

SHORT CRUISE REPORT

RV MERIAN: cruise MSM09-1

by : Prof. Dr. Monika Rhein, chief scientist

*Institut für Umweltphysik
Abt. Ozeanographie, Universität Bremen*

from Bremen, Germany to St. John's, Newfoundland, Canada

July 23 to August 18, 2008

Prof. Dr. Monika Rhein
Institut für Umweltphysik, Abt. Ozeanographie
Universität Bremen
28334 Bremen, Germany
Phon: ++49 421 218 2408
Fax : ++49 421 218 7018
Email : mrhein@physik.uni-bremen.de

Research Program

The objectives of the cruise are (i) to estimate the deepwater formation rate in the Labrador Sea from inventories of the anthropogenic trace gases chlorofluorocarbons (CFCs) and sulphurhexafluoride (SF₆), (ii) to infer the transport variability of the subpolar gyre through combined data from moored Inverted Echo Sounders (PIES), shipboard measurements, float profiles from the ARGO program, and satellite altimetry, and (iii) to calculate the vertical turbulent mixing in the deep western boundary current using time series from moored sensors (velocity, temperature and salinity) and from shipboard measurements as CTD/LADCP profiles, and profiles from a Microstructure probe which could be lowered to 2000m. The CTD data of the upper 1000m are directly transferred to CORIOLIS (Ifremer, Brest).

The cruise is part of the german joint research project 'Nordatlantischer Ozean', funded by the german Ministry of Education and Research (BMBF), and part of a process study on turbulence in the deep ocean, funded by the german national science foundation DFG. Biooptical measurements are carried out in atmosphere and mixed layer to validate remote sensing chlorophyll products.

Cruise Narrative

The MERIAN left Bremen on April 23, 7 UTC time, and headed towards the English Channel. On the way to the research area, the shallow-water echosounder was calibrated and scientific equipment (CTD/LADCP, Microstructure-Probe) was tested at April 25 to ensure that all sensors and the closing mechanisms of the Niskin bottles are working well. The tests started at 6 UTC and ended at 16 UTC. Afterwards the MERIAN headed towards Brest, where the technician carrying out the echosounder calibration left the ship at 21 UTC. The MERIAN turned east to reach the position of the southernmost PIES. To compensate for the unplanned calibration and the detour to Brest, the MERIAN steamed westward with 14-15kn. After leaving the French economic zone, the underway measurements systems thermosalinograph, fluorimeter and vessel mounted ADCP were switched on. After passing Ireland, the swell, presumably caused by the remnants of a former hurricane, located north of our track hit the MERIAN, reducing the speed to about 13kn.

At April, 27, 12 UTC, a CTD/LADCP station was carried out to obtain SF₆ free water to continue the tests of the new analysis system. Therefore, the CTD - carousel was lowered to 3500 m, the water above is already contaminated with SF₆. The radiometer probe was lowered to 180 m. The MERIAN continued on her way west and arrived at the location of the PIES B12 at 47°40'N, 31°11'W on July 29, 7 UTC. The acoustic reading of the PIES data was successful. In total, the retrieving of the two-year time series needed about 8 hours. In order to avoid ambient noise and air bubbles below the hull, the ship was steered manually. At the PIES location, a CTD/LADCP station and radiometer measurements were carried out at 16 UTC, followed by two microstructure profiles (MSS) down to 1000m and 1200m depth. These were the first deep profiles taken with this system. On the way to the PIES B13 at 49°N, 32°37'W, CTD/LADCP stations were taken every 24nm. Despite deteriorating weather conditions with Bft. 8-9, the station work continued without incident, although the speed of

the MERIAN slowed somewhat. The new Bremen analysis system for SF₆ and the CFC component CFC-12 worked excellently from the start.

At July, 30, 13 to 21 UTC, the 2 year time series of PIES B13 (49°01'N, 32°37'W) was successfully acquired by acoustic telemetry. During deployment of B13 in 2006, no depth reading was available, and we used the MERIAN multibeam-echosounder for a survey of the bathymetry near the PIES position. The CTD and MSS station work at the same position could be carried out under favourable weather and wave conditions. Vessel mounted ADCP velocity distributions revealed an eddy like structure. Here, the MSS was applied twice. The first attempt failed due to electronic winch problems, the second profile reached 1000 m depth.

On the way to PIES B14 (51°N26'N, 35°26'W), CTD/LADCP stations were done every 20nm. The good weather and wave conditions allowed the MERIAN to steam with 13kn. Telemetric reading of PIES B14 started at August 1, 14:30 UTC. The instrument responded immediately and the data transfer was successfully finished at 21:40 UTC. After the topographic survey at the PIES location, a CTD station was carried out. The station work was continued every 20 nm till the position of the PIES B15 at 52°31'N, 36°51'W. The duration of the successful acoustic reading was from August 2, 14:25 to 20:50 UTC. At 21 UTC, we deployed an Argo float.

For the required absolute calibration of the PIES inferred transports with shipboard measurements, all PIES have to be in place, so we could not recover one of the instruments until the section was finished. Since the deployment of the instruments, three calibration attempts failed: one during the deployment cruise in 2006 due to technical problems of the RV Poseidon, which forced us to shorten the cruise and only deploy the instruments, and it failed during cruise MSM05-1 in 2007 for similar problems with the RV MERIAN. The third try with Pelagia in October 2007 failed due to bad weather. Now, we were successful. To assess the quality of the telemetry, however, we need to recover one PIES to receive the full stored data set. The lack of a replacement instrument will force us to go back to the deployment location after 2-3 days. Therefore, the MERIAN steamed back to the southernmost PIES B12, which enables us to work at the 47°N section while the PIES is refurbished. PIES B12 was released at 2:45 UTC, sighted at 4:00 UTC, and on board at 4:18. Although the full data set was stored in the PIES, we were not able to read the card, and this task was postponed.

The measurement continued the section to the southeast. The inclement wind and wave conditions at the next CTD position (CTD20) at 47°17'N, 30°30'W did not allow to lower as planned the MSS. The attempt was abandoned after 1 hour. At CTD 21, the pump of the conductivity sensor malfunctioned, and after cleaning the electric contacts, it worked properly. Meanwhile, radiometer measurements were carried out. The MSS failed again, this time due to technical problems, which could not be solved till August, 9.

At August 5, 0:30 UTC, the CTD transmitted data spikes starting at a depth of 1800 m. The CTD was immediately brought back on board, and the electric wire was changed from the 'yellow' to the 'violet' system. Afterwards, a CTD cast was carried out at the same position as the former, but the data transfer also malfunctioned at a similar depth. When on board the

MERIAN steamed towards the next planned CTD cast position, but stopped after the repair of the CTD was finished. The next cast also failed, but after exchanging the electric cable between CTD and the conductivity pump, the system worked properly again, and the CTD could be lowered to the bottom. The system was back on board at 5:35 UTC, and the CTD system worked without problems. The quality of the SF₆ analysis remained excellent.

At August 7, 16:30 UTC, the MERIAN arrived at the deployment location of the PIES. After 80 minutes, the PIES reached its final position at the bottom. The exact position of the PIES was determined by ranging from 4 different positions. While ranging, the second Argo-float was deployed. At 18:40 UTC, the MERIAN steamed southwest to continue the 47°N section with CTD station 34 at August 7, 7:40 UTC. During the night, heavy weather prevented the MERIAN to steam faster. In the deeper part of the Newfoundland Basin, the CTD stations are 40nm apart. After repair, the MSS probe was tested at August 7, 14 UTC, but the system failed when reaching 500m and was hauled back on board. At 21 UTC, we deployed the last of the three Argo floats.

With time, the winch in use for the CTD showed more and more problems during heaving, so at August 7, before CTD 34, the winch was again changed to the yellow system. This did at first not improve the situation, but at August 8, at CTD 37, the winch ran smoothly during heaving with 1.2m/s. Unfortunately, this state of the winch did not last long, and a station later the winch was back to having problems during heaving. The problems did not deteriorate the scientific data, but prolonged the station time between 20 and 60 minutes. Part of the time loss was compensated by the fast speed of the MERIAN between the stations. West of 41°03'W, the station spacing was reduced to 20nm. At CTD 42, the MSS was tested after repair and worked well. West of 42°26'W station spacing was from 9 nm to 2 nm. This position was reached at August 9, 18:54 UTC.

On CTD stations 43, 44, and 45 water samples were taken in the deep overflow water to analyse Iodine 129. This component was discharged from nuclear fuel reprocessing plants in France and the United Kingdom. It is transported into the Nordic Seas, and there tags the water overflowing the sills between Greenland, Iceland and Scotland. It follows the path of the Deep Western Boundary Current through the Irminger Sea and Labrador Sea. Meanwhile it is expected that the I-129 signal has reached 47°N. The analysis will be carried out at the Bedford Institute of Oceanography, Dartmouth, Canada.

Unfortunately, the MSS failed again on August 10, 7 UTC. The CTD work continued, but the winch problems remained. At CTD 48 (47°N, 43°12'W), situated closely to the steepest part of the continental slope, the CTD had contact with the bottom during heaving. Fortunately, no instruments and bottles were lost, and all instruments worked properly afterwards. About 200m of wire had to be cut off, and CTD 49 was carried out with only one LADCP, since the fixation of the upward looking instrument had to be repaired. After CTD 50, another test of the MSS profiler was performed, which was successful. The CTD section was finished with CTD 54 at August 10, 23:30 UTC. In order to overcome the winch problems, 5500m of the wire on the violet winch was lowered and heaved before the first mooring B16 at 47°01'N, 43°14'W was released at August 11, 9:16 UTC. The third mooring was on board at 15:45. The pressure case of one T/S sensor (Microcat) was open and the electronic was flooded. The retrieval of all three moorings was done under favourable weather and wind conditions, and

an excellent collaboration between crew and scientific technical staff during deployment and recovery guaranteed the success.

At 16:50, the CTD yoyo station at 47°N, 43°12'W started. Before deploying the CTD, a break in the frame of the carousel had to be repaired. During the first hours of the yoyo station, the Deep Western Boundary Current (DWBC) consisted of two southward flowing cores, interspersed with a strong northward flow around 2500m. This structure changed with time to a more homogeneous southward flow throughout the water column, a condition we have measured at the former cruises. Within 35 hours, 15 MSS and 12 CTD profiles were performed. The weather stayed pleasant. On August, 13, after having finished the topography survey at the continental slope, the MERIAN steamed 10 nm north for a yoyo station at 47°10'N, 43°14'W. Here, 5 CTD/LADCP and 3 MSS profiles were performed. The yoyo station was finished at August 14, 4:50, and the MERIAN headed to the 48°N section at 48°19.5'N, 45°08'W. The continental slope is not as steep as at 47°N, and the station spacing was 10nm. The first station (CTD 72) was performed at August 14, 14 UTC. At August 15, the SF₆ analysis system was shut down by an electronic failure, which could be solved in the morning, and the system was running again at August 15, 13 UTC. The station spacing increased to 16nm and 23nm east of 42°52'W. Iodine 129 samples were taken in the deep overflow waters at CTD stations 80 to 83.

The scientific work was finished at August 15, 23 UTC at 49°23'N, 42°20'W (CTD 83). This occurred earlier than anticipated due to an upcoming storm. The MERIAN escaped by steaming north before heading southwest to St. John's, and was hit by wind speeds higher than 30m/s. The conditions improved considerably during the next day, and the MERIAN arrived in St. John's in the evening of August 17.

Table 1 Acoustic Telemetry PIES

Name	PIESNo	Latitude	Longitude	Depth	Listening Date	Time (UTC)
B12	186	47°40.20'N	31°10.51'W	3986m	29.7.2008,	06:48-14:45
B13	075	49°00.86'N	32°36.87'W	3930m	30.7.2008,	13:20-20:50
B14	188	51°25.63'N	35°26.29'W	3619m	01.8.2008,	14:26-21:40
B15	056	52°30.57'N	36°51.16'W	3467m	02.8.2008,	14:07-20:52

PIES: Inverted Echo Sounder with Pressure sensor
Time in UTC

Name	PIESNo	Latitude	Longitude	Depth	Recovery
B12	186	47°40.20'N	31°10.51'W	3986m	04.8.2008, 04:18

Name	PIESNo	Latitude	Longitude	Depth	Deployment
B22	186	47°40.26'N	31°08.97'W	4084m	06.08.2008,16:31

PIES: Inverted Echo Sounder with Pressure sensor
Time in UTC

Table 2 Turbulence Moorings

Name	Latitude	Longitude	Depth	Deployment	Recovered
B16	47°01.88'N	43°14.09'W	2844m	28.4.2007	11.8.08, 10:52
	with radio beacon, flashlight				
B17	47°02.44'N	43°12.63'W	3155m	28.4.2007	11.8.08, 13:39
	with radio beacon, flashlight				
	radio did not function, one releaser did not respond properly				
B18	47°03.06'N	43°10.89'W	3280m	28.4.2007	11.8.08, 15:45
	with radio beacon, flashlight				
	one Microcat had water in the pressure case.				

Table 3 Deployment of Argo Floats

Instrument number	WMO-ID	Deployment Date	Deployment Time (UTC)	Latitude of deployment	Longitude of deployment
4035	6900553	2008/08/02	20:56	52°30.570'N	36°51.117'W
4036	6900554	2008/08/06	18:19	47°40.673'N	31°08.903'W
4037	6900555	2008/08/07	21:24	46°40.650'N	36°05.361'W

Table 4 Radiometer and pigment measurements

Datum	CTD Nr	Radiometer Messung	Wasserschöpfer (Tiefe)
25/07/2008	Test		10m, 20m, 30m, 40m, 50m, 60m
27/07/2008	Test	X	10m, 30m
29/07/2008	CTD 2	X	20m, 35m
30/07/2008	CTD 4		25m
31/07/2008	CTD 7		50m
31/07/2008	CTD 8		70m
31/07/2008	CTD 10		20m, 50m
01/08/2008	CTD 13		10, 30m
02/08/2008	CTD 17		50m, 70m
02/08/2008	CTD 18		10m, 40m
04/08/2008	CTD 22	X	20m, 40m
05/08/2008	CTD 28	X	25m, 40m, 60m
06/08/2008	CTD 32		10m, 30m
08/08/2008	CTD 37	X	20m, 40m
09/08/2008	CTD 40		10m, 40m, 70m
09/08/2008	CTD 43		25m, 40m
10/08/2008	CTD 47	X	25m, 40m
10/08/2008	CTD 49		20m, 40m
10/08/2008	CTD 51		10m, 20m, 40m
11/08/2008	CTD 55		10m, 20m, 30m, 40m, 50m, 60m, 70m
12/08/2008	CTD 60	X	10m, 20m, 30m, 40m, 50m, 60m, 70m
13/08/2008	CTD 66		10m, 20m, 30m, 40m, 50m, 60m, 70m
13/08/2008	CTD 68		10m, 20m, 30m, 40m, 50m, 60m, 70m
14/08/2008	CTD 72		10m, 20m, 30m
14/08/2008	CTD 75		10m, 20m, 30m
15/08/2008	CTD 80		10m, 20m, 30m

Table 5 Participants MERIAN, Leg MSM 09/1

1. Monika Rhein	Chief Scientist	UniHB
2. Klaus Bulsiewicz	SF6 – CFC - Analysis	UniHB
3. Wolfgang Böke	CTD, PIES, moorings	UniHB
4. Dagmar Kieke	CTD, Tracer, Argo floats, PIES	UniHB
5. Reiner Steinfeldt	Calibration of sensors, interpretation	UniHB
6. Christian Mertens	vm-ADCP, LADCP, moorings	UniHB
7. Sandra Erdmann	SF6 – CFC - Watch	UniHB
8. Madlen Gebler	CTD/LADCP Watch	UniHB
9. Frank Bernhardt	CTD/LADCP Watch	UniHB
10. Vladislav Nenakhov	CTD/LADCP Watch	UniHB
11. Kristian Frank	CTD/LADCP Watch	UniHB
12. Tim Grieb	CTD/LADCP Watch	UniHB
13. Judith Krawinkel	SF6 – CFC - Watch	UniHB
14. Stefanie Czudaj	CTD/LADCP Watch	UniHB
15. Sven-Helge Didwischus	Mikrostructure Profiler	IFM-GEOMAR
16. Bettina Schmitt	Biooptical measurements	AWI
17. Anja Theis	Biooptical measurements	AWI

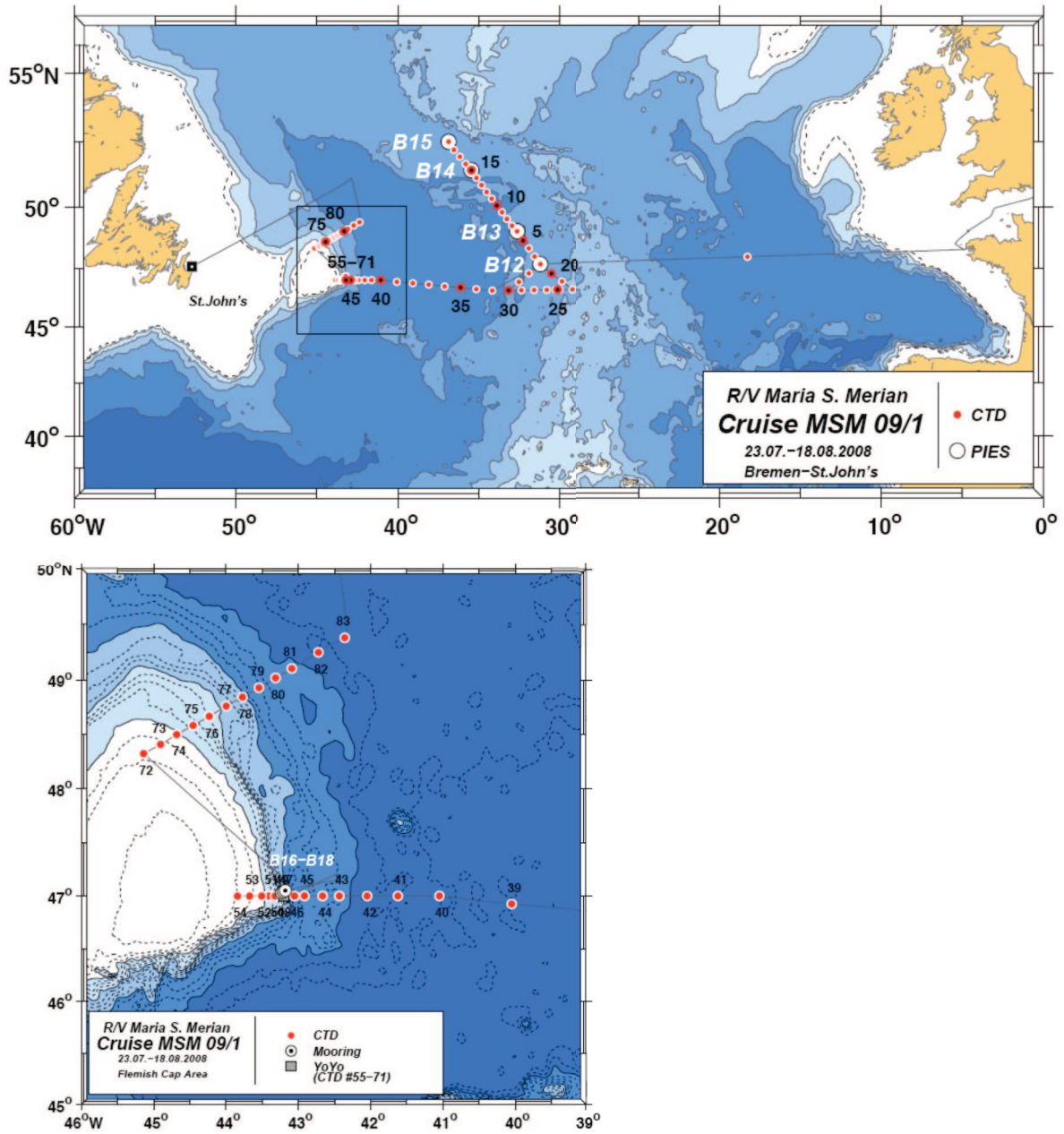


Figure 1 CTD/LADCP stations and cruise track of the RV MERIAN cruise MSM09-1. The boundary current area is separately shown in the lower map. The locations of the PIES(B12-B15) and the turbulence moorings (B16-B18) are indicated.

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Prof.	Sta.	Date	Time	Latitude	Longitude	Water Depth	Prof. Depth	CFC-12 SF ₆	Pig-ment	¹²⁹ I	LADCP	MSS	Comments
1	0	2008/07/25	08:35	49° 1.95' N	4° 41.25' W	0	NaN	x	x	-	x	-	
2	342	2008/07/27	12:22	47° 57.65' N	18° 16.34' W	4570	3499	x	x	-	x	2	
3	343	2008/07/29	14:56	47° 40.15' N	31° 10.45' W	3850	3842	x	-	-	x	-	
4	344	2008/07/29	21:30	47° 58.95' N	31° 31.42' W	3805	3797	x	x	-	x	-	
5	345	2008/07/30	02:30	48° 19.08' N	31° 53.01' W	3840	3784	x	-	-	x	-	
6	346	2008/07/30	08:03	48° 38.51' N	32° 15.09' W	3703	3688	x	-	-	x	2	
7	348	2008/07/31	02:58	49° 14.49' N	32° 55.46' W	3884	3871	x	x	-	x	-	
8	349	2008/07/31	06:58	49° 30.48' N	33° 14.49' W	4047	4037	-	x	-	x	-	
9	350	2008/07/31	11:05	49° 46.99' N	33° 33.00' W	4229	4217	x	-	-	x	-	
10	351	2008/07/31	15:11	50° 2.99' N	33° 51.98' W	4266	4260	x	x	-	x	2	
11	352	2008/07/31	21:49	50° 19.00' N	34° 10.96' W	3629	3612	x	-	-	x	-	
12	353	2008/08/01	01:52	50° 35.03' N	34° 29.94' W	4193	4172	-	-	-	x	-	
13	354	2008/08/01	06:29	50° 50.99' N	34° 48.48' W	3532	3501	x	x	-	x	-	
14	355	2008/08/01	10:16	51° 7.49' N	35° 7.48' W	4085	4064	x	-	-	x	-	
15	356	2008/08/01	22:25	51° 25.61' N	35° 26.23' W	3621	3594	x	-	-	x	-	
16	357	2008/08/02	02:12	51° 39.99' N	35° 47.96' W	3725	3703	x	-	-	x	-	
17	358	2008/08/02	06:15	51° 56.51' N	36° 9.42' W	3878	3850	x	x	-	x	-	
18	359	2008/08/02	10:09	52° 12.49' N	36° 31.54' W	3568	3526	-	x	-	x	-	
19	360	2008/08/02	21:26	52° 30.59' N	36° 51.15' W	3429	3423	x	-	-	x	-	
20	362	2008/08/04	08:50	47° 16.44' N	30° 29.47' W	3619	3612	x	-	-	x	-	
21	363	2008/08/04	15:09	46° 56.52' N	29° 50.50' W	3211	3216	x	-	-	x	-	
22	364	2008/08/04	19:57	46° 36.02' N	29° 11.54' W	2744	2724	x	x	-	x	-	
23	365	2008/08/05	00:24	46° 35.46' N	29° 58.98' W	3517	1740	-	-	-	x	-	aborted
24	365	2008/08/05	02:49	46° 35.47' N	29° 58.98' W	3517	1852	-	-	-	x	-	aborted
25	366	2008/08/05	04:43	46° 35.53' N	30° 6.58' W	3534	1853	-	-	-	x	-	aborted
26	366	2008/08/05	06:41	46° 35.49' N	30° 13.98' W	3474	3469	x	-	-	x	-	
27	367	2008/08/05	10:31	46° 34.98' N	30° 46.52' W	3353	3354	x	-	-	x	-	
28	368	2008/08/05	15:16	46° 34.43' N	31° 33.59' W	3736	3729	-	-	-	x	-	
29	369	2008/08/05	20:03	46° 33.97' N	32° 20.96' W	3875	3845	x	-	-	x	-	
30	370	2008/08/06	01:07	46° 33.49' N	33° 8.38' W	3883	3868	x	-	-	x	-	
31	371	2008/08/06	06:13	46° 55.50' N	32° 30.49' W	3785	3760	x	-	-	x	-	
32	372	2008/08/06	11:16	47° 17.01' N	31° 52.99' W	3672	3655	x	x	-	x	-	
33	373	2008/08/07	07:39	46° 33.02' N	34° 9.02' W	4295	4279	x	-	-	x	-	
34	376	2008/08/07	14:48	46° 36.99' N	35° 8.38' W	4355	4341	x	-	-	x	1	
35	377	2008/08/07	21:45	46° 41.04' N	36° 6.98' W	4148	4124	x	-	-	x	-	
36	378	2008/08/08	03:53	46° 44.01' N	37° 6.00' W	4570	4556	x	-	-	x	-	
37	380	2008/08/08	09:50	46° 48.48' N	38° 4.99' W	4474	4551	x	x	-	x	-	
38	381	2008/08/08	16:14	46° 51.94' N	39° 3.96' W	4139	4583	x	-	-	x	-	
39	382	2008/08/08	21:56	46° 55.50' N	40° 3.00' W	4580	4559	x	-	-	x	-	
40	383	2008/08/09	04:29	47° 0.00' N	41° 2.97' W	4514	4489	-	-	-	x	-	
41	384	2008/08/09	09:37	46° 59.98' N	41° 37.42' W	4280	4261	x	-	-	x	-	
42	385	2008/08/09	13:33	47° 0.02' N	42° 2.98' W	4214	4187	x	-	-	x	1	

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Prof.	Sta.	Date	Time	Latitude	Longitude	Water Depth	Prof. Depth	CFC-12 SF ₆	Pig-ment	¹²⁹ I	LADCP	MSS	Comments
43	386	2008/08/09	18:52	47° 0.01' N	42° 26.07' W	3822	3800	x	-	x	x	-	
44	387	2008/08/09	22:14	47° 0.01' N	42° 39.99' W	3655	3624	x	-	x	x	-	
45	388	2008/08/10	01:44	47° 0.04' N	42° 55.00' W	3512	3485	x	-	x	x	-	
46	389	2008/08/10	05:04	46° 59.99' N	43° 3.24' W	3266	3284	x	-	-	x	0	
47	390	2008/08/10	08:03	47° 0.02' N	43° 12.02' W	3093	3060	-	x	-	x	-	
48	391	2008/08/10	10:41	46° 59.99' N	43° 13.96' W	2952	2340	x	-	-	x	-	
49	392	2008/08/10	14:00	47° 0.01' N	43° 16.00' W	1833	1802	x	-	-	x	-	
50	393	2008/08/10	16:06	47° 0.01' N	43° 19.42' W	1540	1512	-	-	-	x	1	
51	394	2008/08/10	18:37	47° 0.01' N	43° 24.44' W	1235	1211	x	x	-	x	-	
52	395	2008/08/10	20:11	47° 0.01' N	43° 30.43' W	983	958	x	-	-	x	-	
53	396	2008/08/10	21:33	46° 59.96' N	43° 40.44' W	759	737	x	-	-	x	-	
54	397	2008/08/10	23:04	46° 59.96' N	43° 50.50' W	565	544	x	-	-	x	-	
55	401	2008/08/11	16:45	47° 0.00' N	43° 11.99' W	3095	3066	-	x	-	x	-	Yo-Yo
56	401	2008/08/11	19:32	46° 59.99' N	43° 11.99' W	3096	3067	-	-	-	x	-	Yo-Yo
57	401	2008/08/11	21:59	46° 59.99' N	43° 11.98' W	3100	3067	-	-	-	x	11	Yo-Yo
58	401	2008/08/12	09:15	46° 59.99' N	43° 12.00' W	3100	3070	x	-	-	x	-	Yo-Yo
59	401	2008/08/12	11:56	46° 59.99' N	43° 12.00' W	3100	3071	-	x	-	x	-	Yo-Yo
60	401	2008/08/12	14:24	47° 0.00' N	43° 11.94' W	3100	3084	-	-	-	x	-	Yo-Yo
61	401	2008/08/12	16:53	47° 0.00' N	43° 12.01' W	3100	3075	-	-	-	x	1	Yo-Yo
62	401	2008/08/12	20:19	46° 59.97' N	43° 12.00' W	3095	3066	-	-	-	x	1	Yo-Yo
63	401	2008/08/12	23:21	47° 0.09' N	43° 12.50' W	3000	3071	-	-	-	x	1	Yo-Yo
64	401	2008/08/13	02:55	47° 0.01' N	43° 12.02' W	3100	3072	-	-	-	x	1	Yo-Yo
65	401	2008/08/13	06:08	46° 59.98' N	43° 11.98' W	3100	3075	-	-	-	x	1	Yo-Yo
66	401	2008/08/13	09:11	47° 0.00' N	43° 12.00' W	3100	3082	-	-	-	x	-	Yo-Yo
67	402	2008/08/13	14:50	47° 9.94' N	43° 13.52' W	2980	2956	-	-	-	x	1	Yo-Yo
68	402	2008/08/13	18:23	47° 9.96' N	43° 13.56' W	2980	2954	-	-	-	x	1	Yo-Yo
69	402	2008/08/13	21:15	47° 9.95' N	43° 13.53' W	2978	2956	-	-	-	x	1	Yo-Yo
70	402	2008/08/14	00:15	47° 9.91' N	43° 13.51' W	2978	2957	-	-	-	x	-	Yo-Yo
71	402	2008/08/14	02:52	47° 9.49' N	43° 13.44' W	2986	2964	-	-	-	x	-	Yo-Yo
72	403	2008/08/14	13:54	48° 19.50' N	45° 8.52' W	582	572	x	x	-	x	-	
73	404	2008/08/14	15:22	48° 24.61' N	44° 54.36' W	703	695	x	-	-	x	-	
74	405	2008/08/14	16:56	48° 29.98' N	44° 41.02' W	982	973	x	-	-	x	-	
75	406	2008/08/14	18:36	48° 35.00' N	44° 27.39' W	1403	1392	x	x	-	x	-	
76	407	2008/08/14	20:33	48° 39.96' N	44° 13.93' W	1822	1814	x	-	-	x	-	
77	408	2008/08/14	22:56	48° 45.52' N	43° 59.86' W	2120	2109	x	-	-	x	-	
78	409	2008/08/15	01:36	48° 50.48' N	43° 46.43' W	3050	3051	x	-	-	x	-	
79	410	2008/08/15	04:45	48° 55.59' N	43° 32.73' W	3447	3436	-	-	-	x	-	
80	411	2008/08/15	08:05	49° 0.96' N	43° 18.99' W	3817	3804	-	x	x	x	-	
81	412	2008/08/15	11:26	49° 6.06' N	43° 5.55' W	3924	3912	x	-	x	x	-	
82	413	2008/08/15	15:35	49° 14.80' N	42° 43.37' W	4123	4121	-	-	x	x	-	
83	414	2008/08/15	19:38	49° 22.69' N	42° 21.51' W	4282	4281	x	-	x	x	-	