

CRUISE REPORT

HUDSON 94030

NEWFOUNDLAND BASIN

WOCE CONTROL VOLUME AR13

12 OCTOBER - 10 NOVEMBER, 1994

1. Highlights

- a. WOCE Designation: Control Volume 4,
Atlantic Repeat Hydrographic Section 13
- b. Expedition Designation: Hudson 94030
- c. Chief Scientist: R. Allyn Clarke
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- d. Ship: CSS Hudson
- e. Ports of Call: October 12, 1994 Bedford Institute of Oceanography (BIO),
Dartmouth, NS, Canada
November 10, 1994 BIO, Dartmouth, NS, Canada
- f. Cruise Dates: October 12, 1994 to November 10, 1994

2. Cruise Summary Information

a. Cruise Track

A cruise track is included with time information in Figure 1. This map also shows the locations of the North Atlantic Current Meter Mooring Array (ACM6) set from Oceanus in August 1993.

The CTD station positions are shown in Figure 2 while the Moving Vessel CTD (MVCTD) stations are shown in Figure 3. Station numbers are indicated in both figures for clarity. Float deployments are shown in Figure 4. The boundaries of the station occupation region are defined by 38-47°N and 38-50°W.

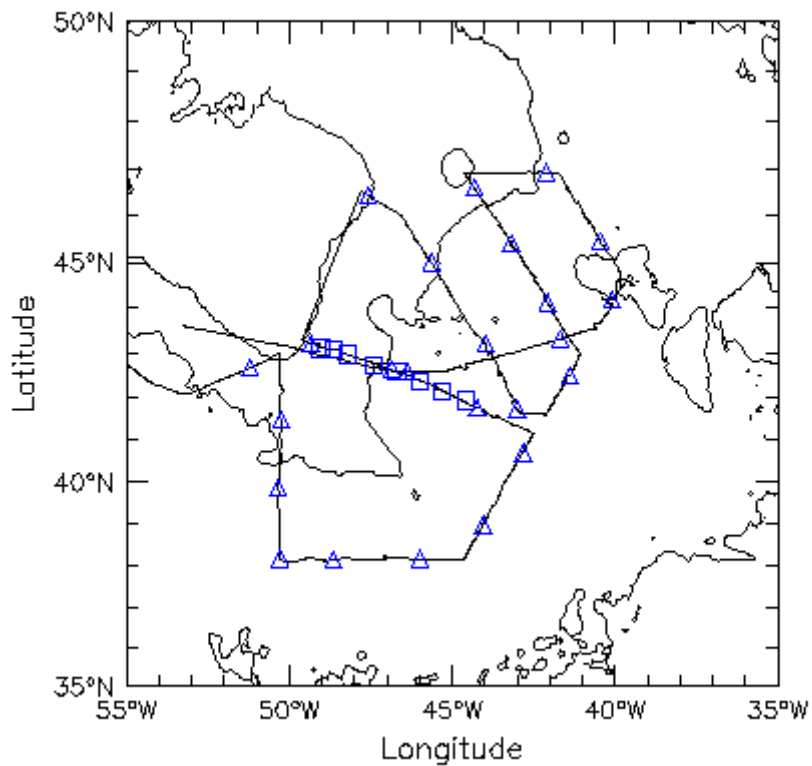


Figure 1. The Study Area and Cruise Track.

The 200m and 4000m isobaths are shown.

The following symbols are used:

Δ - midnight ship positions for each day in the study area. The symbol closest to the Tail of the Bank is on Oct. 15/94.

\sim - the North Atlantic Current Meter Mooring Array (ACM6) deployed in August/93.

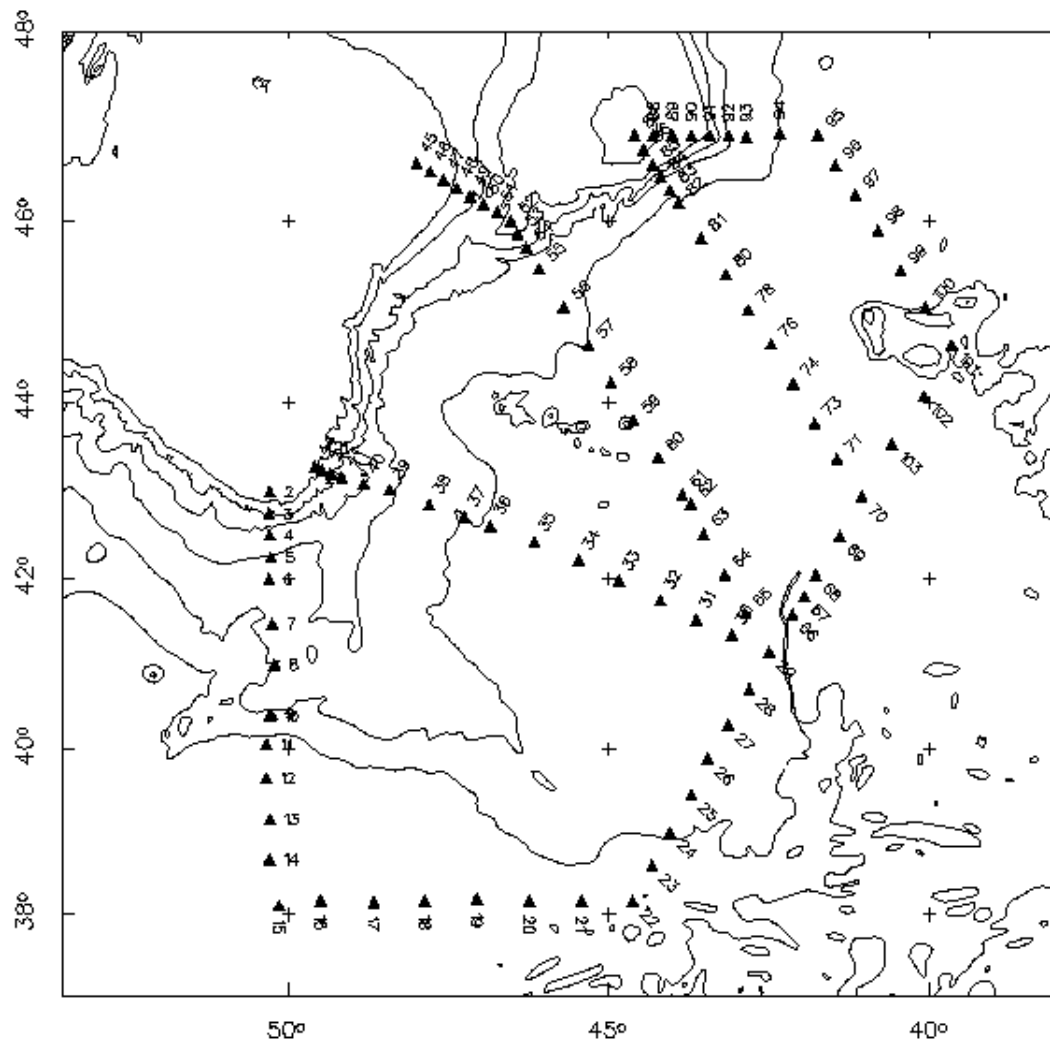


Figure 2. CTD Station Numbers and Positions.

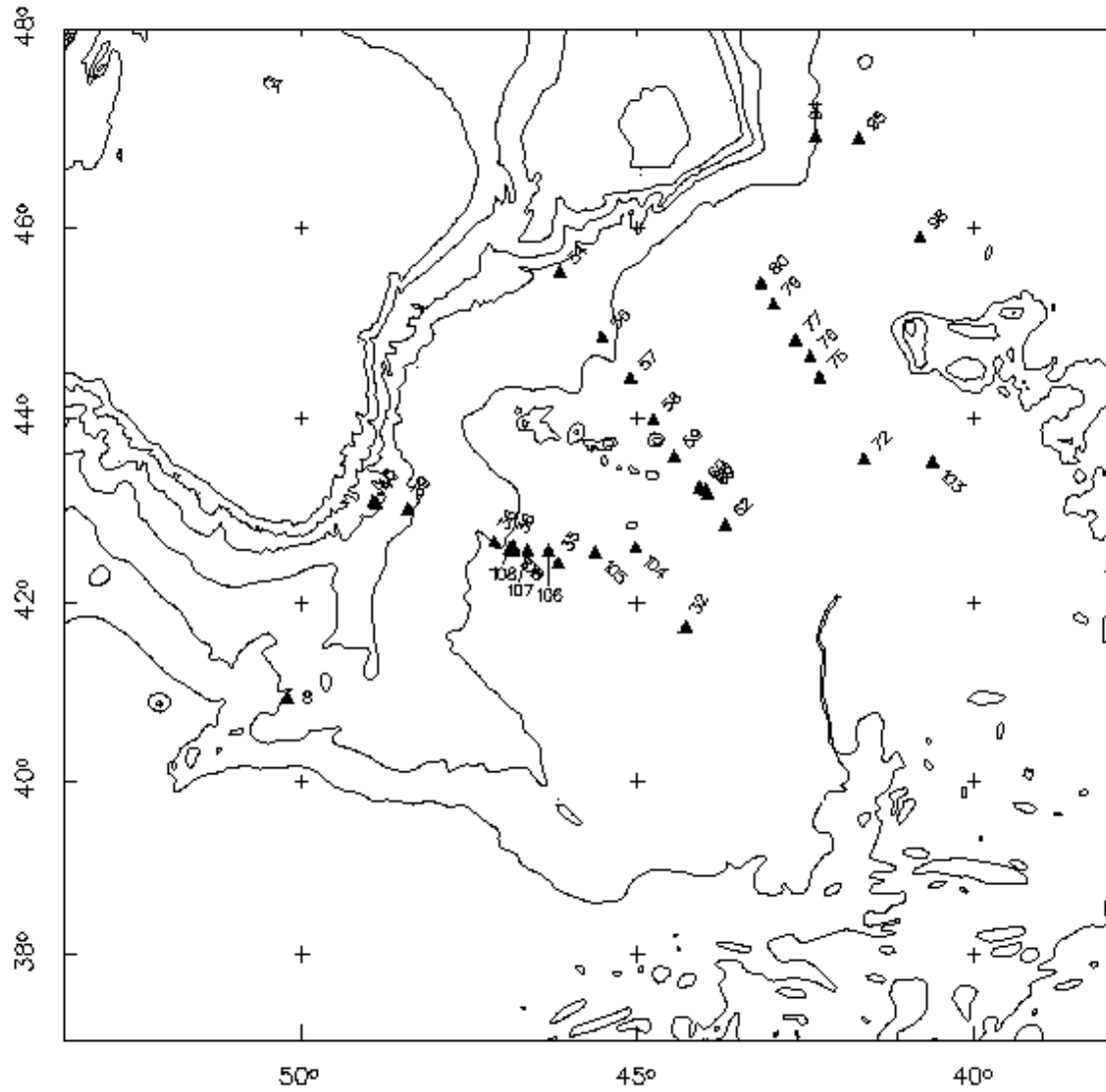


Figure 3. MVCTD Station Numbers and Positions.

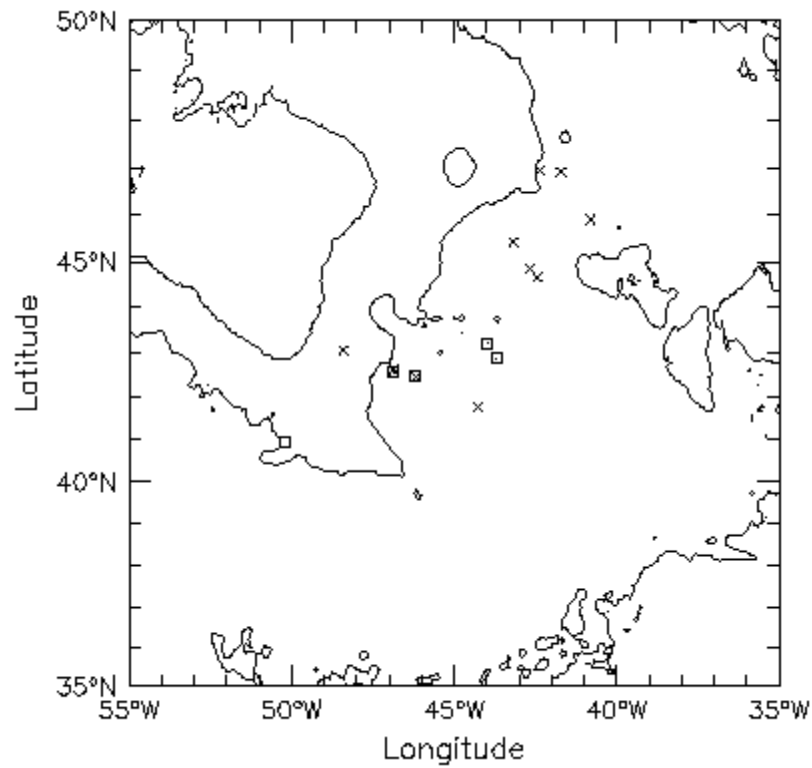


Figure 4. Float Deployments.

The study area is shown along with 200m and 4000m isobaths.

The following symbols are used:

□ - RAFOS float deployments.

× - electric field float deployments.

b. Total Number of Stations Occupied

- 97 full depth CTD stations with up to 20 rosette samples analyzed for CFC's, carbon tetrachloride, methyl chloroform, total carbonate, alkalinity, oxygen, salinity and nutrients.
- 2 CTD stations without water sampling to depths of less than 1000m
- 10 XBT profiles
- 19 profiles to 600m using the moving vessel CTD

c. Floats and Drifters Deployed

A total of 27 RAFOS floats were released as planned on three of the four transects of the North Atlantic Current and on a repeat transect of the mooring section on the homeward voyage from the eastern side of the working area.

Five Electric Field Floats (EFF's) were released for the Applied Physics Laboratory, University of Washington, Seattle. The first EFF was released in the core of the Gulf Stream as it crossed 50°W. Two were released in the core of the North Atlantic Current (NAC) on the Mooring Section and two more on the Newfoundland Seamount Section. It was originally planned to set four EFF's across the velocity core of the NAC on the mooring section, however, the core was crossed too quickly to permit such a deployment.

d. Moorings Deployed or Recovered

No moorings were deployed or recovered.

3. List of Principal Investigators

Name	Affiliation	Responsibility
Alyn Clarke	BIO clarkea@mar.dfo- mpo.gc.ca	chief scientist CTD data, oxygens, salts, XBT
Peter Jones	BIO jonesp@mar.dfo- mpo.gc.ca	alkalinity, carbonate, CFCs
Tom Rossby	URI tom@rafos.gso.uri.edu	sound sources, RAFOS floats
Tom Sandford	University of Washington	Electric field floats
Jean-Guy Dessurault	BIO	MVCTD

4. Scientific Program and Methods

a. Narrative

This was primarily a hydrographic survey involving a series of full depth CTD/Tracer stations spaced at 20 nautical miles or less apart. The sections were selected to be either historical sections for which there were a number of earlier occupations or along TOPEX/POSEIDON ground paths. The sections enclosed four volumes of water; it is hoped that the section data and the boxes may be used to determine the splitting of the Gulf Stream, North Atlantic Current, Labrador Current and Deep Western Undercurrent within this topographically and dynamically complex region. Initial results indicate that this goal is achievable, at least, in the three southern-most boxes. It was originally intended to split the southern-most box into two parts with a section crossing the Southeast Newfoundland ridge (normally at a location at which the shallowest depth crossing the ridge would have been about 4000 metres). It was hoped that this section would reveal the Gulf Stream flowing eastward south of the ridge and the NA Current flowing to the west on the north side.

The RAFOS float program was led by Tom Rossby of the University of Rhode Island. The floats were set in and near the North Atlantic Current in order to map the lagrangian velocity fields on isopycnal surfaces in the upper pycnocline throughout the Newfoundland Basin. The floats were positioned by four sound sources moored in the north-west North Atlantic in July, 1993. The floats were programmed to return to the surface and report their data in late June, 1995.

The Electric Field Floats were Lagrangian isobaric floats which measured the two horizontal components of the electric field as they moved with the current at a preset depth. The electric field allows one to estimate the vertically averaged horizontal velocity field at the float location. One float was released in the velocity core of the Gulf Stream and the remaining four floats were set in the core of the North Atlantic Current. The floats were programmed to return to the surface and send back their data in late December 1994. The project leader was Tom Sanford of the University of Washington.

The MVCTD (described in Clarke et al., 1995) was an instrument development project led by Jean-Guy Desserault. This device consisted of a special winch, power block, launch, recovery chute, heavy brass body containing a Falmouth Scientific Instruments CTD, Onset Tattletail 8 computer and radio modem. The system is capable of obtaining profiles greater than 1000 metres while steaming at 12 knots. A profile was obtained by first turning on the CTD by sending a signal to the fish via its radio modem. The operator then entered the target depth and the ship's speed into the PC computer that controlled the winch and power block. The PC was then used to initiate the profile. The entire operation of deploying and recovering the fish was performed completely under

computer control. The radio modem was then used to download the data from the fish when recovery was complete. Unfortunately, the FSI CTD was equipped with a 600 dbar pressure transducer which restricted the profiles to 600m. This meant that the system was only operational in those areas in which the 10 degree isotherm was believed to be shallower than 600m.

5. Major Problems and Goals Not Achieved

Two major problems were encountered during this cruise.

The first problem dealt with the plumbing of the CTD unit. All sensors on this unit, except the pressure sensor, should be mounted in a duct through which a pump pulls sea water. However, for stations 1 through 14 inclusive, the pump was installed in reverse. This resulted in the flow direction proceeding first through the pump, then oxygen, conductivity and temperature sensors. A procedure to correct these initial stations has been developed, see Appendix 1 for details.

The second problem involved the large number of leaking rosette bottles. This problem was present throughout the entire cruise.

6. Other Incidents of Note

The hydraulics used to open and close the hatch for the boom in the winch room were destroyed some time prior to the cruise. On several occasions, while moving between stations, considerable amounts of water entered the hatch during sample collection. This produced a source of possible sample contamination, as well as, discomfort to the sampling crew.

7. List of Cruise Participants

<u>Name</u>	<u>Responsibility</u>	<u>Affiliation</u>
Brian Beanlands	MVCTD	BIO
Larry Bellefontaine	Watchkeeper	BIO
Gerry Boudreau	Computers/watchkeeper	BIO
Mary-Elana Carr	RAFOS/EFF/watchkeeper	URI
Bruce Carson	CTD tech./salts	BIO
Alyn Clarke	Chief Scientist	BIO
Pierre Clement	Nutrients	BIO
Jean-Guy Dessureault	MVCTD	BIO
Sandy Fontana	RAFOS/EFF/watchkeeper	URI

Bob Gershey	CFC/Alkalinity/Carbonate	BDR Research
Cathy Griffiths	Watchkeeper	BIO
Mike Hingston	CFC/Alkalinity/Carbonate	BDR Research
John Moffatt	Oxygens	BIO
Liam Petrie	Watchkeeper	BIO
Charlie Ross	Data Quality/watchkeeper	BIO
Ed Verge	Watchkeeper	BIO
Igor Yashayaev	Data Quality/watchkeeper	Shirshov
Frank Zemlyak	CFC/Alkalinity/Carbonate	BIO

BIO Bedford Institute of Oceanography
P.O. Box 1006
Dartmouth, NS, CANADA B2Y 2A4

BDR BDR Research Ltd.
Box 652, Station 'M'
Halifax, N.S.,
Canada, B3J 2T3

URI University of Rhode Island
Graduate School of Oceanography
University of Rhode Island
South Ferry Road
Narragansett, RI 02882

Shirshov P.P. Shirshov Institute of Oceanology
Russian Academy of Sciences
Krasikova, 23
Moscow, Russia

B. UNDERWAY MEASUREMENTS

1. Navigation and Bathymetry

Anthony W. Isenor

The navigation system onboard CSS Hudson consisted of a Trimble Navigation Loran-GPS 10X decoder and AGCNAV software. The decoder received the satellite fixes and decoded the signals to obtain latitude, longitude and time. The decoder signals were approximately 1 Hz.

The AGCNAV software ran on a PC and graphically indicated the ship's position, way-points, course, speed, etc. AGCNAV is a PC based display and way-point setting software package developed at the Atlantic Geoscience Centre at BIO.

All navigation data was logged directly to a micro VAX II. The navigation logging was conducted by the shipboard acquisition command procedure, LOGGER. LOGGER produces three files for each successful invocation, the .DATA, .TIME and .HEAD files. These files are then decoded using a PIPE deck, with the primary directive being NMEA_NAV, producing ASCII files containing date, time, position, ships heading, etc. LOGGER was initiated 19 times during the trip, to produce 19 groups of .DATA, .TIME, and .HEAD files.

The echo sounder system used for collecting bathymetric data consisted of a Universal Graphic Recorder model UGR-196C-11 connected to a hull mounted 12kHz transducer. The transducer beam width was 15 degrees. The sweep rate of the record was adjusted throughout the course of data collection to aid in identifying the bottom signal. The recorder was also linked to a clock, and thus could indicate five minute intervals on the sounder paper. The system was used to collect bathymetric soundings at five minute intervals while underway between stations. A total of 4100km of deep sea bathymetric sounding data was recorded.

During the cruise, the paper take-up mechanism began to fail on the Universal Graphic Recorder and the instrument was replaced by a Raytheon Line Scan Recorder, Model LSR 1811-1.

2. Acoustic Doppler Current Profiler

Murray Scotney

The Hudson was equipped with a hull mounted RDI acoustic doppler current profiler. The transducer (serial number 177) had SC ADCP electronics (serial number 172) converted for ship board use. Logging, using Transect software, was started on October 12, 1994 at 1830Z in Halifax Harbour (Bedford Basin). The configuration of the equipment resulted in a bin length of eight metres and a total of 50 bins. The raw data was stored to disk and backed up every two days. Two days of logging created

approximately 30 Mbytes of data. The data was also averaged in real-time over one minute intervals. ADCP logging was stopped on November 6, 1994. A total of 600 hours of Acoustic Doppler Current Profiler data was recorded.

3. Thermosalinograph

No instrument was used.

4. XBT and XCTD

10 XBT probes were dropped between CTD stations in frontal regions.

Profiles to 600 metres were obtained using a Falmouth Scientific Instruments model MCTD-DBP-S CTD (serial number 1323) mounted in a special fish that permits semi-automatic upper ocean profiling from a vessel steaming at normal cruising speeds.

All XBT and CTD profiles were placed on the GTS via TESAC messages.

5. Meteorological Observations

Routine reporting of meteorological variables was carried out by the ship's crew.

6. Atmospheric Chemistry

There was no atmospheric chemistry program.

C. HYDROGRAPHIC MEASUREMENTS - DESCRIPTIONS, TECHNIQUES AND CALIBRATIONS

1. CTD Measurements Yashayaev

Allyn Clarke, Anthony Isenor and Igor

a. Description of the Equipment and Technique

The CTD measurements were made with a standard SEABIRD model 9Plus CTD (serial number 09P 9984-0370, BIO System #5) that was equipped with a model 3-02/F temperature sensor, a model 4-02/0 conductivity sensor, a paroscientific digiquartz model 410K-105 pressure sensor and a model 13-02 dissolved oxygen sensor. All but the pressure sensor were mounted in a duct through which a pump pulled sea water. Hence, the water flow past the actual sensors was independent of the lowering rate; this simplified the data processing considerably.

The Seabird CTD was mounted vertically within the BIO designed and built CTD/Rosette platform. This platform consisted of a central 10 inch diameter aluminum tube, which at its upper end, had a space containing the sea unit for a General Oceanics Model 1015-24 bottle rosette unit (BIO Rosette #3 was used throughout the cruise) and at its bottom end, a smaller well that contained a General Oceanics model 6000 12 Khz pinger unit. The space between the central six inch diameter pinger well and the 10 inch outer tube was filled with lead and the bottom end of the tube was covered with a fibreglass nose cone that was acoustically transparent.

The CTD sea unit was placed in a six inch diameter aluminum tube that was welded to the central tube. The CTD sensors were held in a heavy aluminum cage of approximately six inches in diameter which was welded to the opposite side. Around the mid point and the top of the central column were attached aluminum rings on which 20, eight litre sampling bottles were fastened. The number of bottles was set by the maximum diameter that could comfortably be handled through the doors of the enclosed winch room on CSS Hudson. The bottles were somewhat protected from damage by metal bands which had larger diameters than the outer diameters of the bottles when they were mounted. These metal bands were situated just below the bottom of the bottles.

The rosette bottles were of a BIO design that were manufactured by Brooke Ocean Technology, a local ocean engineering company. They differed from standard rosette bottles in that their top and bottom caps rotated about a horizontal axis to close. The energy to close the bottles was provided by stretching rubber tubing between the outside edges of the two caps along the outside surface of the bottle. This design had two advantages. First, the tubing was not inside the bottle either before or after

the water sample had been captured. Second, the tubing was applied after the bottle was cocked in the rosette tripping mechanism, and hence, eliminated the struggle with the tubing when attempting to cock the General Oceanics Inc. rosette.

b. Sampling Procedure and Data Processing Techniques

The CTD was deployed with a lowering rate of 60 metres/min (40 metres/min in the upper 200 metres or deeper if the conditions were rough). It was recovered at a rate of 90 metres/min (40 metres/min when deeper than 4000 metres or when conditions were rough)

The CTD data was recorded onto disk by a 486 computer using SEABIRD SEASOFT Version 4.201 software. A screen display of temperature, oxygen and salinity profiles vs pressure was used to determine the depths at which bottles were to be tripped on the up cast. The bottles were tripped using the enable and fire buttons on the SEABIRD deck unit. The SEASAVE software stored 73 scans (3 seconds) at each bottle trip within a separate file.

At the end of the station, all the data and header files associated with the station were transferred immediately via Ethernet to a second 486 computer. The SEASAVE software was used on this second machine to create one and two dbar processed data files, an IGOSS TESAC message and a processed rosette trip file. All the raw and processed data files associated with the station were then transferred to the ship's micro Vax II computer for archive and subsequent access and distribution to various users on the vessel.

The data processing used the following steps:

- | | |
|----------|---|
| DATCNV | Converted the raw data to physical parameters. |
| SPLIT | Split the data into DOWN and UP cast. |
| WILDEDIT | For every block of 12 scans, flagged all scans whose pressure, temperature, conductivity and oxygen values differed from the mean by more than two standard deviations. Recomputed the mean and standard deviation from unflagged data then marked as bad all scans exceeding four standard deviations from these new values. |
| FILTER | Used a low pass filter to time match pressure and conductivity parameters for salinity computation. Time constant used for conductivity is 0.045 seconds, for pressure 0.150 seconds. |

- LOOPEDIT Marked as bad, all cycles on the down trace for which the vertical velocity of the CTD unit was less than 0.1 metres/second.
- ALIGNCTD Aligned the temperature, conductivity and oxygen values relative to the pressure values accounting for the time delays in the system. Time offsets of 0.010 seconds for conductivity, 0.000 seconds for temperature and 3.000 seconds for oxygen were used.
- CELLTM A recursive filter used to remove the thermal mass effects from the conductivity data. Thermal anomaly amplitude and time constants of 0.0300 and 9.0000 were used.
- DERIVE Computed oxygen values.
- BINAVG Averaged the down cast into one or two dbar pressure bins. (Note: The procedure to produce the two dbar averages took about 5% of the total processing time).
- DERIVE Computed salinity, potential temperature and σ_{theta} .

c. Calibration Data

A calibration summary is presented in Table 1. The four headings in the Table (Shipboard Processing, First Calibration, ...) represent sections in the text that follows. In the Oxygen row, the numerals I, II, and III represent procedures that were followed to determine the applied coefficients. The procedures are described in section v. Oxygen Calibration Procedure. The numerics in this table (e.g. 1 - 104) represent station numbers.

Parameter	24 Hz Data		1 and 2 dbar data	
	Shipboard Processing	First Calibration	Second Calibration	Third Calibration
Conductivity	1-104	1-14 ⁽¹⁾ 15-104 ⁽²⁾		
Temperature	1-104	1-14 ⁽³⁾ 15-104 ⁽⁴⁾		
Pressure	1-104	1-14 ⁽⁵⁾		
Salinity	1-104			2-14 ⁽⁸⁾ 15-104 ⁽⁹⁾

Oxygen	1-104	45-104 ⁽⁶⁾	2-44 ⁽⁷⁾	2-44 ⁽¹⁰⁾ 45-54 ⁽¹⁰⁾ 55-84 ⁽¹⁰⁾ 85-91 ⁽¹⁰⁾ 92-104 ⁽¹⁰⁾
		I, II ⇒ 45-104	I, II ⇒ 2-44	I, III ⇒ 2-104

(1) : adjusted by -0.27 seconds (see Appendix 1); see Eqn. 1 section ii; coefficients as per “i. Shipboard Processing”

(2) : see Eqn. 1 section ii; coefficients as per “i. Shipboard Processing”

(3) : adjusted by -0.015 °C (see Appendix 1); see Eqn. 2 section ii; coefficients as per “i. Shipboard Processing”

(4) : see Eqn. 2 section ii; coefficients as per “i. Shipboard Processing”

(5) : adjusted by 7 seconds (see Appendix 1)

(6) : see section for expression and coefficients. This calibration was applied to all stations, 1-104. However, the resulting oxygen concentrations from station 1-44 were not used in subsequent analyses, thus only 45-104 are identified in the Table. Concentrations for stations 1-44 were subsequently replaced with results from the Second Calibration.

(7) : see section for expression and coefficients. The Second Calibration used the oxygen sensor mean temperature and current in the 1 or 2 dbar bin and did not use the oxygen concentration computed in the First Calibration.

(8) : see Eqn. 3 section iv

(9) : see Eqn. 4 section iv

(10) : see section; same expression but different coefficients for each group.

Table 1. Calibration Summary.

i. Shipboard Processing

The following calibration coefficients were used during the shipboard processing.

Conductivity Sensor (041375) Coefficients Used for Stations 1 to 104

$$\text{Conductivity} = (af^m + bf^2 + c + dt)/[10(1-9.57(10^{-8})p)]$$

where

- f is the frequency
- m = 4.3
- p is pressure in dbars
- t is the temperature
- a = 1.18499540E-05
- b = 5.13875405E-01

$$c = -4.13341052E+00$$

$$d = 4.56046244E-05$$

Temperature Sensor (031638) Coefficients Used for Stations 1 to 104

$$\text{Temperature} = 1/\{a + b[\ln(f_0/f)] + c[\ln^2[f_0/f] + d[\ln^3(f_0/f)]]\} - 273.15$$

where \ln indicates a natural logarithm
 f is the frequency
 $a = 3.68096719E-03$
 $b = 6.0268375E-04$
 $c = 1.55348636E-05$
 $d = 2.30707462E-06$
 $f_0 = 6034.53$

Pressure Sensor (50601) Coefficients Used for Stations 1 to 104

$$\text{Pressure} = C (1 - T_0^2/T^2) (1 - D[1 - T_0^2/T^2])$$

where P is the pressure (psia)
 T is the pressure period (μsec)
 $C = C_1 + C_2 U + C_3 U^2$
 $D = D_1 + D_2 U$
 $T_0 = T_1 + T_2 U + T_3 U^2 + T_4 U^3 + T_5 U^4$
 U is the temperature (deg C)
 $U = Mt + B$
 t is the pressure temperature compensation
 $M = 0.01145$
 $B = -8.57985$
 $C_1 = -42746.87 \text{ psia}$
 $C_2 = 1.06915E+00 \text{ psia/deg C}$
 $C_3 = 1.26600E-02 \text{ psia/deg C}^2$
 $D_1 = 0.040873$
 $D_2 = 0$
 $T_1 = 30.09559 \text{ micro sec}$
 $T_2 = -5.61120E-05 \text{ micro sec/deg C}$
 $T_3 = 4.34504E-06 \text{ micro sec/deg C}^2$
 $T_4 = 2.42883E-09 \text{ micro sec/deg C}^3$
 $T_5 = 0$

Oxygen Sensor (130266 and 130287) Coefficients for Stations 1 to 104

$$\text{Oxygen} = [\text{Soc} (\text{oc} + \text{tau} * \text{doc}/\text{dt}) + \text{Boc}] * \text{OXSAT}(\text{T}, \text{S}) * e^{\{\text{tcor} [\text{T} + \text{wt} * (\text{T}_o - \text{T})] + \text{pcor} * \text{p}\}}$$

where

- Soc = 2.1015
- oc is oxygen sensor current (microamps)
- oc = mV + b
- m = 2.4692E-07
- V is the oxygen temperature sensor voltage signal
- b = -4.1977E-10
- tau = 2.0
- doc/dt is the time derivative of oc
- Boc = -0.0646
- OXSAT is the oxygen saturation value
- S is salinity (PSU)
- e is natural log base
- tcor = -0.033
- wt = 0.67
- T is the water temperature (°C)
- T_o is the oxygen sensor internal temperature (°C)
- T_o = kV + c
- k = 8.8993
- c = -7.0715
- pcor = 1.5E-04
- p is the pressure (psia)

Note: Between stations 44 and 45 there was an exchange of oxygen sensors because sensor 130266 was malfunctioning. Although oxygen sensor 130287 replaced sensor 130266 on the CTD unit; the coefficients for sensor 130266 were never replaced by the coefficients for sensor 130287 in the Seabird software.

ii. First Calibration

On this cruise, it was found that for stations 1 through 14 inclusive, the pump on the CTD was installed in reverse. This caused water to flow past the CTD sensors opposite to the normal flow direction. The detailed correction procedures are given in Appendix 1.

After the Appendix 1 correction was applied, the temperature and conductivity were calibrated using the following linear correction as obtained from the lab calibrations. The First Calibration was applied using SEASOFT modules.

Sensor Coefficients for Stations 1 to 104

$$\text{Conductivity}_{\text{calibrated}} = \text{Conductivity}_{\text{raw}} * 1.00034089 - 0.00061$$

Eqn. 1

Sensor Coefficients for Stations 1 to 104

$$\text{Temperature}_{\text{calibrated}} = \text{Temperature}_{\text{raw}} * 1.00013922 + 0.0007$$

Eqn. 2

The oxygen data was completely (station 1-104) reprocessed. The oxygen coefficients used in the reprocessing were based on the data for stations 45 - 104. These coefficients were applied to the Station 1-44 data in an attempt to improve water sample and CTD comparisons.

The oxygen calibration applied in First Calibration used processing stages I and II as described in the following section v. Oxygen Calibration Procedure. The resulting calibration is as follows:

$$\text{Oxygen} = [\text{Soc} (\text{oc} + \text{tau} * \text{doc}/\text{dt}) + \text{Boc}] * \text{OXSAT}(\text{T}, \text{S}) * e^{\{\text{tcor} [\text{T} + \text{wt} * (\text{T}_o - \text{T})] + \text{pcor} * \text{p}\}}$$

where

- Soc = 4.110
- oc is oxygen sensor current (microamps)
- oc = mV + b
- m = 2.4692E-07
- V is the oxygen temperature sensor voltage signal
- b = -4.1977E-10
- tau = 2.0
- doc/dt is the time derivative of oc
- Boc = -0.0574
- OXSAT is the oxygen saturation value
- S is salinity (PSU)
- e is natural log base
- tcor = -0.040
- wt = 0.67
- T is the water temperature (°C)
- T_o is the oxygen sensor internal temperature (°C)
- T_o = kV + c
- k = 8.8993
- c = -7.0715
- pcor = 1.69E-04
- p is the pressure (psia)

iii. Second Calibration

The Second Calibration used the 1 and 2 dbar mean oxygen temperature and current as input to determine the hardware coefficients for the oxygen sensor used on stations 2 to 44. For the second calibration, new coefficients were found and applied to stations 2 through 44 only. This calibration applied stages I and II as described in section v. Oxygen Calibration Procedure.

Oxygen Sensor Coefficients for Stations 2 to 44

$$\text{Oxygen} = (\text{Soc} _ \text{oc} + \text{Boc}) _ \text{OXSAT}(T_{\text{in situ}}, S_{\text{in situ}}) _ \exp(\text{arg});$$

where

$$\begin{aligned} \text{OXSAT}(T_{\text{in situ}}, S_{\text{in situ}}) = & \exp [A1 + A2 _ (100. / (T_{\text{in situ}} + 273.15)) \\ & + A3 _ \ln ((T_{\text{in situ}} + 273.15) / 100.) \\ & + A4 _ ((T_{\text{in situ}} + 273.15) / 100.) \\ & + S_{\text{in situ}} _ (B1 + B2 _ ((T_{\text{in situ}} + 273.15) / 100.) \\ & \quad + B3 _ ((T_{\text{in situ}} + 273.15) / 100.) \\ & _ ((T_{\text{in situ}} + 273.15) / 100.)]; \end{aligned}$$

$$\text{arg} = \text{tcor} _ (T_{\text{in situ}} + \text{wt} _ (T_o - T_{\text{in situ}})) + \text{pcor} _ \text{p}_{\text{in situ}} ;$$

$$\text{Soc} = 0.614$$

oc is the current from the oxygen sensor

$$\text{Boc} = 0.72$$

OXSAT is the oxygen saturation value

$T_{\text{in situ}}$ is the water temperature (°C)

$S_{\text{in situ}}$ is salinity (PSU)

$$A1 = -173.4292$$

$$A2 = 249.6339$$

$$A3 = 143.3483$$

ln (*natural logarithm*)

$$A4 = -21.8492$$

$$B1 = -0.033096$$

$$B2 = 0.014259$$

$$B3 = -0.001700$$

$$\text{tcor} = -0.0164$$

$$\text{wt} = 0.67$$

T_o is the oxygen sensor internal temperature (°C), where $T_o = kV + c$

$$k = 8.8993$$

V is the oxygen temperature sensor voltage signal

$$c = -7.0715$$

pcor = 3.95E-06
 p_{in situ} is the pressure (psia)

iv. Third Calibration

The following salinity corrections were made to the 1 and 2 dbar datasets.

$$\text{CTD Salinity}_{\text{calibrated}} = \text{CTD Salinity}_{\text{raw}} + 0.0040 \quad (\text{Stn. 2 - 14}) \quad \text{Eqn. 3}$$

$$\text{CTD Salinity}_{\text{calibrated}} = \text{CTD Salinity}_{\text{raw}} + 0.0018 \quad (\text{Stn. 15 - 104})$$

Eqn. 4

The CTD oxygen Third Calibration used the results of the Second Calibration for the station 2-44 data and the results of the First Calibration for the station 45 to 104 data. The Third Calibration applied stages I and III as described in section v. Oxygen Calibration Procedure. The resulting oxygen corrections were applied to the 1 and 2 dbar datasets. The corrections were of the form:

$$\begin{aligned} O_{x_{ctd}} = O_{x_{ctd}} + o \cdot O_{x_{ctd}} \\ + t_1 \cdot T_{ctd} + t_2 \cdot T_{ctd}^2 + t_3 \cdot T_{ctd}^3 + t_4 \cdot T_{ctd}^4 \\ + p_1 \cdot P_{ctd} + p_2 \cdot P_{ctd}^2 + p_3 \cdot P_{ctd}^3 + p_4 \cdot P_{ctd}^4 \\ + a + \text{Time_cor (Station number)}, \end{aligned}$$

where for Stations 2 to 44:

a = -6.1523,
 o = 0.906663,
 t₁ = 0.25782,
 t₂ = -0.0823562,
 t₃ = 0.00824184,
 t₄ = -0.000222572,
 p₁ = 0.000331526,
 p₂ = -1.20509E-007,
 p₃ = 1.19481E-011,
 p₄ = 0.0,
 Time_cor (Station number) - see Table 2;

where for Stations 45 to 54:

a = -0.432137,
 o = 0.0,
 t₁ = 0.0,

$t_2 = 0.0,$
 $t_3 = 0.0,$
 $t_4 = 0.0,$
 $p_1 = 0.000975191,$
 $p_2 = -4.89749E-007,$
 $p_3 = 8.00916E-011,$
 $p_4 = 0.0,$
Time_cor (Station number) - see Table 2;

where for Stations 55 to 84 and 92 to 104:

$a = -0.0652795,$
 $o = 0.0,$
 $t_1 = 0.0,$
 $t_2 = 0.0,$
 $t_3 = 0.0,$
 $t_4 = 0.0,$
 $p_1 = 0.000155021,$
 $p_2 = -8.31746E-008,$
 $p_3 = 2.21829E-011,$
 $p_4 = -2.20387E-015,$
Time_cor (Station number) - see Table 2;

where for Stations 85 to 91:

$a = 2.139,$
 $o = -0.379712,$
 $t_1 = 0.0,$
 $t_2 = 0.0,$
 $t_3 = 0.0,$
 $t_4 = 0.0,$
 $p_1 = 0.000976793,$
 $p_2 = -4.33667E-007,$
 $p_3 = 0.0,$
 $p_4 = 0.0,$
Time_cor (Station number) - see Table 2.

Table 2. Time corrections used during the third recalibration of the CTD oxygen data.

Station number	Correction (Time_cor)	Station number	Correction (Time_cor)	Station number	Correction (Time_cor)
2	-.0564	37	0.2697	72	0.0800
3	-.0564	38	0.2077	73	0.1145
4	-.0568	39	0.2249	74	0.1193
5	-.0411	40	0.1608	75	0.1000
6	-.0069	41	0.1039	76	0.0980
7	.0548	42	0.2419	77	0.0800
8	.1100	43	0.2419	78	0.0624
9	.1848	44	0.2419	79	0.0500
10	.2104	45	-1.2447	80	0.0386
11	.1013	46	-0.5000	81	0.0029
12	.0887	47	0.2970	82	0.0186
13	.0396	48	2.3301	83	-0.0004
14	.0686	49	3.7974	84	-0.0092
15	.1184	50	4.4502	85	0.000
16	-.0276	51	4.4127	86	0.000
17	-.1520	52	3.5728	87	0.000
18	-.0039	53	2.4972	88	0.000
19	-0.0814	54	0.7181	89	0.000
20	-0.2208	55	-0.0108	90	0.000
21	-0.2645	56	-0.0442	91	0.000
22	-0.5040	57	-0.1054	92	0.0147
23	-0.5252	58	0.0078	93	0.0297
24	-0.4459	59	-0.0102	94	-0.0296
25	-0.3255	60	0.0473	95	-0.0156
26	-0.2460	61	0.0441	96	-0.0339
27	-0.0103	62	0.0450	97	-0.0265
28	0.1073	63	0.0468	98	-0.0652
29	0.1305	64	0.0979	99	-0.0025
30	-0.6365	65	0.1039	100	-0.0291
31	0.1767	66	0.0585	101	-0.0170
32	0.3133	67	0.0750	102	-0.0161
33	0.3320	68	0.1029	103	-0.0767
34	0.2505	69	0.0881	104	-0.0767
35	0.2234	70	0.0512		
36	0.2774	71	0.0542		

v. Oxygen Calibration Procedure

The calibration parameters for the CTD oxygen data were based on down trace CTD data and measurements of water sample oxygen concentration from bottles tripped on the uptrace. Although these datasets are inconsistent (to some degree) in time and spatial location, they were considered the only reliable source of information for calibration of CTD oxygen.

The procedure for finding the calibrations to be applied to the downcast CTD oxygen was subdivided into three stages (both II and III are iterative procedures):

- I. Creating a calibration file,**
- II. Computing non-linear 'hardware' coefficients,**
- III. Computing corrections of time drift and residual effects of pressure, temperature and oxygen (*secondary correction*).**

I. Creating a Calibration File

- 1) The *calibration file* is used for finding and testing calibrations (set of coefficients) later applied to the CTD data, while computing CTD Oxygen. A base for this file consisted of discrete CTD readings of temperature, pressure, salinity, etc. averaged over three seconds at the depth and time of bottle tripping. The *calibration file* creation steps are outlined below;
- 2) Water sample salinity and oxygen concentration determined onboard were added to the *calibration file*;
- 3) For initial 'indirect' check of quality, the differences between water sample and calibrated CTD salinity were computed. If the absolute difference exceeded 0.004 the point (record) containing this data was considered unreliable and discarded from further analysis;
- 4) Next, a search and selection was performed for each record of the *calibration file*. The goal is to find a point in a downtrace profile in the same general water type.
 - data from a downtrace profile were restricted to a certain pressure (or/and) density (or/and) temperature (or/and) salinity vicinity of the uptrace point (the *calibration file*). This defines a *group*. Typical criteria (definition of vicinity): differences between uptrace and downtrace pressure 25 db, potential temperature 0.5K, salinity 0.02. [Note: For some upcast data points, no downcast point was found within the defined criteria. In these cases, the CTD oxygen in the SEA file is indicated with a null value of -9.0 and a quality flag of 9, not sampled.]

- find a point in the *group* which is closest to the uptrace data point (from the *calibration file*) in multidimensional space, where dimensions are normalized (weighted or rescaled) pressure, potential temperature, salinity and density. Normalization for each axis was done according to expected variability within a water type. In ultimate cases only one or two dimensions were chosen. The found point was identified as being “closest” to the upcast CTD data point at the time of bottle trip.

At this point, the downtrace CTD data has been added to the calibration file.

- 5) Next the dataset was split into *sets* based on distinct changes in the sensors behavior. The *set* represented quasi-steady periods of oxygen sensor behavior. This avoided extreme temporal drifts in any of the *sets* and allowed the use of the same non-linear coefficients for each *set*.

II. Computing Non-linear ‘Hardware’ Coefficients

- 1) A nonlinear multiparametric least square technique was used to determine the oxygen sensor processing coefficients (*soc*, *boc*, *tcor*, and *bcor*) using $oxygen_{ws}$ vs. downcast $temperature_{ctd}$, $salinity_{ctd}$, $pressure_{ctd}$, $oxygen\ current_{ctd}$ and $oxygen\ temperature_{ctd}$ (where the *ws/ctd* subscripts represents water sample/CTD data).
- 2) Applying the results of step II.1, the $oxygen_{ctd}$ was derived.
- 3) Compute $oxygen_{ws} - oxygen_{ctd}$. Statistics of the difference were computed and the records that produced outliers (no matter if the outliers were produced by $oxygen_{ws}$ or $oxygen_{ctd}$) were marked or deleted from the *calibration file*.
- 4) Checking the $oxygen_{ws} - oxygen_{ctd}$ distributions:
 - if the differences ($oxygen_{ws} - oxygen_{ctd}$) are randomly distributed versus all parameters (temperature, pressure, oxygen current, and oxygen temperature) and there are no evident outliers, proceed to stage III,
 - otherwise, using the cleaned *calibration file* (derived in stage I and cleaned according to II.3) repeat all the steps of stage II until the first part of the check II.4 is true (typically, it requires 10 to 15 iterations to clean the *calibration file* and determine the oxygen sensor processing coefficients *soc*, *boc*, *tcor*, and *bcor*).

III. Computing corrections of time drift and residual effects of pressure, temperature and oxygen

- 1) Using the differences from II.4 (*first iteration on this stage*) or III.4 (*second and higher iteration*), compute the median $oxygen_{ws} - oxygen_{ctd}$ for each station. The series of station-by-station medians represents the *time drift* of the sensor.
- 2) Subtract the individual station median (*time drift*, III.1) from the differences $oxygen_{ws} - oxygen_{ctd}$ for that station, which must be taken from II.4.
- 3) Individually for pressure, temperature and then oxygen, use the *set* of stations (as defined in I.5) to compute a polynomial fit of the residuals from III.2 in pressure, temperature and oxygen.
- 4) Subtract the polynomial correction, derived in III.3, from the differences computed in II.4 (before subtraction of the *time-drift*). Check if there are any outliers.
- 5) Subtract the *time drift* (station median) from the results of III.4.
 - If these (*new* III.5) residuals don't depend on pressure, temperature, oxygen or time and their statistics is not improving with any sequential iteration (distribution getting tighter) advance to III.6.
 - Otherwise, use the results of step III.4 and repeat all the steps of stage III until the first bulleted part of III.5 is true. This iteration typically requires 7 to 14 repetitions.
- 6) Finalize calibration coefficients.

vi. CTD Quality Flagging

The processed 2 dbar CTD was quality flagged by applying “bad” flags to the near-surface data. This data would have been collected before the system pump was activated, and thus does not represent a measurement from a properly operating system. This typically meant that the temperature, salinity and oxygen data above 10 dbars is flagged using WOCE code “4”.

2. Salinity

Bruce Carson

a. Description of Equipment and Technique

Salinity samples were analyzed on one of two Guildline Autosal model 8400 salinometers. Samples were drawn in 150 ml medicine bottles. New caps, equipped with plastic liners, were placed on the sample bottles for each use.

The salinometer cell was filled and rinsed three times with sample water before readings were recorded. Two readings of the salinometer were recorded for every sample and standardization. If the values fluctuated, more readings were taken.

b. Sampling Procedure and Data Processing Technique

Salinity samples were drawn into the medicine bottles after three rinses. The bottles were filled up to the shoulders and then capped with new caps with plastic liners.

Data files for each separate run were prepared. These files consisted of various metadata (date, cruise, lab temperature, geographic location, operator, etc.) and sample specific data such as the bath temperature, sample ID number, and average conductivity ratio. A PC based program computed the salinity using average conductivity ratio of the runs and the standard IAPSO formula. Any changes in the salinometer readings between successive standardizations was assumed to have occurred as a linear drift of the instrument. Thus, the program applied a correction to the ratios, which varied linearly with the samples analyzed. The salinity data was then placed in the water sample database.

c. Laboratory and Sample Temperatures

Full cases of samples were taken from the winch room to the GP lab where they were left for a period of at least 10 hours to equilibrate to laboratory temperature before being analyzed.

The baths in these two salinometers were kept at 21°C and 24°C. The salinometer which was just above the current laboratory temperature would be the one that was used for any given run of samples.

d. Replicate Analysis

A replicate salinity sample was drawn from one of the rosette bottles on most stations. In total, 93 replicate samples were drawn for 93 sample id numbers. Of these sample id numbers, two (sample numbers 151372 and 151377) had at least one unacceptable sample value. The 186 sample values are given in Table C.1. Statistics of the difference of acceptable replicate values follow. The statistics were determined using the absolute value of the replicate difference.

Statistic	Value
Number of Replicate Differences	91
Minimum	0
Maximum	0.0148
Mean	0.0013

Median	0.0006
Standard Deviation	0.0024

Table C.1 Replicate water sample salinity values.

Sample ID Number	Salinity	WOCE QF	Sample ID Number	Salinity	WOCE QF
150603	34.9270	2			
150603	34.9268	2	150857	34.8729	2
			150857	34.8729	2
150613	34.9211	2			
150613	34.9252	2	150877	34.8749	2
			150877	34.8751	2
150627	34.7655	2			
150627	34.7663	2			
150635	34.8647	2			
150635	34.8677	2			
150651	34.9390	2			
150651	34.9390	2			
150679	34.8937	2			
150679	34.8947	2			
150691	34.9061	2			
150691	34.9163	2			
150708	34.8792	2			
150708	34.8784	2			
150726	34.8463	2			
150726	34.8473	2			
150746	34.9479	2			
150746	34.9489	2			
150757	34.8793	2			
150757	34.8803	2			
150790	35.0453	2			
150790	35.0449	2			
150806	34.9559	2			
150806	34.9553	2			
150820	34.8844	2			
150820	34.8869	2			
150837	34.9064	2			
150837	34.9066	2			

Table C.1 Replicate water sample salinity values.

Sample ID Number	Salinity	WOCE QF	Sample ID Number	Salinity	WOCE QF
150908	35.0274	2			
150908	35.0270	2	151206	34.9134	2
			151206	34.9136	2
150917	34.8876	2			
150917	34.8880	2	151222	34.9437	2
			151222	34.9441	2
150943	34.9201	2			
150943	34.9213	2			
150963	34.9307	2			
150963	34.9321	2			
150977	34.8818	2			
150977	34.8835	2			
151003	34.9419	2			
151003	34.9431	2			
151017	34.8840	2			
151017	34.8842	2			
151042	34.9138	2			
151042	34.9142	2			
151060	34.9053	2			
151060	34.9055	2			
151080	34.9099	2			
151080	34.9119	2			
151097	34.9001	2			
151097	34.9006	2			
151121	34.9140	2			
151121	34.9158	2			
151137	34.8900	2			
151137	34.8904	2			
151160	34.9067	2			
151160	34.9061	2			
151177	34.8882	2			
151177	34.8883	2			

Sample ID Number	Salinity	WOCE QF	Sample ID Number	Salinity	WOCE QF
151238	34.9024	2	151404	34.9685	2
151238	34.9016	2			
151265	34.9235	2	151409	34.6100	2
151265	34.9235	2	151409	34.6100	2
151284	34.9234	2	151411	34.8473	2
151284	34.9253	2	151411	34.8500	2
151316	35.1849	2			
151316	35.1849	2			
151342	34.9062	2			
151342	34.9062	2			
151355	34.7559	2			
151355	34.7561	2			
151362	34.8224	2			
151362	34.8218	2			
151370	33.2254	2			
151370	33.2258	2			
151372	33.1364	4			
151372	33.5264	2			
151374	33.5739	2			
151374	33.5744	2			
151377	33.7536	4			
151377	33.7551	4			
151382	33.2338	2			
151382	33.2343	2			
151383	34.4263	2			
151383	34.4264	2			
151387	34.8448	2			
151387	34.8456	2			
151396	34.8382	2			
151396	34.8382	2			
151404	34.9683	2			

Sample ID Number	Salinity	WOCE QF	Sample ID Number	Salinity	WOCE QF
151425	34.8963	2	151714	34.9012	2
151425	34.8965	2			
151442	34.8721	2	151733	34.8980	2
151442	34.8704	2	151733	34.9002	2
151457	34.9201	2	151754	34.9053	2
151457	34.9202	2	151754	34.9036	2
151473	34.8937	2			
151473	34.8939	2			
151493	34.8950	2			
151493	34.8950	2			
151513	34.8906	2			
151513	34.8932	2			
151535	34.8974	2			
151535	34.8984	2			
151553	34.8942	2			
151553	34.8954	2			
151575	34.9055	2			
151575	34.9059	2			
151597	34.9209	2			
151597	34.9221	2			
151613	34.8910	2			
151613	34.8985	2			
151643	34.9140	2			
151643	34.9148	2			
151657	34.9368	2			
151657	34.9376	2			
151673	34.8936	2			
151673	34.8932	2			
151693	34.8949	2			
151693	34.8961	2			
151714	34.9005	2			

Sample ID Number	Salinity	WOCE QF	Sample ID Number	Salinity	WOCE QF
151777	35.0018	2	151962	34.8972	2
151777	35.0016	2	151962	34.8969	2
151805	34.9906	2	151985	34.9237	2
151805	34.9906	2	151985	34.9237	2
151818	34.9183	2	152001	34.8949	2
151818	34.9187	2	152001	34.8957	2
151833	34.8934	2	152022	34.8971	2
151833	34.8937	2	152022	34.8981	2
151860	34.8942	2	152046	34.9220	2
151860	34.8987	2	152046	34.9242	2
151873	34.8902	2	152061	34.8993	2
151873	34.8930	2	152061	34.8989	2
151895	34.9048	2	152084	34.9119	2
151895	34.9048	2	152084	34.9119	2
151912	34.8235	2	152101	34.9069	2
151912	34.8226	2	152101	34.9093	2
151917	32.8017	2	152123	34.9053	2
151917	32.8019	2	152123	34.9080	2
151927	34.8389	2	152153	34.9455	2
151927	34.8399	2	152153	34.9456	2
151932	34.8426	2	152167	34.9362	2
151932	34.8438	2	152167	34.9215	2
151947	34.8739	2			
151947	34.8607	2			

3. Oxygen

Pierre Clement

a. Description of Equipment and Technique

The automated procedure followed was based on the method developed by the Physical and Chemical Services Branch (PCS) of the Bedford Institute of Oceanography (BIO) (Levy et al. 1977).

The PCS procedure was a modified Winkler titration from Carritt and Carpenter (1966), using a whole bottle titration. In this method there was no starch indicator. A wetting agent (Wetting Agent A, BDH) was introduced to reduce bubble formation. The full description of the system and method can be found in Jones, et al. (1992).

In summary the automated titration system consisted of an IBM PC linked to a Brinkmann PC800 colorimeter and a Metrohm 655 Multi-Dosimat Automatic Titrator. The PC talked to the peripherals through a Data Translation, DT2806 and three Data Translation DTX350s.

b. Sampling Procedure and Data Processing Technique

The sampling bottles were 125ml Iodine flasks with custom ground stoppers (Levy et al. 1977). The flask volumes were determined gravimetrically. The matched flasks and stoppers were etched with identification numbers and entered into the Oxygen program database.

For this cruise eight litre Niskin bottles were used to obtain the original sample. Then, the oxygen subsamples were drawn through the bottles spigot with a latex or silicone tube attached so as to introduce the water to the bottom of the flask. Once the flow was started, the flask was inverted to ensure that there was no air trapped in the tube. Next, the tube was partially pinched to reduce the flow rate and the flask reoriented and filled to overflowing. The flow was allowed to continue until at least two to three volumes had run through, then the flask slowly retracted with continuous low flow to ensure that no air got trapped in the flask. The flask was then brought to the reagent station and one millilitre of the Alkaline Iodide and Manganous Chloride Reagents were added and the stoppers carefully inserted, again ensuring that no air got into the flasks. The flasks were then shaken and carried to the lab for analysis.

c. Replicate Analysis

There were 1580 unique sample id numbers for the cruise. Oxygen samples were intentionally not drawn for 20 sample id numbers. Six sample id numbers did not have enough water in the Rosette bottle to sample for oxygen. While two others had totally unreliable data that was not reported. The remaining 1552 sample id numbers were analyzed for dissolved oxygen; of these sample id numbers, 1455 had one sample value, 10 had two sample values and 87 had three sample values. The replicate samples were taken from a water sample bottle at each station in order to monitor precision, which can be affected by flaws in sampling or titration.

Statistics of the replicate differences follow. Only the 233 acceptable values were used in calculating the 229 replicate differences. There were four sample id numbers having acceptable values including one replicate and 75 sample id numbers having acceptable values including two replicates.

Number of acceptable replicate differences

$$\begin{aligned}
 &= 4 \text{ sample id numbers having one replicate} * 1 \text{ possible difference} \\
 &+ 75 \text{ sample id numbers having two replicates} * 3 \text{ possible differences} \\
 &= 229
 \end{aligned}$$

Median of [(absolute difference/sample mean concentration) * 100%] = 0.28 %

Statistic	Value (μmoles/kg)
Minimum	0.0
Maximum	60.8
Mean	2.3
Median	0.8
Standard Deviation	7.3

Cumulative Frequency	Oxygen Difference (μmoles/kg)
50 %	≤ 0.8
68 %	≤ 1.5
95 %	≤ 5.3

All 281 oxygen replicate sample values with their respective quality flags are given in Table C.2.

Table C.2 Replicate water sample oxygen values in $\mu\text{moles/kg}$.

Sample ID Number	Oxygen	WOCE QF	Sample ID Number	Oxygen	WOCE QF
150624	294.9	2	150826	276.3	2
150624	293.9	2			
			150838	275.2	2
150632	280.0	2	150838	273.9	2
150632	282.9	2	150838	272.3	2
150651	277.4	2			
150651	278.0	2			
150651	278.2	2			
150670	284.9	2			
150670	285.2	2			
150670	286.4	2			
150695	274.9	2			
150695	278.6	2			
150695	278.6	2			
150715	153.3	2			
150715	154.1	2			
150715	155.6	2			
150729	242.4	2			
150729	247.2	2			
150729	247.8	2			
150751	164.4	2			
150751	162.3	2			
150751	162.5	2			
150758	197.7	2			
150758	256.7	2			
150758	258.5	2			
150785	274.0	2			
150785	275.2	2			
150785	278.2	2			
150800	269.6	2			
150800	272.4	2			
150800	272.5	2			
150826	275.0	2			
150826	275.0	2			

Table C.2 Replicate water sample oxygen values in $\mu\text{moles/kg}$.

Sample ID Number	Oxygen	WOCE QF	Sample ID Number	Oxygen	WOCE QF
150870	265.3	2	151058	272.2	2
150870	265.6	2	151058	271.8	2
150870	264.7	2			
			151080	280.1	4
150878	266.9	2	151080	-3.7	4
150878	267.8	2			
150878	268.3	2			
150907	267.7	2			
150907	267.3	2			
150907	267.3	2			
150932	170.1	2			
150932	169.8	2			
150932	170.1	2			
150944	273.1	2			
150944	273.5	2			
150944	273.6	2			
150974	217.6	4			
150974	190.4	4			
150975	210.6	2			
150975	204.5	2			
150975	202.9	2			
150993	213.8	2			
150993	213.8	2			
150993	213.9	2			
151001	271.8	2			
151001	273.7	2			
151001	273.7	2			
151023	270.7	2			
151023	270.7	2			
151023	272.4	2			
151041	274.1	2			
151041	274.7	2			
151041	276.1	2			
151058	272.0	2			

Sample ID Number	Oxygen	WOCE QF	Sample ID Number	Oxygen	WOCE QF
151081	274.6	2	151286	291.9	2
151081	274.7	2	151286	292.0	2
151081	276.4	2	151286	292.2	2
151111	181.6	2	151297	287.8	2
151111	190.5	2	151297	288.1	2
151111	191.3	2	151297	290.9	2
151128	262.9	2			
151128	263.8	2			
151129	239.6	2			
151129	239.6	2			
151129	238.2	2			
151143	278.4	2			
151143	278.6	2			
151143	278.6	2			
151156	19.6	3			
151156	215.6	2			
151163	281.6	2			
151163	282.7	2			
151163	283.2	2			
151180	277.9	2			
151180	278.1	2			
151180	279.3	2			
151201	280.1	2			
151201	284.4	2			
151201	279.9	2			
151226	280.8	2			
151226	280.9	2			
151226	279.7	2			
151240	283.5	2			
151240	283.5	2			
151240	283.7	2			
151257	281.8	2			
151257	287.0	2			
151257	286.2	2			

Sample ID Number	Oxygen	WOCE QF	Sample ID Number	Oxygen	WOCE QF
151330	263.3	2	151395	299.8	2
151330	267.9	2			
151330	262.6	2	151401	294.2	2
			151401	294.3	2
151341	289.6	2	151401	295.6	2
151341	290.5	2			
151341	289.1	2			
151354	295.8	2			
151354	295.8	2			
151354	295.8	2			
151364	291.7	2			
151364	292.5	2			
151364	291.8	2			
151368	291.8	2			
151368	291.8	2			
151368	292.2	2			
151372	318.6	2			
151372	321.4	2			
151372	321.4	2			
151376	316.9	2			
151376	318.0	2			
151376	318.8	2			
151377	301.5	2			
151377	312.8	2			
151377	315.7	2			
151381	320.9	2			
151381	320.6	2			
151381	320.6	2			
151386	330.7	2			
151386	330.8	2			
151386	331.8	2			
151388	301.8	2			
151388	301.9	2			
151388	302.2	2			
151395	299.4	2			
151395	299.7	2			

Sample ID Number	Oxygen	WOCE QF	Sample ID Number	Oxygen	WOCE QF
151408	256.9	2			
151408	257.3	2	151595	278.7	2
151408	257.3	2	151595	278.9	2
			151595	278.4	2
151414	276.7	2			
151414	271.4	2	151619	275.6	2
151414	274.9	2	151619	276.7	2
			151619	276.9	2
151427	287.5	2			
151427	284.6	2			
151427	284.1	2			
151436	285.2	2			
151436	285.8	2			
151436	286.2	2			
151442	296.9	4			
151442	298.2	4			
151454	290.1	2			
151454	291.5	2			
151454	289.8	2			
151476	284.3	2			
151476	334.0	2			
151476	283.9	2			
151502	283.9	2			
151502	287.2	2			
151502	287.5	2			
151526	237.6	2			
151526	241.2	2			
151526	237.7	2			
151536	279.5	2			
151536	281.1	2			
151536	281.2	2			
151571	179.6	2			
151571	180.2	2			
151571	183.3	2			
151576	279.9	2			
151576	280.1	2			
151576	279.7	2			

Sample ID Number	Oxygen	WOCE QF	Sample ID Number	Oxygen	WOCE QF
151637	279.2	2			
151637	281.2	2	151857	288.3	2
151637	279.6	2	151857	290.6	2
			151857	290.1	2
151663	273.5	2			
151663	273.5	2			
151663	273.8	2			
151681	272.0	4			
151681	283.2	4			
151682	280.3	2			
151682	281.6	2			
151682	279.7	2			
151694	283.5	2			
151694	284.6	2			
151694	282.3	2			
151717	282.4	4			
151717	272.7	4			
151717	281.4	4			
151752	232.1	2			
151752	231.9	2			
151752	231.7	2			
151755	280.3	2			
151755	280.8	2			
151755	280.8	2			
151781	279.9	2			
151781	280.3	2			
151781	280.3	2			
151801	287.7	2			
151801	287.8	2			
151801	287.4	2			
151820	277.9	2			
151820	278.4	2			
151820	277.1	2			
151852	269.2	2			
151852	269.7	2			
151852	270.0	2			

Sample ID Number	Oxygen	WOCE QF	Sample ID Number	Oxygen	WOCE QF
151879	288.5	2	152026	282.5	3
151879	290.5	2	152026	282.4	3
151879	291.6	2	152026	282.5	3
151896	290.5	2	152048	296.7	4
151896	291.1	2	152048	296.9	3
151896	292.5	2	152048	298.4	3
151916	307.1	2	152063	282.6	3
151916	307.4	2	152063	283.1	3
			152063	281.4	3
151931	301.0	2	152086	280.5	3
151931	303.2	2	152086	280.6	3
151931	300.8	2	152086	280.8	3
151941	1.0	4			
151941	291.5	4	152103	280.3	3
			152103	281.7	3
151947	287.8	2	152103	282.4	3
151947	288.8	2			
151947	287.6	2	152121	281.4	3
			152121	283.8	3
151964	288.0	3	152121	277.6	3
151964	288.5	3			
151964	289.9	3	152144	281.9	3
			152144	281.9	3
151984	287.4	3	152144	281.6	3
151984	287.4	3			
151984	287.7	3	152162	277.7	3
			152162	275.5	3
152005	286.5	3	152162	276.6	3
152005	284.6	3			
152005	284.8	3			

4. Nutrients

Pierre Clement

a. Description of Equipment and Technique

Nutrient concentrations were determined using a Technicon Autoanalyser II. The chemistries were standard Technicon (Silicate 186-72W, Phosphate 155-71W, Nitrate/Nitrite 158-71W) except for Phosphate which was modified by separating the Ascorbic Acid (4.0 gms/L) from the Mixed Reagent. This alteration was achieved by introducing the modified Mixed Reagent instead of water at the start of the sample stream at 0.23 ml/minute and the Ascorbic Acid was pumped into the stream between the two mixing coils at 0.32 ml/minute.

b. Sampling Procedure and Data Processing Technique

Duplicate nutrient subsamples were drawn into 30 ml HDPE (Nalge) wide mouth sample bottles from 8 litre Niskins. The bottles were 10% HCl washed, rinsed once with tap water, three times with Super-Q and oven dried at >100 Degrees F.

A sample run included six Working Standards run at the beginning and end. Duplicate Check Standards were run every 16 samples followed by blanks as a Baseline Check. These Standards were made up in 33 ppt NaCl (VWR, Analar grade) as was the wash water. The Standards were tested against CSK Solution Standards (Sagami Chemical Center, Japan).

Analog data was converted to digital, processed and statistics calculated by a Pascal 6.0 in house program (Logger) on a PC. Chart recordings, hard copy and disk copies of the data were kept for reference.

c. Replicate Analysis

A total of 3158 seawater samples were analyzed for silicate, phosphate and $\text{NO}_2 + \text{NO}_3$. Included in these samples were a total of 1579 duplicate samples. Duplicate samples were drawn from each rosette bottle on every cast for the determination of silicate, phosphate and nitrate concentrations. Statistics relating to the precision of the sample values follow. All values are given in $\mu\text{moles/kg}$. All sample values are listed in Table C.3.

Precision is a measure of the variability of individual measurements and in the following analysis two categories of precision were determined; field and analytical precision. Analytical precision is based on the pooled estimate of the standard deviation of the check standards over the course of a complete autoanalyzer run and is a measure of the greatest precision possible for a particular analysis. Field precision is based on the analysis of two or more water samples taken from a single Niskin sampling bottle and has an added component of variance due to subsampling, storage and natural sample variability.

Both categories of precision were determined by computing the variance, σ_i^2 , of each replicate set, where “i” is the index of the replicate set. In the case of analytical (field) precision, a replicate set consisted of all the check standards (duplicate samples). Given p replicate sets and n samples within any replicate set, the mean standard deviation, $\bar{\sigma}$, was determined from

$$\bar{\sigma} = \sqrt{\frac{\sum_{i=1}^p (n-1)_i \sigma_i^2}{p \sum_{i=1}^p (n-1)_i}}$$

The precision expressed in percent was based on the mean concentration, M, of the check standards (analytical precision) or water samples (field precision) and was given by

$$P_{\%} = \frac{\bar{\sigma}}{M} \times 100\%$$

The following table indicates the analytical and field precision obtained for this cruise.

	Silicate	Phosphate	NO2+NO3
Number of Samples	3159	3159	3159
Number of Duplicates	1579	1579	1579
Mean concentration (μmoles/kg)	13.24	1.05	15.71
Field Precision (μmoles/kg)	0.23	0.03	0.24
Field Precision (%)	1.8	3.2	1.5
Analytical Precision (μmoles/kg)	0.57	0.05	0.27
Analytical Precision (%)	2.1	4.52	1.71
Detection Limit (μmoles/kg)	0.24	0.02	0.25

The laboratory temperature during all analyses was between 21 and 23 °C.

The conversion to mass units for the analytical precision and detection limits used a standard density of 1.02443 kg/L corresponding to 33 ppt and 15°C. The conversion of individual sample values from volume to mass units used a potential density with a fixed temperature of 15°C.

The nutrient detection limits noted in the above table were applied to the dataset. All values at or below the detection limits were set to zero.

The following duplicate measurements were used to compute the values given in the SEA file. All values that follow are in $\mu\text{moles/kg}$.

Table C.3 Nutrient replicate water sample values in $\mu\text{moles/kg}$.

ID	SiO4	PO4	NO2+NO3	WOCE QF	ID	SiO4	PO4	NO2+NO3	WOCE QF
150601 5	12.07	1.17	17.80	55	150609 5				55
150601 5	12.06	1.14	18.16	55	150610 5				55
150602 5	11.97	1.35	18.28	55	150610 5				55
150602 5	11.98	1.18	18.16	55	150611 5				55
150603 5	11.79	1.21	18.35	55	150611 5				55
150603 5	11.91	1.17	18.27	55	150612 5				55
150604 5	12.02	1.23	17.98	55	150612 5				55
150604 5	12.23	1.19	18.14	55	150613 5				55
150605 5	12.02	1.22	18.01	55	150613 5				55
150605 5	11.97	1.16	17.71	55	150614 5				55
150606 5	11.92	1.29	18.22	55	150614 5				55
150606 5	11.95	1.22	18.36	55	150615 5				55
150607 5	11.85	1.20	18.23	55	150615 5				55
150607 5	11.99	1.28	18.32	55	150616 5				55
150608 5	11.79	1.23	17.98	55	150616 5				55
150608 5	11.98	1.22	17.92	55	150617 5				55
150609 5				55	150617 5				55

Table C.3 Nutrient replicate water sample values in $\mu\text{moles/kg}$.

ID	SiO4	PO4	NO2+NO3	WOCE QF	ID	SiO4	PO4	NO2+NO3	WOCE QF
150618 5				55	150626 2	10.39	1.08	17.80	32
150618 5				55	150627 2	10.76	1.08	17.32	32
150619 5				55	150627 2	10.79	1.08	17.21	32
150619 5				55	150628 2	10.62	1.09	17.50	32
150620 5				55	150628 2	10.71	1.07	17.03	32
150620 5				55	150629 2	10.87	1.04	15.88	32
150621 2	9.57	1.00	10.46	32	150629 2	10.97	1.06	15.79	32
150621 2	9.70	0.98	10.65	32	150630 2	11.02	1.01	12.24	32
150622 2	7.60	0.88	7.95	32	150630 2	10.98	1.01	12.33	32
150622 2	7.63	0.85	7.89	32	150631 2	1.20	0.32	0.71	32
150623 2	0.91	0.28	0.60	32	150631 2	1.38	0.31	0.84	32
150623 2	0.77	0.30	0.57	32	150632 2	13.76	1.11	17.91	32
150624 2	10.42	1.07	17.34	32	150632 2	13.81	1.10	18.03	32
150624 2	10.58	1.06	17.41	32	150633 5				55
150625 2	10.37	1.06	17.54	32	150633 5				55
150625 2	10.72	1.07	17.53	32	150634 2	10.95	1.06	17.59	32
150626 2	10.38	1.09	17.63	32	150634 2	11.00	1.09	17.46	32

ID	SiO4	PO4	NO2+NO3	WOCE QF	ID	SiO4	PO4	NO2+NO3	WOCE QF
150635	11.15	1.07	17.30	32	150644	12.01	1.24	18.94	32
2					2				
150635	11.40	1.08	17.46	32	150644	12.08	1.22	19.41	32
2					2				
150636	11.11	1.09	17.38	32	150645				55
2					5				
150636	11.35	1.11	17.76	32	150645				55
2					5				
150637	11.00	1.08	17.83	32	150646	1.09	0.28	0.00	32
2					2				
150637	11.06	1.09	17.64	32	150646	1.27	0.25	0.00	32
2					2				
150638	11.32	1.10	17.31	32	150647	17.57	1.07	16.45	32
2					2				
150638	11.24	1.08	17.48	32	150647	17.75	1.08	16.61	32
2					2				
150639	10.68	1.08	17.34	32	150648	16.20	1.12	16.62	32
2					2				
150639	10.72	1.10	17.48	32	150648	16.10	1.12	16.77	32
2					2				
150640	10.77	1.10	17.79	32	150649	16.04	1.10	16.55	32
2					2				
150640	10.77	1.10	17.60	32	150649	16.12	1.10	16.67	32
2					2				
150641	11.25	1.14	17.97	32	150650	16.73	1.16	17.43	32
2					2				
150641	11.54	1.14	18.17	32	150650	16.65	1.16	17.57	32
2					2				
150642	10.91	1.12	17.76	32	150651	15.60	1.16	17.57	32
2					2				
150642	10.86	1.13	17.68	32	150651	15.33	1.15	17.30	32
2					2				
150643	10.39	1.12	17.55	32	150652	15.35	1.19	17.99	32
2					2				
150643	10.29	1.11	17.25	32	150652	15.38	1.18	18.02	32
2					2				

ID	SiO4	PO4	NO2+NO3	WOCE QF	ID	SiO4	PO4	NO2+NO3	WOCE QF
150653 2	14.55	1.17	17.94	32	150662 2	12.30	1.29	18.02	32
150653 2	14.83	1.17	17.94	32	150662 2	12.43	1.29	18.16	32
150654 2	13.44	1.20	17.56	32	150663 2	10.54	1.10	14.77	32
150654 2	13.57	1.18	17.68	32	150663 2	10.60	1.11	14.60	32
150655 2	12.60	1.16	16.93	32	150664 2	10.08	1.07	13.00	32
150655 2	12.76	1.20	16.83	32	150664 2	10.11	1.06	12.86	32
150656 2	12.29	1.19	17.12	32	150665 2	8.00	1.02	8.89	32
150656 2	12.17	1.19	17.10	32	150665 2	8.11	1.02	9.05	32
150657 2	12.06	1.20	17.51	32	150666 2	1.20	0.24	0.29	32
150657 2	12.28	1.20	17.30	32	150666 2	1.07	0.26	0.00	32
150658 2	12.08	1.21	17.25	32	150667 2	18.80	1.04	16.81	32
150658 2	12.23	1.22	17.36	32	150667 2	18.38	1.19	16.78	32
150659 2	12.07	1.24	17.46	32	150668 2	18.85	1.05	16.99	32
150659 2	12.08	1.24	17.71	32	150668 2	19.00	1.05	17.11	32
150660 2	10.91	1.18	16.12	32	150669 2	18.56	1.06	17.06	32
150660 2	10.87	1.17	16.32	32	150669 2	18.66	1.06	17.02	32
150661 2	12.52	1.32	18.65	32	150670 5				55
150661 2	12.64	1.32	18.70	32	150670 2	17.73	1.06	17.56	32

ID	SiO4	PO4	NO2+NO3	WOCE QF	ID	SiO4	PO4	NO2+NO3	WOCE QF
150671 2	16.84	1.07	17.73	32	150680 2	11.93	1.09	18.63	32
150671 2	16.77	1.06	17.67	32	150680 2	12.11	1.10	18.77	32
150672 2	16.01	1.08	17.73	32	150681 2	11.71	1.10	18.70	32
150672 2	16.08	1.09	17.83	32	150681 2	11.66	1.11	19.03	32
150673 2	14.93	1.07	17.68	32	150682 2	11.09	1.12	19.25	32
150673 2	14.93	1.07	17.74	32	150682 2	11.19	1.13	19.35	32
150674 2	17.07	1.11	18.43	32	150683 2	11.34	1.14	19.48	32
150674 2	17.44	1.12	18.43	32	150683 2	11.25	1.27	18.81	32
150675 2	16.37	1.12	18.90	32	150684 2	10.67	1.09	18.11	32
150675 2	15.90	1.25	18.43	32	150684 2	10.42	1.06	18.41	32
150676 2	14.77	1.10	18.53	32	150685 2	11.67	1.07	17.19	32
150676 2	14.68	1.11	18.59	32	150685 2	11.79	1.10	17.47	32
150677 2	13.51	1.11	19.01	32	150686 2	0.72	0.25	0.00	32
150677 2	13.69	1.10	18.61	32	150686 2	0.87	0.13	0.31	32
150678 2	11.88	1.05	18.38	32	150687 5				55
150678 2	12.05	1.10	18.74	32	150687 2	21.25	1.22	18.53	32
150679 2	11.42	1.07	18.44	32	150688 5				55
150679 2	11.63	1.08	18.32	32	150688 2	20.47	1.09	18.48	32

ID	SiO4	PO4	NO2+NO3	WOCE QF	ID	SiO4	PO4	NO2+NO3	WOCE QF
150689 2	19.98	1.08	18.44	32	150698 2	11.06	1.10	19.01	32
150689 5				55	150698 2	11.23	1.09	18.92	32
150690 5				55	150699 2	12.14	1.16	19.34	32
150690 2	19.41	1.09	18.22	32	150699 2	11.98	1.10	19.25	32
150691 5				55	150700 2	11.73	1.12	19.25	32
150691 2	17.62	1.08	18.20	32	150700 2	11.57	1.12	19.41	32
150692 5				55	150701 2	11.07	1.13	18.90	32
150692 2	15.72	1.08	18.14	32	150701 2	11.26	1.11	19.05	32
150693 2	16.58	1.14	19.08	32	150702 2	10.60	1.12	18.82	32
150693 5				55	150702 2	10.86	1.12	18.97	32
150694 2	15.49	1.13	19.46	32	150703 2	10.07	1.08	16.92	32
150694 2	15.67	1.13	19.40	32	150703 2	10.56	1.17	16.68	32
150695 2	14.56	1.10	18.73	32	150704 2	7.27	0.87	8.80	32
150695 2	14.76	1.21	18.45	32	150704 2	7.32	0.86	8.86	32
150696 2	13.25	1.10	19.15	32	150705 2	1.86	0.33	0.76	32
150696 2	13.47	1.10	18.88	32	150705 2	1.72	0.39	0.72	32
150697 2	11.26	1.10	18.70	32	150706 2	0.78	0.27	0.00	32
150697 2	11.31	1.08	18.61	32	150706 2	0.83	0.27	0.00	32

ID	SiO4	PO4	NO2+NO3	WOCE QF	ID	SiO4	PO4	NO2+NO3	WOCE QF
150707 5				55	150716 2	4.15	0.60	10.78	32
150707 5				55	150716 2	4.33	0.51	10.99	32
150708 2	10.60	1.13	17.98	32	150717 3	17.67	1.09	18.33	33
150708 2	10.93	1.06	18.17	32	150717 3	17.74	1.16	18.09	33
150709 2	11.25	1.05	18.53	32	150718 3	16.96	1.11	18.67	33
150709 2	11.30	1.09	18.46	32	150718 3	17.03	1.11	18.57	33
150710 2	10.63	1.08	18.11	32	150719 2	15.86	1.12	18.39	32
150710 2	10.87	1.06	18.31	32	150719 2	16.03	1.12	18.58	32
150711 2	10.32	1.07	17.95	32	150720 2	17.04	1.27	18.71	32
150711 2	10.35	1.08	18.19	32	150720 2	16.62	1.16	18.56	32
150712 2	10.96	1.21	18.36	32	150721 2	16.76	1.15	18.87	32
150712 2	10.73	1.09	18.41	32	150721 2	17.02	1.15	19.21	32
150713 2	12.36	1.21	20.61	32	150722 2	14.42	1.13	18.88	32
150713 2	12.38	1.23	20.68	32	150722 2	14.55	1.12	18.69	32
150714 2	12.52	1.21	20.07	32	150723 2	13.72	1.12	18.52	32
150714 2	13.07	1.23	20.22	32	150723 2	13.74	1.11	18.83	32
150715 2	13.54	1.39	24.23	32	150724 2	11.34	1.12	18.12	32
150715 2	13.78	1.38	24.19	32	150724 2	11.42	1.07	18.11	32

ID	SiO4	PO4	NO2+NO3	WOCE QF	ID	SiO4	PO4	NO2+NO3	WOCE QF
150725 2	11.14	1.11	18.48	32	150734 2	2.29	0.28	4.37	32
150725 2	11.14	1.08	18.39	32	150734 2	2.46	0.27	4.37	32
150726 2	10.62	1.06	17.54	32	150735 2	1.56	0.11	0.00	32
150726 2	10.64	1.07	17.68	32	150735 2	1.60	0.09	0.25	32
150727 2	11.40	1.13	19.20	32	150736 2	1.95	0.15	0.00	32
150727 2	11.60	1.12	18.83	32	150736 2	1.75	0.12	0.00	32
150728 2	11.10	1.10	17.56	32	150737 2	20.46	1.19	17.64	32
150728 2	11.25	1.21	17.26	32	150737 2	21.06	1.05	17.84	32
150729 2	12.15	1.21	19.28	32	150738 2	15.16	1.11	18.04	32
150729 2	12.17	1.21	19.15	32	150738 2	15.28	1.08	17.92	32
150730 2	13.84	1.43	24.01	32	150739 2	20.33	1.11	17.63	32
150730 2	14.26	1.48	24.06	32	150739 2	20.41	1.10	17.44	32
150731 2	9.58	1.10	20.04	32	150740 2	18.98	1.10	17.80	32
150731 2	9.48	1.13	20.11	32	150740 2	18.93	1.10	17.86	32
150732 2	5.20	0.66	12.91	32	150741 2	17.73	1.10	17.95	32
150732 2	5.11	0.71	12.87	32	150741 2	17.50	1.10	17.89	32
150733 2	2.64	0.36	6.43	32	150742 2	16.58	1.13	17.86	32
150733 2	2.71	0.35	6.54	32	150742 2	16.65	1.09	17.72	32

ID	SiO4	PO4	NO2+NO3	WOCE QF	ID	SiO4	PO4	NO2+NO3	WOCE QF
150743 2	14.86	1.11	17.62	32	150752 2	8.53	1.13	19.00	32
150743 2	15.12	1.12	17.87	32	150752 2	8.93	1.16	18.99	32
150744 2	13.57	1.16	17.18	32	150753 2	2.79	0.61	10.59	32
150744 2	13.69	1.15	17.41	32	150753 2	3.49	0.60	10.60	32
150745 2	13.28	1.16	17.70	32	150754 2	0.65	0.16	3.48	32
150745 2	13.37	1.15	18.35	32	150754 2	0.50	0.17	3.40	32
150746 2	12.03	1.16	18.14	32	150755 2	-0.13	0.11	2.07	42
150746 2	11.93	1.16	18.28	32	150755 2	0.00	0.11	2.11	32
150747 2	11.62	1.17	18.29	32	150756 2	-0.29	0.03	0.28	42
150747 2	11.77	1.19	18.14	32	150756 2	0.56	0.05	0.39	32
150748 2	10.37	1.13	17.14	32	150757 2	36.80	1.35	20.77	32
150748 2	10.19	1.13	17.33	32	150757 2	37.45	1.34	20.99	32
150749 2	11.54	1.21	18.58	32	150758 2	28.75	1.24	19.52	32
150749 2	11.30	1.21	18.68	32	150758 2	28.50	1.26	19.88	32
150750 2	12.68	1.31	20.63	32	150759 2	34.59	1.37	20.97	32
150750 2	13.43	1.31	21.04	32	150759 2	35.04	1.34	20.50	32
150751 2	13.37	1.46	23.40	32	150760 2	31.13	1.26	19.54	32
150751 2	13.73	1.46	23.80	32	150760 2	31.28	1.27	19.47	32

ID	SiO4	PO4	NO2+NO3	WOCE QF	ID	SiO4	PO4	NO2+NO3	WOCE QF
150761 2	28.73	1.25	19.18	32	150770 2	10.27	1.10	17.95	32
150761 2	28.90	1.25	19.33	32	150770 2	10.05	1.12	17.94	32
150762 2	21.92	1.22	19.00	32	150771 2	10.93	1.22	19.99	32
150762 2	22.18	1.20	18.66	32	150771 2	11.32	1.23	19.89	32
150763 2	21.18	1.18	18.90	32	150772 2	11.17	1.27	20.01	32
150763 2	21.26	1.20	18.90	32	150772 2	11.31	1.28	20.13	32
150764 2	16.95	1.10	17.40	32	150773 2	10.05	1.34	22.69	32
150764 2	16.89	1.10	17.33	32	150773 2	10.29	1.33	22.89	32
150765 2	17.76	1.19	18.75	32	150774 2	1.00	0.39	7.03	32
150765 2	17.64	1.18	18.50	32	150774 2	1.19	0.36	7.12	32
150766 2	13.68	1.13	18.20	32	150775 2	0.95	0.14	1.95	32
150766 2	13.75	1.14	18.36	32	150775 2	1.18	0.15	1.88	32
150767 2	14.28	1.17	18.50	32	150776 2	1.72	0.11	0.30	32
150767 2	14.48	1.16	18.73	32	150776 2	2.24	0.08	0.31	32
150768 2	12.00	1.12	18.05	32	150777 2	42.49	1.34	21.35	32
150768 2	12.21	1.12	17.73	32	150777 2	41.01	1.32	21.72	32
150769 2	11.05	1.13	17.97	32	150778 2	10.74	1.09	19.04	32
150769 2	11.34	1.12	17.99	32	150778 2	11.21	1.06	19.43	32

ID	SiO4	PO4	NO2+NO3	WOCE QF	ID	SiO4	PO4	NO2+NO3	WOCE QF
150779 2	34.97	1.28	20.70	32	150788 4	12.00	1.14	29.53	32
150779 2	35.68	1.28	20.62	32	150788 2	12.02	1.14	18.82	32
150780 2	32.37	1.25	20.05	32	150789 2	11.43	1.16	19.04	32
150780 2	32.60	1.25	20.76	32	150789 2	11.43	1.15	18.78	32
150781 2	29.32	1.24	19.71	32	150790 2	11.93	1.22	21.24	32
150781 2	29.45	1.24	20.27	32	150790 2	12.17	1.21	20.21	32
150782 2	23.50	1.19	19.11	32	150791 2	13.73	1.41	23.50	32
150782 2	23.71	1.20	19.37	32	150791 2	13.90	1.40	23.14	32
150783 2	23.14	1.18	19.02	32	150792 2	9.80	1.18	19.96	32
150783 2	23.32	1.17	18.95	32	150792 2	10.16	1.18	19.74	32
150784 2	19.47	1.14	18.56	32	150793 2	5.18	0.78	13.05	32
150784 2	19.55	1.15	18.19	32	150793 2	5.32	0.74	12.89	32
150785 2	17.61	1.15	18.64	32	150794 2	3.42	2.04	9.18	34
150785 2	17.53	1.14	18.61	32	150794 2	3.50	0.51	9.40	32
150786 2	14.76	1.15	18.56	32	150795 2	1.71	0.21	2.45	32
150786 2	14.80	1.14	18.48	32	150795 2	1.76	0.22	2.50	32
150787 2	13.25	1.14	18.31	32	150796 2	0.84	0.08	0.00	32
150787 2	13.31	1.12	18.55	32	150796 2	0.90	0.09	0.00	32

ID	SiO4	PO4	NO2+NO3	WOCE QF	ID	SiO4	PO4	NO2+NO3	WOCE QF
150797 2	37.47	1.35	21.08	32	150806 2	15.73	1.17	18.62	32
150797 2	38.23	1.35	21.20	32	150806 2	15.48	1.16	18.33	32
150798 2	20.56	1.21	19.66	32	150807 2	13.79	1.15	18.34	32
150798 2	20.69	1.21	20.41	32	150807 2	14.10	1.31	18.33	32
150799 2	34.62	1.32	21.05	32	150808 2	12.27	1.15	17.73	32
150799 2	35.84	1.31	20.78	32	150808 2	12.43	1.12	17.95	32
150800 2	32.28	1.29	20.30	32	150809 2	11.84	1.14	18.06	32
150800 2	32.65	1.28	19.93	32	150809 2	12.20	1.12	17.92	32
150801 2	29.94	1.27	19.88	32	150810 2	11.52	1.16	18.86	32
150801 2	29.92	1.27	19.96	32	150810 2	11.70	1.15	18.31	32
150802 2	25.63	1.23	19.12	32	150811 2	11.83	1.18	18.88	32
150802 2	25.82	1.21	18.95	32	150811 2	11.69	1.20	19.16	32
150803 2	23.08	1.19	18.68	32	150812 2	12.20	1.29	20.63	32
150803 2	23.52	1.19	18.92	32	150812 2	12.25	1.26	20.54	32
150804 2	19.69	1.21	18.64	32	150813 2	11.47	1.31	21.20	32
150804 2	19.73	1.17	18.24	32	150813 2	11.36	1.33	21.37	32
150805 2	17.68	1.18	18.82	32	150814 2	5.51	0.78	13.18	32
150805 2	17.67	1.18	18.63	32	150814 2	5.45	0.79	13.16	32

ID	SiO4	PO4	NO2+NO3	WOCE QF	ID	SiO4	PO4	NO2+NO3	WOCE QF
150815 2	3.58	0.54	9.00	32	150824 2	19.74	1.19	17.98	32
150815 2	3.84	0.54	9.02	32	150824 2	20.15	1.17	18.15	32
150816 2	0.60	0.10	0.00	32	150825 2	17.63	1.18	18.12	32
150816 2	1.11	0.13	0.00	32	150825 2	18.78	1.20	18.10	32
150817 2	36.31	1.40	20.90	32	150826 2	16.12	1.21	18.47	32
150817 2	36.46	1.36	20.91	32	150826 2	16.16	1.20	18.36	32
150818 2	17.45	1.19	18.65	32	150827 2	14.01	1.18	18.35	32
150818 2	18.31	1.18	18.75	32	150827 2	14.05	1.16	18.30	32
150819 2	33.42	1.35	20.45	32	150828 2	12.56	1.16	18.16	32
150819 2	32.81	1.34	20.34	32	150828 2	12.63	1.17	18.18	32
150820 2	29.52	1.37	19.95	32	150829 2	11.95	1.16	18.09	32
150820 2	38.80	1.31	19.85	32	150829 2	11.77	1.17	18.18	32
150821 2	33.70	1.28	19.38	32	150830 2	11.82	1.18	18.40	32
150821 2	33.85	1.28	19.33	32	150830 2	11.59	1.17	18.52	32
150822 2	28.67	1.25	19.18	32	150831 2	11.88	1.22	18.87	32
150822 2	29.19	1.25	19.34	32	150831 2	11.97	1.22	19.01	32
150823 2	24.52	1.21	18.73	32	150832 2	12.13	1.25	19.98	32
150823 2	23.96	1.19	18.52	32	150832 2	12.20	1.26	19.52	32

ID	SiO4	PO4	NO2+NO3	WOCE QF	ID	SiO4	PO4	NO2+NO3	WOCE QF
150833 2	13.27	1.43	22.76	32	150842 2	15.97	1.13	18.18	22
150833 2	13.66	1.44	23.02	32	150842 2	15.77	1.15	17.86	22
150834 2	10.55	1.25	19.95	32	150843 2	13.98	1.14	17.58	22
150834 2	10.76	1.24	20.32	32	150843 2	14.07	1.09	17.66	22
150835 2	4.36	0.61	10.06	32	150844 2	12.43	1.10	17.66	22
150835 2	4.17	0.62	9.96	32	150844 2	12.72	1.10	18.08	22
150836 2	1.11	0.15	0.00	32	150845 2	11.88	1.11	17.85	22
150836 2	1.19	0.16	0.00	32	150845 2	11.95	1.07	17.89	22
150837 2	27.06	1.34	18.15	22	150846 2	11.43	1.25	17.53	22
150837 2	27.07	1.18	18.49	22	150846 2	11.52	1.10	17.94	22
150838 5				55	150847 2	11.18	1.12	17.92	22
150838 5				55	150847 2	11.53	1.11	18.34	22
150839 2	21.60	1.18	17.97	22	150848 2	11.28	1.12	18.71	22
150839 2	21.78	1.16	18.31	22	150848 2	11.30	1.13	18.71	22
150840 2	19.90	1.17	18.23	22	150849 2	11.46	1.17	18.89	22
150840 2	19.97	1.16	18.57	22	150849 2	11.50	1.15	19.12	22
150841 2	17.75	1.13	18.10	22	150850 2	12.46	1.24	20.15	22
150841 2	17.83	1.14	18.33	22	150850 2	12.17	1.24	20.03	22

ID	SiO4	PO4	NO2+NO3	WOCE QF	ID	SiO4	PO4	NO2+NO3	WOCE QF
150851 2	10.84	1.13	16.49	22	150860 2	30.91	1.25	19.35	22
150851 2	10.95	1.11	16.97	22	150860 2	31.21	1.22	19.47	22
150852 2	7.28	0.99	16.45	22	150861 2	28.85	1.20	18.88	22
150852 2	7.41	0.96	16.45	22	150861 2	28.94	1.21	18.92	22
150853 2	2.78	0.47	8.17	22	150862 2	27.24	1.22	18.71	22
150853 2	2.86	0.40	8.23	22	150862 2	27.21	1.37	18.73	22
150854 2	1.26	0.22	2.97	22	150863 2	23.72	1.20	18.42	22
150854 2	1.41	0.27	2.95	22	150863 2	24.00	1.18	18.50	22
150855 2	1.74	0.31	4.72	22	150864 2	21.07	1.19	18.41	22
150855 2	1.70	0.29	4.69	22	150864 2	21.14	1.19	18.39	22
150856 2	0.83	0.11	0.00	22	150865 2	19.41	1.16	18.06	22
150856 2	0.86	0.10	0.00	22	150865 2	19.46	1.18	18.10	22
150857 2	41.65	1.50	21.18	22	150866 2	16.30	1.13	17.94	22
150857 2	42.93	1.35	21.29	22	150866 2	16.28	1.12	17.47	22
150858 2	22.29	1.14	18.08	22	150867 2	13.67	1.13	17.70	22
150858 2	22.95	1.08	18.36	22	150867 2	13.94	1.11	17.34	22
150859 2	34.01	1.26	19.88	22	150868 2	12.66	1.14	17.57	22
150859 2	34.13	1.26	19.99	22	150868 2	12.87	1.12	17.52	22

ID	SiO4	PO4	NO2+NO3	WOCE QF	ID	SiO4	PO4	NO2+NO3	WOCE QF
150869 2	12.44	1.12	17.67	22	150878 2	38.45	1.38	20.27	22
150869 2	12.84	1.15	17.44	22	150878 2	38.34	1.38	20.30	22
150870 2	12.36	1.32	17.71	22	150879 5				55
150870 2	12.19	1.17	18.30	22	150879 5				55
150871 2	12.71	1.22	19.31	22	150880 2	31.85	1.33	19.29	22
150871 2	12.67	1.23	19.15	22	150880 2	32.04	1.32	19.07	22
150872 2	14.12	1.35	21.37	22	150881 2	28.83	1.29	18.87	22
150872 2	14.23	1.36	21.25	22	150881 2	29.20	1.30	18.53	22
150873 2	12.73	1.35	22.29	22	150882 2	25.03	1.25	18.57	22
150873 2	12.75	1.36	22.25	22	150882 2	25.11	1.26	18.61	22
150874 2	4.17	0.61	9.65	22	150883 2	20.55	1.25	17.84	22
150874 2	4.31	0.49	9.68	22	150883 2	20.62	1.22	18.01	22
150875 2	1.79	0.22	2.32	22	150884 2	17.88	1.22	17.61	22
150875 2	1.88	0.17	2.41	22	150884 2	17.59	1.22	17.68	22
150876 2	1.71	0.14	0.00	22	150885 2	15.66	1.18	17.33	22
150876 2	1.70	0.15	0.00	22	150885 2	15.82	1.18	17.62	22
150877 2	41.68	1.40	20.95	22	150886 2	14.60	1.18	17.33	22
150877 2	42.08	1.40	20.77	22	150886 2	14.66	1.20	17.53	22

ID	SiO4	PO4	NO2+NO3	WOCE QF	ID	SiO4	PO4	NO2+NO3	WOCE QF
150887 2	13.91	1.21	18.05	22	150896 2	0.72	0.08	0.00	32
150887 2	13.94	1.21	17.72	22	150896 2	0.80	0.10	0.00	32
150888 3	11.63	1.19	17.50	22	150897 2	35.29	1.34	19.89	22
150888 3	11.69	1.19	16.79	22	150897 2	36.31	1.36	20.10	22
150889 2	11.42	1.19	17.80	22	150898 2	33.45	1.37	20.04	22
150889 2	11.45	1.19	17.94	22	150898 2	36.19	1.38	20.08	22
150890 5				55	150899 2	34.57	1.36	19.59	22
150890 5				55	150899 2	34.51	1.36	19.58	22
150891 2	12.24	1.30	19.49	22	150900 2	33.29	1.35	19.85	22
150891 2	12.20	1.31	19.29	22	150900 2	33.38	1.34	20.01	22
150892 2	10.81	1.36	20.67	22	150901 2	30.34	1.34	19.13	22
150892 2	10.94	1.35	20.70	22	150901 2	30.35	1.32	19.34	22
150893 2	1.64	0.30	3.96	22	150902 2	13.08	1.26	18.68	22
150893 2	1.88	0.29	3.85	22	150902 2	13.34	1.27	18.72	22
150894 2	1.42	0.27	3.85	22	150903 2	22.58	1.24	18.34	22
150894 2	1.48	0.28	3.91	22	150903 2	21.97	1.22	18.09	22
150895 2	1.45	0.26	3.18	22	150904 2	20.25	1.27	18.37	22
150895 2	1.55	0.27	3.08	22	150904 2	20.02	1.27	18.39	22

ID	SiO4	PO4	NO2+NO3	WOCE QF	ID	SiO4	PO4	NO2+NO3	WOCE QF
150905 2	17.89	1.26	18.09	22	150914 2	2.50	0.45	6.45	22
150905 2	18.17	1.26	18.40	22	150914 2	2.58	0.47	6.54	22
150906 2	16.64	1.25	18.49	22	150915 2	1.53	0.24	3.33	22
150906 2	16.77	1.26	18.22	22	150915 2	1.56	0.25	3.41	22
150907 2	14.34	1.23	18.45	22	150916 2	1.01	0.07	0.00	22
150907 2	14.64	1.23	18.39	22	150916 2	1.07	0.09	0.00	22
150908 2	12.80	1.25	18.09	22	150917 2	35.54	1.34	19.71	22
150908 2	12.93	1.24	18.40	22	150917 2	35.41	1.33	19.52	22
150909 2	12.35	1.26	18.71	22	150918 2	36.06	1.37	20.13	22
150909 2	11.13	1.26	18.62	22	150918 2	36.24	1.38	19.88	22
150910 2	11.90	1.27	18.59	22	150919 2	32.14	1.34	19.01	22
150910 2	12.06	1.29	18.50	22	150919 2	32.28	1.33	19.06	22
150911 2	12.33	1.29	19.31	22	150920 2	31.76	1.34	18.90	22
150911 2	12.26	1.27	18.90	22	150920 2	32.51	1.35	19.08	22
150912 2	12.75	1.39	21.01	22	150921 2	25.06	1.31	18.62	22
150912 2	12.74	1.39	21.04	22	150921 2	24.93	1.31	18.64	22
150913 2	6.29	0.97	14.37	22	150922 2	26.06	1.30	18.39	22
150913 2	6.39	0.98	14.17	22	150922 2	26.07	1.31	18.68	22

ID	SiO4	PO4	NO2+NO3	WOCE QF	ID	SiO4	PO4	NO2+NO3	WOCE QF
150923 2	21.86	1.27	17.85	22	150932 2	13.51	1.48	22.31	22
150923 2	21.90	1.27	17.81	22	150932 2	13.46	1.48	22.07	22
150924 2	19.75	1.29	18.20	22	150933 2	2.85	0.51	6.68	22
150924 2	20.18	1.30	18.23	22	150933 2	3.00	0.50	6.84	22
150925 2	17.68	1.25	17.81	22	150934 2	1.95	0.29	4.03	22
150925 2	17.84	1.25	17.70	22	150934 2	1.96	0.30	4.01	22
150926 2	14.48	1.21	17.24	22	150935 2	1.97	0.27	3.56	22
150926 2	14.50	1.20	17.29	22	150935 2	2.13	0.29	3.53	22
150927 2	16.86	1.27	17.96	22	150936 2	1.46	0.07	0.00	22
150927 2	16.80	1.24	17.72	22	150936 2	1.36	0.08	0.00	22
150928 2	14.43	1.25	17.62	22	150937 2	37.76	1.36	19.89	22
150928 2	14.06	1.25	17.62	22	150937 2	37.40	1.37	19.86	22
150929 2	12.82	1.24	17.63	22	150938 2	35.49	1.37	19.70	22
150929 2	12.84	1.25	17.94	22	150938 2	36.18	1.37	19.81	22
150930 2	12.04	1.29	18.68	22	150939 2	34.84	1.35	19.36	22
150930 2	12.10	1.30	18.91	22	150939 2	34.95	1.34	19.63	22
150931 2	12.73	1.34	19.27	22	150940 2	31.12	1.32	19.18	22
150931 2	12.76	1.34	19.50	22	150940 2	31.45	1.31	19.28	22

ID	SiO4	PO4	NO2+NO3	WOCE QF	ID	SiO4	PO4	NO2+NO3	WOCE QF
150941 2	27.50	1.29	18.75	22	150950 2	12.37	1.22	18.14	22
150941 2	28.02	1.27	18.80	22	150950 2	11.79	1.23	18.27	22
150942 2	24.51	1.26	18.16	22	150951 2	12.43	1.24	18.49	22
150942 2	24.46	1.27	18.06	22	150951 2	12.53	1.25	18.44	22
150943 2	22.84	1.25	17.98	22	150952 2	11.81	1.29	19.22	22
150943 2	23.21	1.24	18.44	22	150952 2	11.87	1.30	19.22	22
150944 2	19.15	1.23	17.98	22	150953 2	5.64	0.93	13.95	22
150944 2	18.80	1.25	18.18	22	150953 2	5.78	0.93	14.40	22
150945 2	17.86	1.23	17.87	22	150954 2	2.59	0.48	6.60	22
150945 2	17.79	1.21	17.68	22	150954 2	2.50	0.46	6.66	22
150946 5				55	150955 2	1.20	0.21	2.85	22
150946 5				55	150955 2	1.24	0.22	2.91	22
150947 2	14.12	1.21	17.65	22	150956 2	0.78	0.08	0.00	22
150947 2	14.26	1.22	17.98	22	150956 2	0.86	0.09	0.00	22
150948 2	13.63	1.20	17.60	22	150957 2	37.67	1.33	20.18	22
150948 2	13.70	1.22	18.05	22	150957 2	38.42	1.34	20.25	22
150949 2	12.01	1.21	18.10	22	150958 2	36.32	1.34	19.92	22
150949 2	12.10	1.20	18.13	22	150958 2	36.98	1.36	20.30	22

ID	SiO4	PO4	NO2+NO3	WOCE QF	ID	SiO4	PO4	NO2+NO3	WOCE QF
150959 2	33.51	1.36	20.13	22	150968 2	11.57	1.27	18.55	22
150959 2	33.81	1.36	20.19	22	150968 2	11.67	1.24	18.44	22
150960 2	34.36	1.33	19.40	22	150969 2	11.66	1.28	19.29	22
150960 2	34.10	1.33	19.57	22	150969 2	11.95	1.31	19.25	22
150961 2	23.26	1.26	18.61	22	150970 2	12.76	1.32	20.55	22
150961 2	22.86	1.28	18.50	22	150970 2	12.80	1.36	20.92	22
150962 2	23.58	1.20	16.94	22	150971 2	10.42	1.31	19.77	22
150962 2	23.62	1.23	17.78	22	150971 2	10.50	1.30	20.03	22
150963 2	19.64	1.24	18.11	22	150972 2	5.40	0.85	13.08	22
150963 2	19.66	1.24	18.04	22	150972 2	5.47	0.87	13.08	22
150964 2	17.71	1.24	17.84	22	150973 2	2.59	0.43	6.68	22
150964 2	17.74	1.22	17.79	22	150973 2	2.58	0.45	6.67	22
150965 2	14.42	1.22	17.54	22	150974 2	1.62	0.22	3.40	22
150965 2	14.64	1.21	17.56	22	150974 2	1.62	0.24	3.44	22
150966 2	12.96	1.21	17.57	22	150975 2	1.36	0.15	2.34	22
150966 2	12.87	1.21	17.62	22	150975 2	1.36	0.15	2.37	22
150967 2	12.14	1.27	18.29	22	150976 2	1.06	0.06	0.00	22
150967 2	12.20	1.26	18.10	22	150976 2	1.07	0.08	0.00	22

ID	SiO4	PO4	NO2+NO3	WOCE QF	ID	SiO4	PO4	NO2+NO3	WOCE QF
150977 2	34.96	1.31	20.05	22	150986 2	15.66	1.22	17.76	22
150977 2	35.88	1.36	19.80	22	150986 2	15.55	1.23	18.07	22
150978 2	35.37	1.33	19.92	22	150987 2	13.80	1.23	17.86	22
150978 2	35.38	1.34	19.67	22	150987 2	13.88	1.24	18.03	22
150979 2	33.04	1.34	19.55	22	150988 2	12.63	1.23	17.90	22
150979 2	33.22	1.34	19.45	22	150988 2	12.66	1.25	17.90	22
150980 2	30.80	1.33	19.11	22	150989 2	11.99	1.26	17.94	22
150980 2	30.97	1.31	18.98	22	150989 2	12.09	1.24	18.20	22
150981 2	27.34	1.30	18.71	22	150990 2	12.11	1.30	18.80	22
150981 2	27.15	1.30	18.57	22	150990 2	12.11	1.30	18.91	22
150982 2	25.04	1.28	18.37	22	150991 2	12.45	1.34	19.44	22
150982 2	25.23	1.27	18.75	22	150991 2	12.65	1.34	19.80	22
150983 2	21.99	1.27	18.28	22	150992 2	12.70	1.37	20.47	22
150983 2	21.99	1.26	18.46	22	150992 2	12.67	1.39	20.53	22
150984 2	21.44	1.28	19.04	22	150993 2	1.92	0.26	3.13	22
150984 2	21.53	1.28	18.84	22	150993 2	1.69	0.24	3.00	22
150985 2	19.68	1.29	18.77	22	150994 2	4.71	0.73	10.56	22
150985 2	19.78	1.27	18.49	22	150994 2	4.94	0.71	10.40	22

ID	SiO4	PO4	NO2+NO3	WOCE QF	ID	SiO4	PO4	NO2+NO3	WOCE QF
150995 2	1.77	0.22	2.86	22	151004 2	18.07	1.23	18.35	22
150995 2	1.90	0.24	2.96	22	151004 2	18.32	1.23	18.38	22
150996 2	1.38	0.07	0.00	22	151005 2	16.84	1.25	18.31	22
150996 2	1.43	0.08	0.00	22	151005 2	16.87	1.19	18.39	22
150997 2	35.58	1.35	20.19	22	151006 2	13.57	1.18	18.14	22
150997 2	35.57	1.41	19.76	22	151006 2	13.78	1.16	18.57	22
150998 2	34.92	1.33	19.78	22	151007 2	12.33	1.17	18.25	22
150998 2	34.93	1.36	19.74	22	151007 2	12.16	1.24	18.23	22
150999 2	32.76	1.30	19.83	22	151008 2	11.72	1.17	18.49	22
150999 2	33.60	1.31	19.92	22	151008 2	11.85	1.17	18.48	22
151000 2	31.64	1.27	19.50	22	151009 2	10.51	1.13	17.79	22
151000 2	31.85	1.28	19.63	22	151009 2	10.46	1.15	17.70	22
151001 2	23.64	1.24	18.91	22	151010 2	11.31	1.21	19.02	22
151001 2	23.09	1.24	18.82	22	151010 2	11.14	1.21	19.09	22
151002 2	22.55	1.22	18.40	22	151011 2	12.37	1.31	20.75	22
151002 2	22.32	1.22	18.54	22	151011 2	12.69	1.29	21.04	22
151003 2	21.46	1.26	18.80	22	151012 2	10.05	1.21	20.14	22
151003 2	21.58	1.26	18.52	22	151012 2	10.16	1.23	20.27	22

ID	SiO4	PO4	NO2+NO3	WOCE QF	ID	SiO4	PO4	NO2+NO3	WOCE QF
151013 2	3.55	0.57	9.27	22	151022 2	21.15	1.21	19.80	22
151013 2	3.64	0.63	9.39	22	151022 2	21.27	1.25	20.19	22
151014 2	2.12	0.35	6.03	22	151023 2	18.30	1.19	19.57	22
151014 2	2.12	0.34	6.03	22	151023 2	18.39	1.21	19.60	22
151015 2	1.45	0.18	3.01	22	151024 2	15.47	1.19	18.89	22
151015 2	1.37	0.17	3.00	22	151024 2	15.96	1.19	19.33	22
151016 2	1.20	0.07	0.00	22	151025 2	13.36	1.17	18.82	22
151016 2	1.22	0.07	0.00	22	151025 2	13.19	1.18	18.81	22
151017 2	37.47	1.36	20.95	22	151026 2	12.74	1.16	18.72	22
151017 2	38.05	1.32	20.98	22	151026 2	12.34	1.17	18.72	22
151018 2	35.71	1.34	20.59	22	151027 2	11.97	1.18	18.96	22
151018 2	35.96	1.33	20.74	22	151027 2	12.17	1.19	19.09	22
151019 2	31.51	1.29	20.02	22	151028 2	11.99	1.17	19.12	22
151019 2	31.49	1.28	20.05	22	151028 2	12.30	1.19	18.99	22
151020 2	27.18	1.24	19.32	22	151029 2	11.40	1.18	19.80	22
151020 2	27.27	1.26	19.81	22	151029 2	11.57	1.24	19.43	22
151021 2	21.33	1.21	19.08	22	151030 2	11.25	1.22	20.19	22
151021 2	21.33	1.24	19.15	22	151030 2	11.62	1.21	19.91	22

ID	SiO4	PO4	NO2+NO3	WOCE QF	ID	SiO4	PO4	NO2+NO3	WOCE QF
151031 2	12.81	1.31	21.79	22	151040 2	29.07	1.27	20.17	22
151031 2	12.59	1.33	21.81	22	151040 2	29.43	1.27	20.54	22
151032 2	13.82	1.42	23.50	22	151041 2	26.74	1.27	20.60	22
151032 2	13.93	1.43	23.68	22	151041 2	26.90	1.25	20.10	22
151033 2	2.89	0.48	7.87	22	151042 2	23.82	1.26	19.68	22
151033 2	3.00	0.43	8.06	22	151042 2	24.18	1.21	19.70	22
151034 2	1.69	0.25	4.22	22	151043 2	21.29	1.23	19.92	22
151034 2	1.72	0.27	4.28	22	151043 2	21.35	1.23	20.04	22
151035 2	1.40	0.19	2.53	22	151044 2	16.45	1.16	19.19	22
151035 2	1.42	0.19	2.50	22	151044 2	16.60	1.16	19.00	22
151036 2	1.17	0.08	0.00	22	151045 2	14.55	1.18	18.67	22
151036 2	1.22	0.08	0.00	22	151045 2	14.58	1.14	19.12	22
151037 2	38.45	1.39	21.95	22	151046 2	12.04	1.12	18.42	22
151037 2	39.02	1.46	21.72	22	151046 2	11.76	1.11	18.37	22
151038 2	37.28	1.37	21.46	22	151047 2	10.93	1.14	18.80	22
151038 2	37.01	1.39	21.91	22	151047 2	11.14	1.13	18.46	22
151039 2	35.65	1.33	21.23	22	151048 2	11.60	1.17	19.51	22
151039 2	35.85	1.33	21.34	22	151048 2	11.81	1.16	19.44	22

ID	SiO4	PO4	NO2+NO3	WOCE QF	ID	SiO4	PO4	NO2+NO3	WOCE QF
151049 2	11.28	1.18	19.94	22	151058 2	33.15	1.28	20.80	22
151049 2	11.43	1.21	20.00	22	151058 2	34.12	1.27	21.37	22
151050 2	12.33	1.27	21.45	22	151059 2	23.74	1.18	19.05	22
151050 2	12.07	1.26	21.28	22	151059 2	23.75	1.17	19.24	22
151051 2	14.48	1.46	24.96	22	151060 2	22.37	1.18	19.63	22
151051 2	14.57	1.49	25.40	22	151060 2	22.46	1.17	19.15	22
151052 2	8.90	1.16	20.54	22	151061 2	20.69	1.15	19.16	22
151052 2	9.11	1.14	20.72	22	151061 2	20.79	1.24	18.87	22
151053 2	1.41	0.21	3.24	22	151062 2	20.19	1.16	19.12	22
151053 2	1.46	0.25	3.23	22	151062 2	20.85	1.16	19.49	22
151054 2	1.45	0.20	3.33	22	151063 2	14.61	1.09	18.26	22
151054 2	1.47	0.21	3.34	22	151063 2	14.68	1.09	18.09	22
151055 2	1.62	0.20	3.22	22	151064 2	14.51	1.11	18.34	22
151055 2	1.64	0.20	3.30	22	151064 2	14.21	1.13	18.54	22
151056 2	1.09	0.07	0.00	22	151065 2	13.94	1.14	18.84	22
151056 2	1.12	0.08	0.00	22	151065 2	14.18	1.14	19.13	22
151057 2	40.34	1.38	22.20	22	151066 2	13.83	1.18	19.29	22
151057 2	41.58	1.35	22.66	22	151066 2	13.90	1.15	19.44	22

ID	SiO4	PO4	NO2+NO3	WOCE QF	ID	SiO4	PO4	NO2+NO3	WOCE QF
151067 2	12.89	1.15	19.20	22	151076 2	1.00	0.12	0.00	32
151067 2	13.13	1.16	19.37	22	151076 2	1.06	0.10	0.00	32
151068 2	12.24	1.14	18.85	22	151077 2	29.67	1.39	17.87	32
151068 2	12.56	1.15	19.40	22	151077 2	29.85	1.29	18.19	32
151069 2	11.06	1.13	19.00	22	151078 2	27.70	1.28	18.34	32
151069 2	11.27	1.16	18.50	22	151078 2	28.29	1.27	18.45	32
151070 2	11.13	1.16	19.39	22	151079 2	24.68	1.22	17.97	32
151070 2	11.28	1.16	19.38	22	151079 2	24.22	1.24	17.39	32
151071 2	11.20	1.17	19.66	22	151080 2	22.33	1.22	17.19	32
151071 2	11.16	1.17	19.50	22	151080 2	22.44	1.22	17.25	32
151072 2	11.54	1.20	20.33	22	151081 2	15.71	1.20	17.02	32
151072 2	11.55	1.22	20.34	22	151081 2	15.81	1.29	16.90	32
151073 2	13.22	1.46	22.64	32	151082 2	16.10	1.20	17.57	32
151073 2	13.40	1.58	22.69	32	151082 2	16.39	1.20	17.52	32
151074 2	12.90	1.47	22.57	32	151083 2	19.51	1.22	17.75	32
151074 2	12.98	1.47	22.94	32	151083 2	19.21	1.20	17.51	32
151075 2	2.60	0.50	7.08	32	151084 2	16.37	1.20	17.39	32
151075 2	2.75	0.40	7.25	32	151084 2	16.53	1.21	17.49	32

ID	SiO4	PO4	NO2+NO3	WOCE QF	ID	SiO4	PO4	NO2+NO3	WOCE QF
151085 2	14.64	1.20	17.47	32	151094 2	1.56	0.28	3.78	32
151085 2	14.97	1.19	17.60	32	151094 2	1.56	0.25	3.79	32
151086 2	12.92	1.19	17.03	32	151095 2	1.15	0.20	2.23	32
151086 2	13.05	1.18	17.33	32	151095 2	1.09	0.19	2.22	32
151087 2	11.85	1.21	17.01	32	151096 2	0.94	0.11	0.00	32
151087 2	11.98	1.21	17.14	32	151096 2	0.94	0.07	0.00	32
151088 2	11.51	1.20	17.26	32	151097 2	20.99	1.26	16.63	32
151088 2	11.68	1.19	17.39	32	151097 2	21.40	1.18	16.95	32
151089 2	11.21	1.22	18.04	32	151098 2	23.62	1.22	17.64	32
151089 2	11.31	1.30	17.33	32	151098 2	23.67	1.22	17.67	32
151090 2	11.70	1.26	18.91	32	151099 2	21.08	1.20	17.01	32
151090 2	12.01	1.29	18.67	32	151099 2	20.91	1.21	17.17	32
151091 2	11.33	1.26	19.06	32	151100 2	21.45	1.21	17.38	32
151091 2	11.36	1.27	18.99	32	151100 2	21.04	1.22	17.43	32
151092 2	8.00	1.15	16.72	32	151101 2	15.94	1.18	17.20	32
151092 2	8.20	1.13	16.95	32	151101 2	16.45	1.19	17.26	32
151093 2	3.88	0.70	10.41	32	151102 2	14.26	1.20	16.75	32
151093 2	3.88	0.67	10.26	32	151102 2	14.48	1.19	16.58	32

ID	SiO4	PO4	NO2+NO3	WOCE QF	ID	SiO4	PO4	NO2+NO3	WOCE QF
151103 2	12.91	1.18	16.51	32	151112 2	8.44	1.18	17.53	32
151103 2	13.30	1.17	16.93	32	151112 2	8.62	1.19	17.69	32
151104 2	12.83	1.17	17.14	32	151113 2	7.22	1.07	16.29	32
151104 2	13.10	1.17	16.99	32	151113 2	7.14	1.16	15.70	32
151105 2	13.12	1.26	16.77	32	151114 2	1.75	0.33	4.62	32
151105 2	12.89	1.19	17.03	32	151114 2	1.87	0.27	4.89	32
151106 2	11.69	1.22	16.83	32	151115 2	1.38	0.22	3.12	32
151106 2	12.02	1.20	17.04	32	151115 2	1.34	0.22	3.08	32
151107 2	11.25	1.19	17.59	32	151116 2	0.97	0.08	0.00	32
151107 2	11.15	1.20	17.22	32	151116 2	1.00	0.07	0.00	32
151108 2	11.65	1.23	18.02	32	151117 2	34.74	1.34	19.32	32
151108 2	11.42	1.23	17.89	32	151117 2	34.96	1.39	19.33	32
151109 2	11.68	1.27	18.69	32	151118 2	29.37	1.27	18.63	32
151109 2	11.82	1.28	18.71	32	151118 2	29.86	1.29	18.58	32
151110 2	12.41	1.34	20.55	32	151119 2	27.91	1.27	18.23	32
151110 2	12.50	1.34	20.20	32	151119 2	28.05	1.30	18.49	32
151111 2	10.15	1.26	18.95	32	151120 2	26.61	1.28	17.85	32
151111 2	10.27	1.25	19.17	32	151120 2	26.64	1.29	17.82	32

ID	SiO4	PO4	NO2+NO3	WOCE QF	ID	SiO4	PO4	NO2+NO3	WOCE QF
151121	23.30	1.36	17.15	32	151130	11.62	1.27	18.81	32
2					2				
151121	23.54	1.27	17.75	32	151130	11.65	1.31	18.54	32
2					2				
151122	22.36	1.27	17.89	32	151131	11.66	1.34	19.59	32
2					2				
151122	22.55	1.28	18.01	32	151131	11.81	1.34	19.56	32
2					2				
151123	19.50	1.27	17.32	32	151132	9.79	1.27	18.55	32
2					2				
151123	20.42	1.26	18.09	32	151132	10.03	1.27	18.62	32
2					2				
151124	16.32	1.25	17.18	32	151133	6.14	0.95	14.07	32
2					2				
151124	16.90	1.24	17.64	32	151133	6.21	0.98	14.11	32
2					2				
151125	14.89	1.23	17.75	32	151134	3.32	0.58	8.73	32
2					2				
151125	14.91	1.23	17.69	32	151134	3.35	0.59	8.75	32
2					2				
151126	12.79	1.22	17.20	32	151135	1.48	0.24	3.60	32
2					2				
151126	12.92	1.21	17.25	32	151135	1.53	0.27	3.48	32
2					2				
151127	11.76	1.21	17.43	32	151136	0.65	0.07	0.00	32
2					2				
151127	12.11	1.22	17.32	32	151136	0.62	0.07	0.00	32
2					2				
151128	11.75	1.24	17.94	32	151137	31.26	1.40	18.19	32
2					2				
151128	11.84	1.21	17.89	32	151137	31.94	1.34	18.86	32
2					2				
151129	11.80	1.32	17.99	32	151138	29.02	1.28	18.09	32
2					2				
151129	11.62	1.24	18.10	32	151138	29.27	1.29	18.43	32
2					2				

ID	SiO4	PO4	NO2+NO3	WOCE QF	ID	SiO4	PO4	NO2+NO3	WOCE QF
151139 2	27.08	1.29	17.95	32	151148 2	11.48	1.15	17.26	32
151139 2	27.21	1.28	17.88	32	151148 2	11.22	1.14	16.82	32
151140 2	25.02	1.26	17.61	32	151149 2	10.83	1.15	17.05	32
151140 2	25.24	1.27	17.61	32	151149 2	10.68	1.15	16.98	32
151141 2	21.73	1.26	17.04	32	151150 2	10.80	1.17	17.30	32
151141 2	21.90	1.26	17.55	32	151150 2	10.81	1.19	17.56	32
151142 2	18.36	1.22	16.89	32	151151 2	11.73	1.22	18.44	32
151142 2	18.50	1.23	17.08	32	151151 2	11.93	1.22	18.61	32
151143 2	16.00	1.22	16.69	32	151152 2	12.38	1.33	19.55	32
151143 2	16.11	1.22	16.77	32	151152 2	12.72	1.32	19.90	32
151144 2	15.36	1.24	17.02	32	151153 2	12.70	1.36	21.43	32
151144 2	15.22	1.23	16.61	32	151153 2	12.99	1.41	21.51	32
151145 2	12.08	1.10	16.75	32	151154 2	7.98	1.07	16.54	32
151145 2	12.21	1.16	16.81	32	151154 2	7.93	1.07	16.62	32
151146 2	10.21	1.09	16.07	32	151155 2	2.17	0.35	4.95	32
151146 2	10.56	1.09	16.09	32	151155 2	2.20	0.40	4.81	32
151147 2	10.50	1.11	16.52	32	151156 2	1.04	0.11	0.00	32
151147 2	10.75	1.11	16.83	32	151156 2	0.95	0.11	0.00	32

ID	SiO4	PO4	NO2+NO3	WOCE QF	ID	SiO4	PO4	NO2+NO3	WOCE QF
151157 2	24.15	1.21	16.96	32	151166 2	11.67	1.16	16.66	32
151157 2	23.77	1.17	17.18	32	151166 2	12.00	1.15	16.77	32
151158 2	21.81	1.16	16.89	32	151167 2	11.05	1.16	17.02	32
151158 2	22.13	1.16	16.77	32	151167 2	11.05	1.18	17.20	32
151159 2	21.11	1.16	16.84	32	151168 2	10.41	1.17	17.55	32
151159 2	21.22	1.16	16.94	32	151168 2	10.48	1.19	17.36	32
151160 2	22.64	1.23	17.10	32	151169 2	11.42	1.26	17.70	32
151160 2	23.23	1.20	17.65	32	151169 2	11.27	1.28	17.82	32
151161 2	11.78	1.22	17.56	32	151170 2	11.43	1.07	18.06	32
151161 2	12.07	1.18	17.79	32	151170 2	11.50		18.11	34
151162 2	18.10	1.17	16.78	32	151171 2	11.90	1.34	18.95	32
151162 2	18.07	1.17	17.04	32	151171 2	12.10	1.34	19.12	32
151163 2	14.35	1.14	16.37	32	151172 2	11.54	1.44	19.07	32
151163 2	14.40	1.13	16.13	32	151172 2	11.61	1.36	19.74	32
151164 2	12.29	1.13	16.09	32	151173 2	12.13	1.42	20.84	32
151164 2	12.29	1.12	16.07	32	151173 2	12.54	1.36	20.30	32
151165 2	12.75	1.15	16.66	32	151174 2	4.31	0.72	10.51	32
151165 2	13.03	1.14	17.07	32	151174 2	4.38	0.72	11.06	32

ID	SiO4	PO4	NO2+NO3	WOCE QF	ID	SiO4	PO4	NO2+NO3	WOCE QF
151175 2	2.15	0.38	5.54	32	151184 2	11.72	1.16	16.76	32
151175 2	2.28	0.40	5.60	32	151184 2	11.83	1.16	16.88	32
151176 2	0.96	0.15	0.00	32	151185 2	12.01	1.16	16.78	32
151176 2	0.97	0.12	0.00	32	151185 2	12.14	1.22	16.97	32
151177 2	31.87	1.30	18.41	32	151186 2	11.37	1.19	17.05	32
151177 2	31.84	1.35	18.31	32	151186 2	11.66	1.20	17.33	32
151178 2	27.50	1.24	18.08	32	151187 2	11.35	1.19	17.46	32
151178 2	28.70	1.27	18.00	32	151187 2	11.37	1.19	17.68	32
151179 2	24.77	1.22	18.07	32	151188 2	11.33	1.23	17.68	32
151179 2	24.84	1.25	18.10	32	151188 2	11.43	1.22	17.78	32
151180 2	23.00	1.20	17.22	32	151189 2	12.02	1.30	18.78	32
151180 2	23.47	1.20	17.48	32	151189 2	12.23	1.29	18.81	32
151181 2	16.55	1.20	17.44	32	151190 2	12.28	1.38	20.70	32
151181 2	16.17	1.18	17.14	32	151190 2	12.67	1.38	20.86	32
151182 2	15.87	1.20	17.66	32	151191 2	4.29	0.69	9.86	32
151182 2	16.15	1.20	17.32	32	151191 2	4.42	0.65	9.97	32
151183 2	13.62	1.17	16.93	32	151192 2	2.01	0.33	4.72	32
151183 2	13.93	1.17	17.16	32	151192 2	2.08	0.34	4.71	32

ID	SiO4	PO4	NO2+NO3	WOCE QF	ID	SiO4	PO4	NO2+NO3	WOCE QF
151193 2	2.05	0.33	4.55	32	151202 2	20.18	1.22	16.97	32
151193 2	2.12	0.39	4.61	32	151202 2	20.06	1.22	16.81	32
151194 2	2.04	0.33	4.80	32	151203 2	17.87	1.20	16.73	32
151194 2	2.08	0.33	4.77	32	151203 2	18.18	1.19	16.73	32
151195 2	2.10	0.34	5.07	32	151204 2	15.47	1.18	16.49	32
151195 2	2.03	0.35	4.99	32	151204 2	15.98	1.18	16.64	32
151196 2	0.71	0.07	0.00	32	151205 2	13.85	1.21	16.69	32
151196 2	0.76	0.08	0.00	32	151205 2	13.93	1.19	16.35	32
151197 2	30.38	1.30	17.62	32	151206 2	12.53	1.20	16.87	32
151197 2	30.64	1.28	17.80	32	151206 2	12.58	1.18	16.82	32
151198 2	24.71	1.22	16.82	32	151207 2	11.62	1.20	16.78	32
151198 2	25.65	1.22	17.12	32	151207 2	12.03	1.20	17.06	32
151199 2	24.21	1.22	17.36	32	151208 2	11.01	1.21	16.75	32
151199 2	24.51	1.22	17.41	32	151208 2	11.02	1.20	16.83	32
151200 2	23.06	1.23	17.18	32	151209 2	11.81	1.30	17.23	32
151200 2	23.57	1.23	17.32	32	151209 2	11.94	1.22	17.35	32
151201 2	19.62	1.20	16.77	32	151210 2	12.60	1.33	19.14	32
151201 2	20.10	1.24	16.68	32	151210 2	12.49	1.30	18.85	32

ID	SiO4	PO4	NO2+NO3	WOCE QF	ID	SiO4	PO4	NO2+NO3	WOCE QF
151211 2	8.13	1.11	15.88	32	151220 2	23.51	1.16	17.10	32
151211 2	8.43	1.09	16.15	32	151220 2	23.97	1.14	17.19	32
151212 2	2.41	0.43	5.47	32	151221 2	14.08	1.09	16.83	32
151212 2	2.43	0.38	5.53	32	151221 2	14.32	1.10	16.81	32
151213 2	2.20	0.37	4.93	32	151222 2	16.02	1.10	17.00	32
151213 2	2.29	0.36	4.81	32	151222 2	16.20	1.10	17.05	32
151214 2	2.21	0.36	4.98	32	151223 2	14.14	1.10	16.82	32
151214 2	2.14	0.34	4.95	32	151223 2	14.24	1.08	16.54	32
151215 2	1.98	0.35	5.10	32	151224 2	10.86	0.99	15.49	32
151215 2	2.00	0.37	5.04	32	151224 2	11.10	1.02	15.60	32
151216 2	0.74	0.09	0.00	32	151225 2	11.49	1.05	16.55	32
151216 2	0.74	0.07	0.00	32	151225 2	11.50	1.12	16.50	32
151217 2	30.93	1.23	17.97	32	151226 2	12.27	1.08	17.13	32
151217 2	31.26	1.28	17.59	32	151226 2	12.04	1.09	16.84	32
151218 2	24.31	1.15	16.91	32	151227 2	12.01	1.10	17.52	32
151218 2	24.32	1.16	16.75	32	151227 2	12.11	1.10	17.51	32
151219 2	22.13	1.12	16.85	32	151228 2	11.64	1.13	17.54	32
151219 2	22.26	1.13	16.79	32	151228 2	11.66	1.11	17.62	32

ID	SiO4	PO4	NO2+NO3	WOCE QF	ID	SiO4	PO4	NO2+NO3	WOCE QF
151229 2	11.36	1.12	17.73	32	151238 2	20.36	1.09	17.05	32
151229 2	11.40	1.13	17.70	32	151238 2	19.89	1.04	16.52	32
151230 2	11.51	1.15	17.80	32	151239 2	20.73	1.08	17.06	32
151230 2	11.29	1.14	17.98	32	151239 2	20.45	1.09	17.01	32
151231 2	11.78	1.16	18.97	32	151240 2	19.58	1.09	16.46	32
151231 2	11.58	1.17	18.79	32	151240 2	19.91	1.07	16.56	32
151232 2	10.46	1.21	19.32	32	151241 2	13.67	1.16	17.10	32
151232 2	10.60	1.18	19.45	32	151241 2	14.53	1.10	17.22	32
151233 2	3.64	0.57	9.04	32	151242 2	17.07	1.09	17.00	32
151233 2	3.65	0.53	9.10	32	151242 2	17.33	1.09	16.83	32
151234 2	2.28	0.34	6.15	32	151243 2	14.54	1.08	16.28	32
151234 2	2.32	0.33	6.12	32	151243 2	14.69	1.07	16.49	32
151235 2	1.76	0.27	4.87	32	151244 2	12.57	1.06	16.38	32
151235 2	1.81	0.26	4.99	32	151244 2	12.45	1.09	16.48	32
151236 2	0.56	0.04	0.00	32	151245 2	11.55	1.08	16.30	32
151236 2	0.47	0.04	0.00	32	151245 2	11.68	1.08	16.55	32
151237 2	20.27	1.08	15.91	32	151246 2	12.29	1.10	16.58	32
151237 2	20.45	1.05	16.68	32	151246 2	12.28	1.10	16.63	32

ID	SiO4	PO4	NO2+NO3	WOCE QF	ID	SiO4	PO4	NO2+NO3	WOCE QF
151247 2	10.88	1.12	16.65	32	151256 2	0.89	0.18	0.00	33
151247 2	11.25	1.10	17.42	32	151256 2	1.09	0.07	0.00	32
151248 2	11.23	1.11	17.52	32	151257 2	18.70	1.10	15.67	32
151248 2	11.38	1.13	17.34	32	151257 2	19.27	1.05	16.05	32
151249 2	12.11	1.27	18.14	32	151258 2	20.73	1.11	16.41	32
151249 2	12.17	1.22	18.59	32	151258 2	21.09	1.08	16.57	32
151250 2	13.63	1.38	21.72	32	151259 2	17.52	1.09	16.07	32
151250 2	13.76	1.37	21.67	32	151259 2	17.81	1.09	16.41	32
151251 2	13.79	1.40	22.35	32	151260 2	17.34	1.07	16.10	32
151251 2	13.83	1.41	22.58	32	151260 2	17.30	1.08	15.84	32
151252 2	9.26	1.13	17.76	32	151261 2	15.35	1.06	16.20	32
151252 2	9.36	1.11	18.21	32	151261 2	15.49	1.08	16.27	32
151253 2	3.42	0.55	8.66	32	151262 2	15.47	1.11	16.72	32
151253 2	3.54	0.55	8.91	32	151262 2	15.74	1.09	16.83	32
151254 2	2.15	0.35	6.09	32	151263 2	14.37	1.09	16.26	32
151254 2	2.17	0.35	5.98	32	151263 2	14.40	1.09	16.32	32
151255 2	2.41	0.37	6.47	32	151264 2	12.58	1.07	16.11	32
151255 2	2.52	0.37	6.54	32	151264 2	12.77	1.09	16.57	32

ID	SiO4	PO4	NO2+NO3	WOCE QF	ID	SiO4	PO4	NO2+NO3	WOCE QF
151265 2	12.44	1.08	16.27	32	151274 2	5.95	0.86	13.51	32
151265 2	12.66	1.15	16.49	32	151274 2	6.02	0.83	13.74	32
151266 2	11.43	1.08	16.12	32	151275 2	1.80	0.25	4.66	32
151266 2	11.72	1.09	16.26	32	151275 2	1.78	0.28	4.59	32
151267 2	11.22	1.08	16.53	32	151276 2	0.75	0.08	0.00	32
151267 2	11.13	1.08	16.74	32	151276 2	0.85	0.08	0.00	32
151268 2	11.27	1.11	16.72	32	151277 2	18.44	1.10	15.57	32
151268 2	11.66	1.10	17.11	32	151277 2	18.64	1.06	15.75	32
151269 2	11.12	1.13	16.89	32	151278 2	20.26	1.10	16.15	32
151269 2	11.15	1.13	17.16	32	151278 2	20.73	1.10	16.24	32
151270 2	11.35	1.15	17.39	32	151279 2	18.37	1.09	15.91	32
151270 2	11.76	1.17	17.56	32	151279 2	18.30	1.06	15.88	32
151271 2	11.90	1.18	18.62	32	151280 2	16.59	1.08	15.31	32
151271 2	11.93	1.19	18.09	32	151280 2	17.14	1.08	16.02	32
151272 2	12.58	1.29	19.87	32	151281 2	14.21	1.06	15.76	32
151272 2	12.86	1.30	19.87	32	151281 2	14.59	1.10	15.73	32
151273 2	12.85	1.37	21.25	32	151282 2	13.43	1.07	15.90	32
151273 2	13.08	1.43	21.40	32	151282 2	13.82	1.07	15.68	32

ID	SiO4	PO4	NO2+NO3	WOCE QF	ID	SiO4	PO4	NO2+NO3	WOCE QF
151283 2	13.24	1.06	15.90	32	151292 2	12.30	1.31	19.14	32
151283 2	13.32	1.06	15.74	32	151292 2	12.65	1.31	19.06	32
151284 2	11.33	1.07	15.77	32	151293 2	10.73	1.28	19.14	32
151284 2	11.49	1.08	16.30	32	151293 2	10.98	1.27	19.33	32
151285 2	10.93	1.05	15.60	32	151294 2	4.37	0.70	10.48	32
151285 2	11.30	1.07	16.20	32	151294 2	4.63	0.66	10.68	32
151286 2	10.98	1.08	16.18	32	151295 2	2.54	0.42	6.77	32
151286 2	11.05	1.07	16.16	32	151295 2	2.51	0.42	6.66	32
151287 2	11.44	1.08	16.36	32	151296 5				55
151287 2	11.75	1.09	16.61	32	151296 5				55
151288 2	11.79	1.11	16.73	32	151297 2	17.94	1.10	15.13	32
151288 2	12.24	1.11	16.41	32	151297 2	18.24	1.07	15.57	32
151289 2	11.07	1.11	16.38	32	151298 2	16.56	1.11	15.24	32
151289 2	11.49	1.15	16.59	32	151298 2	16.60	1.06	15.25	32
151290 2	10.58	1.11	16.59	32	151299 2	14.56	1.06	15.40	32
151290 2	10.67	1.13	16.55	32	151299 2	14.70	1.06	15.41	32
151291 2	11.91	1.20	17.83	32	151300 2	13.95	1.04	15.72	32
151291 2	11.67	1.26	17.50	32	151300 2	13.97	1.07	15.56	32

ID	SiO4	PO4	NO2+NO3	WOCE QF	ID	SiO4	PO4	NO2+NO3	WOCE QF
151301	12.67	1.10	15.98	32	151310	11.44	1.19	17.49	32
2					2				
151301	12.64	1.10	15.79	32	151310	11.61	1.17	17.64	32
2					2				
151302	12.54	1.07	15.80	32	151311	13.03	1.33	19.45	32
2					2				
151302	12.66	1.07	15.71	32	151311	13.15	1.34	19.46	32
2					2				
151303	14.09	1.11	16.34	32	151312	10.96	1.28	19.12	32
2					2				
151303	13.82	1.11	16.32	32	151312	11.26	1.27	19.17	32
2					2				
151304	10.64	1.07	15.80	32	151313	8.51	1.03	14.43	32
2					2				
151304	10.59	1.05	15.75	32	151313	8.40	1.07	14.92	32
2					2				
151305	11.29	1.09	16.06	32	151314	5.73	0.83	12.80	22
2					2				
151305	11.51	1.08	16.02	32	151314	5.79	0.80	13.18	22
2					2				
151306	10.49	1.15	15.69	32	151315	2.29	0.37	4.79	22
2					2				
151306	10.57	1.07	15.84	32	151315	2.40	0.37	4.99	22
2					2				
151307	11.28	1.12	16.48	32	151316	0.88	0.10	0.00	22
2					2				
151307	11.30	1.13	16.61	32	151316	0.97	0.10	0.00	22
2					2				
151308	11.35	1.16	16.63	32	151317	15.66	1.05	15.38	22
2					2				
151308	11.42	1.15	16.60	32	151317	15.81	1.03	15.29	22
2					2				
151309	11.73	1.16	17.32	32	151318	14.50	1.05	15.80	22
2					2				
151309	11.51	1.15	17.33	32	151318	14.56	1.07	15.83	22
2					2				

ID	SiO4	PO4	NO2+NO3	WOCE QF	ID	SiO4	PO4	NO2+NO3	WOCE QF
151319 2	14.30	1.05	15.93	22	151328 2	11.60	1.13	17.31	22
151319 2	14.24	1.05	16.05	22	151328 2	11.64	1.11	17.14	22
151320 2	13.47	1.07	16.26	22	151329 2	11.52	1.15	17.25	22
151320 2	13.46	1.08	15.97	22	151329 2	11.54	1.13	17.09	22
151321 2	13.07	1.08	16.17	22	151330 2	11.47	1.15	17.31	22
151321 2	13.21	1.10	16.34	22	151330 2	11.72	1.14	17.55	22
151322 2	12.19	1.09	16.07	22	151331 2	12.16	1.21	18.78	22
151322 2	12.30	1.06	16.49	22	151331 2	12.38	1.18	18.31	22
151323 2	12.78	1.08	16.56	22	151332 2	12.79	1.30	19.89	22
151323 2	12.78	1.08	16.60	22	151332 2	12.68	1.28	19.58	22
151324 2	12.14	1.11	16.42	22	151333 2	13.42	1.36	20.25	22
151324 2	12.20	1.10	16.39	22	151333 2	13.44	1.36	20.00	22
151325 2	12.10	1.10	16.65	22	151334 2	12.71	1.36	20.61	22
151325 2	12.01	1.09	16.39	22	151334 2	12.73	1.36	20.96	22
151326 2	11.66	1.10	16.30	22	151335 2	6.08	0.87	11.08	22
151326 2	11.67	1.09	16.68	22	151335 2	6.10	0.86	11.03	22
151327 2	11.55	1.11	16.95	22	151336 2	0.76	0.24	0.00	22
151327 2	11.70	1.12	17.11	22	151336 2	0.81	0.23	0.00	22

ID	SiO4	PO4	NO2+NO3	WOCE QF	ID	SiO4	PO4	NO2+NO3	WOCE QF
151337 2	11.21	1.09	15.94	22	151346 2	11.24	1.17	16.79	22
151337 2	11.29	1.08	15.98	22	151346 2	11.66	1.15	16.80	22
151338 2	11.67	1.08	16.21	22	151347 2	12.76	1.26	18.55	22
151338 2	11.67	1.10	16.02	22	151347 2	12.85	1.29	18.85	22
151339 2	11.39	1.10	16.51	22	151348 2	12.55	1.27	19.17	22
151339 2	11.71	1.08	16.16	22	151348 2	12.61	1.29	19.26	22
151340 2	11.12	1.09	16.38	22	151349 2	7.98	0.96	11.08	22
151340 2	10.95	1.10	16.37	22	151349 2	8.07	0.99	10.85	22
151341 2	10.88	1.11	16.61	22	151350 2	0.72	0.26	0.00	22
151341 2	10.92	1.10	16.69	22	151350 2	0.77	0.24	0.00	22
151342 2	10.98	1.12	16.98	22	151351 2	10.28	1.09	16.00	22
151342 2	11.53	1.11	16.79	22	151351 2	10.37	1.09	15.86	22
151343 2	11.20	1.15	17.46	22	151352 2	10.05	1.08	16.03	22
151343 2	11.20	1.14	17.05	22	151352 2	10.16	1.11	15.74	22
151344 2	10.89	1.14	16.87	22	151353 2	10.07	1.08	15.58	22
151344 2	10.71	1.14	16.85	22	151353 2	10.22	1.10	15.63	22
151345 2	11.60	1.17	17.95	22	151354 2	10.27	1.11	15.83	22
151345 2	11.96	1.18	17.62	22	151354 2	10.34	1.11	15.70	22

ID	SiO4	PO4	NO2+NO3	WOCE QF	ID	SiO4	PO4	NO2+NO3	WOCE QF
151355 2	10.92	1.12	15.28	22	151364 2	11.39	1.10	14.88	22
151355 2	11.10	1.10	15.47	22	151364 2	11.41	1.13	14.92	22
151356 2	11.93	1.09	14.63	22	151365 2	9.75	1.04	8.98	22
151356 2	11.41	1.12	14.92	22	151365 2	9.77	1.04	9.03	22
151357 2	10.89	1.04	12.95	22	151366 2	2.17	0.50	0.75	22
151357 2	11.08	1.07	12.89	22	151366 2	2.11	0.49	0.64	22
151358 2	9.99	1.05	9.07	22	151367 2	10.86	1.11	14.62	22
151358 2	10.01	1.05	9.20	22	151367 2	10.89	1.11	14.91	22
151359 2	1.36	0.40	0.00	22	151368 2	11.65	1.11	15.07	22
151359 2	1.37	0.40	0.00	22	151368 2	11.51	1.11	15.02	22
151360 2	10.35	1.11	15.38	22	151369 2	11.72	1.11	13.89	22
151360 2	10.30	1.11	15.88	22	151369 2	11.63	1.09	14.28	22
151361 2	10.29	1.10	15.90	22	151370 2	9.63	1.04	8.35	22
151361 2	10.25	1.11	15.93	22	151370 2	9.78	1.02	8.40	22
151362 2	10.16	1.10	15.68	22	151371 2	11.31	1.07	12.88	22
151362 2	10.18	1.10	15.28	22	151371 2	11.40	1.08	12.99	22
151363 2	10.87	1.11	15.48	22	151372 2	9.96	1.06	9.71	22
151363 2	10.89	1.09	15.70	22	151372 2	9.99	1.05	9.86	22

ID	SiO4	PO4	NO2+NO3	WOCE QF	ID	SiO4	PO4	NO2+NO3	WOCE QF
151373 2	1.28	0.38	0.00	22	151382 2	10.88	1.05	9.47	22
151373 2	1.30	0.35	0.00	22	151382 2	11.05	1.07	9.23	22
151374 2	15.09	1.11	11.50	22	151383 2	13.17	1.08	15.00	22
151374 2	15.05	1.11	11.48	22	151383 2	13.21	1.10	15.29	22
151375 2	8.68	1.03	7.99	22	151384 2	12.68	1.05	14.42	22
151375 2	8.71	1.01	8.09	22	151384 2	12.35	1.06	14.22	22
151376 2	0.79	0.33	0.00	22	151385 2	7.93	0.94	9.74	22
151376 2	0.72	0.35	0.00	22	151385 2	8.00	0.94	9.94	22
151377 2	10.99	1.00	11.66	22	151386 2	1.92	0.42	0.78	22
151377 2	11.24	1.00	11.97	22	151386 2	2.04	0.40	0.98	22
151378 3	5.23	0.90	5.96	33	151387 2	9.78	1.06	15.47	22
151378 3	5.29	0.93	5.74	33	151387 2	9.89	1.06	16.01	22
151379 3	0.80	0.35	-0.06	33	151388 2	9.37	1.05	15.82	22
151379 3	0.80	0.34	0.04	33	151388 2	9.51	1.05	16.23	22
151380 2	10.28	0.98	11.97	22	151389 2	8.63	1.04	15.60	22
151380 2	10.37	0.98	11.67	22	151389 2	8.80	1.03	15.67	22
151381 2	10.63	1.01	10.87	22	151390 2	6.58	0.92	12.66	22
151381 2	10.77	1.01	10.79	22	151390 2	6.57	0.90	12.66	22

ID	SiO4	PO4	NO2+NO3	WOCE QF	ID	SiO4	PO4	NO2+NO3	WOCE QF
151391 2	1.56	0.34	0.50	22	151400 2	10.41	1.05	16.26	22
151391 2	1.57	0.34	0.72	22	151400 2	10.52	1.07	16.09	22
151392 2	12.22	1.07	15.91	22	151401 2	10.29	1.07	16.12	22
151392 2	12.30	1.06	16.14	22	151401 2	10.33	1.06	16.08	22
151393 2	10.09	1.05	16.17	22	151402 2	10.15	1.06	16.38	22
151393 2	10.20	1.04	16.26	22	151402 2	10.30	1.15	16.48	22
151394 2	9.57	1.04	16.20	22	151403 5				55
151394 2	9.65	1.04	16.33	22	151403 5				55
151395 2	9.54	1.05	17.74	22	151404 2	10.83	1.14	17.41	22
151395 2	9.85	1.07	18.31	22	151404 2	10.85	1.15	17.61	22
151396 2	9.44	1.07	16.39	22	151405 2	11.19	1.15	17.75	22
151396 2	9.50	1.06	15.86	22	151405 2	10.89	1.16	17.62	22
151397 2	9.73	1.09	16.00	22	151406 2	11.92	1.20	17.76	22
151397 2	9.45	1.06	15.81	22	151406 2	12.05	1.21	18.12	22
151398 2	8.33	1.00	14.62	22	151407 3	10.98	1.13	16.75	33
151398 2	8.45	0.99	15.00	22	151407 3	11.01	1.10	17.19	33
151399 2	1.03	0.23	0.00	22	151408 2	11.16	1.16	18.14	22
151399 2	1.11	0.22	0.25	22	151408 2	11.23	1.15	18.18	22

ID	SiO4	PO4	NO2+NO3	WOCE QF	ID	SiO4	PO4	NO2+NO3	WOCE QF
151409 2	11.26	1.19	17.69	22	151418 2	7.37	0.93	10.94	22
151409 2	11.11	1.18	17.71	22	151418 2	7.28	0.92	10.95	22
151410 2	0.94	0.27	0.26	22	151419 2	11.87	1.06	16.31	22
151410 2	0.77	0.28	0.00	22	151419 2	11.92	1.08	16.24	22
151411 2	9.85	1.05	15.54	22	151420 2	11.27	1.06	15.90	22
151411 2	10.00	1.04	15.79	22	151420 2	11.47	1.06	16.01	22
151412 2	10.06	1.05	15.95	22	151421 2	10.64	1.07	15.79	22
151412 2	10.21	1.07	16.38	22	151421 2	10.70	1.06	16.01	22
151413 2	10.70	1.08	17.24	22	151422 2	10.35	1.08	15.83	22
151413 2	10.72	1.09	17.26	22	151422 2	10.43	1.07	15.66	22
151414 2	10.83	1.12	17.60	22	151423 2	10.34	1.07	15.95	22
151414 2	11.01	1.11	17.33	22	151423 2	10.32	1.05	16.13	22
151415 2	9.98	1.06	16.22	22	151424 2	10.45	1.08	15.95	22
151415 2	9.82	1.05	16.30	22	151424 2	10.58	1.10	16.16	22
151416 2	10.97	1.16	17.56	22	151425 2	10.45	1.10	16.46	22
151416 2	11.03	1.14	17.53	22	151425 2	10.63	1.11	16.16	22
151417 2	9.97	1.11	14.83	22	151426 2	10.26	1.12	16.34	22
151417 2	9.88	1.10	15.03	22	151426 2	10.44	1.10	16.62	22

ID	SiO4	PO4	NO2+NO3	WOCE QF	ID	SiO4	PO4	NO2+NO3	WOCE QF
151427 2	10.68	1.10	17.03	22	151436 2	14.71	1.06	15.90	22
151427 2	10.71	1.11	17.31	22	151436 2	14.85	1.07	15.90	22
151428 2	10.49	1.12	17.07	22	151437 2	13.65	1.07	15.65	22
151428 2	10.54	1.11	17.15	22	151437 2	13.75	1.08	15.88	22
151429 2	10.68	1.15	17.31	22	151438 2	13.00	1.07	15.88	22
151429 2	10.73	1.16	17.20	22	151438 2	12.98	1.07	15.77	22
151430 2	9.94	1.13	16.34	22	151439 2	12.57	1.08	16.02	22
151430 2	9.88	1.12	16.32	22	151439 2	12.68	1.09	15.88	22
151431 2	10.29	1.10	16.26	22	151440 2	11.56	1.09	16.04	22
151431 2	10.31	1.13	16.12	22	151440 2	11.61	1.08	15.94	22
151432 2	10.60	1.16	16.73	22	151441 2	10.91	1.08	15.72	22
151432 2	10.66	1.19	16.57	22	151441 2	10.94	1.09	15.97	22
151433 2	16.26	1.07	15.50	22	151442 2	10.49	1.08	15.66	22
151433 2	16.41	1.07	15.37	22	151442 2	10.40	1.08	15.82	22
151434 2	15.39	1.06	15.45	22	151443 2	10.35	1.08	15.68	22
151434 2	15.42	1.06	15.20	22	151443 2	10.47	1.09	15.96	22
151435 2	14.14	1.17	15.20	22	151444 2	10.16	1.11	16.18	22
151435 2	14.34	1.04	15.55	22	151444 2	10.23	1.08	15.95	22

ID	SiO4	PO4	NO2+NO3	WOCE QF	ID	SiO4	PO4	NO2+NO3	WOCE QF
151445	10.27	1.09	16.04	22	151454	15.25	1.07	14.65	22
2					2				
151445	10.35	1.11	16.28	22	151454	15.28	1.07	14.81	22
2					2				
151446	10.63	1.10	16.09	22	151455	14.44	1.07	14.98	22
2					2				
151446	10.63	1.11	16.16	22	151455	14.47	1.08	14.87	22
2					2				
151447	10.37	1.11	16.16	22	151456	13.48	1.10	15.14	22
2					2				
151447	10.57	1.11	16.30	22	151456	13.47	1.09	14.98	22
2					2				
151448	10.72	1.14	16.66	22	151457	13.24	1.11	14.86	22
2					2				
151448	10.93	1.16	16.65	22	151457	13.29	1.11	15.21	22
2					2				
151449	9.99	1.14	15.97	22	151458	12.86	1.11	15.34	22
2					2				
151449	10.09	1.15	15.96	22	151458	13.02	1.10	15.43	22
2					2				
151450	11.24	1.23	16.76	22	151459	12.61	1.11	15.51	22
2					2				
151450	11.25	1.22	16.47	22	151459	12.62	1.12	15.43	22
2					2				
151451	8.39	1.07	13.05	22	151460	11.62	1.11	15.47	22
2					2				
151451	8.55	1.08	13.20	22	151460	11.62	1.11	15.60	22
2					2				
151452	0.67	0.30	0.00	22	151461	11.40	1.12	15.89	22
2					2				
151452	0.73	0.30	0.00	22	151461	11.45	1.11	15.78	22
2					2				
151453	18.43	1.11	15.29	22	151462	10.31	1.12	15.60	22
2					2				
151453	18.54	1.11	15.30	22	151462	10.44	1.12	15.52	22
2					2				

ID	SiO4	PO4	NO2+NO3	WOCE QF	ID	SiO4	PO4	NO2+NO3	WOCE QF
151463 2	10.49	1.12	15.67	22	151472 2	0.82	0.27	0.00	22
151463 2	10.41	1.11	15.54	22	151472 2	0.85	0.26	0.00	22
151464 2	10.92	1.15	16.05	22	151473 2	15.52	1.06	14.59	22
151464 2	11.02	1.15	15.99	22	151473 2	15.62	1.06	14.77	22
151465 2	10.27	1.14	15.93	22	151474 2	15.30	1.07	14.63	22
151465 2	10.31	1.15	16.07	22	151474 2	15.59	1.08	14.86	22
151466 2	10.47	1.16	16.12	22	151475 2	15.04	1.08	14.93	22
151466 2	10.47	1.16	16.13	22	151475 2	14.98	1.08	14.85	22
151467 2	10.46	1.16	16.17	22	151476 2	19.21	1.16	15.89	22
151467 2	10.47	1.16	16.37	22	151476 2	19.29	1.15	15.84	22
151468 2	10.84	1.20	17.17	22	151477 2	16.14	1.15	15.92	22
151468 2	10.95	1.20	17.21	22	151477 2	16.18	1.14	15.62	22
151469 2	11.08	1.21	17.72	22	151478 2	15.62	1.16	16.03	22
151469 2	11.23	1.25	17.86	22	151478 2	15.72	1.14	16.14	22
151470 2	11.87	1.28	17.95	22	151479 2	13.65	1.12	16.16	22
151470 2	11.93	1.29	18.19	22	151479 2	13.85	1.14	16.07	22
151471 2	10.67	1.22	16.58	22	151480 2	12.82	1.15	16.15	22
151471 2	10.52	1.21	16.26	22	151480 2	12.95	1.16	16.03	22

ID	SiO4	PO4	NO2+NO3	WOCE QF	ID	SiO4	PO4	NO2+NO3	WOCE QF
151481	12.21	1.15	15.93	22	151490	11.91	1.34	18.24	22
2					2				
151481	12.21	1.16	16.10	22	151490	12.01	1.33	18.34	22
2					2				
151482	11.26	1.15	15.88	22	151491	4.89	0.85	9.07	22
2					2				
151482	11.42	1.16	15.93	22	151491	4.81	0.85	9.23	22
2					2				
151483	11.34	1.16	16.13	22	151492	0.79	0.18	0.00	22
2					2				
151483	11.34	1.16	16.13	22	151492	0.72	0.18	0.00	22
2					2				
151484	11.12	1.16	16.46	22	151493	20.76	1.14	15.70	22
2					2				
151484	11.13	1.16	16.07	22	151493	20.78	1.14	15.45	22
2					2				
151485	11.38	1.17	16.66	22	151494	22.50	1.18	15.81	22
2					2				
151485	11.46	1.17	16.74	22	151494	22.57	1.18	15.71	22
2					2				
151486	11.58	1.20	17.03	22	151495	21.98	1.18	16.13	22
2					2				
151486	11.70	1.20	17.06	22	151495	22.01	1.16	15.90	22
2					2				
151487	11.59	1.21	17.42	22	151496	21.19	1.17	16.06	22
2					2				
151487	11.58	1.20	17.35	22	151496	21.42	1.18	16.16	22
2					2				
151488	11.96	1.24	17.76	22	151497	12.01	1.18	16.22	22
2					2				
151488	11.96	1.26	17.72	22	151497	11.98	1.16	16.10	22
2					2				
151489	12.13	1.31	17.78	22	151498	16.48	1.17	15.66	22
2					2				
151489	12.23	1.31	17.92	22	151498	16.53	1.19	15.57	22
2					2				

ID	SiO4	PO4	NO2+NO3	WOCE QF	ID	SiO4	PO4	NO2+NO3	WOCE QF
151499 2	14.00	1.16	15.59	22	151508 2	12.29	1.25	17.64	22
151499 2	13.72	1.15	15.63	22	151508 2	12.31	1.23	17.72	22
151500 2	14.24	1.18	16.05	22	151509 2	13.83	1.42	19.37	22
151500 2	13.98	1.19	16.16	22	151509 2	13.99	1.41	19.09	22
151501 2	12.43	1.16	15.88	22	151510 2	12.13	1.35	17.99	22
151501 2	12.74	1.18	16.26	22	151510 2	12.28	1.37	18.37	22
151502 2	12.77	1.16	16.30	22	151511 2	5.58	0.86	11.09	22
151502 2	12.95	1.18	16.37	22	151511 2	5.63	0.87	10.99	22
151503 2	12.09	1.16	15.86	22	151512 2	0.68	0.17	0.00	22
151503 2	12.16	1.16	15.68	22	151512 2	0.73	0.17	0.00	22
151504 2	10.85	1.15	15.53	22	151513 2	21.09	1.18	15.43	22
151504 2	10.95	1.15	15.62	22	151513 2	21.46	1.19	15.90	22
151505 2	11.48	1.19	15.86	22	151514 2	22.58	1.21	16.08	22
151505 2	11.32	1.16	15.73	22	151514 2	23.06	1.21	16.44	22
151506 2	11.50	1.25	16.81	22	151515 2	21.87	1.21	16.31	22
151506 2	11.56	1.24	16.72	22	151515 2	22.05	1.20	16.19	22
151507 2	12.14	1.23	17.54	22	151516 2	16.87	1.15	15.35	22
151507 2	11.92	1.23	17.45	22	151516 2	17.08	1.16	15.54	22

ID	SiO4	PO4	NO2+NO3	WOCE QF	ID	SiO4	PO4	NO2+NO3	WOCE QF
151517 2	16.50	1.17	15.85	22	151526 2	11.88	1.23	19.49	22
151517 2	16.65	1.21	15.76	22	151526 2	11.91	1.25	19.64	22
151518 2	15.93	1.18	15.38	22	151527 2	12.59	1.26	20.09	22
151518 2	15.98	1.20	15.38	22	151527 2	12.63	1.30	20.37	22
151519 2	13.78	1.10	17.07	22	151528 2	12.78	1.38	21.92	22
151519 2	13.81	1.11	17.13	22	151528 2	12.75	1.37	21.78	22
151520 2	13.29	1.12	17.34	22	151529 2	10.00	1.20	17.90	22
151520 2	13.35	1.12	17.40	22	151529 2	10.17	1.20	17.96	22
151521 2	12.57	1.13	17.41	22	151530 2	7.41	1.02	14.94	22
151521 2	12.40	1.12	17.45	22	151530 2	7.48	1.02	15.09	22
151522 2	11.69	1.13	17.38	22	151531 2	5.36	0.83	12.32	22
151522 2	11.72	1.11	17.49	22	151531 2	5.45	0.83	12.45	22
151523 2	11.27	1.15	17.64	22	151532 2	0.53	0.23	0.40	22
151523 2	11.28	1.14	17.62	22	151532 2	0.56	0.23	0.62	22
151524 2	11.20	1.16	17.78	22	151533 2	26.45	1.19	18.82	22
151524 2	11.35	1.17	17.97	22	151533 2	26.62	1.21	18.89	22
151525 2	11.47	1.19	18.79	22	151534 2	25.55	1.20	18.58	22
151525 2	11.55	1.20	18.82	22	151534 2	26.05	1.21	18.74	22

ID	SiO4	PO4	NO2+NO3	WOCE QF	ID	SiO4	PO4	NO2+NO3	WOCE QF
151535	25.50	1.17	18.27	22	151544	11.92	1.14	18.14	22
2					2				
151535	25.51	1.20	18.51	22	151544	12.14	1.15	18.17	22
2					2				
151536	23.66	1.19	18.37	22	151545	11.46	1.15	18.20	22
2					2				
151536	23.52	1.18	17.98	22	151545	11.58	1.15	18.14	22
2					2				
151537	13.71	1.16	18.77	22	151546	11.24	1.15	18.15	22
2					2				
151537	13.82	1.17	18.61	22	151546	11.26	1.16	18.41	22
2					2				
151538	21.67	1.17	18.35	22	151547	11.07	1.15	18.61	22
2					2				
151538	21.87	1.17	18.38	22	151547	11.20	1.16	18.46	22
2					2				
151539	19.32	1.16	18.12	22	151548	11.32	1.16	19.98	22
2					2				
151539	19.49	1.17	18.12	22	151548	11.35	1.19	19.26	22
2					2				
151540	17.43	1.16	18.09	22	151549	11.47	1.25	19.98	22
2					2				
151540	17.29	1.17	17.98	22	151549	11.66	1.26	20.03	22
2					2				
151541	15.83	1.15	17.87	22	151550	12.89	1.39	21.86	22
2					2				
151541	15.99	1.16	18.01	22	151550	13.02	1.39	22.06	22
2					2				
151542	14.23	1.16	17.72	22	151551	5.79	0.88	14.72	22
2					2				
151542	14.86	1.15	17.90	22	151551	5.80	0.88	14.72	22
2					2				
151543	13.40	1.11	18.28	22	151552	0.65	0.22	0.00	22
2					2				
151543	13.47	1.13	18.16	22	151552	0.58	0.22	0.00	22
2					2				

ID	SiO4	PO4	NO2+NO3	WOCE QF	ID	SiO4	PO4	NO2+NO3	WOCE QF
151553 2	23.35	1.17	18.31	22	151562 2	12.25	1.15	18.14	22
151553 2	23.36	1.17	18.53	22	151562 2	11.99	1.15	17.65	22
151554 2	18.79	1.15	17.81	22	151563 2	11.57	1.17	18.39	22
151554 2	18.96	1.17	17.76	22	151563 2	11.65	1.16	18.17	22
151555 2	22.25	1.20	18.21	22	151564 2	11.22	1.18	18.33	22
151555 2	22.34	1.21	18.31	22	151564 2	11.21	1.17	18.45	22
151556 2	19.55	1.17	17.73	22	151565 2	11.10	1.18	18.46	22
151556 2	19.53	1.16	17.61	22	151565 2	11.06	1.18	18.41	22
151557 2	12.02	1.16	18.04	22	151566 2	11.35	1.23	19.14	22
151557 2	11.85	1.18	18.24	22	151566 2	11.43	1.21	19.01	22
151558 2	17.53	1.18	17.88	22	151567 2	11.33	1.24	19.39	22
151558 2	17.75	1.18	18.19	22	151567 2	11.38	1.24	19.52	22
151559 2	15.65	1.13	17.66	22	151568 2	12.18	1.31	20.63	22
151559 2	15.80	1.15	17.97	22	151568 2	12.59	1.31	20.69	22
151560 2	12.71	1.11	17.19	22	151569 2	13.95	1.44	22.84	22
151560 2	12.78	1.12	17.29	22	151569 2	13.99	1.45	22.87	22
151561 2	12.93	1.15	17.82	22	151570 2	6.65	0.97	15.59	22
151561 2	13.01	1.15	17.85	22	151570 2	6.50	0.96	15.35	22

ID	SiO4	PO4	NO2+NO3	WOCE QF	ID	SiO4	PO4	NO2+NO3	WOCE QF
151571 2	4.42	0.74	11.92	22	151580 2	13.76	1.16	17.13	22
151571 2	4.52	0.75	11.99	22	151580 2	13.69	1.14	16.96	22
151572 2	0.82	0.09	0.00	22	151581 2	13.77	1.21	17.73	22
151572 2	0.85	0.09	0.00	22	151581 2	13.68	1.18	17.87	22
151573 2	30.37	1.29	19.48	22	151582 2	12.08	1.17	17.36	22
151573 2	31.11	1.29	19.50	22	151582 2	12.17	1.18	17.35	22
151574 2	25.48	1.21	18.55	22	151583 2	11.49	1.17	17.95	22
151574 2	25.12	1.22	18.55	22	151583 2	11.49	1.15	17.58	22
151575 2	23.33	1.20	17.86	22	151584 2	11.67	1.18	18.09	22
151575 2	23.43	1.19	17.76	22	151584 2	11.73	1.19	17.90	22
151576 2	22.38	1.20	17.92	22	151585 2	11.74	1.21	18.34	22
151576 2	22.43	1.20	17.77	22	151585 2	11.68	1.21	18.23	22
151577 2	20.23	1.22	17.99	22	151586 2	11.27	1.22	18.61	22
151577 2	20.47	1.21	18.01	22	151586 2	11.29	1.21	18.64	22
151578 2	18.59	1.20	18.07	22	151587 2	10.90	1.26	19.17	22
151578 2	18.92	1.21	17.97	22	151587 2	11.01	1.27	19.71	22
151579 2	16.29	1.19	17.73	22	151588 2	11.92	1.39	21.56	22
151579 2	16.34	1.18	17.67	22	151588 2	12.13	1.38	21.75	22

ID	SiO4	PO4	NO2+NO3	WOCE QF	ID	SiO4	PO4	NO2+NO3	WOCE QF
151589 2	5.94	0.89	13.73	22	151598 2	17.18	1.18	17.76	22
151589 2	5.91	0.92	13.85	22	151598 2	16.82	1.18	17.57	22
151590 2	2.46	0.42	6.17	22	151599 2	15.15	1.16	17.47	22
151590 2	2.45	0.42	6.28	22	151599 2	15.44	1.16	17.40	22
151591 2	1.85	0.30	4.82	22	151600 2	14.29	1.19	17.73	22
151591 2	1.87	0.32	4.84	22	151600 2	14.64	1.18	17.79	22
151592 2	0.73	0.07	0.00	22	151601 2	12.24	1.15	17.32	22
151592 2	0.76	0.06	0.00	22	151601 2	12.49	1.14	17.47	22
151593 2	28.66	1.24	18.50	22	151602 2	11.68	1.16	17.55	22
151593 2	29.12	1.26	18.52	22	151602 2	11.87	1.16	17.74	22
151594 2	30.48	1.27	18.77	22	151603 2	11.57	1.16	17.65	22
151594 2	30.56	1.26	18.70	22	151603 2	11.57	1.16	17.62	22
151595 2	25.04	1.23	17.86	22	151604 2	11.06	1.18	17.93	22
151595 2	24.85	1.21	17.87	22	151604 2	11.24	1.17	17.90	22
151596 2	22.56	1.20	17.80	22	151605 2	11.19	1.20	18.51	22
151596 2	23.06	1.20	18.00	22	151605 2	11.28	1.21	18.55	22
151597 2	18.38	1.18	17.76	22	151606 2	12.05	1.27	19.31	22
151597 2	18.26	1.18	17.69	22	151606 2	12.21	1.28	19.30	22

ID	SiO4	PO4	NO2+NO3	WOCE QF	ID	SiO4	PO4	NO2+NO3	WOCE QF
151607 2	11.80	1.27	20.08	22	151616 2	27.69	1.27	18.79	22
151607 2	11.68	1.27	19.66	22	151616 2	27.75	1.26	18.77	22
151608 2	12.32	1.36	21.46	22	151617 2	23.39		17.72	24
151608 2	12.34	1.36	21.80	22	151617 2	23.58		18.17	24
151609 2	2.19	0.36	5.38	22	151618 2	22.21		18.24	24
151609 2	2.21	0.37	5.31	22	151618 2	22.39		18.34	24
151610 2	2.16	0.35	5.33	22	151619 2	18.63		18.04	24
151610 2	2.17	0.34	5.30	22	151619 2	18.23		18.03	24
151611 2	1.62	0.22	3.42	22	151620 2	15.71		17.97	24
151611 2	1.64	0.22	3.46	22	151620 2	15.83		17.81	24
151612 2	0.81	0.07	0.00	22	151621 2	11.57	1.21	17.11	22
151612 2	0.88	0.08	0.00	22	151621 2	11.84	1.20	17.07	22
151613 2	30.18	1.24	19.09	22	151622 2	11.32	1.19	17.26	22
151613 2	30.07	1.28	19.47	22	151622 2	11.44	1.19	17.15	22
151614 2	30.54	1.28	19.39	22	151623 2	11.38	1.19	17.41	22
151614 2	30.00	1.29	19.58	22	151623 2	11.58	1.18	17.26	22
151615 2	28.00	1.25	18.91	22	151624 2	11.51	1.21	17.63	22
151615 2	28.09	1.27	18.82	22	151624 2	11.72	1.22	17.83	22

ID	SiO4	PO4	NO2+NO3	WOCE QF	ID	SiO4	PO4	NO2+NO3	WOCE QF
151625 2	11.42	1.21	17.90	22	151634 2	24.82	1.20	17.63	22
151625 2	11.44	1.19	17.79	22	151634 2	24.55	1.21	17.73	22
151626 2	11.63	1.23	18.28	22	151635 2	22.74	1.23	17.72	22
151626 2	11.38	1.23	18.23	22	151635 2	23.06	1.23	17.72	22
151627 2	11.52	1.27	19.05	22	151636 2	22.65	1.22	17.68	22
151627 2	11.62	1.28	18.98	22	151636 2	22.67	1.23	17.84	22
151628 2	12.70	1.36	20.40	22	151637 2	19.83	1.21	17.55	22
151628 2	12.72	1.36	20.49	22	151637 2	20.22	1.21	17.54	22
151629 2	11.71	1.35	20.90	22	151638 2	19.12	1.20	17.32	22
151629 2	11.82	1.35	20.93	22	151638 2	19.49	1.20	17.43	22
151630 2	4.40	0.72	10.56	22	151639 2	18.00	1.21	17.23	22
151630 2	4.46	0.73	10.64	22	151639 2	17.79	1.20	17.25	22
151631 2	2.05	0.33	4.76	22	151640 2	15.36	1.22	17.09	22
151631 2	2.07	0.34	4.82	22	151640 2	15.67	1.20	17.01	22
151632 2	1.03	0.08	0.00	22	151641 2	14.79	1.16	17.22	22
151632 2	1.10	0.09	0.00	22	151641 2	14.84	1.18	17.32	22
151633 2	30.22	1.25	18.34	22	151642 2	13.13	1.18	17.17	22
151633 2	30.42	1.27	18.65	22	151642 2	13.45	1.17	17.28	22

ID	SiO4	PO4	NO2+NO3	WOCE QF	ID	SiO4	PO4	NO2+NO3	WOCE QF
151643 2	11.60	1.17	17.03	22	151652 2	0.92	0.06	0.00	22
151643 2	11.67	1.18	17.16	22	151652 2	0.95	0.08	0.00	22
151644 2	11.46	1.18	17.05	22	151653 2	29.63	1.24	18.04	22
151644 2	11.60	1.20	17.14	22	151653 2	29.65	1.22	18.36	22
151645 2	11.39	1.19	17.46	22	151654 2	29.32	1.22	18.30	22
151645 2	11.26	1.19	17.34	22	151654 2	29.30	1.22	18.19	22
151646 2	11.41	1.24	18.40	22	151655 2	23.05	1.15	17.14	22
151646 2	11.27	1.24	18.68	22	151655 2	22.87	1.14	17.23	22
151647 2	11.58	1.24	18.54	22	151656 2	22.47	1.15	17.45	22
151647 2	11.76	1.23	18.66	22	151656 2	22.59	1.16	17.87	22
151648 2	12.02	1.30	19.35	22	151657 2	15.79	1.13	17.57	22
151648 2	12.25	1.31	19.41	22	151657 2	15.82	1.13	17.61	22
151649 2	10.36	1.29	19.85	22	151658 2	16.71	1.11	17.17	22
151649 2	10.57	1.26	20.00	22	151658 2	16.81	1.11	17.18	22
151650 2	6.82	1.01	15.60	22	151659 2	14.94	1.11	17.11	22
151650 2	6.74	1.01	15.35	22	151659 2	15.03	1.09	16.95	22
151651 2	2.24	0.37	4.94	22	151660 2	13.43	1.12	17.23	22
151651 2	2.32	0.38	5.05	22	151660 2	13.39	1.11	17.31	22

ID	SiO4	PO4	NO2+NO3	WOCE QF	ID	SiO4	PO4	NO2+NO3	WOCE QF
151661 2	12.11	1.11	17.15	22	151670 2	2.44	0.37	6.24	22
151661 2	12.20	1.11	17.34	22	151670 2	2.49	0.40	6.25	22
151662 2	12.04	1.12	17.56	22	151671 2	1.88	0.27	4.52	22
151662 2	11.99	1.12	17.72	22	151671 2	1.88	0.27	4.56	22
151663 5				55	151672 2	0.87	0.06	0.00	22
151663 5				55	151672 2	0.89	0.06	0.00	22
151664 2	11.89	1.16	18.57	22	151673 2	26.92	1.18	17.87	22
151664 2	12.11	1.16	18.53	22	151673 2	27.24	1.17	17.85	22
151665 2	12.09	1.19	19.01	22	151674 2	25.90	1.17	18.07	22
151665 2	12.10	1.19	19.03	22	151674 2	26.30	1.17	18.20	22
151666 2	11.55	1.18	19.17	22	151675 2	24.25	1.16	17.92	22
151666 2	11.60	1.17	19.04	22	151675 2	24.15	1.16	17.65	22
151667 2	10.05	1.17	18.68	22	151676 2	24.53	1.17	17.85	22
151667 2	10.08	1.14	18.83	22	151676 2	24.53	1.17	17.99	22
151668 2	7.29	0.95	15.33	22	151677 2	20.45	1.16	17.46	22
151668 2	7.21	0.94	15.36	22	151677 2	20.55	1.16	17.55	22
151669 2	3.56	0.53	8.60	22	151678 2	19.75	1.14	16.76	22
151669 2	3.62	0.53	8.76	22	151678 2	19.81	1.14	16.85	22

ID	SiO4	PO4	NO2+NO3	WOCE QF	ID	SiO4	PO4	NO2+NO3	WOCE QF
151679 2	16.85	1.11	16.50	22	151688 2	12.41	1.25	18.96	22
151679 2	16.96	1.13	16.79	22	151688 2	12.26	1.26	18.93	22
151680 2	14.87	1.11	16.81	22	151689 2	13.98	1.46	22.52	22
151680 2	14.89	1.11	16.82	22	151689 2	14.10	1.47	22.89	22
151681 2	13.82	1.11	17.08	22	151690 2	12.11	1.36	20.76	22
151681 2	13.87	1.12	17.14	22	151690 2	12.19	1.35	20.95	22
151682 2	14.07	1.13	17.27	22	151691 2	3.03	0.47	7.23	22
151682 2	14.11	1.13	17.36	22	151691 2	3.05	0.46	7.25	22
151683 2	12.64	1.12	17.12	22	151692 2	1.79	0.24	3.92	22
151683 2	12.60	1.12	17.26	22	151692 2	1.83	0.24	3.91	22
151684 2	11.86	1.16	17.28	22	151693 2	23.39	1.18	17.21	22
151684 2	11.96	1.14	17.46	22	151693 2	23.28	1.20	17.19	22
151685 2	11.53	1.15	17.48	22	151694 2	21.64	1.14	16.89	22
151685 2	11.57	1.14	17.37	22	151694 2	21.65	1.14	16.83	22
151686 2	11.34	1.15	17.39	22	151695 2	22.26	1.16	17.35	22
151686 2	11.35	1.16	17.37	22	151695 2	22.22	1.17	17.31	22
151687 2	11.58	1.19	17.82	22	151696 2	21.83	1.17	17.32	22
151687 2	11.56	1.19	17.89	22	151696 2	21.82	1.16	17.31	22

ID	SiO4	PO4	NO2+NO3	WOCE QF	ID	SiO4	PO4	NO2+NO3	WOCE QF
151697 2	18.92	1.15	17.09	22	151706 2	12.23	1.27	18.71	22
151697 2	18.95	1.17	17.14	22	151706 2	12.38	1.25	18.94	22
151698 2	16.30	1.15	16.87	22	151707 2	13.54	1.37	20.64	22
151698 2	16.31	1.14	16.78	22	151707 2	13.59	1.37	20.43	22
151699 2	15.73	1.14	17.15	22	151708 2	10.66	1.26	19.07	22
151699 2	15.75	1.17	17.15	22	151708 2	10.70	1.26	19.24	22
151700 2	13.77	1.17	17.10	22	151709 2	8.71	1.15	17.39	22
151700 2	13.84	1.18	17.07	22	151709 2	8.72	1.13	17.29	22
151701 2	12.04	1.15	17.02	22	151710 2	4.43	0.71	10.49	22
151701 2	12.03	1.15	17.10	22	151710 2	4.44	0.70	10.62	22
151702 2	11.42	1.16	16.93	22	151711 2	2.37	0.36	4.50	22
151702 2	11.50	1.17	17.03	22	151711 2	2.20	0.36	4.43	22
151703 2	11.53	1.18	17.38	22	151712 2	0.99	0.06	0.00	22
151703 2	11.63	1.19	17.52	22	151712 2	0.98	0.06	0.00	22
151704 2	10.95	1.19	17.27	22	151713 2	20.89	1.15	16.61	22
151704 2	11.12	1.19	17.40	22	151713 2	21.09	1.15	16.95	22
151705 2	11.85	1.23	18.34	22	151714 2	21.19	1.16	16.96	22
151705 2	11.67	1.23	18.26	22	151714 2	21.28	1.17	17.22	22

ID	SiO4	PO4	NO2+NO3	WOCE QF	ID	SiO4	PO4	NO2+NO3	WOCE QF
151715 2	20.29	1.21	17.17	22	151725 2	11.71	1.16	18.63	22
151715 2	20.31	1.17	17.21	22	151725 2	11.72	1.17	18.62	22
151716 2	20.58	1.20	17.48	22	151726 2	11.90	1.23	19.50	22
151716 2	20.43	1.19	17.32	22	151726 2	12.02	1.25	19.32	22
151717 2	18.62	1.18	17.11	22	151727 2	12.65	1.24	19.99	22
151717 2	18.71	1.19	17.20	22	151727 2	12.22	1.24	19.83	22
151718 2	16.39	1.12	16.71	22	151728 2	13.45	1.38	22.92	22
151718 2	16.56	1.14	16.64	22	151728 2	13.53	1.38	23.26	22
151719 2	14.89	1.12	16.91	22	151729 2	7.94	1.00	17.06	22
151719 2	15.02	1.15	17.33	22	151729 2	7.80	1.00	16.86	22
151720 2	13.55	1.12	17.13	22	151730 2	5.04	0.73	12.05	22
151720 2	13.48	1.12	17.06	22	151730 2	4.97	0.72	12.17	22
151721 2	12.62	1.11	17.11	22	151731 2	0.99	0.07	0.00	22
151721 2	12.46	1.12	17.32	22	151731 2	1.07	0.06	0.28	22
151723 2	11.24	1.12	17.40	22	151732 2		0.05	0.00	42
151723 2	11.37	1.13	17.52	22	151732 2	1.09	0.04	0.00	22
151724 2	11.18	1.13	17.85	22	151733 2	24.79	1.14	17.99	22
151724 2	11.27	1.15	17.98	22	151733 2	24.87	1.12	18.02	22

ID	SiO4	PO4	NO2+NO3	WOCE QF	ID	SiO4	PO4	NO2+NO3	WOCE QF
151734 2	24.63	1.16	18.22	22	151743 2	11.08	1.11	17.42	22
151734 2	24.83	1.15	17.99	22	151743 2	11.19	1.10	17.46	22
151735 2	21.62	1.14	17.60	22	151744 2	11.30	1.13	17.56	22
151735 2	21.42	1.12	17.05	22	151744 2	11.31	1.13	17.70	22
151736 2	22.45	1.15	18.21	22	151745 2	11.87	1.22	18.97	22
151736 2	22.79	1.14	17.94	22	151745 2	11.80	1.22	18.92	22
151737 2	16.20	1.12	17.71	22	151746 2	12.45	1.27	20.20	22
151737 2	16.31	1.14	17.62	22	151746 2	12.38	1.25	19.79	22
151738 2	18.76	1.13	17.33	22	151747 2	12.38	1.32	21.56	22
151738 2	19.08	1.14	17.28	22	151747 2	12.54	1.32	21.30	22
151739 2	15.79	1.11	16.98	22	151748 2	11.40	1.31	21.21	22
151739 2	15.58	1.11	16.69	22	151748 2	11.62	1.32	20.90	22
151740 2	14.41	1.11	16.97	22	151749 2	5.64	0.83	13.61	22
151740 2	14.61	1.15	17.47	22	151749 2	5.82	0.84	13.69	22
151741 2	13.23	1.10	17.41	22	151750 2	2.52	0.44	7.17	22
151741 2	13.28	1.12	17.78	22	151750 2	2.55	0.44	7.03	22
151742 2	11.69	1.11	17.20	22	151751 2	0.73	0.15	1.42	22
151742 2	11.85	1.11	17.31	22	151751 2	0.72	0.11	1.41	22

ID	SiO4	PO4	NO2+NO3	WOCE QF	ID	SiO4	PO4	NO2+NO3	WOCE QF
151752 2		0.04	0.00	42	151761 2	14.19	1.14	17.27	22
151752 2	0.87	0.00	0.00	22	151761 2	14.43	1.17	17.50	22
151753 2	23.19	1.14	17.18	22	151762 2	13.19	1.16	17.73	22
151753 2	23.69	1.15	17.20	22	151762 2	13.23	1.16	17.42	22
151754 2	23.04	1.14	17.29	22	151763 2	11.33	1.15	17.39	22
151754 2	23.38	1.19	17.75	22	151763 2	11.67	1.15	17.53	22
151755 2	21.96	1.16	17.44	22	151764 2	10.90	1.16	17.60	22
151755 2	22.38	1.17	17.76	22	151764 2	11.01	1.16	17.50	22
151756 2	21.31	1.16	17.47	22	151765 2	11.12	1.16	17.72	22
151756 2	21.32	1.16	17.53	22	151765 2	11.23	1.18	17.79	22
151757 2	11.80	1.20	18.43	22	151766 2	11.41	1.20	18.21	22
151757 2	12.21	1.21	18.71	22	151766 2	11.31	1.19	17.97	22
151758 2	18.13	1.16	17.08	22	151767 2	11.32	1.20	18.58	22
151758 2	18.05	1.16	17.13	22	151767 2	11.72	1.21	18.70	22
151759 2	17.95	1.16	17.34	22	151768 2	11.74	1.28	19.72	22
151759 2	18.02	1.16	17.50	22	151768 2	11.75	1.27	19.81	22
151760 2	14.89	1.15	17.36	22	151769 2	12.62	1.39	21.21	22
151760 2	14.91	1.13	17.23	22	151769 2	13.16	1.40	21.50	22

ID	SiO4	PO4	NO2+NO3	WOCE QF	ID	SiO4	PO4	NO2+NO3	WOCE QF
151770 2	7.07	0.98	15.35	22	151779 2	15.85	1.16	17.17	22
151770 2	7.10	0.98	15.44	22	151779 2	16.04	1.16	17.48	22
151771 2	3.00	0.51	8.29	22	151780 2	14.19	1.15	17.28	22
151771 2	2.94	0.50	8.14	22	151780 2	14.19	1.16	17.47	22
151772 2	0.63	0.05	0.00	22	151781 2	13.96	1.18	17.54	22
151772 2	0.68	0.04	0.00	22	151781 2	14.13	1.17	17.26	22
151773 2	19.81	1.16	16.90	22	151782 2	12.72	1.16	17.20	22
151773 2	20.24	1.13	16.76	22	151782 2	12.50	1.16	17.16	22
151774 2	23.05	1.17	17.41	22	151783 2	11.21	1.14	17.20	22
151774 2	23.26	1.17	17.48	22	151783 2	11.38	1.12	17.01	22
151775 2	22.36	1.16	17.29	22	151784 2	10.96	1.15	17.40	22
151775 2	23.06	1.18	17.38	22	151784 2	11.16	1.17	17.29	22
151776 2	20.83	1.16	17.41	22	151785 2	11.57	1.19	17.69	22
151776 2	21.52	1.19	17.43	22	151785 2	11.59	1.19	17.61	22
151777 2	11.62	1.18	17.53	22	151786 2	11.22	1.18	17.31	22
151777 2	11.58	1.17	17.53	22	151786 2	10.91	1.18	17.45	22
151778 2	17.89	1.16	17.48	22	151787 2	11.58	1.22	18.83	22
151778 2	17.68	1.16	17.41	22	151787 2	11.37	1.23	18.64	22

ID	SiO4	PO4	NO2+NO3	WOCE QF	ID	SiO4	PO4	NO2+NO3	WOCE QF
151788 2	13.19	1.38	21.45	22	151797 2	12.35	1.15	17.23	22
151788 2	13.31	1.39	21.73	22	151797 2	12.57	1.18	17.29	22
151789 2	11.10	1.36	20.98	22	151798 2	16.65	1.15	16.82	22
151789 2	11.39	1.37	21.22	22	151798 2	16.83	1.16	17.11	22
151790 2	7.38	1.03	16.06	22	151799 2	14.26	1.14	16.57	22
151790 2	7.39	1.03	15.85	22	151799 2	14.49	1.13	16.98	22
151791 2	2.71	0.46	7.19	22	151800 2	13.00	1.15	16.92	22
151791 2	2.78	0.48	7.20	22	151800 2	12.91	1.23	17.11	22
151792 2	0.86	0.09	0.00	22	151801 2	11.80	1.15	17.36	22
151792 2	0.85	0.09	0.00	22	151801 2	11.86	1.15	17.36	22
151793 2	19.96	1.16	16.67	22	151802 2	11.13	1.16	17.55	22
151793 2	20.13	1.12	16.72	22	151802 2	11.29	1.17	17.45	22
151794 2	22.36	1.17	17.44	22	151803 2	10.94	1.17	17.98	22
151794 2	22.02	1.17	17.30	22	151803 2	11.15	1.20	17.91	22
151795 2	20.99	1.16	17.06	22	151804 2	11.28	1.21	18.16	22
151795 2	20.96	1.16	17.14	22	151804 2	11.27	1.18	18.21	22
151796 2	20.56	1.16	17.10	22	151805 2	11.29	1.21	18.51	22
151796 2	20.71	1.17	17.06	22	151805 2	11.34	1.20	18.39	22

ID	SiO4	PO4	NO2+NO3	WOCE QF	ID	SiO4	PO4	NO2+NO3	WOCE QF
151806				55	151815	19.90	1.19	17.55	22
5					2				
151806				55	151815	20.23	1.20	17.31	22
5					2				
151807	12.35	1.35	20.68	22	151816	21.47	1.17	17.41	22
2					2				
151807	12.44	1.37	20.59	22	151816	21.37	1.20	17.30	22
2					2				
151808	11.04	1.30	19.33	22	151817	19.10	1.23	17.37	22
2					2				
151808	11.19	1.30	19.27	22	151817	19.44	1.16	17.29	22
2					2				
151809	7.40	1.04	14.95	22	151818	17.63	1.18	17.14	22
2					2				
151809	7.50	1.06	14.99	22	151818	17.65	1.16	17.13	22
2					2				
151810	5.00	0.79	11.81	22	151819	15.57	1.15	17.10	22
2					2				
151810	4.90	0.77	11.75	22	151819	15.79	1.15	17.00	22
2					2				
151811	3.43	0.60	8.34	22	151820	13.57	1.13	16.96	22
2					2				
151811	3.36	0.57	8.22	22	151820	13.64	1.15	16.96	22
2					2				
151812	0.78	0.17	0.00	22	151821	13.21	1.16	16.78	22
2					2				
151812	0.82	0.17	0.00	22	151821	13.40	1.15	16.89	22
2					2				
151813	20.86	1.19	16.45	22	151822	11.92	1.15	16.77	22
2					2				
151813	21.24	1.23	16.91	22	151822	11.97	1.16	16.91	22
2					2				
151814	22.26	1.19	17.15	22	151823	11.41	1.16	17.04	22
2					2				
151814	22.27	1.18	17.23	22	151823	11.22	1.15	17.06	22
2					2				

ID	SiO4	PO4	NO2+NO3	WOCE QF	ID	SiO4	PO4	NO2+NO3	WOCE QF
151824 2	11.46	1.16	16.89	22	151833 2	23.10	1.18	17.06	22
151824 2	11.56	1.16	16.67	22	151833 2	23.49	1.17	17.13	22
151825 2	11.50	1.18	17.11	22	151834 2	21.76	1.18	17.04	22
151825 2	11.60	1.20	17.28	22	151834 2	21.85	1.20	17.18	22
151826 2	11.51	1.20	17.66	22	151835 2	22.95	1.20	17.10	22
151826 2	11.60	1.19	17.62	22	151835 2	22.84	1.19	16.94	22
151827 2	11.69	1.20	17.81	22	151836 2	22.34	1.25	17.07	22
151827 2	11.76	1.21	18.10	22	151836 2	22.41	1.20	17.23	22
151828 2	11.83	1.22	18.52	22	151837 2	16.21	1.18	16.98	22
151828 2	11.95	1.23	18.58	22	151837 2	16.42	1.16	16.89	22
151829 2	12.08	1.29	19.46	22	151838 2	18.26	1.18	16.85	22
151829 2	12.25	1.28	19.35	22	151838 2	18.28	1.16	16.66	22
151830 2	12.62	1.31	19.88	22	151839 2	16.11	1.17	16.74	22
151830 2	12.73	1.34	20.36	22	151839 2	16.21	1.16	16.66	22
151831 2	9.81	1.21	17.44	22	151840 2	14.24	1.13	16.88	22
151831 2	9.80	1.23	17.31	22	151840 2	14.42	1.14	16.67	22
151832 2	0.79	0.19	0.00	22	151841 2	13.66	1.15	16.78	22
151832 2	0.81	0.17	0.00	22	151841 2	13.89	1.15	17.14	22

ID	SiO4	PO4	NO2+NO3	WOCE QF	ID	SiO4	PO4	NO2+NO3	WOCE QF
151842 2	11.80	1.14	16.98	22	151851 2	6.40	0.94	11.97	22
151842 2	11.85	1.13	16.87	22	151851 2	6.23	0.94	11.80	22
151843 2	11.52	1.15	17.24	22	151852 2	0.86	0.21	0.00	22
151843 2	11.58	1.15	17.08	22	151852 2	0.84	0.21	0.00	22
151844 2	11.02	1.15	17.21	22	151853 2	16.49	1.11	15.67	22
151844 2	11.07	1.15	17.02	22	151853 2	16.66	1.10	15.92	22
151845 2	10.96	1.18	17.29	22	151854 2	20.54	1.17	16.62	22
151845 2	11.14	1.18	17.44	22	151854 2	20.59	1.16	16.38	22
151846 2	11.35	1.20	17.71	22	151855 2	21.44	1.20	16.72	22
151846 2	11.37	1.20	17.78	22	151855 2	21.54	1.21	17.04	22
151847 2	11.93	1.24	18.68	22	151856 2	21.90	1.17	17.06	22
151847 2	11.87	1.24	18.55	22	151856 2	22.03	1.22	17.21	22
151848 2	12.14	1.27	18.67	22	151857 2	14.78	1.14	16.18	22
151848 2	12.19	1.27	18.81	22	151857 2	14.46	1.13	16.08	22
151849 2	12.44	1.34	19.73	22	151858 2	14.36	1.12	16.09	22
151849 2	12.53	1.34	19.77	22	151858 2	14.38	1.12	16.11	22
151850 2	10.72	1.26	18.38	22	151859 2	15.38	1.17	16.66	22
151850 2	10.73	1.27	18.26	22	151859 2	15.19	1.16	16.42	22

ID	SiO4	PO4	NO2+NO3	WOCE QF	ID	SiO4	PO4	NO2+NO3	WOCE QF
151860 2	13.12	1.15	16.58	22	151869 2	9.80	1.06	16.96	22
151860 2	13.04	1.15	16.48	22	151869 2	9.77	1.07	16.85	22
151861 2	11.63	1.18	16.25	22	151870 2	9.77	1.06	17.17	22
151861 2	11.66	1.16	16.31	22	151870 2	9.85	1.04	17.21	22
151862 2	12.31	1.14	16.58	22	151871 2	8.85	1.04	16.26	22
151862 2	12.37	1.15	16.63	22	151871 2	8.91	1.03	16.17	22
151863 2	11.61	1.16	16.54	22	151872 2	1.02	0.19	0.00	22
151863 2	11.71	1.16	16.66	22	151872 2	1.07	0.21	0.00	22
151864 2	10.77	1.04	16.85	22	151873 2	15.49	1.00	16.19	22
151864 2	10.82	1.05	16.83	22	151873 2	15.57	1.00	16.08	22
151865 2	10.37	1.05	16.89	22	151874 2	19.02	1.05	16.97	22
151865 2	10.26	1.07	16.95	22	151874 2	19.27	1.07	17.04	22
151866 2	9.94	1.04	16.90	22	151875 2	20.08	1.11	17.22	22
151866 2	9.99	1.05	16.76	22	151875 2	20.04	1.09	17.04	22
151867 2	9.94	1.04	16.65	22	151876 2	19.16	1.08	16.81	22
151867 2	9.99	1.04	16.68	22	151876 2	18.63	1.09	16.80	22
151868 2	9.70	1.06	16.79	22	151877 2	15.23	1.07	16.59	22
151868 2	9.71	1.06	16.64	22	151877 2	15.66	1.06	16.77	22

ID	SiO4	PO4	NO2+NO3	WOCE QF	ID	SiO4	PO4	NO2+NO3	WOCE QF
151878 2	17.29	1.10	17.29	22	151887 2	10.09	1.06	17.23	22
151878 2	17.36	1.10	17.48	22	151887 2	10.10	1.05	17.04	22
151879 2	12.11	1.03	16.50	22	151888 2	10.39	1.03	16.95	22
151879 2	12.34	1.03	16.51	22	151888 2	10.16	1.04	17.10	22
151880 2	11.35	1.02	16.08	22	151889 2	9.70	1.06	17.06	22
151880 2	11.53	1.03	16.36	22	151889 2	9.87	1.06	17.00	22
151881 2	11.34	1.02	16.80	22	151890 2	9.98	1.08	17.22	22
151881 2	11.31	1.03	16.67	22	151890 2	9.98	1.09	17.28	22
151882 2	10.52	1.02	16.64	22	151891 2	9.79	1.09	16.92	22
151882 2	10.68	1.05	16.75	22	151891 2	9.82	1.09	16.79	22
151883 2	9.73	1.06	16.64	22	151892 2	1.34	0.23	0.49	22
151883 2	9.93	1.06	16.73	22	151892 2	1.41	0.23	0.67	22
151884 2	9.94	1.04	16.48	22	151893 2	12.94	1.00	15.66	22
151884 2	10.11	1.04	16.31	22	151893 2	13.24	1.00	16.12	22
151885 2	9.91	1.03	16.59	22	151894 2	12.67	1.02	16.14	22
151885 2	10.11	1.05	16.54	22	151894 2	12.94	1.03	16.19	22
151886 2	9.92	1.05	16.89	22	151895 2	12.49	1.02	16.27	22
151886 2	9.97	1.06	17.01	22	151895 2	12.77	1.01	16.08	22

ID	SiO4	PO4	NO2+NO3	WOCE QF	ID	SiO4	PO4	NO2+NO3	WOCE QF
151896 2	12.93	1.00	15.79	22	151905 2	9.94	1.05	16.57	22
151896 2	12.78	1.00	15.57	22	151905 2	9.96	1.04	16.67	22
151897 2	12.66	1.03	16.14	22	151906 2	9.97	1.07	17.18	22
151897 2	12.74	1.01	16.11	22	151906 2	10.01	1.06	16.97	22
151898 2	11.76	1.05	16.55	22	151907 2	9.70	1.07	16.83	22
151898 2	11.84	1.05	16.57	22	151907 2	9.79	1.07	16.84	22
151899 2	11.21	1.04	16.37	22	151908 2	7.28	0.91	13.37	22
151899 2	11.32	1.04	16.58	22	151908 2	7.20	0.90	13.51	22
151900 2	10.78	1.04	16.43	22	151909 2	1.56	0.25	0.90	22
151900 2	11.00	1.04	16.44	22	151909 2	1.59	0.25	1.02	22
151901 2	10.98	1.03	16.26	22	151910 2	9.98	1.07	16.28	22
151901 2	10.61	1.03	16.40	22	151910 2	10.01	1.05	16.70	22
151902 2	10.32	1.04	16.41	22	151911 2	9.82	1.06	16.92	22
151902 2	10.44	1.05	16.40	22	151911 2	9.84	1.05	16.86	22
151903 2	9.92	1.04	16.57	22	151912 2	10.97	1.07	16.70	22
151903 2	10.16	1.04	16.74	22	151912 2	10.94	1.10	17.10	22
151904 2	10.13	1.03	16.32	22	151913 2	8.98	1.03	15.97	22
151904 2	10.16	1.02	16.35	22	151913 2	9.00	1.04	15.92	22

ID	SiO4	PO4	NO2+NO3	WOCE QF	ID	SiO4	PO4	NO2+NO3	WOCE QF
151914 2	1.07	0.27	0.00	22	151923 2	12.47	1.10	17.07	22
151914 2	1.11	0.20	0.00	22	151923 2	12.49	1.09	17.18	22
151915 2	12.27	1.15	16.97	22	151924 2	9.44	1.03	15.83	22
151915 2	12.56	1.15	17.28	22	151924 2	9.39	1.06	15.82	22
151916 2	6.18	0.95	12.90	22	151925 2	3.85	0.74	7.57	22
151916 2	6.12	0.95	12.64	22	151925 2	3.75	0.76	7.61	22
151917 2	0.98	0.21	0.00	22	151926 2	1.43	0.23	0.44	22
151917 2	0.83	0.21	0.00	22	151926 2	1.48	0.24	0.52	22
151918 2	9.28	1.08	15.39	22	151927 2	9.66	1.05	16.36	22
151918 2	9.36	1.08	15.43	22	151927 2	9.83	1.04	16.24	22
151919 2	0.74	0.18	0.00	22	151928 2	9.68	1.13	16.41	22
151919 2	0.77	0.20	0.00	22	151928 2	9.86	1.04	16.71	22
151920 2	14.65	1.26	18.66	22	151929 2	9.74	1.06	16.75	22
151920 2	14.76	1.24	18.62	22	151929 2	9.82	1.07	16.62	22
151921 2	2.64	0.81	9.30	22	151930 2	9.34	1.05	16.35	22
151921 2	2.72	0.81	9.52	22	151930 2	9.23	1.08	16.46	22
151922 2	0.71	0.28	0.00	22	151931 2	1.51	0.28	0.98	22
151922 2	0.69	0.21	0.00	22	151931 2	1.56	0.27	1.21	22

ID	SiO4	PO4	NO2+NO3	WOCE QF	ID	SiO4	PO4	NO2+NO3	WOCE QF
151932 2	9.56	1.04	16.10	22	151941 2	12.99	1.02	15.60	22
151932 2	9.63	1.04	16.38	22	151941 2	13.09	1.01	15.73	22
151933 2	9.88	1.04	16.47	22	151942 2	12.57	1.01	15.97	22
151933 2	9.91	1.05	16.61	22	151942 2	12.58	1.03	15.95	22
151934 2	9.66	1.05	16.46	22	151943 2	12.36	1.03	15.70	22
151934 2	9.72	1.06	16.44	22	151943 2	12.42	1.04	15.90	22
151935 2	9.84	1.05	16.52	22	151944 2	12.33	1.06	16.02	22
151935 2	9.87	1.06	16.54	22	151944 2	12.41	1.03	15.92	22
151936 2	9.97	1.05	16.68	22	151945 2	12.14	1.04	16.08	22
151936 2	10.05	1.06	16.85	22	151945 2	12.02	1.04	16.16	22
151937 2	9.48	1.06	16.68	22	151946 2	12.05	1.05	16.06	22
151937 2	9.31	1.05	16.68	22	151946 2	12.12	1.04	16.04	22
151938 3	9.45	1.05	16.66	33	151947 2	11.78	1.04	15.95	22
151938 3	9.46	1.05	16.43	33	151947 2	11.82	1.04	16.20	22
151939 3	8.70	1.04	15.54	33	151948 2	11.03	1.05	16.03	22
151939 3	8.70	1.02	15.55	33	151948 2	11.13	1.08	16.24	22
151940 3	0.90	0.21	0.18	33	151949 2	10.67	1.07	16.38	22
151940 3	0.93	0.20	0.07	33	151949 2	10.66	1.08	16.77	22

ID	SiO4	PO4	NO2+NO3	WOCE QF	ID	SiO4	PO4	NO2+NO3	WOCE QF
151950 2	9.82	1.05	16.62	22	151959 2	11.85	1.25	18.91	22
151950 2	9.66	1.05	16.41	22	151959 2	11.86	1.21	19.02	22
151951 2	9.58	1.07	16.45	22	151960 2	4.09	0.90	11.27	22
151951 2	9.68	1.06	16.45	22	151960 2	4.15	0.99	11.23	22
151952 2	9.67	1.07	16.62	22	151961 2	14.43	1.00	15.18	22
151952 2	9.77	1.07	16.64	22	151961 2	14.53	0.99	15.56	22
151953 2	9.74	1.08	16.74	22	151962 2	15.93	1.02	15.80	22
151953 2	9.94	1.09	16.89	22	151962 2	16.18	1.01	15.91	22
151954 2	9.74	1.07	16.71	22	151963 2	17.30	1.03	16.66	22
151954 2	9.82	1.07	16.95	22	151963 2	17.21	1.02	16.57	22
151955 2	9.64	1.08	16.87	22	151964 2	13.99	1.00	16.29	22
151955 2	9.56	1.07	16.74	22	151964 2	14.06	1.00	16.03	22
151956 2	9.26	1.07	16.48	22	151965 2	16.75	1.06	16.93	22
151956 2	9.29	1.09	16.47	22	151965 2	16.81	1.11	17.09	22
151957 2	10.88	1.15	17.79	22	151966 2	15.13	1.06	16.84	22
151957 2	10.75	1.16	17.59	22	151966 2	15.27	1.06	16.83	22
151958 2	12.66	1.24	18.44	22	151967 2	14.68	1.04	16.71	22
151958 2	11.93	1.19	18.44	22	151967 2	14.64	1.04	17.04	22

ID	SiO4	PO4	NO2+NO3	WOCE QF	ID	SiO4	PO4	NO2+NO3	WOCE QF
151968 2	13.29	1.05	17.12	22	151977 2	10.92	1.06	17.71	22
151968 2	13.74	1.05	17.30	22	151977 2	10.99	1.07	17.76	22
151969 2	12.58	1.02	16.39	22	151978 2	12.47	1.12	18.84	22
151969 2	12.70	1.02	16.74	22	151978 2	12.15	1.12	18.87	22
151970 2	11.28	1.01	16.80	22	151979 2	10.04	1.04	16.73	22
151970 2	11.52	1.00	16.65	22	151979 2	10.13	1.05	16.92	22
151971 2	10.77	1.00	16.91	22	151980 2	0.98	0.18	0.00	22
151971 2	10.85	0.99	16.87	22	151980 2	1.41	0.16	0.00	22
151972 2	11.47	1.01	17.15	22	151981 2	13.98	0.92	15.39	22
151972 2	11.52	1.03	17.04	22	151981 2	14.34	0.92	15.54	22
151973 2	10.39	1.01	16.72	22	151982 2	17.72	0.98	16.25	22
151973 2	10.31	1.01	16.69	22	151982 2	17.56	0.97	16.20	22
151974 2	10.47	1.01	16.78	22	151983 2	15.72	0.96	15.88	22
151974 2	10.41	1.01	16.75	22	151983 2	15.65	0.98	15.92	22
151975 2	10.70	1.02	17.38	22	151984 2	13.71	0.98	16.39	22
151975 2	10.86	1.03	17.49	22	151984 2	13.72	1.00	16.50	22
151976 2	10.43	1.01	17.42	22	151985 2	13.90	1.00	16.78	22
151976 2	10.53	1.01	17.00	22	151985 2	13.94	0.99	16.84	22

ID	SiO4	PO4	NO2+NO3	WOCE QF	ID	SiO4	PO4	NO2+NO3	WOCE QF
151986 2	13.72	1.00	16.50	22	151995 2	11.86	1.12	18.88	22
151986 2	13.75	1.00	16.68	22	151995 2	12.32	1.13	19.02	22
151987 2	13.25	1.01	16.55	22	151996 2	12.53	1.20	20.03	22
151987 2	13.35	1.01	16.63	22	151996 2	12.49	1.19	19.97	22
151988 2	11.88	1.00	16.69	22	151997 2	11.83	1.22	20.05	22
151988 2	11.87	1.01	16.75	22	151997 2	11.89	1.22	20.29	22
151989 2	11.98	1.02	16.89	22	151998 2	10.20	1.15	19.49	22
151989 2	12.31	1.02	17.25	22	151998 2	10.41	1.15	19.48	22
151990 2	11.81	1.04	17.56	22	151999 2	3.97	0.57	10.10	22
151990 2	11.72	1.04	17.39	22	151999 2	4.08	0.57	10.04	22
151991 2	11.59	1.04	17.48	22	152000 2	0.94	0.14	0.60	22
151991 2	11.57	1.04	17.42	22	152000 2	0.84	0.15	0.49	22
151992 2	11.30	1.05	17.72	22	152001 2	15.16	1.00	15.81	22
151992 2	11.42	1.05	17.63	22	152001 2	15.38	0.99	15.84	22
151993 2	11.52	1.06	17.91	22	152002 2	18.94	1.03	16.41	22
151993 2	11.64	1.06	17.78	22	152002 2	19.54	1.04	16.59	22
151994 2	11.45	1.06	17.78	22	152003 2	19.62	1.06	16.76	22
151994 2	11.53	1.07	17.70	22	152003 2	19.79	1.07	17.06	22

ID	SiO4	PO4	NO2+NO3	WOCE QF	ID	SiO4	PO4	NO2+NO3	WOCE QF
152004 2	15.27	1.03	16.07	22	152013 2	10.88	1.10	17.94	22
152004 2	15.28	1.02	16.18	22	152013 2	10.92	1.10	17.80	22
152005 2	12.70	1.02	16.30	22	152014 2	10.58	1.11	17.98	22
152005 2	12.75	1.03	16.33	22	152014 2	10.59	1.15	17.85	22
152006 2	14.48	1.05	16.68	22	152015 2	11.28	1.16	18.59	22
152006 2	14.32	1.05	16.72	22	152015 2	11.29	1.18	18.64	22
152007 2	13.69	1.06	16.94	22	152016 2	11.72	1.23	19.46	22
152007 2	13.59	1.05	16.89	22	152016 2	11.75	1.24	19.61	22
152008 2	12.31	1.08	16.96	22	152017 2	10.54	1.21	19.34	22
152008 2	12.45	1.07	17.05	22	152017 2	10.57	1.21	19.40	22
152009 2	11.40	1.08	17.02	22	152018 2	7.30	0.96	15.09	22
152009 2	11.42	1.07	17.26	22	152018 2	7.34	0.95	15.24	22
152010 2	11.46	1.06	17.17	22	152019 2	2.48	0.42	6.84	22
152010 2	11.49	1.07	17.34	22	152019 2	2.45	0.43	6.72	22
152011 2	10.75	1.08	17.17	22	152020 2	1.06	0.19	1.43	22
152011 2	10.79	1.07	17.01	22	152020 2	1.15	0.19	1.49	22
152012 2	11.09	1.10	17.71	22	152021 2	13.09	1.00	15.33	22
152012 2	11.02	1.10	17.52	22	152021 2	13.16	0.98	15.35	22

ID	SiO4	PO4	NO2+NO3	WOCE QF	ID	SiO4	PO4	NO2+NO3	WOCE QF
152022 2	15.08	1.05	16.08	22	152031 2	10.04	1.08	17.09	22
152022 2	15.09	1.03	16.06	22	152031 2	10.05	1.08	17.11	22
152023 2	15.56	1.04	16.23	22	152032 2	10.38	1.08	17.18	22
152023 2	15.68	1.05	16.28	22	152032 2	10.09	1.08	17.27	22
152024 2	17.41	1.09	16.92	22	152033 2	10.44	1.11	17.69	22
152024 2	17.52	1.07	16.90	22	152033 2	10.45	1.10	17.59	22
152025 2	16.00	1.06	16.85	22	152034 2	10.09	1.12	17.50	22
152025 2	16.04	1.07	16.86	22	152034 2	10.39	1.11	17.76	22
152026 2	14.53	1.06	16.64	22	152035 2	10.66	1.15	18.32	22
152026 2	14.71	1.06	16.53	22	152035 2	10.71	1.15	18.18	22
152027 2	12.51	1.06	16.71	22	152036 2	11.30	1.23	19.50	22
152027 2	12.49	1.06	16.78	22	152036 2	11.62	1.23	19.57	22
152028 2	11.30	1.05	16.81	22	152037 2	8.37	1.04	16.67	22
152028 2	11.35	1.06	16.69	22	152037 2	8.46	1.04	16.74	22
152029 2	10.29	1.06	16.76	22	152038 2	3.71	0.58	9.64	22
152029 2	10.31	1.06	16.96	22	152038 2	3.69	0.60	9.52	22
152030 2	9.99	1.07	16.95	22	152039 2	1.10	0.19	1.49	22
152030 2	10.12	1.07	16.87	22	152039 2	0.95	0.19	1.38	22

ID	SiO4	PO4	NO2+NO3	WOCE QF	ID	SiO4	PO4	NO2+NO3	WOCE QF
152040 2	1.04	0.19	1.18	22	152049 2	10.75	1.09	16.91	22
152040 2	1.07	0.19	1.19	22	152049 2	10.89	1.33	16.88	22
152041 2	13.72	1.00	15.37	22	152050 2	10.41	1.05	16.36	22
152041 2	13.84	0.99	15.65	22	152050 2	10.44	1.03	16.43	22
152042 2	13.79	0.99	15.65	22	152051 2	10.63	1.04	16.93	22
152042 2	13.86	1.02	15.40	22	152051 2	10.82	1.04	17.13	22
152043 2	17.28	1.08	16.59	22	152052 2	10.58	1.04	17.03	22
152043 2	17.16	1.07	16.57	22	152052 2	11.29	1.04	17.08	22
152044 2	14.99	1.05	16.64	22	152053 2	10.14	1.04	16.81	22
152044 2	15.05	1.06	16.63	22	152053 2	10.11	1.03	16.95	22
152045 2	14.31	1.08	16.80	22	152054 2	11.18	1.10	17.73	22
152045 2	14.34	1.07	16.76	22	152054 2	11.42	1.10	17.70	22
152046 2	12.97	1.08	16.85	22	152055 2	11.45	1.11	18.60	22
152046 2	13.03	1.08	16.79	22	152055 2	11.32	1.12	18.12	22
152047 2	11.74	1.10	16.91	22	152056 2	12.35	1.18	19.61	22
152047 2	11.56	1.06	16.92	22	152056 2	12.15	1.18	19.41	22
152048 2	10.16	1.07	16.60	22	152057 2	12.31	1.27	20.25	22
152048 2	10.10	1.17	16.68	22	152057 2	12.40	1.26	20.06	22

ID	SiO4	PO4	NO2+NO3	WOCE QF	ID	SiO4	PO4	NO2+NO3	WOCE QF
152058 2	5.91	0.75	13.50	22	152067 2	11.15	1.01	16.48	22
152058 2	6.02	0.75	13.72	22	152067 2	11.28	1.04	16.37	22
152059 2	3.69	0.53	9.77	22	152068 2	11.83	1.04	16.88	22
152059 2	3.73	0.52	9.75	22	152068 2	12.01	1.04	16.79	22
152060 2	0.93	0.10	0.00	22	152069 5				55
152060 2	0.96	0.10	0.00	22	152069 5				55
152061 2	18.28	1.00	16.32	22	152070 2	11.39	1.04	17.15	22
152061 3	18.11	1.01	18.08	22	152070 2	11.43	1.04	16.97	22
152062 2	18.25	1.01	16.50	22	152071 2	11.23	1.08	17.69	22
152062 2	18.47	1.02	16.74	22	152071 2	11.15	1.07	17.63	22
152063 5				55	152072 2	11.37	1.09	17.86	22
152063 2	19.40	1.05	17.00	22	152072 2	11.29	1.10	17.92	22
152064 2	17.94	1.04	16.73	22	152073 2	11.58	1.12	18.20	22
152064 2	18.08	1.03	16.89	22	152073 2	11.60	1.13	18.24	22
152065 2	11.80	1.04	17.36	22	152074 2	11.73	1.16	18.73	22
152065 2	11.68	1.04	17.31	22	152074 2	11.78	1.16	18.59	22
152066 2	13.64	1.04	16.72	22	152075 2	12.07	1.29	19.55	22
152066 2	13.70	1.02	16.98	22	152075 2	12.13	1.23	19.79	22

ID	SiO4	PO4	NO2+NO3	WOCE QF	ID	SiO4	PO4	NO2+NO3	WOCE QF
152076 2	11.46	1.20	19.47	22	152085 2	16.98	1.06	16.98	22
152076 2	11.48	1.20	19.57	22	152085 2	17.09	1.06	17.05	22
152077 2	5.85	0.74	12.42	22	152086 2	14.89	1.05	16.93	22
152077 2	5.85	0.76	12.36	22	152086 2	15.27	1.04	17.10	22
152078 2	3.96	0.55	9.58	22	152087 2	13.03	1.02	16.52	22
152078 2	3.98	0.56	9.61	22	152087 2	13.24	1.03	16.47	22
152079 2	1.57	0.23	3.60	22	152088 2	12.71	1.05	16.65	22
152079 2	1.60	0.23	3.73	22	152088 2	12.84	1.06	16.93	22
152080 2	0.95	0.09	0.00	22	152089 2	11.58	1.05	16.66	22
152080 2	0.95	0.09	0.00	22	152089 2	11.60	1.04	16.96	22
152081 2	17.14	0.99	15.88	22	152090 2	11.21	1.05	16.86	22
152081 2	17.47	1.00	15.64	22	152090 2	11.25	1.04	16.93	22
152082 2	19.36	1.03	16.76	22	152091 2	11.32	1.06	16.88	22
152082 2	19.38	1.04	16.51	22	152091 2	11.34	1.06	16.54	22
152083 2	19.04	1.03	16.39	22	152092 2	11.08	1.07	17.41	22
152083 2	19.49	1.05	16.44	22	152092 2	11.04	1.08	17.51	22
152084 2	18.26	1.03	16.41	22	152093 2	11.30	1.08	17.64	22
152084 2	18.24	1.05	16.54	22	152093 2	11.30	1.09	17.79	22

ID	SiO4	PO4	NO2+NO3	WOCE QF	ID	SiO4	PO4	NO2+NO3	WOCE QF
152094 2	11.80	1.15	18.75	22	152103 2	17.66	1.06	16.88	22
152094 2	12.19	1.16	18.76	22	152103 2	17.87	1.08	16.97	22
152095 2	12.18	1.20	19.29	22	152104 2	15.75	1.05	16.83	22
152095 2	12.25	1.17	19.24	22	152104 2	15.84	1.06	16.86	22
152096 2	12.06	1.30	20.72	22	152105 2	13.95	1.06	16.81	22
152096 2	11.93	1.27	21.03	22	152105 2	14.05	1.06	16.66	22
152097 2	8.15	0.98	16.16	22	152106 2	13.19	1.06	16.69	22
152097 2	8.16	0.98	16.14	22	152106 2	13.22	1.06	16.84	22
152098 2	5.12	0.71	11.84	22	152107 2	11.48	1.05	16.63	22
152098 2	5.15	0.71	11.97	22	152107 2	11.62	1.05	16.72	22
152099 2	2.91	0.42	7.23	22	152108 2	10.61	1.05	16.49	22
152099 2	2.97	0.44	7.18	22	152108 2	10.75	1.06	16.63	22
152100 2	1.23	0.16	1.86	22	152109 2	11.05	1.08	16.97	22
152100 2	1.24	0.16	1.80	22	152109 2	11.14	1.07	16.76	22
152101 2	19.23	1.03	16.43	22	152110 2	11.10	1.07	17.25	22
152101 2	19.44	1.06	16.76	22	152110 2	11.03	1.08	17.33	22
152102 2	18.84	1.07	16.68	22	152111 5				55
152102 2	18.98	1.09	16.81	22	152111 2	11.05	1.08	17.59	22

ID	SiO4	PO4	NO2+NO3	WOCE QF	ID	SiO4	PO4	NO2+NO3	WOCE QF
152112 2	11.14	1.11	17.71	22	152121 2	22.88	1.10	17.03	22
152112 2	11.25	1.11	17.69	22	152121 2	22.94	1.10	17.43	22
152113 2	11.58	1.18	18.02	22	152122 2	23.19	1.14	17.73	22
152113 2	11.69	1.14	18.18	22	152122 2	23.33	1.13	17.58	22
152114 2	11.84	1.18	18.53	22	152123 2	22.01	1.17	17.27	22
152114 2	11.92	1.17	18.84	22	152123 2	22.20	1.15	17.54	22
152115 2	12.07	1.22	18.69	22	152124 2	21.58	1.16	17.82	22
152115 2	12.21	1.22	18.95	22	152124 2	21.66	1.16	17.91	22
152116 2	9.70	1.13	18.06	22	152125 2	18.44	1.14	17.74	22
152116 2	9.78	1.12	18.06	22	152125 2	18.40	1.17	17.62	22
152117 2	5.54	0.74	12.03	22	152126 2	15.72	1.13	17.45	22
152117 2	5.52	0.76	12.11	22	152126 2	15.85	1.12	17.41	22
152118 2	3.26	0.51	8.30	22	152127 2	13.75	1.12	17.38	22
152118 2	3.32	0.50	8.32	22	152127 2	14.00	1.12	17.26	22
152119 2	2.09	0.37	5.59	22	152128 2	12.74	1.14	17.30	22
152119 2	2.09	0.35	5.70	22	152128 2	12.86	1.14	17.34	22
152120 2	0.79	0.11	0.00	22	152129 2	11.69	1.13	17.32	22
152120 2	0.84	0.11	0.00	22	152129 2	11.61	1.11	17.29	22

ID	SiO4	PO4	NO2+NO3	WOCE QF	ID	SiO4	PO4	NO2+NO3	WOCE QF
152130 2	10.68	1.09	16.89	22	152139 2	4.58	0.71	11.15	22
152130 2	10.91	1.11	17.19	22	152139 2	4.71	0.71	11.35	22
152131 2	10.62	1.13	16.82	22	152140 2	2.11	0.42	6.45	22
152131 2	10.63	1.10	16.95	22	152140 2	2.14	0.41	6.44	22
152132 2	10.86	1.10	17.35	22	152141 2	18.42	1.06	16.27	22
152132 2	10.87	1.12	17.31	22	152141 2	18.34	1.08	16.36	22
152133 2	10.97	1.13	17.84	22	152142 2	24.21	1.15	17.61	22
152133 2	11.07	1.14	18.11	22	152142 2	24.26	1.15	17.58	22
152134 2	11.00	1.14	18.18	22	152143 2	20.22	1.11	17.33	22
152134 2	11.14	1.15	18.60	22	152143 2	20.47	1.11	16.92	22
152135 2	11.36	1.23	19.32	22	152144 2	20.45	1.12	17.14	22
152135 2	11.42	1.21	19.31	22	152144 2	20.62	1.14	17.57	22
152136 2	11.72	1.32	20.45	22	152145 2	18.45	1.13	17.53	22
152136 2	11.78	1.28	20.39	22	152145 2	18.09	1.14	17.23	22
152137 2	11.57	1.28	20.58	22	152146 2	17.89	1.12	17.37	22
152137 2	11.57	1.29	20.70	22	152146 2	17.82	1.12	17.58	22
152138 2	11.15	1.30	20.71	22	152147 2	15.28	1.10	17.07	22
152138 2	11.26	1.28	20.65	22	152147 2	15.50	1.12	17.45	22

ID	SiO4	PO4	NO2+NO3	WOCE QF	ID	SiO4	PO4	NO2+NO3	WOCE QF
152148 2	13.76	1.11	17.44	22	152157 2	10.72	1.23	19.43	22
152148 2	13.78	1.14	17.51	22	152157 2	10.78	1.24	19.52	22
152149 2	12.24	1.11	17.38	22	152158 2	5.89	0.84	13.35	22
152149 2	12.34	1.10	17.30	22	152158 2	5.99	0.82	13.40	22
152150 2	12.61	1.11	17.46	22	152159 2	1.91	0.34	5.67	22
152150 2	12.72	1.12	17.48	22	152159 2	1.89	0.35	5.58	22
152151 2	11.72	1.11	17.38	22	152160 2	0.83	0.13	0.48	22
152151 2	11.51	1.10	17.29	22	152160 2	0.98	0.13	0.42	22
152152 2	11.44	1.11	17.52	22	152161 2	31.92	1.28	19.15	22
152152 2	11.53	1.15	17.64	22	152161 2	31.41	1.26	18.99	22
152153 2	11.30	1.14	17.78	22	152162 2	27.66	1.25	18.36	22
152153 2	11.23	1.16	17.88	22	152162 2	28.10	1.24	18.46	22
152154 2	11.44	1.18	18.70	22	152163 2	23.50	1.18	17.55	22
152154 2	11.33	1.16	18.23	22	152163 2	23.74	1.20	17.69	22
152155 2	11.70	1.21	19.06	22	152164 2	22.33	1.20	18.02	22
152155 2	12.02	1.22	18.77	22	152164 2	22.96	1.20	18.05	22
152156 2	11.97	1.30	20.47	22					
152156 2	12.02	1.28	20.22	22					

ID	SiO4	PO4	NO2+NO3	WOCE QF	ID	SiO4	PO4	NO2+NO3	WOCE QF
152165 2	20.16	1.18	17.79	22	152174 2	12.81	1.34	20.08	22
152165 2	20.25	1.16	17.74	22	152174 2	12.72	1.31	20.25	22
152166 5				55	152175 2	14.01	1.45	23.13	22
152166 2	16.37	1.14	16.87	22	152175 2	13.75	1.49	22.93	22
152167 2	14.54	1.12	17.08	22	152176 2	8.57	1.11	16.49	22
152167 2	14.65	1.18	17.50	22	152176 2	8.59	1.09	16.62	22
152168 2	13.77	1.20	17.77	22	152177 2	4.58	0.70	11.24	22
152168 2	13.99	1.15	17.78	22	152177 2	4.58	0.70	11.51	22
152169 2	11.69	1.12	17.43	22	152178 2	1.99	0.31	5.15	22
152169 2	11.70	1.08	16.98	22	152178 2	2.03	0.32	5.13	22
152170 2	11.15	1.13	17.46	22	152179 2	1.82	0.27	4.50	22
152170 2	11.19	1.13	17.24	22	152179 2	1.88	0.27	4.43	22
152171 2	10.74	1.13	17.30	22	152180 2	0.94	0.09	0.00	22
152171 2	10.82	1.13	17.29	22	152180 2	0.93	0.15	0.00	22
152172 2	11.36	1.17	17.76	22					
152172 2	11.61	1.18	17.82	22					
152173 2	11.69	1.21	18.94	22					
152173 2	11.73	1.28	18.86	22					

5. Dissolved Inorganic Carbon in Seawater

Bob Gershey

a. Description of Equipment and Technique

The total dissolved inorganic carbon content of seawater was defined as the total concentration of carbonate ion, bicarbonate ion and unionized species of carbon dioxide. Before analysis, the sample was treated with acid to convert all ionized species to the unionized form, which was then separated from the liquid phase and subsequently measured by the coulometric titration technique. This involved the reaction of carbon dioxide gas with a dimethylsulfoxide solution of ethanoline to produce hydroxyethylcarbamic acid. The acidic solution was titrated with hydroxide ion formed by the electrolytic decomposition of water. The progress of the titration was followed through colorimetric measurement of the absorbance of a Ph indicator dye (thymolphthalein) in the ethanoline solution.

A known volume of seawater was dispensed into a stripping chamber from a pipet of known volume and temperature controlled to within 0.4 °C. It was then acidified with ten percent of its volume with an eight percent solution of carbon dioxide-free phosphoric acid. The solution was stripped of carbon dioxide gas by bubbling with a stream of nitrogen gas directed through a glass frit. The carrier gas exiting the stripper passed through a magnesium perchlorate trap which removed water vapour and acidic water droplets.

The gas stream was then directed into the coulometric titrator where the total amount of carbon dioxide gas was quantified. The coulometer was calibrated in two ways. Calibration using gas loops was accomplished by filling stainless steel sample loops (1.5, 2.5 ml) with 99.995% carbon dioxide gas and injecting these into the coulometer. The temperature and pressure of the gas within the loops must be known to within 0.05 °C and 20 Pa respectively. Standard solutions of sodium carbonate were also used to calibrate the system. These samples were treated in the same manner as a seawater sample.

Values were reported in units of $\mu\text{mol/kg}$. The overall precision of the analysis should have been at least 1.5 $\mu\text{mol/kg}$ for samples with concentrations in the range of 1800-2300 $\mu\text{mol/kg}$.

b. Sampling Procedure and Data Processing Technique

Water samples were initially collected using a Niskin bottle or similar sampler. Samples for analysis of total inorganic carbon were taken as soon as possible after recovery of the samples to minimize exchange of carbon dioxide gas with the head space in the sampler which would typically result in a loss of carbon dioxide. It was desirable that the samples be drawn before half the sampler was emptied and within ten minutes of recovery. Clean borosilicate glass bottles were rinsed twice with 30 - 50 ml of the sample. The bottle was then filled from the bottom using a

length of vinyl tubing attached to the spigot of the sampler. The sample was overflowed by at least one half of the volume of the bottle (typically 250 ml). A head space of one percent was left to allow for expansion without leakage. If samples were not to be analyzed within four to five hours, the samples were poisoned with 100 µl/250 ml of 50% saturated mercuric chloride solution. The bottle was tightly sealed and stored near the temperature of collection.

c. Replicate Analysis

In total, 105 replicate carbonate measurements were obtained for 99 sample id numbers. Six sample id numbers had two replicates, while the remaining 93 sample id numbers only had one replicate. The replicate for sample id number, 151847 (1 replicate), could not be obtained because of a system malfunction. Thus, only 98 sample id numbers were available to be used in calculating replicate difference statistics. The following is a statistical summary of the absolute value of the differences between replicates. Table C.4 lists all replicate measurements.

Number of Replicate Differences = 6 ids had two replicates * 3 possible differences + 92 ids had one replicate * 1 possible difference = 18 + 92 = 110

Statistic	Value
Number of Replicate Differences	110
Minimum (µmoles/kg)	0
Maximum (µmoles/kg)	290.2
Mean (µmoles/kg)	12.8
Median (µmoles/kg)	1.1
Standard Deviation (µmoles/kg)	46.8

Table C.4 Replicate water sample total carbon values in $\mu\text{moles/kg}$.

Sample ID Number	Total Carbon	WOCE QF	Sample ID Number	Total Carbon	WOCE QF
150625	2158.7	2			
150625	2158.6	2	150839	2169.1	2
			150839	2169.4	2
150659	2165.7	2			
150659	2167.5	2	150862	2162.2	2
			150862	2164.0	2
150664	2123.6	2			
150664	2130.3	2			
150675	2161.6	2			
150675	2162.4	2			
150710	2156.5	2			
150710	2156.9	2			
150714	2165.2	2			
150714	2166.0	2			
150727	2162.0	2			
150727	2160.7	2			
150731	2138.2	2			
150731	2170.0	2			
150748	2157.2	2			
150748	2157.6	2			
150759	2184.6	2			
150759	2184.7	2			
150762	2166.1	2			
150762	2168.1	2			
150764	2153.1	2			
150764	2155.4	2			
150801	2181.3	2			
150801	2178.2	2			
150803	2170.4	2			
150803	2169.2	2			
150819	2183.9	2			
150819	2185.2	2			

Table C.4 Replicate water sample total carbon values in $\mu\text{moles/kg}$.

Sample ID Number	Total Carbon	WOCE QF	Sample ID Number	Total Carbon	WOCE QF
150912	2172.8	2	151098	2164.9	2
150912	2174.3	2	151098	2166.3	2
150922	2165.4	2	151121	2166.8	2
150922	2165.5	2	151121	2165.7	2
150932	2177.8	2			
150932	2179.3	2			
150940	2175.2	2			
150940	2174.9	2			
150953	2140.9	2			
150953	2142.0	2			
150963	2160.5	2			
150963	2160.9	2			
150988	2157.3	2			
150988	2158.9	2			
150992	2176.3	2			
150992	2176.5	2			
150999	2179.2	2			
150999	2180.3	2			
151025	2158.2	2			
151025	2158.3	2			
151025	2159.4	2			
151039	2057.7	2			
151039	2178.2	2			
151039	2178.8	2			
151046	2152.4	2			
151046	2153.2	2			
151076	2022.5	2			
151076	2024.6	2			
151082	2158.4	2			
151082	2160.4	2			

Sample ID Number	Total Carbon	WOCE QF	Sample ID Number	Total Carbon	WOCE QF
151122	2136.7	2	151371	2134.8	2
151122	2157.9	2			
151122	2163.0	2	151378	2108.5	2
			151378	2107.2	2
151147	2149.3	2			
151147	2150.6	2	151382	2130.5	2
151147	2157.9	2	151382	2130.3	2
151165	2154.5	2			
151165	2154.9	2			
151187	2154.4	2			
151187	2157.8	2			
151217	2174.3	2			
151217	2174.4	2			
151225	2153.0	2			
151225	2154.1	2			
151241	2158.1	2			
151241	2158.7	2			
151252	2161.7	2			
151252	2161.9	2			
151256	2025.7	2			
151256	2027.3	2			
151282	2152.2	2			
151282	2151.5	2			
151322	2149.4	2			
151322	2152.1	2			
151340	2151.6	2			
151340	2152.8	2			
151356	2148.8	2			
151356	2149.3	2			
151367	2149.2	2			
151367	2149.4	2			
151371	2133.7	2			

Sample ID Number	Total Carbon	WOCE QF	Sample ID Number	Total Carbon	WOCE QF
151385	2116.5	2	151556	2159.0	2
151385	2117.9	2			
			151566	2158.9	2
151389	2147.5	2	151566	2159.7	2
151389	2148.0	2			
			151574	2162.9	2
151393	2151.1	2	151574	2163.9	2
151393	2151.6	2			
151402	2150.9	2			
151402	2152.2	2			
151402	2153.0	2			
151410	1998.4	2			
151410	1998.3	2			
151412	1912.2	2			
151412	2151.7	2			
151422	2149.6	2			
151422	2150.4	2			
151425	2152.7	2			
151425	2153.0	2			
151437	2152.2	2			
151437	2152.5	2			
151456	2150.5	2			
151456	2151.7	2			
151494	2161.3	2			
151494	2161.7	2			
151498	2154.6	2			
151498	2156.2	2			
151501	1939.5	2			
151501	1954.1	2			
151501	2150.4	2			
151516	2155.2	2			
151516	2156.3	2			
151556	2157.6	2			

Sample ID Number	Total Carbon	WOCE QF	Sample ID Number	Total Carbon	WOCE QF
151590	2098.5	2	151847		5
151590	2099.3	2	151847	2167.3	2
151594	2171.4	2			
151594	2167.1	2			
151628	2171.1	2			
151628	2172.0	2			
151635	2161.0	2			
151635	2162.0	2			
151655	2121.6	2			
151655	2124.2	2			
151667	2078.9	2			
151667	2082.8	2			
151675	1879.5	2			
151675	2169.7	2			
151696	2167.6	2			
151696	2168.3	2			
151717	2161.9	2			
151717	2162.0	2			
151719	2157.8	2			
151719	2159.8	2			
151757	2168.0	2			
151757	2169.9	2			
151783	2151.2	2			
151783	2153.9	2			
151800	2154.5	2			
151800	2156.0	2			
151815	2162.7	2			
151815	2163.9	2			
151840	2158.3	2			
151840	2157.6	2			

Sample ID Number	Total Carbon	WOCE QF	Sample ID Number	Total Carbon	WOCE QF
151856	2164.6	2	152164	2168.5	2
151856	2164.9	2	152164	2167.4	2
151874	2161.5	2			
151874	2162.0	2			
151897	2152.9	2			
151897	2154.8	2			
151933	2151.0	2			
151933	2151.0	2			
151936	2152.7	2			
151936	2153.3	2			
151952	2150.9	2			
151952	2151.0	2			
151981	2156.8	2			
151981	2157.1	2			
152023	2155.5	2			
152023	2156.4	2			
152042	2156.8	2			
152042	2158.9	2			
152065	2158.8	2			
152065	2158.6	2			
152082	2159.0	2			
152082	2160.4	2			
152105	2155.0	2			
152105	2156.0	2			
152116	2160.6	2			
152116	2161.3	2			
152132	2153.6	2			
152132	2154.1	2			
152155	2168.4	2			
152155	2172.5	2			

6. Alkalinity

Frank Zemlyak

a. Description of Equipment and Technique

Total alkalinity was determined using the Marine Chemistry automated titration system. A potentiometric titration of the sea water sample using hydrochloric acid was utilized to determine the total alkalinity. Once the sample was connected to the system, the operation proceeded automatically, from the glass reaction vessel being rinsed and filled with the sea water sample, to the final calculations at the conclusion of the titration.

When the reaction vessel was filled, the semi-micro combination Ross electrode senses when the sample had come to equilibrium and the initial relative mvolt reading was logged, at the same time, the cell temperature was also recorded. At this point, a rather large quantity of 0.2N hydrochloric acid, was added to the cell via a Metrohm E-655 Dosimat. The increase in volume was accommodated by the withdrawal, by a stepper motor via an ACME lead screw, of an internal glass piston. This large quantity of acid added titrated the sample beyond the carbonate endpoint. Next, smaller aliquots (0.040mL) of acid were added until the sample had been titrated to and beyond the second inflection point. With each addition of acid the sample was allowed to come to equilibrium and the mvolt reading was logged. Thus, with these relative changes in the voltage in the cell, the endpoint was calculated by using a modified Gran function. Corrections to the final total alkalinity result were made by using the sample salinity, sample temperature and the nutrients, silicate and phosphate.

b. Sampling Procedure and Data Processing Technique

The 500 ml samples used for alkalinity analysis were collected from eight litre Niskin bottles in much the same fashion as oxygen samples. The samples were stored in a cold water bath whilst awaiting analysis.

Note: The alkalinity data is currently under quality review.

c. Replicate Analysis

No replicate information is currently available.

7. CFC's

Mike Hingston

a. Description of Equipment and Technique

The analyses were carried out on two purge and trap systems developed at the Bedford Institute of Oceanography. The water samples were injected into the systems directly from the syringes. To ensure proper rinsing, at least two volumes of water were passed through the sample pipette before the actual sample volume. The samples were purged for four minutes with ultra high purity nitrogen at a flow rate of 60 ml/min. The components were trapped in Porapak-N trap which was cooled to a temperature of less than 10°C. They were then desorbed by heating the trap up to at least 170°C. The contents of the trap were then passed through a 75m DB-624 megabore column.

b. Sampling Procedure and Data Processing Technique

All samples were collected directly from the Niskin bottles using 100 ml syringes. The syringes were rinsed three times before they were filled. To prevent contamination, the CFC samples were the first samples collected from the Niskin bottles. The samples were then stored in a water bath of continuously flowing surface sea water until analysis. Air samples from the winch room were taken periodically to ensure that it had not become contaminated. The analysis of the samples was always completed within 24 hours after they had been drawn.

c. Replicate Analysis

A total of 81 sample id numbers had replicate CFC water samples drawn. In total, 13 sample id numbers had duplicate samples drawn and 68 sample id numbers had triplicate samples drawn. Replicates were taken at each station, with some of these being run on each system to ensure that the results were comparable. The following is a statistical summary, in pmoles/kg, of the absolute value of the replicate differences. Only acceptable sample values were used when calculating replicate differences. The sample id numbers having replicate measurements are listed in Table C.5.

Statistic	CFC11	CFC12	CFC113	Carbon Tet.	Methyl Chl.
Number of Replicate Differences	209	206	205	209	207
Minimum (pmoles/kg)	0.000	0.001	0	0.003	0.004
Maximum (pmoles/kg)	0.603	0.612	0.126	1.089	10.480
Mean (pmoles/kg)	0.076	0.095	0.025	0.161	2.660
Median (pmoles/kg)	0.039	0.077	0.019	0.100	2.170
Standard Deviation (pmoles/kg)	0.099	0.090	0.025	0.186	2.428

Detection Limits (pmoles/kg)	0.022	0.017	0.010	0.040	0.017
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Table C.5 Replicate CFC samples in pmoles/kg.

Sample ID Number	Freon 11	Freon 12	Freon 113	Carbon Tetrachloride	Methyl Chloroform	WOCE QF
150621	5.017	3.029	0.401	7.131	21.452	22222
150621	4.912	2.868	0.396	6.972	20.863	22222
150628	3.092	1.628	0.258	4.190	9.246	22222
150628	3.257	1.551	0.229	4.350	7.040	22222
150640	2.144		0.118	3.482	4.366	25222
150640	2.368	0.994	0.089	3.273	8.964	22222
150653	0.559	0.628	0.019	1.309	2.203	22222
150653	0.539	0.747	0.020	1.388	1.766	22222
150653	0.552	0.721	0.000	1.548	1.212	22222
150674	0.395	0.354	0.000	0.877	0.668	22222
150674	0.392	0.373	0.000	1.006	1.238	22222
150674	0.392	0.447	0.000	1.028	1.568	22222
150700	1.724	0.949	0.037	2.531	1.807	22222
150700	1.777	0.967	0.055	2.853	7.215	22222
150700	1.783	0.939	0.044	2.816	2.489	22222
150711	3.335	1.737	0.190	5.081	13.760	22222
150711	3.359	1.786	0.281	5.085	14.490	22222
150730	0.791	0.472	0.189	0.848	3.034	22222
150730	0.796	0.650	0.096	0.843	4.409	22222
150730	0.768	0.524	0.062	0.799	2.132	22222
150743	0.741	0.663	0.035	1.509	0.993	22222
150743	0.782	0.417	0.017	1.727	2.924	22222
150743	0.787	0.428	0.022	1.594	0.205	22222
150774	1.724	0.972	0.000	0.320	2.861	22222
150774	1.749	0.976	0.020	0.416	3.402	22222
150774	1.763	0.803	0.012	0.389	4.241	22222
150783	0.331	0.231	0.000	0.886	0.000	22222
150783	0.331	0.232	0.012	0.953	1.714	22222
150801	0.339	0.288	0.014	0.911	1.508	22222
150801	0.338	0.217	0.000	0.946	1.653	22222
150801	0.308	0.197	0.000	0.858	0.000	22222
150830	1.349	0.791	0.029	2.170	1.279	22222

Table C.5 Replicate CFC samples in pmoles/kg.

Sample ID Number	Freon 11	Freon 12	Freon 113	Carbon Tetrachloride	Methyl Chloroform	WOCE QF
150830	1.317	0.710	0.035	2.294	5.234	22222
150844	0.938	0.458	0.051	2.066	2.881	22222
150844	0.956	0.560	0.045	1.936	3.259	22222
150844	0.969	0.654	0.043	1.976	3.187	22222

Sample ID Number	Freon 11	Freon 12	Freon 113	Carbon Tetrachloride	Methyl Chloroform	WOCE QF
150869	1.232	0.701	0.051	2.264	4.899	22222
150869	1.143	0.624	0.074	2.117	2.256	22222
150869	1.160	0.641	0.046	2.017	1.164	22222
150891	1.330	0.643	0.077	2.012	6.851	22222
150891	1.276	0.573	0.056	1.944	4.829	22222
150891	1.278	0.690	0.044	1.963	5.319	22222
150904	0.330	0.219	0.028	1.019	2.764	22222
150904	0.269	0.227	0.000	0.899	1.636	22222
150904	0.316	0.109	0.042	0.933	2.147	22222
150924	0.477	0.223	0.000	0.847	1.072	22222
150924	0.444	0.251	0.014	0.785	1.701	22222
150924	0.451	0.226	0.013	0.781	1.698	22222
150945	0.299	0.169	0.018	0.000	1.157	22222
150945	0.315	0.284	0.020	0.781	0.143	22222
150945	0.321	0.158	0.000	0.882	1.308	22222
150964	0.349	0.231	0.000	0.895	1.288	22222
150964	0.357	0.278	0.000	0.905	1.530	22222
150964	0.366	0.356	0.000	0.774	0.000	22222
150985						55555
150985	0.204	0.144	0.000	0.697	0.859	22222
150985	0.213	0.068	0.012	0.842	0.575	22222
151010	1.123	0.516	0.044	1.792	0.943	22222
151010	1.177	0.646	0.057	1.890	4.489	22222
151010	1.214	0.703	0.065	1.877	4.785	22222
151033	1.784	1.088	0.089	1.143	3.655	22222
151033	1.808	1.255	0.061	0.898	1.484	22222
151033	2.049	1.220	0.126	0.946	6.272	22222
151047	1.869	0.935	0.060	3.322	1.646	22222
151047	1.881	0.994	0.178	3.221	8.329	22222
151047	1.895	0.972	0.182	3.280	8.533	22222
151063	1.042	0.544	0.061	2.019	4.679	22222
151063	1.056	0.607	0.024	2.349	2.344	22222
151063	1.065	0.596	0.030	2.243	1.049	22222
151083	0.379	0.149	0.000	1.076	0.560	22222
151083	0.418	0.266	0.015	1.056	1.609	22222

Sample ID Number	Freon 11	Freon 12	Freon 113	Carbon Tetrachloride	Methyl Chloroform	WOCE QF
151083	0.426	0.280	0.016	1.069	1.518	22222
151100	0.726	0.409	0.045	1.578	3.103	22222
151100	0.689	0.402	0.000	1.981	0.820	22222
151100	0.623	0.286	0.000	1.392	0.000	22222

Sample ID Number	Freon 11	Freon 12	Freon 113	Carbon Tetrachloride	Methyl Chloroform	WOCE QF
151131	1.010	0.551	0.031	1.070	3.861	22222
151131	1.016	0.564	0.035	1.072	3.956	22222
151131	0.886	0.481	0.028	0.820	0.000	22222
151145	1.447	0.720	0.048	3.095	1.102	22222
151145	1.502	0.808	0.065	3.649	3.659	22222
151145	1.636	0.827	0.089	2.958	6.633	22222
151171	1.218	0.781	0.027	1.766	0.529	22222
151171	1.259	0.687	0.050	1.595	4.467	22222
151171	1.277	0.750	0.036	1.600	4.484	22222
151189	1.323	0.931	0.030	1.759	4.815	22222
151189	1.265	0.791	0.065	1.774	2.578	22222
151189	1.267	0.624	0.052	1.631	2.222	22222
151203	0.609	0.356	0.000	1.366	2.550	22222
151203	0.599	0.323	0.023	1.334	2.624	22222
151203	0.547	0.258	0.024	1.243	0.213	22222
151246	0.843	0.597	0.038	2.188	0.915	22222
151246	0.904	0.600	0.040	1.988	3.631	22222
151246	1.176	1.209	0.152	2.725	3.762	22222
151263	0.728	0.511	0.041	1.618	3.084	22222
151263	0.739	0.464	0.052	1.680	3.061	22222
151263	0.746	0.479	0.010	1.698	0.457	22222
151283	1.083	0.409	0.017	2.060	0.087	22222
151283	1.106	0.693	0.046	2.040	4.567	22222
151313	1.972	0.988	0.095	1.930	1.965	22222
151313	2.152	1.124	0.121	1.976	7.476	22222
151313	2.165	1.038	0.132	1.966	7.830	22222
151336	2.512	1.527	0.213	3.753	3.963	22222
151336	2.711	1.448	0.226	4.307	9.336	22222
151357	4.660	2.484	0.410	6.422	7.908	22222
151357	4.705	2.249	0.466	6.369	17.318	22222
151357	4.568	2.602	0.654	6.339	17.892	22322
151364	4.145	2.001	0.324	4.726	9.435	22222
151364	4.147	2.143	0.304	5.811	15.376	22222
151364	4.157	1.942	0.330	4.722	10.700	22222

Sample ID Number	Freon 11	Freon 12	Freon 113	Carbon Tetrachloride	Methyl Chloroform	WOCE QF
151373	3.877	1.965	0.329	4.713	12.737	22222
151373	3.953	1.879	0.336	4.775	11.516	22222
151375	5.356	2.758	0.418	6.105	18.463	22222
151375	4.765	2.642	0.441	6.681	14.336	22222
151375	5.368	2.640	0.413	6.131	18.592	22222
151386	4.264	3.232	0.405	6.294	8.061	22222
151386	4.644	3.076	0.379	5.762	14.312	22222
151389	3.629	1.946	0.319	4.965	6.252	22222
151389	3.707	2.230	0.319	5.244	5.820	22222
151396	3.275	1.925	0.241	4.494	3.533	22222
151396	3.454	1.924	0.254	4.754	3.004	22222
151396	3.724	2.019	0.251	4.767	13.483	22222
151406	2.811	1.508	0.182	3.336	10.557	22222
151406	2.839	1.421	0.162	3.289	10.414	22222
151406	2.537	1.391	0.160	3.230	1.828	22222
151407	2.605	1.224	0.120	3.472	9.473	22222
151407	2.285	1.119	0.109	3.729	6.702	22222
151416	2.194	1.041	0.133	2.970	5.103	22222
151416	2.235	1.112	0.136	2.950	4.169	22222
151416	2.521	1.324	0.124	3.063	9.177	22222
151423	2.483	1.114	0.107	3.850	3.734	22222
151423	2.530	1.147	0.130	3.953	4.583	22222
151423	2.706	1.343	0.113	3.881	11.291	22222
151440	1.612	0.710	0.051	2.750	2.205	22222
151440	1.720	0.911	0.069	2.765	7.011	22222
151440	1.723	0.910	0.039	2.719	6.623	22222
151466	2.329	1.392	0.091	3.593	3.305	22222
151466	2.344	1.511	0.105	3.982	4.953	22222
151466	2.546	1.393	0.147	3.535	10.831	22222
151483						55555
151483	1.848	0.992	0.118	3.377	7.878	22222
151483	1.865	1.001	0.119	3.224	7.628	22222
151496	1.023	0.409	0.094	2.193	3.460	22222
151496	0.678	0.308	0.019	1.504	2.687	22222

Sample ID Number	Freon 11	Freon 12	Freon 113	Carbon Tetrachloride	Methyl Chloroform	WOCE QF
151496	0.723	0.417	0.029	1.543	2.962	22222
151522	1.421	0.728	0.102	2.686	6.372	22222
151522	1.413	0.675	0.046	2.559	1.683	22222
151522	1.407	0.732	0.113	2.586	6.012	22222
151552	2.114	1.338	0.134	3.112	1.889	22222
151552	2.135	1.198	0.187	3.169	8.680	22222
151552	2.225	1.527	0.175	3.706	4.998	22222
151563	1.369	0.775	0.042	2.533	1.344	22222
151563	1.411	0.684	0.070	2.596	6.529	22222
151563	1.458	0.760	0.064	2.740	6.971	22222

Sample ID Number	Freon 11	Freon 12	Freon 113	Carbon Tetrachloride	Methyl Chloroform	WOCE QF
151585	1.274	0.611	0.157	2.179	6.235	22222
151585	1.294	0.607	0.059	2.256	3.545	22222
151585	1.295	0.589	0.040	1.971	0.973	22222
151606	1.408	0.751	0.053	1.847	0.879	22222
151606	1.473	0.685	0.126	1.907	5.703	22222
151606	1.479	0.729	0.107	1.928	5.783	22222
151629	1.004	0.804	0.026	0.765	0.000	22222
151629	1.021	0.603	0.066	0.956	0.832	22222
151629	1.073	0.657	0.083	0.807	3.934	22222
151640	0.744	0.395	0.011	1.572		22225
151640	0.776	0.402	0.016	1.725	3.280	22222
151640	0.777	0.419	0.011	1.673	3.163	22222
151670	1.854	1.167	0.040	0.785	1.248	22222
151670	1.905	1.039	0.066	0.833	2.267	22222
151670	1.982	1.159	0.062	0.876	4.865	22222
151679	0.776	0.536	0.000	1.810	1.106	22222
151679	0.780	0.452	0.048	1.625	3.239	22222
151679	0.789	0.437	0.051	1.699	3.375	22222
151709	1.222	0.426	0.000	0.660	4.568	22222
151709	1.278	0.737	0.000	0.717	4.304	22222
151709	1.168	0.700	0.034	0.785	3.855	22222
151721						55555
151721	1.379	0.696	0.048	2.707	5.636	22222
151721	1.386	0.780	0.045	2.591	5.517	22222
151748	1.158	0.837	0.031	0.978	0.833	22222
151748	1.191	0.728	0.070	1.125	2.503	22222
151748	1.235	0.685	0.093	1.045	4.576	22222
151758						55555
151758	0.625	0.319	0.028	1.384	2.351	22222
151758	0.636	0.404	0.011	1.803	0.976	22222
151786	1.790	0.857	0.061	3.386	4.361	22222
151786	1.821	1.048	0.067	3.567	5.551	22222
151786	1.944	1.007	0.094	3.321	8.157	22222
151797	1.512	0.815	0.058	2.593	6.252	22222
151797	1.552	0.757	0.072	2.671	6.350	22222

Sample ID Number	Freon 11	Freon 12	Freon 113	Carbon Tetrachloride	Methyl Chloroform	WOCE QF
151797	1.411	0.653	0.000	2.696	1.810	22222
151828	1.371	0.674	0.062	2.064	2.894	22222
151828	1.439	0.752	0.103	2.088	5.500	22222
151828	1.361		0.101	2.288	4.145	25222

Sample ID Number	Freon 11	Freon 12	Freon 113	Carbon Tetrachloride	Methyl Chloroform	WOCE QF
151838	0.715	0.366	0.060	1.325	0.079	22222
151838	0.735	0.417	0.024	1.660	3.313	22222
151838	0.744	0.398	0.027	1.574	3.290	22222
151865	2.535	1.278	0.102	4.318	3.512	22222
151865	2.541	1.289	0.121	4.623	7.347	22222
151865	2.680	1.265	0.058	4.276	11.085	22222
151892	3.446	1.594	0.213	5.292	4.518	22222
151892	3.542	1.634	0.267	5.338	13.812	22222
151892	3.543	1.662	0.270	5.107	13.111	22222
151899	1.949	0.914	0.127	3.778	5.052	22222
151899	2.137	0.938	0.124	3.581	8.955	22222
151899	1.958	0.998	0.112	3.732	4.499	22222
151954	3.056	1.675	0.199	5.151	9.905	22222
151954	3.146	1.909	0.162	4.895	3.184	22222
151954	3.308	1.721	0.212	5.018	12.295	22222
151984	1.415	0.902	0.127	2.688	0.057	22222
151984	1.476	0.737	0.106	2.632	5.697	22222
151984	1.482	0.797	0.078	2.769	5.991	22222
152008	1.424	0.771	0.069	2.579	3.953	22222
152008	1.471	0.761	0.042	2.711	5.820	22222
152008	1.498	0.764		2.652	5.657	22522
152066	0.935	0.590	0.043	1.931	0.305	22222
152066	0.973	0.458	0.030	2.113	2.382	22222
152066	1.009	0.532	0.000	1.994	3.794	22222
152099	2.073	1.118	0.092	0.969	0.466	22222
152099	2.165	1.219	0.089	1.222	6.945	22222
152099	2.186	1.065	0.128	1.073	6.605	22222
152107	2.097	0.875	0.071	3.111	1.557	22222
152107	2.109	1.140	0.086	3.454	6.383	22222
152125	0.637	0.305	0.026	1.469	2.735	22222
152125	0.660	0.240	0.010	1.510	0.000	22222
152125	0.662	0.305	0.022	1.485	2.574	22222
152147	0.754	0.449	0.028	1.636	3.041	22222
152147	0.767	0.428	0.033	1.661	3.372	22222
152147	0.787	0.540	0.033	1.779	2.418	22222

Sample ID Number	Freon 11	Freon 12	Freon 113	Carbon Tetrachloride	Methyl Chloroform	WOCE QF
152175	0.915	0.479	0.022	0.915	3.834	22222
152175	0.903	0.573	0.069	0.871	1.138	22222
152175	0.913	0.454	0.059	0.851	0.808	22222

d. Standards Used

Standardization was carried out using gas standards made up at Brookhaven National Laboratories. Standard volumes were corrected for lab temperature and pressure. Results were reported in units of pmol/kg of sea water. Clean air samples were also analyzed with each station, as a check on the standardization.

8. Reversing Thermometers

Anthony W. Isenor

a. Description of Equipment and Technique

Sensoren-Instrumente-Systeme digital reversing thermometers model RTM 4002 were used to verify CTD thermistor readings on most deep stations. The thermometers had a depth range of up to 10000 m. The pressure housing was made of a glass tube closed at the ends by metal stoppers. One end contained the platinum sensor and at the other end was the battery compartment. The thermometers were placed on bottles one and three on the rosette, thus, sampling the temperature at the deepest and third deepest bottle trips.

The thermometers were placed in standard reversing thermometer racks on the Niskin bottles. Before deployment, a magnet was passed over the thermometers to clear the display and place the thermometer in sample mode. A new temperature was then recorded upon reversal of the thermometer.

On the deepest stations, unprotected mercury in glass thermometers were also attached to the deepest and third deepest bottle trips. The following table lists the number of readings from each thermometer. Digital thermometers are indicated with a 'T' in the serial number.

Thermometer Ser. No.	Number of Readings
000T345	94
000T347	94
000T350	96
000T352	1
000T354	95
0010987	114
0010988	125

b. Sampling Procedure and Data Processing Technique

The thermometers indicated the temperature reading either via a digital display or column of mercury. The temperature was read and noted on log sheets. The readings were later digitized and calibrations applied using the water sample database system.

c. Calibration Data

The digital thermometers were calibrated at BIO in June 1994, while the mercury thermometers were last calibrated in January 1989.

d. Replicate Analysis

A total of 180 sample id numbers had one digital thermometer temperature replicate. The following is a statistical summary of the absolute value of the replicate differences. Only acceptable values were used in calculating the statistics.

Statistic	
Number of Replicate Differences	120
Minimum (°C)	0.002
Maximum (°C)	0.011
Mean (°C)	0.007
Median (°C)	0.007
Standard Deviation (°C)	0.002

All of the replicate reversing thermometer temperature values, along with the reversing thermometer pressure values are given in Table C.6.

Table C.6 Replicate Reversing Thermometer samples.
 Temperature is in °C and ITS-90 scale. Pressure is in dbars.

Sample ID Number	Thermometer Serial Number	Main Corrected	Thermometer Pressure	WOCE QF
150601	000T350	3.644		29
150601	000T352	3.646		29
150601	0010988			99
150603	000T345	3.639		29
150603	000T347	3.644		29
150603	0010987			99
150621	000T350	-0.849		39
150621	000T354	-0.850		39
150621	0010988			99
150623	000T345	9.211		39
150623	000T347	9.219		39
150623	0010987			99
150624	000T350	3.276		29
150624	000T354	3.283		29
150624	0010988			99
150626	000T345	3.374		29
150626	000T347	3.380		29
150626	0010987			99
150632	000T350	3.285		39
150632	000T354	3.279		39
150632	0010988			99
150634	000T345	3.103		29
150634	000T347	3.110		29
150634	0010987			99
150647	000T350	2.237		29
150647	000T354	2.245		29
150649	000T345	2.593		29
150649	000T347	2.598		29
150667	000T350	2.215		29
150667	000T354	2.223		29
150667	0010988		3575.7	92
150669	000T345	2.318		29
150669	000T347	2.324		29

Table C.6 Replicate Reversing Thermometer samples.
 Temperature is in °C and ITS-90 scale. Pressure is in dbars.

Sample ID Number	Thermometer Serial Number	Main Corrected	Thermometer Pressure	WOCE QF
150669	0010987			99
150687	000T350	2.239		29
150687	000T354	2.246		29
150687	0010988		3854.4	93

Sample ID Number	Thermometer Serial Number	Main Corrected	Thermometer Pressure	WOCE QF
150689	000T345	2.272		39
150689	000T347	2.279		39
150689	0010987		3601.8	93
150707	000T350			99
150707	000T354			99
150707	0010988			99
150709	000T345			99
150709	000T347			99
150709	0010987			99
150717	000T350	2.547		29
150717	000T354	2.553		29
150717	0010988			99
150719	000T345	3.401		49
150719	000T347	3.406		49
150719	0010987			99
150737	000T350	2.250		29
150737	000T354	2.257		29
150737	0010988		4144.2	92
150737	0010988		4144.5	92
150739	000T345	2.327		39
150739	000T347	2.333		39
150739	0010987		3749.5	93
150739	0010987		3748.2	93
150757	000T350	2.269		29
150757	000T354	2.276		29
150757	0010988		5486.4	92
150757	0010988		5506.4	92
150759	000T345	2.255		29
150759	000T347	2.262		29
150759	0010987		5154.3	92
150759	0010987		5155.4	92
150777	000T350	2.267		29
150777	000T354	2.275		29
150777	0010988		5500.8	92
150779	000T345	2.274		29
150779	000T347	2.279		29

Sample ID Number	Thermometer Serial Number	Main Corrected	Thermometer Pressure	WOCE QF
150779	0010987		5198.7	92
150797	000T350	2.266		29
150797	000T354	2.274		29
150797	0010988		5493.8	92
150797	0010988		5481.2	92

Sample ID Number	Thermometer Serial Number	Main Corrected	Thermometer Pressure	WOCE QF
150799	000T345	2.262		29
150799	000T347	2.267		29
150799	0010987		5184.2	92
150799	0010987		5184.7	92
150817	000T350	2.278		29
150817	000T354	2.285		29
150817	0010988		5508.8	92
150817	0010988		5514.7	92
150819	000T345	2.259		29
150819	000T347	2.265		29
150819	0010987		5186.1	92
150819	0010987		5186.1	92
150837	000T350	2.356		29
150837	000T354	2.362		29
150837	0010988		4126.5	92
150837	0010988		4126.8	92
150839	000T345	2.658		29
150839	000T347	2.663		29
150839	0010987		3520.0	92
150839	0010987		3516.1	92
150857	000T350	2.229		29
150857	000T354	2.237		29
150857	0010988		5486.2	92
150857	0010988		5498.3	92
150859	000T345	2.274		29
150859	000T347	2.280		29
150859	0010987		4992.8	92
150859	0010987		5006.4	92
150877	000T350	2.243		29
150877	000T354	2.251		29
150877	0010988		5437.0	92
150877	0010988		5450.1	92
150879	000T345	2.269		29
150879	000T347	2.274		29
150879	0010987		4917.1	93
150879	0010987		4917.6	93
150897	000T350	2.302		29

Sample ID Number	Thermometer Serial Number	Main Corrected	Thermometer Pressure	WOCE QF
150897	000T354	2.310		29
150897	0010988		5443.5	92
150897	0010988		5444.9	92

Sample ID Number	Thermometer Serial Number	Main Corrected	Thermometer Pressure	WOCE QF
150899	000T345	2.280		29
150899	000T347	2.285		29
150899	0010987		5134.5	92
150899	0010987		5141.5	92
150917	000T350	2.302		29
150917	000T354	2.308		29
150917	0010988		5382.7	92
150919	000T345	2.264		29
150919	000T347	2.271		29
150919	0010987		4751.0	93
150937	000T350	2.277		29
150937	000T354	2.286		29
150937	0010988		5325.6	92
150939	000T345	2.259		29
150939	000T347	2.264		29
150939	0010987		4966.5	92
150939	0010987		4991.1	92
150957	000T350	2.270		29
150957	000T354	2.277		29
150957	0010988		5313.3	92
150959	000T345	2.263		39
150959	000T347	2.190		39
150959	0010987		4997.2	93
150977	000T350	2.284		29
150977	000T354	2.292		29
150977	0010988		5241.6	92
150977	0010988		5254.7	92
150979	000T345	2.258		29
150979	000T347	2.264		29
150979	0010987		4718.6	92
150997	000T350	2.281		29
150997	000T354	2.288		29
150997	0010988		5225.9	92
150997	0010988		5230.4	92
150999	000T345	2.258		29
150999	000T347	2.263		29

Sample ID Number	Thermometer Serial Number	Main Corrected	Thermometer Pressure	WOCE QF
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150999	0010987		4897.6	92
150999	0010987		4885.6	92
151017	000T350			99
151017	000T354			99
151017	0010988			99

Sample ID Number	Thermometer Serial Number	Main Corrected	Thermometer Pressure	WOCE QF
151019	000T345	2.219		29
151019	000T347	2.225		29
151019	0010987		4492.2	92
151019	0010987		4504.8	92
151037	000T350	2.172		29
151037	000T354	2.179		29
151037	0010988		4679.3	92
151039	000T345	2.185		29
151039	000T347	2.191		29
151039	0010987		4375.4	92
151057	000T350	2.157		29
151057	000T354	2.165		29
151057	0010988		4739.7	92
151059	000T345	2.253		29
151059	000T347	2.259		29
151059	0010987		4401.9	92
151059	0010987		4389.3	92
151077	000T350	2.263		29
151077	000T354	2.270		29
151077	0010988		4873.0	92
151077	0010988		4874.0	92
151079	000T345	2.281		29
151079	000T347	2.288		29
151079	0010987		4576.4	92
151079	0010987		4572.8	92
151097	000T350	2.303		29
151097	000T354	2.310		29
151097	0010988		4898.5	93
151097	0010988		4911.1	93
151099	000T345	2.322		29
151099	000T347	2.328		29
151099	0010987		4425.4	92
151099	0010987		4432.3	92
151117	000T350			99
151117	000T354			99
151117	0010988			99

Sample ID Number	Thermometer Serial Number	Main Corrected	Thermometer Pressure	WOCE QF
151119	000T345	2.302		39
151119	000T347	2.307		39
151119	0010987		4268.6	94
151137	000T350	2.287		29
151137	000T354	2.296		29
151137	0010988		4982.7	92

Sample ID Number	Thermometer Serial Number	Main Corrected	Thermometer Pressure	WOCE QF
151139	000T345	2.298		29
151139	000T347	2.304		29
151139	0010987		4408.4	92
151139	0010987	4421.0		92
151157	000T350	2.300		29
151157	000T354	2.307		29
151157	0010988		4990.8	92
151157	0010988		4992.8	92
151159	000T345	3.210		49
151159	000T347	3.215		49
151159	0010987			99
151177	000T350	2.272		29
151177	000T354	2.280		29
151177	0010988		4854.4	93
151177	0010988		4854.9	93
151179	000T345	3.998		49
151179	000T347	4.004		49
151179	0010987			99
151197	000T350	2.266		29
151197	000T354	2.274		29
151197	0010988		4935.5	94
151197	0010988		4935.2	94
151199	000T345			99
151199	000T347			99
151199	0010987			99
151217	000T350	2.253		29
151217	000T354	2.260		29
151217	0010988		4361.1	93
151217	0010988		4379.5	93
151219	000T345	3.993		49
151219	000T347	3.995		49
151219	0010987			99
151237	000T350	2.303		29
151237	000T354	2.311		29
151237	0010988		4613.0	93
151239	000T345			99

Sample ID Number	Thermometer Serial Number	Main Corrected	Thermometer Pressure	WOCE QF
151239	000T347			99
151239	0010987			99
151257	000T350	2.223		29
151257	000T354	2.231		29
151257	0010988		4223.9	92

Sample ID Number	Thermometer Serial Number	Main Corrected	Thermometer Pressure	WOCE QF
151259	000T345	3.016		49
151259	000T347	3.022		49
151259	0010987			99
151277	000T350	2.209		29
151277	000T354	2.216		29
151277	0010988		4032.0	92
151277	0010988		4032.8	92
151279	000T345	2.855		49
151279	000T347	2.861		49
151279	0010987			99
151297	000T350	2.167		29
151297	000T354	2.173		39
151297	0010988		3703.3	93
151297	0010988		3704.5	93
151299	000T345	2.952		29
151299	000T347	2.959		29
151299	0010987			99
151317	000T350	15.295		49
151317	000T354	15.193		49
151317	0010988			99
151319	000T345	3.119		49
151319	000T347	3.125		49
151319	0010987			99
151337	000T350	3.104		29
151337	000T354	3.112		29
151337	0010988			99
151339	000T345	3.101		29
151339	000T347	3.106		29
151339	0010987			99
151351	000T350	3.372		29
151351	000T354	3.379		29
151351	0010988			99
151353	000T345	3.489		49
151353	000T347	3.492		49
151353	0010987			99

Sample ID Number	Thermometer Serial Number	Main Corrected	Thermometer Pressure	WOCE QF
151360	000T350	3.477		29
151360	000T354	3.484		29
151360	0010988			99
151362	000T345	-0.858		49
151362	000T347	-0.856		49
151362	0010988			99

Sample ID Number	Thermometer Serial Number	Main Corrected	Thermometer Pressure	WOCE QF
151367	000T350	3.142		29
151367	000T354	3.150		29
151367	0010988			99
151369	000T345			99
151369	000T347			99
151369	0010987			99
151371	000T350	0.905		39
151371	000T354	0.916		39
151371	0010988			99
151373	000T345	9.579		39
151373	000T347	9.503		39
151373	0010987			99
151374	000T350	-0.858		39
151374	000T354	-0.850		39
151377	000T350	-0.462		39
151377	000T354	-0.453		39
151378	000T345			99
151378	000T347			99
151380	000T350	-0.122		29
151380	000T354	-0.113		29
151380	0010988			99
151382	000T345			99
151382	000T347			99
151382	0010987			99
151383	000T350	2.003		29
151383	000T354	2.012		29
151383	0010988			99
151385	000T345	5.266		49
151385	000T347	5.290		49
151385	0010987			99
151387	000T350	3.101		49
151387	000T354	3.109		49
151387	0010988			99
151389	000T345	2.499		49

Sample ID Number	Thermometer Serial Number	Main Corrected	Thermometer Pressure	WOCE QF
151389	000T347	2.504		49
151389	0010987			99
151392	000T350	2.946		49
151392	000T354	2.956		49
151392	0010988			99

Sample ID Number	Thermometer Serial Number	Main Corrected	Thermometer Pressure	WOCE QF
151394	000T345	3.461		49
151394	000T347	3.468		49
151394	0010987			99
151400	000T350	3.188		29
151400	000T354	3.197		29
151402	000T345	4.439		49
151402	000T347	4.444		49
151407	000T350	3.725		29
151407	000T354	3.733		29
151409	000T345			99
151409	000T347			99
151411	000T350	2.986		29
151411	000T354	2.995		29
151411	0010988			99
151413	000T345	3.402		29
151413	000T347	3.407		29
151413	0010987			99
151419	000T350	3.068		29
151419	000T354	11.046		49
151419	0010988			99
151421	000T345	3.032		39
151421	000T347	3.037		39
151421	0010987			99
151433	000T350	2.233		29
151433	000T354	10.672		49
151433	0010988		3000.2	92
151435	000T345	2.246		49
151435	000T347	10.722		49
151435	0010987			99
151453	000T350	2.190		29
151453	000T354	2.199		29
151453	0010988		3635.0	92
151453	0010988		3640.8	92
151455	000T345	3.140		49

Sample ID Number	Thermometer Serial Number	Main Corrected	Thermometer Pressure	WOCE QF
151455	000T347	3.128		49
151455	0010987			99
151473	000T350	2.192		39
151473	000T354	2.181		39
151473	0010988		3801.0	93
151473	0010988		3801.1	93

Sample ID Number	Thermometer Serial Number	Main Corrected	Thermometer Pressure	WOCE QF
151475	000T345	2.428		49
151475	000T347	2.436		49
151475	0010987		3483.8	94
151475	0010987	3485.7		94
151493	000T350	2.223		29
151493	000T354	2.231		29
151493	0010988		4303.2	92
151495	000T345	3.385		49
151495	000T347	3.389		49
151495	0010987			99
151513	000T350	2.282		29
151513	000T354	2.288		29
151513	0010988		4498.9	92
151515	000T345	2.597		49
151515	000T347	2.601		49
151515	0010987			99
151533	000T350	2.289		29
151533	000T354	2.297		29
151533	0010988		4881.4	92
151533	0010988		4882.7	92
151535	000T345	2.318		49
151535	000T347	2.322		49
151535	0010987		4138.3	94
151535	0010987		4138.8	94
151553	000T350	2.270		29
151553	000T354	2.278		29
151553	0010988		4949.3	94
151555	000T345	2.401		49
151555	000T347	2.405		49
151555	0010987		4275.6	94
151573	000T350	2.266		49
151573	000T354	2.274		29
151573	0010988		4953.1	92
151573	0010988		4950.0	92
151575	000T345	2.307		29
151575	000T347	2.311		29

Sample ID Number	Thermometer Serial Number	Main Corrected	Thermometer Pressure	WOCE QF
151575	0010987		4415.8	93
151575	0010987		4416.2	93
151593	000T350	2.293		29
151593	000T354	2.300		29
151593	0010988		4945.8	92

Sample ID Number	Thermometer Serial Number	Main Corrected	Thermometer Pressure	WOCE QF
151595	000T345	2.359		49
151595	000T347	2.363		49
151595	0010987		4210.5	94
151613	000T350	2.285		39
151613	000T354	2.294		39
151613	0010988		4908.3	93
151613	0010988		4909.6	93
151615	000T345	2.289		29
151615	000T347	2.293		29
151615	0010987		4699.5	92
151615	0010987		4700.1	92
151633	000T350	2.293		29
151633	000T354	2.301		29
151633	0010988		5005.3	92
151633	0010988		4993.3	92
151635	000T345	2.347		29
151635	000T347	2.351		29
151635	0010987		4243.8	92
151635	0010987		4249.2	92
151653	000T350	2.289		29
151653	000T354	2.298		29
151653	0010988		4968.4	92
151653	0010988		4964.7	92
151655	000T345	2.314		29
151655	000T347	2.318		29
151655	0010987		4659.5	92
151673	000T350	2.300		29
151673	000T354	2.309		29
151673	0010988		4933.9	92
151673	0010988		4935.2	92
151675	000T345	2.309		29
151675	000T347	2.313		29
151675	0010987		4544.3	92
151693	000T350	2.305		29
151693	000T354	2.315		29
151693	0010988		4914.7	92

Sample ID Number	Thermometer Serial Number	Main Corrected	Thermometer Pressure	WOCE QF
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151695	000T345	2.344		29
151695	000T347	2.349		29
151695	0010987		4654.8	92

Sample ID Number	Thermometer Serial Number	Main Corrected	Thermometer Pressure	WOCE QF
151713	000T350	2.297		29
151713	000T354	2.305		29
151713	0010988		4888.8	92
151713	0010988		4887.5	92
151715	000T345	2.462		49
151715	000T347	2.467		49
151715	0010987		4179.7	94
151715	0010987		4180.4	94
151733	000T350	2.294		39
151733	000T354	2.300		39
151733	0010988			99
151735	000T345	3.186		49
151735	000T347	3.192		49
151735	0010987			99
151753	000T350	2.284		29
151753	000T354	2.293		29
151753	0010988		4832.9	92
151753	0010988		4834.2	92
151755	000T345	16.140		49
151755	000T347	15.815		49
151755	0010987			99
151773	000T350	2.285		29
151773	000T354	2.294		29
151773	0010988		4831.5	92
151773	0010988		4840.5	92
151775	000T345	16.935		99
151775	000T347	16.458		99
151813	000T350	2.286		29
151813	000T354	2.295		29
151813	0010988		4748.3	92
151815	000T345	2.300		29
151815	000T347	2.305		29
151815	0010987		4309.6	92
151833	000T350	2.277		29
151833	000T354	2.284		29
151833	0010988		4651.1	93

Sample ID Number	Thermometer Serial Number	Main Corrected	Thermometer Pressure	WOCE QF
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151835	000T345	2.282		29
151835	000T347	2.285		29
151835	0010987		4415.0	92

Sample ID Number	Thermometer Serial Number	Main Corrected	Thermometer Pressure	WOCE QF
151853	000T350	2.177		29
151853	000T354	2.186		29
151853	0010988		4166.0	92
151855	000T345	2.200		29
151855	000T347	2.206		29
151855	0010987		3972.9	92
151873	000T350	2.164		29
151873	000T354	2.174		29
151873	0010988		3952.0	92
151875	000T345	2.233		29
151875	000T347	2.237		29
151875	0010987		3624.5	92
151893	000T350	2.590		29
151893	000T354	2.599		29
151893	0010988			99
151895	000T345	9.271		99
151895	000T347	9.243		99
151895	0010987			99
151910	000T350	2.979		29
151910	000T354	2.990		29
151912	000T345	3.409		29
151912	000T347	3.412		29
151915	000T350	2.170		29
151915	000T354	2.178		29
151915	0010988			99
151917	000T345	10.065		39
151917	000T347	10.066		39
151917	0010987			99
151918	000T350	1.529		39
151918	000T354	1.537		39
151918	0010988			99
151920	000T350	2.695		29
151920	000T354	2.706		29
151920	0010988			99

Sample ID Number	Thermometer Serial Number	Main Corrected	Thermometer Pressure	WOCE QF
151922	000T345	9.393		29
151922	000T347	9.397		29
151922	0010987			99
151923	000T350	3.434		29
151923	000T354	3.445		29
151923	0010988			99

Sample ID Number	Thermometer Serial Number	Main Corrected	Thermometer Pressure	WOCE QF
151925	000T345	1.895		39
151925	000T347	1.898		39
151925	0010987			99
151927	000T350	2.836		29
151927	000T354	2.843		29
151929	000T345	3.336		49
151929	000T347	3.338		49
151932	000T350	2.830		29
151932	000T354	2.840		29
151932	0010988			99
151934	000T345	2.833		39
151934	000T347	2.838		39
151934	0010987			99
151941	000T350	2.318		29
151941	000T354	2.329		29
151941	0010988			99
151943	000T345	2.613		29
151943	000T347	2.618		29
151943	0010987			99
151961	000T350	2.060		29
151961	000T354	2.070		29
151961	0010988		3580.7	92
151963	000T345	2.289		29
151963	000T347	2.294		29
151963	0010987			99
151981	000T350	2.079		29
151981	000T354	2.088		29
151981	0010988		3977.7	92
151981	0010988		3978.2	92
151983	000T345	2.210		39
151983	000T347	2.214		39
151983	0010987		3701.7	93
151983	0010987		3700.6	93
152001	000T350	2.186		29
152001	000T354	2.196		29

Sample ID Number	Thermometer Serial Number	Main Corrected	Thermometer Pressure	WOCE QF
152001	0010988		4262.7	92
152003	000T345	2.287		29
152003	000T347	2.291		29
152003	0010987		3781.6	92

Sample ID Number	Thermometer Serial Number	Main Corrected	Thermometer Pressure	WOCE QF
152021	000T350	2.133		29
152021	000T354	2.143		29
152021	0010988		4385.3	92
152023	000T345	2.297		39
152023	000T347	2.302		39
152023	0010987		3985.4	93
152041	000T350	2.156		29
152041	000T354	2.165		29
152041	0010988		4611.6	92
152043	000T345	2.319		29
152043	000T347	2.321		29
152043	0010987		4244.5	92
152061	000T350	2.286		29
152061	000T354	2.296		29
152061	0010988		4572.8	92
152063	000T345	2.329		29
152063	000T347	2.331		29
152063	0010987		4280.2	92
152081	000T350	2.256		29
152081	000T354	2.265		29
152081	0010988		4665.4	92
152081	0010988		4665.9	92
152083	000T345	2.475		49
152083	000T347	2.479		49
152083	0010987		4009.2	94
152083	0010987		4009.5	94
152101	000T350	2.399		39
152101	000T354	2.400		39
152101	0010988			99
152103	000T345	2.820		49
152103	000T347	2.824		49
152103	0010987			99
152121	000T350	2.293		29
152121	000T354	2.301		29
152121	0010988		4193.1	92
152121	0010988		4193.8	92

Sample ID Number	Thermometer Serial Number	Main Corrected	Thermometer Pressure	WOCE QF
152123	000T345	2.336		29
152123	000T347	2.340		29
152123	0010987		3755.7	92
152123	0010987		3754.7	92

Sample ID Number	Thermometer Serial Number	Main Corrected	Thermometer Pressure	WOCE QF
152141	000T350	2.281		29
152141	000T354	2.292		29
152141	0010988		4854.2	92
152141	0010988		4873.1	92
152143	000T345	2.308		29
152143	000T347	2.314		29
152143	0010987		4493.8	92
152143	0010987		4481.7	92
152161	000T350	15.277		49
152161	000T354	15.057		49
152161	0010988		3821.8	94
152161	0010988		3822.1	94
152163	000T345	15.355		49
152163	000T347	15.133		49
152163	0010987		3420.2	94
152163	0010987		3419.0	94

D. ACKNOWLEDGEMENTS

E. REFERENCES

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Clarke, R. Allyn, Jean-Guy Dessureault and Geoff Lebars. 1995. Upper-ocean Profiling from Vessels Underway, Sea Technology, February 1995.

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Appendix 1 94030 Reversed Pump Investigation

March 13, 1995

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A.1 INTRODUCTION

On cruise 94030, it was found that for stations 1 through 14 inclusive, the pump on the CTD was hooked up in reverse. This caused water to flow past the CTD sensors opposite to the normal flow direction as shown in Figure A1. (See also the document *94030 Reversed Pump Problem*, January 16, 1995).

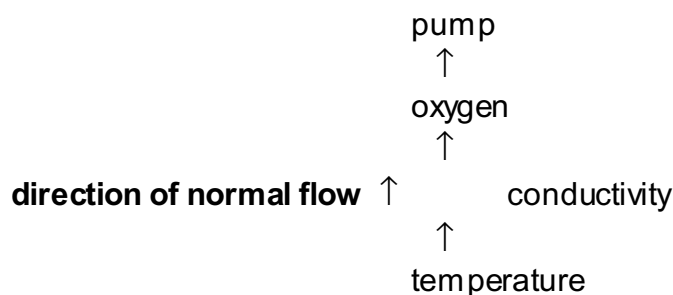


Figure A1: Relative location of sensors on CTD showing normal direction of water flow.

A.2 CONDUCTIVITY AND TEMPERATURE ALIGNMENT

In either the normal or reversed case, the physical distance between sensors results in a finite time for a parcel of water to move between sensors. In turn, this produces a time delay between the sensor signals that result by exposing the sensors to the particular parcel of water (i.e. in the normal flow case the signal produced by the conductivity sensor refers to a parcel of water which arrived at the temperature sensor Δt seconds earlier). It is necessary to align the signals in time so that they refer to the same parcel of water. The SEASOFT module ALIGNCTD allows for time alignment of the conductivity and temperature signals by specifying values for Δt (where Δt is the time advance of conductivity relative to temperature).

The Seabird manual *CTD Data Acquisition Software SEASOFT Version 4.201* (pg. 18) states that: "the best diagnostic of proper alignment is the elimination of salinity spikes that coincide with very sharp temperature steps." Graphs of salinity, density and potential temperature were produced using various values of Δt to determine which Δt would minimize salinity spiking.

A.2.1 Determining an Initial Guess for Δt

The Seabird manual titled *The Temperature and Conductivity Duct: Installation, Use and Data Processing Steps to Minimize Salinity Spiking Error* gave an indication of the direction to change Δt based on the observed direction of salinity spikes on a salinity vs. pressure curve. "If salinity spikes are negative, conductivity must be lagged (negative advance). If salinity spikes are positive, conductivity must be advanced." (p.12). Figure A2 was taken from the above manual and illustrates the 2 possible situations¹. The magnitude of the change to Δt was determined by subjectively evaluating the effect of various Δt 's on the salinity spiking.

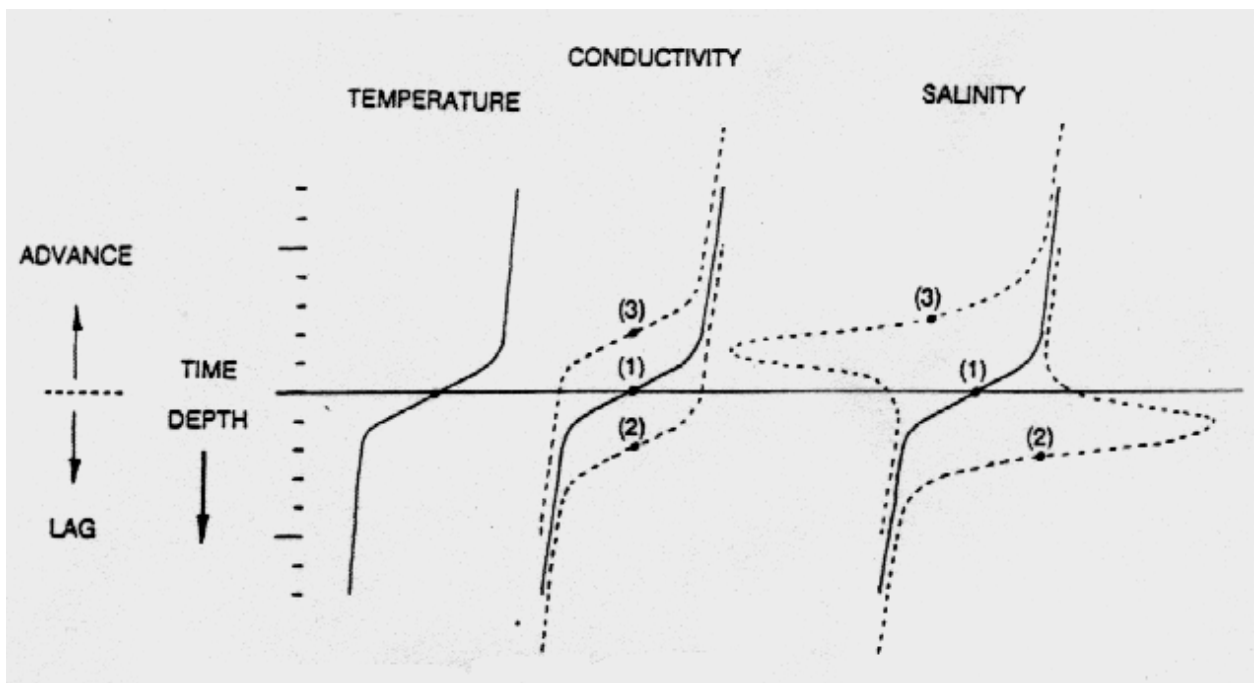


Figure A2: The shift of conductivity data relative to temperature.

A.2.2 Procedure to Determine a Δt Value (stations 1 to 14):

- download the .odf, .dat and .con file for a station in the reversed-pump range. Station 6 was chosen. The filenames were d030a006_1dbar.odf, 030a006.dat and 030a006.con. The files are located on the Fundy VAX under the directory digby\$dka200:[data.seabird].

¹ An analogy can be used to help clarify the meaning of "advance" and "lag" as they apply to conductivity and temperature signals. Think of a meeting occurring on some date. To "advance" the meeting means to move it in time a negative number of days or hours. To postpone or "lag" the meeting would mean to move it in time a positive number of days or hours.

- using the SigmaPlot plotting software, plot Salinity, Density and Potential Temperature vs. Pressure from the archived .odf file, and select a region of pressure where there is a large temperature gradient.
- make an initial guess for Δt in ALIGNCTD and run station 6 using the process.bat file (see Appendix B for processing sequence).
- import the resulting .cnv file into SigmaPlot and plot Salinity, Density and Potential Temperature vs. Pressure
- based on the direction of salinity spiking (see under Introduction, Determining an Initial Guess for Δt) repeat the above 2 steps until salinity spiking is minimized.
- for 2 other stations in the reversed-pump range, create .cnv files using the Δt value determined above. This is to ensure that the Δt value chosen will apply to other stations.

A.2.3 Results of Δt Investigation

As expected, large salinity spikes were noted for the reversed-pump stations with a standard Δt value. For station 6, it was found that the coefficient that produced salinity curves with the least amount of spiking was $\Delta t = -0.270$. For the 2 other stations (10 and 14), $\Delta t = -0.270$ also produced salinity curves with minimal spiking. Figure A3 is a plot created from station 6 data after processing with ALIGNCTD using -0.270 for Δt .

A.3 PRESSURE SPIKING PROBLEM

In addition to the reversed-pump problem, it was found that large pressure spikes were occurring on the first 10 stations. At the time of data collection, the problem was thought to be related to electronic interference from the deck unit. It was later determined to be a pressure sensor problem.

A pressure spike removal program was created which marked bad any points included in these spikes. During processing using SEASOFT, these bad points were excluded from processing. See Appendix A for additional information on the pressure spike removal program.

A.4 HEATING EFFECT

The reversed pump situation appeared to introduce a thermal signal in the water passing through the duct system. Comparison of CTD and thermometer data from stations 1-14 with stations 15 onward indicate an increase in CTD temperature of 0.015°C (see report by C.K. Ross) for the reversed pump situation. Thus, the 0.015°C signal is removed from the temperature data for stations 1-14.

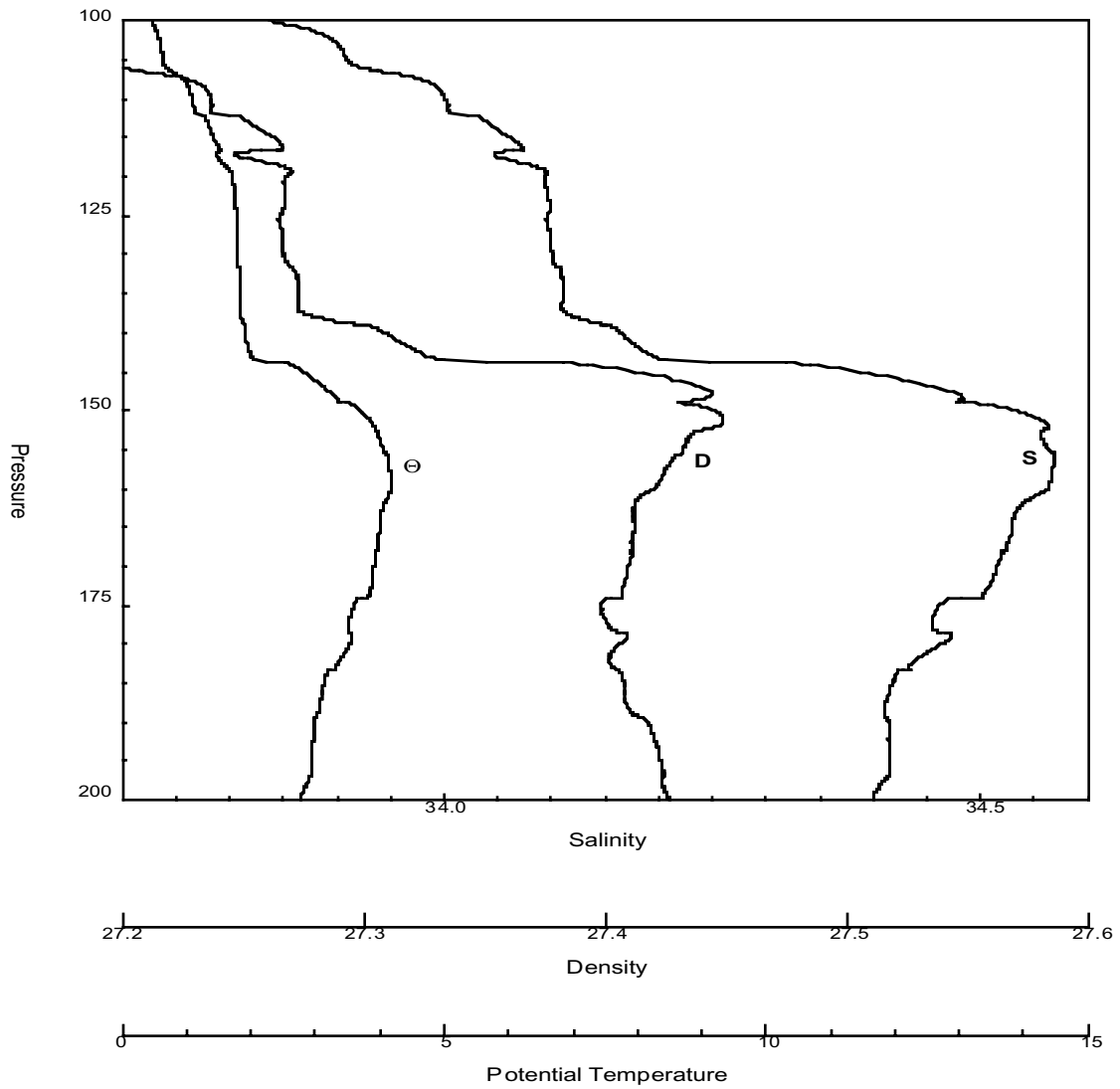


Figure A3. Station 6, Cruise 94030, 24 Hz .cnv data, Zoomed Pressure and $\Delta t = -0.270$

A.5 PRESSURE OFFSET

A diagram of the CTD (Figure A4) shows that water in the reversed-flow case travels a large distance (92 inches) before reaching the sensors at point **A**. The time lag associated with travelling this distance resulted in the pressure associated with the conductivity and temperature measurements being offset. This lag is important for associating the conductivity and temperature signals with the correct pressure from which the water parcel originated.

This time lag was estimated using two methods.

Method 1: Approximate the diameter of the tube over the entire circuit and then using the pump specification of 30 ml/s compute the time required to complete the circuit.

The distance-weighted tube diameter was:

$$(0.6 \text{ cm}) \cdot \frac{12}{92} + (1.12 \text{ cm}) \cdot \frac{35}{92} + (0.97 \text{ cm}) \cdot \frac{45}{92} \approx 1.0 \text{ cm} \quad (1)$$

and so the time required for the water to flow through the entire circuit was

$$\frac{\text{Volume}}{\text{Flowrate}} = \frac{(92'')(2.54 \text{ cm / in})\pi(0.5 \text{ cm})^2}{30 \text{ ml / s}} \approx 6.1 \text{ seconds} \quad (2)$$

Using the data shown in Figure A5, we estimated dp/dt at Station 4 using the scan number and the 24 Hz sampling rate. Station 4 was chosen because of the large salinity gradient near the bottom of the cast. The large gradient provides the signal required to estimate the pressure offset, while the proximity to the bottom implies minimal time between the up and down cast. The following estimate of dp/dt was obtained from station 4 data.

Direction	Scan Range	dp/dt (dbar/s)
Down	63244-68184	0.97
Up	83467-78912	1.05

Applying these vertical CTD velocities, we obtained the Δp associated with this estimate of the flow. Table 2 summarizes these results for both the up and down motion of the CTD.

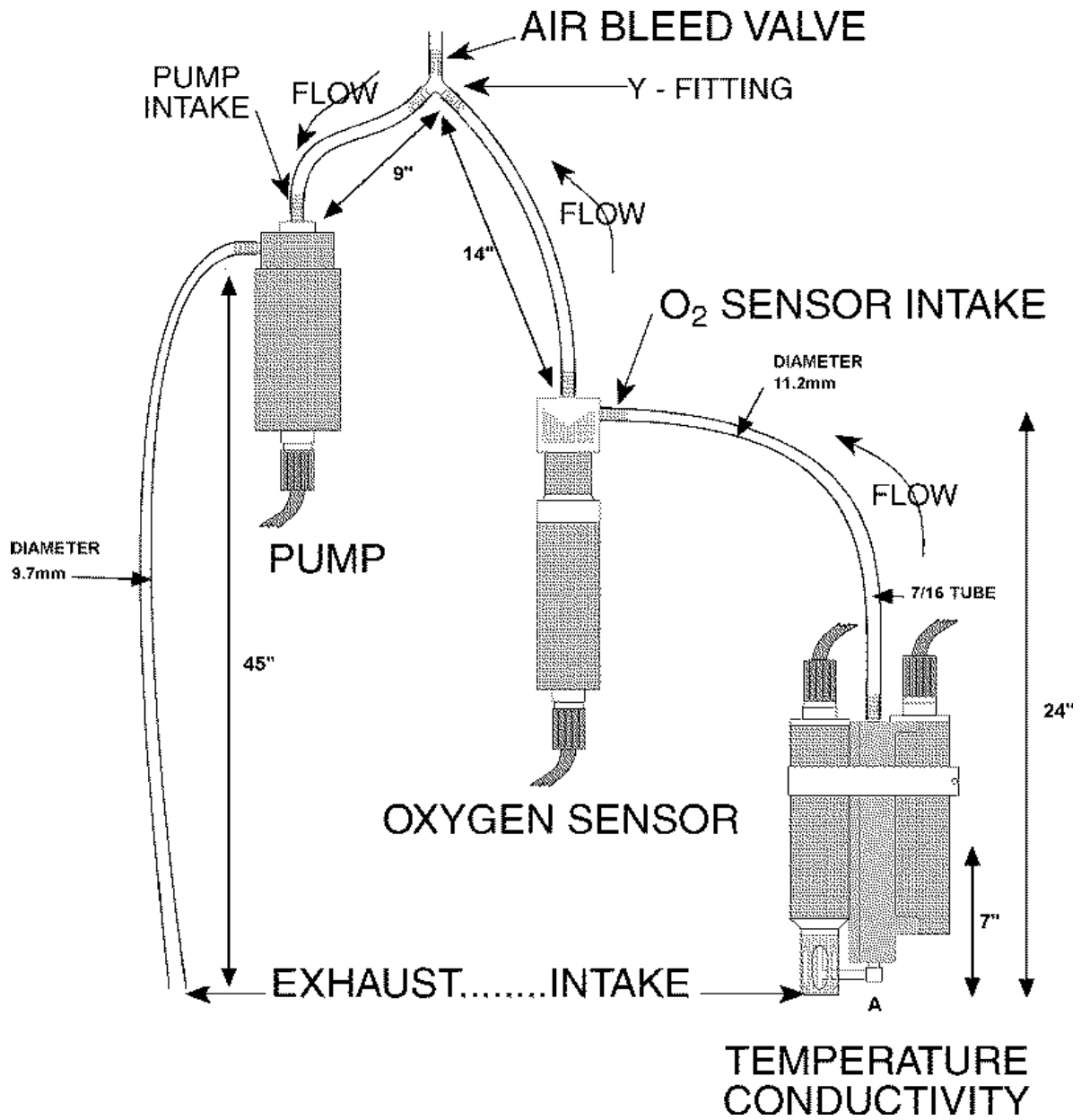


Figure A4: Exhaust Path of Temperature/Conductivity Duct Water

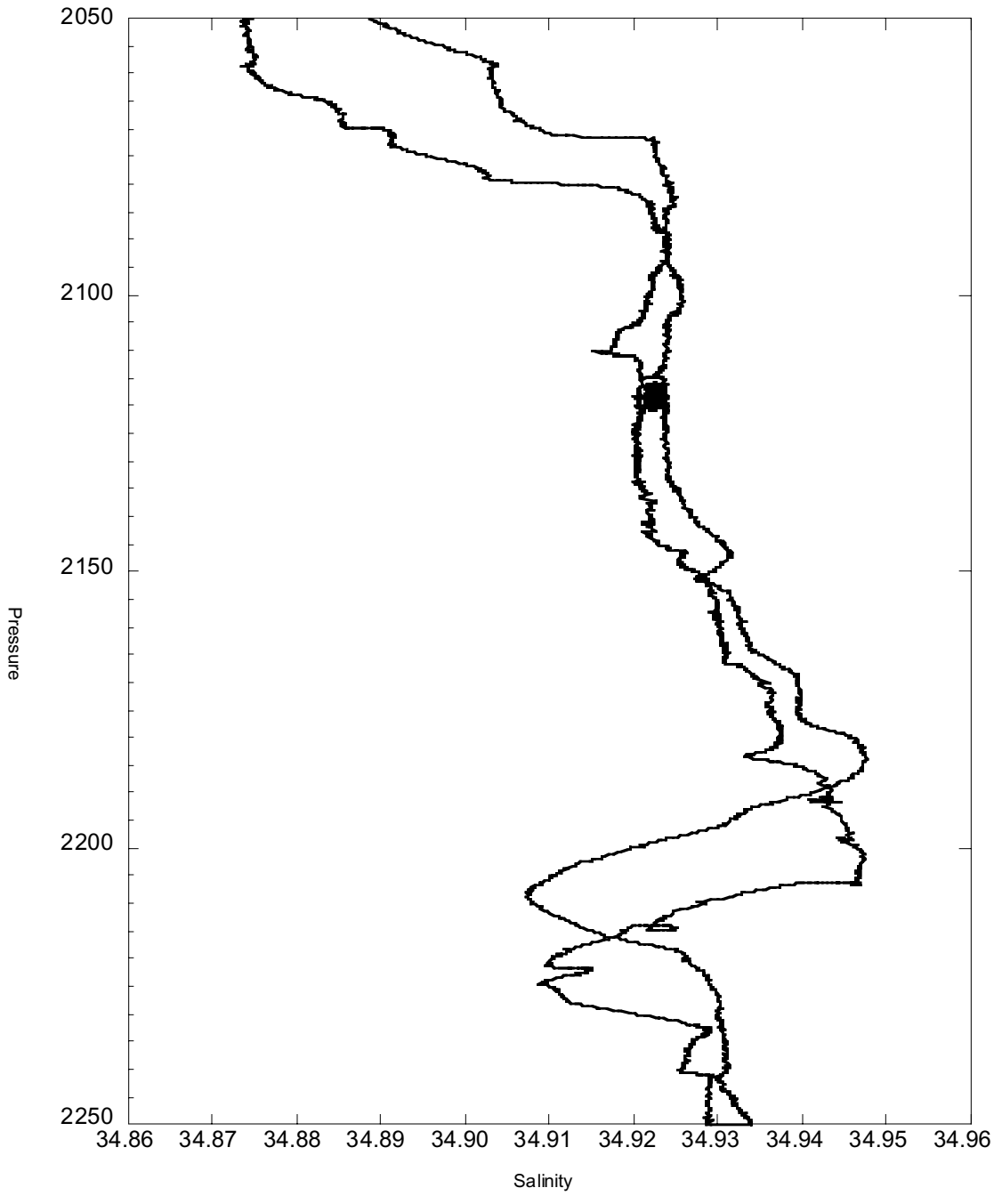


Figure A5: Upcast and Downcast for station 4.

Table 2A: Δp associated with method 1 calculation.

CTD Motion	Δp
down cast	5.9 dbars
up cast	6.4 dbars
Total	12.3 dbars

Method 2: This method is based on the Δt value used for ALIGNCTD. We know that it takes ~ 0.2 s for water to travel between the temperature and conductivity sensors, a distance of ~ 18 cm. (Note: a 0.07 s offset was applied in the deck unit. To correct this, a value of -0.07 s must be applied in ALIGNCTD. Thus, $0.27 - 0.07 = 0.2$. A value of 0.2 actually indicates the lag between the two sensors.) So the velocity in this section was:

$$\frac{18 \text{ cm}}{0.2 \text{ s}} = 90 \frac{\text{cm}}{\text{s}} \quad (3)$$

To estimate the velocity in the larger tubing, scale the velocity in eqn. (3) by the tube area:

$$(4) \quad \frac{(0.3)^2}{(0.5)^2} \cdot 90 \frac{\text{cm}}{\text{s}} = 32 \frac{\text{cm}}{\text{s}}$$

This gave a travel time in the larger tubing of:

$$\frac{(92'')(2.54 \text{ cm / in}) - 18 \text{ cm}}{32 \text{ cm / s}} = 6.7 \text{ s} \quad (5)$$

for a total travel time of:

$$6.7 + 0.2 \approx 7 \text{ s} \quad (6)$$

Again, using the above estimates of vertical CTD velocity we obtained Table A3 which estimated these results for both the up and down motion of the CTD.

Table A3: Δp associated with method 2 calculation.

CTD Motion	Δp
down cast	6.8 dbars
up cast	7.4 dbars
Total	14.2 dbars

So, an overall estimate based on the results of these two calculations gave a total pressure offset between 12.3 and 14.2 dbars.

Station 4 was then analyzed to determine whether this estimate agreed with an observed pressure offset. This station was chosen because of a salinity jump near the end of the cast which would allow the pressure offset to be detected (see Figure A5). The 24 Hz salinity data for the up and down casts was used to produce a 0.5 dbar dataset. Pressure, downcast salinity and upcast salinity were imported into Quattro Pro for Windows. The upcast salinity was adjusted or "lagged" relative to the downcast salinity using pressures between 10 to 20 dbars. For each lag used, a correlation coefficient (r-value) was computed between the upcast and downcast salinity. High correlation coefficients would indicate that the downcast and upcast data were correlated for that region. The overall goal here was to determine by how much the upcast and downcast pressures were offset and to see if this offset agreed with the estimated offset.

It was found that the best r-value ($r = 0.971$) for the correlation was obtained when the upcast salinity was lagged by 14.5 dbars over the pressure range 2050 - 2250 dbars. The entire range of correlation coefficients calculated are given in Table A4. They are also displayed in Figure A6.

Correlation Coefficient vs Pressure Lag
2050 - 2250 dbar region of station 4, 94030

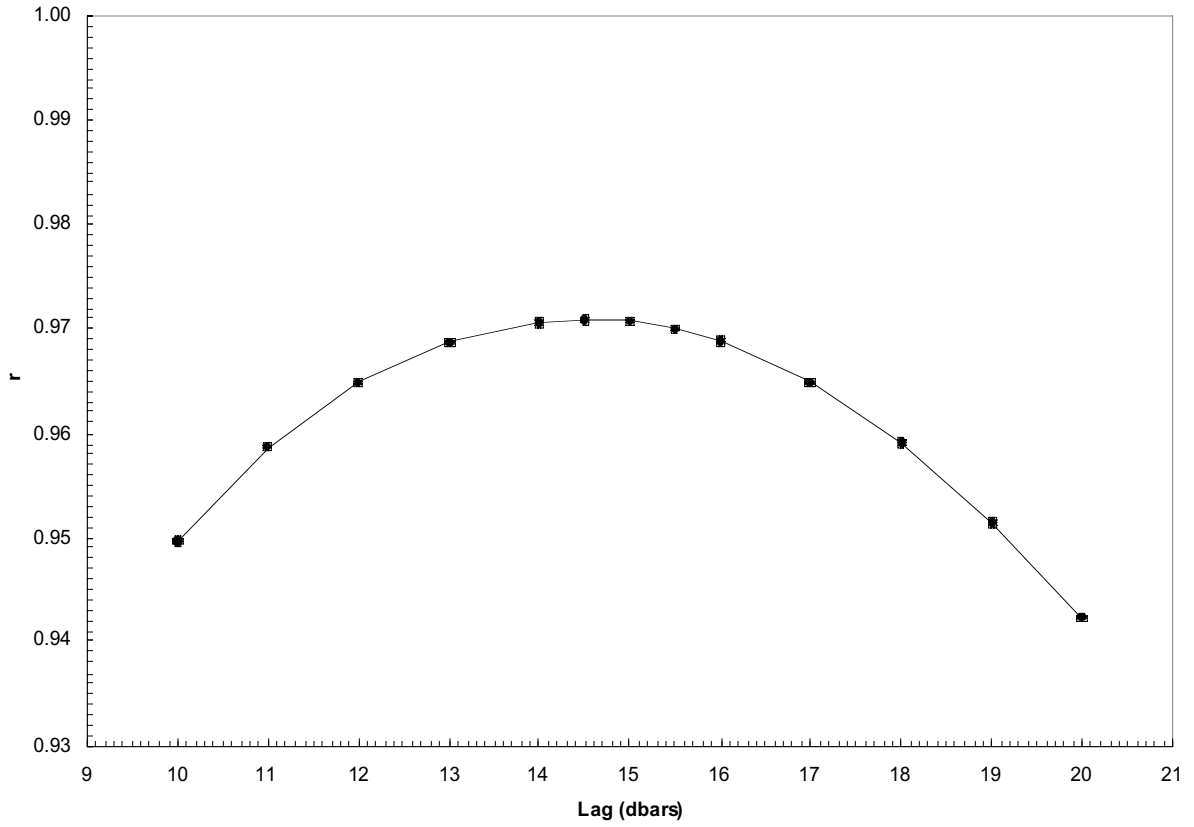


Figure A6: Results of the correlation between upcast and downcast salinity for various offsets in upcast salinity.

Table A4: Results of the correlation between upcast and downcast salinity for various offsets in upcast salinity.

Lag value (dbars)	r-value
10	0.949664
11	0.958635
12	0.964828
13	0.968735
14	0.970667
14.5	0.970952
15	0.970732
15.5	0.970011
16	0.968781
17	0.964893
18	0.959119
19	0.951483
20	0.942292

CONCLUSION

To correct the reversed pump situation for stations 1-14 the following procedure was followed to produce the 1 dbar and 2 dbar datasets from the raw 24 Hz data:

- Conductivity was shifted by -0.27 s relative to temperature. Consider a parcel of water, W_1 , at the exit of the tubing (what would normally be the entrance). Suppose this parcel has conductivity and temperature of $C_{1+\Delta t}$ and T_1 respectively ($C_{1+\Delta t}$ represents the time shifted conductivity).
- Salinity is computed based on P_1 , $C_{1+\Delta t}$, and T_1 , where P_1 represents the pressure at the time W_1 is at the temperature sensor..

- remove the 0.015°C heating effect from the temperature signal
- offset the pressure and scan number channels from all other parameter channels by lagging scan number and pressure by 7 seconds, or 168 scans.
- compute the 1 and 2 dbar averages
- compute theta and sigma parameters

The following procedure was followed for the discrete CTD data found in the SEA file:

- salinity was computed within the DATCNV module and 10 seconds of data was output to the ROS file.
- remove the 0.015°C heating effect from the temperature signal
- offset the pressure and scan number channels from all other parameter channels by lagging scan number and pressure by 7 seconds, or 168 scans.
- compute a 72 scan average for the discrete CTD values

INCONSISTENCIES

1. The 72 scan average for the discrete CTD values should have been a 73 scan average to be consistent the shipboard processing.
2. The 168 scan offset represents a shift of 6.9583 seconds, not truly 7 seconds.
3. The produced QAT files for stations 1-14 will not contain a conductivity channel because of the different processing method
4. The CTD oxygen calculated for stations 1-14 during the reversed pump correction will be incorrect. The problem results from the in-situ temperature and pressure in the expression for oxygen. The in-situ temperature would have been high by 0.015 while the pressure would not have been offset by the required 7 seconds. We expect these problems would have been rectified during subsequent oxygen calibration steps.

Appendix A

Description of the spike removal program `ctd_prsp.exe`

(Program was created by Igor Yashayaev)

The spike removal program takes an ASCII input data file (which is the .cnv file produced by the SEASOFT module DATCNV, running in ASCII-output mode) and marks as "bad" any regions where there are large pressure spikes. It does this by putting a small value (-9.99e-29) across all columns of the dat file where the pressure is spiking. It also writes out the values in this spiked pressure region to the file called "garbage". `ctd_prsp` also places a comment '* Pressure Spikes Removal Date <date> <time>' in the header of the .cnv file being processed. The command line for the program is:

```
ctd_prsp [input .cnv file] [output file name]
```

Appendix B

Processing sequence for this investigation:

```
datcnv -c94030 -i030axxx1  
ctd_prsp 030axxx nospikes.cnv2  
move nospikes.cnv 030axxx.cnv  
trans 030axxx3  
wildedit -i030axxx  
filter -i030axxx  
alignctd -i030axxx -oa030axxx4  
celltm -ia030axxx  
binavg -ia030axxx5  
derive -ia030axxx  
asciout -ia030axxx6
```

¹datcnv.cfg was set up to produce ASCII output, as the input file to ctd_prsp must be in ASCII (not binary)

²see Appendix A for a description of how to use the spike removal program

³converted data back to binary to run the rest of the programs (binary files run faster ASCII files)

⁴the file was given a new name so that it would not be necessary to run all the programs previous to alignctd everytime Δt was changed

⁵BINAVG was run only when the number of scan lines was greater than 68000 (the maximum number of lines allowed by SigmaPlot is approximately 68000). In the most extreme case, BINAVG was used to reduce the data from 24 to 8 Hz.

⁶ASCIIOUT was used instead of TRANS because ASCIIOUT removed the scans marked as bad by ctd_prsp