SCIENCE APPLICATIONS, INC.

WAVE CLIMATE
GREEN HARBOR, MASSACHUSETTS

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CONTRIBUTION #31

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Table of Contents

List of Figures

List of Tables

Appendices

1.0 INTRODUCTION AND METHODS

The nearshore directional wave characteristics at Green Harbor, Massachusetts, were measured from 15 June 1983 through 14 August 1983 to monitor the coastal wave climate in Cape Cod Bay, Massachusetts. The instrument used for wave measurements was a Sea Data Corporation Directional Wave Gage Model 735-9. Its burst sampling capabilities permit measurement of waves as well as mean flows. More complete theory of operation and error analysis are contained in Aubrey (1981) and Grosskopf, Aubrey, Mattie and Mathieson (1983). For this time period, waves were sampled once every eight hours (three times a day) for seventeen minutes, acquiring a measurement of pressure and two horizontal velocity components once every half second for a total of 2048 samples per burst. Spectral estimates from these data were ensemble-averaged over 16 data subsets, yielding 32 degrees of freedom, with a frequency resolution of 0.0156 hz. Confidence intervals of 95% for these spectra with 32 degrees of freedom give an expected spectral estimate within 0.65 and 1.76 of the sample value.

The instrument was deployed with the pressure sensor 1.48 m above the bottom, and the current meter 2.06 m above the bottom, above and slightly (<30 cm) to one side of the pressure sensor. The bottom within approximately 50 meters of the installation is flat, sandy, with medium sand grain size and widely scattered 1-2 ft. high boulders. Attempts to fluidize in a 1" I.D. pipe, and visual inspections, indicated that the sand cover is about 6"-12" deep and overlies a cobbly bottom.

2.0 RESULTS

Over the 61 day deployment, wave energy was very low, averaging only 25 cm^2 in variance (Table 1). Variance (n^2) is defined by

$$E = \rho g \langle \eta^2 \rangle$$

where E is the total energy, p is density of water, and g is the gravitational acceleration. Variance therefore is a direct function of the wave energy. Besides wave variance, another useful parameter representing wave energy is the significant wave height, $H_{1/3}$, where:

$$H_{1/3} \simeq 4\sqrt{\langle \eta^2 \rangle}$$

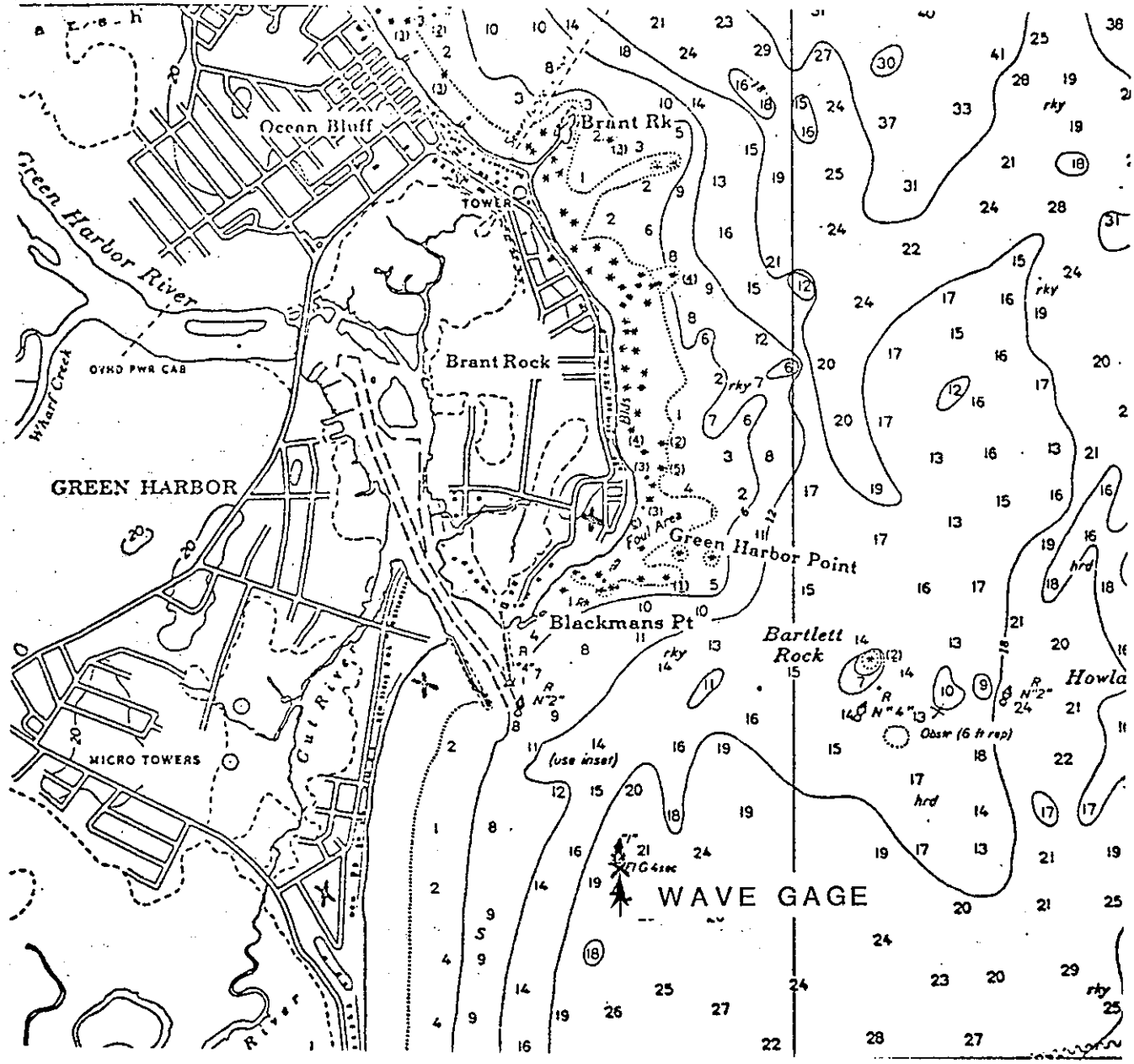
This wave height is close to the wave height one would estimate visually from a random wave field.

For the period of measurement, the mean significant wave height was only 0.12 m. The mean peak wave period was just over 10 seconds. Because the analysis was cut-off at 4.0 seconds due to depth limitations, periods less than this are not reported. Variances calculated from pressure data did not agree as well as expected with those calculated from velocity data, although agreement is still acceptable. Since velocity information was primarily used only to establish wave direction, and secondarily, for variance comparison and calculation of mean flow velocities, we do not consider this a serious problem. Possible explanations for this situation are a noisy current meter probe or incorrect calibration of the probe. These are being investigated at this time. Corrections, if required, will be provided in the next data report.

Wave propagation for the most part was toward the west

(≈260) with an occasional shift toward the northwest or southwest during locally generated events. Mean current flow for the period was toward the northeast (030° TN) suggesting a clockwise general mean circulation in Cape Cod Bay. Further data now being collected will aid in establishing mean flow behavior.

In conclusion, for the measurement period, wave energy was very low, making it difficult to establish any regional trends without further data. We have encouraged the N.E.D. of the U.S.A.C.E. to extend the measurement period through the winter months.



X = Location of shore navigation stations.

Figure 1. Green Harbor Wave Gage Location Map.

TABLE I

INSTRUMENT DEPLOYMENT SUMMARY

Instrument Type:	Sea Data Corporation Directional Wave Gage Model 635-9
Location:	Green Harbor, MA; vicinity of Buoy "1"
Deployment Date:	15 June 1983
Retrieval Date:	26 August 1983
Data Start Date:	15 June 1983
Data End Date:	14 August 1983
Burst Sample Interval:	8 hours
Burst Duration:	1024 seconds
Burst Sample Rate:	0.5 seconds
Continuous Sample Rate:	(N/A)*
Internal Averaging:	Yes
Data Quality:	Excellent
Height of Pressure Sensor above Bottom:	1.48m
Height of Current Meter above Bottom:	2.06m

Orientation of Current Meter (Positive X axis is towards Direction from which + X flow is coming): 346.0°T.N.

Daily Measurement Times:

01: 0113 E.D.T.
02: 0913 E.D.T.
03: 1713 E.D.T.

*(N/A) - Not applicable in this instrument

TABLE II

Analysis of the 61 day wave/tide record, measured at Green Harbor, Massachusetts with a Sea Data 635-9. Values are recorded at 8 hour intervals for the following parameters:

$\bar{h}$ = mean water depth (m)

E_T = total energy varience in wave (cm^2)
This parameter is proportional to the amount of energy in the wave. Comparison values calculated from pressure and velocity are presented. Velocity calculated values are in parentheses.

$H_{1/3}$ = significant wave height (m)
This parameter is derived directly from E_T. Where: $H_{1/3} \simeq 4\sqrt{<\eta^2>}$

Peak F = peak wave frequency (sec^{-1})

Peak T = peak wave period = $\frac{1}{\text{peak wave frequency}}$

α_o = direction of wave propagation, measured in degrees clockwise from true north

$P(\alpha_o)$ = angular spread of direction of propagation of the wave field

E_p = energy in peak frequency variance (cm^2)

$\bar{U},\bar{V}$ = components of current velocity (m/sec); U is positive to the north, V is positive to the east

Dashes in the wave data indicates absence of significant wave peaks at periods greater than 4 seconds.

RUN	h (m)	E_T(cm^2)	$H_{1/3}$(m)	Peak F (sec^{-1})	Peak T (sec)	α_o	P(α_o)	E_P(cm^2)	U (m/sec)	V (m/sec)
15 June 83 - 03	10.13	1	(6)	.04	.0781	12.8	230	55	0.4	0.03	-0.12
16 June 83 - 01	9.81	2	(21)	.06	.0781	12.8	260	88	0.5	0.02	-0.06
- 02	7.88	0	(19)	.00	----	----	---	--	---	-0.07	-0.01
- 03	10.51	6	(45)	.10	.1094	9.1	259	45	2.1	-0.06	-0.05
17 June 83 - 01	9.00	4	(49)	.08	.1250	8.0	259	59	0.7	0.01	-0.02
- 02	8.58	1	(30)	.04	----	---	---	--	---	-0.11	-0.09
- 03	10.60	--	(39)	.25(vel)	.1094	9.1	258	57	9.5(vel)	0.03	0.00
18 June 83 - 01	8.30	2	(18)	.06	.1094	9.1	269	51	0.6	-0.02	0.05
- 02	9.12	2	(24)	.06	.1094	9.1	287	71	0.5	-0.06	-0.03
- 03	10.31	2	(20)	.06	.0938	10.7	332	47	0.7	0.05	0.01
19 June 83 - 01	8.03	0	(11)	.00	----	----	---	--	---	-0.01	-0.01
- 02	9.79	1	(9)	.04	.1094	9.1	273	68	0.4	-0.10	-0.03
- 03	9.75	2	(15)	.06	.1094	9.1	274	53	0.9	0.05	0.00
20 June 83 - 01	7.90	1	(18)	.04	.1094	9.1	278	76	0.4	-0.04	-0.04
- 02	10.26	3	(12)	.07	.0938	10.7	259	61	0.6	-0.02	-0.16
- 03	9.17	1	(17)	.04	.0781	12.8	264	44	0.2	-0.05	-0.06
21 June 83 - 01	8.27	1	(10)	.04	.1094	9.1	282	52	0.3	-0.15	-0.09
- 02	10.52	2	(12)	.06	.0781	12.8	236	79	0.4	-0.03	-0.17
- 03	8.69	1	(12)	.04	.0781	12.8	248	52	0.4	-0.05	-0.09
22 June 83 - 01	8.84	1	(5)	.04	.0781	12.8	270	47	0.3	-0.23	-0.07
- 02	10.33	3	(13)	.07	.0781	12.8	254	44	0.8	-0.08	-0.06
- 03	8.19	1	(5)	.04	.0938	10.7	260	73	0.1	-0.07	-0.05
23 June 83 - 01	9.45	1	(3)	.04	.0938	10.7	255	65	0.2	-0.18	-0.04
- 02	9.92	1	(5)	.04	.0938	10.7	252	53	0.3	0.00	-0.10
- 03	7.93	1	(4)	.04	.0938	10.7	292	56	0.2	-0.08	0.02
24 June 83 - 01	9.86	1	(4)	.04	.0938	10.7	268	53	0.3	-0.06	-0.08
- 02	9.39	1	(4)	.04	.0938	10.7	286	55	0.2	-0.04	-0.07
- 03	8.08	0	(3)	.00	----	----	---	--	---	-0.05	-0.02

RUN	$\bar{h}$ (m)	E_T (cm^2)	$H_{1/3}$ (m)	Peak F (sec^{-1})	Peak T (sec)	α_o	$P(\alpha_o)$	E_P (cm^2)	$\bar{U}$ (m/sec)	$\bar{V}$ (m/sec)
25 June 83 - 01	10.30	1 (6)	.04	.0781	12.8	213	72	0.4	-0.11	-0.06
- 02	9.01	1 (6)	.04	.0781	12.8	237	42	0.2	-0.01	-0.06
- 03	8.24	1 (15)	.04	.0781	12.8	298	66	0.2	-0.02	-0.04
26 June 83 - 01	10.70	2 (10)	.06	.0938	10.7	251	74	1.0	-0.12	-0.13
- 02	8.65	1 (9)	.04	.1094	9.1	286	63	0.4	-0.05	-0.07
- 03	8.83	0 (14)	.00	----	----	---	--	---	-0.09	-0.10
27 June 83 - 01	10.75	2 (16)	.06	.0938	10.7	223	81	0.9	0.01	-0.05
- 02	8.24	2 (17)	.06	.1094	9.1	260	44	1.2	-0.01	-0.01
- 03	8.96	1 (9)	.04	.0938	10.7	271	72	0.4	-0.08	-0.05
28 June 83 - 01	10.64	4 (24)	.08	.1094	9.1	205	77	1.3	-0.02	-0.11
- 02	8.07	1 (17)	.04	.1094	9.1	267	49	0.3	0.06	-0.03
- 03	9.34	3 (41)	.07	.1094	9.1	298	81	0.5	-0.08	-0.11
29 June 83 - 01	10.41	3 (21)	.07	.1250	8.0	244	65	0.5	0.06	-0.03
- 02	7.91	1 (8)	.04	.1094	9.1	275	72	0.2	-0.08	-0.02
- 03	9.71	2 (14)	.06	.1094	9.1	280	68	0.2	-0.05	-0.12
30 June 83 - 01	10.02	2 (8)	.06	.0781	12.8	268	55	0.8	0.00	0.05
- 02	7.93	1 (10)	.04	.0781	12.8	232	60	0.5	-0.03	0.01
- 03	9.97	6 (22)	.10	.0781	12.8	274	42	2.4	-0.05	-0.05
01 July 83 - 01	9.57	7 (34)	.11	.1094	9.1	270	45	2.3	-0.04	-0.02
- 02	8.09	3 (19)	.07	.0781	12.8	273	53	0.8	-0.01	-0.09
- 03	10.12	3 (14)	.07	.0781	12.8	242	65	0.7	-0.11	-0.06
02 July 83 - 01	9.12	4 (19)	.08	.1094	9.1	281	50	1.1	0.00	-0.02
- 02	8.41	3 (16)	.07	.1094	9.1	276	55	0.9	-0.02	-0.09
- 03	10.23	5 (17)	.09	.1094	9.1	276	57	1.3	-0.10	-0.06
03 July 83 - 01	8.79	4 (16)	.08	.1250	8.0	261	43	1.4	0.03	0.00
- 02	8.87	4 (15)	.08	.1250	8.0	282	56	1.1	-0.05	-0.17
- 03	10.27	6 (23)	.10	.1094	9.1	283	46	1.2	-0.05	-0.04
04 July 83 - 01	8.42	2 (9)	.06	.1094	9.1	289	38	0.4	-0.01	0.01
- 02	9.27	2 (11)	.06	.1094	9.1	285	65	0.6	-0.06	-0.07
- 03	10.04	3 (13)	.07	.1094	9.1	245	46	0.6	-0.03	-0.03

RUN	h (m)	E_T(cm^2)		$H_{1/3}$(m)	Peak F (sec^{-1})	Peak T (sec)	α_o	P(α_o)	E_P(cm^2)	u (m/sec)	V (m/sec)
05 July 83 - 01	8.12	1	(4)	.04	.0938	10.7	271	32	0.4	-0.11	-0.04
- 02	9.68	2	(7)	.06	.0625	16.0	260	60	0.5	-0.01	-0.09
- 03	9.68	2	(5)	.06	.0938	10.7	286	42	0.6	-0.10	-0.03
06 July 83 - 01	8.06	1	(4)	.04	.0625	16.0	261	54	0.5	-0.02	-0.14
- 02	10.07	2	(4)	.06	.0625	16.0	262	47	1.2	0.01	-0.17
- 03	9.34	2	(5)	.06	.0625	16.0	269	49	0.6	-0.07	-0.02
07 July 83 - 01	8.33	2	(11)	.06	.0625	16.0	292	54	1.0	-0.06	-0.09
- 02	10.32	41	(124)	.26	.1875	5.3	248	51	11.	-0.07	-0.01
- 03	8.89	12	(38)	.14	.1094	9.1	288	41	2.0	0.03	-0.03
08 July 83 - 01	8.73	7	(20)	.11	.1094	9.1	264	63	1.6	-0.08	-0.03
- 02	10.32	12	(21)	.14	.1094	9.1	281	33	3.1	0.06	-0.01
- 03	8.29	6	(15)	.10	.1094	9.1	276	42	3.5	0.06	0.03
09 July 83 - 01	9.33	3	(8)	.07	.0781	12.8	278	36	1.0	-0.14	-0.04
- 02	10.03	4	(10)	.08	.1094	9.1	267	67	1.0	0.01	-0.01
- 03	7.51	2	(6)	.06	.0781	12.8	268	46	0.4	-0.03	-0.03
10 July 83 - 01	10.11	6	(23)	.10	.0781	12.8	262	46	1.3	-0.02	-0.09
- 02	9.55	6	(27)	.10	.2500	4.0	237	58	1.3	-0.04	-0.12
- 03	7.69	2	(10)	.06	.0781	12.8	284	79	0.4	-0.06	-0.04
11 July 83 - 01	10.74	2	(6)	.06	.0781	12.8	193	79	0.5	-0.08	-0.04
- 02	8.84	1	(4)	.04	.0781	12.8	261	54	0.2	0.02	0.03
- 03	7.98	2	(4)	.06	.0781	12.8	275	45	0.6	-0.11	-0.04
12 July 83 - 01	11.21	4	(10)	.08	.0938	10.7	223	62	1.1	-0.05	-0.02
- 02	8.19	5	(13)	.09	.1094	9.1	273	51	1.5	-0.02	-0.01
- 03	8.68	4	(9)	.08	.1094	9.1	275	45	1.4	-0.04	-0.13
13 July 83 - 01	11.23	16	(31)	.16	.0781	12.8	230	62	8.8	-0.04	-0.02
- 02	7.52	48	(83)	.28	.1094	9.1	284	31	30.	-0.01	0.05
- 03	9.39	18	(31)	.17	.0938	10.7	277	32	4.9	0.06	-0.09

RUN	$\bar{h}$ (m)	E_T(cm^2)		$H_{1/3}$(m)	Peak F (sec^{-1})	Peak T (sec)	α_o	$P(\alpha_o)$	E_P(cm^2)	U (m/sec)	V (m/sec)
14 July 83 - 01	10.75	17	(28)	.16	.1094	9.1	252	48	3.6	-0.06	-0.04
- 02	7.39	8	(14)	.11	.1094	9.1	280	31	3.2	-0.02	-0.03
- 03	10.11	9	(25)	.12	.1094	9.1	242	49	1.9	-0.01	-0.07
15 July 83 - 01	9.96	5	(10)	.09	.1094	9.1	283	35	1.8	-0.02	-0.02
- 02	7.58	2	(7)	.06	.1094	9.1	270	53	0.8	-0.02	-0.06
- 03	10.58	5	(8)	.09	.1094	9.1	242	46	1.4	0.02	-0.12
16 July 83 - 01	9.13	4	(7)	.08	.1094	9.1	260	21	1.0	-0.06	-0.02
- 02	8.20	2	(5)	.06	----	---	(SEQAO)	--	---	-0.04	-0.09
- 03	10.82	6	(11)	.10	.1094	9.1	213	65	1.3	-0.02	-0.02
17 July 83 - 01	8.48	2	(4)	.06	.1250	8.0	252	51	0.3	-0.01	0.02
- 02	8.97	2	(6)	.06	.0938	10.7	271	45	0.4	0.02	-0.05
- 03	10.60	6	(12)	.10	.1250	8.0	239	42	1.1	-0.04	0.02
18 July 83 - 01	7.99	6	(11)	.10	.1094	9.1	279	33	2.1	-0.06	0.02
- 02	9.58	4	(8)	.08	.1094	9.1	278	32	1.6	-0.03	-0.08
- 03	10.10	5	(8)	.09	.1094	9.1	280	47	1.6	-0.10	-0.02
19 July 83 - 01	7.87	4	(11)	.08	.1094	9.1	285	45	2.2	-0.03	-0.02
- 02	10.07	5	(9)	.09	.1094	9.1	241	39	1.1	-0.01	-0.14
- 03	9.56	4	(7)	.08	.1094	9.1	280	37	1.2	-0.01	-0.01
20 July 83 - 01	8.13	3	(5)	.07	.1094	9.1	287	44	1.0	-0.13	-0.04
- 02	10.37	4	(8)	.08	.1094	9.1	214	53	0.7	-0.07	-0.08
- 03	9.02	3	(7)	.07	.1094	9.1	267	36	0.5	-0.02	0.01
21 July 83 - 01	8.64	2	(5)	.06	.1094	9.1	273	60	0.5	-0.10	-0.07
- 02	10.28	6	(12)	.10	.0938	10.7	256	43	1.2	0.00	-0.07
- 03	8.47		(9)	.12(vel)	.1250	8.0	279	41	1.2(vel)	-0.07	0.01
22 July 83 - 01	9.16	2	(7)	.06	.1094	9.1	277	49	0.5	-0.02	-0.06
- 02	10.07	5	(15)	.09	.0938	10.7	244	56	0.7	0.02	-0.02
- 03	8.28	65	(124)	.32	.1406	7.1	258	35	21.	-0.05	-0.01
23 July 83 - 01	9.75	110	(176)	.42	.1406	7.1	253	29	40.	-0.02	-0.05
- 02	9.71	187	(211)	.55	.1250	8.0	240	24	37.	0.03	-0.03
- 03	8.12	39	(57)	.25	.1406	7.1	261	26	12.	0.01	0.01

RUN	h (m)	E_T(cm^2)		$H_{1/3}$(m)	Peak F (sec^{-1})	Peak T (sec)	α_o	$P(\alpha_o)$	E_P(cm^2)	$\bar{U}$ (m/sec)	$\bar{V}$ (m/sec)
24 July 83 - 01	10.17	19	(28)	.17	.0938	10.7	284	45	2.8	-0.08	-0.06
- 02	9.26	11	(12)	.13	.0938	10.7	281	26	2.8	0.02	0.02
- 03	8.21	7	(14)	.11	.0938	10.7	282	43	2.3	-0.06	-0.06
25 July 83 - 01	10.60	13	(18)	.14	.0938	10.7	247	61	3.9	-0.11	-0.10
- 02	8.95	114	(145)	.43	.1875	5.3	244	30	33.	-0.05	0.02
- 03	8.47	22	(47)	.19	.2031	4.9	252	65	4.4	-0.03	-0.04
26 July 83 - 01	10.78	34	(47)	.23	.1875	5.3	248	43	5.5	-0.07	-0.07
- 02	8.57	11	(15)	.13	.1094	9.1	275	22	2.4	0.00	0.04
- 03	8.77	31	(47)	.22	.1250	8.0	265	46	8.2	-0.04	-0.07
27 July 83 - 01	10.78	98	(111)	.40	.1250	8.0	265	34	3.6	-0.12	-0.07
- 02	8.32	20	(24)	.18	.1250	8.0	272	21	7.0	0.00	0.00
- 03	9.12	23	(29)	.19	.1250	8.0	281	31	6.0	-0.03	-0.07
28 July 83 - 01	10.65	17	(19)	.16	.0781	12.8	257	39	4.6	-0.12	-0.06
- 02	8.09	6	(8)	.10	.1094	9.1	276	24	1.7	0.02	0.03
- 03	9.44	11	(22)	.13	.0781	12.8	281	48	3.5	-0.05	-0.17
29 July 83 - 01	10.25	10	(11)	.13	.0781	12.8	279	34	3.6	-0.11	-0.05
- 02	7.87	7	(9)	.11	.1094	9.1	285	20	2.9	0.02	-0.02
- 03	9.75	4	(6)	.08	.0781	12.8	253	35	0.8	-0.08	-0.06
30 July 83 - 01	9.83	6	(9)	.10	.1094	9.1	274	42	1.5	0.03	-0.06
- 02	7.88	4	(6)	.08	.0938	10.7	268	22	1.3	-0.03	0.00
- 03	10.02	6	(9)	.10	.1094	9.1	278	42	1.1	-0.03	-0.03
31 July 83 - 01	9.39	6	(8)	.10	.0781	12.8	271	32	2.2	0.02	0.02
- 02	8.15	5	(8)	.09	.0781	12.8	277	32	1.4	-0.05	-0.06
- 03	10.33	13	(23)	.14	.0781	12.8	251	49	2.9	0.00	-0.09

RUN	$\bar{h}$ (m)	E_T(cm^2)		$H_{1/3}$(m)	Peak F (sec^{-1})	Peak T (sec)	α_o	$P(\alpha_o)$	E_P(cm^2)	U (m/sec)	V (m/sec)
01 Aug. 83 - 01	9.06	6	(9)	.10	.1094	9.1	285	36	0.9	-0.07	-0.01
- 02	8.50	6	(11)	.10	.0781	12.8	268	44	1.3	-0.04	-0.03
- 03	10.48	8	(11)	.11	.1094	9.1	267	65	1.4	-0.10	-0.05
02 Aug. 83 - 01	8.61	5	(7)	.09	.0781	12.8	271	26	1.2	-0.05	-0.07
- 02	8.84	3	(4)	.07	.0938	10.7	279	29	1.3	-0.03	-0.06
- 03	10.34	5	(6)	.09	.0938	10.7	262	43	1.3	-0.09	-0.04
03 Aug. 83 - 01	8.19	2	(3)	.06	.1094	9.1	287	28	0.7	0.01	-0.01
- 02	9.41	2	(2)	.06	.1094	9.1	278	38	0.4	-0.01	-0.15
- 03	10.14	4	(4)	.08	.0781	12.8	246	41	0.7	-0.01	0.00
04 Aug. 83 - 01	7.97	2	(2)	.06	.1094	9.1	293	35	0.4	-0.06	-0.02
- 02	9.84	3	(3)	.07	.0781	12.8	235	40	0.5	-0.04	0.00
- 03	9.72	3	(5)	.07	.0781	12.8	274	37	0.6	-0.01	-0.05
05 Aug. 83 - 01	8.03	2	(3)	.06	.0781	12.8	281	34	0.6	-0.04	-0.02
- 02	10.28	4	(4)	.08	.0938	10.7	250	47	1.4	-0.03	-0.08
- 03	9.26	2	(2)	.06	.0938	10.7	285	38	0.7	-0.07	-0.01
06 Aug. 83 - 01	8.43	1	(3)	.04	.0938	10.7	266	60	0.3	-0.01	-0.09
- 02	10.43	2	(5)	.06	.0938	10.7	229	56	0.5	-0.01	-0.08
- 03	8.56	1	(2)	.04	.1094	9.1	264	49	0.2	0.01	0.01
07 Aug. 83 - 01	9.08	2	(7)	.06	.1094	9.1	281	57	0.7	-0.06	-0.05
- 02	10.29	3	(7)	.07	.0938	10.7	215	58	0.7	0.02	-0.03
- 03	7.89	2	(6)	.06	.0938	10.7	285	76	0.5	-0.02	-0.01
08 Aug. 83 - 01	9.85	2	(5)	.06	.0938	10.7	267	53	0.5	-0.08	-0.03
- 02	9.78	2	(8)	.06	.0938	10.7	257	67	0.3	-0.02	-0.02
- 03	7.55	1	(4)	.04	.0938	10.7	275	67	0.2	-0.04	-0.07
09 Aug. 83 - 01	10.56	4	(4)	.08	.0938	10.7	259	44	1.2	-0.07	-0.05
- 02	9.14	2	(4)	.06	.0781	12.8	275	39	0.5	0.01	0.01
- 03	7.74	1	(3)	.04	.0781	12.8	277	44	0.4	-0.02	-0.02
10 Aug. 83 - 01	11.23	4	(9)	.08	.0781	12.8	252	67	1.3	-0.06	-0.04
- 02	8.46	17	(45)	.16	.2031	4.9	252	63	3.4	0.00	0.06
- 03	8.37	7	(12)	.11	.0781	12.8	259	45	1.3	-0.10	-0.03

RUN	h (m)	E_T(cm^2)	$H_{1/3}$(m)	Peak F (sec^{-1})	Peak T (sec)	α_o	P(α_o)	E_P(cm^2)	U (m/sec)	V (m/sec)
11 Aug. 83 - 01	11.30	11 (17)	.13	.0781	12.8	237	56	3.5	-0.02	-0.05
- 02	7.89	1 (4)	.04	.0781	12.8	272	47	0.4	-0.01	0.00
- 03	9.18	18 (67)	.17	.2500	4.0	290	79	8.9	-0.04	-0.14
12 Aug. 83 - 01	10.89	193 (386)	.56	.2188	4.9	300	46	66.	0.04	0.00
- 02	7.60	39 (96)	.25	.1406	7.1	260	58	7.3	-0.04	0.00
- 03	10.13	836 (1471)	1.16	.1094	9.1	247	50	261.	0.01	-0.03
13 Aug. 83 - 01	10.26	1209 (1669)	1.39	.1094	9.1	252	40	227.	0.04	0.02
- 02	7.72	189 (356)	.55	.1250	8.0	265	50	44.	0.04	0.03
- 03	10.63	304 (488)	.70	.1250	8.0	265	41	61.	-0.05	-0.05
14 Aug. 83 - 01	9.41	171 (288)	.52	.1094	9.1	278	50	36.	0.03	0.01
- 02	8.07	49 (84)	.28	.1094	9.1	284	44	14.	-0.09	-0.06
- 03	10.86	59 (84)	.31	.1250	8.0	262	49	11.	-0.07	-0.02
MEAN	9.27	25 (45)							-0.04	-0.04
S.D.	1.00	115 (173)							0.05	0.05

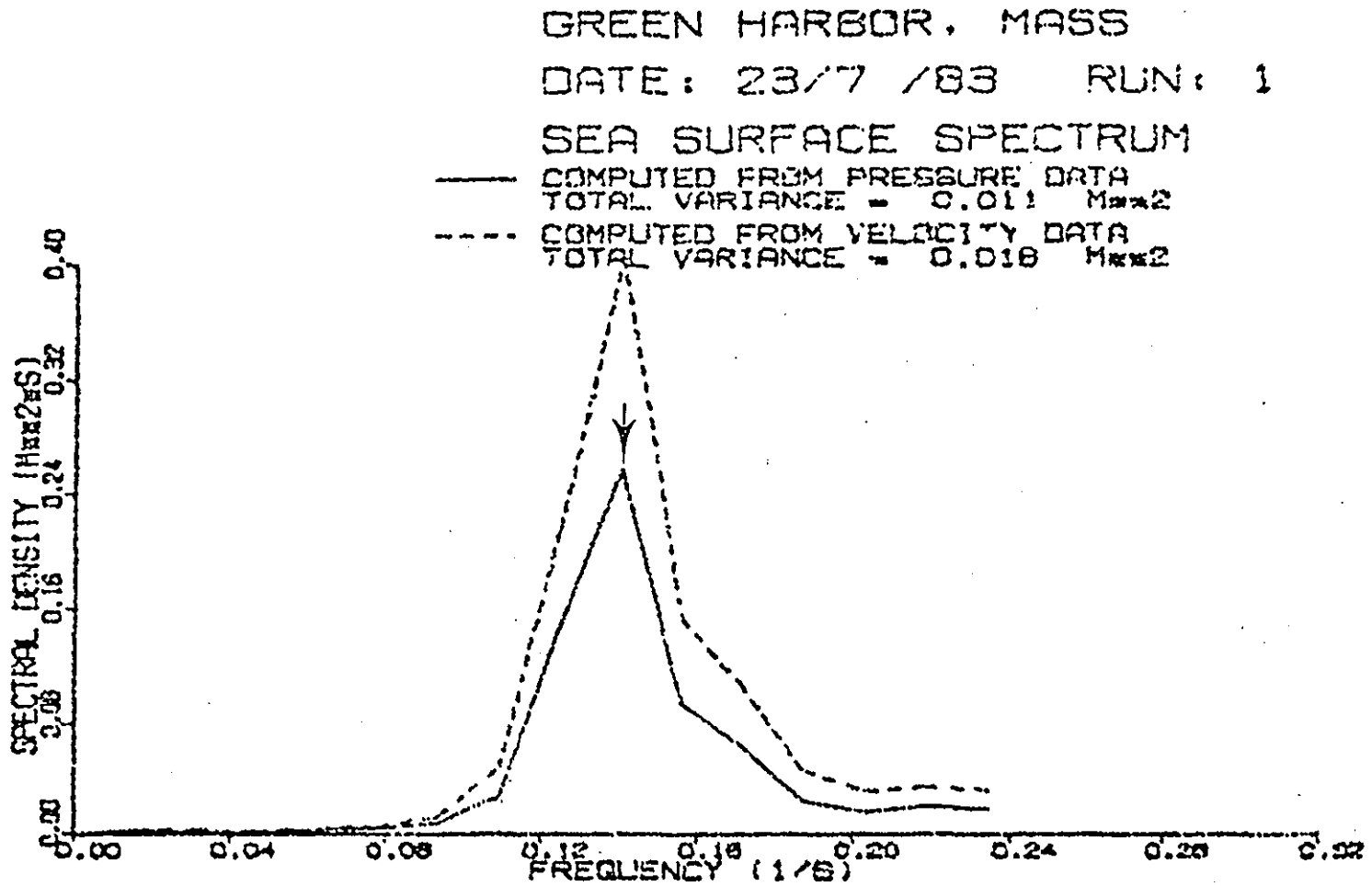
Literature Cited

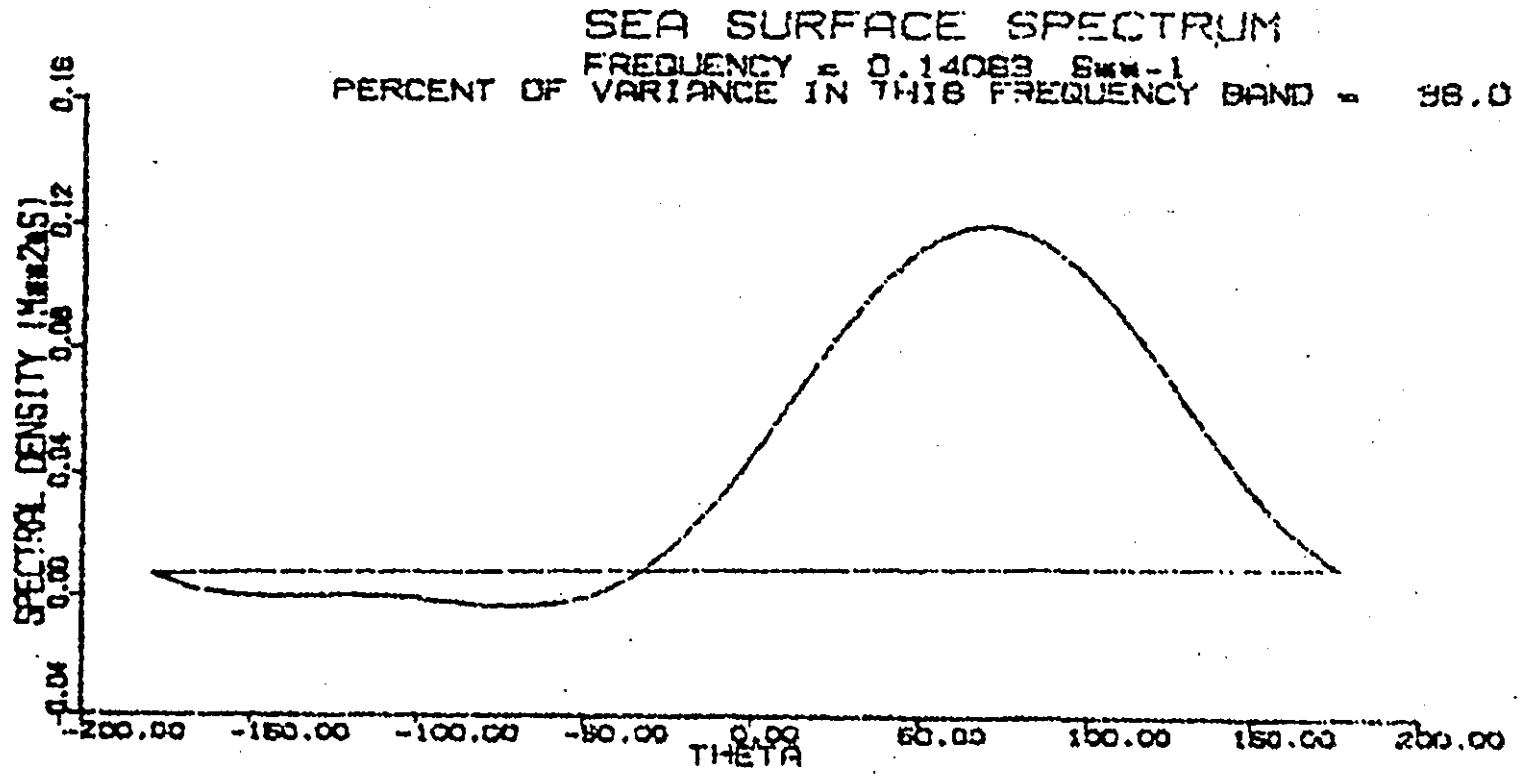
Aubrey, D.G. 1981. Field Evaluation of Sea Data directional wave gage (Model 635-9). WHOI Technical Report 81-28, 52 pp.

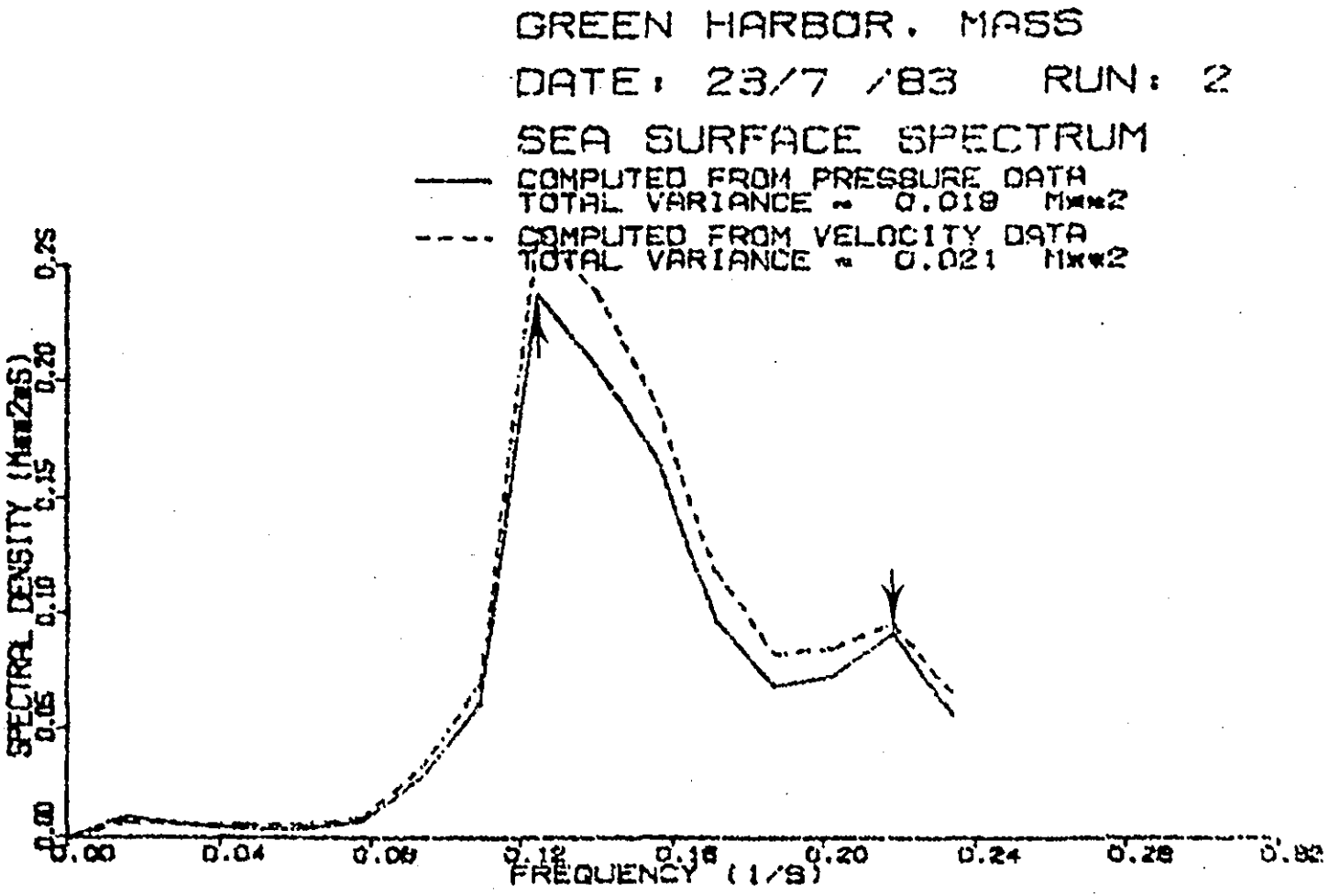
Grosskopf, W.G.,D.G. Aubrey, M.G. Mattie and M. Mathiesen, 1983. Field intercomparison of nearshore directional wave sensors, IEEE Journal of Oceanographic Engineering.

APPENDIX I

Theta in spectral plots indicates direction from which waves are propagating. Note that this convention is different from that in table and text.


GREEN HARBOR, MASS
DATE: 23/7 /83 RUN: 1
SEA SURFACE SPECTRUM
COMPUTED FROM PRESSURE DATA
TOTAL VARIANCE = 0.011 M**2
COMPUTED FROM VELOCITY DATA
TOTAL VARIANCE = 0.018 M**2
SPECTRAL DENSITY (M**2/S)
0.00
0.08
0.16
0.24
0.32
0.40
0.00
0.04
0.08
0.12
0.16
0.20
0.24
0.28
0.32
FREQUENCY (1/S)


SEA SURFACE SPECTRUM
FREQUENCY = 0.14063 S**-1
PERCENT OF VARIANCE IN THIS FREQUENCY BAND = 98.0
SPECTRAL DENSITY (M**2/S)
-0.04
0.00
0.04
0.08
0.12
0.16
-200.00
-150.00
-100.00
-50.00
0.00
50.00
100.00
150.00
200.00
THETA


GREEN HARBOR, MASS
DATE: 23/7 /83 RUN: 2
SEA SURFACE SPECTRUM
COMPUTED FROM PRESSURE DATA
TOTAL VARIANCE = 0.019 M**2
COMPUTED FROM VELOCITY DATA
TOTAL VARIANCE = 0.021 M**2
SPECTRAL DENSITY (M**2/S)
0.00
0.05
0.10
0.15
0.20
0.25
0.00
0.04
0.08
0.12
0.16
0.20
0.24
0.28
0.32
FREQUENCY (1/S)

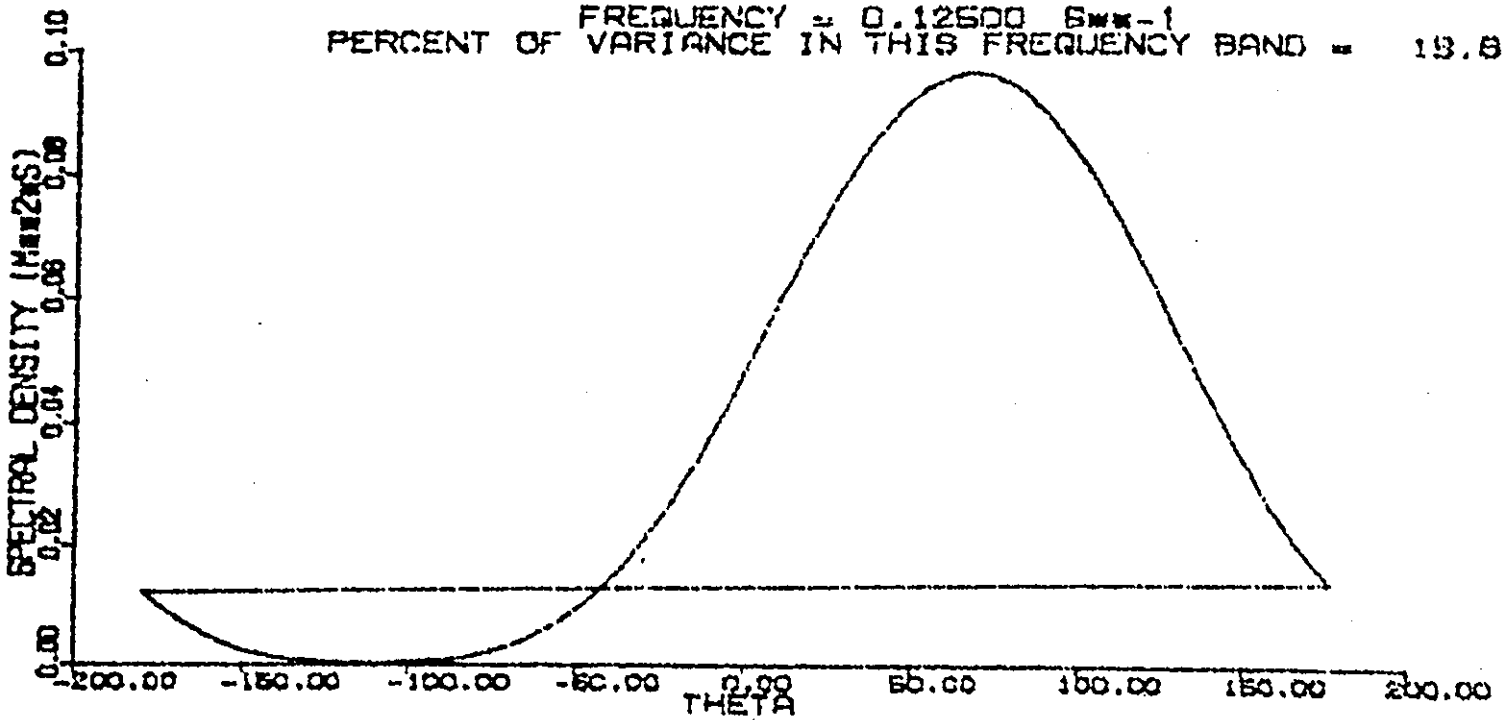
GREEN HARBOR, MASS

DATE: 23/7 /83 RUN: 2

SEA SURFACE SPECTRUM

FREQUENCY = 0.12500 S**-1

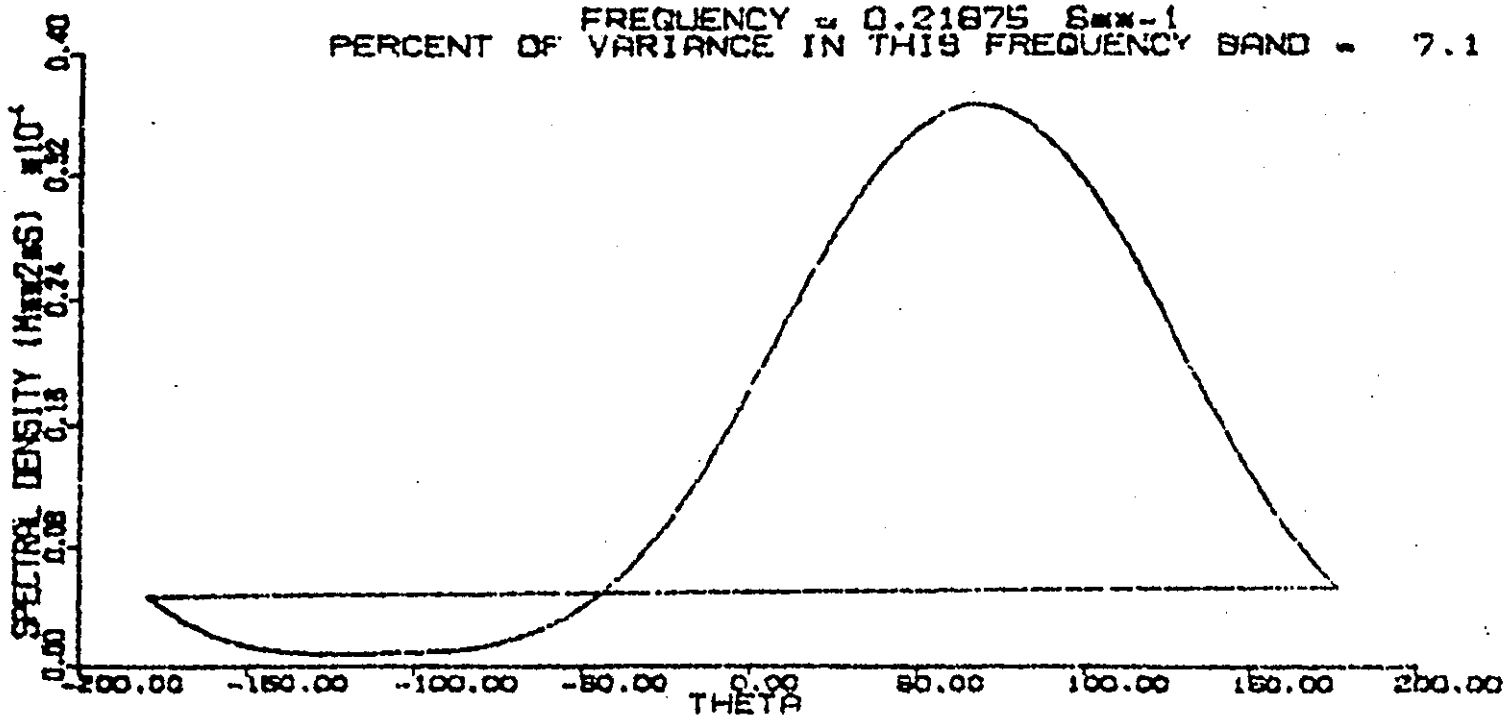
PERCENT OF VARIANCE IN THIS FREQUENCY BAND = 19.8



SEA SURFACE SPECTRUM

FREQUENCY = 0.21875 S**-1

PERCENT OF VARIANCE IN THIS FREQUENCY BAND = 7.1



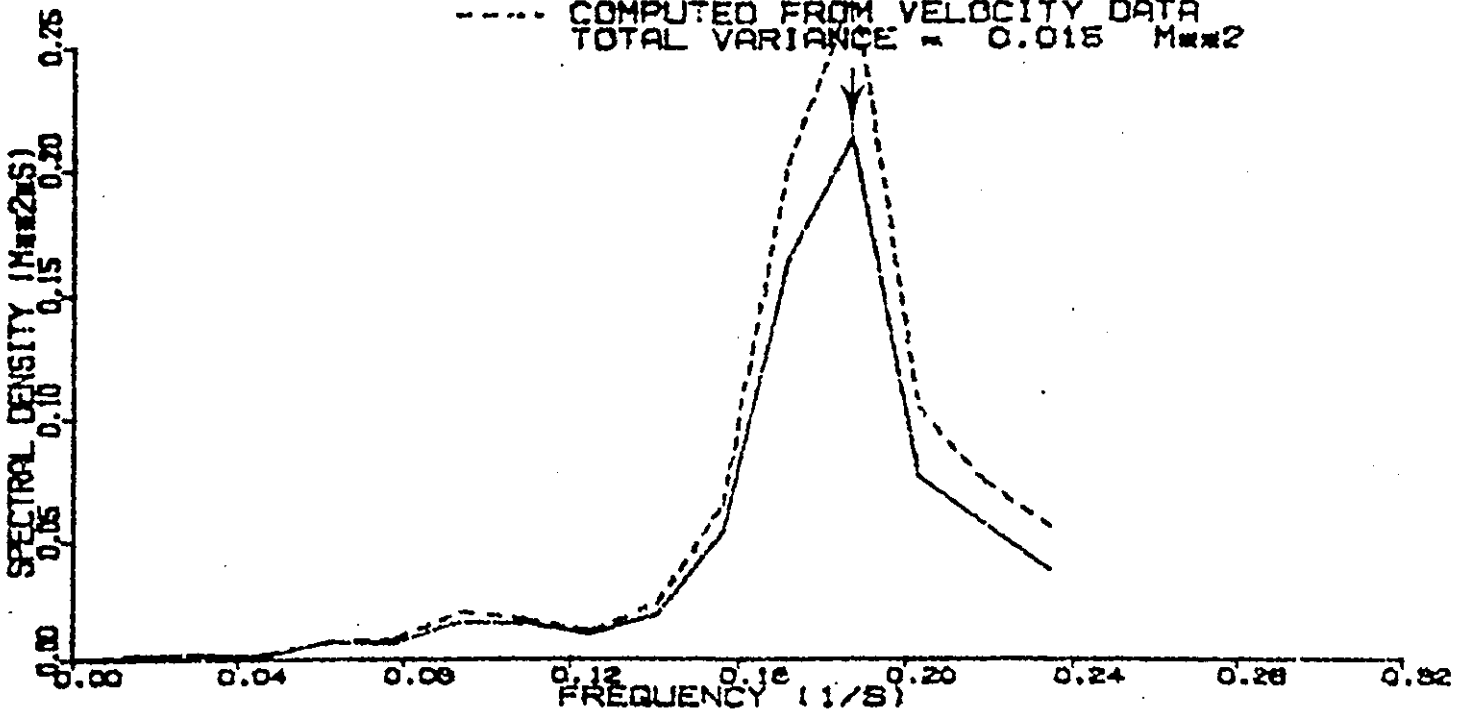
GREEN HARBOR, MASS

DATE: 25/7 /83 RUN: 2

SEA SURFACE SPECTRUM

—— COMPUTED FROM PRESSURE DATA
TOTAL VARIANCE = 0.011 M**2

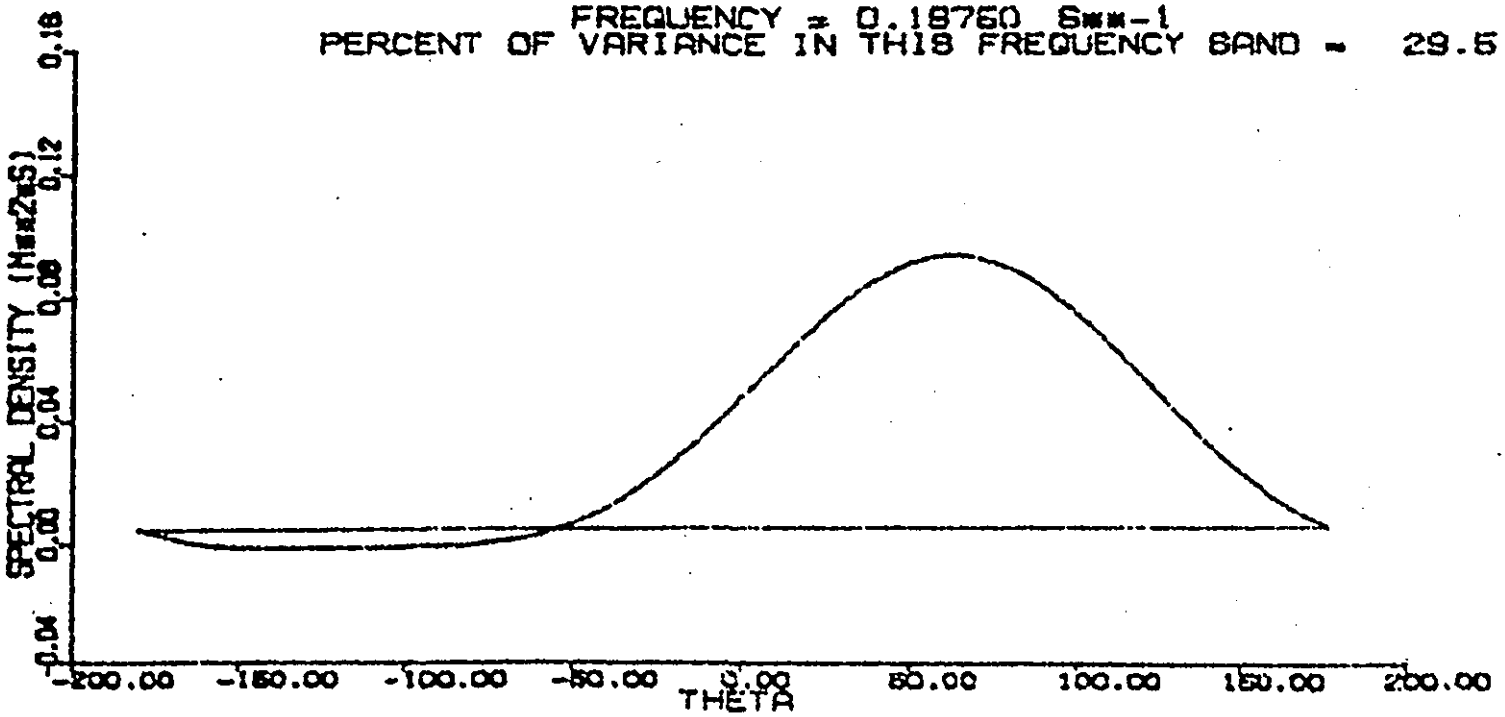
- - - - COMPUTED FROM VELOCITY DATA
TOTAL VARIANCE = 0.015 M**2

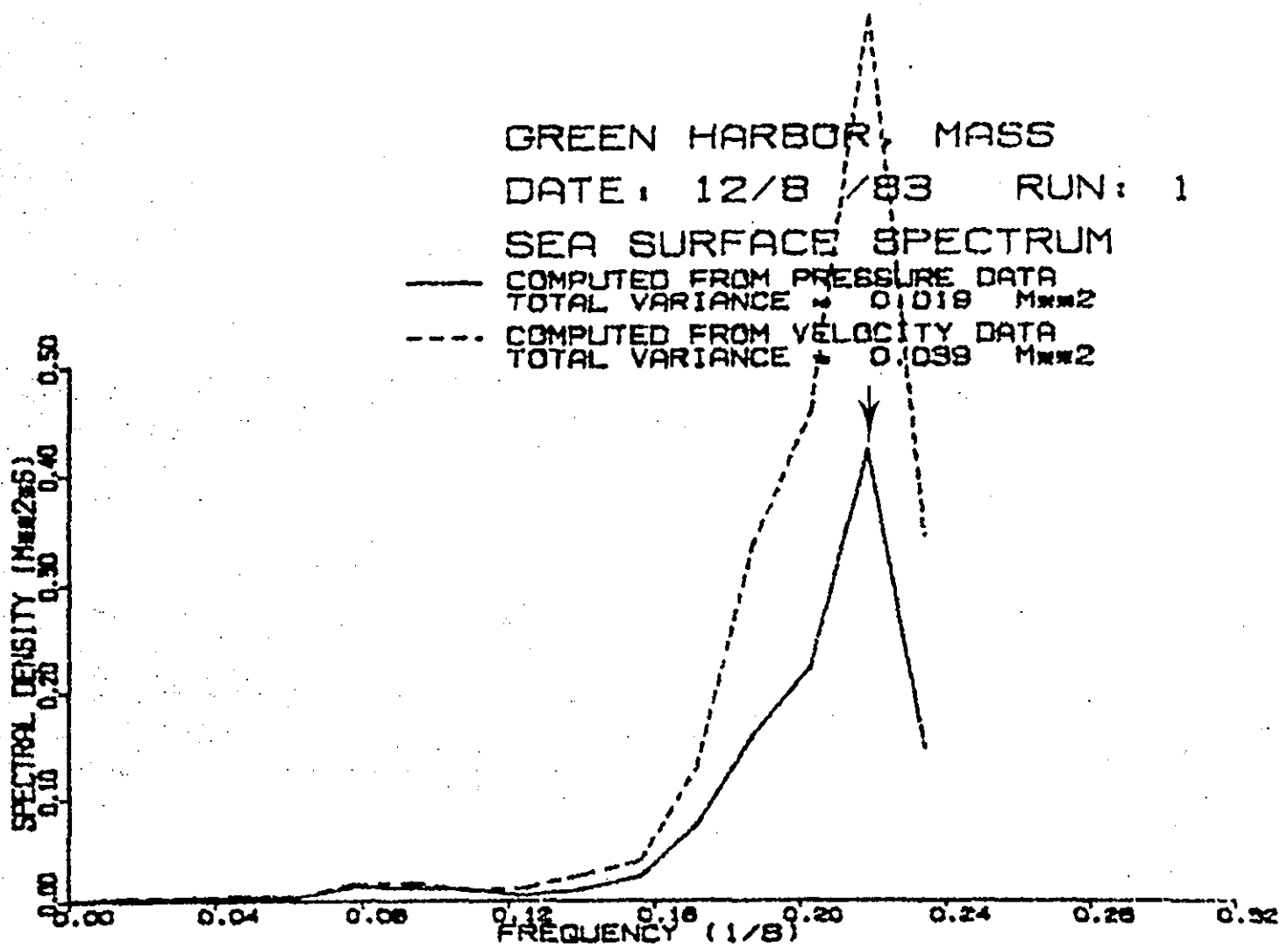


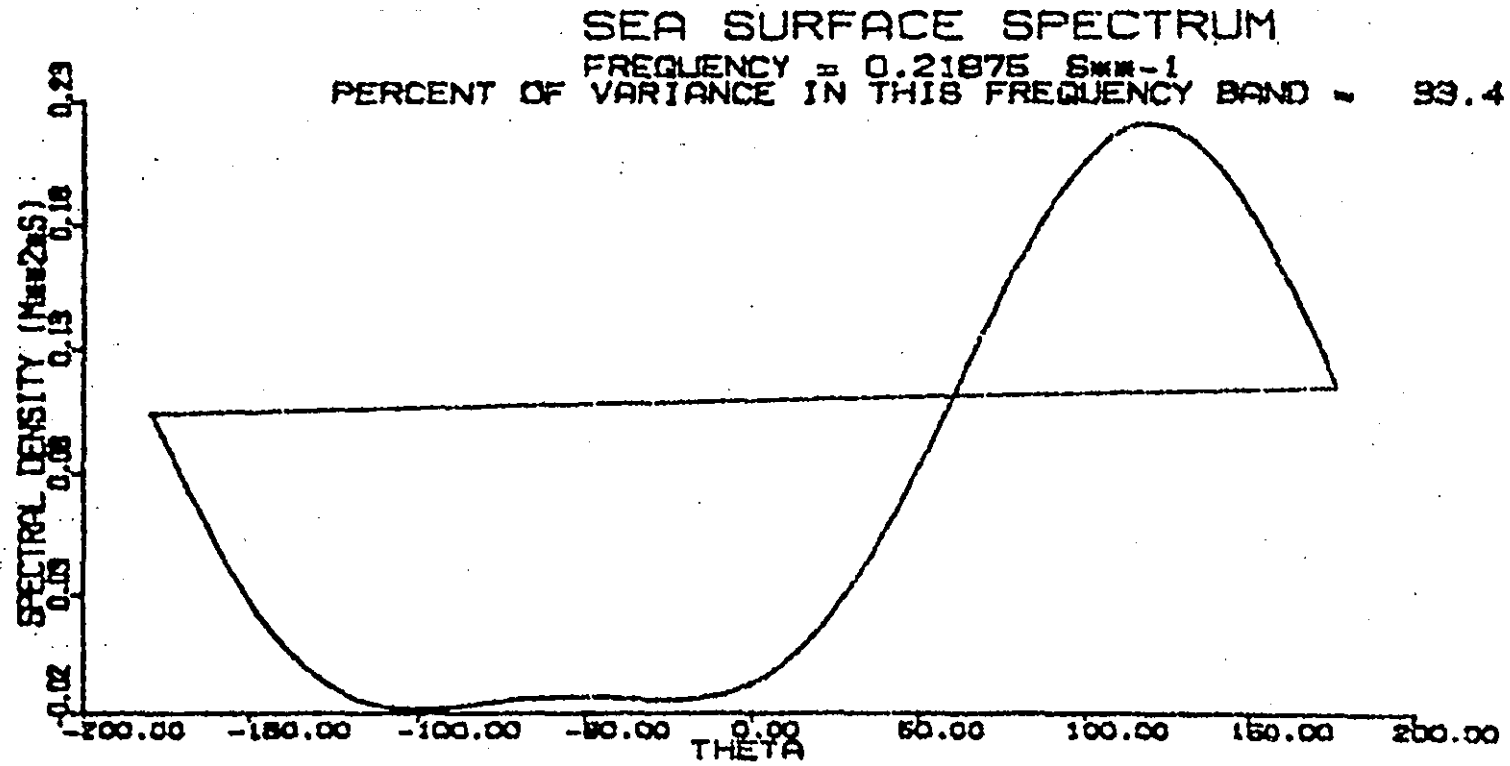
SEA SURFACE SPECTRUM

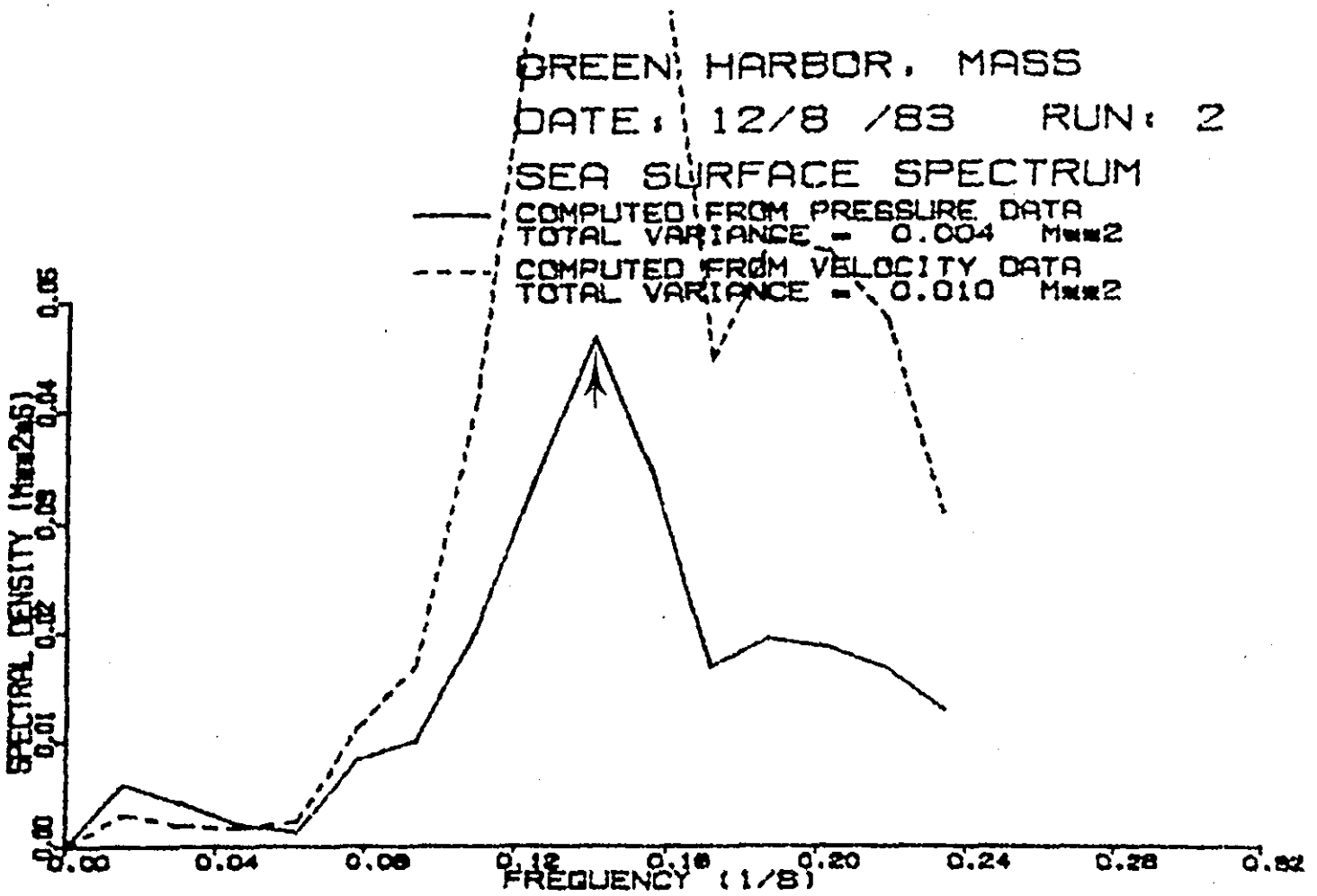
FREQUENCY = 0.18760 S**-1

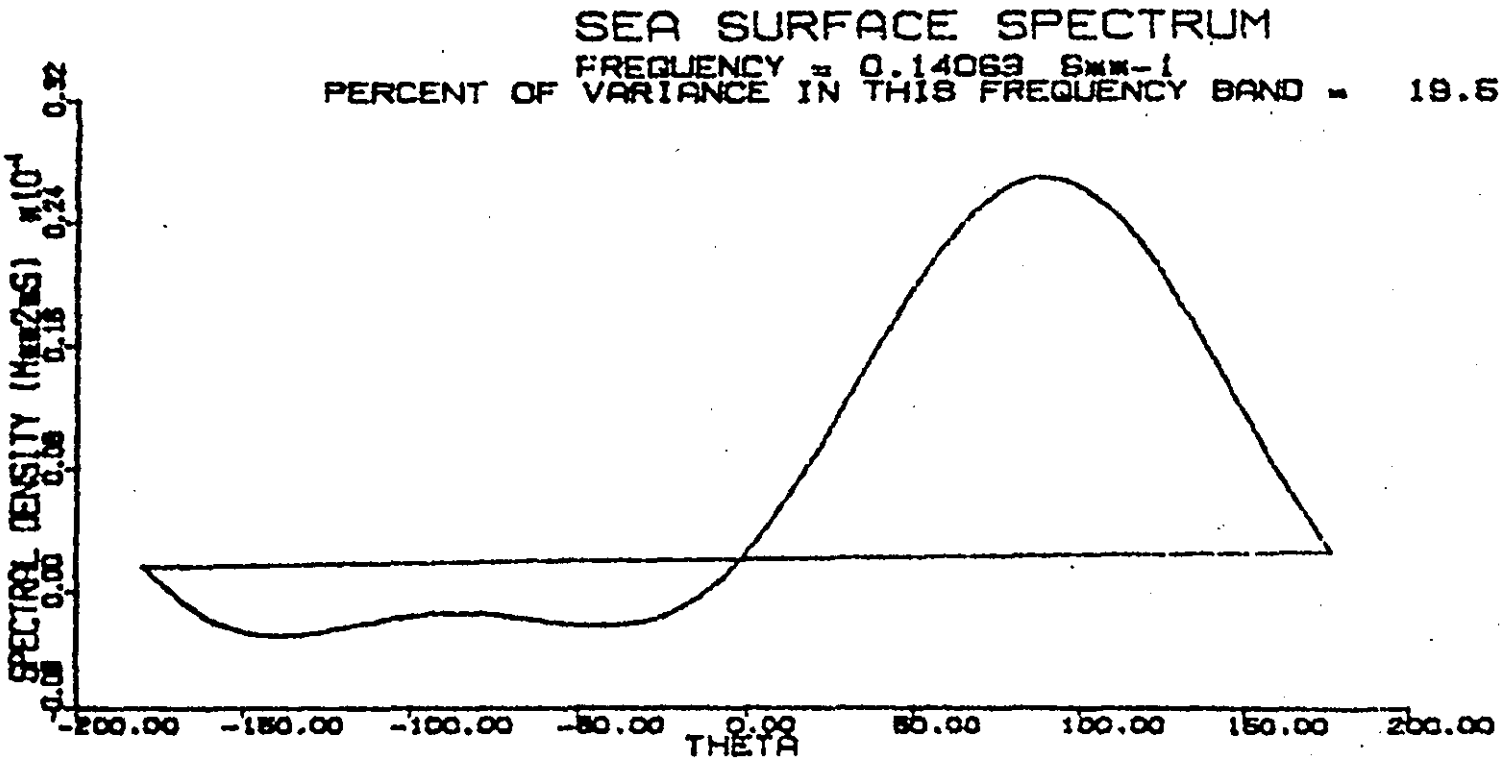
PERCENT OF VARIANCE IN THIS FREQUENCY BAND = 29.5

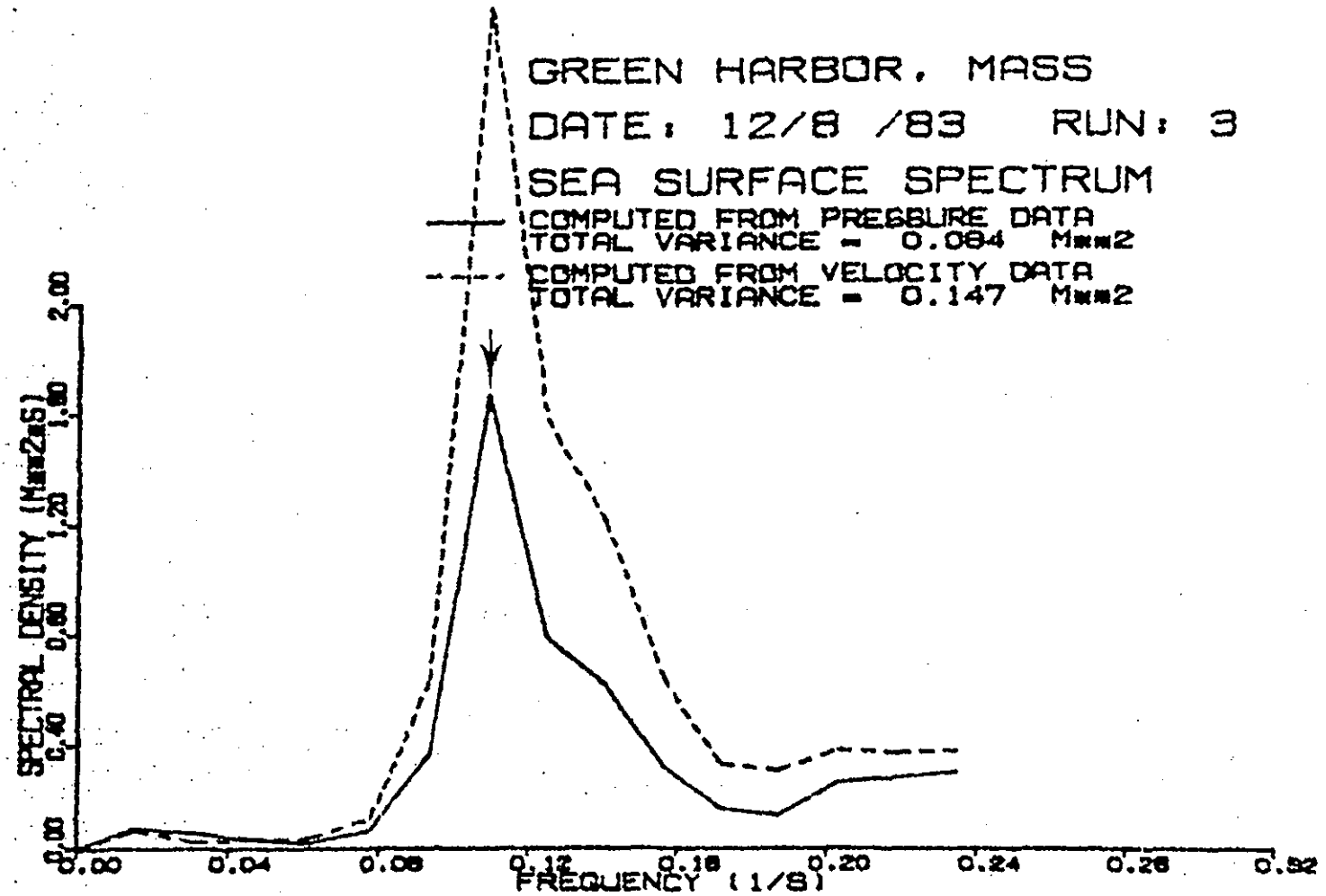


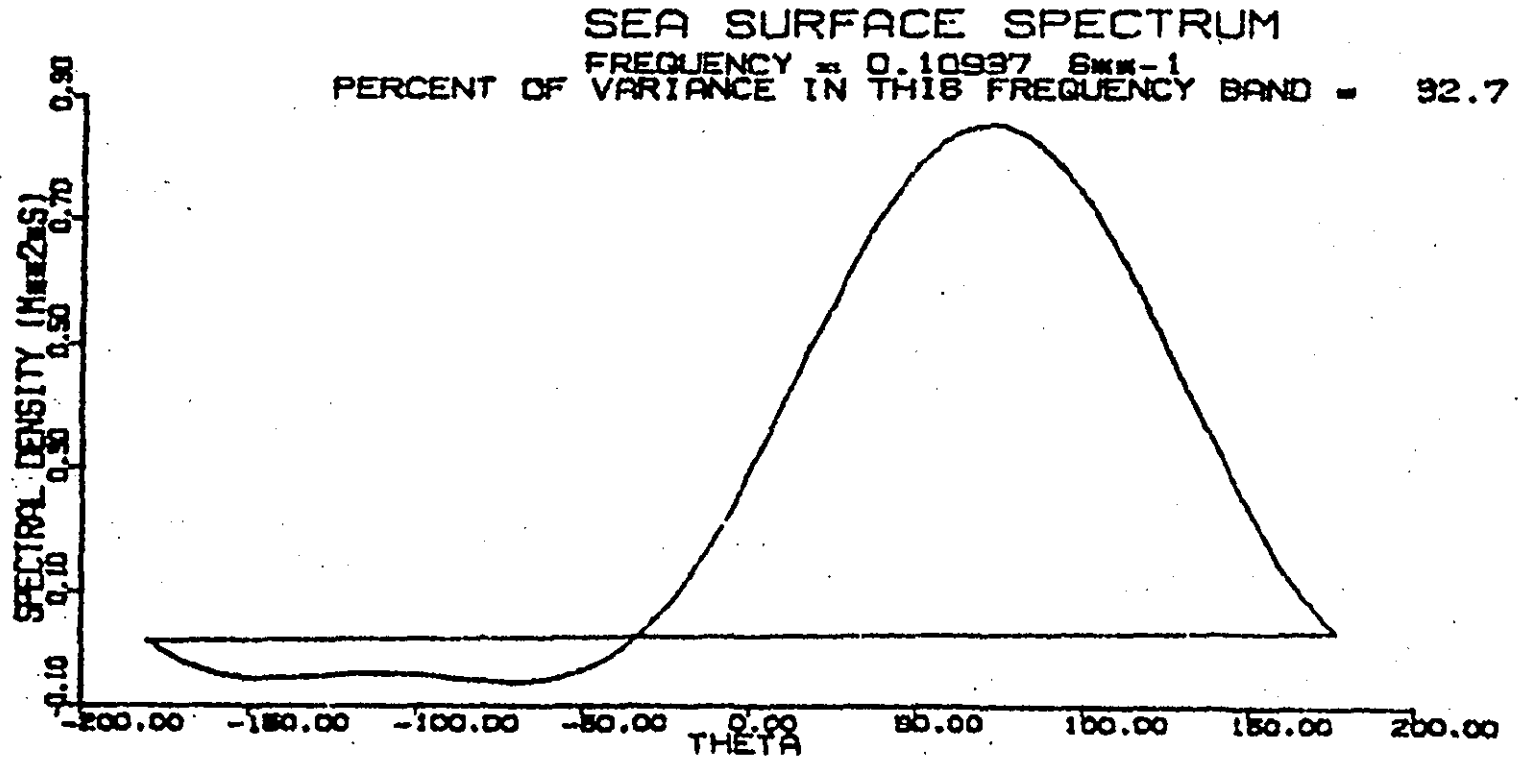

GREEN HARBOR, MASS
DATE: 12/8 /83 RUN: 1
SEA SURFACE SPECTRUM
COMPUTED FROM PRESSURE DATA
TOTAL VARIANCE = 0.018 M**2
COMPUTED FROM VELOCITY DATA
TOTAL VARIANCE = 0.039 M**2
SPECTRAL DENSITY (M**2S)
0.00
0.10
0.20
0.30
0.40
0.50
0.00
0.04
0.08
0.12
0.16
0.20
0.24
0.28
0.32
FREQUENCY (1/S)

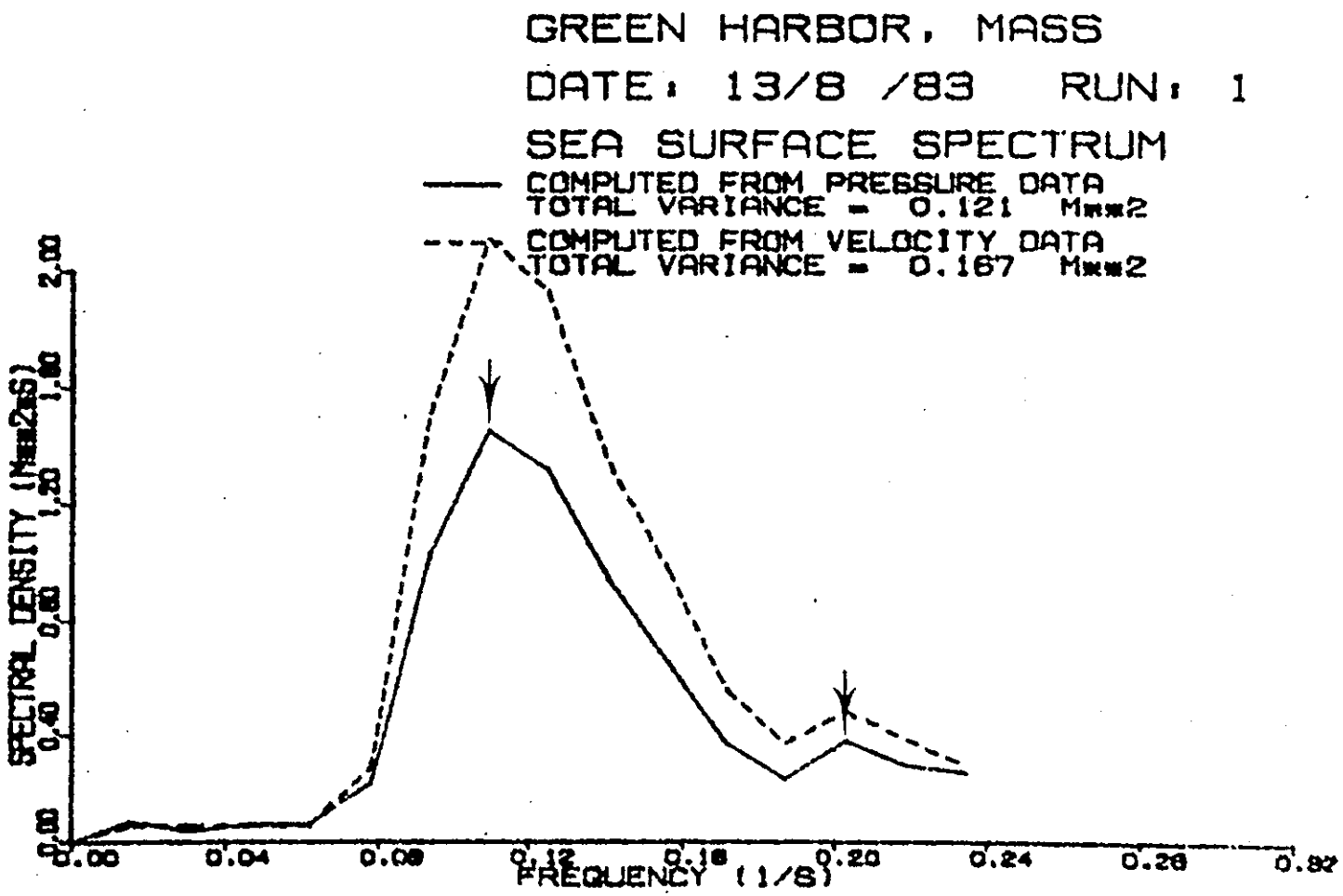

SEA SURFACE SPECTRUM
FREQUENCY = 0.21875 S**-1
PERCENT OF VARIANCE IN THIS FREQUENCY BAND = 93.4
SPECTRAL DENSITY (M**2S)
0.02
0.05
0.08
0.13
0.18
0.23
-200.00
-150.00
-100.00
-50.00
0.00
50.00
100.00
150.00
200.00
THETA


GREEN HARBOR, MASS
DATE: 12/8 /83 RUN: 2
SEA SURFACE SPECTRUM
COMPUTED FROM PRESSURE DATA
TOTAL VARIANCE = 0.004 M**2
COMPUTED FROM VELOCITY DATA
TOTAL VARIANCE = 0.010 M**2
SPECTRAL DENSITY (M**2/S)
0.00
0.01
0.02
0.03
0.04
0.05
0.00
0.04
0.08
0.12
0.16
0.20
0.24
0.28
0.32
FREQUENCY (1/S)


SEA SURFACE SPECTRUM
FREQUENCY = 0.14063 S**-1
PERCENT OF VARIANCE IN THIS FREQUENCY BAND = 19.5
SPECTRAL DENSITY (M**2/S) *10**-4
0.00
0.06
0.12
0.18
0.24
0.32
-200.00
-150.00
-100.00
-50.00
0.00
50.00
100.00
150.00
200.00
THETA


GREEN HARBOR, MASS
DATE: 12/8 /83 RUN: 3
SEA SURFACE SPECTRUM
COMPUTED FROM PRESSURE DATA
TOTAL VARIANCE = 0.084 M**2
COMPUTED FROM VELOCITY DATA
TOTAL VARIANCE = 0.147 M**2
SPECTRAL DENSITY (M**2/S)
0.00
0.40
0.80
1.20
1.60
2.00
0.00
0.04
0.08
0.12
0.16
0.20
0.24
0.28
0.32
FREQUENCY (1/S)


SEA SURFACE SPECTRUM
FREQUENCY = 0.10937 S**-1
PERCENT OF VARIANCE IN THIS FREQUENCY BAND = 92.7
SPECTRAL DENSITY (M**2/S)
0.10
0.30
0.50
0.70
0.90
-200.00
-150.00
-100.00
-50.00
0.00
50.00
100.00
150.00
200.00
THETA


GREEN HARBOR, MASS
DATE: 13/8 /83 RUN: 1
SEA SURFACE SPECTRUM
COMPUTED FROM PRESSURE DATA
TOTAL VARIANCE = 0.121 M**2
COMPUTED FROM VELOCITY DATA
TOTAL VARIANCE = 0.167 M**2
SPECTRAL DENSITY (M**2S)
0.00
0.40
0.80
1.20
1.60
2.00
0.00
0.04
0.08
0.12
0.16
0.20
0.24
0.28
0.32
FREQUENCY (1/S)

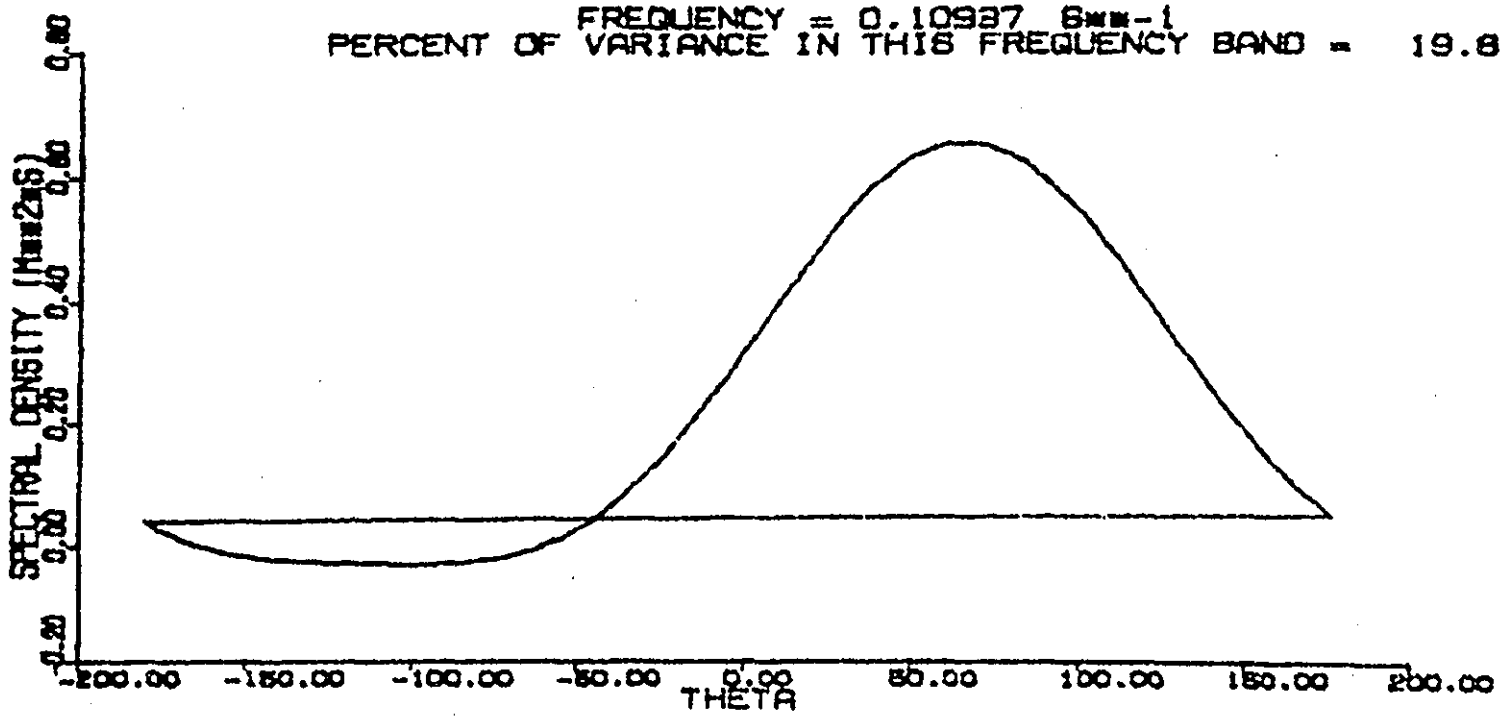
GREEN HARBOR, MASS

DATE: 13/8 /83 RUN: 1

SEA SURFACE SPECTRUM

FREQUENCY = 0.10937 S**-1

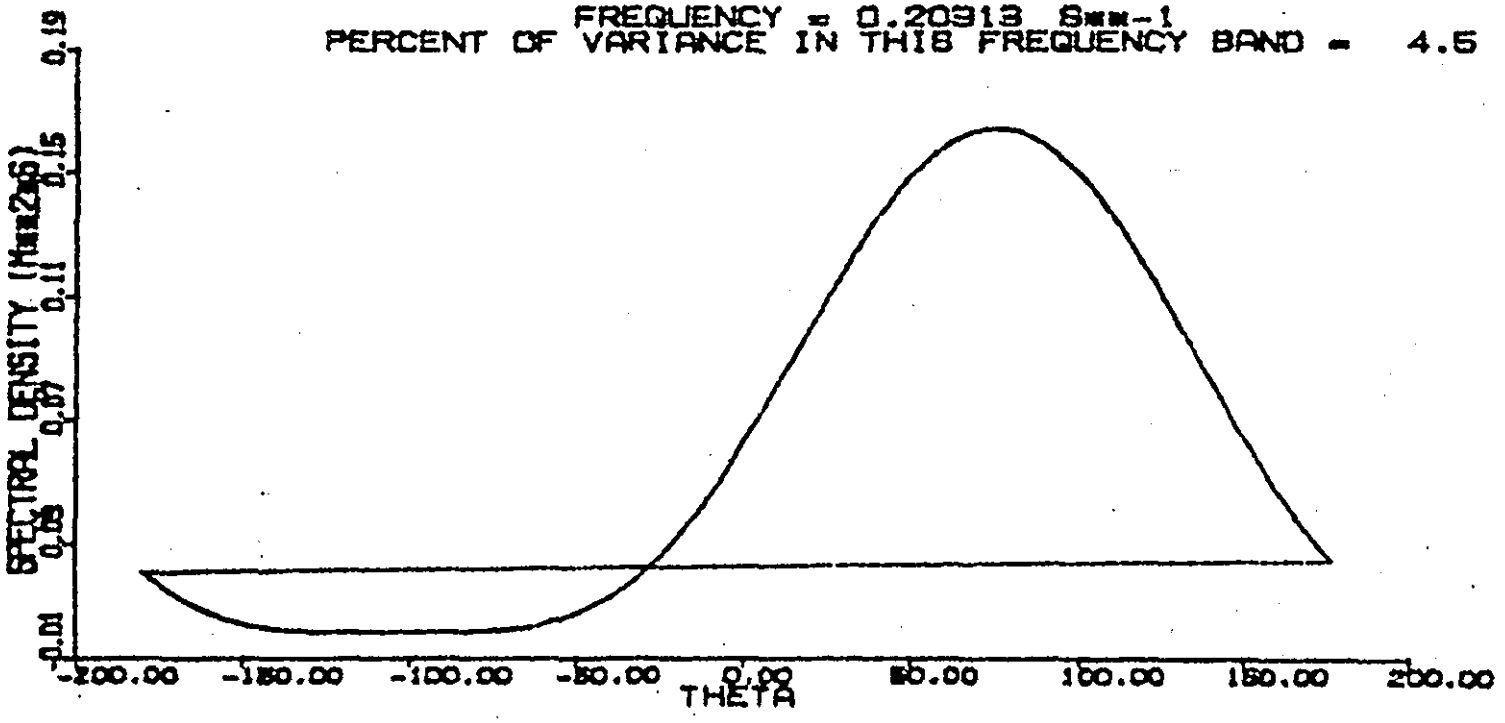
PERCENT OF VARIANCE IN THIS FREQUENCY BAND = 19.8

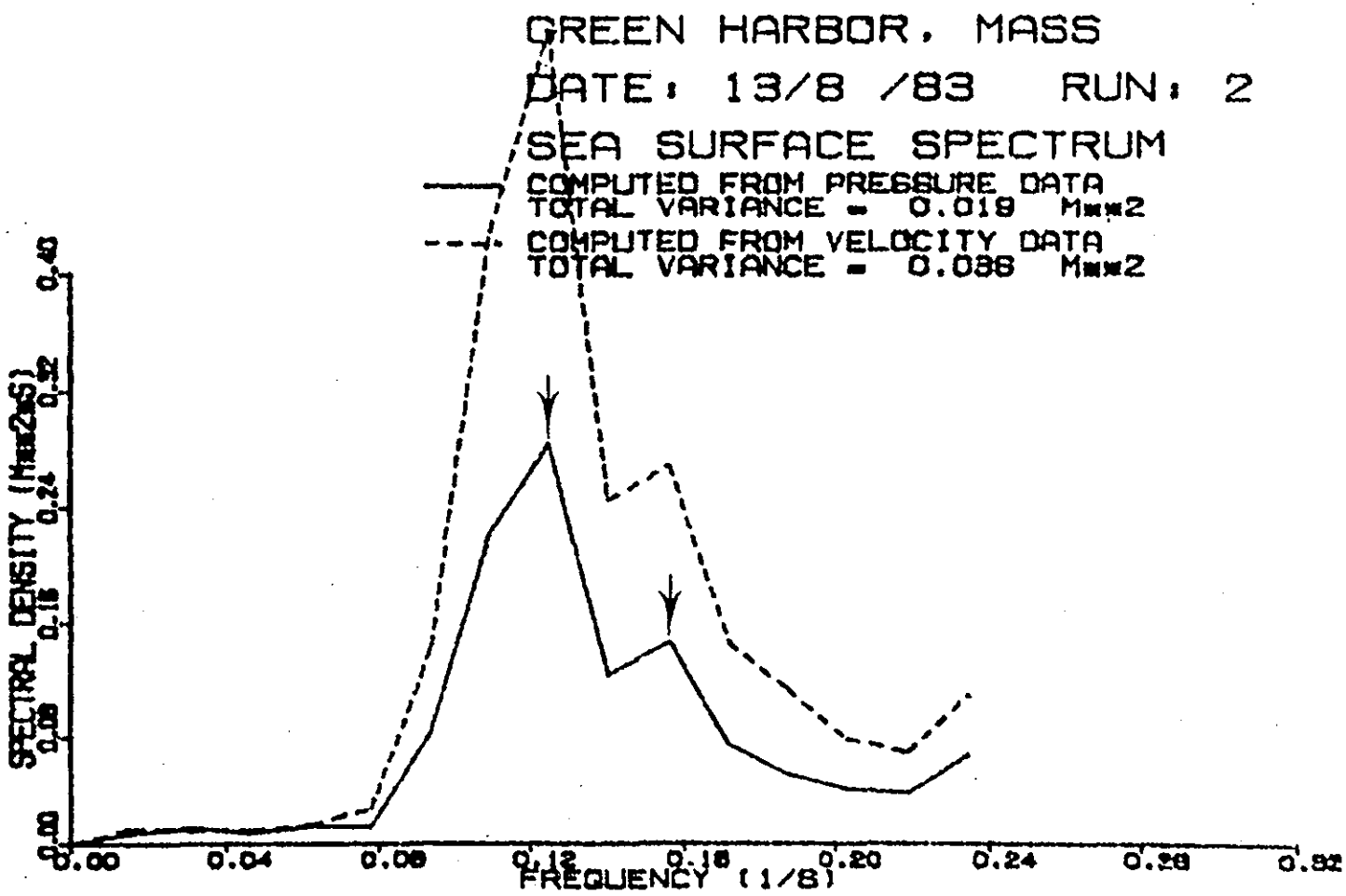


SEA SURFACE SPECTRUM

FREQUENCY = 0.20313 S**-1

PERCENT OF VARIANCE IN THIS FREQUENCY BAND = 4.5




GREEN HARBOR, MASS
DATE: 13/8 /83 RUN: 2
SEA SURFACE SPECTRUM
COMPUTED FROM PRESSURE DATA
TOTAL VARIANCE = 0.019 M**2
COMPUTED FROM VELOCITY DATA
TOTAL VARIANCE = 0.036 M**2
SPECTRAL DENSITY (M**2/S)
0.00
0.08
0.16
0.24
0.32
0.40
0.00
0.04
0.08
0.12
0.16
0.20
0.24
0.28
0.32
FREQUENCY (1/S)

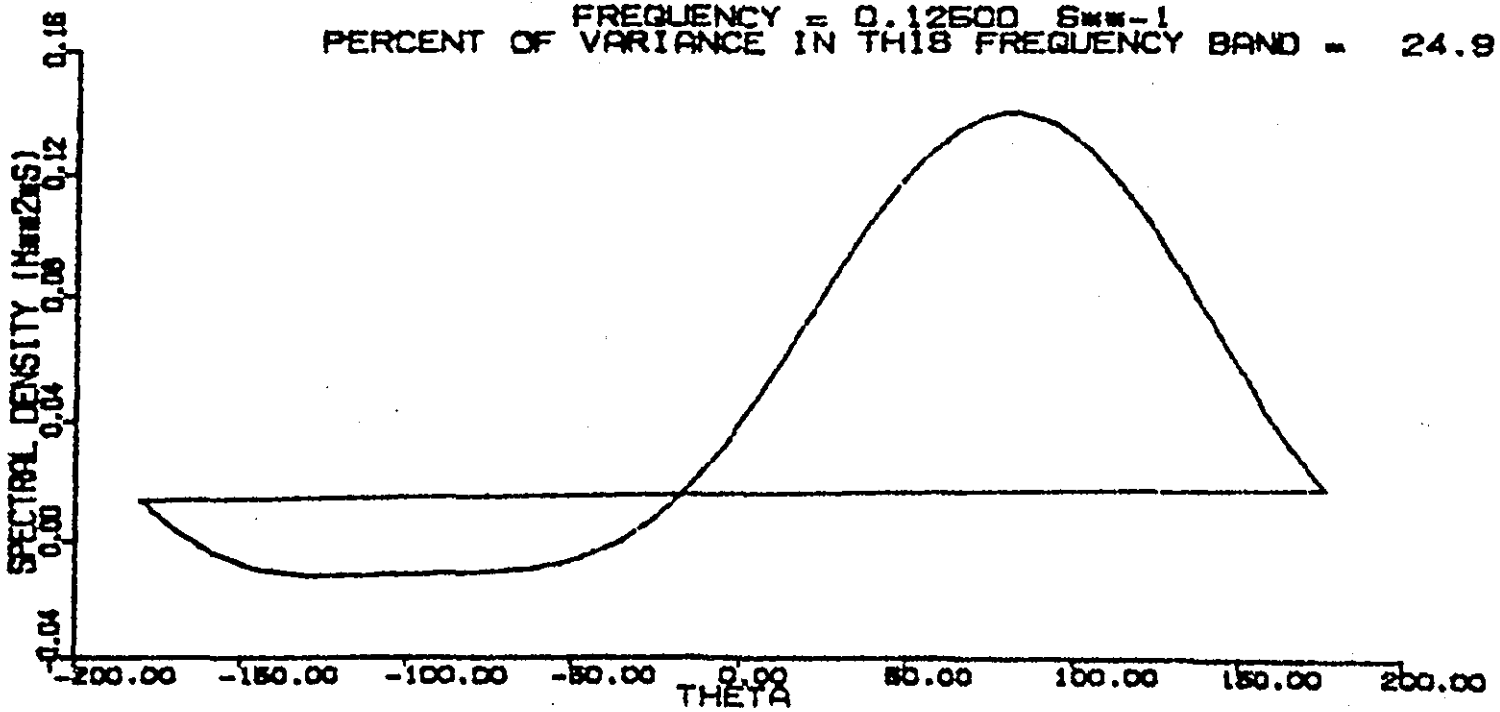
GREEN HARBOR, MASS

DATE: 13/8 /83 RUN: 2

SEA SURFACE SPECTRUM

FREQUENCY = 0.12500 S**-1

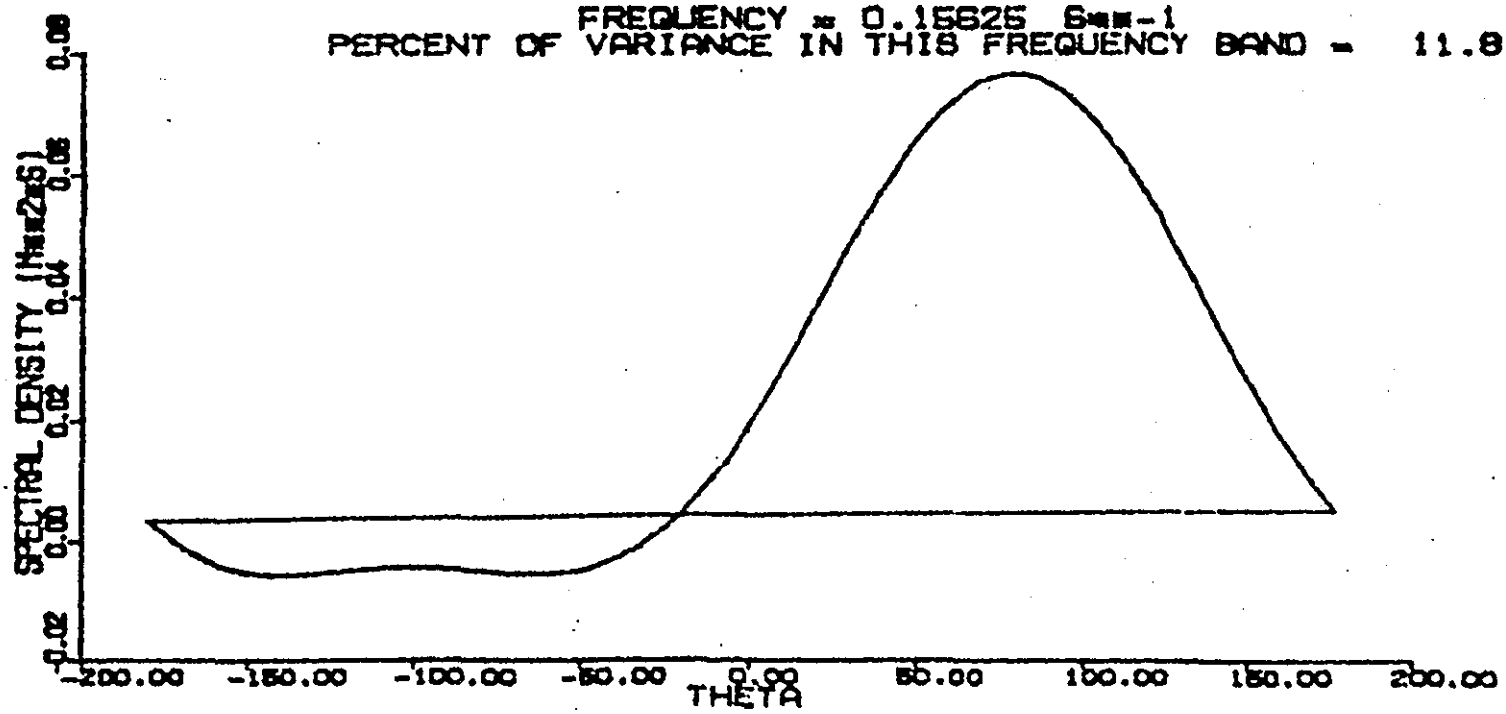
PERCENT OF VARIANCE IN THIS FREQUENCY BAND = 24.9

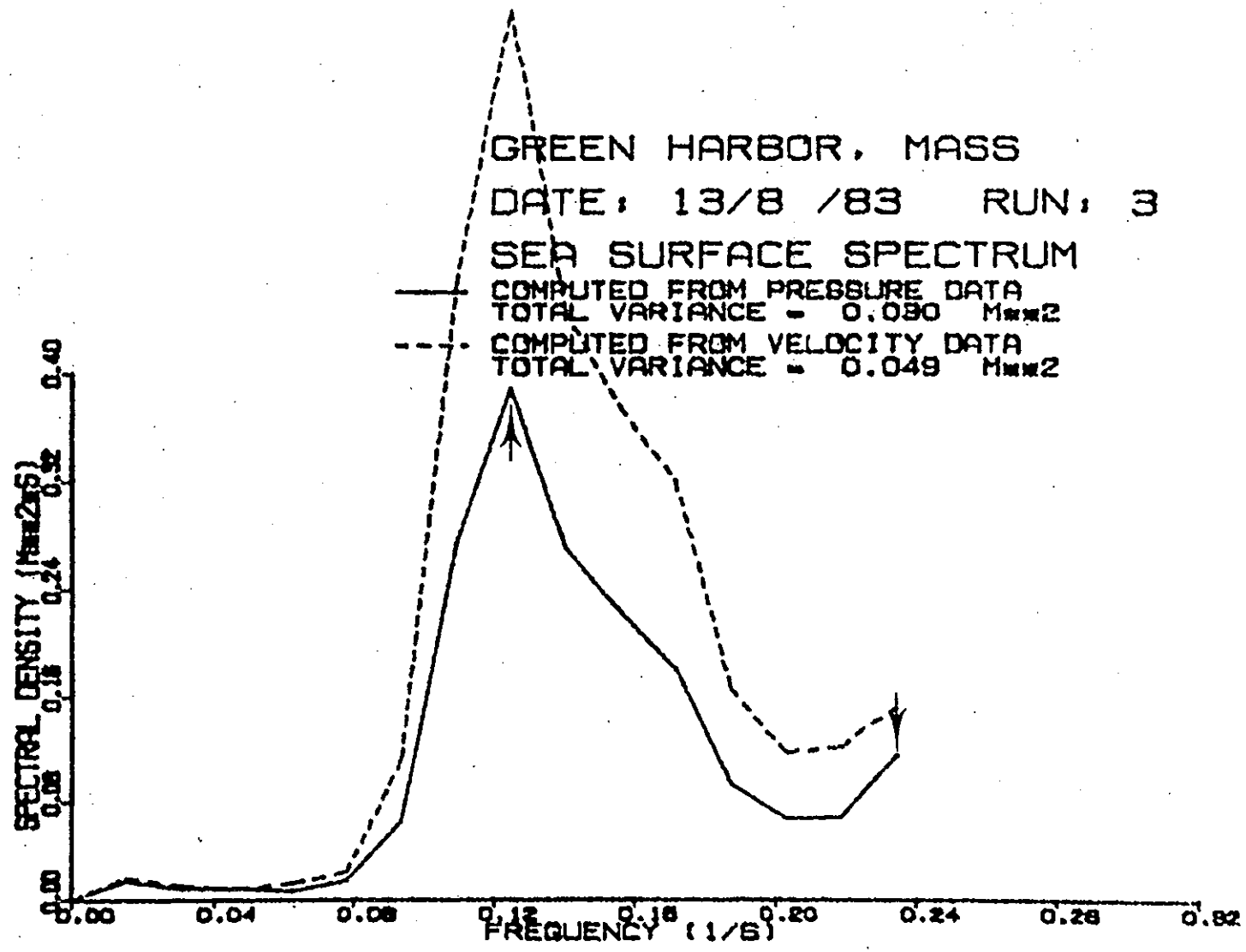


SEA SURFACE SPECTRUM

FREQUENCY = 0.15625 S**-1

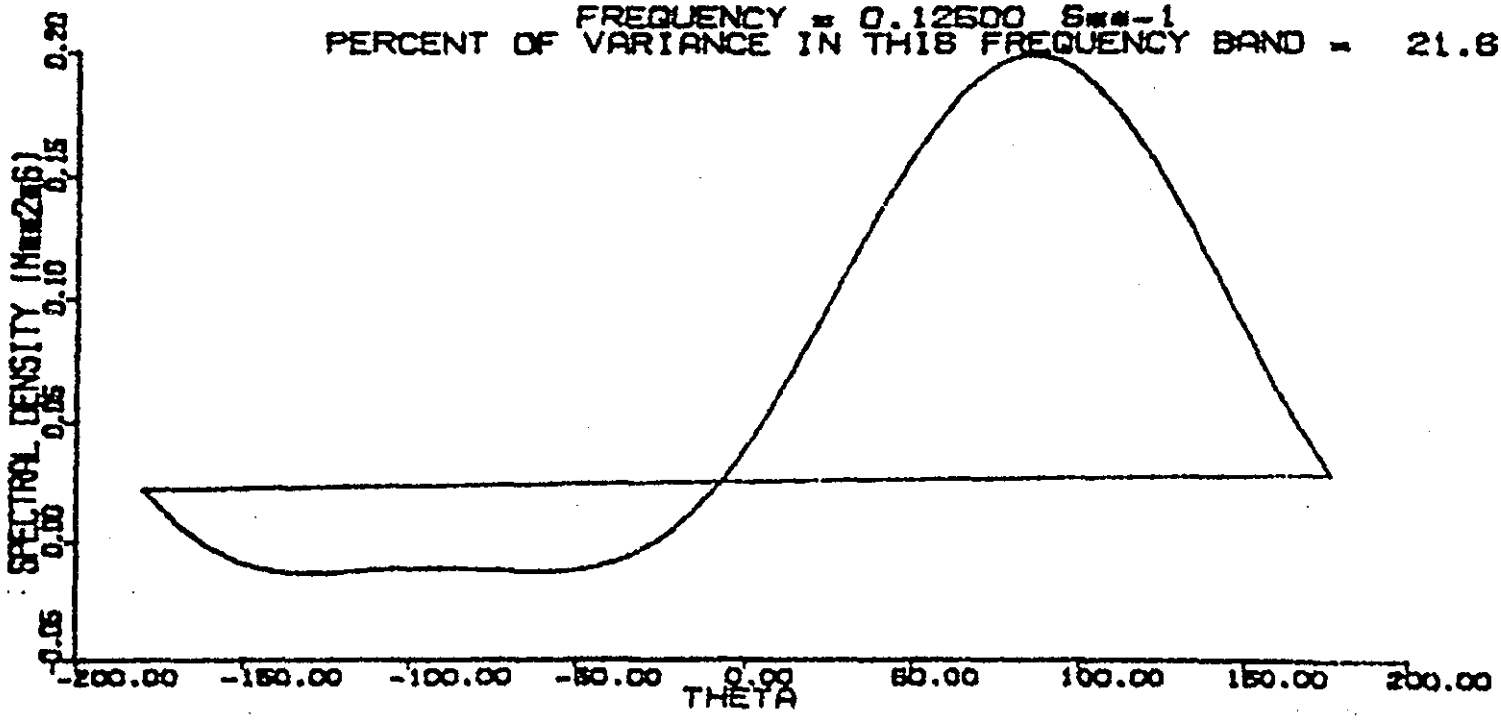
PERCENT OF VARIANCE IN THIS FREQUENCY BAND = 11.8



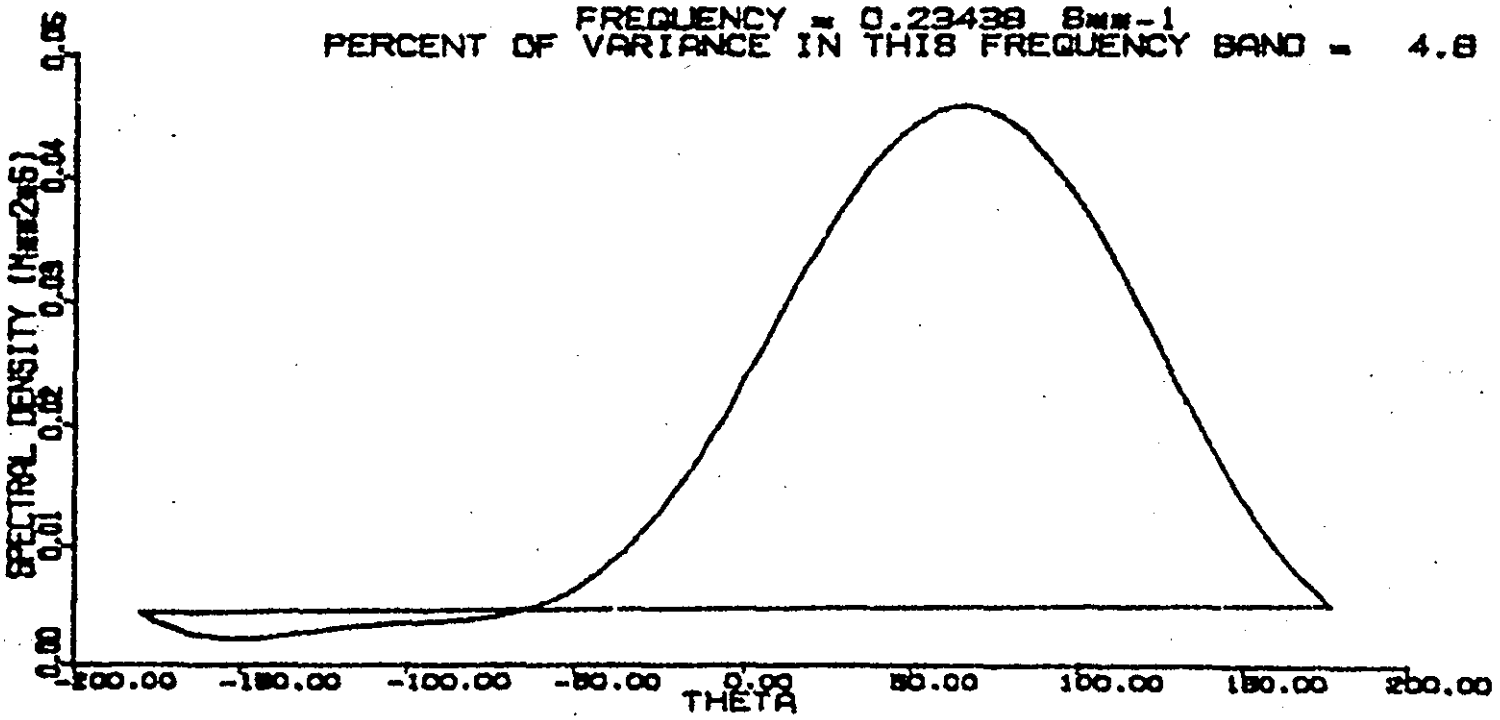

GREEN HARBOR, MASS
DATE: 13/8 /83 RUN: 3
SEA SURFACE SPECTRUM
COMPUTED FROM PRESSURE DATA
TOTAL VARIANCE = 0.090 M**2
COMPUTED FROM VELOCITY DATA
TOTAL VARIANCE = 0.049 M**2
SPECTRAL DENSITY (M**2/S)
0.00
0.08
0.16
0.24
0.32
0.40
0.00
0.04
0.08
0.12
0.16
0.20
0.24
0.28
0.32
FREQUENCY (1/S)

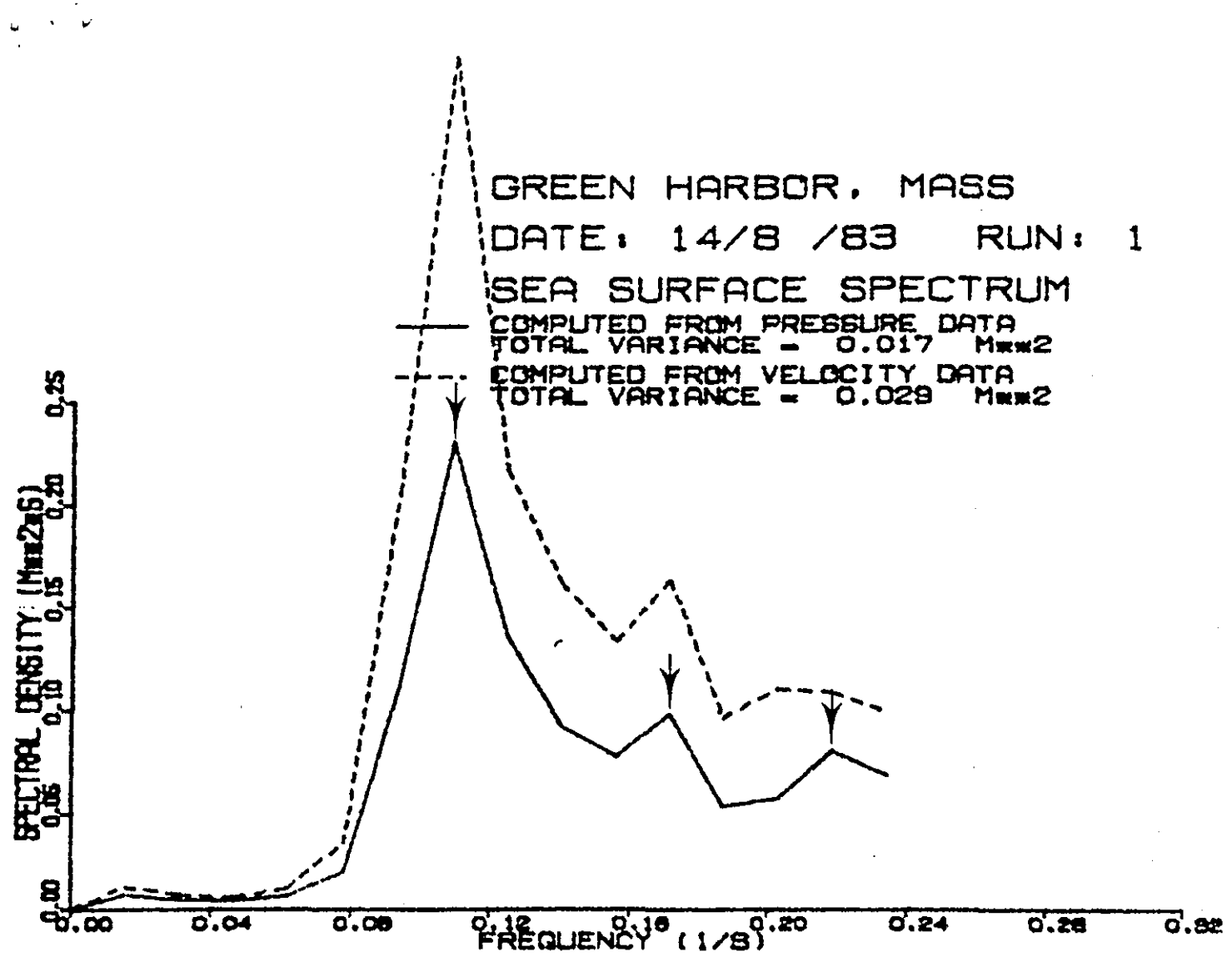
GREEN HARBOR, MASS
DATE: 13/8 /83 RUN: 3

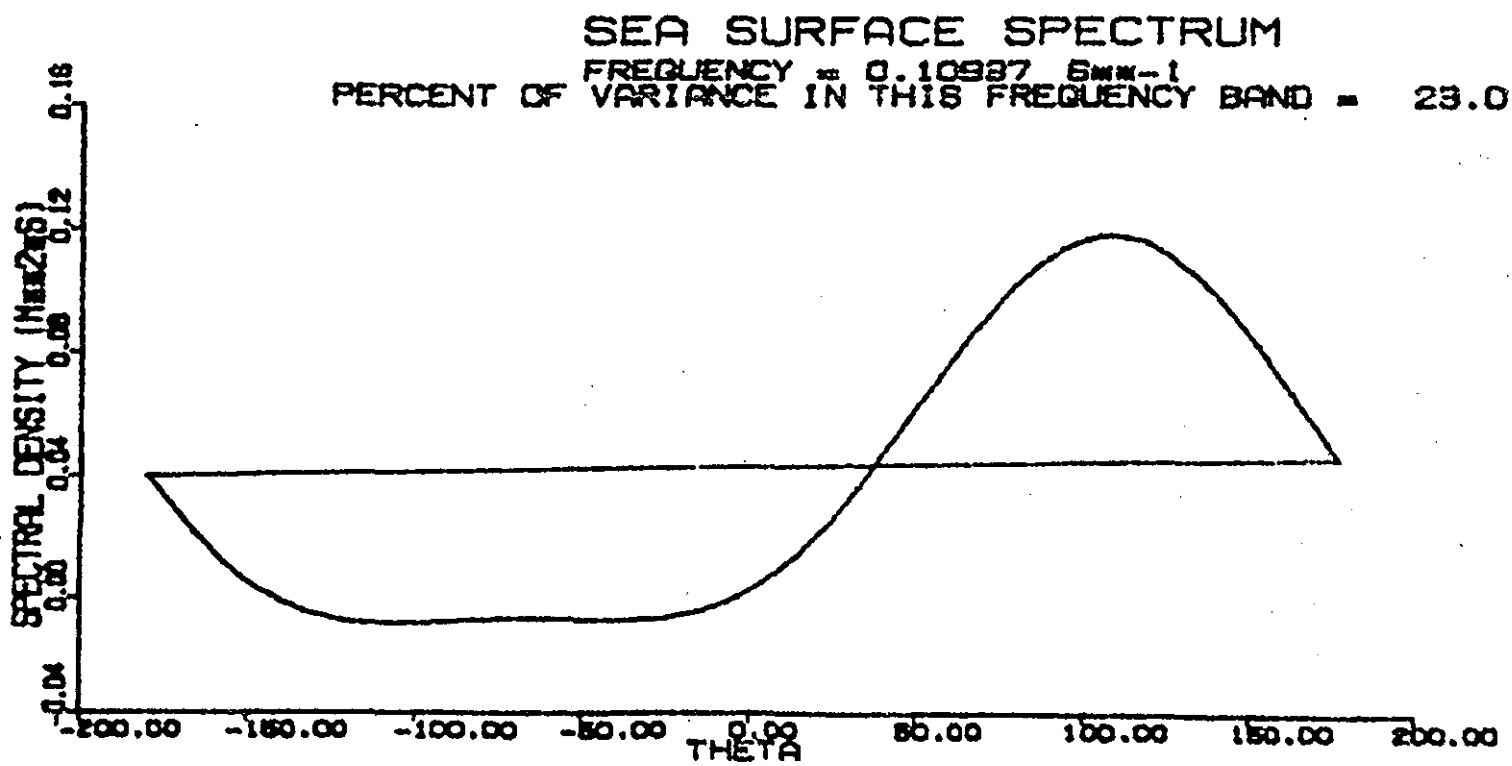
SEA SURFACE SPECTRUM
FREQUENCY = 0.12500 S**-1
PERCENT OF VARIANCE IN THIS FREQUENCY BAND = 21.6



SEA SURFACE SPECTRUM
FREQUENCY = 0.23438 S**-1
PERCENT OF VARIANCE IN THIS FREQUENCY BAND = 4.8

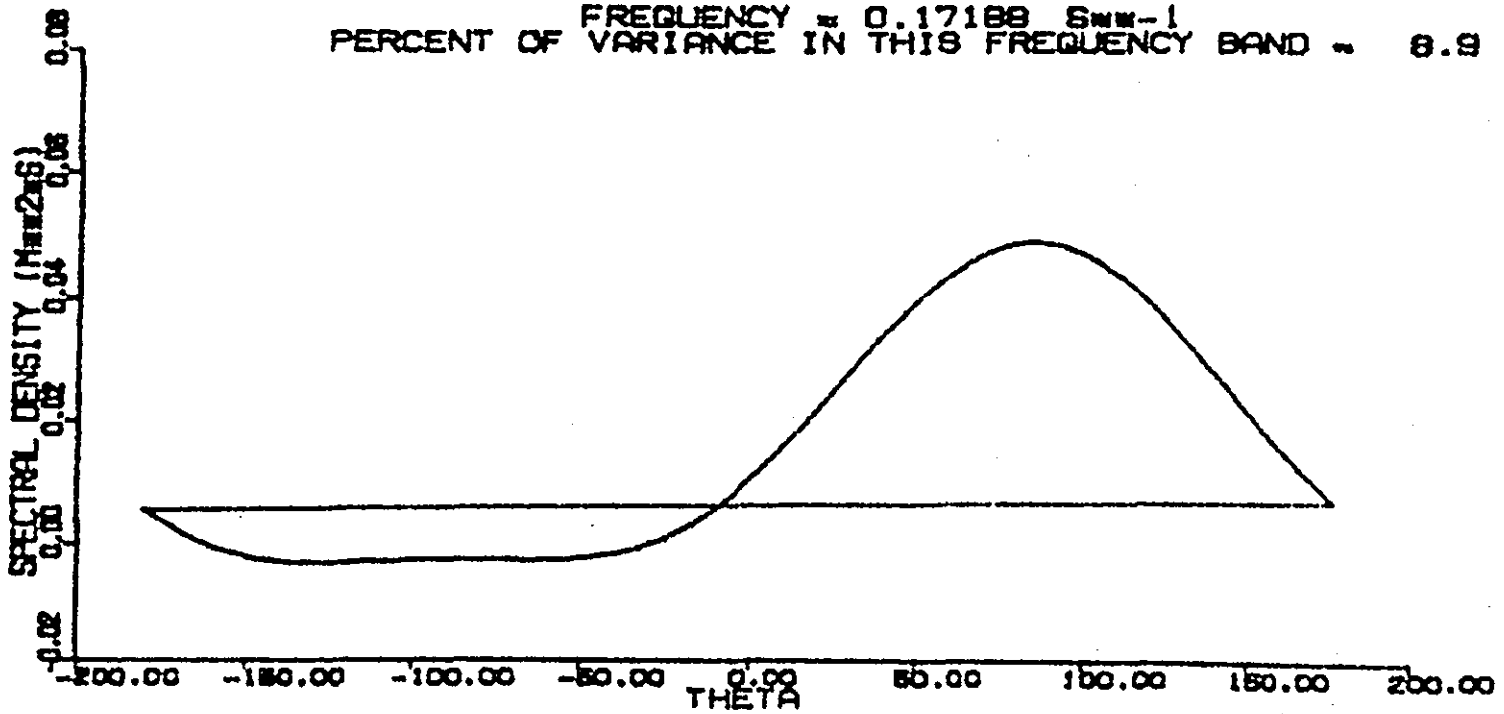



GREEN HARBOR, MASS
DATE: 14/8 /83 RUN: 1
SEA SURFACE SPECTRUM
COMPUTED FROM PRESSURE DATA
TOTAL VARIANCE = 0.017 M**2
COMPUTED FROM VELOCITY DATA
TOTAL VARIANCE = 0.029 M**2
SPECTRAL DENSITY (M**2/S)
0.00
0.05
0.10
0.15
0.20
0.25
0.00
0.04
0.08
0.12
0.16
0.20
0.24
0.28
0.32
FREQUENCY (1/S)


SEA SURFACE SPECTRUM
FREQUENCY = 0.10937 S**-1
PERCENT OF VARIANCE IN THIS FREQUENCY BAND = 23.0
SPECTRAL DENSITY (M**2/S)
-0.04
0.00
0.04
0.08
0.12
0.16
-200.00
-150.00
-100.00
-50.00
0.00
50.00
100.00
150.00
200.00
THETA

GREEN HARBOR, MASS
DATE: 14/8 /83 RUN: 1

SEA SURFACE SPECTRUM
FREQUENCY = 0.17188 Sww-1
PERCENT OF VARIANCE IN THIS FREQUENCY BAND = 8.9



SEA SURFACE SPECTRUM
FREQUENCY = 0.21875 Sww-1
PERCENT OF VARIANCE IN THIS FREQUENCY BAND = 5.9