Aurora Australis Marine Science Cruises AU0803 and AU0806 - Oceanographic Field Measurements and Analysis

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1 INTRODUCTION

Oceanographic measurements were collected aboard Aurora Australis cruises au0803 (voyage 3 2007/2008, 16th December 2007 to 27th January 2008) and au0806 (voyage 6 2007/2008, 22nd March 2008 to 17th April 2008). Cruise au0803 focused on the Antarctic continental margin in the region of the Adélie Depression and on the southern end of the CLIVAR/WOCE meridional repeat section SR3, as part of the CASO oceanographic and CEAMARC biological programs. Cruise au0806 completed the CASO oceanographic program, with a full occupation of the SR3 transect between Antarctica and Tasmania, and included GEOTRACES program trace metal work. This report discusses only the CASO oceanographic data from these cruises.

CASO program objectives were:

1. to measure changes in water mass properties and inventories throughout the full ocean depth between Australia and Antarctica along 140^{o}E (the CLIVAR/WOCE repeat section SR3), as part of a multi-national International Polar Year program to obtain a circumpolar snapshot of the Southern Ocean in austral summer 2007-8;

2. to estimate the transport of mass, heat and other properties south of Australia, and to compare results to previous occupations of the SR3 line and other sections in the Australian sector;

3. to deploy moorings near the Adélie Depression (142-145^{o}E) as part of a joint Australia-France-Italy program to monitor changes in the properties and flow of Adélie Land Bottom Water;

4. to identify mechanisms responsible for variability in ocean climate south of Australia.

The CASO program (with a full occupation of the SR3 transect) was originally scheduled for a single cruise. The shipping schedule was re-arranged following an unexpected period in drydock, due to a problem with the ship's thrusters, and as a result the CASO program was split over the two cruises. Several of the southern stations occupied on the first cruise au0803 were repeated on the second cruise au0806, to minimise the impact on the data set of the time gap between the cruises.

A total of 131 CTD vertical profile stations were taken on au0803, and 73 CTD station were taken on au0806, most to within 20 metres of the bottom (Table 1). During the 2 cruises, over 2900 Niskin bottle water samples were collected for the measurement (Table 2) of salinity, dissolved oxygen, nutrients (phosphate, nitrate+nitrite and silicate), ^{18}O, CFC's, dissolved inorganic carbon, alkalinity, ^{14}C, dissolved organic carbon, density (i.e. analysis of the effect of water composition on water density), germanium/silica/boron isotopes, trace metals, neodymium, chlorophyll-a, cell counts, pigments, genetic analyses, and other biological parameters, using a 24 bottle rosette sampler. Full depth current profiles were collected by an LADCP attached to the CTD package, while upper water column current profile data were collected by a ship mounted ADCP. Data were also collected by the array of ship's underway sensors.

This report describes the processing/calibration of the CTD data, and details the data quality. An offset correction is derived for the underway sea surface temperature and salinity data, by comparison with near surface CTD data. CTD station positions are shown in Figures 1 and 2, while CTD station information is summarised in Table 1. Mooring and drifter deployments/recoveries are summarised in Table 14. Mooring data from the Adélie Depression deployments are discussed in the mooring data reports Rosenberg (unpublished report, 2009) and Meijers (unpublished report, 2009). Further cruise itinerary/summary details can be found in the voyage leader reports (Australian Antarctic Division unpublished reports: Riddle, V3 2007/08 VL report; Rintoul, V6 2007/08 VL report). Hydrochemistry and CFC cruise reports are in Appendix 1 and Appendix 2.

2 CTD INSTRUMENTATION

SeaBird SBE9plus CTD serial 704, with dual temperature and conductivity sensors and a single SBE43 dissolved oxygen sensor (serial 0178, on the primary sensor pump line), was used for both cruises, mounted on a SeaBird 24 bottle rosette frame, together with a SBE32 24 position pylon and 22 x 10 litre General Oceanics Niskin bottles. The following additional sensors were mounted:

* Tritech 500 kHz altimeter
* Wetlabs ECO-AFL/FL fluorometer serial 296
* Biospherical Instruments photosynthetically active radiation (i.e. PAR) sensor
* Sontek lowered ADCP (i.e. LADCP) with upward and downward looking transducer sets

CTD data were transmitted up a 6 mm seacable to a SBE11plusV2 deck unit, at a rate of 24 Hz, and data were logged simultaneously on 2 PC's using SeaBird data acquisition software "Seasave". The LADCP was powered by a separate battery pack, and data were logged internally and downloaded after each CTD cast. Note that physical mounting of the upward looking LADCP transducer set requires removal of 2 Niskin bottles, thus only 22 Niskins were fitted for the cruises.

The CTD deployment method was as follows:

* CTD initially deployed down to ~10 to 20 m
* after confirmation of pump operation, CTD returned up to just below the surface (depth dependent on sea state)
* after returning to just below the surface, downcast proper commenced

For most casts, the package was stopped for 5 minutes on the upcast at ~50 m above the bottom, for logging of LADCP bottom track data.

Pre cruise temperature, conductivity and pressure calibrations were performed by the CSIRO Division of Marine and Atmoshperic Research calibration facility (Table 3) (April to May 2007). Manufacturer supplied calibrations were used for the dissolved oxygen, fluorometer and altimeter. PAR sensor data were uncalibrated (raw voltage data only). Final conductivity and dissolved oxygen calibrations derived from in situ Niskin bottle samples are listed later in the report.

3 CTD DATA PROCESSING AND CALIBRATION

Preliminary CTD data processing was done at sea, to confirm correct functioning of instrumentation. Final processing of the data was done in Hobart. The first processing step is application of a suite of the SeaBird "Seasoft" processing programs to the raw data, in order to:
* convert raw data signals to engineering units
* remove the surface pressure offset for each station
* realign the oxygen sensor with respect to time (note that conductivity sensor alignment is done by the deck unit at the time of data logging)
* remove conductivity cell thermal mass effects
* apply a low pass filter to the pressure data
* flag pressure reversals
* search for bad data (e.g. due to sensor fouling)

For au0806, an additional processing step was done early on, running all data through the SeaBird data despiking program "wildedit". Further processing and data calibration were done in a UNIX environment, using a suite of fortran programs. Processing steps here include:
* forming upcast burst CTD data for calibration against bottle data, where each upcast burst is the average of 10 seconds of data prior to each Niskin bottle firing

* merging bottle and CTD data, and deriving CTD conductivity calibration coefficients by comparing upcast CTD burst average conductivity data with calculated equivalent bottle sample conductivities
* forming pressure monotonically increasing data, and from there calculating 2 dbar averaged downcast CTD data
* calculating calibrated 2 dbar averaged salinity from the 2 dbar pressure, temperature and conductivity values
* deriving CTD dissolved oxygen calibration coefficients by comparing bottle sample dissolved oxygen values (collected on the upcast) with CTD dissolved oxygen values from the equivalent 2 dbar downcast pressures
* extracting the appropriate fluorescence data to assign to each 2 dbar bin

Full details of the data calibration and processing methods are given in Rosenberg et al. (unpublished report), referred to hereafter as the *CTD methodology*. Additional processing steps, in particular for the fluorescence data, are discussed below in the results section. For calibration of the CTD oxygen data, whole profile fits were used for shallower stations, while split profile fits were used for deeper stations.

Final station header information, including station positions at the start, bottom and end of each CTD cast, were obtained from underway data for the cruise (see section 5 below). Note the following for the station header information:
* All times are UTC.
* "Start of cast" information is at the commencement of the downcast proper, as described above.
* "Bottom of cast" information is at the maximum pressure value.
* "End of cast" information is when the CTD leaves the water at the end of the cast, as indicated by a drop in salinity values.
* All bottom depth values are corrected for local sound speed, where sound speed values are calculated from the CTD data at each station.
* "Bottom of cast" depths are calulated from CTD maximum pressure and altimeter values at the bottom of the casts.

Lastly, data were converted to MATLAB format, and final data quality checking was done within MATLAB.

4 CTD AND BOTTLE DATA RESULTS AND DATA QUALITY

Data from the primary CTD sensor pair (temperature and conductivity) were used for both cruises. Suspect CTD 2 dbar averages are listed in Table 9, while suspect nutrient and dissolved oxygen bottle samples are listed in Tables 11 and 12 respectively.

4.1 Conductivity/salinity

The conductivity calibration and equivalent salinity results for the cruises are plotted in Figures 3 and 4, and the derived conductivity calibration coefficients are listed in Tables 4 and 5. Station groupings used for the calibration are included in Table 4. International standard seawater batch numbers used for salinometer standardisation were as follows:

au0803
stn 1-51 P147 (6th June 2006)
stn 51-130 P148 (10th June 2006)
(note: for station 51, P147 used for 300 dbar down to bottom, P148 used for top 200 dbar)

au0806
station 1-8, 11-73 P147 (6th June 2006)
station 9-10 P148 (10th June 2006)

The salinometer (Guildline Autosal serial 62548) appeared stable throughout the cruises. Overall, CTD salinity for the cruises can be considered accurate to better than 0.0015 (PSS78).

Close inspection of the vertical profiles of the bottle-CTD salinity difference values reveals a slight biasing for a few stations, mostly of the order 0.001 (PSS78), as follows:

station	bottle-CTD bias (PSS78)	
au0803		
1	+0.0015	
2,3,7,13,102	-0.001	(for 2,3: bottles all at 1000 dbar; 7,13,102 all shallow stations)
36	+0.0005	(a shallower station)
59,119	+0.001	(119: a shallow station)
au0806		
2,73	-0.0015	(73: a shallow station)
19,20,28,42	-0.0005	
26	-0.001	
44,66	+0.0005	

This is most likely due to a combination of factors, including salinometer performance, and station groupings for shallow stations. There is no significant diminishing of overall CTD salinity accuracy.

For au0803, a small pressure dependent salinity residual is evident for stations deeper than 2000 dbar (except for stations 2, 71 and 72). The magnitude of the residual is at most ~0.002 (PSS78) over the whole profile, with the trend a negative increase in bottle-CTD residual with depth. For au0806, there is no similar consistent residual evident, and a small pressure dependence can only be seen in the residuals for a few of the stations.

For the first 58 stations on au0803, bad secondary conductivity readings often occurred in the top 100 m of the upcast. The connectors were cleaned after station 58, and only two further cases of bad secondary conductivity were seen, during stations 62 and 128. Note that secondary sensor data have not been used in the final data set.

Bad salinity bottle samples (not deleted from the data files) are listed in Table 10.

4.2 Temperature

Primary and secondary CTD temperature data (t_p and t_s respectively) for the cruises are compared in Figure 5. CTD upcast burst data, obtained at each Niskin bottle stop, are used for the comparison. From previous cruises (e.g. au0603 in Rosenberg, unpublished report, 2006), a very small pressure dependency of t_p-t_s for CTD704 of the order 0.0005^{o}C is evident over the full ocean depth range. This value is the same for cruises au0803 and au0806, however t_p-t_s starts from an average value of ~-0.0005^{o}C at the surface, decreasing to ~-0.001^{o}C at the bottom, indicating an initial calibration offset between the two temperature sensors. The magnitude of the t_p-t_s pressure dependency is within the assumed temperature accuracy of 0.001^{o}C (i.e. the accredited temperature accuracy of the CSIRO calibration facility). However without some temperature standard for comparison, it is unknown which of the temperature sensors provides more accurate data overall for cruises au0803 and au0806.

For both cruises, data spikes in the secondary temperature were common at temperatures below 0^{o}C, of no consequence in this case as primary sensor data were used. Note that this same behaviour has been observed on previous cruises.

4.3 Pressure

For both cruises, surface pressure offsets for each cast (Table 6) were obtained from inspection of the data before the package entered the water.

For au0806, data transmission errors initially caused some pressure spiking. The problem was fixed after retermination of the CTD wire (after station 3).

4.4 Dissolved oxygen

au0803

CTD oxygen data for profiles deeper than 3000 dbar (i.e. stations 1, 55 to 71, and 127 to 130) were calibrated as split profile fits, while profiles shallower than 3000 dbar were calibrated as whole profile fits. Calibration results are plotted in Figure 6, and the derived calibration coefficients are listed in Table 7a. Overall the calibrated CTD oxygen agrees with the bottle data to well within 1% of full scale (where full scale is ~400 µmol/l above 1500 dbar, and ~260 µmol/l below 1500 dbar).

The following stations had insufficient (or no) bottle samples for calibration of the CTD oxygen:

2, 3, 29, 37, 90, 92, 112-118, 131

For the split profile calibration of stations 56 and 69, the *CTD methodology* rules were varied, with increased bottle overlap between the shallow and deep fits, and merging of the fits at 1000 dbar rather than the usual 1500 dbar.

au0806

CTD oxygen data were calibrated using split profile fits, as per the *CTD methodology*. Calibration results are plotted in Figure 6, and the derived calibration coefficients are listed in Table 7b. Overall the calibrated CTD oxygen agrees with the bottle data to well within 1% of full scale (where full scale is ~350 µmol/l above 1500 dbar, and ~260 µmol/l below 1500 dbar).

Bottle overlaps between the shallow and deep fits were varied slightly for some stations, while merging of the fits was changed to 2500 dbar for station 60, 2000 dbar for station 64, and 1000 dbar for station 65. For stations 15 and 55, whole profile fits were required to improve the calibration for the top part of the profile.

For stations 47 and 64, CTD oxygen accuracy is reduced for most of the top half of the profile (Table 9), due to sparse bottle samples.

4.5 Fluorescence, PAR, altimeter

All fluorescence data for the cruises have a calibration, as supplied by the manufacturer (Table 3), applied to the data. PAR sensor data are uncalibrated, and supplied as raw voltages. The data have **not** been verified by linkage to other data sources (e.g. chlorophyll-a concentration data, particulate data, etc).

In the ***CTD 2 dbar averaged data files***, both downcast and upcast data are supplied for fluorescence and PAR. In these files, fluorescence data are not in fact averages: they are the **minimum** value within each 2 dbar bin, providing a profile "envelope" which minimizes the spikiness of the data.

In the ***bottle data files***, fluorescence (and PAR) values are the averages of 10 second bursts of CTD data, and thus include all the data spikes within each 10 second averaging period. For comparison with Niskin bottle data, these 10 second averages best represent (short of referring to the full 24 Hz data) what the Niskin bottle is sampling as the package moves up and down with the swell prior to bottle closure. Note that these fluorescence data are different to the data in the CTD 2 dbar averaged files (described above).

For the Tritech 500 kHz altimeter used on both cruises, on some stations a false bottom reading was obtained before coming within the nominal altimeter range of 50 m. This false bottom could be due to detection of the echo from the previous altimeter ping, or alternatively a combination of a good echo return from the bottom and a slightly better range in cold water. As a result of this behaviour, the real bottom was missed for a few stations. Note that similar behaviour for Tritech 500 kHz altimeters has been observed elsewhere (RV Tangaroa).

4.6 Nutrients

Nutrients measured on the cruises were phosphate, total nitrate (i.e. nitrate+nitrite), and silicate, using a Lachat autoanalyser. Some nitrite analyses were done on au0806, but only for the trace metal related nutrient samples (not discussed here). Suspect nutrient values not deleted from the bottle data files are listed in Table 11. Nitrate+nitrite versus phosphate data are shown in Figure 7. Note that most values are an average of two repeat analyses. Also note that full scale for phosphate, nitrate and silicate are respectively 3.0 μmol/l, 35 μmol/l, and 140 μmol/l.

Overall, silicate data are the cleanest, while nitrate data have the most inaccuracies (Table 11). For au0803, much of the nitrate data set has a reduced accuracy, in part because suspect analyses were not identified in time to allow repeat analysis runs. Specifically, for au0803 stations 1 to 29 and 38 to 54, nitrate values may be inaccurate by up to 3% of full scale. At the time of writing, the CSIRO hydrochemists advise that nitrate results may improve for future cruises, with the added pre-analysis step of warming the sample and thus bringing all the samples to a constant temperature for analysis.

Phosphate data appeared mostly okay, however the most surprising result is the consistent offset between au0806/au0803 phosphates and phosphates from previous cruises (Figures 8 and 9), with au0806/au0803 values ~0.13 μmol/l larger (i.e. ~4.3% of full scale). This offset is most likely due to the new data processing techniques for the Lachat data as compared to the old Alpkem system (Bec Cowley, CSIRO, pers. comm.), with the new data (i.e. au0803/au0806) assumed to be correct. The only way to completely confirm this would be to run old Alpkem data through the new data processing routines. Unfortunately, the resources to do this are currently unavailable.

4.7 Additional CTD data processing/quality notes

* au0803 station 7: the CTD broke the surface and the pumps switched off before the last bottle stop at 5 dbar. The package was lowered back down to 7 dbar, and the bottles were fired after the pumps were back on.

* au0803 station 14: no salinity bottle samples - they were mistakenly poured out, and the bottles used for sampling station 15.

* au0803 station 60: touched the bottom - upcast data all okay

* au0803 station 127: after firing bottle 20, the CTD was accidentally raised out of the water. The package was lowered back down to 10 dbar, and the last bottle was fired after the pumps were back on.

* au0806 station 15: primary sensors fouled when package hit the bottom - all upcast primary sensor data are bad.

* In the WOCE "Exchange" format bottle data file for both cruises, a laboratory temperature of 20.5^{o}C was used for conversion of nutrient units from μmol/l to μmol/kg.

5 UNDERWAY MEASUREMENTS

Underway data were logged to an Oracle database on the ship. Quality control for the cruises was largely automated. 12 kHz bathymetry data for au0803 were quality controlled on the cruise (Belinda Ronai, AAD programmer), however the usual quality control steps were not applied for the au0806 bathymetry data.

1 minute instantaneous underway data are contained in the files au0803.ora and au0806.ora as column formatted text; and in the files au0803ora.mat and au0806ora.mat as matlab format. A correction for the hull mounted temperature sensor and the thermosalinograph salinity was derived by comparing the underway data to CTD temperature and salinity data at 8 dbar, for cruise au0803

(Figures 10a and b) and cruise au0806 (Figures 11a and b). The following corrections were then applied to the underway data:

au0803

$T = T_{dls} - 0.013$
$S = S_{dls} + 0.055$

au0806

$T = T_{dls} - 0.007$
S: no correction required

for corrected underway temperature and salinity T and S respectively, and uncorrected values T_{dls} and S_{dls}. For au0803 underway salinity data, the split horizontal grouping of data points (Figure 10b) appears to be underway salinity calibration shifts in time throughout the cruise.

6 INTERCRUISE COMPARISONS

Historical comparisons

Intercruise comparisons of dissolved oxygen and nutrient data on neutral density (i.e. γ) surfaces are shown in bulk plots, comparing au0806 and au0103 (Figure 9a), and au0806 and au9601 (Figure 9b). Coinciding station profiles for au0803 and au0103 are compared in Figure 8 (the comparison in this case is not done on γ surfaces, as the spread of γ values is restricted for these southern stations). The most obvious difference is for phosphate (as discussed in section 4.6 above), with au0806 phosphate values higher than au0103 and au9601 by ~0.13 μmol/l, and au0803 similarly higher than au0103. For the au0806/au0103/au9601 comparisons (Figures 9a and b), nitrate values for the 3 cruises all agree to within ~1%; the average silicate difference between cruises is ~0.5 μmol/l for au0806 and au0103, and ~5.0 μmol/l for au0806 and au9601, with au0806 higher in both cases; and au0806 dissolved oxygen values are lower than au0103 and au9601 by ~4 μmol/l. For the au0803/au0103 comparison (Figure 8), there's no obvious offsets for nitrate, silicate and oxygen. Examination of plots for individual stations (not shown here) for these 2 cruises show a variable nitrate comparison (sometimes good), good silicate comparison, and au0803 oxygen values sometimes lower than au0103 values by ~1%.

au0803/au0806 station overlaps

Nutrient and dissolved oxygen profiles for overlap (i.e. coinciding) stations on au0803 and au0806 are shown in Figures 12a to f. Silicate and dissolved oxygen comparisons below 800 dbar are mostly okay,although there are some noticeable silicate differences in Figures 12c, d and f. Phosphate and nitrate differences are more often apparent, with the most obvious difference for phosphate in Figures 12e and f - in this case the maximum difference is ~1 μmol/l, or ~3% of full scale.

REFERENCES

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<u>Table 1a:</u> Summary of station information for cruise au0803. All times are UTC; "PULSE", "SAZC", "POLYNYA-WEST", "POLYNYA-CENTRAL" and "POLYNYA-EAST" are all mooring locations; "ICEBERG" = samples near a large iceberg (B-17A); "for the Jeff's" is a large volume sample for genetic analyses; "alt" = minimum altimeter value (m), "maxp" = maximum pressure (dbar).

	------------------------start of CTD------------------------------					-----------------bottom of CTD-----------------				-------------------end of CTD-------------------					
CTD station	date	time	latitude	longitude	depth	time	latitude	longitude	depth	time	latitude	longitude	depth	alt	maxp
001 PULSE	17 Dec 2007	061509	44 52.78 S	145 32.43 E	3527	071030	44 52.42 S	145 32.20 E	3542	082328	44 52.16 S	145 31.94 E	3546	-	3008
002 SAZC	19 Dec 2007	021809	53 44.91 S	141 49.68 E	2433	023535	53 44.95 S	141 49.81 E	-	025949	53 45.02 S	141 50.02 E	-	-	1003
003 SAZC	19 Dec 2007	035248	53 45.41 S	141 51.55 E	2962	041903	53 45.49 S	141 51.71 E	-	043404	53 45.55 S	141 51.89 E	-	-	1002
004 CEAMARC	22 Dec 2007	231332	66 00.28 S	142 39.56 E	443	232505	66 00.32 S	142 39.52 E	443	235425	66 00.49 S	142 39.48 E	440	13.1	434
005 CEAMARC	23 Dec 2007	172230	65 58.79 S	143 03.46 E	461	173512	65 58.75 S	143 03.31 E	458	180157	65 58.67 S	143 03.07 E	456	11.7	451
006 CEAMARC	24 Dec 2007	015702	66 00.20 S	143 19.88 E	460	020518	66 00.17 S	143 20.08 E	462	023554	65 59.98 S	143 21.17 E	458	5.8	461
007 CEAMARC	24 Dec 2007	101801	65 59.57 S	143 38.27 E	424	102603	65 59.57 S	143 38.10 E	422	105624	65 59.61 S	143 37.66 E	427	8.4	418
008 CEAMARC	24 Dec 2007	181726	66 21.75 S	143 41.85 E	584	183001	66 21.69 S	143 41.72 E	581	185747	66 21.58 S	143 41.75 E	581	10.9	576
009 CEAMARC	25 Dec 2007	002546	66 19.78 S	143 17.14 E	685	003752	66 19.79 S	143 16.95 E	677	010313	66 19.87 S	143 16.36 E	691	11.5	674
010 CEAMARC	25 Dec 2007	063754	66 20.24 S	142 59.17 E	649	064652	66 20.26 S	142 59.20 E	646	072129	66 20.32 S	142 58.91 E	645	13.3	640
011 CEAMARC	26 Dec 2007	130456	66 19.75 S	142 38.40 E	381	131254	66 19.73 S	142 38.18 E	376	133310	66 19.58 S	142 37.81 E	373	4.2	375
012 CEAMARC	26 Dec 2007	173844	66 20.27 S	142 17.63 E	216	174309	66 20.26 S	142 17.46 E	214	175837	66 20.17 S	142 16.62 E	211	12.7	203
013 CEAMARC	26 Dec 2007	203356	66 20.62 S	141 59.08 E	257	203917	66 20.66 S	141 58.97 E	254	205241	66 20.77 S	141 58.45 E	263	11.4	245
014 CEAMARC	27 Dec 2007	005031	66 34.05 S	142 00.16 E	310	005638	66 34.09 S	142 00.13 E	304	011613	66 34.10 S	141 59.78 E	295	9.2	298
015 CEAMARC	27 Dec 2007	064524	66 33.45 S	142 19.04 E	365	065343	66 33.50 S	142 19.00 E	359	071407	66 33.62 S	142 18.83 E	357	6.6	356
016 CEAMARC	27 Dec 2007	115748	66 34.13 S	142 38.94 E	396	120425	66 34.18 S	142 38.83 E	391	123036	66 34.46 S	142 38.24 E	365	13.9	381
017 CEAMARC	27 Dec 2007	185344	66 33.65 S	143 00.33 E	846	190809	66 33.59 S	143 00.15 E	841	193707	66 33.39 S	142 59.90 E	842	13.5	838
018 CEAMARC	28 Dec 2007	022948	66 33.45 S	143 19.63 E	804	024250	66 33.38 S	143 19.94 E	799	031313	66 33.16 S	143 20.55 E	801	5.4	803
019 CEAMARC	28 Dec 2007	072604	66 39.85 S	143 01.42 E	597	073549	66 39.82 S	143 01.33 E	629	080450	66 39.69 S	143 01.24 E	559	18.2	618
020 CEAMARC	28 Dec 2007	124948	66 44.92 S	142 39.82 E	685	131240	66 44.76 S	142 39.09 E	721	133806	66 44.78 S	142 39.06 E	698	18.2	712
021 CEAMARC	28 Dec 2007	180930	66 52.69 S	142 39.72 E	412	181731	66 52.70 S	142 39.61 E	431	183722	66 52.70 S	142 39.26 E	396	14.1	422
022 CEAMARC	29 Dec 2007	001217	66 45.42 S	143 17.32 E	169	001529	66 45.41 S	143 17.35 E	176	002953	66 45.46 S	143 17.14 E	162	27.5	150
023 CEAMARC	29 Dec 2007	034849	66 41.36 S	143 40.24 E	739	040040	66 41.45 S	143 40.20 E	741	043027	66 41.73 S	143 40.23 E	713	9.7	740
024 CEAMARC	29 Dec 2007	100704	66 45.14 S	143 59.16 E	596	101951	66 45.24 S	143 58.90 E	528	104548	66 45.47 S	143 58.24 E	487	17.2	517
025 CEAMARC	29 Dec 2007	160025	66 52.60 S	144 04.09 E	602	161212	66 52.58 S	144 04.00 E	613	163502	66 52.48 S	144 03.56 E	631	14.9	605
026 CEAMARC	29 Dec 2007	204706	66 56.57 S	144 39.41 E	326	205325	66 56.57 S	144 39.26 E	328	210643	66 56.48 S	144 39.08 E	324	12.9	318
027 CEAMARC	30 Dec 2007	004932	67 02.59 S	144 40.00 E	178	005305	67 02.57 S	144 40.04 E	181	010300	67 02.56 S	144 40.04 E	178	14.8	168
028 CEAMARC	30 Dec 2007	072711	67 01.86 S	145 11.96 E	1209	074737	67 01.94 S	145 11.99 E	1204	082753	67 02.12 S	145 12.04 E	1209	10.3	1210
029 CEAMARC	30 Dec 2007	105747	67 03.53 S	145 11.54 E	1315	112345	67 03.38 S	145 11.57 E	1314	114734	67 03.25 S	145 11.68 E	1296	7.9	1323
030 CEAMARC	30 Dec 2007	153646	66 51.10 S	145 23.09 E	632	155025	66 51.05 S	145 22.90 E	629	161149	66 50.84 S	145 22.57 E	630	11.5	624
031 CEAMARC	30 Dec 2007	181355	66 45.04 S	145 31.59 E	520	182157	66 45.05 S	145 31.58 E	524	184204	66 45.11 S	145 31.47 E	521	13.5	516
032 CEAMARC	30 Dec 2007	224155	66 45.26 S	145 13.47 E	582	225257	66 45.19 S	145 13.34 E	583	231343	66 45.08 S	145 13.26 E	582	11.1	579
033 CEAMARC	31 Dec 2007	041427	66 44.30 S	144 58.71 E	636	042426	66 44.33 S	144 58.46 E	635	045306	66 44.30 S	144 57.61 E	628	8.4	634
034 CEAMARC	31 Dec 2007	083151	66 44.89 S	144 40.18 E	822	084615	66 44.83 S	144 39.88 E	823	091624	66 44.80 S	144 39.53 E	822	5.3	827
035 CEAMARC	31 Dec 2007	185356	66 45.52 S	144 20.69 E	891	190956	66 45.43 S	144 20.77 E	891	193421	66 45.21 S	144 20.83 E	892	11.9	890
036 CEAMARC	02 Jan 2008	050045	66 36.45 S	144 08.90 E	816	051414	66 36.46 S	144 08.45 E	817	055407	66 36.43 S	144 07.19 E	813	6.4	820
037 CEAMARC	02 Jan 2008	181011	66 45.03 S	144 19.59 E	887	182932	66 45.00 S	144 19.58 E	889	184448	66 45.01 S	144 19.51 E	888	9.4	890

Table 1a: (continued)

	start of CTD					bottom of CTD				end of CTD					
CTD station	date	time	latitude	longitude	depth	time	latitude	longitude	depth	time	latitude	longitude	depth	alt	maxp
038 CEAMARC	02 Jan 2008	225348	66 33.58 S	144 39.95 E	569	230513	66 33.56 S	144 39.89 E	566	232508	66 33.59 S	144 39.87 E	571	14.7	557
039 CEAMARC	03 Jan 2008	030028	66 33.98 S	144 58.55 E	455	030812	66 33.98 S	144 58.34 E	453	034234	66 33.89 S	144 57.34 E	456	4.6	454
040 CEAMARC	03 Jan 2008	065259	66 33.37 S	145 19.83 E	399	070317	66 33.32 S	145 19.78 E	399	072737	66 33.29 S	145 19.44 E	404	10.7	392
041 CEAMARC	03 Jan 2008	130643	66 20.13 S	144 59.73 E	378	131315	66 20.16 S	144 59.80 E	385	133722	66 20.14 S	145 00.16 E	384	9.9	380
042 CEAMARC	03 Jan 2008	161958	66 19.94 S	144 39.53 E	414	162807	66 19.95 S	144 39.51 E	418	164815	66 19.97 S	144 39.19 E	416	14.0	408
043 CEAMARC	03 Jan 2008	191735	66 20.03 S	144 19.64 E	450	192710	66 20.02 S	144 19.53 E	452	194829	66 19.96 S	144 19.29 E	449	13.9	443
044 CEAMARC	03 Jan 2008	225329	66 20.00 S	143 59.05 E	505	230211	66 19.98 S	143 58.99 E	506	232638	66 19.87 S	143 58.80 E	507	14.4	497
045 CEAMARC	04 Jan 2008	083122	66 09.35 S	143 19.92 E	527	084134	66 09.40 S	143 19.66 E	530	091142	66 09.50 S	143 18.94 E	530	5.5	530
046 POLYNYA-WEST	04 Jan 2008	135127	66 10.15 S	142 55.55 E	-	140411	66 10.11 S	142 55.37 E	533	142710	66 09.97 S	142 55.22 E	539	7.6	531
047 POLYNYA-CENTRAL	04 Jan 2008	153026	66 10.74 S	143 09.77 E	569	154237	66 10.70 S	143 09.56 E	570	160620	66 10.72 S	143 09.05 E	570	12.6	563
048 POLYNYA-EAST	04 Jan 2008	170629	66 10.70 S	143 28.61 E	529	171636	66 10.72 S	143 28.52 E	531	173826	66 10.76 S	143 28.46 E	529	13.4	524
049 CEAMARC	04 Jan 2008	222202	65 50.69 S	142 58.98 E	418	222941	65 50.73 S	142 59.02 E	422	225015	65 50.81 S	142 59.11 E	420	7.6	419
050 CEAMARC	05 Jan 2008	014526	65 48.32 S	142 58.64 E	976	020041	65 48.25 S	142 58.81 E	989	024146	65 47.95 S	142 59.18 E	1068	12.1	989
051 CEAMARC	05 Jan 2008	055808	65 46.17 S	142 57.49 E	1646	063112	65 46.04 S	142 57.31 E	1683	073023	65 45.87 S	142 56.87 E	1732	14.1	1693
052 CEAMARC	05 Jan 2008	190705	65 43.39 S	142 57.43 E	2079	193940	65 43.44 S	142 57.29 E	2002	202846	65 43.63 S	142 57.14 E	2054	13.1	2018
053 CEAMARC	05 Jan 2008	235231	65 39.50 S	143 02.64 E	2364	002919	65 39.55 S	143 02.47 E	2290	013355	65 39.57 S	143 02.00 E	2355	13.8	2312
054 CASO	06 Jan 2008	032123	65 31.94 S	143 09.41 E	2677	040516	65 32.08 S	143 09.31 E	2675	052221	65 32.39 S	143 09.08 E	2667	12.3	2706
055 CASO	06 Jan 2008	072525	65 14.99 S	143 02.20 E	3023	081546	65 15.10 S	143 01.85 E	3022	093621	65 15.40 S	143 01.22 E	3017	12.4	3061
056 CASO	06 Jan 2008	115001	65 00.62 S	143 29.63 E	3256	124604	65 00.75 S	143 29.19 E	3270	140255	65 00.75 S	143 28.45 E	3247	11.2	3317
057 CASO	06 Jan 2008	153450	64 47.08 S	143 38.92 E	3405	163709	64 47.14 S	143 37.93 E	3406	175233	64 47.30 S	143 36.99 E	3389	7.1	3461
058 CASO	06 Jan 2008	202002	64 23.45 S	143 17.83 E	3574	212129	64 23.33 S	143 18.33 E	3579	223525	64 23.42 S	143 18.83 E	3581	7.4	3638
059 CASO	07 Jan 2008	015714	63 48.05 S	143 22.58 E	3771	030027	63 48.26 S	143 21.76 E	3765	044603	63 48.61 S	143 20.45 E	3759	12.5	3824
060 CASO	07 Jan 2008	081809	63 12.57 S	143 29.83 E	3964	092949	63 12.56 S	143 29.36 E	3961	112117	63 12.58 S	143 28.23 E	3966	0.0	4038
061 CASO	07 Jan 2008	135400	62 45.69 S	143 36.52 E	4088	151407	62 45.50 S	143 37.15 E	4086	164902	62 45.47 S	143 37.84 E	4084	9.9	4156
062 CASO	07 Jan 2008	202937	62 54.25 S	145 03.27 E	3996	213704	62 54.24 S	145 02.69 E	3993	230125	62 54.25 S	145 01.99 E	3991	8.8	4062
063 CASO	08 Jan 2008	024738	63 03.25 S	146 28.70 E	3921	035435	63 03.26 S	146 28.87 E	3919	055732	63 03.37 S	146 29.11 E	3918	10.6	3983
064 CASO	08 Jan 2008	093650	63 10.45 S	147 51.09 E	3882	105102	63 10.54 S	147 51.64 E	3881	123235	63 10.97 S	147 52.51 E	3881	14.3	3940
065 CASO	08 Jan 2008	154205	63 18.62 S	149 13.01 E	3768	164753	63 18.86 S	149 13.48 E	3694	180131	63 19.15 S	149 13.42 E	3765	16.5	3746
066 CASO	08 Jan 2008	202341	63 29.83 S	150 00.36 E	3703	213042	63 29.75 S	150 01.07 E	3696	224716	63 29.83 S	150 01.73 E	3698	5.8	3760
067 CASO	09 Jan 2008	010109	63 53.98 S	150 00.04 E	3639	020438	63 53.66 S	150 00.68 E	3639	034132	63 53.57 S	150 01.40 E	3638	7.9	3698
068 CASO	09 Jan 2008	060958	64 18.12 S	149 59.98 E	3561	071955	64 17.91 S	150 00.79 E	3540	085356	64 17.71 S	150 02.18 E	3544	19.4	3585
069 CASO	09 Jan 2008	111959	64 35.63 S	150 00.04 E	3439	122519	64 35.38 S	150 01.71 E	3441	135207	64 35.12 S	150 03.38 E	3438	13.5	3490
070 CASO	09 Jan 2008	161954	64 59.87 S	149 59.74 E	3270	171037	64 59.60 S	149 59.80 E	3269	182347	64 59.04 S	149 59.77 E	3280	7.5	3320
071 CASO	10 Jan 2008	004642	65 23.71 S	149 29.84 E	3037	014136	65 23.66 S	149 30.39 E	3038	031223	65 23.63 S	149 31.26 E	3035	7.8	3082
072 CASO	10 Jan 2008	060142	65 34.50 S	148 53.03 E	2647	065807	65 34.40 S	148 53.32 E	2658	082342	65 34.30 S	148 53.41 E	2659	12.4	2689
073 CASO	10 Jan 2008	133914	65 19.56 S	146 54.67 E	2926	142605	65 19.61 S	146 54.16 E	2925	153425	65 19.68 S	146 53.30 E	2915	8.5	2966
074 CASO	10 Jan 2008	171941	65 37.82 S	146 55.09 E	2663	180036	65 37.84 S	146 54.59 E	2678	190432	65 37.81 S	146 53.66 E	2670	12.7	2709
075 CASO	10 Jan 2008	210154	65 47.61 S	146 36.99 E	2009	213850	65 47.51 S	146 36.53 E	1980	222721	65 47.40 S	146 35.91 E	2064	13.6	1996
076 CASO	10 Jan 2008	233140	65 49.73 S	146 35.47 E	1398	000130	65 49.67 S	146 35.14 E	1445	004011	65 49.59 S	146 34.87 E	1463	-	1476

Table 1a: (continued)

	start of CTD					bottom of CTD				end of CTD					
CTD station	date	time	latitude	longitude	depth	time	latitude	longitude	depth	time	latitude	longitude	depth	alt	maxp
077 CASO	11 Jan 2008	014823	65 52.36 S	146 34.65 E	897	020424	65 52.37 S	146 34.21 E	894	024603	65 52.34 S	146 33.21 E	853	9.5	896
078 CASO	11 Jan 2008	040236	65 54.95 S	146 34.03 E	518	041235	65 54.95 S	146 33.93 E	523	044917	65 55.10 S	146 33.64 E	510	9.6	519
079 CASO	11 Jan 2008	061219	66 02.27 S	146 31.31 E	282	061809	66 02.33 S	146 31.19 E	279	064209	66 02.35 S	146 30.71 E	279	3.8	278
080 CEAMARC	12 Jan 2008	034313	65 55.03 S	143 59.80 E	364	035132	65 54.98 S	143 59.90 E	365	042311	65 54.83 S	144 00.17 E	356	8.0	361
081 CEAMARC	12 Jan 2008	072746	65 52.64 S	144 05.29 E	787	074620	65 52.63 S	144 05.47 E	802	083005	65 52.52 S	144 05.94 E	836	17.7	793
082 CEAMARC	12 Jan 2008	114200	65 51.88 S	144 06.23 E	1104	120658	65 51.79 S	144 06.15 E	1154	125942	65 51.58 S	144 05.84 E	1196	20.1	1148
083 CEAMARC	12 Jan 2008	175834	65 59.88 S	142 20.24 E	231	180408	65 59.86 S	142 20.23 E	234	181916	65 59.83 S	142 20.19 E	231	15.5	220
084 CEAMARC	12 Jan 2008	204449	65 59.81 S	141 56.74 E	239	205008	65 59.80 S	141 56.69 E	240	210528	65 59.72 S	141 56.57 E	237	10.5	232
085 CEAMARC	12 Jan 2008	235958	65 59.85 S	141 17.44 E	228	000241	65 59.86 S	141 17.42 E	231	001938	65 59.91 S	141 17.33 E	229	9.8	224
086 CEAMARC	13 Jan 2008	031821	66 20.30 S	141 20.83 E	226	032352	66 20.33 S	141 20.80 E	230	034739	66 20.39 S	141 20.35 E	224	14.4	218
087 CEAMARC	13 Jan 2008	061842	66 34.02 S	141 18.92 E	171	062258	66 34.04 S	141 18.94 E	173	064047	66 34.09 S	141 18.97 E	169	12.4	162
088 CEAMARC	13 Jan 2008	111829	66 33.83 S	140 51.92 E	308	112556	66 33.89 S	140 51.97 E	310	114845	66 34.05 S	140 52.05 E	308	15.2	298
089 CEAMARC	13 Jan 2008	172442	66 32.03 S	140 03.04 E	175	172753	66 32.03 S	140 03.02 E	194	173915	66 31.97 S	140 02.79 E	251	14.6	181
090 CEAMARC	13 Jan 2008	201710	66 26.17 S	140 31.98 E	1169	204830	66 26.18 S	140 31.67 E	1168	210458	66 26.16 S	140 31.57 E	1169	9.6	1174
091 CEAMARC	13 Jan 2008	234744	66 26.20 S	140 32.10 E	1144	001707	66 26.33 S	140 31.64 E	1180	004938	66 26.38 S	140 31.23 E	1033	18.5	1177
092 CEAMARC	14 Jan 2008	020525	66 26.22 S	140 32.15 E	1140	022851	66 26.36 S	140 31.93 E	1179	030207	66 26.60 S	140 31.72 E	942	10.2	1184
093 CEAMARC	14 Jan 2008	080940	66 23.15 S	140 27.12 E	674	082503	66 23.11 S	140 27.32 E	673	090643	66 23.07 S	140 27.80 E	660	11.2	670
094 CEAMARC	14 Jan 2008	131550	66 20.55 S	140 28.82 E	412	132606	66 20.57 S	140 28.89 E	414	134905	66 20.56 S	140 28.84 E	394	14.9	404
095 CEAMARC	14 Jan 2008	161939	66 19.86 S	140 39.81 E	167	162410	66 19.84 S	140 39.74 E	169	163625	66 19.83 S	140 39.44 E	167	9.4	161
096 CEAMARC	14 Jan 2008	184604	66 09.73 S	140 39.70 E	222	184938	66 09.71 S	140 39.65 E	220	190421	66 09.63 S	140 39.45 E	216	11.2	211
097 CEAMARC	14 Jan 2008	230904	66 20.80 S	139 56.87 E	612	232521	66 20.86 S	139 56.76 E	631	234822	66 20.96 S	139 56.60 E	643	14.8	623
098 CEAMARC	15 Jan 2008	024739	66 23.50 S	139 48.41 E	890	030636	66 23.51 S	139 48.28 E	886	034751	66 23.53 S	139 47.80 E	-	9.4	887
099 CEAMARC	15 Jan 2008	072303	66 08.59 S	139 15.66 E	633	073437	66 08.56 S	139 15.54 E	631	081210	66 08.36 S	139 15.53 E	628	9.6	628
100 CEAMARC	15 Jan 2008	105455	66 10.03 S	139 42.10 E	380	110232	66 10.09 S	139 42.16 E	386	112826	66 10.21 S	139 42.47 E	384	9.3	381
101 CEAMARC	15 Jan 2008	135749	66 10.54 S	139 59.89 E	153	140158	66 10.55 S	139 59.87 E	156	141515	66 10.52 S	140 00.19 E	150	13.0	144
102 CEAMARC	15 Jan 2008	170051	66 00.07 S	139 59.93 E	194	170447	66 00.07 S	139 59.90 E	194	171722	66 00.00 S	139 59.82 E	191	11.8	184
103 CEAMARC	15 Jan 2008	203110	66 00.13 S	139 39.96 E	212	203555	66 00.13 S	139 39.91 E	217	204756	66 00.15 S	139 39.76 E	220	14.9	204
104 CEAMARC	15 Jan 2008	220604	66 00.05 S	139 19.91 E	461	221523	66 00.09 S	139 19.78 E	459	223548	66 00.20 S	139 19.72 E	460	11.0	453
105 CEAMARC	16 Jan 2008	055631	65 29.20 S	139 13.10 E	409	060627	65 29.18 S	139 13.12 E	408	063125	65 29.14 S	139 13.13 E	407	14.8	397
106 CEAMARC	16 Jan 2008	100748	65 26.39 S	139 17.35 E	1188	103441	65 26.33 S	139 17.42 E	1239	112913	65 26.22 S	139 17.33 E	1256	14.3	1241
107 CEAMARC	16 Jan 2008	173315	65 28.19 S	139 20.65 E	754	174750	65 28.24 S	139 20.42 E	749	181401	65 28.36 S	139 20.21 E	690	10.8	746
108 CEAMARC	17 Jan 2008	130407	65 38.86 S	140 26.33 E	1161	133133	65 38.90 S	140 26.29 E	1188	141203	65 39.07 S	140 26.22 E	1080	6.3	1197
109 CEAMARC	17 Jan 2008	223415	65 41.12 S	140 31.89 E	770	224529	65 41.11 S	140 31.94 E	775	231221	65 41.15 S	140 31.93 E	765	12.3	771
110 CEAMARC	18 Jan 2008	033135	65 41.72 S	140 34.30 E	452	034044	65 41.77 S	140 34.32 E	442	041410	65 41.58 S	140 34.24 E	503	10.0	437
111 CEAMARC	18 Jan 2008	102434	65 37.96 S	140 23.17 E	1404	105704	65 37.91 S	140 23.26 E	1383	115932	65 37.85 S	140 23.48 E	1337	-	1396
112 ICEBERG	19 Jan 2008	042420	65 35.74 S	141 06.31 E	1280	043034	65 35.69 S	141 06.38 E	1294	044526	65 35.62 S	141 06.38 E	1302	-	303
113 ICEBERG	19 Jan 2008	055208	65 34.67 S	140 53.60 E	1270	055901	65 34.64 S	140 53.62 E	1271	061455	65 34.52 S	140 53.69 E	1302	-	301
114 ICEBERG	19 Jan 2008	070709	65 33.07 S	140 48.26 E	1004	071247	65 33.05 S	140 48.28 E	1005	073318	65 32.93 S	140 48.65 E	970	-	302
115 ICEBERG	19 Jan 2008	082434	65 32.11 S	140 42.35 E	1027	083023	65 32.11 S	140 42.43 E	1034	085129	65 32.08 S	140 42.86 E	1036	-	303

Table 1a: (continued)

	start of CTD					bottom of CTD				end of CTD					
CTD station	date	time	latitude	longitude	depth	time	latitude	longitude	depth	time	latitude	longitude	depth	alt	maxp
116 ICEBERG	19 Jan 2008	092432	65 32.89 S	140 41.18 E	965	093318	65 32.82 S	140 41.25 E	961	095230	65 32.75 S	140 41.48 E	929	-	304
117 ICEBERG	19 Jan 2008	103358	65 33.85 S	140 39.74 E	912	104146	65 33.85 S	140 39.89 E	900	105925	65 33.83 S	140 40.08 E	892	-	304
118 ICEBERG	19 Jan 2008	113105	65 34.82 S	140 38.40 E	971	113604	65 34.82 S	140 38.48 E	970	115456	65 34.66 S	140 38.65 E	968	-	301
119 SR3	19 Jan 2008	161753	65 48.08 S	139 51.12 E	209	162138	65 48.06 S	139 51.06 E	212	163907	65 47.98 S	139 51.08 E	208	13.9	201
120 SR3	19 Jan 2008	173144	65 42.36 S	139 51.02 E	300	173615	65 42.38 S	139 51.08 E	298	175223	65 42.38 S	139 51.08 E	297	12.3	289
121 SR3	19 Jan 2008	190644	65 33.96 S	139 51.02 E	874	192234	65 33.95 S	139 51.10 E	902	194747	65 33.94 S	139 51.24 E	892	7.8	905
122 SR3	19 Jan 2008	214053	65 31.63 S	139 50.90 E	1265	220003	65 31.58 S	139 51.19 E	1268	223313	65 31.43 S	139 51.44 E	1286	7.7	1277
123 SR3	19 Jan 2008	233522	65 25.84 S	139 51.07 E	1812	000728	65 25.80 S	139 51.32 E	1791	004953	65 25.78 S	139 51.59 E	1757	-	1851
124 SR3	20 Jan 2008	015739	65 23.90 S	139 51.56 E	2405	024039	65 23.81 S	139 51.70 E	2333	035902	65 23.75 S	139 52.39 E	2427	10.8	2359
125 SR3	20 Jan 2008	062104	65 04.44 S	139 51.85 E	2532	071321	65 04.19 S	139 52.45 E	2565	084429	65 03.78 S	139 53.67 E	2661	9.7	2597
126 SR3	20 Jan 2008	103415	64 48.74 S	139 51.78 E	2566	112602	64 48.59 S	139 51.73 E	2568	125452	64 48.48 S	139 51.64 E	2574	10.7	2599
127 SR3	20 Jan 2008	144743	64 32.99 S	139 51.14 E	3048	153515	64 32.95 S	139 51.32 E	3051	165556	64 32.98 S	139 51.61 E	3046	12.9	3090
128 SR3	20 Jan 2008	192738	64 12.61 S	139 50.76 E	3496	202837	64 12.49 S	139 51.63 E	3498	214143	64 12.20 S	139 52.68 E	3500	13.9	3548
129 SR3	21 Jan 2008	002101	63 51.94 S	139 50.68 E	3696	012708	63 51.91 S	139 52.12 E	3698	025507	63 51.84 S	139 54.01 E	3703	11.9	3755
130 SR3	21 Jan 2008	060322	63 21.11 S	139 50.07 E	3776	071655	63 21.52 S	139 50.00 E	3772	085023	63 21.95 S	139 49.33 E	3778	11.6	3832
131 for the Jeff's	22 Jan 2008	215514	56 41.41 S	141 52.45 E	3503	230644	56 41.24 S	141 52.99 E	3646	235456	56 41.17 S	141 53.36 E	3542	10.0	3702

<u>Table 1b:</u> Summary of station information for cruise au0806. All times are UTC; "TEST" = test cast; "alt" = minimum altimeter value (m), "maxp" = maximum pressure (dbar).

	------------------------start of CTD-------------------------------					-----------------bottom of CTD-----------------				-------------------end of CTD-------------------					
CTD station	date	time	latitude	longitude	depth	time	latitude	longitude	depth	time	latitude	longitude	depth	alt	maxp
001 TEST	23 Mar 2008	224828	50 12.07 S	145 23.16 E	-	233648	50 11.84 S	145 23.63 E	-	002500	50 11.59 S	145 24.01 E	4167	-	2210
002 TEST	25 Mar 2008	000010	54 24.07 S	143 48.79 E	2772	005026	54 24.04 S	143 48.92 E	2778	021750	54 23.93 S	143 49.08 E	2569	10.4	2811
003 TEST	25 Mar 2008	222657	57 30.43 S	142 50.48 E	2898	223752	57 30.41 S	142 50.42 E	-	224559	57 30.40 S	142 50.42 E	-	-	302
004 SR3	28 Mar 2008	212819	65 48.08 S	139 40.93 E	334	213449	65 48.16 S	139 40.82 E	333	215200	65 48.37 S	139 40.62 E	335	10.8	325
005 SR3	29 Mar 2008	024623	65 34.45 S	139 39.49 E	392	025616	65 34.45 S	139 39.24 E	390	033504	65 34.29 S	139 38.93 E	394	14.3	380
006 SR3	29 Mar 2008	055100	65 31.27 S	139 51.94 E	1333	061535	65 31.30 S	139 51.59 E	1338	070822	65 31.36 S	139 50.95 E	1317	12.6	1343
007 SR3	29 Mar 2008	094521	65 25.56 S	139 50.45 E	1940	102147	65 25.53 S	139 50.24 E	1989	112005	65 25.42 S	139 49.68 E	2297	-	2122
008 SR3	29 Mar 2008	154936	65 23.79 S	139 55.11 E	2427	162519	65 23.80 S	139 54.86 E	2353	173153	65 23.81 S	139 54.46 E	2402	13.7	2375
009 SR3	29 Mar 2008	214843	65 04.25 S	139 45.03 E	2190	222443	65 04.27 S	139 44.89 E	2119	232905	65 04.28 S	139 44.78 E	2195	12.5	2138
010 SR3	30 Mar 2008	022030	64 48.75 S	139 51.66 E	2562	030126	64 48.64 S	139 51.49 E	2565	041814	64 48.52 S	139 51.13 E	2581	13.9	2592
011 SR3	30 Mar 2008	084145	64 52.64 S	140 12.41 E	3055	085531	64 52.65 S	140 12.29 E	2989	093621	64 52.64 S	140 12.12 E	3023	-	754
012 SR3	30 Mar 2008	140731	64 32.88 S	139 51.05 E	3051	150911	64 33.00 S	139 50.30 E	3057	163457	64 33.10 S	139 49.17 E	3070	13.9	3096
013 SR3	30 Mar 2008	194546	64 12.55 S	139 50.46 E	3501	204850	64 12.55 S	139 50.30 E	3498	221100	64 12.80 S	139 50.17 E	3496	10.9	3551
014 SR3	31 Mar 2008	000251	64 12.58 S	139 50.53 E	3500	003432	64 12.51 S	139 50.65 E	3502	013309	64 12.44 S	139 50.72 E	3503	-	2004
015 SR3	31 Mar 2008	052915	63 51.90 S	139 50.81 E	3705	062033	63 51.86 S	139 51.32 E	3699	074800	63 51.82 S	139 51.85 E	3704	0.0	3768
016 SR3	31 Mar 2008	115011	63 21.03 S	139 49.94 E	3776	125315	63 20.96 S	139 50.12 E	3773	142725	63 20.76 S	139 49.99 E	3777	13.6	3831
017 SR3	31 Mar 2008	181649	62 51.01 S	139 51.10 E	3179	190854	62 51.21 S	139 51.28 E	3176	202917	62 51.46 S	139 51.65 E	3175	11.3	3220
018 SR3	01 Apr 2008	004736	62 21.64 S	139 50.44 E	3866	020325	62 22.14 S	139 50.54 E	3934	033455	62 22.96 S	139 50.60 E	-	12.8	3997
019 SR3	01 Apr 2008	065500	61 50.98 S	139 50.66 E	4213	084550	61 51.77 S	139 50.24 E	4263	102906	61 52.64 S	139 50.20 E	-	16.5	4331
020 SR3	01 Apr 2008	161927	61 21.02 S	139 50.31 E	4264	173156	61 21.32 S	139 50.15 E	4316	191212	61 21.80 S	139 49.82 E	-	12.4	4390
021 SR3	01 Apr 2008	231730	60 51.02 S	139 51.13 E	4325	003008	60 51.16 S	139 51.01 E	4378	021231	60 51.34 S	139 50.78 E	-	12.8	4453
022 SR3	02 Apr 2008	035844	60 50.98 S	139 50.96 E	4295	052545	60 51.20 S	139 50.95 E	4378	070147	60 51.53 S	139 50.77 E	4323	13.1	4452
023 SR3	02 Apr 2008	114559	60 20.97 S	139 51.12 E	4362	131257	60 20.86 S	139 50.68 E	4416	145434	60 20.81 S	139 50.01 E	4361	13.6	4491
024 SR3	02 Apr 2008	184138	59 50.93 S	139 51.54 E	-	200225	59 50.89 S	139 51.59 E	4453	213816	59 50.69 S	139 51.41 E	-	12.5	4531
025 SR3	03 Apr 2008	014736	59 20.97 S	139 51.09 E	4057	030452	59 20.73 S	139 51.12 E	4194	044137	59 20.24 S	139 51.07 E	-	13.1	4263
026 SR3	03 Apr 2008	074311	58 50.93 S	139 50.53 E	3862	085430	58 50.66 S	139 51.01 E	3904	103505	58 50.15 S	139 51.67 E	-	13.6	3964
027 SR3	03 Apr 2008	115140	58 51.03 S	139 50.38 E	3863	122923	58 50.94 S	139 50.66 E	-	134215	58 50.65 S	139 51.43 E	-	-	2002
028 SR3	03 Apr 2008	183733	58 20.96 S	139 51.23 E	3898	194429	58 20.99 S	139 51.82 E	3970	211239	58 20.99 S	139 52.86 E	-	11.5	4034
029 SR3	04 Apr 2008	001527	57 50.98 S	139 51.03 E	3964	012226	57 50.96 S	139 51.09 E	3987	025644	57 50.80 S	139 51.38 E	-	12.8	4049
030 SR3	04 Apr 2008	071136	57 20.90 S	139 52.52 E	3955	084319	57 20.90 S	139 53.27 E	4100	104835	57 20.88 S	139 53.84 E	-	12.6	4165
031 SR3	04 Apr 2008	140909	56 55.75 S	139 50.95 E	3976	141157	56 55.73 S	139 50.93 E	-	142229	56 55.75 S	139 50.89 E	-	-	154
032 SR3	04 Apr 2008	162955	56 55.76 S	139 51.04 E	4214	174216	56 55.57 S	139 50.79 E	4114	191602	56 55.39 S	139 50.87 E	-	12.9	4180
033 SR3	05 Apr 2008	010841	56 25.76 S	140 06.06 E	3820	023351	56 25.36 S	140 05.63 E	4116	043529	56 24.47 S	140 05.62 E	-	14.7	4180
034 SR3	05 Apr 2008	073348	55 55.72 S	140 24.61 E	3418	085646	55 55.41 S	140 24.55 E	3604	103648	55 55.08 S	140 24.92 E	-	14.7	3653
035 SR3	05 Apr 2008	155225	55 30.09 S	140 43.94 E	4106	171045	55 30.11 S	140 44.57 E	4157	184721	55 30.03 S	140 45.37 E	-	11.6	4225
036 SR3	05 Apr 2008	222030	55 01.18 S	141 01.11 E	2921	234245	55 00.98 S	141 01.54 E	3313	010855	55 00.81 S	141 01.73 E	-	12.2	3357
037 SR3	06 Apr 2008	083324	54 31.74 S	141 19.96 E	2738	095008	54 31.36 S	141 20.35 E	2854	113717	54 31.10 S	141 20.99 E	2888	11.3	2888
038 SR3	06 Apr 2008	152330	54 04.26 S	141 36.05 E	-	162423	54 04.18 S	141 36.53 E	2536	173244	54 04.04 S	141 37.25 E	2484	12.1	2563

Table 1b: (continued)

		start of CTD					bottom of CTD				end of CTD					
CTD	station	date	time	latitude	longitude	depth	time	latitude	longitude	depth	time	latitude	longitude	depth	alt	maxp
039	SR3	06 Apr 2008	185606	54 04.12 S	141 36.40 E	-	191950	54 04.09 S	141 36.65 E	-	200307	54 03.97 S	141 37.08 E	2520	-	1506
040	SR3	07 Apr 2008	002907	53 34.94 S	141 51.67 E	-	011056	53 35.33 S	141 51.97 E	2631	023310	53 36.03 S	141 52.96 E	2904	11.7	2659
041	SR3	07 Apr 2008	054833	53 07.97 S	142 08.30 E	-	071408	53 08.36 S	142 08.83 E	3181	090147	53 08.71 S	142 09.49 E	-	15.3	3218
042	SR3	07 Apr 2008	133110	52 40.25 S	142 23.52 E	3321	145029	52 40.68 S	142 23.79 E	3449	155726	52 41.14 S	142 23.96 E	-	10.6	3498
043	SR3	07 Apr 2008	172421	52 40.28 S	142 23.30 E	3329	174545	52 40.42 S	142 23.36 E	-	181707	52 40.64 S	142 23.59 E	-	-	1001
044	SR3	07 Apr 2008	204152	52 22.17 S	142 32.09 E	-	214750	52 22.43 S	142 32.78 E	3500	230457	52 22.51 S	142 33.40 E	-	10.0	3550
045	SR3	08 Apr 2008	023037	52 04.81 S	142 42.74 E	3452	034237	52 05.04 S	142 43.48 E	3461	051945	52 05.27 S	142 45.08 E	3359	14.1	3506
046	SR3	09 Apr 2008	160707	51 48.64 S	142 50.45 E	3659	171410	51 48.78 S	142 51.36 E	3721	183726	51 49.10 S	142 52.55 E	-	12.1	3775
047	SR3	09 Apr 2008	203309	51 32.35 S	142 59.63 E	-	214259	51 32.39 S	143 00.78 E	3708	230949	51 32.41 S	143 02.18 E	3436	10.5	3763
048	SR3	10 Apr 2008	003658	51 32.39 S	142 59.92 E	-	010906	51 32.33 S	143 00.41 E	3633	021612	51 32.14 S	143 01.56 E	-	-	2006
049	SR3	10 Apr 2008	053111	51 15.56 S	143 07.91 E	-	065308	51 15.39 S	143 09.37 E	3706	083851	51 15.25 S	143 11.04 E	3674	12.3	3759
050	SR3	10 Apr 2008	102820	51 00.66 S	143 16.44 E	-	115750	51 00.03 S	143 18.50 E	3797	135018	50 59.28 S	143 20.79 E	3805	14.5	3850
051	SR3	10 Apr 2008	160038	50 40.79 S	143 25.19 E	-	170220	50 40.36 S	143 26.23 E	3516	182919	50 39.80 S	143 27.33 E	3474	12.2	3564
052	SR3	10 Apr 2008	213535	50 23.93 S	143 31.82 E	-	224524	50 23.31 S	143 32.36 E	3493	000909	50 22.72 S	143 32.96 E	3549	11.2	3542
053	SR3	11 Apr 2008	030119	50 09.57 S	143 39.70 E	3582	041959	50 09.17 S	143 39.76 E	3816	060432	50 08.60 S	143 40.25 E	-	13.6	3870
054	SR3	11 Apr 2008	083057	49 53.59 S	143 48.05 E	3615	094418	49 53.12 S	143 48.54 E	3756	113549	49 52.42 S	143 49.13 E	-	15.2	3807
055	SR3	11 Apr 2008	144551	49 36.59 S	143 55.75 E	-	155227	49 36.34 S	143 55.88 E	3753	171916	49 36.11 S	143 56.05 E	3707	13.4	3806
056	SR3	11 Apr 2008	195250	49 16.25 S	144 05.67 E	4216	210537	49 16.14 S	144 06.05 E	4239	222545	49 15.98 S	144 06.22 E	-	9.8	4309
057	SR3	12 Apr 2008	000846	49 16.18 S	144 05.96 E	4216	003649	49 16.00 S	144 06.07 E	-	012532	49 15.87 S	144 06.17 E	-	-	1948
058	SR3	12 Apr 2008	053148	48 46.70 S	144 19.06 E	4078	065123	48 46.43 S	144 18.62 E	4168	083158	48 46.11 S	144 18.04 E	-	11.5	4234
059	SR3	12 Apr 2008	112642	48 19.22 S	144 31.82 E	3970	124416	48 19.58 S	144 32.69 E	4001	143248	48 19.76 S	144 33.70 E	-	14.4	4059
060	SR3	12 Apr 2008	182840	47 59.99 S	144 40.43 E	4036	195021	47 59.95 S	144 41.17 E	4307	211934	47 59.97 S	144 41.69 E	-	7.2	4380
061	SR3	12 Apr 2008	224102	47 59.96 S	144 40.24 E	4218	230252	47 59.98 S	144 40.32 E	-	234352	48 00.19 S	144 40.51 E	-	-	1103
062	SR3	13 Apr 2008	031655	47 28.10 S	144 54.13 E	4343	044205	47 27.79 S	144 54.14 E	4383	062207	47 27.23 S	144 54.16 E	-	13.0	4452
063	SR3	13 Apr 2008	094006	47 08.87 S	144 54.35 E	4740	110853	47 08.27 S	144 54.22 E	4810	125715	47 07.88 S	144 54.22 E	4755	13.9	4892
064	SR3	13 Apr 2008	161342	46 38.92 S	145 15.10 E	3287	171229	46 38.75 S	145 15.34 E	3342	182149	46 38.53 S	145 15.56 E	-	12.9	3383
065	SR3	13 Apr 2008	195905	46 39.01 S	145 14.93 E	-	202534	46 38.91 S	145 14.98 E	-	211614	46 38.65 S	145 15.11 E	3306	-	1802
066	SR3	14 Apr 2008	012205	46 10.21 S	145 28.31 E	2690	021256	46 10.28 S	145 28.33 E	2724	032956	46 10.16 S	145 27.98 E	2692	14.1	2751
067	SR3	14 Apr 2008	065518	45 41.99 S	145 39.47 E	1990	073400	45 42.12 S	145 39.37 E	2040	083617	45 42.49 S	145 39.16 E	2114	13.4	2054
068	SR3	14 Apr 2008	131114	45 13.37 S	145 51.07 E	2823	140749	45 13.84 S	145 51.37 E	2845	151515	45 14.27 S	145 51.91 E	2750	12.2	2876
069	SR3	14 Apr 2008	183548	44 43.21 S	146 03.07 E	3160	193115	44 43.59 S	146 02.71 E	3229	204616	44 43.93 S	146 02.26 E	3225	13.8	3266
070	SR3	15 Apr 2008	003321	44 22.75 S	146 11.53 E	2299	011906	44 22.78 S	146 11.35 E	2326	022350	44 23.09 S	146 11.42 E	2298	12.4	2345
071	SR3	15 Apr 2008	042916	44 07.09 S	146 13.37 E	997	045704	-	-	1042	054351	44 07.14 S	146 14.26 E	1078	13.5	1039
072	SR3	15 Apr 2008	074356	44 02.90 S	146 17.54 E	544	075749	-	-	562	083038	44 03.08 S	146 17.77 E	539	14.9	552
073	SR3	15 Apr 2008	093130	43 59.92 S	146 19.31 E	220	093703	-	-	228	100319	44 00.11 S	146 19.56 E	220	15.0	215

<u>Table 2a:</u> Cruise au0803 summary of samples drawn from Niskin bottles at each station, including "sal"= salinity, "ox"=dissolved oxygen, "nuts"= nutrients (i.e. phosphate, nitrate+nitrite, silicate), "CFC"=chlorofluorocarbons, "CO2"=dissolved inorganic carbon and alkalinity, "^{18}O", and "gen"=large volume sample for genetic analyses. Note: biological samples (except for "gen") not included here.

station	sal	ox	nuts	CFC	CO2	ge	^{18}O	gen
1	X	X	X	X	X	X		
2	X							
3	X			X				
4	X	X	X	X	X			
5	X	X	X	X	X			
6	X	X	X	X	X	X		
7	X	X	X	X	X			
8	X	X	X	X	X			
9	X	X	X	X	X	X		
10	X	X	X	X	X			
11	X	X	X	X	X			
12	X	X	X	X	X	X		
13	X	X	X	X	X			
14	X	X	X	X	X			
15	X	X	X	X	X	X		X
16	X	X	X	X	X	X		
17	X	X	X	X	X	X	X	
18	X	X	X	X	X	X	X	
19	X	X	X	X	X			
20	X	X	X	X	X			
21	X	X	X	X	X	X		
22	X	X	X	X	X	X		
23	X	X	X	X	X		X	
24	X	X	X	X	X			
25	X	X	X	X	X			
26	X	X	X	X	X	X		
27	X	X	X	X	X	X		
28	X	X	X	X	X	X	X	
29	X	X	X				X	X
30	X	X	X	X	X		X	
31	X	X	X	X	X		X	
32	X	X	X	X	X	X	X	
33	X	X	X	X	X		X	
34	X	X	X	X	X		X	
35	X	X	X	X	X		X	
36	X	X	X	X	X		X	
37	X	X	X		X			X
38	X	X	X	X	X	X	X	
39	X	X	X	X	X			
40	X	X	X	X	X			
41	X	X	X	X	X	X		
42	X	X	X	X	X			
43	X	X	X	X	X			
44	X	X	X	X	X			
45	X	X	X	X	X		X	
46	X	X	X	X	X			
47	X	X	X	X	X			
48	X	X	X	X	X			
49	X	X	X	X	X		X	
50	X	X	X	X	X		X	
51	X	X	X	X	X	X	X	
52	X	X	X	X	X		X	
53	X	X	X	X	X		X	
54	X	X	X	X	X		X	
55	X	X	X	X	X		X	
56	X	X	X	X	X		X	
57	X	X	X	X	X		X	
58	X	X	X	X	X	X		
59	X	X	X	X	X		X	
60	X	X	X	X	X	X	X	
61	X	X	X	X	X		X	
62	X	X	X	X	X		X	
63	X	X	X	X	X		X	
64	X	X	X	X	X		X	
65	X	X	X	X	X		X	
66	X	X	X	X	X	X	X	
67	X	X	X	X	X		X	
68	X	X	X	X	X		X	
69	X	X	X	X	X	X	X	
70	X	X	X	X	X		X	
71	X	X	X	X	X		X	
72	X	X	X	X	X		X	
73	X	X	X	X	X		X	
74	X	X	X	X	X		X	

Table 2a: (continued)

station	sal	ox	nuts	CFC	CO2	ge	^{18}O	gen
75	X	X	X	X	X		X	
76	X	X	X	X	X		X	
77	X	X	X	X	X	X	X	
78	X	X	X	X	X		X	
79	X	X	X	X	X		X	
80	X	X	X	X	X			
81	X	X	X	X	X	X		
82	X	X	X	X	X			
83	X	X	X	X	X	X		
84	X	X	X	X	X			
85	X	X	X	X	X			
86	X	X	X	X	X	X		
87	X	X	X	X	X	X		
88	X	X	X	X	X	X		
89	X	X	X	X	X	X		
90	X	X	X					X
91	X	X	X	X	X	X		
92	X	X	X					X
93	X	X	X	X	X	X		
94	X	X	X	X	X			
95	X	X	X	X	X			
96	X	X	X	X	X			
97	X	X	X	X	X			
98	X	X	X	X	X			
99	X	X	X	X	X			
100	X	X	X	X	X			
101	X	X	X	X	X	X		
102	X	X	X	X	X			
103	X	X	X	X	X			

station	sal	ox	nuts	CFC	CO2	ge	^{18}O	gen
104	X	X	X	X	X			
105	X	X	X	X	X			
106	X	X	X	X	X			
107	X	X	X	X	X			
108	X	X	X	X	X			
109	X	X	X	X	X			
110	X	X	X	X	X			
111	X	X	X	X	X			
112	X		X					
113	X		X					
114	X		X					
115	X		X					
116	X		X					
117	X		X					
118	X		X					
119	X	X	X	X	X			
120	X	X	X	X	X		X	
121	X	X	X	X	X		X	
122	X	X	X	X	X		X	
123	X	X	X	X	X		X	
124	X	X	X	X	X		X	
125	X	X	X	X	X		X	
126	X	X	X	X	X	X	X	
127	X	X	X	X	X		X	
128	X	X	X	X	X		X	
129	X	X	X	X	X		X	
130	X	X	X	X	X		X	
131								X

<u>Table 2b:</u> Cruise au0806 summary of samples drawn from Niskin bottles (except for "NIWA") at each station, including "sal"= salinity, "ox"=dissolved oxygen, "nuts"=nutrients (i.e. phosphate, nitrate+nitrite, silicate), "CFC"=chlorofluorocarbons, "CO2"=dissolved inorganic carbon and alkalinity, "^{14}C", "DOC"=dissolved organic carbon, "^{18}O", "dens"=analysis of the effect of water composition on water density, "ge"=germanium/silica/boron isotopes, "NIWA"=trace metal rosette deployed from trawldeck, "TM"=trace metal bottles on CTD package, "chl-a"=chlorophyll-a, "cell #"=cell counts, "pig"=pigments, and "Nd"=neodymium.

station	sal	ox	nuts	CFC	CO2	^{14}C	DOC	^{18}O	dens	ge	NIWA	TM	chl-a	cell #	pig	Nd	Comments
1	X	X	X														CTD test
2	X	X	X		X												CTD test
3																	Test of TM Niskins
4	X	X	X	X	X	X	X	X		X	X		X	X	X	X	
5	X	X	X	X	X	X	X	X									
6	X	X	X	X	X	X		X									
7	X	X	X	X	X			X			X	X	X	X	X		
8	X	X	X	X	X	X	X	X	X								
9	X	X	X	X	X			X		X							
10	X	X	X	X	X			X					X				
11	X	X	X					X			X		X	X	X		near iceberg
12	X	X	X	X	X	X	X	X									
13	X	X	X	X	X			X		X		X	X			X	
14	X	X	X	X	X			X		X	X				X		
15	X	X	X	X	X	X	X	X							X		
16	X	X	X	X	X			X	X	X			X				XBT
17	X	X	X	X	X		X	X			X				X		
18	X	X	X	X	X			X		X							
19	X	X	X	X	X		X	X			X		X	X	X		
20	X	X	X	X	X	X	X	X	X	X							
21	X	X	X	X	X			X				X	X	X	X		XBT
22	X	X	X	X	X			X			X						
23	X	X	X	X	X		X	X		X							
24	X	X	X	X	X			X	X		X		X	X	X		
25	X	X	X	X	X	X	X	X		X							XBT
26	X	X	X	X	X			X				X	X	X	X		
27	X	X	X	X	X			X			X						
28	X	X	X	X	X		X	X	X	X							
29	X	X	X	X	X	X	X	X			X		X	X	X		
30	X	X	X	X	X			X		X							XBT
31												X					all bottles at 80 m for C. Hassler
32	X	X	X	X	X		X	X	X		X		X	X	X		
33	X	X	X	X	X		X	X									Argo 2948
34	X	X	X	X	X			X			X		X	X	X		
35	X	X	X	X	X	X	X	X	X	X							

Table 2b: **(continued)**

station	sal	ox	nuts	CFC	CO2	^{14}C	DOC	^{18}O	dens	ge	NIWA	TM	chl-a	cell #	pig	Nd	Comments
36	X	X	X	X	X						X		X	X	X		
37	X	X	X	X	X		X			X							oxy-isotope to compare with u/w; XBT
38	X	X	X	X	X							X	X	X	X		
39	X	X	X	X	X						X						
40	X	X	X	X	X	X	X		X	X							
41	X	X	X	X	X						X		X	X	X		Argo 2953
42	X	X	X	X	X							X				X	
43	X	X	X	X	X												
44	X	X	X	X	X	X	X				X		X	X	X		
45	X	X	X	X	X					X							XBT
46	X	X	X	X	X												
47	X	X	X	X	X							X	X	X	X		
48	X	X	X		X						X						
49	X	X	X		X		X			X							
50	X	X	X	X	X	X	X										Argo 2944; 1 TM bottle at chl max
51	X	X	X	X	X						X		X	X	X		
52	X	X	X	X	X		X										XBT
53	X	X	X	X	X				X	X							
54	X	X	X	X	X						X		X	X	X		
55	X	X	X	X	X	X	X										
56	X	X	X	X	X							X	X	X	X		
57	X	X	X	X	X						X						
58	X	X	X	X	X		X			X							XBT
59	X	X	X	X	X						X		X	X	X		Argo 2952
60	X	X	X	X	X					X		X				X	
61	X	X	X	X	X					X							
62	X	X	X	X	X	X	X				X		X	X	X		
63	X	X	X	X	X												XBT
64	X	X	X	X	X						X	X	X	X	X		
65	X	X	X	X	X												
66	X	X	X	X	X	X	X			X							
67	X	X	X	X	X						X	X	X	X	X		
68	X	X	X	X	X	X	X			X							
69	X	X	X	X	X		X		X		X		X	X	X		Argo 2950; 1 TM bottle at chl max; oxy-isotope for comp u/w
70	X	X	X	X	X	X	X		X	X							
71	X	X	X	X	X						X		X	X	X		
72	X	X	X	X	X					X							TM bottle near chl max
73	X	X	X	X	X						X		X	X	X		

<u>Table 3:</u> CTD serial 704 calibration coefficients and calibration dates for cruises au0803 and au0806 (same calibrations used for both cruises). Note that platinum temperature calibrations are for the ITS-90 scale. Pressure slope/offset, temperature and conductivity values are from the CSIRO Division of Marine and Atmospheric Research calibration facility. Remaining values are manufacturer supplied.

Primary Temperature, serial 4248, 17/04/2007

G	: 4.3877775e-003
H	: 6.5187583e-004
I	: 2.3855632e-005
J	: 1.9839367e-006
F0	: 1000.000
Slope	: 1.00000000
Offset	: 0.0000

Secondary Temperature, serial 4246, 17/04/2007

G	: 3.9792192e-003
H	: 6.2190883e-004
I	: 1.8759246e-005
J	: 1.5805230e-006
F0	: 1000.000
Slope	: 1.00000000
Offset	: 0.0000

Primary Conductivity, serial 2977, 17/04/2007

G	: -1.0711335e+001
H	: 1.4782696e+000
I	: 1.9940078e-003
J	: -7.6134805e-005
CTcor	: 3.2500e-006
CPcor	: -9.57000000e-008
Slope	: 1.00000000
Offset	: 0.00000

Secondary Conductivity, serial 2808, 17/04/2007

G	: -9.2855258e+000
H	: 1.4251822+000
I	: -5.9428225e-005
J	: 8.6006408e-005
CTcor	: 3.2500e-006
CPcor	: -9.57000000e-008
Slope	: 1.00000000
Offset	: 0.00000

Pressure, serial 89084, 30/05/2007

C1	: -5.337692e+004
C2	: -5.768735e-001
C3	: 1.541700e-002
D1	: 3.853800e-002
D2	: 0.000000e+000
T1	: 2.984003e+001
T2	: -4.090591e-004
T3	: 3.693030e-006
T4	: 3.386020e-009
T5	: 0.000000e+000
Slope	: 0.99992139
Offset	: 0.8298967
AD590M	: 1.283280e-002
AD590B	: -9.705660e+000

Oxygen, serial 0178, 11/05/2007

Soc	: 5.5760e-001
Boc	: 0.0000
Offset	: -0.4930
Tcor	: 0.0099
Pcor	: 1.350e-004
Tau	: 0.0

Fluorometer, serial 296, 23/05/2005

Vblank	: 0.12
Scale factor	: 7.000e+000

Table 4: CTD conductivity calibration coefficients for cruises au0803 and au0806. F_1, F_2 and F_3 are respectively conductivity bias, slope and station-dependent correction calibration terms. n is the number of samples retained for calibration in each station grouping; σ is the standard deviation of the conductivity residual for the n samples in the station grouping.

stn grouping	F_1	F_2	F_3	n	σ
au0803					
001 to 031	-0.58395229E-03	0.99998139E-03	0.20686489E-09	283	0.000997
032 to 051	0.10130006E-02	0.99995148E-03	-0.16019067E-08	166	0.000615
052 to 075	0.30777776E-02	0.99975509E-03	0.21164851E-09	459	0.000603
076 to 101	0.87620023E-03	0.99985717E-03	0.25587303E-09	177	0.000682
102 to 131	0.38699061E-02	0.99980105E-03	-0.37596166E-09	272	0.000641
au0806					
001 to 010	0.10342055E-01	0.99968467E-03	-0.97792982E-08	135	0.000861
011 to 028	-0.19794018E-02	0.10000440E-02	-0.16522113E-08	312	0.000735
029 to 038	-0.18389307E-01	0.10006718E-02	-0.40139781E-08	170	0.000476
039 to 052	-0.16136552E-02	0.99999518E-03	-0.23017785E-09	261	0.000502
053 to 061	-0.22156146E-02	0.99992538E-03	0.12127648E-08	172	0.000649
062 to 073	0.12520987E-03	0.99985758E-03	0.81101976E-09	193	0.000838

Table 5: Station-dependent-corrected conductivity slope term ($F_2 + F_3 . N$), for station number N, and F_2 and F_3 the conductivity slope and station-dependent correction calibration terms respectively, for cruises au0803 and au0806.

station number	($F_2 + F_3 . N$)	station number	($F_2 + F_3 . N$)	station number	($F_2 + F_3 . N$)	station number	($F_2 + F_3 . N$)
au0803							
1	0.99998160E-03	34	0.99977957E-03	67	0.99980732E-03	100	0.99980546E-03
2	0.99998180E-03	35	0.99977818E-03	68	0.99980758E-03	101	0.99980548E-03
3	0.99998201E-03	36	0.99977679E-03	69	0.99980784E-03	102	0.99980345E-03
4	0.99998222E-03	37	0.99977540E-03	70	0.99980810E-03	103	0.99980298E-03
5	0.99998242E-03	38	0.99977401E-03	71	0.99980837E-03	104	0.99980251E-03
6	0.99998263E-03	39	0.99977261E-03	72	0.99980863E-03	105	0.99980204E-03
7	0.99998284E-03	40	0.99977122E-03	73	0.99980889E-03	106	0.99980157E-03
8	0.99998304E-03	41	0.99976983E-03	74	0.99980915E-03	107	0.99980110E-03
9	0.99998325E-03	42	0.99976844E-03	75	0.99980941E-03	108	0.99980063E-03
10	0.99998346E-03	43	0.99976705E-03	76	0.99980490E-03	109	0.99980016E-03
11	0.99998366E-03	44	0.99976566E-03	77	0.99980493E-03	110	0.99979969E-03
12	0.99998387E-03	45	0.99976427E-03	78	0.99980495E-03	111	0.99979922E-03
13	0.99998408E-03	46	0.99976288E-03	79	0.99980497E-03	112	0.99979875E-03
14	0.99998429E-03	47	0.99976149E-03	80	0.99980500E-03	113	0.99979828E-03
15	0.99998449E-03	48	0.99976010E-03	81	0.99980502E-03	114	0.99979781E-03
16	0.99998470E-03	49	0.99975871E-03	82	0.99980504E-03	115	0.99979734E-03
17	0.99998491E-03	50	0.99975732E-03	83	0.99980506E-03	116	0.99979687E-03
18	0.99998511E-03	51	0.99975593E-03	84	0.99980509E-03	117	0.99979640E-03
19	0.99998532E-03	52	0.99980340E-03	85	0.99980511E-03	118	0.99979593E-03
20	0.99998553E-03	53	0.99980366E-03	86	0.99980513E-03	119	0.99979546E-03
21	0.99998573E-03	54	0.99980392E-03	87	0.99980516E-03	120	0.99979499E-03
22	0.99998594E-03	55	0.99980418E-03	88	0.99980518E-03	121	0.99979452E-03
23	0.99998615E-03	56	0.99980444E-03	89	0.99980520E-03	122	0.99979405E-03
24	0.99998635E-03	57	0.99980471E-03	90	0.99980523E-03	123	0.99979358E-03
25	0.99998656E-03	58	0.99980497E-03	91	0.99980525E-03	124	0.99979311E-03
26	0.99998677E-03	59	0.99980523E-03	92	0.99980527E-03	125	0.99979264E-03
27	0.99998697E-03	60	0.99980549E-03	93	0.99980529E-03	126	0.99979217E-03
28	0.99998718E-03	61	0.99980575E-03	94	0.99980532E-03	127	0.99979170E-03
29	0.99998739E-03	62	0.99980601E-03	95	0.99980534E-03	128	0.99979123E-03
30	0.99998760E-03	63	0.99980627E-03	96	0.99980536E-03	129	0.99979076E-03
31	0.99998780E-03	64	0.99980654E-03	97	0.99980539E-03	130	0.99979029E-03
32	0.99978235E-03	65	0.99980680E-03	98	0.99980541E-03	131	0.99979029E-03
33	0.99978096E-03	66	0.99980706E-03	99	0.99980543E-03		

Table 5: (continued)

station number	(F$_2$ + F$_3$. N)	station number	(F$_2$ + F$_3$. N)	station number	(F$_2$ + F$_3$. N)	station number	(F$_2$ + F$_3$. N)
au0806							
1	0.99967489E-03	20	0.10000109E-02	39	0.99998620E-03	58	0.99999572E-03
2	0.99966511E-03	21	0.10000093E-02	40	0.99998597E-03	59	0.99999693E-03
3	0.99965533E-03	22	0.10000076E-02	41	0.99998574E-03	60	0.99999815E-03
4	0.99964555E-03	23	0.10000060E-02	42	0.99998551E-03	61	0.99999936E-03
5	0.99963577E-03	24	0.10000043E-02	43	0.99998528E-03	62	0.99990787E-03
6	0.99962599E-03	25	0.10000026E-02	44	0.99998505E-03	63	0.99990868E-03
7	0.99961621E-03	26	0.10000010E-02	45	0.99998482E-03	64	0.99990949E-03
8	0.99960643E-03	27	0.99999934E-03	46	0.99998459E-03	65	0.99991030E-03
9	0.99959665E-03	28	0.99999769E-03	47	0.99998436E-03	66	0.99991111E-03
10	0.99958687E-03	29	0.10005554E-02	48	0.99998413E-03	67	0.99991192E-03
11	0.10000258E-02	30	0.10005513E-02	49	0.99998390E-03	68	0.99991273E-03
12	0.10000241E-02	31	0.10005473E-02	50	0.99998367E-03	69	0.99991354E-03
13	0.10000225E-02	32	0.10005433E-02	51	0.99998344E-03	70	0.99991435E-03
14	0.10000208E-02	33	0.10005393E-02	52	0.99998321E-03	71	0.99991516E-03
15	0.10000192E-02	34	0.10005353E-02	53	0.99998966E-03	72	0.99991598E-03
16	0.10000175E-02	35	0.10005313E-02	54	0.99999087E-03	73	0.99991679E-03
17	0.10000159E-02	36	0.10005273E-02	55	0.99999208E-03		
18	0.10000142E-02	37	0.10005232E-02	56	0.99999330E-03		
19	0.10000126E-02	38	0.10005192E-02	57	0.99999451E-03		

Table 6: Surface pressure offsets (i.e. poff, in dbar) for cruises au0803 and au0806. For each station, these values are subtracted from the pressure calibration "offset" value in Table 3.

stn	poff	stn	poff	stn	poff	stn	poff	stn	poff	stn	poff
au0803											
1	0.85	23	0.35	45	0.34	67	0.30	89	0.49	111	0.38
2	0.63	24	0.35	46	0.33	68	0.30	90	0.44	112	0.38
3	0.70	25	0.35	47	0.32	69	0.26	91	0.36	113	0.56
4	0.41	26	0.35	48	0.33	70	0.31	92	0.36	114	0.40
5	0.43	27	0.35	49	0.38	71	0.43	93	0.38	115	0.40
6	0.39	28	0.38	50	0.36	72	0.26	94	0.47	116	0.39
7	0.21	29	0.23	51	0.70	73	0.34	95	0.43	117	0.40
8	0.31	30	0.30	52	0.52	74	0.25	96	0.35	118	0.42
9	0.22	31	0.35	53	0.42	75	0.27	97	0.38	119	0.45
10	0.21	32	0.33	54	0.36	76	0.18	98	0.38	120	0.50
11	0.40	33	0.33	55	0.28	77	0.35	99	0.36	121	0.42
12	0.28	34	0.30	56	0.34	78	0.26	100	0.35	122	0.38
13	0.35	35	0.31	57	0.29	79	0.32	101	0.37	123	0.43
14	0.43	36	0.22	58	0.32	80	0.46	102	0.36	124	0.42
15	0.39	37	0.36	59	0.35	81	0.33	103	0.34	125	0.44
16	0.42	38	0.32	60	0.41	82	0.39	104	0.38	126	0.42
17	0.35	39	0.34	61	0.33	83	0.42	105	0.41	127	0.35
18	0.29	40	0.37	62	0.41	84	0.47	106	0.40	128	0.34
19	0.25	41	0.39	63	0.37	85	0.41	107	0.33	129	0.36
20	0.25	42	0.25	64	0.46	86	0.49	108	0.44	130	0.42
21	0.34	43	0.30	65	0.32	87	0.49	109	0.37	131	0.41
22	0.33	44	0.25	66	0.33	88	0.47	110	0.32		
au0806											
1	0.64	14	0.26	27	0.15	40	0.62	53	0.56	66	0.73
2	0.55	15	0.25	28	0.24	41	0.61	54	0.53	67	0.81
3	0.32	16	0.24	29	0.22	42	0.68	55	0.58	68	0.78
4	0.29	17	0.24	30	0.23	43	0.47	56	0.47	69	0.78
5	0.28	18	0.25	31	0.21	44	0.63	57	0.38	70	0.83
6	0.22	19	0.20	32	0.24	45	0.70	58	0.54	71	0.72
7	0.31	20	0.29	33	0.41	46	0.73	59	0.48	72	0.74
8	0.30	21	0.27	34	0.42	47	0.67	60	0.58	73	0.73
9	0.33	22	0.13	35	0.53	48	0.60	61	0.40		
10	0.25	23	0.24	36	0.49	49	0.72	62	0.59		
11	0.31	24	0.28	37	0.62	50	0.63	63	0.63		
12	0.33	25	0.23	38	0.69	51	0.67	64	0.61		
13	0.31	26	0.30	39	0.54	52	0.65	65	0.60		

<u>Table 7a:</u> CTD dissolved oxygen calibration coefficients for cruise au0803: slope, bias, tcor (= temperature correction term), and pcor (= pressure correction term). dox is equal to 2.8σ , for σ as defined in the *CTD Methodology*. For deep stations, coefficients are given for both the shallow and deep part of the profile, according to the profile split used for calibration (see section 4.4 in the text); whole profile fit used for stations shallower than 3000 dbar (i.e. stations with only "shallow" set of coefficients in the table).

	---------------------shallow----------------------------					---------------------deep---------------------------------				
stn	slope	bias	tcor	pcor	dox	slope	bias	tcor	pcor	dox
1	0.427786	-0.109195	0.000207	0.000053	0.160493	0.511620	-0.274024	-0.009704	0.000141	0.028915
2	-	-	-	-	-					
3	-	-	-	-	-					
4	0.396565	0.019589	0.039588	0.000117	0.027455					
5	0.453997	-0.177394	0.001822	0.000164	0.138066					
6	0.499448	-0.293491	-0.006825	0.000178	0.160466					
7	0.544851	-0.348060	0.033375	0.000259	0.087520					
8	0.544475	-0.405101	-0.016203	0.000197	0.085409					
9	0.496019	-0.276603	-0.006474	0.000167	0.137101					
10	0.491001	-0.285224	-0.021460	0.000165	0.162961					
11	0.147777	0.873420	0.199935	0.000098	0.139939					
12	0.939544	-0.827988	0.293372	0.000631	0.060601					
13	0.501571	-0.292480	-0.006325	0.000182	0.048954					
14	0.267296	0.398080	0.080509	0.000081	0.073026					
15	0.131919	0.800924	0.134249	0.000060	0.117454					
16	0.411085	0.024984	0.066847	0.000163	0.049937					
17	0.290371	0.311503	0.073016	0.000083	0.164172					
18	0.443133	-0.138695	0.009369	0.000142	0.125920					
19	0.168166	0.656547	0.114755	0.000061	0.198810					
20	0.435798	-0.119904	0.006539	0.000128	0.053972					
21	0.343123	0.166902	0.059556	0.000159	0.119368					
22	0.237043	0.404171	0.044135	0.000008	0.122849					
23	0.455684	-0.165324	-0.001963	0.000108	0.160522					
24	0.672884	-0.774043	-0.064764	0.000322	0.076672					
25	-0.002488	1.164684	0.181286	0.000046	0.163289					
26	0.345443	0.147029	0.044360	0.000090	0.033190					
27	0.141110	0.873845	0.186252	0.000081	0.096519					
28	0.411367	-0.097003	-0.013050	0.000122	0.044179					
29	0.292019	0.132401	0.006446	0.000151	1.103887					
30	0.483799	-0.239807	0.000275	0.000149	0.049828					
31	0.395769	-0.081870	-0.023461	0.000139	0.074950					
32	0.319299	0.050204	-0.077567	0.000014	0.130802					
33	0.235277	0.203090	-0.081038	0.000068	0.096836					
34	0.264403	0.348819	0.065375	0.000090	0.142535					
35	0.229465	0.509202	0.110287	0.000073	0.048907					
36	0.006753	1.118414	0.173396	0.000049	0.146971					
37	2.465381	-3.434575	1.699939	0.003934	40.000000					
38	0.301852	0.105059	-0.040071	0.000113	0.113278					
39	0.506500	-0.298438	-0.004573	0.000178	0.135575					
40	0.511966	-0.302933	0.001777	0.000190	0.037394					
41	0.487592	-0.247167	0.003351	0.000169	0.072285					
42	0.486022	-0.243593	0.008495	0.000192	0.081831					
43	0.450488	-0.155143	0.019422	0.000194	0.119587					
44	0.448582	-0.148322	0.012332	0.000173	0.103154					
45	0.699095	-0.835253	-0.106844	0.000153	0.193763					
46	0.653069	-0.699342	-0.057316	0.000231	0.065666					
47	0.501137	-0.288842	-0.006093	0.000177	0.028652					
48	0.195627	0.404277	0.013678	0.000118	0.038744					
49	0.487192	-0.244554	-0.003432	0.000131	0.089037					
50	0.499763	-0.267175	0.008524	0.000150	0.161074					
51	0.477771	-0.224296	-0.011882	0.000133	0.166323					
52	0.485878	-0.242652	-0.003317	0.000140	0.075290					
53	0.479074	-0.227028	-0.005280	0.000135	0.088561					
54	0.506079	-0.272273	-0.011232	0.000141	0.243668					
55	0.483132	-0.232550	-0.000419	0.000132	0.063574	0.407686	-0.267031	0.289103	0.000291	0.093203
56	0.548470	-0.390531	0.039545	0.000203	0.064740	0.401656	-0.098887	0.000059	0.000124	0.087820
57	0.490611	-0.247333	-0.004417	0.000139	0.108881	0.396913	-0.104758	0.011257	0.000131	0.030433
58	0.479044	-0.222276	-0.007713	0.000129	0.065433	0.596036	-0.401345	-0.032650	0.000146	0.052840
59	0.496370	-0.295049	0.028586	0.000170	0.069910	0.595972	-0.400855	-0.029573	0.000148	0.032392
60	0.479556	-0.267722	0.037237	0.000159	0.126566	0.707625	-0.598057	-0.030501	0.000190	0.057203
61	0.484116	-0.246964	0.006291	0.000146	0.073325	0.598801	-0.399279	-0.028252	0.000147	0.031858
62	0.478725	-0.206030	-0.017479	0.000120	0.085993	0.503993	-0.261647	-0.015010	0.000139	0.043235

Table 7a: (continued)

	----shallow----					----deep----				
stn	slope	bias	tcor	pcor	dox	slope	bias	tcor	pcor	dox
63	0.495691	-0.269018	0.006700	0.000154	0.092143	0.396886	-0.104919	0.007120	0.000128	0.026750
64	0.500217	-0.263810	-0.001117	0.000140	0.056760	0.397704	-0.104362	0.007449	0.000128	0.054198
65	0.541553	-0.397330	0.059683	0.000198	0.096841	0.394254	-0.107307	0.012838	0.000132	0.037536
66	0.498587	-0.275431	0.009542	0.000152	0.060068	0.396055	-0.105827	0.010366	0.000129	0.036482
67	0.510197	-0.304109	0.018484	0.000162	0.057121	0.397366	-0.105356	0.011945	0.000129	0.055688
68	0.530144	-0.349579	0.029957	0.000181	0.107726	0.392304	-0.108990	0.025264	0.000137	0.048362
69	0.509907	-0.306472	0.016937	0.000173	0.122485	0.401112	-0.099102	-0.002997	0.000123	0.045209
70	0.505095	-0.282597	0.000589	0.000162	0.218064	0.395630	-0.105676	0.025164	0.000136	0.049641
71	0.509985	-0.283589	0.006800	0.000146	0.169907	0.471616	-0.223115	0.001687	0.000143	0.028223
72	0.482432	-0.231865	-0.005878	0.000137	0.083711					
73	0.505279	-0.279058	-0.000189	0.000150	0.150684					
74	0.481465	-0.225672	-0.004413	0.000134	0.062569					
75	0.524538	-0.301987	0.012735	0.000146	0.174446					
76	0.505363	-0.265795	0.003147	0.000134	0.141618					
77	0.502571	-0.269278	0.005358	0.000156	0.162077					
78	0.419799	0.015566	0.071293	0.000095	0.132452					
79	0.502424	-0.283412	-0.032600	0.000035	0.096100					
80	0.571638	-0.451273	-0.027189	0.000251	0.245243					
81	0.428663	-0.095076	0.011234	0.000068	0.131499					
82	0.541451	-0.379390	-0.016296	0.000210	0.197745					
83	0.290858	0.187669	-0.020916	0.000014	0.044349					
84	0.397764	0.006754	0.049587	0.000139	0.088052					
85	0.506277	-0.286871	-0.008358	0.000132	0.042886					
86	0.505565	-0.289249	-0.015641	0.000124	0.231313					
87	1.357917	-2.652934	-0.245696	0.001774	0.096919					
88	0.524251	-0.331085	0.002159	0.000216	0.056147					
89	0.376260	0.134815	0.089438	0.000167	0.075452					
90	0.043340	0.778305	0.005587	0.000357	1.395597					
91	0.514559	-0.338379	-0.031105	0.000157	0.077061					
92	2.699669	-3.778601	1.647994	0.002404	40.000000					
93	0.504993	-0.287956	-0.005886	0.000166	0.136099					
94	0.509077	-0.261018	0.023508	0.000151	0.077056					
95	0.786538	-1.065292	-0.107391	0.000923	0.116465					
96	0.405211	-0.027424	0.022046	0.000014	0.142171					
97	0.510325	-0.300261	-0.012337	0.000149	0.130600					
98	0.496192	-0.295052	-0.028993	0.000154	0.075303					
99	0.495640	-0.226853	0.033796	0.000186	0.194735					
100	0.449715	-0.131657	0.015547	0.000087	0.068003					
101	0.599504	-0.503462	-0.003366	0.000334	0.076090					
102	0.309664	0.214373	0.050825	0.000035	0.021747					
103	0.331679	0.178087	0.060033	0.000003	0.105710					
104	0.505952	-0.279626	0.005883	0.000214	0.159005					
105	0.563717	-0.443363	-0.010933	0.000377	0.065222					
106	0.518427	-0.309918	-0.010722	0.000147	0.229878					
107	0.453489	-0.161833	0.007186	0.000097	0.096644					
108	0.480002	-0.234451	-0.001761	0.000144	0.106974					
109	0.506271	-0.290694	-0.003366	0.000171	0.124783					
110	0.515126	-0.295734	0.010001	0.000146	0.064423					
111	0.483913	-0.240877	-0.001201	0.000142	0.062955					
112	0.504025	-0.288693	-0.001154	0.000185	0.257888					
113	0.504025	-0.288693	-0.001154	0.000185	0.257888					
114	0.504025	-0.288693	-0.001154	0.000185	0.257888					
115	0.504025	-0.288693	-0.001154	0.000185	0.257888					
116	0.504025	-0.288693	-0.001154	0.000185	0.257888					
117	0.504025	-0.288693	-0.001154	0.000185	0.257888					
118	0.504025	-0.288693	-0.001154	0.000185	0.257888					
119	0.501612	-0.291546	-0.000324	0.000290	0.052654					
120	0.596635	-0.526075	-0.031100	0.000323	0.059770					
121	0.480031	-0.232975	-0.000969	0.000145	0.042451					
122	0.497159	-0.273002	-0.001915	0.000156	0.217881					
123	0.489093	-0.254015	0.001108	0.000148	0.079206					
124	0.491604	-0.256011	0.001865	0.000147	0.122260					
125	0.486684	-0.249000	0.011320	0.000148	0.142685					
126	0.467237	-0.216801	0.012599	0.000145	0.143743					
127	0.478361	-0.217157	-0.004490	0.000126	0.104614	0.439099	-0.245978	0.108481	0.000212	0.021771
128	0.483272	-0.239105	0.005983	0.000143	0.056201	0.501384	-0.226876	-0.041808	0.000115	0.024280
129	0.462102	-0.210926	0.018242	0.000139	0.195680	0.598549	-0.396806	-0.022955	0.000142	0.068609
130	0.485644	-0.182417	-0.042281	0.000100	0.103639	0.515231	-0.284480	0.005107	0.000144	0.057571
131	-	-	-	-	-	-	-	-	-	-

<u>Table 7b:</u> CTD dissolved oxygen calibration coefficients for cruise au0806: slope, bias, tcor (= temperature correction term), and pcor (= pressure correction term). dox is equal to 2.8σ , for σ as defined in the *CTD Methodology*. Note that coefficients are given for both the shallow and deep part of the profile, according to the profile split used for calibration (see section 4.4 in the text). Note: split profile fit for all stations except stations 3, 4, 5, 6, 11, 15, 31, 43, 61, 55, 71, 72, 73 i.e. stations with only "shallow" set of coefficients in the table.

	---------------------shallow-----------------------------					---------------------deep---------------------------------				
stn	slope	bias	tcor	pcor	dox	slope	bias	tcor	pcor	dox
1	-	-	-	-	-	-	-	-	-	-
2	0.508776	-0.273201	-0.011471	0.000142	0.110065	0.600405	-0.397500	-0.025326	0.000143	0.063524
3	-	-	-	-	-					
4	0.505697	-0.278160	0.007657	0.000145	0.043210					
5	0.333585	-0.315013	-0.337127	0.000766	0.085714					
6	0.526856	-0.255178	0.002441	0.000126	0.142496					
7	0.520065	-0.262576	-0.003154	0.000138	0.084498	0.490205	-0.213292	-0.018789	0.000132	0.017054
8	0.481924	-0.235379	-0.002939	0.000140	0.088786	0.310536	0.087994	-0.093301	0.000074	0.028999
9	0.485480	-0.238436	0.003322	0.000134	0.083590	0.263042	0.174352	-0.086597	0.000062	0.019285
10	0.606841	-0.460837	0.026408	0.000205	0.111804	0.400785	-0.099495	0.012368	0.000134	0.011334
11	0.505571	-0.270593	-0.000625	0.000146	0.070104					
12	0.462883	-0.199131	-0.020147	0.000136	0.158122	0.594195	-0.400973	-0.029473	0.000142	0.036920
13	0.418980	-0.067923	-0.059618	0.000077	0.077159	0.596687	-0.399043	-0.032540	0.000142	0.032200
14	0.394783	-0.010027	-0.079798	0.000063	0.085826	0.521109	-0.335618	0.027703	0.000181	0.017124
15	0.472172	-0.220414	-0.004343	0.000137	0.087030					
16	0.498917	-0.227658	-0.017598	0.000126	0.112452	0.603583	-0.392855	-0.025521	0.000145	0.026751
17	0.492231	-0.276445	0.012883	0.000164	0.051366	0.396269	-0.105645	0.005848	0.000130	0.018647
18	0.473344	-0.250885	0.017368	0.000161	0.081829	0.590282	-0.462855	0.027442	0.000207	0.056324
19	0.487733	-0.234176	-0.011770	0.000132	0.030255	0.395437	-0.107796	0.006887	0.000129	0.030157
20	0.484946	-0.225467	-0.013550	0.000128	0.079913	0.594244	-0.401494	-0.024572	0.000155	0.036136
21	0.500344	-0.242851	-0.019528	0.000127	0.065213	0.395046	-0.107691	0.007377	0.000128	0.022729
22	0.472553	-0.236714	0.006665	0.000151	0.071519	0.397806	-0.105207	0.002917	0.000126	0.026907
23	0.505461	-0.263594	-0.014295	0.000141	0.062616	0.394691	-0.107612	0.009341	0.000129	0.018962
24	0.475872	-0.234145	0.001745	0.000145	0.057599	0.394377	-0.108254	0.011544	0.000129	0.026471
25	0.478477	-0.244532	0.002787	0.000152	0.063987	0.390732	-0.109746	0.014839	0.000133	0.038832
26	0.512866	-0.272591	-0.012252	0.000138	0.033533	0.400591	-0.106398	-0.000371	0.000123	0.033519
27	0.497377	-0.246612	-0.008604	0.000132	0.133012	0.397875	-0.104016	0.001676	0.000125	0.009705
28	0.471253	-0.227573	0.003057	0.000142	0.086009	0.395133	-0.107190	0.006884	0.000127	0.017861
29	0.482213	-0.241619	-0.000421	0.000143	0.080800	0.393293	-0.109002	0.009105	0.000129	0.017968
30	0.483658	-0.244516	-0.000238	0.000145	0.075609	0.348877	0.009350	-0.017120	0.000092	0.034411
31	-	-	-	-	-	-	-	-	-	-
32	0.490449	-0.245401	-0.004243	0.000138	0.044382	0.398542	-0.105960	0.002398	0.000123	0.034662
33	0.501184	-0.264360	-0.006076	0.000145	0.064026	0.382619	-0.043393	-0.019889	0.000098	0.034015
34	0.473654	-0.231275	0.002336	0.000145	0.081853	0.464778	-0.174895	-0.020445	0.000115	0.023617
35	0.433295	-0.181717	0.017012	0.000143	0.063874	0.570259	-0.410108	0.011288	0.000190	0.039388
36	0.486568	-0.235180	-0.004273	0.000134	0.048154	0.396917	-0.105851	0.005261	0.000126	0.018842
37	0.483625	-0.245650	0.000017	0.000150	0.073867	0.396355	-0.106028	0.004539	0.000127	0.017087
38	0.476831	-0.233804	0.001386	0.000144	0.027584	0.396559	-0.107388	0.004045	0.000129	0.021684
39	0.504775	-0.270337	-0.006006	0.000156	0.069707	0.597691	-0.403464	-0.005221	0.000142	0.007469
40	0.481891	-0.236869	-0.000976	0.000140	0.084324	0.075201	0.487900	0.088716	0.000136	0.022927
41	0.496789	-0.267664	-0.002605	0.000159	0.059421	0.398278	-0.109065	0.002083	0.000125	0.033421
42	0.481268	-0.233386	-0.001425	0.000136	0.019476	0.483325	-0.223084	-0.009731	0.000132	0.052914
43	0.507699	-0.315449	0.000663	0.000229	0.071641					
44	0.503256	-0.252112	-0.008022	0.000131	0.072527	0.401089	-0.110755	0.001767	0.000123	0.041847
45	0.406835	-0.142450	0.015287	0.000129	0.127149	0.400283	-0.113415	0.000294	0.000127	0.045447
46	0.460665	-0.226358	0.005481	0.000154	0.079184	0.447890	-0.210366	0.009348	0.000152	0.051282
47	0.500191	-0.285075	-0.001131	0.000169	0.166280	0.519671	-0.296910	-0.000788	0.000150	0.042612
48	0.498770	-0.294080	0.000622	0.000193	0.105489	0.393991	-0.113277	0.001057	0.000135	0.020646
49	0.446185	-0.178508	0.003422	0.000122	0.050173	0.494746	-0.229211	-0.012182	0.000126	0.048459
50	0.456893	-0.155647	-0.002088	0.000082	0.113978	0.490728	-0.238930	-0.006471	0.000137	0.047679
51	0.441638	-0.157406	0.002268	0.000103	0.110426	0.425210	-0.210338	0.029027	0.000168	0.026662
52	0.497467	-0.286157	0.000428	0.000177	0.122029	0.606532	-0.381150	-0.027967	0.000141	0.057939
53	0.500734	-0.270555	-0.002417	0.000154	0.072047	0.439518	-0.214897	0.017495	0.000160	0.070478
54	0.500105	-0.279997	-0.001192	0.000162	0.053151	0.479229	-0.231567	-0.003251	0.000139	0.034726
55	0.516582	-0.276531	-0.005952	0.000139	0.089163					
56	0.502699	-0.283525	-0.001509	0.000165	0.032949	0.468467	-0.192804	-0.013404	0.000124	0.017906
57	0.503555	-0.272149	-0.002596	0.000145	0.044277	0.597590	-0.392144	-0.028321	0.000178	0.020918
58	0.479714	-0.230930	-0.000781	0.000136	0.089947	0.396025	-0.039947	-0.033213	0.000089	0.050977
59	0.482486	-0.237386	-0.000445	0.000138	0.053674	0.754695	-0.262882	-0.157465	0.000027	0.016391
60	0.476167	-0.236585	0.000837	0.000144	0.080228	0.394528	-0.111298	-0.001087	0.000126	0.054844
61	0.483773	-0.233420	-0.000799	0.000127	0.040768					
62	0.405656	-0.127278	0.008574	0.000117	0.087513	0.300367	-0.002163	0.016754	0.000123	0.037343
63	0.444342	-0.189243	0.004418	0.000131	0.052031	0.491681	-0.262053	0.002229	0.000148	0.033183

Table 7b: **(continued)**

	shallow					deep				
stn	slope	bias	tcor	pcor	dox	slope	bias	tcor	pcor	dox
64	0.835837	-0.637368	-0.036325	0.000104	0.133658	0.377963	-0.098574	0.009008	0.000128	0.022884
65	0.537333	-0.219146	-0.013196	0.000019	0.057135	0.509517	-0.272425	-0.007086	0.000144	0.057215
66	0.475925	-0.231014	0.000852	0.000131	0.122869	0.292960	-0.051764	0.042368	0.000172	0.062121
67	0.430495	-0.106424	0.000452	0.000046	0.087628	0.512372	-0.276351	-0.007624	0.000146	0.020297
68	0.490046	-0.140868	-0.008801	0.000006	0.086377	0.478771	-0.232715	0.000483	0.000137	0.025282
69	0.471962	-0.203725	-0.000349	0.000117	0.175024	0.260614	0.015762	0.043796	0.000137	0.073198
70	0.459297	-0.214908	0.002654	0.000144	0.068047	0.234714	-0.067342	0.101358	0.000274	0.044244
71	0.421452	-0.170627	0.007829	0.000154	0.089342					
72	0.428540	-0.129489	0.001524	0.000124	0.083848					
73	0.502113	-0.291677	0.000546	0.000139	0.014794					

Table 8a: **Missing data points in 2 dbar-averaged files for cruise au0803. "x" indicates missing data for the indicated parameters: T=temperature; S/C=salinity and conductivity; O=oxygen; F=fluorescence downcast; PAR=photosynthetically active radiation downcast; F_up=fluorescence upcast; PAR_up=photosynthetically active radiation upcast.**
Note: 2 and 4 dbar values not included here - 2 dbar value missing for most casts, 4 dbar value missing for many casts.

station	pressure (dbar) where data missing	T	S/C	O	F	PAR	F_up	PAR_up
1-3	6-8	x	x	x	x	x		
2	10-1004			x				
3	10-1002							
5	452	x	x	x	x	x	x	x
29	6-1324			x				
32	6-22			x				
33	6	x	x	x	x	x		
33	6-94			x				
36	6-8	x	x	x	x	x		
37	6-890			x				
38	6-10	x	x	x	x	x		
38	12-62			x				
48	6-66			x				
65	6	x	x	x	x	x		
90	6-1174			x				
92	6	x	x	x	x	x		
92	8-1184			x				
112	6-304			x				
113	6-302			x				
114	6-302			x				
115	6-302			x				
116	6-304			x				
117	6-304			x				
118	6-300			x				
120	6-8	x	x	x	x	x		
128	6	x	x	x	x	x		
131	6-8	x	x	x	x	x		
131	10-3702			x				

Table 8b: Missing data points in 2 dbar-averaged files for cruise au0806, as per Table 8a.

station	pressure (dbar) where data missing	T	S/C	O	F	PAR	F_up	PAR_up
1	6-16, 630,632,768,1030						x	x
1	862,1276							x
1	18-2210			x				
2	788,910,918							x
2	798						x	x
2	1640,2572			x				
2	2520,2540					x		
2	2524				x			
3	6-8	x	x	x	x	x		
3	10-302			x				
30	6-20	x	x	x		x		
31	6	x	x	x	x	x		
31	8-154							
32-33	6-8	x	x	x	x	x		
34-35	6	x	x	x	x	x		
36	6-24	x	x	x	x	x		
37	6	x	x	x	x	x		
40	6-8	x	x	x	x	x		
41	6	x	x	x	x	x		
44	6-8	x	x	x	x	x		
45	6	x	x	x	x	x		
46-47	6-8	x	x	x	x	x		
52	6-22	x	x	x	x	x		
53-54	6-8	x	x	x	x	x		
56-58	6	x	x	x	x	x		
59	4060	x	x	x	x	x	x	x
60-61	6-8	x	x	x	x	x		
61	1104	x	x	x	x	x	x	x
62	6-8	x	x	x	x	x		
63	6	x	x	x	x	x		
64-65	6-8	x	x	x	x	x		
69	6	x	x	x	x	x		
71	6-8	x	x	x	x	x		

Table 9: Suspect CTD 2 dbar averages (not deleted from the CTD 2 dbar average files) for the indicated parameters, for cruises au0803 and au0806.

station	suspect 2 dbar value (dbar)	parameters	comment
au0803			
5	4-28	oxygen	transient error at start
28	4-20	oxygen	transient error at start
54	6-46	oxygen	transient error at start
87	4-20	oxygen	transient error at start
au0806			
4	4-18	oxygen	transient error at start
5	4-102	oxygen	transient error at start
15	3768	oxygen	fouling after bottom contact
47	200-2000	oxygen	maybe innaccurate by up to ~2umol/l due to lack of bottles
64	250-1700	oxygen	reduced accurcay due to small number of bottles

<u>Table 10:</u> Bad salinity bottle samples (not deleted from bottle data file) for cruises au0803 and au0806.

au0803 station	rosette position	*au0806* station	rosette position
1	7,17,18	1	24
20	24	4	8
23	18	12	21,24
33	3,5	14	12
43	13	16	5
51	15	20	17
54	24	21	8
55	13	23	21
56	24	25	5
69	21	27	9
91	2	37	7
93	12	43	9
97	18	46	21
99	3	55	22
103	12	59	13
110	6	64	18
111	19	65	7
119	12	66	18
124	20	70	9
		71	9

<u>Table 11a:</u> Suspect nutrient sample values (not deleted from bottle data file) for cruise au0803.

PHOSPHATE station number	rosette position	NITRATE station number	rosette position	SILICATE station number	rosette position
		4,6	whole stn		
		8	15,18		
		12	1		
		16	6,8,10		
		17	6		
		21	2		
		26	2		
		24,26-29	whole stn		
		34	8		
		39	10,12,13,16		
		43	1,7		
		52	15-19		
		57	9-13		
		60,61	whole stn		
		62	1-6,17-21,24		
		68	14-16		
74	20	74	20		
		78-80	whole stn		
		81	1		
		95	4,6,8		
		97	4,16		
		94-97	whole stn		
		106	4,6,18,20		
		107	6,8,10,12		
		110	20		
		124	6,8-11,20		
		126	9-15		

<u>Table 11b:</u> Suspect nutrient sample values (not deleted from bottle data file) for cruise au0806.

PHOSPHATE		NITRATE		SILICATE	
station number	rosette position	station number	rosette position	station number	rosette position
		2	6		
		5	17,19		
7	14	7	14		
9	6	9	6	9	6
14	11				
		16	11		
		17	1-4		
23	4				
27	9	27	9	27	9
		29	9-15		
		35	3-6		
		36	24		
		38	15		
		39	2-5		
40	13,14	40	13,14		
		46	11-21,24		
		50	1-4,7,8		
53	9	53	9	53	9
		54	9-12		
		55	8		
		59	9		
		63	11		
		67	3		

<u>Table 12:</u> Suspect dissolved oxygen bottle values (not deleted from bottle data file) for cruises au0803 and au0806.

station	rosette position
au0803	
-	-
au0806	
16	16
19	9
36	1
38	11
66	1

<u>Table 13a:</u> Scientific personnel (cruise participants) for cruise au0803.

Edi Albert	doctor, CTD
Margot Foster	media, CTD
Beverley Henry	hydrochemistry
Chris Kuplis	comms, CTD
Sarah Merefield	biology, CTD
Alicia Navidad	hydrochemistry
Tomas Remenyi	hydrochemistry, iceberg sampling
Steve Rintoul	CTD, CASO chief scientist
Mark Rosenberg	CTD, moorings
Ben Smethurst	biology, CTD
Jess Trevena	CTD
Esmee van Wijk	CTD
Kate Berry	carbon
Melissa Coman	carbon
Danica Ellicott	carbon
Kristina Paterson	carbon
Emily Lemagie	CFC
Mark Warner	CFC
Helena Baird	biology, sediment
Jean-François Barazer	biology
Rob Beaman	biology
Jules Biggart	biology
Kim Briggs	electronics, gear
Fred Busson	biology
Romain Causse	biology
Stefan Chilmonczyk	biology
Stuart Crapper	gear officer
Marc Eleaume	biology
Bertrand Richer de Forges	biology
Bryan Fry	biology
Chris Gillies	biology, sediment
Jeff Hoffman	genetics
Samuel Iglesias	biology
Glenn Johnstone	biology
Andrea de Leon	germanium, biology, sediment
Harvey Marchant	biology
Jeff McQuaid	genetics
Bernard Métivier	biology
Sophie Mouge	media, biology
Janette Norman	biology
Catherine Ozouf-Costaz	biology
Jack Pittar	biology
Martin Riddle	voyage leader, CEAMARC chief scientist
Sarah Robinson	deputy voyage leader, biology
Belinda Ronai	programming
Thomas Silberfeld	biology
Aaron Spurr	gear officer
Jill Sutton	germanium
Hanne Thoen	biology
Claire Thompson	biology
Eivind Undheim	biology
Tony Veness	electronics, gear

<u>Table 13b:</u> Scientific personnel (cruise participants) for cruise au0806.

Carrie Bloomfield	hydrochemistry
Laura Herraiz Borreguero	CTD
Mehera Kidston	CTD
Chris Kuplis	comms, CTD
Alicia Navidad	hydrochemistry
Mark Rayner	hydrochemistry
Steve Rintoul	CTD, voyage leader
Jean-Baptiste Sallee	CTD
Serguei Sokolov	CTD
Esmee van Wijk	CTD
Jan Zika	CTD
Kate Berry	carbon
Andrew Bowie	trace metals
Kim Briggs	electronics
Ed Butler	trace metals
Wee Cheah	biology
Daniel Cossa	trace metals
Grady Cowley	carbon
Cath Deacon	doctor
Andrew Deep	deputy voyage leader, continuous plankton recorder
Lars Heimburger	trace metals
Sophie Hoft	carbon
Peter Jansen	programming
Delphine Lannuzel	trace metals
Emily Lemagie	CFC
Jesse McIvor	biology
Kristina Paterson	carbon
Alan Poole	electronics
Tomas Remenyi	trace metals
Tim Smit	particulate inorganic carbon
Aaron Spurr	gear
Jill Sutton	germanium
Alessandro Tagliabue	trace metals
Wenneke ten Hout	carbon
Anais van Ditzhuyzen	carbon
Mark Warner	CFC
Ros Watson	trace metals
Alice Watt	particulate inorganic carbon
Martin Wille	trace metals

<u>Table 14:</u> Summary of mooring deplyments/recoveries and ARGO float deployments on cruises au0803 and au0806. All times are UTC.

au0803

deployments

PULSE3	44^o 47.39'S	145^o 35.10'E	3631	044416, 17/12/2007	44.7898^{o}S 145.5850^{o}E
POLYNYA1	66^o 12.027'S	143^o 28.659'E	542	093315, 22/12/2007	66.20045^{o}S 143.47765^{o}E
POLYNYA2	66^o 12.006'S	143^o 10.065'E	590	164836, 22/12/2007	66.20010^{o}S 143.16775^{o}E
POLYNYA3	66^o 11.958'S	142^o 54.174'E	540	125401, 22/12/2007	66.19930^{o}S 142.90290^{o}E
POLYNYA-TEMPA	66^o 11.310'S	142^o 55.326'E	537	144505, 22/12/2007	66.18850^{o}S 142.92210^{o}E
POLYNYA-TEMPB	66^o 11.118'S	143^o 28.064'E	529	182235, 04/01/2008	66.18530^{o}S 143.46773^{o}E
POLYNYA4	66^o 10.804'S	143^o 09.949'E	563	232926, 11/01/2008	66.18007^{o}S 143.16581^{o}E
ARGO #3636	44^o 52.45'S	145^o 31.58'E		0842, 17/12/2007	

recoveries

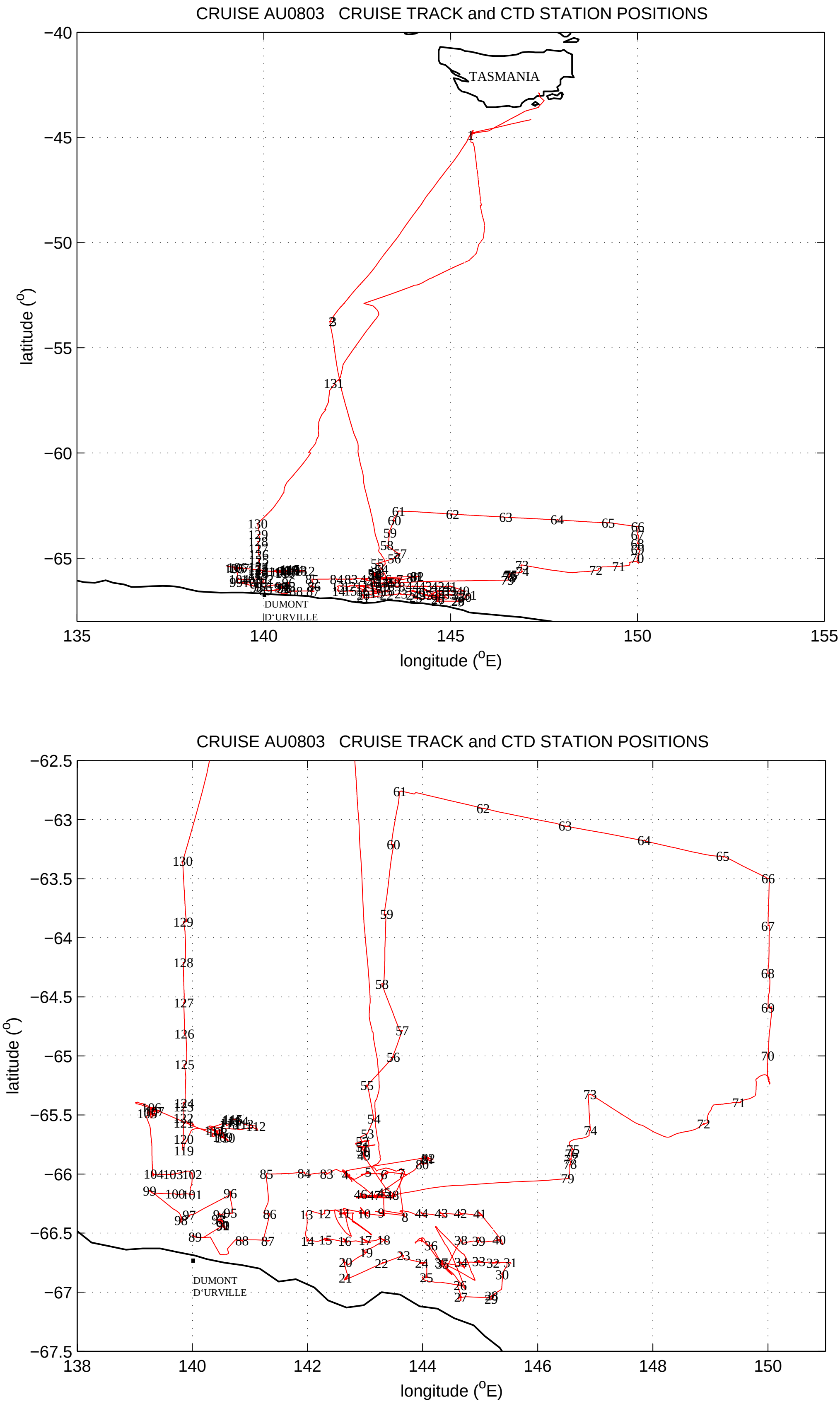
SAZC-10	53^o 44.35'S	141^o 46.13'E	2060	2325, 18/12/2007	53.7392^{o}S 141.7688^{o}E
POLYNYA-TEMPA	66^o 11.310'S	142^o 55.326'E	537	1249, 04/01/2008	66.18850^{o}S 142.92210^{o}E
POLYNYA-TEMPB	66^o 11.118'S	143^o 28.064'E	529	1305, 11/01/2008	66.18530^{o}S 143.46773^{o}E

au0806

deployments

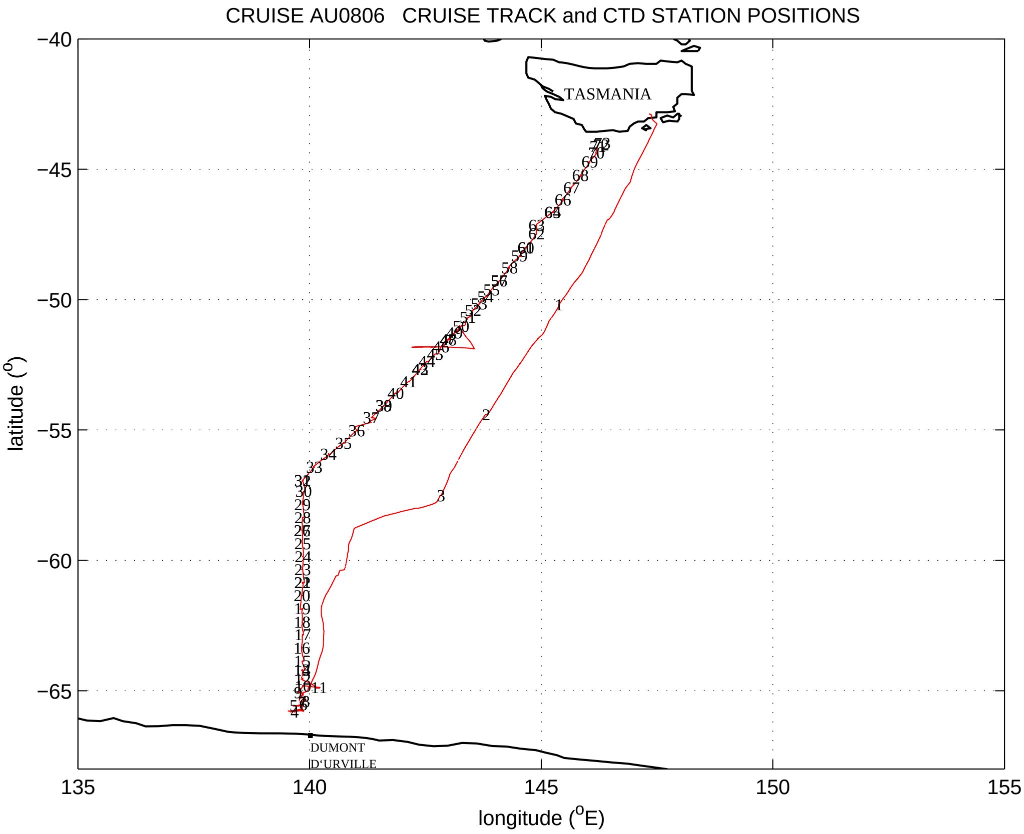
ARGO #2948	56^o 24.37'S	140^o 05.50'E	0445, 05/04/2008
ARGO #2953	53^o 08.38'S	142^o 09.11'E	1022, 07/04/2008
ARGO #2944	50^o 59.18'S	143^o 21.05'E	1359, 10/04/2008
ARGO #2952	48^o 19.87'S	144^o 32.48'E	1559, 12/04/2008
ARGO #2950	44^o 44.12'S	146^o 01.30'E	2202, 14/04/2008

(a)

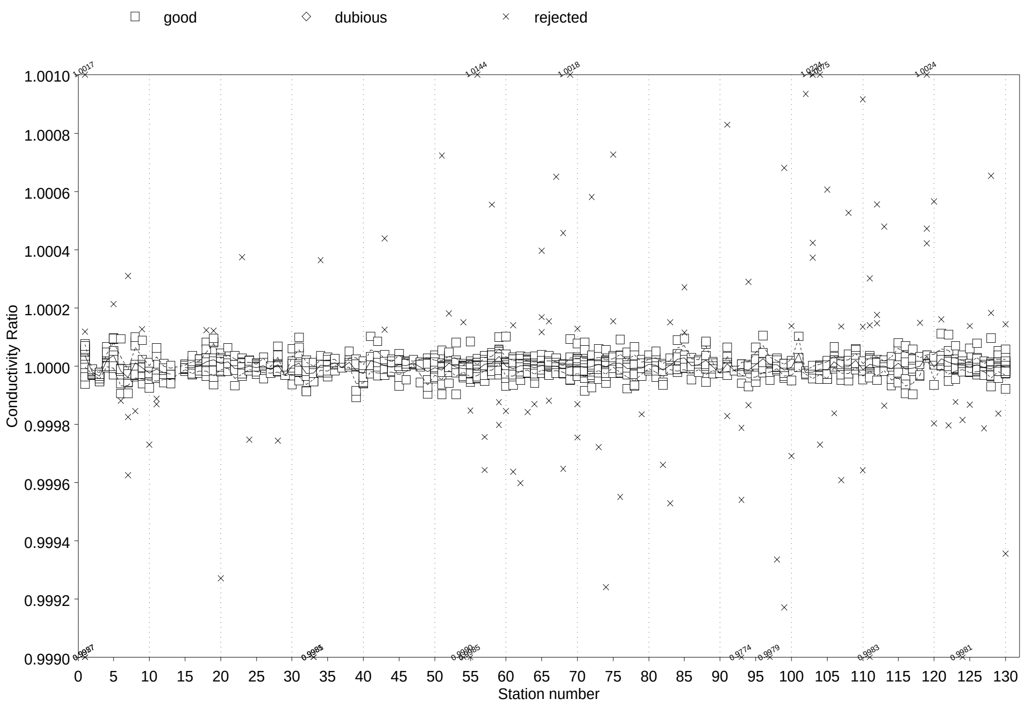


(b)

Figure 1: CTD station positions and ship's track for cruise au0803, for (a) whole cruise, and (b) southern stations.



<u>Figure 2:</u> CTD station positions and ship's track for cruise au0806.

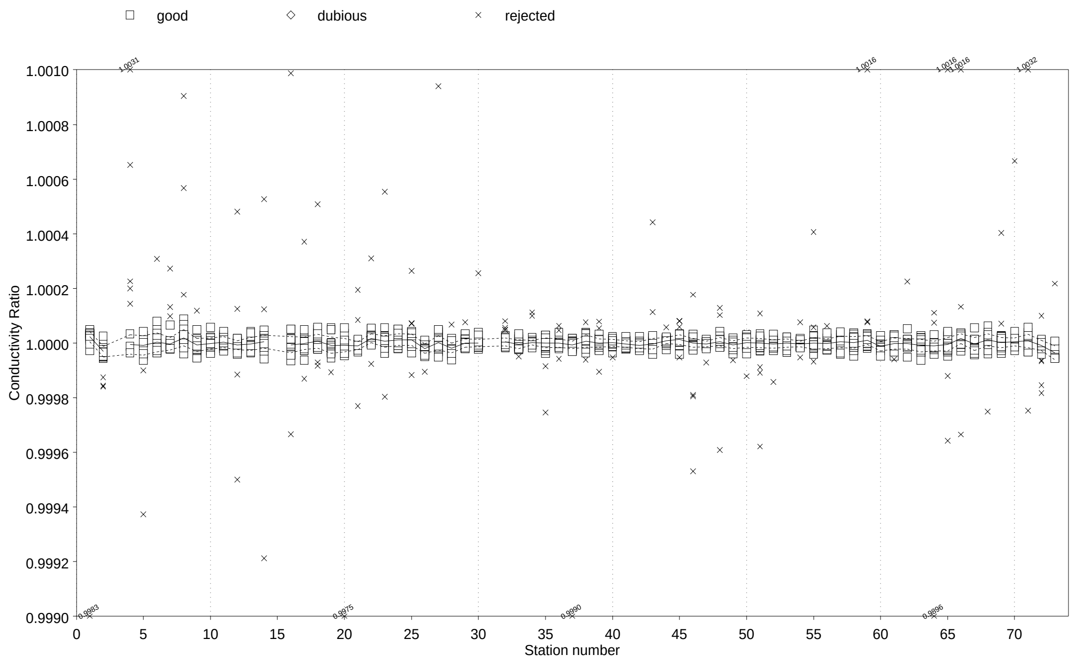


Calibration data for cruise : au0803

Calibration file : a0803.bot

Conductivity s.d. = 0.00003

Number of bottles used = 1401 out of 1522 Mean ratio for all bottles = 1.00000



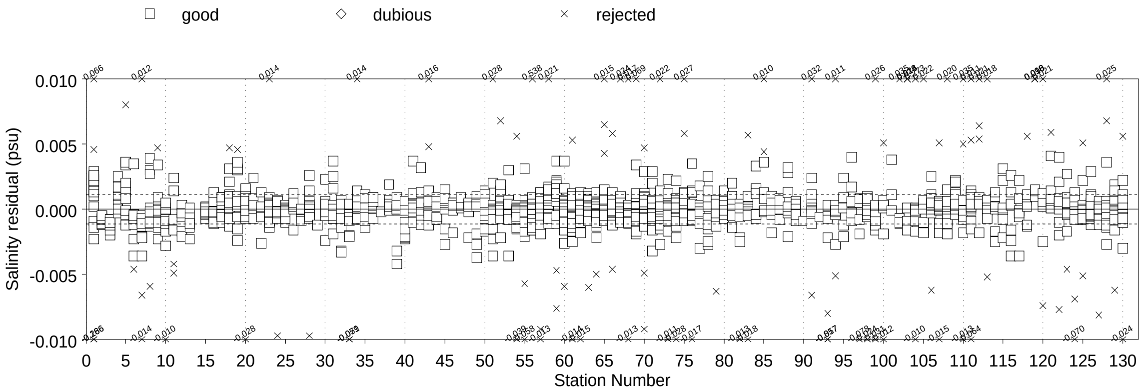
Calibration data for cruise : au0806

Calibration file : a0806.bot

Conductivity s.d. = 0.00002

Number of bottles used = 1243 out of 1368 Mean ratio for all bottles = 1.00000

<u>Figure 3:</u> Conductivity ratio c_{btl}/c_{cal} versus station number for cruises au0803 and au0806. The solid line follows the mean of the residuals for each station; the broken lines are ± the standard deviation of the residuals for each station. c_{cal} = calibrated CTD conductivity from the CTD upcast burst data; c_{btl} = 'in situ' Niskin bottle conductivity, found by using CTD pressure and temperature from the CTD upcast burst data in the conversion of Niskin bottle salinity to conductivity.

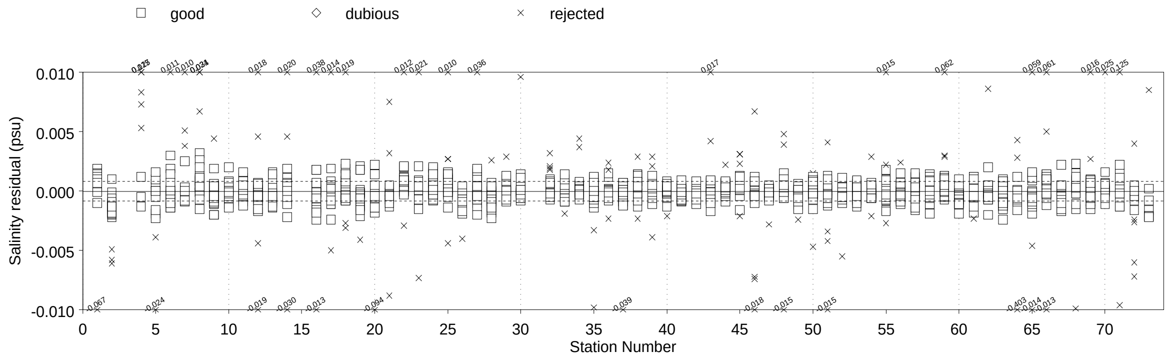


Calibration data for cruise : au0803

Calibration file : a0803.bot

Mean offset salinity = 0.0000psu (s.d. = 0.0011 psu)

Number of bottles used = 1401 out of 1522



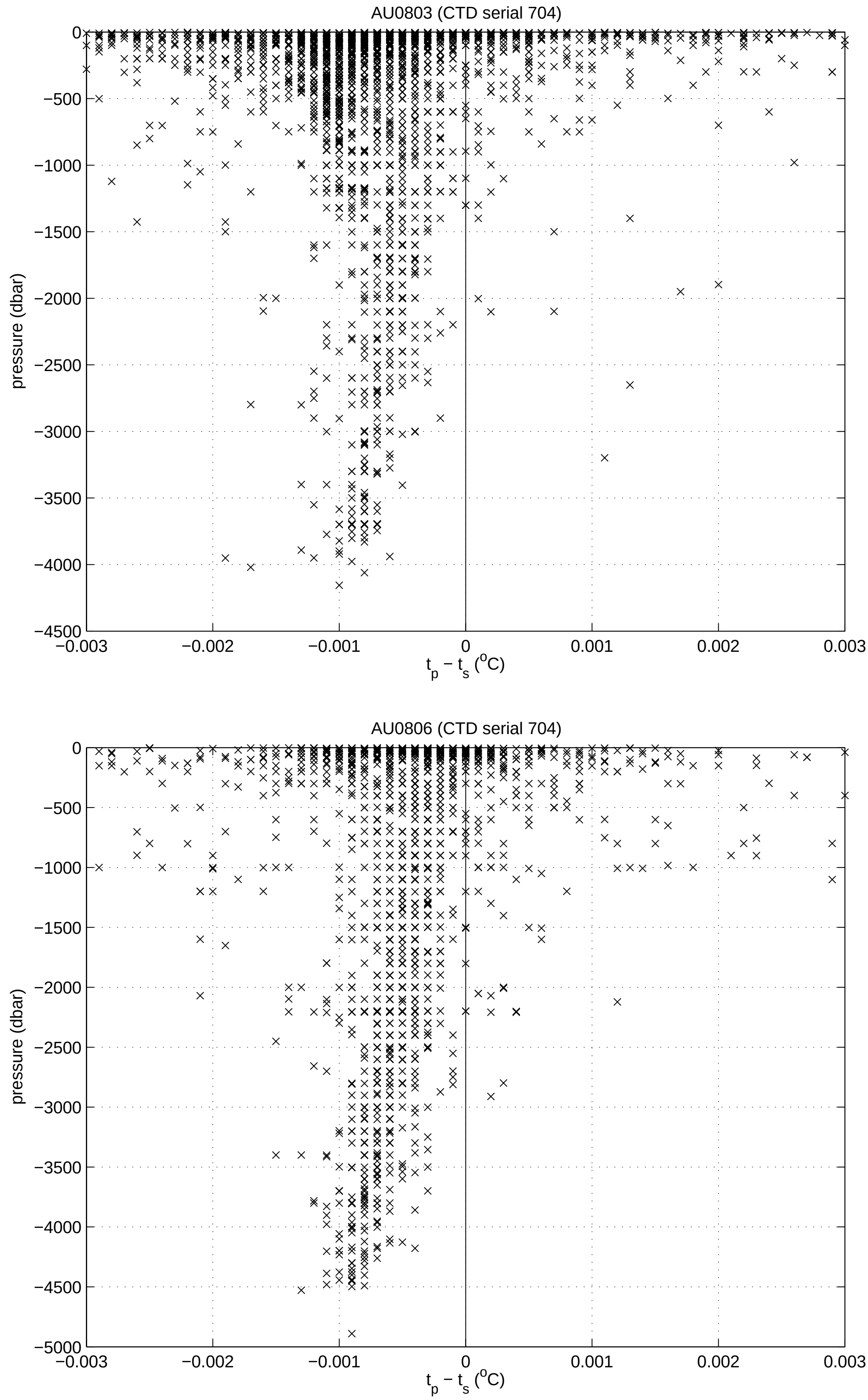
Calibration data for cruise : au0806

Calibration file : a0806.bot

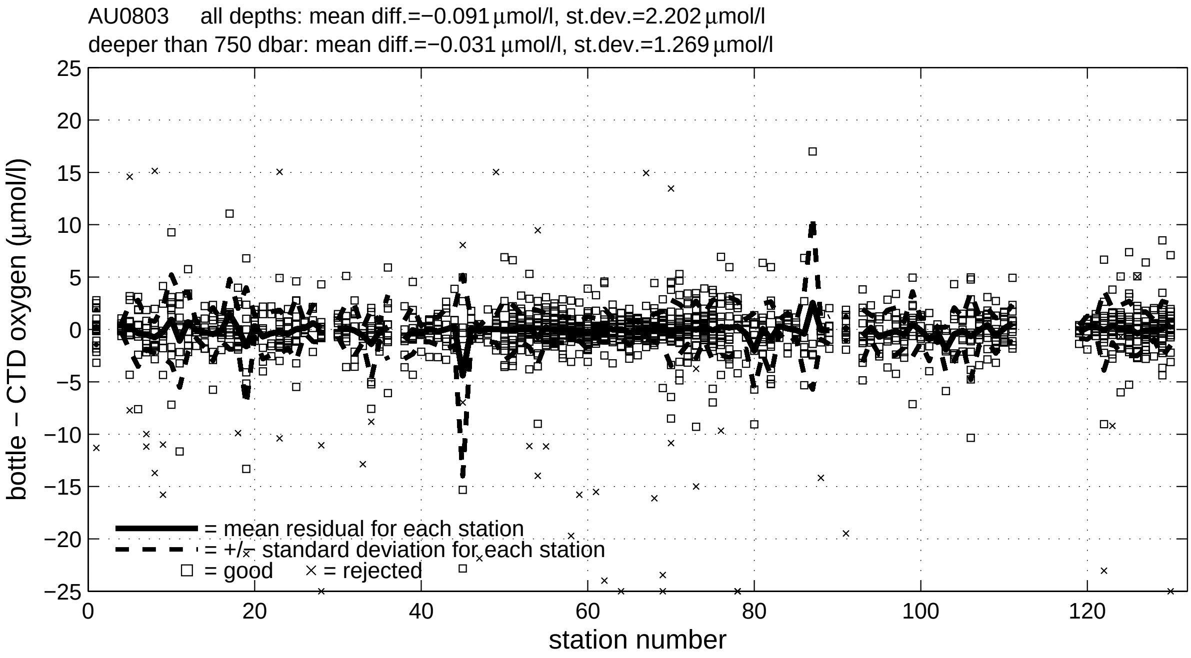
Mean offset salinity = 0.0000psu (s.d. = 0.0008 psu)

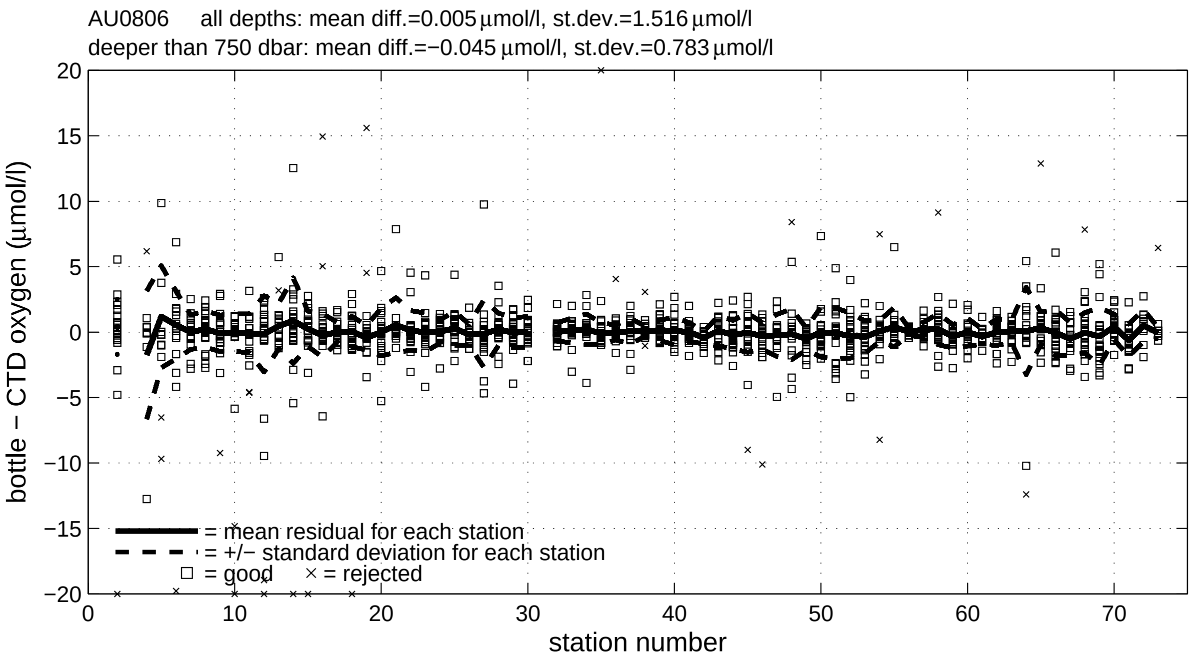
Number of bottles used = 1243 out of 1368

<u>Figure 4:</u> Salinity residual (s_{btl} - s_{cal}) versus station number for cruises au0803 and au0806. The solid line is the mean of all the residuals; the broken lines are ± the standard deviation of all the residuals. s_{cal} = calibrated CTD salinity; s_{btl} = Niskin bottle salinity value.



<u>Figure 5:</u> Difference between primary and secondary temperature sensor (t_p - t_s) for CTD upcast burst data from Niskin bottle stops, for cruises au0803 and au0806.





<u>Figure 6:</u> Dissolved oxygen residual (o_{btl} - o_{cal}) versus station number for cruises au0803 and au0806. The solid line follows the mean residual for each station; the broken lines are ± the standard deviation of the residuals for each station. o_{cal}=calibrated downcast CTD dissolved oxygen; o_{btl}=Niskin bottle dissolved oxygen value. Note: values outside vertical axes are plotted on axes limits.

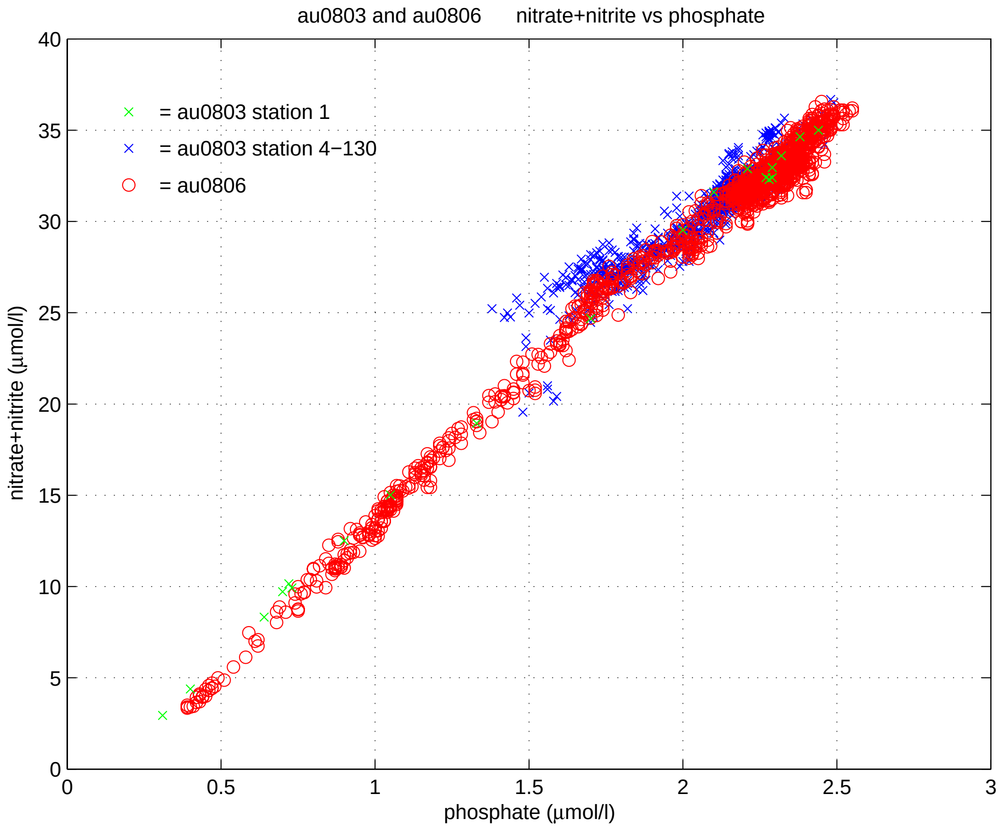


Figure 7: **Nitrate+nitrite versus phosphate data for cruises au0803 and au0806.**

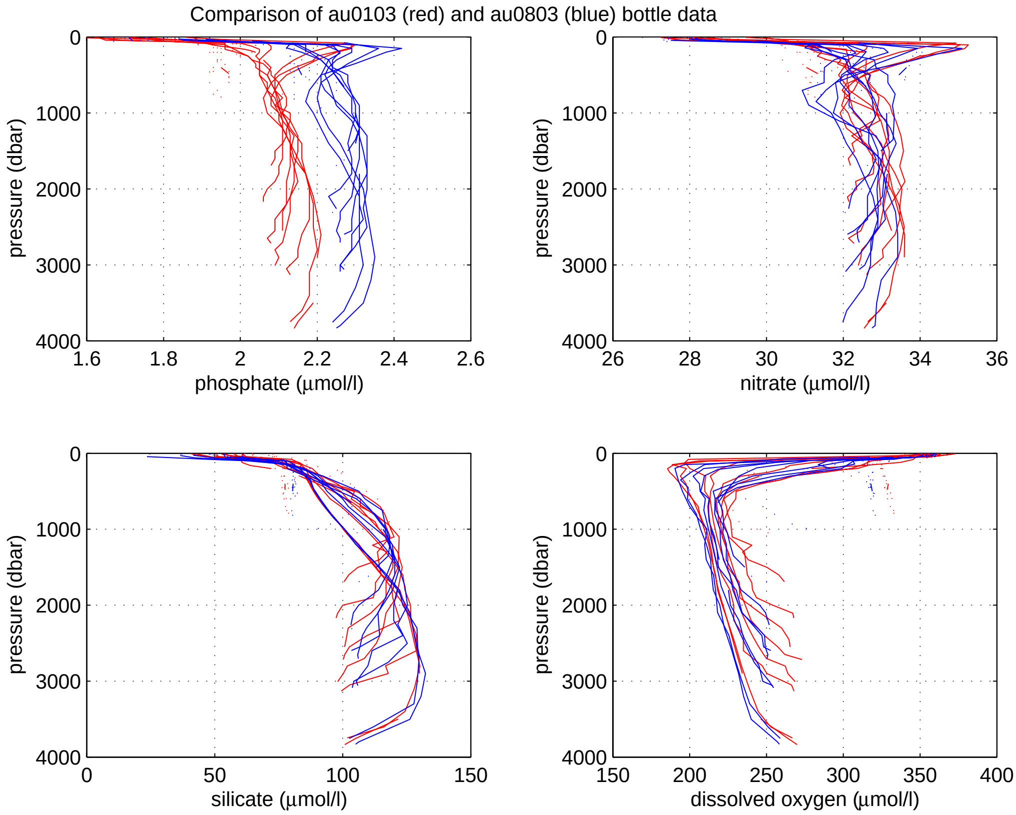
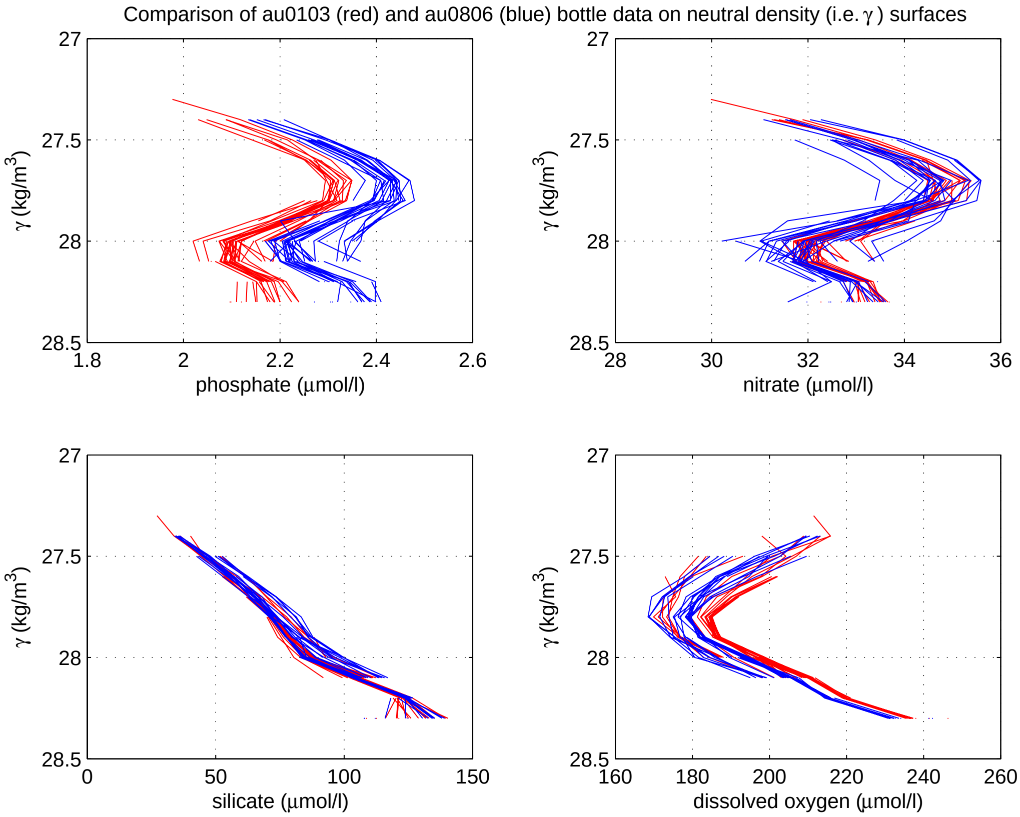


Figure 8: **Bulk plots showing intercruise comparison of oxygen and nutrient data for au0803 and au0103.**

(a)



(b)

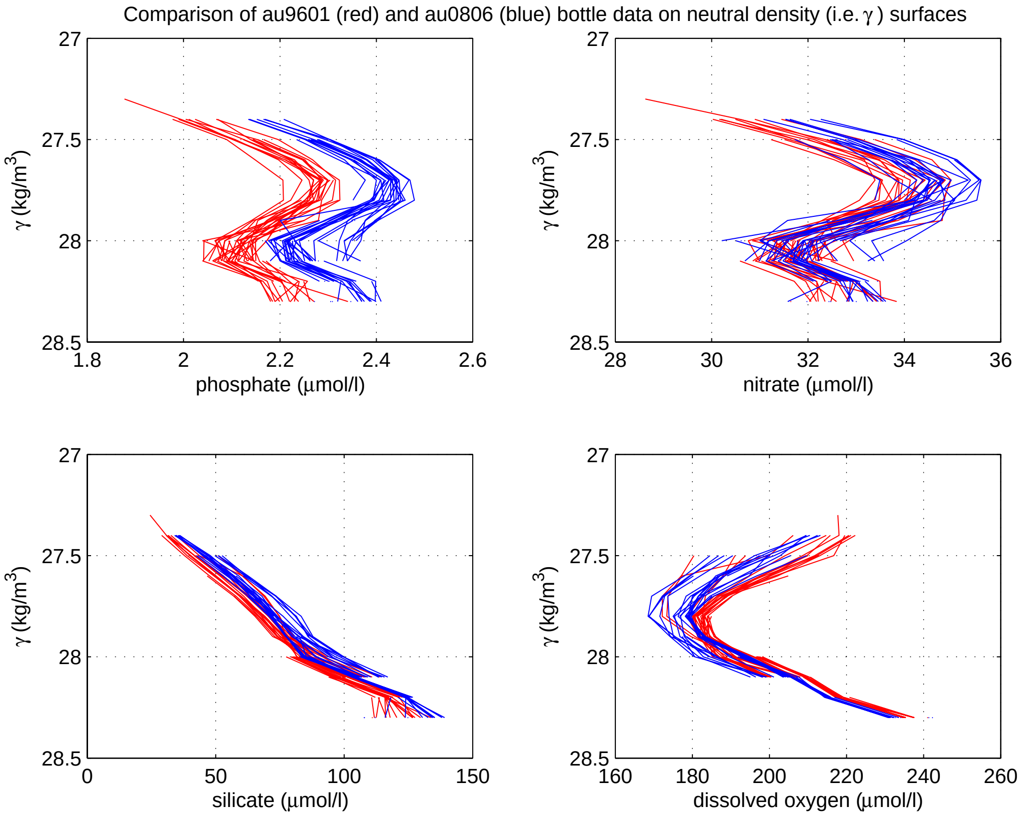
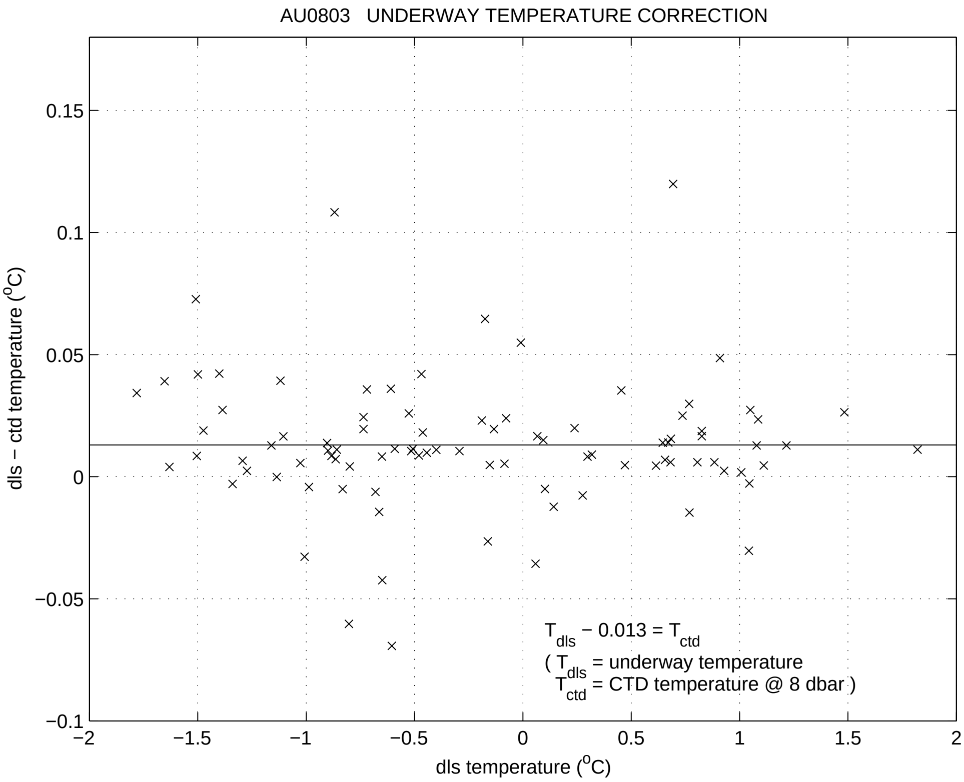


Figure 9: **Bulk plots showing intercruise comparisons of oxygen and nutrient data on neutral density (i.e. γ) surfaces, for (a) au0806 and au0103, and (b) au0806 and au9601.**

(a)



(b)

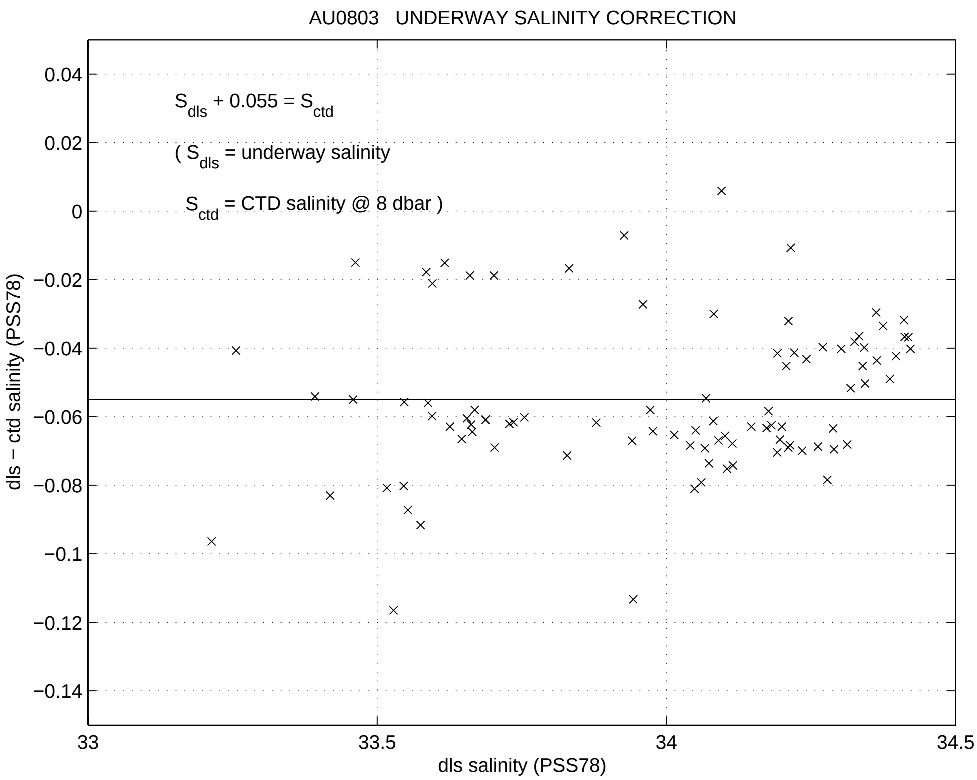
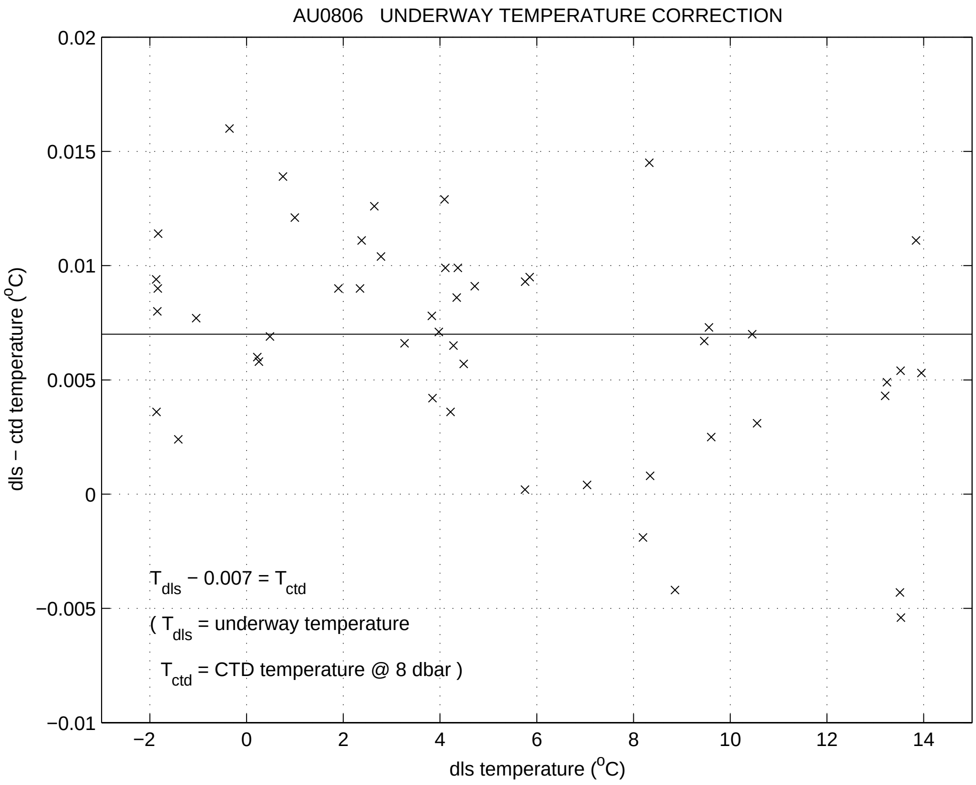
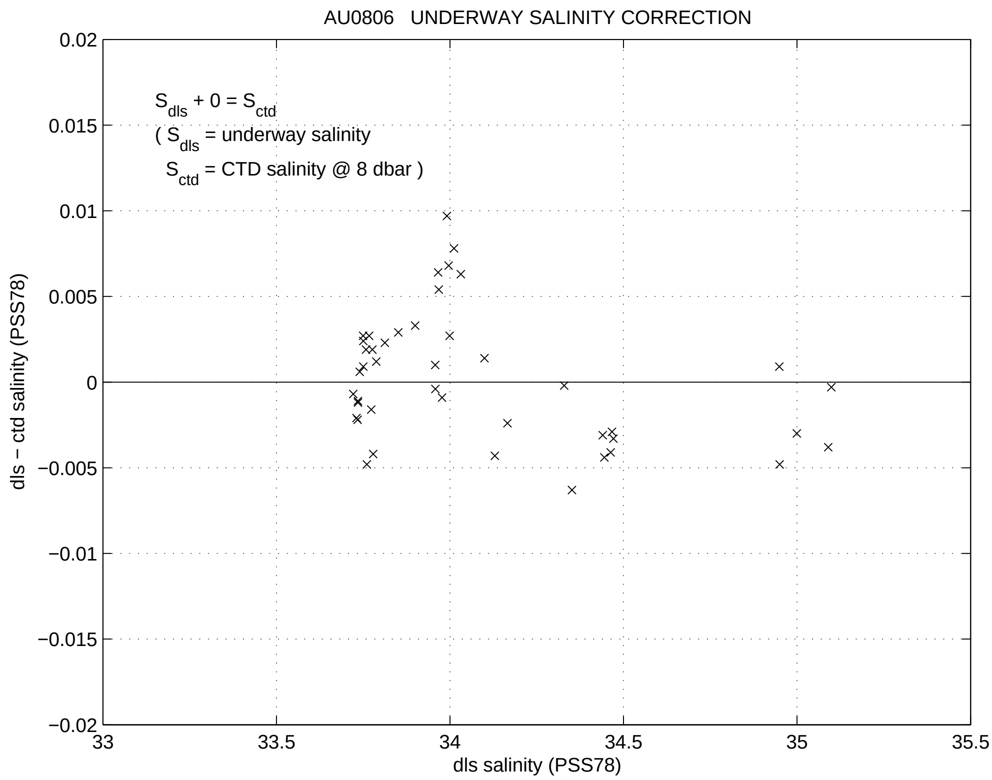


Figure 10a and b: au0803 comparison between (a) CTD and underway temperature data (i.e. hull mounted temperature sensor), and (b) CTD and underway salinity data, including bestfit lines. Note: dls refers to underway data.

(a)

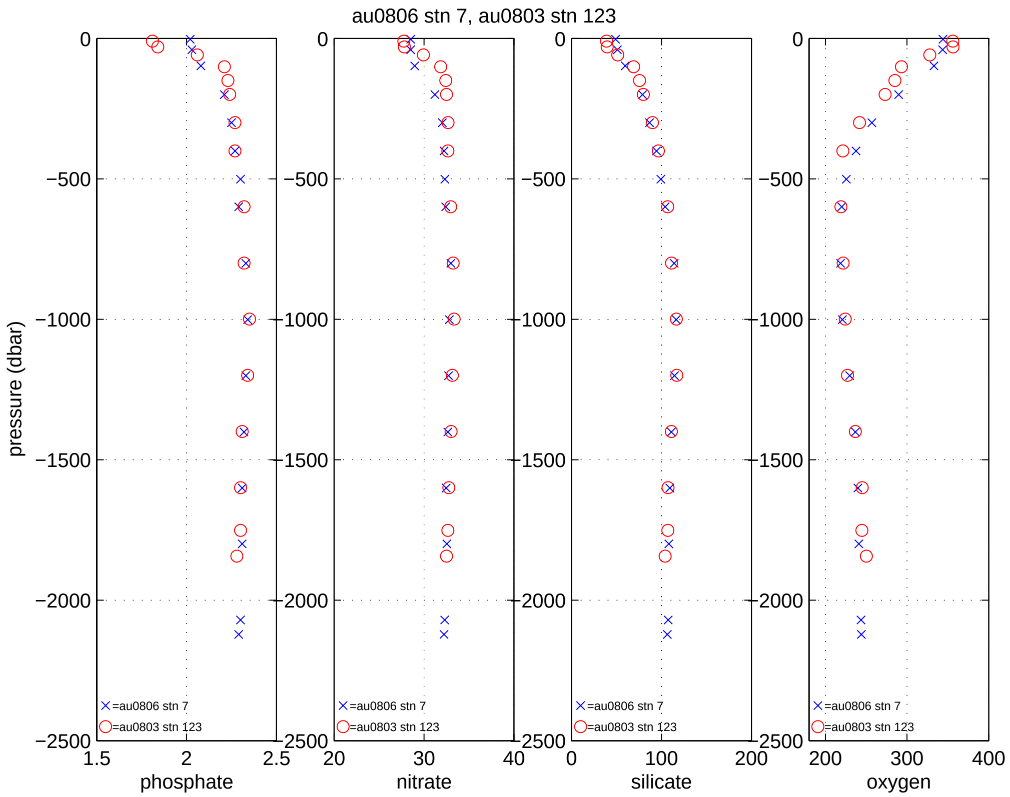


(b)



<u>Figure 11a and b:</u> au0806 comparison between (a) CTD and underway temperature data (i.e. hull mounted temperature sensor), and (b) CTD and underway salinity data, including bestfit lines. Note: dls refers to underway data.

(a)



(b)

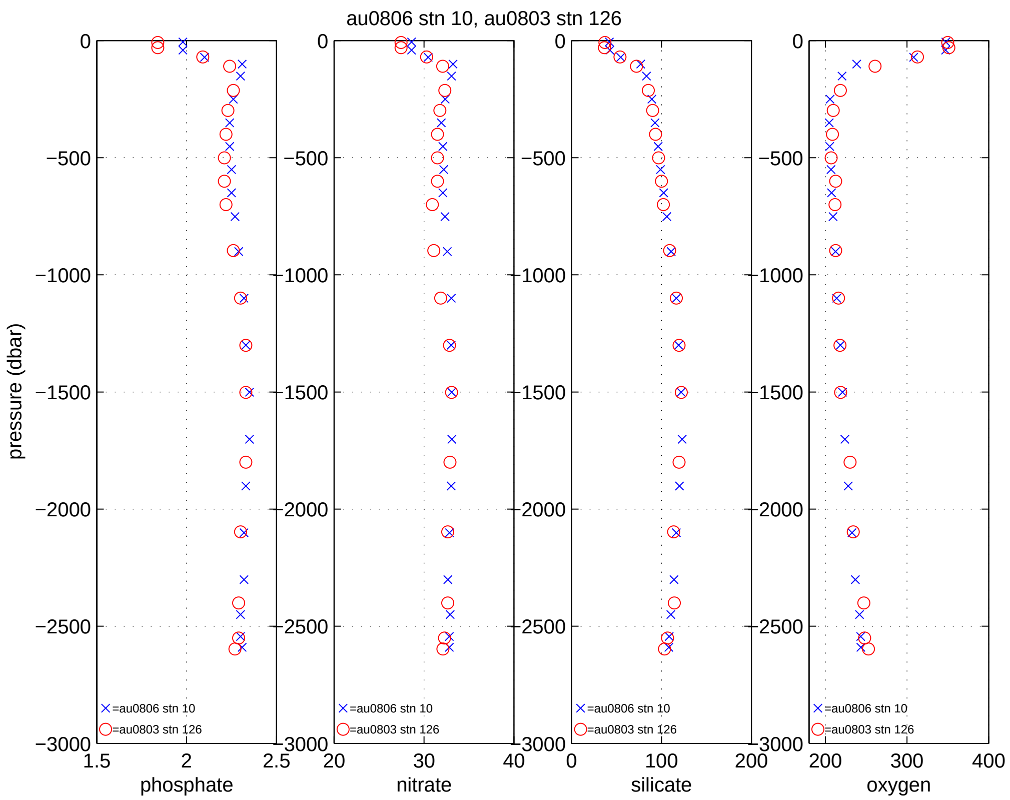
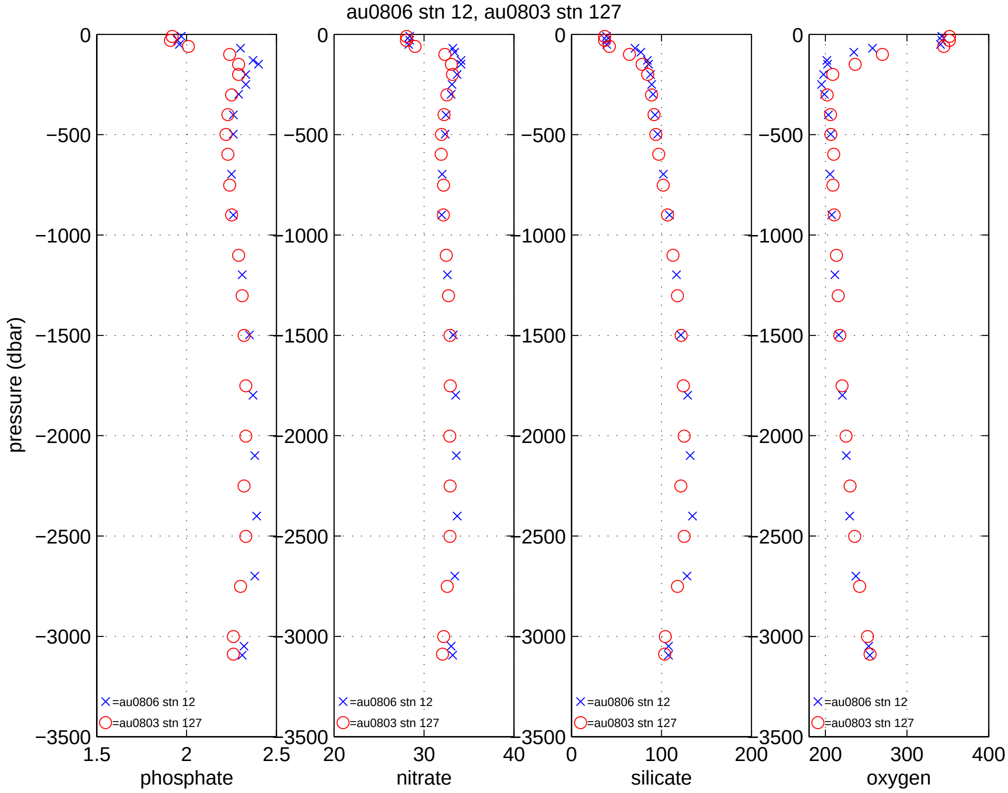
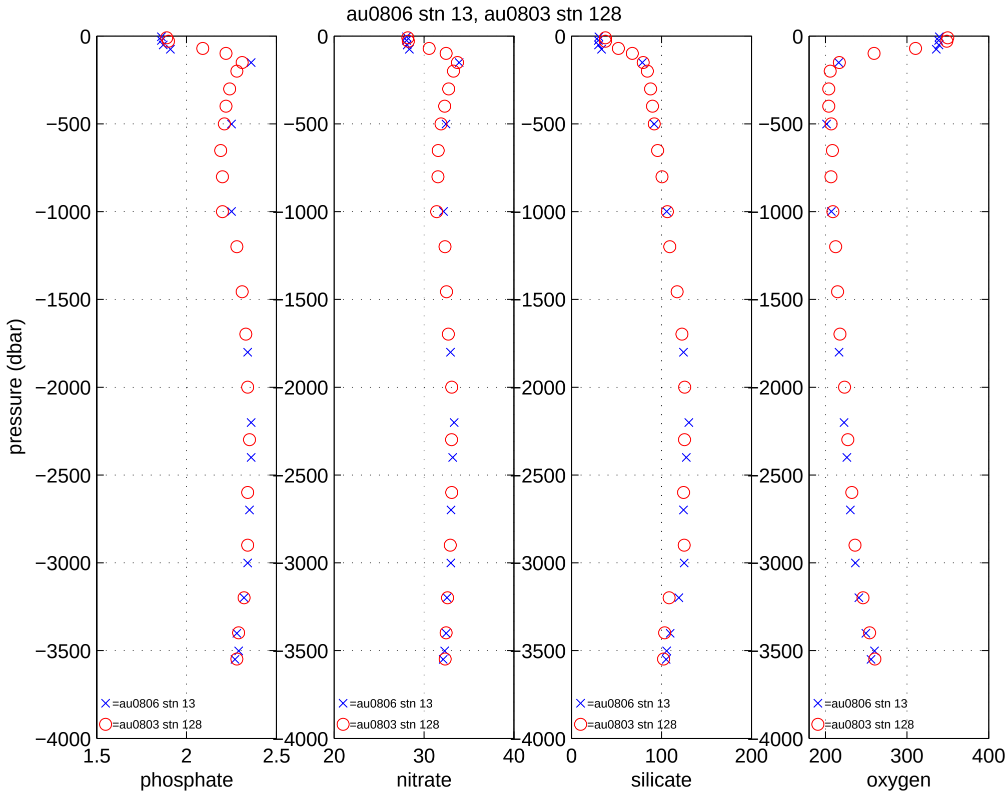


Figure 12a and b: **Nutrient and oxygen profiles for au0803 and au0806 overlap stations.**

(c)

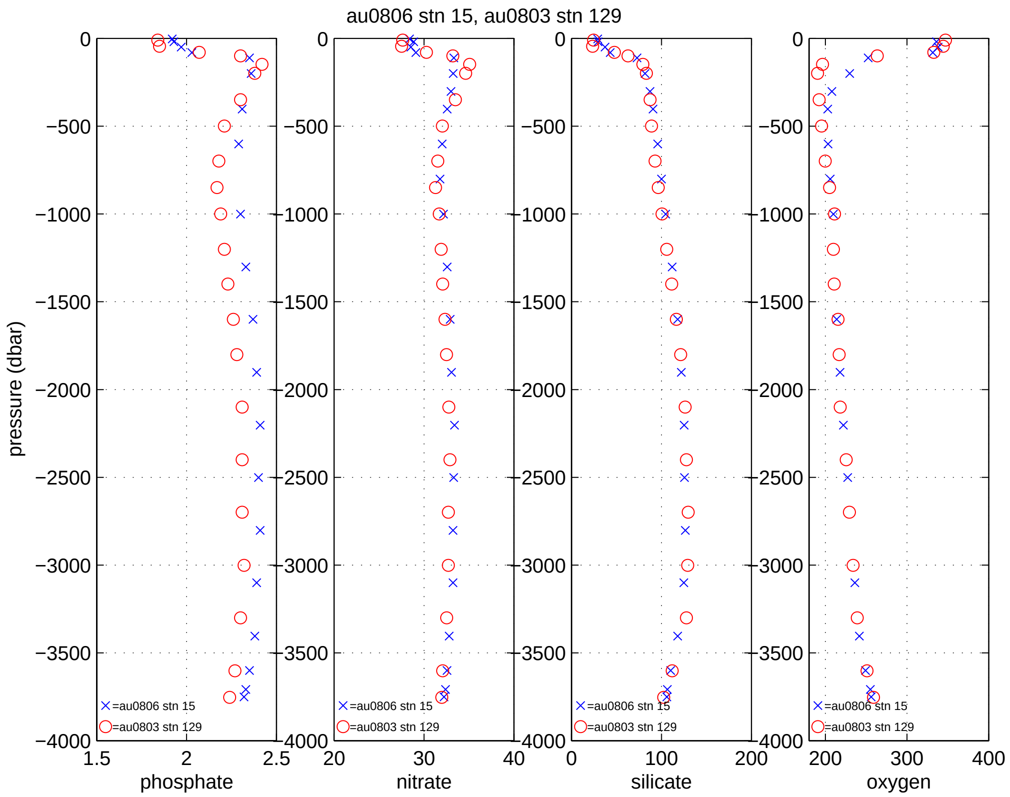


(d)

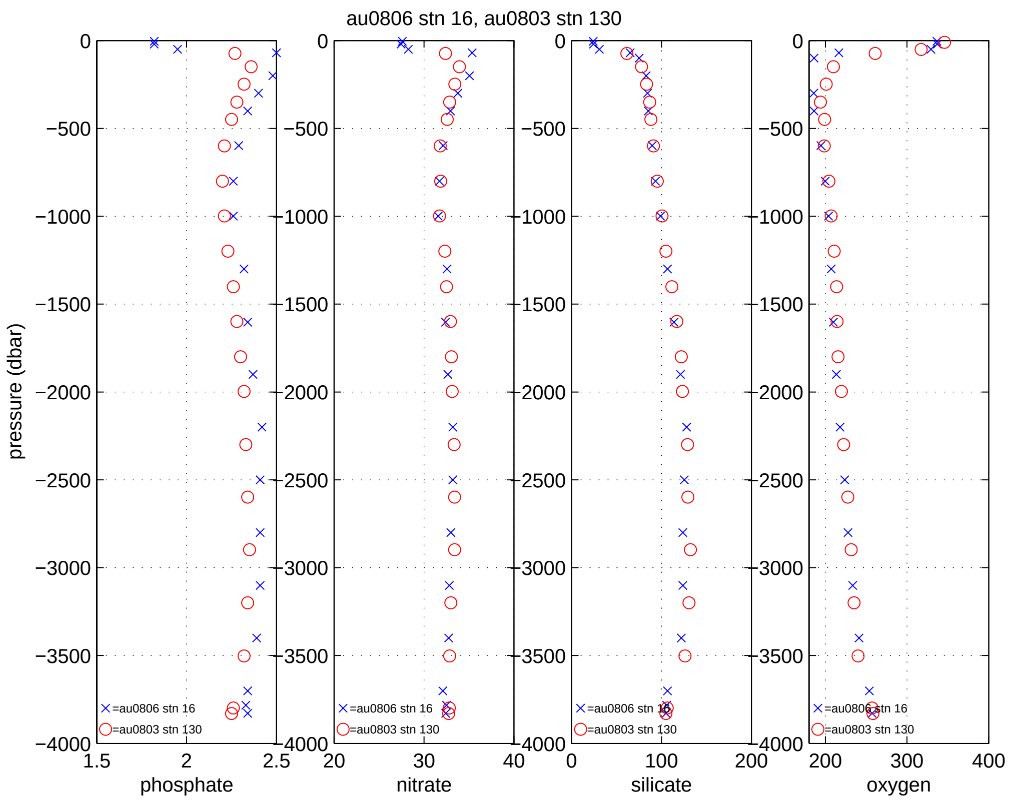


<u>Figure 12c and d:</u> Nutrient and oxygen profiles for au0803 and au0806 overlap stations.

(e)



(f)



<u>Figure 12e and f:</u> Nutrient and oxygen profiles for au0803 and au0806 overlap stations.

APPENDIX 1 AU0806 Hydrochemistry Cruise Report

ALICIA NAVIDAD and MARK RAYNER, *CSIRO CMAR*

(this appendix summarised from the complete cruise lab report by the above authors)

Analaysts: Alicia Navidad and Mark Rayner (nutrients)
Carrie Bloomfield (dissolved oxygen)
Laura Herraiz Borreguero (salinity)

A1.1 Nutrients

Set-up details:

carrier used	ASW
diluent for manual standards	LNSW
standard range used (nitrate+nitrite in µm/l)	0-35
standard range used (silicate in µm/l)	0-140
standard range used (phosphate in µm/l)	0-3.0
standard range used (nitrite in µm/l)	0-0.7
SRM range used (nitrate+nitrite in µm/l)	10 & 30
SRM range used (silicate in µm/l)	10, 30 & 140
SRM range used (phosphate in µm/l)	1 & 3
SRM range used (nitrite in µm/l)	0.1 & 0.3

The Lachat analyser was used for nutrient analyses on the cruise. Prior to running samples, initial quality runs gave values for detection limits and sampling precision, as well as accuracy and precision (Table A1.1).

<u>Table A1.1:</u> Detection limits (DL), sampling precision (SP), accuracy and precision from initial Lachat analyser quality run. Accuracy is reported as the % error over the top standard (35 for nitrate+nitrite, 140 for silicate, 3 for phosphate). The reported DL is the limit of detection of the analyte at 99% confidence interval.

Nutrient (high/low) in µmol/l	DL µmol/l	SP CV%	precision CV%	accuracy low % error	accuracy high % error
nitrate+nitrite (30/10)	0.021	0.31	0.11	0.79	0.51
silicate (140/10)	0.015	0.07	0.16	0.15	0.59
phosphate (3/1)	0.016	0.47	0.29	0.31	1.24*

** after working on phosphates and conducting another quality run, this value came down to 1.18%, and by the time station 2 dummy run was done it was below 1%*

For each sample, 4 sampling tubes were taken, and 2 were frozen and 2 kept in the fridge. The fresh samples were analysed for phosphate, nitrate and silicate. The trace metal group also requested nitrite, and for these the frozen samples were used and separate runs were done.

The LNSW (low nutrient seawater) used was collected from Maria Island in October 2007, and was allowed to leach for several weeks. It was tested on the Lachat prior to cruise au0803, and shown to have very low if any concentration for all 3 nutrients.

The analysis on the cruise was carried out under new strict quality control protocols, including modifications to the frequency of standard reference materials and samples, cleaning regimes and post processing steps.

From trials undertaken with the Lachat dilutor, it was decided that for the level of accuracy required the dilutor would not be used. All standards were made manually, and stock standards were validated before the voyage.

A new excel macro created by Dave Terhell was used, allowing for a sensitivity factor to be applied, meaning any instrument/environmental drift could be accounted for uniformly throughout a run. The macro also calculated the precision between duplicate samples, highlighting any lying outside the designated deviation between duplicates. Highlighted samples were repeated.

A1.2 Dissolved oxygen

The DO system used for the voyage was the Scripps photometric system using the National Instrumentation A/D board and associated software and hardware. Standardisation was carried out every day prior to analyses, and a blank was performed at every reagent change. On two occasions the system was standardised against an external standard, with excellent comparison.

A1.3 Salinity

Guildline Autosal serial 62548 was used, calibrated with OSI international seawater standards. The instrument provided stable salinity data for the entire cruise. A large bubble at the start of the glass chamber was present consistently and did not interfere with the analysis (same as noted on au0803).

A1.4 Laboratory temperature control

The new "sky lab" on the mezzanine deck was used for all hydrochemistry, and temperature stability in the lab was good. There were 3 temperature loggers situated in the lab, next to each of the instruments (Table A1.2).

Table A1.2: Laboratory temperature averages and standard deviations. For temperatures near the dissolved oxygen system and salinometer, temperature logger data was for 23/03/2008 to 16/04/2008. For the nutrient analyser, the logger malfunctioned, and the values in the table are only for 20/03/2008 to 23/03/2008.

logger location	average temperature (^{o}C)	standard deviation (^{o}C)
dissolved oxygen system	20.52	0.61
salinometer	21.2	0.58
nutrient analyser	20.56	0.32

APPENDIX 2 AU0803 CEAMARC/CASO and AU0806 CASO Chlorofluorocarbon (CFC) Measurements - Cruise Reports and Preliminary Data

MARK J. WARNER, *University of Washington, Seattle*

(this appendix merges the two cruise reports by the above author)

Samplers and Analysts: Mark J. Warner, University of Washington (warner@u.washington.edu)
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Samples for the analysis of dissolved CFC-11, CFC-12, and CFC-113 were drawn from 1410 of the Niskin water samples collected during au0803, and 1148 of the Niskin water samples collected during au0806. When taken, water samples for CFC analysis were the first samples drawn from the 10-liter bottles. Care was taken to co-ordinate the sampling of CFCs with other samples to minimize the time between the initial opening of each bottle and the completion of sample drawing. In most cases, dissolved oxygen, alkalinity and dissolved inorganic carbon samples were collected within several minutes of the initial opening of each bottle. To minimize contact with air, the CFC samples were drawn directly through the stopcocks of the 10-liter bottles into 100-ml precision glass syringes equipped with 3-way plastic stopcocks. The syringes were immersed in a holding bath of seawater until analyzed.

For air sampling, a ~300 meter length of 3/8" OD Dekaron tubing was run from the portable laboratory to the bow of the ship. A flow of air was drawn through this line into the CFC van using an Air Cadet pump. The air was compressed in the pump, with the downstream pressure held at ~1.5 atm. using a back-pressure regulator. A tee allowed a flow (100 ml min^{-1}) of the compressed air to be directed to the gas sample valves of the CFC analytical systems, while the bulk flow of the air (>7 l min^{-1}) was vented through the back pressure regulator. Air samples were generally analyzed when the relative wind direction was within 100 degrees of the bow of the ship to reduce the possibility of shipboard contamination. The pump was run for approximately 30 minutes prior to analysis to insure that the air inlet lines and pump were thoroughly flushed. The average atmospheric concentrations determined during the cruises (from a set of 5 measurements analyzed when possible, n=33, for each cruise) were as follows: for au0803, 241.8 +/- 2.4 parts per trillion (ppt) for CFC-11, 538.6 +/- 2.2 ppt for CFC-12, and 69.7 +/- 3.2 ppt for CFC-113; for au0806, 241.4 +/- 0.9 parts per trillion (ppt) for CFC-11, 536.5 +/- 2.7 ppt for CFC-12, and 77.5 +/- 1.8 ppt for CFC-113.

Concentrations of CFC-11 and CFC-12, and CFC-113 in air samples, seawater and gas standards were measured by shipboard electron capture gas chromatography (EC-GC) using techniques modified from those described by Bullister and Weiss (1988). For seawater analyses, water was transferred from a glass syringe to a fixed volume chamber (~30 ml). The contents of the chamber were then injected into a glass sparging chamber. The dissolved gases in the seawater sample were extracted by passing a supply of CFC-free purge gas through the sparging chamber for a period of 4 minutes at 70 ml min^{-1} for au0803, and at 80 ml min^{-1} for au0806. Water vapor was removed from the purge gas during passage through an 18 cm long, 3/8" diameter glass tube packed with the desiccant magnesium perchlorate. The sample gases were concentrated on a cold-trap consisting of a 1/8" OD stainless steel tube with a ~10 cm section packed tightly with Porapak N (60-80 mesh). A vortex cooler, using compressed air at 95 psi, was used to cool the trap, to approximately –20°C. After 4 minutes of purging, the trap was isolated, and the trap was heated electrically to ~100°C. The sample gases held in the trap were then injected onto a precolumn (~25 cm of 1/8" O.D. stainless steel tubing packed with 80-100 mesh Porasil C, held at 70°C) for the initial separation of CFC-12, CFC-11 and CFC-113 from other compounds. After the CFCs had passed from the pre-column into the main analytical column (~183 cm of 1/8" OD stainless steel tubing packed with Carbograph 1AC, 80-100 mesh, held at 70°C) of GC1 (a HP 5890 Series II gas chromatograph with ECD), the flow through the pre-column was reversed to backflush slower eluting compounds.

The analytical system was calibrated frequently using a standard gas of known CFC composition. Gas sample loops of known volume were thoroughly flushed with standard gas and injected into the system. The temperature and pressure was recorded so that the amount of gas injected could be calculated. The procedures used to transfer the standard gas to the trap, precolumn, main chromatographic column and EC detector were similar to those used for analyzing water samples. Two sizes of gas sample loops were used. Multiple injections of these loop volumes could be made to allow the system to be calibrated over a relatively wide range of concentrations. Air samples and system blanks (injections of loops of CFC-free gas) were injected and analyzed in a similar manner. For au0803, the typical analysis time for seawater, air, standard or blank samples was ~10.5 minutes. For au0806, the typical analysis time for seawater samples was 11.5 min., and for gas samples was ~10.5 minutes.

Concentrations of the CFCs in air, seawater samples and gas standards are reported relative to the SIO98 calibration scale (Prinn et. al., 2000). Concentrations in air and standard gas are reported in units of mole fraction CFC in dry gas, and are typically in the parts per trillion (ppt) range. Dissolved CFC concentrations are given in units of picomoles per kilogram seawater (pmol kg^{-1}). CFC concentrations in air and seawater samples were determined by fitting their chromatographic peak areas to multi-point calibration curves, generated by injecting multiple sample loops of gas from a working standard (UW cylinder 45191 for CFC-11: 386.94 ppt, CFC-12: 200.92 ppt, and CFC-113: 105.4 ppt) into the analytical instrument. The response of the detector to the range of moles of CFC-12 and CFC-113 passing through the detector remained relatively constant during the cruises. The response of the detector to the upper range of CFC-11 amounts was found to slowly change during the cruises. Full-range calibration curves were run at intervals of 10 days during the cruises. These were supplemented with occasional injections of multiple aliquots of the standard gas at more frequent time intervals. Single injections of a fixed volume of standard gas at one atmosphere were run much more frequently (at intervals of ~90 minutes) to monitor short-term changes in detector sensitivity. The CFC-113 peak was often on a small bump on the baseline, resulting in a large dependence of the peak area on the choice of endpoints for integration. The height of the peak was instead used to provide better precision. For au0803, the precisions of measurements of the standard gas in the fixed volume (n=784) were ± 0.51% for CFC-12, 0.81% for CFC-11, and 4.2% for CFC-113. For au0806, the precisions of measurements of the standard gas in the fixed volume (n=450) were ± 0.61% for CFC-12, 0.89% for CFC-11, and 5.2% for CFC-113.

The efficiency of the purging process was evaluated periodically by re-stripping high concentration surface water samples and comparing the residual concentrations to initial values. For au0803, these re-strip values were approximately 2-3 % for all 3 compounds, and a fit of the re-strip efficiency as a function of temperature will be applied to the final data set; no correction has been applied to the preliminary data set. For au0806, these re-strip values were approximately 1% for all 3 compounds, and a correction has been applied to the shipboard data.

The determination of a blank due to sampling and analysis of CFC-free waters was hampered by the lack of CFC-free waters. For au0803, at CTD 1 CFCs in the deepest sample at 3000 m were 0.005 pmol kg^{-1} for CFC-11 and CFC-12. For au0806, at several stations at the northern end of the section, CFCs in the deepest sample were measured to be less than 0.005 pmol kg^{-1} for CFC-11 and CFC-12. No sampling blank corrections have been made to the preliminary data sets.

For au0803, based on the analysis of 74 duplicate samples, we estimate precisions (1 standard deviation) of 1.1% or 0.006 pmol kg^{-1} (whichever is greater) for dissolved CFC-11, 0.56% or 0.003 pmol kg^{-1} for CFC-12 measurements, and 2.8% or 0.004 pmol kg^{-1} for CFC-113.

For au0806, based on the analysis of 46 duplicate samples, we estimate precisions (1 standard deviation) of 0.75% or 0.003 pmol kg^{-1} (whichever is greater) for dissolved CFC-11, 0.30% or 0.003 pmol kg^{-1} for CFC-12 measurements, and 4.8% or 0.005 pmol kg^{-1} for CFC-113.

A very small number of water samples had anomalously high CFC concentrations relative to adjacent samples. These samples occurred sporadically during the cruises and were not clearly associated with other features in the water column (e.g. anomalous dissolved oxygen, salinity or temperature features). This suggests that these samples were probably contaminated with CFCs during the sampling or analysis processes. Measured concentrations for these anomalous samples are included in the preliminary data, but are given a quality flag value of either 3 (questionable measurement) or 4 (bad measurement).

For au0806, a small amount of water vapor made its way onto the chromatographic column on April

10th and resulted in less than optimal performance of the analytical system for a few days. During that time CFC-113 peaks were located atop a broad contaminant peak and difficult to integrate. A large amount of CFC-113 data are flagged as bad (4) during this period. As the contamination cleared up over 2-3 days, this broad peak gradually disappeared. CFC-113 values have been flagged as questionable during this interval, until the baseline was flat. Although the baseline was very noisy, the data quality for CFC-11 and CFC-12 was only slightly worse than normal and was not flagged.

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