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Marine Environmental Data Service Report for 1990

by

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1. Introduction

A substantial portion of 1990 and continuing into 1991 was spent in converting MEDS ocean processing systems to our VAX computer and in upgrading those systems. The input processing for BATHY and TESAC data is completed. We have installed basic elements in the output system to deliver observed data and limited products. More extensive products are currently being worked on.

While building the new software elements described above, MEDS was also preparing for the start of the Global Temperature Salinity Pilot Project (GTSPP). Our contribution is to receive, process and transfer the global traffic in BATHY and TESAC data. The system that we have built uses data not only from our own link to the GTS but also from two other GTS links in the US, the National Weather Service, and the Fleet Numerical Oceanographic Center. Since January we have been comparing data sets from the 3 GTS sources to investigate differences. Monthly reports from this project are available upon request to the IOC or MEDS.

A second major software development was the implementation of most of the quality control routines described in the GTSPP Real-time Quality Control Manual (copies of this manual may be requested from the IOC). This has substantially improved our handling of the IGOSS data. The same software will form the basis for our quality control of delayed mode ocean data as well. A discussion paper describing experiences thus far in the project is in preparation for an upcoming GTSPP meeting.

The final major piece of software has been the development of code to detect duplications in received data. This was a necessity because of our receiving 3 sources of GTS data. Just as for the quality control software, the duplicates checking software will be used in our processing of delayed mode data.

MEDS has upgraded the way that it receives GTS data. Within Canada, the meteorological service broadcasts, via satellite, all of the GTS data coming into Canada. MEDS installed a satellite receiver and now is processing the data from this stream. This is an improvement over the previous link because we no longer need tell the meteorological service exactly which GTS bulletins we wish to have routed to us. Now, we receive everything and with our own software we can sort out which bulletins we wish to process.

There is still some work to do in completing the input processing streams for delayed mode data. The major software pieces are in place and working. There remains to build input format conversion software and some software to improve the ease of large data file handling.

There appears to have been an increase in data collections during the past year. For those data sets for which we have very good monitoring procedures, the IGOSS data and drifting buoys, there has been important increases. There has been a significant increase in the number of wave spectra collected. This has largely been because of the buoys deployed by the US now reporting spectra every hour. There is also an increase in historical data received at MEDS in

the past year, over the previous year. This has been difficult to determine because the software systems to process these data are still not complete. The one area that has shown a large decrease is in the number of current meter records collected. This has been reduced by a factor of ten from 1989 to 1990. This is largely due to funding reductions.

2. 1990 Data Not Yet Received by MEDS

Table 1 presents the information known about the data collections made in the NAFO area during 1990 but from which the data have not yet come to MEDS. The information has been obtained from Cruise Summary Reports (formerly ROSCOP forms), NAFO documents and reporting sheets and cruise reports. There are about 2200 stations involved which represents about the same number as reported last year. Whatever information is known has been included.

3. 1990 Data Received and Processed

Table 2 records the information about data received at MEDS this year. There are about twice as many stations reported as last year. None of these data have yet been incorporated into our archives. This is waiting on the processing system for delayed mode ocean data. There is still some work to do before this is completed, but we expect it to be finished this year. Because the data have not been processed it is not possible to deliver exact figures on stations nor exact areas from which the data were collected. However, the information supplied with the data was used to produce this table.

Table 3 lists the IGOSS data (reports of BATHYs and TESACs) collected in the NAFO area from 1990. All of these data are received at MEDS in near real-time by our link to the GTS. This year shows a substantial increase over the amounts reported in the previous year. This is a great improvement over last year which seemed to indicate a reduction in IGOSS data reporting. Recently, MEDS has switched over to a new system for receiving IGOSS data. We expect communications losses to be reduced from the old method and so to improve data reporting due to this factor.

The IGOSS data were retrieved and split into "cruises" using software. A new cruise is defined to be if there is an interruption of more than 5 days in the reporting of data. By and large, this makes for a convenient grouping of data, with few resulting cruises with a small number of stations. The same software uses a file defining NAFO subarea boundaries to accurately locate where the data were collected.

4. Drifting Buoy Data Received in 1990

Table 4 records the drifting buoy data collected in 1990. Much of it was received in real-time from the GTS with MEDS acting in our role as a Responsible National Oceanographic Data Center for these data. Those buoys reporting over the GTS have a WMO assigned 5 digit number. Buoys with a 4 digit number were deployed by Canadians and did not report in real-time. We have also made some progress in acquiring delayed drifting buoy data and incorporating the processing of these data into our systems.

There is an increase in the number of buoy months over previous years. This reflects the greater emphasis in using drifting buoys for data collection. We expect this trend to continue with the commencement of the surface velocity program within WOCE.

5. Current Meter Moorings in 1990

Table 5 records the information about current meter deployments in the NAFO area in 1989. There has been a very large decrease in the number of current meter deployments made in the NAFO area in 1990 compared to 1989. However, last year we noted that 1989 seemed to be a particularly active year for current meter data collections, so that perhaps, things are returning to a more normal state of affairs. Work was carried out only in subareas 3 and 4.

6. Wave Data Collections

Table 6 presents information about wave spectra measurements made during 1990. There has been a substantial increase over last year. This is largely due to a change in the way the buoys from the United States report data. They now use the WAVEOB code form on the GTS and report spectra every hour.

Canadian wave stations have also recently begun to report data in the same code. MEDS wave processing system is not yet in its final form, so that information about exact operating periods is not available.

7. Historical Data Acquisitions

Table 7 notes the data received at MEDS in 1990 from years earlier than 1990. There is a decrease of about 50% over last year. Part of the reason has been Canadian oceanographic institutes holding back submission of data to MEDS until we were ready to receive them. None of these data have been included in MEDS archives as yet. Processing of these data should begin in the next few months.

8. Review of Environmental Conditions

This review is based on an examination of reports published by the Bedford Institute of Oceanography and NOAA. We are in the process of installing software to calculate anomalies of temperature and salinity into our new ocean processing system. This will mean that once again we will be able to produce our own analyses of temperature and salinity anomalies.

Overall this year, colder than normal surface temperatures were in evidence in the more northerly regions of the NAFO subareas. In the southerly regions, subareas 4 to 6, significant warm surface temperature anomalies appeared in mid-summer and persisted for a few months. A warmer anomaly was present throughout most of the year in the offshore parts of subarea 6.

Subareas 0 and 1

During January, surface temperatures in these subareas appeared to be slightly below normal. This condition was uniform over the entire region. With the coming of spring, temperatures were still below normal and this persisted everywhere until May. In May, temperatures near Greenland rose to slightly above normal and this persisted until August. The rest of the region was still below normal in temperature until about the same time when the most northerly part, subareas 0 and 1A, show slightly elevated temperatures. In September, these warmer than normal conditions extend throughout subarea 0 and the northerly parts of subarea 1. By October, conditions returned to near or slightly below normal and this continued to the end of the year.

Subareas 2 and 3

In these subareas, conditions began the year being colder than normal. This was most marked in subarea 3LM where surface temperatures were up to 3 degrees colder than normal. February and March showed the same conditions although there appeared to be more normal temperatures in subarea 3 quite close to the coast. By April, conditions were not quite so cold with temperatures now closer to 1 degree cooler than normal. April also witnessed the ice in subarea 3 reaching to one of its most southerly latitudes. Surface temperatures in May were still below normal. The analysis from BIO indicated that temperatures in the southern parts returned to more normal conditions by June, while the analysis from NOAA suggests it was not until August that more normal conditions returned. August also seemed to be the time when slightly warmer than normal temperatures were evident in the northern part of subarea 2. In September and October, conditions appear to be either well above normal (2 to 4 degrees according to BIO) or only slightly above (according to NOAA). In November and December NOAA stated that temperatures in the Grand Banks area were colder than normal while BIO had them about normal values.

Subarea 4

This subarea began the year with slightly below normal surface temperatures. By March, the Gulf of St. Lawrence was showing slightly warmer conditions, but the rest of the subarea was near or slightly below normal. In April, subareas 4RST returned to below normal temperatures which was the same throughout the rest of the subarea. June and July appeared to be near normal in most areas. BIO reported higher than normal temperatures in the Bay of Fundy. August had slightly above normal temperatures everywhere. By October, surface temperatures had risen to be 1-5 degrees warmer than normal with warmer anomalies reported from the Gulf of Maine. By November, however, surface temperatures had returned to more normal values and on the Scotian Shelf, temperatures went below normal. The year closed with cooler than normal temperatures except for the Gulf of St. Lawrence where they were above normal.

Subareas 5 and 6

The year began slightly cooler than normal in subarea 5 but slightly above normal in subarea 6. As spring progressed, warmer anomalies appeared in the offshore parts of subarea 6 but the Gulf of Maine remained at near normal surface temperatures. By April a warm pool had developed offshore with temperatures 2-3 degrees above normal. Into May and June, colder than normal temperatures remained in the coastal regions, and the temperatures offshore fell somewhat although still remaining above normal. By August, warmer water had appeared in subarea 5 and still persisted offshore, although temperatures were only slightly above normal. As October began, warmer than normal temperatures were in evidence throughout these subareas, again with higher anomalies in the offshore regions. At the start of November and into December, slightly colder than normal conditions once more appeared in the near shore regions.

Table 1: Data collected in the NAFO area in 1990 but not yet received at MEDS. Total = 3091 stations.

Ship Name	Cruise Period	NAFO Subarea	Standard Section	Number	Reference
		CANADA			
Dawson	2 - 8 Jan	4RST		29	CR-REP
Hudson	2 - 29 Jan	4Vs,6G		44	CSR
A.Needler	19 Feb - 7 Mar	5Ze		140	CR-REP
A.Needler	13 - 22 Mar	4W		77	CR-REP
Baffin	25 Mar - 14 Apr			113	CSR
Hudson	5 - 28 Apr	3		40	CR-REP
A.Needler	17 - 27 Apr	5Ze		90	CR-REP
Dawson	29 May - 6 Jun	3K		14	CR-REP
L.Hammond	1 - 6 Jun	3KL		4	CR-REP
Shamook	7 - 16 Jun	#1		19	CR-REP
Shamook	7 - 18 Jun	3K		19	CR-REP
Shamook	21 Jun - 16 Jul	3L		103	CR-REP
Dawson	29 Jun - 13 Jul	2		50	CR-REP
A.Needler	3 - 19 Jul	4WX		152	CR-REP
Dawson	12 - 25 Jul	3K		119	CR-REP
A.Needler	23 Jul - 1 Aug	5Ze		72	CR-REP
J.L.Hart	3 - 8 Aug	4T		40	CR-REP
Hudson	31 Aug - 18 Sep	0,1		117	CR-REP
Marinus	11 - 12 Sep	3L		7	CR-REP
Dawson	13 - 22 Sep	4X		60	CR-REP
Shamook	25 Sep - 1 Oct	3L		43	CR-REP
Dawson	9 - 16 Oct	4W		69	CSR
Dawson	26 Oct - 9 Nov	3K		51	CR-REP
Dawson	16 - 26 Nov	4RST		54	CSR
L.Hammond	20 - 28 Nov	4T		83	CR-REP
Dawson	10 - 13 Dec	4X		2	CR-REP
		Fed. Rep. Germany			
W.Herwig	Oct - Dec			130	NAFO
W.Herwig	23 Oct		Farewell	5	NAFO
	29 - 30 Oct		Desolat	4	NAFO
	2 Nov		Egedesmi	6	NAFO
	7 - 8 Nov		Holstein	5	NAFO
	12 Nov		Fylla	5	NAFO
	19 Nov		Frederic	5	NAFO
		USA			
Delaware 2	Jan	5		178	NAFO
Delaware 2	Feb	5		93	NAFO
Delaware 2	Apr	5		98	NAFO
Delaware 2	May	5		100	NAFO
Delaware 2	Aug	6		46	NAFO
Delaware 2	Sep - Oct	5,6		75	NAFO
Delaware 2	Nov	5		131	NAFO
Delaware 2	Dec	5		130	NAFO

Ship Name	Cruise Period	NAFO Subarea	Section	Number	Reference
		USSR			
Evrika	Apr - Sep	4		366	NAFO

CR-REP: Information from cruise reports
CSR: Cruise Summary Report
NAFO: Information from NAFO Inventory Forms

Constructed from:
a) ROSCOP forms
b) CAMDI entries
c) Accessions list
d) cruise reports

Table 2: Data collected in the NAFO area in 1990 and received at MEDS. Total = 3610 stations.

Ship Name	Cruise Period	NAFO Subarea	Data type BT	BOT	CTD	Cruise Number
		Canada				
Marinus	15 Jan - 2 Mar	3LPs	9			180590027
W.Templeman	16 - 29 Jan	3LNO	27		66	180590012
Skeena	22 Jan - 9 Feb		26			181890009
Athabaskan	23 Jan - 14 Mar		106			181890023
W.Templeman	31 Jan - 20 Feb	3P	16		113	180590013
G.Atlantica	1 - 24 Feb	2J,3K	85			180590001
W.Templeman	22 Feb - 12 Mar	3KLNO	22		26	180590014
W.Templeman	14 - 28 Mar	3LN	28			180590015
Shamook	20 - 30 Mar	3L	8			180590025
Skeena	23 Mar - 12 Aug		221			181890025
W.Templeman	18 Apr - 1 May	3O	2		68	180590016
G.Atlantica	25 Apr - 7 May	3Ps	5			180590002
W.Templeman	4 - 16 May	3NO	52		46	180590017
L.Hammond	6 - 13 May	3LO	4			180590030
G.Atlantica	9 - 28 May	3L	18			180590003
L.Hammond	14 - 22 May	3LPs	17			180590031
Fraser	14 May - 13 Jun		123			181890005
W.Templeman	18 May - 5 Jun	3L	168			180590018
L.Hammond	23 - 31 May	3KL	34			180590032
G.Atlantica	31 May - 19 Jun	3KL	105		11	180590004
W.Templeman	7 - 14 Jun	3LNO	10			180590019
Margaree	3 - 4 Jul		2			181890017
G.Atlantica	7 - 25 Jul	2HJ,3K	2		132	180590005
Margaree	18 Jul		3			181890018
Margaree	23 - 27 Jul		4			181890020
Shamook	23 Jul - 16 Aug	2J	10			180590026
G.Atlantica	27 Jul - 19 Aug	3P,4RSTUW	45			180590006
Marinus	2 - 14 Aug	3KL (Bonavista)	24			180590028
W.Templeman	7 - 20 Aug	3L	12		145	180590020
G.Atlantica	21 Aug - 24 Sep	3Ps	1			180590007
W.Templeman	23 Aug - 5 Sep	3NO	6		113	180590021
Fraser	25 Aug - 1 Sep		8			181890006
Athabaskan	25 Aug - 19 Oct		106			181890024
W.Templeman	7 - 27 Sep	3LO	3		91	180590022
Fraser	1 - 5 Oct		12			181890007
Skeena	1 - 5 Oct		17			181890010
Ottawa	1 - 10 Oct		8			181890001
Margaree	2 Oct		6			181890019
G.Atlantica	3 - 29 Oct	2J,3K	34			180590008
Fraser	8 - 10 Oct		14			181890008
Skeena	8 - 11 Oct		10			181890011
Skeena	15 - 18 Oct		9			181890012
Margaree	16 Oct		2			181890021
Marinus	18 Oct - 29 Nov	3KL	14			180590029
Skeena	22 - 28 Oct		10			181890013
Ottawa	22 - 28 Oct		11			181890002
Margaree	23 Oct - 8 Nov		11			181890022
W.Templeman	27 Oct - 19 Nov	3L	3		196	180590023

Ship Name	Cruise Period	NAFO Subarea	Data type BT	BOT	CTD	Cruise Number
Ottawa	29-30 Oct		3			181890004
Skeena	29 Oct - 2 Nov		10			181890014
G.Atlantica	31 Oct - 15 Nov	2J			86	180590009
Ottawa	5-6 Nov		5			181890003
Skeena	5-6 Nov		3			181890015
G.Atlantica	16 Nov - 3 Dec	2J,3K	8		146	180590010
W.Templeman	21 Nov - 10 Dec	3NO	9		171	180590024
Skeena	22 Nov		3			181890016
G.Atlantica	5-20 Dec	3KL	6		115	180590011
USSR						
Persey 3	5 Apr - 21 Jul	3KMNO	354			90P390048
Shaitanov	20 Sep - 29 Nov	2J,3KLMNO	95			90CJ90001
Kokshaisk	29 Oct - 11 Dec	0B,1BCD,2GHj,3k	116			90KS90023

Table 3: IGOSS data received during 1990.
Total = 3631 stations.

Ship Name	Country	Call Sign	Message Type Cruise Period	BATHY	TESAC	NAFO Subarea
Shamook	Canada	CG2676	24 - 30 Apr	8	0	3L
Marinus	Canada	CG2680	23 - 24 Jan	3	0	3Ps
			5 - 6 Feb	2	0	3Ps
			23 - 26 Feb	3	0	3L
A.Needler	Canada	CG2683	4 - 19 Jul	109	0	4WX,5YZe
Dawson	Canada	CGBV	3 - 6 Jan	0	20	4RSTVn
			2- 9 Jul	0	28	1F,2HJ
			13 - 17 Sep	0	30	4X,5Ze
Hudson	Canada	CGDG	7 - 16 Jan	0	21	3MN
			22 - 25 Jan	0	20	3N,4Vs,6G
			3 - 7 Sep	0	34	0AB,1BC
W.Templeman	Canada	CGDV	17 - 18 Jan	4	0	3L
			23 Jan - 8 Feb	35	0	3LNPs
			16 - 20 Feb	4	0	3LPs
			5 - 28 May	48	0	3LNO
			10 May - 5 Jun	220	0	3LNO
			22 Nov - 10 Dec	178	0	3LNO
K.Atlantic	FRG	DAKE	12 Feb	8	0	3LM
			24 - 25 Feb	12	0	3MN
			22 - 24 Mar	22	0	3MNO,4VsW
			19 - 21 Ap	15	0	3NO,4VsW
			17 - 19 May	17	0	3MNOPs,4Vs
			15 - 16 Jun	10	0	3MN
			13 - 14 Jul	9	0	3LM
			10 - 11 Aug	10	0	3LM
			8 Sep	9	0	3LM
			1 - 3 Nov	12	0	3LMPs
			30 Nov - 1 Dec	9	0	3LMO
			28 - 29 Dec	6	0	3MN
Y.Clipper	FRG	DLEZ	1 Jan	10	0	4X,5YZw
			12 - 13 Feb	10	0	4X,5YZw
			5 - 6 Mar	7	0	4X,5YZw
			20 - 21 Apr	10	0	4X,5YZw
			11 - 12 May	5	0	5YZw
			8 - 9 Jun	12	0	4X,5YZw
			7 Jul	9	0	4X,5YZw
			8 - 9 Sep	3	0	4X,5YZw
P.Princess	Liberia	ELED8	25 - 26 Sep	3	0	6GH
Monsoon	USSR	EREA	1 - 3 Jan	4	1	4W,6F
			9 - 25 Mar	4	41	2J,3MNO,4Vs,6H
			31 Mar - 3 Apr	7	4	3MN
			23 Apr - 9 May	45	39	1F,3MN,6H
			3 - 31 Oct	86	66	3NO,4VsWX, 6EFGH
Volna	USSR	EREB	23 - 24 Mar	4	2	3MN
			31 Mar - 28 Apr	7	71	3MN
			3 - 4 May	0	7	2J,3K
V.Bugaen	USSR	ERES	6- 23 Mar	40	39	3NO,4Vs,6FGH
			29 Mar - 22 Apr	67	61	3MNO,4Vs

Ship Name	Country	Call Sign	Message Type Cruise Period	BATHY	TESAC	NAFO Subarea
			29 Apr - 14 May	52	50	3NO, 4Vs, 6GH
G.Ushakov	USSR	ERET	6 - 20 Aug	40	0	2J, 3MN, 6H
Persey 3	USSR	ESGU	3 Apr - 11 Jun	0	250	3KLNO, 4Vs
			16 - 18 Jun	0	9	3K
Cryos	France	FNBA	28 Feb - 27 Mar	116	0	3PsPn
Delaware 2	USA	KNBD	6 Mar - 17 Apr	105	0	4X, 5YZeZw, 6ABC
			7 - 16 Aug	37	0	5ZeZw, 6ABCD
			12 - 27 Sep	44	0	5Zw, 6ABC
			16 - 24 Oct	28	0	4X, 5YZeZw
T.Clipper	USA	KVWA	18 - 23 Jun	9	0	3MN, 4Vs, 6CDE
Unknown	USA	NAWR	7 - 10 Nov	3	0	6C
			16 - 18 Nov	2	0	6C
Unknown	USA	NHNC	14 - 15 Mar	2	0	6CD
Unknown	USA	NIDK	6 May	4	0	3MN
			20 - 24 Jun	4	0	3N
Unknown	USA	NRAR	26 - 28 May	5	0	5Ze, 6BD
Eagle	USA	NRCB	17 - 18 Jun	5	0	6BC
			7 - 11 Jul	3	0	5Ze, 6B
			25 - 29 Jul	3	0	6BC
Polar Sea	USA	NRUO	5 - 30 Jul	49	0	1ABCDEF, 2GHJ, 4RTX, 5Y
			11 - 13 Sep	9	0	0A, 1BCD
Unknown	USA	NSBR	17 - 21 Jul	2	0	6AB
Unknown	USA	NYGG	24 - 29 Mar	7	0	6CDEH
M.Maersk	Denmark	OWEQ2	24 - 25 Apr	2	0	3N, 4Vs
			7 - 8 May	4	0	3MN, 4VsW
			15 - 17 Jul	3	0	3N, 4VsW
L.Maersk	Denmark	OXMD2	11 - 13 Jun	7	0	3MN, 4VsW, 5Ze
			3- Sep	3	0	3MO, 4W
			17-18 Sep	2	0	3L, 4Vs
Oleander	Netherlands	PJJU	26 Oct - 1 Nov	11	0	6AB
			9 - 10 Nov	7	0	6A
			15 - 16 Nov	8	0	6AB
			24 - 29 Nov	10	0	6AB
			13 Dec	9	0	6AB
Hibiscus	Netherlands	PJYG	5 Jan	17	0	6AB
			6 Apr	15	0	5Zw, 6AB
			19 - 26 Apr	36	0	6AB
			4 - 10 May	30	0	6AB
			7 - 14 Jun	34	0	6AB
			21 - 28 Jun	39	0	6ABD
			6 Jul	10	0	6AB
			20 - 26 Jul	32	0	6ABC
			3 - 9 Aug	17	0	6AB
			17 - 22 Aug	4	0	6AB
			14 - 20 Sep	11	0	6AB
			5 Oct	5	0	6AB
K.Shaitano	USSR	UFYN	20 - 28 Sep	0	11	3K
			9 - 17 Oct	0	18	0B, 1BCD
			24 Oct - 9 Nov	0	36	0B, 1CD
			25 - 29 Nov	0	5	2G
Passat	USSR	UZGH	17 - 18 Oct	2	1	1F, 3K
			25 Oct - 13 Nov	36	8	3MN, 6H
G.Atlantica	Canada	VC9450	5 - 24 Feb	65	0	2J, 3KL
			5 - 20 Dec	121	0	3KL
L.Hammond	Canada	VC9616	14 - 31 May	51	0	3KL
C.Roger	Canada	VCBT	6 - 8 Feb	2	0	3NPs
C.Briar	Canada	VCTF	13 - 18 Jan	3	0	4VsW
			11 - 15 Feb	6	0	4Vs
			27 Feb - 5 Mar	3	0	4VsW
			11 - 13 Mar	2	0	3PsPn
			30 Mar - 2 Apr	3	0	4VnVs
			23 May - 2 Jun	9	0	4SVsX
			12 - 18 Jun	5	0	4VsW
			26 Jun - 2 Jul	5	0	3O, 4Vs
			9 - 12 Aug	4	0	4Vn
			21 - 24 Aug	3	0	3LN
			25 - 27 Sep	3	0	4RS
			8 - 12 Oct	4	0	4SVs
			30 Oct - 5 Nov	22	0	4Vs
			14 - 15 Nov	4	0	4Vs
			30 Nov - 3 Dec	4	0	4Vs

Ship Name	Country	Call Sign	Message Type Cruise Period	BATHY	TESAC	NAFO Subarea
Snipe	Australia	VKML	25 - 26 Jul	3	0	5Zw,6B
			1 - 2 Aug	6	0	6C
Aircraft	USA	VXN-8	7 - 9 Mar	16	0	6CD
A.Alabama	USA	WPKD	1 - 3 Jul	7	0	3MN,4Vs,6DE
			24 - 26 Jul	4	0	3MN,4Vs,5Ze
			5 - 8 Aug	6	0	3NO,6CDEH
B.Venture	USA	WRA4560	24 Jan - 2 Feb	8	0	6C
Oregon 2	USA	WTDO	27 Jul - 17 Aug	85	0	5ZeZw,6ABC
Chapman	USA	WTED	7 - 15 Aug	6	0	5Ze,6C
Whiting	USA	WTEW	22 - 28 Feb	3	0	6BC
			9 - 13 Mar	8	0	6BC
			21 Mar - 11 Apr	16	0	6BC
			11 - 14 Jul	4	0	6B
P.Anderson	USA	WXQ7334	14 - 25 Jul	10	0	5Zw

Table 4: Data collected by drifting buoys in the NAFO area in 1990.
Total = 153 buoy months

BUOY	DATE RANGE	DAYS	SST	.AP	.AT	.WS	.WD	.TC	NAFO SUB-AREAS
41012	27 Sep - 31 Dec	96	X	X	X	X	X	-	6D
41014	27 Sep - 3 Oct	7	X	X	X	X	X	-	6C
41511	16 Aug - 2 Oct	30	X	-	-	-	-	-	3MN,6GH
41511	8 Oct - 18 Oct	4	X	-	-	-	-	-	6H
41513	17 Aug - 31 Dec	.55	-	-	-	-	-	-	3MN,4VsWX,5Ze,6DE
41525	2 Jun - 30 Jul	55	X	X	X	-	-	-	4WX,6CDEF
41527	1 - 19 Jan	19	X	X	X	-	-	-	3M,6H
42501	8 - 10 Aug	3	-	X	X	-	-	X	6BC
44016	28 Sep - 31 Dec	95	X	X	X	X	X	-	6B
44017	27 Sep - 31 Dec	.96	X	X	X	X	X	-	6A
44018	20 Sep - 12 Nov	54	X	X	X	X	X	-	6B
44020	28 Sep - 31 Dec	94	X	X	X	X	X	-	6B
44021	27 Sep - 31 Dec	95	X	X	X	X	X	-	6ABC
44022	20 Sep - 11 Nov	49	X	X	X	X	X	-	4W,6BCD
44503	14 May - 24 Jul	70	X	X	-	-	-	-	3NO
44504	12 Jun - 20 Jul	37	X	-	-	-	-	-	3MN
44505	12 Jun - 8 Oct	116	X	X	-	-	-	-	3KLMNO,4Vs
44506	28 Jun - 2 Oct	94	X	-	-	-	-	-	1F,2J,3KLM
44510	12 Apr - 13 Aug	121	X	-	-	-	-	-	3LMN
44510	15 - 16 Sep	2	X	-	-	-	-	-	3M
44510	12 - 17 Oct	6	X	-	-	-	-	-	3M
44510	4 - 9 Nov	6	X	-	-	-	-	-	3KM
44513	20 Jun - 7 Jul	16	X	X	X	-	-	-	6DE
44514	11 Jun - 17 Aug	65	X	X	X	-	-	-	3MN,4Vs,6FGH
44515	11 Jun - 14 Sep	92	X	X	X	-	-	-	6FGH
44516	11 Jun - 4 Jul	24	X	X	X	-	-	-	3MN,4Vs,6GH
44517	11 Jun - 4 Jul	24	X	X	X	-	-	-	3MNO,4Vs
44517	11 - 13 Jul	3	X	X	X	-	-	-	3M
44518	25 - 27 Oct	3	X	-	-	-	-	-	6GH
44518	6 - 10 Nov	2	X	-	-	-	-	-	6H
44521	18 Jun - 1 Aug	43	X	-	-	-	-	-	6AB
44521	27 - 30 Sep	4	X	-	-	-	-	-	6A
44521	16 Oct - 31 Dec	72	X	-	-	-	-	-	3MNO,4VsW,6BCDEG
44522	18 Jun - 31 Dec	127	X	-	-	-	-	-	3MN,4VsW,6BCDE
44523	18 Jun - 16 Nov	86	X	-	-	-	-	-	3O,4VsW,6E
44524	18 Jun - 31 Dec	123	X	-	-	-	-	-	3O,4VsWX,5Ze,6ABCDE
44525	18 Jun - 7 Aug	49	X	-	-	-	-	-	3MN,4VsW,6H
44526	18 Jun - 9 Sep	81	X	-	-	-	-	-	4VsWX,6BCDEG
44527	18 Jun - 16 Sep	89	X	-	-	-	-	-	5ZeZw,6BCD
44528	18 Jun - 31 Dec	150	X	-	-	-	-	-	4VsWX,5Ze,6BCDE
44529	18 Jun - 21 Dec	139	X	-	-	-	-	-	3MNO,4VsW,6BCDEGH
44530	18 Jun - 31 Dec	121	X	-	-	-	-	-	3MN,4VsWX,6BCEFGH
44531	25 Jun - 1 Sep	67	X	-	-	-	-	-	4VsW,6BCDEFG
44532	3 Jul - 31 Dec	136	X	-	-	-	-	-	4WX,6BCDE
44533	25 Jul - 28 Aug	35	X	-	-	-	-	-	4X,5Ze,6BCD
44534	25 Jul - 19 Oct	87	X	-	-	-	-	-	4X,5Ze,6BD
44535	25 Jul - 12 Nov	111	X	-	-	-	-	-	3O,4VsWX,6ABDE
44536	27 Aug - 20 Dec	115	X	-	-	-	-	-	4VsW,5Ze,6ABCD
44537	27 Aug - 9 Dec	105	X	-	-	-	-	-	3NO,4VsW,6BCDGH
44538	27 Aug - 26 Nov	84	X	-	-	-	-	-	4WX,5ZeZw,6ABE
44539	27 Aug - 20 Nov	86	X	-	-	-	-	-	3MNO,4VsWX,6BCD
44540	28 Sep - 31 Dec	92	X	-	-	-	-	-	4VsW,5Zw,6ABCDE

BUOY	DATE RANGE	DAYS	SST	.AP	.AT	.WS	.WD	.TC	NAFO SUB-AREAS
44541	17 Nov - 31 Dec	45	X	-	-	-	-	-	4X,5Ze,6BD
44543	22 - 31 Dec	10	-	-	-	-	-	-	6AB
44550	8 - 27 Nov	19	X	X	X	-	-	-	3OPs
44551	15 Nov - 22 Dec	31	X	X	X	-	-	-	3M,6H
44598	11 - 23 Jun	13	X	X	X	-	-	-	6DE
44599	11 Jun - 27 Jul	44	X	X	X	-	-	-	3MN,4VsW,6DEG
44600	1 - 3 Jul	3	X	X	X	-	-	-	6D
44607	1 Jan - 3 Mar	61	X	-	-	X	X	-	1F,2HJ
44610	17 - 31 Dec	15	X	X	-	X	X	-	1F,2J
44616	2 Nov - 24 Dec	53	X	X	-	-	-	-	1F
44617	6 Nov - 19 Dec	44	X	X	X	-	-	-	1F
44623	1 - 17 Jan	16	X	X	-	-	-	-	1EF
44666	13 - 15 Dec	3	X	X	-	-	-	-	2J
44667	13 - 22 Dec	10	X	X	X	-	-	-	3K
44743	24 Oct - 1 Nov	9	X	X	X	-	-	-	1F
47555	1 Jan - 13 Jun	160	-	-	-	-	-	-	0B,1ABC
47556	1 - 25 Jan	17	-	-	-	-	-	-	0A,1A
47556	2 Feb	1	-	-	-	-	-	-	0A
47556	14 Mar - 7 Jun	80	-	-	-	-	-	-	0B,1C,2GHJ
47558	14 Nov - 31 Dec	48	-	-	X	-	-	-	0AB
48536	27 Jun - 2 Sep	63	-	X	-	-	-	-	1EF
62552	16 - 31 May	16	-	X	-	-	-	-	6A
62692	25 Jun - 29 Oct	96	X	X	X	-	-	-	3MNO,4VsWX,5Ze,6CDEGH
64564	29 Nov - 4 Dec	6	X	X	X	-	-	-	1F
65504	17 Jan - 5 Feb	18	-	X	X	-	-	-	1EF
4457	28 Mar - 12 Apr	15		X					3KLM
4753	23 Oct - 12 Nov	20		X	X	X	X		4W
4755	23 Oct - 21 Nov	29		X	X	X	X		4W
5182	28 Mar - 3 Apr	6		X					3L
5183	28 Mar - 11 Apr	14						X	3L
5215	13 Mar - 9 Apr	27							3K
5216	6 Mar - 12 Mar	6							2J
5217	6 Mar - 19 Mar	13							1F,2HJ,3K
5218	5 Mar - 9 Mar	4							3K
8650	28 Mar - 29 Apr	32							3KL
8651	28 Mar - 11 Apr	14							3L
8652	28 Mar - 30 Apr	33							3KL
8653	28 Mar - 30 Apr	33							3KLM
8661	28 Mar - 7 Apr	10							3L
8662	28 Mar - 7 Apr	10							3L
8664	6 Mar - 21 Mar	15		X					4S
8665	10 Mar - 12 Mar	2		X					2J

Table 5: Current meter moorings in the NAFO area in 1990.
Total = 1322 meter days

ID	N Lat	W Long	Depth	Period	Area	East Mean	North Mean
90014	43.65	63.27	147	10 Oct - 15 Oct	4W	-0.022	-0.014
90902	45.05	66.82	5	16 Feb - 27 Apr	4X	-0.013	-0.028
			19	16 Feb - 14 Apr		-0.006	-0.003
90906	45.06	66.83	5	03 May - 19 Jul	4X	0.022	0.061
		66.83	12	03 May - 19 Jul		0.046	0.063
90906	45.06	66.82	5	03 May - 19 Jul	4X	-0.011	-0.026
			19	03 May - 19 Jul		-0.002	-0.001
90906	45.06	66.83	5	03 May - 19 Jul	4X	0.003	-0.051
			15	03 May - 19 Jul		0.054	-0.011
89041	47.70	50.35	15	26 Mar - 02 Jun	3L	-0.006	-0.013
			20	26 Mar - 03 Jun		-0.001	-0.011
			30	26 Mar - 03 Jun		0.000	-0.006
			40	26 Mar - 03 Jun		0.000	-0.004
			59	26 Mar - 03 Jun		-0.002	-0.004
			80	26 Mar - 03 Jun		-0.004	-0.005
89041	47.58	50.38	15	26 Mar - 02 Jun	3L	0.001	-0.070
			30	26 Mar - 03 Jun		0.004	0.006
			60	26 Mar - 29 May		0.004	0.007
89041	47.21	50.36	15	26 Mar - 01 May	3L	0.010	0.015
			30	26 Mar - 01 May		0.006	0.012
			60	26 Mar - 01 May		0.005	0.010
89041	49.92	49.97	10	01 Apr - 03 Apr	3K	0.040	-0.045
			30	01 Apr - 03 Apr		0.035	-0.024

Table 6: Locations of instrumented wave data collections.
Total = 55040 spectra

Station Name	Latitude	Longitude	Area	Period	Number	1-D	2-D
Hotel	38.50	70.70	6B	1 Jan - 31 Dec	8760	X	
Gulf of Maine	42.07	68.30	5Ze	1 Jan - 31 Dec	8760	X	
Nantucket	40.50	69.40	5Ze	1 Jan - 31 Dec	8760	X	
Delaware Bay	38.50	74.60	6B	1 Jan - 31 Dec	8760	X	
Georges Bank	41.10	66.60	5Ze	1 Jan - 31 Dec	8760	X	
E Scotian Shelf	41.19	61.13	4W	1 Jan - 31 Dec	2920		X
SW Grand Banks	44.25	53 37	3O	1 Jan - 31 Dec	2920		X
Banquereau	44.32	57.36	4Vs	1 Jan - 31 Dec	2920		X
Tail of Bank	42.73	50.61	3N	5 Oct - 31 Dec	696		X
Laurentian Fan	42.12	56.13	4Vs	5 Oct - 23 Nov	392		X
La Have Bank	42.49	64.20	4X	5 Oct - 31 Dec	696		X
Shearwater	44.49	63.40	4W	1 Jan - 31 Dec	696		X

Table 7: Historical data received at MEDS in 1990.
Total = 3160 stations

Ship Name	Cruise Period	NAFO Subarea	Number	Reference
		Canada		
	23 - 28 May '85	4X,5Ze	.58	181085013
	2 - 4 May '86	4X	16	181086008
	4 - 23 Aug '86	0A,2H	70	181086021
	3 - 7 Aug '86	4X	23	181086022
	5 - 8 Nov '86	4X	11	181086036
	3 - 12 May '87	3KLNO	65	181087012
	20 - 23 May '87	4WX	103	181087015
Saguenay	10 Apr - 6 Aug '89		179	181889022
Athabaskan	24 Aug - 4 Oct '89		88	181889023
Gatineau	15 May - 25 Jun '89		127	181889024
Gatineau	23 Aug - 3 Oct '89		82	181889025
Margaree	13 - 20 Sep '89		30	181889026
Margaree	21 - 22 Sep '89		4	181889027
Fraser	10 - 17 May '89		59	181889028
Fraser	17 Jan - 10 Feb '89		29	181889029
Fraser	20 - 21 Sep '89		17	181889030
Fraser	26 - 29 Oct '89		27	181889031
Fraser	28 Feb - 15 Mar '89		30	181889032
Fraser	29 Nov - 4 Dec '89		15	181889033
Fraser	27 May - 19 Jun '89		32	181889034
Skeena	23 Aug - 2 Oct '89		62	181889035
Skeena	25 - 31 Oct '89		16	181889036
Skeena	6 - 10 Nov '89		19	181889037
Skeena	27 - 30 Nov '89		8	181889038
Annapolis	14 Aug - 21 Sep '89		44	181889039
Ottawa	18 Jul - 21 Nov '89		132	181889040
G.Atlantica			41	180589001
G.Atlantica			9	180589002
G.Atlantica			5	180589003
G.Atlantica			43	180589004
G.Atlantica			72	180589005
G.Atlantica			44	180589006
G.Atlantica			25	180589007
G.Atlantica			23	180589008
G.Atlantica			9	180589009
G.Atlantica			26	180589010
G.Atlantica			108	180589011
G.Atlantica			17	180589012
G.Atlantica			108	180589013
W.Templeman			33	180589014
W.Templeman			103	180589015
W.Templeman			213	180589016
W.Templeman			172	180589017
W.Templeman			39	180589018
W.Templeman			98	180589019
W.Templeman			11	180589020
W.Templeman			197	180589021
W.Templeman			35	180589022
Marinus			32	180589023

Ship Name	Cruise Period	NAFO Subarea	Number	Reference
Marinus			11	180589024
Marinus			26	180589025
Shamook			25	180589026
Shamook			31	180589027
Shamook			10	180589028
Shamook			9	180589029
Shamook			14	180589030
L.Hammond			14	180589031
L.Hammond			48	180589032
L.Hammond			44	180589033
		USA		
Delaware 2	8 - 17 Jan '85	5ZeZw	37	316G85001
		USSR		
Shaitanov	13 Sep - 8 Dec '89	0B,2GHJ,3KMNO	82	90KS89017