SCIENCE APPLICATIONS, INC.

# WAVE CLIMATE
# GREEN HARBOR, MASSACHUSETTS

26 AUGUST 1983 - 27 OCTOBER 1983

CONTRIBUTION #37

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Submitted to:

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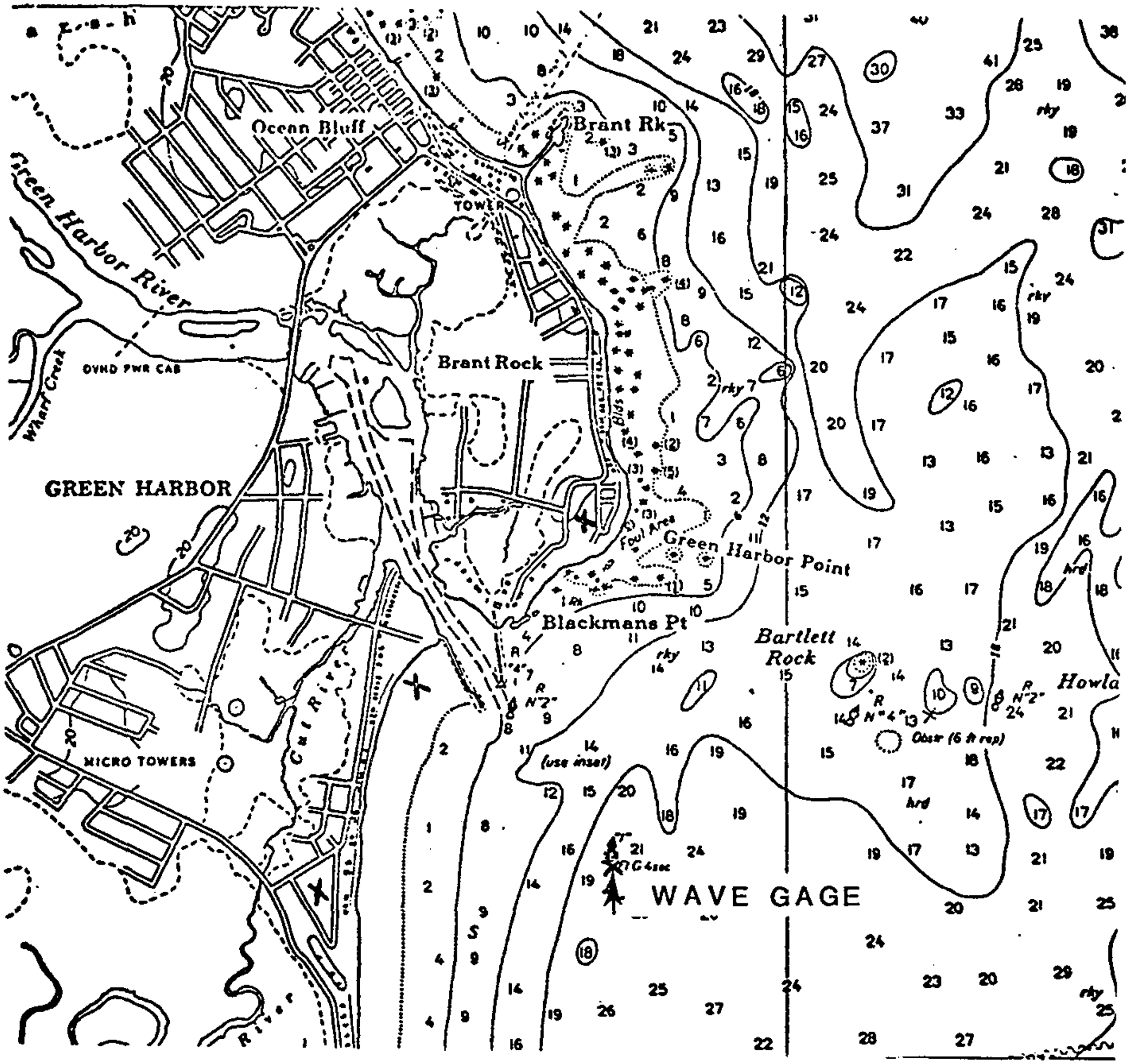
## 1.0 INTRODUCTION AND METHODS

The nearshore directional wave characteristics at Green Harbor, Massachusetts (Figure 1), were measured from 26 August 1983 through 27 October 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 635-12. 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 (Table 1).

The instrument was deployed with the pressure sensor 0.18 m above the bottom, and the current meter 1.98 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.




X = Location of shore navigation stations.

Figure 1. Green Harbor Wave Gage Location Map.

TABLE 1

INSTRUMENT DEPLOYMENT SUMMARY

| | |
|---|---|
| Instrument Type: | Sea Data Corporation Directional Wave Gage Model 635-12 |
| Location: | Green Harbor, MA (Vicinity of Buoy "1") |
| Deployment Date: | 26 August 1983 |
| Retrieval Date: | 27 October 1983 |
| Data Start Date: | 26 August 1983 |
| Data End Date: | 26 October 1983 |
| Burst Sample Interval: | 8 hours |
| Burst Duration: | 1024 seconds |
| Burst Sample Rate: | 0.5 seconds |
| Continuous Sample Rate: | 7.5 minutes |
| Internal Averaging: | Yes |
| Data Quality: | Excellent |
| Height of Pressure Sensor above Bottom: | 0.18 m |
| Height of Current Meter above Bottom: | 1.98 m |

Orientation of Current Meter: $94.25^{\circ}$TN
(Positive X axis is towards direction from which + X flow is coming)

Daily Measurement Times:

01: 0632 E.D.T.
02: 1432 E.D.T.
03: 2232 E.D.T.

## 2.0 RESULTS

Over the 63 day deployment, wave energy averaged 120 $cm^2$ in variance (Table 2). Variance ($<\eta^2>$) is defined by

$$E = \rho g<\eta^2>$$

where E is the total energy, $\rho$ 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:

$$H1/3 \approx 4\sqrt{<\eta^2>}$$

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 0.32 m. The mean peak wave period was just under 9 seconds. Because the analysis was cut-off at 4.0 seconds due to depth limitations, periods less than this are not reported. Variances, as calculated from pressure, agree well with those calculated from velocity in the first month of the data set (approximately 26 August - 26 September). Throughout the rest of the data set a gradual degradation of the relationship between the two variances occurs with the velocity variance consistently lower than the pressure. We attribute this occurence to soft, filamentous fouling which was found on the EMCM ball at the time of retrieval. While this fouling should not have affected directionality as hard fouling would have, the EMCM response and absolute measurement would certainly be affected. The continuing degradation of the relationship between pressure and velocity variance seems to support this theory as the fouling would have

Analysis of the 63 day wave/tide record, measured at Green Harbor, Massachusetts with a Sea Data 635-12 Values are recorded at 8 hour intervals for the following parameters:

| | |
|---|---|
| $\bar{h}$ | = mean water depth (m) |
| $E_T(<\eta^2>)$ | = 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: $H_{1/3} \approx 4\sqrt{<\eta^2>}$ |
| Peak F | = peak wave frequency ($sec^{-1}$) |
| Peak T | = peak wave period = $\frac{1}{\text{peak wave frequency}}$ |
| $\alpha_o$ | = 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.

* Indicates bad data or questionable data in that particular field.
** Indicates entire record is bad.

# TABLE VII

WAVE CLIMATE SUMMARY - GREEN HARBOR, MA 26 AUGUST 1983 - 27 OCTOBER 1983 SEA DATA 635-12 

| DATE | TIME | $\bar{h}$ (m) | $E_T$ ($cm^2$) | | $H_{1/3}$ (m) | Peak F ($sec^{-1}$) | Peak T (sec) | $\alpha_o$ | $P(\alpha_o)$ | $E_P$ ($cm^2$) | $\bar{U}$ (m/sec) | $\bar{V}$ (m/sec) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 26 Aug 83 | 1432 | 10.05 | 6. | (73.)* | 0.10 | 0.1094 | 9.1 | 280. | 72. | 1. | 0.02* | 0.05* |
| | 2232 | 8.45 | 6. | (7.) | 0.10 | 0.1250 | 8.0 | 267. | 34. | 1. | -0.01 | 0.00 |
| 27 Aug 83 | 632 | 8.22 | 5. | (5.) | 0.09 | 0.1094 | 9.1 | 278. | 40. | 2. | 0.00 | 0.07 |
| | 1432 | 10.11 | 6. | (11.) | 0.10 | 0.1094 | 9.1 | 274. | 44. | 1. | -0.04 | -0.01 |
| | 2232 | 8.12 | 5. | (6.) | 0.09 | 0.1250 | 8.0 | 268. | 35. | 1. | -0.01 | -0.07 |
| 28 Aug 83 | 632 | 8.64 | 11. | (9.) | 0.13 | 0.1094 | 9.1 | 266. | 39. | 2. | 0.00 | 0.07 |
| | 1432 | 10.05 | 12. | (17.) | 0.14 | 0.1250 | 8.0 | 261. | 50. | 5. | 0.03 | -0.04 |
| | 2232 | 7.85 | 5. | (6.) | 0.09 | 0.1250 | 8.0 | 274. | 33. | 1. | -0.02 | -0.02 |
| 29 Aug 83 | 632 | 8.99 | 7. | (43.) | 0.11 | 0.1250 | 8.0 | 269. | 39. | 1. | -0.02 | 0.02 |
| | 1432 | 9.85 | 8. | (15.) | 0.12 | 0.2500 | 4.0 | 230. | 53. | 2. | 0.03 | -0.04 |
| | 2232 | 7.66 | 12. | (14.) | 0.14 | 0.2500 | 4.0 | 221. | 29. | 4. | -0.01 | -0.06 |
| 30 Aug 83 | 632 | 9.38 | 28. | (28.)* | 0.21 | 0.2500 | 4.0 | 213. | 32. | 9. | -0.02 | 0.05* |
| | 1432 | 9.47 | 27. | (29.) | 0.21 | 0.2500 | 4.0 | 238. | 42. | 7. | -0.05 | 0.01 |
| | 2232 | 7.69 | 12. | (14.) | 0.14 | 0.2344 | 4.3 | 237. | 28. | 3. | 0.01 | 0.07 |
| 31 Aug 83 | 632 | 9.67 | 18. | (22.) | 0.17 | 0.1406 | 7.1 | 258. | 36. | 3. | -0.03 | 0.00 |
| | 1432 | 9.02 | 32. | (34.) | 0.23 | 0.1563 | 6.4 | 259. | 27. | 6. | 0.01 | 0.08 |
| | 2232 | 7.94 | 64. | (68.) | 0.32 | 0.1094 | 9.1 | 270. | 24. | 20. | -0.13 | -0.01 |
| 01 Sep 83 | 632 | 9.88 | 173. | (192.) | 0.53 | 0.1094 | 9.1 | 268. | 28. | 51. | -0.03 | 0.01 |
| | 1432 | 8.55 | 121. | (121.)* | 0.44 | 0.0938 | 10.7 | 265. | 32. | 38. | -0.02 | -0.13* |
| | 2232 | 8.48 | 80. | (87.) | 0.36 | 0.0938 | 10.7 | 269. | 22. | 39. | -0.02 | 0.02 |
| 02 Sep 83 | 632 | 9.77 | 96. | (106.) | 0.39 | 0.0938 | 10.7 | 272. | 33. | 36. | 0.03 | 0.07 |
| | 1432 | 8.04 | 47. | (44.) | 0.27 | 0.1094 | 9.1 | 262. | 36. | 22. | -0.01 | -0.10 |
| | 2232 | 9.07 | 33. | (37.) | 0.23 | 0.0938 | 10.7 | 261. | 26. | 14. | -0.05 | 0.02 |
| 03 Sep 83 | 632 | 9.33 | 31. | (34.) | 0.22 | 0.0938 | 10.7 | 263. | 33. | 10. | 0.02 | 0.05 |
| | 1432 | 7.60 | 18. | (22.) | 0.17 | 0.0938 | 10.7 | 271. | 33. | 7. | -0.03 | 0.00 |
| | 2232 | 9.87 | 21. | (25.)* | 0.18 | 0.0938 | 10.7 | 268. | 53. | 6. | -0.02 | 0.05* |
| 04 Sep 83 | 632 | 8.79 | 10. | (11.) | 0.13 | 0.0938 | 10.7 | 264. | 43. | 3. | 0.01 | 0.01 |
| | 1432 | 7.55 | 10. | (12.) | 0.13 | 0.0781 | 12.8 | 257. | 26. | 5. | -0.02 | 0.01 |
| | 2232 | 10.43 | 23. | (26.)* | 0.19 | 0.0781 | 12.8 | 260. | 63. | 7. | -0.02* | 1.32* |

| DATE | TIME | $\bar{h}$ (m) | $E_T$($cm^2$) | | $H_{1/3}$(m) | Peak F ($sec^{-1}$) | Peak T (sec) | $\alpha_o$ | P($\alpha_o$) | $E_P$($cm^2$) | $\bar{U}$ (m/sec) | $\bar{V}$ (m/sec) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 05 Sep 83 | 632 | 8.11 | 16. | (19.) | 0.16 | 0.0781 | 12.8 | 270. | 28. | 6. | 0.01 | -0.01 |
| | 1432 | 7.98 | 13. | (56.) | 0.14 | 0.0938 | 10.7 | 265. | 61. | 4. | -0.06 | 0.08 |
| | 2232 | 10.75 | 12. | (19.) | 0.14 | 0.0781 | 12.8 | 314. | 59. | 3. | -0.03 | 0.07 |
| 06 Sep 83 | 632 | 7.48 | 13. | (16.) | 0.14 | 0.1094 | 9.1 | 280. | 30. | 4. | 0.03 | -0.01 |
| | ** 1432 | 8.71 | 12. | (1.) | 0.14 | 0.0781 | 12.8 | 413. | 2. | 4. | -0.10 | 0.05** |
| | 2232 | 10.57 | 11. | (12.) | 0.13 | 0.0781 | 12.8 | 303. | 54. | 3. | 0.03 | 0.06 |
| 07 Sep 83 | 632 | 6.98 | 11. | (15.) | 0.14 | 0.1094 | 9.1 | 280. | 35. | 4. | -0.03 | -0.02 |
| | 1432 | 9.43 | 6. | (10.) | 0.10 | 0.0938 | 10.7 | 256. | 33. | 2. | -0.06 | 0.01 |
| | 2232 | 9.96 | 6. | (11.) | 0.10 | 0.0938 | 10.7 | 278. | 67. | 2. | -0.02 | 0.02 |
| 08 Sep 83 | 632 | 6.88 | 6. | (8.) | 0.10 | 0.0781 | 12.8 | 272. | 27. | 2. | -0.03 | -0.02 |
| | 1432 | 10.10 | 6. | (8.) | 0.10 | 0.0938 | 10.7 | 271. | 38. | 2. | -0.02 | 0.08 |
| | 2232 | 9.16 | 6. | (9.) | 0.10 | 0.0938 | 10.7 | 266. | 48. | 1. | 0.07 | -0.01 |
| 09 Sep 83 | 632 | 7.23 | 3. | (5.) | 0.07 | 0.1094 | 9.1 | 278. | 36. | 1. | -0.04 | 0.06 |
| | 1432 | 10.52 | 5. | (6.) | 0.09 | 0.1094 | 9.1 | 231. | 66. | 1. | 0.00 | 0.06 |
| | 2232 | 8.26 | 2. | (4.) | 0.06 | 0.0938 | 10.7 | 257. | 38. | 1. | -0.02 | 0.05 |
| 10 Sep 83 | 632 | 7.84 | 2. | (4.) | 0.05 | 0.1094 | 9.1 | 271. | 32. | 1. | -0.03 | 0.06 |
| | 1432 | 10.54 | 3. | (7.) | 0.07 | 0.1094 | 9.1 | 282. | 52. | 1. | -0.03 | 0.02 |
| | 2232 | 7.74 | 6. | (7.) | 0.09 | 0.2344 | 4.3 | 284. | 49. | 2. | 0.01 | -0.04 |
| 11 Sep 83 | 632 | 8.72 | 3. | (6.) | 0.07 | 0.0625 | 16.0 | 269. | 45. | 1. | -0.05 | 0.05 |
| | 1432 | 10.36 | 6. | (10.) | 0.10 | 0.2500 | 4.0 | 272. | 72. | 1. | 0.01 | 0.05 |
| | 2232 | 7.31 | 3. | (5.) | 0.07 | 0.0625 | 16.0 | 276. | 34. | 1. | -0.03 | -0.05 |
| 12 Sep 83 | 632 | 9.26 | 3. | (5.) | 0.07 | 0.0781 | 12.8 | 261. | 34. | 1. | -0.08 | 0.02 |
| | 1432 | 9.79 | 7. | (7.)* | 0.11 | 0.0781 | 12.8 | 271. | 83. | 1. | 0.06* | 0.00* |
| | 2232 | 7.35 | 3. | (3.) | 0.07 | 0.0781 | 12.8 | 280. | 40. | 1. | 0.02 | 0.09 |
| 13 Sep 83 | 632 | 9.70 | 3. | (6.) | 0.07 | 0.0781 | 12.8 | 278. | 48. | 1. | -0.04 | 0.01 |
| | 1432 | 9.23 | 79. | (81.) | 0.36 | 0.2031 | 4.9 | 234. | 25. | 23. | -0.03 | 0.04 |
| | 2232 | 7.78 | 18. | (26.) | 0.17 | 0.2031 | 4.9 | 256. | 37. | 5. | -0.06 | 0.04 |

| DATE | TIME | $\bar{h}$ (m) | $E_T$(cm$^2$) | $H_{1/3}$(m) | Peak F (sec$^{-1}$) | Peak T (sec) | $\alpha_o$ | $P(\alpha_o)$ | $E_P$(cm$^2$) | $\bar{U}$ (m/sec) | $\bar{V}$ (m/sec) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 14 Sep 83 | 632 | 9.97 | 440. (654.) | 0.84 | 0.1875 | 5.3 | 240. | 28. | 115. | -0.02 | 0.06 |
| | 1432 | 8.77 | 274. (281.) | 0.66 | 0.1719 | 5.8 | 245. | 25. | 81. | 0.01 | -0.03 |
| | 2232 | 8.42 | 138. (155.) | 0.47 | 0.1563 | 6.4 | 252. | 19. | 30. | -0.01 | 0.05 |
| 15 Sep 83 | 632 | 9.93 | 202. (209.) | 0.57 | 0.2031 | 4.9 | 252. | 31. | 50. | -0.02 | -0.04 |
| | 1432 | 8.36 | 145. (152.) | 0.48 | 0.1719 | 5.8 | 237. | 23. | 50. | -0.02 | -0.03 |
| | 2232 | 9.03 | 33. (36.) | 0.23 | 0.1563 | 6.4 | 265. | 28. | 7. | -0.02 | 0.09 |
| 16 Sep 83 | 632 | 9.58 | 50. (127.) | 0.28 | 0.0938 | 10.7 | 280. | 24. | 8. | 0.00 | -0.03 |
| | 1432 | 8.04 | 27. (29.) | 0.21 | 0.1094 | 9.1 | 264. | 23. | 7. | -0.02 | 0.00 |
| | 2232 | 9.51 | 67. (75.) | 0.33 | 0.2500 | 4.0 | 294. | 40. | 21. | -0.02 | 0.08 |
| 17 Sep 83 | 632 | 9.06 | 131. (135.) | 0.46 | 0.2500 | 4.0 | 252. | 32. | 33. | -0.01 | 0.01 |
| | 1432 | 7.99 | 75. (111.)* | 0.35 | 0.1563 | 6.4 | 270. | 24. | 13. | 0.00* | 0.02* |
| | 2232 | 9.92 | 94. (99.) | 0.39 | 0.1094 | 9.1 | 266. | 35. | 16. | -0.02 | 0.04 |
| 18 Sep 83 | 632 | 8.60 | 72. (71.) | 0.34 | 0.1406 | 7.1 | 264. | 26. | 10. | -0.01 | -0.01 |
| | 1432 | 8.14 | 56. (56.) | 0.30 | 0.1094 | 9.1 | 278. | 22. | 15. | -0.05 | 0.05 |
| | 2232 | 10.11 | 54. (124.)* | 0.29 | 0.1406 | 7.1 | 262. | 39. | 11. | 0.01* | 1.05* |
| 19 Sep 83 | 632 | 8.21 | 45. (45.) | 0.27 | 0.1250 | 8.0 | 273. | 32. | 14. | 0.00 | -0.02 |
| | 1432 | 8.46 | 20. (23.) | 0.18 | 0.1250 | 8.0 | 264. | 27. | 6. | -0.06 | 0.03 |
| | 2232 | 10.15 | 23. (27.) | 0.19 | 0.1250 | 8.0 | 249. | 32. | 5. | -0.03 | -0.06 |
| 20 Sep 83 | 632 | 7.88 | 23. (23.) | 0.19 | 0.1250 | 8.0 | 273. | 28. | 7. | 0.00 | -0.04 |
| | 1432 | 8.79 | 20. (19.) | 0.18 | 0.0938 | 10.7 | 270. | 34. | 5. | 0.00 | 0.00 |
| | 2232 | 10.05 | 55. (61.) | 0.30 | 0.0938 | 10.7 | 259. | 47. | 15. | 0.05 | 0.02 |
| 21 Sep 83 | 632 | 7.62 | 75. (64.) | 0.35 | 0.1094 | 9.1 | 259. | 36. | 46. | 0.01 | -0.06 |
| | 1432 | 9.12 | 22. (23.) | 0.19 | 0.0938 | 10.7 | 260. | 27. | 8. | -0.03 | 0.03 |
| | 2232 | 9.83 | 65. (58.) | 0.32 | 0.0938 | 10.7 | 267. | 37. | 24. | -0.02 | -0.02 |
| 22 Sep 83 | 632 | 7.48 | 43. (108.)* | 0.26 | 0.0938 | 10.7 | 263. | 30. | 9. | -0.01* | 0.81* |
| | 1432 | 9.47 | 40. (37.) | 0.25 | 0.0938 | 10.7 | 268. | 25. | 21. | -0.03 | 0.02 |
| | 2232 | 9.51 | 39. (158.)* | 0.25 | 0.0938 | 10.7 | 265. | 33. | 11. | -0.05* | 2.25* |

| DATE | TIME | $\bar{h}$ (m) | $E_T$(cm²) | | $H_{1/3}$(m) | Peak F (sec⁻¹) | Peak T (sec) | $\alpha_o$ | $P(\alpha_o)$ | $E_P$(cm²) | $\bar{U}$ (m/sec) | $\bar{V}$ (m/sec) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 23 Sep 83 | 632 | 7.48 | 37. | (33.) | 0.24 | 0.1094 | 9.1 | 271. | 26. | 14. | -0.02 | 0.05 |
| | 1432 | 9.80 | 33. | (34.) | 0.23 | 0.0938 | 10.7 | 271. | 29. | 10. | 0.01 | 0.04 |
| | 2232 | 9.16 | 25. | (25.) | 0.20 | 0.1094 | 9.1 | 270. | 33. | 7. | 0.03 | -0.01 |
| 24 Sep 83 | 632 | 7.69 | 14. | (12.) | 0.15 | 0.0938 | 10.7 | 256. | 51. | 4. | 0.01 | 0.06 |
| | 1432 | 10.12 | 13. | (76.) | 0.14 | 0.1250 | 8.0 | 245. | 61. | 2. | -0.06 | 0.00 |
| | 2232 | 8.73 | 29. | (29.) | 0.22 | 0.2344 | 4.3 | 225. | 38. | 8. | 0.00 | 0.06 |
| 25 Sep 83 | 632 | 7.97 | 10. | (8.) | 0.12 | 0.0938 | 10.7 | 270. | 38. | 3. | -0.01 | 0.07 |
| | 1432 | 10.34 | 23. | (25.) | 0.19 | 0.0781 | 12.8 | 261. | 43. | 7. | -0.06 | 0.04 |
| | 2232 | 8.30 | 33. | (26.) | 0.23 | 0.0938 | 10.7 | 266. | 28. | 13. | 0.00 | 0.00 |
| 26 Sep 83 | 632 | 8.28 | 26. | (19.) | 0.20 | 0.0781 | 12.8 | 273. | 31. | 11. | -0.04 | 0.07 |
| | 1432 | 10.34 | 30. | (27.) | 0.22 | 0.0938 | 10.7 | 269. | 34. | 11. | -0.03 | -0.01 |
| | 2232 | 7.88 | 34. | (27.) | 0.23 | 0.0781 | 12.8 | 265. | 36. | 11. | -0.01 | 0.02 |
| 27 Sep 83 | 632 | 8.70 | 33. | (26.) | 0.23 | 0.0781 | 12.8 | 267. | 35. | 16. | -0.02 | 0.03 |
| | 1432 | 10.18 | 38. | (101.)* | 0.25 | 0.0938 | 10.7 | 271. | 45. | 14. | -0.01* | -0.05* |
| | 2232 | 7.63 | 43. | (118.)* | 0.26 | 0.0781 | 12.8 | 264. | 39. | 19. | 0.00* | 0.30* |
| 28 Sep 83 | 632 | 9.21 | 137. | (122.) | 0.47 | 0.2188 | 4.6 | 223. | 31. | 31. | -0.01 | 0.01 |
| | 1432 | 9.89 | 273. | (221.) | 0.66 | 0.1563 | 6.4 | 238. | 28. | 66. | -0.04 | -0.03 |
| | 2232 | 7.57 | 70. | (57.) | 0.33 | 0.1719 | 5.8 | 258. | 31. | 12. | -0.02 | 0.01 |
| 29 Sep 83 | 632 | 9.65 | 85. | (126.)* | 0.37 | 0.2500 | 4.0 | 254. | 35. | 12. | 0.00* | 0.02* |
| | 1432 | 9.40 | 59. | (47.) | 0.31 | 0.2344 | 4.3 | 253. | 35. | 13. | -0.01 | -0.03 |
| | 2232 | 7.72 | 19. | (15.) | 0.17 | 0.1094 | 9.1 | 281. | 35. | 3. | -0.01 | 0.03 |
| 30 Sep 83 | 632 | 9.76 | 23. | (17.) | 0.19 | 0.0781 | 12.8 | 258. | 44. | 3. | 0.00 | 0.03 |
| | 1432 | 8.79 | 17. | (13.) | 0.16 | 0.1875 | 5.3 | 251. | 35. | 2. | -0.01 | -0.03 |
| | 2232 | 8.31 | 9. | (8.) | 0.12 | 0.0938 | 10.7 | 264. | 40. | 3. | -0.02 | 0.04 |
| 01 Oct 83 | 632 | 10.03 | 11. | (10.) | 0.13 | 0.0938 | 10.7 | 267. | 66. | 2. | 0.00 | 0.05 |
| | 1432 | 8.22 | 6. | (5.) | 0.10 | 0.1094 | 9.1 | 260. | 43. | 1. | -0.01 | -0.03 |
| | 2232 | 8.99 | 5. | (5.) | 0.09 | 0.1094 | 9.1 | 264. | 44. | 1. | -0.02 | 0.08 |

| DATE | TIME | $\bar{h}$ (m) | $E_T$(cm$^2$) | | $H_{1/3}$(m) | Peak F (sec$^{-1}$) | Peak T (sec) | $\alpha_o$ | P($\alpha_o$) | $E_P$(cm$^2$) | $\bar{U}$ (m/sec) | $\bar{V}$ (m/sec) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 02 Oct 83 | 632 | 9.65 | 9. | (6.) | 0.12 | 0.0938 | 10.7 | 268. | 42. | 2. | 0.00 | -0.02 |
| | 1432 | 7.65 | 9. | (37.)* | 0.12 | 0.1094 | 9.1 | 257. | 50. | 2. | 0.00* | -0.03* |
| | 2232 | 9.70 | 14. | (88.)* | 0.15 | 0.0781 | 12.8 | 266. | 57. | 4. | -0.03* | 0.06* |
| 03 Oct 83 | 632 | 9.10 | 26. | (20.) | 0.21 | 0.1094 | 9.1 | 270. | 38. | 5. | 0.02 | 0.01 |
| | 1432 | 7.45 | 21. | (12.) | 0.18 | 0.1094 | 9.1 | 276. | 48. | 5. | -0.01 | 0.05 |
| | 2232 | 10.29 | 19. | (12.) | 0.17 | 0.0781 | 12.8 | 265. | 58. | 5. | -0.01 | 0.04 |
| 04 Oct 83 | 632 | 8.38 | 12. | (8.) | 0.14 | 0.0781 | 12.8 | 269. | 51. | 4. | 0.01 | 0.02 |
| | 1432 | 7.83 | 8. | (6.) | 0.11 | 0.0781 | 12.8 | 262. | 41. | 3. | -0.03 | 0.01 |
| | 2232 | 10.70 | 10. | (9.) | 0.13 | 0.0781 | 12.8 | 285. | 56. | 3. | 0.00 | -0.01 |
| 05 Oct 83 | 632 | 7.90 | 26. | (15.) | 0.20 | 0.0781 | 12.8 | 267. | 51. | 5. | 0.01 | -0.02 |
| | 1432 | 8.61 | 40. | (30.) | 0.25 | 0.1563 | 6.4 | 244. | 35. | 9. | -0.07 | 0.04 |
| | 2232 | 10.62 | 52. | (38.) | 0.29 | 0.2500 | 4.0 | 283. | 45. | 8. | 0.00 | 0.01 |
| 06 Oct 83 | 632 | 7.27 | 16. | (10.) | 0.16 | 0.0781 | 12.8 | 264. | 47. | 6. | 0.00 | -0.01 |
| | 1432 | 9.25 | 10. | (7.) | 0.13 | 0.0781 | 12.8 | 259. | 52. | 4. | 0.00 | 0.04 |
| | 2232 | 10.08 | 14. | (10.) | 0.15 | 0.0781 | 12.8 | 276. | 52. | 5. | -0.03 | 0.02 |
| 07 Oct 83 | 632 | 7.03 | 8. | (5.) | 0.11 | 0.0781 | 12.8 | 273. | 45. | 3. | 0.00 | -0.01 |
| | 1432 | 9.98 | 8. | (7.) | 0.11 | 0.0781 | 12.8 | 250. | 45. | 3. | -0.03 | 0.03 |
| | 2232 | 9.35 | 7. | (364.)* | 0.11 | 0.0781 | 12.8 | 256. | 75. | 2. | 0.00* | 0.09* |
| 08 Oct 83 | 632 | 7.29 | 7. | (3.) | 0.11 | 0.0781 | 12.8 | 261. | 51. | 2. | 0.00 | 0.02 |
| | 1432 | 10.47 | 19. | (11.) | 0.17 | 0.2500 | 4.0 | 267. | 51. | 5. | -0.01 | 0.01 |
| | 2232 | 8.63 | 8. | (5.) | 0.11 | 0.0938 | 10.7 | 252. | 50. | 2. | 0.00 | 0.00 |
| 09 Oct 83 | 632 | 7.76 | 10. | (4.) | 0.13 | 0.0938 | 10.7 | 252. | 52. | 3. | -0.01 | 0.05 |
| | 1432 | 10.70 | 309. | (441.)* | 0.70 | 0.2031 | 4.9 | 227. | 41. | 88. | -0.01* | 0.15* |
| | 2232 | 8.08 | 105. | (151.)* | 0.41 | 0.1719 | 5.8 | 257. | 39. | 30. | 0.01* | -0.01* |
| 10 Oct 83 | 632 | 8.51 | 269. | (176.) | 0.66 | 0.1719 | 5.8 | 248. | 35. | 89. | -0.01 | 0.01 |
| | 1432 | 10.69 | 495. | (318.) | 0.89 | 0.1563 | 6.4 | 241. | 37. | 110. | -0.01 | -0.01 |
| | 2232 | 7.80 | 132. | (86.) | 0.46 | 0.2500 | 4.0 | 245. | 34. | 21. | 0.00 | -0.04 |

| DATE | TIME | $\bar{h}$ (m) | $E_T$(cm$^2$) | | $H_{1/3}$(m) | Peak F (sec$^{-1}$) | Peak T (sec) | $\alpha_o$ | P($\alpha_o$) | $E_P$(cm$^2$) | $\bar{U}$ (m/sec) | $\bar{V}$ (m/sec) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 11 Oct 83 | 632 | 9.19 | 95. | (59.) | 0.39 | 0.1563 | 6.4 | 255. | 40. | 15. | -0.02 | 0.03 |
| | 1432 | 10.28 | 265. | (149.) | 0.65 | 0.2500 | 4.0 | 271. | 40. | 85. | -0.01 | -0.04 |
| | 2232 | 7.60 | 284. | (166.) | 0.67 | 0.2500 | 4.0 | 285. | 39. | 64. | -0.03 | -0.05 |
| 12 Oct 83 | 632 | 9.51 | 164. | (105.)* | 0.51 | 0.2500 | 4.0 | 258. | 38. | 40. | -0.01 | 1.01* |
| | 1432 | 9.64 | 110. | (61.) | 0.42 | 0.2500 | 4.0 | 256. | 59. | 17. | 0.00 | -0.03 |
| | 2232 | 7.72 | 299. | (171.) | 0.69 | 0.2031 | 4.9 | 293. | 44. | 88. | -0.03 | 0.03 |
| 13 Oct 83** | 632 | 9.77 | 223. | (80.) | 0.60 | 0.2500 | 4.0 | ---- | 5. | 30. | -0.01 | 0.06** |
| | 1432 | 9.02 | 120. | (66.) | 0.44 | 0.1406 | 7.1 | 266. | 51. | 19. | -0.01 | -0.01 |
| | 2232 | 8.07 | 71. | (35.) | 0.34 | 0.1094 | 9.1 | 278. | 50. | 18. | 0.00 | 0.01 |
| 14 Oct 83 | 632 | 9.78 | 99. | (43.) | 0.40 | 0.0938 | 10.7 | 269. | 53. | 24. | 0.01 | 0.04 |
| | 1432 | 8.49 | 55. | (71.) | 0.30 | 0.1250 | 8.0 | 276. | 42. | 17. | 0.00 | 0.00 |
| | 2232 | 8.58 | 36. | (58.) | 0.24 | 0.1094 | 9.1 | 265. | 49. | 16. | -0.01 | 0.00 |
| 15 Oct 83 | 632 | 9.55 | 23. | (69.) | 0.19 | 0.1094 | 9.1 | 261. | 58. | 7. | -0.01 | -0.01 |
| | 1432 | 8.16 | 14. | (7.) | 0.15 | 0.1094 | 9.1 | 269. | 52. | 5. | 0.00 | -0.01 |
| | 2232 | 9.12 | 64. | (33.) | 0.32 | 0.2188 | 4.6 | 212. | 43. | 11. | -0.01 | 0.01 |
| 16 Oct 83 | 632 | 9.37 | 56. | (27.) | 0.30 | 0.1875 | 5.3 | 232. | 47. | 16. | -0.01 | -0.02 |
| | ** 1417 | 7.76 | 27. | (8.) | 0.21 | 0.0156 | 64.0 | ---- | 6. | 10. | -0.15 | 0.07** |
| 17 Oct 83 | 632 | 9.08 | 44. | (14.) | 0.27 | 0.2500 | 4.0 | 227. | 54. | 8. | -0.01 | -0.02 |
| | 1432 | 8.11 | 17. | (38.) | 0.16 | 0.0938 | 10.7 | 267. | 61. | 4. | -0.01 | 0.01 |
| | 2232 | 9.89 | 23. | (8.) | 0.19 | 0.0938 | 10.7 | 260. | 62. | 11. | -0.01 | 0.02 |
| 18 Oct 83 | 632 | 8.58 | 19. | (8.) | 0.17 | 0.0938 | 10.7 | 272. | 58. | 5. | 0.00 | 0.00 |
| | 1432 | 8.14 | 12. | (5.) | 0.14 | 0.0938 | 10.7 | 278. | 57. | 4. | -0.01 | 0.01 |
| | 2232 | 10.06 | 17. | (7.) | 0.17 | 0.0938 | 10.7 | 273. | 57. | 4. | 0.00 | 0.00 |
| 19 Oct 83 | 632 | 8.37 | 66. | (29.) | 0.33 | 0.2500 | 4.0 | 220. | 46. | 23. | 0.00 | -0.01 |
| | 1432 | 8.52 | 49. | (22.) | 0.28 | 0.2500 | 4.0 | 238. | 47. | 9. | -0.02 | 0.01 |
| | 2232 | 10.24 | 46. | (354.)* | 0.27 | 0.2344 | 4.3 | 225. | 51. | 13. | -0.01* | 3.06* |
| 20 Oct 83 | 632 | 8.15 | 220. | (95.) | 0.59 | 0.1563 | 6.4 | 238. | 49. | 54. | 0.01 | -0.03 |
| | 1432 | 8.87 | 218. | (99.) | 0.59 | 0.1563 | 6.4 | 226. | 48. | 44. | -0.01 | 0.00 |
| | 2232 | 10.09 | 299. | (131.) | 0.69 | 0.1563 | 6.4 | 248. | 47. | 58. | 0.00 | -0.01 |

| DATE | TIME | $\bar{h}$ (m) | $E_T$ ($cm^2$) | $H_{1/3}$ (m) | Peak F ($sec^{-1}$) | Peak T (sec) | $\alpha_o$ | $P(\alpha_o)$ | $E_P$ ($cm^2$) | $\bar{U}$ (m/sec) | $\bar{V}$ (m/sec) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 21 Oct 83 | 632 | 7.87 | 235. (101.) | 0.61 | 0.1719 | 5.8 | 263. | 52. | 66. | 0.01 | -0.04 |
| | 1432 | 9.33 | 566. (223.) | 0.95 | 0.1406 | 7.1 | 256. | 48. | 167. | -0.04 | -0.04 |
| | 2232 | 9.80 | 575. (242.) | 0.96 | 0.1406 | 7.1 | 251. | 50. | 90. | 0.00 | -0.02 |
| 22 Oct 83 | 632 | 7.74 | 239. (92.) | 0.62 | 0.1250 | 8.0 | 266. | 53. | 64. | -0.02 | -0.04 |
| | 1432 | 9.61 | 227. (95.) | 0.60 | 0.1094 | 9.1 | 265. | 50. | 37. | -0.01 | 0.01 |
| | 2232 | 9.42 | 340. (136.) | 0.74 | 0.1250 | 8.0 | 273. | 49. | 69. | 0.00 | -0.03 |
| 23 Oct 83 | 632 | 7.61 | 224. (96.) | 0.60 | 0.0938 | 10.7 | 277. | 50. | 70. | -0.01 | -0.01 |
| | 1432 | 9.99 | 334. (134.) | 0.73 | 0.0938 | 10.7 | 268. | 51. | 109. | -0.04 | 0.00 |
| | 2232 | 8.99 | 268. (104.) | 0.65 | 0.0781 | 12.8 | 273. | 50. | 84. | -0.02 | -0.02 |
| 24 Oct 83 | 632 | 7.72 | 270. (102.) | 0.66 | 0.0781 | 12.8 | 274. | 53. | 100. | -0.02 | 0.02 |
| | 1432 | 10.52 | 1534. (533.) | 1.57 | 0.1406 | 7.1 | 239. | 54. | 523. | 0.01 | -0.03 |
| | 2232 | 8.67 | 1704. (724.) | 1.65 | 0.1250 | 8.0 | 255. | 47. | 370. | 0.01 | 0.08 |
| 25 Oct 83 | 632 | 8.39 | 1212. (635.) | 1.39 | 0.1094 | 9.1 | 260. | 48. | 279. | 0.00 | -0.06 |
| | 1432 | 10.75 | 2160. (872.) | 1.86 | 0.1094 | 9.1 | 252. | 49. | 475. | 0.00 | -0.01 |
| | 2232 | 8.34 | 865. (359.) | 1.18 | 0.1094 | 9.1 | 265. | 50. | 231. | 0.00 | -0.05 |
| 26 Oct 83 | 632 | 8.67 | 848. (380.) | 1.16 | 0.0938 | 10.7 | 270. | 47. | 236. | -0.01 | 0.03 |
| | 1432 | 10.50 | 895. (400.) | 1.20 | 0.0781 | 12.8 | 277. | 49. | 308. | 0.00 | -0.01 |
| | 2232 | 7.62 | 187. (70.) | 0.55 | 0.0781 | 12.8 | 267. | 53. | 60. | 0.00 | -0.01 |
| 27 Oct 83 | 632 | 8.99 | 96. (30.) | 0.39 | 0.0781 | 12.8 | 262. | 57. | 39. | -0.01 | 0.02 |
| MEAN | | 8.92 | 120. (74.) | | | | | | | -0.01 | 0.01 |
| S.D. | | 1.00 | 277. (131.) | | | | | | | 0.02 | 0.04 |

been light at first and accumulated through the deployment period. 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. We will address this more thoroughly in the final report.

We encountered a new problem with reduction of the 635-12 data, which is apparent in this wave summary (Appendix I). Velocity variances (hence directional estimates) are questionable for a number of runs because of a difficulty in separating error records from velocity roll-overs, a problem peculiar to the 635-12 (this roll-over does not occur in the 635-9, the instrument used for the first two months of data acquisition). Software changes have been tested to resolve this problem; the questionable data will be corrected in the final report.

Wave propogation for the most part was toward the west ( $260^{o}$ TN) with an occasional shift toward the northwest or southwest during locally generated events. Mean current flow for the period was toward the northeast ( $050^{o}$ TN) again suggesting a clockwise general mean circulation in Cape Cod Bay. Further data now being collected will aid in establishing mean flow behavior.

A storm on 24-25 October 1983 provides the most energetic data to date. Preceded by a fairly active period from 20 October - 23 October, this storm produced a peak significant wave height of 1.86 m and a peak total energy variance of 2160 $cm^2$ during the 25 October 1983, 1432 measurement. Winds for the storm were forecast E/NE 30-35 mph by NOAA weather radio, which agrees with the directions of wave propagation of 239° - 277° TN and wave periods of 7.1 - 12.8 seconds. These data are plotted and included as Appendix I.

In conclusion, for the measurement period, wave energy was low, except for one storm event on 24-25 October 1983. The data from this storm as well as on site observations of large amounts of suspended material in the water column two days later on 27 October, when the instrument was retrieved, indicate that significant sand transport occurs in this area during storm conditions. However, sand cover in the vicinity of the tripod did not appear to have changed, and small scale sand ripples (<15 cm) were still observed. In comparison with wave data from June - August 1983 that was collected at this same site, the present data shows higher energy overall, with one major storm event, and several more minor events. The largest waves uniformly approach from the east-northeast, with a minor higher-frequency mode from the southeast.

## 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.

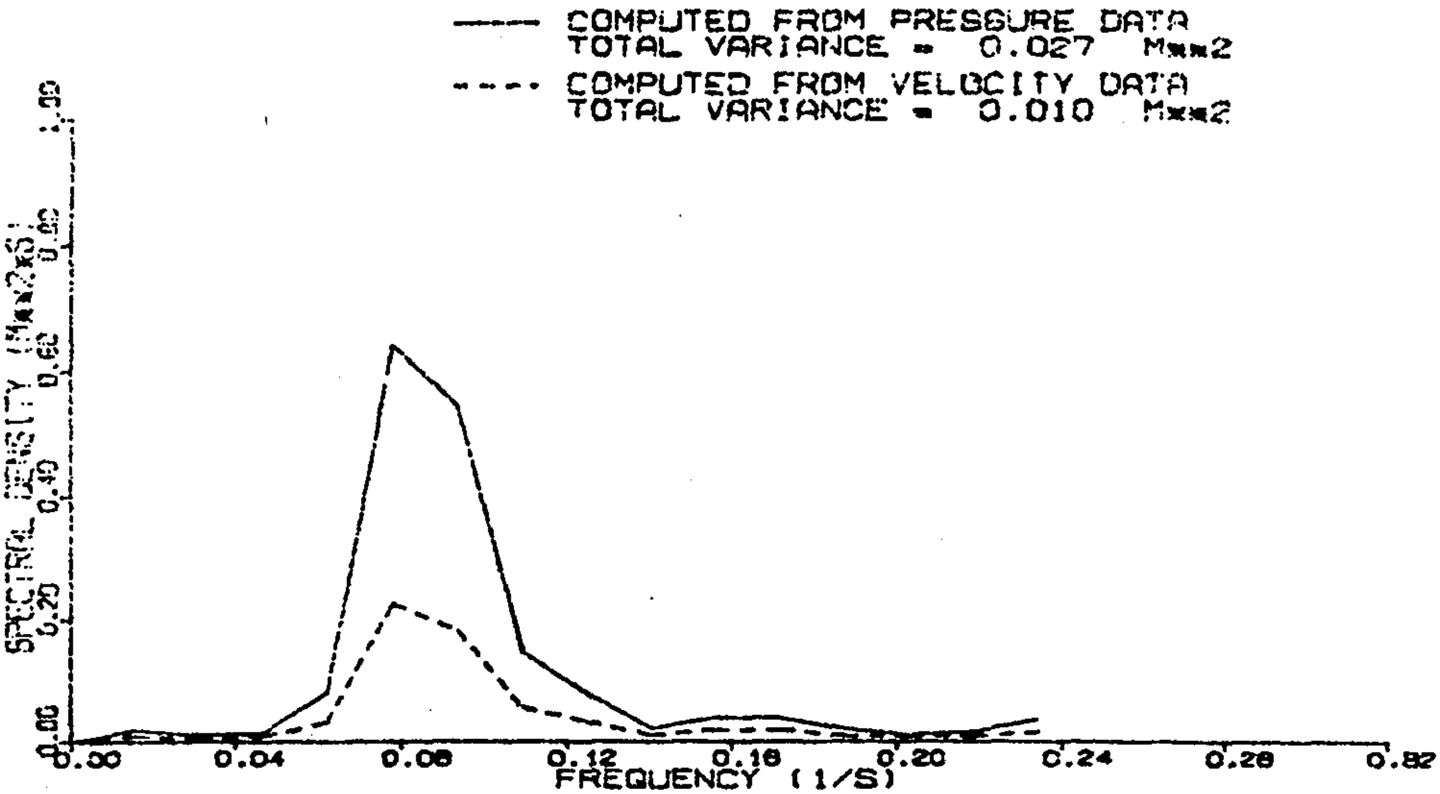
## APPENDIX I

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: 24/10/83 RUN: 632

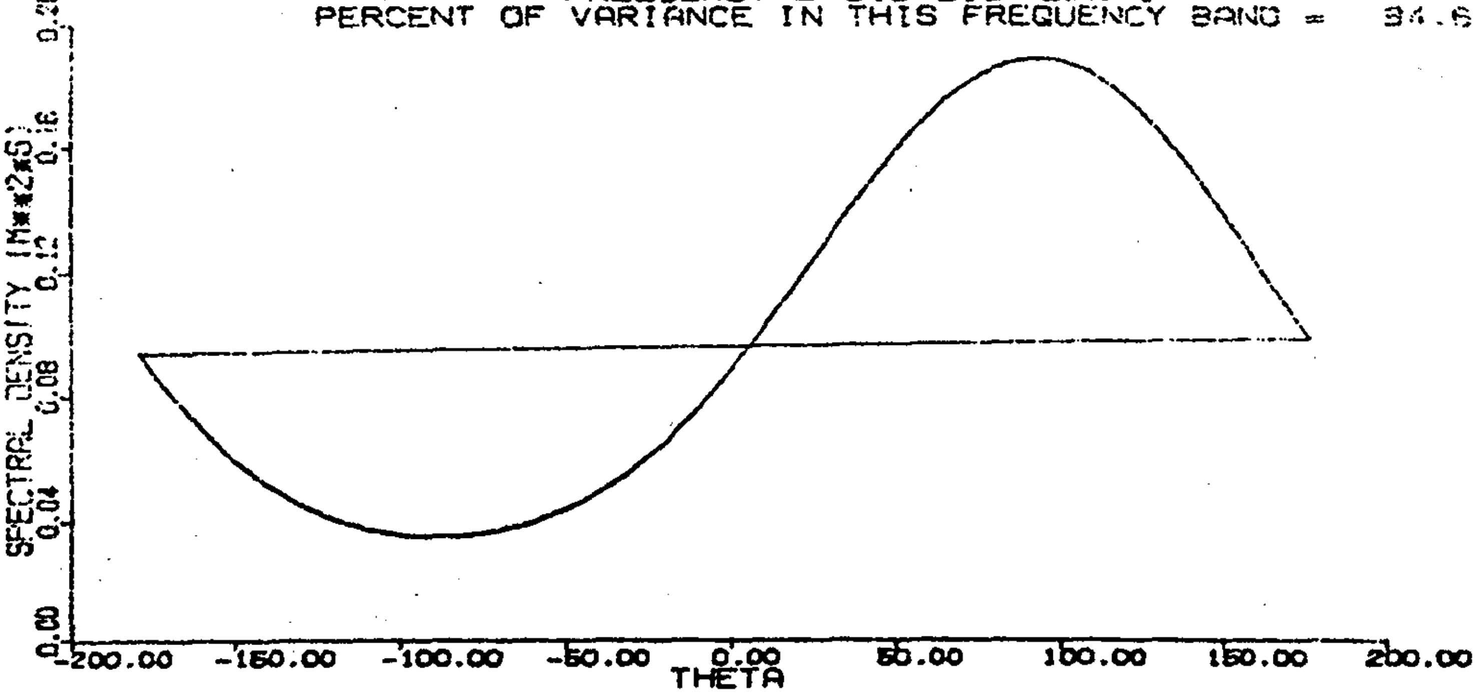
SEA SURFACE SPECTRUM

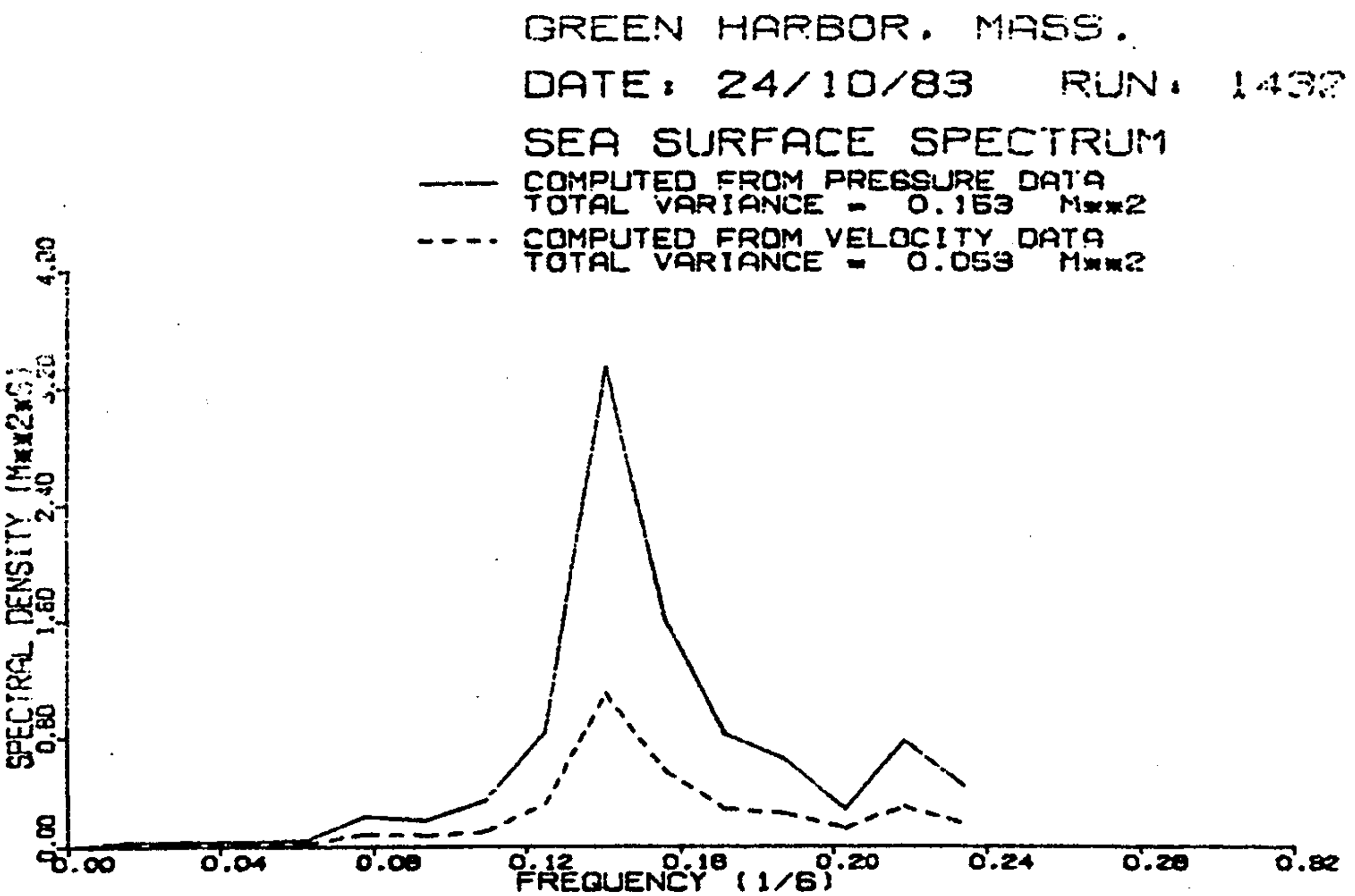


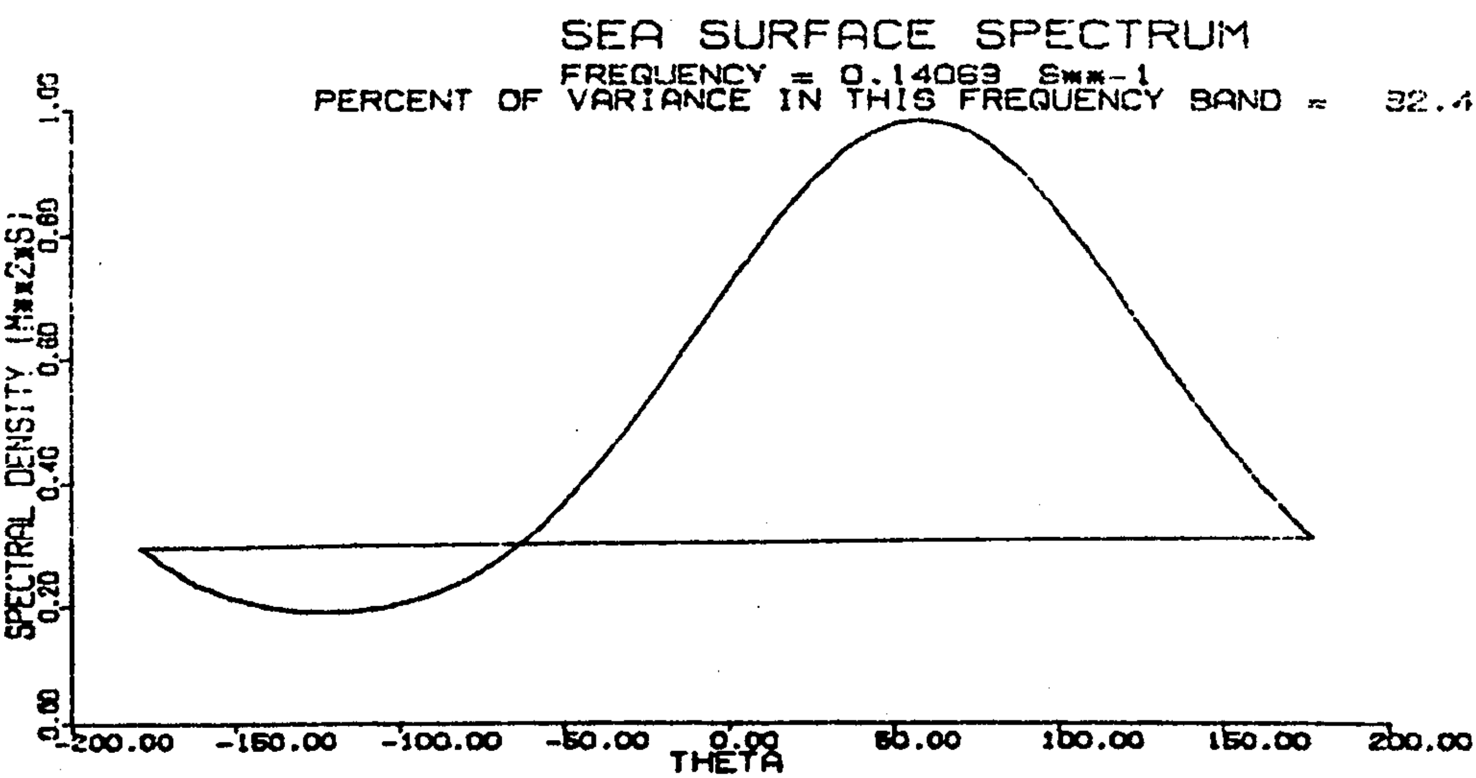

SEA SURFACE SPECTRUM

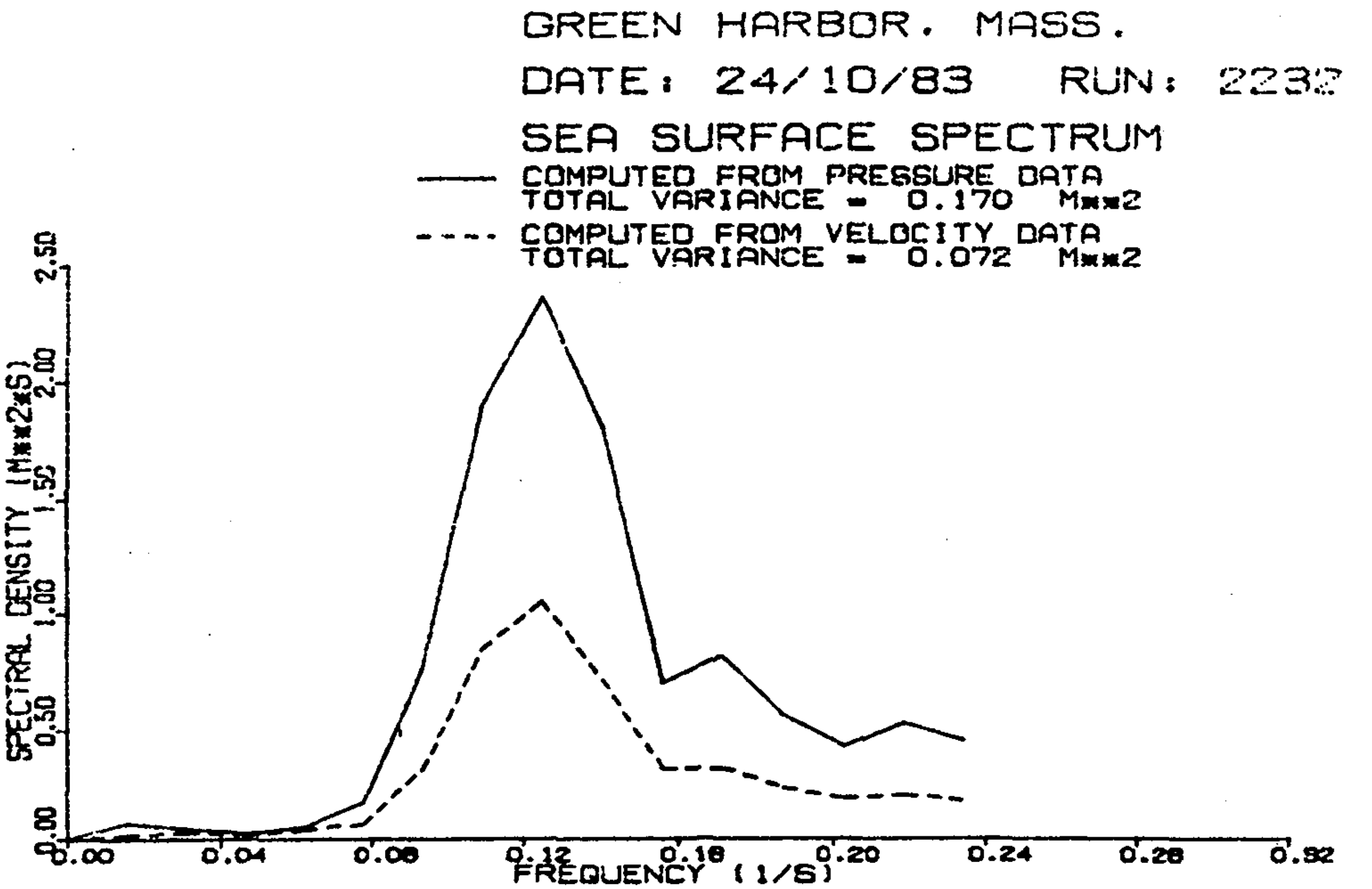
FREQUENCY = 0.07813 S**-1

PERCENT OF VARIANCE IN THIS FREQUENCY BAND = 34.6

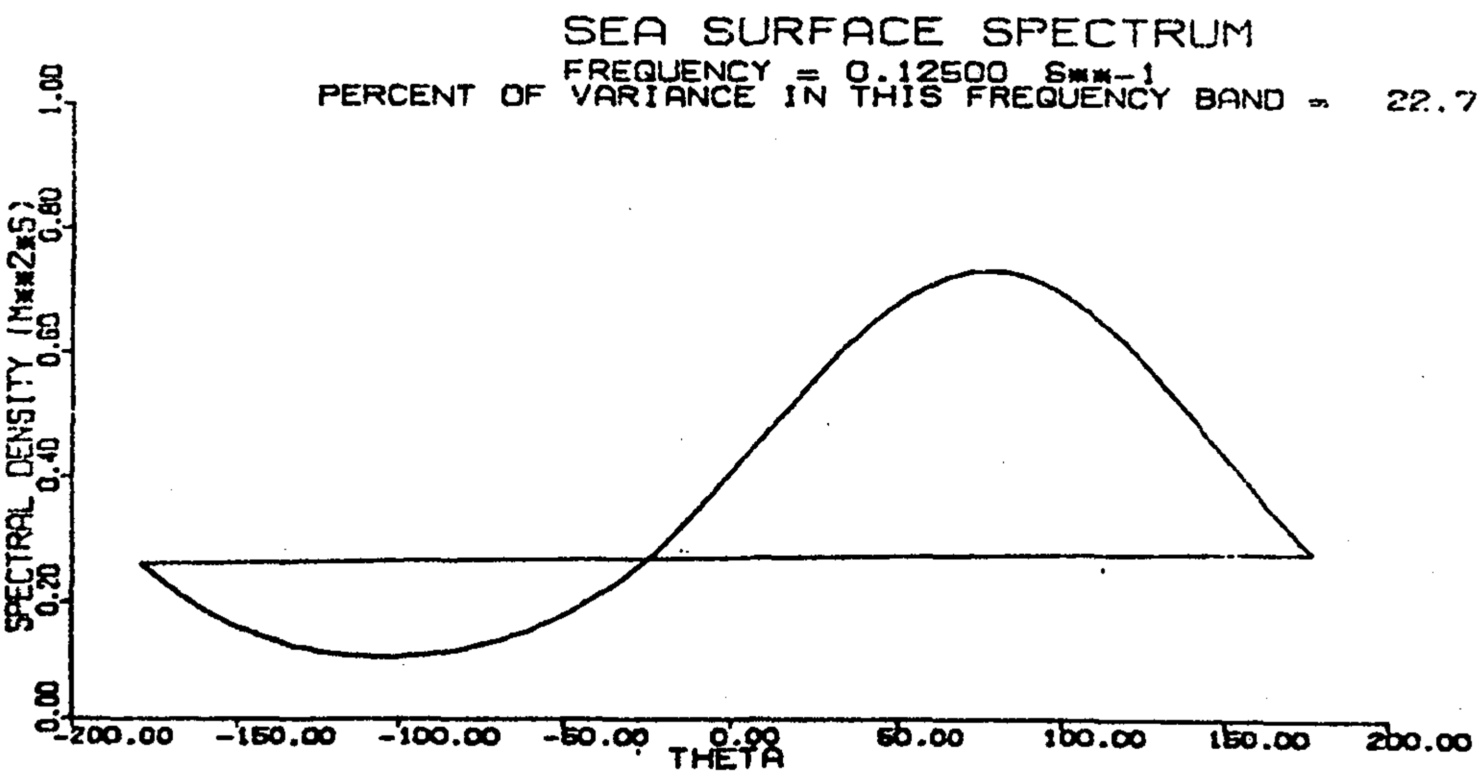



GREEN HARBOR, MASS.
DATE: 24/10/83 RUN: 1437
SEA SURFACE SPECTRUM
COMPUTED FROM PRESSURE DATA
TOTAL VARIANCE = 0.153 M**2
COMPUTED FROM VELOCITY DATA
TOTAL VARIANCE = 0.053 M**2
SPECTRAL DENSITY (M**2*S)
0.00
0.80
1.60
2.40
3.20
4.00
0.00
0.04
0.08
0.12
0.16
0.20
0.24
0.28
0.32
FREQUENCY (1/S)

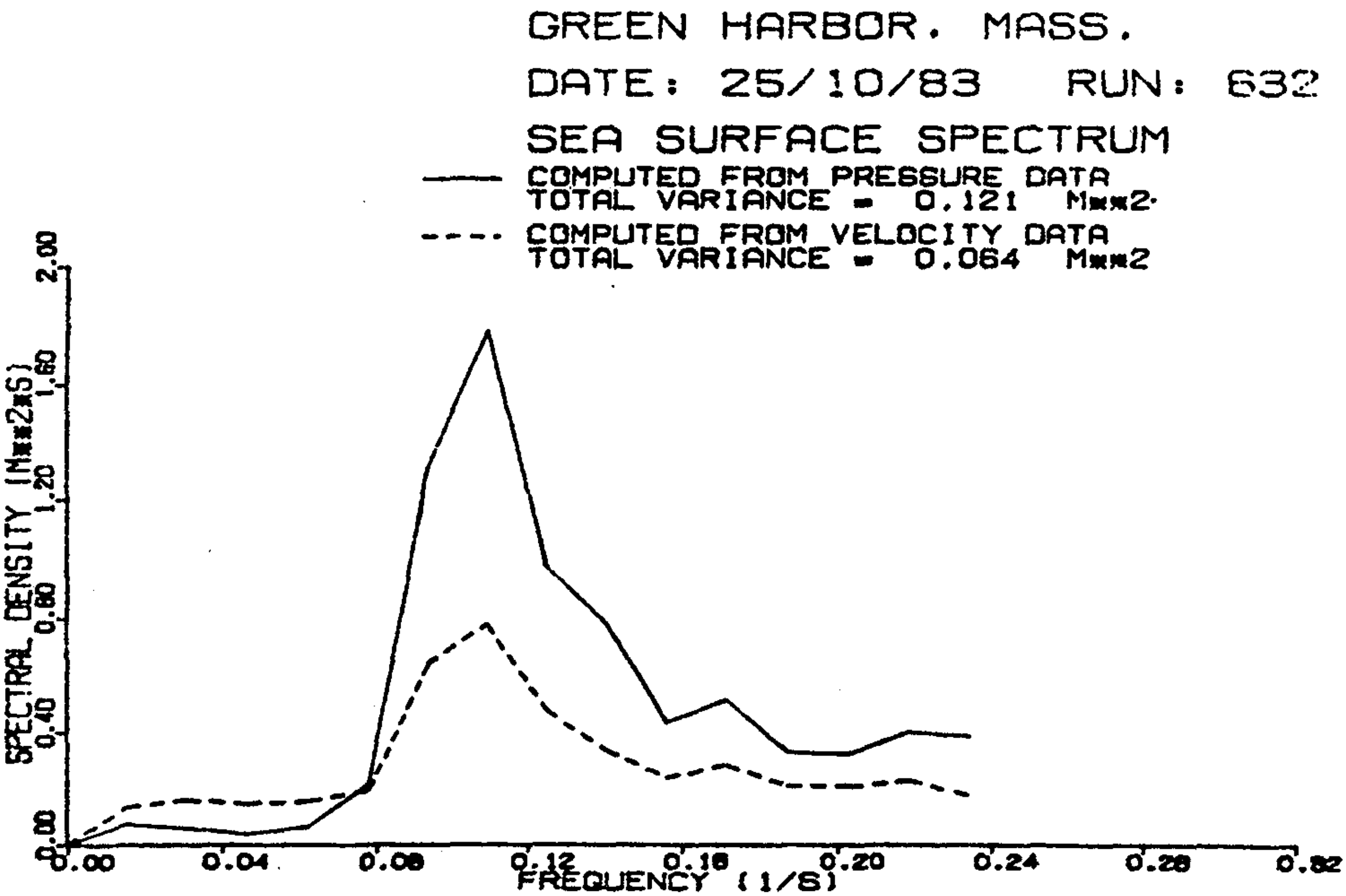

SEA SURFACE SPECTRUM
FREQUENCY = 0.14063 S**-1
PERCENT OF VARIANCE IN THIS FREQUENCY BAND = 32.4
SPECTRAL DENSITY (M**2*S)
0.00
0.20
0.40
0.60
0.80
1.00
-200.00
-150.00
-100.00
-50.00
0.00
50.00
100.00
150.00
200.00
THETA

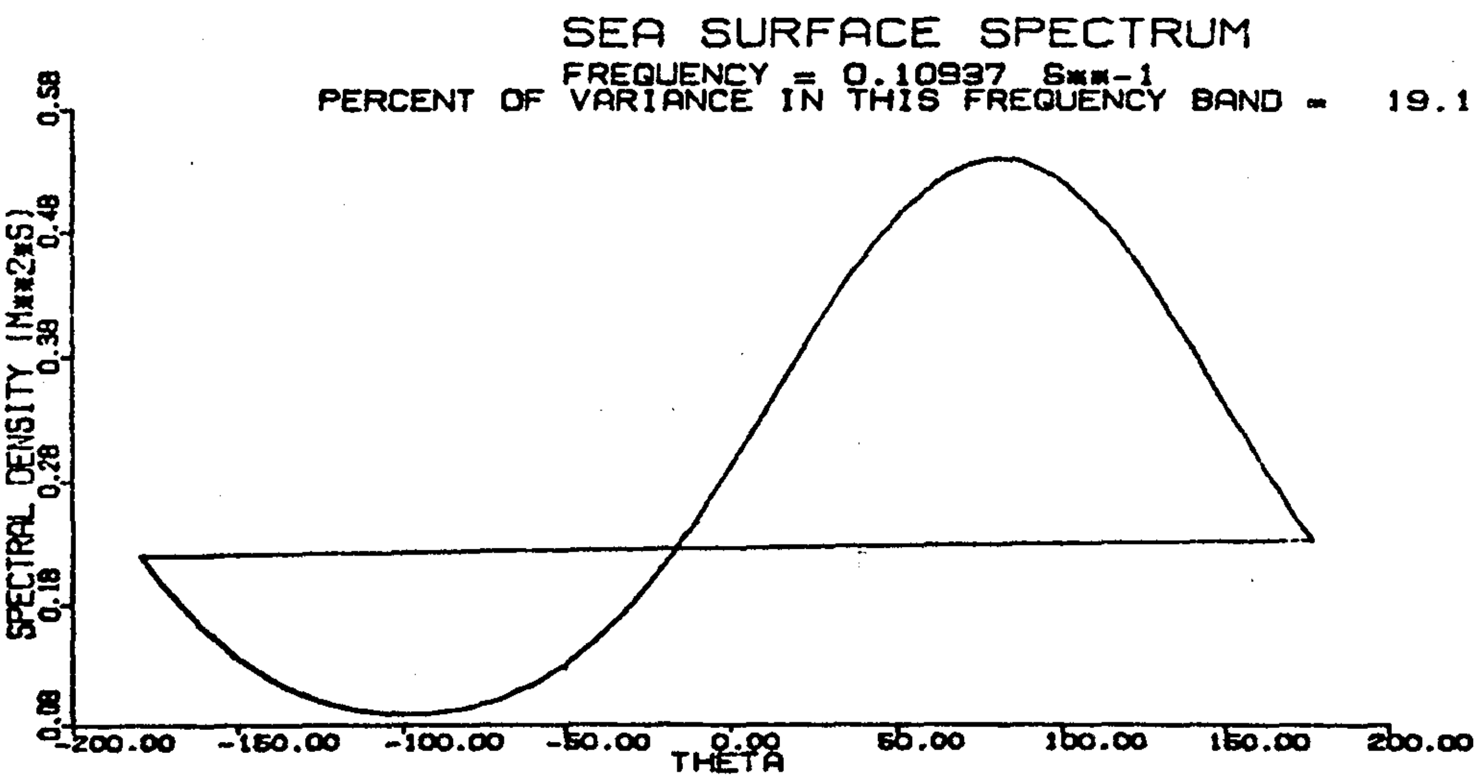


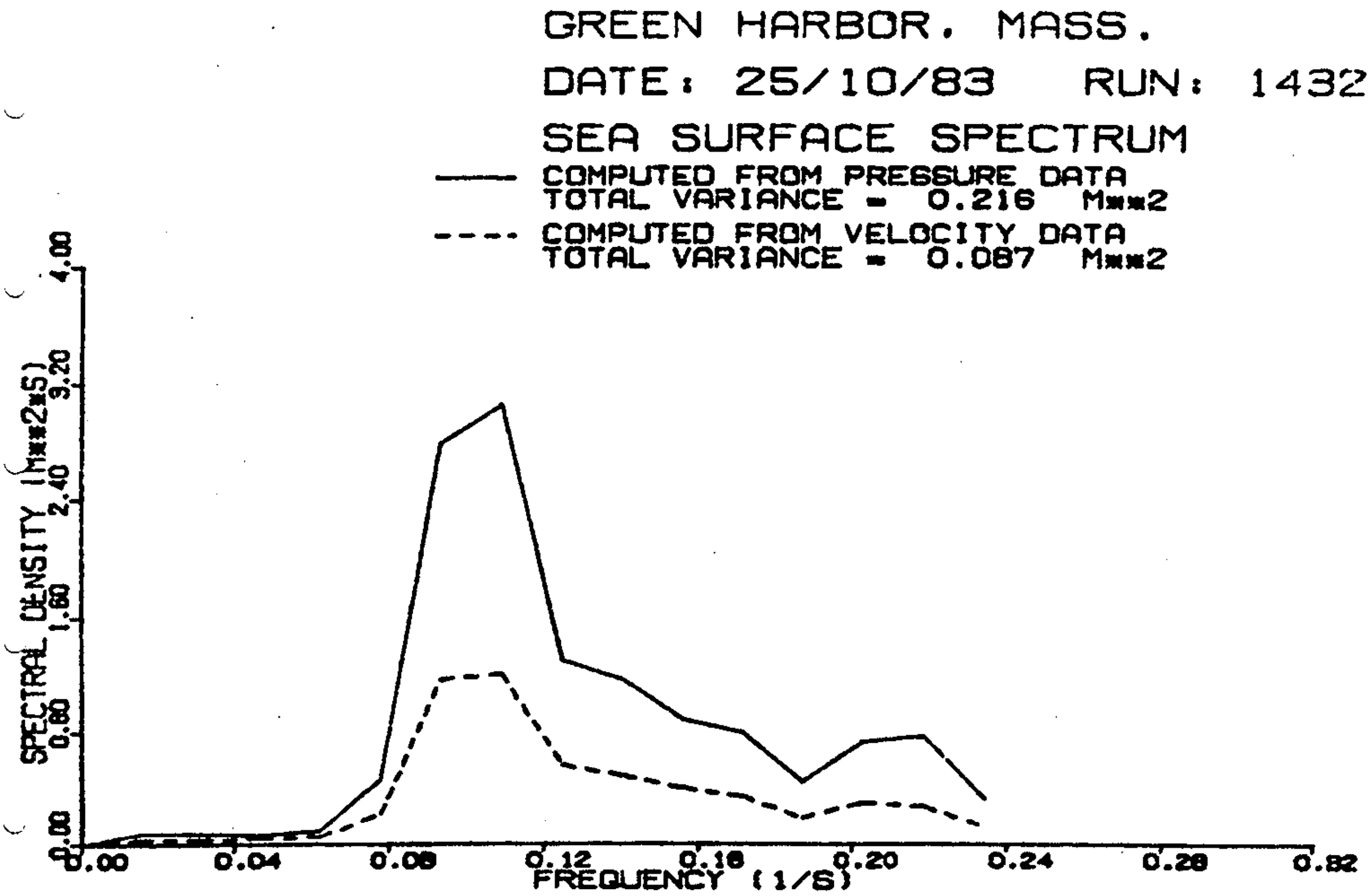
GREEN HARBOR. MASS.
DATE: 24/10/83 RUN: 2232
SEA SURFACE SPECTRUM
COMPUTED FROM PRESSURE DATA
TOTAL VARIANCE = 0.170 M**2
COMPUTED FROM VELOCITY DATA
TOTAL VARIANCE = 0.072 M**2
SPECTRAL DENSITY (M**2*S)
0.00
0.50
1.00
1.50
2.00
2.50
0.00
0.04
0.08
0.12
0.16
0.20
0.24
0.28
0.32
FREQUENCY (1/S)

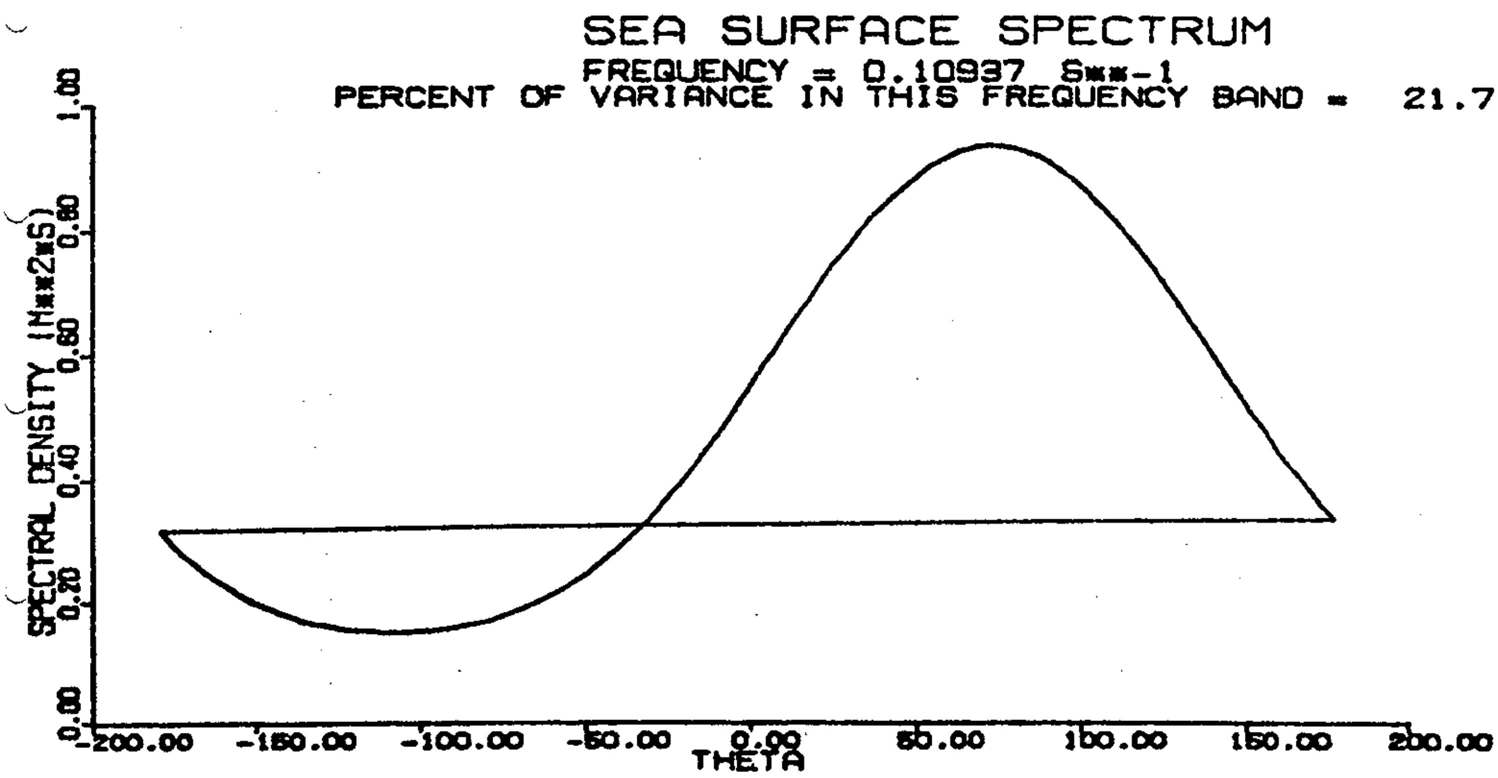



SEA SURFACE SPECTRUM
FREQUENCY = 0.12500 S**-1
PERCENT OF VARIANCE IN THIS FREQUENCY BAND = 22.7
SPECTRAL DENSITY (M**2*S)
0.00
0.20
0.40
0.60
0.80
1.00
-200.00
-150.00
-100.00
-50.00
0.00
50.00
100.00
150.00
200.00
THETA


GREEN HARBOR. MASS.
DATE: 25/10/83 RUN: 632
SEA SURFACE SPECTRUM
COMPUTED FROM PRESSURE DATA
TOTAL VARIANCE = 0.121 M**2
COMPUTED FROM VELOCITY DATA
TOTAL VARIANCE = 0.064 M**2
SPECTRAL DENSITY (M**2*S)
FREQUENCY (1/S)
0.00
0.40
0.80
1.20
1.60
2.00
0.04
0.08
0.12
0.16
0.20
0.24
0.28
0.32


SEA SURFACE SPECTRUM
FREQUENCY = 0.10937 S**-1
PERCENT OF VARIANCE IN THIS FREQUENCY BAND = 19.1
SPECTRAL DENSITY (M**2*S)
THETA
-200.00
-150.00
-100.00
-50.00
0.00
50.00
100.00
150.00
200.00

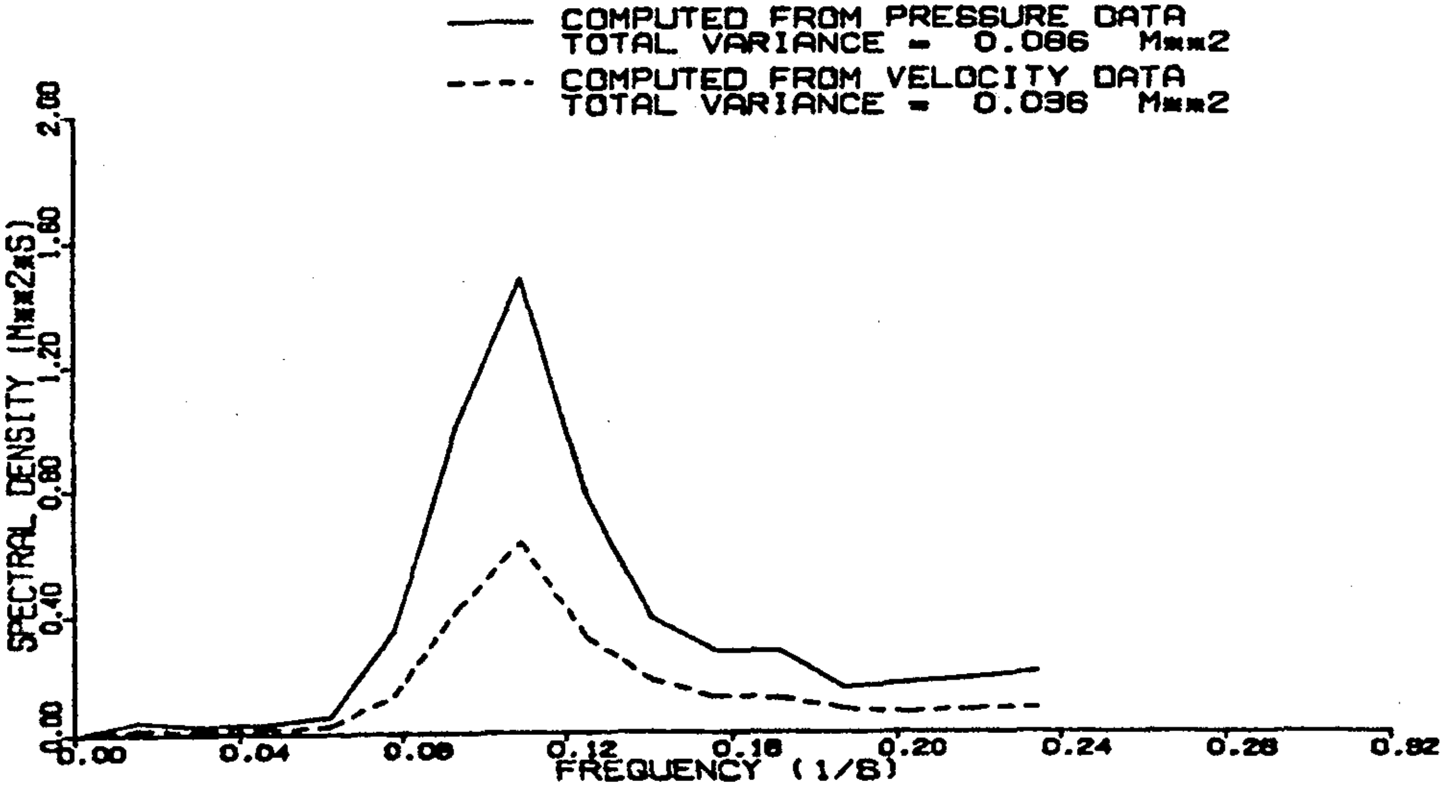

GREEN HARBOR, MASS.
DATE: 25/10/83 RUN: 1432
SEA SURFACE SPECTRUM
COMPUTED FROM PRESSURE DATA
TOTAL VARIANCE = 0.216 M**2
COMPUTED FROM VELOCITY DATA
TOTAL VARIANCE = 0.087 M**2
SPECTRAL DENSITY (M**2*S)
FREQUENCY (1/S)


SEA SURFACE SPECTRUM
FREQUENCY = 0.10937 S**-1
PERCENT OF VARIANCE IN THIS FREQUENCY BAND = 21.7
SPECTRAL DENSITY (M**2*S)
THETA

GREEN HARBOR, MASS.

DATE: 25/10/83    RUN: 2232

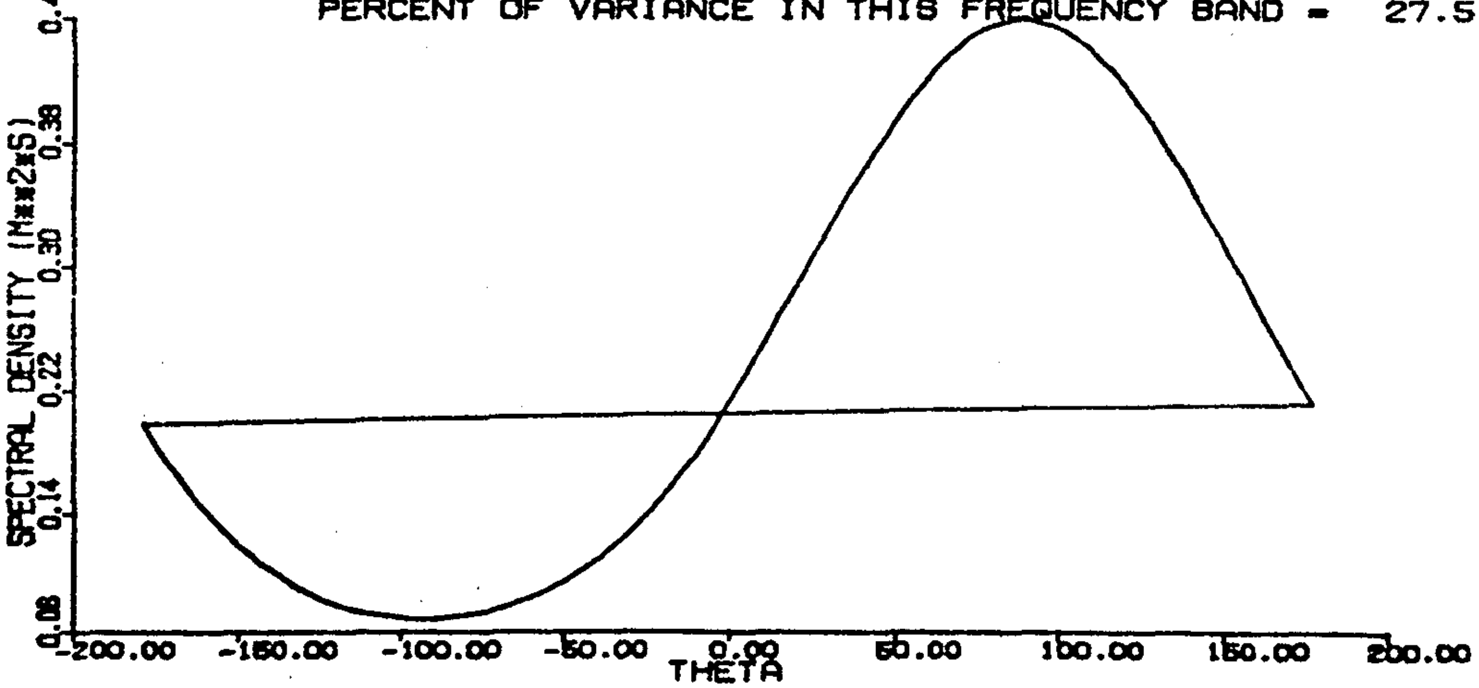
SEA SURFACE SPECTRUM

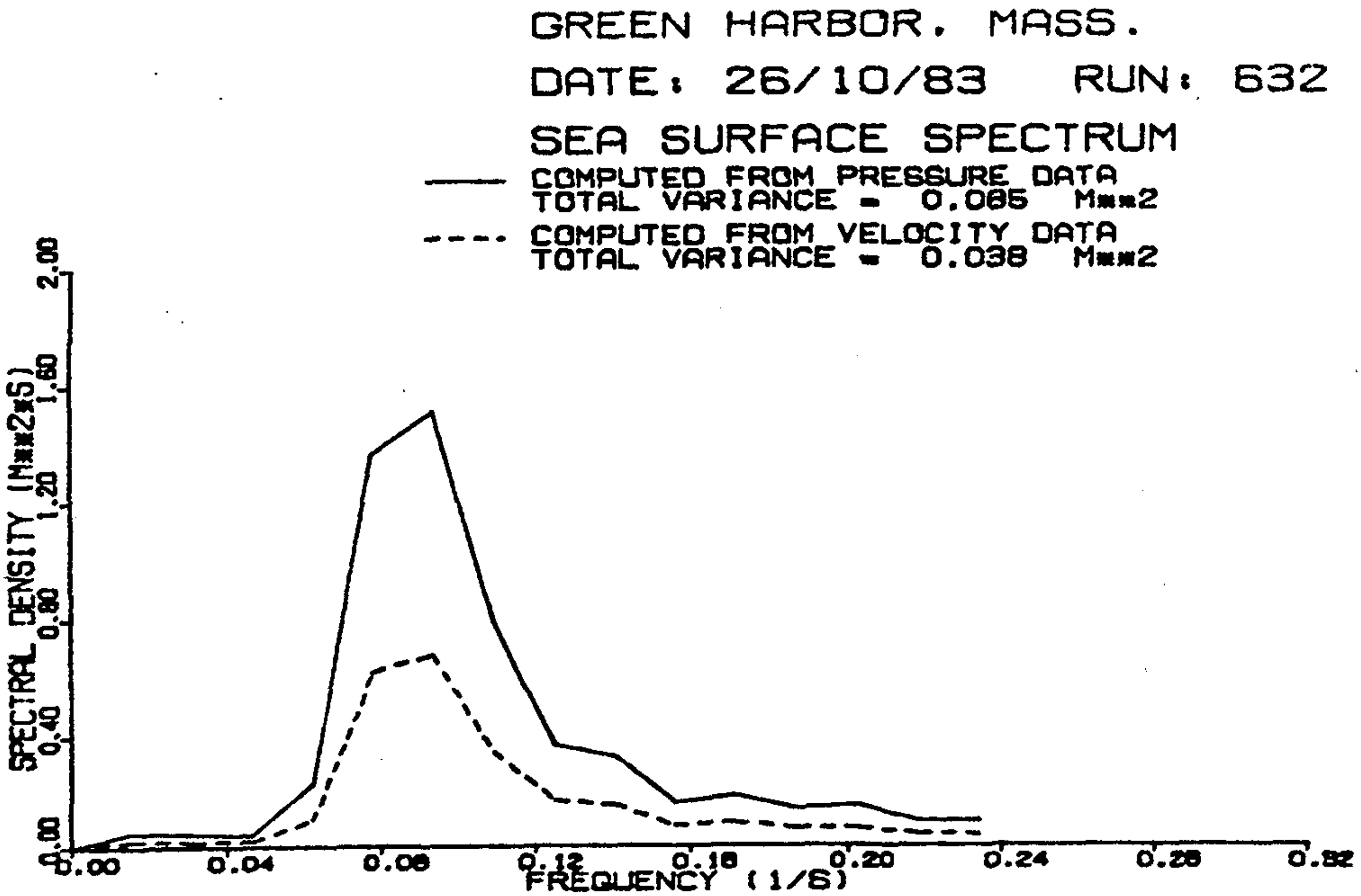


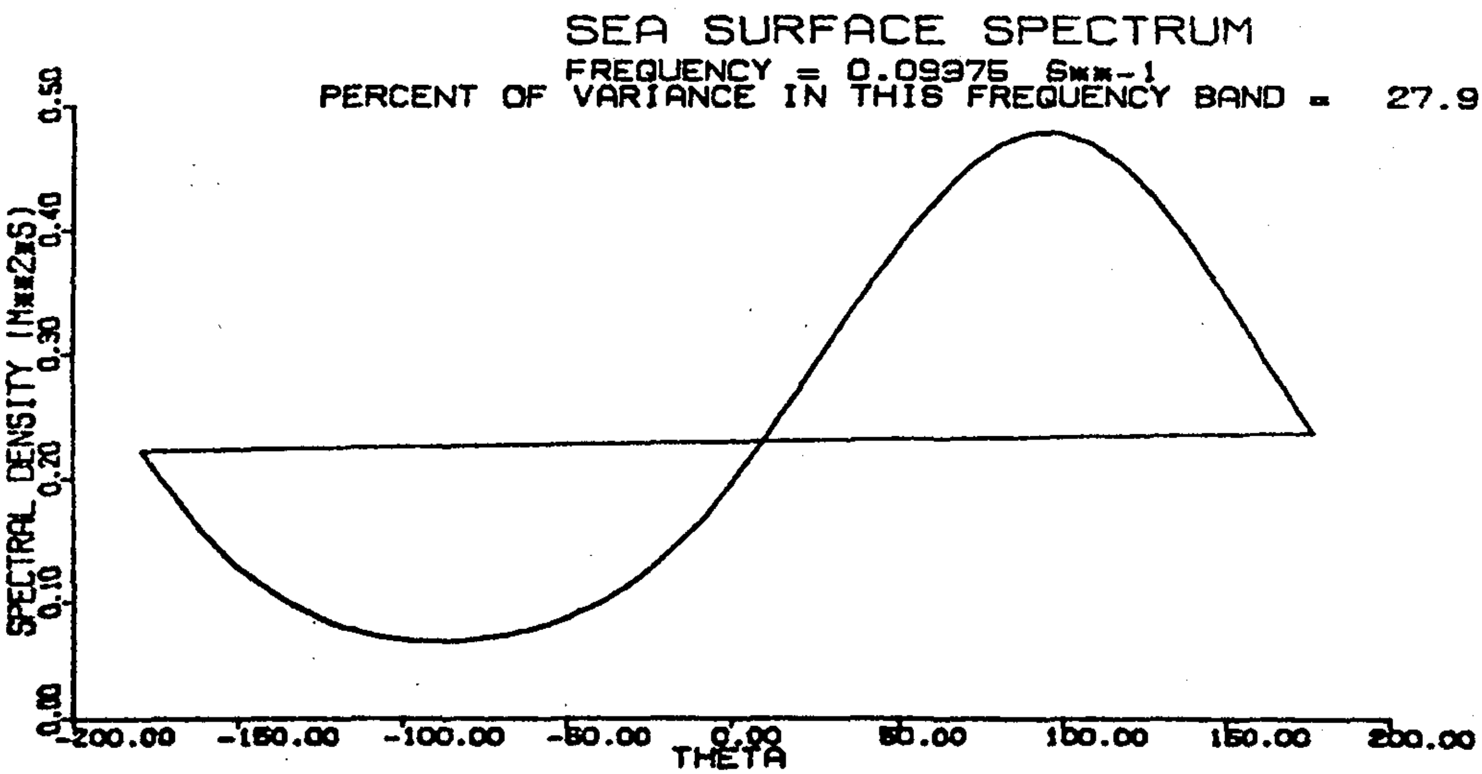

SEA SURFACE SPECTRUM

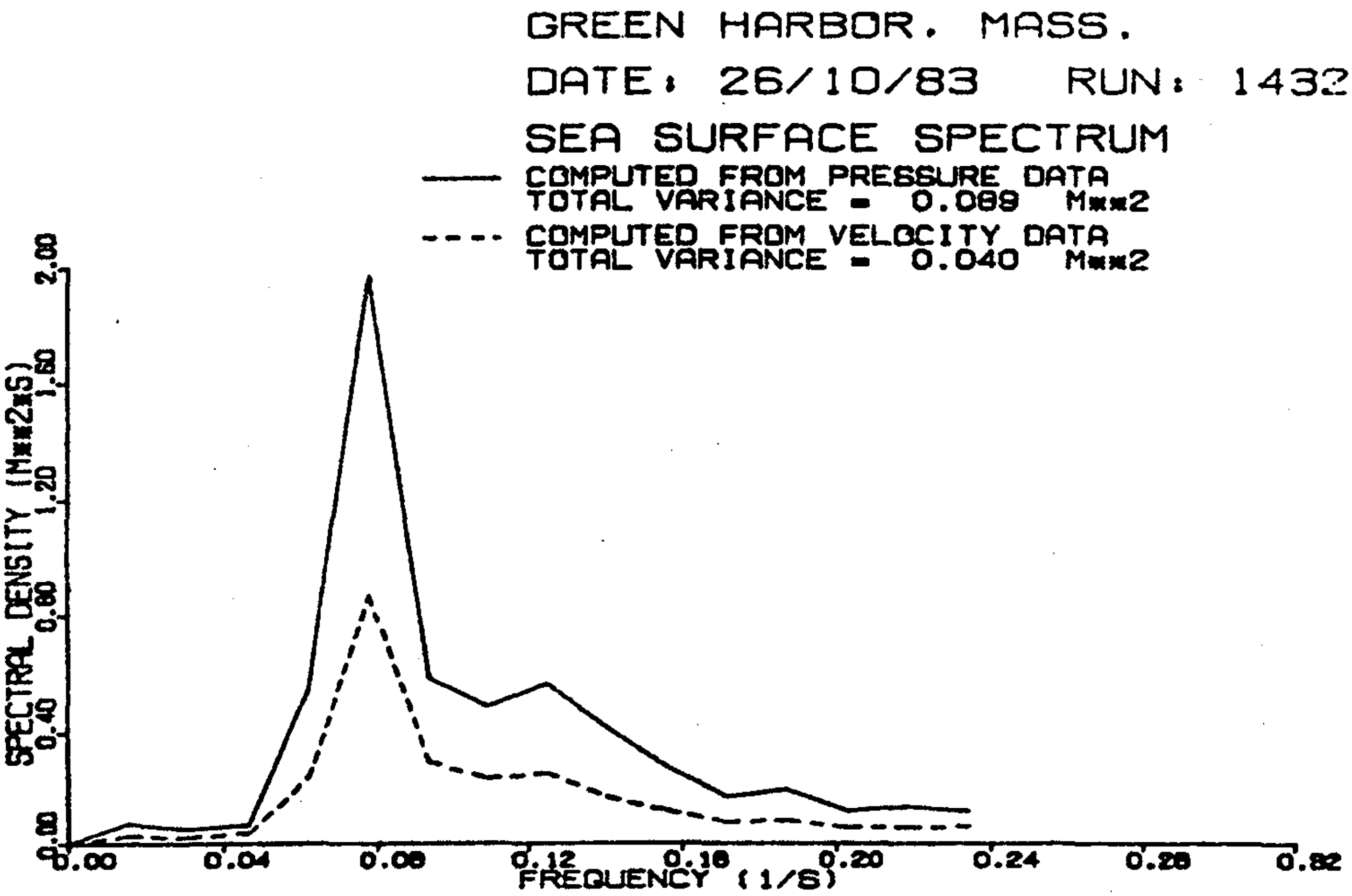
FREQUENCY = 0.10937 S**-1

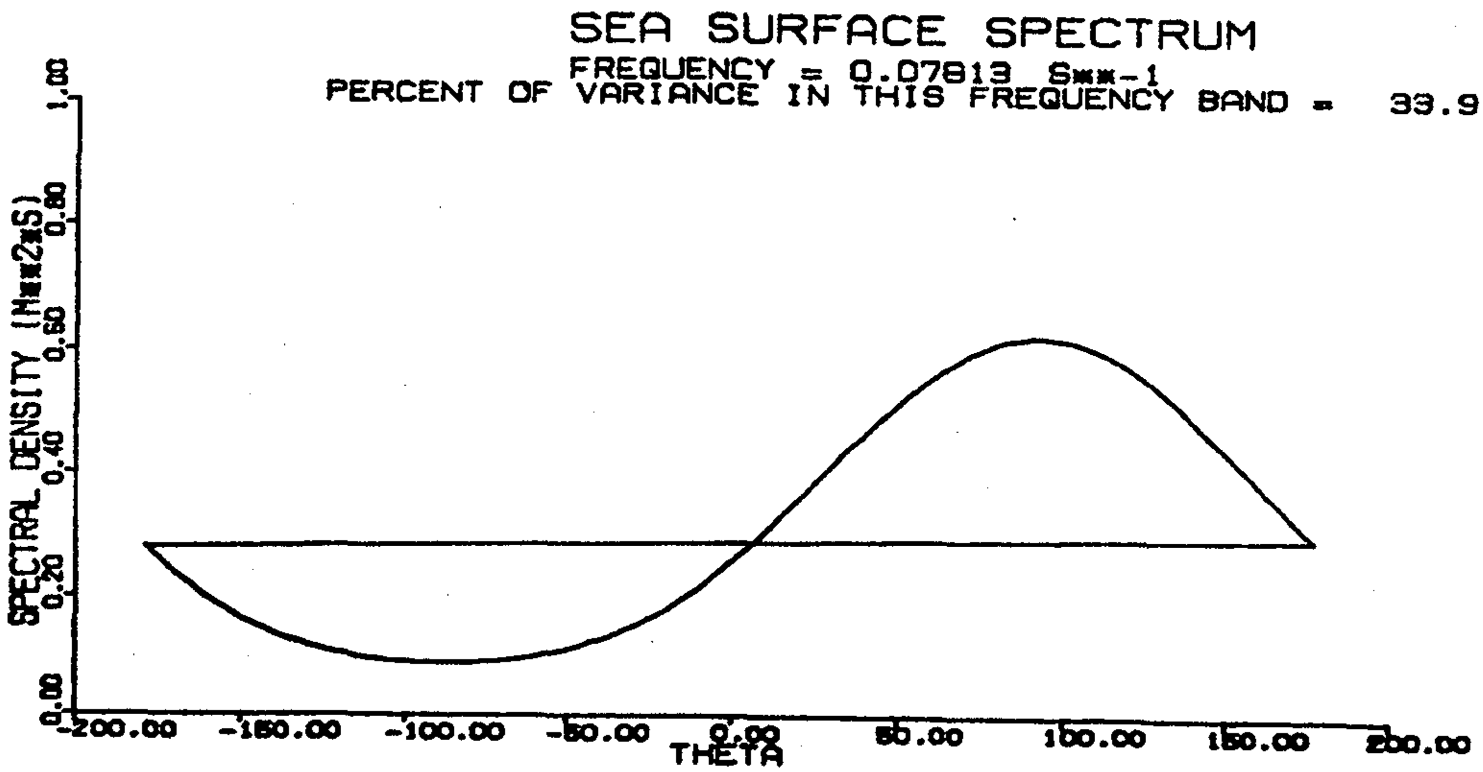
PERCENT OF VARIANCE IN THIS FREQUENCY BAND = 27.5

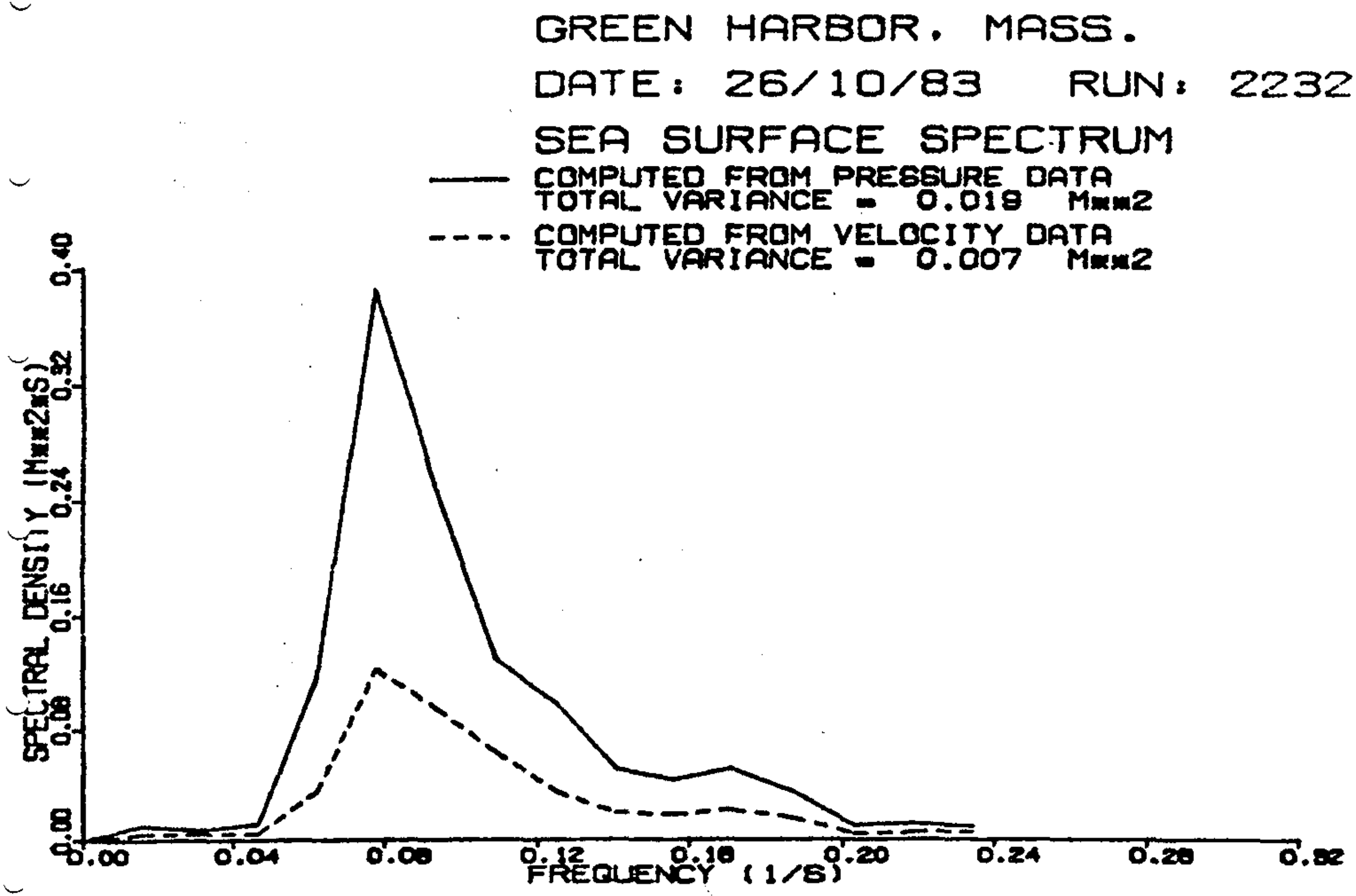


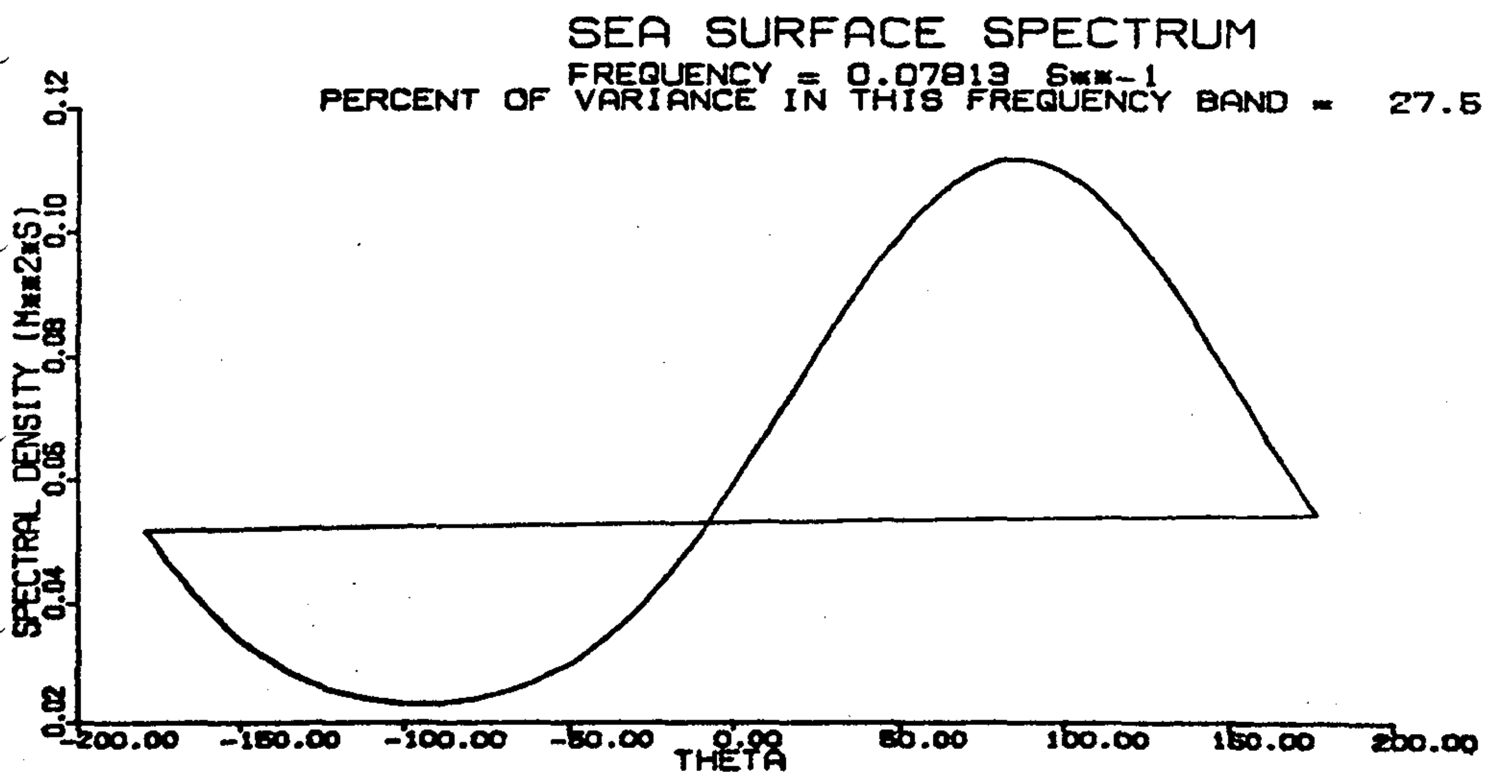

GREEN HARBOR, MASS.
DATE: 26/10/83 RUN: 632
SEA SURFACE SPECTRUM
COMPUTED FROM PRESSURE DATA
TOTAL VARIANCE = 0.085 M**2
COMPUTED FROM VELOCITY DATA
TOTAL VARIANCE = 0.038 M**2
SPECTRAL DENSITY (M**2*S)
FREQUENCY (1/S)

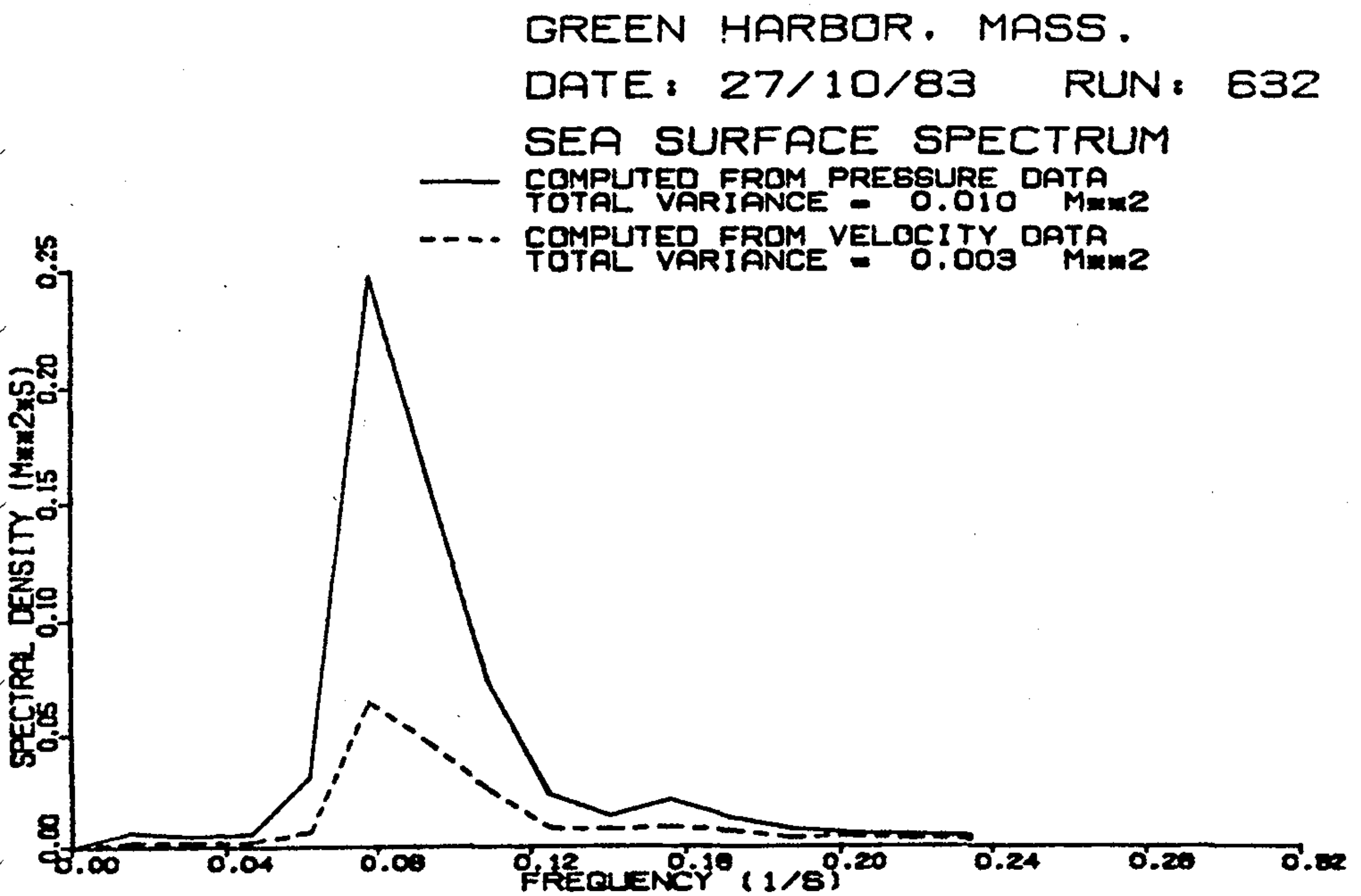

SEA SURFACE SPECTRUM
FREQUENCY = 0.09375 S**-1
PERCENT OF VARIANCE IN THIS FREQUENCY BAND = 27.9
SPECTRAL DENSITY (M**2*S)
THETA

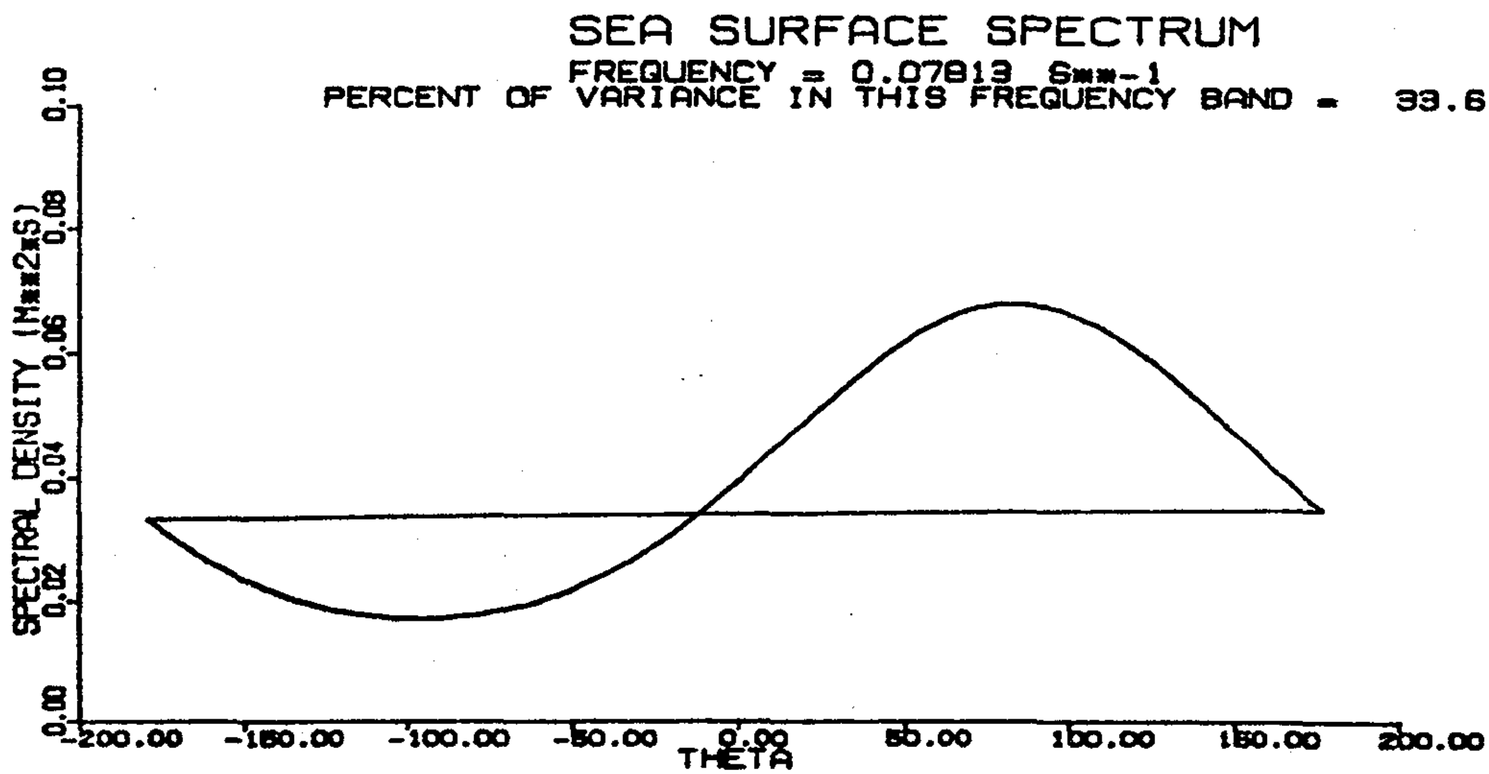

GREEN HARBOR, MASS.
DATE: 26/10/83 RUN: 1432
SEA SURFACE SPECTRUM
COMPUTED FROM PRESSURE DATA
TOTAL VARIANCE = 0.089 M**2
COMPUTED FROM VELOCITY DATA
TOTAL VARIANCE = 0.040 M**2
SPECTRAL DENSITY (M**2*S)
0.00
0.40
0.80
1.20
1.60
2.00
0.00
0.04
0.08
0.12
0.16
0.20
0.24
0.28
0.32
FREQUENCY (1/S)


SEA SURFACE SPECTRUM
FREQUENCY = 0.07813 S**-1
PERCENT OF VARIANCE IN THIS FREQUENCY BAND = 33.9
SPECTRAL DENSITY (M**2*S)
0.00
0.20
0.40
0.60
0.80
1.00
-200.00
-150.00
-100.00
-50.00
0.00
50.00
100.00
150.00
200.00
THETA


GREEN HARBOR, MASS.
DATE: 26/10/83 RUN: 2232
SEA SURFACE SPECTRUM
COMPUTED FROM PRESSURE DATA
TOTAL VARIANCE = 0.019 M**2
COMPUTED FROM VELOCITY DATA
TOTAL VARIANCE = 0.007 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 = 0.07813 S**-1
PERCENT OF VARIANCE IN THIS FREQUENCY BAND = 27.5
SPECTRAL DENSITY (M**2*S)
0.02
0.04
0.06
0.08
0.10
0.12
-200.00
-150.00
-100.00
-50.00
0.00
50.00
100.00
150.00
200.00
THETA


GREEN HARBOR, MASS.
DATE: 27/10/83 RUN: 632
SEA SURFACE SPECTRUM
COMPUTED FROM PRESSURE DATA
TOTAL VARIANCE = 0.010 M**2
COMPUTED FROM VELOCITY DATA
TOTAL VARIANCE = 0.003 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 = 0.07813 S**-1
PERCENT OF VARIANCE IN THIS FREQUENCY BAND = 33.6
SPECTRAL DENSITY (M**2*S)
0.00
0.02
0.04
0.06
0.08
0.10
-200.00
-150.00
-100.00
-50.00
0.00
50.00
100.00
150.00
200.00
THETA