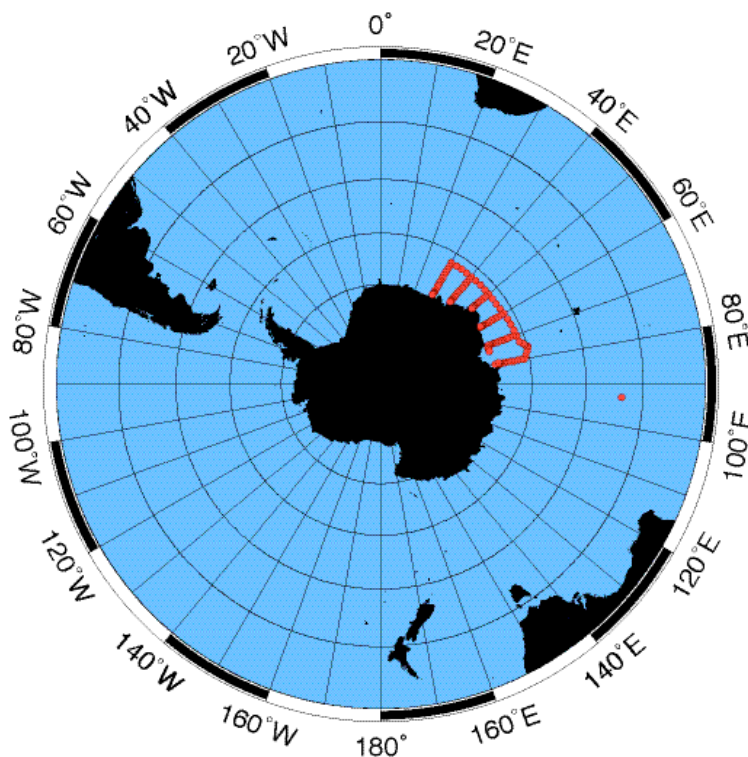


## A. CRUISE REPORT: S04I

(Last Update 2006 06)



### A.1 HIGHLIGHTS

#### CRUISE SUMMARY INFORMATION

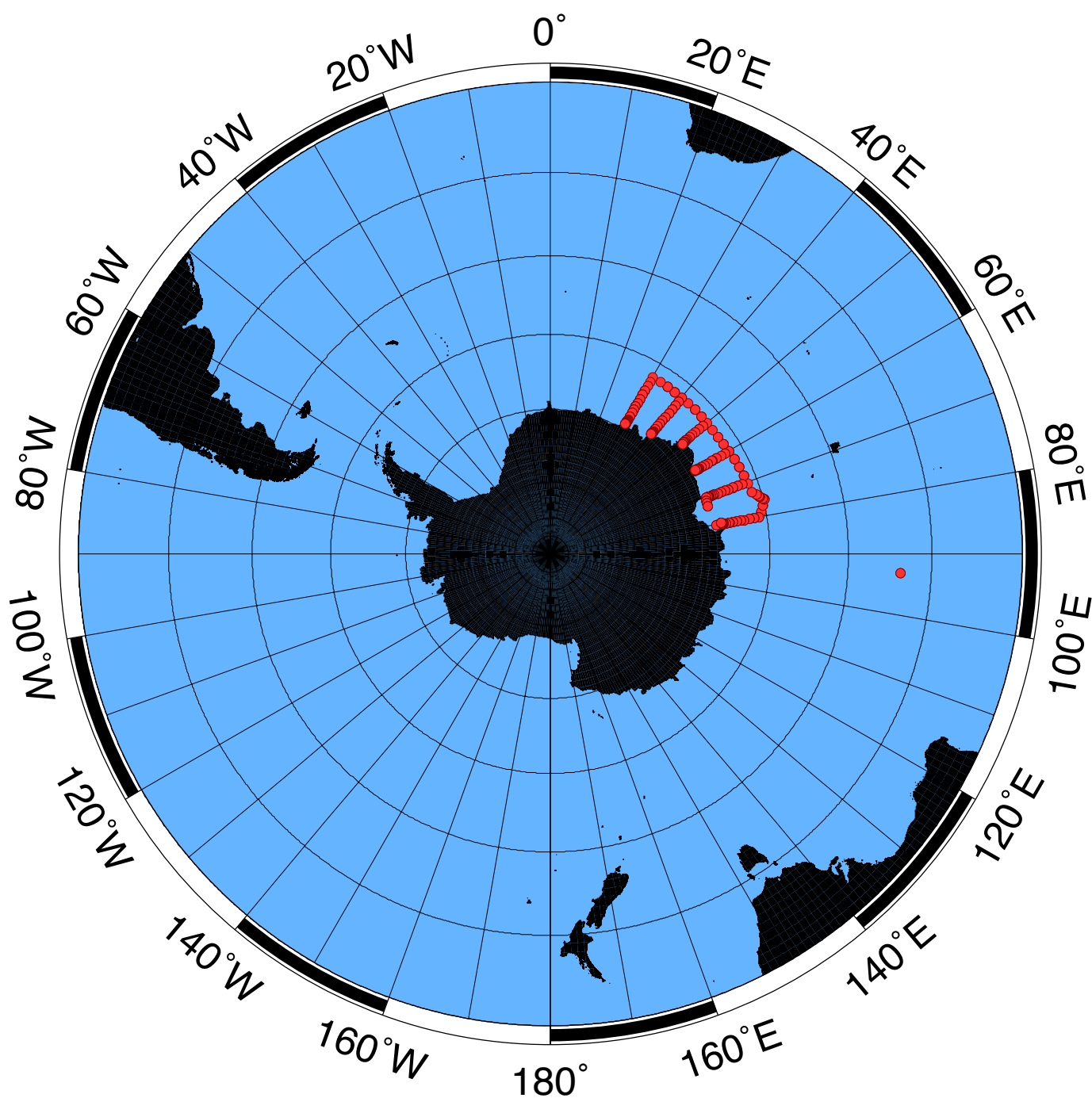
Section designation	<b>S04I</b>		
Expedition designation (EXPOCODE)	<b>09AR20060102</b>		
Chief Scientist & affiliation	<b>Mark Rosenberg/ACE CRC*</b>		
Dates	2006 JAN 02 - 2006 MAR 12		
Ship	R/V Aurora Australis		
Ports of call	Fremantle, Australia; Mawson, Antarctica; Davis, Antarctica; Hobart, Australia		
Number of stations	120		
Geographic boundaries of the stations	43°38.05'S		
	29°56.04'E		93°04.56'E
	69°12.25'S		
Floats and drifters deployed	0 Floats, 0 Drifters		
Moorings deployed or recovered	0 Deployed, 0 recovered		

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## Links to text locations

Shaded sections are not relevant to this cruise or were not available when this report was compiled

Cruise Summary Information	Hydrographic Measurements
Description of Scientific Program	<b>CTD Data:</b>
Geographic Boundaries	Acquisition
Cruise Track (Figure): PI CCHDO	Processing
Description of Stations	Calibration
Description of Parameters Sampled	Salinities
Bottle Depth Distributions (Figure)	Temperature/Pressure/Oxygens
Floats and Drifters Deployed	<b>Bottle Data</b>
Moorings Deployed or Recovered	Oxygen
	Nutrients
Principal Investigators	Carbon System Parameters
Cruise Participants	Helium / Tritium
	Radiocarbon
Problems and Goals Not Achieved	
Other Incidents of Note	
Underway Data Information	References
Navigation Bathymetry	
Acoustic Doppler Current Profiler (ADCP)	
Thermosalinograph	
XBT and/or XCTD	
Meteorological Observations	<b>Acknowledgments</b>
Atmospheric Chemistry Data	
Data Processing Notes	



*Produced from .sum file by CCHDO*

# **BROKE West Survey, Marine Science Cruise AU0603 - Oceanographic Field Measurements and Analysis**

MARK ROSENBERG  
*ACE CRC, Hobart, Australia*  
July, 2006

## **1 INTRODUCTION**

Oceanographic measurements around the "BROKE West" survey area along the Antarctic continental margin between 30° and 80° south were conducted aboard Aurora Australis cruise au0603 (voyage 3 2005/2006, 2nd January to 12th March 2006). A total of 120 CTD vertical profile stations were taken, most to within 15 m of the bottom. Over 2500 Niskin bottle water samples were collected for the measurement of salinity, dissolved oxygen, nutrients (phosphate, nitrate+nitrite, silicate and ammonia), <sup>18</sup>O, dissolved inorganic carbon, alkalinity, particulate organic carbon/nitrogen/silicate, dimethyl sulphide, and biological parameters, using a 24 bottle rosette sampler. Full depth current profiles were collected by an LADCP attached to the CTD package, while near surface current profile data were collected by a ship mounted ADCP. Data from the array of ship's underway sensors are included in the data set.

This report describes the processing/calibration of the CTD and ADCP 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. LADCP data are not discussed in this report. Note that the data processor was not a cruise participant, thus this report does not describe all details of the shipboard field data collection or the problems encountered. CTD station positions are shown in [Figures 1a](#) and [b](#), while CTD station information is summarised in [Table 1](#). Niskin bottle sampling at each station is summarised in [Table 2](#).

## **2 CTD INSTRUMENTATION**

SeaBird SBE9plus CTD serial 704, with dual temperature and conductivity sensors and a single SBE43 dissolved oxygen sensor (on the primary sensor pump line), was used for the entire cruise, 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:

- Benthos model 2110 altimeter
- Tritech 200 kHz and 500 kHz altimeters
- Wetlabs fluorometer serial 296
- photosynthetically active radiation (i.e. PAR) sensor
- Wetlabs C-star transmissometer serial 899DR
- 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 cruise.

The CTD deployment method was as follows:

- CTD initially deployed down 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 Atmospheric Research calibration facility ([Table 3](#)) (July to August 2005). Manufacturer supplied calibrations were used for the dissolved oxygen, fluorometer, transmissometer and altimeters. PAR data are uncalibrated. 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

CTD data were processed in Hobart. The first 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)

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

Full details of the data calibration and processing methods are given in Rosenberg et al. (in preparation), referred to hereafter as the *CTD methodology*.

Final station header information, including station positions and sounder depths at the start, bottom and end of each CTD cast, were obtained from underway data for the cruise (see [section 6](#) 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.
- "Start of cast" and "end of cast" sounder depths are calculated at a sound speed of 1456 m/s, with a ship's draught of 7.3 m added.
- For cases where depth information is missing in the underway bathymetry data set, depth values recorded at the time of CTD logging are used (i.e. as read from the Echogram display, with sound speed 1456 m/s).
- "Bottom of cast" depths are calculated from CTD maximum pressure and altimeter value 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 this cruise.

### 4.1 Conductivity/salinity

The conductivity calibration and equivalent salinity results for the cruise are plotted in [Figures 2 and 3](#), and the derived conductivity calibration coefficients are listed in [Tables 4 and 5](#). International standard seawater batch numbers P144 and P146 were used for salinometer standardisation. The salinometer (Guildline Autosol serial 62549) appeared very stable throughout the cruise, however significant sample scatter occurred during calibration of the CTD conductivity, particularly for shallower samples. The problem was eventually traced to a poor refit of the salinometer, during servicing of the instrument by a contractor prior to the cruise. From Neale Johnston's cruise hydrochemistry report:

"...salinometer gave symptoms of the water bath overheating....when (salinometer) last serviced the sample inlet line was placed too close to the electronics inside the Guildline, which was heating the sample above the bath temperature before the sample was introduced into the bath. The inlet line was moved and the overheating problem did not reoccur."

In general, the problem was worse for shallower samples, as they were typically warmer already. As a result, large station groupings were required for the CTD calibration ([Table 4](#)), to ensure sufficient sample coverage for the lower conductivity values in the shallow part of the vertical profiles. Thus the salinity standard deviation value of ~0.0013 (PSS78) from the the salinity calibration in [Figure 3](#) is considered an overestimate of CTD salinity accuracy. Overall, CTD salinity for the cruise should only be considered accurate to 0.002 (PSS78).

Prior to calibration, a small "step" in the CTD/bottle conductivity comparison was noted for stations 60 to 64. The reason for this step could not be determined (i.e. salinometer or CTD? real or error?), particularly as the profile shapes for these stations were different to surrounding stations. The samples were retained for the conductivity calibration, however CTD salinity for these stations should only be considered accurate to 0.0025 (PSS78).

Salinometer instabilities occurred for stations 15 and 48; salinity samples from these stations were rejected for the CTD calibration. In both cases there is sufficient sample coverage from surrounding stations, and thus there is no significant diminishing of salinity accuracy.

## 4.2 Temperature

Primary and secondary CTD temperature data ( $t_p$  and  $t_s$  respectively) are compared for the cruise in [Figure 4](#). CTD upcast burst data, obtained at each Niskin bottle stop, are used for the comparison. From the figure, there is a very small pressure dependency of  $t_p-t_s$  for CTD704 of the order  $0.0005^\circ\text{C}$  over 5500 dbar. Without some temperature standard for comparison, it cannot be determined whether the 2 temperature sensors have the same or different pressure dependencies. Nevertheless, this pressure dependence lies within the assumed temperature accuracy of  $0.001^\circ\text{C}$  (i.e. the accredited temperature accuracy of the CSIRO calibration facility).

## 4.3 Pressure

Surface pressure offsets for each cast ([Table 6](#)) were obtained from inspection of the data before the package entered the water.

When creating the 2 dbar bin averages, a minimum attendance of 8 data scans per bin was required. Data transmission faults and buffer overloads resulted in pressure spikes and small data gaps for several stations. As a result several 2 dbar bins have no data, for the following stations:

7, 18, 37, 46, 76, 88, 95, 98

## 4.4 Dissolved oxygen

For casts deeper than 1400 dbar the profiles were split into a shallow and deep part for separate calculation of oxygen calibration coefficients, with a linear interpolation between the 2 calibrations around the split point (see the *CTD methodology* for full details). Casts shallower than 1400 dbar were calibrated as whole profile fits. The CTD oxygen calibration results are plotted in [Figure 5](#), and the derived calibration coefficients are listed in [Table 7](#). Overall the calibrated CTD oxygen agrees with the bottle data to well within 1% of full scale (where full scale is  $\sim 400\ \mu\text{mol/l}$  above 750 dbar, and  $\sim 270\ \mu\text{mol/l}$  below 750 dbar). Suspect bottle oxygen samples and 2 dbar CTD data (not deleted from the bottle and CTD files) are listed in [Tables 8](#) and [9](#) respectively.

A significant number of bad bottle oxygen samples occurred for the first half of the CTD stations - specifically, 89 bad samples occurred up to station 58, a much higher bad sample rate than usual. Many of these bad samples were due to sampling error i.e insufficient shaking of samples following addition of reagents. The sampling problem was corrected, and after station 58 only a further 8 bad samples occurred. Bad samples were deleted from the data files. In most cases, sufficient bottle samples remained for calibration of CTD oxygen data.

Further dissolved oxygen data processing notes:

- For station 31, a split point of 1300 dbar was used for the split profile calibration.
- For station 43, all oxygen bottle samples were bad, therefore the CTD oxygen data were unusable.
- For station 58, the top 5 oxygen bottle samples were bad, so the top 36 dbar of CTD oxygen data were unusable.



- For station 97, the bottom 8 bottle oxygen samples were bad, thus the CTD oxygen data below 228 dbar were unusable.
- No bottle oxygen samples were taken at station 119 and 120, thus the CTD oxygen data were unusable.

#### 4.5 Fluorescence, PAR, transmittance

All fluorescence and transmittance data have a calibration as supplied by the manufacturer ([Table 3](#)). PAR sensor data are uncalibrated. The data have **not** been verified by linkage to other data sources (e.g. chlorophyll-a concentration data, particulate data, etc). For example, unusually high CTD fluorescence values evident at stations 100, 101 and 102 must be verified from Niskin bottle pigment data (P.I. Simon Wright).

#### 4.6 Nutrients

Nutrients measured on the cruise were phosphate, total nitrate (i.e. nitrate+nitrite), silicate, and ammonia (only up to station 85). At the time of writing, all phosphate data for the cruise are bad.

Initial phosphate analysis results, using a phosphate standard made in the lab prior to the cruise (referred to as "lab standard" in the following discussion), were all ~10% low. During phosphate analysis runs on the Lachat instrument, samples of standard reference material (SRM) were inserted into each run. Following analysis a "phosphate recovery" correction was attempted for each station, on the assumption that the lab standard was low and the SRM was correct. Note that these corrected phosphate values still showed a scatter of  $\pm 3\%$  between different groups of stations. On return to Hobart, both the lab standard and SRM were checked - the lab standard appeared to be correct, and the SRM gave inconsistent results on repeat checks. Thus no explanation was found for the low results on the ship, and all phosphate data were unrecoverable.

Suspect nitrate+nitrite and silicate values not deleted from the bottle data files are listed in [Table 10](#). Further data quality notes:

- Nitrate+nitrite values for stations 82 to 88 were all low by ~5 to 8%, and have been removed from the files.
- Nitrate+nitrite values for station 46 are all low by ~3%.
- All nutrient data for station 20 were bad.
- Ammonia data are unverified, and should be used with caution.

#### 4.7 Additional CTD data processing/quality notes

- Station 10 - The final elevation at the bottom of the cast is unknown, as the altimeter never came in range. Future processing of the LADCP bottom track data may reveal whether the bottom was within 192 m (i.e. bottom detection range of the LADCP).
- Station 95 - The minimum reliable altimeter reading at the bottom of the cast was 1.6 m, however the CTD operators from the cruise believe there may have been bottom contact. There is no noticeable shift in temperature and conductivity sensor data at the bottom, thus the data are unaffected.
- Station 103 - The CTD was lifted out of the water prematurely, before bottle 24 was fired. It was lowered back down to 10 dbar to fire the bottle.



## 5 ADCP

The hull mounted ADCP on the Aurora Australis is described in Rosenberg (unpublished report, 1999), with the following updates:

- (i) There is no longer a Fugro differential GPS system - all GPS data, including heading, come from the Ashtech 3D system.
- (ii) Triggering of the 12 kHz sounder and the higher frequency hydroacoustics array are now separate, resulting in a higher ping rate for the ADCP (linked to the higher frequency hydroacoustics array).

Logging parameters and calibration coefficients for the cruise are summarised in [Table 11](#). Current vectors for the cruise are plotted in [Figures 6a](#) and [b](#); the apparent vertical current shear error for different ship speed classes is plotted in [Figure 7](#).

Several gaps in the ADCP data occur over the cruise, due to GPS and/or ADCP logging failure. The main gaps are:

1600 on 27th January to 0200 on 28th January  
0033 on 31st January to 2233 on 31st January  
0000 on 5th February to 2227 on 5th February  
1728 on 18th February to 0706 on 19th February

These data gaps cover the times of the following CTD's: 46, 59, 66 (upcast), 67, 68, 69, 70, 71, 91 and 92.

In general, ADCP data are contaminated by ship's motion when the ship accelerates i.e. changes direction or speed. Noise and turbulence often diminish ADCP data quality when the ship travels at speeds greater than ~13 knots, or during rough sea states. Thus the best quality ADCP data is when the ship is steaming in a straight line at a suitable constant speed, and during milder sea conditions. The most reliable data are collected when the ship is "on station" (on station data is defined here as data where ship speed  $\leq 0.35$  m/s).

An erroneous vertical ADCP current shear occurs when the ship is underway. This shear has a magnitude for this cruise of up to ~0.08 m/s over the ADCP current profile ([Figure 7](#)). A likely cause for this error is acoustic ringing against a small air/water interface inside the transducer seachest. From [Figure 7](#), when the ship is underway the effect is most significant over bins 1 to 10, and data from these bins should be treated with caution. Also from the figure, when the ship is travelling at  $\leq 1$  m/s the effect is no longer significant.

## 6 UNDERWAY MEASUREMENTS

Underway data were logged to an Oracle database on the ship. For more information, see the AADC (Antarctic Division Data Centre) website, and the cruise dotzapper (i.e. data quality controller) report for AU0603:

Marine Science Support Data Quality Report, RSV Aurora Australis Voyage 1 2005-2006, Voyage 2 2005-2006, Voyage 3 2005-2006 (BROKE WEST), Belinda Ronai, March 2006. Antarctic Division unpublished report.

1 minute averaged underway data are contained in the files *brokewest.ora* (column formatted text file) and *brokewest.ora.mat* (matlab format). 10 second instantaneous position and depth data are contained in the files *brokewestbath.alf* (column formatted text file) and *brokewestbathalf.mat* (matlab format).

Bathymetry data were processed by Esmee Van Wijk (Antarctic Division). A sound speed of 1456 m/s was used for ocean depth calculation, and the ship's draught of 7.3 m was accounted for (i.e. depths are from the water surface). Data were only processed from along the transect lines in the BROKE West survey area. In addition, during the cruise 12 kHz data below 5000 m were not logged. As a result, there are many gaps in the underway bathymetry data.

Underway temperature data from the Antarctic Division hull mounted temperature sensor near the sea water inlet are considered reliable. Underway salinity data from the Antarctic Division thermosalinograph in the oceanographic lab have a significant error in colder waters, due to icing effects in the debubbler (Bronte Tilbrook, CSIRO, personal communication); these salinity data should not be used. Alternative underway salinity data were obtained from a separate CSIRO thermosalinograph in lab 1 (P.I. Bronte Tilbrook, CSIRO), and these data are considered reliable. A correction for the hull mounted temperature sensor and the lab 1 salinity was derived by comparing the underway data to CTD temperature and salinity data at 8 dbar (Figures 8a and b). The following corrections were then applied to the underway data:

$$\begin{aligned}T &= T_{\text{dls}} - 0.038 \\S &= S_{\text{dls}} + 0.041\end{aligned}$$

for corrected underway temperature and salinity T and S respectively, and uncorrected values  $T_{\text{dls}}$  and  $S_{\text{dls}}$ .

## REFERENCES

- Rosenberg, M., unpublished. *Aurora Australis ADCP data status*. Antarctic Cooperative Research Centre, unpublished report, November 1999. 51 pp.
- Rosenberg, M., Fukamachi, Y., Rintoul, S., Church, J., Curran, C., Helmond, I., Miller, K., McLaughlan, D., Berry, K., Johnston, N. and Richman, J., in preparation. *Kerguelen Deep Western Boundary Current Experiment and CLIVAR I9 transect, marine science cruises AU0304 and AU0403 - oceanographic field measurements and analysis*. ACE CRC Research Report.

## ACKNOWLEDGEMENTS

Thanks to all scientific personnel who participated in the cruise, and to the crew of the RSV Aurora Australis. Special thanks to the oceanography team for a great job collecting the data.

## CCHDO DATA PROCESSING NOTES

Date	Contact	Data Type	Action	Summary
2007-12-12	Rosenberg	CTD/BTL/SUM	Submitted	Data are public
	<p>Detailed Notes</p> <p>Status: public</p> <p>Name: Rosenberg, Mark</p> <p>Institute: ACECRC</p> <p>Country: Australia</p> <p>Expo: 09AR0603 (BROKE WEST SURVEY)</p> <p>Date: 2006-01-02</p> <p>Action: Place Online</p>			
2008-11-21	Bartolucci	CTD/BTL/SUM	Website Updated	Data Reformatted/Online
	<p>BOTTLE:</p> <ul style="list-style-type: none"> <li>• sent in exchange format. Edited the SECT-ID from BROKEW to S04I based on cruise track and former WOCE line geography. Did not edit the TEST or AMcal station designations.</li> <li>• edited expocode from 09AR0603_1 to 09AR20060102</li> <li>• Added date/name stamp</li> <li>• changed name from a0603.sea to s04i_09ar20060102_hy1.csv</li> <li>• added needed first header line of: BOTTLE:20081103CCHDOSIODBK</li> <li>• added END_DATA line at end of file.</li> <li>• CTDFLUORO,CTDFLUORO_FLAG_W was edited to CTDFLUOR,CTDFLUOR_FLAG_W in header line to adhere to WOCE parameter naming conventions.</li> </ul> <p>SUM:</p> <ul style="list-style-type: none"> <li>• sent in woce format.</li> <li>• edited EXPOCODE from 09AR0603/1 to 09AR20060102.</li> <li>• edited SECT_ID from BROKEW to S04I</li> <li>• removed leading zero from station numbers to match bottle file station numbers.</li> <li>• added date/name stamp and WOCE_ID to header.</li> <li>• renamed file from a0603.sum to s04i_09ar20060102su.txt</li> <li>• format checked file with sumcheck. No errors reported.</li> </ul> <p>CTD:</p> <ul style="list-style-type: none"> <li>• All files contain non-WOCE parameters and their flags which appear to be in raw voltages: PAR, TRANS</li> <li>• changed SECT_ID from BROKEW to S04I</li> <li>• changed EXPOCODE from 09AR0603_1 to 09AR20060102</li> <li>• removed leading zero from station numbers to match sum and bottle file station numbers.</li> <li>• edited name/date stamp</li> <li>• edited FLUORO and FLUORO_FLAG to read FLUOR and FLUOR_FLAG</li> <li>• edited all names to conform to post-WOCE naming convention</li> <li>• zipped all files and named zip file s04i_09ar20060102_ct1.zip</li> <li>• ctd files were not readable by JOA.</li> </ul> <p>Placed all files in new cruise directory. Emailed reformatting notes to J. Kappa.</p>			

**Table 1:** Summary of station information for cruise au0603. All times UTC; "leg" = BROKE West CTD leg number, "TEST" = test cast, "FSIcal" = calibration cast for the FSI CTD from the Amery Ice Shelf borehole work; "alt" = minimum altimeter value (m), "maxp" = maximum pressure (dbar).

station	date	-----start of CTD-----					-----bottom of CTD-----					-----end of CTD-----				
		time	latitude	longitude	depth		time	latitude	longitude	depth		time	latitude	longitude	depth	alt maxp
001 TEST	06 Jan 2006	064038	43 38.10 S	093 04.95 E	-		074348	43 38.26 S	093 05.67 E	2679		084817	43 38.34 S	093 06.19 E	2761	17.4 2701
002 leg12.1	10 Jan 2006	154918	60 36.08 S	078 32.22 E	2971		165713	60 36.01 S	078 32.51 E	3037		181920	60 35.98 S	078 32.96 E	-	10.6 3078
003 leg12.2	11 Jan 2006	003342	60 12.10 S	077 03.89 E	2478		013525	60 12.16 S	077 04.14 E	2432		024403	60 12.08 S	077 04.40 E	2481	8.1 2462
004 leg12.3	11 Jan 2006	070804	59 47.89 S	075 36.03 E	1730		074107	59 47.82 S	075 35.88 E	1685		084210	59 47.68 S	075 35.77 E	1722	10.2 1698
005 leg12.4	11 Jan 2006	120219	59 59.68 S	075 13.12 E	2091		124037	59 59.62 S	075 12.97 E	2048		134622	59 59.64 S	075 12.43 E	2081	10.4 2068
006 leg12.5	11 Jan 2006	164931	60 19.24 S	074 35.55 E	2554		174018	60 19.24 S	074 35.26 E	2486		185632	60 19.22 S	074 35.22 E	2553	11.9 2513
007 leg12.6	11 Jan 2006	203923	60 23.51 S	074 27.76 E	2944		214155	60 23.53 S	074 28.03 E	2898		230923	60 23.29 S	074 28.20 E	2921	14.2 2932
008 leg12.7	12 Jan 2006	013236	60 40.69 S	073 54.17 E	-		025055	60 40.69 S	073 53.98 E	3247		040712	60 40.57 S	073 54.29 E	3341	13.3 3290
009 leg12.8	12 Jan 2006	074519	61 12.11 S	072 53.99 E	-		090423	61 12.23 S	072 54.14 E	4118		103725	61 12.36 S	072 54.73 E	4237	14.6 4184
010 leg12.9	12 Jan 2006	160632	61 18.80 S	070 20.63 E	-		173156	61 18.59 S	070 20.93 E	-		192316	61 18.02 S	070 21.58 E	4163	- 4105
011 leg12.10	13 Jan 2006	014127	61 25.60 S	067 47.35 E	4360		025647	61 25.20 S	067 47.50 E	4359		044708	61 24.70 S	067 47.74 E	4356	9.6 4437
012 leg12.11	13 Jan 2006	101028	61 32.60 S	065 13.78 E	4458		113208	61 32.63 S	065 14.41 E	4459		132912	61 32.55 S	065 15.10 E	4459	18.5 4532
013 leg12.12	13 Jan 2006	185254	61 39.49 S	062 40.29 E	4447		201125	61 39.59 S	062 40.22 E	4450		221628	61 39.58 S	062 40.28 E	4447	7.5 4534
014 leg12.13	14 Jan 2006	032913	61 46.19 S	060 07.01 E	4698		050051	61 46.19 S	060 07.04 E	4699		070755	61 45.68 S	060 07.77 E	4697	5.7 4793
015 leg12.14	14 Jan 2006	122433	61 53.07 S	057 33.33 E	4805		135303	61 53.06 S	057 33.76 E	4829		155024	61 52.96 S	057 34.37 E	4827	15.4 4917
016 leg12.15	14 Jan 2006	211615	62 00.06 S	055 00.25 E	4984		225735	62 00.05 S	055 00.89 E	4990		011530	62 00.16 S	055 01.42 E	4986	9.4 5089
017 leg12.16	15 Jan 2006	063034	61 59.94 S	052 30.31 E	-		081138	62 00.25 S	052 30.83 E	5137		101125	62 00.37 S	052 31.05 E	-	14.9 5235
018 leg12.17	15 Jan 2006	202144	61 59.99 S	049 59.64 E	-		220350	62 00.34 S	049 59.58 E	5123		235206	62 00.72 S	049 59.76 E	-	10.6 5225
019 leg12.18	16 Jan 2006	074621	61 59.99 S	047 30.10 E	5067		091326	62 00.06 S	047 30.64 E	5069		111625	62 00.03 S	047 31.29 E	5068	13.7 5167
020 leg12.19	16 Jan 2006	180138	61 59.99 S	045 00.02 E	5012		193227	62 00.14 S	044 59.99 E	5016		212621	62 00.50 S	045 00.44 E	5004	10.5 5114
021 leg12.20	17 Jan 2006	033135	61 59.93 S	042 30.22 E	-		051555	62 00.04 S	042 29.89 E	5142		071647	62 00.02 S	042 29.20 E	-	13.0 5243
022 leg12.21	17 Jan 2006	131310	62 00.02 S	040 00.10 E	-		143957	61 59.95 S	040 00.04 E	5170		164100	61 59.68 S	040 00.31 E	5170	14.8 5270
023 leg12.22	17 Jan 2006	232628	61 59.87 S	037 30.05 E	5159		011938	61 59.53 S	037 30.35 E	5163		031332	61 59.34 S	037 30.98 E	5166	12.2 5265
024 leg12.23	18 Jan 2006	085024	62 00.02 S	034 59.90 E	5094		101957	62 00.23 S	034 59.71 E	5090		120034	62 00.40 S	034 59.24 E	5086	15.7 5186
025 leg12.24	18 Jan 2006	175539	61 59.71 S	032 29.16 E	-		191628	61 59.30 S	032 29.83 E	5150		211809	61 58.79 S	032 31.80 E	-	12.4 5252
026 leg12.25	19 Jan 2006	042454	62 00.01 S	030 00.05 E	-		060130	62 00.05 S	030 00.27 E	5175		075423	62 00.30 S	030 01.01 E	-	15.9 5274
027 leg1.1	19 Jan 2006	133538	62 40.00 S	030 00.36 E	-		150715	62 40.05 S	030 01.31 E	5160		164552	62 40.06 S	030 02.09 E	-	15.8 5258
028 leg1.2	19 Jan 2006	213013	63 19.91 S	030 00.64 E	-		231114	63 19.87 S	030 01.52 E	5131		005803	63 19.90 S	030 02.60 E	-	7.3 5238
029 leg1.3	20 Jan 2006	062621	64 00.00 S	030 00.05 E	5088		080606	64 00.02 S	030 00.19 E	5086		093902	64 00.07 S	030 00.66 E	5083	14.5 5184
030 leg1.4	20 Jan 2006	150417	64 39.99 S	030 00.20 E	4965		163110	64 40.03 S	030 00.02 E	4972		180408	64 40.05 S	029 59.96 E	4964	13.9 5067
031 leg1.5	20 Jan 2006	231322	65 20.03 S	030 00.26 E	4804		004732	65 19.91 S	030 01.06 E	4811		023217	65 19.66 S	030 01.61 E	4806	6.9 4908
032 leg1.6	21 Jan 2006	073819	65 59.96 S	030 00.01 E	4484		085619	65 59.83 S	029 59.76 E	4500		102438	65 59.59 S	029 59.38 E	4486	16.5 4577
033 leg1.7	21 Jan 2006	144415	66 30.01 S	029 59.89 E	4224		160607	66 29.93 S	029 59.51 E	4271		173612	66 29.88 S	029 59.05 E	4250	14.6 4343
034 leg1.8	21 Jan 2006	211339	66 59.97 S	029 59.93 E	4029		223530	66 59.87 S	029 59.42 E	4092		000114	66 59.87 S	029 59.12 E	4080	8.4 4166
035 leg1.9	22 Jan 2006	044146	67 30.04 S	029 59.97 E	3559		055128	67 29.93 S	029 59.38 E	3584		071223	67 29.92 S	029 58.94 E	3591	11.5 3640
036 leg1.10	22 Jan 2006	112726	67 59.84 S	030 00.81 E	3707		123040	67 59.90 S	030 00.88 E	3716		135912	67 59.93 S	030 00.56 E	3713	15.6 3772
037 leg1.11	22 Jan 2006	204954	68 29.92 S	029 59.88 E	-		215754	68 29.98 S	029 59.51 E	3506		231859	68 30.01 S	029 59.49 E	-	10.8 3561
038 leg1.12	23 Jan 2006	020457	68 41.71 S	030 00.27 E	2982		030214	68 41.50 S	030 00.56 E	3000		042041	68 41.24 S	030 00.79 E	2956	10.1 3043
039 leg1.13	23 Jan 2006	062654	68 49.86 S	030 00.08 E	2512		071854	68 49.80 S	030 00.40 E	2593		083310	68 49.74 S	030 00.56 E	2532	10.0 2626

**Table 1: (cntd)**

station	-----start of CTD-----					-----bottom of CTD-----					-----end of CTD-----					alt	maxp
	date	time	latitude	longitude	depth	time	latitude	longitude	depth	time	latitude	longitude	depth				
040 leg1.14	23 Jan 2006	103800	68 55.36 S	029 59.88 E	1959	111114	68 55.47 S	029 59.69 E	1977	121113	68 55.67 S	029 59.74 E	1922	16.8	1990		
041 leg1.15	23 Jan 2006	133853	69 00.69 S	029 58.63 E	1254	140309	69 00.80 S	029 58.15 E	1333	145526	69 01.15 S	029 56.85 E	1437	15.7	1336		
042 leg1.16	23 Jan 2006	162058	69 04.72 S	029 59.81 E	820	163835	69 04.73 S	029 59.62 E	865	172005	69 04.76 S	029 59.12 E	908	15.1	860		
043 leg1.17	23 Jan 2006	185502	69 06.64 S	029 59.90 E	267	190110	69 06.66 S	029 59.87 E	267	193530	69 06.77 S	029 59.32 E	279	10.8	260		
044 leg1.18	23 Jan 2006	235015	69 12.43 S	029 56.07 E	211	235830	69 12.45 S	029 56.05 E	228	002731	69 12.41 S	029 55.81 E	252	7.6	223		
045 leg3.1	27 Jan 2006	121931	62 39.96 S	040 00.17 E	5014	140627	62 40.03 S	040 00.32 E	5017	155628	62 40.07 S	040 00.37 E	5014	13.8	5112		
046 leg3.2	27 Jan 2006	202659	63 19.89 S	039 59.74 E	4930	220401	63 19.58 S	039 59.55 E	4936	233924	63 19.25 S	039 59.56 E	4933	9.0	5035		
047 leg3.3	28 Jan 2006	044749	63 59.98 S	040 00.05 E	4829	062059	63 59.89 S	040 00.52 E	4830	075821	63 59.81 S	040 01.58 E	4807	7.5	4926		
048 leg3.4	28 Jan 2006	132711	64 40.06 S	040 00.34 E	4726	145146	64 40.07 S	040 00.42 E	4726	164601	64 39.91 S	040 00.60 E	4719	14.4	4812		
049 leg3.5	28 Jan 2006	215940	65 20.28 S	040 00.23 E	4735	233258	65 20.41 S	040 00.69 E	4745	011222	65 20.56 S	040 01.03 E	4740	10.4	4836		
050 leg3.6	29 Jan 2006	053407	66 00.05 S	040 00.25 E	4484	065903	66 00.20 S	040 00.30 E	4488	084702	66 00.04 S	039 59.75 E	4489	7.4	4575		
051 leg3.7	29 Jan 2006	125754	66 30.03 S	040 00.04 E	4520	141935	66 30.00 S	040 00.09 E	4524	160250	66 29.93 S	040 00.02 E	4519	9.4	4610		
052 leg3.8	29 Jan 2006	193243	67 00.08 S	039 59.81 E	3632	204614	66 59.98 S	039 59.17 E	3656	222118	67 00.05 S	039 57.74 E	3704	8.8	3716		
053 leg3.9	30 Jan 2006	030751	67 29.96 S	039 59.56 E	3222	041051	67 30.10 S	039 58.99 E	3244	054327	67 30.16 S	039 58.22 E	3207	8.4	3294		
054 leg3.10	30 Jan 2006	094828	67 56.49 S	039 59.78 E	2216	102545	67 56.47 S	039 59.96 E	2244	112404	67 56.51 S	039 59.68 E	2141	13.0	2267		
055 leg3.11	30 Jan 2006	132348	68 02.87 S	039 59.95 E	1521	140339	68 03.08 S	039 59.68 E	1804	144947	68 03.21 S	039 59.58 E	1800	14.1	1817		
056 leg3.12	30 Jan 2006	164232	68 07.89 S	040 00.11 E	979	170149	68 07.98 S	040 00.04 E	999	174236	68 08.21 S	040 00.04 E	798	10.6	1001		
057 leg3.13	30 Jan 2006	191333	68 08.66 S	040 00.05 E	508	192922	68 08.77 S	039 59.91 E	485	201311	68 08.83 S	039 59.58 E	415	10.8	480		
058 leg3.14	30 Jan 2006	215649	68 11.83 S	040 00.35 E	309	220832	68 11.83 S	040 00.20 E	323	224556	68 11.68 S	040 00.34 E	313	6.9	320		
059 leg3.15	31 Jan 2006	003447	68 20.86 S	039 59.74 E	310	004549	68 20.86 S	039 59.63 E	315	011755	68 20.78 S	039 59.33 E	315	9.0	310		
060 leg5.1	03 Feb 2006	014151	62 40.06 S	049 59.99 E	4995	032859	62 40.37 S	049 59.96 E	4994	051629	62 40.58 S	049 59.59 E	4992	10.4	5093		
061 leg5.2	03 Feb 2006	094942	63 20.08 S	050 00.00 E	4843	112128	63 19.99 S	049 59.74 E	4845	132041	63 19.87 S	049 59.42 E	4842	15.8	4933		
062 leg5.3	03 Feb 2006	185425	64 00.13 S	049 59.80 E	-	202249	63 59.92 S	049 59.44 E	4392	215300	63 59.62 S	049 59.17 E	4410	10.8	4471		
063 leg5.4	04 Feb 2006	031904	64 30.65 S	049 59.60 E	-	044527	64 30.73 S	049 58.99 E	4272	061244	64 30.66 S	049 58.52 E	-	10.8	4348		
064 leg5.5	04 Feb 2006	115030	65 00.05 S	049 59.81 E	2542	123726	64 59.97 S	049 59.54 E	2563	134342	64 59.98 S	049 59.15 E	2542	15.7	2588		
065 leg5.6	04 Feb 2006	183056	65 22.80 S	049 59.90 E	-	190657	65 22.76 S	049 59.74 E	2029	201805	65 22.78 S	049 58.97 E	-	4.3	2055		
066 leg5.7	04 Feb 2006	231535	65 37.14 S	049 59.20 E	2001	235949	65 37.24 S	049 59.10 E	2018	010113	65 37.40 S	049 59.04 E	1999	10.6	2038		
067 leg5.8	05 Feb 2006	025740	65 51.76 S	049 59.09 E	1557	033807	65 52.03 S	049 59.09 E	1658	043509	65 52.30 S	049 58.45 E	1685	10.4	1671		
068 leg5.9	05 Feb 2006	061618	66 00.47 S	049 59.64 E	935	063955	66 00.57 S	049 59.02 E	934	072103	66 00.68 S	049 58.19 E	854	13.6	932		
069 leg5.10	05 Feb 2006	085454	66 01.63 S	049 59.82 E	489	090909	66 01.66 S	049 59.65 E	514	094447	66 01.73 S	049 59.32 E	496	7.7	512		
070 leg5.11	05 Feb 2006	130609	66 05.57 S	049 59.33 E	253	131208	66 05.53 S	049 59.24 E	265	133829	66 05.45 S	049 58.93 E	253	12.6	255		
071 leg5.12	05 Feb 2006	160834	66 20.35 S	050 09.22 E	172	161414	66 20.35 S	050 09.23 E	181	164429	66 20.32 S	050 09.22 E	172	12.1	171		
072 leg7.1	08 Feb 2006	045508	62 19.91 S	059 59.91 E	4664	063043	62 19.98 S	060 00.14 E	4672	082722	62 20.44 S	060 00.24 E	-	16.1	4754		
073 leg7.2	08 Feb 2006	153231	62 59.96 S	060 00.28 E	-	164924	62 59.95 S	060 00.42 E	4466	184222	63 00.20 S	060 00.94 E	-	10.1	4548		
074 leg7.3	09 Feb 2006	010614	63 40.07 S	060 00.11 E	4368	023022	63 40.20 S	060 00.28 E	4375	040756	63 40.26 S	060 00.52 E	4376	10.4	4454		
075 leg7.4	09 Feb 2006	090136	64 19.99 S	059 59.99 E	4226	101920	64 20.23 S	059 59.98 E	4229	120327	64 20.62 S	060 00.05 E	4224	10.8	4304		
076 leg7.5	09 Feb 2006	182418	65 00.14 S	060 00.25 E	4039	194401	65 00.32 S	060 00.56 E	4042	211210	65 00.66 S	060 00.94 E	4040	4.9	4117		
077 leg7.6	10 Feb 2006	005654	65 29.95 S	059 59.86 E	3801	021117	65 29.97 S	059 59.87 E	3812	034101	65 30.06 S	059 59.77 E	3799	6.0	3879		
078 leg7.7	10 Feb 2006	083215	65 59.99 S	059 59.84 E	2676	092259	66 00.17 S	059 59.68 E	2675	103404	66 00.18 S	059 59.53 E	2657	11.5	2708		
079 leg7.8	10 Feb 2006	141345	66 18.89 S	059 59.95 E	-	150809	66 18.86 S	059 59.97 E	2675	163150	66 18.82 S	059 59.95 E	2686	12.9	2706		
080 leg7.9	10 Feb 2006	193215	66 30.03 S	059 59.61 E	1783	201230	66 30.01 S	059 58.87 E	1845	211812	66 29.90 S	059 57.64 E	1717	15.7	1856		

**Table 1: (cntd)**

station	-----start of CTD-----					-----bottom of CTD-----					-----end of CTD-----					alt	maxp
	date	time	latitude	longitude	depth	time	latitude	longitude	depth	time	latitude	longitude	depth				
081 leg7.10	10 Feb 2006	230902	66 33.41 S	059 59.28 E	1327	234538	66 33.41 S	059 58.73 E	1391	003852	66 33.43 S	059 58.07 E	1318			9.4	1400
082 leg7.11	11 Feb 2006	021048	66 39.70 S	059 59.71 E	895	023431	66 39.63 S	059 59.07 E	936	032215	66 39.68 S	059 58.03 E	861			11.1	937
083 leg7.12	11 Feb 2006	051757	66 40.94 S	059 59.58 E	453	053148	66 40.94 S	059 59.44 E	472	060511	66 40.84 S	059 58.51 E	457			10.0	468
084 leg7.13	11 Feb 2006	080532	66 54.04 S	060 00.03 E	409	081321	66 54.04 S	059 59.98 E	475	085250	66 54.14 S	059 59.52 E	586			15.7	465
085 leg7.14	11 Feb 2006	104905	66 55.94 S	059 56.39 E	931	111141	66 55.96 S	059 56.38 E	940	115829	66 55.99 S	059 56.35 E	933			15.8	936
086 leg9.1	17 Feb 2006	003704	61 59.95 S	069 59.99 E	4119	015426	61 59.90 S	069 59.60 E	4124	032828	62 00.01 S	069 59.24 E	-			8.4	4196
087 leg9.2	17 Feb 2006	100350	62 40.04 S	070 00.01 E	4036	120702	62 40.03 S	069 59.28 E	4045	135135	62 40.04 S	069 59.74 E	4038			11.3	4113
088 leg9.3	17 Feb 2006	202006	63 20.21 S	069 59.36 E	3830	213831	63 20.24 S	069 59.12 E	3840	225856	63 20.17 S	069 59.17 E	3835			6.2	3907
089 leg9.4	18 Feb 2006	063006	63 59.77 S	070 00.04 E	3506	073553	63 59.49 S	070 00.02 E	3510	090639	63 59.34 S	070 00.05 E	3507			6.8	3568
090 leg9.5	18 Feb 2006	123138	64 29.99 S	069 59.89 E	3237	133424	64 29.98 S	069 59.98 E	3241	144642	64 29.90 S	070 00.07 E	3235			12.1	3287
091 leg9.6	18 Feb 2006	222317	64 59.87 S	069 59.80 E	2907	231658	64 59.68 S	069 59.33 E	2918	002859	64 59.56 S	069 58.73 E	2907			4.7	2963
092 leg9.7	19 Feb 2006	035616	65 30.10 S	069 59.78 E	2707	045337	65 30.13 S	069 59.91 E	2727	061229	65 30.17 S	069 59.38 E	2692			9.4	2763
093 leg9.8	19 Feb 2006	113534	66 00.04 S	069 59.78 E	2409	121638	66 00.07 S	069 59.64 E	2423	132119	66 00.05 S	070 00.14 E	2424			11.0	2451
094 leg9.9	19 Feb 2006	154312	66 14.99 S	069 59.69 E	2291	162819	66 14.96 S	069 59.03 E	2295	172624	66 14.90 S	069 58.34 E	2287			8.6	2322
095 leg9.10	19 Feb 2006	202839	66 30.38 S	069 59.99 E	1984	210058	66 30.35 S	069 59.93 E	1991	220604	66 30.20 S	069 59.44 E	1983			1.6	2020
096 leg9.11	19 Feb 2006	235953	66 43.68 S	069 59.95 E	1520	002536	66 43.64 S	069 59.89 E	1533	011742	66 43.70 S	069 59.47 E	1520			8.1	1546
097 leg9.12	20 Feb 2006	041205	66 49.19 S	070 00.27 E	1039	043051	66 49.24 S	069 59.97 E	1031	051558	66 49.39 S	069 59.49 E	950			7.1	1037
098 leg9.13	20 Feb 2006	072453	66 52.56 S	069 59.96 E	500	073712	66 52.59 S	069 59.98 E	508	080950	66 52.67 S	070 00.09 E	495			13.4	501
099 leg9.14	20 Feb 2006	105028	67 10.84 S	070 00.35 E	267	105652	67 10.81 S	070 00.37 E	273	112915	67 10.61 S	070 00.27 E	281			15.6	260
100 leg9.15	20 Feb 2006	181730	67 18.80 S	070 59.47 E	383	182619	67 18.73 S	070 59.38 E	394	190957	67 18.25 S	070 59.53 E	394			9.4	390
101 leg9.16	20 Feb 2006	234408	67 19.29 S	071 58.69 E	565	235826	67 19.29 S	071 58.75 E	571	003611	67 19.19 S	071 58.59 E	567			8.1	570
102 leg9.17	21 Feb 2006	042559	67 19.16 S	073 00.12 E	546	043559	67 19.19 S	073 00.01 E	554	051852	67 19.29 S	072 59.76 E	549			7.8	553
103 leg11.1	24 Feb 2006	030200	60 59.97 S	080 00.26 E	2628	035022	60 59.72 S	080 00.24 E	2634	045617	60 59.46 S	080 00.08 E	2629			6.6	2670
104 leg11.2	24 Feb 2006	101434	61 39.77 S	080 00.14 E	2328	110047	61 39.77 S	080 00.05 E	2332	120214	61 39.74 S	079 59.77 E	2328			16.2	2352
105 leg11.3	24 Feb 2006	174755	62 20.01 S	079 59.91 E	2468	183019	62 20.04 S	079 59.60 E	2480	193957	62 20.14 S	079 59.12 E	2478			6.1	2513
106 leg11.4	25 Feb 2006	102953	63 00.07 S	079 59.97 E	3495	113437	63 00.16 S	080 00.14 E	3504	125337	63 00.16 S	080 00.62 E	3470			10.6	3558
107 leg11.5	25 Feb 2006	172259	63 29.98 S	079 59.75 E	-	182226	63 30.09 S	080 00.05 E	3538	194037	63 30.11 S	080 00.14 E	3522			9.8	3593
108 leg11.6	25 Feb 2006	232200	64 00.05 S	079 59.65 E	3642	001935	64 00.13 S	080 00.13 E	3650	013636	64 00.20 S	080 00.73 E	3645			8.2	3710
109 leg11.7	26 Feb 2006	060242	64 30.03 S	079 59.86 E	3603	071538	64 29.99 S	079 59.66 E	3608	084047	64 29.92 S	079 59.77 E	3604			13.5	3662
110 leg11.8	26 Feb 2006	124756	65 00.02 S	079 59.96 E	3535	135709	65 00.08 S	079 59.82 E	3546	151217	65 00.36 S	079 59.18 E	3539			13.4	3598
111 leg11.9	26 Feb 2006	194141	65 30.28 S	080 00.12 E	3221	203655	65 30.64 S	079 59.98 E	3227	220027	65 31.07 S	079 59.39 E	3223			7.9	3277
112 leg11.10	27 Feb 2006	014929	65 49.13 S	079 59.64 E	-	022701	65 49.28 S	079 59.52 E	2223	033324	65 49.54 S	079 59.27 E	2203			11.0	2246
113 leg11.11	27 Feb 2006	053254	65 51.10 S	079 59.96 E	1962	061503	65 51.10 S	079 59.81 E	2003	070824	65 51.01 S	079 59.43 E	1998			6.9	2026
114 leg11.12	27 Feb 2006	095456	65 57.10 S	079 59.78 E	1512	102646	65 57.18 S	079 59.51 E	1554	112255	65 57.37 S	079 58.83 E	1499			9.4	1567
115 leg11.13	27 Feb 2006	131325	66 01.42 S	079 59.77 E	1097	133422	66 01.47 S	079 59.80 E	1097	141618	66 01.54 S	079 59.67 E	1064			10.3	1101
116 leg11.14	27 Feb 2006	161113	66 07.91 S	079 58.50 E	518	163012	66 07.97 S	079 58.20 E	524	170942	66 08.06 S	079 57.61 E	513			5.0	526
117 leg11.15	27 Feb 2006	210958	66 24.63 S	079 59.40 E	223	211702	66 24.59 S	079 59.29 E	228	215023	66 24.50 S	079 58.64 E	222			11.7	219
118 leg11.16	28 Feb 2006	014437	66 44.71 S	080 00.62 E	324	015103	66 44.72 S	080 00.63 E	328	022204	66 44.83 S	080 00.53 E	326			7.7	324
119 FSICAL	03 Mar 2006	073651	66 04.97 S	079 27.91 E	1497	080319	66 05.04 S	079 27.74 E	1541	084731	66 05.10 S	079 27.38 E	1504			10.3	1552
120 FSICAL	03 Mar 2006	092302	66 05.11 S	079 27.58 E	1476	095403	66 05.24 S	079 27.24 E	1522	104741	66 05.45 S	079 27.03 E	1570			12.1	1531

**Table 2:** Cruise au0603 summary of samples drawn from Niskin bottles at each station, including salinity (sal), dissolved oxygen (do), nutrients (nut) (i.e. phosphate, nitrate+nitrite, silicate), ammonia (NH<sub>3</sub>), dissolved inorganic carbon (dic) and alkalinity (alk), oxygen-18 (<sup>18</sup>O), particulate carbon and particulate nitrogen and particulate silicate (POC/N/Si), dimethyl sulphide (dms), HPLC (i.e. pigments), lugols iodine fixed algal counts (lug), gluteraldehyde fixed samples for electron microscopy (em), gluteraldehyde fixed samples for bacteria (gbac), carbon-14 (<sup>14</sup>C), and viruses from Wright et al. group (vir). Note that 1=samples taken, 0=no samples taken, 2=surface sample only. Additional biological parameters not listed in the table include samples for flow cytometry, bacteria genetics, viruses sampled by Danny Ashcroft, viscosity, and bio-optics.

station	sal	do	nut	NH <sub>3</sub>	dic	alk	<sup>18</sup> O	POC/N/Si	dms	HPLC	lug	em	gbac	<sup>14</sup> C	vir
1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0
2	1	1	1	1	1	2	1	0	1	1	0	0	0	0	0
3	1	1	1	1	0	0	1	1	0	1	0	0	0	0	0
4	1	1	1	1	1	2	1	0	1	1	1	0	0	0	0
5	1	1	1	1	0	0	1	1	0	1	0	0	0	0	0
6	1	1	1	1	1	2	1	0	0	1	1	0	0	0	0
7	1	1	1	1	0	0	1	1	0	1	0	0	0	0	0
8	1	1	1	1	1	2	1	0	0	1	1	0	0	0	1
9	1	1	1	0	0	0	1	1	1	1	0	0	0	0	0
10	1	1	1	1	1	2	1	0	0	1	1	1	0	0	1
11	1	1	1	1	0	0	1	1	0	1	0	0	0	0	0
12	1	1	1	1	1	2	1	0	1	1	1	0	0	0	1
13	1	1	1	1	0	0	1	1	0	1	0	0	0	0	0
14	1	1	1	1	1	2	1	0	0	1	1	0	0	0	1
15	1	1	1	0	0	0	1	1	0	1	0	0	0	0	0
16	1	1	1	1	1	2	1	0	0	1	1	0	0	0	1
17	1	1	1	1	0	0	1	1	0	1	0	0	0	0	0
18	1	1	1	1	1	2	1	0	1	1	0	0	0	0	1
19	1	1	1	1	0	0	1	1	0	1	0	0	0	0	0
20	1	1	1	1	1	2	1	0	0	1	0	1	0	0	1
21	1	1	1	1	0	0	1	1	0	1	0	0	0	0	0
22	1	1	1	1	1	2	1	0	1	1	0	0	0	0	0
23	1	1	1	1	0	0	1	1	0	1	0	0	0	0	0
24	1	1	1	1	1	2	1	0	0	1	1	1	0	0	1
25	1	1	1	1	0	0	1	1	0	1	0	0	0	0	0
26	1	1	1	1	1	2	1	0	1	1	1	1	0	0	1
27	1	1	1	1	0	0	1	1	0	1	0	0	0	1	0
28	1	1	1	1	1	2	1	0	0	1	1	0	0	0	1
29	1	1	1	0	1	0	1	1	0	1	0	0	0	0	0
30	1	1	1	1	1	1	1	0	0	1	1	1	0	1	1
31	1	1	1	1	1	0	1	1	1	1	0	0	0	0	0
32	1	1	1	1	1	2	1	0	0	1	0	0	0	1	1
33	1	1	1	1	1	0	1	1	0	1	0	0	0	0	0
34	1	1	1	1	1	2	1	0	0	1	0	0	0	1	1
35	1	1	1	1	1	0	1	1	1	1	0	0	0	0	0
36	1	1	1	1	1	2	1	0	0	1	1	1	0	1	1
37	1	1	1	1	1	0	1	1	0	1	0	0	0	0	0
38	1	1	1	1	1	2	1	0	0	1	0	0	0	0	0
39	1	1	1	1	1	0	1	1	1	1	0	0	0	0	0
40	1	1	1	1	1	2	1	0	0	1	0	1	0	1	0
41	1	1	1	1	1	0	1	1	0	1	0	0	0	0	0
42	1	1	1	1	1	2	1	0	1	1	0	0	0	0	0
43	1	1	1	1	1	0	1	1	0	1	0	0	0	0	0
44	1	1	1	1	1	2	1	1	1	1	0	0	0	0	0
45	1	1	1	1	1	0	1	1	0	1	0	0	0	1	0
46	1	1	1	1	1	2	1	0	0	1	1	1	0	0	1
47	1	1	1	1	1	0	1	1	0	1	0	0	0	1	0
48	1	1	1	1	1	2	1	0	1	1	0	0	0	0	1
49	1	1	1	1	1	0	1	1	0	1	0	0	0	1	0
50	1	1	1	1	1	2	1	0	0	1	1	1	0	0	1
51	1	1	1	1	1	0	1	1	0	1	0	0	0	1	0



**Table 2: (continued)**

station	sal	do	nut	NH <sub>3</sub>	dic	alk	<sup>18</sup> O	POC/N/Si	dms	HPLC	lug	em	gbac	<sup>14</sup> C	vir
52	1	1	1	1	1	2	1	0	0	1	0	0	0	0	0
53	1	1	1	1	1	0	1	1	1	1	0	0	0	0	0
54	1	1	1	1	1	2	1	0	0	1	1	0	0	1	1
55	1	1	1	1	1	0	1	1	1	1	0	0	0	0	0
56	1	1	1	1	1	2	1	0	0	1	0	1	0	0	1
57	1	1	1	1	1	0	1	1	0	1	0	0	0	0	0
58	1	1	1	1	1	0	1	0	0	1	1	1	0	1	1
59	1	1	1	1	1	0	1	1	1	1	0	0	0	0	0
60	1	1	1	1	1	2	1	1	0	1	0	0	0	1	0
61	1	1	1	1	1	0	1	0	0	1	0	0	0	0	1
62	1	1	1	1	1	0	1	1	0	1	0	0	0	0	0
63	1	1	1	1	1	2	1	0	0	1	0	1	0	1	0
64	1	1	1	1	1	0	1	1	0	1	0	0	0	0	0
65	1	1	1	1	1	2	1	0	0	1	0	0	0	0	1
66	1	1	1	1	1	0	1	1	0	1	0	0	0	1	0
67	1	1	1	1	1	2	1	0	0	1	0	0	0	0	0
68	1	1	1	1	1	0	1	1	0	1	0	0	0	1	0
69	1	1	1	1	1	2	1	0	0	1	1	1	0	0	1
70	1	1	1	1	1	0	1	1	0	1	0	0	0	0	0
71	1	1	1	1	1	2	1	1	0	1	1	1	0	1	1
72	1	1	1	1	1	0	1	1	0	1	0	0	0	1	0
73	1	1	1	1	1	2	1	0	0	1	0	0	0	0	1
74	1	1	1	1	1	0	1	1	0	1	0	0	0	1	0
75	1	1	1	1	1	1	1	0	0	1	1	1	0	0	1
76	1	1	1	1	1	0	1	1	0	1	0	0	0	1	0
77	1	1	1	1	1	2	1	0	0	1	0	0	0	0	0
78	1	1	1	1	1	0	1	1	0	1	0	0	0	0	0
79	1	1	1	1	1	2	1	0	0	1	0	0	0	1	1
80	1	1	1	1	1	0	1	1	0	1	0	0	0	0	0
81	1	1	1	1	1	2	1	0	0	1	0	0	0	0	0
82	1	1	1	1	1	0	1	1	0	1	0	0	0	1	0
83	1	1	1	1	1	2	1	0	0	1	1	0	0	0	1
84	1	1	1	1	1	0	1	1	1	1	1	0	0	0	0
85	1	1	1	1	1	2	1	0	0	1	0	1	0	1	0
86	1	1	1	0	1	0	1	1	1	1	0	0	0	1	0
87	1	1	1	0	1	2	1	0	0	1	1	0	0	0	1
88	1	1	1	0	1	0	1	1	0	1	0	0	0	1	0
89	1	1	1	0	1	2	1	0	0	1	1	0	0	0	1
90	1	1	1	0	1	0	1	1	1	1	0	0	0	1	0
91	1	1	1	0	1	2	1	0	0	1	0	1	0	0	1
92	1	1	1	0	1	0	1	1	0	1	0	0	0	0	0
93	1	1	1	0	1	2	1	0	0	1	1	0	0	1	1
94	1	1	1	0	1	0	1	1	1	1	0	0	0	0	0
95	1	1	1	0	1	2	1	0	0	1	0	0	0	0	1
96	1	1	1	0	1	0	1	1	0	1	0	0	0	1	0
97	1	1	1	0	1	2	1	0	0	1	1	1	0	0	1
98	1	1	1	0	1	0	1	1	1	1	0	0	0	0	0
99	1	1	1	0	1	2	1	1	1	1	0	0	0	1	0
100	1	1	1	0	1	0	1	1	0	1	0	0	0	0	0
101	1	1	1	0	1	2	1	1	0	1	0	0	0	0	0
102	1	1	1	0	1	0	1	1	0	1	0	0	0	0	0
103	1	1	1	0	1	1	1	1	0	1	0	0	1	0	1
104	1	1	1	0	1	1	1	0	1	1	0	0	1	1	1
105	1	1	1	0	1	0	1	1	0	1	0	0	1	0	1
106	1	1	1	0	1	2	1	0	0	1	1	1	1	1	1
107	1	1	1	0	1	0	1	1	0	1	0	0	1	0	1
108	1	1	1	0	1	1	1	0	0	1	0	0	1	0	1
109	1	1	1	0	1	0	1	1	1	1	0	0	1	1	1
110	1	1	1	0	1	2	1	0	0	1	0	0	1	0	1
111	1	1	1	0	1	0	1	1	0	1	0	0	1	1	1
112	1	1	1	0	1	1	1	0	0	1	0	0	1	0	1

**Table 2: (continued)**

station	sal	do	nut	NH <sub>3</sub>	dic	alk	<sup>18</sup> O	POC/N/Si	dms	HPLC	lug	em	gbac	<sup>14</sup> C	vir
113	1	1	1	0	1	0	1	1	1	1	0	0	1	0	1
114	1	1	1	0	1	2	1	0	0	1	0	0	1	1	1
115	1	1	1	0	1	1	1	1	1	1	0	0	1	0	1
116	1	1	1	0	1	1	1	1	0	1	1	1	1	0	1
117	1	1	1	0	1	1	1	1	1	1	0	0	1	1	1
118	1	1	1	0	1	1	1	1	0	1	1	0	1	0	1
119	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
120	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0

**Table 3: CTD serial 704 calibration coefficients and calibration dates for cruise au0603. 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, 26/07/2005*      *Secondary Temperature, serial 4246, 26/07/2005*

G	: 4.3871123e-003	G	: 3.9792308e-003
H	: 6.5052040e-004	H	: 6.2199100e-004
I	: 2.2944734e-005	I	: 1.8925560e-005
J	: 1.7823539e-006	J	: 1.6721644e-006
F0	: 1000.000	F0	: 1000.000
Slope	: 1.00000000	Slope	: 1.00000000
Offset	: 0.0000	Offset	: 0.0000

*Primary Conductivity, serial 2977, 26/07/2005*      *Secondary Conductivity, serial 2808, 26/07/2005*

G	: -1.0699102e+001	G	: -9.2842298e+000
H	: 1.4736757e+000	H	: 1.4245489e+000
I	: 3.3457988e-003	I	: 1.1906212e-004
J	: -1.8473099e-004	J	: 7.4562350e-005
CTcor	: 3.2500e-006	CTcor	: 3.2500e-006
CPcor	: -9.57000000e-008	CPcor	: -9.57000000e-008
Slope	: 1.00000000	Slope	: 1.00000000
Offset	: 0.00000	Offset	: 0.00000

*Pressure, serial 89084, 23/07/2004*

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

*(22/08/2005 for pressure slope/offset)*

Slope	: 1.00006101
Offset	: 0.73719
AD590M	: 1.283280e-002
AD590B	: -9.705660e+000

*Oxygen, serial 0178, 26/07/2004*

Soc	: 5.2230e-001
Boc	: 0.0000
Offset	: -0.4914
Tcor	: 0.0021
Pcor	: 1.35e-004
Tau	: 0.0

*Fluorometer, serial 296, 23/05/2005*

Vblank	: 0.12
Scale factor	: 7.000e+000

*Transmissometer, serial 899DR*

A0	: -0.0130705
A1	: 0.214270

**Table 4:** CTD conductivity calibration coefficients.  $F_1$ ,  $F_2$  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;  $\sigma$  is the standard deviation of the conductivity residual for the  $n$  samples in the station grouping.

stn grouping	$F_1$	$F_2$	$F_3$	$n$	$\sigma$
001 to 008	0.60848557E-02	0.99970030E-03	-0.52078625E-08	151	0.000830
009 to 038	0.13009766E-01	0.99942691E-03	-0.88263702E-10	489	0.000794
039 to 059	0.11348442E-01	0.99958755E-03	-0.19812640E-08	303	0.001237
060 to 073	0.72429942E-02	0.99947385E-03	0.14586309E-08	248	0.001626
074 to 120	0.41993984E-02	0.99971942E-03	-0.95881876E-10	791	0.000816

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

station number	( $F_2 + F_3 \cdot N$ )	station number	( $F_2 + F_3 \cdot N$ )	station number	( $F_2 + F_3 \cdot N$ )	station number	( $F_2 + F_3 \cdot N$ )
1	0.99969510E-03	31	0.99942417E-03	61	0.99956282E-03	91	0.99970820E-03
2	0.99968989E-03	32	0.99942408E-03	62	0.99956428E-03	92	0.99970811E-03
3	0.99968468E-03	33	0.99942400E-03	63	0.99956574E-03	93	0.99970803E-03
4	0.99967947E-03	34	0.99942391E-03	64	0.99956720E-03	94	0.99970794E-03
5	0.99967427E-03	35	0.99942382E-03	65	0.99956866E-03	95	0.99970786E-03
6	0.99966906E-03	36	0.99942373E-03	66	0.99957012E-03	96	0.99970777E-03
7	0.99966385E-03	37	0.99942364E-03	67	0.99957157E-03	97	0.99970769E-03
8	0.99965864E-03	38	0.99942356E-03	68	0.99957303E-03	98	0.99970761E-03
9	0.99942611E-03	39	0.99951028E-03	69	0.99957449E-03	99	0.99970752E-03
10	0.99942603E-03	40	0.99950830E-03	70	0.99957595E-03	100	0.99970744E-03
11	0.99942594E-03	41	0.99950631E-03	71	0.99957741E-03	101	0.99970735E-03
12	0.99942585E-03	42	0.99950433E-03	72	0.99957887E-03	102	0.99970727E-03
13	0.99942576E-03	43	0.99950235E-03	73	0.99958033E-03	103	0.99970718E-03
14	0.99942567E-03	44	0.99950037E-03	74	0.99970963E-03	104	0.99970710E-03
15	0.99942559E-03	45	0.99949839E-03	75	0.99970955E-03	105	0.99970701E-03
16	0.99942550E-03	46	0.99949641E-03	76	0.99970946E-03	106	0.99970693E-03
17	0.99942541E-03	47	0.99949443E-03	77	0.99970938E-03	107	0.99970684E-03
18	0.99942532E-03	48	0.99949245E-03	78	0.99970930E-03	108	0.99970676E-03
19	0.99942523E-03	49	0.99949046E-03	79	0.99970921E-03	109	0.99970668E-03
20	0.99942514E-03	50	0.99948848E-03	80	0.99970913E-03	110	0.99970659E-03
21	0.99942506E-03	51	0.99948650E-03	81	0.99970904E-03	111	0.99970651E-03
22	0.99942497E-03	52	0.99948452E-03	82	0.99970896E-03	112	0.99970642E-03
23	0.99942488E-03	53	0.99948254E-03	83	0.99970887E-03	113	0.99970634E-03
24	0.99942479E-03	54	0.99948056E-03	84	0.99970879E-03	114	0.99970625E-03
25	0.99942470E-03	55	0.99947858E-03	85	0.99970870E-03	115	0.99970617E-03
26	0.99942461E-03	56	0.99947660E-03	86	0.99970862E-03	116	0.99970608E-03
27	0.99942453E-03	57	0.99947461E-03	87	0.99970853E-03	117	0.99970600E-03
28	0.99942444E-03	58	0.99947263E-03	88	0.99970845E-03	118	0.99970591E-03
29	0.99942435E-03	59	0.99947065E-03	89	0.99970837E-03	119	0.99970583E-03
30	0.99942426E-03	60	0.99956136E-03	90	0.99970828E-03	120	0.99970575E-03

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

stn	poff	stn	poff	stn	poff	stn	poff	stn	poff	stn	poff
-----		-----		-----		-----		-----		-----	
1	0.50	21	0.20	41	0.02	61	0.07	81	0.10	101	0.37
2	0.21	22	0.17	42	-0.02	62	0.12	82	0.15	102	0.33
3	0.08	23	0.23	43	0.04	63	0.12	83	0.13	103	0.18
4	0.09	24	0.24	44	0.32	64	0.24	84	0.15	104	0.21
5	0.11	25	0.23	45	0.27	65	0.23	85	0.13	105	0.19
6	0.05	26	0.28	46	0.16	66	0.17	86	0.18	106	0.20
7	0.09	27	0.27	47	0.14	67	0.16	87	0.26	107	0.22
8	0.11	28	0.33	48	0.06	68	0.14	88	0.23	108	0.16
9	0.16	29	0.28	49	0.14	69	0.22	89	0.26	109	0.21
10	0.26	30	0.33	50	0.17	70	0.26	90	0.18	110	0.23
11	0.27	31	0.21	51	0.18	71	0.26	91	0.09	111	0.22
12	0.29	32	0.28	52	0.17	72	0.18	92	0.14	112	0.21
13	0.33	33	0.18	53	0.26	73	0.20	93	0.20	113	0.20
14	0.28	34	0.30	54	0.28	74	0.18	94	0.12	114	0.23
15	0.36	35	0.21	55	0.16	75	0.16	95	0.17	115	0.23
16	0.30	36	0.27	56	0.14	76	0.26	96	0.17	116	0.23
17	0.33	37	0.33	57	0.22	77	0.17	97	0.07	117	0.30
18	0.21	38	0.16	58	0.19	78	0.18	98	0.21	118	0.29
19	0.10	39	0.17	59	0.17	79	0.16	99	0.25	119	0.30
20	0.17	40	0.08	60	0.15	80	0.11	100	0.29	120	0.53

**Table 7:** CTD dissolved oxygen calibration coefficients for cruise au0603: slope, bias, tcor ( = temperature correction term), and pcor ( = pressure correction term). dox is equal to  $2.8\sigma$  , for  $\sigma$  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.

-----shallow-----						-----deep-----				
stn	slope	bias	tcor	pcor	dox	slope	bias	tcor	pcor	do
1	0.652755	-0.416852	0.009799	0.000145	0.193244	0.497538	-0.218103	0.022524	0.000130	0.027116
2	0.653810	-0.429028	0.022044	0.000132	0.179887	0.794188	-0.607257	-0.001306	0.000130	0.013078
3	0.669730	-0.476656	0.046578	0.000158	0.161050	1.670758	-1.970783	0.015426	0.000364	0.043035
4	0.684011	-0.507804	0.031222	0.000216	0.152964	0.474102	-0.054474	-0.035472	0.000022	0.040387
5	0.660470	-0.458257	0.037197	0.000151	0.099698	0.200860	0.200178	0.057777	0.000107	0.040653
6	0.664130	-0.453189	0.029405	0.000138	0.110466	0.703574	-0.495252	0.013746	0.000133	0.022050
7	0.642075	-0.403848	0.015855	0.000133	0.162404	0.489549	-0.213434	0.054644	0.000125	0.042457
8	0.616481	-0.356341	0.015693	0.000116	0.134772	0.495403	-0.205919	0.038437	0.000119	0.066180
9	0.631571	-0.398517	0.022234	0.000131	0.118930	0.193519	0.198422	0.075632	0.000104	0.058706
10	0.620268	-0.359728	0.009063	0.000123	0.074635	0.801764	-0.597336	-0.019204	0.000131	0.028403
11	0.598171	-0.315438	0.002013	0.000120	0.136092	0.500658	-0.202125	0.031330	0.000125	0.028063
12	0.606874	-0.342114	0.010893	0.000147	0.102842	0.500524	-0.200491	0.034404	0.000134	0.011065
13	0.616549	-0.334505	0.008346	0.000152	0.083590	0.602834	-0.297027	-0.010808	0.000136	0.029179
14	0.609348	-0.309621	0.001007	0.000142	0.096908	0.547868	-0.256211	0.052547	0.000155	0.050806
15	0.620449	-0.330071	0.001473	0.000150	0.117867	0.603617	-0.296561	-0.000917	0.000136	0.016490
16	0.600951	-0.287909	-0.005711	0.000131	0.162832	0.602477	-0.296491	-0.000050	0.000137	0.010429
17	0.604975	-0.298162	-0.005566	0.000137	0.054926	0.603059	-0.297845	0.000522	0.000137	0.012943
18	0.611651	-0.310447	-0.000605	0.000141	0.082575	0.548465	-0.220194	0.001507	0.000128	0.065723
19	0.624048	-0.338570	0.005064	0.000153	0.085900	0.603465	-0.297339	0.002162	0.000137	0.027155
20	0.601953	-0.291331	-0.006036	0.000134	0.081647	0.604283	-0.295594	-0.006702	0.000135	0.016391
21	0.607320	-0.303626	-0.002029	0.000140	0.037882	0.571478	-0.243383	-0.015383	0.000126	0.017508
22	0.606933	-0.302108	-0.003926	0.000139	0.121606	0.679815	-0.435171	0.050391	0.000176	0.034819
23	0.497234	-0.129109	-0.019167	0.000106	0.037859	0.553805	-0.202877	-0.045724	0.000112	0.015802
24	0.604866	-0.296325	-0.005579	0.000137	0.075179	0.551469	-0.206584	-0.030505	0.000116	0.015895
25	0.611564	-0.303277	-0.008937	0.000133	0.175248	0.603739	-0.296462	-0.008397	0.000136	0.016062
26	0.607867	-0.305531	-0.001651	0.000142	0.193981	0.603659	-0.296155	0.005274	0.000137	0.016972
27	0.611695	-0.305354	-0.002364	0.000134	0.136342	0.604025	-0.296690	-0.002167	0.000136	0.019580
28	0.441625	-0.040731	-0.038812	0.000088	0.198870	0.596224	-0.278708	-0.012324	0.000129	0.047241
29	0.606304	-0.298373	-0.005789	0.000136	0.076852	0.604678	-0.295820	-0.001486	0.000135	0.012172
30	0.600522	-0.292956	-0.003656	0.000139	0.038336	0.482959	-0.092064	-0.072161	0.000093	0.033108
31	0.481758	-0.100581	-0.031258	0.000100	0.098810	0.605291	-0.297417	0.002152	0.000137	0.031703
32	0.605307	-0.305697	0.000708	0.000144	0.174340	0.603867	-0.296606	-0.007932	0.000136	0.013205
33	0.506181	-0.141709	-0.023420	0.000109	0.078817	0.603142	-0.297267	0.009979	0.000138	0.013629
34	0.674393	-0.418004	0.014412	0.000163	0.201932	0.556595	-0.227713	0.003282	0.000128	0.044618
35	0.425775	-0.008091	-0.041782	0.000083	0.278395	0.600843	-0.295747	0.024181	0.000140	0.033884
36	0.572987	-0.250838	-0.002823	0.000131	0.187225	0.604056	-0.295987	-0.007590	0.000135	0.013263
37	0.651226	-0.380097	0.003912	0.000161	0.261881	0.590272	-0.261340	-0.033124	0.000121	0.020805
38	0.606917	-0.304512	-0.007528	0.000144	0.163422	0.565429	-0.226094	-0.038219	0.000118	0.022693
39	0.542564	-0.199096	-0.015979	0.000119	0.248078	0.597404	-0.299401	0.105410	0.000149	0.019058
40	0.596777	-0.290404	-0.006295	0.000142	0.171317	0.603359	-0.295104	-0.010357	0.000136	0.024746
41	0.523074	-0.157965	-0.018801	0.000100	0.101439	0.523074	-0.157965	-0.018801	0.000100	0.101439
42	0.753569	-0.565740	0.030918	0.000250	0.244201	0.753569	-0.565740	0.030918	0.000250	0.244201
43	-	-	-	-	-	-	-	-	-	-
44	0.297723	0.666462	0.207927	0.000013	0.064569	0.297723	0.666462	0.207927	0.000013	0.064569
45	0.591743	-0.289417	0.001884	0.000142	0.107771	0.566507	-0.240407	-0.018413	0.000126	0.022519
46	0.515432	-0.155865	-0.020066	0.000106	0.132540	0.689684	-0.480881	0.123670	0.000204	0.054072
47	0.612795	-0.321984	0.001446	0.000148	0.160034	0.601484	-0.297538	-0.003295	0.000137	0.009715
48	0.596912	-0.299352	0.001393	0.000145	0.094305	0.604663	-0.296480	-0.014746	0.000134	0.019194
49	0.563741	-0.249019	0.000657	0.000137	0.114220	0.685792	-0.446500	0.054654	0.000177	0.019897
50	0.600806	-0.294675	-0.006552	0.000135	0.157640	0.601274	-0.297353	-0.001412	0.000137	0.016019
51	0.598651	-0.297996	-0.000556	0.000141	0.038654	0.601152	-0.297928	-0.006161	0.000138	0.024874
52	0.577671	-0.264776	-0.011079	0.000138	0.187041	0.594936	-0.301189	0.025205	0.000147	0.054034
53	0.610524	-0.325717	-0.002052	0.000160	0.210539	0.601831	-0.297796	-0.009560	0.000137	0.007939
54	0.603678	-0.307178	-0.004542	0.000147	0.132689	0.299889	0.099303	0.097307	0.000131	0.009856
55	0.596082	-0.294671	-0.003413	0.000143	0.145980	0.903046	-0.696019	-0.057099	0.000139	0.006375
56	0.598722	-0.285248	0.002495	0.000116	0.177874	0.598722	-0.285248	0.002495	0.000116	0.177874
57	0.566481	-0.229158	-0.003994	0.000070	0.185430	0.566481	-0.229158	-0.003994	0.000070	0.185430
58	0.573139	-0.205219	0.021613	0.000098	0.128024	0.573139	-0.205219	0.021613	0.000098	0.128024
59	0.647191	-0.463655	-0.047252	0.000269	0.059516	0.647191	-0.463655	-0.047252	0.000269	0.059516
60	0.603196	-0.293128	-0.007540	0.000132	0.111865	0.602583	-0.296691	-0.005734	0.000136	0.014881
61	0.599644	-0.299499	0.000837	0.000140	0.099733	0.599803	-0.298521	-0.002396	0.000139	0.012022
62	0.583824	-0.247515	-0.027634	0.000112	0.035156	0.604178	-0.297368	-0.009886	0.000134	0.055011

**Table 7: (continued)**

-----shallow-----						-----deep-----				
stn	slope	bias	tcor	pcor	dox	slope	bias	tcor	pcor	do
63	0.622449	-0.352013	0.024063	0.000163	0.184615	0.599301	-0.298173	0.003797	0.000140	0.030850
64	0.604973	-0.307364	-0.003781	0.000145	0.105261	0.601857	-0.297417	-0.013183	0.000136	0.020213
65	0.602963	-0.301313	-0.005471	0.000143	0.113575	0.455733	-0.056124	-0.143921	0.000082	0.013079
66	0.600203	-0.297123	-0.007865	0.000139	0.143704	0.490932	-0.108626	-0.143385	0.000087	0.009735
67	0.605310	-0.304206	-0.009937	0.000138	0.118820	0.370663	0.102580	-0.307390	0.000035	0.019258
68	0.697366	-0.506755	-0.011861	0.000260	0.102049	0.697366	-0.506755	-0.011861	0.000260	0.102049
69	0.375713	0.190276	0.026137	0.000003	0.092151	0.375713	0.190276	0.026137	0.000003	0.092151
70	0.303615	0.363771	0.052605	0.000015	0.065590	0.303615	0.363771	0.052605	0.000015	0.065590
71	0.508509	-0.085413	0.009181	0.000058	0.050672	0.508509	-0.085413	0.009181	0.000058	0.050672
72	0.605223	-0.304944	-0.006197	0.000143	0.132656	0.687225	-0.449278	0.043325	0.000177	0.034410
73	0.599973	-0.304178	-0.005388	0.000147	0.105875	0.607212	-0.294662	-0.030051	0.000133	0.050940
74	0.618572	-0.352913	0.022386	0.000165	0.024913	0.599063	-0.300304	-0.001880	0.000139	0.016806
75	0.618511	-0.346235	0.011201	0.000160	0.105645	0.596940	-0.303263	0.005534	0.000143	0.027972
76	0.620842	-0.349926	0.012375	0.000167	0.175265	0.598596	-0.299286	0.007775	0.000141	0.035382
77	0.597980	-0.298170	0.003350	0.000140	0.100016	0.629859	-0.338363	-0.000071	0.000142	0.035386
78	0.588936	-0.281352	-0.004631	0.000137	0.159051	0.602466	-0.298390	-0.007297	0.000136	0.009556
79	0.588599	-0.272385	-0.001915	0.000120	0.132707	0.450622	-0.065108	-0.068371	0.000103	0.105367
80	0.604353	-0.310046	-0.000709	0.000147	0.158210	0.553485	-0.216431	-0.008198	0.000120	0.017316
81	0.570763	-0.247056	-0.004529	0.000128	0.137514	0.570763	-0.247056	-0.004529	0.000128	0.137514
82	0.511558	-0.096292	0.005107	0.000023	0.227326	0.511558	-0.096292	0.005107	0.000023	0.227326
83	0.510396	-0.072678	0.027873	0.000085	0.068433	0.510396	-0.072678	0.027873	0.000085	0.068433
84	0.570697	-0.230352	-0.002830	0.000108	0.124031	0.570697	-0.230352	-0.002830	0.000108	0.124031
85	0.547824	-0.183512	0.004795	0.000117	0.064202	0.547824	-0.183512	0.004795	0.000117	0.064202
86	0.591769	-0.286439	-0.002960	0.000131	0.129514	0.599868	-0.299521	-0.009938	0.000137	0.012667
87	0.625004	-0.356896	0.008294	0.000168	0.160091	0.603100	-0.296711	-0.007172	0.000135	0.010458
88	0.601416	-0.306277	0.004289	0.000142	0.114731	0.601677	-0.297657	-0.004480	0.000137	0.015879
89	0.602600	-0.310617	0.005244	0.000148	0.101107	0.601707	-0.297947	-0.007258	0.000136	0.007543
90	0.607763	-0.314725	0.000526	0.000148	0.097458	0.602825	-0.297146	-0.007817	0.000135	0.007344
91	0.586840	-0.268034	-0.003737	0.000121	0.174229	0.601409	-0.298020	0.004027	0.000137	0.005347
92	0.597519	-0.293590	-0.004623	0.000139	0.093166	0.604054	-0.295883	-0.015066	0.000132	0.014515
93	0.599533	-0.297223	-0.009178	0.000141	0.165715	0.946965	-0.859477	0.084971	0.000265	0.004955
94	0.597052	-0.290942	0.004882	0.000134	0.108387	0.603024	-0.296559	-0.009702	0.000134	0.031953
95	0.612679	-0.321346	-0.003832	0.000149	0.113507	0.574600	-0.136006	-0.175431	0.000021	0.027745
96	0.605893	-0.308061	-0.006174	0.000143	0.054024	0.288212	0.267549	-0.140394	0.000001	0.016164
97	1.454430	-2.126514	-0.153056	0.000784	0.121560	-	-	-	-	-
98	0.546056	-0.185231	-0.001644	0.000053	0.172478	0.546056	-0.185231	-0.001644	0.000053	0.172478
99	0.572271	-0.248816	-0.000119	0.000208	0.165633	0.572271	-0.248816	-0.000119	0.000208	0.165633
100	0.517196	0.001072	0.079250	0.000165	0.101136	0.517196	0.001072	0.079250	0.000165	0.101136
101	0.625130	-0.246245	0.063866	0.000166	0.118148	0.625130	-0.246245	0.063866	0.000166	0.118148
102	0.555191	-0.211816	-0.004539	0.000134	0.085224	0.555191	-0.211816	-0.004539	0.000134	0.085224
103	0.592115	-0.283174	-0.010276	0.000129	0.125568	0.602435	-0.298428	-0.011751	0.000131	0.031424
104	0.614509	-0.350635	0.014669	0.000165	0.187176	1.125279	-1.049072	-0.058620	0.000244	0.004938
105	0.604459	-0.318983	-0.000385	0.000148	0.121836	0.602151	-0.298807	-0.007945	0.000130	0.024139
106	0.596318	-0.324288	0.021392	0.000150	0.140398	0.596474	-0.303039	-0.003484	0.000140	0.010927
107	0.587203	-0.277545	-0.009392	0.000129	0.096931	0.597193	-0.302668	-0.001083	0.000141	0.013531
108	0.595608	-0.304058	0.004371	0.000147	0.075133	0.601981	-0.298302	-0.012235	0.000135	0.009206
109	0.600617	-0.307316	-0.002693	0.000145	0.169045	0.600348	-0.299597	-0.009992	0.000137	0.014380
110	0.597901	-0.299653	-0.001489	0.000140	0.114600	0.601728	-0.298972	-0.009008	0.000135	0.029764
111	0.591275	-0.286424	-0.000584	0.000135	0.188512	0.599104	-0.300809	-0.000619	0.000139	0.015369
112	0.586880	-0.277070	-0.006406	0.000132	0.098578	0.955418	-1.100285	0.491995	0.000703	0.013512
113	0.603500	-0.303530	-0.000368	0.000135	0.120229	0.601896	-0.297967	-0.007119	0.000134	0.004760
114	0.600480	-0.303178	-0.004469	0.000138	0.148337	0.394864	-0.007404	0.009988	0.000115	0.017344
115	0.594421	-0.293862	-0.005063	0.000146	0.133443	0.594421	-0.293862	-0.005063	0.000146	0.133443
116	0.600301	-0.302078	-0.010212	0.000122	0.137565	0.600301	-0.302078	-0.010212	0.000122	0.137565
117	0.720728	-0.679434	-0.099457	0.000341	0.114207	0.720728	-0.679434	-0.099457	0.000341	0.114207
118	0.496520	-0.122527	-0.031029	0.000036	0.119947	0.496520	-0.122527	-0.031029	0.000036	0.119947
119	-	-	-	-	-	-	-	-	-	-
120	-	-	-	-	-	-	-	-	-	-

**Table 8:** Suspect dissolved oxygen bottle values (not deleted from bottle data file).

station number	rosette position
3	6
28	3
85	11
116	10, 12

**Table 9:** Suspect CTD 2 dbar averages (not deleted from the CTD 2dbar average files) for the indicated parameters: T=temperature; S=salinity and conductivity; O=oxygen; F=fluorescence.

station number	questionable 2 dbar value(dbar)	parameters
23	2-28	O
31	2-18	O
39	2-20	O
41	2-18	O
42	2-18	O
62	34-64	O
73	50-56	O
83	2-12	O
97	38-62	O
101	2-18	O
102	2-24	O
115	2-16	O
117	2-20	O



**Table 10: Suspect nutrient sample values (not deleted from bottle data file) for cruise au0603.**

PHOSPHATE		NITRATE		SILICATE	
station number	rosette position	station number	rosette position	station number	rosette position
5	5	5	5		
7	4			6	9,14
9	3			7	4
				9	3
				11	2
				13	16
		15	19,20,21		
		19	21,24	19	15
22	5	22	5	22	5
26	5	26	5	26	5
28	21				
30	5				
				34	5
				41	7
				45	12
		46	whole stn	46	15
47	14	47	14	47	14
50	8				
52	20				
65	8,11				
73	10			73	10
		82	whole stn		
		83	whole stn		
		84	whole stn		
		85	whole stn		
		86	whole stn		
108	4,6	108	7	108	4
110	20	110	21		

**Table 11: ADCP logging and calibration parameters for cruise au0603.***ping parameters*

no. of bins: 60  
bin length: 8 m  
pulse length: 8 m  
delay: 4 m  
ping interval: minimum

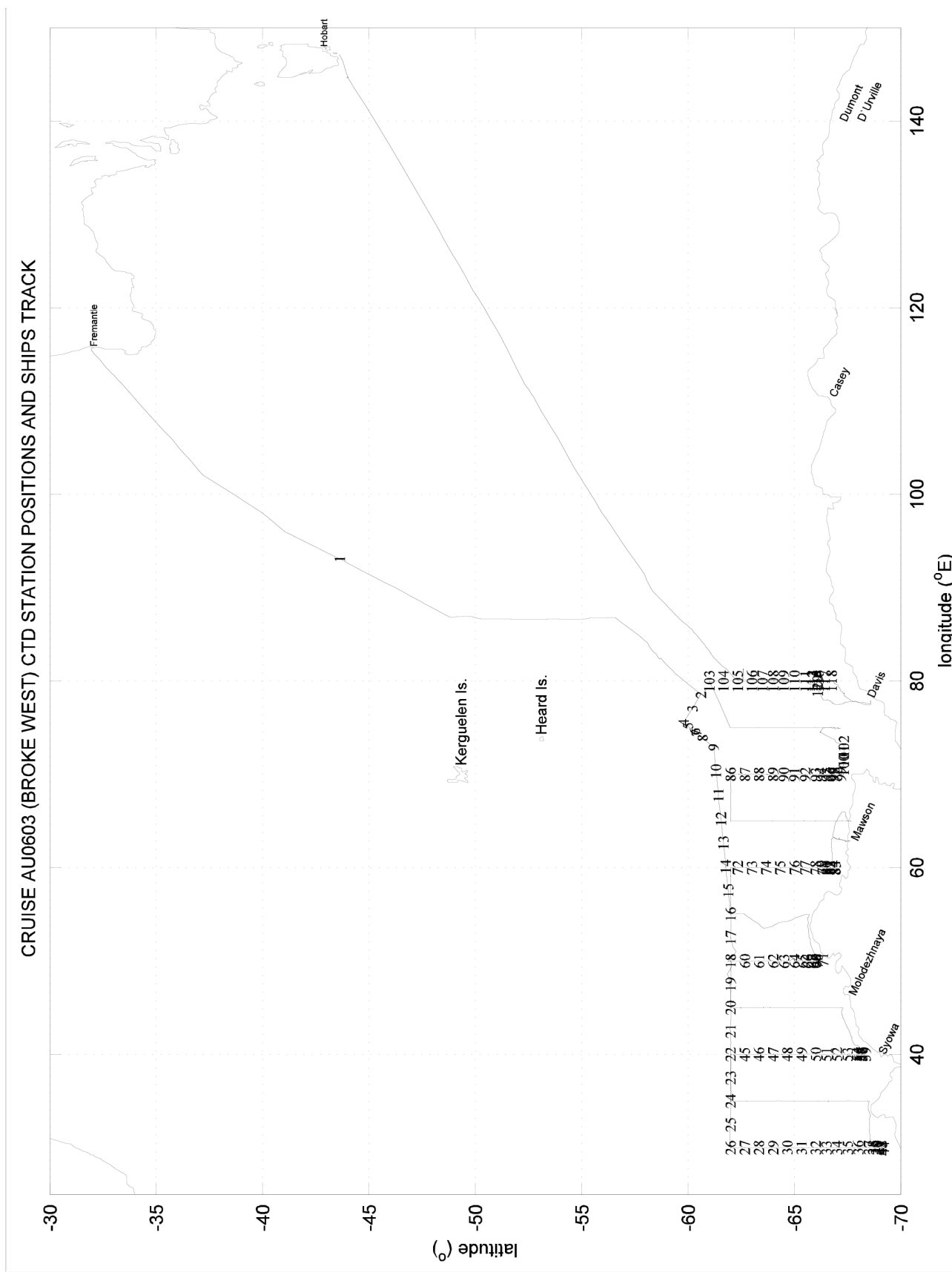
*bottom track ping parameters*

no. of bins: 128  
bin length: 4 m  
pulse length: 32 m  
ping interval: same as profiling pings

reference layer averaging: bins 8 to 20  
XROT: 822  
ensemble averaging duration: 3 min. (for logged data)  
30 min. (for final processed data)

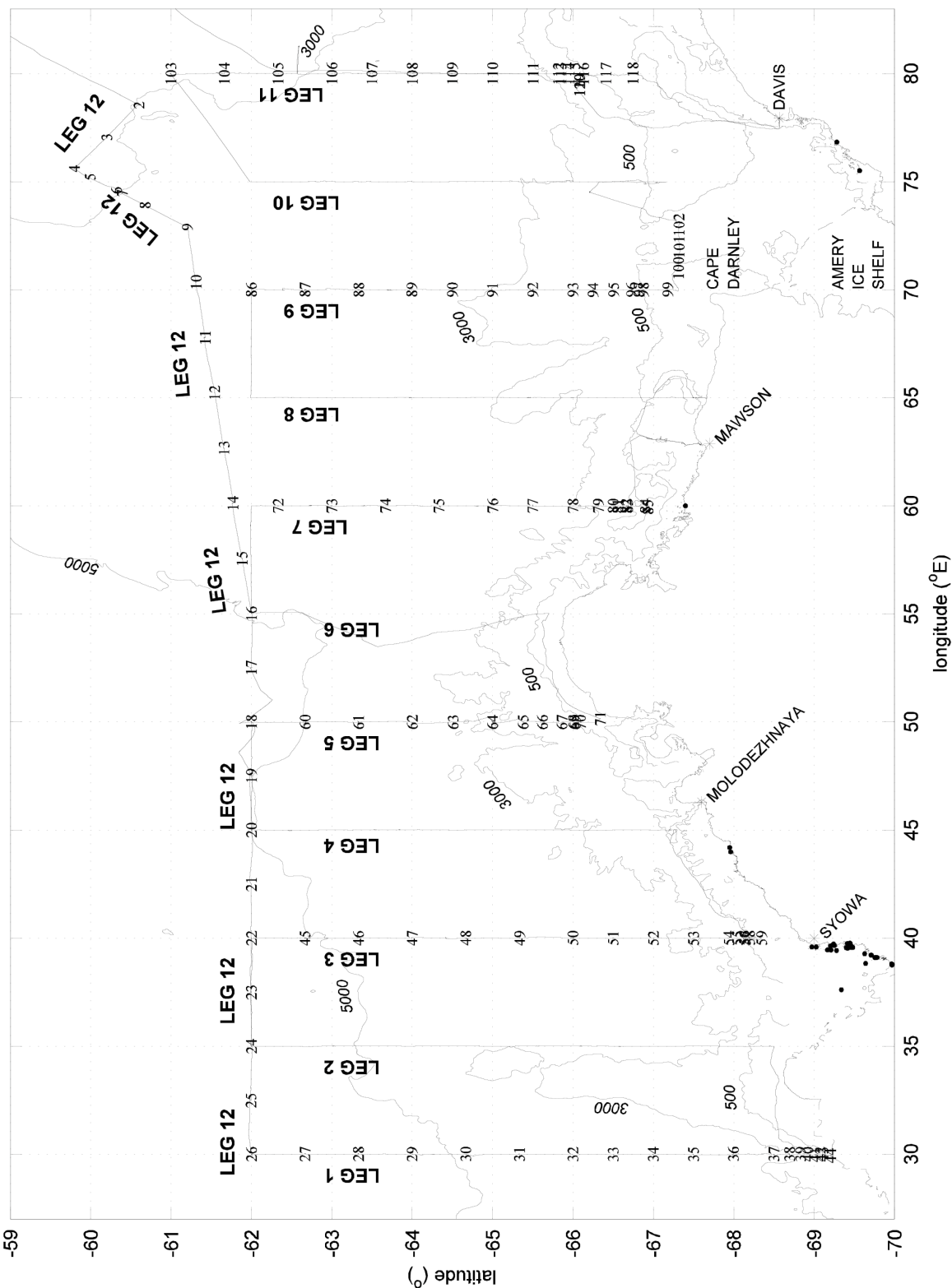
*calibration*

$\alpha$ ( $\pm$ standard deviation)	$1+\beta$ ( $\pm$ standard deviation)	no. of calibration sites
$2.436 \pm 0.525$	$1.0509 \pm 0.010$	229

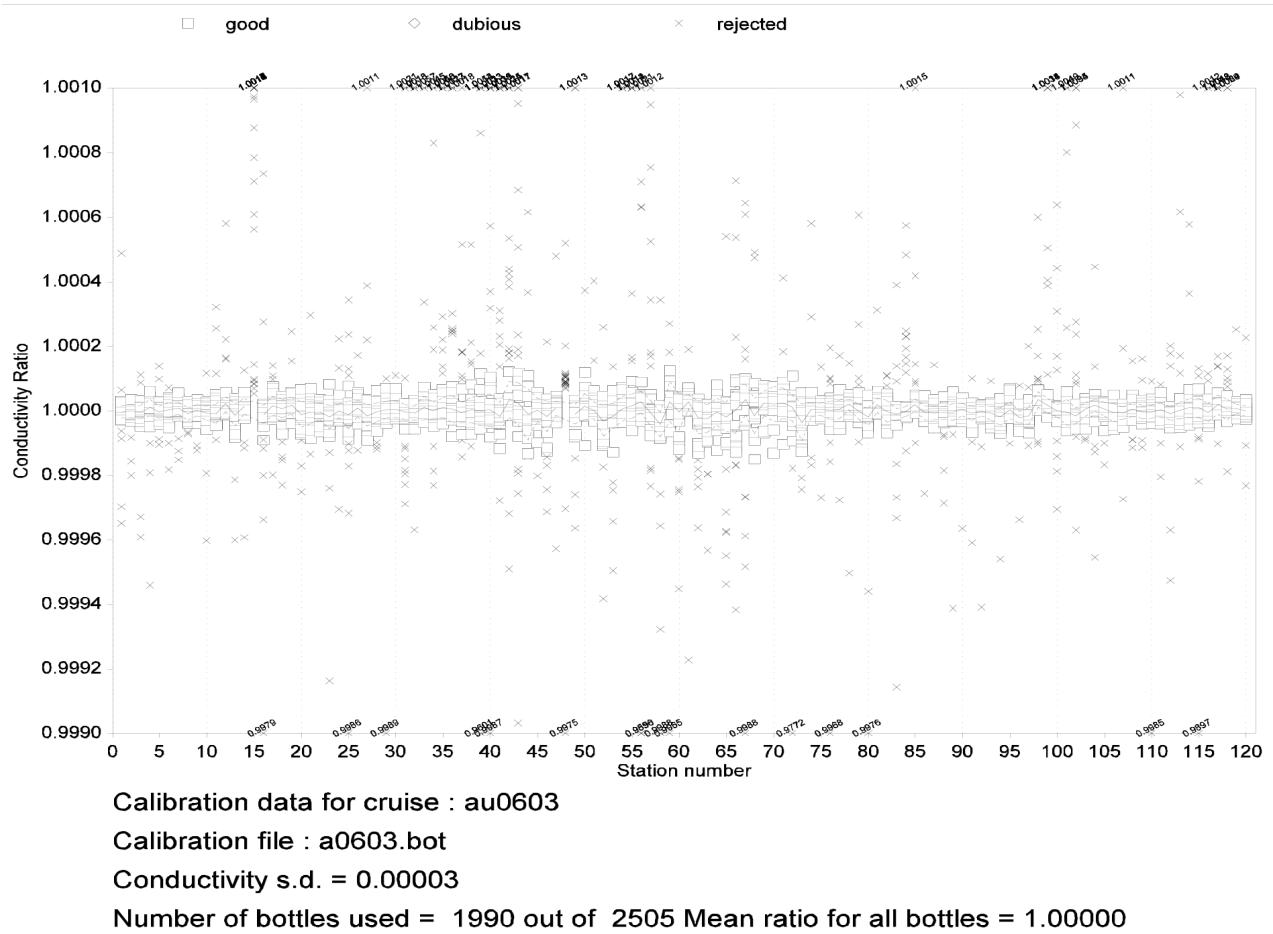


**Figure 1a:** CTD station positions and ship's track for cruise au0603.

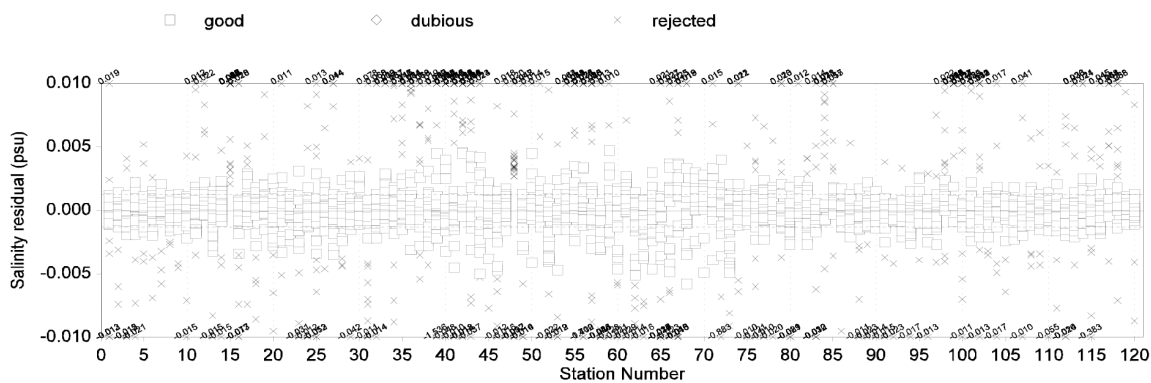
CRUISE AU0603 (BROKE WEST) CTD STATION POSITIONS AND SHIPS TRACK, BROKE WEST SURVEY AREA



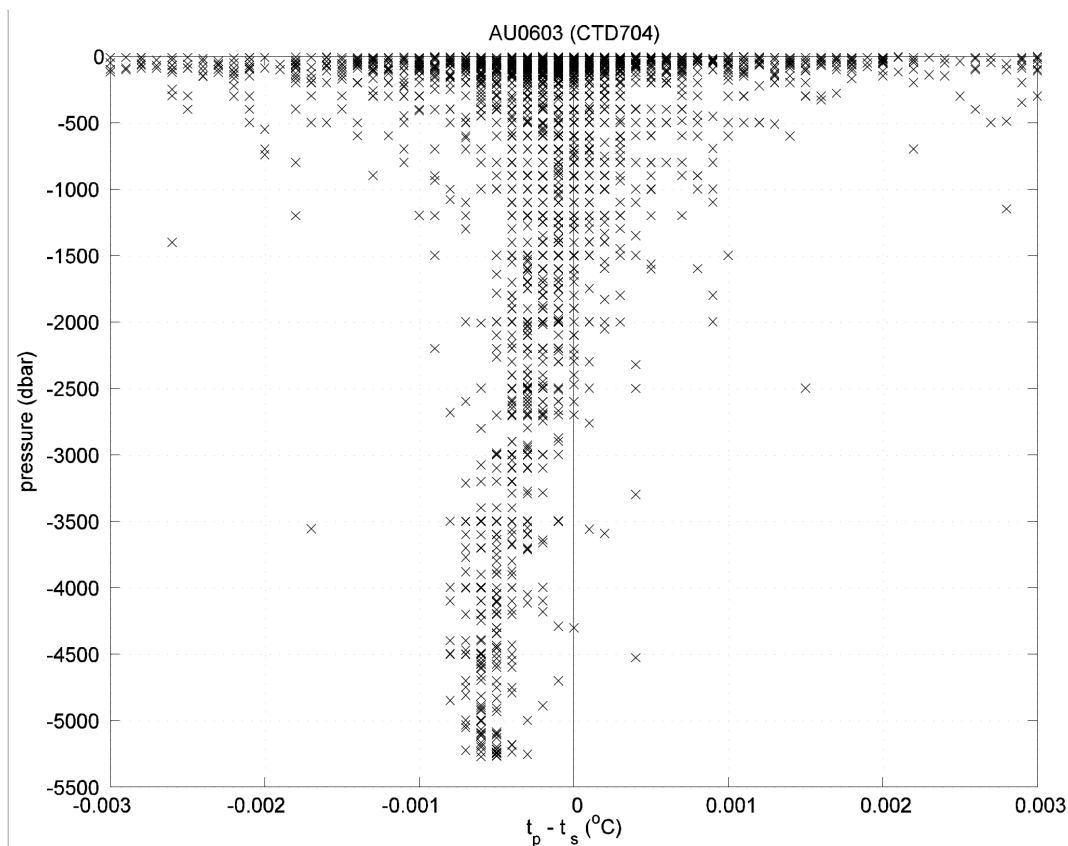
**Figure 1b:** CTD station positions and ship's track for cruise au0603, BROKE West survey area, including depth contours from GEBCO2003 bathymetry.



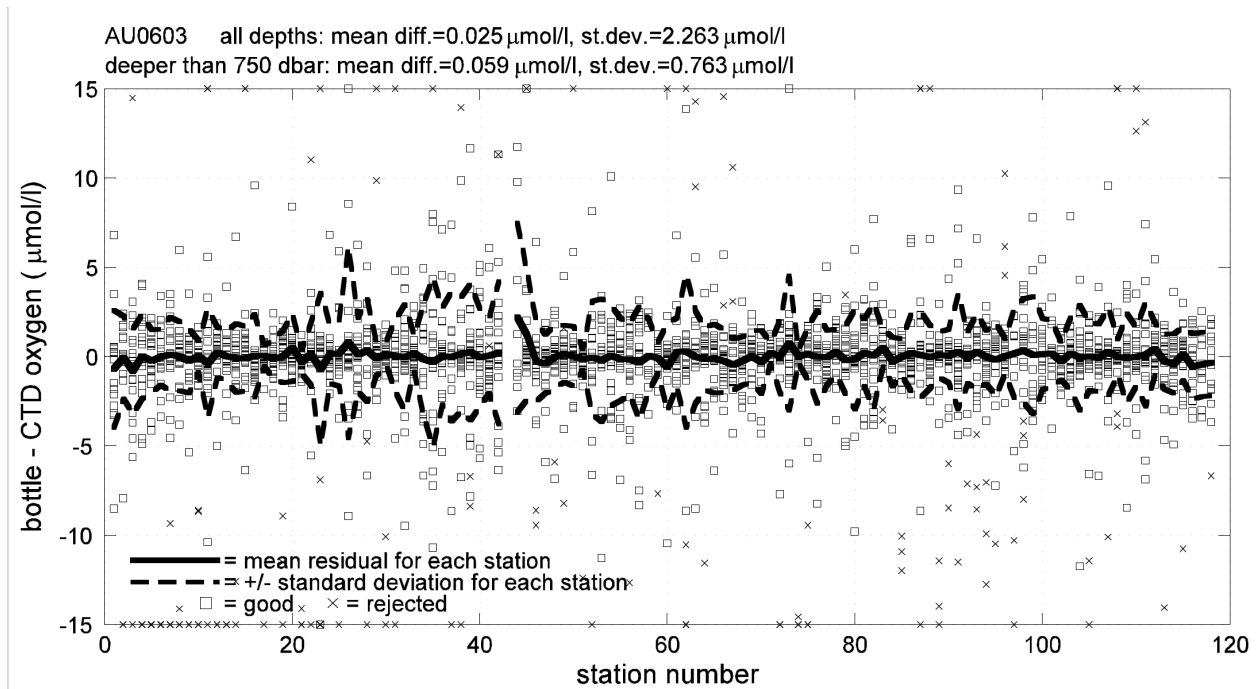
**Figure 2:** Conductivity ratio  $c_{btl}/c_{cal}$  versus station number for cruise au0603. The solid line follows the mean of the residuals for each station; the broken lines are  $\pm$  the standard deviation of the residuals for each station.  $c_{cal}$  = calibrated CTD conductivity from the CTD 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.



**Figure 3:** Salinity residual ( $s_{btl} - s_{cal}$ ) versus station number for cruise au0603. The solid line is the mean of all the residuals; the broken lines are  $\pm$  the standard deviation of all the residuals.  $s_{cal}$  = calibrated CTD salinity;  $s_{btl}$  = Niskin bottle salinity value.

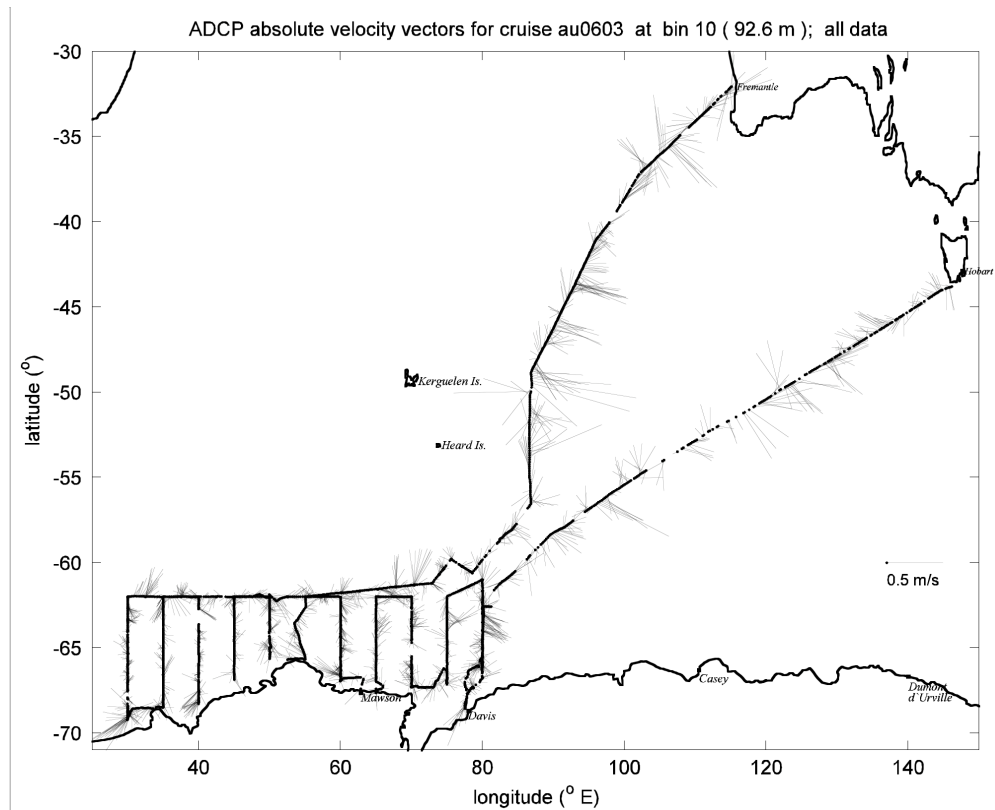


**Figure 4:** Difference between primary and secondary temperature sensor ( $t_p - t_s$ ) for CTD upcast burst data from Niskin bottle stops, for cruise au0603.

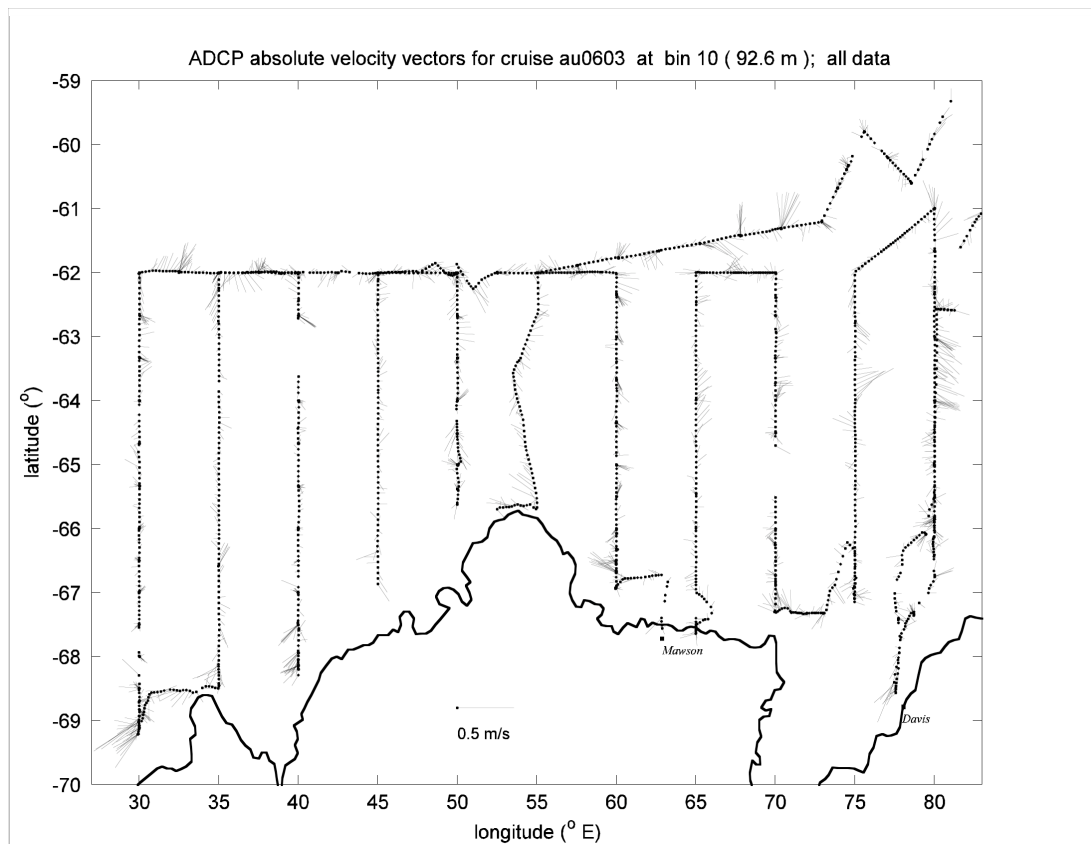


**Figure 5:** Dissolved oxygen residual ( $o_{\text{btl}} - o_{\text{cal}}$ ) versus station number for cruise au0603. The solid line follows the mean residual for each station; the broken lines are  $\pm$  the standard deviation of the residuals for each station.  $o_{\text{cal}}$ =calibrated downcast CTD dissolved oxygen;  $o_{\text{btl}}$ =Niskin bottle dissolved oxygen value. Note: values outside vertical axes are plotted on axes limits.

(a)

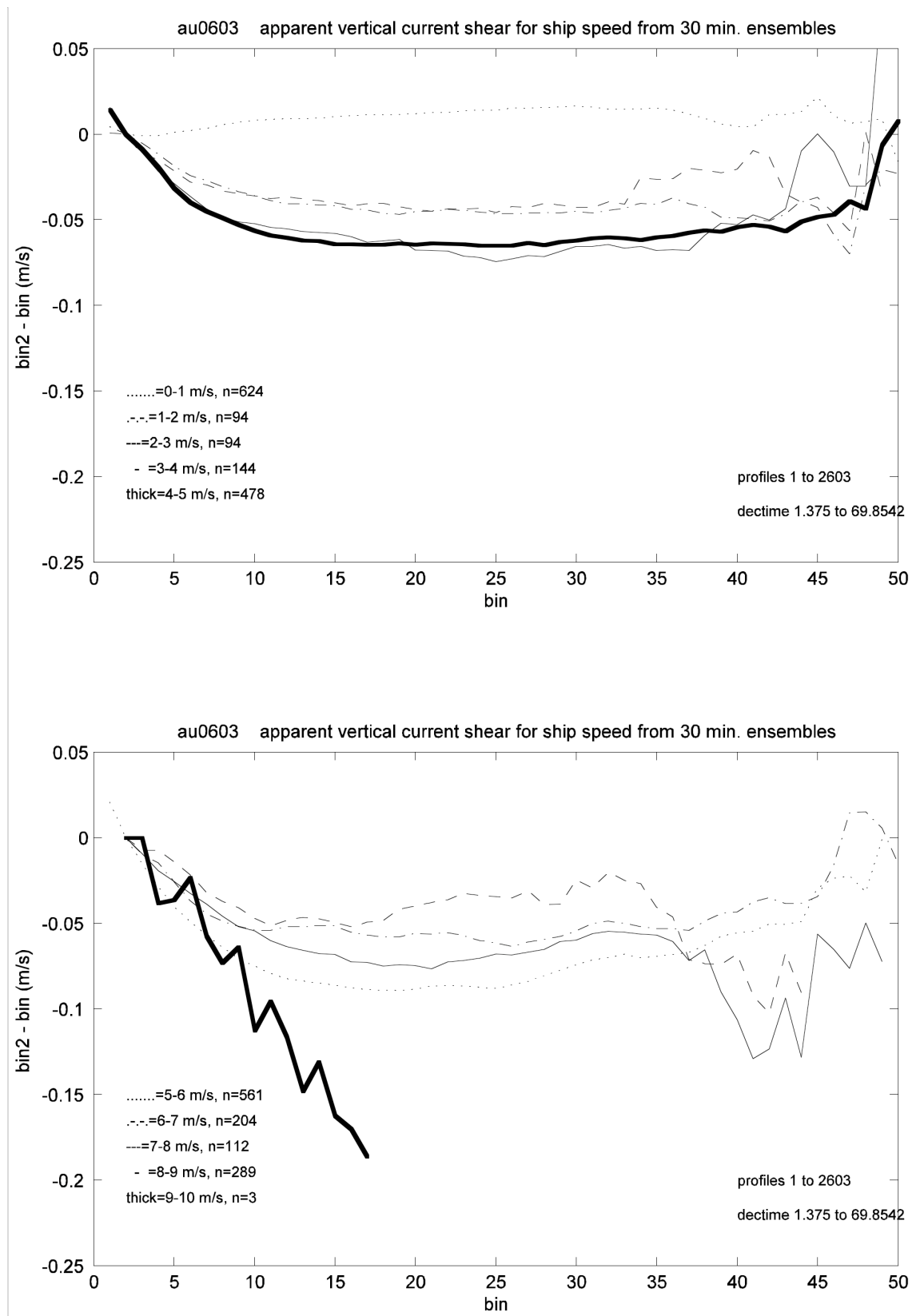


(b)



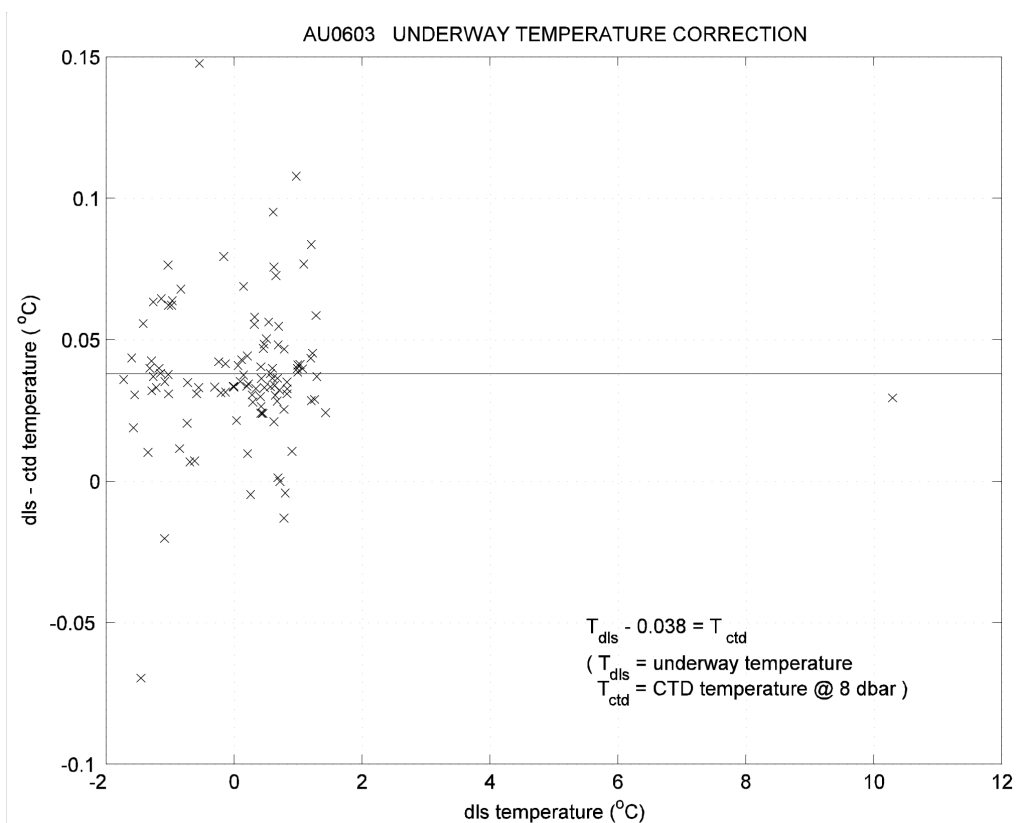
**Figure 6a and b:** au0603 hull mounted ADCP 30 minute ensemble data, for (a) whole cruise track, and (b) BROKE West survey area.



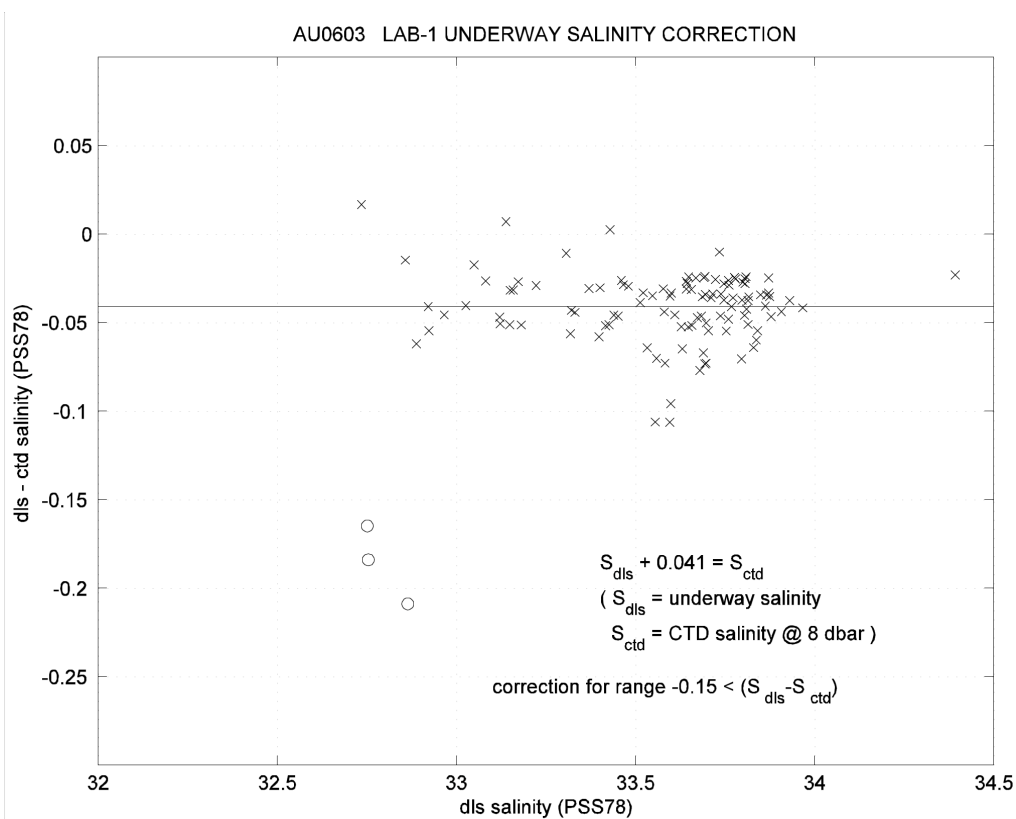


**Figure 7:** au0603 apparent ADCP vertical current shear, calculated from uncorrected (i.e. ship speed included) ADCP velocities. The data are divided into different speed classes, according to ship speed during the 30 minute ensembles. For each speed class, the profile is an average over the entire cruise.

(a)



(b)



**Figure 8a and b:** au0603 comparison between (a) CTD and underway temperature data (i.e. hull mounted temperature sensor), and (b) CTD and underway salinity data (i.e. Tilbrook's lab 1 SeaBird), including bestfit lines. Note: dls refers to underway data.