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Marine Environmental Data Service Report for 1989

by

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1. Introduction

This past year has been extremely busy at MEDS. Last year, we reported that we were in the process of rebuilding data handling systems. This is still continuing this year. Currently, we are rebuilding the last major system which is to handle oceanographic data. We expect to have the historical archives rebuilt and to be able to handle requests for data by the fall of this year. We still have work to do on the input data handling procedures and on product software. All of our real-time data systems were maintained during the past year although there was an interruption in the products from the system. Because the ocean data processing systems were interrupted, many of the data collections noted to be at MEDS have not been processed as yet. This will take place in the coming year. We expect that our new data systems will allow us to deal with the data backlog in an efficient manner. We expect that by next year, most of MEDS processing and request handling capability will have returned to normal but with greater capabilities to handle increased data volumes and more products than previously. As noted in the sections below, there have been effects on the production of this years report.

It is difficult to make a general statement about data collections this past year. On the one hand, there appears to be an increase in data collected in the NAFO area, but fewer have reached MEDS so far. This latter fact is likely in part due to contributors holding data back until our software conversion is nearer completion. There has been a notable increase in data collected both by drifting buoys, current meters and wave measuring devices. On the other hand, oceanographic data reported over the GTS has fallen. Likewise, data received from years earlier than 1989 are lower than previous years to some extent. Overall though, it would seem that there has been an increase in the data collected in the NAFO area in 1989 compared to 1988.

2. 1989 Data Not Yet Received by MEDS

Table 1 presents the information known about data collections made in the NAFO area in 1989 but from which the data have not yet reached MEDS. The information was obtained from ROSCOP forms, cruise reports, NAFO forms, and NAFO documents. The CAMDI system was not available at MEDS so this was not a source this year. There are about 1900 stations represented in the list which is a reduction from last year. A large number of the Canadian cruises do not have the numbers of stations reported. This is because the information was not available in the documents examined. Because of this, the numbers of stations reported above is clearly much lower than is the case. It is not possible to estimate the true figure. However, the numbers of cruises reported would suggest an increase over 1988.

3. 1989 Data Received and Processed

Table 2 records the data collected in 1989 and received at MEDS through the usual data exchange routes. The total numbers of stations represents about half of the figure from last year. Part of the reason for this is that Canadian Institutes have not been sending their data to us because they are aware of the software conversion process that is taking place. We expect that these data will be forwarded to us as the new ocean processing system becomes operational in the coming months. A further caution to these

figures is that some are derived from Canadian naval vessels that do not spend all of their time in the NAFO area. Again, due to system conversion, we do not know the areas traveled in the cruises and so cannot refine the numbers to represent only those stations collected in the NAFO area.

Table 3 lists the data collected through the IGOSS program. As was true last year, there has been a reduction this year. There are fewer than 50% of the data being reported in real-time this year as compared to 2 years ago. This drop is reflected in the global IGOSS traffic as well but the global reductions are not as dramatic as for the NAFO area. There also appears to be fewer TESAC messages. This is not desirable in light of the efforts being made within global science programs such as WOCE to increase data collections.

4. Drifting Buoy Data Received in 1989

Table 4 records the data collected using drifting buoys in the NAFO area. Those buoys reporting over the GTS have a 5 digit buoy number while those with 4 digits do not report in real-time. These latter buoys have been deployed by scientists and the Bedford Institute. The number of buoy months shows a slight increase over last year. A large percentage of the buoys were operating in the early part of the year. There were fewer deployments made in the summer and fall. Most of the buoys reported sea surface temperature, sea level pressure and air temperature.

5. Current Meter Moorings in 1989

Table 5 records the data collected from current meters during 1989. No figures were given last year for the numbers of days of moorings so it is difficult to compare. However, there are many more meters represented in Table 5 and so it is estimated that there was an increase in the number of meter-days of data collected. The total of 16,000 plus days represents over 44 years of data collection by a single meter. Moorings were made in each of subareas of NAFO from 0, 2, 3, 4 and 5. Most were made in subareas 3 and 4. The system for managing current meter at BIO was changed in the past year and so the identification information has changed. As well, the inventory no longer provides mean currents over the measurement period.

6. Wave Data Collections

Table 6 shows the locations and durations of wave measurements made last year. There is an increase of about 40% over the collections from 1988. There was a large increase in the number of directional spectra collected although only at 2 locations. A number of the data were collected from buoys operated by the United States. Typically they used large NOMAD type buoys with strap-down accelerometers. All of the Canadian measurements used Datawell Waverider buoys.

7. Historical Data Acquisitions

Table 7 shows the data collected in the NAFO area from years prior to 1989 and received since our last report. There are roughly 4,500 stations. While this represents a significant drop from last year, last years figures were much higher than normal due to a large volume of historical data received from the World Data Center.

8. Review of Environmental Conditions

This review is based on a number of analyses. Information is taken from the monthly reports issued by the Bedford Institute, from sea surface temperature anomaly maps from the US, and analyses made at MEDS. Overall, conditions in the NAFO area would appear to be near normal with a tendency to be slightly below normal in surface temperature.

Subarea 0 and 1

January of 1989 began slightly colder than normal generally throughout these subareas. The exception was that water warmer than normal was present near the southern tip of Greenland in region 1F. These conditions persisted into March, with some fluctuation of the boundaries but little change. April through June showed a similar pattern. In July a tongue of warmer than normal water extended into the 1F region from the coast of Labrador. There was also evidence of warmer conditions in the region of Hudson Strait.

August showed these features broadening. September through November showed conditions reverting to be colder than normal. In December, warmer than normal conditions appeared through almost all of these subareas. Overall, it would appear that these areas were generally somewhat colder than normal.

Subarea 2 and 3

These subareas began 1989 with colder than normal surface temperatures generally. The most intense cold, although less than 1 degree below normal, was situated offshore of the Grand Banks. These conditions tended to persist into March, although some water warmer than normal appeared in the 3K region. In April, warmer than normal water was hugging the coast of Newfoundland. This extended to the north along the coast of Labrador in May. By June, apart from a region of colder water in the Flemish Cap region, conditions tended to be warmer than normal in inshore regions. In offshore regions of 2GHJ, conditions were still colder than normal. In July, a tongue of warmer than normal water extended offshore from the coast of Labrador in the 2HJ areas. As for earlier months, the inshore regions appeared to be warmer than normal and the offshore regions colder. In August, the warmer conditions started to push further offshore, but by October, temperatures had all fallen below normal throughout these subareas. November brought a warm tongue of water along the coast of Labrador which by December had spread throughout subarea 2. Subarea 3 persisted with colder than normal temperatures in December. Overall there does not appear to be any predominance of cold over warm conditions throughout the year.

Subarea 4

Conditions in region 4RSTVn tended to start the year with temperatures warmer than normal. Conditions along the coast of Nova Scotia all tended to be colder than normal. Into February and March, temperatures warmed up along the Nova Scotia coast and into the Bay of Fundy. By April, the waters that were colder than normal reappeared off Nova Scotia, but the 4RST regions still persisted with warmer than normal conditions. May and June showed conditions reverting to those of February and March. In the summer months into September, inshore regions of 4WX became colder, but offshore they were still warmer than normal. These conditions gradually spread throughout all of this subarea over the early winter so that by December the entire subarea experienced colder than normal temperatures.

Subarea 5 and 6

These regions began 1989 with colder water close to the coast and temperatures warmer than normal offshore. All of region 5 experienced colder than normal conditions at the start of the year. Into February, March and April, these conditions persisted with some fluctuations. This was also true for May and June. The region of colder than normal conditions was still confined to inshore regions and fluctuated in size with time. June through August showed similar patterns but the colder water started to extend a little further offshore. The extent of the cold water grew erratically through to December, when generally the entire area of these subareas were covered by colder than normal waters.

Table 1: Data collected in the NAFO area in 1989 but not yet received at MEDS. Total = 1,980 stations.

<u>Ship Name</u>	<u>Cruise Period</u>	<u>NAFO Subarea</u>	<u>Standard Section Number</u>	<u>Reference</u>
<u>CANADA</u>				
A.Needler	22 Feb - 7 Mar	5Ze	95	AN116
A.Needler	13 - 21 Mar	4WVs	28	AN117
A.Needler	11 - 22 Apr	4WX	?	AN119
Dawson	15 - 28 Apr	3L	?	DA002
Baffin	17 Apr - 19 May	4WX	?	BA003
A.Needler	25 Apr - 8 May	3L	?	AN120
Dawson	29 Apr - 2 May	3L	?	DA005
A.Needler	9 - 19 May	3L	?	AN121
Navicula	9 - 19 May	4Vn	?	SN011
Dawson	20 May - 10 Jun	4RST	?	DA007
L.Hammond	24 May - 3 Jun	3L	?	LH198
E.E.Prince	29 May - 8 Jun	4VsW	?	EP385
A.Needler	5 - 15 Jun	4WX	31	AN122

<u>Ship Name</u>	<u>Cruise Period</u>	<u>NAFO Subarea</u>	<u>Standard Section</u>	<u>Number</u>	<u>Reference</u>
<u>CANADA (Cont'd)</u>					
L.Hammond	18 - 28 Jun	4RST		?	LH200
L.Hammond	29 Jun - 8 Jul	4W		?	LH201
A.Needler	4 - 16 Jul	4X, 5Y		?	AN123
Navicula	4 - 13 Jul	4T		15	SN013
Baffin	10 - 20 Jul	2J		?	BA014
L.Hammond	12 - 30 Jul	5Ze		?	LH202
Navicula	14 Jul - 2 Aug	4T		45	SN015
A.Needler	18 - 27 Jul	4VnVsW		?	AN124
Dawson	25 Jul - 4 Aug	2J, 3KLMNO		?	DA016
A.Needler	29 Jul - 8 Aug	4ST		?	AN125
Dawson	5 - 18 Aug	1F, 2J, 3K		?	DA016B
A.Needler	9 - 19 Aug	4WX		?	AN126
L.Hammond	14 Aug - 2 Sep	4ST		197	LH203
Dawson	18 Aug - 7 Sep	0A, 1B		?	DA016C
Navicula	21 - 28 Aug	4W		?	SN020
L.Hammond	3 - 26 Sep	4T		39	LH204
Dawson	9 - 21 Sep	3LNO		?	DA024
L.Hammond	11 - 21 Oct	4VnVsW		?	LH205
Maltsevo	17 - 30 Oct	4WX		?	MA0406
Navicula	21 - 30 Oct	4Vn		?	SN021
L.Hammond	23 Oct - 9 Nov	5Ze		39	LH207
E.E.Prince	23 Oct - 9 Nov	4X, 5Y		?	EP391
Dawson	26 Oct - 7 Nov	3L		?	DA032
A.Needler	1 - 30 Nov	4T		?	AN128
Dawson	10 Nov - 1 Dec	4W, 6CDE		?	DA034
L.Hammond	12 - 28 Nov	3NO		60	LH208
E.E.Prince	13 Nov - 5 Dec	4ST		?	EP392
Dawson	4 - 15 Dec	4RST		45	DA036

Fed. Rep. Germany

Poseidon	6 - 20 Jul	1F		27	ROSCOP
Poseidon	21 Jul - 4 Aug	1F		4	ROSCOP
W.Herwig	Oct - Nov	1		131	NAFO
W.Herwig	20 Oct	1	C.Farewl	4	NAFO
W.Herwig	26 Oct	1	C.Desola	4	NAFO
W.Herwig	3 Nov	1	Holstein	4	NAFO
W.Herwig	17 Nov	1	Fyllas	6	NAFO
W.Herwig	21 Nov	1	Frederik	4	NAFO

USA

Delaware 2	5 - 20 Jan	5YZe		132	DE01
Delaware 2	27 Feb - 17 Mar	5Ze, 6ABC		39	DE02A
Delaware 2	22 - 31 Mar	5Ze		36	DE02B
Delaware 2	4 - 13 Apr	4X, 5YZe		22	DE02C
Delaware 2	18 Apr - 1 Jun	5ZeZw, 6ABC		137	DE03
Delaware 2	6 - 18 Jun	6A		127	DE04
Albatross 4	9 - 19 Jun	5Zw, 6ABC		60	AL03
Delaware 2	26 Jun - 21 Jul	6ABC		127	DE05
Chapman	6 - 14 Jul	5Zw, 6A		17	CH03A
Oregon 2	1 - 9 Aug	5ZeZw, 6A		28	OR04
Oregon 2	11 - 22 Aug	6A		72	OR05
Delaware 2	11 - 29 Sep	6ABC		64	DE06A
Delaware 2	2 - 13 Oct	5ZeZw		46	DE06B
Delaware 2	17 - 28 Oct	4X, 5YZe		34	DE06C
Delaware 2	30 Oct - 2 Nov	5Y		11	DE06D
Delaware 2	6 - 16 Nov	5YZe		119	DE07
Delaware 2	27 Nov - 16 Dec	5YZeZw		125	DE09

USSR

Kapitan	22 Sep	2	38-A	6	NAFO
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Table 2: Data collected in the NAFO area in 1989 and received at MEDS.
Total = 1,404 stations.

Ship Name	Cruise Period	NAFO Subarea	Data type		Cruise Number
			BT	BOT CTD	
<u>Canada</u>					
Margaree	14 Jan - 3 Apr			133	181889017
Athabaskan	16 Jan - 4 Apr			160	181889009
Annapolis	16 Jan - 5 Feb			25	181889010
Saguenay	16 Jan - 22 Feb			64	181889014
Skeena	18 - 29 Jan			9	181889002
Gatineau	30 Jan - 4 Apr			94	181889008
Ottawa	23 Feb - 2 Mar			15	181889015
Annapolis	26 Feb - 15 Mar			55	181889011
Skeena	27 Feb - 3 Mar			16	181889003
Fraser	27 - 28 Feb			3	181889020
Ottawa	6 - 23 Mar			16	181889016
Skeena	18 Apr			1	181889004
Skeena	24 - 26 Apr			3	181889005
Annapolis	10 - 17 May			27	181889012
Skeena	15 May - 13 Jun			78	181889006
Annapolis	31 May - 13 Jun			32	181889013
Athabaskan	31 May - 19 Jun			45	181889021
Margaree	7 - 21 Jul			6	181889019
Margaree	11 - 12 Jul			7	181889018
Skeena	16 Jul			1	181889007
Skeena	18 - 21 Jul			13	181889001

USSR

Persei 3	23 Mar - 8 Jul	3KLMNO		440	90P389043
K.Shaitanov	13 Sep - 8 Dec	1CD, 2GHJ, 3KLN0		161	90KS89017

Table 3: IGOSS data received during 1989.
Total = 2,361 stations.

Ship Name	Country	Call Sign	Cruise Period	Message Type		NAFO Subarea
				BATHY	TESAC	
??	USA	ACTF	19 Jan	6		6ABD
??	Canada	CG2676	4 Aug - 13 Aug	9		2J
		CG2676	9 - 13 Oct	14		3L
Marinus	Canada	CG2680	5 - 6 Sep	4		3L
		CG2680	26 Sep - 9 Oct	26		3L
A.Needler	Canada	CG2683	23 Feb - 6 Mar	22		5Ze
		CG2683	6 - 27 Jul	25		4VsWX, 5Ze
W.Templeman	Canada	CGDV	31 Jan - 17 Feb	102		3LNOPs, 4Vs
		CGDV	5 - 8 May	37		3NO
		CGDV	27 Aug - 6 Sep	24		3LNO
		CGDV	14 - 17 Sep	34		3LOPs
		CGDV	27 Sep - 1 Nov	208		2GHJ, 3KL
		CGDV	9 - 13 Nov	35		3LO
Koeln Atl.	FRG	DAKE	16 - 17 Jan	12		3MN, 4Vs
		DAKE	12 Mar	10		3LM
		DAKE	23 - 25 Mar	12		3MN, 4VsW
		DAKE	21 Apr	4		3MN
		DAKE	19 - 20 May	12		3MN
		DAKE	17 Jun	4		3M
		DAKE	14 - 15 Jul	7		3KLM
		DAKE	12 Aug	7		3KLM
		DAKE	9 - 10 Sep	5		3KL
		DAKE	7 Oct	6		3K
		DAKE	2 - 3 Dec	5		3M
Y.Clipper	FRG	DLEZ	4 Feb	10		5Ze
		DLEZ	7 Mar	10		5Ze
		DLEZ	7 - 8 Apr	10		5Ze
		DLEZ	6 May	11		5Ze
		DLEZ	17 Jun	11		5Ze
		DLEZ	8 Jul	10		5Ze
		DLEZ	5 Aug	10		5Ze
		DLEZ	2 Sep	11		5Y
		DLEZ	7 Oct	9		4X, 5Y

Ship Name	Country	Call Sign	Cruise Period	Message Type		NAFO Subarea		
				BATHY	TESAC			
?? Monsoon	USSR	DLEZ	4 Nov	11		4X, 5Y		
		DLEZ	9 Dec	7		4X, 5Y		
		FLHL6	24 - 30 Oct	4		6A		
		EREA	7 Jan - 3 Feb	32	28	3MN, 6H		
		EREA	2 - 31 Dec	59	51	3NO, 4Vs, 6FGH		
Volna	USSR	EREB	27 Nov	2	2	3M		
		EREB	2 - 12 Dec		19	3N, 6H		
V. Bugaen	USSR	ERES	30 Apr - 28 May	42	18	3KLMN, 6H		
		ERES	12 - 17 Nov	18	10	6DEFGH		
E. Krenkel	USSR	EREU	1 - 13 Apr	10	2	3KM		
		EREU	4 - 28 Aug	71	4	3MN		
Persey 3 Cryos	USSR	ESGU	3 Mar - 19 Jun		278	3KLNO		
		FNBA	20 - 27 Feb	30		3Ps		
	FNBA	1 Mar	6		3Ps			
	FNBA	8 - 9 Mar	19		3Ps			
Cirolana Skogafoss	UK	GNAM	6 - 9 Jul	5		1F, 2J, 3K		
		HO4667	31 May - 2 Jun	22		1F, 2J, 3KL		
	USA	KNBD	12 - 30 Mar	38		5Ze, 6A		
Delaware 2	USA	KNBD	5 - 13 Apr	20		5YZe		
		KNBD	4 - 19 Jul	9		5Ze, 6B		
		KNBD	13 - 25 Sep	27		5Zw, 6ABC		
		KNBD	21 Oct - 2 Nov	33		5YZeZw		
		NBTM	30 Jun - 10 Jul	11		0AB, 2JG, 3Pn		
		NBTM	17 - 22 Jul	6		0AB		
		NBTM	30 Jul - 3 Aug	5		0A		
		??	USA	NIDK	17 - 18 Jun	8		3KLM
		??	USA	NNAS	27 - 28 Jun	4		6C
		??	USA	NOCF	6 Jan	11		4Vs, 6EF
Oleander	Netherlands	NOCF	20 Jan	26		4VsWX, 5Ze, 6E		
		PJYG	7 Jan	12		6AB		
		PJYG	3 Feb	18		6AB		
		PJYG	3 Mar	14		6AB		
		PJYG	7 Apr	12		6AB		
		PJYG	13 - 14 Apr	17		6AB		
		PJYG	11 - 13 May	19		6AB		
		PJYG	9 - 10 Jun	14		6AB		
		PJYG	7 Jul	14		6AB		
		PJYG	2 - 4 Aug	15		6AB		
		PJYG	1 Sep	15		6AB		
		PJYG	11 - 12 Oct	19		6AB		
		PJYG	10 Nov	18		6AB		
		PJYG	15 Dec	17		6AB		
		K. Shaitanov	USSR	UFYN	6 - 7 Oct		4	1CD
		Solntsevo	USSR	UFYN	19 Nov - 8 Dec		37	3KLMNO
				USCG	24 - 28 Mar	6		3N
USCG	7 - 10 Apr			4		3MN		
USCG	21 Apr			5		3M		
USCG	5 - 8 May			6		3M		
G. Atlantica	Canada	VC9450	3 - 24 Feb	41		2J, 3KL		
		VC9450	11 - 30 Oct	23		2J, 3KL		
		VC9450	13 Nov - 1 Dec	20		2J, 3K		
		VC9450	10 - 14 Dec	14		2J, 3K		
C. Roger	Canada	VCBT	18 - 27 Feb	14		3MNO		
		VCBT	10 - 12 Mar	6		3L		
		VCBT	1 - 11 Apr	11		3MNOPs		
		VCBT	8 - 15 Jun	6		3KL		
C. Briar	Canada	VCTF	8 - 14 Jun	9		4X		
		VCTF	9 - 15 Jul	10		4Vs		
		VCTF	20 - 24 Jul	6		4VsW		
		VCTF	2 - 5 Aug	4		4W		
		VCTF	11 - 17 Nov	8		3D, 4Vs		
Aircraft	USA	VXN-8	10 Mar	18		4W, 6DE		
		VXN-8	15 - 16 Mar	56		4VsW, 6DE		
		VXN-8	18 May	20		4VsW, 6EF		
		VXN-8	13 Aug	11		6CD		
		VXN-8	11 Dec	15		6D		
Albatross 4	USA	WMVF	10 - 20 Jun	42		5Zw, 6AB		
??	USA	WRA4560	6 May	4		6C		

Ship Name	Country	Call Sign	Cruise Period	Message Type		NAFO Subarea
				BATHY	TESAC	
??	USA	WRA4560	11 May	4		6C
		WRA4560	21 Jul	4		6C
		WRA4560	26 - 30 Sep	4		6C
		WRA4560	11 - 15 Oct	4		6C
		WRA4560	5 Nov	5		6C
		WRA4560	15 - 18 Nov	5		6C
Oregon 2	USA	WTD0	3 - 8 Aug	18		5Ze
Chapman	USA	WTED	7 - 13 Jul	15		5Ze
Ferrel	USA	WTEZ	27 Feb - 1 Mar	5		6C
		WTEZ	25 - 29 Apr	5		6C

Table 4: Data collected by drifting buoys in the NAFO area in 1989.
Total = 143 buoy months

Buoy Number	Period	NAFO Subarea	SST	AP	AT	WS	WD	TC
41527	1 Oct - 31 Dec	4WX, 5ZeZw, 6ABCDEF	X		X			
44231	13 Mar - 13 Apr	3Ps, 4VnVs	X	X				
44235	15 - 16 Mar	2J, 3K						
44501	11 May - 4 Jul	3LMN	X					
44502	9 Jun - 30 Nov	2J, 3KLM	X		X			
44506	28 - 30 Mar	3L	X	X				
44507	5 Apr - 30 Jun	3KLM	X					
44508	28 Apr - 12 Oct	3KLMN	X					
44509	28 Apr - 31 Jul	1F, 2J, 3K	X	X				
44510	28 Mar - 30 Sep	1F, 2J, 3KLM	X	X				
44511	28 Apr - 30 Sep	3KLN	X					
44512	28 Apr - 31 Jul	3KLMN	X					
44529	1 Jan	6G	X	X	X			
44531	1 - 13 Jan	30, 4Vs	X	X	X			
44541	1 Jan - 29 Mar	3MO, 4Vs, 6FGH	X	X	X			
44557	13 Jan	6E	X	X	X			
44560	18 - 23 Jan	6E	X	X	X			
44561	18 - 20 Jan	4W, 6E	X	X	X			
44562	18 - 24 Jan	6D	X	X	X			
44563	18 - 23 Jan	5Ze, 6D	X	X	X			
44564	18 Jan - 30 Mar	3MN, 4VsW, 6EFGH	X	X	X			
44565	18 - 23 Jan	6E	X	X	X			
44566	18 - 24 Jan	4VsW	X	X	X			
44567	18 - 23 Jan	4Vs	X	X	X			
44568	20 Jan	4Vs	X	X	X			
44569	18 Jan - 28 Apr	3MNO, 4VsW	X	X	X			
44570	23 Jan - 3 Feb	5Zw, 6A	X	X	X			
44571	24 - 28 Jan	4WX	X	X	X			
44572	24 - 25 Jan	6E	X	X	X			
44573	2 Feb - 3 Mar	6B	X	X	X			
44574	3 Feb - 28 Apr	6BCDE	X	X	X			
44575	3 Feb - 17 Mar	6CD	X	X	X			
44576	3 Feb - 27 Apr	4VsW, 6DEFG	X	X	X			
44579	9 Feb - 5 May	3MNO, 4VsWX	X	X	X			
44580	9 Feb - 15 May	4X, 5ZeZw	X	X	X			
44581	14 Feb - 15 May	3MNO, 4Vs	X	X	X			
44582	8 - 17 Feb	6D	X	X	X			
44583	3 Feb - 31 Mar	4VsWX, 5Ze, 6DEF	X	X	X			
44585	1 - 8 Feb	4X	X	X	X			
44586	31 Jan - 15 Feb	4X	X	X	X			
44587	8 - 15 Feb	6BDE	X	X	X			
44588	9 - 18 Feb	4W, 6EF	X	X	X			
44607	1 Nov - 31 Dec	1F, 2G	X			X	X	
44608	15 Sep - 15 Nov	1F	X	X	X	X	X	
44623	1 - 31 Dec	1EF	X	X				
44673	15 Mar - 26 May	2HJ, 3K						
44682	15 Mar - 26 May	1F, 2J, 3K						
44683	15 Mar - 26 May	2HJ, 3K						
44690	15 Mar - 18 May	2J						
44691	15 Mar - 26 May	2HJ						
44692	29 Mar - 8 May	3K						
44693	29 Mar - 15 Apr	3K						
44694	29 Mar - 21 Jun	3KLM						
44695	15 Mar - 21 Jun	2J, 3KLM						

Buoy Number	Period	NAFO Subarea	SST	AP	AT	WS	WD	TC
44696	29 Mar - 21 Jun	3KLM						
44703	17 - 23 Mar	2J,3K						
44727	1 - 31 Jan	1F	X	X	X			
44728	24 Mar - 30 Apr	1F	X	X	X			
44743	17 May - 30 Jun	1F	X	X	X			
47550	15 Mar - 23 Apr	2J,3K						
47552	7 Jun - 2 Jul	1A		X				
47553	7 Jun - 26 Aug	1A		X				
47554	8 Jun - 2 Aug	0A,1A		X				
47555	5 - 31 Dec	1A				X		
47556	5 - 31 Dec	0A,1A				X		
64523	1 Jan - 31 Mar	1F	X	X				
64528	26 May - 3 Jun	1F	X	X				
64529	1 - 31 Dec	1EF	X	X	X			
64533	26 Mar - 3 Apr	6A		X				
64560	1 - 12 Jan	1EF	X					
64603	1 - 14 Dec	1DEF	X	X	X			
65504	15 - 31 Dec	1CDEF		X	X			
65581	20 - 31 Jan	1F	X	X	X			
2485	11 - 29 Jul	4X	X					
2754	13 - 29 Jul	4W	X					
3324	1 - 30 Apr	2J,3K				X	X	
4651	1 - 23 Apr	2J						
8646	Jan - May	2J	X					
8647	Jan - May	2J	X					
8654	Jan - Apr	2J,3K	X					
8655	Jan - Apr	2J	X					
8656	1 Apr - 8 May	3K				X	X	
8657	1 - 15 Apr	3K	X					
8658	23 Mar - 31 May	3K	X					
8659	1 Apr - 31 May	3K	X					
8660	1 Apr - 31 May	3KLM	X					

Table 5: Current meter moorings in the NAFO area in 1989.
Total = 16,273 meter days

ID	N Lat	W Long	Depth	Period	Area
88025	56.53	60.32	220	1 Jan - 31 Aug	2H
88025	56.94	59.29	149	1 Jan - 13 Aug	2H
88025	57.11	58.86	200	1 Jan - 10 Sep	2H
88025	57.11	58.86	400	1 Jan - 30 Sep	2H
88037	66.25	60.47	153	1 Jan - 27 Sep	0B
88037	66.25	60.47	302	1 Jan - 9 Sep	0B
88037	66.24	59.98	165	1 Jan - 27 Sep	0B
88037	66.24	59.98	313	1 Jan - 27 Sep	0B
88037	66.24	59.98	513	1 Jan - 27 Sep	0B
88037	66.26	59.04	170	1 Jan - 27 Sep	0B
88037	66.26	59.04	318	1 Jan - 27 Sep	0B
88037	66.26	59.04	517	1 Jan - 27 Sep	0B
88037	66.25	57.44	146	1 Jan - 26 Sep	0B
88037	66.25	57.44	295	1 Jan - 26 Sep	0B
88037	66.25	57.44	495	1 Jan - 18 Jun	0B
88037	66.26	56.66	156	1 Jan - 26 Sep	0B
88037	66.26	56.66	304	1 Jan - 27 Sep	0B
88037	66.26	56.66	504	1 Jan - 27 Sep	0B
89005	44.24	50.07	46	30 Apr - 11 Jul	30
89202	41.99	66.80	13	13 - 30 Jul	5Ze
89202	41.99	66.80	36	13 - 30 Jul	5Ze
89202	41.99	66.80	60	13 - 30 Jul	5Ze
89202	41.99	66.80	13	13 - 29 Jul	5Ze
89202	41.99	66.80	37	13 - 30 Jul	5Ze
89902	45.06	66.83	3	16 May - 5 Jul	4X
89902	45.06	66.83	13	16 May - 30 Jun	4X
89902	45.06	66.83	2	16 May - 5 Jul	4X
89902	45.05	66.85	3	16 May - 5 Jul	4X
89902	45.06	66.82	4	16 May - 5 Jul	4X
89902	45.06	66.82	20	16 May - 5 Jul	4X
89902	45.06	66.83	3	16 May - 5 Jul	4X
89911	46.45	63.89	11	28 Sep - 11 Nov	4T
89911	46.45	63.89	15	28 Sep - 11 Nov	4T

ID	N Lat	W Long	Depth	Period	Area
89909	45.06	66.85	5	14 Sep - 17 Oct	4X
89909	45.06	66.85	13	14 Sep - 17 Oct	4X
89909	45.06	66.82	5	14 Sep - 17 Oct	4X
89909	45.06	66.82	15	14 Sep - 17 Oct	4X
89909	45.06	66.81	4	14 Sep - 17 Oct	4X
89909	45.06	66.81	21	14 Sep - 17 Oct	4X
89908	45.06	66.83	5	5 - 14 Jul	4X
89908	45.06	66.83	13	5 - 14 Jul	4X
89908	45.06	66.83	5	5 - 14 Jul	4X
89908	45.06	66.82	5	5 - 14 Jul	4X
89908	45.06	66.82	15	5 - 14 Jul	4X
89908	45.04	66.82	5	5 - 14 Jul	4X
89908	45.04	66.84	5	5 - 14 Jul	4X
89913	45.06	66.83	5	17 Oct - 27 Nov	4X
89913	45.06	66.83	12	17 Oct - 27 Nov	4X
89913	45.06	66.82	5	17 Oct - 27 Nov	4X
89913	45.06	66.82	15	17 Oct - 27 Nov	4X
89913	45.04	66.81	4	17 Oct - 27 Nov	4X
89913	45.06	66.81	21	17 Oct - 27 Nov	4X
89915	45.04	66.79	6	27 Nov - 31 Dec	4X
89915	45.04	66.79	20	27 Nov - 31 Dec	4X
88001	42.61	50.25	375	1 Jan - 31 Dec	3N
88001	42.61	50.25	875	1 Jan - 31 Dec	3N
88001	42.61	50.25	1975	1 Jan - 31 Dec	3N
88001	42.24	50.26	297	1 Jan - 31 Dec	3N
88001	42.24	50.26	797	1 Jan - 31 Dec	3N
88001	42.24	50.26	1297	1 Jan - 31 Dec	3N
88001	42.24	50.26	2897	1 Jan - 31 Dec	3N
88001	41.82	50.28	355	1 Jan - 31 Dec	3N
88001	41.82	50.28	855	1 Jan - 31 Dec	3N
88001	41.82	50.28	3655	1 Jan - 31 Dec	3N
88001	41.19	50.27	364	1 Jan - 31 Dec	3N
88001	41.19	50.27	864	1 Jan - 31 Dec	3N
88001	41.19	50.27	1364	1 Jan - 31 Dec	3N
88001	41.19	50.27	3764	1 Jan - 31 Dec	3N
88001	40.75	50.23	845	1 Jan - 31 Dec	3N
88001	40.75	50.23	3745	1 Jan - 31 Dec	3N
88001	40.75	50.23	4351	1 Jan - 31 Dec	3N
88001	40.22	50.23	195	1 Jan - 31 Dec	3N
88001	40.22	50.23	695	1 Jan - 31 Dec	3N
88001	40.22	50.23	1195	1 Jan - 31 Dec	3N
88001	40.22	50.23	3895	1 Jan - 31 Dec	3N
88001	39.45	50.24	330	1 Jan - 31 Dec	3N
88001	39.45	50.24	830	1 Jan - 31 Dec	3N
88001	39.45	50.24	1330	1 Jan - 31 Dec	3N
88001	39.45	50.24	4030	1 Jan - 31 Dec	3N
89016	66.17	60.97	142	28 Sep - 31 Dec	0B
89016	66.17	60.97	292	28 Sep - 31 Dec	0B
89016	66.23	60.00	151	27 Sep - 31 Dec	0B
89016	66.23	60.00	301	27 Sep - 31 Dec	0B
89016	66.23	60.00	501	27 Sep - 31 Dec	0B
89016	66.25	59.02	163	27 Sep - 31 Dec	0B
89016	66.25	59.02	313	27 Sep - 31 Dec	0B
89016	66.25	59.02	513	27 Sep - 31 Dec	0B
89016	66.25	57.47	150	27 Sep - 31 Dec	0B
89016	66.25	57.47	300	27 Sep - 31 Dec	0B
89016	66.25	57.47	500	27 Sep - 31 Dec	0B
89016	66.26	56.68	150	26 Sep - 31 Dec	0B
89016	66.26	56.68	300	26 Sep - 31 Dec	0B
89016	66.26	56.68	500	26 Sep - 31 Dec	0B

Table 6: Locations of instrumented wave data collections.
Total = 37,086 Spectra

Station Name	Latitude	Longitude	Area	Period	Number	1-D 2-D
DELAWARE BAY	38.50	74.60	6B	19 JAN - 31 DEC	2492	X
SHEARWATER	44.49	63.40	4X	1 JAN - 31 DEC	6429	X

Station Name	Latitude	Longitude	Area	Period	Number	1-D	2-D
SHEARWATER	44.49	63.40	4X	25 SEP - 31 DEC	776		X
TORBAY	47.63	52.50	3L	1 JAN - 31 DEC	5094	X	
HOTEL	38.50	70.70	6B	1 JAN - 31 DEC	2490	X	
GULF OF MAINE	42.70	68.30	5Y	1 JAN - 20 NOV	2396	X	
NANTUCKET	40.50	69.40	5Ze	1 JAN - 31 DEC	2648	X	
GEORGES BANK	41.10	66.60	5Ze	1 JAN - 31 DEC	2612	X	
GULF STREAM	41.32	61.35	4W	8 SEP - 31 DEC	704	X	
GRAND BANKS	44.25	53.62	3Ps	1 JAN - 31 DEC	3365	X	
SABLE ISLAND	44.34	57.35	4W	1 JAN - 9 AUG	1564	X	
BANQUEREAU	44.32	57.36	4Vs	5 SEP - 31 DEC	427	X	
STE-FLAVIE I K	48.64	68.17	4T	9 JUN - 31 OCT	1105	X	
STE-FLAVIE O K	48.64	68.17	4T	23 JUN - 31 OCT	880	X	
STE-FLAVIE WC	48.67	68.22	4T	1 JUN - 31 OCT	976		X
STE-FLAVIE WR	48.65	68.16	4T	2 JUN - 1 NOV	3128	X	

Table 7: Historical data received at MEDS in 1989.
Total = 4,535 stations

Ship Name	Cruise Period	NAFO Subarea	Number	Reference
<u>Canada</u>				
Marinus	7 - 11 Sep '87		13	180687034
Marinus	19 Oct - 19 Nov '87		7	180587035
G.Atlantica	3 - 22 Feb '88		60	180588001
Shamook	12 - 30 Mar '88		50	180588013
W.Templeman	5 - 10 Apr '88		35	180588025
W.Templeman	20 Apr - 9 May '88		202	180588026
G.Atlantica	24 Apr - 10 May '88		9	180588002
Lady Hammond	27 Apr - 3 May '88		32	180588035
Lady Hammond	6 - 20 May '88		39	180588036
W.Templeman	11 - 24 May '88		130	180588027
G.Atlantica	13 May - 1 Jun '88		31	180588003
W.Templeman	27 May - 9 Jun '88		121	180588028
G.Atlantica	3 - 19 Jun '88		133	180588004
Marinus	3 - 18 Jun '88		8	180588019
Shamook	9 - 22 Jun '88		32	180588014
G.Atlantica	21 Jun - 4 Jul '88		56	180588005
Shamook	28 Jun - 11 Jul '88		35	180588015
G.Atlantica	6 - 26 Jul '88		169	180588006
Gatineau	11 Jul - 13 Dec '88		198	181888047
Shamook	24 Jul - 9 Aug '88		20	180588016
G.Atlantica	28 Jul - 14 Aug '88		49	180588007
W.Templeman	1 - 15 Aug '88		253	180588029
Marinus	12 - 23 Aug '88		25	180588020
G.Atlantica	16 Aug - 8 Sep '88		151	180588008
W.Templeman	18 - 22 Aug '88		2	180588030
Shamook	24 Aug - 16 Sep '88		25	180588017
W.Templeman	25 Aug - 13 Sep '88		129	180588031
Marinus	29 Aug - 2 Sep '88		19	180588021
Marinus	7 - 20 Sep '88		26	180588022
W.Templeman	18 Sep - 6 Oct '88		17	180588032
Shamook	4 - 13 Oct '88		27	180588018
G.Atlantica	7 - 25 Oct '88		39	180588009
W.Templeman	9 - 21 Oct '88		40	180588033
Marinus	25 Oct - 6 Dec '88		15	180588023
W.Templeman	26 Oct - 13 Nov '88		196	180588034
G.Atlantica	3 - 14 Nov '88		40	180588010
G.Atlantica	17 - 29 Nov '88		85	180588011
Annapolis	28 Nov - 8 Dec '88		18	181888046
G.Atlantica	30 Nov - 14 Dec '88		118	180588012
<u>USA</u>				
Albatross IV	Feb - Mar '86		60	31A486001
Albatross IV	Mar - Apr '86		32	31A486002
Albatross IV	Apr '86		62	31A486003
Albatross IV	Apr - May '86		20	31A486004
Delaware II	Jun '86		186	316G86001
Delaware II	Jun '86		197	316G86002
Albatross IV	Jun - Jul '86		26	31A486005

<u>Ship Name</u>	<u>Cruise Period</u>	<u>NAFO Subarea</u>	<u>Number</u>	<u>Reference</u>
Delaware II	Jul - Aug '86		253	316G86003
Albatross IV	Jul - Aug '86		75	31A486006
Albatross IV	Aug '86		41	31A486007
Albatross IV	Aug '86		3	31A486008
Albatross IV	Sep '86		32	31A486009
Albatross IV	Sep '86		5	31A486010
Delaware II	Sep - Oct '86		42	316G86004
Albatross IV	Oct '86		23	31A486011
Albatross IV	Oct - Nov '86		49	31A486012
Albatross IV	Nov '86		3	31A486013
Albatross IV	Dec '86		1	31A486014
Albatross IV	Dec '86		2	31A486015
Delaware II	Sep '87		178	316G87001
Delaware II	Nov - Dec '87		118	316G87002
Delaware II	Jan '88		62	316G88001
Albatross IV	Mar '88		102	31A488001
Albatross IV	Apr '88		49	31A488002
Albatross IV	Jun - Jul '88		7	31A488003
Albatross IV	Jul '88		83	31A488004
Albatross IV	Aug '88		39	31A488005
Albatross IV	Oct '88		19	31A488006

USSR

K. Shaitanov	1 Sep - 11 Dec '88		212	90KS88012
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