failure prior to sta 157. Ctd lifted off deck. 9-track offline. Brought ctd back to deck. Stopped aqui. Power outage. Systems stayed up on UPS. Power came back on, restarted station. Believe power to have been cause of problem (9-track going offline) on sta 156. 9-track has narrower window of frequency operation than UPS's.

Spikes at 2100,4400,5500 dbars sta 156-167 on down and up cast. Erroneous tags in .wrw file. Cable appears to be cause.

Prior to sta 168, swapped ctd signal and 12 bottle pylon conductors. No more spikes, data clean.

Kermadec Trench sta 174-175. CTD taken down to approx 6900 dbars. CTD pressure transducer maxed out at 6553.5 dbars. Spike in co, te, and ox at bottom. Pressure for last two rec tags estimated from wire out. Could be off by 15 dbars.

Prior to sta 179, took out large air bubble in ctd 10 oxy sensor. Refilled with oil.

Transmissometer on again sta 180.

Sta 182 EAST longitude.

Fired inner rosette first sta 183,185,188.

AQUI89 mag tapes recorded on low density (800 bpi) sta 185 & 186.

Double cast sta 187 (ctd 9) and sta 188 (ctd 10). Sta 187 had another funny oxy blip similar to 141. Could not fit ctd oxygen to bottle oxygen sta 187. Recommend new oxy sensor if ctd 9 used on leg 5. Conductivity looks fine.

At end of leg 4, rosette troubles. Getting confirmed firings but pins not releasing because sticking due to salt deposit buildup. Pylon was not being lubricated regularly. Sprayed liberally with CRC sta 185. Bottles 23 & 24 not confirming. Believe cause is harness plug. Pete will replace prior to leg 5. Realigned motor housing on two backup pylons, now ready to go if need be.

LEG 5:

At dock in Aukland, the DEC software Licenses expired. This killed things like mail (critically necessary for AQUI), fortran compilers, and communications (ftp and telnet). Appearantly the microvaxes were shipped before the current license upgrade got to WHOI, so were not upgraded. Tom B. Warren and Cyndy all assisted with sending along the appropriate fixes. Thank god for Fax & telex. Necessary operations were back up before leaving Aukland at 1600 July 13 (but it was close).

Stations 189 & 190 were repeats ot 187 & 188 at the end of leg4. 187 and 189 were with ctd 9, 188 and 190 were with ctd10. Ctd10still looks fine, so will continue to use with no modifications.

Stn 201 Crashed CTD (60m/min) because missed a wrap on the pdr. The only obvious problem was that the bolts securing the ctd to the framehad sheared, and the ctd itself was loose on recovery. Swapped to the other winch while reterminating, but just as got the fish in the water the power went off on the winch, and so had to wait for Peter to reterminate.

Post crash nums look pretty good. There's a slight salinity shift in the deep water that John thinks is due to conductivity shift, not temperature (the FSI ctd's temp offset is what was pre-crash).

BOTTOM CONTACT: Sta 137,139 : 201,252

PROBLEM STATIONS:

Tag files sta 74, 78 & 112. Power low, erroneous tags. Recreated from raw downcast data. Downcast 1800-2100 sta 79 due to winch failure. Need to ctlog cu mode cut and paste. Sta 112- no oxy downcast. Cond noisy end of downcast, failed on upcast. Sensor head flooded.No bottle data sta 141 test ctd 9. Could not calibrateoxygens. Test ctd 9 again sta 187. Could not fitctd oxy to bottle oxygens.

193 - has a very spiky 1st record that cannot beremoved with ctded78. tried upping the pmin, andrecmin, and in both cases the 1st recore remained,and the second record changed.

215 & 228 HAD SAM SPIKE AT THE BEGINNING AS 193. allwere fixed by using ctlog to copy records X to Y ofthe file to 9-track, then ctded-ing 1,y-x from the 9-track.

246 had an GNXTR error and would not read at all in plt78, so couldn't even find the record limits. Reprocessed to disk from audio, and then worked OK.

SUMMARY OF FITS TO THE LABORATORY DATA

CTD 10:
PRESSURE
PRECRUISE FIT CTD10

LABFIT: FHBIAS,Pslope
0.00000000E-01 0.10000000
MEAN CCR= ???????????? PRS ROOM TEMP= 22.70
PROGRAM VERSION RUSCAL 910316
DISK FILE = 10mr92pr.cal
VARIABLE=PRESSURE
19 DATA POINTS ORDER OF POLY 2

POLY COEF =-.246449E+00 0.100352E+00 -.294565E-08

	INSTRUMENT	OBSERVED	CALCULATED	DIFFERENCE
1	1.80000	0.120000	-0.065816	0.185816
2	7283.40	730.609985	730.498962	0.111012
3	14156.4	1419.780030	1419.782230	-0.002208
4	21029.4	2109.010010	2108.787110	0.223012
5	27905.8	2798.260010	2797.854740	0.405385
6	34783.2	3487.540040	3486.743410	0.796742
7	41668.4	4176.810060	4176.134280	0.675649
8	48559.6	4866.129880	4865.846190	0.283559
9	55450.4	5555.439940	5555.238770	0.201039
10	62343.6	6244.799800	6244.591310	0.208363
11	55457.6	5555.439940	5555.958980	-0.519176
12	48568.6	4866.129880	4866.747070	-0.617320
13	41680.2	4176.810060	4177.315430	-0.505504
14	34793.0	3487.540040	3487.724850	-0.184703
15	27912.2	2798.260010	2798.495850	-0.235728
16	21037.0	2109.010010	2109.549070	-0.538951
17	14159.6	1419.780030	1420.103030	-0.323009
18	7287.00	730.609985	730.860046	-0.250072
19	2.80000	0.120000	0.034535	0.085465
MEAN DEVIATION = -0.329794E-04				
STANDARD DEVIATION = 0.406677E+00				

PRESSURE
POST CRUISE FIT CTD10

LABFIT: FHBIAS,Pslope
0.00000000E-01 0.10000000
MEAN CCR= ???????????? PRS ROOM TEMP= 21.40
PROGRAM VERSION RUSCAL 910316
DISK FILE = 10se92pr.cal
VARIABLE=PRESSURE
21 DATA POINTS ORDER OF POLY 2

POLY COEF =-.139633E+01 0.100309E+00 -.251698E-08

	INSTRUMENT	OBSERVED	CALCULATED	DIFFERENCE
1	8.80000	0.060000	-0.513614	0.573614
2	3859.40	385.940002	385.697021	0.242978
3	7298.40	730.559998	730.561646	-0.001620
4	14171.8	1419.729980	1419.651000	0.078946
5	21047.0	2108.969970	2108.683110	0.286954
6	27925.0	2798.239990	2797.757570	0.482510
7	34805.0	3487.520020	3486.794190	0.725919
8	41692.0	4176.799800	4176.292970	0.506680
9	48582.8	4866.120120	4865.933110	0.186856
10	55473.4	5555.450200	5555.314940	0.135098
11	62368.0	6244.810060	6244.856930	-0.047031
12	55474.6	5555.450200	5555.434570	0.015469
13	48590.2	4866.120120	4866.673830	-0.553867
14	41702.6	4176.799800	4177.353520	-0.553867
15	34814.4	3487.520020	3487.735350	-0.215243
16	27932.8	2798.239990	2798.538820	-0.298740
17	21053.0	2108.969970	2109.284180	-0.314120
18	14176.2	1419.729980	1420.092040	-0.362094
19	7303.00	730.559998	731.022888	-0.462863
20	3865.80	385.940002	386.338867	-0.398868
21	14.8000	0.060000	0.088237	-0.028237
MEAN DEVIATION = -0.726130E-04				
STANDARD DEVIATION = 0.380907E+00				

PRESSURE
COMBINATION FIT CTD10 (FINAL FIT)

LABFIT: FHBIAS,Pslope
0.00000000E-01 0.10000000
MEAN CCR= ???????????? PRS ROOM TEMP= 22.70
PROGRAM VERSION RUSCAL 910316
DISK FILE = pr10bc.cal
VARIABLE=PRESSURE
40 DATA POINTS ORDER OF POLY 2

POLY COEF =-.436677E+00 0.100333E+00 -.276775E-08

	INSTRUMENT	OBSERVED	CALCULATED	DIFFERENCE
1	1.20000	0.120000	-0.316277	0.436277
2	7282.80	730.609985	730.122681	0.487275
3	14155.8	1419.780030	1419.304570	0.475495
4	21028.8	2109.010010	2108.224610	0.785309
5	27905.2	2798.260010	2797.224120	1.035798
6	34782.6	3487.540040	3486.062010	1.477937
7	41667.8	4176.810060	4175.418950	1.391267
8	48559.0	4866.129880	4865.114260	1.015778
9	55449.8	5555.439940	5554.506350	0.933747
10	62343.0	6244.799800	6243.874510	0.925446
11	55457.0	5555.439940	5555.226070	0.214020
12	48568.0	4866.129880	4866.014160	0.115876
13	41679.6	4176.810060	4176.600100	0.210114
14	34792.4	3487.540040	3487.043460	0.496491
15	27911.6	2798.260010	2797.865480	0.394440
16	21036.4	2109.010010	2108.986330	0.023591
17	14159.0	1419.780030	1419.625370	0.154694
18	7286.40	730.609985	730.483704	0.126252
19	2.20000	0.120000	-0.215944	0.335944
20	0.600000	0.060000	-0.376477	0.436477
21	3851.20	385.940002	385.925262	0.014741
22	7290.20	730.559998	730.864868	-0.304900
23	14163.6	1419.729980	1420.086550	-0.356536
24	21038.8	2108.969970	2109.226810	-0.256927
25	27916.8	2798.239990	2798.386230	-0.146331
26	34796.8	3487.520020	3487.483890	0.036042
27	41683.8	4176.799800	4177.020510	-0.220550
28	48574.6	4866.120120	4866.674800	-0.554534
29	55465.2	5555.450200	5556.046390	-0.596038
30	62359.8	6244.810060	6245.555180	-0.744964
31	55466.4	5555.450200	5556.166500	-0.716155

	INSTRUMENT	OBSERVED	CALCULATED	DIFFERENCE
32	48582.0	4866.120120	4867.415530	-1.295257
33	41694.4	4176.799800	4178.082030	-1.282073
34	34806.2	3487.520020	3488.425540	-0.905608
35	27924.6	2798.239990	2799.167720	-0.927825
36	21044.8	2108.969970	2109.828120	-0.858245
37	14168.0	1419.729980	1420.527710	-0.797698
38	7294.80	730.559998	731.326172	-0.766204
39	3857.60	385.940002	386.567261	-0.627258
40	6.60000	0.060000	0.225522	-0.165522
MEAN DEVIATION = 0.957400E-05				
STANDARD DEVIATION = 0.707909E+00				

CTD 9
PRESSURE
PRECRUISE FIT CTD9

LABFIT: FHBIAS,Pslope
0.00000000E-01 0.10000000
MEAN CCR= 0.000000E+00 PRS ROOM TEMP= 20.80
PROGRAM VERSION RUSCAL 910316
DISK FILE = 9MR92PR.cal
VARIABLE=PRESSURE
19 DATA POINTS ORDER OF POLY 2

POLY COEF =0.450652E+00 0.100557E+00 0.297377E-09

	INSTRUMENT	OBSERVED	CALCULATED	DIFFERENCE
1	-6.00000	0.090000	-0.152691	0.242691
2	7256.00	730.590027	730.108582	0.481416
3	14108.8	1419.770020	1419.249880	0.520173
4	20962.0	2109.010010	2108.459470	0.550569
5	27815.0	2798.280030	2797.676510	0.603547
6	34668.4	3487.570070	3486.961910	0.608186
7	41521.4	4176.850100	4176.235350	0.614778
8	48378.6	4866.189940	4865.958500	0.231477
9	55231.2	5555.509770	5555.247070	0.262727
10	62088.4	6244.879880	6245.026370	-0.146453
11	55236.2	5555.509770	5555.750000	-0.240203
12	48382.6	4866.189940	4866.360840	-0.170867
13	41531.0	4176.850100	4177.200680	-0.350554
14	34680.4	3487.570070	3488.168700	-0.598601
15	27825.6	2798.280030	2798.742680	-0.462615
16	20977.8	2109.010010	2110.048340	-1.038299

	INSTRUMENT	OBSERVED	CALCULATED	DIFFERENCE
17	14119.8	1419.770020	1420.356200	-0.586150
18	7264.40	730.590027	730.953308	-0.363311
19	-2.00000	0.090000	0.249538	-0.159538
MEAN DEVIATION = -0.541398E-04				
STANDARD DEVIATION = 0.498984E+00				

PRESSURE
POSTCRUISE FIT CTD9

LABFIT: FHBIAS,Pslope
0.00000000E-01 0.10000000
MEAN CCR= ???????????? PRS ROOM TEMP= 22.00
PROGRAM VERSION RUSCAL 910316
DISK FILE = C9SE92PR.cal
VARIABLE=PRESSURE
21 DATA POINTS ORDER OF POLY 2

POLY COEF =0.365801E+01 0.100568E+00 0.405269E-09

	INSTRUMENT	OBSERVED	CALCULATED	DIFFERENCE
1	-40.0000	0.040000	-0.364729	0.404729
2	3797.60	385.920013	385.582794	0.337229
3	7225.00	730.539978	730.286560	0.253428
4	14076.4	1419.709960	1419.380620	0.329295
5	20927.2	2108.949950	2108.452390	0.497508
6	27778.2	2798.209960	2797.582520	0.627390
7	34630.0	3487.489990	3486.831050	0.658885
8	41480.6	4176.770020	4175.997070	0.773142
9	48337.2	4866.100100	4865.804690	0.295603
10	55190.8	5555.419920	5555.348630	0.071482
11	62044.0	6244.779790	6244.890140	-0.110158
12	55192.2	5555.419920	5555.489750	-0.069631
13	48343.6	4866.100100	4866.448240	-0.347951
14	41493.2	4176.770020	4177.264650	-0.494436
15	34641.6	3487.489990	3487.997560	-0.507619
16	27791.4	2798.209960	2798.910160	-0.700246
17	20937.0	2108.949950	2109.438230	-0.488332
18	14085.8	1419.709960	1420.326050	-0.616140
19	7232.40	730.539978	731.030823	-0.490835
20	3804.20	385.920013	386.246582	-0.326559
21	-35.0000	0.040000	0.138113	-0.098113
MEAN DEVIATION = -0.633136E-04				
STANDARD DEVIATION = 0.464840E+00				

PRESSURE
COMBINATION FIT CTD9 (FINAL FIT)

LABFIT: FHBIAS,Pslope
0.00000000E-01 0.10000000
MEAN CCR= ???????????? PRS ROOM TEMP= 20.80
PROGRAM VERSION RUSCAL 910316
DISK FILE = pr9bc.cal
VARIABLE=PRESSURE
40 DATA POINTS ORDER OF POLY 2

POLY COEF =-.338764E+00 0.100564E+00 0.338159E-09

	INSTRUMENT	OBSERVED	CALCULATED	DIFFERENCE
1	0.900000	0.090000	-0.248257	0.338257
2	7262.90	730.590027	730.064148	0.525898
3	14115.7	1419.770020	1419.257450	0.512592
4	20968.9	2109.010010	2108.522710	0.487202
5	27821.9	2798.280030	2797.799560	0.480366
6	34675.3	3487.570070	3487.148930	0.421039
7	41527.3	4176.850100	4176.388670	0.461323
8	48385.5	4866.189940	4866.283690	-0.093853
9	55238.1	5555.509770	5555.647950	-0.138287
10	62095.3	6244.879880	6245.505860	-0.626080
11	55243.1	5555.509770	5556.150880	-0.641216
12	48389.5	4866.189940	4866.686520	-0.496685
13	41537.9	4176.850100	4177.454590	-0.604595
14	34687.3	3487.570070	3488.355960	-0.785992
15	27832.5	2798.280030	2798.865970	-0.586041
16	20984.7	2109.010010	2110.111820	-1.101910
17	14126.7	1419.770020	1420.363890	-0.593853
18	7271.30	730.590027	730.908875	-0.318829
19	4.90000	0.090000	0.153999	-0.063999
20	0.400000	0.040000	-0.298539	0.338538
21	3838.00	385.920013	385.630157	0.289844
22	7265.40	730.539978	730.315552	0.224445
23	14116.8	1419.709960	1419.368160	0.341816
24	20967.6	2108.949950	2108.391850	0.558002
25	27818.6	2798.209960	2797.468020	0.741840
26	34670.4	3487.489990	3486.655760	0.834125
27	41521.0	4176.770020	4175.754880	1.015034
28	48377.6	4866.100100	4865.489260	0.610737
29	55231.2	5555.419920	5554.953610	0.466205
30	62084.4	6244.779790	6244.409670	0.370014
31	55232.6	5555.419920	5555.094240	0.325580

	INSTRUMENT	OBSERVED	CALCULATED	DIFFERENCE
32	48384.0	4866.100100	4866.133300	-0.033306
33	41533.6	4176.770020	4177.021970	-0.252056
34	34682.0	3487.489990	3487.822750	-0.332867
35	27831.8	2798.209960	2798.795410	-0.585552
36	20977.4	2108.949950	2109.377690	-0.427838
37	14126.2	1419.709960	1420.313600	-0.603619
38	7272.80	730.539978	731.059814	-0.519817
39	3844.60	385.920013	386.293915	-0.373913
40	5.40000	0.040000	0.204281	-0.164281
MEAN DEVIATION = -0.432690E-04				
STANDARD DEVIATION = 0.528148E+00				

TEMPERATURE

Both CTD 9 and 10 have pre and post cruise temperature calibrations that show a shift has occurred in the sensors. With each CTD having been opened and sensor arms rotated to fit in a specific frame, the shift is not surprising. The fits look good although CTD 10's post cruise calibration fit has a higher standard deviation than it's pre cruise cal.

CTD10:
Temperature data scaled with the CTD 10 pre cruise calibration terms matches quite closely the redundant temperature data scaled with its post cruise calibration.

Stations 64 to 75: CTD - Red. Temperature = 3.3466e-04
Stations 86 to 94: CTD - Red. Temperature = 6.8729e-04

The difference changes by .0003 degrees. CTD10 failed and was opened to effect repair after station 75 which could account for the change. The change however is small enough to ignore. This relative consistency supports CTD10's pre cruise calibration being applied to the all of CTD10's stations.

CTD9:
CTD9, the backup CTD was called into service at two different times. The first time was for stations 76 through 85. Temperature data scaled with the CTD9 pre cruise calibration terms compared to the neighboring CTD10 data with its pre cruise calibration differ by 6.0131e-3, CTD9 is colder. For CTD9 data to match CTD10 and the redundant temperature data, the bias in CTD9's scaling terms was adjusted by this amount.

In the second group, stations 248 through 267, CTD9 differs from the redundent temperature by 1.77767e-02, CTD colder. The difference between CTD9's pre and post cruise cal is 1.77e-02, CTD drifting colder. The difference between CTD9 being scaled with the corrected terms for stations 76 through 85, and the postcruise cal is 1.2012e-02. This indicates that the post cruise cal will be a good one to use on the second set, stations 248 to 267, and that a bias adjusted of 6e-3 to the pre cruise cals to scale the first set, is appropriate.

TEMPERATURE: quadratic fit

		BIAS	SLOPE	QUADRATIC
PRE-CRUISE	CTD10	.186416E-2	.499864E-3	.225955E-11
	CTD9	-.361583E-1	.500248E-3	.197920E-11
POST-CRUISE CTD10		-.803350E-03	0.499708E-03	0.310515E-11
	CTD9	-.189004E-01	0.500366E-03	0.160650E-11
SCALING TERMS USED				
ALL STA	CTD10	.186416E-2	.499864E-3	.225955E-11
STA 76-85	CTD9	-.30145E-1	.500248E-3	.197920E-11
STA 248-267 CTD9		-.188737E-01	.500365E-3	.162401E-11

CTD 9,10 = temperature time lag of .25 seconds

Temperature lag checked for each CTD by plotting theta v. salinity andlooking for consistent looping in the high gradient areas of the thermocline. Consistent looping, indicating density inversions, would be caused by an incorrect temperature lag. Minimal looping was found. Station plots that did show looping also had non uniform descent rates.The non uniform descent rate, probably due to the sea state, couldhave caused density inversion because the large rosette package may have been pulling masses of water around with it as it bounced up and down, thus truly measuring a density inversion although it was created by the package.

SUMMARY OF FITS TO LABORATORY DATA

TEMPERATURE
PRE CRUISE CTD10

PROGRAM VERSION RUSCAL 910316
DISK FILE = 10mr92te.cal
VARIABLE=TEMPERATURE
5 DATA POINTS ORDER OF POLY 2

POLY COEF =0.186416E-02 0.499864E-03 0.225955E-11

	INSTRUMENT	OBSERVED	CALCULATED	DIFFERENCE
1	60034.8	30.019218	30.019215	0.000003
2	45060.4	22.530518	22.530500	0.000016
3	30038.4	15.018928	15.019004	-0.000076
4	15429.6	7.715182	7.715096	0.000086
5	1086.00	0.544688	0.544719	-0.000031
MEAN DEVIATION = -0.274321E-06				
STANDARD DEVIATION = 0.598524E-04				

TEMPERATURE
POST CRUISE CTD10

PROGRAM VERSION RUSCAL 910316
DISK FILE = C10E92TE.cal
VARIABLE=TEMPERATURE
7 DATA POINTS ORDER OF POLY 2

POLY COEF =-.803350E-03 0.499708E-03 0.310515E-11

	INSTRUMENT	OBSERVED	CALCULATED	DIFFERENCE
1	60224.0	30.104589	30.104853	-0.000263
2	48914.0	24.449780	24.449326	0.000454
3	39992.0	19.989140	19.988472	0.000668
4	30096.0	15.040070	15.041211	-0.001141
5	19990.0	9.988570	9.989594	-0.001023
6	10696.0	5.346520	5.344425	0.002095
7	952.000	0.474130	0.474921	-0.000791
MEAN DEVIATION = -0.111917E-06				
STANDARD DEVIATION = 0.116087E-02				

TEMPERATURE
PRE CRUISE CTD9

PROGRAM VERSION RUSCAL 910316
DISK FILE = C9AP92TE.cal
VARIABLE=TEMPERATURE
5 DATA POINTS ORDER OF POLY 2

POLY COEF =-.361583E-01 0.500248E-03 0.197920E-11

	INSTRUMENT	OBSERVED	CALCULATED	DIFFERENCE
1	60039.6	30.005600	30.005671	-0.000070
2	45048.4	22.503328	22.503235	0.000094
3	30064.0	15.005210	15.005088	0.000122
4	15066.0	7.500756	7.501028	-0.000272
5	1181.60	0.555058	0.554938	0.000120
MEAN DEVIATION = -0.106618E-05				
STANDARD DEVIATION = 0.171104E-03				

TEMPERATURE
POST CRUISE CTD9

PROGRAM VERSION RUSCAL 910316
DISK FILE = C9SE92TE.cal
VARIABLE=TEMPERATURE
7 DATA POINTS ORDER OF POLY 2

POLY COEF =-.189004E-01 0.500366E-03 0.160650E-11

	INSTRUMENT	OBSERVED	CALCULATED	DIFFERENCE
1	59366.0	29.691441	29.691519	-0.000078
2	49798.0	24.902460	24.902334	0.000126
3	40212.0	20.104509	20.104435	0.000075
4	30183.0	15.084920	15.085126	-0.000206
5	19074.0	9.525800	9.525675	0.000125
6	9922.00	4.945820	4.945894	-0.000074
7	2734.00	1.349150	1.349114	0.000036
MEAN DEVIATION = 0.755170E-06				
STANDARD DEVIATION = 0.124119E-03				

CONDUCTIVITY

The WHOI CTD Group conducts laboratory conductivity calibrations to check instrument functionality and to obtain initial scaling factors to relate instrument output to ocean conductivity. These are updated/refined/replaced with scalings based on water sample data.

SUMMARY OF LABORATORY DATA

		BIAS	SLOPE
PRE-CRUISE	CTD10	-.177214E-2	.100631E-2
	CTD9	-.231510E-1	.997986E-3
POST-CRUISE	CTD10	-.163660E-02	0.100915E-02
	CTD9	-.119142E-01	0.100050E-02

CONDUCTIVITY
PRE CRUISE CTD10

LABFIT: FHBIAS,Pslope
0.00000000E-01 0.10000000
MEAN CCR= 0.100626E-02 PRS ROOM TEMP= 19.99
PROGRAM VERSION RUSCAL 910316
DISK FILE = 10mr92co.cal
VARIABLE=CONDUCTIVITY
5 DATA POINTS ORDER OF POLY 1

POLY COEF =-.177214E-02 0.100631E-02

	INSTRUMENT	OBSERVED	CALCULATED	DIFFERENCE
1	57872.2	58.235512	58.235428	0.000082
2	46892.1	47.185162	47.186073	-0.000913
3	41586.0	41.848011	41.846500	0.001509
4	33214.6	33.421310	33.422283	-0.000974
5	25064.2	25.220819	25.220535	0.000284
MEAN DEVIATION = -0.245608E-05				
STANDARD DEVIATION = 0.101838E-02				

CONDUCTIVITY
POST CRUISE CTD10

PROGRAM VERSION RUSCAL 910316
DISK FILE = 10se92co.cal
VARIABLE=CONDUCTIVITY
5 DATA POINTS ORDER OF POLY 1

POLY COEF =-.163660E-02 0.100915E-02

	INSTRUMENT	OBSERVED	CALCULATED	DIFFERENCE
1	62200.1	62.767502	62.767540	-0.000038
2	54831.1	55.331310	55.331127	0.000183
3	41825.4	42.206329	42.206493	-0.000164
4	34402.9	34.715900	34.716015	-0.000114
5	25132.9	25.361401	25.361259	0.000141
MEAN DEVIATION = 0.161610E-05				
STANDARD DEVIATION = 0.154037E-03				

CONDUCTIVITY
PRE CRUISE CTD9

LABFIT: FHBIAS,Pslope
0.00000000E-01 0.10000000
MEAN CCR= 0.997355E-03 PRS ROOM TEMP= 19.99
PROGRAM VERSION RUSCAL 910316
DISK FILE = C9AP92CO.cal
VARIABLE=CONDUCTIVITY
5 DATA POINTS ORDER OF POLY 1

POLY COEF =-.231510E-01 0.997986E-03

	INSTRUMENT	OBSERVED	CALCULATED	DIFFERENCE
1	55291.9	55.158146	55.157375	0.000770
2	45172.9	45.058846	45.058811	0.000034
3	40757.0	40.650867	40.651749	-0.000882
4	32971.0	32.880333	32.881477	-0.001145
5	23982.6	23.912357	23.911146	0.001211
MEAN DEVIATION = -0.228733E-05				
STANDARD DEVIATION = 0.101834E-02				

CONDUCTIVITY
POST CRUISE CTD9

LABFIT: FHBIAS,Pslope
0.00000000E-01 0.10000000
MEAN CCR= 0.100018E-02 PRS ROOM TEMP= 19.99
PROGRAM VERSION RUSCAL 910316
DISK FILE = C9SE92CO.cal
VARIABLE=CONDUCTIVITY
5 DATA POINTS ORDER OF POLY 1

POLY COEF =-.119142E-01 0.100050E-02

	INSTRUMENT	OBSERVED	CALCULATED	DIFFERENCE
1	58219.4	58.237228	58.236534	0.000695
2	48291.3	48.303188	48.303532	-0.000342
3	39531.9	39.539108	39.539745	-0.000636
4	32529.1	32.532810	32.533413	-0.000602
5	23647.8	23.648640	23.647747	0.000894
MEAN DEVIATION = 0.162441E-05				
STANDARD DEVIATION = 0.735835E-03				

FITTING PROCEDURE USING STATION WATER SAMPLE SALINITIES

Basic fitting procedures followed that of Millard (1982) and Millard and Yang (1993). The process was initiated by taking a subset of stations having high-quality water sample salinity data, 137 to 175, and refit comparing

a) fitting for slope and bias, full depth
b) fitting for slope using avg of pre and post cruise bias, full depth
c) fitting for slope using bias found in a), with observations 1100db
d) fitting for slope using bias from b), with observations 1100db

a) and b) gave similar enough slopes and c) and d) were similar to both a) and b) so we decided to go with using the averaged pre and post cruise laboratory bias and fit throughout the cruise just for slope. We further concluded that the nominal coefficient for conductivity cell distortion under pressure of beta=1.5E-8 gave acceptable results in the deep ocean (where this term has the most noticeable effect).

However, careful examination of the CTD - watersample conductivity data from the thermocline revealed several irregularities (curvature of the CTD-watersample residuals in pressure and temperature). Several non-standard procedures were implemented in order that the final calibrated CTD salinity downcasts were consistent with the water sample salinity data. In addition to altering alpha, the coefficient of thermal expansion of conductivity cell from its nominal value of -6.5E-6, an empirical correction to the conductivities in the upper third of the ocean was implemented in order that the derived CTD salinity data agreed with the water samples. The correction was, as stated, done to the raw CTD conductivity data, although it may have been equivalently applied to the CTD temperature. The small magnitude of the shift (around 0.002 psu) was such that we could not distinguish. It is suspicious that the empirical correction was needed for CTD stations collected with instrument #10 after it had failed on Leg 4 and been opened for repair. This hints that it may have been a temperature shift. However, as the error signal was detected in salinity, we decided to alter conductivity.

Summary of non-standard corrections to conductivity:

CTD #10

Sta 1 to 75, 86 to 247

reduced alpha by half in cond cal to increase surface CTD salt by .002 psu at the surface to attempt to straighten out hooked line Pv salt diff.Change alpha so that it is consistant for CTD 10 throughout cruise.Alpha = -3.25e-6 for all CTD 10 stations.

Sta 86 to 246

added an emperically determined conductivity offset (which was a function of pressure) to the downcast CTD conductivity profile data and the upcast data collected at the time of water bottle tripping. The offset C-off was of the form:

C-off = 1.47781E-8 *{P**2} * exp{-[P/500]}

The offset was thus zero at the surface, approached zero exponentially at depth and had a maximum effect of 0.002 mmho at 1000 dbars.

Sta 76 to 85 CTD 9

alpha was increased above the nominal value to reduce surface CTD salt. Alpha set to -16.25e-6.

Sta 249 to 267 CTD9

the nominal alpha of -6.5E-6 was employed successfully for these data. It is not known why a different value from the earlier station group worked.

Given these shaping parameters, conductivity slope factors were derived by regres-sion against the water sample data following standard procedures.

KN138 Conductivity scalings applied to the final P6 data
(fitting groups and fit statistics)
CTD10

LEG 3 CTD10
CHILE TO EASTER ISLAND
STATIONS 4-72

Stations 4,5,9 to 19 Use fit of stations 6 to 19

number of data points read in: 212
STATIONS 6. 19. PRES. BOUNDS 1100.0 6500.0 edit= 2.8
Applied cond. bias: -0.0016
PASS No. = 8

	St.#	P	T	C	COEFF.	GOOD
1	0.00	0.00	0.00	1.00	0.10062730E-02	0.935E+05
2	1.00	0.00	0.00	1.00	-.19822450E-08	2.59
N = 175	AVE = -0.85378E-06		STD. DEV.= 0.11202E-02			

STATION	COND. SLOPE
6.	0.10062611E-02
7.	0.10062591E-02
8.	0.10062572E-02
9.	0.10062552E-02
10.	0.10062532E-02
11.	0.10062512E-02
12.	0.10062492E-02
13.	0.10062472E-02
14.	0.10062453E-02
15.	0.10062433E-02
16.	0.10062413E-02
17.	0.10062393E-02
18.	0.10062373E-02
19.	0.10062354E-02

Station 6

Manually adjusted slope from above fit (Stations 6 ot 19) to match water sample data and CTD traces.
new slope: 0.100624e-2

Station 7

Manually adjusted slope from above fit (Stations 6 to 19) to match water

sample data and CTD traces.
new slope: 0.100624e-2

Station 8

Manually adjusted slope from above fit (Stations 6 to 19) to match water sample data and CTD traces.
new slope: 0.100624e-2

Stations 22,23,24,28,29,31 to 40 Use fit of stations 20 to 40

number of data points read in: 309
STATIONS 20. 40. PRES. BOUNDS 1100.0 6500.0 edit= 2.8
Applied cond. bias: -0.0016
PASS No. = 5

	St.#	P	T	C	COEFF.	GOOD
1	0.00	0.00	0.00	1.00	0.10062870E-02	0.312E+06

N = 292 AVE = -0.89956E-06 STD. DEV.= 0.17366E-02

Station 20

Manually adjusted slope from above fit (Stations 20 to 40) to match water sample data and CTD traces.
new slope: 0.100631e-2

Station 21

Manually adjusted slope from above fit (Stations 20 to 40) to match water sample data and CTD traces.
new slope: 0.100631e-2

Station 25

Manually adjusted slope from above fit (Stations 20 to 40) to match water sample data and CTD traces.
new slope: 0.100627e-2

Station 26

Manually adjusted slope from above fit (Stations 20 to 40) to match water sample data and CTD traces.
new slope: 0.100627e-2

Station 27

Manually adjusted slope from above fit (Stations 20 to 40) to match water sample data and CTD traces.
new slope: 0.100627e-2

Station 30

Manually adjusted slope from above fit (Stations 20 to 40) to match water sample data and CTD traces.
new slope: 0.100624e-2

Stations 41 to 55

number of data points read in: 242

STATIONS 41. 55. PRES. BOUNDS 1100.0 6500.0 edit= 2.8

Applied cond. bias: -0.0016

PASS No. = 5

	St.#	P	T	C	COEFF.	GOOD
1	0.00	0.00	0.00	1.00	0.10063006E-02	0.297E+06

N = 230 AVE = 0.84329E-06 STD. DEV.= 0.16192E-02

Stations 56 to 58,60 to 68 Use fit of stations 56 to 68

number of data points read in: 203

STATIONS 56. 68. PRES. BOUNDS 1100.0 6500.0 edit= 2.8

Applied cond. bias: -0.0016

PASS No. = 4

	St.#	P	T	C	COEFF.	GOOD
1	0.00	0.00	0.00	1.00	0.10066862E-02	0.143E+05
2	1.00	0.00	0.00	1.00	-.74668625E-08	6.59

N = 200 AVE = 0.61313E-06 STD. DEV.= 0.19213E-02

STATION	COND. SLOPE
56.	0.10062680E-02
57.	0.10062606E-02
58.	0.10062531E-02
59.	0.10062456E-02
60.	0.10062382E-02
61.	0.10062307E-02
62.	0.10062232E-02
63.	0.10062157E-02
64.	0.10062083E-02
65.	0.10062008E-02
66.	0.10061933E-02
67.	0.10061859E-02
68.	0.10061784E-02

Station 59

Manually adjusted slope from above fit (Stations 56 to 68) to match water sample data and CTD traces.
new slope: 0.100635e-2

Stations 69 to 75

```
 number of data points read in:     79
STATIONS    69.   75.  PRES. BOUNDS    1100.0  6500.0 edit=  2.8
 Applied cond. bias: -0.0016
 PASS No. =          4
    St.#,  P,    T,     C,     COEFF.           GOOD
  1  0.00  0.00  0.00  1.00   0.10062813E-02   0.127E+06
 N =     76 AVE =    0.14307E-05 STD. DEV.=    0.21687E-02
```

LEG 4 CTD10 EASTER ISLAND TO NEW ZEALAND STATIONS 75 TO 188
(EXCEPT 76 TO 85, 112, 141, AND 187)

Stations 87 to 101 Use fit of stations 86 to 101

```
 number of data points read in:    259
STATIONS    86.  101.  PRES. BOUNDS    1100.0  6500.0 edit=  2.8
 Applied cond. bias: -0.0016
 PASS No. =          7
    St.#,  P,    T,     C,     COEFF.           GOOD
  1  0.00  0.00  0.00  1.00   0.10070056E-02   0.143E+05
  2  1.00  0.00  0.00  1.00   -.79787251E-08    10.6
 N =    243 AVE =    0.13312E-05 STD. DEV.=    0.17053E-02
```

STATION	COND. SLOPE
86.	0.10063194E-02
87.	0.10063114E-02
88.	0.10063035E-02
89.	0.10062955E-02
90.	0.10062875E-02
91.	0.10062795E-02
92.	0.10062715E-02
93.	0.10062636E-02
94.	0.10062556E-02
95.	0.10062476E-02
96.	0.10062396E-02
97.	0.10062317E-02
98.	0.10062237E-02
99.	0.10062157E-02
100.	0.10062077E-02
101.	0.10061997E-02

Station 86

Manually adjusted slope from above fit (Stations 86 to 101) to match water sample data and CTD traces.
new slope: 0.100640e-2

Stations 103 to 120 Use fit of stations 102 to 120

```
 number of data points read in:    324
STATIONS   102.  120.  PRES. BOUNDS    1100.0  6500.0 edit=  2.8
 Applied cond. bias: -0.0016
 PASS No. =          9
    St.#,  P,    T,     C,     COEFF.           GOOD
  1  0.00  0.00  0.00  1.00   0.10063121E-02   0.325E+06
 N =    287 AVE =    0.93993E-06 STD. DEV.=    0.16520E-02
```

Station 102

Manually adjusted slope from above fit (Stations 102 to 120) to match water
sample data and CTD traces.
new slope: 0.100626e-2

Stations 121 Use fit of stations 121 to 122

```
 number of data points read in:     43
STATIONS   121.  122.  PRES. BOUNDS    1100.0  6500.0 edit=  2.8
 Applied cond. bias: -0.0016
 PASS No. =          5
    St.#,  P,    T,     C,     COEFF.           GOOD
  1  0.00  0.00  0.00  1.00   0.10062360E-02   0.730E+05
 N =     39 AVE =   -0.14327E-05 STD. DEV.=    0.27091E-02
```

Station 122

Manually adjusted slope from above fit (Stations 121 to 122) to match water
sample data and CTD traces.
new slope: 0.100634e-2

Stations 123 to 136

```
 number of data points read in:    293
STATIONS   123.  136.  PRES. BOUNDS    1100.0  6500.0 edit=  2.8
 Applied cond. bias: -0.0016
 PASS No. =          8
    St.#,  P,    T,     C,     COEFF.           GOOD
  1  0.00  0.00  0.00  1.00   0.10063488E-02   0.688E+06
 N =    263 AVE =    0.56917E-06 STD. DEV.=    0.74673E-03
```

Stations 138 to 175 Use fit of stations 137 to 175

```
 number of data points read in:    880
STATIONS   137.  175.  PRES. BOUNDS    1100.0  6500.0 edit=  2.8
 Applied cond. bias: -0.0016
 PASS No. =          8
    St.#,  P,    T,     C,     COEFF.           GOOD
  1  0.00  0.00  0.00  1.00   0.10064198E-02   0.115E+07
 N =    803 AVE =    0.70922E-07 STD. DEV.=    0.78187E-03
```

Station 137

Manually adjusted slope from above fit (Stations 137 to 175) to match water
sample data and CTD traces.
new slope: 0.100635e-2

Stations 176 to 188

```
 number of data points read in:    219
STATIONS   176.  188.  PRES. BOUNDS    1100.0  6500.0 edit=  2.8
 Applied cond. bias: -0.0016
 PASS No. =          7
    St.#,  P,    T,     C,     COEFF.           GOOD
  1  0.00  0.00  0.00  1.00   0.10061674E-02   0.107E+05
  2  1.00  0.00  0.00  1.00   0.15838572E-08    3.05
 N =    200 AVE =    0.18406E-05 STD. DEV.=    0.88455E-03
```

STATION	**COND. SLOPE**
176.	0.10064462E-02
177.	0.10064477E-02
178.	0.10064493E-02
179.	0.10064509E-02
180.	0.10064525E-02
181.	0.10064541E-02
182.	0.10064557E-02
183.	0.10064573E-02
184.	0.10064588E-02
185.	0.10064604E-02
186.	0.10064620E-02
187.	0.10064636E-02
188.	0.10064652E-02

LEG 5 CTD10
NEW ZEALAND TO AUSTRALIA
STATIONS 190 TO 246

Stations 190 to 200

number of data points read in: 165
STATIONS 190. 200. PRES. BOUNDS 1100.0 6500.0 edit= 2.8
Applied cond. bias: -0.0016
PASS No. = 4

St.#,	P,	T,	C,	COEFF.	GOOD
1	0.00	0.00	0.00	1.00 0.10084371E-02	0.426E+04
2	1.00	0.00	0.00	1.00 -.10094641E-07	8.26

N = 156 AVE = 0.14242E-05 STD. DEV.= 0.14036E-02

STATION	COND. SLOPE
190.	0.10065191E-02
191.	0.10065090E-02
192.	0.10064989E-02
193.	0.10064888E-02
194.	0.10064787E-02
195.	0.10064686E-02
196.	0.10064585E-02
197.	0.10064484E-02
198.	0.10064383E-02
199.	0.10064282E-02
200.	0.10064181E-02

Stations 201 to 219

number of data points read in: 163
STATIONS 201. 219. PRES. BOUNDS 1100.0 6500.0 edit= 2.8
Applied cond. bias: -0.0016
PASS No. = 5

St.#,	P,	T,	C,	COEFF.	GOOD
1	0.00	0.00	0.00	1.00 0.10064438E-02	0.306E+06

N = 152 AVE = 0.79471E-05 STD. DEV.= 0.12917E-02

Station 220 to 246

number of data points read in: 299
STATIONS 220. 244. PRES. BOUNDS 1100.0 6500.0 edit= 2.8
Applied cond. bias: -0.0016
PASS No. = 8

St.#,	P,	T,	C,	COEFF.	GOOD
1	0.00	0.00	0.00	1.00 0.10064778E-02	0.447E+06

N = 271 AVE = 0.50069E-05 STD. DEV.= 0.11725E-02

CTD9

LEG3 CTD9
CHILE TO EASTER ISLAND
NO STATIONS

LEG4 CTD9
EASTER ISLAND TO NEW ZEALAND
STATIONS 76 TO 85

Stations 76,78 to 85 Use fit of stations 76 to 85

```
  number of data points read in:    162
 STATIONS    76.   85.  PRES. BOUNDS    1100.0  6500.0 edit=  2.8
  Applied cond. bias: -0.0180
  PASS No. =          5
     St.#,  P,    T,     C,     COEFF.            GOOD
   1  0.00  0.00  0.00  1.00   0.99750453E-03   0.104E+05
   2  1.00  0.00  0.00  1.00   0.75034637E-08    6.34
  N =    148 AVE =   -0.15751E-05 STD. DEV.=    0.13061E-02
```

STATION	COND. SLOPE
76.	0.99807480E-03
77.	0.99808230E-03
78.	0.99808980E-03
79.	0.99809731E-03
80.	0.99810481E-03
81.	0.99811231E-03
82.	0.99811982E-03
83.	0.99812732E-03
84.	0.99813482E-03
85.	0.99814233E-03

Station 77

Manually adjusted slope from above fit (Stations 76 to 85) to match water sample data and CTD traces.
new slope: 0.998002e-3

LEG 5 CTD9
NEW ZEALAND TO AUSTRALIA
STATIONS 248 TO 267

Stations 249 to 257 Use fit of stations 248 to 257

```
 number of data points read in:      35
STATIONS   248.  255.  PRES. BOUNDS    1100.0  6500.0 edit=  2.8
 Applied cond. bias: -0.0180
 PASS No. =           5
    St.#,  P,    T,     C,     COEFF.           GOOD
  1  0.00  0.00  0.00  1.00   0.99814130E-03   0.163E+06
 N =     30 AVE =    0.17127E-05 STD. DEV.=    0.10655E-02
```

Station 248

Manually adjusted slope from above fit (Stations 248 to 257) to match water
sample data and CTD traces.
new slope: 0.998101e-3

Stations 258 to 267

```
 number of data points read in:      34
STATIONS   258.  265.  PRES. BOUNDS    1100.0  6500.0 edit=  2.8
 Applied cond. bias: -0.0180
 PASS No. =           4
    St.#,  P,    T,     C,     COEFF.           GOOD
  1  0.00  0.00  0.00  1.00   0.99818393E-03   0.921E+05
 N =     31 AVE =   -0.89016E-06 STD. DEV.=    0.19239E-02
```

Table of conductivity bias and slope versus station number used to reduce the P6 CTD data

sta	bias	slope
4	-.162216E-02	0.100626E-02
5	-.162216E-02	0.100626E-02
6	-.162216E-02	0.100624E-02
7	-.162216E-02	0.100624E-02
8	-.162216E-02	0.100624E-02
9	-.162216E-02	0.100626E-02
10	-.162216E-02	0.100625E-02
11	-.162216E-02	0.100625E-02
12	-.162216E-02	0.100625E-02
13	-.162216E-02	0.100625E-02
14	-.162216E-02	0.100625E-02
15	-.162216E-02	0.100624E-02
16	-.162216E-02	0.100624E-02
17	-.162216E-02	0.100624E-02
18	-.162216E-02	0.100624E-02
19	-.162216E-02	0.100624E-02
20	-.162216E-02	0.100631E-02
21	-.162216E-02	0.100631E-02
22	-.162216E-02	0.100629E-02
23	-.162216E-02	0.100629E-02
24	-.162216E-02	0.100629E-02
25	-.162216E-02	0.100627E-02
26	-.162216E-02	0.100627E-02
27	-.162216E-02	0.100627E-02
28	-.162216E-02	0.100629E-02
29	-.162216E-02	0.100629E-02
30	-.162216E-02	0.100624E-02
31	-.162216E-02	0.100629E-02
32	-.162216E-02	0.100629E-02
33	-.162216E-02	0.100629E-02
34	-.162216E-02	0.100629E-02
35	-.162216E-02	0.100629E-02
36	-.162216E-02	0.100629E-02
37	-.162216E-02	0.100629E-02
38	-.162216E-02	0.100629E-02
39	-.162216E-02	0.100629E-02
40	-.162216E-02	0.100629E-02
41	-.162216E-02	0.100630E-02
42	-.162216E-02	0.100630E-02
43	-.162216E-02	0.100630E-02
44	-.162216E-02	0.100630E-02
45	-.162216E-02	0.100630E-02
46	-.162216E-02	0.100630E-02
47	-.162216E-02	0.100630E-02

sta	bias	slope
48	-.162216E-02	0.100630E-02
49	-.162216E-02	0.100630E-02
50	-.162216E-02	0.100630E-02
51	-.162216E-02	0.100630E-02
52	-.162216E-02	0.100630E-02
53	-.162216E-02	0.100630E-02
54	-.162216E-02	0.100630E-02
55	-.162216E-02	0.100630E-02
56	-.162216E-02	0.100627E-02
57	-.162216E-02	0.100626E-02
58	-.162216E-02	0.100625E-02
59	-.162216E-02	0.100635E-02
60	-.162216E-02	0.100624E-02
61	-.162216E-02	0.100623E-02
62	-.162216E-02	0.100622E-02
63	-.162216E-02	0.100622E-02
64	-.162216E-02	0.100621E-02
65	-.162216E-02	0.100620E-02
66	-.162216E-02	0.100619E-02
67	-.162216E-02	0.100619E-02
68	-.162216E-02	0.100618E-02
69	-.162216E-02	0.100628E-02
70	-.162216E-02	0.100628E-02
71	-.162216E-02	0.100628E-02
72	-.162216E-02	0.100628E-02
75	-.162216E-02	0.100628E-02
76	-.179552E-01	0.998075E-03
77	-.179552E-01	0.998002E-03
78	-.179552E-01	0.998090E-03
79	-.179552E-01	0.998097E-03
80	-.179552E-01	0.998105E-03
81	-.179552E-01	0.998112E-03
82	-.179552E-01	0.998120E-03
83	-.179552E-01	0.998127E-03
84	-.179552E-01	0.998135E-03
85	-.179552E-01	0.998142E-03
86	-.162216E-02	0.100640E-02
87	-.162216E-02	0.100631E-02
88	-.162216E-02	0.100630E-02
89	-.162216E-02	0.100630E-02
90	-.162216E-02	0.100629E-02
91	-.162216E-02	0.100628E-02
92	-.162216E-02	0.100627E-02
93	-.162216E-02	0.100626E-02

sta	bias	slope
94	-.162216E-02	0.100626E-02
95	-.162216E-02	0.100625E-02
96	-.162216E-02	0.100624E-02
97	-.162216E-02	0.100623E-02
98	-.162216E-02	0.100622E-02
99	-.162216E-02	0.100622E-02
100	-.162216E-02	0.100621E-02
101	-.162216E-02	0.100620E-02
102	-.162216E-02	0.100626E-02
103	-.162216E-02	0.100631E-02
104	-.162216E-02	0.100631E-02
105	-.162216E-02	0.100631E-02
106	-.162216E-02	0.100631E-02
107	-.162216E-02	0.100631E-02
108	-.162216E-02	0.100631E-02
109	-.162216E-02	0.100631E-02
110	-.162216E-02	0.100631E-02
111	-.162216E-02	0.100631E-02
113	-.162216E-02	0.100631E-02
114	-.162216E-02	0.100631E-02
115	-.162216E-02	0.100631E-02
116	-.162216E-02	0.100631E-02
117	-.162216E-02	0.100631E-02
118	-.162216E-02	0.100631E-02
119	-.162216E-02	0.100631E-02
120	-.162216E-02	0.100631E-02
121	-.162216E-02	0.100626E-02
122	-.162216E-02	0.100634E-02
123	-.162216E-02	0.100635E-02
124	-.162216E-02	0.100635E-02
125	-.162216E-02	0.100635E-02
126	-.162216E-02	0.100635E-02
127	-.162216E-02	0.100635E-02
128	-.162216E-02	0.100635E-02
129	-.162216E-02	0.100635E-02
130	-.162216E-02	0.100635E-02
131	-.162216E-02	0.100635E-02
132	-.162216E-02	0.100635E-02
133	-.162216E-02	0.100635E-02
134	-.162216E-02	0.100635E-02
135	-.162216E-02	0.100635E-02
136	-.162216E-02	0.100635E-02
137	-.162216E-02	0.100635E-02
138	-.162216E-02	0.100642E-02
139	-.162216E-02	0.100642E-02
140	-.162216E-02	0.100642E-02
142	-.162216E-02	0.100642E-02

sta	bias	slope
143	-.162216E-02	0.100642E-02
144	-.162216E-02	0.100642E-02
145	-.162216E-02	0.100642E-02
146	-.162216E-02	0.100642E-02
147	-.162216E-02	0.100642E-02
148	-.162216E-02	0.100642E-02
149	-.162216E-02	0.100642E-02
150	-.162216E-02	0.100642E-02
151	-.162216E-02	0.100642E-02
152	-.162216E-02	0.100642E-02
153	-.162216E-02	0.100642E-02
154	-.162216E-02	0.100642E-02
155	-.162216E-02	0.100642E-02
156	-.162216E-02	0.100642E-02
157	-.162216E-02	0.100642E-02
158	-.162216E-02	0.100642E-02
159	-.162216E-02	0.100642E-02
160	-.162216E-02	0.100642E-02
161	-.162216E-02	0.100642E-02
162	-.162216E-02	0.100642E-02
163	-.162216E-02	0.100642E-02
164	-.162216E-02	0.100642E-02
165	-.162216E-02	0.100642E-02
166	-.162216E-02	0.100642E-02
167	-.162216E-02	0.100642E-02
168	-.162216E-02	0.100642E-02
169	-.162216E-02	0.100642E-02
170	-.162216E-02	0.100642E-02
171	-.162216E-02	0.100642E-02
172	-.162216E-02	0.100642E-02
173	-.162216E-02	0.100642E-02
174	-.162216E-02	0.100642E-02
175	-.162216E-02	0.100642E-02
176	-.162216E-02	0.100645E-02
177	-.162216E-02	0.100645E-02
178	-.162216E-02	0.100645E-02
179	-.162216E-02	0.100645E-02
180	-.162216E-02	0.100645E-02
181	-.162216E-02	0.100645E-02
182	-.162216E-02	0.100646E-02
183	-.162216E-02	0.100646E-02
184	-.162216E-02	0.100646E-02
185	-.162216E-02	0.100646E-02
186	-.162216E-02	0.100646E-02
188	-.162216E-02	0.100647E-02
190	-.162216E-02	0.100652E-02
191	-.162216E-02	0.100651E-02

sta	bias	slope
192	-.162216E-02	0.100650E-02
193	-.162216E-02	0.100649E-02
194	-.162216E-02	0.100648E-02
195	-.162216E-02	0.100647E-02
196	-.162216E-02	0.100646E-02
197	-.162216E-02	0.100645E-02
198	-.162216E-02	0.100644E-02
199	-.162216E-02	0.100643E-02
200	-.162216E-02	0.100642E-02
201	-.162216E-02	0.100644E-02
202	-.162216E-02	0.100644E-02
203	-.162216E-02	0.100644E-02
204	-.162216E-02	0.100644E-02
205	-.162216E-02	0.100644E-02
206	-.162216E-02	0.100644E-02
207	-.162216E-02	0.100644E-02
208	-.162216E-02	0.100644E-02
209	-.162216E-02	0.100644E-02
210	-.162216E-02	0.100644E-02
211	-.162216E-02	0.100644E-02
212	-.162216E-02	0.100644E-02
213	-.162216E-02	0.100644E-02
214	-.162216E-02	0.100644E-02
215	-.162216E-02	0.100644E-02
216	-.162216E-02	0.100644E-02
217	-.162216E-02	0.100644E-02
218	-.162216E-02	0.100644E-02
219	-.162216E-02	0.100644E-02
220	-.162216E-02	0.100648E-02
221	-.162216E-02	0.100648E-02
222	-.162216E-02	0.100648E-02
223	-.162216E-02	0.100648E-02
224	-.162216E-02	0.100648E-02
225	-.162216E-02	0.100648E-02
226	-.162216E-02	0.100648E-02
227	-.162216E-02	0.100648E-02
228	-.162216E-02	0.100648E-02
229	-.162216E-02	0.100648E-02
230	-.162216E-02	0.100648E-02

sta	bias	slope
231	-.162216E-02	0.100648E-02
232	-.162216E-02	0.100648E-02
233	-.162216E-02	0.100648E-02
234	-.162216E-02	0.100648E-02
235	-.162216E-02	0.100648E-02
236	-.162216E-02	0.100648E-02
237	-.162216E-02	0.100648E-02
238	-.162216E-02	0.100648E-02
239	-.162216E-02	0.100648E-02
240	-.162216E-02	0.100648E-02
241	-.162216E-02	0.100648E-02
242	-.162216E-02	0.100648E-02
243	-.162216E-02	0.100648E-02
244	-.162216E-02	0.100648E-02
245	-.162216E-02	0.100648E-02
246	-.162216E-02	0.100648E-02
248	-.179552E-01	0.998101E-03
249	-.179552E-01	0.998141E-03
250	-.179552E-01	0.998141E-03
251	-.179552E-01	0.998141E-03
252	-.179552E-01	0.998141E-03
253	-.179552E-01	0.998141E-03
254	-.179552E-01	0.998141E-03
255	-.179552E-01	0.998141E-03
256	-.179552E-01	0.998141E-03
257	-.179552E-01	0.998141E-03
258	-.179552E-01	0.998184E-03
259	-.179552E-01	0.998184E-03
260	-.179552E-01	0.998184E-03
261	-.179552E-01	0.998184E-03
262	-.179552E-01	0.998184E-03
263	-.179552E-01	0.998184E-03
264	-.179552E-01	0.998184E-03
265	-.179552E-01	0.998184E-03
266	-.179552E-01	0.998184E-03
267	-.179552E-01	0.998184E-03

OXYGEN

Leg 3, stations 4 to 72, ctd10 was using an oxygen pump. As noted above, the oxygen pump caused some problems with the observations. Affects of using oxygen pump:

> Top 1000m oxygen current very noisy, very difficult to fit.
> Bottoms of stations do not show the typical oxygen "foot" due to slowing of the package.

As well there were the usual difficulties processing data from this sensor. The following details the derivations of the various shaping parameters for CTD oxygen. See Owens and Millard (1985) for details to the algorithm.

CTD10

LEG 3 CHILE TO EASTER ISLAND: STATIONS 4-72

Leg three had an oxygen water pump attached to CTD 10. The data was noisy, especially at the surface. More serious, fits to the water sample data using data over the full water column were left with significant depth dependence in the oxygen - water sample residuals. The pressure dependence in the fit was removed from the final data by fitting the top and bottom water separately. All stations have one calibration for the top 1000 db and a second calibration for the data below 1000 db EXCEPT for stations 4,5,70,72-75. Stations 4 and 5 do not have data below 1000 db and stations 70, and 72-75 fit well with one calibration for the entire depth. Stations 72-75 and perhaps 70 did not use the oxygen pump. Operationally a full water column fit was performed and the derived parameters applied to the top 1000 m of the water column to obtain one estimate of the oxygen profile. Next a fit was done only to the data below 1000 db, and these parameters used to derive a second oxygen profile estimate. The reported profile is a blend of these with a linear overlap region within 100 db vertically of 1000 db.

Fit statistics:

Station 4

```
 Edit Fact=  2.80 Histo Bin= 0.2500E-01 OcSlope= 0.1400E-02
  ratio upper/deep variance , P_switch  0.00000000E-01   0.00000000E-01
   1 Min/Max Sta:   4.-   4.  1 StdDev:  0.1600E+00 #Obs:   10  dOx: 0.448
        1: Bias  2:Slope     3:Pcor    4:Tcor   5: Wt  6: Lag  7: bias/station
 OX Parms:  0.073 0.1428E-02 -.6485E-02  -0.0324   0.75   8.00   0.0000E+00
```

Station 5 Use fit of stations 4 and 5

Edit Fact= 2.00 Histo Bin= 0.2500E-01 OcSlope= 0.1400E-02
ratio upper/deep variance , P_switch 0.00000000E-01 0.00000000E-01
2 Min/Max Sta: 4.- 5. 1 StdDev: 0.2461E+00 #Obs: 22 dOx: 0.492
1: Bias 2:Slope 3:Pcor 4:Tcor 5: Wt 6: Lag 7: bias/station
OX Parms: -0.154 0.1230E-02 0.3078E-03 -0.0319 0.75 8.00 0.0000E+00

SHALLOW **Stations 6 to 11**

Edit Fact= 2.50 Histo Bin= 0.2500E-01 OcSlope= 0.1400E-02
ratio upper/deep variance , P_switch 0.00000000E-01 0.00000000E-01
7 Min/Max Sta: 6.- 11. 1 StdDev: 0.1015E+00 #Obs: 122 dOx: 0.254
1: Bias 2:Slope 3:Pcor 4:Tcor 5: Wt 6: Lag 7: bias/station
OX Parms: -0.007 0.1089E-02 0.1761E-03 -0.0234 0.75 8.00 0.0000E+00

DEEP **Stations 6 to 11**

Edit Fact= 2.80 Histo Bin= 0.2500E-01 OcSlope= 0.1400E-02
ratio upper/deep variance , P_switch 0.00000000E-01 0.00000000E-01
3 Min/Max Sta: 6.- 11. 1 StdDev: 0.2525E-01 #Obs: 49 dOx: 0.071
1: Bias 2:Slope 3:Pcor 4:Tcor 5: Wt 6: Lag 7: bias/station
OX Parms: -0.026 0.1245E-02 0.1487E-03 -0.0473 0.75 8.00 0.1721E-02

Station No. =	6	Bais = -.0157
Station No. =	7	Bais = -.0139
Station No. =	8	Bais = -.0122
Station No. =	9	Bais = -.0105
Station No. =	10	Bais = -.0088
Station No. =	11	Bais = -.0071

Station 6

Manually adjusted bias of calculated oxygen in CTD and SEA file by -.04ml/l oxygen, to match water samlple data and CTD traces.

SHALLOW Stations 12 to 21

Edit Fact= 2.50 Histo Bin= 0.2500E-01 OcSlope= 0.1400E-02
ratio upper/deep variance , P_switch 0.00000000E-01 0.00000000E-01
13 Min/Max Sta: 12.- 21. 1 StdDev: 0.4677E-01 #Obs: 217 dOx: 0.117
1: Bias 2:Slope 3:Pcor 4:Tcor 5: Wt 6: Lag 7: bias/station
OX Parms: 0.019 0.1058E-02 0.1596E-03 -0.0222 0.95 3.80 0.0000E+00

DEEP **Staions 12 to 21**

Edit Fact= 2.80 Histo Bin= 0.2500E-01 OcSlope= 0.1400E-02
ratio upper/deep variance , P_switch 0.00000000E-01 0.00000000E-01
4 Min/Max Sta: 12.- 21. 1 StdDev: 0.2461E-01 #Obs: 144 dOx: 0.069
1: Bias 2:Slope 3:Pcor 4:Tcor 5: Wt 6: Lag 7: bias/station
OX Parms: 0.018 0.1156E-02 0.1424E-03 -0.0412 0.95 4.00 0.0000E+00

SHALLOW Stations 22 to 25

Edit Fact= 2.50 Histo Bin= 0.2500E-01 OcSlope= 0.1400E-02
ratio upper/deep variance , P_switch 0.00000000E-01 0.00000000E-01
16 Min/Max Sta: 22.- 25. 1 StdDev: 0.4481E-01 #Obs: 87 dOx: 0.112
1: Bias 2:Slope 3:Pcor 4:Tcor 5: Wt 6: Lag 7: bias/station
OX Parms: 0.036 0.9957E-03 0.1607E-03 -0.0197 0.95 3.70 0.0000E+00

DEEP Stations 22 to 25

Edit Fact= 2.80 Histo Bin= 0.2500E-01 OcSlope= 0.1400E-02
ratio upper/deep variance , P_switch 0.00000000E-01 0.00000000E-01
7 Min/Max Sta: 22.- 25. 1 StdDev: 0.1040E-01 #Obs: 46 dOx: 0.029
1: Bias 2:Slope 3:Pcor 4:Tcor 5: Wt 6: Lag 7: bias/station
OX Parms: 0.012 0.1204E-02 0.1404E-03 -0.0467 0.95 4.00 0.0000E+00

SHALLOW Stations 26 to 32

Edit Fact= 2.50 Histo Bin= 0.2500E-01 OcSlope= 0.1400E-02
ratio upper/deep variance , P_switch 0.00000000E-01 0.00000000E-01
9 Min/Max Sta: 26.- 32. 1 StdDev: 0.6487E-01 #Obs: 187 dOx: 0.162
1: Bias 2:Slope 3:Pcor 4:Tcor 5: Wt 6: Lag 7: bias/station
OX Parms: 0.027 0.1048E-02 0.1573E-03 -0.0251 0.75 8.00 0.0000E+00

DEEP Stations 26 to 32

Edit Fact= 2.80 Histo Bin= 0.2500E-01 OcSlope= 0.1400E-02
ratio upper/deep variance , P_switch 0.00000000E-01 0.00000000E-01
5 Min/Max Sta: 26.- 32. 1 StdDev: 0.2109E-01 #Obs: 98 dOx: 0.059
1: Bias 2:Slope 3:Pcor 4:Tcor 5: Wt 6: Lag 7: bias/station
OX Parms: 0.015 0.1241E-02 0.1324E-03 -0.0557 0.75 8.00 0.0000E+00

SHALLOW Stations 33 to 38

Edit Fact= 2.50 Histo Bin= 0.2500E-01 OcSlope= 0.1400E-02
ratio upper/deep variance , P_switch 0.00000000E-01 0.00000000E-01
7 Min/Max Sta: 33.- 38. 1 StdDev: 0.5781E-01 #Obs: 165 dOx: 0.145
1: Bias 2:Slope 3:Pcor 4:Tcor 5: Wt 6: Lag 7: bias/station
OX Parms: 0.029 0.1032E-02 0.1603E-03 -0.0219 0.75 8.00 0.0000E+00

DEEP Stations 33 to 38

Edit Fact= 2.50 Histo Bin= 0.2500E-01 OcSlope= 0.1400E-02
ratio upper/deep variance , P_switch 0.00000000E-01 0.00000000E-01
10 Min/Max Sta: 33.- 38. 1 StdDev: 0.1144E-01 #Obs: 80 dOx: 0.029
1: Bias 2:Slope 3:Pcor 4:Tcor 5: Wt 6: Lag 7: bias/station
OX Parms: 0.005 0.1241E-02 0.1384E-03 -0.0494 0.75 8.00 0.0000E+00

SHALLOW Stations 39 to 42

```
 Edit Fact=  2.50 Histo Bin= 0.2500E-01 OcSlope= 0.1400E-02
  ratio upper/deep variance , P_switch  0.00000000E-01   0.00000000E-01
  11 Min/Max Sta:  39.-  42.  1 StdDev:  0.6401E-01 #Obs:  110  dOx: 0.160
         1: Bias  2:Slope     3:Pcor    4:Tcor   5: Wt  6: Lag  7: bias/station
 OX Parms:  0.044 0.1001E-02 0.1490E-03  -0.0207   0.95   6.40   0.0000E+00
```

DEEP Stations 39 to 42

```
 Edit Fact=  2.80 Histo Bin= 0.2500E-01 OcSlope= 0.1400E-02
  ratio upper/deep variance , P_switch  0.00000000E-01   0.00000000E-01
   4 Min/Max Sta:  39.-  42.  1 StdDev:  0.2435E-01 #Obs:   60  dOx: 0.068
         1: Bias  2:Slope     3:Pcor    4:Tcor   5: Wt  6: Lag  7: bias/station
 OX Parms:  0.016 0.1206E-02 0.1328E-03  -0.0475   0.95   6.50   0.0000E+00
```

SHALLOW Stations 43 to 45

```
 Edit Fact=  2.50 Histo Bin= 0.2500E-01 OcSlope= 0.1400E-02
  ratio upper/deep variance , P_switch  0.00000000E-01   0.00000000E-01
   9 Min/Max Sta:  43.-  45.  1 StdDev:  0.4373E-01 #Obs:   82  dOx: 0.109
         1: Bias  2:Slope     3:Pcor    4:Tcor   5: Wt  6: Lag  7: bias/station
 OX Parms:  0.036 0.1017E-02 0.1543E-03  -0.0202   0.95   4.40   0.0000E+00
```

DEEP Stations 43 to 45

```
 Edit Fact=  2.50 Histo Bin= 0.2500E-01 OcSlope= 0.1400E-02
  ratio upper/deep variance , P_switch  0.00000000E-01   0.00000000E-01
   4 Min/Max Sta:  43.-  45.  1 StdDev:  0.1951E-01 #Obs:   42  dOx: 0.049
         1: Bias  2:Slope     3:Pcor    4:Tcor   5: Wt  6: Lag  7: bias/station
 OX Parms:  0.015 0.1205E-02 0.1337E-03  -0.0443   0.95   4.50   0.0000E+00
```

SHALLOW Stations 46 to 56 Use fit of stations 46 to 57

```
 Edit Fact=  2.50 Histo Bin= 0.2500E-01 OcSlope= 0.1400E-02
  ratio upper/deep variance , P_switch  0.00000000E-01   0.00000000E-01
  10 Min/Max Sta:  46.-  57.  1 StdDev:  0.5963E-01 #Obs:  343  dOx: 0.149
         1: Bias  2:Slope     3:Pcor    4:Tcor   5: Wt  6: Lag  7: bias/station
 OX Parms:  0.036 0.1024E-02 0.1534E-03  -0.0228   0.75   8.00   0.0000E+00
```

SHALLOW Station 57

```
 Edit Fact=  2.80 Histo Bin= 0.2500E-01 OcSlope= 0.1400E-02
  ratio upper/deep variance , P_switch  0.00000000E-01   0.00000000E-01
   5 Min/Max Sta:  57.-  57.  1 StdDev:  0.3000E-01 #Obs:   32  dOx: 0.084
         1: Bias  2:Slope     3:Pcor    4:Tcor   5: Wt  6: Lag  7: bias/station
 OX Parms:  0.016 0.1072E-02 0.1612E-03  -0.0247   1.00   8.56   0.0000E+00
```

DEEP Stations 46 to 57

Edit Fact= 2.80 Histo Bin= 0.2500E-01 OcSlope= 0.1400E-02
ratio upper/deep variance , P_switch 0.00000000E-01 0.00000000E-01
9 Min/Max Sta: 46.- 57. 1 StdDev: 0.1570E-01 #Obs: 176 dOx: 0.044
1: Bias 2:Slope 3:Pcor 4:Tcor 5: Wt 6: Lag 7: bias/station
OX Parms: 0.008 0.1206E-02 0.1418E-03 -0.0446 0.75 8.00 0.0000E+00

SHALLOW Stations 58 to 61

Edit Fact= 2.50 Histo Bin= 0.2500E-01 OcSlope= 0.1400E-02
ratio upper/deep variance , P_switch 0.00000000E-01 0.00000000E-01
10 Min/Max Sta: 58.- 61. 1 StdDev: 0.4268E-01 #Obs: 111 dOx: 0.107
1: Bias 2:Slope 3:Pcor 4:Tcor 5: Wt 6: Lag 7: bias/station
OX Parms: 0.029 0.1045E-02 0.1551E-03 -0.0234 0.95 11.60 0.0000E+00

DEEP Stations 58 to 61

Edit Fact= 2.80 Histo Bin= 0.2500E-01 OcSlope= 0.1400E-02
ratio upper/deep variance , P_switch 0.00000000E-01 0.00000000E-01
3 Min/Max Sta: 58.- 61. 1 StdDev: 0.1469E-01 #Obs: 63 dOx: 0.041
1: Bias 2:Slope 3:Pcor 4:Tcor 5: Wt 6: Lag 7: bias/station
OX Parms: -0.004 0.1219E-02 0.1454E-03 -0.0394 0.95 11.60 0.0000E+00

SHALLOW Stations 62,64 to 68

Edit Fact= 2.50 Histo Bin= 0.2500E-01 OcSlope= 0.1400E-02
ratio upper/deep variance , P_switch 0.00000000E-01 0.00000000E-01
11 Min/Max Sta: 62.- 68. 1 StdDev: 0.3513E-01 #Obs: 171 dOx: 0.088
1: Bias 2:Slope 3:Pcor 4:Tcor 5: Wt 6: Lag 7: bias/station
OX Parms: 0.043 0.1044E-02 0.1411E-03 -0.0236 0.95 5.60 0.0000E+00

DEEP Stations 62 to 68 (63 included)

Edit Fact= 2.80 Histo Bin= 0.2500E-01 OcSlope= 0.1400E-02
ratio upper/deep variance , P_switch 0.00000000E-01 0.00000000E-01
3 Min/Max Sta: 62.- 68. 1 StdDev: 0.1604E-01 #Obs: 103 dOx: 0.045
1: Bias 2:Slope 3:Pcor 4:Tcor 5: Wt 6: Lag 7: bias/station
OX Parms: -0.021 0.1251E-02 0.1544E-03 -0.0399 0.95 6.00 0.0000E+00

SHALLOW Station 63

Edit Fact= 2.50 Histo Bin= 0.2500E-01 OcSlope= 0.1400E-02
ratio upper/deep variance , P_switch 0.00000000E-01 0.00000000E-01
5 Min/Max Sta: 63.- 63. 1 StdDev: 0.5965E-01 #Obs: 29 dOx: 0.149
1: Bias 2:Slope 3:Pcor 4:Tcor 5: Wt 6: Lag 7: bias/station
OX Parms: 0.043 0.1057E-02 0.1420E-03 -0.0241 0.95 7.50 0.0000E+00

DEEP Station 62 to 68 (Station 63 included)

```
 Edit Fact=  2.80 Histo Bin= 0.2500E-01 OcSlope= 0.1400E-02
  ratio upper/deep variance , P_switch  0.00000000E-01   0.00000000E-01
   3 Min/Max Sta:  62.-  68.  1 StdDev:  0.1604E-01 #Obs:  103  dOx: 0.045
        1: Bias  2:Slope     3:Pcor    4:Tcor   5: Wt  6: Lag  7: bias/station
 OX Parms: -0.021 0.1251E-02 0.1544E-03  -0.0399   0.95   6.00   0.0000E+00
```

SHALLOW Stations 69 and 71

```
 Edit Fact=  2.50 Histo Bin= 0.2500E-01 OcSlope= 0.1400E-02
  ratio upper/deep variance , P_switch  0.00000000E-01   0.00000000E-01
   5 Min/Max Sta:  69.-  71.  1 StdDev:  0.4604E-01 #Obs:   62  dOx: 0.115
        1: Bias  2:Slope     3:Pcor    4:Tcor   5: Wt  6: Lag  7: bias/station
 OX Parms:  0.032 0.1058E-02 0.1494E-03  -0.0244   0.95   9.00   0.0000E+00
```

DEEP Stations 69 to 71

```
 Edit Fact=  2.50 Histo Bin= 0.2500E-01 OcSlope= 0.1400E-02
  ratio upper/deep variance , P_switch  0.00000000E-01   0.00000000E-01
   3 Min/Max Sta:  69.-  71.  1 StdDev:  0.1487E-01 #Obs:   30  dOx: 0.037
        1: Bias  2:Slope     3:Pcor    4:Tcor   5: Wt  6: Lag  7: bias/station
 OX Parms: -0.034 0.1301E-02 0.1543E-03  -0.0446   0.95   9.00   0.0000E+00
```

Station 70

```
 Edit Fact=  2.50 Histo Bin= 0.2500E-01 OcSlope= 0.1400E-02
  ratio upper/deep variance , P_switch  0.00000000E-01   0.00000000E-01
   3 Min/Max Sta:  70.-  70.  1 StdDev:  0.1582E-01 #Obs:   33  dOx: 0.040
        1: Bias  2:Slope     3:Pcor    4:Tcor   5: Wt  6: Lag  7: bias/station
 OX Parms:  0.018 0.1114E-02 0.1572E-03  -0.0265   0.75   8.00   0.0000E+00
```

Stations 72 to 75

```
 Edit Fact=  2.50 Histo Bin= 0.2500E-01 OcSlope= 0.1400E-02
  ratio upper/deep variance , P_switch  0.00000000E-01   0.00000000E-01
   9 Min/Max Sta:  72.-  75.  1 StdDev:  0.2478E-01 #Obs:   54  dOx: 0.062
        1: Bias  2:Slope     3:Pcor    4:Tcor   5: Wt  6: Lag  7: bias/station
 OX Parms:  0.043 0.1032E-02 0.1469E-03  -0.0226   0.95   9.00   0.0000E+00
```

LEG 4 EASTER ISLAND TO NEW ZEALAND STATIONS 75 TO 188
(EXCEPT 76 TO 85, 112, 141, AND 187)

MISSING STATION 110 (files not present)

Station 86 to 92

```
 Edit Fact=  2.80 Histo Bin= 0.2500E-01 OcSlope= 0.1400E-02
  ratio upper/deep variance , P_switch  0.00000000E-01   0.00000000E-01
   7 Min/Max Sta:  86.-  92.  1 StdDev:  0.3403E-01 #Obs:  225  dOx: 0.095
        1: Bias  2:Slope     3:Pcor    4:Tcor   5: Wt  6: Lag  7: bias/station
 OX Parms:  0.003 0.1109E-02 0.1495E-03  -0.0267   0.77  10.54   0.2013E-03
```

Station No. =	86	Bais = 0.0207
Station No. =	87	Bais = 0.0209
Station No. =	88	Bais = 0.0211
Station No. =	89	Bais = 0.0213
Station No. =	90	Bais = 0.0215
Station No. =	91	Bais = 0.0217
Station No. =	92	Bais = 0.0219

Station 93 to 97

```
 Edit Fact=  2.50 Histo Bin= 0.2500E-01 OcSlope= 0.1400E-02
  ratio upper/deep variance , P_switch  0.00000000E-01   0.00000000E-01
   8 Min/Max Sta:  93.-  97.  1 StdDev:  0.3510E-01 #Obs:  157  dOx: 0.088
        1: Bias  2:Slope     3:Pcor    4:Tcor   5: Wt  6: Lag  7: bias/station
 OX Parms:  0.085 0.1102E-02 0.1484E-03  -0.0272   0.70  10.05   -.6505E-03
```

Station No. =	93	Bais = 0.0242
Station No. =	94	Bais = 0.0236
Station No. =	95	Bais = 0.0229
Station No. =	96	Bais = 0.0223
Station No. =	97	Bais = 0.0216

Station 93 to 103

```
 Edit Fact=  2.80 Histo Bin= 0.2500E-01 OcSlope= 0.1400E-02
  ratio upper/deep variance , P_switch      3.00000000    1000.00000000
  17 Min/Max Sta:  98.- 103.  1 StdDev:  0.2703E-01 #Obs:  173  dOx: 0.076
        1: Bias  2:Slope     3:Pcor    4:Tcor   5: Wt  6: Lag  7: bias/station
 OX Parms:  0.009 0.1083E-02 0.1426E-03  -0.0271   0.63   4.90   0.2407E-03
```

Station No. =	98	Bais = 0.0326
Station No. =	99	Bais = 0.0328
Station No. =	100	Bais = 0.0330
Station No. =	101	Bais = 0.0333
Station No. =	102	Bais = 0.0335
Station No. =	103	Bais = 0.0338

Station 104 to 106

Edit Fact= 2.80 Histo Bin= 0.2500E-01 OcSlope= 0.1400E-02
ratio upper/deep variance , P_switch 3.00000000 1000.00000000
7 Min/Max Sta: 104.- 106. 1 StdDev: 0.2727E-01 #Obs: 93 dOx: 0.076
1: Bias 2:Slope 3:Pcor 4:Tcor 5: Wt 6: Lag 7: bias/station
OX Parms: -0.019 0.1115E-02 0.1486E-03 -0.0279 0.70 8.01 0.3648E-03

Station No. = 104 Bais = 0.0189
Station No. = 105 Bais = 0.0193
Station No. = 106 Bais = 0.0196

Station 107 to 109

Edit Fact= 2.80 Histo Bin= 0.2500E-01 OcSlope= 0.1400E-02
ratio upper/deep variance , P_switch 0.00000000E-01 0.00000000E-01
6 Min/Max Sta: 107.- 109. 1 StdDev: 0.2736E-01 #Obs: 93 dOx: 0.077
1: Bias 2:Slope 3:Pcor 4:Tcor 5: Wt 6: Lag 7: bias/station
OX Parms: -0.004 0.1112E-02 0.1457E-03 -0.0274 0.70 8.00 0.2605E-03

Station No. = 107 Bais = 0.0243
Station No. = 108 Bais = 0.0245
Station No. = 109 Bais = 0.0248

Station 110, 111 Use fit of Station 111

Edit Fact= 2.80 Histo Bin= 0.2500E-01 OcSlope= 0.1400E-02
ratio upper/deep variance , P_switch 3.00000000 1000.00000000
5 Min/Max Sta: 111.- 111. 1 StdDev: 0.4520E-01 #Obs: 26 dOx: 0.127
1: Bias 2:Slope 3:Pcor 4:Tcor 5: Wt 6: Lag 7: bias/station
OX Parms: 0.034 0.1071E-02 0.1452E-03 -0.0260 0.75 8.00 0.0000E+00

Station 113, 114 Use fit of stations 111,113,114

Edit Fact= 2.80 Histo Bin= 0.2500E-01 OcSlope= 0.1400E-02
ratio upper/deep variance , P_switch 3.00000000 1000.00000000
8 Min/Max Sta: 111.- 114. 1 StdDev: 0.4247E-01 #Obs: 85 dOx: 0.119
1: Bias 2:Slope 3:Pcor 4:Tcor 5: Wt 6: Lag 7: bias/station
OX Parms: 0.012 0.1087E-02 0.1402E-03 -0.0264 0.70 7.50 0.2076E-03

Station No. = 111 Bais = 0.0351
Station No. = 112 Bais = 0.0353
Station No. = 113 Bais = 0.0355
Station No. = 114 Bais = 0.0357

Station 115, 117 to 119

Edit Fact= 2.80 Histo Bin= 0.2500E-01 OcSlope= 0.1400E-02
ratio upper/deep variance , P_switch 3.00000000 1000.00000000
9 Min/Max Sta: 115.- 119. 1 StdDev: 0.2686E-01 #Obs: 123 dOx: 0.075
1: Bias 2:Slope 3:Pcor 4:Tcor 5: Wt 6: Lag 7: bias/station
OX Parms: 0.056 0.1080E-02 0.1421E-03 -0.0260 0.70 7.48 -.1708E-03

Station No. = 115 Bais = 0.0366
Station No. = 116 Bais = 0.0364
Station No. = 117 Bais = 0.0362
Station No. = 118 Bais = 0.0361
Station No. = 119 Bais = 0.0359

Station 116

Edit Fact= 2.80 Histo Bin= 0.2500E-01 OcSlope= 0.1400E-02
ratio upper/deep variance , P_switch 3.00000000 1000.00000000
5 Min/Max Sta: 116.- 116. 1 StdDev: 0.2690E-01 #Obs: 30 dOx: 0.075
1: Bias 2:Slope 3:Pcor 4:Tcor 5: Wt 6: Lag 7: bias/station
OX Parms: 0.012 0.1139E-02 0.1486E-03 -0.0301 0.70 7.00 0.0000E+00

Station 120 to 123 **Use fit of stations 120 to 124**

Edit Fact= 2.50 Histo Bin= 0.2500E-01 OcSlope= 0.1400E-02
ratio upper/deep variance , P_switch 3.00000000 1000.00000000
10 Min/Max Sta: 120.- 124. 1 StdDev: 0.2269E-01 #Obs: 138 dOx: 0.057
1: Bias 2:Slope 3:Pcor 4:Tcor 5: Wt 6: Lag 7: bias/station
OX Parms: 0.029 0.1116E-02 0.1465E-03 -0.0273 0.68 7.00 -.6418E-04

Station No. = 120 Bais = 0.0213
Station No. = 121 Bais = 0.0212
Station No. = 122 Bais = 0.0211
Station No. = 123 Bais = 0.0211
Station No. = 124 Bais = 0.0210

Station 124

Edit Fact= 2.80 Histo Bin= 0.2500E-01 OcSlope= 0.1400E-02
ratio upper/deep variance , P_switch 3.00000000 1000.00000000
3 Min/Max Sta: 124.- 124. 1 StdDev: 0.1921E-01 #Obs: 34 dOx: 0.054
1: Bias 2:Slope 3:Pcor 4:Tcor 5: Wt 6: Lag 7: bias/station
OX Parms: 0.017 0.1117E-02 0.1510E-03 -0.0272 0.64 6.86 0.0000E+00

Station 125 to 126
Edit Fact= 2.30 Histo Bin= 0.2500E-01 OcSlope= 0.1400E-02
ratio upper/deep variance , P_switch 3.00000000 1000.00000000
16 Min/Max Sta: 125.- 126. 1 StdDev: 0.2032E-01 #Obs: 40 dOx: 0.047
1: Bias 2:Slope 3:Pcor 4:Tcor 5: Wt 6: Lag 7: bias/station
OX Parms: 0.007 0.1167E-02 0.1500E-03 -0.0288 0.78 8.00 0.0000E+00

Station 127 to 130
Edit Fact= 2.80 Histo Bin= 0.2500E-01 OcSlope= 0.1400E-02
ratio upper/deep variance , P_switch 3.00000000 1000.00000000
5 Min/Max Sta: 127.- 130. 1 StdDev: 0.2907E-01 #Obs: 131 dOx: 0.081
1: Bias 2:Slope 3:Pcor 4:Tcor 5: Wt 6: Lag 7: bias/station
OX Parms: -0.006 0.1154E-02 0.1501E-03 -0.0287 0.75 8.00 0.1250E-03

Station No. = 127 Bais = 0.0094
Station No. = 128 Bais = 0.0095
Station No. = 129 Bais = 0.0097
Station No. = 130 Bais = 0.0098

Station 131 to 135
Edit Fact= 2.50 Histo Bin= 0.2500E-01 OcSlope= 0.1400E-02
ratio upper/deep variance , P_switch 3.00000000 1000.00000000
7 Min/Max Sta: 131.- 135. 1 StdDev: 0.2351E-01 #Obs: 146 dOx: 0.059
1: Bias 2:Slope 3:Pcor 4:Tcor 5: Wt 6: Lag 7: bias/station
OX Parms: -0.007 0.1161E-02 0.1497E-03 -0.0288 0.76 8.00 0.1174E-03

Station No. = 131 Bais = 0.0083
Station No. = 132 Bais = 0.0084
Station No. = 133 Bais = 0.0085
Station No. = 134 Bais = 0.0086
Station No. = 135 Bais = 0.0088

Station 136
Edit Fact= 2.00 Histo Bin= 0.2500E-01 OcSlope= 0.1400E-02
ratio upper/deep variance , P_switch 3.00000000 4000.00000000
8 Min/Max Sta: 136.- 136. 1 StdDev: 0.1063E-01 #Obs: 30 dOx: 0.021
1: Bias 2:Slope 3:Pcor 4:Tcor 5: Wt 6: Lag 7: bias/station
OX Parms: 0.003 0.1180E-02 0.1518E-03 -0.0299 0.64 8.00 0.0000E+00

Station 137 to 140, 142 to 144
Edit Fact= 2.80 Histo Bin= 0.2500E-01 OcSlope= 0.1400E-02
ratio upper/deep variance , P_switch 3.00000000 1000.00000000
6 Min/Max Sta: 137.- 144. 1 StdDev: 0.3574E-01 #Obs: 215 dOx: 0.100
1: Bias 2:Slope 3:Pcor 4:Tcor 5: Wt 6: Lag 7: bias/station
OX Parms: 0.000 0.1189E-02 0.1487E-03 -0.0299 0.81 8.68 0.1720E-04

Station No. = 137 Bais = 0.0028
Station No. = 138 Bais = 0.0028
Station No. = 139 Bais = 0.0028
Station No. = 140 Bais = 0.0028
Station No. = 141 Bais = 0.0029
Station No. = 142 Bais = 0.0029
Station No. = 143 Bais = 0.0029
Station No. = 144 Bais = 0.0029

Station 145 to 150
Edit Fact= 2.50 Histo Bin= 0.2500E-01 OcSlope= 0.1400E-02
ratio upper/deep variance , P_switch 3.00000000 1000.00000000
5 Min/Max Sta: 145.- 150. 1 StdDev: 0.3730E-01 #Obs: 225 dOx: 0.093
1: Bias 2:Slope 3:Pcor 4:Tcor 5: Wt 6: Lag 7: bias/station
OX Parms: 0.010 0.1172E-02 0.1470E-03 -0.0307 0.75 8.00 0.0000E+00

Station 151 to 155
Edit Fact= 2.80 Histo Bin= 0.2500E-01 OcSlope= 0.1400E-02
ratio upper/deep variance , P_switch 3.00000000 1000.00000000
8 Min/Max Sta: 151.- 155. 1 StdDev: 0.2762E-01 #Obs: 147 dOx: 0.077
1: Bias 2:Slope 3:Pcor 4:Tcor 5: Wt 6: Lag 7: bias/station
OX Parms: 0.001 0.1189E-02 0.1469E-03 -0.0297 0.79 15.15 0.4069E-04

Station No. = 151 Bais = 0.0075
Station No. = 152 Bais = 0.0076
Station No. = 153 Bais = 0.0076
Station No. = 154 Bais = 0.0077
Station No. = 155 Bais = 0.0077

Station 156
Edit Fact= 2.80 Histo Bin= 0.2500E-01 OcSlope= 0.1400E-02
ratio upper/deep variance , P_switch 3.00000000 1000.00000000
4 Min/Max Sta: 156.- 156. 1 StdDev: 0.2703E-01 #Obs: 30 dOx: 0.076
1: Bias 2:Slope 3:Pcor 4:Tcor 5: Wt 6: Lag 7: bias/station
OX Parms: 0.007 0.1195E-02 0.1458E-03 -0.0309 0.72 23.15 0.0000E+00

Station 157 to 159
Edit Fact= 2.50 Histo Bin= 0.2500E-01 OcSlope= 0.1400E-02
ratio upper/deep variance , P_switch 3.00000000 1000.00000000
6 Min/Max Sta: 157.- 159. 1 StdDev: 0.2792E-01 #Obs: 85 dOx: 0.070
1: Bias 2:Slope 3:Pcor 4:Tcor 5: Wt 6: Lag 7: bias/station
OX Parms: 0.004 0.1207E-02 0.1467E-03 -0.0305 0.80 15.35 0.0000E+00

Station 160 to 162

```
 Edit Fact=  2.50 Histo Bin= 0.2500E-01 OcSlope= 0.1400E-02
  ratio upper/deep variance , P_switch      3.00000000    1000.00000000
   7 Min/Max Sta: 160.- 162.  1 StdDev:  0.3854E-01 #Obs:  105  dOx: 0.096
        1: Bias  2:Slope     3:Pcor    4:Tcor   5: Wt  6: Lag  7: bias/station
 OX Parms:  0.014 0.1183E-02 0.1445E-03  -0.0299   0.81   9.09   0.0000E+00
```

Station 163

```
 Edit Fact=  2.50 Histo Bin= 0.2500E-01 OcSlope= 0.1400E-02
  ratio upper/deep variance , P_switch      3.00000000    1000.00000000
   4 Min/Max Sta: 163.- 163.  1 StdDev:  0.1831E-01 #Obs:   29  dOx: 0.046
        1: Bias  2:Slope     3:Pcor    4:Tcor   5: Wt  6: Lag  7: bias/station
 OX Parms: -0.002 0.1224E-02 0.1471E-03  -0.0325   0.70   9.00   0.0000E+00
```

Station 164 to 167

```
 Edit Fact=  2.80 Histo Bin= 0.2500E-01 OcSlope= 0.1400E-02
  ratio upper/deep variance , P_switch  0.00000000E-01   0.00000000E-01
   7 Min/Max Sta: 164.- 167.  1 StdDev:  0.3208E-01 #Obs:  114  dOx: 0.090
        1: Bias  2:Slope     3:Pcor    4:Tcor   5: Wt  6: Lag  7: bias/station
 OX Parms:  0.031 0.1161E-02 0.1458E-03  -0.0290   0.74   4.68   -.9247E-04

                     Station No. =   164  Bais = 0.0155
                     Station No. =   165  Bais = 0.0154
                     Station No. =   166  Bais = 0.0153
                     Station No. =   167  Bais = 0.0152
```

Stations 168 to 170

```
 Edit Fact=  2.80 Histo Bin= 0.2500E-01 OcSlope= 0.1400E-02
  ratio upper/deep variance , P_switch  0.00000000E-01   0.00000000E-01
   5 Min/Max Sta: 168.- 170.  1 StdDev:  0.3139E-01 #Obs:   93  dOx: 0.088
        1: Bias  2:Slope     3:Pcor    4:Tcor   5: Wt  6: Lag  7: bias/station
 OX Parms: -0.003 0.1194E-02 0.1469E-03  -0.0303   0.82   3.00   0.4917E-04

                     Station No. =   168  Bais = 0.0057
                     Station No. =   169  Bais = 0.0058
                     Station No. =   170  Bais = 0.0058
```

Stations 171 to 174

```
 Edit Fact=  2.80 Histo Bin= 0.2500E-01 OcSlope= 0.1400E-02
  ratio upper/deep variance , P_switch      3.00000000    1000.00000000
  18 Min/Max Sta: 171.- 174.  1 StdDev:  0.2560E-01 #Obs:   90  dOx: 0.072
        1: Bias  2:Slope     3:Pcor    4:Tcor   5: Wt  6: Lag  7: bias/station
 OX Parms: -0.001 0.1270E-02 0.1453E-03  -0.0393   0.90   3.00   -.4661E-04
```

Station No. = 171 Bais = -.0091
Station No. = 172 Bais = -.0092
Station No. = 173 Bais = -.0092
Station No. = 174 Bais = -.0093

Stations 175 to 178

Edit Fact= 2.80 Histo Bin= 0.2500E-01 OcSlope= 0.1400E-02
ratio upper/deep variance , P_switch 3.00000000 1000.00000000
8 Min/Max Sta: 175.- 178. 1 StdDev: 0.6433E-01 #Obs: 127 dOx: 0.180
1: Bias 2:Slope 3:Pcor 4:Tcor 5: Wt 6: Lag 7: bias/station
OX Parms: 0.016 0.1175E-02 0.1447E-03 -0.0296 0.90 3.00 0.0000E+00

Station 179 to 182

Edit Fact= 2.80 Histo Bin= 0.2500E-01 OcSlope= 0.1400E-02
ratio upper/deep variance , P_switch 3.00000000 1000.00000000
5 Min/Max Sta: 179.- 182. 1 StdDev: 0.6177E-01 #Obs: 119 dOx: 0.173
1: Bias 2:Slope 3:Pcor 4:Tcor 5: Wt 6: Lag 7: bias/station
OX Parms: 0.016 0.1085E-02 0.1546E-03 -0.0244 0.84 3.00 0.5458E-04

Station No. = 179 Bais = 0.0258
Station No. = 180 Bais = 0.0259
Station No. = 181 Bais = 0.0260
Station No. = 182 Bais = 0.0260

Stations 183 to 184

Edit Fact= 2.80 Histo Bin= 0.2500E-01 OcSlope= 0.1400E-02
ratio upper/deep variance , P_switch 3.00000000 1000.00000000
4 Min/Max Sta: 183.- 184. 1 StdDev: 0.3034E-01 #Obs: 52 dOx: 0.085
1: Bias 2:Slope 3:Pcor 4:Tcor 5: Wt 6: Lag 7: bias/station
OX Parms: 0.040 0.1083E-02 0.1346E-03 -0.0249 0.95 8.00 0.0000E+00

Stations 185 to 188

Edit Fact= 2.50 Histo Bin= 0.2500E-01 OcSlope= 0.1400E-02
ratio upper/deep variance , P_switch 3.00000000 1000.00000000
9 Min/Max Sta: 185.- 188. 1 StdDev: 0.3887E-01 #Obs: 81 dOx: 0.097
1: Bias 2:Slope 3:Pcor 4:Tcor 5: Wt 6: Lag 7: bias/station
OX Parms: 0.112 0.1136E-02 0.1480E-03 -0.0269 0.87 8.00 -.5249E-03

Station No. = 185 Bais = 0.0150
Station No. = 186 Bais = 0.0145
Station No. = 187 Bais = 0.0140
Station No. = 188 Bais = 0.0135

LEG 5 CTD 10
NEW ZEALAND TO AUSTRALIA
STATIONS 190 TO 246

Station 190 to 194
Edit Fact= 2.80 Histo Bin= 0.2500E-01 OcSlope= 0.1400E-02
ratio upper/deep variance , P_switch 3.00000000 1000.00000000
7 Min/Max Sta: 190.- 194. 1 StdDev: 0.2064E-01 #Obs: 152 dOx: 0.058
1: Bias 2:Slope 3:Pcor 4:Tcor 5: Wt 6: Lag 7: bias/station
OX Parms: -0.005 0.1071E-02 0.1290E-03 -0.0261 0.72 1.20 0.2826E-03

Station No. = 190 Bais = 0.0486
Station No. = 191 Bais = 0.0489
Station No. = 192 Bais = 0.0492
Station No. = 193 Bais = 0.0495
Station No. = 194 Bais = 0.0498

Stations 195 to 201 Use fit of stations 190 to 201
Edit Fact= 2.80 Histo Bin= 0.2500E-01 OcSlope= 0.1400E-02
ratio upper/deep variance , P_switch 3.00000000 1000.00000000
9 Min/Max Sta: 190.- 201. 1 StdDev: 0.2944E-01 #Obs: 317 dOx: 0.082
1: Bias 2:Slope 3:Pcor 4:Tcor 5: Wt 6: Lag 7: bias/station
OX Parms: 0.002 0.1100E-02 0.1347E-03 -0.0273 0.75 5.10 0.1808E-03

Station No. = 190 Bais = 0.0361
Station No. = 191 Bais = 0.0363
Station No. = 192 Bais = 0.0365
Station No. = 193 Bais = 0.0367
Station No. = 194 Bais = 0.0368
Station No. = 195 Bais = 0.0370
Station No. = 196 Bais = 0.0372
Station No. = 197 Bais = 0.0374
Station No. = 198 Bais = 0.0376
Station No. = 199 Bais = 0.0377
Station No. = 200 Bais = 0.0379
Station No. = 201 Bais = 0.0381

Stations 202 to 211
Edit Fact= 2.80 Histo Bin= 0.2500E-01 OcSlope= 0.1400E-02
ratio upper/deep variance , P_switch 3.00000000 1000.00000000
4 Min/Max Sta: 202.- 211. 1 StdDev: 0.3065E-01 #Obs: 189 dOx: 0.086
1: Bias 2:Slope 3:Pcor 4:Tcor 5: Wt 6: Lag 7: bias/station
OX Parms: 0.026 0.1063E-02 0.1307E-03 -0.0253 0.73 5.10 0.1343E-03

Station No. = 202 Bais = 0.0531
Station No. = 203 Bais = 0.0532
Station No. = 204 Bais = 0.0533
Station No. = 205 Bais = 0.0535
Station No. = 206 Bais = 0.0536
Station No. = 207 Bais = 0.0537
Station No. = 208 Bais = 0.0539
Station No. = 209 Bais = 0.0540
Station No. = 210 Bais = 0.0541
Station No. = 211 Bais = 0.0543

Station 212 to 221
Edit Fact= 2.80 Histo Bin= 0.2500E-01 OcSlope= 0.1400E-02
ratio upper/deep variance , P_switch 0.00000000E-01 0.00000000E-01
6 Min/Max Sta: 212.- 221. 1 StdDev: 0.2997E-01 #Obs: 198 dOx: 0.084
1: Bias 2:Slope 3:Pcor 4:Tcor 5: Wt 6: Lag 7: bias/station
OX Parms: 0.012 0.1076E-02 0.1388E-03 -0.0256 0.74 8.59 0.1357E-03

Station No. = 212 Bais = 0.0406
Station No. = 213 Bais = 0.0407
Station No. = 214 Bais = 0.0409
Station No. = 215 Bais = 0.0410
Station No. = 216 Bais = 0.0412
Station No. = 217 Bais = 0.0413
Station No. = 218 Bais = 0.0414
Station No. = 219 Bais = 0.0416
Station No. = 220 Bais = 0.0417
Station No. = 221 Bais = 0.0418

Station 222 to 231
Edit Fact= 2.80 Histo Bin= 0.2500E-01 OcSlope= 0.1400E-02
ratio upper/deep variance , P_switch 3.00000000 1000.00000000
8 Min/Max Sta: 222.- 231. 1 StdDev: 0.2690E-01 #Obs: 169 dOx: 0.075
1: Bias 2:Slope 3:Pcor 4:Tcor 5: Wt 6: Lag 7: bias/station
OX Parms: 0.025 0.1069E-02 0.1579E-03 -0.0249 0.82 9.18 0.1949E-04

Station No. = 222 Bais = 0.0290
Station No. = 223 Bais = 0.0290
Station No. = 224 Bais = 0.0291
Station No. = 225 Bais = 0.0291
Station No. = 226 Bais = 0.0291
Station No. = 227 Bais = 0.0291
Station No. = 228 Bais = 0.0291
Station No. = 229 Bais = 0.0292
Station No. = 230 Bais = 0.0292
Station No. = 231 Bais = 0.0292

Stations 232 to 240

Edit Fact= 2.80 Histo Bin= 0.2500E-01 OcSlope= 0.1400E-02
ratio upper/deep variance , P_switch 3.00000000 1000.00000000
6 Min/Max Sta: 232.- 240. 1 StdDev: 0.4332E-01 #Obs: 285 dOx: 0.121
1: Bias 2:Slope 3:Pcor 4:Tcor 5: Wt 6: Lag 7: bias/station
OX Parms: -0.005 0.1149E-02 0.1490E-03 -0.0284 0.90 10.00 0.7517E-04

Station No. =	232	Bais = 0.0127
Station No. =	233	Bais = 0.0128
Station No. =	234	Bais = 0.0128
Station No. =	235	Bais = 0.0129
Station No. =	236	Bais = 0.0130
Station No. =	237	Bais = 0.0131
Station No. =	238	Bais = 0.0131
Station No. =	239	Bais = 0.0132
Station No. =	240	Bais = 0.0133

Stations 241 to 246

Edit Fact= 2.80 Histo Bin= 0.2500E-01 OcSlope= 0.1400E-02
ratio upper/deep variance , P_switch 3.00000000 1000.00000000
6 Min/Max Sta: 241.- 246. 1 StdDev: 0.3474E-01 #Obs: 79 dOx: 0.097
1: Bias 2:Slope 3:Pcor 4:Tcor 5: Wt 6: Lag 7: bias/station
OX Parms: 0.015 0.1071E-02 0.1636E-03 -0.0250 0.85 3.17 0.4869E-04

Station No. =	241	Bais = 0.0264
Station No. =	242	Bais = 0.0264
Station No. =	243	Bais = 0.0265
Station No. =	244	Bais = 0.0265
Station No. =	245	Bais = 0.0266
Station No. =	246	Bais = 0.0266

Station 246

Manually adjusted bias of calculated oxygen in CTD and SEA file by +0.1 ml/l oxygen, to match water samlple data and CTD traces.

CTD09

LEG 3 CTD 09
CHILE TO EASTER ISLAND
STATION 3

Station 3
Edit Fact= 2.00 Histo Bin= 0.2500E-01 OcSlope= 0.1400E-02
ratio upper/deep variance , P_switch 3.00000000 1000.00000000
8 Min/Max Sta: 3.- 3. 1 StdDev: 0.3573E-01 #Obs: 21 dOx: 0.071
1: Bias 2:Slope 3:Pcor 4:Tcor 5: Wt 6: Lag 7: bias/station
OX Parms: -0.007 0.9272E-03 0.1697E-03 -0.0285 0.90 10.00 0.0000E+00

LEG 4 CTD 09
EASTER ISLAND TO NEW ZEALAND
STATIONS 76 TO 85 , not including duplicate stations 112, 141,and 187

Stations 76 to 78
Edit Fact= 2.30 Histo Bin= 0.2500E-01 OcSlope= 0.1400E-02
ratio upper/deep variance , P_switch 3.00000000 1000.00000000
16 Min/Max Sta: 76.- 78. 1 StdDev: 0.1369E-01 #Obs: 74 dOx: 0.031
1: Bias 2:Slope 3:Pcor 4:Tcor 5: Wt 6: Lag 7: bias/station
OX Parms: 0.011 0.8891E-03 0.1654E-03 -0.0284 0.60 10.00 0.0000E+00

Stations 79, 81 to 85 **Use fit of stations 76 to 79, 81 to 85**
Edit Fact= 2.80 Histo Bin= 0.2500E-01 OcSlope= 0.1400E-02
ratio upper/deep variance , P_switch 3.00000000 1500.00000000
9 Min/Max Sta: 76.- 85. 1 StdDev: 0.3899E-01 #Obs: 286 dOx: 0.109
1: Bias 2:Slope 3:Pcor 4:Tcor 5: Wt 6: Lag 7: bias/station
OX Parms: 0.020 0.8835E-03 0.1597E-03 -0.0286 0.59 9.17 0.0000E+00

Station 80
Edit Fact= 2.80 Histo Bin= 0.2500E-01 OcSlope= 0.1400E-02
ratio upper/deep variance , P_switch 0.00000000E-01 0.00000000E-01
2 Min/Max Sta: 80.- 80. 1 StdDev: 0.6161E-01 #Obs: 35 dOx: 0.172
1: Bias 2:Slope 3:Pcor 4:Tcor 5: Wt 6: Lag 7: bias/station
OX Parms: 0.004 0.8364E-03 0.2127E-03 -0.0247 0.48 9.20 0.0000E+00

LEG 5 CTD 09

NEW ZEALAND TO AUSTRALIA

STATIONS 248 TO 267, not including duplicate stations 189, 247

Stations 248 to 257 Use fit of stations 249-255

Edit Fact= 2.50 Histo Bin= 0.2500E-01 OcSlope= 0.1400E-02
ratio upper/deep variance , P_switch 0.00000000E-01 0.00000000E-01
4 Min/Max Sta: 249.- 255. 1 StdDev: 0.4877E-01 #Obs: 49 dOx: 0.122
1: Bias 2:Slope 3:Pcor 4:Tcor 5: Wt 6: Lag 7: bias/station
OX Parms: 0.012 0.8430E-03 0.1556E-03 -0.0288 0.50 6.90 0.9029E-04

Station No. =	249	Bais = 0.0349
Station No. =	250	Bais = 0.0350
Station No. =	251	Bais = 0.0351
Station No. =	252	Bais = 0.0352
Station No. =	253	Bais = 0.0353
Station No. =	254	Bais = 0.0354
Station No. =	255	Bais = 0.0355

Stations 258 to 267 Use fit of stations 258-264

Edit Fact= 2.50 Histo Bin= 0.2500E-01 OcSlope= 0.1400E-02
ratio upper/deep variance , P_switch 0.00000000E-01 0.00000000E-01
4 Min/Max Sta: 258.- 264. 1 StdDev: 0.6324E-01 #Obs: 48 dOx: 0.158
1: Bias 2:Slope 3:Pcor 4:Tcor 5: Wt 6: Lag 7: bias/station
OX Parms: 0.003 0.8746E-03 0.1615E-03 -0.0293 0.55 10.67 0.7379E-04

Station No. =	258	Bais = 0.0220
Station No. =	259	Bais = 0.0221
Station No. =	260	Bais = 0.0221
Station No. =	261	Bais = 0.0222
Station No. =	262	Bais = 0.0223
Station No. =	263	Bais = 0.0223
Station No. =	264	Bais = 0.0224

Station 256

Manually adjusted bias of calculated oxygen in CTD and SEA file by -0.1 ml/l oxygen, to match water samlple data and CTD traces.

Table of calibration scaling factors used to derive CTD oxygen data on P6

sta	bias	slope	pcor	tcor	wt	lag
4	0.730000E-01	0.142800E-02	-.648500E-02	-.324000E-01	0.750000E-01	0.800000E+01
5	-.154000E+00	0.123000E-02	0.307800E-03	-.319000E-01	0.750000E+00	0.800000E+01
6	-.700000E-02	0.108900E-02	0.176100E-03	-.234000E-01	0.750000E+00	0.800000E+01
7	-.700000E-02	0.108900E-02	0.176100E-03	-.234000E-01	0.750000E+00	0.800000E+01
8	-.700000E-02	0.108900E-02	0.176100E-03	-.234000E-01	0.750000E+00	0.800000E+01
9	-.700000E-02	0.108900E-02	0.176100E-03	-.234000E-01	0.750000E+00	0.800000E+01
10	-.700000E-02	0.108900E-02	0.176100E-03	-.234000E-01	0.750000E+00	0.800000E+01
11	-.700000E-02	0.108900E-02	0.176100E-03	-.234000E-01	0.750000E+00	0.800000E+01
12	0.190000E-01	0.105800E-02	0.159600E-03	-.222000E-01	0.950000E+00	0.380000E+01
13	0.190000E-01	0.105800E-02	0.159600E-03	-.222000E-01	0.950000E+00	0.380000E+01
14	0.190000E-01	0.105800E-02	0.159600E-03	-.222000E-01	0.950000E+00	0.380000E+01
15	0.190000E-01	0.105800E-02	0.159600E-03	-.222000E-01	0.950000E+00	0.380000E+01
16	0.190000E-01	0.105800E-02	0.159600E-03	-.222000E-01	0.950000E+00	0.380000E+01
17	0.190000E-01	0.105800E-02	0.159600E-03	-.222000E-01	0.950000E+00	0.380000E+01
18	0.190000E-01	0.105800E-02	0.159600E-03	-.222000E-01	0.950000E+00	0.380000E+01
19	0.190000E-01	0.105800E-02	0.159600E-03	-.222000E-01	0.950000E+00	0.380000E+01
20	0.190000E-01	0.105800E-02	0.159600E-03	-.222000E-01	0.950000E+00	0.380000E+01
21	0.190000E-01	0.105800E-02	0.159600E-03	-.222000E-01	0.950000E+00	0.380000E+01
22	0.360000E-01	0.995700E-03	0.160700E-03	-.197000E-01	0.950000E+00	0.370000E+01
23	0.360000E-01	0.995700E-03	0.160700E-03	-.197000E-01	0.950000E+00	0.370000E+01
24	0.360000E-01	0.995700E-03	0.160700E-03	-.197000E-01	0.950000E+00	0.370000E+01
25	0.360000E-01	0.995700E-03	0.160700E-03	-.197000E-01	0.950000E+00	0.370000E+01
26	0.270000E-01	0.104800E-02	0.157300E-03	-.251000E-01	0.750000E+00	0.800000E+01
27	0.270000E-01	0.104800E-02	0.157300E-03	-.251000E-01	0.750000E+00	0.800000E+01
28	0.270000E-01	0.104800E-02	0.157300E-03	-.251000E-01	0.750000E+00	0.800000E+01
29	0.270000E-01	0.104800E-02	0.157300E-03	-.251000E-01	0.750000E+00	0.800000E+01
30	0.270000E-01	0.104800E-02	0.157300E-03	-.251000E-01	0.750000E+00	0.800000E+01
31	0.270000E-01	0.104800E-02	0.157300E-03	-.251000E-01	0.750000E+00	0.800000E+01
32	0.270000E-01	0.104800E-02	0.157300E-03	-.251000E-01	0.750000E+00	0.800000E+01
33	0.290000E-01	0.103200E-02	0.160300E-03	-.219000E-01	0.750000E+00	0.800000E+01
34	0.290000E-01	0.103200E-02	0.160300E-03	-.219000E-01	0.750000E+00	0.800000E+01
35	0.290000E-01	0.103200E-02	0.160300E-03	-.219000E-01	0.750000E+00	0.800000E+01
36	0.290000E-01	0.103200E-02	0.160300E-03	-.219000E-01	0.750000E+00	0.800000E+01
37	0.290000E-01	0.103200E-02	0.160300E-03	-.219000E-01	0.750000E+00	0.800000E+01
38	0.290000E-01	0.103200E-02	0.160300E-03	-.219000E-01	0.750000E+00	0.800000E+01
39	0.440000E-01	0.100100E-02	0.149000E-03	-.207000E-01	0.950000E+00	0.640000E+01
40	0.440000E-01	0.100100E-02	0.149000E-03	-.207000E-01	0.950000E+00	0.640000E+01
41	0.440000E-01	0.100100E-02	0.149000E-03	-.207000E-01	0.950000E+00	0.640000E+01
42	0.440000E-01	0.100100E-02	0.149000E-03	-.207000E-01	0.950000E+00	0.640000E+01
43	0.360000E-01	0.101700E-02	0.154300E-03	-.202000E-01	0.950000E+00	0.440000E+01
44	0.360000E-01	0.101700E-02	0.154300E-03	-.202000E-01	0.950000E+00	0.440000E+01
45	0.360000E-01	0.101700E-02	0.154300E-03	-.202000E-01	0.950000E+00	0.440000E+01
46	0.360000E-01	0.102400E-02	0.153400E-03	-.228000E-01	0.750000E+00	0.800000E+01
47	0.360000E-01	0.102400E-02	0.153400E-03	-.228000E-01	0.750000E+00	0.800000E+01
48	0.360000E-01	0.102400E-02	0.153400E-03	-.228000E-01	0.750000E+00	0.800000E+01
49	0.360000E-01	0.102400E-02	0.153400E-03	-.228000E-01	0.750000E+00	0.800000E+01
50	0.360000E-01	0.102400E-02	0.153400E-03	-.228000E-01	0.750000E+00	0.800000E+01
51	0.360000E-01	0.102400E-02	0.153400E-03	-.228000E-01	0.750000E+00	0.800000E+01
52	0.360000E-01	0.102400E-02	0.153400E-03	-.228000E-01	0.750000E+00	0.800000E+01
53	0.360000E-01	0.102400E-02	0.153400E-03	-.228000E-01	0.750000E+00	0.800000E+01

sta	bias	slope	pcor	tcor	wt	lag
54	0.360000E-01	0.102400E-02	0.153400E-03	-.228000E-01	0.750000E+00	0.800000E+01
55	0.360000E-01	0.102400E-02	0.153400E-03	-.228000E-01	0.750000E+00	0.800000E+01
56	0.360000E-01	0.102400E-02	0.153400E-03	-.228000E-01	0.750000E+00	0.800000E+01
57	0.160000E-01	0.107200E-02	0.161200E-03	-.247000E-01	0.100000E+01	0.856000E+01
58	0.290000E-01	0.104500E-02	0.155100E-03	-.234000E-01	0.950000E+00	0.116000E+02
59	0.290000E-01	0.104500E-02	0.155100E-03	-.234000E-01	0.950000E+00	0.116000E+02
60	0.290000E-01	0.104500E-02	0.155100E-03	-.234000E-01	0.950000E+00	0.116000E+02
61	0.290000E-01	0.104500E-02	0.155100E-03	-.234000E-01	0.950000E+00	0.116000E+02
62	0.430000E-01	0.104400E-02	0.141100E-03	-.236000E-01	0.950000E+00	0.560000E+01
63	0.430000E-01	0.105700E-02	0.142000E-03	-.241000E-01	0.950000E+00	0.750000E+01
64	0.430000E-01	0.104400E-02	0.141100E-03	-.236000E-01	0.950000E+00	0.560000E+01
65	0.430000E-01	0.104400E-02	0.141100E-03	-.236000E-01	0.950000E+00	0.560000E+01
66	0.430000E-01	0.104400E-02	0.141100E-03	-.236000E-01	0.950000E+00	0.560000E+01
67	0.430000E-01	0.104400E-02	0.141100E-03	-.236000E-01	0.950000E+00	0.560000E+01
68	0.430000E-01	0.104400E-02	0.141100E-03	-.236000E-01	0.950000E+00	0.560000E+01
69	0.320000E-01	0.105800E-02	0.149400E-03	-.244000E-01	0.950000E+00	0.900000E+01
70	0.180000E-01	0.111400E-02	0.157200E-03	-.265000E-01	0.750000E+00	0.800000E+01
71	0.320000E-01	0.105800E-02	0.149400E-03	-.244000E-01	0.950000E+00	0.900000E+01
72	0.430000E-01	0.103200E-02	0.146900E-03	-.226000E-01	0.950000E+00	0.900000E+01
75	0.430000E-01	0.103200E-02	0.146900E-03	-.226000E-01	0.950000E+00	0.900000E+01
76	0.110000E-01	0.889100E-03	0.165400E-03	-.284000E-01	0.600000E+00	0.100000E+02
77	0.110000E-01	0.889100E-03	0.165400E-03	-.284000E-01	0.600000E+00	0.100000E+02
78	0.110000E-01	0.889100E-03	0.165400E-03	-.284000E-01	0.600000E+00	0.100000E+02
79	0.200000E-01	0.883500E-03	0.159700E-03	-.286000E-01	0.590000E+00	0.917000E+01
80	0.400000E-02	0.836400E-03	0.212700E-03	-.247000E-01	0.480000E+00	0.920000E+01
81	0.200000E-01	0.883500E-03	0.159700E-03	-.286000E-01	0.590000E+00	0.917000E+01
82	0.200000E-01	0.883500E-03	0.159700E-03	-.286000E-01	0.590000E+00	0.917000E+01
83	0.200000E-01	0.883500E-03	0.159700E-03	-.286000E-01	0.590000E+00	0.917000E+01
84	0.200000E-01	0.883500E-03	0.159700E-03	-.286000E-01	0.590000E+00	0.917000E+01
85	0.200000E-01	0.883500E-03	0.159700E-03	-.286000E-01	0.590000E+00	0.917000E+01
86	0.207000E-01	0.110900E-02	0.149500E-03	-.267000E-01	0.770000E+00	0.105400E+02
87	0.209000E-01	0.110900E-02	0.149500E-03	-.267000E-01	0.770000E+00	0.105400E+02
88	0.211000E-01	0.110900E-02	0.149500E-03	-.267000E-01	0.770000E+00	0.105400E+02
89	0.213000E-01	0.110900E-02	0.149500E-03	-.267000E-01	0.770000E+00	0.105400E+02
90	0.215000E-01	0.110900E-02	0.149500E-03	-.267000E-01	0.770000E+00	0.105400E+02
91	0.217000E-01	0.110900E-02	0.149500E-03	-.267000E-01	0.770000E+00	0.105400E+02
92	0.219000E-01	0.110900E-02	0.149500E-03	-.267000E-01	0.770000E+00	0.105400E+02
93	0.242000E-01	0.110200E-02	0.148400E-03	-.272000E-01	0.700000E+00	0.100500E+02
94	0.236000E-01	0.110200E-02	0.148400E-03	-.272000E-01	0.700000E+00	0.100500E+02
95	0.229000E-01	0.110200E-02	0.148400E-03	-.272000E-01	0.700000E+00	0.100500E+02
96	0.223000E-01	0.110200E-02	0.148400E-03	-.272000E-01	0.700000E+00	0.100500E+02
97	0.216000E-01	0.110200E-02	0.148400E-03	-.272000E-01	0.700000E+00	0.100500E+02
98	0.326000E-01	0.108300E-02	0.142600E-03	-.271000E-01	0.630000E+00	0.490000E+01
99	0.328000E-01	0.108300E-02	0.142600E-03	-.271000E-01	0.630000E+00	0.490000E+01
100	0.330000E-01	0.108300E-02	0.142600E-03	-.271000E-01	0.630000E+00	0.490000E+01
101	0.333000E-01	0.108300E-02	0.142600E-03	-.271000E-01	0.630000E+00	0.490000E+01
102	0.335000E-01	0.108300E-02	0.142600E-03	-.271000E-01	0.630000E+00	0.490000E+01
103	0.338000E-01	0.108300E-02	0.142600E-03	-.271000E-01	0.630000E+00	0.490000E+01
104	0.189000E-01	0.111500E-02	0.148600E-03	-.279000E-01	0.700000E+00	0.801000E+01
105	0.193000E-01	0.111500E-02	0.148600E-03	-.279000E-01	0.700000E+00	0.801000E+01
106	0.196000E-01	0.111500E-02	0.148600E-03	-.279000E-01	0.700000E+00	0.801000E+01
107	0.243000E-01	0.111200E-02	0.145700E-03	-.274000E-01	0.700000E+00	0.800000E+01

sta	bias	slope	pcor	tcor	wt	lag
108	0.245000E-01	0.111200E-02	0.145700E-03	-.274000E-01	0.700000E+00	0.800000E+01
109	0.248000E-01	0.111200E-02	0.145700E-03	-.274000E-01	0.700000E+00	0.800000E+01
110	0.340000E-01	0.107100E-02	0.145200E-03	-.260000E-01	0.750000E+00	0.800000E+01
111	0.340000E-01	0.107100E-02	0.145200E-03	-.260000E-01	0.750000E+00	0.800000E+01
113	0.355000E-01	0.108700E-02	0.140200E-03	-.264000E-01	0.700000E+00	0.750000E+01
114	0.357000E-01	0.108700E-02	0.140200E-03	-.264000E-01	0.700000E+00	0.750000E+01
115	0.366000E-01	0.108000E-02	0.142100E-03	-.260000E-01	0.700000E+00	0.748000E+01
116	0.120000E-01	0.113900E-02	0.148600E-03	-.301000E-01	0.700000E+00	0.700000E+01
117	0.362000E-01	0.108000E-02	0.142100E-03	-.260000E-01	0.700000E+00	0.748000E+01
118	0.361000E-01	0.108000E-02	0.142100E-03	-.260000E-01	0.700000E+00	0.748000E+01
119	0.359000E-01	0.108000E-02	0.142100E-03	-.260000E-01	0.700000E+00	0.748000E+01
120	0.213000E-01	0.111600E-02	0.146500E-03	-.273000E-01	0.680000E+00	0.700000E+01
121	0.212000E-01	0.111600E-02	0.146500E-03	-.273000E-01	0.680000E+00	0.700000E+01
122	0.211000E-01	0.111600E-02	0.146500E-03	-.273000E-01	0.680000E+00	0.700000E+01
123	0.211000E-01	0.111600E-02	0.146500E-03	-.273000E-01	0.680000E+00	0.700000E+01
124	0.170000E-01	0.111700E-02	0.151000E-03	-.272000E-01	0.640000E+00	0.686000E+01
125	0.700000E-02	0.116700E-02	0.150000E-03	-.288000E-01	0.780000E+00	0.800000E+01
126	0.700000E-02	0.116700E-02	0.150000E-03	-.288000E-01	0.780000E+00	0.800000E+01
127	0.940000E-02	0.115400E-02	0.150100E-03	-.287000E-01	0.750000E+00	0.800000E+01
128	0.950000E-02	0.115400E-02	0.150100E-03	-.287000E-01	0.750000E+00	0.800000E+01
129	0.970000E-02	0.115400E-02	0.150100E-03	-.287000E-01	0.750000E+00	0.800000E+01
130	0.980000E-02	0.115400E-02	0.150100E-03	-.287000E-01	0.750000E+00	0.800000E+01
131	0.830000E-02	0.116100E-02	0.149700E-03	-.288000E-01	0.760000E+00	0.800000E+01
132	0.840000E-02	0.116100E-02	0.149700E-03	-.288000E-01	0.760000E+00	0.800000E+01
133	0.850000E-02	0.116100E-02	0.149700E-03	-.288000E-01	0.760000E+00	0.800000E+01
134	0.860000E-02	0.116100E-02	0.149700E-03	-.288000E-01	0.760000E+00	0.800000E+01
135	0.880000E-02	0.116100E-02	0.149700E-03	-.288000E-01	0.760000E+00	0.800000E+01
136	0.300000E-02	0.118000E-02	0.151800E-03	-.299000E-01	0.640000E+00	0.800000E+01
137	0.280000E-02	0.118900E-02	0.148700E-03	-.299000E-01	0.810000E+00	0.868000E+01
138	0.280000E-02	0.118900E-02	0.148700E-03	-.299000E-01	0.810000E+00	0.868000E+01
139	0.280000E-02	0.118900E-02	0.148700E-03	-.299000E-01	0.810000E+00	0.868000E+01
140	0.280000E-02	0.118900E-02	0.148700E-03	-.299000E-01	0.810000E+00	0.868000E+01
142	0.290000E-02	0.118900E-02	0.148700E-03	-.299000E-01	0.810000E+00	0.868000E+01
143	0.290000E-02	0.118900E-02	0.148700E-03	-.299000E-01	0.810000E+00	0.868000E+01
144	0.290000E-02	0.118900E-02	0.148700E-03	-.299000E-01	0.810000E+00	0.868000E+01
145	0.100000E-01	0.117200E-02	0.147000E-03	-.307000E-01	0.750000E+00	0.800000E+01
146	0.100000E-01	0.117200E-02	0.147000E-03	-.307000E-01	0.750000E+00	0.800000E+01
147	0.100000E-01	0.117200E-02	0.147000E-03	-.307000E-01	0.750000E+00	0.800000E+01
148	0.100000E-01	0.117200E-02	0.147000E-03	-.307000E-01	0.750000E+00	0.800000E+01
149	0.100000E-01	0.117200E-02	0.147000E-03	-.307000E-01	0.750000E+00	0.800000E+01
150	0.100000E-01	0.117200E-02	0.147000E-03	-.307000E-01	0.750000E+00	0.800000E+01
151	0.750000E-02	0.118900E-02	0.146900E-03	-.297000E-01	0.790000E+00	0.151500E+02
152	0.760000E-02	0.118900E-02	0.146900E-03	-.297000E-01	0.790000E+00	0.151500E+02
153	0.760000E-02	0.118900E-02	0.146900E-03	-.297000E-01	0.790000E+00	0.151500E+02
154	0.770000E-02	0.118900E-02	0.146900E-03	-.297000E-01	0.790000E+00	0.151500E+02
155	0.770000E-02	0.118900E-02	0.146900E-03	-.297000E-01	0.790000E+00	0.151500E+02
156	0.700000E-02	0.119500E-02	0.145800E-03	-.309000E-01	0.720000E+00	0.231500E+02
157	0.400000E-02	0.120700E-02	0.146700E-03	-.305000E-01	0.800000E+00	0.153500E+02
158	0.400000E-02	0.120700E-02	0.146700E-03	-.305000E-01	0.800000E+00	0.153500E+02
159	0.400000E-02	0.120700E-02	0.146700E-03	-.305000E-01	0.800000E+00	0.153500E+02
160	0.140000E-01	0.118300E-02	0.144500E-03	-.299000E-01	0.810000E+00	0.909000E+01
161	0.140000E-01	0.118300E-02	0.144500E-03	-.299000E-01	0.810000E+00	0.909000E+01

sta	bias	slope	pcor	tcor	wt	lag
162	0.140000E-01	0.118300E-02	0.144500E-03	-.299000E-01	0.810000E+00	0.909000E+01
163	-.200000E-02	0.122400E-02	0.147100E-03	-.325000E-01	0.700000E+00	0.900000E+01
164	0.155000E-01	0.116100E-02	0.145800E-03	-.290000E-01	0.740000E+00	0.468000E+01
165	0.154000E-01	0.116100E-02	0.145800E-03	-.290000E-01	0.740000E+00	0.468000E+01
166	0.153000E-01	0.116100E-02	0.145800E-03	-.290000E-01	0.740000E+00	0.468000E+01
167	0.152000E-01	0.116100E-02	0.145800E-03	-.290000E-01	0.740000E+00	0.468000E+01
168	0.570000E-02	0.119400E-02	0.146900E-03	-.303000E-01	0.820000E+00	0.300000E+01
169	0.580000E-02	0.119400E-02	0.146900E-03	-.303000E-01	0.820000E+00	0.300000E+01
170	0.580000E-02	0.119400E-02	0.146900E-03	-.303000E-01	0.820000E+00	0.300000E+01
171	-.910000E-02	0.127000E-02	0.145300E-03	-.393000E-01	0.900000E+00	0.300000E+01
172	-.920000E-02	0.127000E-02	0.145300E-03	-.393000E-01	0.900000E+00	0.300000E+01
173	-.920000E-02	0.127000E-02	0.145300E-03	-.393000E-01	0.900000E+00	0.300000E+01
174	-.930000E-02	0.127000E-02	0.145300E-03	-.393000E-01	0.900000E+00	0.300000E+01
175	0.160000E-01	0.117500E-02	0.144700E-03	-.296000E-01	0.900000E+00	0.300000E+01
176	0.160000E-01	0.117500E-02	0.144700E-03	-.296000E-01	0.900000E+00	0.300000E+01
177	0.160000E-01	0.117500E-02	0.144700E-03	-.296000E-01	0.900000E+00	0.300000E+01
178	0.160000E-01	0.117500E-02	0.144700E-03	-.296000E-01	0.900000E+00	0.300000E+01
179	0.258000E-01	0.108500E-02	0.154600E-03	-.244000E-01	0.840000E+00	0.300000E+01
180	0.259000E-01	0.108500E-02	0.154600E-03	-.244000E-01	0.840000E+00	0.300000E+01
181	0.260000E-01	0.108500E-02	0.154600E-03	-.244000E-01	0.840000E+00	0.300000E+01
182	0.260000E-01	0.108500E-02	0.154600E-03	-.244000E-01	0.840000E+00	0.300000E+01
183	0.400000E-01	0.108300E-02	0.134600E-03	-.249000E-01	0.950000E+00	0.800000E+01
184	0.400000E-01	0.108300E-02	0.134600E-03	-.249000E-01	0.950000E+00	0.800000E+01
185	0.150000E-01	0.113600E-02	0.148000E-03	-.269000E-01	0.870000E+00	0.800000E+01
186	0.145000E-01	0.113600E-02	0.148000E-03	-.269000E-01	0.870000E+00	0.800000E+01
188	0.135000E-01	0.113600E-02	0.148000E-03	-.269000E-01	0.870000E+00	0.800000E+01
190	0.486000E-01	0.107100E-02	0.129000E-03	-.261000E-01	0.720000E+00	0.120000E+01
191	0.489000E-01	0.107100E-02	0.129000E-03	-.261000E-01	0.720000E+00	0.120000E+01
192	0.492000E-01	0.107100E-02	0.129000E-03	-.261000E-01	0.720000E+00	0.120000E+01
193	0.495000E-01	0.107100E-02	0.129000E-03	-.261000E-01	0.720000E+00	0.120000E+01
194	0.498000E-01	0.107100E-02	0.129000E-03	-.261000E-01	0.720000E+00	0.120000E+01
195	0.370000E-01	0.110000E-02	0.134700E-03	-.273000E-01	0.750000E+00	0.510000E+01
196	0.372000E-01	0.110000E-02	0.134700E-03	-.273000E-01	0.750000E+00	0.510000E+01
197	0.374000E-01	0.110000E-02	0.134700E-03	-.273000E-01	0.750000E+00	0.510000E+01
198	0.376000E-01	0.110000E-02	0.134700E-03	-.273000E-01	0.750000E+00	0.510000E+01
199	0.377000E-01	0.110000E-02	0.134700E-03	-.273000E-01	0.750000E+00	0.510000E+01
200	0.379000E-01	0.110000E-02	0.134700E-03	-.273000E-01	0.750000E+00	0.510000E+01
201	0.381000E-01	0.110000E-02	0.134700E-03	-.273000E-01	0.750000E+00	0.510000E+01
202	0.531000E-01	0.106300E-02	0.130700E-03	-.253000E-01	0.730000E+00	0.510000E+01
203	0.532000E-01	0.106300E-02	0.130700E-03	-.253000E-01	0.730000E+00	0.510000E+01
204	0.533000E-01	0.106300E-02	0.130700E-03	-.253000E-01	0.730000E+00	0.510000E+01
205	0.535000E-01	0.106300E-02	0.130700E-03	-.253000E-01	0.730000E+00	0.510000E+01
206	0.536000E-01	0.106300E-02	0.130700E-03	-.253000E-01	0.730000E+00	0.510000E+01
207	0.537000E-01	0.106300E-02	0.130700E-03	-.253000E-01	0.730000E+00	0.510000E+01
208	0.539000E-01	0.106300E-02	0.130700E-03	-.253000E-01	0.730000E+00	0.510000E+01
209	0.540000E-01	0.106300E-02	0.130700E-03	-.253000E-01	0.730000E+00	0.510000E+01
210	0.541000E-01	0.106300E-02	0.130700E-03	-.253000E-01	0.730000E+00	0.510000E+01
211	0.543000E-01	0.106300E-02	0.130700E-03	-.253000E-01	0.730000E+00	0.510000E+01
212	0.406000E-01	0.107600E-02	0.138800E-03	-.256000E-01	0.740000E+00	0.859000E+01
213	0.407000E-01	0.107600E-02	0.138800E-03	-.256000E-01	0.740000E+00	0.859000E+01
214	0.409000E-01	0.107600E-02	0.138800E-03	-.256000E-01	0.740000E+00	0.859000E+01
215	0.410000E-01	0.107600E-02	0.138800E-03	-.256000E-01	0.740000E+00	0.859000E+01

sta	bias	slope	pcor	tcor	wt	lag
216	0.412000E-01	0.107600E-02	0.138800E-03	-.256000E-01	0.740000E+00	0.859000E+01
217	0.413000E-01	0.107600E-02	0.138800E-03	-.256000E-01	0.740000E+00	0.859000E+01
218	0.414000E-01	0.107600E-02	0.138800E-03	-.256000E-01	0.740000E+00	0.859000E+01
219	0.416000E-01	0.107600E-02	0.138800E-03	-.256000E-01	0.740000E+00	0.859000E+01
220	0.417000E-01	0.107600E-02	0.138800E-03	-.256000E-01	0.740000E+00	0.859000E+01
221	0.418000E-01	0.107600E-02	0.138800E-03	-.256000E-01	0.740000E+00	0.859000E+01
222	0.290000E-01	0.106900E-02	0.157900E-03	-.249000E-01	0.820000E+00	0.918000E+01
223	0.290000E-01	0.106900E-02	0.157900E-03	-.249000E-01	0.820000E+00	0.918000E+01
224	0.291000E-01	0.106900E-02	0.157900E-03	-.249000E-01	0.820000E+00	0.918000E+01
225	0.291000E-01	0.106900E-02	0.157900E-03	-.249000E-01	0.820000E+00	0.918000E+01
226	0.291000E-01	0.106900E-02	0.157900E-03	-.249000E-01	0.820000E+00	0.918000E+01
227	0.291000E-01	0.106900E-02	0.157900E-03	-.249000E-01	0.820000E+00	0.918000E+01
228	0.291000E-01	0.106900E-02	0.157900E-03	-.249000E-01	0.820000E+00	0.918000E+01
229	0.292000E-01	0.106900E-02	0.157900E-03	-.249000E-01	0.820000E+00	0.918000E+01
230	0.292000E-01	0.106900E-02	0.157900E-03	-.249000E-01	0.820000E+00	0.918000E+01
231	0.292000E-01	0.106900E-02	0.157900E-03	-.249000E-01	0.820000E+00	0.918000E+01
232	0.127000E-01	0.114900E-02	0.149000E-03	-.284000E-01	0.900000E+00	0.100000E+02
233	0.128000E-01	0.114900E-02	0.149000E-03	-.284000E-01	0.900000E+00	0.100000E+02
234	0.128000E-01	0.114900E-02	0.149000E-03	-.284000E-01	0.900000E+00	0.100000E+02
235	0.129000E-01	0.114900E-02	0.149000E-03	-.284000E-01	0.900000E+00	0.100000E+02
236	0.130000E-01	0.114900E-02	0.149000E-03	-.284000E-01	0.900000E+00	0.100000E+02
237	0.131000E-01	0.114900E-02	0.149000E-03	-.284000E-01	0.900000E+00	0.100000E+02
238	0.131000E-01	0.114900E-02	0.149000E-03	-.284000E-01	0.900000E+00	0.100000E+02
239	0.132000E-01	0.114900E-02	0.149000E-03	-.284000E-01	0.900000E+00	0.100000E+02
240	0.133000E-01	0.114900E-02	0.149000E-03	-.284000E-01	0.900000E+00	0.100000E+02
241	0.264000E-01	0.107100E-02	0.163600E-03	-.250000E-01	0.850000E+00	0.317000E+01
242	0.264000E-01	0.107100E-02	0.163600E-03	-.250000E-01	0.850000E+00	0.317000E+01
243	0.265000E-01	0.107100E-02	0.163600E-03	-.250000E-01	0.850000E+00	0.317000E+01
244	0.265000E-01	0.107100E-02	0.163600E-03	-.250000E-01	0.850000E+00	0.317000E+01
245	0.266000E-01	0.107100E-02	0.163600E-03	-.250000E-01	0.850000E+00	0.317000E+01
246	0.266000E-01	0.107100E-02	0.163600E-03	-.250000E-01	0.850000E+00	0.317000E+01
248	0.349000E-01	0.843000E-03	0.155600E-03	-.288000E-01	0.500000E+00	0.690000E+01
249	0.349000E-01	0.843000E-03	0.155600E-03	-.288000E-01	0.500000E+00	0.690000E+01
250	0.350000E-01	0.843000E-03	0.155600E-03	-.288000E-01	0.500000E+00	0.690000E+01
251	0.351000E-01	0.843000E-03	0.155600E-03	-.288000E-01	0.500000E+00	0.690000E+01
252	0.352000E-01	0.843000E-03	0.155600E-03	-.288000E-01	0.500000E+00	0.690000E+01
253	0.353000E-01	0.843000E-03	0.155600E-03	-.288000E-01	0.500000E+00	0.690000E+01
254	0.354000E-01	0.843000E-03	0.155600E-03	-.288000E-01	0.500000E+00	0.690000E+01
255	0.355000E-01	0.843000E-03	0.155600E-03	-.288000E-01	0.500000E+00	0.690000E+01
256	0.355000E-01	0.843000E-03	0.155600E-03	-.288000E-01	0.500000E+00	0.690000E+01
257	0.355000E-01	0.843000E-03	0.155600E-03	-.288000E-01	0.500000E+00	0.690000E+01
258	0.220000E-01	0.874600E-03	0.161500E-03	-.293000E-01	0.550000E+00	0.106700E+02
259	0.221000E-01	0.874600E-03	0.161500E-03	-.293000E-01	0.550000E+00	0.106700E+02
260	0.221000E-01	0.874600E-03	0.161500E-03	-.293000E-01	0.550000E+00	0.106700E+02
261	0.222000E-01	0.874600E-03	0.161500E-03	-.293000E-01	0.550000E+00	0.106700E+02
262	0.223000E-01	0.874600E-03	0.161500E-03	-.293000E-01	0.550000E+00	0.106700E+02
263	0.223000E-01	0.874600E-03	0.161500E-03	-.293000E-01	0.550000E+00	0.106700E+02
264	0.224000E-01	0.874600E-03	0.161500E-03	-.293000E-01	0.550000E+00	0.106700E+02
265	0.224000E-01	0.874600E-03	0.161500E-03	-.293000E-01	0.550000E+00	0.106700E+02
266	0.224000E-01	0.874600E-03	0.161500E-03	-.293000E-01	0.550000E+00	0.106700E+02
267	0.224000E-01	0.874600E-03	0.161500E-03	-.293000E-01	0.550000E+00	0.106700E+02

Quality control of 2-dbar CTD data

Salts:

Salinity spikes on or near sea surface were not uncommon. Guideline for quality marking: If the spike is greater than .2 mark the quality word as bad. For spikes smaller than .2 mark quality word as questionable. Don't mark if spike is substantiated by water samples (see station 55). The spike might get through without a questionable if its a small spike that changes with temperature as well as salinity and is a spike to the fresh side.

Causes: As package enters water it is possible the pressure averaging for the first three dbrs. is incorporating conductivity data from above and below the water causing big salt spikes.

Oxygens:

Surface spikes, were the norm for the entire cruise. These were neither individually identified nor the quality word labeled.

Noisy data in top 500 db for all CTD10 stations on Leg3 associated with use of oxygen pump. Leg3 variability on the order of +/-.2 ml/l. Leg 4 and 5 variability on the order of +/-.05 ml/l.

Bottom tails, where oxygen is drifts off low are common in Legs 4 and 5. Likely due to the slowing descent rate of the CTD as it approaches the bottom. The reduced flow past the oxygen sensor results in a lower oxygen current and thus lower oxygen value.

PROCESSING

STATION BY STATION NOTES ON FITTING, INTERPOLATIONS, SPIKES ETC.

1 Test station
2 Test station
3 Test station
4 Surface spike in salinity. 1,3 db salts marked bad.
Refit station 4's oxygen data by itself. Formerly stations 4 and 5 fit together.
5 Surface spike in salinity. 1 db salt marked questionable.
6 Oxygen too high, adjusted by -.04ml/l in CTD and SEA file.
7 Deep water spike in salinity. Interpolate salinity 1233 to 1251db.
8 Spike in salinity. Interpolate salinity 171 to 185.
Spike in salinity. Interpolate salinity 1825 to 1843.
Spike in oxygen. Interpolate oxygen 1819 to 1847.

9 Jump in oxygen, -.04 from 1.55 to 1.65 deg.theta. Could be real, quality word left at 2.

10 Surface spike in salinity. 1,3 db salt marked bad.

11

12 Initially missing top 400 meters of data due to beginning bad records in raw data being interpreted as beginning pressure by the pressure averaging program. Top 400 meters recovered.
Spike in salinity. Interpolate 381db salt.
CTD oxygen does not agree with bottles. Mark top 57 db as questionable.

13

14 Surface spike in salinty. 1 db salt marked bad.

15 CTD oxygen does not agree with bottles. Mark top 79 dbs as questionable.
CTD oxygen might be off around 5 degrees theta, unclear from bottles, CTD quality word left as good.

16 CTD oxygen does not agree with bottles. Mark top 57 db as questionable.

17

18 Deep water spike in salinity due to incorrect data at end of file. The pressure averaging program interpolates all the 2db bins between last good point and first bad point adding ~200 db of bad information which goes below the ocean floor. The bad data at the bottom of the file were removed.
CTD oxygen does not agree with bottles. Mark top 81db as questionable.

19

20 Spike in salinity. Interpolate salt 223 to 231db.
CTD oxygen does not agree with bottles. Mark top 73 db as questionable.

21

22

23 Wayward salinity. Interpolate salt 67 to 73 db.
CTD oxygen does not agree with bottles. Mark top 77 db as questionable.

24 Wayward salinity. Interoplate salt 63 to 71 db.
CTD oxygen does not agree with bottles. Mark top 71 db as questionable.

25 Surface spike in salinity. Mark 1,3 db salts as bad.

26 CTD oxygen does not agree with bottles. Mark top 73 db as questionable.
Tried to refit CTD to match deep bottles better. No better fit found so fit left as it was.

27 CTD oxygen does not agree with bottles. Mark top 93 db as questionable.

29 Deep water spike in salinity. Interpolate salt 1637 to 1761db.

31	Deep water spike in salinity. Interpolate salt 2041 to 2059db. Deep water spike in oxygen. Interpolate oxygen 2045 to 2053 db.
32	Surface spike in salintiy. Mark 1,3 db salts as bad. CTD oxygen does not agree with bottles. Mark top 83 db as questionable.
33	CTD oxygen does not agree with bottles. Mark top 67 db as questionable.
34	CTD oxygen lower than bottles at 2.6 deg.theta. Doesn’t look quite right but quality word left as good.
36	CTD oxygen does not agree with bottles. Mark top 75 db as questionable.
37	CTD oxygen does not agree with bottles. Mark top 65 db as questionable.
39	CTD oxygen does not agree with bottles. Mark top 73 db as questionable.
40	CTD oxygen does not agree with bottles. Mark top 101 db as questionable.
41	CTD oxygen does not agree with bottles. Mark top 73 db as questionable.
42	Surface spike in salinity. Mark 1db salts as bad. Theta salinity plot shows looping. Changing water (fresher than 41 and 43) may add to variability?
44	CTD oxygen does not agree with bottles. Mark top 65 db as questionable.
46	CTD oxygen does not agree with bottles. Mark top 87 db as questionable.
47	CTD oxygen does not agree with bottles. Mark top 189 db as questionable.
49	CTD oxygen does not agree with bottles. Mark top 87 db as questionable.
50	CTD oxygen does not agree with bottles. Mark top 123 db as questionable.
51	CTD oxygen does not agree with bottles. Mark top 79 db as questionable.
52	CTD oxygen does not agree with bottles. Mark top 52 db as questionable.
53	CTD oxygen does not agree with bottles. Mark top 113 db as questionable. Mark oxygens in deeper region for same reason, 555 to 799db.
54	Deep water spike in salinity. Interpolate salt 3177 to 3183db. CTD oxygen does not agree with bottles. Mark top 85 db as questionable.
56	CTD oxygen does not agree with bottles. Mark top 95 db as questionable.
57	Station 57 oxygen data refit by itself. Formerly fit with stations 46 to 57.

58 CTD oxygen does not agree with bottles. Mark top 159 db as questionable.

59 Small surface spike in salinty called ok- spike has changed theta which makes it much more likely to be real.
CTD oxygen does not agree with bottles. Mark top 231 db as questionable.

60 CTD oxygen does not agree with bottles. Mark top 131 db as questionable.

61 CTD oxygen does not agree with bottles. Mark top 161 db as questionable and 423 to 775 as questionable.

62 Surface spike in salinity. Mark 1-5db salts as bad.

63 Spike in salinity. Interpolate salt 535 to 581db.
Gap in data. Interpolate temperature, and salinity 535 to 581db. Interpolate oxygen 531 to 589
CTD oxygen does not agree with bottles. Mark top 213 db as questionable.
Stations 62, 64 and particularly 63 show more noise at depth than other stations in the oxygen profile. Could be due to non uniform lowering rate associated with poor sea state.

64 CTD oxygen does not agree with bottles. Mark top 251 db as questionable.

152 Spike in oxygen. Interpolate oxygen 81 to 105db.

70 to 72 Oxygen is noisier than usual, especially station 72. Salinity profile also has more looping in it. Both salinity and oxygen showing noise and loops supports the thought that the noise is caused by nonuniform lowering rate due to bad weather or big seas. The lowering rate varies from .5m/s to 2m/s unlike station 69 where the lowering rate was fairly consistent at 1m/s.

71 CTD oxygen does not agree with bottles. Mark top 151 db as questionable.

72 Seeing loops in theta salinity plots.

LEG 4

75 Looks like it is on its own in theta salinity plot but it is consistent with station 71 which is moving between station 72 and 75.

76 to 78 refit. The bottom oxygens were not matching the bottles. The original fit was from a larger group 76 to 85.

78 Oxygen does not reach oxygen minimum defined by bottles at 3 degrees theta.

79 Large gap in data. Winch died near 1880db. CTD stopped logging at this depth and was not started again until 2100db.
Fix: Linear interpolation of temperature from 1879 to 2109 db.
Salt and oxygen information copied from station 78 at matching theta intervals. Salt replaced from 1831 to 2401 db. Oxygen

replaced from 1831 to the bottom.
Oxygen does not reach oxygen minimum defined by bottles at 3 deg.

80 Oxygen lower than bottles at 7 deg. theta. Quality word not adjusted.

81 Bottom spike in oxygen spanning 3127 to 3393 db.
This corresponds to the change in the rate of decent as the CTD approaches the bottom. This was checked and found true for Stations 84 through 87 as well.

93 to 97:
Variability in oxygen profile increase. Due to sea state?

101 and 102:
CTD oxygen appears high from 8 to 14 deg.theta by .1 ml/l in both stations 101 and 102

111 Refit oxygen in station 111 by itself. Formerly in group of stations 111,113, 114

118 and 119:
CTD oxygen in 118 and 119 is marginal between good and questionable , low from 3 to 8deg.theta. Quality word left as good.

119 Bottom oxygen drifts high from bottom five bottles. Marked oxygens as questionable throughout the drift, 4661 to 5620 db.

124 Refit oxygen be itself. Formerly fit in group 120 through 124.

128 Abrupt change into new water.

130 Deep water spike in salinity. Interpolate salt 4285 to 4301db
Deep oxygen has looping, jagged, noisier than the other stations.

131 Surface spike in salinity. Mark 1,3 db salts as bad.

132 Surface spike in salinity. Mark 1,3 db salts as questionable.

135 Surface spike in salinity. Mark 1,3 db salts as questionable.

136 Acquistion computers crashed 700 m off the bottom. Acquistion halted and resumed. When resumed, oxygen had changed to a lower oxygen by .04 ml/l. Marked oxygen quality word as bad from 4905 db, where the jump occured to the bottom.

137 to 142 bottle oxygens appear low, CTD oxygens are consistent with earlier stations.

137 Surface spike in salinity. Mark 1,3 db salts as questionable.
Station +.002 psu than other stations. Salt slope reduced in calibrations files.

139 Spike in salinity at bottom of cast. Mark last data point as bad.

143 Surface spike in salinity. Mark 1,3 db salts as bad.
Big surface spike in oxygen. Mark 1 db oxygen and temperature bad.

145 to 150:
Refit oxygens in this group to get bottom oxygens to match bottles. Bottom oxygens now match better although top , near sea surface looks a little worse.

147 Data has gap where there were no observations 2259 to 2313db.
Salinity spikes. Interpolate salt 1903,1909,1911,1931,1991, 2067-2085, 2093-2097, 2013-2027, 2157-2171, 2181-2189, 2257-2321db.
Oxygen spikes. Interpolate oxygen 2073 to 2133 and 2257 to 2321db. Temperature was also interpolated over this range.
148 Bottom oxygen spike. Mark oxygen as questionable 6400db to bottom.
Surface spike in salinity. Mark 1,3 db salts as bad.
156 to 167:
show two systematic spikes (small, around 002 psu) occuring near 2300db and 4400db.
Interpolate over salt spike 5511 to 5545db.
156 Gap in data. Interpolate over gap for temperature, salt and oxygen from 5513 to 5547db.
Surface spike in salinity. Mark 1,3 db salts as bad.
Surface spike in oxygen. Mark 1 db bad.
157 Interpolate over salt spike 4409 to 4411db.
158 Gap in data. Interpolate over gap for temperature, salt and oxygen from 5521 to 5559db.
Interpolate over additional salt spike 4415 to 4449db.
159 Interpolate over salt spike 2333 to 2353db.
Interpolate over oxygen spike 5525 to 5545.
160 to 162:
Refit oxygen because bottom of profile was too high (.04ml/l).
160 Interpolate over salt spike 4415 to 4433db.
161 Interpolate over salt spikes 2307 to 2323 and 4359 to 4361db.
162 Interpolate over salt spike 2357 to 2365db.
163 Interpolate over salt spikes 2363 to 2375 and 4327 to 4339db.
164 Gap in data, 4565 to 4603db. Interpolate temperature, salt and oxygen.
Surface spike in salinity. Mark 1 db salts as questionable.
165 Gap in data, 5593 to 5649db. Interpolate temperatre, salt and oxygen.
166 Gap in data, 5617 to 5645db. Interpolate temperature,salt and oxygen.
Surface spike in salinity. Mark 1 db salts as bad.
167 Interpolate over salt spike 5613 to 5631db.
Interpolate over oxygen spike 5611 to 5631 db.
171 to 174
CTD oxygen does not looked scaled correctly. CTD is .4 ml/l low from 8 deg. theta to surface. Close look at CTD below 2deg. theta looks fine. Bottle data used for fitting had not been corrected for bottles out of order. This may have caused a problem if bottles were subsequently reordered.

171 Surface spike in salinity. Mark 1,3 db salts as bad.
Interpolate over salt spike at 2501db.
173 Spike in salinity. Interpolate 103 db.
174 Interpolate over salt spike 6537 to 6549db.

LEG 5

181 Bottom oxygen is high.
182 to 188
CTD is uniform but water sample salt high,.001psu,
in deep water
185 Spike in salinity. Mark 1,3,5 db salts as bad.
195 Small spike in salinity with looping in theta v salt plot.
Interpolate 405 to 461db.
197 Oxygen data noiser than usual.
198 Surface spike in salinity. Mark 1,3 db salts as bad.
Small spike in salt, interpolate 849 db.
Nice crossover from one water mass to the next through stations
197 to 199.
199 Bottom bottle is deeper than CTD downtrace by 7db.
200 Surface spike in salinity. Mark 1,3 db salts as bad. Small spike,
interpolate salt at 1063 db.
201 Surface spike in salinity. Mark 1,3 db salts as bad. Spikes/ density
inversion, interpolate 453db and 457db.
Salinity spike at bottom. Mark last salt record, 2275db., as bad.
202 Surface spike in salinity. Mark 1 db salt as questionable. Spikes /
density inversions, interpolate 453db and 459db.
207 Surface spike in salinity. Mark 1 db salt as bad.
209 Small spike in salinity, interpolate 375db.
210 Surface spike in salinity. Mark 1,3 db salts as questionable.
211 Surface spike in salinity. Mark 1,3 db salts as bad.
213 Spike in salinity. Interpolate salts 553 to 561db.
215 Surface spike in salintiy. Supported by water sample, accepted
as good.
Bottom spike in salinity. Mark last salt record, 3423db. as bad.
219 Surface spike in salinity. Mark 1,3 db salts as questionable.
222 Salinity jumps low, stays low, then jumps back to where it was.
Due to temporary contamination of the cell? Interpolate salts over
jump from 547 to 567db.
223 Surface spike in salinity. Mark 1 db salt as bad.
224 Surface spike in salinity. Mark 1,3 db salts as bad.
226 Surface spike in salinity. Mark 1db salt as questionable.
227 Surface spike in salinity. Mark 1 db salt as questionable.
CTD oxygen low compared to bottles from 18 deg. theta to
surface. Quality word left as good.
232 Oxygen is a litle high at bottom,.04

235	Odd structure in salt 14 to 16 deg theta. Left as is. Interpolate salinity spike 1087 to 1095db.
236	Surface spike in salinity. Mark 1 db salt as bad. Interpolate over salinity spike 1537 to 1553 db. CTD oxygen low compared to bottles by .04 ml/l. Quality word left as good.
240	Surface spike in salinity. Mark 1db salt as questionable. Interpolate over salinity spike at 23db.
242	Small salinity spike, interpolate salt from 383 to 401.
245	Very warm water at surface. Oxygen too low, a bias of .1 ml/l added to profile.
248	Station salt is+.002 psu than other stations. Salt slope reduced in calibrations files. Interpolate oxygens over 1741 to 1757
253	Interpolate over salinity spike 649 to 659 db.
256	Oxygen too high, a bias of .1ml/l subtracted from profile.

LIST OF INTERPOLATIONS MADE TO DATA.
Any 2db bin in the CTD file that had no observations automatically was assigned a "6" in all quality fields. Those bins with no observations have not been included in this list.

STA	St. Bad Pressure	Interpolated Parameter	End Bad Pressure
7,	1233,	3,	1251
8,	171,	3,	185
8,	1825,	3,	1843
8,	1819,	4,	1847
20,	223,	3,	231
23,	67,	3,	73
24,	63,	3,	71
29,	1637,	3,	1761
31,	2041,	3,	2059
31,	2045,	4,	2053
54,	3177,	3,	3183
63,	435,	2,	581
63,	535,	3,	581
63,	531,	4,	589
69,	81,	4,	105
95,	283,	3,	283
103,	9,	3,	9
105,	1057,	3,	1057
130,	4285,	3,	4301
147,	2259,	2,	2313
147,	1903,	3,	1903
147,	1909,	3,	1909
147,	1911,	3,	1911
147,	1991,	3,	1991
147,	2013,	3,	2027
147,	2067,	3,	2085
147,	2093,	3,	2097
147,	2157,	3,	2171
147,	2181,	3,	2189
147,	2257,	3,	2321
147,	2073,	4,	2133
147,	2255,	4,	2321
156,	5513,	2,	5547
156,	5511,	3,	5545
156,	5511,	4,	5547
157,	4409,	3,	4411
158,	5521,	2,	5559
158,	4415,	3,	4449
158,	5519,	3,	5559
158,	5521,	4,	5559

STA	St. Bad Pressure	Interpolated Parameter	End Bad Pressure
159,	2333,	3,	2253
159,	5525,	4,	5545
160,	4415,	3,	4433
161,	2307,	3,	2323
161,	4359,	3,	4361
162,	2357,	3,	2365
163,	2363,	3,	2375
163,	4327,	3,	4339
164,	4565,	2,	4603
164,	4563,	3,	4599
164,	4559,	4,	4601
165,	5595,	2,	5649
165,	5593,	3,	5649
165,	5591,	4,	5649
166,	5619,	2,	5645
166,	5619,	3,	5645
166,	5617,	4,	5645
167,	5613,	3,	5631
167,	5611,	4,	5631
171,	2501,	3,	2501
173,	103,	3,	103
174,	6537,	3,	6549
195,	405,	3,	461
198,	849,	3,	849
200,	1063,	3,	1063
201,	453,	3,	453
201,	457,	3,	457
202,	453,	3,	453
202,	459,	3,	459
209,	375,	3,	375
213,	553,	3,	561
222,	547,	3,	567
235,	1087,	3,	1095
236,	1537,	3,	1553
240,	23,	3,	23
242,	383,	3,	401
248,	1741,	4,	1757
248,	2217,	4,	2235
253,	649,	3,	659

References

Millard, R.C., Jr. 1982. CTD calibration and data processing techniques at WHOI using the 1987 practical salinity scale. Marine Technology Society Conference paper.

Millard, R., G. Bond and J. Toole, 1992. Implementation of a titanium strain gauge pressure transducer for CTD applications. Deep-Sea Res., 1009-1021.

Millard, R.C. and K. Yang, 1993. CTD calibration and processing methods used at Woods Hole Oceanographic Institution. WHOI Tech. Report No. 93-44. 95 pgs.

Owens, W.B. and R.C. Millard, Jr., 1985. A new algorithm for CTD oxygen calibration. J. Phys. Oc. 15, 621-631.

WOCE Data Processing Notes						
Date	**Contact**	**Data Type**	**Data Status Summary**			
2/27/95	Mantyla	NUTs/S/O	DQE Report rcvd @ WHPO			
3/6/95	Mantyla	NUTs/S/O	DQE Report rcvd @ WHPO			
3/7/95	Mantyla	NUTs/S/O	DQE Report rcvd @ WHPO			
4/3/95	White	CTD	DQE Report rcvd @ WHPO			
11/9/95	Jennings-Jr.	NUTs	PI Response to DQE Report			
	Data are Public					
7/9/96	Key	DELC14	DQE Report rcvd @ WHPO			
8/15/97	Uribe	DOC	Submitted			
	2000.11.27 KJU File contained here is a CRUISE SUMMARY and NOT sumfile. Documentation is online. 2000.10.11 KJU Files were found in incoming directory under whp_reports. This directory was zipped, files were separated and placed under proper cruise. All of them are sum files. Received 1997 August 15th.					
12/14/98	Key	DELC14	Data are Public			
	12/14/98	Key	DELC14	Data are Public		
1/19/99	Willey	CFCs	Data Update			
	I received the CFC-11/12 datasets for the following WHP lines: EXPOCODE 31WTTUNES/2 WHP-ID P17S,P16S EXPOCODE 31WTTUNES/1 WHP-ID P17C EXPOCODE 316N138/12 WHP-ID P19C EXPOCODE 318MWEST_4_5 WHP-ID P21E/W EXPOCODE 316N138/3 WHP-ID P6E Each file looks fine and has been placed in the proper archived directory on our machine. -Steve Diggs Steve- I just ftp'd our cfc files to the /INCOMING/RFine_cfcs directory. The files named *.sea are hydro files with our final cfc values and quality bytes merged in. The files named *_cfcs.dat are files that include station, cast, bottle, cfcs and quality bytes. Please let me know if you have any problems and I'll let you know if we have any changes (hopefully not...). We are still working on P17N and I'll get it to you as soon as we finish.					
2/16/99	Diggs	CFCs	Data Merged/OnLine			
	P06E (316N138/3) CFCs have been updated/merged with the bottle data file. All tables and associated files have been updated as well.					
4/29/99	Quay	DELC13	Data and/or Status info Requested by dmb			
10/20/99	Willey	CFCs	Final Data Rcvd @ WHPO			
	This is a follow-up to last month's message requesting that all of our Pacific and Indian Ocean CFCs be made accessible to the public. Our cruises are; (Pacific) P17C, P1716S, P06E, P19C, P17N, P21E, and (Indian) I09N, I05W/I04, I07N, I10.					
3/7/00	Saunders	Stations	Data Update	Correct # is 111 stns		
	112,141,187 have been discarded - hence number is 111 as all files agree.					

<table>
<tr><td rowspan="2">5/10/00</td><td>Key</td><td>DELC14</td><td colspan="2">Update Needed; See note:</td></tr>
<tr><td colspan="4">The C-14 section captures most of the features for P6, however, I think that you only have about half the data. The details of how this could happen are too long to worry about, but it is probably my fault. I have attached an ascii file with all of the results.

One problem is that the current hydro file at WHPO does not include data for station 3. Early versions of the sea file included stations 1-3, but these locations were re-sampled and subsequently 1-3 declared "test". As early as 1995 I lobbied to get station 3 data added back into the official files, and it was for awhile. When the far eastern portion of the secion was re-sampled, some of the tracers which had been sampled originally were not re-collected.

The reasons varied. With respect to C-14, cutting station 3 is equivalent to discarding ~10K worth of analyses and it creates a very important hole in the section. The problem is less severe (due to sampling density) for carbon parameters, but it exists. I do not know the whether or not H-3 was collected on any of station 1-3.I found no glaring problems with the bottle data from station 3 and think that the C-14 data alone justifies keeping this station in the official WOCE data file.

When the section is remade, it is important that the contour labels be attached to the C-14 minimum around 2300m at the eastern end of the section. The fact that the minimum is segregated into eastern and western lobes is one of the most important results from the deep Pacific radiocarbon program. I also believe that the deep/abyssal relative max around 102W is real and probably indicative of a weak western boundary flow along the flank of the ridge.

WHPO: I have ftp'ed a copy of the attached file to your INCOMING directorycalled P6-C-14.dat</td></tr>
<tr><td rowspan="2">5/31/00</td><td>Talley</td><td>CFCs</td><td>Data Update</td><td>Quality flags, see note:</td></tr>
<tr><td colspan="4">I updated the bottle quality flags in p06ehy.txt as per Rana Fine's email today. I placed the file in the ftp on whpo.ucsd.edu in my subdirectory TALLEY. Please acknowledge receipt and that the file online has been replaced by the edited file.</td></tr>
<tr><td rowspan="2">5/31/00</td><td>Willey</td><td>CFCs</td><td>Update Needed</td><td>Quality flags, see note:</td></tr>
<tr><td colspan="4">After looking at P6E cfcs again, we have a couple of changes to make to P6E quality bytes. They are listed below. Please make these changes to your current file.

P06E (CFCs):
stn cast sampno press cfc val QB (change from 2 to)
36 1 32 154.3 cfc12 1.324 3
70 1 26 423.3 cfc11 2.319 3</td></tr>
<tr><td rowspan="2">8/24/00</td><td>Kozyr</td><td>CO2</td><td colspan="2">Final Data Rcvd @ WHPO</td></tr>
<tr><td colspan="4">I have put the long waited and finally released by Doug Wallace final CO2-related data files for the Pacific Ocean WOCE Sections P6E, P6C, and P6W to the WHPO ftp INCOMING area.</td></tr>
<tr><td rowspan="2">9/20/00</td><td>Bartolacci</td><td>CO2</td><td>Data Update</td><td></td></tr>
<tr><td colspan="4">I have moved all three legs of P06 CO2 data into the parent P06 original directory. Data (TCARB, and PC02, PCO2TEMP) were sent by Alex Kozyr on 2000.08.24. Email accompanies data in /onetime/p06/original/2000.08.24_P06_ALL_LEGS_CO2_KOZYR. Data are public and have not yet been merged. "to merge" table has been updated to reflect this.</td></tr>
</table>

10/3/00	Anfuso	DELC14	Website Updated	Data merged into online file
	Bottle: (delc14, c14err) Merged delC14 and C14err data into hyd file. Updated hyd file was put on line. Merging notes in original subdir 2000.05.10_P06_C14_KEY. All C14 data/notes for P06 legs p06c, p06e, p06w came in one dir from Bob Key (2000.05.10_P06_All_LEGS_C14_KEY).This data dir was copied to each cruise leg subdir. The edited data file, p06_c14_edt.dat, was reformatted and prepared for merging, then copied into each cruise subdir. NOTE: One entry in this file was erroneous. The entry had a station value of b2532. I reviewed the bottle data file and determined this was meant to be station 32, cast 1, sample 25; edited this entry for merging. Also, the Key data file header reports the file format is station, cast, bottle....; This format does not match the bottle file format. C14 data was merged as station, cast, sample..... Specific notes on p06e: Some c14 data existed in the hyd file before merging. This data matched the data to be merged (except it wasn't a complete data set, only partial). Data existed on stations 17,24,44,54,69.Merged new data over existing data. Specific merging notes for p06w: There was some existing C14 data in the previous hyd file version. This data is the same as the updated Bob Key data to be merged, however it was not a complete data set. Merged new c14 data over existing data. Preexisting data was for stations:194,205,210,214,229,234,239.			
10/4/00	Anfuso	CO2	Website Updated	Data merged into BTL file
	Bottle: (tcarbn, pco2) Merged TCARBN and PCO2 data into hyd file. Updated hyd file is on line. **Specific notes for merging TCARBN and PCO2 on p06c:** After merging data, Noticed missing data was in format -9.0. Extracted TCARBN and PCO2 data columns and substituted -9.0 with -999.0 (seemed more appropriate). Remerged. **Specific notes on merging TCARBN and PCO2 on p06e:** After merging data, had to extract all values from hyd file and convert previously existing missing data values from -9.0 (flag1) to -999.0 (flag9). Remerged. **Specific notes on TCARBN & PCO2 merging in p06w:** hyd file had preexisting -9.0 values for missing data. Had to merge Kozyr data, then extract all data, replace -9.0values with -999.0 and remerge. Extracted and edited file called alldata_edt.dat.			
10/25/00	Anfuso	PCO2TMP	Website Updated	Data merged into BTL file
	Merged PCO2TMP data from A. KOZYR into hyd file. Updated hyd file is on-line.			
11/29/00	Kappa	DOC	PDF, TXT Versions Created	
12/8/00	Huynh	DOC	Website Updated	pdf, txt versions online

1/8/01	Stuart	DELC13	Submitted	See Note:
	STUART, DANA would like the data PUBLIC. Sorry about excluding the headers... should have included them in the body of the last message. Here they are: Lab ID (WHOI NOSAMS = 1, U-Wash/Quay = 3 WOCE line/WHPID Station Cast Niskin del-C13 value del-C13 Quality Flag Please also note for those P6 files that the default value is -9, for those which do not have a REAL C13 value.			
6/22/01	Uribe	CTD/BTL	Website Updated	CSV File Added
	CTD and Bottle files in exchange format have been put online.			
6/27/01	Wisegarver	CFCs	DQE Complete	
	precision outside original WOCE standards; meets "relaxed" stnds. The precision of CFC-12 for p06e was estimated at 3%, outside the original standards for precision, but within the relaxed standards (3% or 0.015 pmol/kg overall precision).			
8/23/01	Bartolacci	CTD	Website Updated	
	CTD header updated, new CSV file online I have edited the header information of the Exchange CTD files in order to conform with the new header variables decided by WHPO. Previous exchange CTD has been moved to original directory and new zipped file has been linked.			
8/28/01	Swift	SUM	SUM file contains suspicious longitudes., see note:	
	I was looking through the P06E .sum file and found a couple of suspicious longitudes. 1. Station 7. The present .sum records for Stations 6-8: 316N138_3 P06E 6 1 ROS 050492 2107 BE 32 30.01 S 71 49.97 W 316N138_3 P06E 6 1 ROS 050492 2157 BO 32 30.34 S 71 50.14 W 316N138_3 P06E 7 1 ROS 050592 0108 BE 32 29.45 S 71 59.91 W 316N138_3 P06E 7 1 ROS 050592 0200 BO 32 29.58 S 71 01.22 W 316N138_3 P06E 8 1 ROS 050592 0558 BE 32 29.95 S 72 10.29 W 316N138_3 P06E 8 1 ROS 050592 0653 BO 32 29.83 S 72 11.18 W The corrected Station 7 "BO" almost certainly should be: A. 316N138_3 P06E 7 1 ROS 050592 0200 BO 32 29.58 S 72 01.22 W Please verify that. 2. Station 32. The suspect erroneous longitude record is more subtle than for Station 7. But I think Station 32 has one or more longitude errors. Here is the present version: • 316N138_3 P06E 31 1 ROS 051292 1604 BE 32 29.83 S 85 20.03 W • 316N138_3 P06E 31 1 ROS 051292 1720 BO 32 30.18 S 85 19.99 W • 316N138_3 P06E 32 1 ROS 051292 2258 BE 32 29.79 S 86 19.73 W • 316N138_3 P06E 32 1 ROS 051392 0002 BO 32 30.06 S 86 33.00 W • 316N138_3 P06E 33 1 ROS 051392 0520 BE 32 30.02 S 86 40.00 W • 316N138_3 P06E 33 1 ROS 051392 0634 BO 32 30.81 S 86 40.38 W			

<table>
<tr><td rowspan="2">8/28/01</td><td>Swift</td><td>SUM</td><td colspan="2">SUM file contains suspicious longitudes</td></tr>
<tr><td colspan="4">I cannot tell for certain what the error is, but I think there is one. Can you please check the navigation files and advise? The WHPO will make the necessary changes to the .sum file (& WHP-Exchange files) on receipt of your reply.</td></tr>
<tr><td rowspan="2">8/30/01</td><td>Dunworth-Baker</td><td>CTD/BTL/SUM</td><td colspan="2">Submitted</td></tr>
<tr><td colspan="4">Data submitted to ensure WHPO has the most recent data. The directory this information has been stored in is: 20010830.080206_DUNWORTH-BAKER_P06E.
The Bottle File contains: CastNumber StationNumber BottleNumber SampleNumber.
DUNWORTH-BAKER, JANE would like the data PUBLIC, And would like the following done to the data: check to see if you have the most up to date version of the data</td></tr>
<tr><td rowspan="2">9/20/01</td><td>Diggs</td><td>CTD/BTL/SUM</td><td>Data rcvd @ WHPO</td><td>New data submitted</td></tr>
<tr><td colspan="4">files received from J. Dunworth-Baker and placed in
...onetime/pacific/p06/original/2001.09.19_P06_JADB_ALL_LEGS/P06</td></tr>
<tr><td rowspan="2">9/25/01</td><td>Muus</td><td>CFCs/SUM</td><td colspan="2">Data Merged into BTL file</td></tr>
<tr><td colspan="4">CFCs merged into BTL, SUM corrected, new CSV File Added

Notes on P06C CFC merging Sept 25, 2001.
D. Muus
1. New CFC-11 and CFC-12 from:/usr/export/html-public/data/onetime/pacific/p06/p06c /original/ 20010709_CFC_WISEGARVER_P06C/20010709.185231_WISEGARVER _P06C_p06c_CFC_DQE.dat merged into SEA file taken from web Aug 20, 2001 (20010326WHPOSIOKJU)
All "1"s in QUALT1 changed to "9"s and QUALT2 replaced by new QUALT1 prior to merging. DQE recommendations for Bottle, Salts, Oxygen and Nutrient appear to have been made to QUALT1 word. Web QUALT2 word has many "1"s including BTLNBR QUALT2 code.
2. SUM file: Changed Sta 91 Cast 1 BO Longitude from 122 59.85 to 123 59.85.
165 BO Latitude from 32 39.35 to 32 29.35.
Per Jane Dunworth-Baker message of August 29, 2001.
Removed "^Z" from end of file.
3. Exchange file checked using Java Ocean Atlas.

Notes on P06E CFC merging Sept 25, 2001.
D. Muus
1. New CFC-11 and CFC-12 from:/usr/export/html-public/data/onetime/pacific/p06/p06e/ original/ 20010709_CFC_WISEGARVER_P06E/20010709.185349_WISEGARVER _P06E_p06e_CFC_DQE.dat merged into SEA file taken from web Aug 20, 2001 (20001024WHPOSIOSRA)All "1"s in QUALT1 changed to "9"s and QUALT2 replaced by new QUALT1 prior to merging. DQE recommendations for Bottle, Salts, Oxygen and Nutrient appear to have been made to QUALT1 word. Web QUALT2 word has many "1"s including BTLNBR QUALT2 code.</td></tr>
</table>

<table>
<tr><td rowspan="2">9/25/01</td><td>Muus</td><td>CFCs/SUM</td><td>Data Merged into BTL file</td></tr>
<tr><td colspan="3">2. SUM file: Changed Station 7 Cast 1 BO Longitude from 71 01.22 to 72 01.22.
32 BE Longitude from 86 19.73 to 86 00.00.
32 BO Longitude from 86 33.00 to 86 00.00.
55 BE Latitude from 101 30.11 to 101 20.11.

Per Jane Dunworth-Baker message of August 29, 2001.
Removed "^M"s from end of .SUM file lines. Removed "^Z" from end of .SUM file..

3. Exchange file checked using Java Ocean Atlas.

Notes on P06W CFC merging Sept 24, 2001.
D. Muus
1. New CFC-11 and CFC-12 from:/usr/export/html-public/data/onetime/pacific/p06/p06w/original/ 20010709_CFC_WISEGARVER _P06W/20010709.170933_WISEGARVER_P06W_p06w_CFC_DQE.dat merged into SEA file taken from web Aug 20, 2001 (20010326WHPOSIOKJU)
1. All "1"s in QUALT1 changed to "9"s and QUALT2 replaced by new QUALT1 prior to merging. DQE recommendations for Bottle, Salts, Oxygen and Nutrient appear to have been made to QUALT1 word. Web QUALT2 word has many "1"s including BTLNBR QUALT2 code.

2. SUM file: Removed "^M"s from end of lines.
A. Removed "^Z"from end of file.
B. Moved "LATITUDE" and "LONGITUDE" headers to be left justified with data.

3. Exchange file checked using Java Ocean Atlas.</td></tr>
<tr><td rowspan="2">10/16/01</td><td>Kappa</td><td>DOC</td><td>Final cruise report compiled</td></tr>
<tr><td colspan="3">added all figs, data processing notes, cfc dqe report</td></tr>
</table>