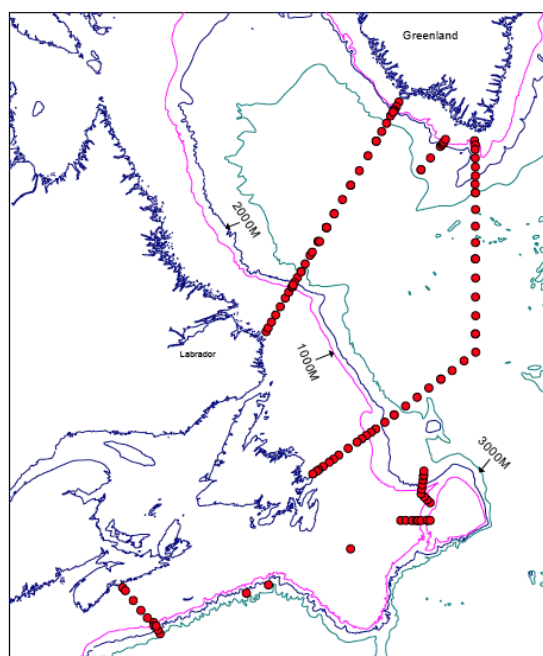


CRUISE REPORT: AR07W

(Updated OCT 2012)



Highlights

Cruise Summary Information

WOCE Section Designation	AR07W		
Expedition designation (ExpoCodes)	18HU20020623		
Chief Scientists	R. Allyn Clarke / BIO		
Dates	2002 JUN 23 to 2002 JUL 19		
Ship	<i>CCGS Hudson</i>		
Ports of call	Dartmouth, NS, Canada		
Geographic Boundaries	60° W	62° N 50° N	40° W
Stations	126		
Floats and drifters deployed	6 Apex floats deployed 1 surface meteorological drifter deployed		
Moorings deployed or recovered	5 recoveries 7 deployments 5 release tests 5 Buoy operations		

Recent Contact Information:

R. Allyn Clarke

Ocean Sciences Division • Department of Fisheries and Oceans • Bedford Institute of Oceanography

PO Box 1006 Dartmouth, NS, Canada B2Y 2A4

Email: clarkea@mar.dfo-mpo.gc.ca

Links To Select Topics

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

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

CRUISE REPORT

HUDSON 2002032

LABRADOR SEA

WOCE LINE AR7W

23 June - 19 July, 2002

A. CRUISE NARRATIVE

1. Highlights

- a. WOCE Designation: WOCE Line AR7W
Atlantic Circulation Experiment
- b. Expedition Designation: Hudson 2002032
- c. Chief Scientist: R. Allyn Clarke
Ocean Sciences Division
Department of Fisheries and Oceans
Bedford Institute of Oceanography
PO Box 1006
Dartmouth, NS, Canada B2Y 2A4
Internet clarkea@mar.dfo-mpo.gc.ca
- d. Ship: CCGS Hudson
- e. Ports of Call: June 23 BIO, Dartmouth, NS, Canada
July 19 BIO, Dartmouth, NS, Canada
- f. Cruise Dates: June 23 to July 19, 2002

2. Cruise Summary Information

a. Cruise Track

A cruise track is shown in [Figure 1](#). The ship's position at 0000Z on each day of the cruise is indicated with a date label.

The WOCE cruise station summary file outlines the science operations conducted during the cruise. Note that two additional cast types have been defined as: MNT – Biological multinet tow and BUY – guard buoy deployment. Finally, in the Comment section of the SUM file there is frequent mention of operation notes indicated by “Op Note”. These notes are included in [Appendix 1](#).

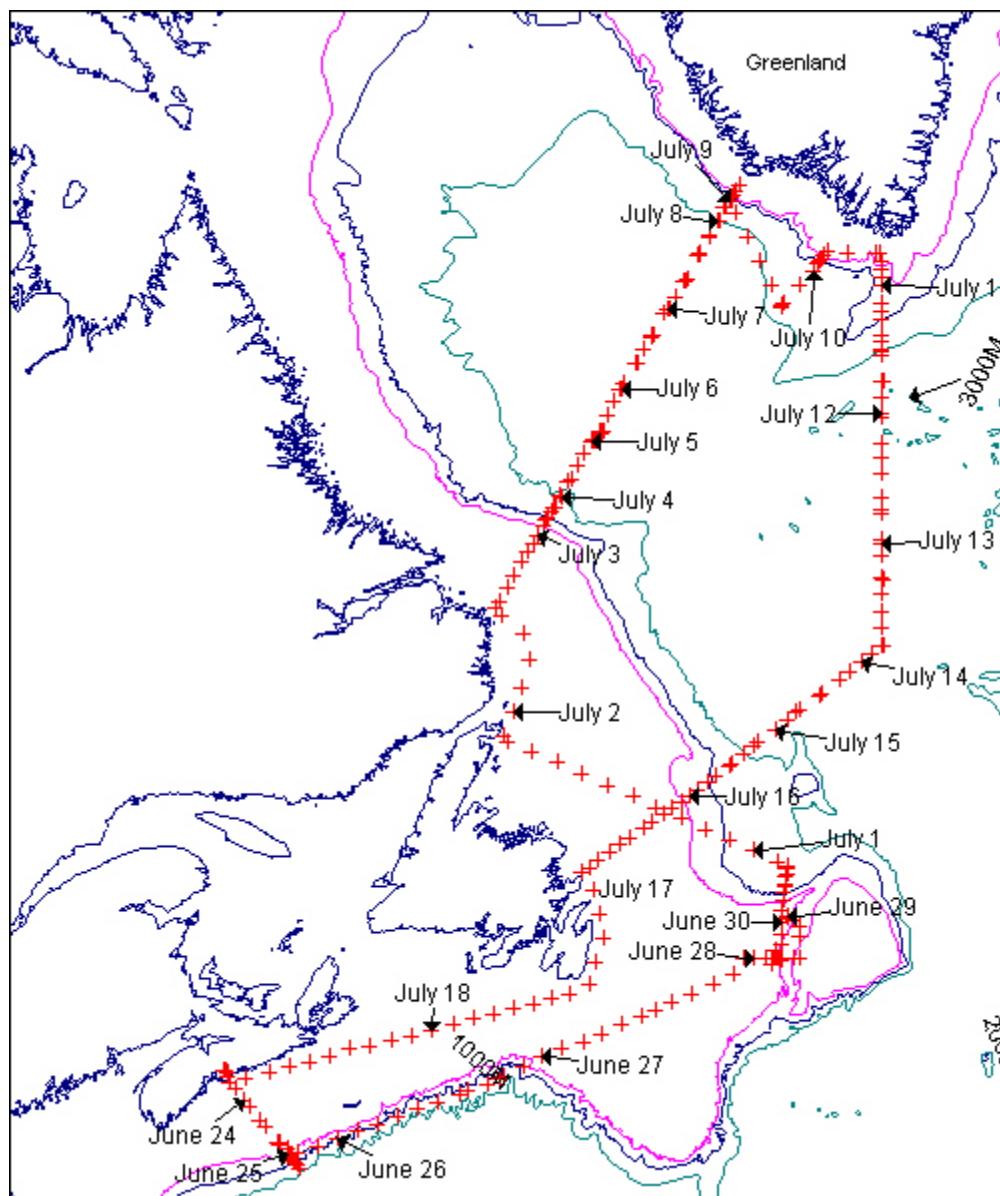


Figure 1. Cruise track for 18HU2002032/1. The date labels indicate the ship's position at 0000Z.

One additional parameter code was defined and appears in the parameter column of the WOCE SUM file. This code is "518 – sulfur hexafluoride (SF_6)". A section that follows in the cruise report describes this measurement.

b. Total Number of Stations Occupied

The CTD and ROS station positions are shown in [Figure 2.1](#). The WHP stations are all contained in the box defined by 50-62°N and 40-60°W. Table 2.1 lists the science operations for 18HU2002032.

Cast Type	Number of Operations	Detailed Division	Operation Numbers
Rosette & CTD	126	28 regular AR7W Sites plus Sites 8.5, 25.3 and 25.7, also sites 16 and 25 were broken up into two casts to collect enough water for sampling.	see Table 2.2
		7 Halifax Line Sites	see Table 2.3
		8 on Flemish Cap Line	45, 48, 49, 52, 53, 54, 59, 60
		9 on Orphan Knoll Line	63, 66, 68, 78, 80, 82, 85, 90, 94
		7 on Eirik Ridge Line	264, 268, 270, 272, 273, 276, 278
		17 on L5 (44 W) Line	See Table 2.4
		21 on Bonavista Line	See Table 2.5
		16 Biology Casts not included In other tables	32, 36, 44, 56, 86, 128, 138, 155, 182, 211, 262, 310, 334, 349, 365, 380
		1 cast for calibrating 4 Seacats	131
		1 Basin test	No operation number assigned.
		6 Failed Casts	35, 137, 140, 142, 144, 154
Moorings	22	5 recoveries	15, 16, 17, 18, 123
		7 deployments	71, 73, 124, 141
		5 release tests	19, 20, 58, 88, 89
		5 Buoy operations	69, 70, 72, 74, 75
Floats	7	6 Apex floats deployed	40, 91, 120, 157, 195, 260
		1 surface meteorological drifter deployed	158
Biology	194	145, 200 µm net tows	2 - 4, 6, 9 - 13, 23 - 26, 29, 30, 37, 39, 41, 42, 46, 47, 50, 51, 55, 57, 61, 62, 64, 67, 76, 77, 79, 81, 83, 84, 87, 93, 95, 97, 99, 101, 103, 105, 108, 110, 112, 114, 115, 117, 121, 125, 127, 130, 133, 136, 139, 146, 148, 149, 151, 153, 163, 172, 174, 183, 190, 192, 202, 204, 212, 214, 219, 221, 227, 228, 232, 234, 241, 242, 245, 247, 255, 257, 263, 265, 267, 269, 271, 274, 275, 277, 279, 283, 285, 286, 293, 295, 300, 302, 306, 311 - 313, 320, 322, 326, 328, 330, 332, 336, 338, 340, 342, 344, 346, 347, 351, 353, 355, 357, 359, 361, 363, 367, 369, 371, 374, 376, 378, 384, 387, 393, 394, 399, 403, 404, 408, 411, 412, 415, 418, 421, 423,

Hudson 2002032			
			425, 427
		31, 76 μ m net tows	5, 38, 96, 106, 109, 126, 147, 152, 173, 191, 203, 213, 220, 233, 248, 256, 266, 280, 284, 294, 321, 329, 337, 343, 352, 356, 362, 370, 377, 424, 428
		1 net tow aborted	65
		17 deep stratified vertical tows with multi-net	92, 119, 135, 143, 145, 165, 194, 206, 223, 236, 261, 288, 333, 348, 364, 379, 388
Chemistry		^{129}I surface	104, 107, 111, 113, 116, 118, 134, 156
		^{129}I profile	132, 150, 175, 205, 229
		^{129}I deep	314, 323, 358, 366, 372, 375
		SF ₆	118, 132, 134, 150, 175, 205, 215, 222, 229, 235, 259, 303, 307, 314, 323, 327, 331, 354
Other		575 hrs Ship Board ADCP	no number assigned
		598 hrs. along 4track T, S, and fluorescence	no number assigned
	80	80 XBT Deployments	159, 160, 161, 162, 167, 168, 169, 170, 171, 176, 177, 178, 179, 180, 181, 185, 186, 187, 188, 189, 196, 197, 198, 199, 200, 201, 207, 208, 209, 210, 216, 217, 218, 224, 225, 226, 230, 231, 237, 238, 239, 240, 244, 250, 251, 252, 289, 290, 291, 292, 297, 298, 301, 304, 305, 308, 309, 315, 316, 317, 318, 319, 324, 325, 373, 382, 383, 386, 390, 392, 396, 398, 401, 402, 406, 407, 410, 414, 417, 420
	1	1 MVP Deployment	430

Table 2.1 Science operations conducted on 18HU2002032/1.

AR7W Site Number	2002032 Deep Cast Operation Number
1	98
2	100
3	102
4	104
5	107
6	111
7	113
8	116
8.5	129
9	122
10	118
11	132
12	134
13	137
14	150
15	156
16	164, 166
17	175
18	184
19	193
20	205
21	215
22	222
23	229
24	235
25	258, 259
25.3	254
25.7	253
26	243
27	249
28	246

Table 2.2. AR7W sites and rosette and CTD operation numbers for 18HU2002032/1.

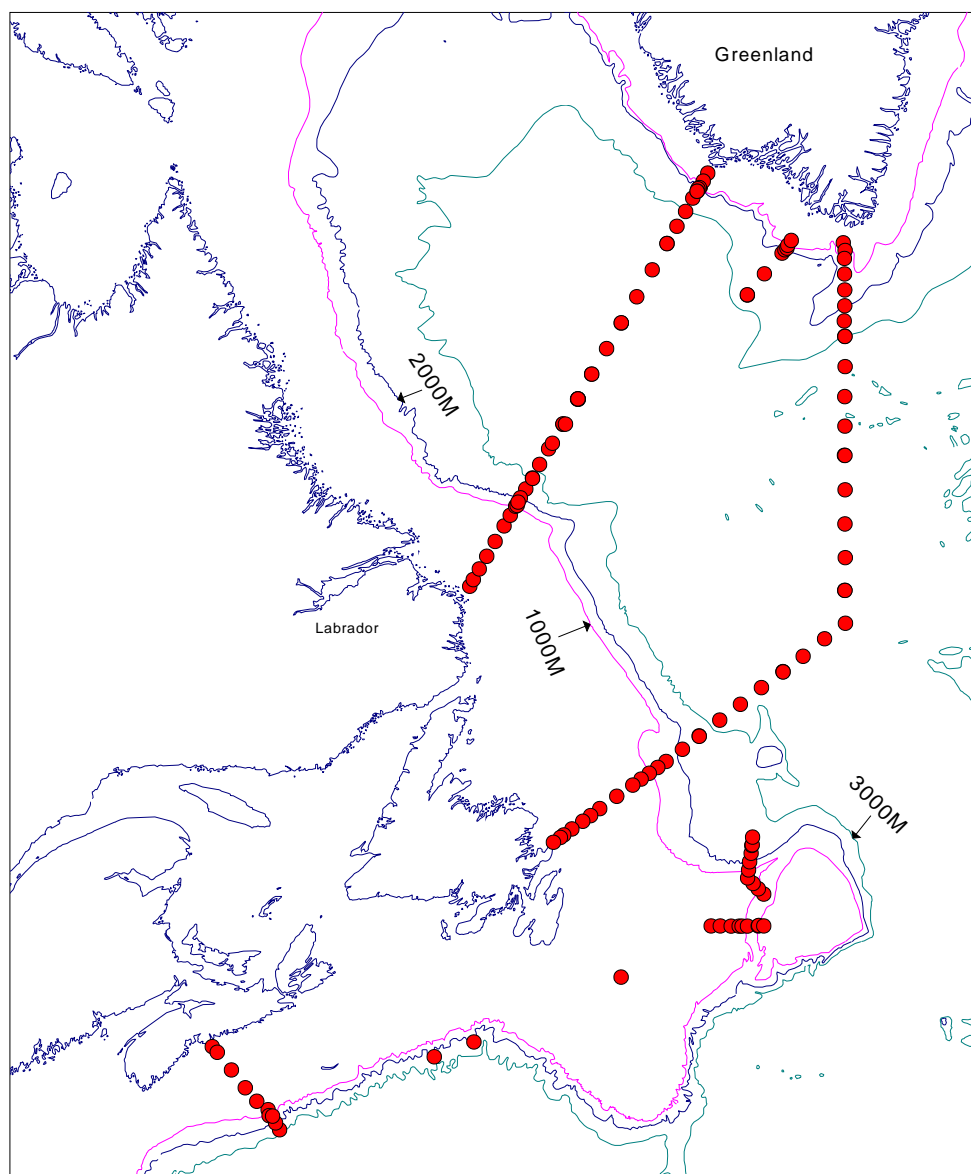


Figure 2.1 CTD and rosette station positions on for Hudson 18HU2002032/1.

Halifax Line Number	2002032 Deep Cast Operation Number
1	1
2	7
3	8
4	14
5	22
6	27
7	28

Table 2.3. Halifax Line sites and rosette operation numbers for 18HU2002032/1.

L5 Line Station Number	2002032 Deep Cast Operation Number
27	281
26.5	282
26	287
25	296
24.5	299
24	303
23.5	307
23	314
22	323
21	327
20	331
19	335
18a	339
17a	341
16a	345
15a	350
13	354

Table 2.4. Line L5 sites and rosette operation numbers for 18HU2002032.

Bonavista Line Station Number	2002032 Deep Cast Operation Number
19	358
18	360
17	366
16	368
15	372
14	375
13	381
12	385
11	389
10.5	391
10	395
9.5	397
9	400
8	405
7	409
6	413
5	416
4	419
3	422
2	426
1	429

Table 2.5 Bonavista Line sites and rosette operation numbers for 18HU2002032/1.

Along AR7W, the stations were full-depth WHP small volume rosette casts with up to 24 rosette bottles. Depending on the station, water samples were analyzed for CFCs, carbon tetrachloride, methyl chloroform, total carbonate, alkalinity, oxygen, salinity, nutrients, methyl halides and chlorinated compounds. On some casts, sampling was also conducted for ^{129}I (iodine-129) and SF_6 (sulfur hexafluoride).

c. Floats and Drifters deployed

Six APEX floats were deployed as in [table 2.6](#); one surface meteorological drifter was deployed as in [table 2.7](#). The deployment logs are given in [Appendix 5](#).

APEX Float #	WMO #	Operation Number	Launch Position		Start Date / Time	Launch Date / Time
			Latitude	Longitude		
366	Q4900136	40	44 29.9 N	55 25.4 W	26 June 2002 14:21	26 June 2002 17:19
506	Q4900234	91	48 42.2 N	46 50.5 W	30 June 2002 12:41	30 June 2002 15:55
330	Q4900125	120	55 25.2 N	53 59.0 W	3 July 2002 04:12	3 July 2002 08:46
255	Q4900101	157	56 57.2 N	52 11.1 W	5 July 2002 19:31	5 July 2002 20:47
335	Q4900130	195	58 38.4 N	50 25.0 W	7 July 2002 00:20	7 July 2002 02:42
334	Q4900129	260	60 17.8 N	48 34.9 W	8 July 2002 23:50	9 July 2002 00:52

Table 2.6 APEX float deployments on Hudson 2002032

Drifter #	WMO #	Operation Number	Launch Position		Start Date / Time	Launch Date / Time
			Latitude	Longitude		
36363	Q4900136	158	56 57.1 N	52 10.9 W	5 July 2002 19:46	5 July 2002 20:47

Table 2.7 Surface meteorological deployments on Hudson 2002032**d. Moorings deployed or recovered**

A total of 22 mooring related operations, consisting of seven deployments, five recoveries, five release tests and five buoy operations were conducted at three principal sites, the Scotian Slope south of Halifax, Flemish Pass and the Labrador Sea. The following tables details the deployments and recoveries. The mooring recovery and deployment logs are attached as [Appendix 6](#). Also the operation ids for these 22 operations are given above in [table 2.1](#).

Deployments:

1	M1429 multi-instrument mooring consisting of five current meters and three Microcats at 1965 m. on the Scotian Slope and Halifax Section. Six month deployment.
1	M1432 multi-instrument mooring consisting of five current meters, four Microcats and ADCP at 1120 m on the Scotian Slope and Halifax section. Six month deployment.
1	M1433 mooring consisting of one pressure gauge at 400 m isobath on Scotian Slope and Halifax Section. Six month deployment.
1	M 1450 standard mooring consisting of four current meters set at 398 m. on the western edge of Flemish Pass on the 47 N Flemish Cap section. Three guard-buoys also set. Six month deployment.
1	M 1451 standard mooring consisting of four current meters and two Microcats set at 1123 m. on the western side of Flemish Pass on the 47 N Flemish Cap section. Two guard-buoys also set. Six month deployment.
1	M 1452 complex mooring consisting of two sediment traps, six current meters, seven Seacats and three releases set at 3518 meters depth near the OWS Bravo site on AR7W in the Labrador Sea (12 month deployment)
1	M 1453 standard mooring consisting of one current meter positioned 20m off bottom along AR7W on the Labrador Slope (12-month deployment) at the 1032 metres.

Recoveries:

1	M1395 standard tide-gauge mooring consisting of one tide-gauge mounted on the anchor and positioned at 400 metres on the upper Scotian Slope on the Halifax Section.
1	M1396 standard mooring consisting of one current meter positioned 20m off bottom along AR7W on the Labrador Slope (12-month deployment) along the 1000m isobath.
1	M1412 multi-instrument mooring consisting of four Microcats and five Aanderaa current meters.
1	M1415 engineering mooring to test shackles
1	M1419 multi-instrument mooring consisting of three Microcats and four Aanderaa current meters

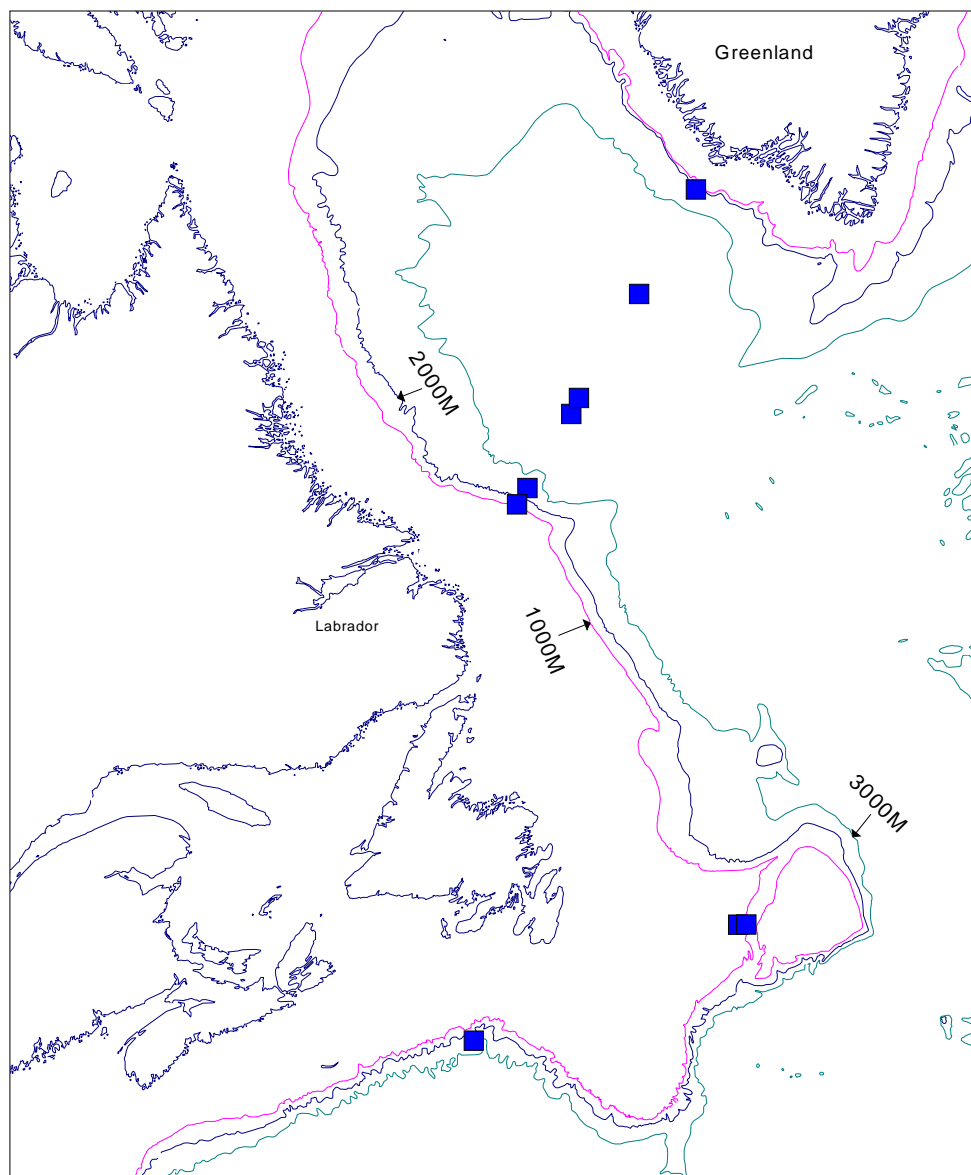


Figure 2.2 Mooring and float deployment locations for Hudson 18HU2002032/1.

3. List of Principal Investigators

Name	Affiliation	Responsibility
Allyn Clarke	BIO clarkea@mar.dfo-mpo.gc.ca	Senior scientist Overall co-ordination
Bob Gershey	BDR Research rgershey@fox.nstn.ns.ca	Alkalinity, carbonate, CFCs
Bassam Ghaleb	GEOTOP, UQAM r13644@er.uqam.ca	Radiogenic isotopes, heavy elements
Glen Harrison	BIO harrisong@mar.dfo-mpo.gc.ca	Coordinator biological program nitrate and ammonium utilization by phytoplankton, sediment traps Labrador Sea.
Erica Head	BIO heade@mar.dfo-mpo.gc.ca	Macrozooplankton distribution, abundance and metabolism
Paul Kepkay	BIO kepkayp@mar.dfo-mpo.gc.ca	Dissolved organic carbon, colloid chemistry and plankton respiration
Peter Jones	BIO jonesp@mar.dfo-mpo.gc.ca	Alkalinity, carbonate, CFC's
John Lazier	BIO lazierj@mar.dfo-mpo.gc.ca	CTD data, moored instrument data
Bill Li	BIO lib@mar.dfo-mpo.gc.ca	Pico-plankton distribution and abundance, bacteria
John Loder	BIO LoderJ@mar.dfo-mpo.gc.ca	Moorings, Scotian Slope and Flemish Pass
Jennifer McKay	GEOTOP, UQAM mckay.jennifer@uqam.ca	Stable and carbon isotopes
Robert Pickart	WHOI pickart@rsp.who.edu	Lowered ADCP
John Smith	BIO smithjn@mar.dfo-mpo.gc.ca	Chemistry isotopes

Table 3.1. List of Principal Investigators. See Section 7 for addresses.

4.1 Physical - Chemical Program

a. Narrative

This expedition was conducting operations in support of four ongoing scientific initiatives.

The first initiative is in support of the North Atlantic Oscillation and the Atlantic Thermohaline Circulation Principal Research Areas of the Climate Variability and Predictability (CLIVAR) project of the World Climate Research Programme (WCRP). The

occupation of the Labrador Sea section and the recovery of the two Labrador Sea moorings provide a measure of the winter cooling and water mass transformations over the winters of 2001/2002. The resetting of the mooring on the 1000 metre isobath on the Labrador slope continues a 20+ year observation program of the Labrador Current.

The second initiative is the continuation of the Labrador Sea project of the Canadian Joint Global Ocean Flux Study (JGOFS). The biological program is designed to characterize the late spring biological processes in the Labrador Sea and its shelf regions and is discussed in a later section of this document. A particular element of this year's program is the mooring of two sediment traps near the old OWS Bravo site in the Labrador Sea. These will measure the particle flux at 200 and 1000 metres over the next 12 months. The physical/chemical oceanographic program observes nutrients, total carbonate, alkalinity and CFCs over the entire water column in order to document the vertical transport of carbon via winter convection in the Labrador Sea as well as the changes in carbon storage in the deep waters of the North Atlantic.

The third objective is to observe the physical and chemical parameters at the various stations of the Halifax Section in support of DFO's Atlantic Zonal Monitoring Program. In addition, the Moving Vessel Profiler (MVP) was deployed on the homeward passage from Cape Race to Halifax. This will provide a T/S section over the upper 200 metres and will be an example of the type of data that could be obtained from this system if it was deployed on the container vessel that services this route on a weekly basis. A second system was also tested. This system samples surface temperature, salinity and fluorescence and automatically reports its data back to shore via cell phone modem whenever an appropriate cell tower is in range.

The fourth objective is to recover and set moorings on the continental slope at the end of the Halifax Section and in Flemish Pass. These moorings are designed to provide information on the structure of the current field to provide information related to the exploration and exploitation of oil and gas under the deeper areas of the continental slope.

b. Radioisotope Sampling Program

John Smith

Near surface water samples were collected for ^{129}I from the upper rosette bottle at eight stations on the AR7W line. Full depth sampling for ^{129}I was also carried out at five stations on the same section. Partial sampling of the three deepest depths was performed on six stations on the L5 and Bonavista lines. See [Table 4.1](#) for operation numbers of the sampling locations.

c. SF₆ Sampling Program

Kumiko Azetsu-Scott

SF₆ is an industrial source transient tracer not found in nature. It can enter the ocean via the atmosphere (similar to CFCs), and it has been deliberately introduced in some ocean regions as a "purposeful tracer". In particular, it was seeded into the Greenland Sea in

1996, and has been traced as far as south of Iceland. We were looking to see if it has reached the Labrador Sea, which if it had would give a transit time for water from the Greenland Sea to reach the Labrador Sea.

Deep sampling for SF₆ was also carried out at ?? stations. See [Table 2.1](#) for operation numbers of the sampling locations.

The samples that were collected were shipped to Goteborg University for analysis. Prof. Leif G. Anderson is the PI. His address is: Department of Analytical and Marine Chemistry, Goteborg University, SE-412 96 Goteborg, Sweden. His email is leif@amc.chalmers.se.

d. Dissolved Inorganic and Organic Carbon

Jennifer McKay

Samples for the analysis of dissolved inorganic and organic carbon and its $\delta^{13}\text{C}$ content by the GEOTOP group were drawn at the following stations. Details concerning the depths sampled and the sample ID numbers are given in [Appendix 2](#).

Date	Site	Operation number	[DIC] and $\delta^{13}\text{C}$ DIC	[DOC] and $\delta^{13}\text{C}$ DOC	^{14}C
30-Jun-02	OK 8	90	Yes	Yes	Yes
03-Jul-02	L3_08	116	Yes	Yes	
04-Jul-02	L3_12	134	Yes	Yes	
05-Jul-02	L3_16	164	Yes	Yes	Yes
05-Jul-02	L3_16	166	Yes	Yes	Yes
06-Jul-02	L3_19	193	Yes	Yes	
07-Jul-02	L3_22	222	Yes	Yes	
08-Jul-02	L3_25	258	Yes	Yes	Yes
08-Jul-02	L3_25	259	Yes	Yes	Yes
10-Jul-02	L5_27	281	Yes	Yes	
10-Jul-02	L5_26	287	Yes	Yes	
11-Jul-02	L5_21	327	Yes	Yes	

Table 4.1.1. GEOTOP sampling stations for dissolved carbon

e. Samples for Stable Isotope Analysis ($\delta^{18}\text{O}$, δD)

Jennifer McKay

Samples for the analysis of dissolved oxygen and its $\delta^{18}\text{O}$ content by the GEOTOP group were drawn at the following stations.

Operation ID	Station	Samples ID for $\delta^{18}\text{O}$, δD Analysis
94	OK-9	253417 to 253440 (excluding 253417, 253422, 253427, 253431)
98	L3-01	253442, 253445, 253448, 253453, 253454
104	L3-04	253492, 253496, 253499, 253505
113	L3-07	253534, 253537, 253539, 253541, 253544, 253548
118	L3-10	253570 to 253593 (excluding 253570, 253573)
132	L3-11	253636 to 253659
150	L3-14	253701 to 253724
164	L3-16	253766, 253767, 253770, 253773, 253775, 253777, 253780
166	L3-16	253782, 253785, 253786, 253787, 253789, 253792, 253794, 253796, 253797, 253799, 253801, 253803
205	L3-20	253894 to 253917
222	L3-22	253959 to 253982
235	L3-24	254007 to 254030
243	L3-26	254031 to 254050 (excluding 254044, 254046, 254048)
246	L3-28	254051, 254052, 254055, 254060, 254062, 254066
282	L5-27	254236, 254240, 254244, 254251, 254256
303	L5-24	254290 to 254308
327	L5-21	254379 to 254402 (bottle 254402 did not trip)
335	L5-19	254444 to 254467 (every other starting with 254445, note 254467 did not trip so sampled 254466 instead)
345	L5-16a	255516 to 255539
358	Bon-19	255606 to 255629
368	Bon-16	255695 to 255718 (255711 did not trip)
381	Bon-13	255784 to 255803 (255802 did not trip)
395	Bon-10	255838 to 255854 (every other starting with 255838)
405	Bon-8	255870, 255872, 255874, 255877, 255880, 255883
419	Bon-4	255930, 255932, 255934, 255937, 255940, 255943

Table 4.1.2. GEOTOP sampling stations for oxygen isotopes

f. Radiogenic isotopes

Bassam Ghaleb

A submersible pump (MacLane WTS-142 LV) was attached to the rosette. It was timed to start pumping at the estimated time for the rosette / CTD to reach the bottom of the cast. Particulate material was collected on a preweighed 142 m μ GFF filter. The dissolved radionuclides were adsorbed on two adsorption MnO₂ cartridges. The cartridges will be analyzed at GEOTOP. The pump was deployed at nine stations, seven of which were on the AR7W line. The detailed logs of each pumping operation are given in [Appendix 3](#).

Station	Operation Number	Volume pumped (litres)	Time Pump Start	Time Pump End
HFX_6	27	200.02	22:00:00	22:28:34
OK_9	94	250.00	16:30:00	17:07:16
L3_10	118	250.00	02:50:00	03:32:05
L3_11	132	250.00	19:30:00	20:11:22
L3_16	166	250.00	01:05:00	01:47:13
L3_18	184	250.00	15:50:00	16:31:22
L3_21	215	250.00	11:50:00	12:33:151
L3_24	235	250.00	02:15:00	02:55:04
L3_25	259	250.00	20:30:00	21:14:01

Table 4.1.3. GEOTOP sampling stations for pumped radiogenic isotopes

Five to ten litre water samples were also collected from a number of rosette casts for ^{226}Ra , ^{230}Th and ^{232}Th analysis by GEOTOP. In order to achieve the necessary volume, water from two and sometimes three adjacent rosette bottles were mixed together. The tables detailing which depths were sampled (and mixed) at these stations are given in [Appendix 4](#).

Station	Operation Numbers	Number of samples
OK_9	94	12
L3_01	98	13
L3_02	100	7
L3_03	102	6
L3_04	104	7
L3_05	107	3
L3_06	111	6
L3_07	113	3
L3_08	116	8
L3_08.5	129	6
L3_09	122	6
L3_10	118	8
L3_11	132	9
L3_12	134	9
L3_14	150	11
L3_15	156	4
L3_16	166	25
L3_18	184	6
L3_19	193	6
L3_21	215	7
L3_22	222	6

L3_23	229	4
L3_24	235	7
L3_25	259	36
L3_26	243	18
L3_27	249	10
L3_28	246	10
L5_27	281	11
Bon_18	360	9
Bon_11	389	8
Bon_10	395	8
Bon_08	405	5
Bon_04	419	5
Bon_01	429	8

Table 4.1.4. GEOTOP sampling stations for radiogenic isotope water samples

4.2 Biological Program

a. Narrative

The biological program conducted as part of cruise 2002032, with some modifications, was a continuation of studies began in 1994 to describe the large-scale (spatial and temporal) variability in plankton biomass, productivity and biogenic carbon inventories in the Labrador Sea.

The program has consisted of essentially five elements:

- 1) a phytoplankton biomass/primary productivity program - conducted Glen Harrison and Jeff Anning with assistance from Christine Riordan (latter for Trevor Platt and Ed Horne),
- 2) a microbial program conducted by Paul Dickie (for Bill Li),
- 3) a mesozooplankton program conducted by Les Harris and Gretchen Fitzgerald (for Erica Head),
- 4) a dissolved organic carbon/community respiration program conducted by Jay Bugden (for Paul Kepkay), and
- 5) a sediment trap program conducted by Jeff Anning and Glen Harrison.

The ultimate aim of these studies is twofold:

- 1) to provide a description of the inventories in and export of biogenic carbon from the Labrador Sea, their turnover rates and variability in space and time as part of OSD's continuing climate-studies and
- 2) to provide a description of plankton life-cycles and productivity in the Labrador Sea and its influence or contribution to ecosystems downstream in support of OSD's fisheries-related research.

In addition to the Labrador Sea study, phytoplankton, mesozooplankton and nutrient samples were collected at the seven stations along the Halifax line in support of OSD's obligations to the Atlantic Zone Monitoring Program (AZMP).

b. Stable Isotope Studies of Carbon and Nitrogen (nitrate and ammonium) Utilization by Phytoplankton

Glen Harrison

This work represents a continuation of research begun in 1994 to determine the primary productivity (in terms of carbon and nitrogen) of phytoplankton in the Labrador Sea. Carbon dioxide (CO₂), nitrate (NO₃) and ammonium (NH₄) utilization rates from eight depths in the photic zone (i.e. the 1% light level ranged from 30-60 m) were determined using stable isotope tracer (¹³C and ¹⁵N) methods. Incubations experiments were carried out in on-deck 'simulated in-situ' incubators. A total of 18 experiments were conducted (see Table 4.2.1). Carbon and nitrogen-based primary productivity rates along the L3 line will be related to vertical fluxes of particulate biogenic carbon and nitrogen derived from our sediment trap deployed on the "Bravo" mooring (M1452).

In addition to productivity measurements, samples from one deep cast were collected for determination of suspended particulate organic carbon (POC) and nitrogen (PON) from surface to ~1,000 m.

Date	Site	Operation #	Photic Depth (m)	¹⁵ N/ ¹³ C	POC/ PON
27-Jun-02	GrBank	35	55	x	
28-Jun-02	FP_07	50	65	x	
30-Jun-02	OK_08	86	40	x	
02-Jul-02	L3_02	100	40	x	
03-Jul-02	M1453	128	40	x	
04-Jul-02	L3_13.2	138	25	x	
05-Jul-02	L3_14	150	-		x
05-Jul-02	L3_15	155	25	x	
06-Jul-02	L3_18	182	30	x	
07-Jul-02	L3_21	211	35	x	
08-Jul-02	L3_28	246	50	x	
09-Jul-02	ER_6	261	40	x	
10-Jul-02	L5_27	282	50	x	
11-Jul-02	L5_23	310	60	x	
12-Jul-02	L5_19	334	50	x	
13-Jul-02	L5_15	349	50	x	
14-Jul-02	Bon_17	365	50	x	
15-Jul-02	Bon_13	380	40	x	
16-Jul-02	Bon_07	409	60	x	

Table 4.2.1. Sampling for stable isotopes.**c. Zooplankton Sampling****L. Harris, G Fitzgerald**

The zooplankton sampling is part of an ongoing program, the aim of which is to investigate the distribution, abundance and life history of the major zooplankton groups found in the Labrador Sea and its associated shelf systems. Particular emphasis is placed on the copepod species of the *Calanus* genus, which dominate the zooplankton in this region.

Vertical net tows ([Figure 4](#)) were taken at 97 stations, using a 3/4 metre 200 µm mesh ring net. At all stations, tows were made from 100 meters to the surface. Additional deep stratified tows (1000 meters to the surface) were taken at 16 of the stations in the Labrador Sea using a multi-net. Samples will be analysed for species composition, copepod stage structure and biomass. Thirty-five additional tows were made using a 30 cm 75 µm net.

d. Measurements Of Copepod Reproduction Rates**L. Harris, G Fitzgerald**

Egg production rates of *Calanus finmarchicus*, the dominant copepod species, were measured at 23 stations from the Labrador Shelf/Labrador Sea.

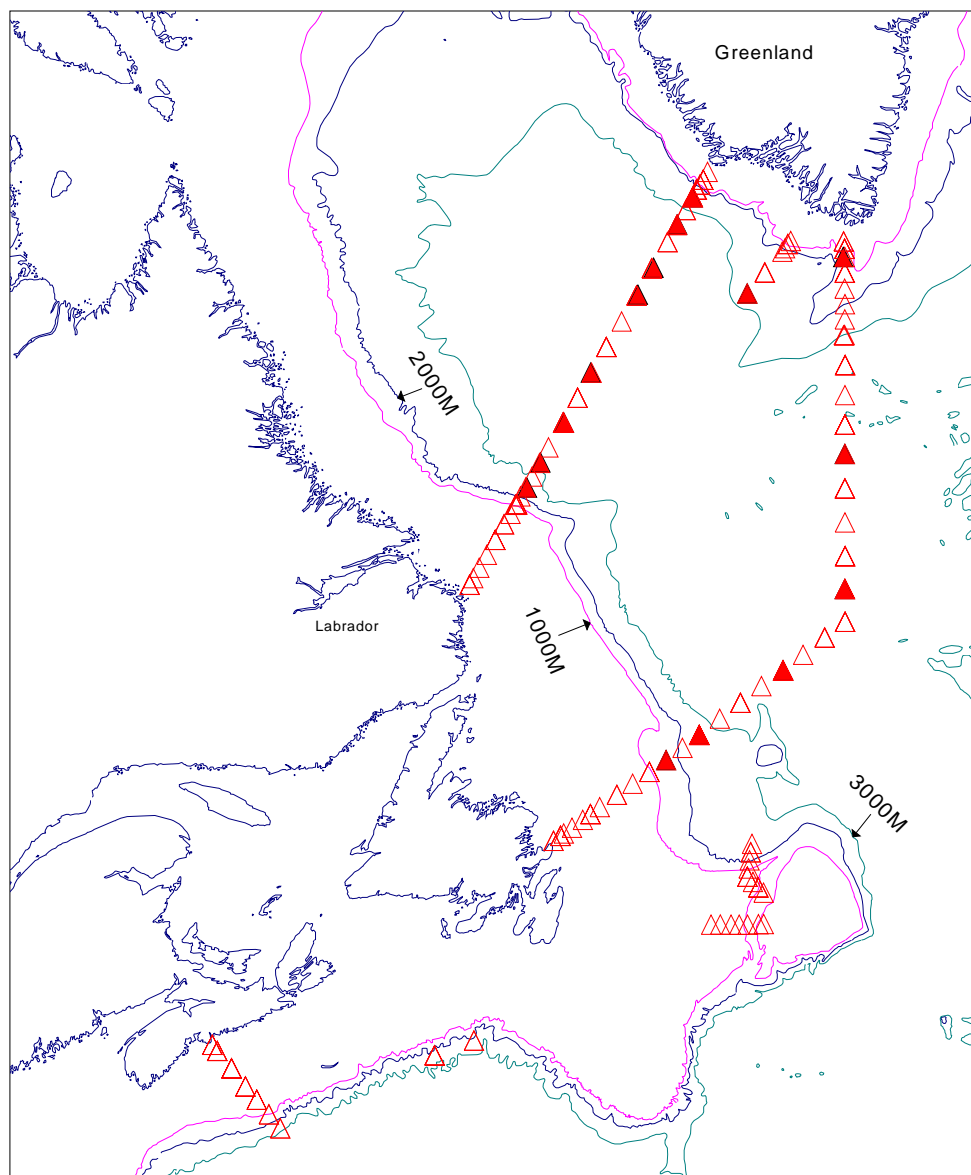


Figure 4.2.1. Net tow (open) and multinet tow (filled) locations for 18HU2002032/1.

**e. Total Organic Carbon (TOC) and Microbial
Community Respiration**

Jay Bugden / Paul Kepkay

In order to try and better understand the cycling of carbon and the mechanisms controlling it in the Labrador Sea, it is necessary to examine the pool of total organic carbon (TOC), and look at the activity of the microbial community in the water column. By examining the rate of respiration and size fractionating the TOC, information on the fate of carbon in this marine environment may be elucidated.

During CCGS Hudson cruise 2002-032 fourteen (14) stations were sampled at 10m, and at the chlorophyll maximum (between 10 and 40m), for gross microbial community

respiration, and size fractionation of TOC (ultrafiltration) was performed at 10m only. The stations sampled are listed below. TOC depth profiles were collected from the twenty-eight (28) stations of the AR7W line listed below.

Station	Respiration	Ultrafiltration	DOC Profile
AR7W site 1			X
AR7W site 2	X	X	X
AR7W site 3			X
AR7W site 4			X
AR7W site 5			X
AR7W site 6			X
AR7W site 7			X
AR7W site 8			X
M1453	X	X	
AR7W site 9			X
AR7W site 10			X
AR7W site 11			X
AR7W site 12			X
AR7W site 13	X	X	X
AR7W site 14			X
AR7W site 15	X	X	X
AR7W site 16			X
AR7W site 17			X
AR7W site 18	X	X	X
AR7W site 19			X
AR7W site 20			X
AR7W site 21	X	X	X
AR7W site 22			X
AR7W site 23			X
AR7W site 24			X
AR7W site 25			X
AR7W site 26			X
AR7W site 27			X
AR7W site 28	X	X	X
OK 8	X	X	
ER 6	X	X	
L5-27	X	X	
L5-23	X	X	
L5-19	X	X	
L5-15a	X	X	
Bon 17	X	X	

Table 4.2.2. Ultrafiltration, respiration and DOC sampling on CCGS Hudson cruise 2002-032. M1453 is a mooring site located on the AR7W line near site 8 (OK – Orphan Knoll; ER – Erik Ridge; Bon – Bonivista Line).

f. Primary Production Measurements

Jeff Anning

Water samples for primary production experiments were collected from the rosette at 20 stations. For each incubation, 33 aliquots were inoculated with sodium bicarbonate ^{14}C and then incubated at in situ temperatures at 30 light levels (+ 3 dark bottles) for approximately 3 hours. At the end of the incubation period the cells were harvested onto GF/F glass fibre filters for later counting in a scintillation counter. Duplicate chlorophyll samples, one particulate carbon, one HPLC, and one Absorption Spectra were collected from each sample.

Photosynthesis/Irradiance incubations were conducted at the following stations:

Station Name	Event #	Date	Time UT	Lat.		Long		Depth (m)	ID
M1429	23	06/25/02	1330	42	41.26	61	31.29	1	253095
M1429	23	06/25/02	1330	42	41.26	61	31.29	50	253090
Enroute Scotian Slope	25	06/26/02	1230	44	10.49	56	38.05	1	253106
Enroute Scotian Slope	25	06/26/02	1230	44	10.49	56	38.05	50	253101
Enroute Grand Banks	35	06/27/02	1115	45	54.88	50	53.12	1	253138
Enroute Grand Banks	35	06/27/02	1115	45	54.88	50	53.12	40	253134
FPx7	50	06/28/02	1215	47	0.19	46	39.73	1	256226
FPx7	50	06/28/02	1215	47	0.19	46	39.73	50	253220
OK 8	86	06/30/02	1215	48	40.38	46	51.51	1	253391
OK 8	86	06/30/02	1215	48	40.38	46	51.51	40	253382
AR7W-2	99	07/02/02	1145	53	47.87	55	26.02	1	253427
AR7W-2	99	07/02/02	1145	53	47.87	55	26.02	30	253470
M1453	128	07/03/02	1515	55	7.93	54	5.19	1	253628
M1453	128	07/03/02	1515	55	7.93	54	5.19	40	253619
AR7W-13.2	138	07/04/02	1051	56	12.6	53	0.12	1	253699
AR7W-13.2	138	07/04/02	1051	56	12.6	53	0.12	40	253690
AR7W-15	155	07/05/02	1725	56	57.71	52	12.75	1	253740
AR7W-15	155	07/05/02	1725	56	57.71	52	12.75	40	253731
AR7W-18	182	07/06/02	1340	58	13	50	52.43	1	253844
AR7W-18	182	07/06/02	1340	58	13	50	52.43	40	253835
AR7W-21	211	07/07/02	1233	59	29.01	49	28.12	1	253933

AR7W-21	211	07/07/02	1233	59	29.01	49	28.12	40	253926
AR7W-28	246	07/08/02	1340	60	34.19	48	12.93	1	254057
AR7W-28	246	07/08/02	1340	60	34.19	48	12.93	40	254067
ER-6	262	07/09/02	1357	58	40.11	47	0.16	1	254138
ER-6	262	07/09/02	1357	58	40.11	47	0.16	20	254130
L5-27	282	07/10/02	1545	59	29.832	44	3.418	30	254247
L5-23	310	07/11/02	1103	57	59.918	44	0.462	1	254329
L5-23	310	07/11/02	1103	57	59.918	44	0.462	20	254329
L5-19	334	07/12/02	1130	56	0.214	44	1.125	1	254442
L5-19	334	07/12/02	1130	56	0.214	44	1.125	10	254436
L5-15A	349	07/13/02	1149	53	36.221	44	0.247	1	255556
L5-15A	349	07/13/02	1149	53	36.221	44	0.247	20	255549
BON-17	365	07/14/02	1246	52	5.235	45	54.243	1	255669
BON-17	365	07/14/02	1246	52	5.235	45	54.243	20	255662
BON-13	380	07/15/02	1126	50	51.327	48	29.325	1	255782
BON-13	380	07/15/02	1126	50	51.327	48	29.325	30	255774
BON 7	409	07/16/02	1203	49	24.748	51	32.673	1	255899
BON 7	409	07/16/02	1203	49	24.748	51	32.673	20	255895

Table 4.2.3. Sampling for primary production.

g. Bacterial Abundance and Production of Microbial Plankton

William Li and Paul Dickie

Seawater samples were collected from the water sample bottles at all stations and all depths for subsequent Flow Cytometric analysis. They were preserved with a final concentration of 1% filtered paraformaldehyde and frozen in liquid Nitrogen. Dr. Bill Li will look at these for enumeration of pico-phytoplankton, bacteria and viruses. At 15 stations on the Labrador- Greenland transect, incubations were conducted on water from the surface to 150 meters for uptake of tritiated leucine into bacterial cells. This gave an estimate of the rate of increase of marine heterotrophic biomass in the photic zone. An additional experiment was performed at station L3-15 using water depths from surface to 3569 meters (23 depths). Eleven additional transit stations were sampled for leucine uptake.

h. Mooring Sediment Traps**Glen Harrison and Jeff Anning**

Two sediment traps were deployed at the “BRAVO” mooring site (at 175 m and 1,053 m) as during the 2000-009 mission. The trap design employed was developed at BIO (Bioflux traps), it has a 24-cup capacity and internal Tattletale computer for programming particle collection intervals. Cups were programmed to collect material for two-week intervals starting 12:01AM (GMT), 15 July, 2002.

5. Major Problems and Goals Not Achieved

The Acoustic Doppler Current Profiler that was to have been part of the CTD/rosette package was damaged when it was being prepared for its initial deployment. The pins on one of the bulkhead connectors were broken when the heavy package was being inserted into the centre of the rosette package from below. With no spare instrument and no spare connector, the instrument could not be brought back into service in spite of considerable effort. The loss of the direct full depth lowered ADCP measurements will place a greater burden on the data from the vessel mounted ADCP.

We had considerable difficulties with the winch and conducting cable associated with the Multi-net system. The winch was loaded onto the vessel in an unacceptable state. It would not payout smoothly as the brake would not release and remain released during this process. After considerable work by the engineering department, including several jury-rigged modifications to replace the missing part that had been left in the winch shop at BIO, the winch was able to perform adequately through 0 to 1000 metres. Since this voyage was late in the spring, this restriction was not particularly harmful to the program, the target species being now nearly exclusively in the upper few hundred metres. It will be a more serious problem in the voyage planned for this December. Soon after the winch was made operational, the cable began exhibiting intermittent shorts. The upper two hundred metres of cable was cut off and the cable re-terminated without success. The final multi-net hauls were successfully completed using the CTD winch in the winch room.

6. Other Incidents of Note

None

7. List of Cruise Participants

Name	Responsibility	Affiliation
Jeff Anning		BIO
Carol Anstey	Nutrients	BIO
Kumiko Azetsu-Scott	CO ₂ and Alkalinity analysis, CF ₆ sampling	BDR
Jay Bugden	DOC Levels, respiration rates	BIO

Rick Boyce	Salts, moorings	BIO
Derek Brittain	MVP, moorings	BIO
Allyn Clarke	Senior Scientist	BIO
Paul Dickie	Bacterial activity	BIO
Gretchen Fitzgerald	Zooplankton, vertical net hauls	BIO
Bob Gershey	Scientist, CO ₂ , CFC's, Alkalinity	BDR
Bassam Ghaleb	Radiogenic isotopes, pump	UQAM
Les Harris	Zooplankton, Net Tows	BIO
Glen Harrison	Assistant Scientist	BIO
Jeff Jackson	Data management	BIO
Jennifer McKay	Stable and carbon isotopes	UQAM
Patrick Poulin	Radiogenic isotopes, pump	UQAM
Christine Riordan	Biological analysis	BIO
Sylvie Roy	Oxygen analysis	BDR
Murray Scotney	Moorings, instrumentation	BIO
Sandrine Solignac	Stable and carbon isotopes	UQAM
Igor Yashayaev	Scientist	BDR
Frank Zemlyak	Technician, CO ₂ , CFC's, Alkalinity	BIO

BIO Bedford Institute of Oceanography
PO Box 1006
Dartmouth, NS, B2Y 2A4
Canada

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

UQAM Université du Québec à Montréal
Centre GEOTOP-UQAM-McGill
CP 8888, succursale Centre-Ville
Montréal (Québec)
H3C 3P8

WHOI Woods Hole Oceanographic Institution
Woods Hole, MA 02543
USA

B. UNDERWAY MEASUREMENTS

1. Navigation and Bathymetry

Jeff Jackson

The navigation system onboard CCGS Hudson consists of a differential GPS receiver and AGCNAV. The receiver is one of many NMEA feeds into a multiplexer that provides all the NMEA strings to a PC on the bridge. The PC, which is running AGCNAV software, then rebroadcasts the NMEA strings to distribution units in the computer room, which provide 16 output lines for the working labs. The resulting broadcast navigation strings are at about 1 Hz. The navigation data are then logged at one second intervals on a PC.

AGCNAV is a PC based display and waypoint setting software package, developed at the Atlantic Geoscience Centre at BIO. This software graphically displays ship position, waypoints, course, speed, etc. to the various science working areas.

The echo sounder system used for collecting bathymetric data at station locations consisted of a Raytheon Line Scan Recorder, Model LSR 1811-1 (serial number A101) connected to a 12kHz transducer. The transducer beam width is 15 degrees. The sweep rate of the record was adjusted throughout the course of data collection to aid in identifying the bottom signal. One transducer is positioned on a Ram that can be lowered or raised depending on conditions. When the ram is up, the waterline to transducer offset is 6 m. When the ram is down, the offset is 8 m.

2. Vessel Mounted Acoustic Doppler Current Profiler

Murray Scotney

The Hudson was equipped with a hull mounted RDI Acoustic Doppler Current Profiler (ADCP). The transducer (serial number 177) had VM ADCP electronics (serial number 172). Logging, using Transect software on a 486 PC, was started on June 24 at 1216 Z off the coast off the Nova Scotia while performing operations on the Halifax Line.

The configuration used for logging resulted in 5 minute averages in 4 metre bins. The averaged data was stored to disk and backed up every few days. ADCP logging was stopped on July 18 at 1053 Z in Halifax Harbour.

3. Continuous Flow Multisensor Package (CFMP)

Jeff Anning

Water from approximately 4m was continuously pumped to the forward lab. The temperature, conductivity and fluorescence were measured and logged every 30 sec. The temperature and conductivity were measured with Seabird sensors and the fluorescence by a Wetlabs flowthrough fluorometer. Incident Photosynthetically Active Radiation was measured with a Li-Cor Spherical Quantum Sensor and this data was merged with the sea water parameters. Exact time and positions were provided by a Northstar GPS and logged with the other data. In addition discrete water samples were collected every 15

minutes by an auto sampler for later analysis for nitrate and silicate. Time and position of these discrete samples were logged by the computer.

4. XBT and XCTD

Igor Yashayev

Expendable Bathythermographs were deployed along the AR7W line on the way from Greenland to Labrador. The XBT's were model 7 from Sparton of Canada. This type of probe is capable of measuring to maximum depths of 800 m at the full cruising speed 15 knots). The vertical resolution of the measurements was about 0.6-0.8 m. 80 XBT's were launched during the cruise.

Continuous deployment of XBT along the AR7W line at 2-4 kilometer intervals revealed inhomogeneities in the thermal structure of the upper layer. Dominant scales appear to be between 20 and 40 kilometers. Preliminary data are shown in [Figure B.4.1](#).

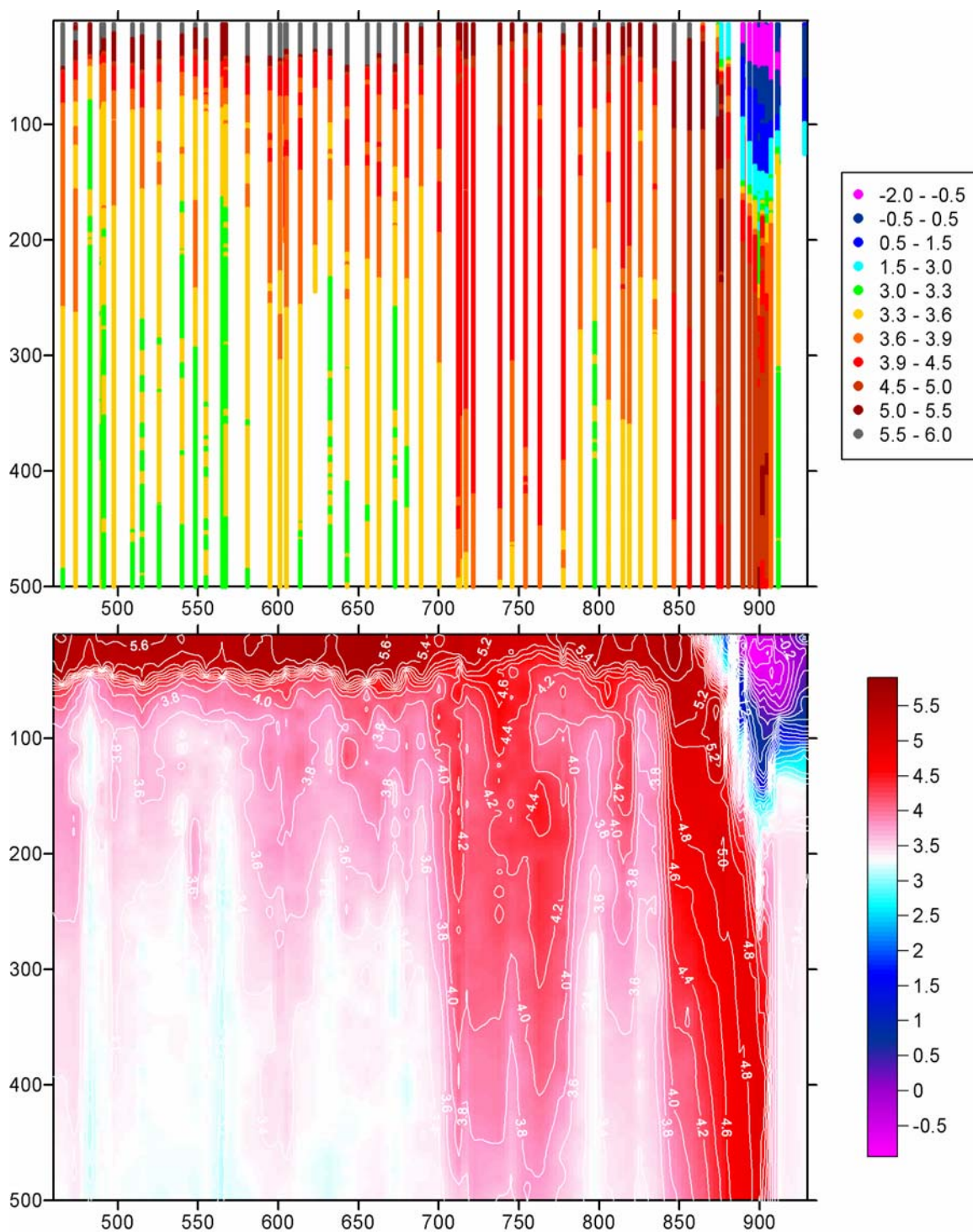


Figure B.4.1 Temperature in the upper 500 metres along the AR7W section.

5. Meteorological observations

The ship's crew logged routine reporting of meteorological variables.

6. Atmospheric Chemistry

There was no atmospheric chemistry program.

**Appendix 1: Operation Notes Report
(sorted by Operation ID Number)**

Note Number: 1	Entry Time: 24/Jun/2002 3:54:16	Note Made By: Jeff Jackson	Operation ID: 1
CTD Cast at site 1 of Halifax line			
Note Number: 2	Entry Time: 24/Jun/2002 3:54:44	Note Made By: Jeff Jackson	Operation ID: 2
Net tow at site 1 of Halifax line.			
Note Number: 3	Entry Time: 24/Jun/2002 3:55:05	Note Made By: Jeff Jackson	Operation ID: 3
Second net tow at site 1 of Halifax line.			
Note Number: 4	Entry Time: 24/Jun/2002 3:55:22	Note Made By: Jeff Jackson	Operation ID: 4
Net tow at site 2 of Halifax line.			
Note Number: 5	Entry Time: 24/Jun/2002 3:56:33	Note Made By: Jeff Jackson	Operation ID: 5
Second net tow at site 2 of Halifax line.			
Note Number: 6	Entry Time: 24/Jun/2002 3:55:57	Note Made By: Jeff Jackson	Operation ID: 6
Third net tow at site 2 of Halifax line.			
Note Number: 7	Entry Time: 24/Jun/2002 3:56:33	Note Made By: Jeff Jackson	Operation ID: 7
CTD cast at site 2 of Halifax line.			
Note Number: 8	Entry Time: 25/Jun/2002 19:22:30	Note Made By: Jeff Jackson	Operation ID: 35
CTD failure, cast aborted. CTD failed at 847 dbar. Was operating normally before it failed.			
Note Number: 9	Entry Time: 28/Jun/2002 14:25:26	Note Made By: Allyn Clarke	Operation ID: 59

Had problems with the block read out at the start of cast. When the IMS software was initiated, the readout in the computer room initially came up with information but then all the fields when blank except for tension and the two tilts. Could not correct by restarting or resetting the display from computer room. The system successfully worked after being shut down and restarted twice in the winchroom.			
Note Number: 10	Entry Time: 07/Jul/2002 21:08:09	Note Made By: Igor Yashayaev	Operation ID: 78
Didn't remove a tube to the CTD before the cast. The upcast data seems to be better than downcast for this station.			
Note Number: 29	Entry Time: 08/Jul/2002 9:29:06	Note Made By: Jeff Jackson	Operation ID: 95
Altimeter with serial number 975 was replaced by altimeter with serial number 222.			
Note Number: 12	Entry Time: 03/Jul/2002 16:45:12	Note Made By: Jeff Jackson	Operation ID: 129
Sounding 1636 m.			
Note Number: 13	Entry Time: 03/Jul/2002 21:07:47	Note Made By: Allyn Clarke	Operation ID: 131
This cast had 4 SeaCats mounted for calibration. At 1100 metres, Murray Scotney realized that on eof the SEaCats was equipped with a pressure sensor that was limited to 1300 metres. Stopped cast and returned to the surface. Stopped at 850 pressure for 5 minutes (T = 3.202, S = 34.812). Stopped at 400 db for 5 minutes. At 9:07 sent the CTD on board.			
Note Number: 14	Entry Time: 03/Jul/2002 23:45:53	Note Made By: Igor Yashayaev	Operation ID: 132
Stopped at 250 for 5 minutes and at 20 db for 5 minutes to collect calibration points for the Seacats.			
Note Number: 15	Entry Time: 04/Jul/2002 8:56:12	Note Made By: Igor Yashayaev	Operation ID: 137
Lost communication with the CTD when it was at 3006 db about 60 db away from the bottom. Terminated the cast and brought the package on board.			
Note Number: 16	Entry Time: 04/Jul/2002 14:28:33	Note Made By: Allyn Clarke	Operation ID: 140

Secondary oxygen is noisy and low compared to primary oxygen.			
Note Number: 17	Entry Time: 04/Jul/2002 15:38:33	Note Made By: Allyn Clarke	Operation ID: 140
CTD stopped operating at 2713 dbars in the same fashion as on station L3_13. Coming up.			
Note Number: 18	Entry Time: 04/Jul/2002 15:48:23	Note Made By: Jeff Jackson	Operation ID: 140
The hose was off the top of the secondary pump.			
Note Number: 19	Entry Time: 05/Jul/2002 0:31:49	Note Made By: Igor Yashayaev	Operation ID: 142
The CTD probe / Pressure was changed to #1 before the station. Changed the CTD settings in .con file. New .con file - 142onward.con			
Note Number: 20	Entry Time: 05/Jul/2002 0:46:38	Note Made By: Igor Yashayaev	Operation ID: 142
At 390 db the CTD stopped sending the data. The cast was stopped and the CTD brought back to surface. At 130 db the CTD started working again. Sent the CTD down it stopped communicating again. Kept sending it down (till stops) and up (till starts working again).			
Note Number: 21	Entry Time: 05/Jul/2002 18:25:07	Note Made By: Igor Yashayaev	Operation ID: 144
Cut about 150 of cable and reconnected the CTD. Changed the CTD and pressure sensor back to #6. Used 95onward.con from this station (144) on.			
Note Number: 22	Entry Time: 05/Jul/2002 4:03:15	Note Made By: Igor Yashayaev	Operation ID: 144
The CTD stopped communication at 373 m. Terminated the cast and brought the CTD on board.			
Note Number: 23	Entry Time: 07/Jul/2002 9:44:52	Note Made By: Igor Yashayaev	Operation ID: 150
We unplugged auxiliary sensors plus both oxygen sensors. In the configuration on station 150 we used primary T, primary C, secondary T, secondary C plus pri. and sec. pumps plus the carousel. This configuration was saved in the file only_t-c.con. Since the order of IDs and positions of the sensors are the same as in 95 onward I later deleted only_t-c.con and used 95onward.con for processing.			

Note Number: 24	Entry Time: 05/Jul/2002 16:45:32	Note Made By: Jeff Jackson	Operation ID: 154
CTD stopped responding at 85 m. Problem seems to be one of the biological sensors. We had the primary and secondary temperature and conductivity sensors, pressure sensor, along with the PAR, Chelsea fluorometer and Wetstar sensors on the CTD. A second ROS operation was performed using this same operation number. Before this second operation the PAR sensor was removed, but the CTD stopped responding at 125 m. This second operation had been 155, but it was removed from ODIN and the CTD data files were renamed as 032b154, in order to be consistent with the bridge log.			
Note Number: 25	Entry Time: 05/Jul/2002 16:45:32	Note Made By: Jeff Jackson	Operation ID: 155
The Wetstar sensor was removed prior to this cast and the PAR sensor was placed back on the CTD. The CTD seemed to work fine except for a bit of flakiness in the PAR and fluorometer sensors. The CTD was taken to a maximum depth of 350 m to test the sensors and the CTD system. This operation had been 156, but it was renamed to 155 to be consistent with the bridge log.			
Note Number: 26	Entry Time: 05/Jul/2002 18:25:07	Note Made By: Jeff Jackson	Operation ID: 156
This operation had been 157, but it was renamed to 156 to be consistent with the bridge log.			
Note Number: 36	Entry Time: 14/Sep/2004 16:05:00	Note Made By: Jeff Jackson	Operation ID: 157
According to the records in the science log, two ROS operations were performed using the same operation number (154). This caused the science log and ODIN to end up being conflicted. ODIN was missing the drifter operation (158 in the science log) since it had these two ROS operations listed as different operations (154 and 155). To correct this conflict. The original ROS operation 155 was removed from ODIN and its CTD data file name was changed from 032a155 to 032b154. Also, operation 156 was renamed as 155, operation 157 was renamed as 156 along with the appropriate changes to the CTD data file names and operation 158 was renamed 157. Then a new operation 158 was inserted into ODIN for the missing drifter operation.			
Note Number: 27	Entry Time: 07/Jul/2002 9:44:52	Note Made By: Jeff Jackson	Operation ID: 182
The altimeter was added to the CTD package. But Jeff used the wrong con file during the cast. The 95onward.con file was copied to 182onward.con. When I entered the Seacon application to make changes I neglected to select the proper con file to update. Thus the incorrect con file was used. I stopped acquisition, modified the con file and restarted it at the bottom, so the cast was split in two. The con file confusion was sorted out after the cast was complete. I should have just used 95onward.con as the configuration file.			

Note Number: 28	Entry Time: 07/Jul/2002 14:59:22	Note Made By: Allyn Clarke	Operation ID: 215
Holding between bottle 1 and 2, at 25 metres off the bottom for 25 minutes for pump sample.			
Note Number: 30	Entry Time: 10/Jul/2002 6:03:56	Note Made By: Igor Yashayaev	Operation ID: 255
The operation IDs are +1 from 256 to 260.			
Note Number: 31	Entry Time: 10/Jul/2002 8:00:31	Note Made By: Igor Yashayaev	Operation ID: 273
<p>The bottom depth at ER 3 (ID=272) was > 2100 m, expected 1700 m. Since the sounding at 2.5 and 2 sec/scan was unclear we used 1 sec/scan and estimated that the station was about 1300 m deep. The CTD was stopped by the sounder (even if the CTD altimeter was showing 100). We were almost certain that we missed one lap, but decided not to risk the CTD and fired the bottles as if the station was 1300 m deep.</p> <p>While drawing the samples on the steam to ER 2, we watched the sounder and marked the position for 1700 m as was expected for ER 3. The new site was between the sites ER 2 and ER 3 (within 2-2.5 miles from each) and about 1900 m deep.</p>			
Note Number: 32	Entry Time: 11/Jul/2002 5:26:41	Note Made By: Allyn Clarke	Operation ID: 287
Note Primary Oxygen under went shift on Down Trace between 150 and 250 metres. Seemed to recover original value for rest of down and for the up trace.			
Note Number: 33	Entry Time: 11/Jul/2002 5:26:43	Note Made By: Igor Yashayaev	Operation ID: 303
<p>Similar to 287:</p> <p>Primary Oxygen had a broad shift on the down trace between 440 and 500 metres. At about 500 it returned back, but its readings were a bit lower than before the shift.</p>			
Note Number: 34	Entry Time: 13/Jul/2002 9:29:32	Note Made By: Igor Yashayaev	Operation ID: 341

Station 341: samples IDs 255501 through 255515

Correction to sample IDs from station 341

The first sample ID on station 341 was 254492, next eight bottles were 254493 to 254500. Then instead of 254501, the sample IDs leaped increased to 255501, skipping 1000 counts. We couldn't find any labels for 254501-255500. The problem with IDs for station 341 was discovered after the sampling was completed.

To keep the processing at its simplest we suggest to change "5" to "4" in the third digit in the labels IDs - from 255501-255515 to the 254501-254515, accordingly. This will make the set consistent through the sampling queue.

Please distribute the note to those who sampled on the station with the sample IDs leaping over 1000. The station 345 has the sample IDs starting with 255516.

Thanks for your cooperation.

Igor Yashayev

Note Number: 35	Entry Time: 15/Jul/2002 14:29:37	Note Made By: Allyn Clarke	Operation ID: 381
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Secondary Oxygen sensor underwent some sort of cut-out at 475 dbars lasting over about 5 metres. The sensor then stabilized at an offset of about 1 ml/l low and moved back towards its usual calibration over the next 60-80 dbars. No sign of any problems with secondary salinity. On the up trace, the net new offset of this sensor appears to be 0.05 ml/l lower. It should be noted that bottle SN S001 in rosette position 21 imploded during the downcast breaking of the spigots of two other bottles in rosette positions 19 and 23. This implosion was most likely the cause of the secondary oxygen being knocked out of sorts.

Table F.1.1 Operation Notes

Appendix 2: GEOTOP Dissolved Inorganic and Organic Carbon Samples

Operation ID	Station	Sample	Pressure (dbars)	Analysis		
				[DIC] and $\delta^{13}\text{C}$ DIC	[DOC] and $\delta^{13}\text{C}$ DOC	^{14}C
90	OK-8	253394	2637	Yes	Yes	Yes
		253396	2317	Yes	Yes	-
		253398	2114	Yes	Yes	Yes
		253399	1914	Yes	Yes	-
		253401	1711	Yes	Yes	Yes
		253402	1509	Yes	Yes	-
		253405	1108	Yes	Yes	Yes
		253408	505	Yes	Yes	-
		253411	252	Yes	Yes	Yes
		253412	151	Yes	Yes	-
		253413	101	Yes	Yes	-
		253415	51	Yes	Yes	Yes
116	L3-08	253551	950	Yes	Yes	-
		253554	700	Yes	Yes	-
		253556	470	Yes	Yes	-
		253558	261	Yes	Yes	-
		253559	170	Yes	Yes	-
		253560	100	Yes	Yes	-
		253563	50	Yes	Yes	-
		253568	10	Yes	Yes	-
134	L3-12	253660	3157	Yes	Yes	-
		253664	2808	Yes	Yes	-
		253669	1990	Yes	Yes	-
		253670	1800	Yes	Yes	-
		253671	1600	Yes	Yes	-
		253673	1200	Yes	Yes	-
		253675	800	Yes	Yes	-
		253676	600	Yes	Yes	-
		253678	288	Yes	Yes	-
		253680	108	Yes	Yes	-
		253681	60	Yes	Yes	-
		253683	5	Yes	Yes	-

Operation ID	Station	Sample ID	Pressure (dbars)	Analysis		
				[DIC] and $\delta^{13}\text{C}$ DIC	[DOC] and $\delta^{13}\text{C}$ DOC	^{14}C
164	L3-16	253767	1070	Yes	Yes	-
		253770	680	Yes	Yes	Yes
		253773	240	Yes	Yes	-
		253775	140	Yes	Yes	Yes
		253777	40	Yes	Yes	Yes
		253780	15	Yes	Yes	-
166	L3-16	253782	3579	Yes	Yes	Yes
		253789	3020	Yes	Yes	Yes
		253792	2851	Yes	Yes	-
		253796	2479	Yes	Yes	-
		253799	2010	Yes	Yes	Yes
		253803	1529	Yes	Yes	Yes
193	L3-19	253870	3566	Yes	Yes	-
		253873	3300	Yes	Yes	-
		253875	3040	Yes	Yes	-
		253878	2501	Yes	Yes	-
		253880	2030	Yes	Yes	-
		253882	1529	Yes	Yes	-
		253884	1090	Yes	Yes	-
		253887	510	Yes	Yes	-
		253889	240	Yes	Yes	-
		253890	140	Yes	Yes	-
		253892	35	Yes	Yes	-
		253893	12	Yes	Yes	-
222	L3-22	253959	3250	Yes	Yes	-
		253962	3019	Yes	Yes	-
		253966	2460	Yes	Yes	-
		253968	2059	Yes	Yes	-
		253970	1640	Yes	Yes	-
		253973	1029	Yes	Yes	-
		253976	480	Yes	Yes	-
		253978	210	Yes	Yes	-
		253979	110	Yes	Yes	-
		253980	50	Yes	Yes	-
		253981	26	Yes	Yes	-
		253982	2	Yes	Yes	-

Operation ID	Station	Sample ID	Pressure (dbars)	Analysis		
				[DIC] and $\delta^{13}\text{C}$ DIC	[DOC] and $\delta^{13}\text{C}$ DOC	^{14}C
259	L3-25	254083	510	Yes	Yes	Yes
		254087	250	Yes	Yes	-
		254091	100	Yes	Yes	Yes
		254093	50	Yes	Yes	-
		254095	20	Yes	Yes	Yes
260	L3-25	254098	2785	Yes	Yes	Yes
		254104	2481	Yes	Yes	-
		254106	2340	Yes	Yes	-
		254108	2170	Yes	Yes	Yes
		254112	1811	Yes	Yes	-
		254116	1430	Yes	Yes	-
		254120	1030	Yes	Yes	Yes
282	L5-27	254236	189	Yes	Yes	-
		254240	100	Yes	Yes	-
		254244	50	Yes	Yes	-
		254251	10	Yes	Yes	-
		254256	3	Yes	Yes	-
287	L5-26	254258	1436	Yes	Yes	-
		254263	978	Yes	Yes	-
		254266	499	Yes	Yes	-
		254268	218	Yes	Yes	-
		254270	50	Yes	Yes	-
		254271	20	Yes	Yes	-
		254272	4	Yes	Yes	-
327	L5-21	254379	3494	Yes	Yes	-
		254383	3079	Yes	Yes	-
		254386	2600	Yes	Yes	-
		254389	1850	Yes	Yes	-
		254391	1450	Yes	Yes	-
		254393	1150	Yes	Yes	-
		354394	975	Yes	Yes	-
		354396	510	Yes	Yes	-
		354399	140	Yes	Yes	-
		254400	70	Yes	Yes	-
		254401	35	Yes	Yes	-

Operation ID	Station	Sample ID	Pressure (dbars)	Analysis		
				[DIC] and $\delta^{13}\text{C}$ DIC	[DOC] and $\delta^{13}\text{C}$ DOC	^{14}C
354	L5-13	255582	3862	Yes	Yes	-
		255587	3010	Yes	Yes	-
		255589	2593	Yes	Yes	-
		255592	1960	Yes	Yes	-
		255594	1539	Yes	Yes	-
		255596	1120	Yes	Yes	-
		255599	520	Yes	Yes	-
		255601	240	Yes	Yes	-
		255602	140	Yes	Yes	-
		255603	71	Yes	Yes	-
		255604	35	Yes	Yes	-
		255605	2	Yes	Yes	-
385	Bon-12	255804	2187	Yes	Yes	-
		255809	1550	Yes	Yes	-
		255812	1029	Yes	Yes	-
		255815	480	Yes	Yes	-
		255817	350	Yes	Yes	-
		255819	100	Yes	Yes	-
		255820	50	Yes	Yes	-
		255821	19	Yes	Yes	-
		255822	2	Yes	Yes	-
395	Bon-10	255838	940	Yes	Yes	-
		255842	500	Yes	Yes	-
		255844	221	Yes	Yes	-
		255845	100	Yes	Yes	-
		255848	50	Yes	Yes	-
		255851	20	Yes	Yes	-
		255854	3	Yes	Yes	-
405	Bon-8	255870	283	Yes	Yes	-
		255872	168	Yes	Yes	-
		255874	99	Yes	Yes	-
		255877	50	Yes	Yes	-
		255880	20	Yes	Yes	-
		255883	2	Yes	Yes	-

Appendix 3: GEOTOP Pump station Files

Data recording start time = 06/24/102 21:35:58

Data recording stop time = 06/24/102 22:28:34

Halifax 6 Depth 1000m Hudson 2002-032

Sample volume = 200 [liters] Initial flow rate = 8000 [ml/min]
 Minimum flow rate = 4000 [ml/min] Time limit = 51 [minutes]
 Pump data period = 1 [minutes] Scheduled start 06/24/102 22:00:00

DEPLOYMENT DATA

Event start: 06/24/102 22:00:00 32.9 Vb 11 °C
 200.02 L delivered in 1713 seconds : Volume reached.
 Event end: 06/24/102 22:28:34 29.7 Vb 17 °C

Normal shutdown.

PUMPING DATA

Sample interval = 1 [minutes]
 [L/min] [liters] [Vbat]

6.82	7.03	27.7
6.97	13.67	27.6
7.24	20.48	27.7
7.26	27.45	27.1
7.54	34.60	26.7
7.39	41.89	27.0
7.59	49.00	26.8
7.61	56.27	26.4
7.46	63.28	26.6
7.50	70.44	26.1
7.28	77.66	26.2
7.43	84.76	25.9
7.32	91.86	26.5
7.37	98.90	26.1

Sample interval = 1 [minutes]
 [L/min] [liters] [Vbat]

7.13	105.95	26.3
7.26	112.90	26.2
7.48	120.02	25.9
7.26	127.02	26.2
7.46	134.09	25.7
7.30	140.97	26.0
7.43	147.99	25.7
6.99	154.91	26.0
7.21	161.76	25.7
7.43	168.79	25.5
7.17	175.66	25.6
6.99	182.62	25.6
7.21	189.39	25.7
7.32	196.31	25.2

Checking for low battery during pumping event . . . done.
 Lowest battery voltage measured while under load: 25.2
 End of instrument data file.

Data recording start time = 06/30/102 15:36:40

Data recording stop time = 06/30/102 17:07:16

Station OK 9 Hudson 2002-032

Sample volume = 250 [liters] Initial flow rate = 7000 [ml/min]
 Minimum flow rate = 4000 [ml/min] Time limit = 63 [minutes]
 Pump data period = 1 [minutes] Scheduled start 06/30/102 16:30:00

DEPLOYMENT DATA

Event start: 06/30/102 16:30:00 32.6 Vb 4 °C
 250.00 L delivered in 2235 seconds : Volume reached.
 Event end: 06/30/102 17:07:16 29.0 Vb 14 °C

Normal shutdown.

PUMPING DATA

Sample interval = 1 [minutes]
 [L/min] [liters] [Vbat]

7.06	6.59	27.1
7.08	13.31	26.9
6.95	20.03	26.7
6.99	26.75	26.6
6.97	33.47	26.5
6.97	40.19	26.4
6.97	46.91	26.2
6.99	53.63	25.9
6.97	60.35	26.0
6.97	67.07	25.8
6.95	73.79	25.6
7.04	80.51	25.9
7.01	87.23	25.6
6.97	93.95	25.6
7.04	100.67	25.7
7.01	107.39	25.5
7.04	114.11	25.5
7.08	120.83	25.4
7.01	127.55	25.0

Sample interval = 1 [minutes]
 [L/min] [liters] [Vbat]

6.97	134.27	25.2
7.04	140.99	25.2
7.06	147.71	25.1
6.95	154.43	24.8
6.99	161.15	25.0
7.04	167.87	24.8
7.06	174.59	24.8
7.06	181.31	24.8
7.08	188.03	24.9
6.95	194.75	24.6
7.01	201.47	24.6
7.06	208.19	24.6
7.06	214.91	24.5
6.95	221.62	24.5
6.95	228.34	24.4
6.95	235.06	24.4
6.97	241.78	24.4
6.95	248.50	24.4

Checking for low battery during pumping event . . . done.

Lowest battery voltage measured while under load: 24.4

Lowest measured battery voltage is less than 25.0

Replacement of battery pack before next deployment is strongly recommended.

End of instrument data file.

Data recording start time = 07/03/102 01:59:15

Data recording stop time = 07/03/102 03:32:05

L3_10

HUDSON 2002-032

Sample volume = 250 [liters] initial flow rate = 8000 [ml/min]
 Minimum flow rate = 4000 [ml/min] Time limit = 63 [minutes]
 Pump data period = 1 [minutes] Scheduled start 07/03/102 02:50:00

DEPLOYMENT DATA

Event start: 07/03/102 02:50:00 34.6 Vb 4 °C

250.00 L delivered in 2524 seconds : Volume reached.

Event end: 07/03/102 03:32:05 31.3 Vb 15 °C

Normal shutdown.

PUMPING DATA

Sample interval = 1 [minutes]
 [L/min] [liters] [Vbat]

6.57	6.99	30.5
6.29	12.93	30.6
6.42	19.00	30.6
6.22	24.86	30.6
6.35	30.86	30.1
6.51	37.00	29.9
6.29	43.19	30.1
6.07	49.20	30.2
6.22	55.06	30.3
6.33	61.06	29.8
6.13	67.08	30.0
6.26	73.02	29.5
6.07	78.93	29.9
6.18	84.81	29.6
6.35	90.83	29.5
6.15	96.80	29.6
6.18	102.73	29.5
6.09	108.62	29.3
6.13	114.48	29.5
6.46	120.51	29.1
6.13	126.40	29.6

Sample interval = 1 [minutes]
 [L/min] [liters] [Vbat]

6.40	132.35	29.2
6.31	138.45	29.2
6.29	144.34	29.0
6.42	150.37	29.1
6.13	156.22	29.1
6.38	162.16	28.9
6.18	167.92	28.9
6.18	173.80	28.8
5.87	179.55	29.2
6.18	185.32	28.8
6.35	191.24	28.8
6.04	197.25	28.6
6.24	203.12	28.6
6.02	209.07	28.6
6.13	214.87	28.6
5.98	220.72	29.0
6.02	226.46	28.9
6.18	232.33	28.6
5.91	238.01	28.5
6.07	243.76	28.5
6.29	249.65	28.4

Checking for low battery during pumping event . . . done.

Lowest battery voltage measured while under load: 28.4

End of instrument data file.

Data recording start time = 07/03/102 18:42:42

Data recording stop time = 07/03/102 20:11:22

L3_11 HUDSON 2002-032

Sample volume = 250 [liters] Initial flow rate = 8000 [ml/min]
 Minimum flow rate = 4000 [ml/min] Time limit = 63 [minutes]
 Pump data period = 1 [minutes] Scheduled start 07/03/102 19:30:00

DEPLOYMENT DATA

Event start: 07/03/102 19:30:00 33.8 Vb 4 øC
250.00 L delivered in 2481 seconds : Volume reached.
Event end: 07/03/102 20:11:22 31.0 Vb 14 øC

Normal shutdown.

PUMPING DATA

Sample interval = 1 [minutes]
 [L/min] [liters] [Vbat]

6.55	6.98	29.7
6.62	13.26	29.7
6.31	19.38	29.6
6.60	25.54	29.4
6.33	31.64	29.7
6.38	37.69	29.4
6.62	43.90	29.4
6.46	50.26	29.1
6.53	56.43	29.1
6.68	62.74	29.1
6.44	68.83	28.8
6.13	74.82	29.3
6.24	80.78	29.2
6.57	86.90	28.9
6.18	92.97	29.0
6.33	98.97	28.7
6.60	105.13	28.6
6.20	111.19	28.7
6.42	117.27	28.4
6.22	123.34	28.7
6.31	129.30	28.6

Sample interval = 1 [minutes]
 [L/min] [liters] [Vbat]

6.49	135.42	28.5
6.26	141.48	28.6
6.40	147.52	28.4
6.20	153.51	28.5
6.22	159.47	28.5
6.11	165.43	28.4
6.22	171.30	28.6
5.96	177.15	28.3
6.15	182.97	28.4
6.31	188.93	28.1
6.09	194.82	28.5
6.13	200.69	28.2
6.46	206.72	28.0
6.26	212.60	28.3
6.42	218.57	28.3
6.20	224.35	28.3
6.24	230.26	27.9
6.11	236.23	28.1
6.24	242.09	28.1
6.02	248.02	28.2

Checking for low battery during pumping event . . . done.

Lowest battery voltage measured while under load: 27.9

End of instrument data file.

Data recording start time = 07/05/102 23:50:56

Data recording stop time = 07/06/102 01:47:13

L3_16 HUDSON 2002-032

Sample volume = 250 [liters] Initial flow rate = 8000 [ml/min]
 Minimum flow rate = 4000 [ml/min] Time limit = 63 [minutes]
 Pump data period = 1 [minutes] Scheduled start 07/06/102 01:05:00

DEPLOYMENT DATA

Event start: 07/06/102 01:05:00 33.7 Vb 4 oC
 250.00 L delivered in 2532 seconds : Volume reached.
 Event end: 07/06/102 01:47:13 30.8 Vb 14 oC

Normal shutdown.

PUMPING DATA

Sample interval = 1 [minutes]

[L/min] [liters] [Vbat]

6.53	6.98	29.7
6.73	13.26	29.6
6.51	19.33	29.6
6.22	25.49	29.7
6.35	31.49	29.4
6.49	37.62	29.3
6.31	43.83	29.4
6.40	49.89	29.2
6.24	55.99	29.1
6.33	61.99	28.8
6.11	67.97	29.0
6.29	73.92	28.8
6.07	79.91	29.1
6.22	85.77	28.9
5.98	91.73	29.1
6.09	97.49	29.0
6.20	103.39	28.6
6.09	109.32	29.1
6.22	115.16	28.5
6.02	121.00	28.5
6.07	126.77	28.7
6.26	132.69	28.1

Sample interval = 1 [minutes]

[L/min] [liters] [Vbat]

6.04	138.52	28.9
6.22	144.39	28.3
6.00	150.12	28.3
6.15	155.94	28.3
6.07	161.87	28.6
6.09	167.64	28.5
5.91	173.50	28.5
6.02	179.19	28.2
6.22	185.03	28.3
6.00	190.87	28.4
6.13	196.65	28.4
6.24	202.58	28.2
6.09	208.40	28.2
6.29	214.29	28.0
6.11	220.01	28.1
6.24	225.85	28.0
5.85	231.56	28.4
6.11	237.29	27.8
6.22	243.17	27.7
5.98	248.91	27.8

Checking for low battery during pumping event . . . done.

Lowest battery voltage measured while under load: 27.7

End of instrument data file.

Data recording start time = 07/06/102 14:45:42

Data recording stop time = 07/06/102 16:31:22

L3_18 Hudson 032-2002

Sample volume = 250 [liters] Initial flow rate = 8000 [ml/min]
 Minimum flow rate = 4000 [ml/min] Time limit = 63 [minutes]
 Pump data period = 1 [minutes] Scheduled start 07/06/102 15:50:00

DEPLOYMENT DATA

Event start: 07/06/102 15:50:00 33.2 Vb 4 øC
 250.00 L delivered in 2482 seconds : Volume reached.
 Event end: 07/06/102 16:31:22 30.7 Vb 14 øC

Normal shutdown.

PUMPING DATA

Sample interval = 1 [minutes]
 [L/min] [liters] [Vbat]

6.49	6.98	29.2
6.29	12.93	29.3
6.42	18.99	29.1
6.29	25.19	29.4
6.35	31.17	29.0
6.49	37.31	28.8
6.29	43.55	29.1
6.40	49.60	28.8
6.20	55.74	28.9
6.31	61.72	28.7
6.53	67.85	28.6
6.26	73.97	28.6
6.38	80.04	28.5
6.20	86.18	28.5
6.31	92.15	28.6
6.44	98.26	28.2
6.24	104.14	28.4
6.38	110.13	28.4
6.20	116.21	28.4
6.26	122.15	28.4
6.38	128.23	28.2

Sample interval = 1 [minutes]
 [L/min] [liters] [Vbat]

6.15	134.29	28.1
6.29	140.32	28.0
6.11	146.32	28.3
6.33	152.28	28.1
6.07	158.22	28.1
6.24	164.10	28.1
6.40	170.12	27.9
6.40	176.30	27.9
6.46	182.30	27.8
6.55	188.44	27.7
6.33	194.37	28.1
6.46	200.42	27.7
6.09	206.35	27.8
6.29	212.28	28.0
6.53	218.38	27.5
6.22	224.29	27.7
6.44	230.32	27.4
6.24	236.17	27.8
6.35	242.12	27.6
6.02	248.01	27.8

Checking for low battery during pumping event . . . done.

Lowest battery voltage measured while under load: 27.4

End of instrument data file.

Data recording start time = 07/07/102 10:50:12

Data recording stop time = 07/07/102 12:33:15

L3_21 Hudson 032-2002

Sample volume = 250 [liters]

Initial flow rate = 8000 [ml/min]

Minimum flow rate = 4000 [ml/min]

Time limit = 63 [minutes]

Pump data period = 1 [minutes]

Scheduled start 07/07/102 11:50:00

DEPLOYMENT DATA

Event start: 07/07/102 11:50:00 33.2 Vb 4 øC

250.00 L delivered in 2595 seconds : Volume reached.

Event end: 07/07/102 12:33:15 30.5 Vb 14 øC

Normal shutdown.

PUMPING DATA

Sample interval = 1 [minutes]
[L/min] [liters] [Vbat]

6.57	6.98	29.2
6.29	12.92	28.9
6.44	18.99	28.9
6.22	25.12	28.9
6.35	31.13	28.5
6.13	37.18	28.7
6.29	43.13	28.6
6.15	49.11	28.6
6.22	54.99	28.6
6.02	60.90	28.4
6.13	66.71	28.3
6.33	72.66	28.1
6.11	78.53	28.2
6.29	84.43	28.1
5.96	90.23	28.5
6.24	96.08	28.0
6.04	102.04	28.1
6.22	107.85	28.1
6.02	113.73	28.0
6.09	119.47	28.0
5.85	125.26	28.3

Sample interval = 1 [minutes]
[L/min] [liters] [Vbat]

6.02	130.95	27.7
5.80	136.66	28.2
6.02	142.29	27.7
6.11	148.05	27.9
5.91	153.77	28.4
6.00	159.47	27.9
6.22	165.32	27.7
6.00	171.02	27.8
5.80	176.64	27.7
5.91	182.19	27.9
5.71	187.72	27.9
5.74	193.20	27.7
6.02	198.83	27.5
5.74	204.35	27.7
5.89	209.92	27.2
5.82	215.34	27.5
5.76	220.87	27.7
5.67	226.21	27.8
5.87	231.68	27.6
5.89	237.29	27.6
6.02	243.03	27.3
5.85	248.71	27.7

Checking for low battery during pumping event . . . done.

Lowest battery voltage measured while under load: 27.2

End of instrument data file.

Data recording start time = 07/08/102 01:21:59

Data recording stop time = 07/08/102 02:55:04

L3_24 Hudson 032-2002

Sample volume = 250 [liters] Initial flow rate = 8000 [ml/min]
 Minimum flow rate = 4000 [ml/min] Time limit = 63 [minutes]
 Pump data period = 1 [minutes] Scheduled start 07/08/102 02:15:00

DEPLOYMENT DATA

Event start: 07/08/102 02:15:00 32.9 Vb 4 oC
250.00 L delivered in 2403 seconds : Volume reached.
Event end: 07/08/102 02:55:04 30.4 Vb 14 oC

Normal shutdown.

PUMPING DATA

Sample interval = 1 [minutes]
 [L/min] [liters] [Vbat]

6.46	7.00	29.0
6.62	13.26	28.7
6.77	19.69	28.4
6.64	25.89	28.7
6.71	32.21	28.2
6.84	38.68	28.0
6.46	44.96	28.0
6.75	51.31	28.0
6.55	57.78	28.2
6.73	64.09	28.2
6.49	70.45	28.1
6.57	76.70	27.7
6.68	83.10	27.7
6.55	89.44	28.0
6.66	95.78	27.7
6.49	102.11	27.7
6.53	108.36	27.8
6.31	114.55	28.0
6.64	120.75	27.4
6.57	127.11	27.7

Sample interval = 1 [minutes]
 [L/min] [liters] [Vbat]

6.57	133.28	27.6
6.51	139.59	27.9
6.51	145.69	27.5
6.66	151.93	27.5
6.24	158.02	27.6
6.57	164.14	27.5
6.40	170.41	27.4
6.44	176.49	27.4
6.64	182.71	27.2
6.35	188.97	27.3
6.55	195.14	27.4
6.24	201.31	27.4
6.46	207.41	27.3
6.26	213.59	27.5
6.40	219.59	27.4
6.18	225.73	27.4
6.33	231.64	27.4
6.42	237.69	27.1
6.26	243.83	27.5
6.38	249.80	27.2

Checking for low battery during pumping event . . . done.

Lowest battery voltage measured while under load: 27.1

End of instrument data file.

Data recording start time = 07/08/102 19:44:34

Data recording stop time = 07/08/102 21:14:01

Hudson 032-2002

L3-25

Sample volume = 250 [liters]

Initial flow rate = 8000 [ml/min]

Minimum flow rate = 4000 [ml/min]

Time limit = 63 [minutes]

Pump data period = 1 [minutes]

Scheduled start 07/08/102 20:30:00

DEPLOYMENT DATA

Event start: 07/08/102 20:30:00 32.8 Vb 5 °C

250.00 L delivered in 2640 seconds : Volume reached.

Event end: 07/08/102 21:14:01 30.1 Vb 14 °C

Normal shutdown.

PUMPING DATA

Sample interval = 1 [minutes]

[L/min] [liters] [Vbat]

6.55	6.97	28.1
6.31	12.92	28.3
6.18	18.67	28.3
5.98	24.52	28.2
6.02	30.20	28.3
6.24	36.01	28.2
6.11	41.96	28.0
6.13	47.68	27.9
6.22	53.54	27.5
6.02	59.46	27.8
6.13	65.25	27.8
5.91	71.06	28.0
6.07	76.80	27.8
5.89	82.58	27.9
6.09	88.25	27.8
6.09	94.05	27.5
6.00	99.83	27.7
6.09	105.57	27.5
5.82	111.33	27.6
6.02	116.98	27.1
6.11	122.77	27.2
5.96	128.49	26.9

Sample interval = 1 [minutes]

[L/min] [liters] [Vbat]

6.07	134.23	26.9
5.82	139.90	27.1
6.00	145.56	27.3
6.24	151.38	26.9
6.02	157.02	27.0
5.78	162.75	27.3
5.98	168.33	27.1
5.69	173.84	27.0
5.76	179.28	26.7
5.87	184.85	26.7
5.65	190.34	27.2
5.93	195.86	26.9
5.67	201.27	27.0
5.89	206.73	27.2
5.58	212.08	27.3
5.80	217.47	26.6
5.85	223.01	26.9
5.76	228.37	27.0
5.85	233.83	26.8
5.49	239.22	27.1
5.60	244.56	26.8

Checking for low battery during pumping event . . . done.

Lowest battery voltage measured while under load: 26.6

End of instrument data file.

Appendix 4: GEOTOP Radiogenic Water Samples

Station	Average Press.	Sample ID	Analysis			Volume Pumped
OK-9	2697	253417	²²⁶ Ra	²³⁰ Th	²³² Th	250
	2561	252419 253420	²²⁶ Ra	²³⁰ Th	²³² Th	
	2293	253421 253422	²²⁶ Ra	²³⁰ Th	²³² Th	
	1983	253424 253425	²²⁶ Ra	²³⁰ Th	²³² Th	
	1613	253426 253427	²²⁶ Ra	²³⁰ Th	²³² Th	
	1512	253428	²²⁶ Ra	²³⁰ Th	²³² Th	
	1210	253429 253430	²²⁶ Ra	²³⁰ Th	²³² Th	
	905	253431	²²⁶ Ra	²³⁰ Th	²³² Th	
	643	253433 253434	²²⁶ Ra	²³⁰ Th	²³² Th	
	363	253435 253436	²²⁶ Ra	²³⁰ Th	²³² Th	
	150	253437 253438	²²⁶ Ra	²³⁰ Th	²³² Th	
	30	253439 253440	²²⁶ Ra	²³⁰ Th	²³² Th	

Station	Average Press.	Sample ID	Analysis			Volume Pumped
L3_01	145	253441	²²⁶ Ra			
	145	252441 253442	²²⁶ Ra	²³⁰ Th	²³² Th	
	125	253443	²²⁶ Ra			
	100	253444 253445	²²⁶ Ra	²³⁰ Th	²³² Th	
	79	253446	²²⁶ Ra			
	59	253447	²²⁶ Ra			
	50	253448	²²⁶ Ra			
	40	253449	²²⁶ Ra			
	30	253450	²²⁶ Ra			
	20	253451	²²⁶ Ra			
	10	253452	²²⁶ Ra			
	10	253453	²²⁶ Ra			
	2	253454	²²⁶ Ra			

Station	Average Press.	Sample ID	Analysis			Volume Pumped
L3_02	198	253455	²²⁶ Ra			
	180	253457	²²⁶ Ra			
	150	253458	²²⁶ Ra			
	101	253461	²²⁶ Ra			
	50	253466	²²⁶ Ra			
	10	253472	²²⁶ Ra			
	2	253477	²²⁶ Ra			

Station	Average Press.	Sample ID	Analysis			Volume Pumped
L3_03	142	253479	²²⁶ Ra			
	125	253480	²²⁶ Ra			
	100	253481	²²⁶ Ra			
	50	253484	²²⁶ Ra			
	10	253488	²²⁶ Ra			
	2	253490	²²⁶ Ra			

Station	Average Press.	Sample ID	Analysis			Volume Pumped
L3_04	160	253491	²²⁶ Ra			
	141	253493	²²⁶ Ra			
	120	253494	²²⁶ Ra			
	100	253495	²²⁶ Ra			
	50	253499	²²⁶ Ra			
	10	253503	²²⁶ Ra			
	4	253506	²²⁶ Ra			

Station	Average Press.	Sample ID	Analysis			Volume Pumped
L3_05	182	253507	²²⁶ Ra			
	100	253510	²²⁶ Ra			
	10	253518	²²⁶ Ra			

Station	Average Press.	Sample ID	Analysis			Volume Pumped
L3_06	235	253520	²²⁶ Ra			
	200	253521	²²⁶ Ra			
	150	253522	²²⁶ Ra			
	100	253524	²²⁶ Ra			
	50	253527	²²⁶ Ra			
	10	253532	²²⁶ Ra			

Station	Average Press.	Sample ID	Analysis			Volume Pumped
L3_07	355	253534	²²⁶ Ra			
	330	253535	²²⁶ Ra			
	10	253549	²²⁶ Ra			

Station	Average Press.	Sample ID	Analysis			Volume Pumped
L3_08	950	253551	²²⁶ Ra			
	861	253552	²²⁶ Ra			
	789	253553	²²⁶ Ra			
	700	253554	²²⁶ Ra			
	360	253557	²²⁶ Ra			
	100	253560	²²⁶ Ra			
	50	253563	²²⁶ Ra			
	10	253567	²²⁶ Ra			

Station	Average Press.	Sample ID	Analysis			Volume Pumped
L3_08.5	1691	253630	²²⁶ Ra	²³⁰ Th	²³² Th	
	1612	253631	²²⁶ Ra	²³⁰ Th	²³² Th	
	1464	253632	²²⁶ Ra	²³⁰ Th	²³² Th	
	1311	253633	²²⁶ Ra	²³⁰ Th	²³² Th	
	1160	253634	²²⁶ Ra	²³⁰ Th	²³² Th	
	1054	253635	²²⁶ Ra	²³⁰ Th	²³² Th	

Station	Average Press.	Sample ID	Analysis			Volume Pumped
L3_09	2065	253594	²²⁶ Ra			
	1971	253595	²²⁶ Ra			
	1900	253596	²²⁶ Ra			
	1210	253601	²²⁶ Ra			
	511	253605	²²⁶ Ra			
	20	253611	²²⁶ Ra			

Station	Average Press.	Sample ID	Analysis			Volume Pumped
L3_10	2700	253570	²²⁶ Ra	²³⁰ Th	²³² Th	250
	2500	253573	²²⁶ Ra	²³⁰ Th	²³² Th	
	2343	253575 253576	²²⁶ Ra	²³⁰ Th	²³² Th	
	1925	253578 253579	²²⁶ Ra	²³⁰ Th	²³² Th	
	1615	253580 253581	²²⁶ Ra	²³⁰ Th	²³² Th	
	930	253584 253585	²²⁶ Ra	²³⁰ Th	²³² Th	
	425	253587 253588	²²⁶ Ra	²³⁰ Th	²³² Th	
	73	253590 253591 253592	²²⁶ Ra	²³⁰ Th	²³² Th	

Station	Average Press.	Sample ID	Analysis			Volume Pumped
L3_11	2918	252636 253637	²²⁶ Ra	²³⁰ Th	²³² Th	250
	2750	253638 253639	²²⁶ Ra	²³⁰ Th	²³² Th	
	2427	253640 253641 253642	²²⁶ Ra	²³⁰ Th	²³² Th	
	2070	253643 253644	²²⁶ Ra	²³⁰ Th	²³² Th	
	1636	253645 253646 253647	²²⁶ Ra	²³⁰ Th	²³² Th	
	1130	253648 253649	²²⁶ Ra	²³⁰ Th	²³² Th	
	760	253650 253651	²²⁶ Ra	²³⁰ Th	²³² Th	
	310	253653 253654	²²⁶ Ra	²³⁰ Th	²³² Th	
	13	253658 253659	²²⁶ Ra	²³⁰ Th	²³² Th	

Station	Average Press.	Sample ID	Analysis			Volume Pumped
L3_12	3129	253660 253661	²²⁶ Ra	²³⁰ Th	²³² Th	
	2859	253663 253664	²²⁶ Ra	²³⁰ Th	²³² Th	
	2617	253665 253666	²²⁶ Ra	²³⁰ Th	²³² Th	
	2319	253667 253668	²²⁶ Ra	²³⁰ Th	²³² Th	
	1895	253669 253670	²²⁶ Ra	²³⁰ Th	²³² Th	
	1500	253671 253672	²²⁶ Ra	²³⁰ Th	²³² Th	
	700	253675 253676	²²⁶ Ra	²³⁰ Th	²³² Th	
	238	253678 253679	²²⁶ Ra	²³⁰ Th	²³² Th	
	28	253681 253682 253683	²²⁶ Ra	²³⁰ Th	²³² Th	

Station	Average Press.	Sample ID	Analysis			Volume Pumped
L3_14	3504	253701 253702	²²⁶ Ra	²³⁰ Th	²³² Th	
	3329	253703 253704	²²⁶ Ra	²³⁰ Th	²³² Th	
	3096	253705 253706	²²⁶ Ra	²³⁰ Th	²³² Th	
	2551	253708 253709	²²⁶ Ra	²³⁰ Th	²³² Th	
	2090	253710 253711	²²⁶ Ra	²³⁰ Th	²³² Th	
	1411	253713 253714	²²⁶ Ra	²³⁰ Th	²³² Th	
	970	253715 253716	²²⁶ Ra	²³⁰ Th	²³² Th	
	596	253717 253718	²²⁶ Ra	²³⁰ Th	²³² Th	
	301	253719 253720	²²⁶ Ra	²³⁰ Th	²³² Th	
	106	253721 253722	²²⁶ Ra	²³⁰ Th	²³² Th	
	16	253723 253724	²²⁶ Ra	²³⁰ Th	²³² Th	

Station	Average Press.	Sample ID	Analysis			Volume Pumped
L3_15	3530	253742 253743	²²⁶ Ra	²³⁰ Th	²³² Th	
	3023	253746 253747 253748	²²⁶ Ra	²³⁰ Th	²³² Th	
	2131	253751 253752	²²⁶ Ra	²³⁰ Th	²³² Th	
	775	253757 253758	²²⁶ Ra	²³⁰ Th	²³² Th	

Station	Average Press.	Sample ID	Analysis			Volume Pumped
L3_16	3579	253781	²²⁶ Ra	²³⁰ Th	²³² Th	250
	3579	253782	²²⁶ Ra	²³⁰ Th	²³² Th	
	3579	253783	²²⁶ Ra	²³⁰ Th	²³² Th	
	3020	253788	²²⁶ Ra	²³⁰ Th	²³² Th	
	3020	253789	²²⁶ Ra	²³⁰ Th	²³² Th	
	3020	253790	²²⁶ Ra	²³⁰ Th	²³² Th	
	2851	253791	²²⁶ Ra	²³⁰ Th	²³² Th	
	2851	253792	²²⁶ Ra	²³⁰ Th	²³² Th	
	2851	253793	²²⁶ Ra	²³⁰ Th	²³² Th	
	2690	253794	²²⁶ Ra	²³⁰ Th	²³² Th	
	2690	253795	²²⁶ Ra	²³⁰ Th	²³² Th	
	2010	253798	²²⁶ Ra	²³⁰ Th	²³² Th	
	2010	253799	²²⁶ Ra	²³⁰ Th	²³² Th	
	2010	253800	²²⁶ Ra	²³⁰ Th	²³² Th	
	1530	253802	²²⁶ Ra	²³⁰ Th	²³² Th	
	1530	253803	²²⁶ Ra	²³⁰ Th	²³² Th	
	1530	253804	²²⁶ Ra	²³⁰ Th	²³² Th	
	680	253769	²²⁶ Ra	²³⁰ Th	²³² Th	
	680	253770	²²⁶ Ra	²³⁰ Th	²³² Th	
	140	253774	²²⁶ Ra	²³⁰ Th	²³² Th	
	140	253775	²²⁶ Ra	²³⁰ Th	²³² Th	
	40	253777	²²⁶ Ra	²³⁰ Th	²³² Th	
	40	253778	²²⁶ Ra	²³⁰ Th	²³² Th	
	15	253779	²²⁶ Ra	²³⁰ Th	²³² Th	
	15	253780	²²⁶ Ra	²³⁰ Th	²³² Th	

Station	Average Press.	Sample ID	Analysis			Volume Pumped
L3_18	3559	253846 253847	²²⁶ Ra	²³⁰ Th	²³² Th	250
	3202	253850	²²⁶ Ra	²³⁰ Th	²³² Th	
	2624	253853 253854	²²⁶ Ra	²³⁰ Th	²³² Th	
	2015	253855 253856 253857	²²⁶ Ra	²³⁰ Th	²³² Th	
	774	253861 253862	²²⁶ Ra	²³⁰ Th	²³² Th	
	20	253868 253869	²²⁶ Ra	²³⁰ Th	²³² Th	

Station	Average Press.	Sample ID	Analysis			Volume Pumped
L3_19	3533	253870 253871	²²⁶ Ra	²³⁰ Th	²³² Th	
	3111	253874 253875	²²⁶ Ra	²³⁰ Th	²³² Th	
	2030	253879 253880 253881	²²⁶ Ra	²³⁰ Th	²³² Th	
	1090	253884	²²⁶ Ra	²³⁰ Th	²³² Th	
	300	253888 253889	²²⁶ Ra	²³⁰ Th	²³² Th	
	24	253892 253893	²²⁶ Ra	²³⁰ Th	²³² Th	

Station	Average Press.	Sample ID		Analysis		Volume Pumped
L3_21	3409	253935 253936	²²⁶ Ra	²³⁰ Th	²³² Th	250
	3015	253939 253940	²²⁶ Ra	²³⁰ Th	²³² Th	
	2680	253941 253942	²²⁶ Ra	²³⁰ Th	²³² Th	
	1947	253944 253945 253946	²²⁶ Ra	²³⁰ Th	²³² Th	
	1175	253948 253949	²²⁶ Ra	²³⁰ Th	²³² Th	
	301	253953 253954	²²⁶ Ra	²³⁰ Th	²³² Th	
	14	253957 253958	²²⁶ Ra	²³⁰ Th	²³² Th	

Station	Average Press.	Sample ID	Analysis			Volume Pumped
L3_22	3225	253959 253960	²²⁶ Ra	²³⁰ Th	²³² Th	
	3069	253961 253962	²²⁶ Ra	²³⁰ Th	²³² Th	
	2695	253964 253965	²²⁶ Ra	²³⁰ Th	²³² Th	
	1955	253968 253969	²²⁶ Ra	²³⁰ Th	²³² Th	
	1330	253971 253972	²²⁶ Ra	²³⁰ Th	²³² Th	
	80	253979 253980	²²⁶ Ra	²³⁰ Th	²³² Th	

Station	Average Press.	Sample ID	Analysis			Volume Pumped
L3_23	2984	253983	²²⁶ Ra	²³⁰ Th	²³² Th	
		253984				
	2493	253987	²²⁶ Ra	²³⁰ Th	²³² Th	
		253988				
		253989				
	1880	253991	²²⁶ Ra	²³⁰ Th	²³² Th	
		253992				
	1015	253995	²²⁶ Ra	²³⁰ Th	²³² Th	
		253996				

Station	Average Press.	Sample ID	Analysis			Volume Pumped
L3_24	2889	254007 254008	²²⁶ Ra	²³⁰ Th	²³² Th	250
	2426	254011 254012	²²⁶ Ra	²³⁰ Th	²³² Th	
	2150	254013 254014	²²⁶ Ra	²³⁰ Th	²³² Th	
	1735	254015 254016	²²⁶ Ra	²³⁰ Th	²³² Th	
	1360	254017 254018	²²⁶ Ra	²³⁰ Th	²³² Th	
	650	254021 254022	²²⁶ Ra	²³⁰ Th	²³² Th	
	30	254028 254029	²²⁶ Ra	²³⁰ Th	²³² Th	

Station	Average Press.	Sample ID	Analysis			Volume Pumped
L3_25	2785	254098	²²⁶ Ra	²³⁰ Th	²³² Th	250
	2785	254099	²²⁶ Ra	²³⁰ Th	²³² Th	
	2701	254100	²²⁶ Ra	²³⁰ Th	²³² Th	
	2701	254101	²²⁶ Ra	²³⁰ Th	²³² Th	
	2600	254102	²²⁶ Ra	²³⁰ Th	²³² Th	
	2600	254103	²²⁶ Ra	²³⁰ Th	²³² Th	
	2481	254104	²²⁶ Ra	²³⁰ Th	²³² Th	
	2481	254105	²²⁶ Ra	²³⁰ Th	²³² Th	
	2340	254106	²²⁶ Ra	²³⁰ Th	²³² Th	
	2340	254107	²²⁶ Ra	²³⁰ Th	²³² Th	
	2170	254108	²²⁶ Ra	²³⁰ Th	²³² Th	
	2170	254109	²²⁶ Ra	²³⁰ Th	²³² Th	
	1990	254110	²²⁶ Ra	²³⁰ Th	²³² Th	
	1990	254111	²²⁶ Ra	²³⁰ Th	²³² Th	
	1811	254112	²²⁶ Ra	²³⁰ Th	²³² Th	
	1811	254113	²²⁶ Ra	²³⁰ Th	²³² Th	
	1630	254114	²²⁶ Ra	²³⁰ Th	²³² Th	
	1630	254115	²²⁶ Ra	²³⁰ Th	²³² Th	
	1430	254116	²²⁶ Ra	²³⁰ Th	²³² Th	
	1430	254117	²²⁶ Ra	²³⁰ Th	²³² Th	
	1250	254118	²²⁶ Ra	²³⁰ Th	²³² Th	
	1250	254119	²²⁶ Ra	²³⁰ Th	²³² Th	
	1030	254120	²²⁶ Ra	²³⁰ Th	²³² Th	
	1030	254121	²²⁶ Ra	²³⁰ Th	²³² Th	
	850	254078	²²⁶ Ra	²³⁰ Th	²³² Th	
	850	254079	²²⁶ Ra	²³⁰ Th	²³² Th	
	670	254080	²²⁶ Ra	²³⁰ Th	²³² Th	
	670	254081	²²⁶ Ra	²³⁰ Th	²³² Th	
	510	254082	²²⁶ Ra	²³⁰ Th	²³² Th	
	510	254083	²²⁶ Ra	²³⁰ Th	²³² Th	
	370	254084	²²⁶ Ra	²³⁰ Th	²³² Th	
	370	254085	²²⁶ Ra	²³⁰ Th	²³² Th	
	100	254090	²²⁶ Ra	²³⁰ Th	²³² Th	
	100	254091	²²⁶ Ra	²³⁰ Th	²³² Th	
	20	254094	²²⁶ Ra	²³⁰ Th	²³² Th	
	20	254095	²²⁶ Ra	²³⁰ Th	²³² Th	

Station	Average Press.	Sample ID	Analysis			Volume Pumped
L3_26	1245	254031	²²⁶ Ra			
	1200	254032	²²⁶ Ra			
	1130	254033	²²⁶ Ra			
	1070	254034	²²⁶ Ra			
	950	254035	²²⁶ Ra			
	820	254036	²²⁶ Ra			
	680	254037	²²⁶ Ra			
	520	254038	²²⁶ Ra			
	380	254039	²²⁶ Ra			
	250	254040	²²⁶ Ra			
	150	254041	²²⁶ Ra			
	80	254043	²²⁶ Ra			
	59	254044	²²⁶ Ra			
	50	254045	²²⁶ Ra			
	30	254047	²²⁶ Ra			
	20	254048	²²⁶ Ra			
	10	254049	²²⁶ Ra			
	2	254050	²²⁶ Ra			

Station	Average Press.	Sample ID	Analysis			Volume Pumped
L3_27	142	254068	²²⁶ Ra			
	100	254069	²²⁶ Ra			
	80	254070	²²⁶ Ra			
	59	254071	²²⁶ Ra			
	50	254072	²²⁶ Ra			
	40	254073	²²⁶ Ra			
	29	254074	²²⁶ Ra			
	20	254075	²²⁶ Ra			
	10	254076	²²⁶ Ra			
	2	254077	²²⁶ Ra			

Station	Average Press.	Sample ID		Analysis		Volume Pumped
L3_28	124	254051	²²⁶ Ra			
	100	254052	²²⁶ Ra			
	80	254053	²²⁶ Ra			
	60	254054	²²⁶ Ra			
	50	254055	²²⁶ Ra			
	39	254059	²²⁶ Ra			
	30	254060	²²⁶ Ra			
	20	254061	²²⁶ Ra			
	10	254062	²²⁶ Ra			
	10	254066	²²⁶ Ra			

Station	Average Press.	Sample ID		Analysis		Volume Pumped
L5_27	189	254236	²²⁶ Ra			
	150	254238	²²⁶ Ra			
	100	254240	²²⁶ Ra			
	80	254242	²²⁶ Ra			
	60	254243	²²⁶ Ra			
	50	254244	²²⁶ Ra			
	40	254246	²²⁶ Ra			
	30	254247	²²⁶ Ra			
	19	254250	²²⁶ Ra			
	10	254251	²²⁶ Ra			
	3	254256	²²⁶ Ra			

Station	Average Press.	Sample ID	Analysis			Volume Pumped
Bon_18	4135	255630 255631	²²⁶ Ra	²³⁰ Th	²³² Th	
	3780	255632 255633	²²⁶ Ra	²³⁰ Th	²³² Th	
	3250	255634 255635	²²⁶ Ra	²³⁰ Th	²³² Th	
	2620	255636 255637	²²⁶ Ra	²³⁰ Th	²³² Th	
	2194	255638 255639	²²⁶ Ra	²³⁰ Th	²³² Th	
	1761	255640 255641	²²⁶ Ra	²³⁰ Th	²³² Th	
	1320	255642 255643	²²⁶ Ra	²³⁰ Th	²³² Th	
	518	255646 255647	²²⁶ Ra	²³⁰ Th	²³² Th	
	64	255651 255652	²²⁶ Ra	²³⁰ Th	²³² Th	

Station	Average Press.	Sample ID	Analysis			Volume Pumped
Bon_11	1502	255823	²²⁶ Ra			
	1371	255825	²²⁶ Ra			
	1141	255827	²²⁶ Ra			
	820	255829	²²⁶ Ra			
	500	255831	²²⁶ Ra			
	220	255833	²²⁶ Ra			
	49	255835	²²⁶ Ra			
	6	255837	²²⁶ Ra			

Station	Average Press.	Sample ID	Analysis			Volume Pumped
Bon_10	940	255838	²²⁶ Ra			
	870	255839	²²⁶ Ra			
	780	255840	²²⁶ Ra			
	500	255842	²²⁶ Ra			
	221	255844	²²⁶ Ra			
	50	255848	²²⁶ Ra			
	9	255852	²²⁶ Ra			
	3	255854	²²⁶ Ra			

Station	Average Press.	Sample ID	Analysis			Volume Pumped
Bon_08	320	255855	²²⁶ Ra			
	280	255856	²²⁶ Ra			
	100	255860	²²⁶ Ra			
	40	255864	²²⁶ Ra			
	10	255868	²²⁶ Ra			

Station	Average Press.	Sample ID	Analysis			Volume Pumped
Bon_04	299	255930	²²⁶ Ra			
	250	255931	²²⁶ Ra			
	99	255934	²²⁶ Ra			
	49	255937	²²⁶ Ra			
	9	255942	²²⁶ Ra			

Station	Average Press.	Sample ID	Analysis			Volume Pumped
Bon_01	94	255968	²²⁶ Ra			
	68	255969	²²⁶ Ra			
	49	255970	²²⁶ Ra			
	39	255971	²²⁶ Ra			
	29	255972	²²⁶ Ra			
	18	255973	²²⁶ Ra			
	7	255974	²²⁶ Ra			
	2	255976	²²⁶ Ra			

Appendix 5: Lagrangian Float Deployment LogsSerial No. 255**APEX Float Launch**

Float was started. Date: July 5/2002 Time: 19:31 GMT
 i.e. you sweep a magnet over the reset point and it beeps.

Float deployed. Date: 5 July Time: 20:47 GMT
 Float should be deployed within 6 hours of start time.

Deployed By: Murray Scotney

Vessel: Hudson Event No. 330

Latitude 56 57.18 N Longitude 52 11.11 W

Water Depth 3540 m Must be deeper than 2500 metres

Nearest CTD cast **Event No of cast.** 329

Date: 5 July Time: 19:36 GMT

Latitude 56 57.32 N Longitude 52 11.88 W

Maximum Depth 3540 m

Any problems associated with the start up and deployment operation

Final Test Procedure completed July 05/02 O.K.

Serial No. 330**APEX Float Launch**

Float was started. Date: July 03, 2002 Time: 04:12 GMT
 i.e. you sweep a magnet over the reset point and it beeps.

Float deployed. Date: July 03, 2002 Time: 08:46 GMT
 Float should be deployed within 6 hours of start time.

Deployed By: Derek Brittain

Vessel: Hudson Event No. 120

Latitude 55 25.2 N Longitude 53 59.0 W

Water Depth 2621 m Must be deeper than 2500 metres

Nearest CTD / XBT cast (circle one) Event No of cast.
118

Date: July 03, 2002 Time: 05:00 GMT

Latitude 55 25.2 N Longitude 53 59.0 W

Maximum Depth 2621 m

Any problems associated with the start up and deployment
 operation

Final test procedure performed July 3 / 02

Serial No. 334**APEX Float Launch**

Float was started. Date: July 8/02 Time: 23:50 GMT
 i.e. you sweep a magnet over the reset point and it beeps.

Float deployed. Date: July 9/02 Time: 00:52 GMT
 Float should be deployed within 6 hours of start time.

Deployed By: Derek Brittain

Vessel: Hudson Event No. 260

Latitude 60 17.8 N Longitude 48 34.9 W

Water Depth 2786 m Must be deeper than 2500 metres

Nearest CTD Event No of cast. 259

Date: July 8 /02 Time: 23:35 GMT

Latitude 60 17.7 N Longitude 48 33.8 W

Maximum Depth 2786

Any problems associated with the start up and deployment
 operation

Final test procedure completed July 08/02

Serial No. 335**APEX Float Launch**

Float was started. Date: July 7/02 Time: 00:20 GMT
i.e. you sweep a magnet over the reset point and it beeps.

Float deployed. Date: July 7/02 Time: 02:42 GMT
Float should be deployed within 6 hours of start time.

Deployed By: Derek Brittain

Vessel: Hudson Event No. 195

Latitude 58 38.4 N Longitude 50 25.0 W

Water Depth 3430 m Must be deeper than 2500 metres

Nearest CTD Event No of cast. 193

Date: July 7 /02 Time: 01:25 GMT

Latitude 58 38.4 N Longitude 50 25.0 W

Maximum Depth 3435

Any problems associated with the start up and deployment
operation

Final test procedure completed July 07/02

Serial No. 506**APEX Float Launch**

Float was started. Date: June 30, 2002 Time: 12:41 GMT
 i.e. you sweep a magnet over the reset point and it beeps.

Float deployed. Date: June 30, 2002 Time: 15:55 GMT
 Float should be deployed within 6 hours of start time.

Deployed By: Murray Scotney

Vessel: Hudson Event No. 90

Latitude 48 42.19 N Longitude 46 50.5 W

Water Depth 2650 m Must be deeper than 2500 metres

Nearest CTD / XBT cast (circle one) Event No of cast.
89

Date: June 30, 2002 Time: 14:53 GMT

Latitude 48 41.49 N Longitude 46 50.84 W

Maximum Depth 2636 m

Any problems associated with the start up and deployment
 operation

Final test performed June 30 / 02 OK

Appendix 6: Mooring Recovery and Deployment logs**Recovery****Mooring No:** 1395**Ship:** Hudson **Cruise No:** 2002-032 **Date:** June 24, 2002**Mooring Tech:** Scotney, Boyce, Britten**Type of Nav:** GPS**Sea State:** 1 m swell light seas **Weather Conditions:** 20 kts SW**Cancel Notship:** Yes ☐ No ☐**Recovery Log**

Time (Z)	Instrument	Remarks
15:22	Release 335	Released, on way up
15:40		Sighted on surface
15:52		Hooked on
15:55	Release, tide gauge	All on board

Recovery**Mooring No:** 1396**Ship:** Hudson **Cruise No:** 2002-032 **Date:** July 3, 2002**Mooring Tech:** Scotney, Boyce,**Type of Nav:** GPS**Sea State:** 1-2 metres **Weather Conditions:** SW 15**Cancel Notship:** Yes ☐ No ☐**Recovery Log**

Time (Z)	Instrument	Remarks
12:43	Release 742	Sent enable command, 0.5 cables from site – no response
12:44	Release 742	Sent enable command, 0.8 cables from site - responded
12:46	Release 742	Sent release command – mooring released
12:59		On surface by acoustic range of 390 m and increasing
13:01		Sighted
13:05		Hooked on
13:09	ACM 5574	On board
13:11	Release, 2bb	On board

Recovery

Mooring No: 1412**Ship:** Hudson **Cruise No:** 2002-032 **Date:** June 24, 2002**Mooring Tech:** Scotney, Boyce, Britten**Type of Nav:** GPS**Sea State:** 1 m swell light seas **Weather Conditions:** 25-30 kts SW, rain squalls**Cancel Notship:** **Yes** **No**

Recovery Log

Time (Z)	Instrument	Remarks
12:35	Release 790	Release command sent / released range 2228 m, vessel 5 cables from site
12:40		Float sighted on surface
12:55		BB package on surface
13:03		Hooked on
13:05		Buoy004 / μ Cat on board
13:10		ACM 4600 on board
13:14		2 bb on board
13:15		ACM 4998 on board
13:20		μ Cat / bb on board
13:23		ACM 5002 on board
13:30		μ Cat & ACM 5575 on board
13:34		2 bb on board
13:37		μ Cat & ACM 5578 on board
13:39		3 bb & release on board

Recovery

Mooring No: 1415**Ship:** Hudson **Cruise No:** 2002-032 **Date:** June 24, 2002**Mooring Tech:** Scotney, Boyce, Britten**Type of Nav:** GPS**Sea State:** 1 m swell / light sea **Weather Conditions:** 20 kts SW**Cancel Notship:** **Yes** **No**

Recovery Log

Time (Z)	Instrument	Remarks
14:56	Release 884	Released mooring
15:06		Package on surface
15:11		Hooked on package and on board

Recovery

Mooring No: 1419
Ship: Hudson **Cruise No:** 2002-032 **Date:** June 24, 2002
Mooring Tech: Scotney, Boyce, Britten
Type of Nav: GPS
Sea State: < 1 m swell **Weather Conditions:** 15-20 kts SSW
Cancel Notship: **Yes** **No**

Recovery Log

Time (Z)	Instrument	Remarks
10:22	Release 810	Enable release / range 1190 m and closing. Moving vessel from 1.5 cables to 4 cable distant
10:29	Release 810	1275 m range – release command sent - successful!
10:32		Sighted on surface
10:45		BB on surface
10:52		Buoy along side – hooked on
10:55		Buoy on board
11:00		Seacat / μ Cat on board
11:03		ACM 697 on board
11:06		μ Cat & bb on board
11:10		ACM 695 on board
11:12		BB on board
11:17		ACM 7127 on board – single loose loop around CM – easily released
11:20		μ Cat & bb on board – tight snarl
11:25		ACM 6405 on board
11:26		3 bb & release on board

Placement

Mooring No: 1429
Geographic Area: Scotian Slope **Intended Duration:** 1 year
Ship: Hudson **Cruise No:** 2002-032 **Date:** June 25, 2002
Sea State: 2 metres NW **Weather Conditions:** 25-30 kts NW
Mooring Tech: Scotney, Boyce, Britten **Navigation Inst.** GPS
Notship # _____
Latitude 42 41.56 N **Longitude** 61 31.31 W **Time of Fix:** 12:42
Depth: Raw: 1070 fthm **Corrected:** 1965 m
Main Float: **Type:** syntatic **Markings:** 004
Beacon: **Type:** Argo **ID: S/N** ID 977/ 17053
Light: **Type:** none **Colour/Rate:** _____
Mooring Line: **Type:** 3/16" jacket **Colour:** yellow
Release: **Type:** 965 A **S/N:** 891 **Release Code:** A / / C Disable B ID: 22
Rx: 10.75 **Tx:** 12.0

Placement Log

Time (Z)	Instrument	Remarks
10:48	Argo Transmitter	Working
10:55	Float & μ Cat 2304	In water, had added 2 5 metre pieces of wire in parallel beneath the ballast weight – paying out 148 m length
11:00	ACM 2663	+ 234 m – in water
11:07	2 bb	+ 10 m wire in water
11:10	ACM 3306	+ 238 m wire (lost power to winch / restored)
11:18	μ Cat 2293	In water
11:19	1 bb & 42 m	In water
11:22	ACM 3584	511 m wire in water
11:25	ACM 4406	185 m wire in water
11:40	2 bb	184 m wire in water
	μ Cat 2292, ACM4603	9 m wire in water μ Cat clamped to wire
11:50	3 bb & release	In water
11:53		Anchor away at 42 41.65 N 61 31.44 W
12:33		Closest approach 42 41.6688 N 61 31.4867 W range 2051 m
12:42		Closest approach 42 41.6065 N 61 31.3495 W range 2025 m
12:53		Closest approach 42 41.4063 N 61 31.2069 W range 2043 m
		Best position 42 41.56 N 61 31.31 W

Placement

Mooring No: 1432_
Geographic Area: Scotian Slope **Intended Duration:** 1 year
Ship: Hudson **Cruise No:** 2002-032 **Date:** June 25, 2002
Sea State: 1-2 m swell, 0.5 m sea **Weather Conditions:** 15-20 kts WSW
Mooring Tech: Scotney, Boyce, Britten **Navigation Inst.** GPS
Notship # _____
Latitude 42 50.66 N **Longitude** 61 37.41 W **Time of Fix:** 17:39
Depth: Raw: 608 fthm **Corrected:** 1120 m at anchor drop site
Main Float: **Type:** syntatic **Markings:** orange 011 on one side, 005 on other
Beacon: **Type:** Argo **ID: S/N** 19500 ID 22191
Light: **Type:** none **Colour/Rate:** _____
Mooring Line: **Type:** 3/16" jacket **Colour:** yellow
Release: **Type:** 965 A **S/N:** 807 **Release Code:** D

Placement Log

Time (Z)	Instrument	Remarks
15:59	Buoyancy & ACM 5359	In water, 47 m
16:04		98 m wire in water
16:06	μ Cat 2305	Clamped on wire / in water
16:08	ACM 1607	221 m wire
16:15	μ Cat 2305 & 1 bb	49 m, swivel moved to top of bb
16:18	ACM 6410	123 m in water
16:21	1 bb	123 m in water
16:25	ACM 7013	197 m in water
16:31	μ Cat 1918 & 2bb	84 m
16:35	ACM 9328	9 m outboard
16:37	3 bb & release	Outboard, towing to position
16:58		Anchor away, 608 fathoms = 1120 metres
		42 50.7916 N 61 37.5574 W
17:24		Closest approach 1172 m 42 50.6618 N 61 37.5463 W
17:39		Closest approach 1155 m 42 50.7927 N 61 37.4125 W
		Best position 42 50.66 N 61 37.41 W

Placement

Mooring No: 1433
Geographic Area: Scotian Slope **Intended Duration:** 1 year
Ship: Hudson **Cruise No:** 2002-032 **Date:** June 25, 2002
Sea State: 2-m waves **Weather Conditions:** 15-20 kts WSW
Mooring Tech: Scotney, Boyce, Britten **Navigation Inst.** GPS
Notship # _____
Latitude 42 50.8 N **Longitude** 61 37.58 W **Time of Fix:** 18:10
Depth: Raw: 605 fthm **Corrected:** 1114 m
Main Float: **Type:** Hibernia **Markings:** yellow
Beacon: **Type:** _____ **ID:** S/N
Light: **Type:** none **Colour/Rate:** _____
Mooring Line: **Type:** _____ **Colour:** _____
Release: **Type:** 966 A **S/N:** 337 **Release Code:** A / / C
Rx: 11.0 **Tx:** 10.0

Placement Log

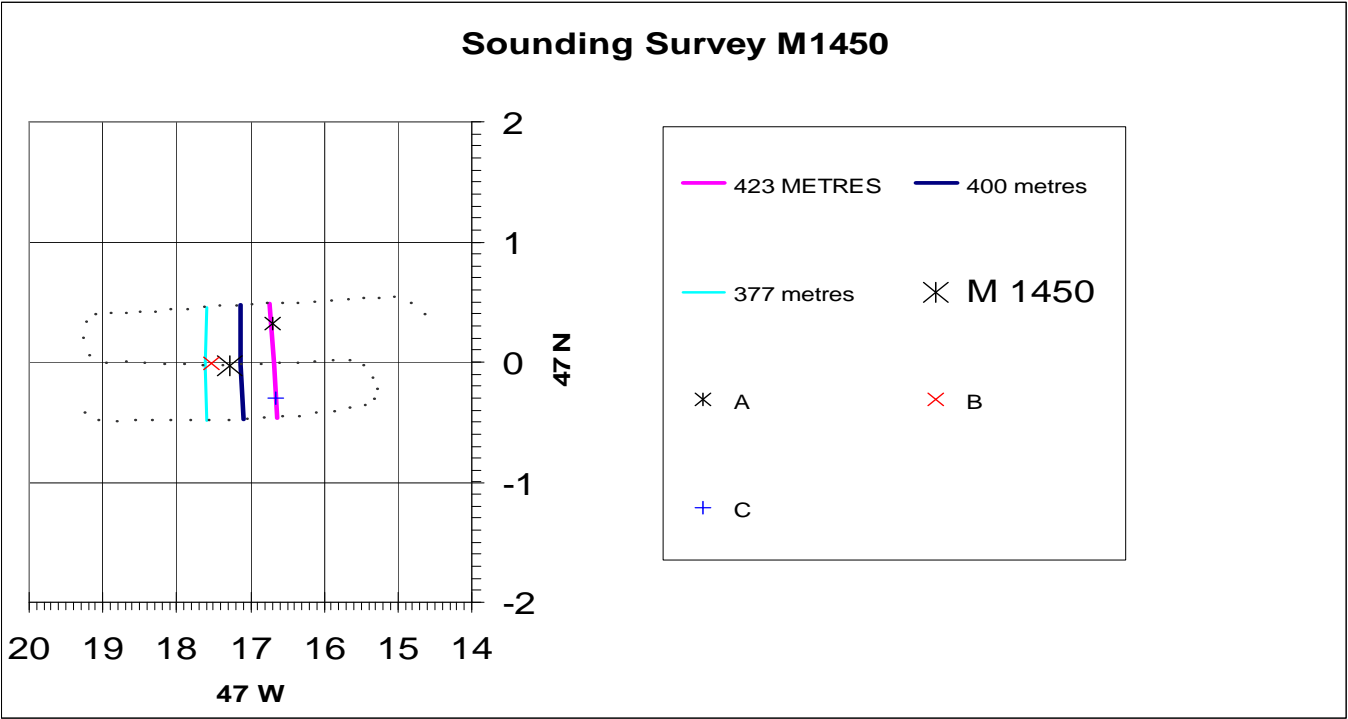
Time (Z)	Instrument	Remarks
18:10	Float, tide gauge 1017, release and anchor	released

Placement

Mooring No: 1450
Geographic Area: Flemish Pass **Intended Duration:** 8 months
Ship: Hudson **Cruise No:** 2002-032 **Date:** June 29, 2002
Sea State: 2 m swell, **Weather Conditions:** 20 kts SSW
Mooring Tech: Scotney, Boyce, Britten **Navigation Inst.** GPS
Notship # 1345
Latitude 46 59.974 N **Longitude** 47 17.287 W **Time of Fix:** 13:31
Depth: Raw: 203 fthm **Corrected:** 398 m
Main Float: **Type:** Braincon 2 disc **Markings:** '7
Beacon: **Type:** Argo **ID: S/N** ID 8544 S/N 12402
Light: **Type:** none **Colour/Rate:**
Mooring Line: **Type:** jacket **Colour:** yellow
Release: **Type:** 965 A **S/N:** 892 **Release Code:** A / / C
Rx: 11.0 **Tx:** 10.0

Placement Log

Time (Z)	Instrument	Remarks
09:40		Guard Buoy 'A' rigged / anchor over the side
09:41		Guard Buoy in water
09:55		47 00.3252 N 47 16.6918 W anchor away 227 ftms, 423 m
10:14		Guard Buoy 'C' in water
10:25		Anchor away 46 59.7024 N 47 16.6581 W 227 ftms, 423 m
11:45		Argo transmitter not working due to pressure switch – disabled pressure switch to continuously on
11:54		Float and ACM 4241 in water
11:56	ACM 4602	160 m in water
12:01	2bb	Test shackle attached, 36 m wire in water
12:03	ACM 4342	74 m wire in water
12:06	ACM 786	9 m wire in water
12:10	3 bb & release	Out board, test shackle attached to bb
12:27:48	Anchor away	46 59.9739 N 47 17.1850 W 213 ftms
12:55		Guard Buoy 'B' in the water
13:07	Anchor away	46 59.9931 N 47 17.5277 W 203 ftms
13:31	Closest approach	Range 401 m at 46 59.9924 N 47 17.2873 W



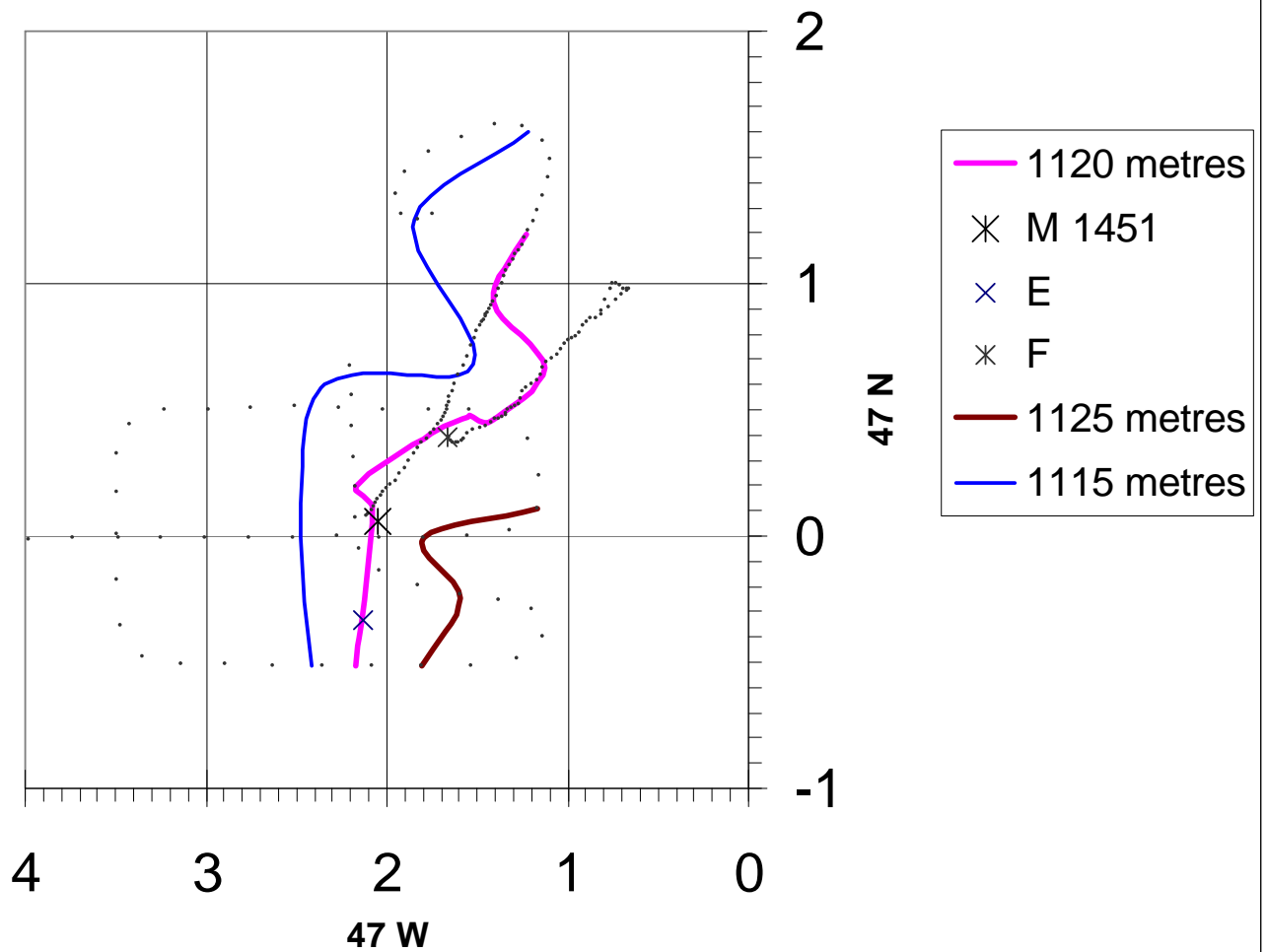
Placement

Mooring No: 1451
Geographic Area: Flemish Pass **Intended Duration:** 8 months
Ship: Hudson **Cruise No:** 2002-032 **Date:** June 29, 2002
Sea State: 1-2 m swell, 0.5 m sea **Weather Conditions:** 20 kts SSW - fog
Mooring Tech: Scotney, Boyce, Brittain **Navigation Inst.** GPS
Notship # 1345
Latitude 47 00.056 N **Longitude** 47 2.054 W **Time of Fix:** 17:56
Depth: Raw: 608 fthm **Corrected:** 1123 m
Main Float: **Type:** Braincon 4 disc **Markings:** 9 on tail
Beacon: **Type:** Argo **ID: S/N** S/N 17052 ID 4765
Light: **Type:** none **Colour/Rate:**
Mooring Line: **Type:** 3/16 jacket **Colour:** yellow
Release: **Type:** 965 A **S/N:** 806 **Release Code:** B / / A
Rx: 11.5

Placement Log

Time (Z)	Instrument	Remarks
16:26	Float & ACM 4349	In water – slip line to front of float caught in fitting / line was cut leaving 6 metres or so on float
16:35	ACM 5573	159 m in water
16:40	3 bb	36 m in water
16:45	µCat 1916 & ACM 4154	297 m wire (power off on winch briefly) in water
16:53	ACM 3300	146 m, in water
16:58	2 bb	145 m in water
17:04	µCat 1917	ACM 3196, 9 m in water
17:07	3 bb & release	Outboard
17:11	Anchor away	47 00.0785 N 47 02.1069 W 608 fthms
17:39:18	Closest approach	1145 m range 47 00.0579 N 47 2.0009 W
17:56:03	Closest approach	1143 m range 47 00.0333 N 47 2.1006 W
18:35		Guard Buoy 'F' in water
19:07		Anchor away 47 00.3911 N 47 1.6647 W 608 fms 1119 m
19:32		Buoy 'E' in water
20:23	Anchor away	46 59.6676 N 47 02.1311 W
		CTD station at 47 39.97 N 46 29.72 W has average sound velocity of 1473.4 m/s
		Sounding of 608 fathoms = 0.7600 secs = 1115 + 8 m = 1123 m

Sounding Survey M 1451



Placement

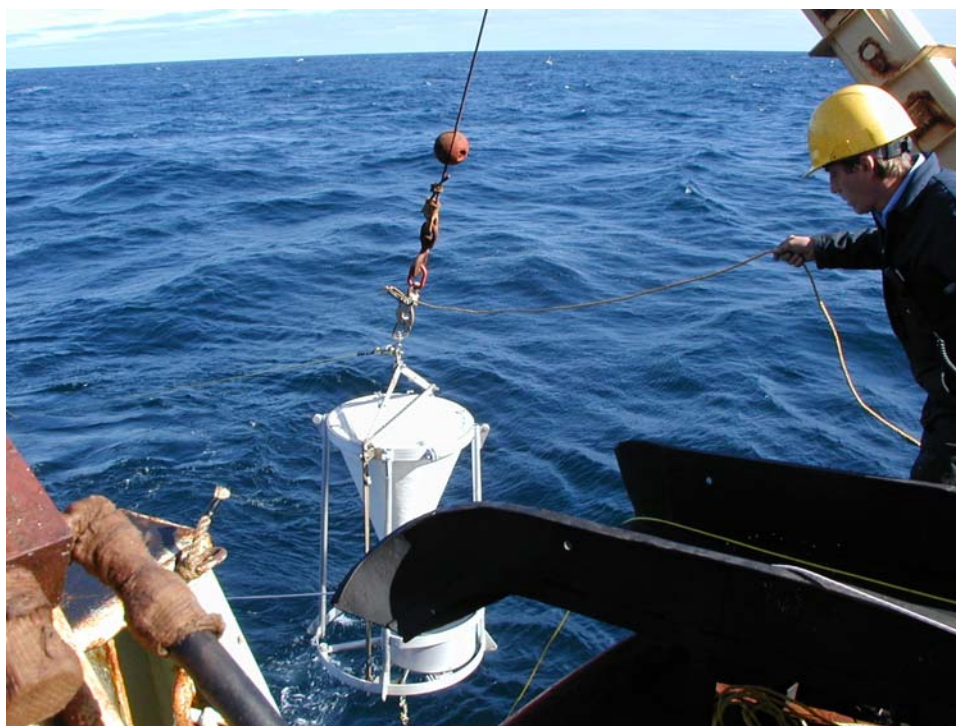
Mooring No: 1452
Geographic Area: Labrador Sea **Intended Duration:** 1 year
Ship: Hudson **Cruise No:** 2002-032 **Date:** July 4, 2002
Sea State: 2-4 metres **Weather Conditions:** 15 W
Mooring Tech: Scotney, Boyce **Navigation Inst.** GPS
Notship # _____
Latitude 56 40.60 N **Longitude** 52 24.90 W **Time of Fix:** 22:48
Depth: Raw: 1884 fthm **Corrected:** 3518 m
Main Float: **Type:** syntatic **Markings:** 001 orange
Beacon: **Type:** Argo **ID: S/N** ID 974 / 13832
Light: **Type:** none **Colour/Rate:** _____
Mooring Line: **Type:** 3/16 jacket **Colour:** yellow
Release: **Type:** 965 A **S/N:** 888 **freq:** Rx 11.5 Tx 10.0 **Code:** Enable B release C ID:19
965A **S/N:** 885 **Freq:** Rx 9.25 Tx 10.0 **Code:** Enable A release C ID:16
965A **S/N:** 808 **Freq:** Rx 10.0 Tx 11.75 **Code:** Enable B release C ID:09

Placement Log

Tim: (Z)	Instrument	Remarks
18:33	Float & SeaCat 1678	In water
18:36	ACM 5567	In water on slip line, 73 m wire
18:55	Trap # 1	Attached to wire top & bottom, in water, 73 m wire
18:58	SeaCat 1624	247 m, in water
19:05	SeaCat 2398	248 m, in water
19:10	ACM 5569	110 m, in water
19:13	2 SUBs	20 m, in water
19:17	2 SUBs	114 m, in water – bar at end of mooring chute bent in process
19:25	SeaCat 1626	50 m, in water, also on slip line, in water
19:35	Trap # 2	50 m, in water
		Shackled to 144 m, in water
19:40	ACM 5577	120 m , in water
19:44	Release 88 & 2 bb	124 m in water
19:47	SeaCat 2365	247 m, in water
19:52	ACM 6402	119 m in water
19:55	3bb	124 m in water
19:59	SeaCat 2393	486 m, in water
20:08	SeaCat 1896	9 m, in water
20:08	ACM 6409	433 m, in water
20:15	3 bb	256m, in water
20:21	Release 885	125 m, in water
20:24	3 bb	134 m, in water
20:26	ACM 7134	20 m, in water
20:31	3 bb, release 888	Outboard on chain



Preparing to launch Sediment trap # 1



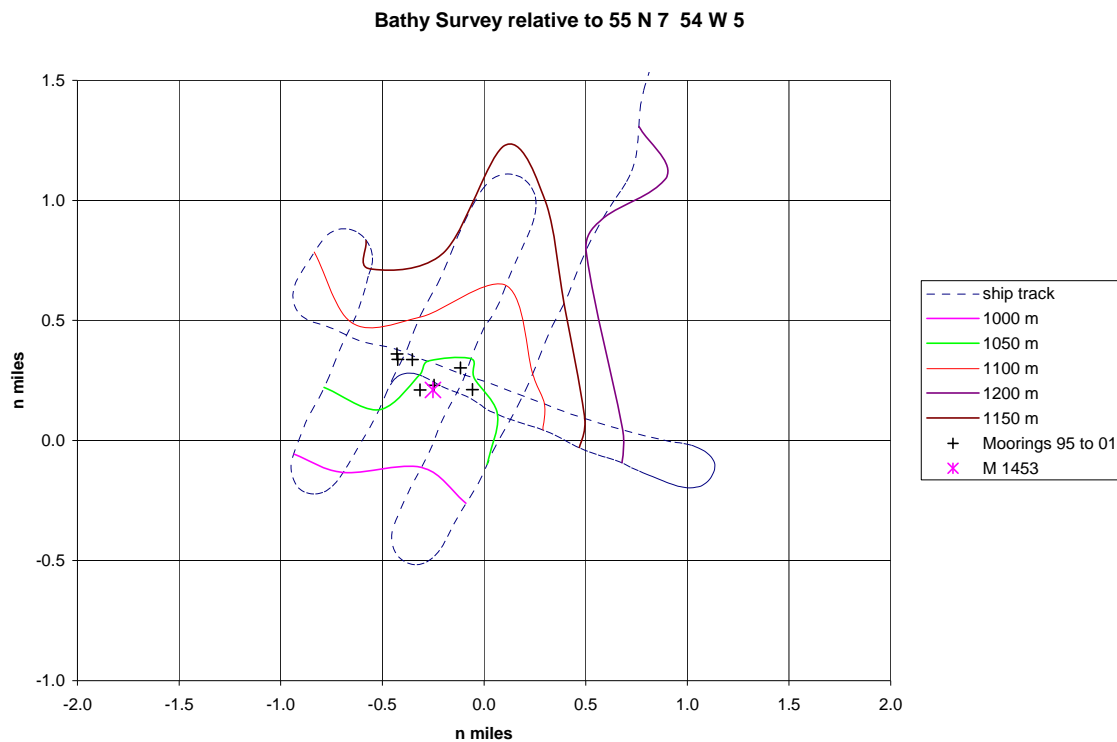
Trap # 2 going into the water

Placement

Mooring No: 1453
Geographic Area: Labrador Sea **Intended Duration:** 1 year
Ship: Hudson **Cruise No:** 2002-032 **Date:** July 3, 2002
Sea State: 1-2 m sea **Weather Conditions:** SW 15
Mooring Tech: Scotney, Boyce **Navigation Inst.** GPS
Notship # _____
Latitude 55 07.21 N **Longitude** 54 05.44 W **Time of Fix:** 16:14
Depth: Raw: 640 fthm **Corrected:** 1032 metres
Main Float: **Type:** Hibernia **Markings:** Yellow
Beacon: **Type:** none **ID:** S/N
Light: **Type:** none **Colour/Rate:** _____
Mooring Line: **Type:** 3/16 jacket **Colour:** yellow
Release: **Type:** 965 A **S/N:** 890 **Release Code:** 10.5 khz / release code C

Placement Log

Time (Z)	Instrument	Remarks
14:01	Float & ACM 4208	In water
14:03	Release & anchor	Anchor away 55 07.237 N 54 05.597 W depth 564 fms 1035 m
15:46:44	Closest approach	North to south, range 1080 m 55 07.2087 N 54 05.6031 W
16:14:56	Closest approach	West to east, range 1077 m 55 07.2556 N 54 05.436 W
		Best position
		55 07.21 N 54 05.44



CCHDO Data Processing Notes

Date	Person	Data Type	Action	Summary
2011-08-23	Jeff Jackson	CTD	Submitted	To go online
2011-08-30	Carolina Berys	CTD	Website Updated	Available under 'Files as received'
	Detailed Notes File 18HU20020623_CTD.zip containing CTD data, submitted by Jeff Jackson on 2011-08-23, available under 'Files as received', unprocessed by CCHDO.			
2011-08-31	Steve Diggs	CTD	Exchange CTD online	Official CTD data online
	Detailed Notes Files checked and format confirmed. Station maps pending.			
2011-11-15	Jeff Jackson	CrsRpt	Submitted	pdf, to go online
	Detailed Notes File cr2002032.pdf containing cruise documentation, submitted by Jeff Jackson on 2011-11-16, available under 'Files as received', unprocessed by CCHDO.			
2012-05-30	Jeff Jackson	SUM	Submitted	to go online
2012-08-23	CCHDO Staff	SUM	Website Update	Available under 'Files as received'
	Detailed Notes The following files are now available online under 'Files as received', unprocessed by the CCHDO. 18HU20020623_sum.txt			
2012-10-10	CCHDO Staff	BTL	Website Update	Available under 'Files as received'
	Detailed Notes The following files are now available online under 'Files as received', unprocessed by the CCHDO. AR07W_2002do.pdf 18HU20020623.exc.csv			
2012-10-10	Bob Key	BTL/CrsRpt	Submitted	to go online
	Detailed Notes 1. All of the data labeled NITRAT are actually NO3+NO2. This is noted in the header text, so if the column header is corrected, then the header text should be edited accordingly. 2. I ran all parameters of each cruise through QC. Many flags have been altered relative to the original submissions. In several cases I went back to the PI and got updates (mostly CTD calibrations).			
2012-10-31	Jerry Kappa	CrsRpt	Submitted	Final PDF version ready to go online
	I've placed 1 new version of the cruise report: ar07w_2002ado.pdf into the directory co2clivar/atlantic/ar07w/ar07w_2002a/. It includes summary pages and CCHDO data processing notes as well as a linked Table of Contents and links to figures, tables and appendices. It will be available on the cchdo website following the next update script run.			