

Library

CSS Dawson Cruise 87-045

Nov. 28 - Dec. 8, 1987

G.L. Bugden

Physical and Chemical Sciences Branch, Scotia-Fundy Region

Department of Fisheries and Oceans

Bedford Institute of Oceanography

Dartmouth, N.S. B2Y 4A2

Canada

Cruise Particulars

Cruise Number: 87-045
Vessel: CSS DAWSON
Dates: Nov. 28 - December 8, 1987
Area: Gulf of St. Lawrence
Responsible Agency: Physical and Chemical Sciences
Scotia-Fundy Region
Dept. of Fisheries and Oceans
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Purpose

1. Obtain temperature-salinity soundings from 35 stations in the Gulf of St. Lawrence for preparation of seasonal ice outlook by the Ice Climatology Branch of the Atmospheric Environment Service.
2. Acquire dissolved oxygen and nutrient data from these 35 stations as well as others extending into the Estuary and outward towards the edge of the Continental Shelf in aid of continuing climatological studies.
3. Deploy bottom mounted doppler current profiler to measure ice motion.

4. Obtain oxygen isotope samples to delineate sources of freshwater in the Gulf of St. Lawrence.
5. Obtain Ra isotope samples from the water column in the Gulf of St. Lawrence and Scotian Shelf areas as an aid to characterizing sedimentary inputs.
6. Collect sediment cores using both Lehigh and box corers to characterize sediment input and fluxes from the St. Lawrence watershed.
7. Study Mn profiles in the water column in relation to Ra activities and Mn release at the sediment water interface.
8. Test and demonstrate to potential users the new MicroVax II PCS data acquisition and analysis software.

Operations and Nature of Data Gathered

CTD- Rosette

Temperature and salinity profiles were obtained at all stations except 47-50 using a Guildline digital CTD. Data were logged and displayed using both an HP2100 computer system and the MicroVax. A rosette sampler was also used with the CTD to collect water samples, at several depths at each station for dissolved oxygen and nutrient analysis. Oxygen isotope samples were also drawn at various stations. One bottle was fitted with a pair of reversing thermometers for temperature calibration and salinity samples were also drawn from this bottle for onboard analysis on a Guildline Autosol salinometer. A decimated series of temperature - salinity profiles were sent to Ice Forecasting Central in Ottawa immediately upon the ship's return.

Oxygen Isotope Samples

A study is underway to evaluate the potential usefulness of oxygen isotope measurements in the description of cross-shelf mixing processes on the Scotian Shelf. An understanding of the isotopic composition of the freshwater component of the outflow from the Gulf of St. Lawrence through Cabot Strait is required for this evaluation. Two isotopically distinct freshwater types are present in Gulf waters, that derived from freshwater inputs to the Gulf, and that found in deep Gulf waters formed much further north. The distribution of these components in the outflow, and its seasonality, are not currently understood.

Sampling was conducted on this cruise (i) to examine the attenuation of the isotopic signature of St. Lawrence River water in surface waters from the Magdalen Shelf (Sta. 1 - 5) and in and near the Gaspé Current (Sta. 8-16) and (ii) to extend the existing data base on the isotopic signature of the water flowing through Cabot Strait (Sta. 39-43) to a new season. A total of 147 samples were collected, with sampling concentrated in surface waters. The evaluation of the isotopic composition of the freshwater component of a water mass ideally requires samples covering salinity gradients within that water mass. The depth of surface mixing found in the Gulf during the cruise precluded such sampling at some stations.

RDI Acoustic Doppler Current Profiler Mooring

The RDI ADCP was moored at Sta. 4 in the Magdalen shallows at 47°54.92N, 63°19.91W at 0754Z 29 November 1987. The BIO mooring number is 868. The mooring consists of the ADCP in its floatation collar suspended above an acoustic release fastened to a train wheel anchor. There is a ground line from the first anchor to a second anchor at 47°54.86N, 63°19.32W. The

water depth at the first anchor was 79 meters. The transducer faces are 3 meters from the bottom.

The ADCP was tested and data collection was started in the lab. It was set up to burst average for 15 minutes every hour on the half hour. The bin size was two meters and 40 bins are being logged. The surface reflections are also being logged in a bottom tracking mode. This will allow us to track the direction and speed of the surface ice after freeze-up.

The mooring was deployed with no problems and the deck crew displayed their usual high degree of experience and ability.

The MicroVax II

The DAWSON Ice Forecast Cruise 87-045 provided an opportunity to test and assess the new MicroVax II PCS data acquisition and analysis software.

A couple of first time VAX users were introduced to both the VAX/VMS operating system and the PCS software system. This proved to be a valuable exercise for both the 'instructor' and 'students'.

The graphics interface to the new Shipboard HP7586 plotter was assessed. This plotter, designed primarily for chart production was found not to be as capable for our applications as expected. Some additional documenting and/or coding may be required to interface with the plotter effectively.

Two new command procedures were written and tested that will assist in managing the PCS software and data sets.

Most of the CTD casts were acquired via the serial data interface and processed in real time to provide graphic and listed outputs.

Chemistry

Standard oceanographic sampling techniques were used to collect water and sediment samples. Water samples were collected using 12 ℓ and 100 ℓ GoFlo bottles on a stainless steel hydrowire. Seawater from the ships firefighting system was used for surface Ra 224 samples at each station.

Water

Seawater samples were collected at various depths using a 100 ℓ GoFlo bottle on a hydrowire for Pb₂₁₀ and Ra₂₂₄. At the same stations 12 ℓ GoFlo bottles specially prepared for sampling trace metals were used to collect water samples for manganese at the same depths as the Pb₂₁₀ and Ra₂₂₄ samples were collected. From each bottle salinity and nutrient samples were also taken.

Samples collected for radionuclides were processed in the following manner.

Pb₂₁₀ Particulate matter was removed using a 0.4, 142 mm Millipore filter. Soluble Pb₂₁₀ was then precipitated from acidified seawater using cobalt nitrate and APCD and the precipitate filtered through a 142 mm, 0.4 millipore filter. The filter was retained for Pb₂₁₀ analysis.

Ra₂₂₄ Ra₂₂₄ was removed by passing water samples through a column of manganese impregnated acrylic fibers. Analysis for Ra₂₂₄ was carried out onboard ship and the acrylic columns were then stored for transport to the University of South Carolina and subsequent Ra₂₂₆, Ra₂₂₈ analysis.

Sediment Sampling

Sediment samples were collected using both a Box and Lehigh corers from selected sites. Box core samples were subsampled onboard the CSS Dawson. Lehigh cores were transported back to BIO for subsequent splitting and analysis.

Summary of Data Obtained

Temperature and salinity profiles were obtained at all stations except 47-50. Surface Ra samples were collected at all stations. The following table lists the number of each type of sample collected at each stations. Core samples are listed separately in a subsequent table.

STN.	DEPTH	S‰	NUTRIENTS	O ₂ Dissolved	O ₁₆ /O ₁₈	Ra PROFILE	Pb ₂₁₀	Mn
1	67	3	3	3	3			
2	56	3	3	3	3			
3	79	4	4	4	4			
4	54	3	3	3	3			
5	383	9	9	9	9			
6	400	12	20	9		3	4	4
7	383	1	9	9				
8	190	8	8	8	8			
9	300	9	9	9	9			
10	380	14	14	9	9	2		3
11	370	10	9	9	9			
12	105	9	5	5	9			
13	340	10	9	9	9			
14	205	10	8	8	9			
15	325	10	9	9	9			
16	330	15	14	9	9	2		3
17	310	6	14	9		2		3
18	290	1	9	9				
19	330	6	14	9		2		3
20	350	6	14	9		2		3
21	325	6	14	9		2		3
22	310	13	21	9		3	4	5
23	330	18	26	9		7	4	6

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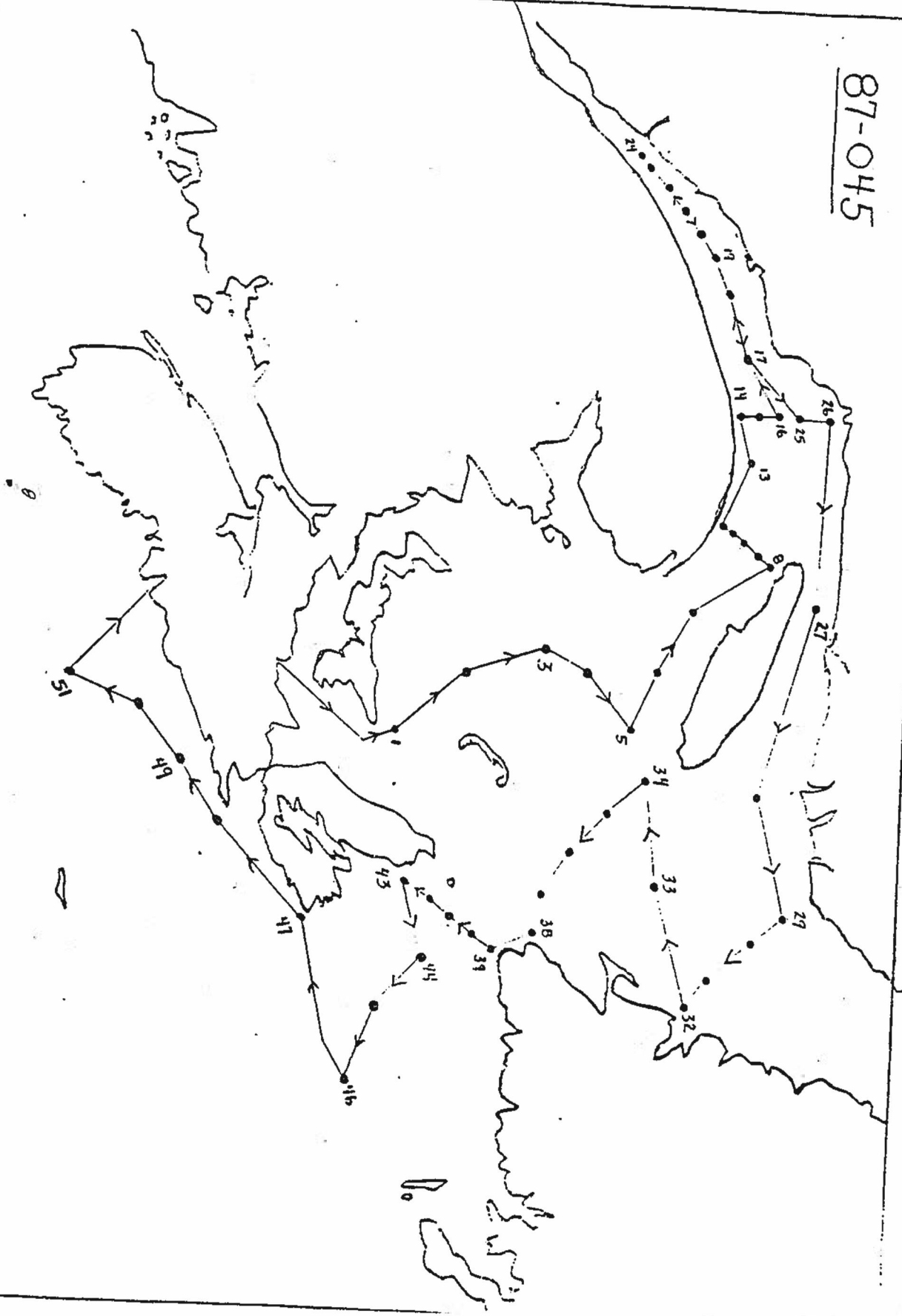
STN.	DEPTH	S‰	NUTRIENTS	O ₂ Dissolved	O ₁₆ /O ₁₈	Ra PROFILE	Pb ₂₁₀	Mn
24	320	6	14	9				5
25	300	1	9	9				
26	147	1	7	7				
27	118	1	6	6				
28	249	1	7	7				
29	115	1	6	6				
30	260	1	9	9				
31	155	1	4	4				
32	66	1	3	3				
33	265	1	9	9				
34	147	1	6	6				
35	390	1	9	9				
36	445	1	9	9				
37	465	1	9	9				
38	174	1	4	4				
39	237	9	9	9	9			
40	475	17	17	9	9	2	3	3
41	457	9	9	9	9			
42	293	9	9	9	9			
43	83	4	4	4	4			
44	445	1	9	9				
45	444	1	9	9				
46	357	1	9	9				

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STN.	DEPTH	S‰	NUTRIENTS	O ₂ Dissolved	O ₁₆ /O ₁₈	Ra PROFILE	Pb ₂₁₀	Mn
47	121	1	1					
48	92	1	1					
49		1	1					
50	152	1	1					
51	265	6	6			3	3	

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APPENDIX 2: Station locations, depths and times.

STATION	LATITUDE N	LONGITUDE W	DEPTH	DATE	GMT
1	46°46.64	62°03.10	67	28-11-87	22:12
2	47°09.46	63°09.39	55	29-11-87	02:44
3	47°54.93	63°19.94	79	29-11-87	07:18
4	48°19.52	63°09.48	54	"	10:50
5	48°42.41	62°19.03	380	"	14:18
6	48°56.48	63°03.92	400	"	21:01
7	49°09.34	63°52.22	382	30-11-87	05:40
8	49°39.09	64°24.57	190	"	09:34
9	49°31.14	64°30.24	300	"	11:20
10	49°23.97	64°40.18	354	"	13:01
11	49°17.91	64°43.47	370	"	17:20
12	48°12.27	64°48.73	105	"	19:34
13	49°25.05	65°35.87	340	"	23:15
14	49°14.48	66°18.59	205	1-12-87	04:05
15	49°24.66	66°18.78	325	"	06:46
16	49°34.12	66°19.17	330	"	09:01
17	49°09.70	67°10.00	310	"	15:50
18	49°00.10	67°48.40	290	"	20:51
19	49°54.20	68°10.14	333	"	23:32
20	48°44.00	68°35.70	350	2-12-87	04:04
21	48°54.50	68°55.00	325	"	08:48
22	48°26.04	69°06.13	300	"	13:25
23	48°17.00	69°21.00	330	"	18:20
24	48°15.31	69°24.30	320	3-12-87	01:33
25	49°48.1	66°19.1	300	"	15:51
26	50°2.0	66°18.5	147	"	17:46
27	50°2.81	64°4.12	118	4-12-87	01:05
28	49°45.08	61°49.13	249	"	08:54

APPENDIX 2: Station locations, depths and times.

STATION	LATITUDE N	LONGITUDE W	DEPTH	DATE	GMT
29	50°5.1	59°55.1	115	"	16:01
30	49°49.94	59°25.00	260	"	18:33
31	49°34.21	58°50.91	155	"	21:30
32	49°20.07	58°29.81	66	"	23:40
33	49°7.09	60°00.15	265	5-12-87	05:17
34	48°55.07	61°39.83	147	"	11:09
35	48°35.98	61°11.14	393	"	13:55
36	48°21.51	60°39.24	445	"	17:32
37	48°09.12	60°06.43	465	"	20:29
38	48°00.00	59°30.10	174	"	23:39
39	47°35.72	59°19.95	237	6-12-87	02:33
40	47°25.50	59°35.39	475	"	04:09 _g
41	47°14.92	59°51.04	457	"	08:39
42	47°04.92	60°01.39	293	"	10:43
43	46°54.95	60°10.73	83	"	12:43
44	46°54.85	59°5.18	445	"	16:41
45	46°26.65	58°22.68	444	"	21:56
46	46°6.00	57°18.80	357	7-12-87	03:10
47	45°44.63	59°47.03	121	"	20:16
48	45°21.22	60°33.57	92	"	23:47
49	44°56.70	61°19.84		8-12-87	02:56
50	43°34.98	61°01.13	152	"	05:50
51	43°55.06	62°52.90	265	"	10:10

Core samples taken during Cruise 87-045

SAMPLE NUMBER	STATION NUMBER	DEPTH M	TYPE	LENGTH	TIME GMT	
034797	5	384	Lehigh	221 cm	29/11/87	17:10
034798	5	384	Box	45 cm	29/11/87	17:32
034308	6	400	Box	45 cm	30/11/87	02:15
035311	10	380	Box	45 cm	30/11/87	16:00
035314	16	330	Box	45 cm	01/12/87	12:05
035317	17	320	Box	45 cm	01/12/87	18:05
035318	18	290	Box	45 cm	01/12/87	21:20
035321	19	330	Box	45 cm	02/12/87	01:45
035322	19	330	Lehigh	208 cm	02/12/87	02:30
035325	20	350	Box	45 cm	02/12/87	06:00
035326	20	350	Lehigh	97 cm	02/12/87	07:00
035329	21	325	Box	45 cm	02/12/87	11:30
035330	21	325	Lehigh	226 cm	02/12/87	12:30
035338	22	310	Box	45 cm	02/12/87	13:30
035350	23	330	Box	45 cm	02/12/87	23:50
035351	23	330	Lehigh	145 cm	03/12/87	00:30
035352	23	330	Lehigh	117 cm	03/12/87	00:52
035353	23	320	Lehigh	107 cm	03/12/87	02:47
035354	22	310	Lehigh		03/12/87	04:50
035355	35	393	Box	45 cm	05/12/87	14:52
035371	51	342	Box	45 cm	08/12/87	13:00
035372	51	342	Lehigh		08/12/87	13:45