



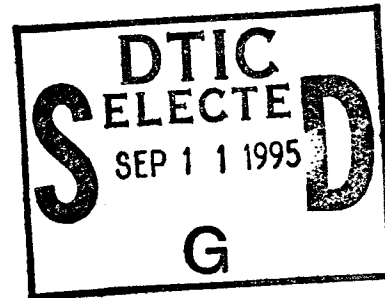
**US Army Corps  
of Engineers**  
Waterways Experiment  
Station

Technical Report CERC-95-6  
June 1995

# Annual Data Summary For 1993 CERC Field Research Facility

## Volume II: Appendixes C Through E

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As used here, "relative" indicates the spectra have been smoothed by the three-dimensional surface drawing routine. Consequently, extremely high- and low-energy density values are modified to produce a smooth surface. The figures are not intended for quantitative measurements; however, they do provide the energy density as a function of frequency relative to the other spectra for the month.

Monthly and annual wave statistics for Gauge 111 for 1993 and for 1985 through 1993 are presented in Table C7.

Figure C9 plots monthly time histories of wave height and period.

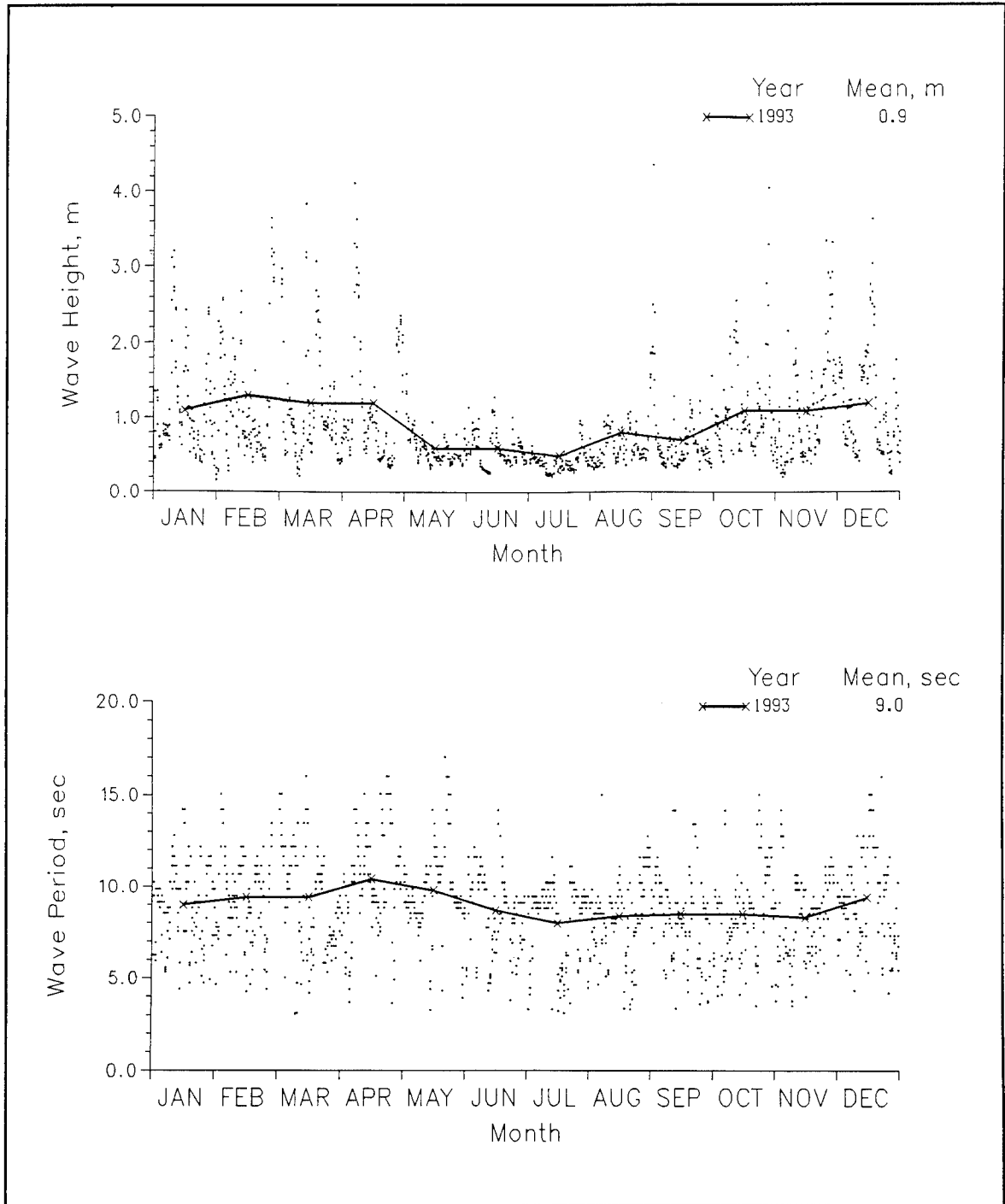


Figure C1. 1993 daily wave height and period values with monthly means for Gauge 111

**Table C1**  
**Annual Joint Distribution of  $H_{mo}$  versus  $T_p$**

Annual 1993, Gauge 111													Total
Percent Occurrence(X100) of Height and Period													
Height(m)	Period(sec)												
	2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9	16.0- Longer	
0.00 - 0.49	.	90	55	83	131	193	661	737	482	103	186	.	2721
0.50 - 0.99	.	83	289	413	393	358	840	957	751	145	282	14	4525
1.00 - 1.49	.	.	41	255	227	138	131	165	248	48	76	.	1329
1.50 - 1.99	.	.	.	69	90	90	41	90	172	34	62	.	648
2.00 - 2.49	.	.	.	7	28	76	48	21	110	21	69	.	380
2.50 - 2.99	.	.	.	.	7	7	21	41	55	69	41	.	241
3.00 - 3.49	.	.	.	.	.	7	.	21	48	14	14	.	104
3.50 - 3.99	.	.	.	.	.	.	.	7	14	7	7	.	35
4.00 - 4.49	.	.	.	.	.	.	.	.	14	.	7	.	21
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - Greater	.	.	.	.	.	.	.	.	.	.	.	.	0
Total	0	173	385	827	876	869	1742	2039	1894	441	744	14	

**Table C2**  
**Monthly Joint Distribution of  $H_{mo}$  versus  $T_p$**

January 1993, Gauge 111  
Percent Occurrence(X100) of Height and Period

Height(m)	Period(sec)												Total
	2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9	16.0- Longer	
0.00 - 0.49	.	.	333	417	250	167	250	583	333	.	83	.	1416
0.50 - 0.99	.	.	.	333	583	667	917	1250	750	.	.	.	4584
1.00 - 1.49	.	.	.	83	83	83	.	250	583	.	83	.	1915
1.50 - 1.99	.	.	.	.	.	167	167	83	250	250	.	.	832
2.00 - 2.49	.	.	.	.	.	.	83	83	167	83	83	.	750
2.50 - 2.99	.	.	.	.	.	.	.	83	83	.	83	.	332
3.00 - 3.49	.	.	.	.	.	.	.	167	.	.	.	.	167
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - Greater	0	0	333	833	916	1167	1417	2332	2333	333	332	0	0
Total	0	0	333	833	916	1167	1417	2332	2333	333	332	0	0

February 1993, Gauge 111  
Percent Occurrence(X100) of Height and Period

Height(m)	Period(sec)												Total
	2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9	16.0- Longer	
0.00 - 0.49	.	.	.	.	.	179	357	179	357	.	89	.	1161
0.50 - 0.99	.	.	268	268	446	268	446	536	1696	.	268	.	4196
1.00 - 1.49	.	.	89	268	179	89	446	268	179	268	89	.	1875
1.50 - 1.99	.	.	.	.	179	179	89	179	268	89	.	.	983
2.00 - 2.49	.	.	.	.	.	446	.	.	89	.	179	.	714
2.50 - 2.99	.	.	.	.	.	89	.	.	89	268	89	.	535
3.00 - 3.49	.	.	.	.	.	.	.	89	89	.	179	.	357
3.50 - 3.99	.	.	.	.	.	.	.	89	89	.	.	.	178
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - Greater	0	0	357	536	804	1250	1338	1340	2856	625	893	0	0
Total	0	0	357	536	804	1250	1338	1340	2856	625	893	0	0

March 1993, Gauge 111  
Percent Occurrence(X100) of Height and Period

Height(m)	Period(sec)												Total
	2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9	16.0- Longer	
0.00 - 0.49	.	161	81	.	81	81	484	242	242	81	161	.	1614
0.50 - 0.99	.	.	242	242	887	726	161	242	887	242	968	.	4597
1.00 - 1.49	.	.	.	323	323	323	242	81	565	81	81	.	2019
1.50 - 1.99	.	.	.	81	.	.	.	.	161	.	81	.	323
2.00 - 2.49	.	.	.	81	81	.	.	81	161	.	242	.	646
2.50 - 2.99	.	.	.	.	.	.	81	81	.	242	81	.	485
3.00 - 3.49	.	.	.	.	.	81	.	81	.	81	.	.	243
3.50 - 3.99	.	.	.	.	.	.	.	.	81	.	.	.	81
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - Greater	0	161	323	727	1372	1211	968	808	2097	727	1614	0	0
Total	0	161	323	727	1372	1211	968	808	2097	727	1614	0	0

(Continued)

(Sheet 1 of 4)

Table C2 (Continued)

April 1993, Gauge 111  
Percent Occurrence(X100) of Height and Period

Height(m)	Period(sec)												Total
	2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9	16.0- Longer	
0.00 - 0.49	.	.	83	333	167	250	250	250	667	500	417	.	1833
0.50 - 0.99	.	167	83	.	.	167	750	1000	500	167	250	.	4251
1.00 - 1.49	.	.	.	.	.	.	83	333	500	167	250	.	1416
1.50 - 1.99	.	.	.	167	.	.	.	167	167	.	83	.	584
2.00 - 2.49	.	.	.	.	83	.	83	.	667	.	167	.	1000
2.50 - 2.99	.	.	.	.	83	.	.	.	167	333	.	.	583
3.00 - 3.49	.	.	.	.	.	.	.	.	167	.	.	.	167
3.50 - 3.99	.	.	.	.	.	.	.	.	.	83	.	.	83
4.00 - 4.49	.	.	.	.	.	.	.	.	83	.	.	.	83
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - Greater	0	167	166	500	416	417	1166	1750	2418	1333	1667	0	0
Total	0	167	166	500	416	417	1166	1750	2418	1333	1667	0	0

May 1993, Gauge 111  
Percent Occurrence(X100) of Height and Period

Height(m)	Period(sec)												Total
	2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9	16.0- Longer	
0.00 - 0.49	.	.	.	.	81	.	645	726	1371	484	565	.	3872
0.50 - 0.99	.	161	403	161	161	242	1532	1855	726	81	242	161	5725
1.00 - 1.49	.	.	.	.	.	.	.	161	161	.	.	.	322
1.50 - 1.99	.	.	.	.	.	.	.	.	81	.	.	.	81
2.00 - 2.49	.	.	.	.	.	.	.	.	.	.	.	.	0
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - Greater	0	161	403	161	242	242	2177	2742	2339	565	807	161	0
Total	0	161	403	161	242	242	2177	2742	2339	565	807	161	0

June 1993, Gauge 111  
Percent Occurrence(X100) of Height and Period

Height(m)	Period(sec)												Total
	2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9	16.0- Longer	
0.00 - 0.49	.	83	250	750	583	417	1083	1333	1417	.	250	.	4250
0.50 - 0.99	.	.	.	500	83	500	417	1167	750	.	.	.	5000
1.00 - 1.49	.	.	.	.	.	.	.	.	.	.	.	.	750
1.50 - 1.99	.	.	.	.	.	.	.	.	.	.	.	.	0
2.00 - 2.49	.	.	.	.	.	.	.	.	.	.	.	.	0
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - Greater	0	83	250	1250	666	1084	1500	2500	2167	250	250	0	0
Total	0	83	250	1250	666	1084	1500	2500	2167	250	250	0	0

(Continued)

(Sheet 2 of 4)

**Table C2 (Continued)**

July 1993, Gauge 111  
Percent Occurrence(X100) of Height and Period

Height(m)	Period(sec)											Total	
	2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9		16.0- Longer
0.00 - 0.49	.	488	569	488	569	81	1301	3415	1138	.	.	.	8049
0.50 - 0.99	.	.	325	569	163	.	407	488	.	.	.	.	1952
1.00 - 1.49	.	.	.	.	.	.	.	.	.	.	.	.	0
1.50 - 1.99	.	.	.	.	.	.	.	.	.	.	.	.	0
2.00 - 2.49	.	.	.	.	.	.	.	.	.	.	.	.	0
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - Greater	.	.	.	.	.	.	.	.	.	.	.	.	0
Total	0	488	894	1057	732	81	1708	3903	1138	0	0	0	0

August 1993, Gauge 111  
Percent Occurrence(X100) of Height and Period

Height(m)	Period(sec)											Total	
	2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9		16.0- Longer
0.00 - 0.49	.	83	.	83	331	331	1488	661	165	.	83	.	3225
0.50 - 0.99	.	248	413	661	248	579	1405	1157	992	.	.	.	5703
1.00 - 1.49	.	.	.	83	165	83	.	.	83	.	83	.	497
1.50 - 1.99	.	.	.	.	.	.	.	.	331	.	83	.	414
2.00 - 2.49	.	.	.	.	.	.	.	.	.	.	83	.	83
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	83	.	83
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - Greater	.	.	.	.	.	.	.	.	.	.	.	.	0
Total	0	331	413	827	744	993	2893	1818	1571	0	415	0	0

September 1993, Gauge 111  
Percent Occurrence(X100) of Height and Period

Height(m)	Period(sec)											Total	
	2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9		16.0- Longer
0.00 - 0.49	.	167	.	167	83	417	1500	583	250	167	167	.	3501
0.50 - 0.99	.	167	250	500	500	167	1000	1250	833	250	250	.	5167
1.00 - 1.49	.	.	83	333	167	250	.	.	167	.	.	.	1000
1.50 - 1.99	.	.	.	83	.	.	83	83	.	.	.	.	249
2.00 - 2.49	.	.	.	.	.	.	.	83	.	.	.	.	83
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - Greater	.	.	.	.	.	.	.	.	.	.	.	.	0
Total	0	334	333	1083	750	834	2583	1999	1250	417	417	0	0

(Continued)

(Sheet 3 of 4)

**Table C2 (Concluded)**

October 1993, Gauge 111  
Percent Occurrence(X100) of Height and Period

Height(m)	Period(sec)											Total	
	2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9		16.0- Longer
0.00 - 0.49	.	.	.	.	.	.	81	161	81	.	.	.	323
0.50 - 0.99	.	81	403	242	403	565	1452	1371	323	403	484	.	5727
1.00 - 1.49	.	.	242	726	484	161	242	161	242	.	242	.	2500
1.50 - 1.99	.	.	.	.	81	.	242	.	161	.	.	.	484
2.00 - 2.49	.	.	.	.	81	242	242	.	81	.	.	.	646
2.50 - 2.99	.	.	.	.	.	.	81	81	.	.	.	.	162
3.00 - 3.49	.	.	.	.	.	.	.	.	81	.	.	.	81
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	81	.	.	.	81
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - Greater	.	.	.	.	.	.	.	.	.	.	.	.	0
Total	0	81	645	968	1049	968	2340	1774	1050	403	726	0	

November 1993, Gauge 111  
Percent Occurrence(X100) of Height and Period

Height(m)	Period(sec)											Total	
	2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9		16.0- Longer
0.00 - 0.49	.	167	.	250	333	250	333	417	83	250	250	.	2333
0.50 - 0.99	.	83	333	333	583	250	750	417	167	.	.	.	2916
1.00 - 1.49	.	.	.	250	583	167	333	417	500	.	.	.	2250
1.50 - 1.99	.	.	.	250	250	250	83	250	417	.	.	.	1500
2.00 - 2.49	.	.	.	.	83	83	83	.	167	.	.	.	416
2.50 - 2.99	.	.	.	.	.	.	.	167	250	.	.	.	417
3.00 - 3.49	.	.	.	.	.	.	.	83	83	.	.	.	166
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - Greater	.	.	.	.	.	.	.	.	.	.	.	.	0
Total	0	250	333	1083	1832	1000	1582	1751	1667	250	250	0	

December 1993, Gauge 111  
Percent Occurrence(X100) of Height and Period

Height(m)	Period(sec)											Total	
	2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9		16.0- Longer
0.00 - 0.49	.	.	.	.	.	161	161	242	323	.	81	.	968
0.50 - 0.99	.	.	161	484	323	161	806	726	1290	.	484	.	4435
1.00 - 1.49	.	.	.	242	161	323	242	323	.	81	81	.	1453
1.50 - 1.99	.	.	.	161	484	565	.	323	242	81	484	.	2340
2.00 - 2.49	.	.	.	.	.	.	.	81	81	161	81	.	242
2.50 - 2.99	.	.	.	.	.	.	.	.	.	81	242	.	404
3.00 - 3.49	.	.	.	.	.	.	.	.	.	81	.	.	81
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	81	.	81
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - Greater	.	.	.	.	.	.	.	.	.	.	.	.	0
Total	0	0	161	887	968	1210	1209	1695	1936	404	1534	0	

**Table C3**  
**Annual Joint Distribution of  $H_{mo}$  versus  $T_p$  (All Years)**

		Annual 1985-1993, Gauge 111 Percent Occurrence(X100) of Height and Period											Total	
Height(m)		Period(sec)												
		2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9	16.0- Longer	
0.00 - 0.49		6	76	39	71	123	224	665	516	409	145	251	11	2536
0.50 - 0.99		2	134	254	419	477	399	928	793	648	131	290	16	4491
1.00 - 1.49		.	12	120	340	278	148	245	205	270	33	94	.	1745
1.50 - 1.99		.	.	7	103	172	79	77	69	124	25	56	2	714
2.00 - 2.49		.	.	.	5	51	42	35	30	53	18	33	2	269
2.50 - 2.99		.	.	.	.	8	14	11	17	33	13	22	.	118
3.00 - 3.49		.	.	.	.	2	6	8	14	18	9	6	.	63
3.50 - 3.99		.	.	.	.	.	1	6	6	16	6	7	2	44
4.00 - 4.49		.	.	.	.	.	.	1	2	9	1	4	3	20
4.50 - 4.99		.	.	.	.	.	.	.	.	2	.	.	.	2
5.00 - Greater		.	.	.	.	.	.	.	1	.	.	.	.	1
Total		8	222	420	938	1111	913	1976	1653	1582	381	763	36	

**Table C4**  
**Monthly Joint Distribution of  $H_{mo}$  versus  $T_p$  (All Years)**

January 1985-1993, Gauge 111  
 Percent Occurrence(X100) of Height and Period

Height(m)	Period(sec)											Total	
	2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9		16.0- Longer
0.00 - 0.49	.	111	9	65	37	231	379	693	379	129	203	18	2254
0.50 - 0.99	.	139	185	471	480	332	720	766	748	65	231	.	4137
1.00 - 1.49	.	9	166	554	443	129	194	231	286	18	46	.	2076
1.50 - 1.99	.	.	9	139	249	83	92	74	139	46	18	.	849
2.00 - 2.49	.	.	.	.	74	92	65	18	65	9	37	.	360
2.50 - 2.99	.	.	.	.	9	.	46	28	92	.	28	.	203
3.00 - 3.49	.	.	.	.	.	.	18	9	37	9	9	.	82
3.50 - 3.99	.	.	.	.	.	.	.	.	18	.	9	.	27
4.00 - 4.49	.	.	.	.	.	.	.	.	.	9	.	.	9
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - Greater	.	.	.	.	.	.	.	.	.	.	.	.	0
Total	0	259	369	1229	1292	867	1514	1819	1764	285	581	18	

February 1985-1993, Gauge 111  
 Percent Occurrence(X100) of Height and Period

Height(m)	Period(sec)											Total	
	2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9		16.0- Longer
0.00 - 0.49	.	41	30	51	91	71	345	426	345	30	162	.	1592
0.50 - 0.99	.	91	294	396	548	406	782	792	853	71	203	10	4446
1.00 - 1.49	.	10	112	477	396	234	325	284	325	51	162	.	2376
1.50 - 1.99	.	.	10	142	274	102	102	71	152	10	20	.	883
2.00 - 2.49	.	.	.	10	91	91	10	20	41	.	51	.	314
2.50 - 2.99	.	.	.	.	10	20	.	30	61	30	41	.	192
3.00 - 3.49	.	.	.	.	10	.	20	51	20	10	20	.	131
3.50 - 3.99	.	.	.	.	.	.	.	20	30	10	.	.	60
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - Greater	.	.	.	.	.	.	.	.	.	.	.	.	0
Total	0	142	446	1076	1420	924	1584	1694	1827	212	659	10	

March 1985-1993, Gauge 111  
 Percent Occurrence(X100) of Height and Period

Height(m)	Period(sec)											Total	
	2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9		16.0- Longer
0.00 - 0.49	9	18	18	55	64	82	329	210	357	91	146	.	1379
0.50 - 0.99	.	91	128	403	467	494	833	805	878	110	311	.	4520
1.00 - 1.49	.	9	201	366	393	165	229	284	485	9	165	.	2306
1.50 - 1.99	.	.	9	101	165	110	82	82	229	18	128	.	924
2.00 - 2.49	.	.	.	9	73	9	64	119	82	.	91	.	447
2.50 - 2.99	.	.	.	.	9	18	9	37	55	37	37	.	202
3.00 - 3.49	.	.	.	.	.	9	.	18	37	9	.	.	73
3.50 - 3.99	.	.	.	.	.	.	9	.	64	9	9	.	91
4.00 - 4.49	.	.	.	.	.	.	.	.	27	.	18	.	45
4.50 - 4.99	.	.	.	.	.	.	.	.	9	.	.	.	9
5.00 - Greater	.	.	.	.	.	.	.	.	.	.	.	.	0
Total	9	118	356	934	1171	887	1555	1555	2223	283	905	0	

(Continued)

(Sheet 1 of 4)

**Table C4 (Continued)**

April 1985-1993, Gauge 111  
Percent Occurrence(X100) of Height and Period

Height(m)	Period(sec)											Total	
	2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9		16.0- Longer
0.00 - 0.49	9	38	9	57	66	104	379	360	303	180	294		1799
0.50 - 0.99	.	152	170	379	464	426	1023	1004	843	227	511	.	5208
1.00 - 1.49	.	28	57	180	218	114	294	331	199	38	114	.	1573
1.50 - 1.99	.	.	19	104	114	66	95	85	227	19	66	.	795
2.00 - 2.49	.	.	.	9	57	.	19	57	123	.	38	.	303
2.50 - 2.99	.	.	.	.	9	.	19	19	47	66	.	.	160
3.00 - 3.49	.	.	.	.	9	9	9	9	28	9	9	.	82
3.50 - 3.99	.	.	.	.	.	.	9	.	9	9	9	.	36
4.00 - 4.49	.	.	.	.	.	.	9	9	9	.	.	.	27
4.50 - 4.99	.	.	.	.	.	.	.	9	.	.	.	.	9
5.00 - Greater	.	.	.	.	.	.	.	.	9	.	.	.	0
Total	9	218	255	729	937	719	1856	1874	1797	548	1041	9	

May 1985-1993, Gauge 111  
Percent Occurrence(X100) of Height and Period

Height(m)	Period(sec)											Total	
	2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9		16.0- Longer
0.00 - 0.49	9	95	47	132	218	199	643	445	587	293	464	.	3132
0.50 - 0.99	.	151	312	274	426	464	1192	823	558	95	208	19	4522
1.00 - 1.49	.	28	57	142	123	151	369	199	237	9	76	.	1391
1.50 - 1.99	.	.	9	57	66	19	57	95	161	28	47	9	548
2.00 - 2.49	.	.	.	.	47	19	57	19	28	38	19	.	227
2.50 - 2.99	.	.	.	.	38	9	9	9	19	9	28	.	121
3.00 - 3.49	.	.	.	.	.	.	.	9	19	9	19	.	56
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - Greater	.	.	.	.	.	.	.	.	.	.	.	.	0
Total	9	274	425	605	918	861	2327	1599	1609	481	861	28	

June 1985-1993, Gauge 111  
Percent Occurrence(X100) of Height and Period

Height(m)	Period(sec)											Total	
	2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9		16.0- Longer
0.00 - 0.49	19	144	38	58	259	422	1507	902	461	154	163	10	4137
0.50 - 0.99	10	106	211	374	489	384	1296	1036	336	154	211	19	4626
1.00 - 1.49	.	10	58	192	173	115	106	58	134	.	48	.	894
1.50 - 1.99	.	.	19	19	48	48	29	19	38	.	38	.	258
2.00 - 2.49	.	.	.	.	10	10	38	.	10	.	19	.	87
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - Greater	.	.	.	.	.	.	.	.	.	.	.	.	0
Total	29	260	326	643	979	979	2976	2015	979	308	479	29	

(Continued)

(Sheet 2 of 4)

**Table C4 (Continued)**

July 1985-1993, Gauge 111  
Percent Occurrence(X100) of Height and Period

Height(m)	Period(sec)											Total	
	2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9		16.0- Longer
0.00 - 0.49	9	161	151	113	255	670	1860	1228	633	236	453	19	5788
0.50 - 0.99	.	189	340	472	340	472	982	453	236	94	142	19	3739
1.00 - 1.49	.	.	28	85	47	47	76	9	47	.	19	.	358
1.50 - 1.99	.	.	.	9	9	9	19	38	28	.	.	.	112
2.00 - 2.49	.	.	.	.	.	.	.	.	.	.	.	.	0
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - Greater	.	.	.	.	.	.	.	.	.	.	.	.	0
Total	9	350	519	679	651	1198	2937	1728	944	330	614	38	

August 1985-1993, Gauge 111  
Percent Occurrence(X100) of Height and Period

Height(m)	Period(sec)											Total	
	2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9		16.0- Longer
0.00 - 0.49	19	68	29	77	203	339	987	687	591	174	184	10	3368
0.50 - 0.99	.	174	232	581	620	474	1016	726	591	155	348	68	4985
1.00 - 1.49	.	.	145	242	155	126	271	97	97	19	48	.	1200
1.50 - 1.99	.	.	.	77	58	29	.	19	68	48	19	.	318
2.00 - 2.49	.	.	.	.	10	10	.	19	39	10	10	.	98
2.50 - 2.99	.	.	.	.	.	.	10	.	.	.	.	.	10
3.00 - 3.49	.	.	.	.	10	.	.	.	.	.	.	.	10
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	10	.	10
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - Greater	.	.	.	.	.	.	.	.	.	.	.	.	0
Total	19	242	406	977	1056	978	2284	1548	1386	406	619	78	

September 1985-1993, Gauge 111  
Percent Occurrence(X100) of Height and Period

Height(m)	Period(sec)											Total	
	2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9		16.0- Longer
0.00 - 0.49	.	49	10	29	39	147	461	304	422	69	216	.	1746
0.50 - 0.99	.	137	245	383	491	402	1109	1021	824	167	294	.	5073
1.00 - 1.49	.	10	98	373	186	206	373	275	285	69	88	.	1963
1.50 - 1.99	.	.	.	108	167	147	167	49	49	29	59	10	785
2.00 - 2.49	.	.	.	.	49	79	20	20	.	59	49	20	296
2.50 - 2.99	.	.	.	.	.	59	10	.	10	.	10	.	89
3.00 - 3.49	.	.	.	.	.	.	10	.	.	.	.	.	10
3.50 - 3.99	.	.	.	.	.	.	.	10	29	.	.	.	39
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - Greater	.	.	.	.	.	.	.	.	.	.	.	.	0
Total	0	196	353	893	932	1040	2150	1679	1619	393	716	30	

(Continued)

(Sheet 3 of 4)

**Table C4 (Concluded)**

October 1985-1993, Gauge 111  
Percent Occurrence(X100) of Height and Period

Height(m)	Period(sec)											Total	
	2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9		16.0- Longer
0.00 - 0.49	.	.	37	19	37	102	260	195	242	84	167	19	1162
0.50 - 0.99	.	112	288	279	465	325	920	846	762	186	428	9	4620
1.00 - 1.49	.	9	242	483	270	112	242	270	502	46	139	.	2315
1.50 - 1.99	.	.	9	177	260	56	158	102	186	46	74	.	1068
2.00 - 2.49	.	.	.	9	46	74	46	37	121	19	28	.	380
2.50 - 2.99	.	.	.	.	9	19	19	28	46	.	37	.	158
3.00 - 3.49	.	.	.	.	.	19	37	19	28	9	19	.	131
3.50 - 3.99	.	.	.	.	.	.	37	9	28	19	9	9	111
4.00 - 4.49	.	.	.	.	.	.	.	.	9	.	.	37	46
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - Greater	.	.	.	.	.	.	.	9	.	.	.	.	9
Total	0	121	576	967	1087	707	1719	1515	1924	409	901	74	

November 1985-1993, Gauge 111  
Percent Occurrence(X100) of Height and Period

Height(m)	Period(sec)											Total	
	2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9		16.0- Longer
0.00 - 0.49	.	57	29	105	76	181	495	333	257	133	200	57	1923
0.50 - 0.99	10	143	343	476	514	362	771	637	457	162	257	.	4132
1.00 - 1.49	.	10	162	485	476	219	333	171	371	76	114	.	2417
1.50 - 1.99	.	.	.	162	285	124	67	124	124	10	29	.	925
2.00 - 2.49	.	.	.	19	48	95	95	29	67	.	19	.	372
2.50 - 2.99	.	.	.	.	.	29	10	29	29	.	10	.	107
3.00 - 3.49	.	.	.	.	.	10	.	38	29	10	.	.	87
3.50 - 3.99	.	.	.	.	.	.	.	19	.	.	.	.	19
4.00 - 4.49	.	.	.	.	.	.	.	10	19	.	.	.	29
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - Greater	.	.	.	.	.	.	.	.	.	.	.	.	0
Total	10	210	534	1247	1399	1020	1771	1390	1353	391	629	57	

December 1985-1993, Gauge 111  
Percent Occurrence(X100) of Height and Period

Height(m)	Period(sec)											Total	
	2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9		16.0- Longer
0.00 - 0.49	.	128	59	89	138	128	336	405	336	158	366	.	2143
0.50 - 0.99	10	128	306	543	425	247	484	613	692	79	336	40	3903
1.00 - 1.49	.	20	109	504	455	168	138	247	257	69	109	.	2076
1.50 - 1.99	.	.	.	138	375	158	59	69	79	49	168	.	1095
2.00 - 2.49	.	.	.	.	109	30	.	20	59	79	30	.	327
2.50 - 2.99	.	.	.	.	10	20	.	20	30	10	79	.	169
3.00 - 3.49	.	.	.	.	.	20	.	10	10	40	.	.	80
3.50 - 3.99	.	.	.	.	.	10	20	20	10	20	49	10	139
4.00 - 4.49	.	.	.	.	.	.	.	10	40	.	20	.	70
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - Greater	.	.	.	.	.	.	.	.	.	.	.	.	0
Total	10	276	474	1274	1512	781	1037	1414	1513	504	1157	50	

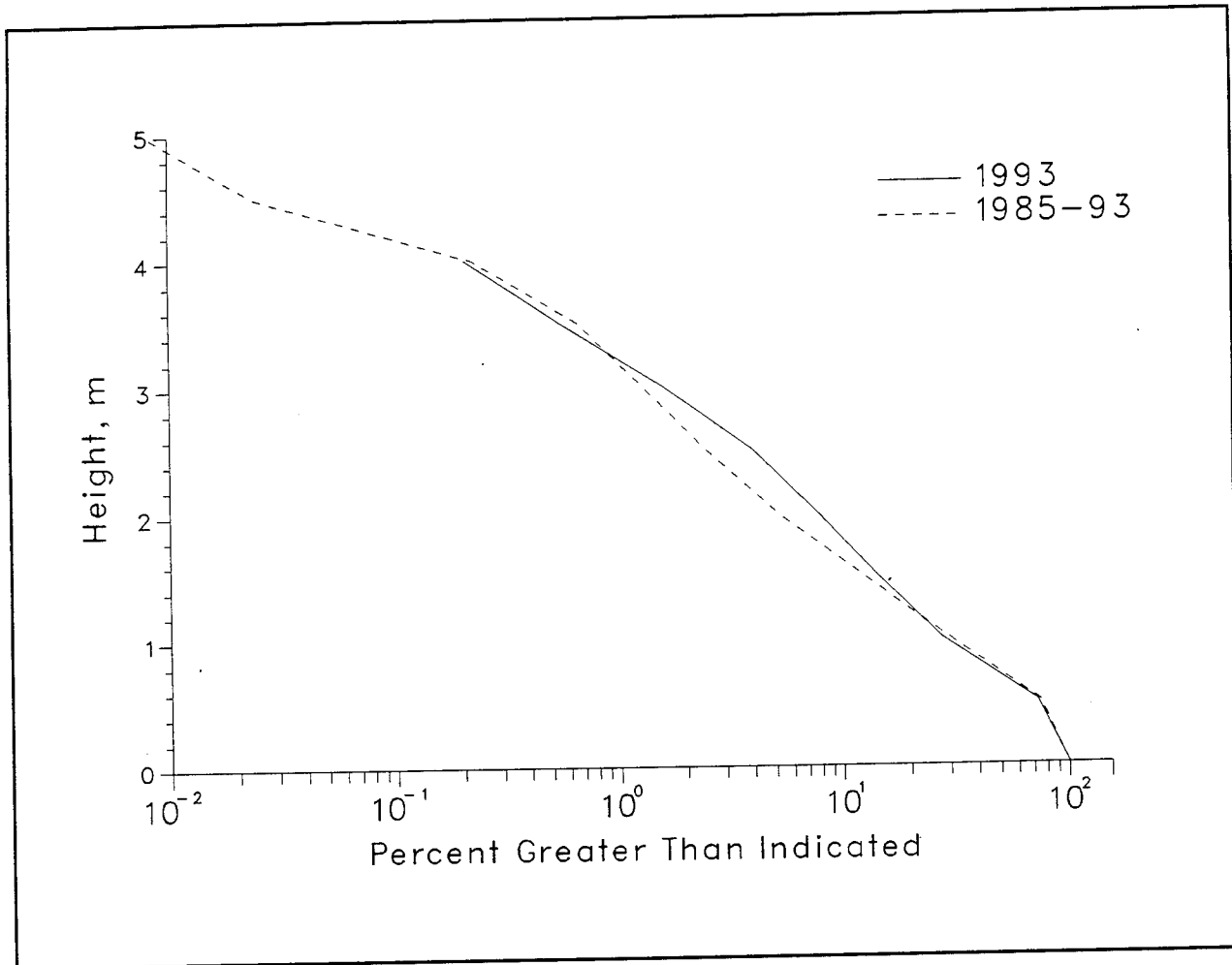


Figure C2. Annual cumulative wave height distributions for Gauge 111

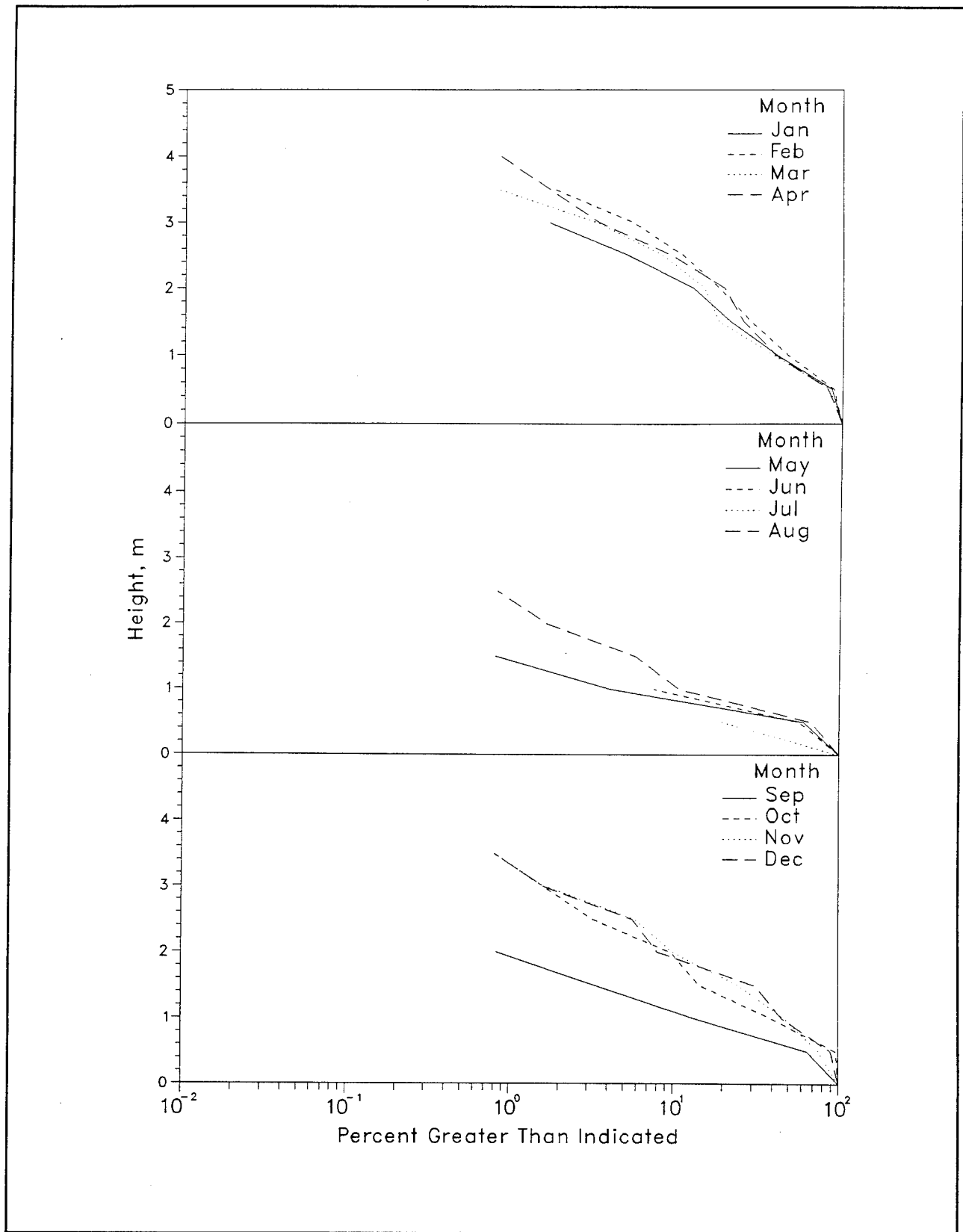


Figure C3. 1993 monthly wave height distributions for Gauge 111

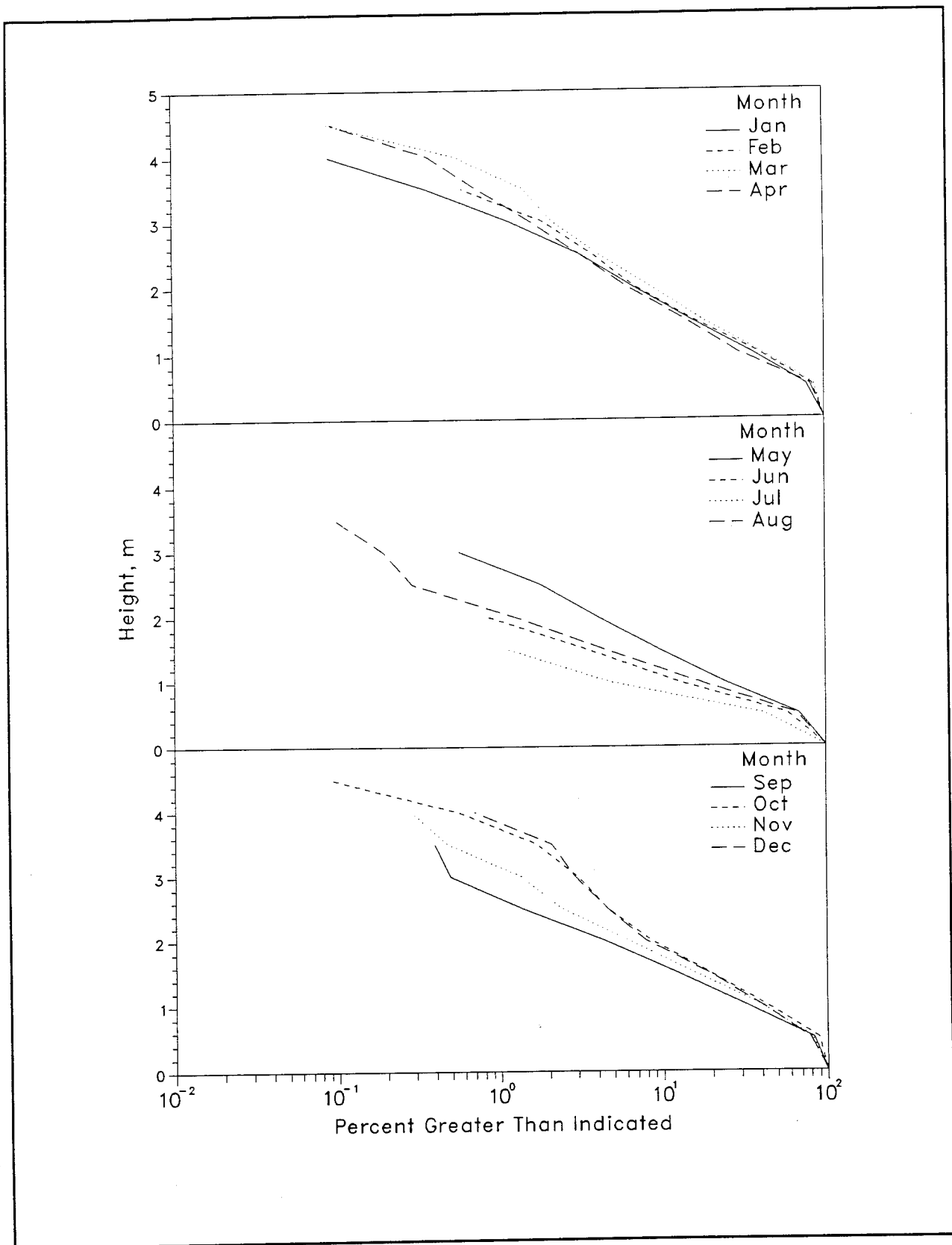


Figure C4. 1985-1993 monthly wave height distributions for Gauge 111

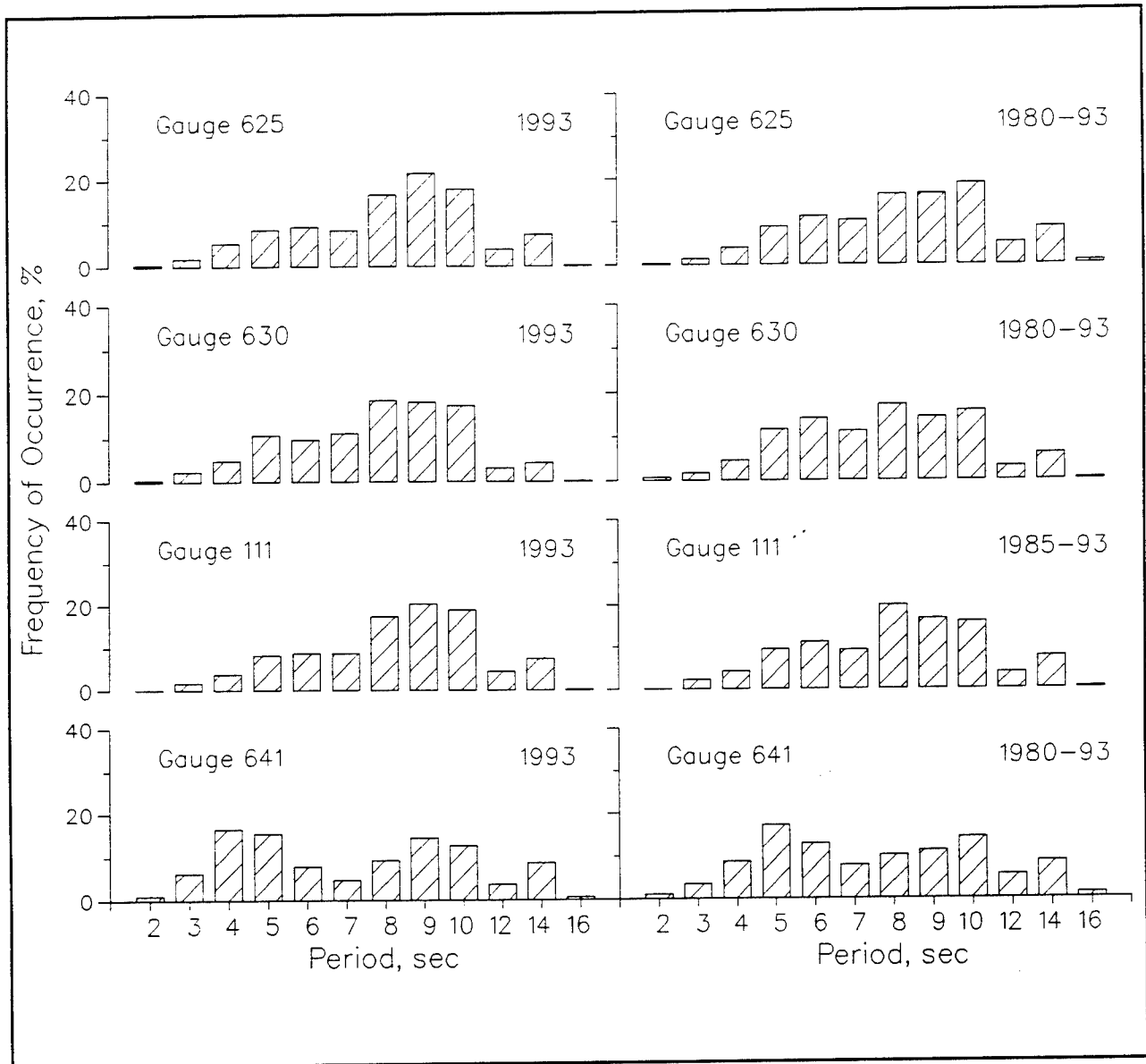


Figure C5. Annual wave period distributions for all gauges

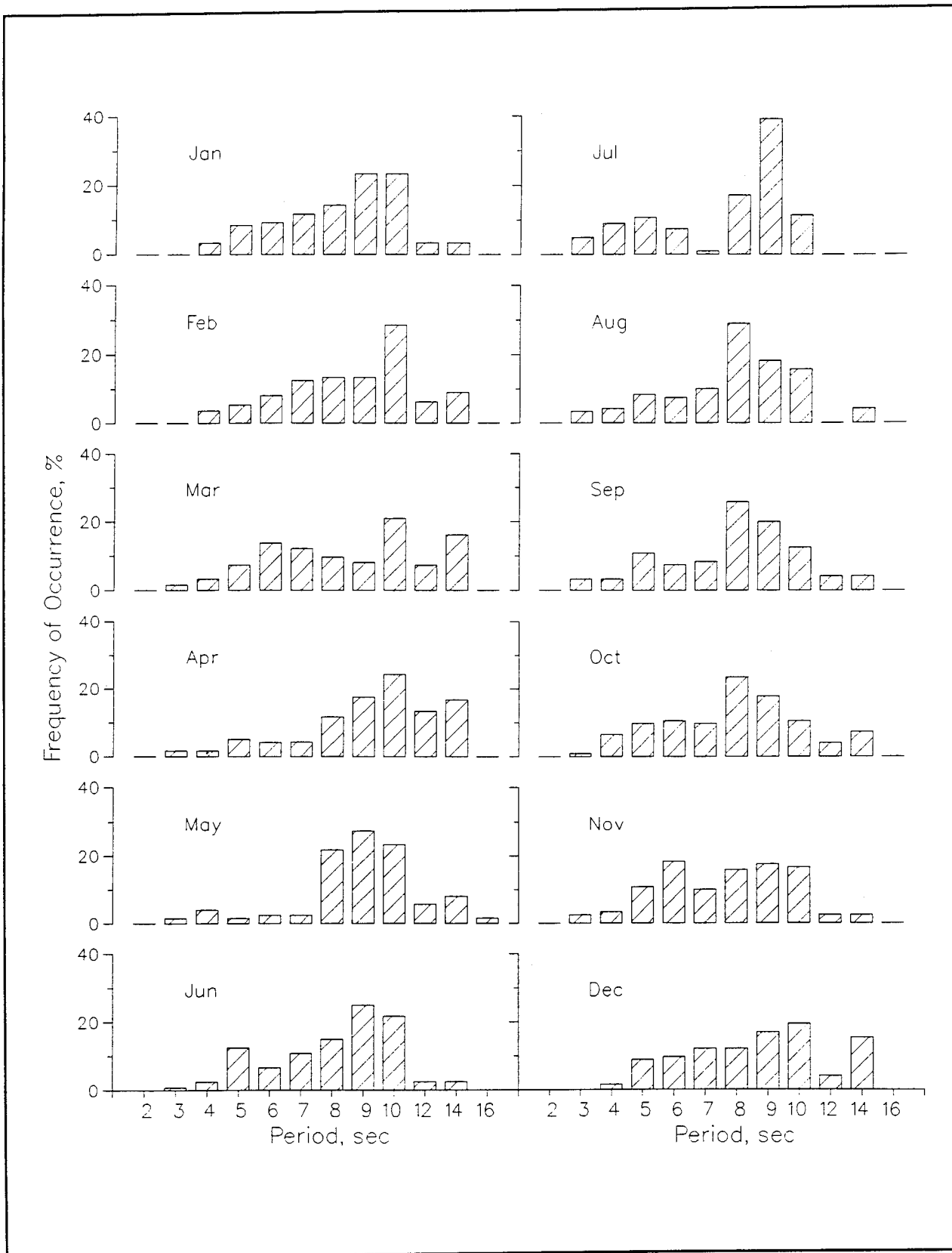


Figure C6. 1993 monthly wave period distributions for Gauge 111

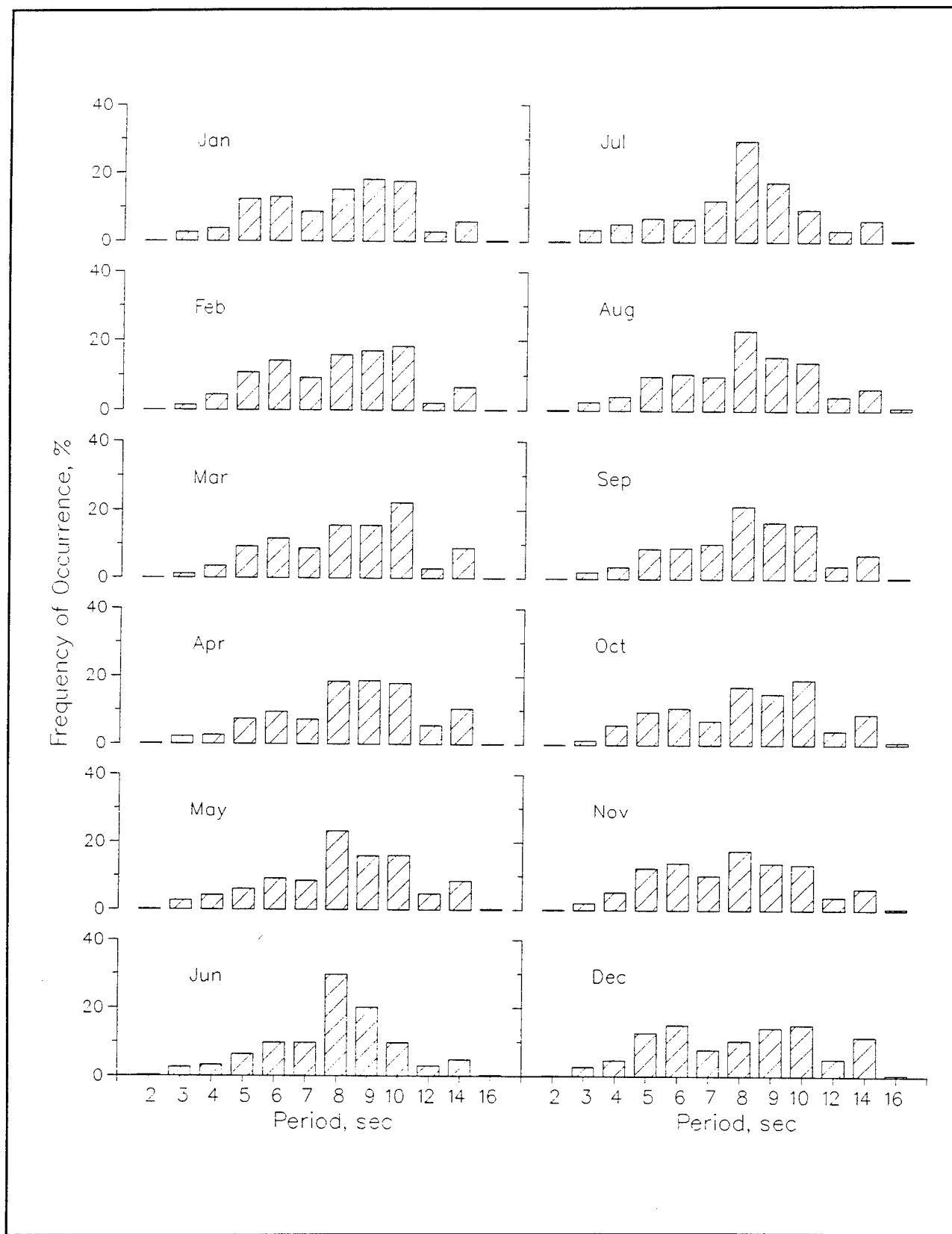


Figure C7. 1985-1993 monthly wave period distributions for Gauge 111

**Table C5**  
**1993 persistence of  $H_{mo}$  for Gauge 111**

Height (m)	Consecutive Day(s) or Longer																		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19+
0.5	28	24		18	14			12				8							7
1.0	46	33	21	15	10	7		4	3		2		1						
1.5	25	18	14	6	4				2										
2.0	19	13	9	3															
2.5	13	7	3	1															
3.0	10	3																	
3.5	6	1																	
4.0	3																		

**Table C6**  
**1985 through 1993 persistence of  $H_{mo}$  for Gauge 111**

Height (m)	Consecutive Day(s) or Longer																		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19+
0.5	29	26	23	21	19	17	15	14	13	12		10	8		7			6	5
1.0	49	34	22	10	7	5	4	3	2		1								
1.5	34	19	9	4	2			1											
2.0	16	9	4		1														
2.5	9	4	2	1															
3.0	5	2	1																
3.5	3	2	1																
4.0	2																		

\* Data from Gauge 640 from 1985 and 1986 as well as data from Gauge 141 for 1987 were used for comparison with Gauge 111. Gauge 511 used for Jan-Aug 1993.

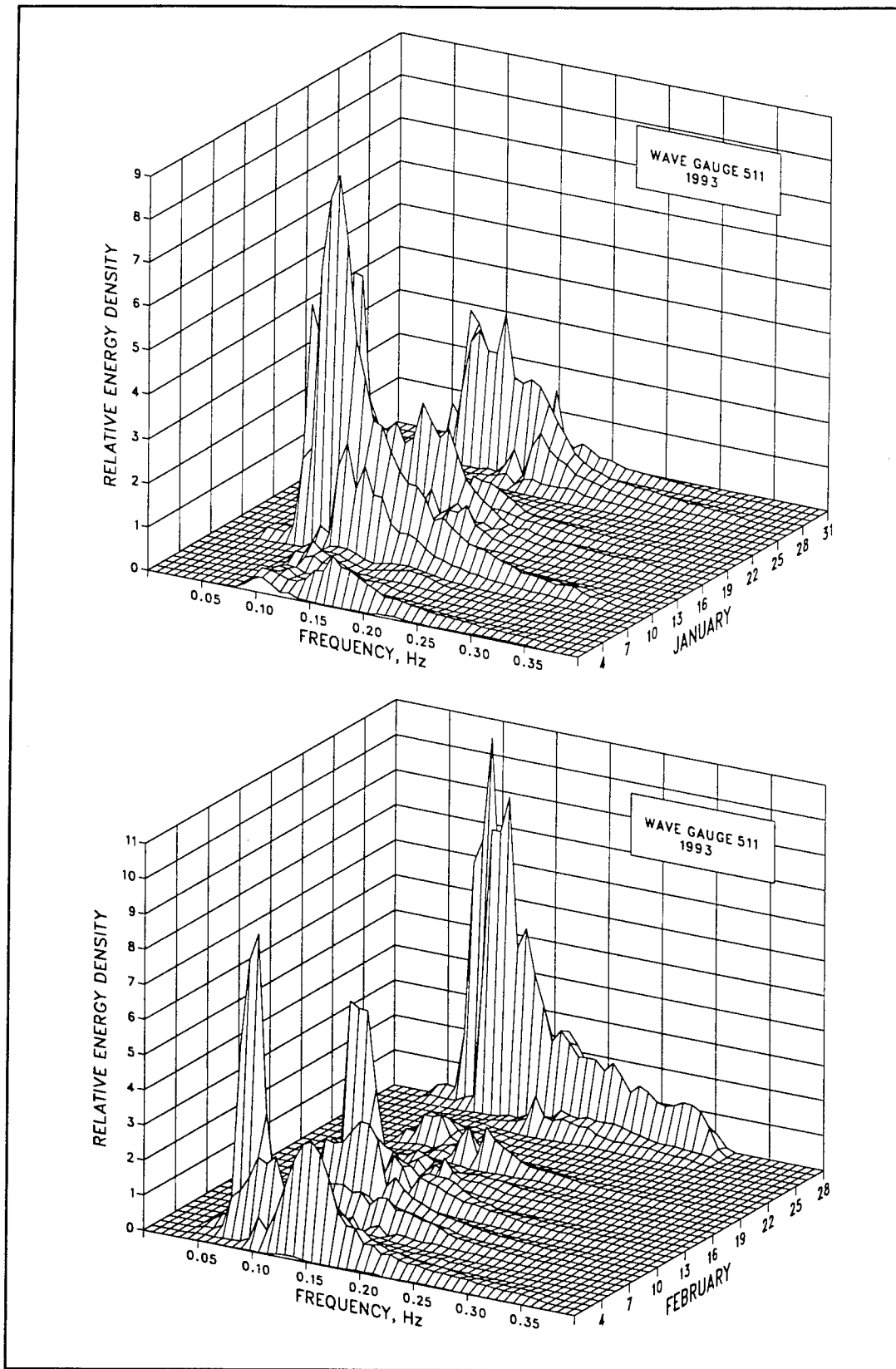


Figure C8. 1993 monthly spectra for Gauge 111 (Sheet 1 of 6)

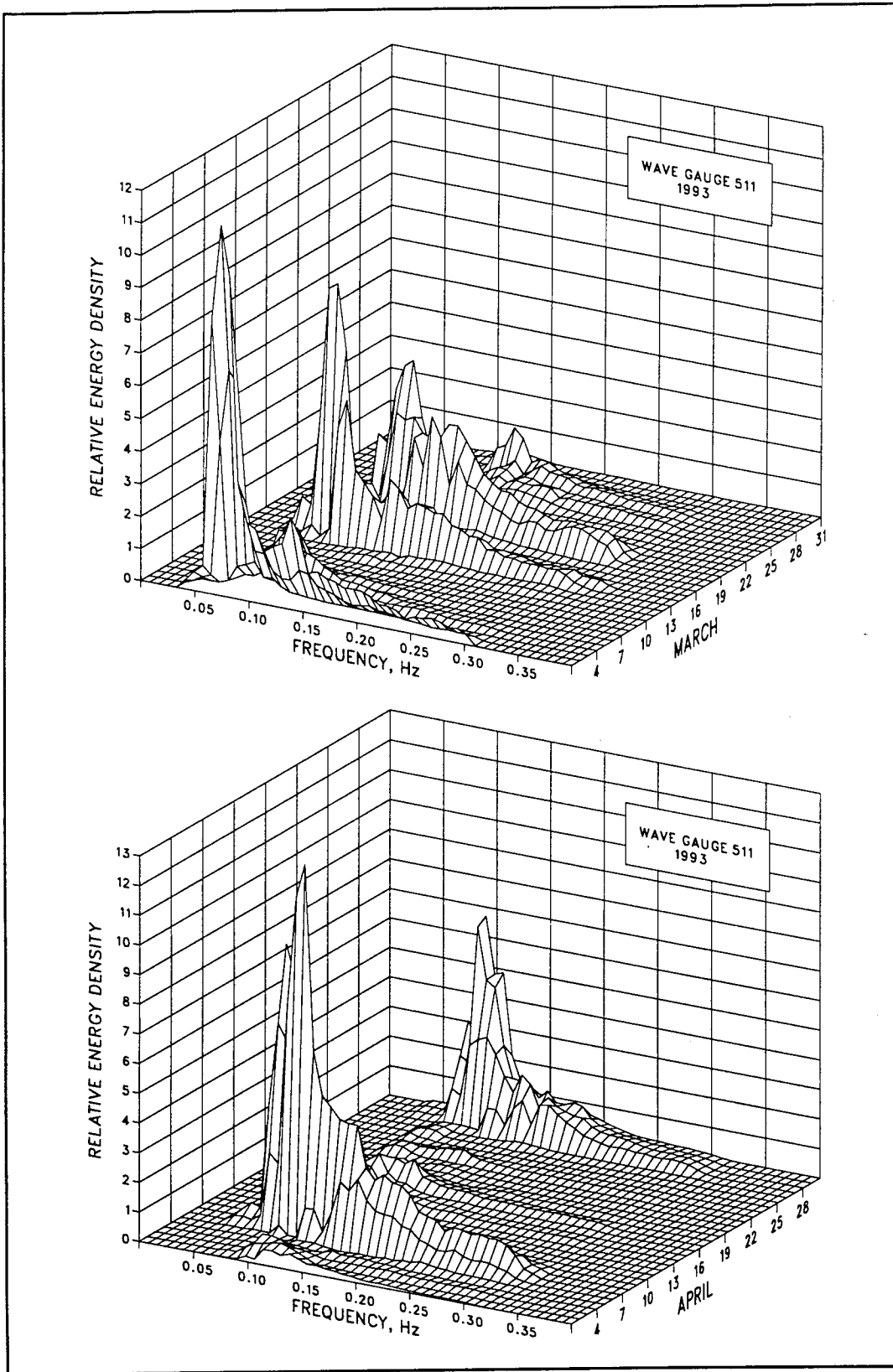


Figure C8. (Sheet 2 of 6)

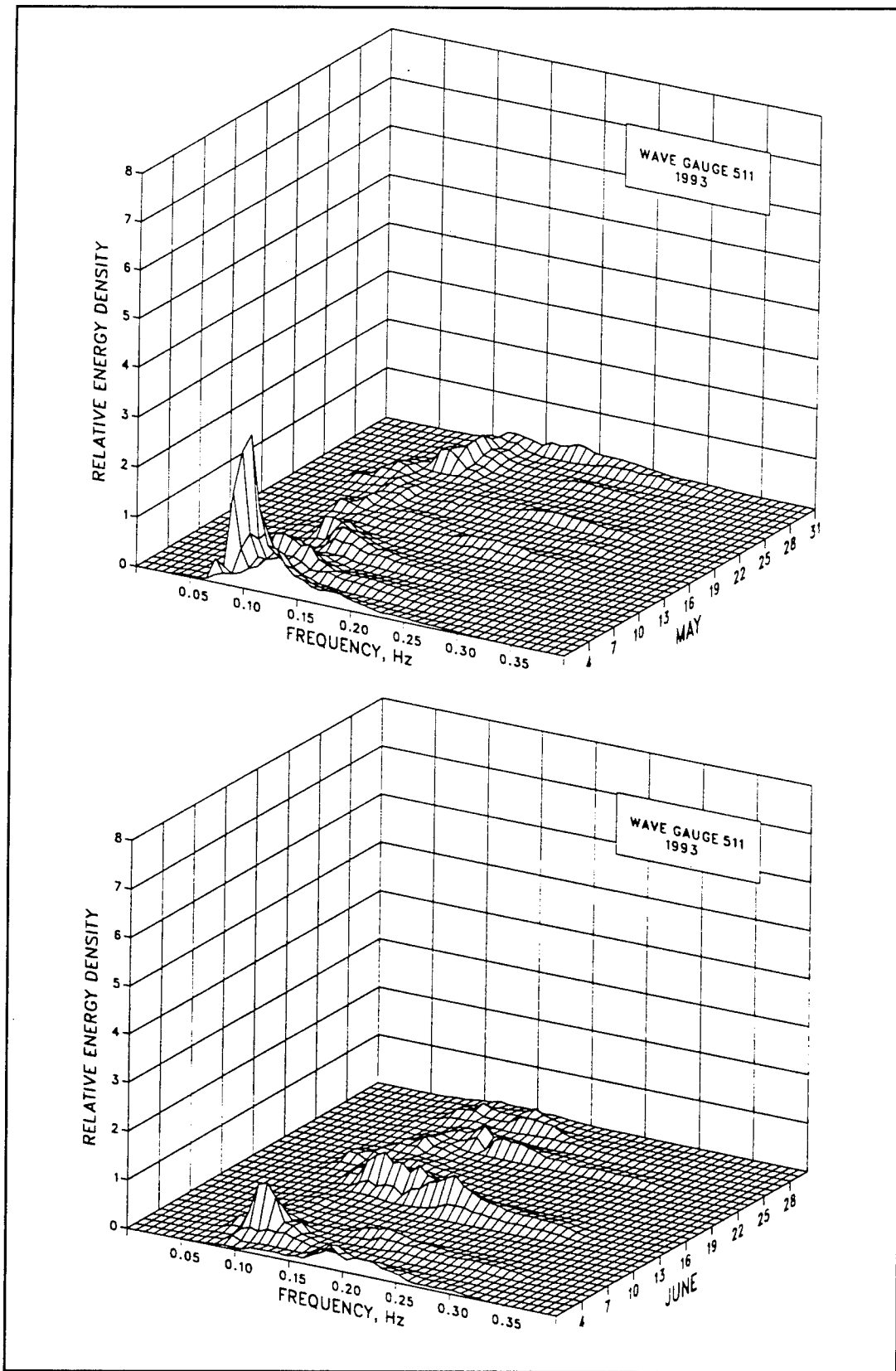


Figure C8. (Sheet 3 of 6)

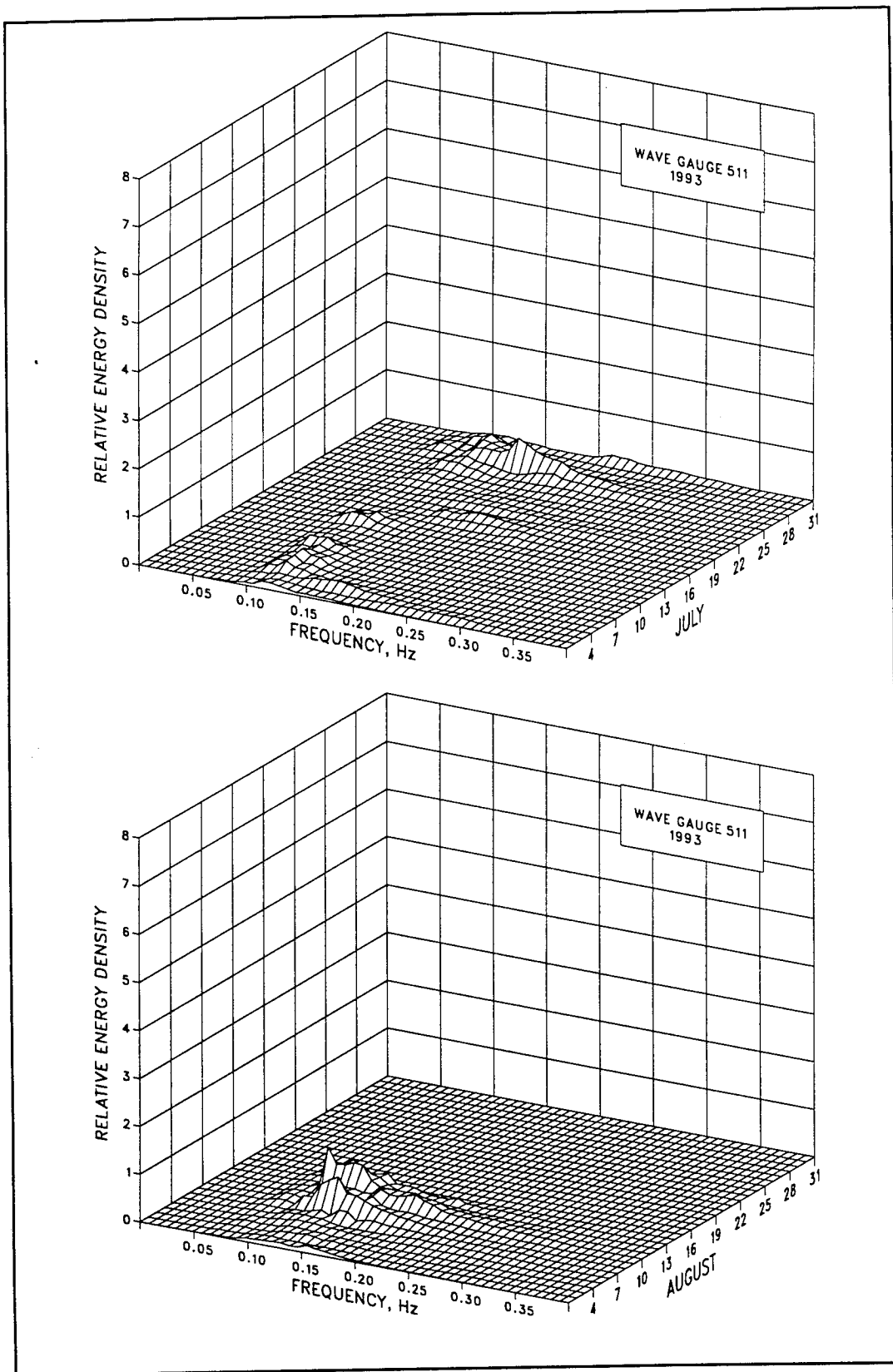


Figure C8. (Sheet 4 of 6)

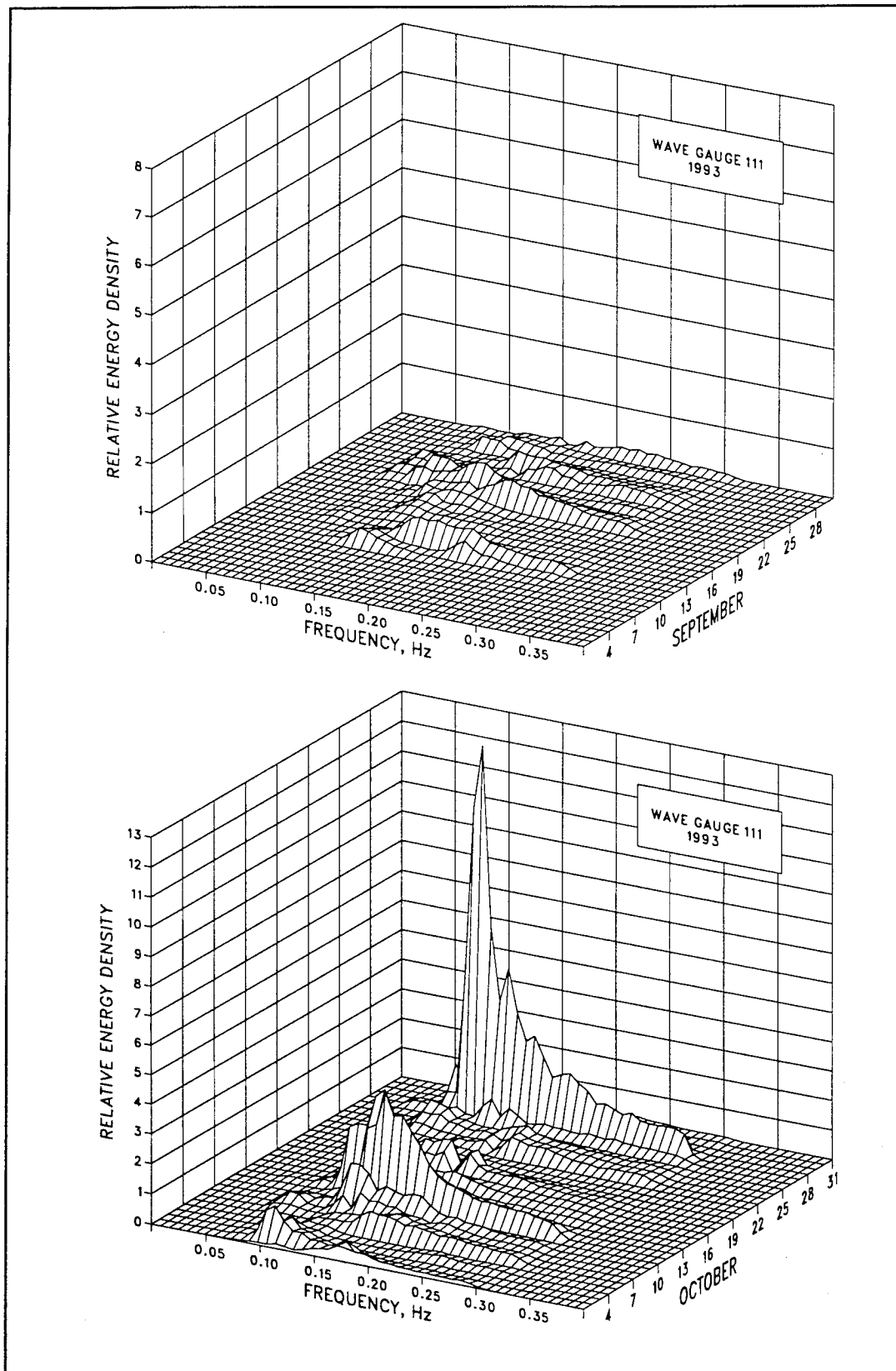


Figure C8. (Sheet 5 of 6)

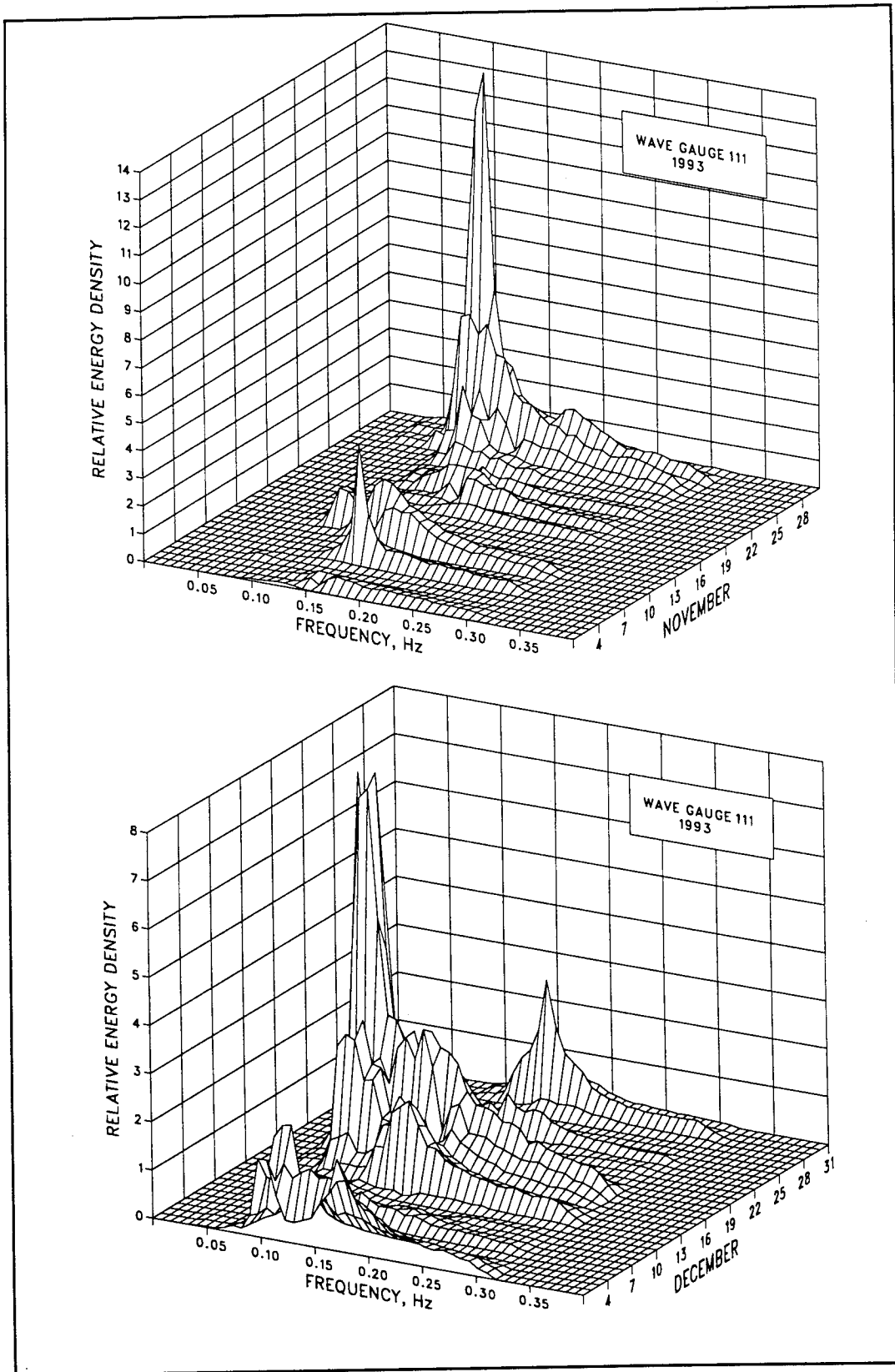


Figure C8. (Sheet 6 of 6)

**Table C7**  
**Wave statistics for Gauge 111**

Month	1993							1985-1993							
	Height			Date	Period			Number Obs.	Height			Date	Period		
	Mean m	Std. Dev. m	Extreme m		Mean sec	Std. Dev. sec	Number Obs.		Mean m	Std. Dev. m	Extreme m		Mean sec	Std. Dev. sec	Number Obs.
Jan	1.1	0.7	3.2	10	9.0	2.2	120	1.0	0.7	4.0	1992	8.6	2.6	1083	
Feb	1.3	0.8	3.6	27	9.4	2.5	112	1.1	0.7	4.0	1989	8.6	2.5	985	
Mar	1.2	0.8	3.8	13	9.4	2.9	124	1.1	0.7	4.5	1987	8.9	2.5	1093	
Apr	1.2	0.9	4.1	6	10.4	2.9	120	1.0	0.7	4.8	1988	9.3	2.7	1056	
May	0.6	0.3	1.6	1	9.8	2.6	124	0.8	0.6	3.3	1986	9.0	2.7	1057	
Jun	0.6	0.3	1.3	14	8.7	2.2	120	0.7	0.4	2.4	1986	8.6	2.4	1042	
Jul	0.5	0.2	1.0	26	8.0	2.2	123	0.6	0.3	1.9	1986	8.6	2.6	1059	
Aug	0.8	0.5	4.3	31	8.4	2.2	121	0.8	0.4	4.3	1991	8.7	2.7	1033	
Sep	0.7	0.4	2.4	1	8.5	2.4	120	1.0	0.6	4.0	1992	8.8	2.6	1019	
Oct	1.1	0.6	4.0	27	8.5	2.5	124	1.1	0.7	5.0	1991	8.9	2.8	1076	
Nov	1.1	0.8	3.3	25	8.3	2.3	120	1.0	0.6	4.2	1991	8.5	2.8	1051	
Dec	1.2	0.7	3.6	17	9.4	2.7	124	1.1	0.8	4.5	1989	8.9	3.1	1012	
Annual	0.9	0.6	4.3	Aug	9.0	2.6	1452	0.9	0.6	5.0	Oct 1991	8.8	2.7	12566	

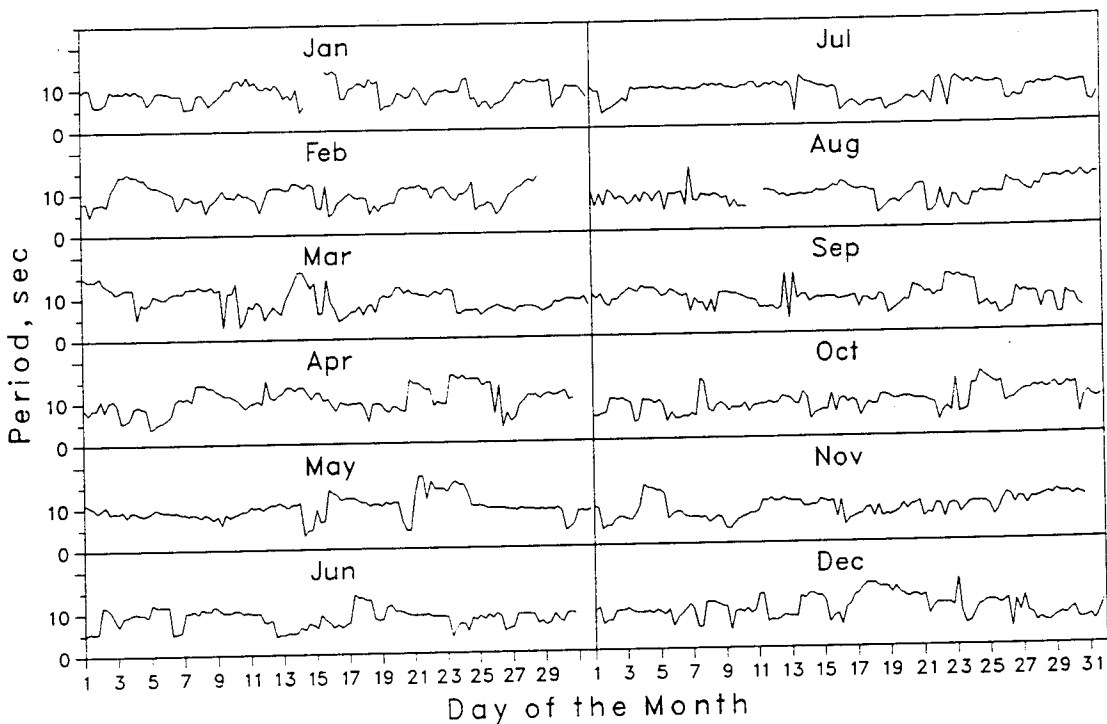
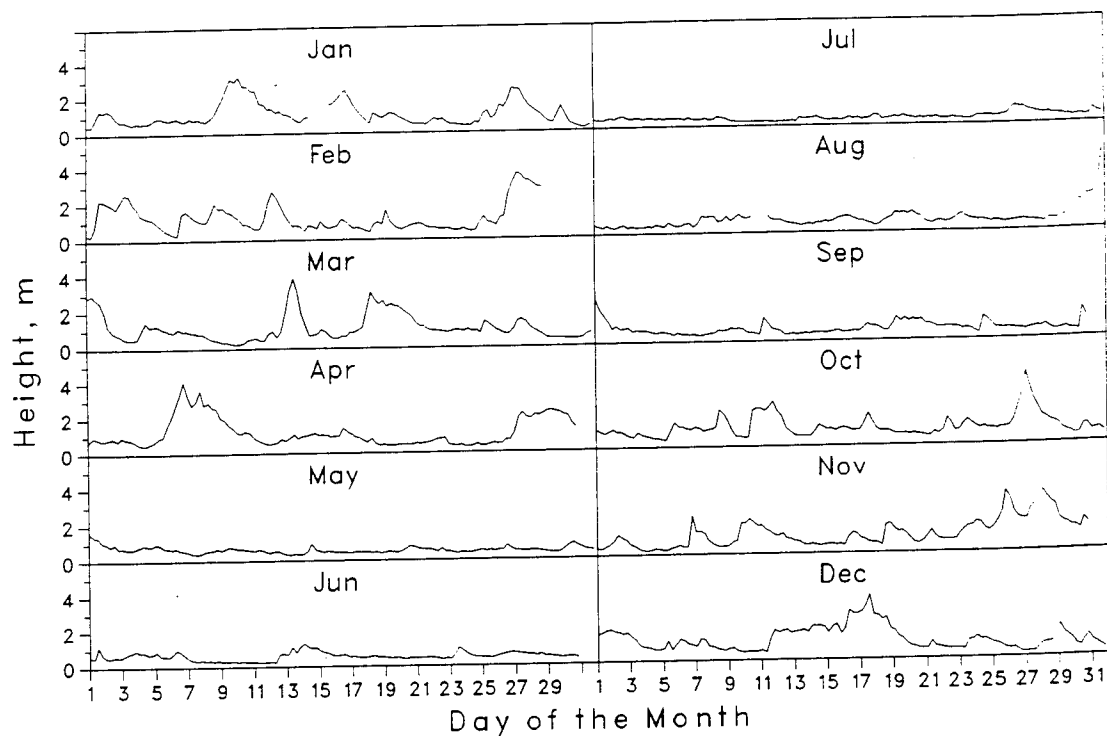


Figure C9. Time-histories of wave height and period for Gauge 111

# Appendix D

## Wave Data for Gauge 625

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Wave data summaries for Gauge 625 for 1993 and for 1980 through 1993 are presented in the following pages:

### Daily $H_{mo}$ and $T_p$

Figure D1 displays the individual wave height  $H_{mo}$  and peak spectral wave period  $T_p$  values, along with the monthly mean values.

### Joint Distributions of $H_{mo}$ and $T_p$

Annual and monthly joint distribution tables are presented in Tables D1 and D2, and data for 1980 through 1993 are in Tables D3 and D4. Each table gives the frequency (in parts per 10,000) for which the wave height and peak period were within the specified intervals; these values can be converted to percentages by dividing by 100. Marginal totals are also included. The row total gives the number of observations out of 10,000 that fell within each specified peak period interval. The column total gives the number of observations out of 10,000 that fell within each specified wave height interval.

### Cumulative Distributions of Wave Height

Annual and monthly wave height distributions for 1993 are plotted in cumulative form in Figures D2 and D3. Data for 1980 through 1993 are plotted in Figure D4.

## Peak Spectral Wave Period Distributions

Annual and monthly peak wave period  $T_p$  distribution histograms for 1993 are presented in Figures D5 and D6. Data for 1980 through 1993 are presented in Figure D7.

## Persistence of Wave Heights

Table D5 shows the number of times in 1993 when the specified wave height was equaled or exceeded at least once during each day for the duration (consecutive days). Data for 1980 through 1993 are averaged and given in Table D6. An example is shown below:

Height m	Consecutive Day(s) or Longer																		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19+
0.5	18	15		14	13	12		11	10	9				8		7			
1.0	50	34	24	21	18	14	12	8	7	3			2						
1.5	41	19	8	6	2	1													
2.0	22	9	5	1															
2.5	10	5	2																
3.0	6	1																	
3.5		1																	
4.0	1																		

This example indicates that wave heights equaled or exceeded 1.0 m 50 times for at least 1 day; 34 times for at least 2 days; 24 times for at least 3 days, etc. Therefore, on 16 occasions the height equaled or exceeded 1.0 m for 1 day exactly ( $50 - 34 = 16$ ); on 10 occasions for 2 days; on 3 occasions for 3 days, etc. Note that the height exceeded 1 m 50 times for 1 day or longer, while heights exceeded 0.5 m only 18 times for this same duration. This change in durations occurred because the longer durations of lower waves may be interspersed with shorter, but more frequent, intervals of higher waves. For example, one of the times that the wave heights exceeded 0.5 m for 16 days may have represented three times the height exceeded 1 m for shorter durations.

## Spectra

Monthly spectra for the offshore staff gauge (Gauge 625) are presented in Figure D8. The plots show "relative" energy density as a function of wave frequency. These figures summarize the large number of spectra for each month. The figures emphasize the higher energy density associated with storms, as well as the general shifts in energy density to different frequencies.

As used here, "relative" indicates the spectra have been smoothed by the three-dimensional surface drawing routine. Consequently, extremely high- and low-energy density values are modified to produce a smooth surface. The figures are not intended for quantitative measurements; however, they do provide the energy density as a function of frequency relative to the other spectra for the month.

Monthly and annual wave statistics for Gauge 625 for 1993 and for 1980 through 1993 are presented in Table D7.

Figure D9 plots monthly time histories of wave height and period.

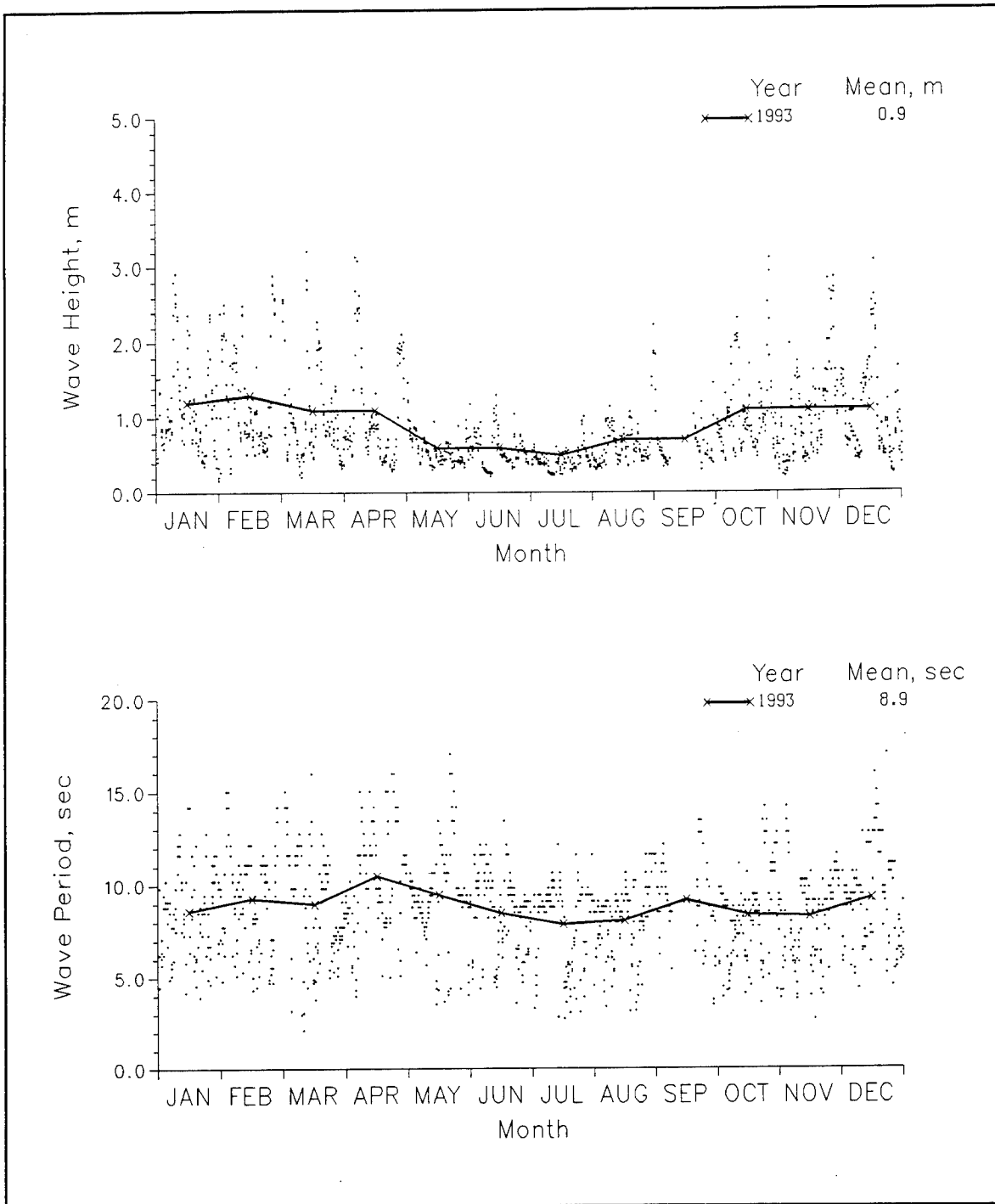


Figure D1. 1993 daily wave height and period values with monthly means for Gauge 625

**Table D1**  
**Annual Joint Distribution of  $H_{mo}$  versus  $T_p$**

		Annual 1993, Gauge 625 Percent Occurrence(X100) of Height and Period											Total	
Height(m)		Period(sec)												
		2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9	16.0- Longer	
0.00 - 0.49		22	29	58	65	94	231	663	879	504	101	216	.	2862
0.50 - 0.99		14	144	339	468	353	339	771	937	648	130	245	14	4402
1.00 - 1.49		.	.	130	238	331	122	130	159	245	36	79	.	1470
1.50 - 1.99		.	.	.	65	115	65	36	72	151	22	72	.	598
2.00 - 2.49		.	.	.	.	14	72	43	36	130	79	50	.	424
2.50 - 2.99		.	.	.	.	.	.	.	58	79	22	50	.	209
3.00 - 3.49		.	.	.	.	.	.	.	7	14	.	14	.	35
3.50 - 3.99		.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49		.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99		.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - Greater		.	.	.	.	.	.	.	.	.	.	.	.	0
Total		36	173	527	836	907	829	1643	2148	1771	390	726	14	

**Table D2**  
**Monthly Joint Distribution of  $H_{mo}$  versus  $T_p$**

January 1993, Gauge 625  
 Percent Occurrence(X100) of Height and Period

Height(m)	Period(sec)											Total	
	2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9		16.0- Longer
0.00 - 0.49	.	.	.	.	.	83	167	667	167	.	83	.	1167
0.50 - 0.99	.	83	.	333	333	417	1417	583	583	.	83	.	3832
1.00 - 1.49	.	.	500	500	583	250	167	167	500	83	.	.	2750
1.50 - 1.99	.	.	.	.	333	167	.	83	167	167	83	.	1000
2.00 - 2.49	.	.	.	.	83	83	250	167	250	.	83	.	916
2.50 - 2.99	.	.	.	.	.	.	.	83	167	.	83	.	333
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - Greater	.	.	.	.	.	.	.	.	.	.	.	.	0
Total	0	83	500	833	1332	1000	2001	1750	1834	250	415	0	

February 1993, Gauge 625  
 Percent Occurrence(X100) of Height and Period

Height(m)	Period(sec)											Total	
	2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9		16.0- Longer
0.00 - 0.49	.	.	.	.	.	179	.	.	179	.	.	.	358
0.50 - 0.99	.	.	268	357	268	89	804	625	1875	.	179	.	4465
1.00 - 1.49	.	.	268	357	357	89	446	89	268	89	268	.	2231
1.50 - 1.99	.	.	.	179	268	89	89	179	268	.	.	.	1072
2.00 - 2.49	.	.	.	.	89	357	.	.	268	357	179	.	1250
2.50 - 2.99	.	.	.	.	.	.	.	89	268	89	179	.	625
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - Greater	.	.	.	.	.	.	.	.	.	.	.	.	0
Total	0	0	536	893	982	803	1339	982	3126	535	805	0	

March 1993, Gauge 625  
 Percent Occurrence(X100) of Height and Period

Height(m)	Period(sec)											Total	
	2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9		16.0- Longer
0.00 - 0.49	163	.	81	.	81	244	488	244	244	.	244	.	1789
0.50 - 0.99	.	244	325	325	894	894	81	325	1138	81	569	.	4876
1.00 - 1.49	.	.	.	325	325	163	.	325	325	81	81	.	1625
1.50 - 1.99	.	.	.	163	.	.	.	163	163	.	244	.	733
2.00 - 2.49	.	.	.	.	.	163	.	81	81	81	81	.	487
2.50 - 2.99	.	.	.	.	.	.	.	81	.	81	244	.	406
3.00 - 3.49	.	.	.	.	.	.	.	.	81	.	.	.	81
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - Greater	.	.	.	.	.	.	.	.	.	.	.	.	0
Total	163	244	406	813	1300	1464	569	1219	2032	324	1463	0	

(Continued)

(Sheet 1 of 4)

Table D2 (Continued)

April 1993, Gauge 625  
Percent Occurrence(X100) of Height and Period

Height(m)	Period(sec)											Total	
	2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9		16.0- Longer
0.00 - 0.49	.	.	83	417	250	417	417	167	.	500	667	.	2168
0.50 - 0.99	.	.	.	83	.	83	750	1167	417	667	417	.	4251
1.00 - 1.49	.	.	250	83	83	.	83	250	417	.	167	.	1250
1.50 - 1.99	.	.	.	83	83	.	83	.	750	.	167	.	1166
2.00 - 2.49	.	.	.	.	.	.	83	.	500	250	.	.	833
2.50 - 2.99	.	.	.	.	.	.	.	83	83	.	.	.	166
3.00 - 3.49	.	.	.	.	.	.	.	.	83	.	83	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - Greater	0	0	333	583	333	583	1333	1667	2167	1500	1501	0	0
Total	0	0	333	583	333	583	1333	1667	2167	1500	1501	0	0

May 1993, Gauge 625  
Percent Occurrence(X100) of Height and Period

Height(m)	Period(sec)											Total	
	2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9		16.0- Longer
0.00 - 0.49	.	161	726	161	242	81	403	1855	1210	403	645	.	4597
0.50 - 0.99	.	.	.	.	.	403	968	1694	323	161	242	81	5162
1.00 - 1.49	.	.	.	.	.	.	.	.	242	.	.	.	242
1.50 - 1.99	.	.	.	.	.	.	.	.	.	.	.	.	0
2.00 - 2.49	.	.	.	.	.	.	.	.	.	.	.	.	0
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - Greater	0	161	726	161	242	484	1371	3549	1775	564	887	81	0
Total	0	161	726	161	242	484	1371	3549	1775	564	887	81	0

June 1993, Gauge 625  
Percent Occurrence(X100) of Height and Period

Height(m)	Period(sec)											Total	
	2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9		16.0- Longer
0.00 - 0.49	.	.	504	840	588	252	1092	1429	1345	.	168	.	4454
0.50 - 0.99	.	84	.	336	252	504	756	672	756	84	168	.	4956
1.00 - 1.49	.	.	.	.	.	.	.	.	.	.	.	.	588
1.50 - 1.99	.	.	.	.	.	.	.	.	.	.	.	.	0
2.00 - 2.49	.	.	.	.	.	.	.	.	.	.	.	.	0
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - Greater	0	84	504	1176	1008	756	1848	2101	2101	84	336	0	0
Total	0	84	504	1176	1008	756	1848	2101	2101	84	336	0	0

(Continued)

(Sheet 2 of 4)

**Table D2 (Continued)**

July 1993, Gauge 625  
Percent Occurrence(X100) of Height and Period

Height(m)	Period(sec)											Total	
	2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9		16.0- Longer
0.00 - 0.49	81	244	488	488	325	163	1789	3171	894	.	81	.	7724
0.50 - 0.99	81	325	407	488	244	.	325	325	.	.	.	.	2195
1.00 - 1.49	.	.	.	.	81	.	.	.	.	.	.	.	81
1.50 - 1.99	.	.	.	.	.	.	.	.	.	.	.	.	0
2.00 - 2.49	.	.	.	.	.	.	.	.	.	.	.	.	0
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - Greater	.	.	.	.	.	.	.	.	.	.	.	.	0
Total	162	569	895	976	650	163	2114	3496	894	0	81	0	0

August 1993, Gauge 625  
Percent Occurrence(X100) of Height and Period

Height(m)	Period(sec)											Total	
	2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9		16.0- Longer
0.00 - 0.49	.	.	85	.	424	763	1695	593	424	.	.	.	3984
0.50 - 0.99	.	339	508	763	85	508	1271	1356	508	.	.	.	5338
1.00 - 1.49	.	.	.	85	169	.	.	.	85	.	.	.	339
1.50 - 1.99	.	.	.	.	.	.	.	.	254	.	.	.	254
2.00 - 2.49	.	.	.	.	.	.	.	.	85	.	.	.	85
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - Greater	.	.	.	.	.	.	.	.	.	.	.	.	0
Total	0	339	593	848	678	1271	2966	1949	1356	0	0	0	0

September 1993, Gauge 625  
Percent Occurrence(X100) of Height and Period

Height(m)	Period(sec)											Total	
	2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9		16.0- Longer
0.00 - 0.49	.	.	.	164	.	.	1639	1311	656	.	328	.	4098
0.50 - 0.99	.	328	.	.	656	328	656	820	820	328	820	.	4756
1.00 - 1.49	.	.	.	328	328	.	164	164	.	.	.	.	984
1.50 - 1.99	.	.	.	.	.	.	.	164	.	.	.	.	164
2.00 - 2.49	.	.	.	.	.	.	.	.	.	.	.	.	0
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - Greater	.	.	.	.	.	.	.	.	.	.	.	.	0
Total	0	328	0	492	984	328	2459	2459	1476	328	1148	0	0

(Continued)

(Sheet 3 of 4)

**Table D2 (Concluded)**

October 1993, Gauge 625  
Percent Occurrence(X100) of Height and Period

Height(m)	Period(sec)												Total
	2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9	16.0- Longer	
0.00 - 0.49	.	.	.	.	.	.	242	81	.	.	161	.	484
0.50 - 0.99	.	161	323	484	242	565	1532	1613	323	323	242	.	5808
1.00 - 1.49	.	.	403	565	565	81	161	81	323	81	161	.	2421
1.50 - 1.99	.	.	.	.	161	81	242	.	81	.	.	.	565
2.00 - 2.49	.	.	.	.	.	161	161	.	161	.	.	.	483
2.50 - 2.99	.	.	.	.	.	.	.	81	81	.	.	.	162
3.00 - 3.49	.	.	.	.	.	.	.	81	.	.	.	.	81
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - Greater	0	161	726	1049	968	888	2338	1937	969	404	564	0	0
Total	0	161	726	1049	968	888	2338	1937	969	404	564	0	0

November 1993, Gauge 625  
Percent Occurrence(X100) of Height and Period

Height(m)	Period(sec)												Total
	2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9	16.0- Longer	
0.00 - 0.49	.	83	.	167	83	250	333	667	417	250	250	.	2500
0.50 - 0.99	83	83	583	583	250	83	500	500	417	.	.	.	3082
1.00 - 1.49	.	.	83	83	750	167	250	500	583	.	.	.	2416
1.50 - 1.99	.	.	.	250	333	83	.	333	83	.	.	.	1082
2.00 - 2.49	.	.	.	.	.	83	.	167	83	.	.	.	333
2.50 - 2.99	.	.	.	.	.	.	.	167	417	.	.	.	584
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - Greater	83	166	666	1083	1416	666	1083	2334	2000	250	250	0	0
Total	83	166	666	1083	1416	666	1083	2334	2000	250	250	0	0

December 1993, Gauge 625  
Percent Occurrence(X100) of Height and Period

Height(m)	Period(sec)												Total
	2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9	16.0- Longer	
0.00 - 0.49	.	.	.	.	.	242	161	484	565	.	.	.	1452
0.50 - 0.99	.	.	161	645	323	161	161	1452	806	.	484	81	4274
1.00 - 1.49	.	.	.	242	565	565	403	323	81	81	242	.	2502
1.50 - 1.99	.	.	.	81	161	323	.	.	.	81	323	.	969
2.00 - 2.49	.	.	.	.	.	.	.	.	81	242	242	.	565
2.50 - 2.99	.	.	.	.	.	.	.	81	.	.	81	.	162
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	81	.	81
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - Greater	0	0	161	968	1049	1291	725	2340	1533	404	1453	81	0
Total	0	0	161	968	1049	1291	725	2340	1533	404	1453	81	0

(Sheet 4 of 4)

**Table D3**  
**Annual Joint Distribution of  $H_{mo}$  versus  $T_p$  (All Years)**

Height(m)	Annual 1980-1993, Gauge 625 Percent Occurrence(X100) of Height and Period												Total
	Period(sec)												
	2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9	16.0- Longer	
0.00 - 0.49	11	24	40	63	112	236	556	521	421	184	259	21	2448
0.50 - 0.99	6	96	248	440	448	420	728	777	830	163	296	29	4481
1.00 - 1.49	.	4	99	299	327	205	201	194	337	45	136	2	1849
1.50 - 1.99	.	.	3	63	174	91	65	64	142	39	69	4	714
2.00 - 2.49	.	.	.	1	38	44	26	33	71	39	43	2	297
2.50 - 2.99	.	.	.	.	3	12	20	24	44	17	34	2	156
3.00 - 3.49	.	.	.	.	1	.	5	7	17	7	12	1	50
3.50 - 3.99	.	.	.	.	.	.	.	.	2	2	2	1	7
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - Greater	.	.	.	.	.	.	.	.	.	.	.	.	0
Total	17	124	390	866	1103	1008	1601	1620	1864	496	851	62	

**Table D4**  
**Monthly Joint Distribution of  $H_{mo}$  versus  $T_p$  (All Years)**

January 1980-1993, Gauge 625  
 Percent Occurrence(X100) of Height and Period

Height(m)	Period(sec)												Total
	2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9	16.0- Longer	
0.00 - 0.49	7	35	42	77	104	195	334	536	355	132	174	14	2005
0.50 - 0.99	.	153	223	397	508	286	606	515	843	125	223	7	3886
1.00 - 1.49	.	.	118	557	529	216	202	174	446	7	77	.	2326
1.50 - 1.99	.	.	.	77	244	188	77	111	181	42	35	.	955
2.00 - 2.49	.	.	.	.	63	125	49	42	160	35	84	.	558
2.50 - 2.99	.	.	.	.	7	14	28	42	70	21	35	.	217
3.00 - 3.49	.	.	.	.	.	.	.	.	7	7	.	.	42
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	14
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - Greater	.	.	.	.	.	.	.	.	.	.	.	.	0
Total	7	188	383	1108	1455	1024	1296	1427	2083	383	628	21	

February 1980-1993, Gauge 625  
 Percent Occurrence(X100) of Height and Period

Height(m)	Period(sec)												Total
	2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9	16.0- Longer	
0.00 - 0.49	.	14	21	35	56	70	239	302	295	77	175	7	1284
0.50 - 0.99	14	56	182	393	386	386	681	730	1074	63	281	.	4253
1.00 - 1.49	.	7	119	379	449	260	274	218	540	56	204	.	2506
1.50 - 1.99	.	.	.	126	302	112	84	112	211	63	91	.	1101
2.00 - 2.49	.	.	.	.	35	84	42	49	84	77	112	.	483
2.50 - 2.99	.	.	.	.	.	14	14	35	98	21	91	.	273
3.00 - 3.49	.	.	.	.	.	.	21	7	28	7	7	.	70
3.50 - 3.99	.	.	.	.	.	.	.	.	7	7	14	.	28
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - Greater	.	.	.	.	.	.	.	.	.	.	.	.	0
Total	14	77	322	933	1228	926	1355	1453	2337	371	975	7	

March 1980-1993, Gauge 625  
 Percent Occurrence(X100) of Height and Period

Height(m)	Period(sec)												Total
	2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9	16.0- Longer	
0.00 - 0.49	19	6	6	62	50	87	280	217	317	118	174	.	1336
0.50 - 0.99	12	50	211	516	447	503	658	634	1025	112	360	.	4528
1.00 - 1.49	.	6	137	292	317	267	186	230	609	43	317	.	2404
1.50 - 1.99	.	.	.	68	168	75	87	81	267	62	155	6	969
2.00 - 2.49	.	.	.	6	50	50	31	43	118	62	56	.	416
2.50 - 2.99	.	.	.	.	.	6	25	19	81	37	62	.	230
3.00 - 3.49	.	.	.	.	.	.	12	12	50	12	31	.	117
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - Greater	.	.	.	.	.	.	.	.	.	.	.	.	0
Total	31	62	354	944	1032	988	1279	1236	2467	446	1155	6	

(Continued)

(Sheet 1 of 4)

Table D4 (Continued)

April 1980-1993, Gauge 625  
Percent Occurrence(X100) of Height and Period

Height(m)	Period(sec)											Total	
	2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9		16.0- Longer
0.00 - 0.49	13	20	13	52	46	111	412	373	373	164	334	.	1911
0.50 - 0.99	7	65	164	360	360	393	864	955	1211	229	543	13	5164
1.00 - 1.49	.	7	98	190	223	196	203	275	334	39	164	.	1729
1.50 - 1.99	.	.	7	39	118	46	79	105	255	13	79	.	741
2.00 - 2.49	.	.	.	7	26	7	33	26	105	33	7	.	244
2.50 - 2.99	.	.	.	.	7	20	26	20	46	33	7	.	159
3.00 - 3.49	.	.	.	.	.	.	.	7	33	.	20	.	60
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - Greater	.	.	.	.	.	.	.	.	.	.	.	.	0
Total	20	92	282	648	780	773	1617	1761	2357	511	1154	13	

May 1980-1993, Gauge 625  
Percent Occurrence(X100) of Height and Period

Height(m)	Period(sec)											Total	
	2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9		16.0- Longer
0.00 - 0.49	24	24	43	86	171	300	581	605	587	238	373	6	3038
0.50 - 0.99	6	153	330	367	501	483	1021	1045	678	104	214	12	4914
1.00 - 1.49	.	.	55	116	128	177	293	189	306	18	79	.	1361
1.50 - 1.99	.	.	.	61	67	18	61	55	98	12	55	.	427
2.00 - 2.49	.	.	.	.	49	24	18	18	6	31	18	6	170
2.50 - 2.99	.	.	.	.	.	.	12	6	31	18	12	.	79
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	6	.	6
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - Greater	.	.	.	.	.	.	.	.	.	.	.	.	0
Total	30	177	428	630	916	1002	1986	1918	1706	421	757	24	

June 1980-1993, Gauge 625  
Percent Occurrence(X100) of Height and Period

Height(m)	Period(sec)											Total	
	2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9		16.0- Longer
0.00 - 0.49	28	49	70	77	294	454	1335	887	524	147	161	14	4040
0.50 - 0.99	7	126	259	447	391	482	1125	1041	608	105	126	35	4752
1.00 - 1.49	.	.	49	147	161	112	119	112	168	.	35	7	910
1.50 - 1.99	.	.	.	28	49	21	14	7	105	.	42	.	266
2.00 - 2.49	.	.	.	.	7	14	7	7	7	.	.	.	42
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - Greater	.	.	.	.	.	.	.	.	.	.	.	.	0
Total	35	175	378	699	902	1083	2600	2054	1412	252	364	56	

(Continued)

(Sheet 2 of 4)

Table D4 (Continued)

July 1980-1993, Gauge 625  
Percent Occurrence(X100) of Height and Period

Height(m)	Period(sec)												Total
	2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9	16.0- Longer	
0.00 - 0.49	7	80	138	109	218	653	1487	1298	682	355	370	58	5455
0.50 - 0.99	7	145	312	435	537	522	674	587	363	218	138	58	3996
1.00 - 1.49	.	.	36	123	109	80	51	29	36	.	15	.	479
1.50 - 1.99	.	.	.	7	15	15	15	7	7	.	.	.	66
2.00 - 2.49	.	.	.	.	.	.	.	.	.	.	.	.	0
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - Greater	14	225	486	674	879	1270	2227	1921	1088	573	523	116	0
Total	14	225	486	674	879	1270	2227	1921	1088	573	523	116	0

August 1980-1993, Gauge 625  
Percent Occurrence(X100) of Height and Period

Height(m)	Period(sec)												Total
	2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9	16.0- Longer	
0.00 - 0.49	.	28	35	48	187	491	974	857	643	242	221	7	3733
0.50 - 0.99	14	111	249	525	525	657	891	836	650	194	283	62	4997
1.00 - 1.49	.	.	76	173	173	124	180	76	55	14	7	.	878
1.50 - 1.99	.	.	.	35	83	35	14	7	55	14	28	.	271
2.00 - 2.49	.	.	.	.	14	7	.	7	28	.	35	.	84
2.50 - 2.99	.	.	.	.	.	.	.	7	7	.	.	.	21
3.00 - 3.49	.	.	.	.	7	.	.	7	7	.	.	.	21
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - Greater	14	139	360	781	989	1314	2066	1790	1445	464	574	69	0
Total	14	139	360	781	989	1314	2066	1790	1445	464	574	69	0

September 1980-1993, Gauge 625  
Percent Occurrence(X100) of Height and Period

Height(m)	Period(sec)												Total
	2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9	16.0- Longer	
0.00 - 0.49	.	8	38	23	61	130	267	373	358	175	213	46	1692
0.50 - 0.99	.	91	236	328	434	457	686	846	1006	160	434	.	4678
1.00 - 1.49	.	.	61	366	335	290	305	320	381	107	183	.	2348
1.50 - 1.99	.	.	.	99	229	130	91	91	69	46	76	8	839
2.00 - 2.49	.	.	.	.	15	84	46	15	15	69	53	8	305
2.50 - 2.99	.	.	.	.	.	8	23	23	38	.	23	.	115
3.00 - 3.49	.	.	.	.	.	.	.	.	23	.	.	.	23
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - Greater	0	99	335	816	1074	1099	1418	1668	1890	557	982	62	0
Total	0	99	335	816	1074	1099	1418	1668	1890	557	982	62	0

(Continued)

(Sheet 3 of 4)

**Table D4 (Concluded)**

October 1980-1993, Gauge 625  
Percent Occurrence(X100) of Height and Period

Height(m)	Period(sec)												Total
	2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9	16.0- Longer	
0.00 - 0.49	6	.	18	48	12	121	272	230	302	91	248	30	1378
0.50 - 0.99	.	85	218	344	356	308	610	773	955	211	302	30	4192
1.00 - 1.49	.	6	163	417	417	169	157	290	471	109	211	12	2422
1.50 - 1.99	.	.	24	91	230	73	91	66	218	97	109	18	1017
2.00 - 2.49	.	.	.	.	73	66	54	91	139	60	54	6	543
2.50 - 2.99	.	.	.	.	12	42	54	42	36	24	66	18	294
3.00 - 3.49	.	.	.	.	.	.	18	18	12	36	30	12	126
3.50 - 3.99	.	.	.	.	.	.	.	.	12	6	.	6	24
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - Greater	.	.	.	.	.	.	.	.	.	.	.	.	0
Total	6	91	423	900	1100	779	1256	1510	2145	634	1020	132	0

November 1980-1993, Gauge 625  
Percent Occurrence(X100) of Height and Period

Height(m)	Period(sec)												Total
	2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9	16.0- Longer	
0.00 - 0.49	6	13	39	77	45	135	361	329	264	219	296	52	1836
0.50 - 0.99	6	52	367	522	522	348	586	657	638	245	290	26	4259
1.00 - 1.49	.	26	135	354	561	309	258	213	322	97	135	6	2416
1.50 - 1.99	.	.	.	71	264	187	103	77	103	71	52	13	941
2.00 - 2.49	.	.	.	.	64	26	19	19	64	45	45	.	282
2.50 - 2.99	.	.	.	.	.	13	26	52	45	19	32	.	187
3.00 - 3.49	.	.	.	.	.	.	6	6	26	6	19	.	63
3.50 - 3.99	.	.	.	.	.	.	.	.	.	6	19	.	13
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	13	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - Greater	.	.	.	.	.	.	.	.	.	.	.	.	0
Total	12	91	541	1024	1456	1018	1359	1353	1462	702	882	97	0

December 1980-1993, Gauge 625  
Percent Occurrence(X100) of Height and Period

Height(m)	Period(sec)												Total
	2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9	16.0- Longer	
0.00 - 0.49	14	21	35	63	118	132	237	355	376	265	355	28	1999
0.50 - 0.99	.	70	223	648	418	230	314	683	878	181	348	105	4098
1.00 - 1.49	.	.	125	481	516	251	181	188	321	49	174	.	2286
1.50 - 1.99	.	.	.	56	328	202	56	42	98	42	98	.	922
2.00 - 2.49	.	.	.	.	42	42	7	77	111	49	56	.	384
2.50 - 2.99	.	.	.	.	7	21	21	42	70	28	70	.	259
3.00 - 3.49	.	.	.	.	.	.	.	21	7	.	28	.	56
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - Greater	.	.	.	.	.	.	.	.	.	.	.	.	0
Total	14	91	383	1248	1429	878	816	1408	1861	614	1129	133	0

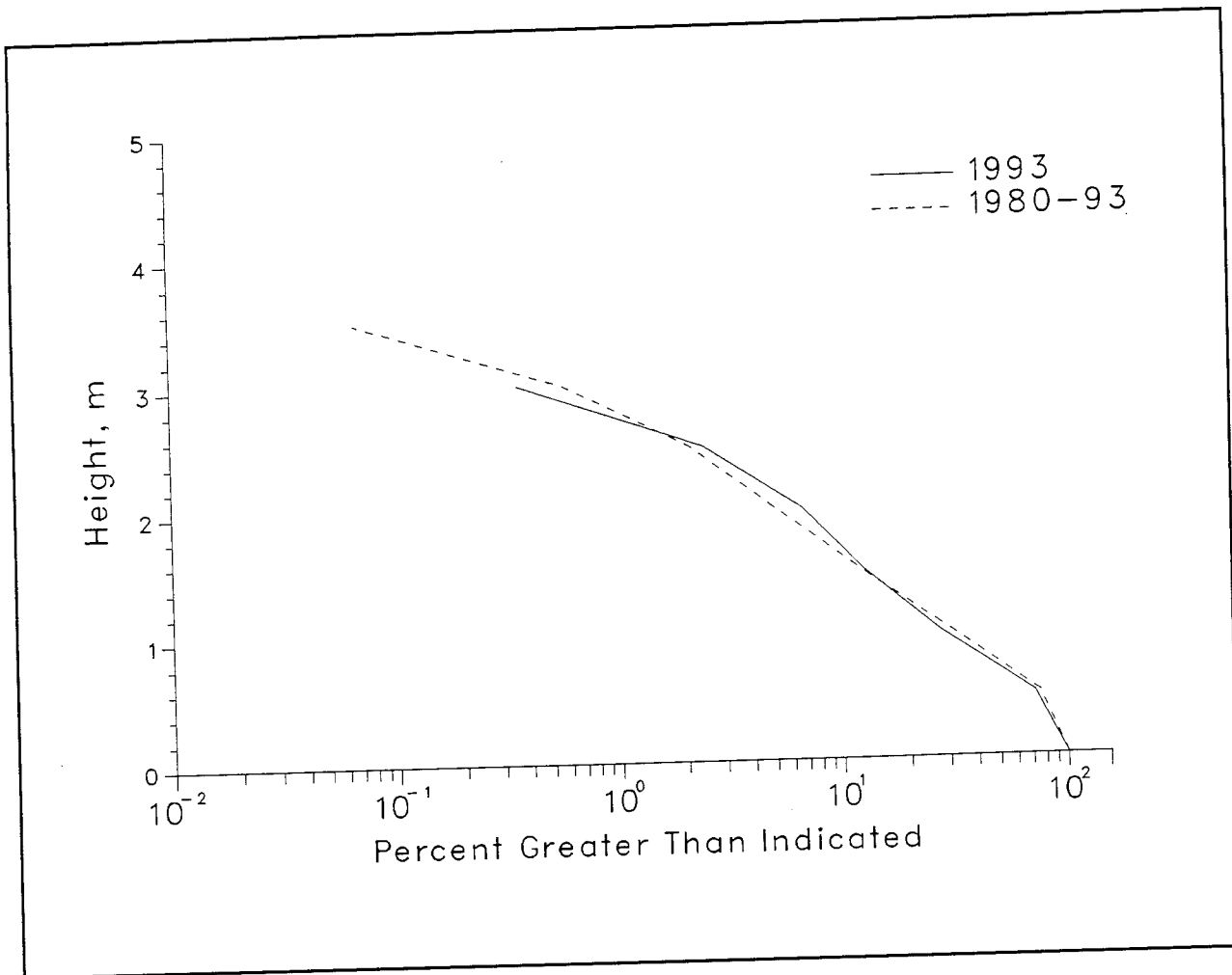


Figure D2. Annual cumulative wave height distributions for Gauge 625

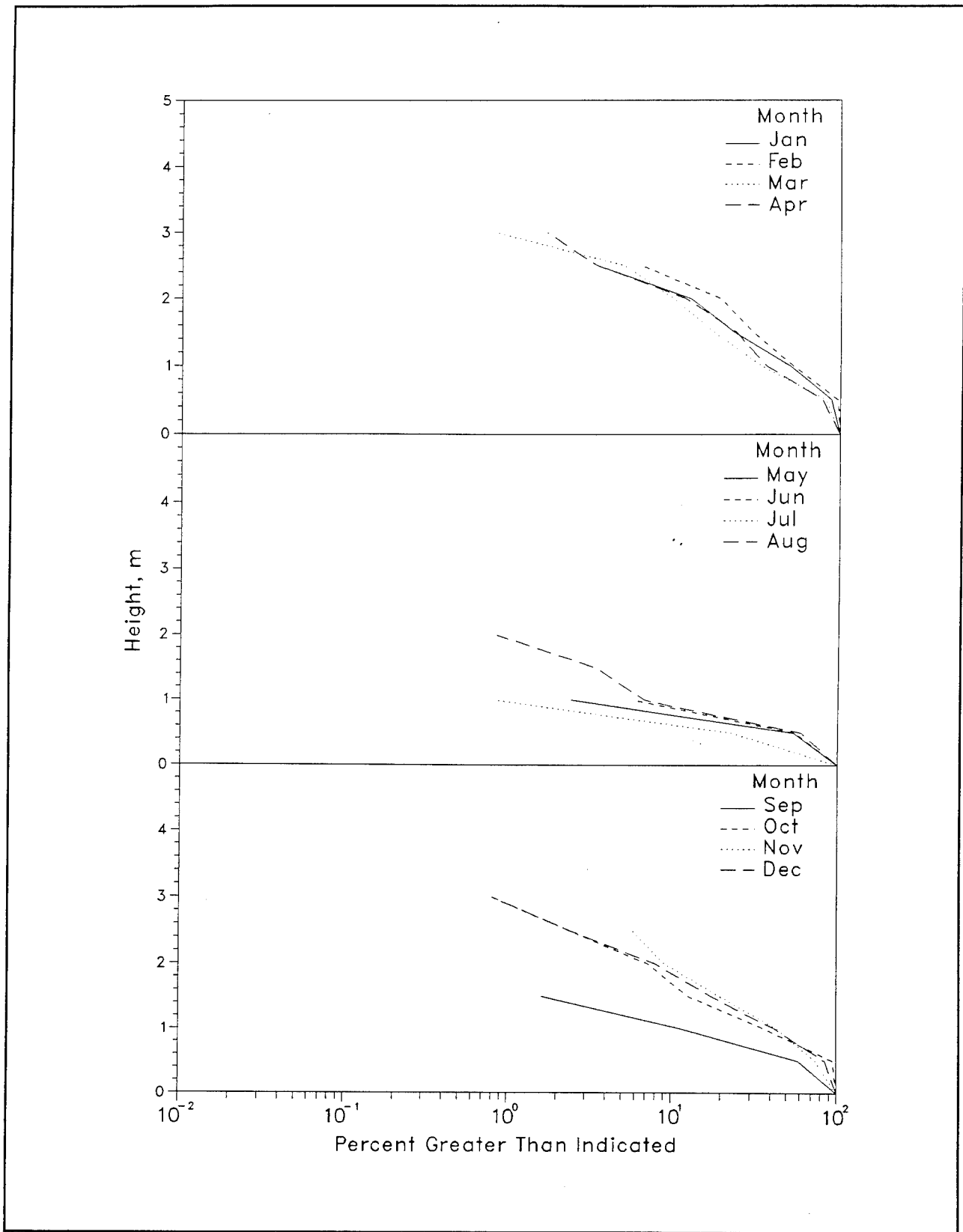


Figure D3. 1993 monthly wave height distributions for Gauge 625

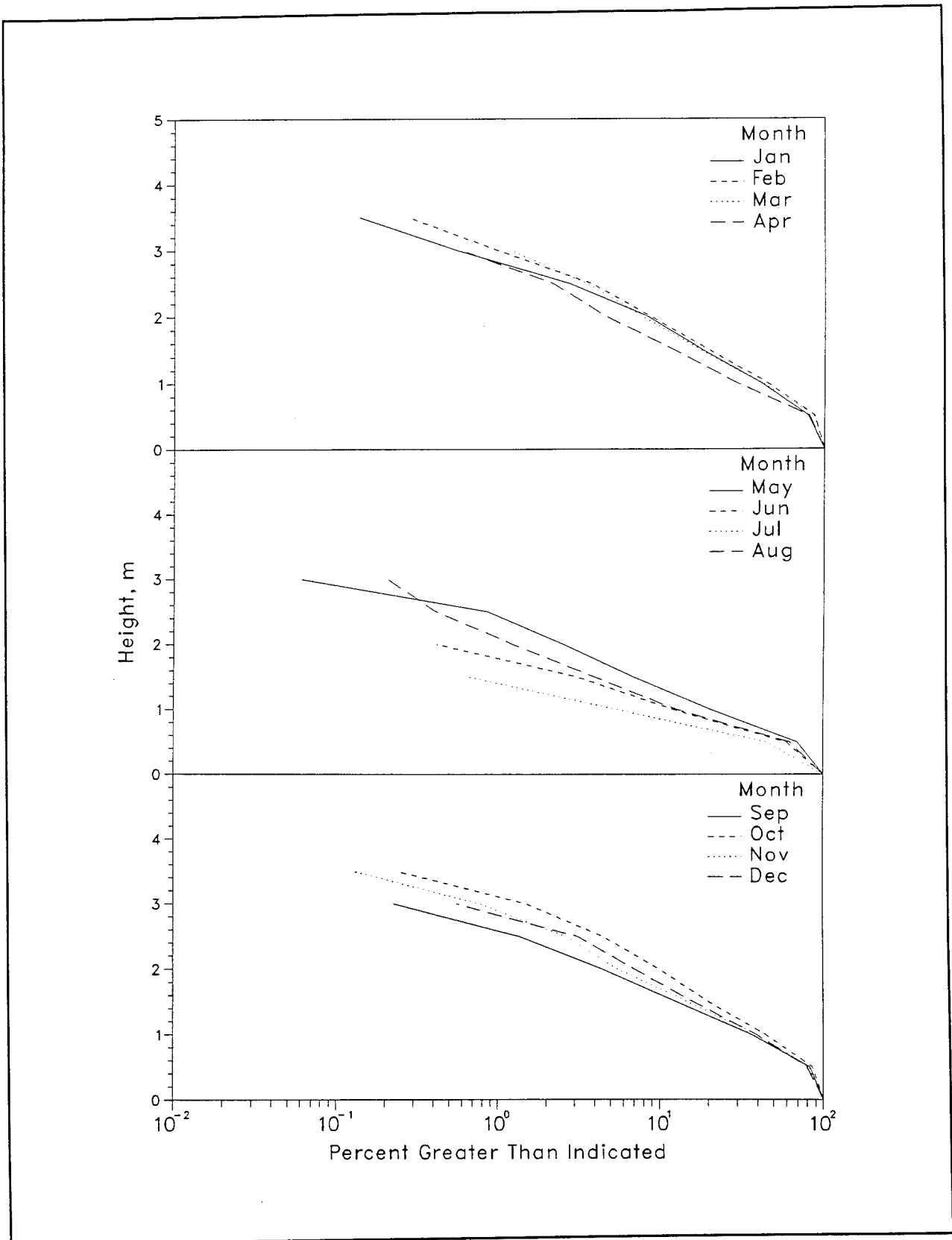


Figure D4. 1980-1993 monthly wave height distributions for Gauge 625

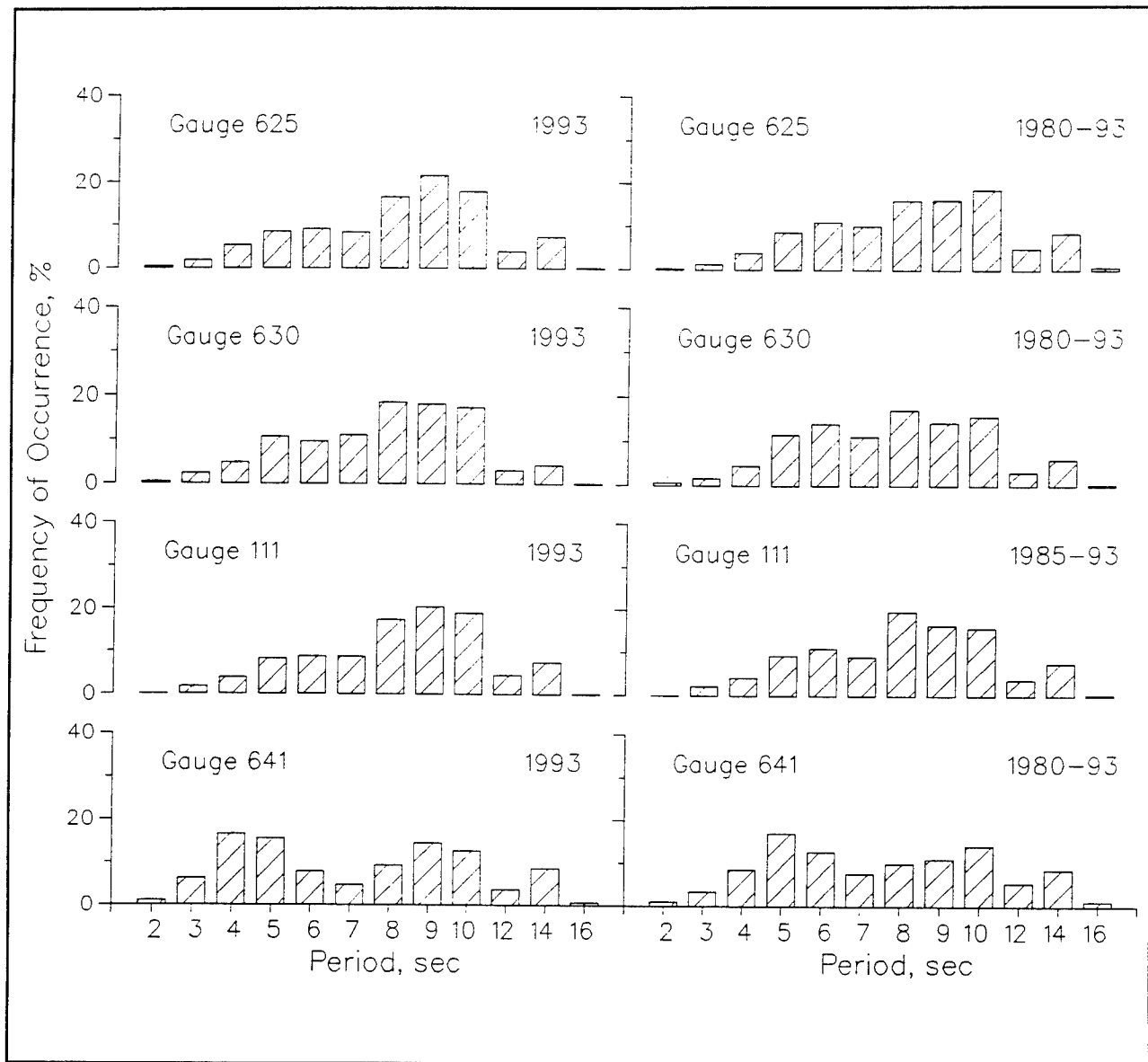


Figure D5. Annual wave period distributions for all gauges

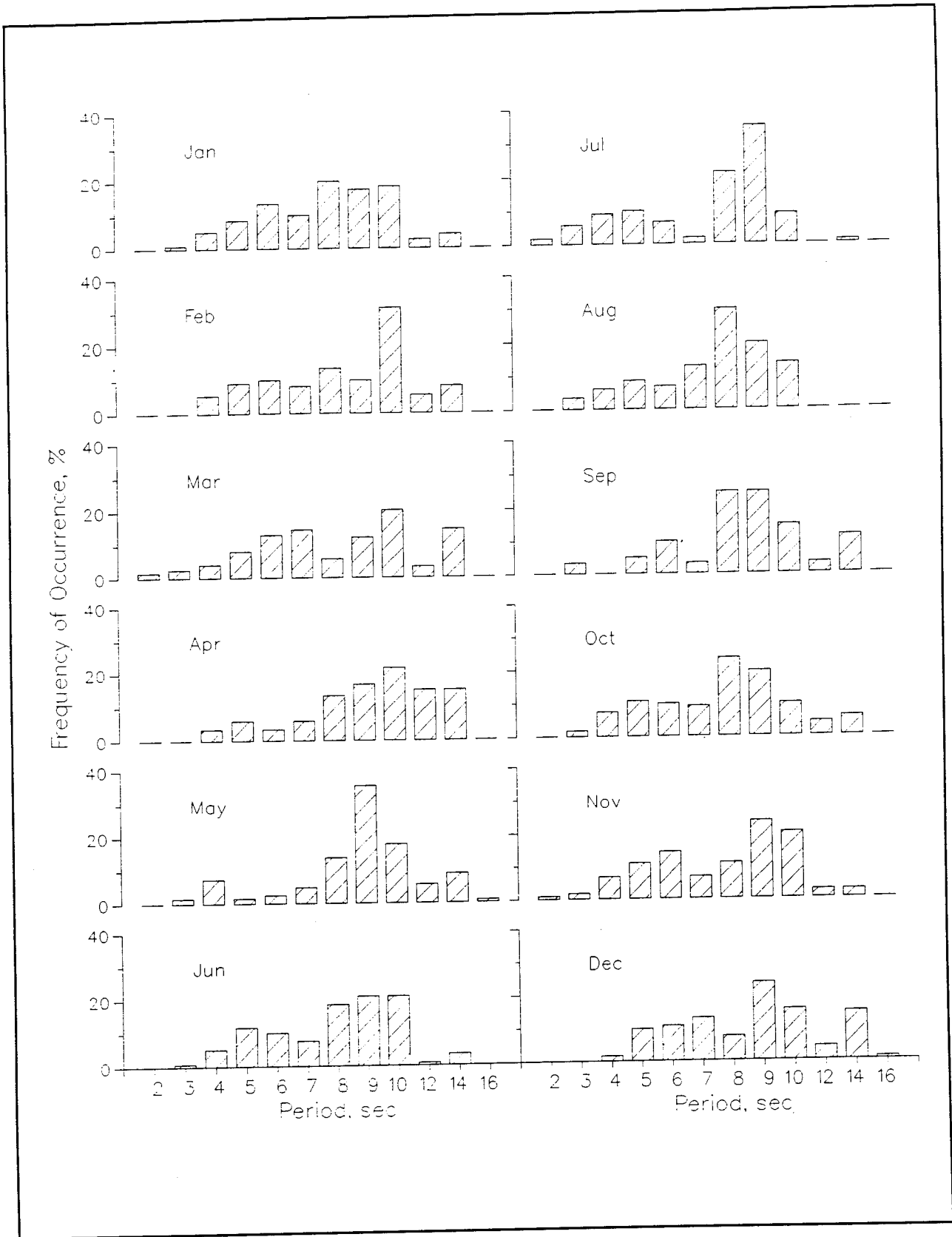


Figure D6. 1993 monthly wave period distributions for Gauge 625

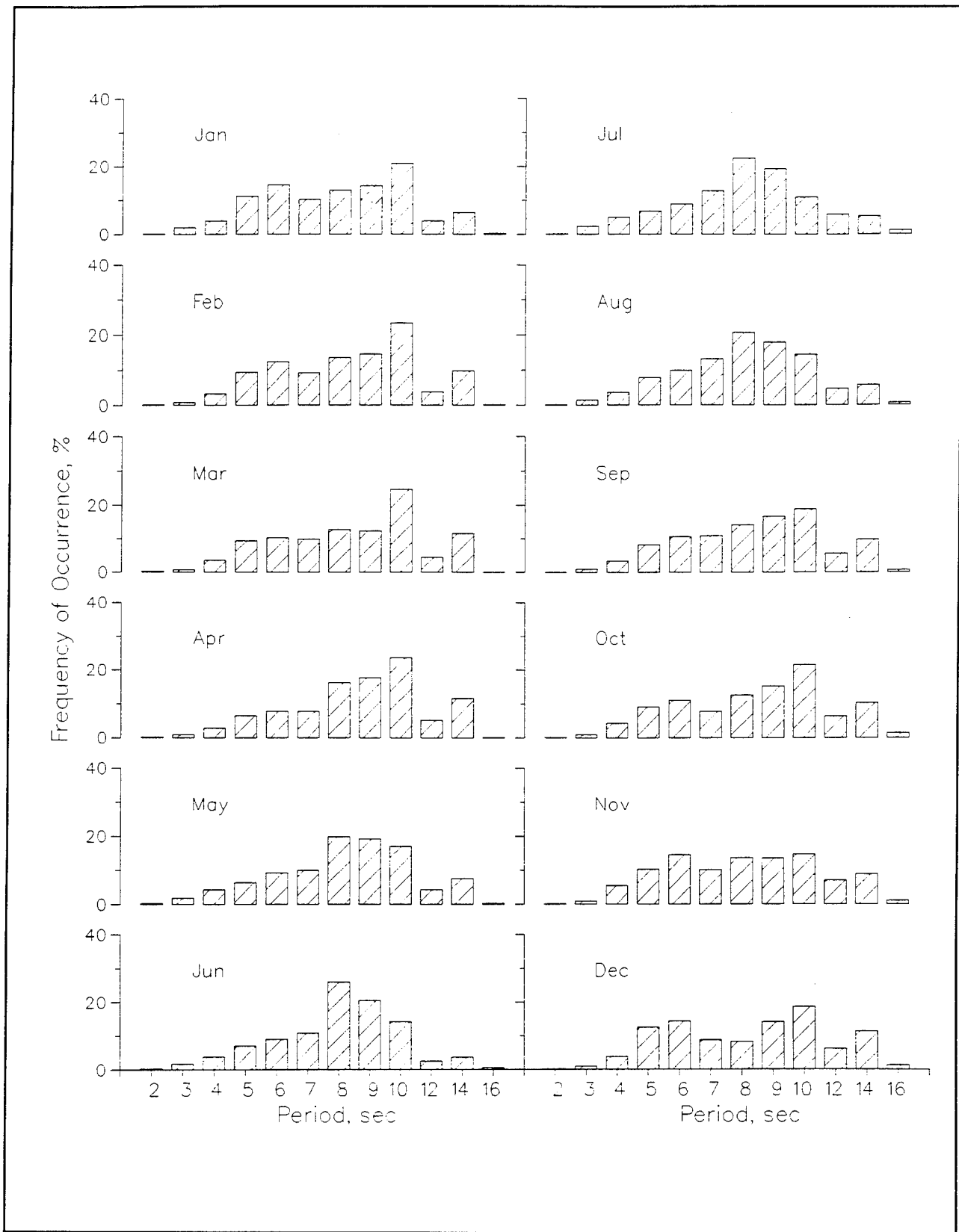


Figure D7. 1980-1993 monthly wave period distributions for Gauge 625

**Table D5**  
**1993 persistence of  $H_{mo}$  for Gauge 625**

Height (m)	Consecutive Day(s) or Longer																		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19+
0.5	31	24	21	20	18		17	14	10	9		7							6
1.0	44	26	17	12	10	8	6	5	4		3		2						
1.5	27	19	12	6	2	1													
2.0	16	12	6	2															
2.5	9	6	2	1															
3.0	1	1																	
3.5																			

**Table D6**  
**1980 through 1993 persistence of  $H_{mo}$  for Gauge 625**

Height (m)	Consecutive Day(s) or Longer																		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19+
0.5	29	25	22	20	17	15	13		10	9	8	7		6		5			4
1.0	45	31	21	14	10	7	5	4	3	2			1						
1.5	29	17	9	5	3	2	1												
2.0	14	8	4	2	1														
2.5	8	4	2	1															
3.0	3	1																	
3.5	1																		
4.0																			

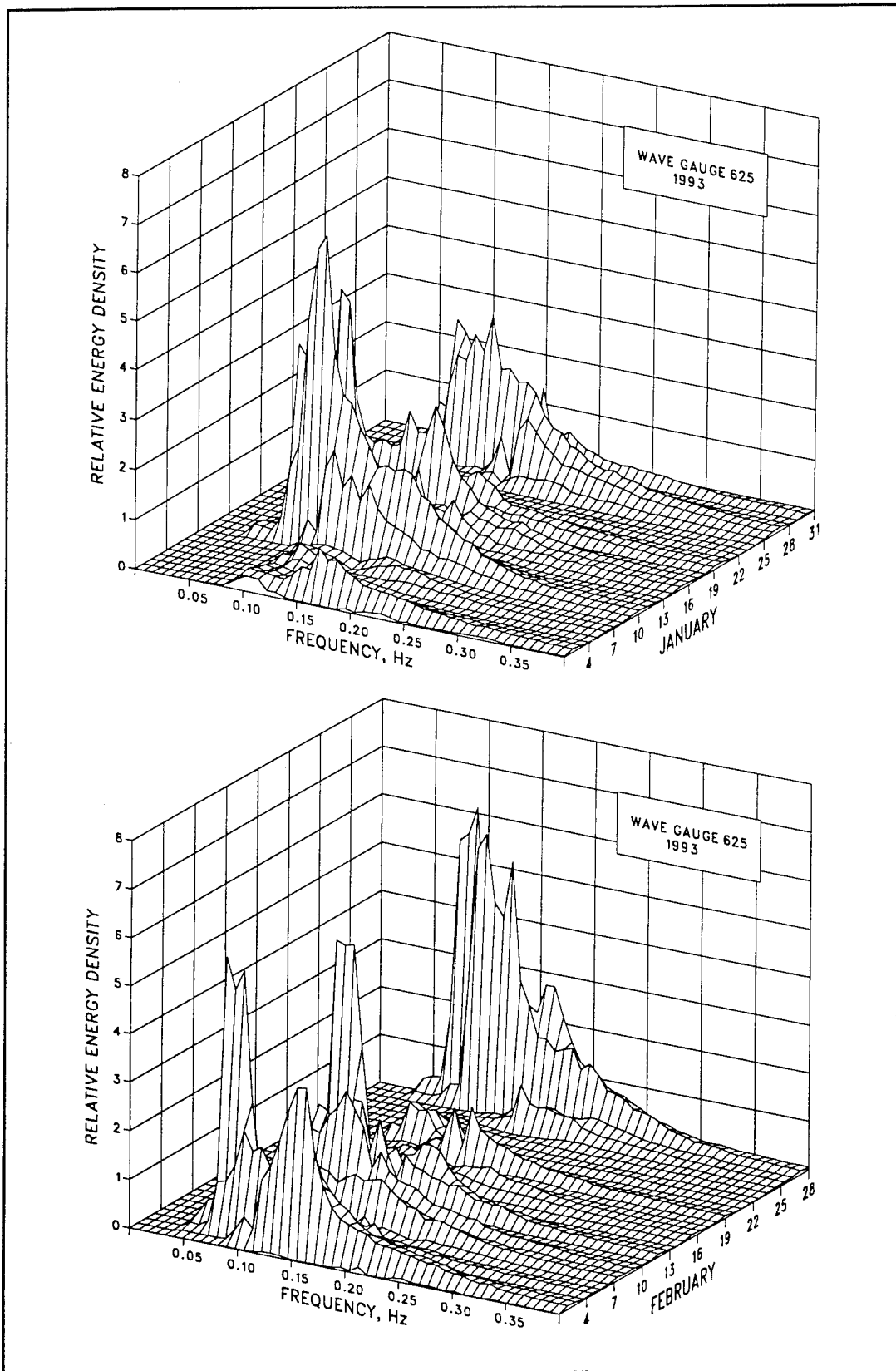


Figure D8. 1993 monthly spectra for Gauge 625 (Sheet 1 of 6)

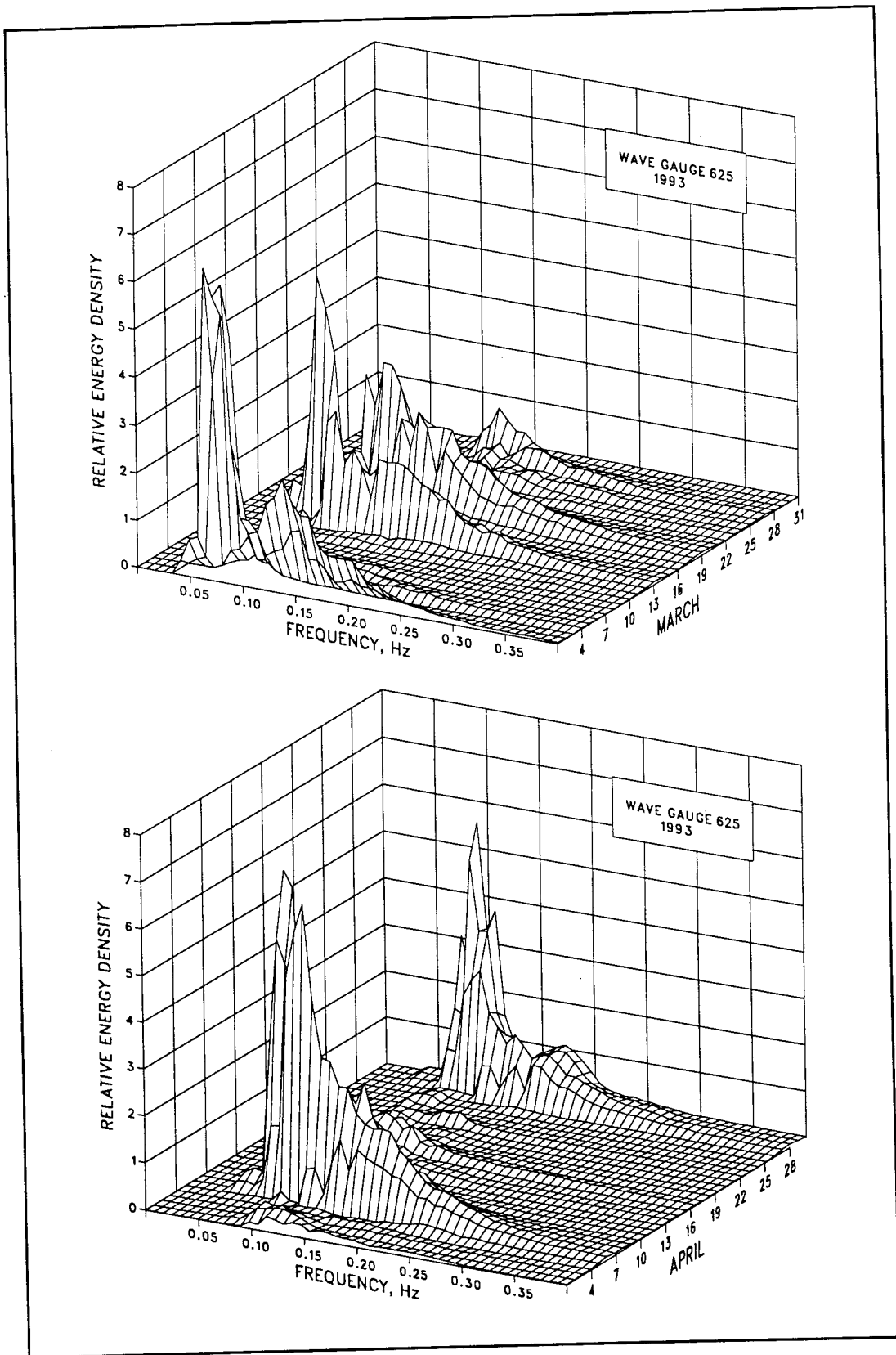


Figure D8. (Sheet 2 of 6)

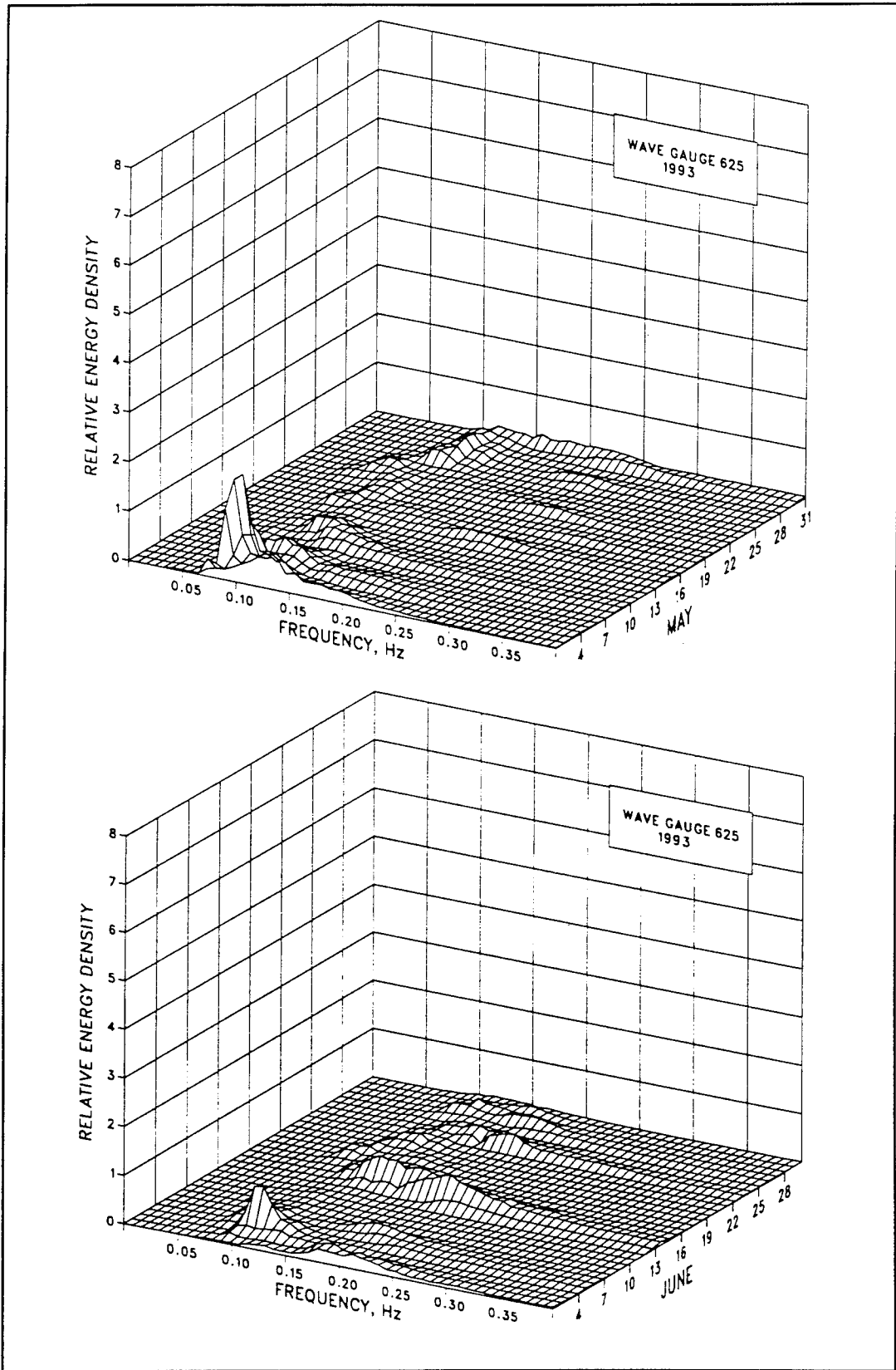


Figure D8. (Sheet 3 of 6)

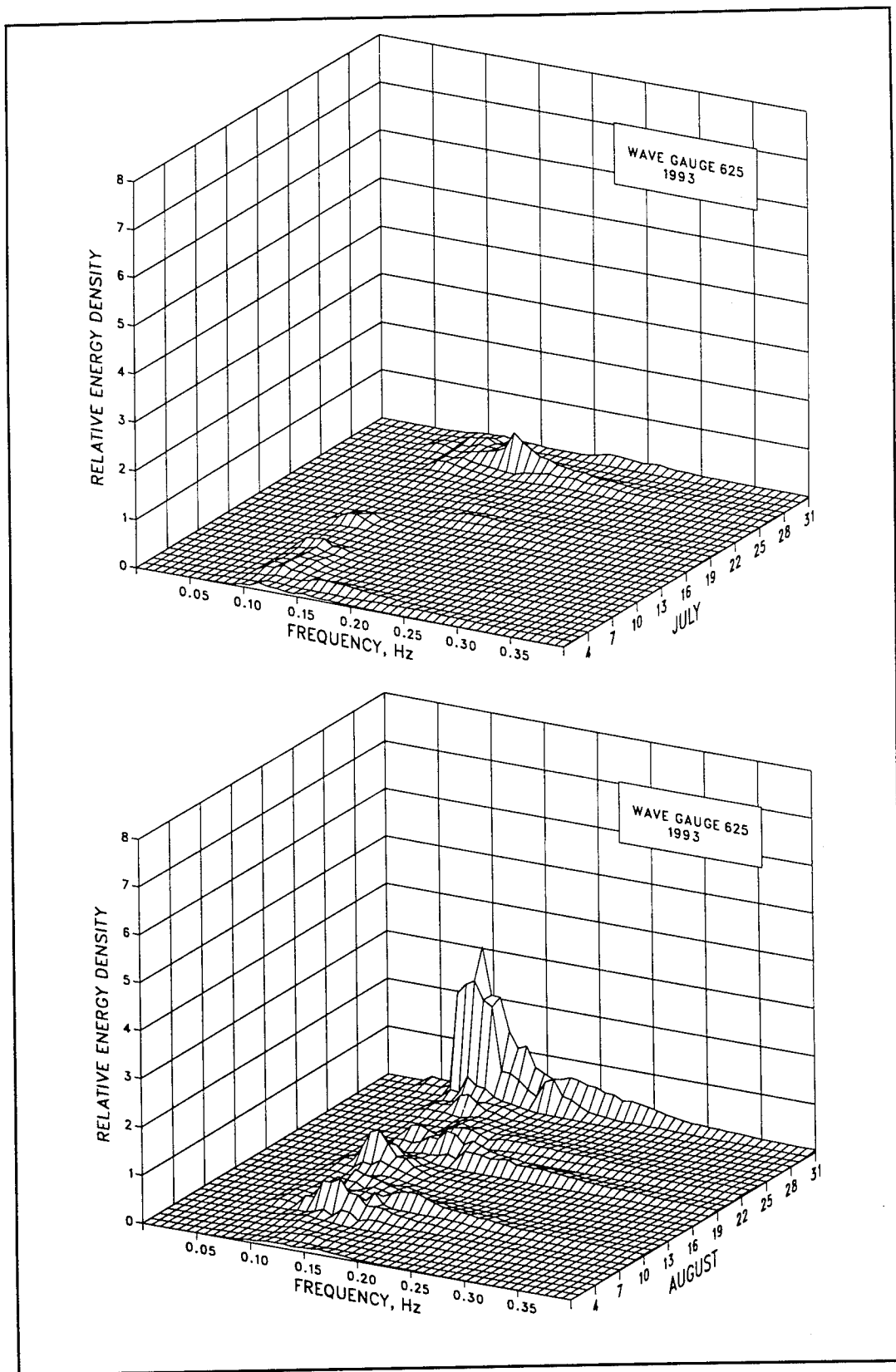


Figure D8. (Sheet 4 of 6)

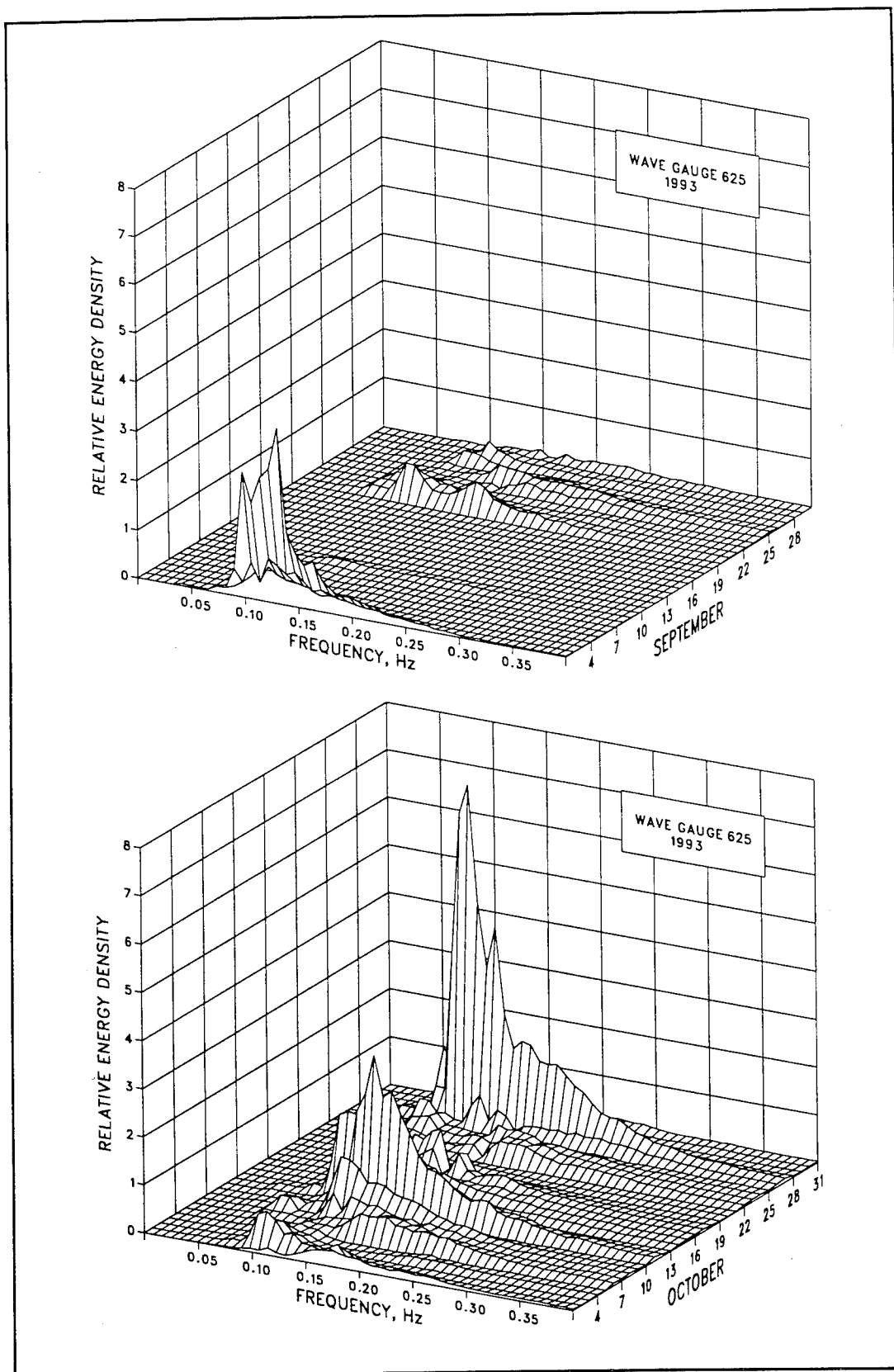


Figure D8. (Sheet 5 of 6)

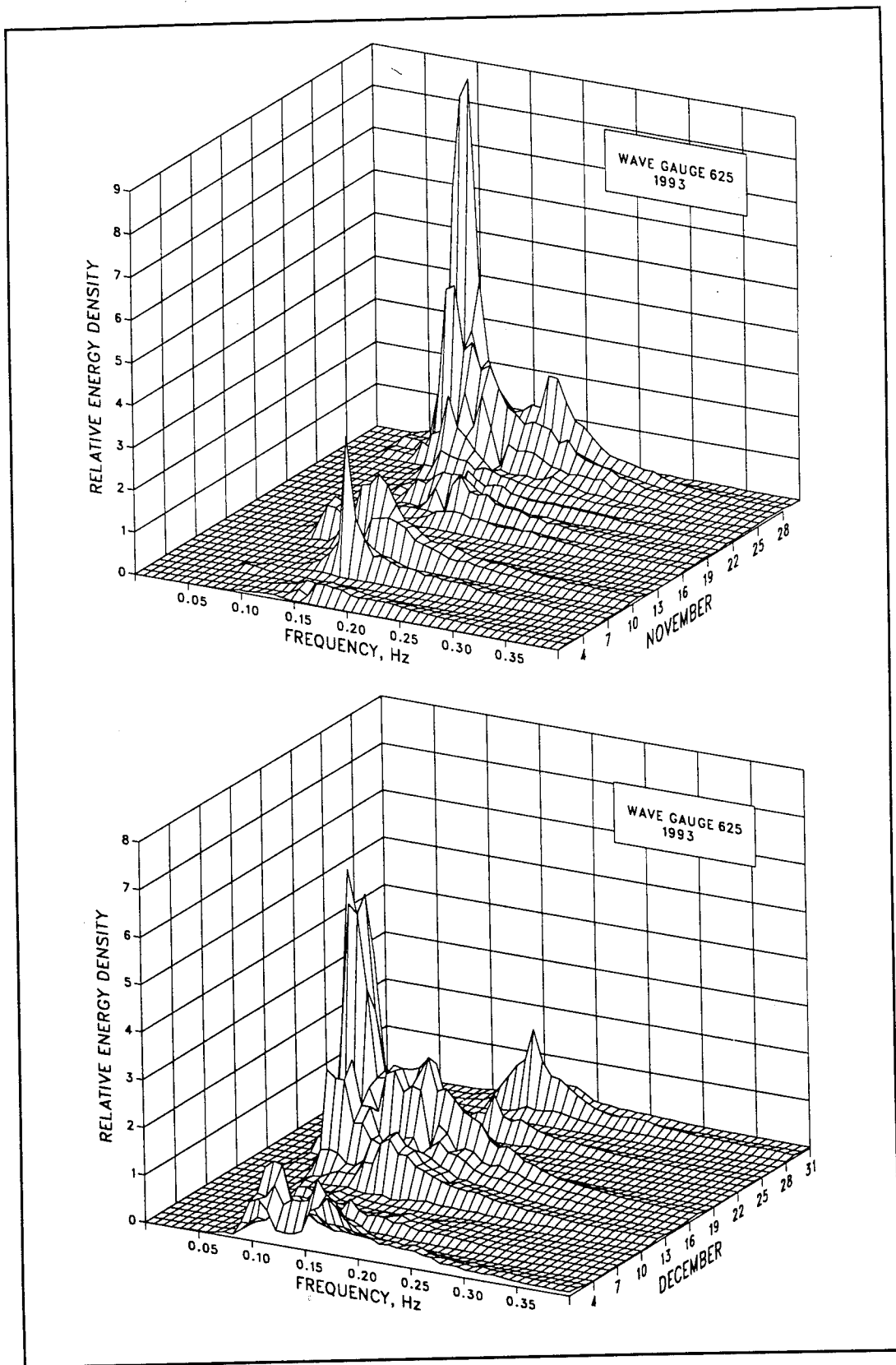


Figure D8. (Sheet 6 of 6)

**Table D7**  
**Wave statistics for Gauge 625**

Month	1993							1980-1993						
	Height			Date	Period		Number	Height			Date	Period		Number
	Mean	Std. Dev.	Extreme		Mean	Std. Dev.		Mean	Std. Dev.	Extreme		Mean	Std. Dev.	
	m	m	m	sec	sec	Obs.	m	m	m	sec	sec	Obs.		
Jan	1.2	0.7	2.9	10	8.6	2.4	120	1.0	0.6	3.6	1992	8.5	2.7	1436
Feb	1.3	0.7	2.9	27	9.3	2.7	112	1.1	0.6	3.8	1989	8.9	2.6	1425
Mar	1.1	0.7	3.2	13	9.0	3.1	123	1.1	0.6	3.4	1983	9.1	2.7	1610
Apr	1.1	0.7	3.1	6	10.5	3.0	120	0.9	0.6	3.4	1988	9.4	2.6	1528
May	0.6	0.2	1.5	1	9.5	2.7	124	0.8	0.5	3.0	1986	8.8	2.6	1636
Jun	0.6	0.3	1.3	14	8.5	2.2	119	0.7	0.4	2.3	1983	8.5	2.4	1431
Jul	0.5	0.2	1.0	27	7.9	2.3	123	0.6	0.3	1.8	1985	8.7	2.8	1379
Aug	0.7	0.4	2.2	31	8.1	2.1	118	0.7	0.4	3.1	1981	8.7	2.6	1447
Sep	0.7	0.3	1.8	1	9.2	2.3	61	1.0	0.6	3.2	1992	9.0	2.7	1312
Oct	1.1	0.6	3.1	27	8.4	2.5	124	1.1	0.7	3.5	1991	9.2	2.9	1655
Nov	1.1	0.7	2.8	28	8.3	2.4	120	1.0	0.6	3.5	1981	8.8	3.0	1552
Dec	1.1	0.6	3.0	17	9.3	2.7	124	1.0	0.6	3.2	1992	9.0	3.1	1435
Annual	0.9	0.6	3.2	Mar	8.9	2.6	1388	0.9	0.6	3.8	Feb 1992	8.9	2.7	17846

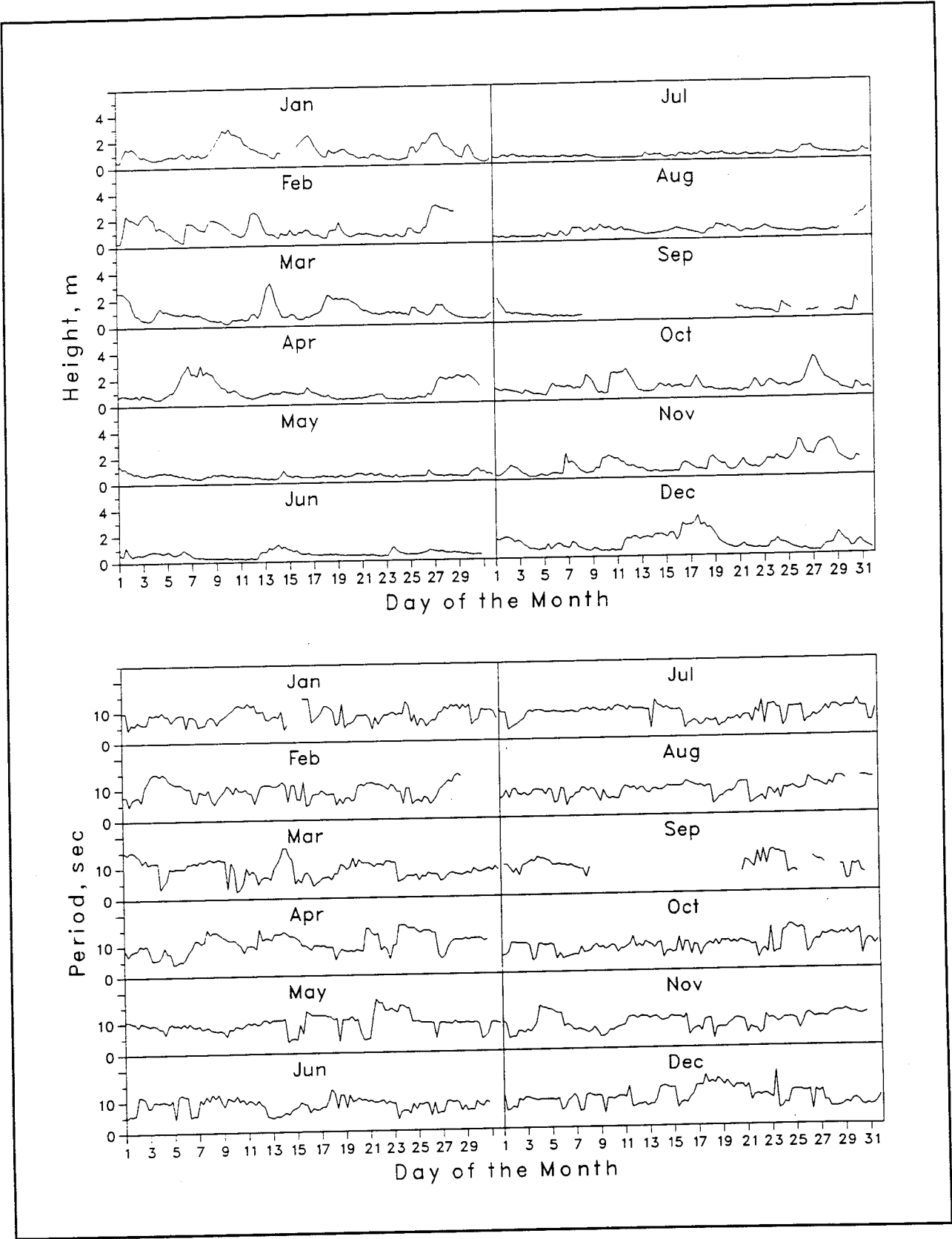


Figure D9. Time-histories of wave height and period for Gauge 625

# Appendix E

## Wave Data for Gauge 641

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Wave data summaries for Gauge 641 for 1993 and for 1980 through 1993<sup>1</sup> are presented in the following pages:

### Daily $H_{mo}$ and $T_p$

Figure E1 displays the individual wave height  $H_{mo}$  and peak spectral wave period  $T_p$  values, along with the monthly mean values.

### Joint Distributions of $H_{mo}$ and $T_p$

Annual and monthly joint distribution tables are presented in Tables E1 and E2, and data for 1980 through 1993 are in Tables E3 and E4. Each table gives the frequency (in parts per 10,000) for which the wave height and peak period were within the specified intervals; these values can be converted to percentages by dividing by 100. Marginal totals are also included. The row total gives the number of observations out of 10,000 that fell within each specified peak period interval. The column total gives the number of observations out of 10,000 that fell within each specified wave height interval.

### Cumulative Distributions of Wave Height

Annual and monthly wave height distributions for 1993 are plotted in cumulative form in Figures E2 and E3. Data for 1980 through 1993 are plotted in Figure E4.

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<sup>1</sup> Data from 1980 through May 1992 are from staff Gauge 645 which was replaced by pressure Gauge 641 in November 1992.

## Peak Spectral Wave Period Distributions

Annual and monthly peak wave period  $T_p$  distribution histograms for 1993 are presented in Figures E5 and E6. Data for 1980 through 1993 are presented in Figure E7.

## Persistence of Wave Heights

Table E5 shows the number of times in 1993 when the specified wave height was equaled or exceeded at least once during each day for the duration (consecutive days). Data for 1980 through 1993 are averaged and given in Table E6. An example is shown below:

Height m	Consecutive Day(s) or Longer																		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19+
0.5	18	15		14	13	12		11	10	9				8		7			
1.0	50	34	24	21	18	14	12	8	7	3			2						
1.5	41	19	8	6	2	1													
2.0	22	9	5	1															
2.5	10	5	2																
3.0	6	1																	
3.5		1																	
4.0	1																		

This example indicates that wave heights equaled or exceeded 1.0 m 50 times for at least 1 day; 34 times for at least 2 days; 24 times for at least 3 days, etc. Therefore, on 16 occasions the height equaled or exceeded 1.0 m for 1 day exactly ( $50 - 34 = 16$ ); on 10 occasions for 2 days; on 3 occasions for 3 days, etc. Note that the height exceeded 1 m 50 times for 1 day or longer, while heights exceeded 0.5 m only 18 times for this same duration. This change in durations occurred because the longer durations of lower waves may be interspersed with shorter, but more frequent, intervals of higher waves. For example, one of the times that the wave heights exceeded 0.5 m for 16 days may have represented three times the height exceeded 1 m for shorter durations.

## Spectra

Monthly spectra for the inshore pressure gauge (Gauge 641) are presented in Figure E8. The plots show "relative" energy density as a function of wave frequency. These figures summarize the large number of spectra for each month. The figures emphasize the higher energy density associated with storms, as well as the general shifts in energy density to different frequencies.

As used here, "relative" indicates the spectra have been smoothed by the three-dimensional surface drawing routine. Consequently, extremely high- and low-energy density values are modified to produce a smooth surface. The figures are not intended for quantitative measurements; however, they do provide the energy density as a function of frequency relative to the other spectra for the month.

Monthly and annual wave statistics for Gauge 641 for 1993 and for 1980 through 1993 are presented in Table E7.

Figure E9 plots monthly time histories of wave height and period.

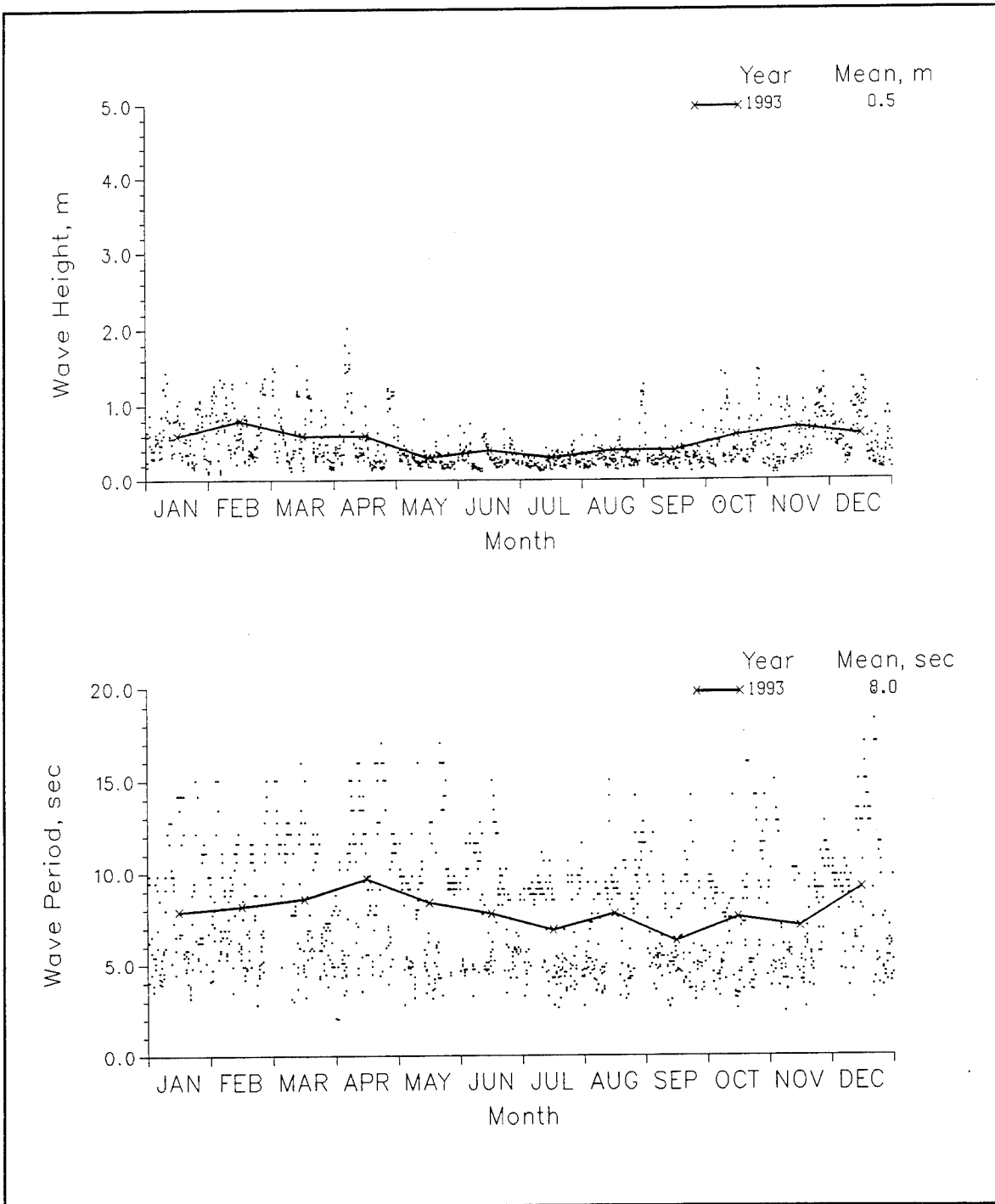


Figure E1. 1993 daily wave height and period values with monthly means for Gauge 641

**Table E1**  
**Annual Joint Distribution of  $H_{mo}$  versus  $T_p$**

Height(m)	Annual 1993, Gauge 641 Percent Occurrence(X100) of Height and Period												Total
	Period(sec)												
	2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9	16.0- Longer	
0.00 - 0.49	99	608	1258	862	261	276	749	1159	735	219	523	57	6806
0.50 - 0.99	.	14	382	587	367	127	106	233	276	85	127	7	2304
1.00 - 1.49	.	.	.	92	141	49	57	42	226	42	177	.	833
1.50 - 1.99	.	.	.	.	.	7	.	.	14	14	14	.	49
2.00 - 2.49	.	.	.	.	.	.	.	.	.	.	7	.	7
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - Greater	99	622	1640	1541	769	459	912	1434	1251	360	848	64	0
Total	99	622	1640	1541	769	459	912	1434	1251	360	848	64	0

**Table E2**  
**Monthly Joint Distribution of  $H_{mo}$  versus  $T_p$**

January 1993, Gauge 641													Total
Percent Occurrence(X100) of Height and Period													
Height(m)	Period(sec)												
	2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9	16.0- Longer	
0.00 - 0.49	.	593	678	508	169	85	169	1102	339	169	339	.	4151
0.50 - 0.99	.	.	763	1356	1017	85	169	339	678	339	254	.	5000
1.00 - 1.49	.	.	.	.	254	.	85	85	254	.	169	.	847
1.50 - 1.99	.	.	.	.	.	.	.	.	.	.	.	.	0
2.00 - 2.49	.	.	.	.	.	.	.	.	.	.	.	.	0
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - Greater	.	.	.	.	.	.	.	.	.	.	.	.	0
Total	0	593	1441	1864	1440	170	423	1526	1271	508	762	0	

February 1993, Gauge 641													Total
Percent Occurrence(X100) of Height and Period													
Height(m)	Period(sec)												
	2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9	16.0- Longer	
0.00 - 0.49	89	179	536	268	.	268	446	446	1161	.	89	.	3482
0.50 - 0.99	.	.	804	1161	1161	179	357	179	89	89	.	.	4198
1.00 - 1.49	.	.	.	.	536	268	179	.	536	179	625	.	2323
1.50 - 1.99	.	.	.	.	.	.	.	.	.	.	.	.	0
2.00 - 2.49	.	.	.	.	.	.	.	.	.	.	.	.	0
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - Greater	.	.	.	.	.	.	.	.	.	.	.	.	0
Total	89	179	1340	1429	1697	715	982	625	1876	268	803	0	

March 1993, Gauge 641													Total
Percent Occurrence(X100) of Height and Period													
Height(m)	Period(sec)												
	2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9	16.0- Longer	
0.00 - 0.49	81	323	887	565	565	484	484	81	1048	81	887	.	5486
0.50 - 0.99	.	81	242	323	403	323	161	323	645	81	403	.	2985
1.00 - 1.49	.	.	.	484	161	81	.	81	81	.	484	.	1372
1.50 - 1.99	.	.	.	.	.	.	.	.	81	.	81	.	162
2.00 - 2.49	.	.	.	.	.	.	.	.	.	.	.	.	0
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - Greater	.	.	.	.	.	.	.	.	.	.	.	.	0
Total	81	404	1129	1372	1129	888	645	485	1855	162	1855	0	

(Continued)

(Sheet 1 of 4)

Table E2 (Continued)

April 1993, Gauge 641  
Percent Occurrence(X100) of Height and Period

Height(m)	Period(sec)												Total
	2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9	16.0- Longer	
0.00 - 0.49	167	333	667	583	333	500	333	250	500	583	1750	83	6082
0.50 - 0.99	.	.	417	417	83	167	.	167	500	167	.	.	1918
1.00 - 1.49	.	.	.	83	167	.	.	83	833	83	250	.	1499
1.50 - 1.99	.	.	.	.	.	83	.	.	83	167	83	.	416
2.00 - 2.49	.	.	.	.	.	.	.	.	.	.	83	.	83
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - Greater	.	.	.	.	.	.	.	.	.	.	.	.	0
Total	167	333	1084	1083	583	750	333	500	1916	833	2333	83	

May 1993, Gauge 641  
Percent Occurrence(X100) of Height and Period

Height(m)	Period(sec)												Total
	2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9	16.0- Longer	
0.00 - 0.49	84	756	1429	1008	336	252	420	2857	756	504	924	168	9494
0.50 - 0.99	.	.	252	.	.	.	.	84	168	.	.	.	504
1.00 - 1.49	.	.	.	.	.	.	.	.	.	.	.	.	0
1.50 - 1.99	.	.	.	.	.	.	.	.	.	.	.	.	0
2.00 - 2.49	.	.	.	.	.	.	.	.	.	.	.	.	0
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - Greater	.	.	.	.	.	.	.	.	.	.	.	.	0
Total	84	756	1681	1008	336	252	420	2941	924	504	924	168	

June 1993, Gauge 641  
Percent Occurrence(X100) of Height and Period

Height(m)	Period(sec)												Total
	2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9	16.0- Longer	
0.00 - 0.49	.	167	1417	1667	417	333	1417	833	1583	167	750	.	8751
0.50 - 0.99	.	.	667	417	83	.	.	.	83	.	.	.	1250
1.00 - 1.49	.	.	.	.	.	.	.	.	.	.	.	.	0
1.50 - 1.99	.	.	.	.	.	.	.	.	.	.	.	.	0
2.00 - 2.49	.	.	.	.	.	.	.	.	.	.	.	.	0
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - Greater	.	.	.	.	.	.	.	.	.	.	.	.	0
Total	0	167	2084	2084	500	333	1417	833	1666	167	750	0	

(Continued)

(Sheet 2 of 4)

Table E2 (Continued)

July 1993, Gauge 641  
Percent Occurrence(X100) of Height and Period

Height(m)	Period(sec)											Total	
	2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9		16.0- Longer
0.00 - 0.49	242	887	2500	1129	242	.	1694	2581	565	.	.	.	9840
0.50 - 0.99	.	.	81	81	.	.	.	.	.	.	.	.	162
1.00 - 1.49	.	.	.	.	.	.	.	.	.	.	.	.	0
1.50 - 1.99	.	.	.	.	.	.	.	.	.	.	.	.	0
2.00 - 2.49	.	.	.	.	.	.	.	.	.	.	.	.	0
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - Greater	.	.	.	.	.	.	.	.	.	.	.	.	0
Total	242	887	2581	1210	242	0	1694	2581	565	0	0	0	0

August 1993, Gauge 641  
Percent Occurrence(X100) of Height and Period

Height(m)	Period(sec)											Total	
	2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9		16.0- Longer
0.00 - 0.49	.	813	1789	813	244	488	1626	1789	976	163	244	.	8945
0.50 - 0.99	.	.	81	81	163	81	.	.	.	.	163	.	569
1.00 - 1.49	.	.	.	.	.	.	.	.	325	.	163	.	488
1.50 - 1.99	.	.	.	.	.	.	.	.	.	.	.	.	0
2.00 - 2.49	.	.	.	.	.	.	.	.	.	.	.	.	0
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - Greater	.	.	.	.	.	.	.	.	.	.	.	.	0
Total	0	813	1870	894	407	569	1626	1789	1301	163	570	0	0

September 1993, Gauge 641  
Percent Occurrence(X100) of Height and Period

Height(m)	Period(sec)											Total	
	2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9		16.0- Longer
0.00 - 0.49	256	1197	1966	2564	513	85	1026	1026	342	85	256	.	9316
0.50 - 0.99	.	.	85	427	.	85	.	85	.	.	.	.	682
1.00 - 1.49	.	.	.	.	.	.	.	.	.	.	.	.	0
1.50 - 1.99	.	.	.	.	.	.	.	.	.	.	.	.	0
2.00 - 2.49	.	.	.	.	.	.	.	.	.	.	.	.	0
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - Greater	.	.	.	.	.	.	.	.	.	.	.	.	0
Total	256	1197	2051	2991	513	170	1026	1111	342	85	256	0	0

(Continued)

(Sheet 3 of 4)

**Table E2 (Concluded)**

October 1993, Gauge 641  
Percent Occurrence(X100) of Height and Period

Height(m)	Period(sec)												Total
	2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9	16.0- Longer	
0.00 - 0.49	85	940	855	427	171	513	684	1282	427	598	342	.	6324
0.50 - 0.99	.	85	684	940	85	342	256	.	85	.	.	.	2562
1.00 - 1.49	.	.	.	.	256	256	171	171	256	.	.	.	1110
1.50 - 1.99	.	.	.	.	.	.	.	.	.	.	.	.	0
2.00 - 2.49	.	.	.	.	.	.	.	.	.	.	.	.	0
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - Greater	85	1025	1539	1367	512	1111	1111	1453	768	598	427	0	0
Total	85	1025	1539	1367	512	1111	1111	1453	768	598	427	0	0

November 1993, Gauge 641  
Percent Occurrence(X100) of Height and Period

Height(m)	Period(sec)												Total
	2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9	16.0- Longer	
0.00 - 0.49	196	686	1569	490	.	98	98	294	392	98	392	.	4313
0.50 - 0.99	.	.	294	1373	882	98	294	686	686	.	98	.	4411
1.00 - 1.49	.	.	.	392	196	.	98	98	490	.	.	.	1274
1.50 - 1.99	.	.	.	.	.	.	.	.	.	.	.	.	0
2.00 - 2.49	.	.	.	.	.	.	.	.	.	.	.	.	0
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - Greater	196	686	1863	2255	1078	196	490	1078	1568	98	490	0	0
Total	196	686	1863	2255	1078	196	490	1078	1568	98	490	0	0

December 1993, Gauge 641  
Percent Occurrence(X100) of Height and Period

Height(m)	Period(sec)												Total
	2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9	16.0- Longer	
0.00 - 0.49	.	420	756	252	84	168	420	1176	672	168	252	420	4788
0.50 - 0.99	.	.	252	672	672	168	84	1008	336	504	252	.	3948
1.00 - 1.49	.	.	.	168	168	.	168	.	.	252	420	84	1260
1.50 - 1.99	.	.	.	.	.	.	.	.	.	.	.	.	0
2.00 - 2.49	.	.	.	.	.	.	.	.	.	.	.	.	0
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - Greater	0	420	1008	1092	924	336	672	2184	1008	924	924	504	0
Total	0	420	1008	1092	924	336	672	2184	1008	924	924	504	0

(Sheet 4 of 4)

**Table E3**  
**Annual Joint Distribution of  $H_{mo}$  versus  $T_p$  (All Years)**

Height(m)	Annual 1980-1993, Gauge 641 Percent Occurrence(X100) of Height and Period												Total
	Period(sec)												
	2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9	16.0- Longer	
0.00 - 0.49	76	167	344	469	280	292	578	670	698	302	418	76	4370
0.50 - 0.99	21	165	460	904	599	281	296	311	479	123	234	21	3894
1.00 - 1.49	.	2	52	309	337	152	106	84	177	79	137	6	1441
1.50 - 1.99	.	.	.	10	44	30	20	30	56	29	52	5	276
2.00 - 2.49	.	.	.	.	1	2	1	1	5	4	5	.	19
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - Greater	.	.	.	.	.	.	.	.	.	.	.	.	0
Total	97	334	856	1692	1261	757	1001	1096	1415	537	846	108	

**Table E4**  
**Monthly Joint Distribution of  $H_{mo}$  versus  $T_p$  (All Years)**

January 1980-1993, Gauge 641  
 Percent Occurrence(X100) of Height and Period

Height(m)	Period(sec)												Total
	2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9	16.0- Longer	
0.00 - 0.49	72	158	336	415	224	191	342	678	652	224	290	79	3661
0.50 - 0.99	26	184	461	1027	698	197	237	296	553	99	217	13	4008
1.00 - 1.49	.	.	99	553	533	230	197	72	237	26	138	.	2085
1.50 - 1.99	.	.	.	7	20	13	13	20	72	39	46	.	230
2.00 - 2.49	.	.	.	.	.	.	.	.	.	7	7	.	14
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - Greater	.	.	.	.	.	.	.	.	.	.	.	.	0
Total	98	342	896	2002	1475	631	789	1066	1514	395	698	92	

February 1980-1993, Gauge 641  
 Percent Occurrence(X100) of Height and Period

Height(m)	Period(sec)												Total
	2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9	16.0- Longer	
0.00 - 0.49	117	103	248	344	151	200	385	379	695	117	358	7	3104
0.50 - 0.99	41	165	496	970	592	248	241	323	613	117	255	.	4061
1.00 - 1.49	.	.	48	523	633	255	124	110	296	165	220	.	2374
1.50 - 1.99	.	.	.	14	89	55	34	28	48	41	124	.	433
2.00 - 2.49	.	.	.	.	7	.	.	.	7	7	7	.	28
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - Greater	.	.	.	.	.	.	.	.	.	.	.	.	0
Total	158	268	792	1851	1472	758	784	840	1659	447	964	7	

March 1980-1993, Gauge 641  
 Percent Occurrence(X100) of Height and Period

Height(m)	Period(sec)												Total
	2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9	16.0- Longer	
0.00 - 0.49	131	106	262	367	205	149	349	386	548	162	411	.	3076
0.50 - 0.99	44	187	442	971	542	274	268	405	666	181	386	6	4372
1.00 - 1.49	.	6	100	386	380	156	125	106	237	143	280	.	1919
1.50 - 1.99	.	.	.	12	56	44	37	87	162	81	112	.	591
2.00 - 2.49	.	.	.	.	6	6	6	.	.	12	12	.	42
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - Greater	.	.	.	.	.	.	.	.	.	.	.	.	0
Total	175	299	804	1736	1189	629	785	984	1613	579	1201	6	

(Continued)

(Sheet 1 of 4)

**Table E4 (Continued)**

April 1980-1993, Gauge 641  
Percent Occurrence(X100) of Height and Period

Height(m)	Period(sec)												Total
	2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9	16.0- Longer	
0.00 - 0.49	60	166	286	439	286	293	445	552	765	366	559	27	4244
0.50 - 0.99	27	226	439	805	505	273	372	326	645	93	339	7	4057
1.00 - 1.49	.	7	47	233	266	106	106	120	259	60	146	.	1350
1.50 - 1.99	.	.	.	13	47	33	53	27	80	33	27	.	313
2.00 - 2.49	.	.	.	.	.	.	.	13	20	.	7	.	40
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - Greater	.	.	.	.	.	.	.	.	.	.	.	.	0
Total	87	399	772	1490	1104	705	976	1038	1769	552	1078	34	

May 1980-1993, Gauge 641  
Percent Occurrence(X100) of Height and Period

Height(m)	Period(sec)												Total
	2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9	16.0- Longer	
0.00 - 0.49	97	213	367	522	284	399	664	844	876	329	535	58	5188
0.50 - 0.99	19	168	554	786	619	335	322	284	438	77	148	19	3769
1.00 - 1.49	.	.	39	174	148	39	84	103	142	39	84	.	852
1.50 - 1.99	.	.	.	19	58	26	6	19	32	13	13	.	186
2.00 - 2.49	.	.	.	.	.	.	6	.	.	.	.	.	6
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - Greater	.	.	.	.	.	.	.	.	.	.	.	.	0
Total	116	381	960	1501	1109	799	1082	1250	1488	458	780	77	

June 1980-1993, Gauge 641  
Percent Occurrence(X100) of Height and Period

Height(m)	Period(sec)												Total
	2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9	16.0- Longer	
0.00 - 0.49	99	227	455	881	533	547	1136	1037	689	362	263	114	6343
0.50 - 0.99	21	149	391	753	384	234	320	298	320	50	43	21	2984
1.00 - 1.49	.	.	36	142	149	50	57	36	121	.	50	.	641
1.50 - 1.99	.	.	.	.	21	7	7	.	.	.	.	.	35
2.00 - 2.49	.	.	.	.	.	.	.	.	.	.	.	.	0
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - Greater	.	.	.	.	.	.	.	.	.	.	.	.	0
Total	120	376	882	1776	1087	838	1520	1371	1130	412	356	135	

(Continued)

(Sheet 2 of 4)

Table E4 (Continued)

July 1980-1993, Gauge 641  
Percent Occurrence(X100) of Height and Period

Height(m)	Period(sec)												Total
	2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9	16.0- Longer	
0.00 - 0.49	69	256	616	699	498	519	1433	1266	789	381	478	145	7149
0.50 - 0.99	.	138	374	651	457	235	270	173	145	69	48	42	2602
1.00 - 1.49	.	.	7	125	35	14	21	.	35	.	.	.	244
1.50 - 1.99	.	.	.	.	7	.	.	.	.	.	.	.	7
2.00 - 2.49	.	.	.	.	.	.	.	.	.	.	.	.	0
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - Greater	69	394	997	1475	997	768	1724	1439	969	450	533	187	0
Total													

August 1980-1993, Gauge 641  
Percent Occurrence(X100) of Height and Period

Height(m)	Period(sec)												Total
	2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9	16.0- Longer	
0.00 - 0.49	47	210	366	556	542	475	881	1125	1037	353	495	54	6141
0.50 - 0.99	7	176	481	793	488	298	305	217	237	27	115	.	3144
1.00 - 1.49	.	.	27	149	156	68	54	14	61	34	75	.	638
1.50 - 1.99	.	.	.	.	14	20	7	.	20	14	.	.	75
2.00 - 2.49	.	.	.	.	.	.	.	.	.	.	.	.	0
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - Greater	54	386	874	1498	1200	861	1247	1356	1355	428	685	54	0
Total													

September 1980-1993, Gauge 641  
Percent Occurrence(X100) of Height and Period

Height(m)	Period(sec)												Total
	2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9	16.0- Longer	
0.00 - 0.49	78	142	298	468	177	305	483	554	617	305	412	50	3889
0.50 - 0.99	35	177	419	731	511	405	405	405	490	234	447	14	4273
1.00 - 1.49	.	.	43	419	319	199	142	114	135	78	128	14	1591
1.50 - 1.99	.	.	.	14	43	57	14	7	14	21	50	7	227
2.00 - 2.49	.	.	.	.	.	.	.	.	.	7	14	.	21
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - Greater	113	319	760	1632	1050	966	1044	1080	1256	645	1051	85	0
Total													

(Continued)

(Sheet 3 of 4)

**Table E4 (Concluded)**

October 1980-1993, Gauge 641  
Percent Occurrence(X100) of Height and Period

Height(m)	Period(sec)												Total
	2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9	16.0- Longer	
0.00 - 0.49	35	146	173	194	160	153	333	402	562	305	374	55	2892
0.50 - 0.99	7	90	444	860	617	236	374	416	791	187	284	35	4341
1.00 - 1.49	.	.	42	374	416	277	180	166	340	180	180	21	2176
1.50 - 1.99	.	.	.	14	62	55	28	62	125	55	83	49	533
2.00 - 2.49	.	.	.	.	.	7	.	.	21	14	14	.	56
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - Greater	.	.	.	.	.	.	.	.	.	.	.	.	0
Total	42	236	659	1442	1255	728	915	1046	1839	741	935	160	

November 1980-1993, Gauge 641  
Percent Occurrence(X100) of Height and Period

Height(m)	Period(sec)												Total
	2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9	16.0- Longer	
0.00 - 0.49	35	105	358	393	147	168	358	302	477	316	372	140	3171
0.50 - 0.99	14	133	547	1200	842	400	260	309	449	204	225	49	4632
1.00 - 1.49	.	7	42	302	526	260	105	77	147	147	147	28	1788
1.50 - 1.99	.	.	.	14	63	35	14	84	84	28	77	.	399
2.00 - 2.49	.	.	.	.	.	.	.	.	7	.	.	.	7
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - Greater	.	.	.	.	.	.	.	.	.	.	.	.	0
Total	49	245	947	1909	1578	863	737	772	1164	695	821	217	

December 1980-1993, Gauge 641  
Percent Occurrence(X100) of Height and Period

Height(m)	Period(sec)												Total
	2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9	16.0- Longer	
0.00 - 0.49	66	171	369	375	165	125	191	533	658	415	454	191	3713
0.50 - 0.99	13	178	461	1277	915	244	184	283	382	138	290	46	4411
1.00 - 1.49	.	.	92	323	481	178	79	92	112	72	171	13	1613
1.50 - 1.99	.	.	.	7	46	13	20	26	26	13	92	7	250
2.00 - 2.49	.	.	.	.	.	13	.	.	.	.	.	.	13
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - Greater	.	.	.	.	.	.	.	.	.	.	.	.	0
Total	79	349	922	1982	1607	573	474	934	1178	638	1007	257	

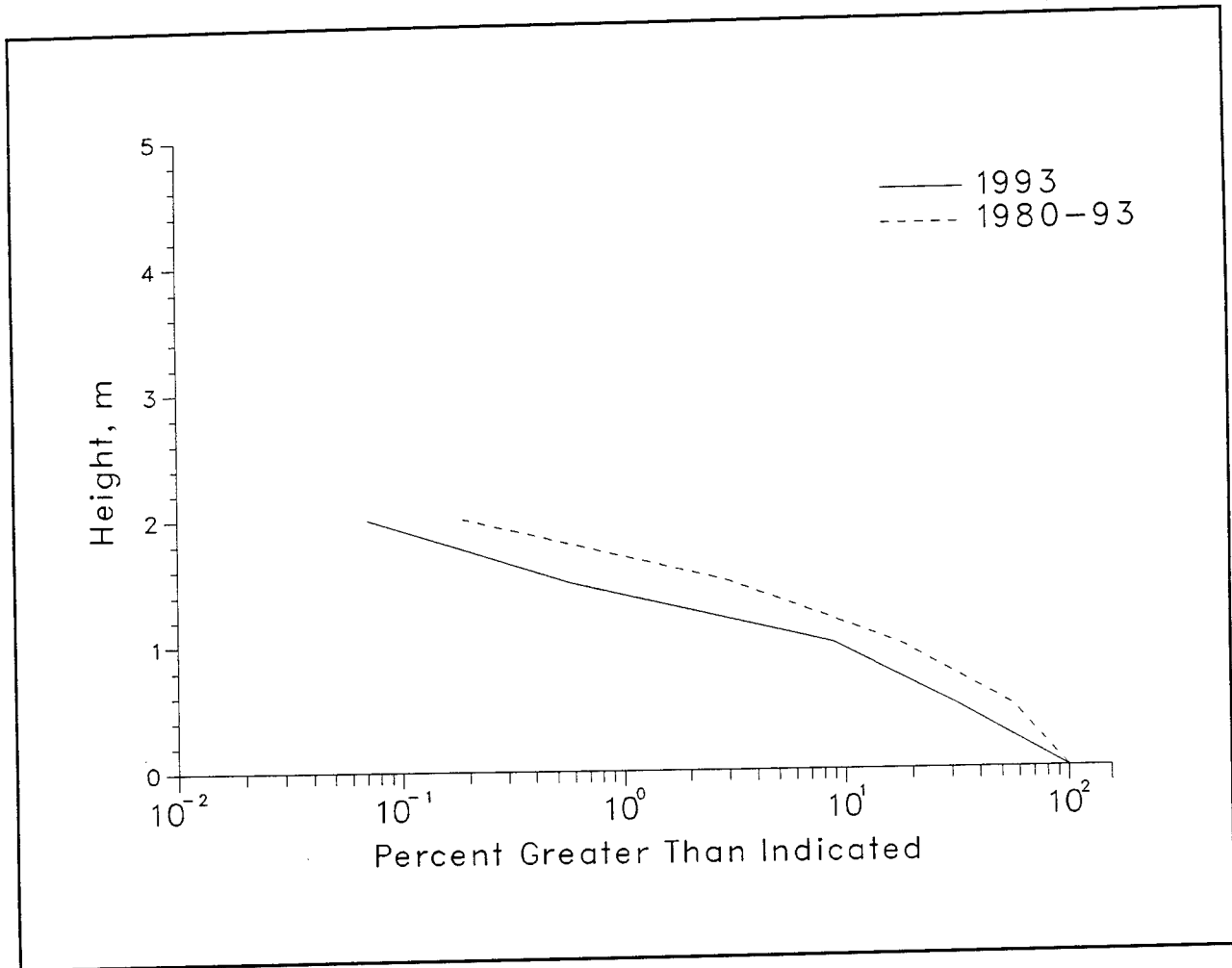


Figure E2. Annual cumulative wave height distributions for Gauge 641

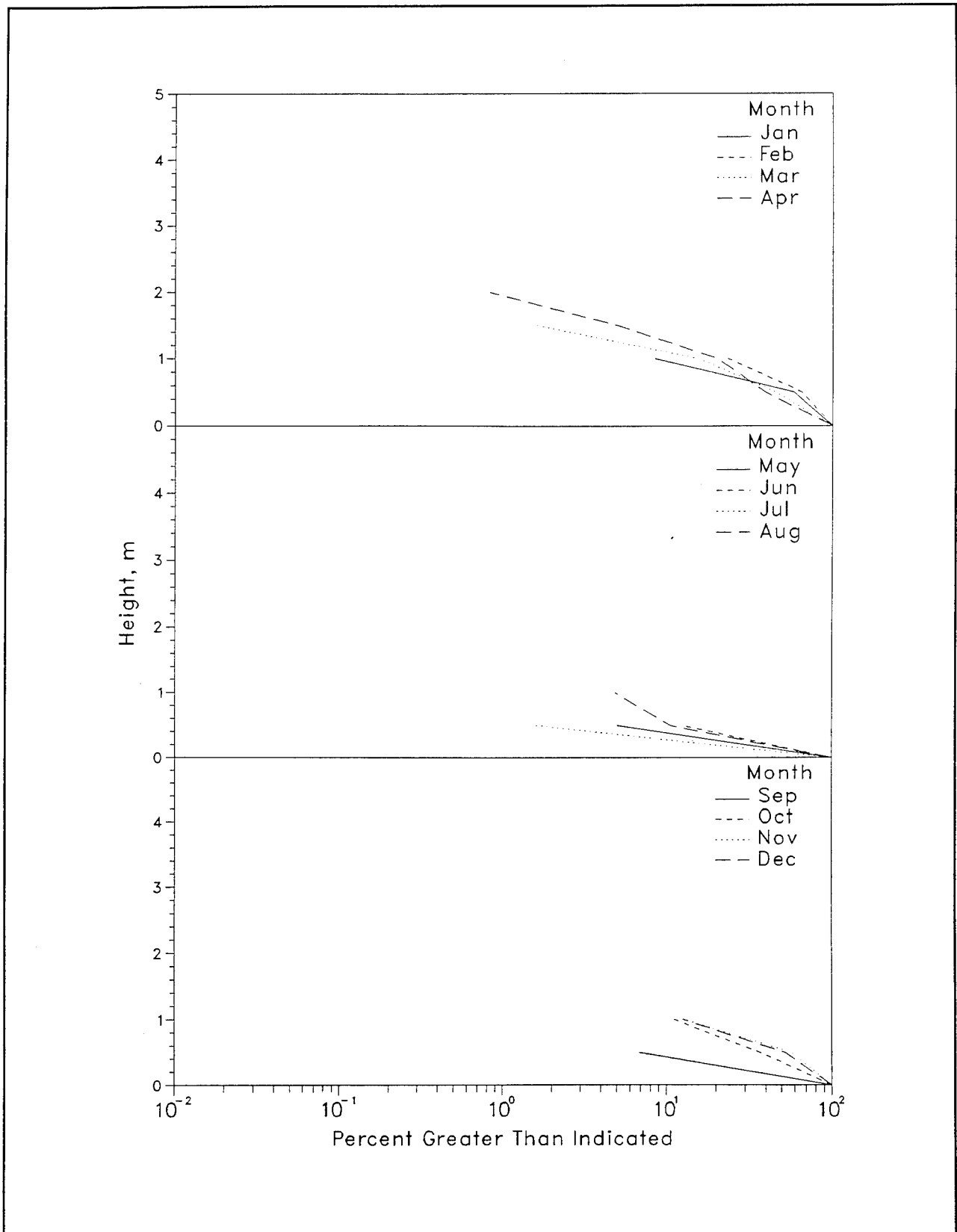


Figure E3. 1993 monthly wave height distributions for Gauge 641

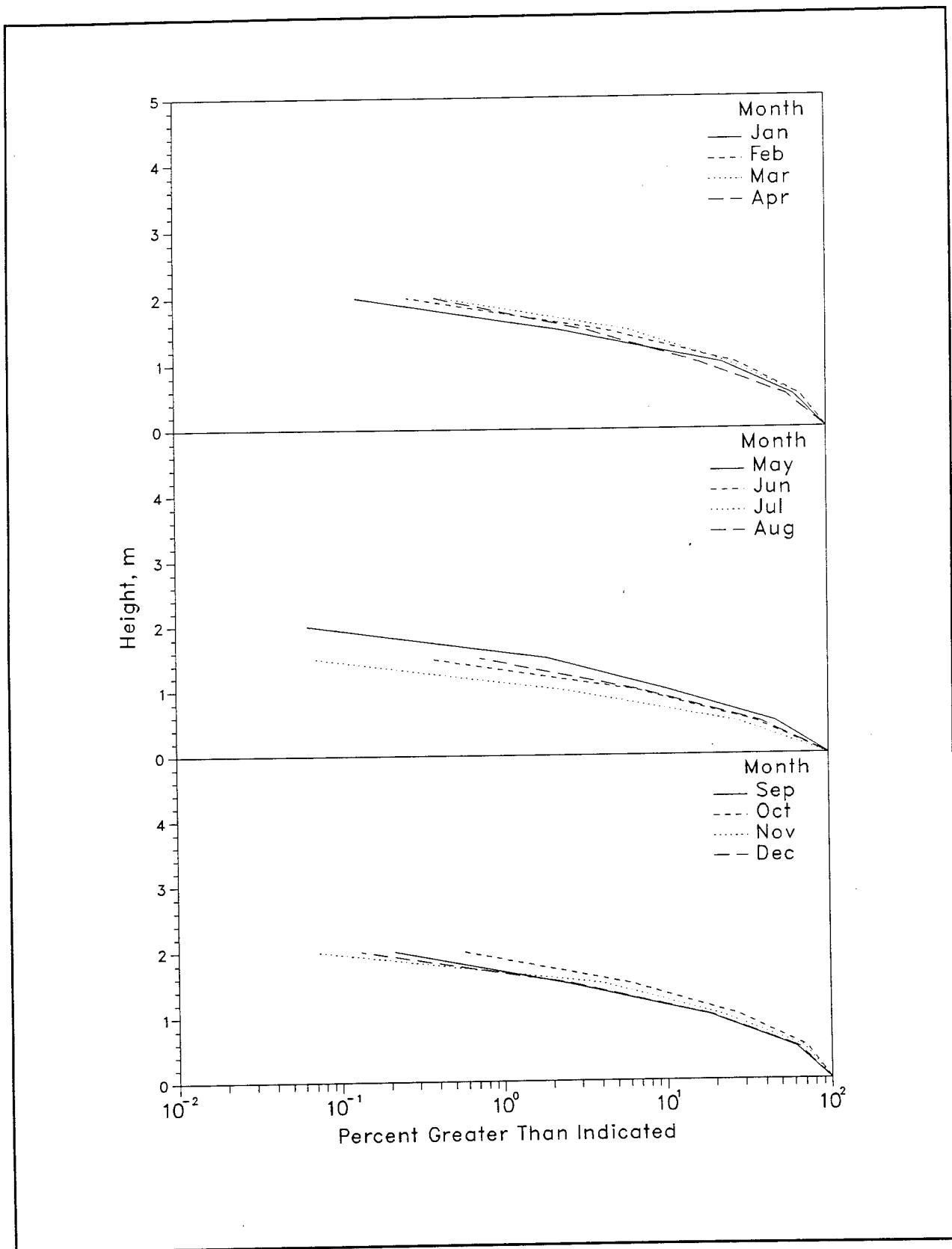


Figure E4. 1980-1993 monthly wave height distributions for Gauge 641

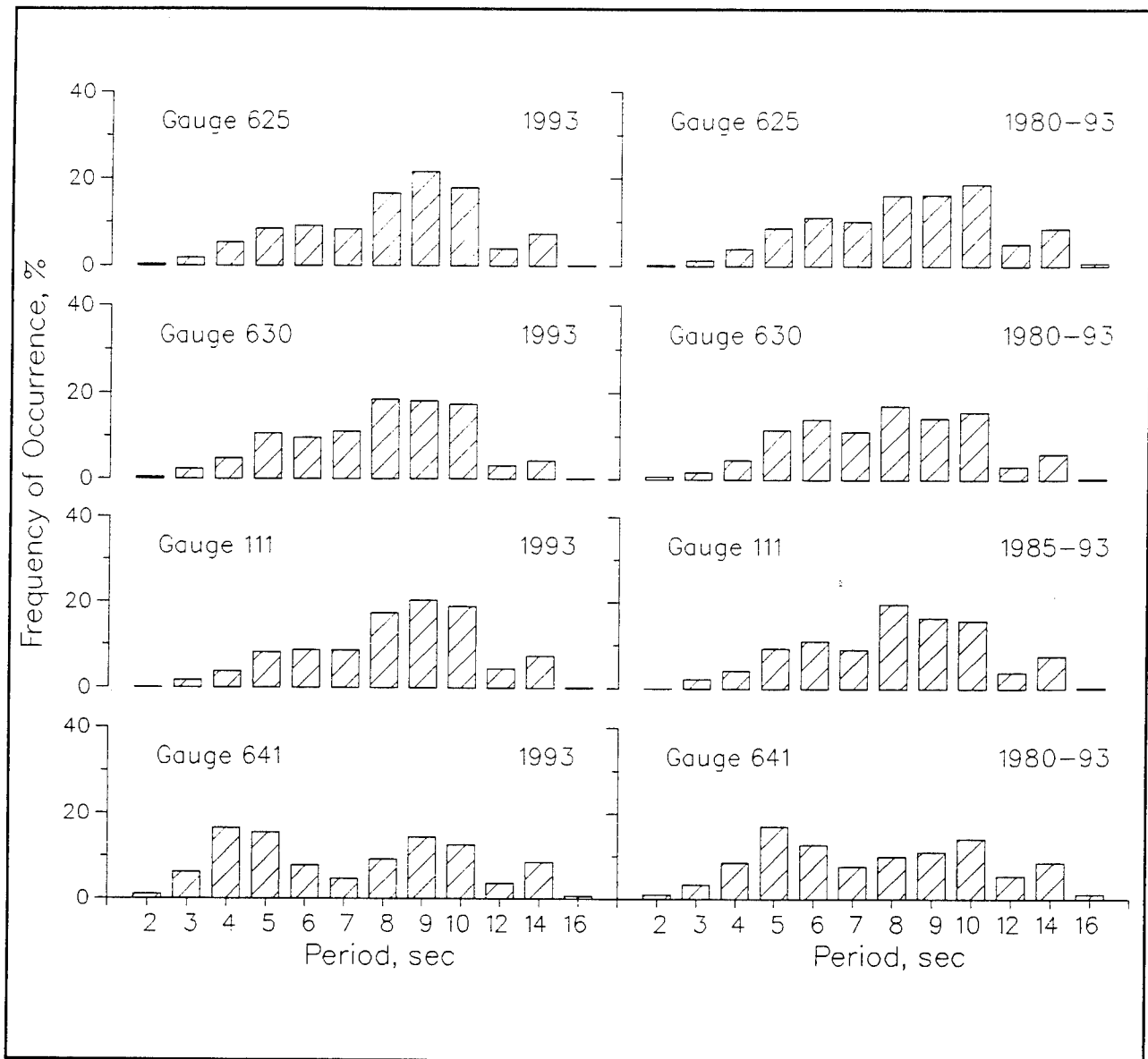


Figure E5. Annual wave period distributions for all gauges

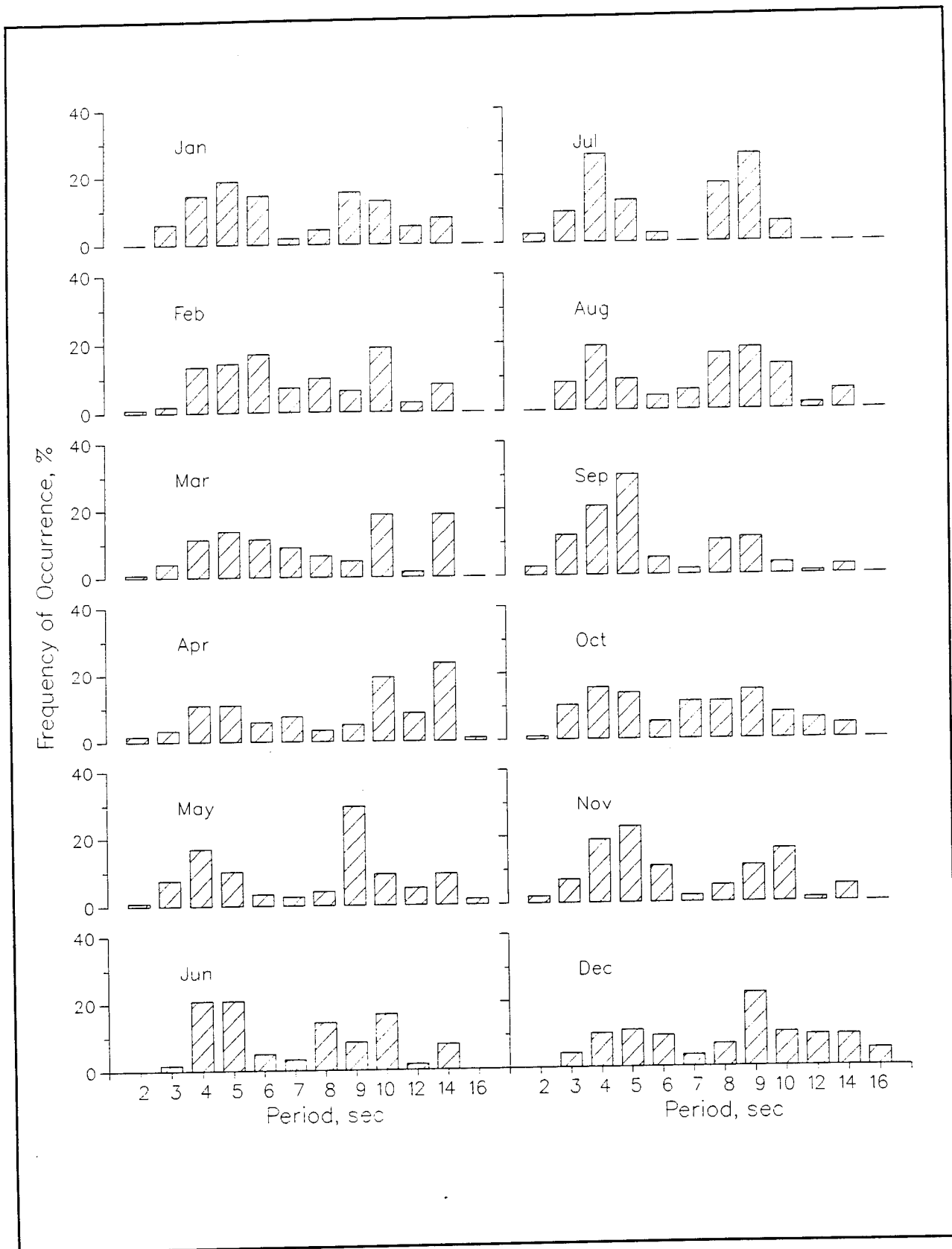


Figure E6. 1993 monthly wave period distributions for Gauge 641

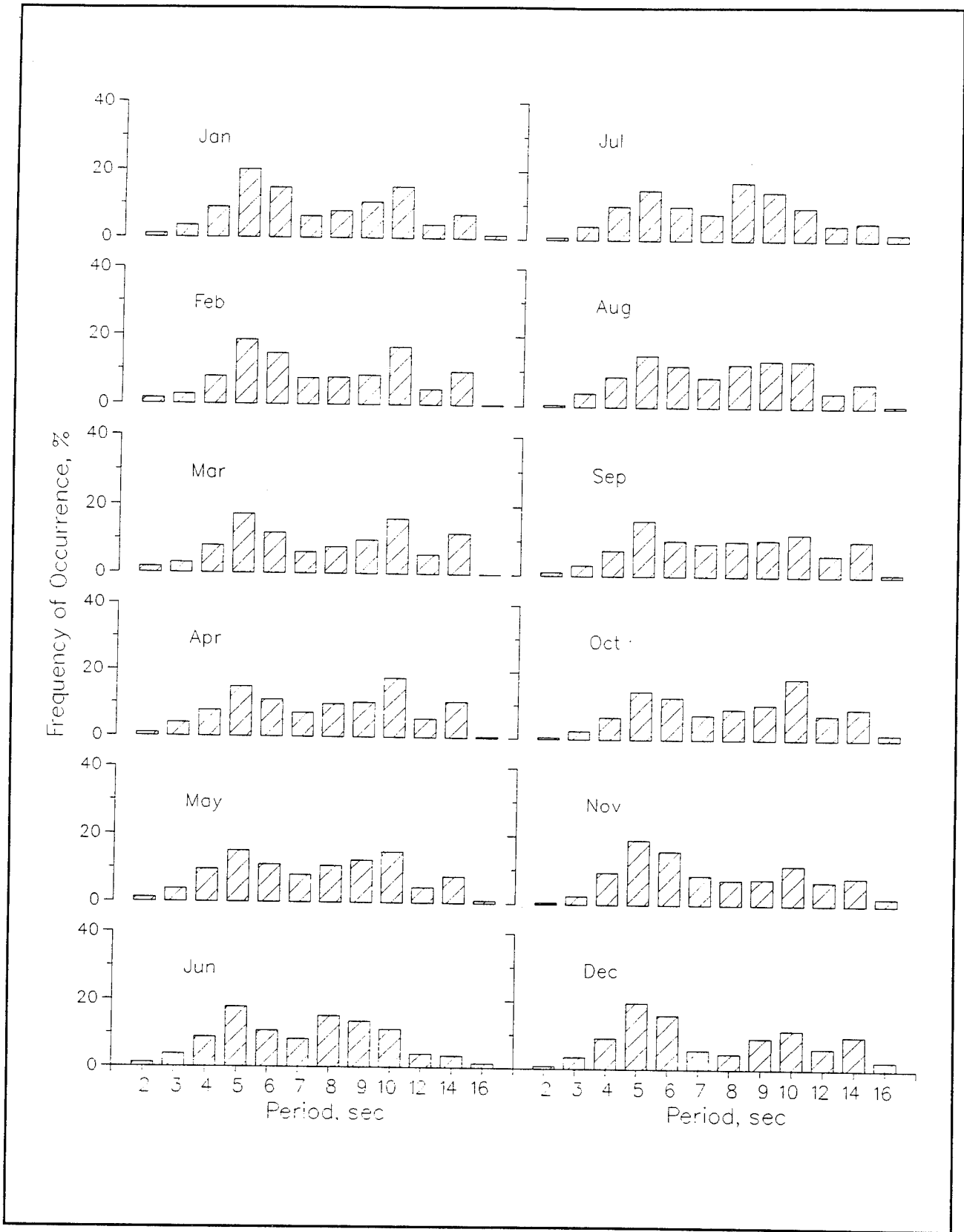


Figure E7. 1980-1993 monthly wave period distributions for Gauge 641

**Table E5**  
**1993 persistence of  $H_{mo}$  for Gauge 641**

Height (m)	Consecutive Day(s) or Longer																		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19+
0.5	52	32	22	17	12	9		5			4				3				1
1.0	26	16	12	5		2		1											
1.5	7	2	1																
2.0	3	1																	
2.5	2																		
3.0	1																		
3.5	1																		
4.0	1																		

**Table E6**  
**1980 through 1993 persistence of  $H_{mo}$  for Gauge 641**

Height (m)	Consecutive Day(s) or Longer																		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19+
0.5	43	35	28	23	19	15	12	10	9	8	7	6		5			4		3
1.0	43	26	15	9	5	3	2		1										
1.5	14	6	3		1														
2.0	3		1																
2.5	1																		
3.0	1																		
3.5																			
4.0																			

\* 1980-1992 data from gauge 645

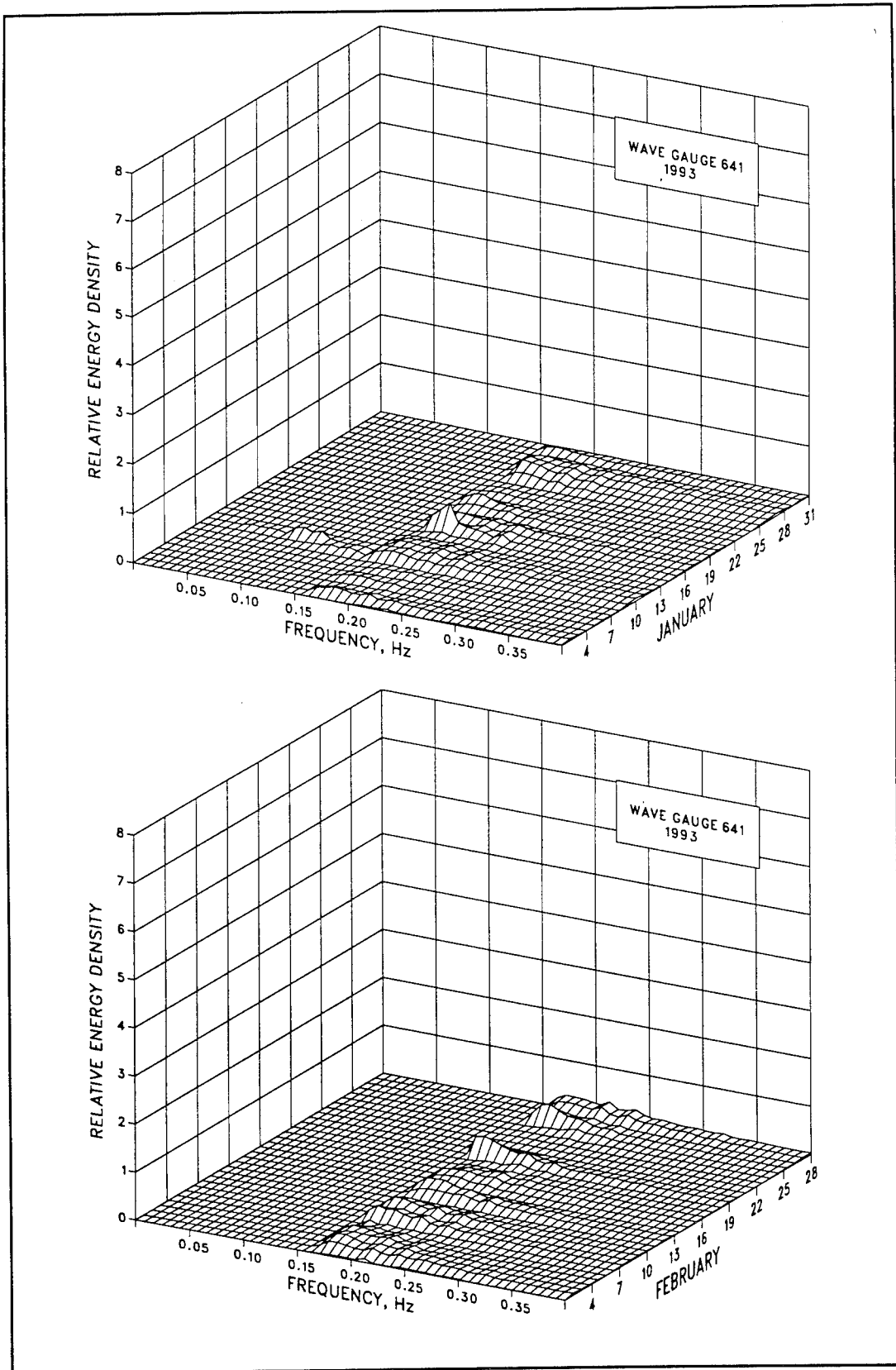


Figure E8. 1993 monthly spectra for Gauge 641 (Sheet 1 of 6)

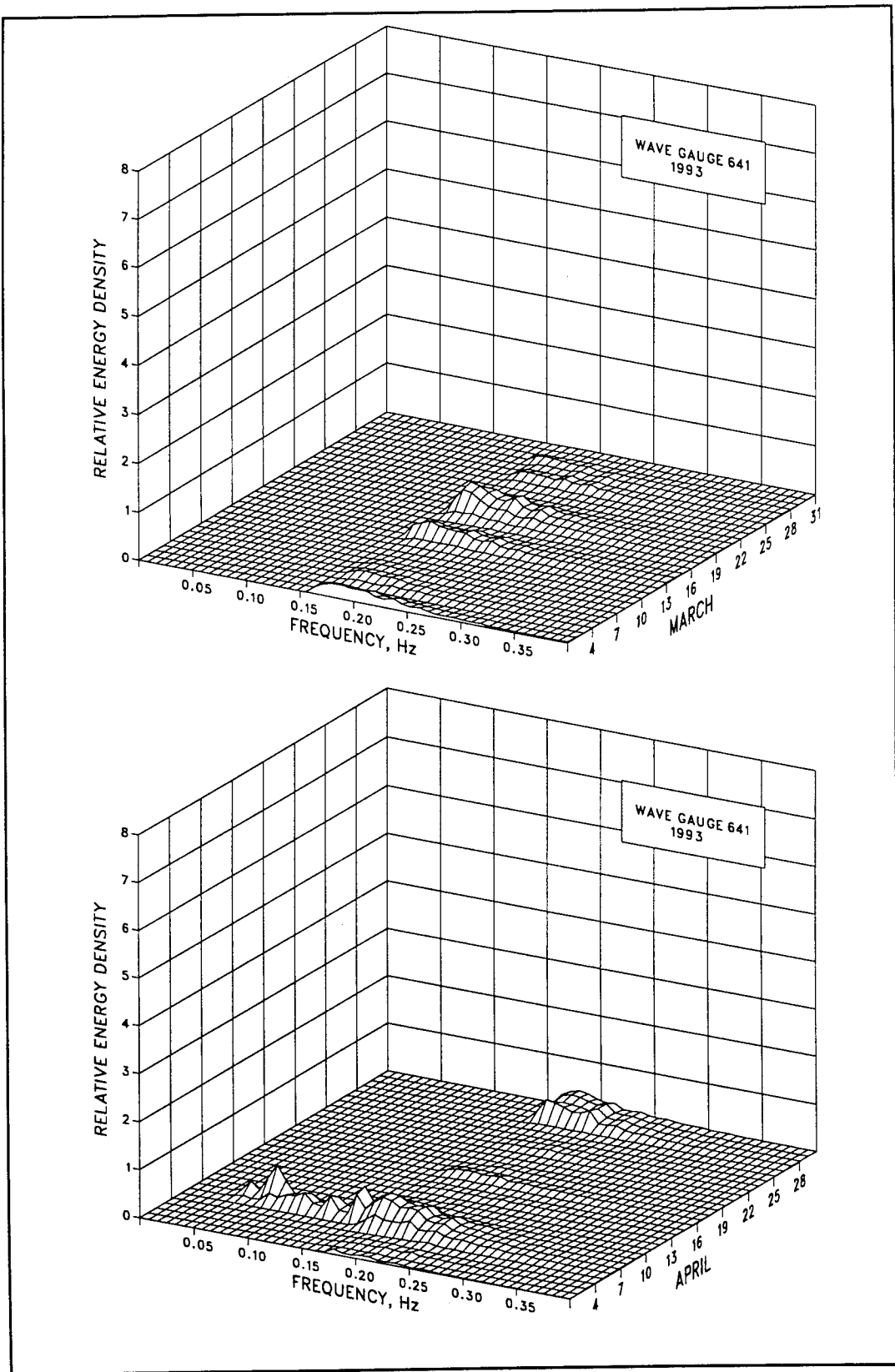


Figure E8. (Sheet 2 of 6)

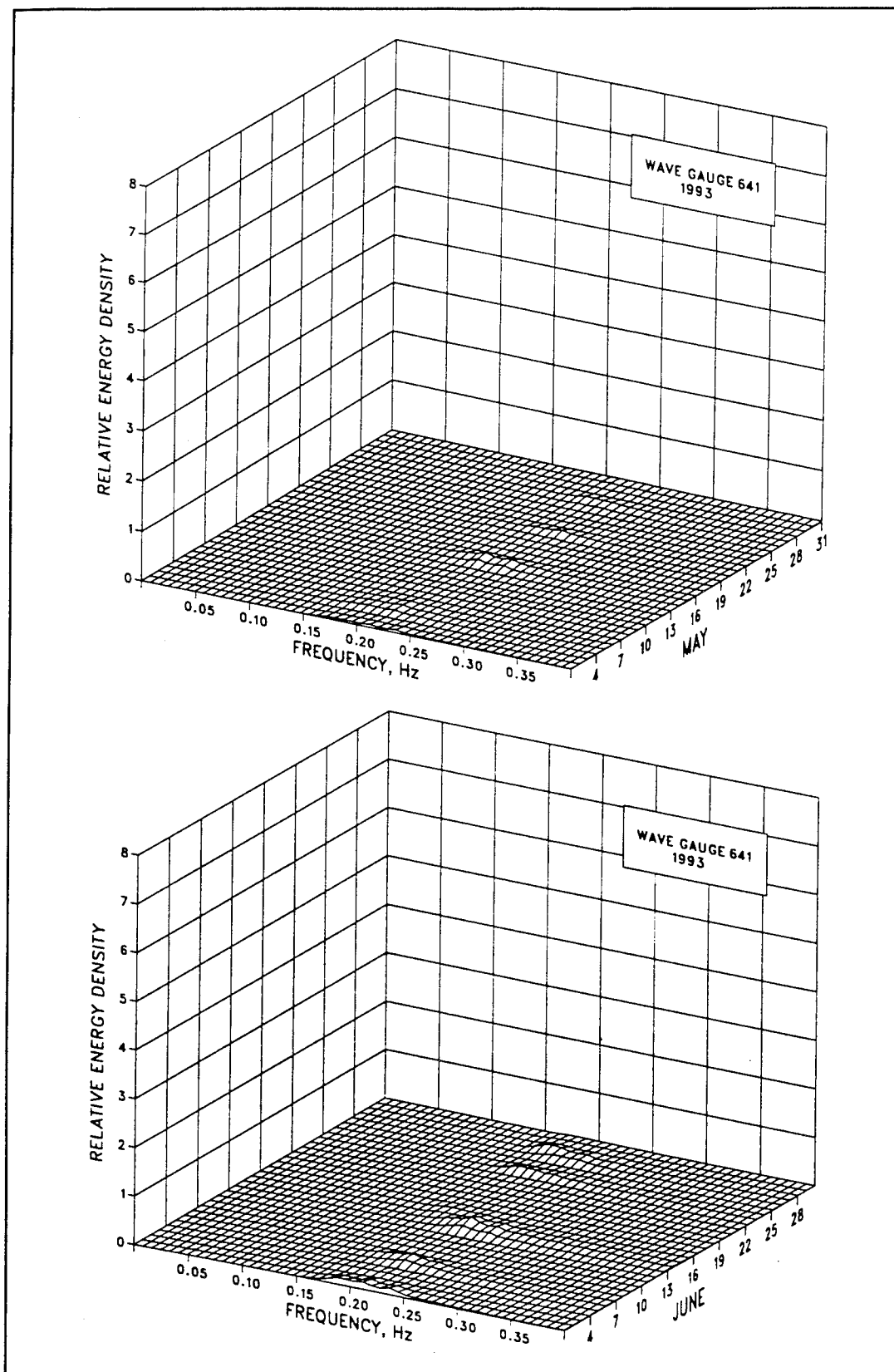


Figure E8. (Sheet 3 of 6)

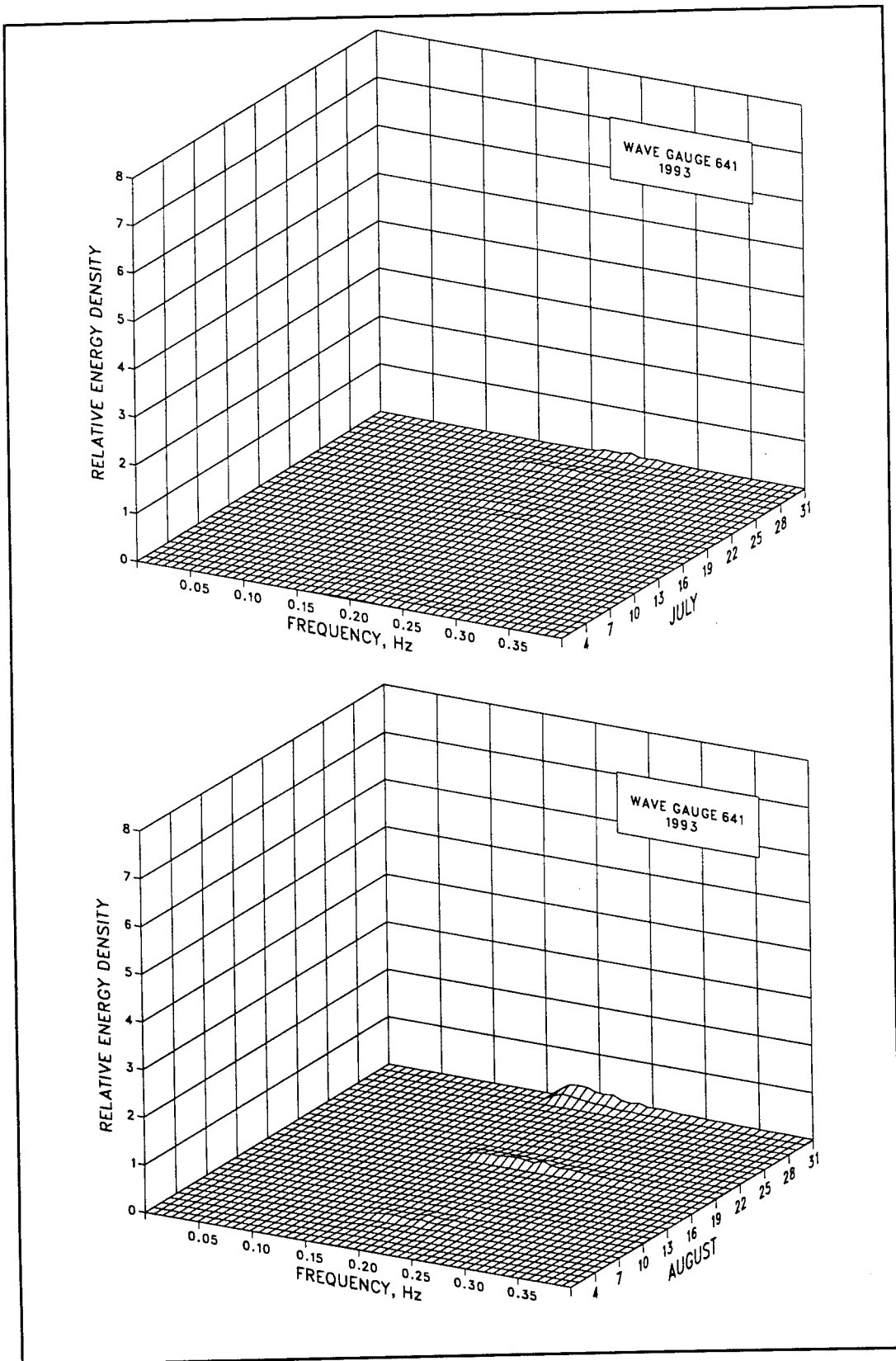


Figure E8. (Sheet 4 of 6)

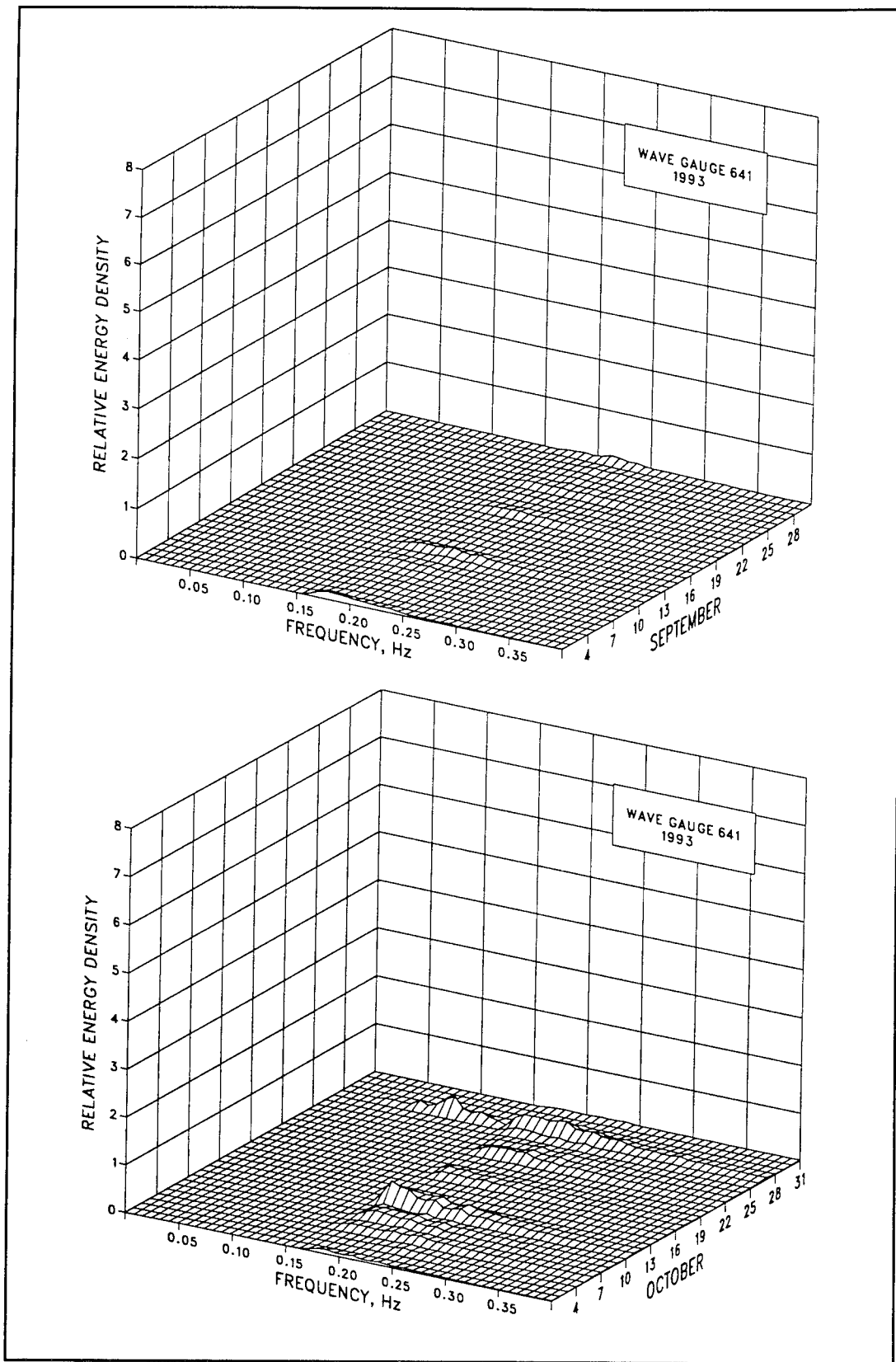


Figure E8. (Sheet 5 of 6)

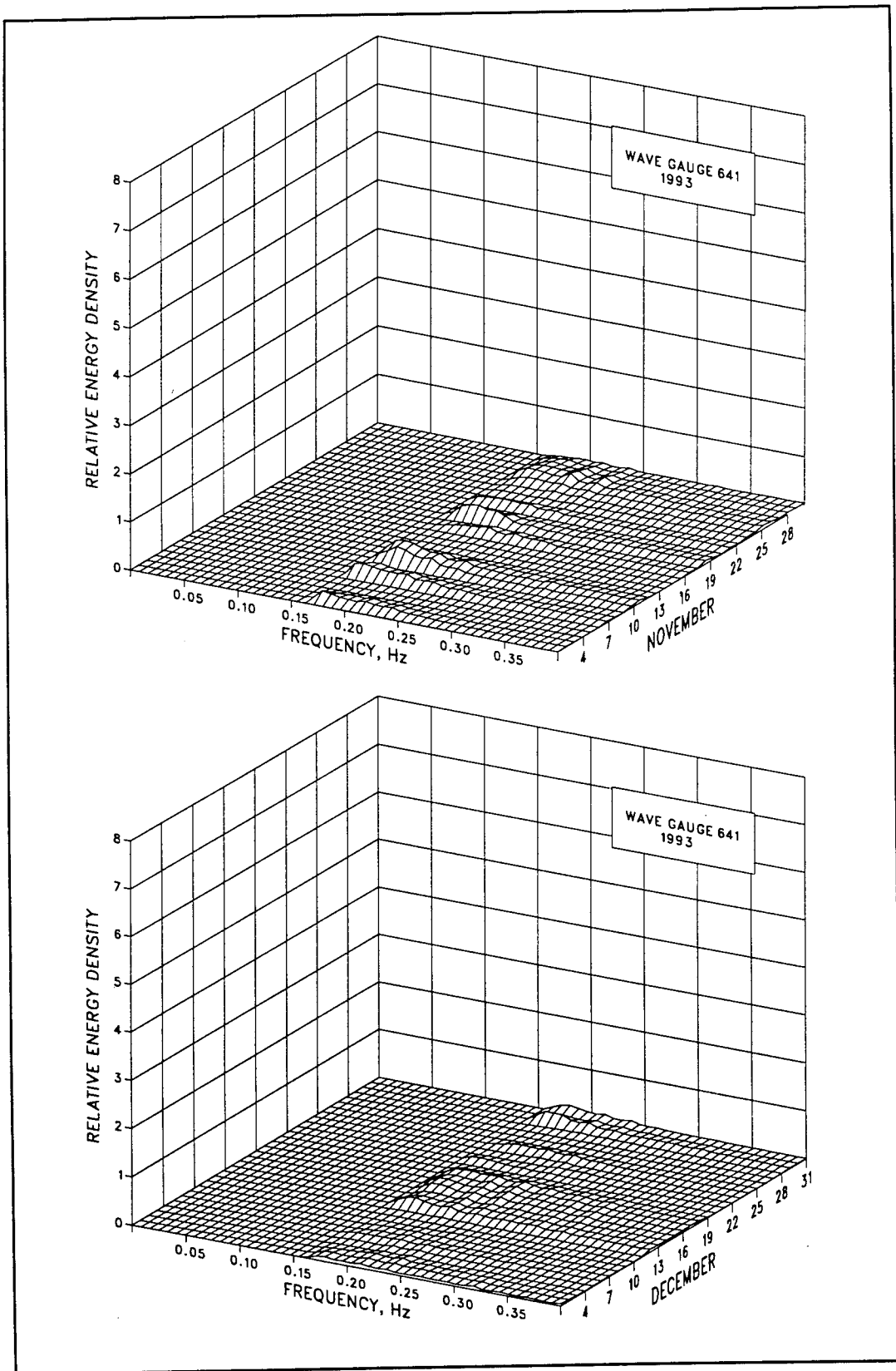


Figure E8. (Sheet 6 of 6)

**Table E7**  
**Wave statistics for Gauge 641**

Month	1993							1980-1993						
	Height			Date	Period			Height			Date	Period		
	Mean	Std.	Extreme		Mean	Dev.	Number	Mean	Std.	Extreme		Mean	Dev.	Number
	m	m	m	sec	sec	Obs.	m	m	m	sec	sec	Obs.		
Jan	0.6	0.3	1.4	10	7.9	3.2	118	0.7	0.4	2.0	1980	7.9	3.2	1519
Feb	0.8	0.4	1.4	28	8.2	3.1	112	0.8	0.4	2.2	1992	8.1	3.1	1453
Mar	0.6	0.4	1.5	13	8.6	3.4	124	0.8	0.5	2.3	1980	8.4	3.3	1606
Apr	0.6	0.5	2.0	7	9.7	4.0	120	0.7	0.4	2.3	1987	8.5	3.3	1504
May	0.3	0.2	0.8	14	8.4	3.6	119	0.6	0.4	2.0	1987	8.1	3.2	1552
Jun	0.4	0.2	0.8	6	7.8	2.9	120	0.5	0.3	1.7	1990	7.8	3.0	1408
Jul	0.3	0.1	0.6	31	6.9	2.5	124	0.5	0.3	1.6	1990	8.0	3.1	1445
Aug	0.4	0.3	1.3	31	7.8	2.9	123	0.5	0.3	1.7	1982	8.1	3.0	1475
Sep	0.4	0.2	0.9	30	6.3	2.5	117	0.7	0.4	2.1	1985	8.4	3.3	1409
Oct	0.6	0.4	1.5	26	7.6	3.3	117	0.8	0.5	2.2	1982	8.7	3.3	1442
Nov	0.7	0.4	1.4	28	7.1	2.9	102	0.8	0.4	2.0	1981	8.2	3.5	1425
Dec	0.6	0.4	1.3	16	9.2	3.8	119	0.7	0.4	2.2	1989	8.3	3.7	1519
Annual	0.5	0.3	2.0	Apr	8.0	3.3	1415	0.7	0.4	2.3	Apr 1987	8.2	3.3	17757

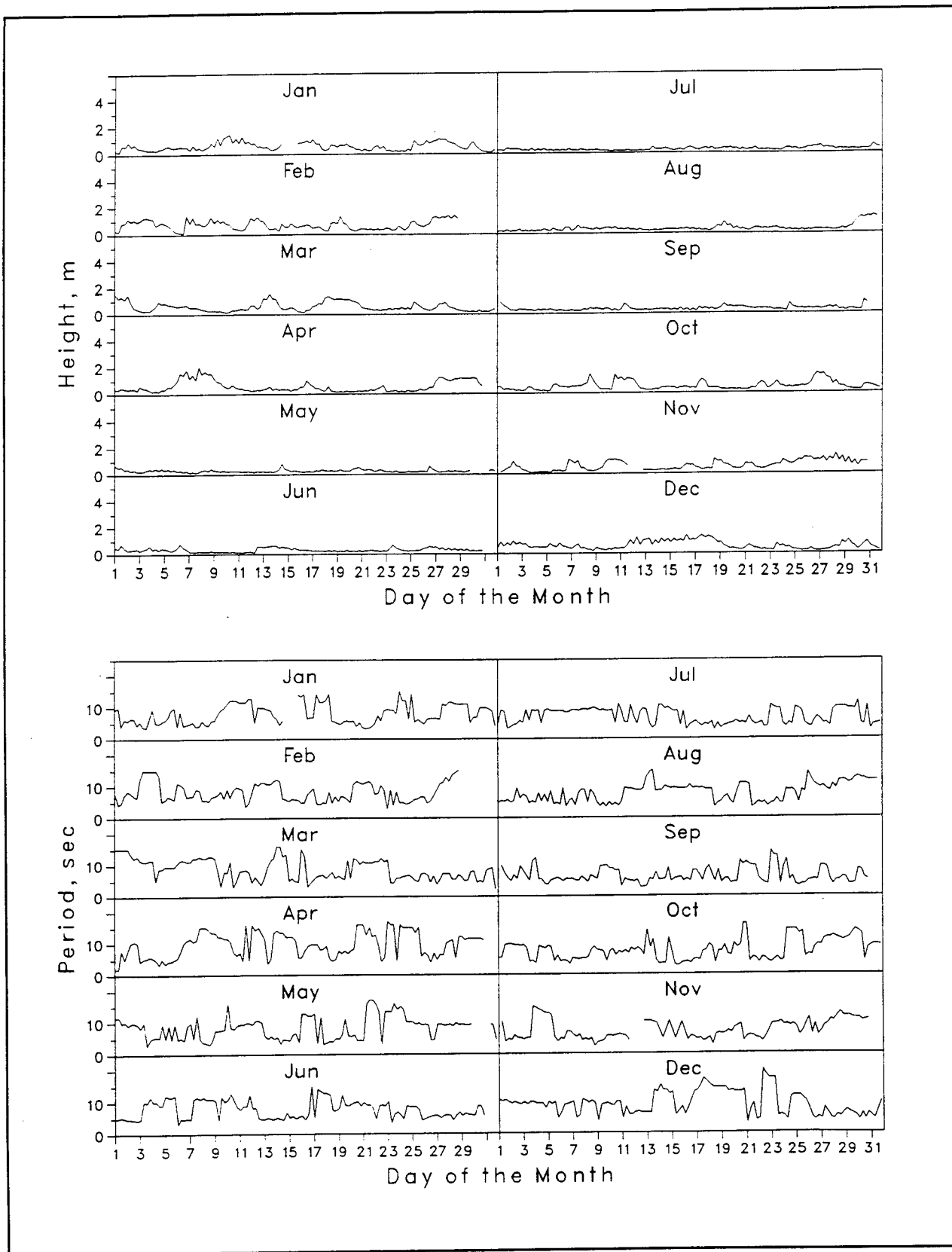


Figure E9. Time-histories of wave height and period for Gauge 641

# REPORT DOCUMENTATION PAGE

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13. ABSTRACT (Maximum 200 words) This report provides basic data and summaries for the measurements made during 1993 at the U.S. Army Engineer Waterways Experiment Station (WES), Coastal Engineering Research Center's (CERC's) Field Research Facility (FRF) in Duck, NC. The report includes comparisons of the present year's data with cumulative statistics from 1980 to the present. Summarized in this report are meteorological and oceanographic data, monthly bathymetric survey results, samples of biannual aerial photography, and descriptions of 15 storms that occurred during the year. The year was highlighted by a major storm in mid March which caused extensive flooding and damage on the western (soundside) side of the Outer Banks. This report is the 15th in a series of annual summaries of data collected at the FRF that began with Miscellaneous Report CERC-82-16, which summarizes data collected during 1977-1979. These reports are available from the WES Technical Report Distribution Section of the Information Technology Laboratory, Vicksburg, MS.				
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