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Research Report Series

**PREDICTION OF OCEAN WAVES IN SHALLOW
WATER.
KEPPEL BAY, QUEENSLAND, RECORDED DATA
ANALYSIS**

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ABSTRACT

There are a few empirical models that predict wave parameters in shallow waters. This report compares two empirical models:

- ♦ Shore Protection Manual model (SPM, 1984) modified later by Hurdle and Strive (1989); and
- ♦ Krylov model (described in Massel, 1996) with field data recorded with Datawell waverider buoy, installed at the depth of 22 m LAT, on the edge of Keppel Bay (Central Queensland, Australia).

Four years of recorded data was analysed. Approximately 430 wave conditions covering the range of significant wave data from 0.5 m to 3.5 m; and peak period from 3 to 13 s, with duration of over 9 hrs in each case was selected for detailed analysis. Not far from the wave-recording buoy is a weather station located on Rundle Island where wind conditions have been recorded automatically every 3 hours.

Analysis has shown that both models significantly overestimate predicted wave heights and periods compared with recorded ones. Vincent and Hughes (1985) formula for significant wave height in the depth-control wave train, when modified by the author by including dispersion of waves, represents recorded data very accurately.

In addition waves with long periods (>9 sec), considered as swell waves were analysed to evaluate predominant swell direction. The proper knowledge of dominant swell waves' direction is important in consideration of coastline realignment as a sustainable "soft" method of beach stabilization.

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1. INTRODUCTION

Coastal engineers regularly require an estimation of wave conditions in coastal regions up to the waterline and at the front of coastal structures. A fully discrete spectral model, accounting for all processes of generation and dissipation and wave current interaction implemented on a fine grid, usually demands excessive computer requirements. Therefore some simplifications are needed. There are few empirical prediction models of wave parameters in shallow waters described by Massel (1996).

Two of them are:

- ♦ Fetch-limited shallow-water forecasting curves given in the last edition of Shore Protection Manual (SPM, 1984), modified later by Hurdle and Strive (1989) and;
- ♦ Krylov prediction method.

The Hurdle and Strive formula asymptotically matches the SPM expression in deep and shallow waters, for small and large fetch length. The Krylov method was developed in the Soviet Union and is not widely known in Western Literature (recently described by Massel, 1996). Finally Vincent and Hughes (1985) presented formulae for significant wave height in the depth-control wave train.

The goal of this paper is verification of these three methods for the Keppel Bay where a wave recording buoy, installed at the depth of 22 m LAT has been recording wave data every one hour since 1996. Not far from the wave-recording buoy is a weather station located on Rundle Island where wind conditions have been recording automatically every 3 hours. The four years of recorded data was analysed and approximately 430 wave conditions covering the range of significant wave data from 0.5 m to 3.5 m and peak period from 3 to 13 s with duration of over 9 hrs in each case were selected.

Additionally waves with long periods (>9 sec) considered as swell waves were analysed to evaluate predominant swell direction.

2. SITE DESCRIPTION

The Datawell Waverider Buoy, operated by the Environmental Protection Agency, is located on position $23^{\circ}18.55'S$ Lat. and $151^{\circ}04.44'E$ Long. on 22 m LAT depth which is about 25 km off the Capricorn Coast, East from Emu Park. Therefore the site where the buoy is located is named "Emu Park" site. The fetch is limited by the Barrier Reef for sector N to ENE and by a group of reefs and shallow water for the sector E to SE (Figure 1). Based on a map north fetch is of the order of 180km, north-east 160 km, east is unlimited and south-east is up to 300 km but with shallow water the entire distance. In engineering approaches it is assumed that the fully developed sea conditions are generally defined by fetch limit and direction of fetch is related to recorded wind direction. In old records the wind direction was presented based on 16 directions (22.5° intervals) recent records of wind is based on 10° intervals. Thus the presented analysis of wind-waves relations were limited to 3 sectors:

sector I 350° to 70° included with average fetch = 170 km

sector II 70° to 110° included with arbitrary fetch = 440 km based on storm duration

sector III 110° to 170° included with average fetch = 300 km

The buoy measures water surface elevation and transmits this data to the receiver station located at Emu Park. The data is then passed to the onsite computer where, each hour, commencing on the hour, water surface elevations are collected into 26.62 minute records. Each record supplied is then analysed with the instrument Datawell computer program to produce wave height and period parameters. The Environmental Protection Agency (EPA) made their own spectral analysis of recorded raw data using Fast Fourier Transformation (FFT) method. Available record data from the buoy program and from FFT analysis was received from EPA and have been analysed in this paper together with the available wind data for this region obtained from the Bureau of Meteorology. The combined information was finally used to evaluate empirical prediction models for Keppel Bay conditions.

3. WIND DATA

3.1 Wind Characteristics

Wind plays a dominant role in local sea conditions as well as having significant influence on sediment transport. There are a few wind stations around the Capricorn Coast and the most representative stations are on Cape Capricorn and Rundle Island. The Cape Capricorn station was closed in 1987 and an automatic weather station opened on Rundle Island in October 1994 (see Figure 3.1). The following data obtained from The Bureau of Meteorology, Melbourne were available for analyses:

Station No 039023 Cape Capricorn, pos. 23.4833 S 151.2333 E. Station is 76 m above MSL. Data from 1.01.1957 to 13.11.1987 (gap 1964 – 1968). Observations were at 9 a.m. and 3 p.m.

Station No 039322 Rundle Island, pos 23.5350S 151.2756 E. Station is 19.8 m above MSL. Data from 10.1994 (significant gaps are for the periods: 13/10/95 – 17/1/96 and 2/10/96 – 4/12/96). Observations every 3 hours

The Cape Capricorn station is approximately 65 kilometres south east of Yeppoon and had a suitably exposed coastal position. The records from this station are giving a reasonable representation of wind conditions across Keppel Bay and along the Capricorn Coast. Rundle Island is located close to the Cape Capricorn, thus the observations could be considered as having the same representative values across Keppel Bay as data from the station Cape Capricorn.

3.2 Frequency of Severe Wind

Only strong wind with the velocity exceeding 10 m/s (36 km/h) has been considered in this analysis. It may develop waves of significant heights 1.5 m or more.

The number of days with strong wind has been evaluated from the available data. The day is considered to have a strong wind if at least one wind data record exceeds the value of 10 m/s. Tables 3.1 and 3.2 present the number of days with strong wind for Cape Capricorn and Rundle Island Stations. Figure 3.2 presents results of analysis based on available data.

Table 3.1:

Cape Capricorn Station, and Rundle Is. Number of Days with Strong Wind (≥ 10 m/s).
Two daily observations considered (9 am & 3 pm).

Year	J	F	M	A	M	J	J	A	S	O	N	D	Total	Available data (%)
1957	16	16	5	5	7	13	1	7	0	7	2	0	79	99.9
1958	4	5	6	22	5	6	0	2	5	3	6	4	68	99.7
1959	15	7	8	11	19	10	13	9	7	5	7	0	111	99.5
1960	7	10	10	7	4	8	13	2	6	3	7	4	81	94.4
1961	19	7	11	19	9	2	3	8	5	5	9	9	106	99.9
1962	3	6	13	14	2	7	9	1	7	7	4	12	85	100.0
1963	11	1	3	17	2	5	0	8	0	12	6	4	69	99.3
1969	7	13	8	8	6	6	9	4	4	2	6	7	80	99.6
1970	2	13	4	6	3	4	4	5	4	3	6	7	61	99.7
1971	1	6	17	11	5	0	7	2	3	12	9	7	80	100.0
1972	12	16	14	14	19	11	3	2	9	4	6	10	120	100.0
1973	8	5	8	12	10	7	10	3	3	7	5	11	89	99.9
1974	14	7	17	3	5	4	0	0	4	2	4	3	63	99.2
1975	9	5	7	15	8	4	0	3	7	4	8	6	76	99.6
1976	11	12	12	13	14	3	7	2	2	1	2	5	84	99.3
1977	9	7	6	8	4	6	9	4	3	4	5	6	71	99.7
1978	1	6	10	9	10	1	5	6	3	11	4	4	70	99.7
1979	16	18	5	7	11	7	6	2	7	7	2	7	95	100.0
1980	6	17	11	14	11	4	5	10	4	2	5	4	93	100.0
1981	3	7	4	4	11	1	5	0	8	9	2	7	61	100.0
1982	10	6	9	14	10	5	2	16	3	4	8	4	91	100.0
1983	11	5	8	8	16	8	6	8	6	2	9	8	95	99.9
1984	1	4	3	14	11	14	5	2	3	8	8	10	83	99.8
1985	10	12	18	4	17	7	8	1	9	9	10	9	114	99.8
1986	14	10	21	15	12	13	11	4	9	5	8	8	130	99.8
Average	8.8	8.8	9.5	11.0	9.2	6.2	5.6	4.4	4.8	5.5	5.9	6.2	86.2	
Max	19	18	21	22	19	14	13	16	9	12	10	12	130	
Rundle Is														
1995	6	8	6	12	10	8	2	8	2	NA	NA	NA	62	
1996	NA	8	20	3	6	8	2	3	1	NA	NA	8	59	
1997	14	7	19	16	8	5	4	4	9	7	8	9	110	
1998	17	6	11	11	12	6	5	11	9	8	6	13	115	
1999	12	10	17	16	18	14	15	10	9	1	13	17	152	
Average	12.2	7.8	14.6	11.6	10.8	8.2	5.6	7.2	6	5.3	9	11.8	99.6	
Max	17	10	20	18	18	14	15	11	9	8	13	17	152	

Table 3.2:
Rundle Island, Number of Days with Strong Wind (≥ 10 m/s).
8 daily observations considered (every 3 hours)

Year	J	F	M	A	M	J	J	A	S	O	N	D	Total	Available data (%)
1995	14	10	12	16	12	10	4	11	4	NA	NA	NA	95	65.1
1996	NA	10	21	3	9	10	4	4	1	NA	NA	15	77	55.9
1997	20	11	21	19	15	5	6	14	13	10	13	14	161	82.5
1998	20	7	16	15	17	10	12	15	13	15	12	18	170	97.3
1999	16	18	21	19	21	19	17	15	18	2	19	24	209	98.0
Average	18	11	18	14	15	11	9	12	10	9	15	18	142.4	
Maximum	20	18	21	19	21	19	17	15	18	15	19	24	209	

Note: NA - means data not available

There is some difference in number of strong wind days for the above two stations. In the present analysis this information has only informative character and will not be analysed further.

A similar analysis was carried out to evaluate dominant wind directions in the region. The detailed data are shown in Tables 3.3 and 3.4. Average annual number of days with wind from a particular direction is shown in Figure 3.3. It shows that dominant wind directions are ESE for Rundle Is. and SE for Cape Capricorn.

Maximum velocity of wind observed on each station for a particular year is shown in Table 3.5. It is found that all strong winds are blowing from sea sector. The probability of strong wind occurrences are analysed using Weibull plotting position formula (Figure 3.4).

The maximum wind velocity, U [km/h], for a return period, T [years], was evaluated from the analysis and can be expressed as follows:

$$U = 55.6 T^{0.27} \quad [\text{km/h}] \quad (3.1a)$$

or

$$U = 15.4 T^{0.27} \quad [\text{m/s}] \quad (3.1b)$$

Thus, for a record of maximum wind velocity 148.3 km/h by Cape Capricorn Station on 25 February 1980 (shown in Table 3.5), a return period of approximately 38 years, has been estimated from the above relation shown in Eq. 3.1a.

Table 3.3:
Cape Capricorn, Number of Strong Wind Days from a Particular Direction
Two daily observations considered (9 am & 3 pm)

Year	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	Total
1957	7	0	0	1	0	3	21	34	9	2	0	0	2	0	0	0	79
1958	7	0	0	1	3	5	14	28	8	1	0	0	1	0	0	0	68
1959	6	1	0	0	4	2	26	58	12	0	0	0	2	0	0	0	111
1960	8	0	0	1	4	8	18	25	14	2	0	0	1	0	0	0	81
1961	2	0	0	0	1	8	26	49	18	1	0	0	1	0	0	0	106
1962	12	0	1	0	2	7	19	29	12	0	0	0	1	1	0	1	85
1963	1	0	0	0	5	12	22	22	4	0	0	0	2	0	1	0	69
1969	3	0	0	1	0	20	40	7	3	0	0	2	0	0	0	4	80
1970	2	0	0	0	7	13	20	16	3	0	0	0	0	0	0	0	61
1971	9	0	1	1	4	12	27	15	1	0	0	0	1	0	0	9	80
1972	7	0	0	1	5	29	45	22	2	0	0	0	0	0	0	9	120
1973	5	0	1	1	6	14	45	12	3	0	0	0	0	0	0	2	89
1974	5	0	1	1	4	11	34	4	1	0	0	0	0	0	0	2	63
1975	2	0	0	0	2	12	46	13	1	0	0	0	0	0	0	0	76
1976	3	0	1	0	3	10	41	20	3	1	0	0	0	0	0	2	84
1977	2	2	0	1	5	12	32	15	2	0	0	0	0	0	0	0	71
1978	3	0	0	1	4	9	22	24	5	2	0	0	0	0	0	0	70
1979	6	0	0	0	6	15	31	34	3	0	0	0	0	0	0	0	95
1980	8	0	1	1	3	4	37	15	16	2	0	2	0	0	1	3	93
1981	4	0	0	1	2	11	28	12	0	0	0	0	0	0	2	1	61
1982	6	0	0	0	12	15	23	26	5	1	0	1	0	0	0	2	91
1983	5	0	0	0	13	3	39	15	10	1	6	0	0	0	0	3	95
1984	0	0	0	1	2	15	31	26	0	0	2	0	0	0	0	6	83
1985	7	1	1	0	7	14	43	31	0	0	3	0	0	0	0	7	114
1986	5	1	1	2	6	13	38	47	9	2	2	2	1	0	0	1	130
Avg	5	0	0	1	5	12	32	22	5	1	1	0	0	0	0	2	86
Max	12	2	1	2	13	29	46	58	18	2	6	2	2	1	2	9	130

Table 3.4:
Rundle Island, Number of Strong Wind Days from a Particular Direction.
Eight daily observations considered (every 3 hours)

Year	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	Total
1995	6	1	0	0	1	9	28	31	12	4	0	0	0	0	0	2	94
1996	3	2	0	2	8	21	26	7	4	1	0	1	0	1	2	1	79
1997	12	2	0	3	39	58	27	10	2	0	1	0	0	0	0	7	161
1998	7	1	1	1	21	62	37	17	12	2	1	2	0	0	1	5	170
1999	6	0	0	1	22	64	68	36	7	0	0	0	1	0	1	3	209
Avg	7	1.2	0.2	1.4	18	42.8	37	20.2	7	1.4	0.4	0.6	0	0.2	0.8	3.6	142.6
Max	12	2	1	3	39	64	68	36	12	4	1	2	1	1	2	7	209

Table 3.5:

Maximum Velocity of Wind Recorded in a Particular Year

Year			
	Date	V [km/h]	Direction, [Deg]
	Cape Capricorn		
1957	18-Aug	81.7	157.0
1958	8-Jun	70.6	157.5
1959	12-Feb	105.5	22.5
1960	19-Feb	83.5	180.0
1961	18-Feb	55.4	157.5
1962	23-Jan	68.4	157.5
1963	25-Jan	51.8	135.0
1969	7-Dec	68.4	360.0
1970	10-Feb	64.8	157.5
1971	27-Dec	64.8	360.0
1972	1-Apr	83.5	157.5
1973	20-Dec	83.5	360.0
1974	18-Sep	64.8	135.0
1975	18-Feb	59.4	135.0
1976	19-Jan	85.3	135.0
1977	9-Mar	70.6	90.0
1978	2-Feb	59.4	90.0
1979	28-Dec	63.0	112.5
1980	25-Feb	148.3	157.5
1981	21-May	70.6	67.5
1982	27-Jan	63.0	135.0
1983	3-Mar	74.2	112.5
1984	13-Jun	61.2	135.0
1985	22-Dec	64.8	337.5
1986	3-May	87.1	157.5
	Rundle Island		
1995	20-Jan	57.2	10
1996	23-Feb	57.2	130
1997	9-March	76	120
1998	28-Aug	72.4	120
1999	28 Jun	72.4	150

4. WAVE DATA ANALYSIS

Wave data received directly from Datawell Waverider Buoy program together with data from FFT spectral analysis from EPA have been obtained. They cover period from 25 July 1996 till 31 December 1999.

Wave data records were analysed and the maximum wave heights for the period of 6 or more hours were selected for further analysis. In each case the pre- and post-condition of the sea indicated a calmer sea state. Example of waves selection is shown in Figure 4.1. Thus it was initially assumed for analysed site that selected waves are corresponding to fully developed sea. For the same time wind information was selected from the wind data recorded on Rundle Island Station. Approximately 430 situations were selected from the recorded data where wind and wave information were available. The set of wave and wind data used in analyses is shown in the Appendix. Wave data was analysed initially to compare instrument records with FFT spectral analysis, and secondly to relate wave data record with wind data information.

4.1 Relations between instrument records and spectral analysis

To verify the relationship between the spectral analysis describing wave and program analysing wave conditions involved in the Datawell instrument, some correlation between these two sets of data has been undertaken.

It started with significant wave heights. Significant wave height H_{m0} from buoy record vs. H_{m0} from spectral analysis is shown in Figure 4.2. The relation indicate that the significant wave, H_{m0} , evaluated from buoy analysis is on average about 10% higher than the significant wave, H_{m0} , evaluated by spectral analysis

Frequently significant wave H_s and H_{m0} are substituted for each other. It should be noted that the development of various reliable digital data recording and analysis techniques over the last 20 years has led to fundamental changes in the way significant wave height is estimated. Except for H_s , being the mean of the highest one-third of wave heights, significant wave height H_{m0} is commonly estimated from gauge record using energy spectrum. H_{m0} is defined as an energy base significant wave height, determined as four times the square root of the area contained under the energy spectrum (IAHR, 1989). In general it is assumed that H_{m0} is approximately equal to H_s except when water depth is small or waves are very steep. The analysed set of data indicates that H_{m0} evaluated from Datawell Waverider program could be up to 20% higher than H_s evaluating traditional way (Figure 4.3).

The difference between H_s and H_{m0} obtained from spectral analysis is shown in Figure 4.4. Record after 1.10.98 shows that H_{m0} from the FFT is equal to H_s . Before this date H_{m0} was up to 10% higher (Figure 4.4). The reason is unknown to the author. It may be the effect of some correction in the program of the spectral analysis used by EPA.

Similar comparable analysis was carried out for periods: average period T_{02} based on spectral analysis and peak periods T_p .

Average period from buoy analysis is about 5% higher than the period from spectral analysis (Figure 4.5)

Relation between peak periods is inconclusive. There is no clear relation between results for the peak period from the two techniques (Figure 4.6) The main reason for this may be the different time steps used in both techniques for analysing raw data records.

In conclusion, the direct information from the buoy gives:

- Significant wave height H_{m0} from buoy is about 10% higher than H_{m0} from spectral analysis and about 20% higher than H_s .
- Average wave periods are similar, however, wave period based on buoy analysis is about 5 % higher than wave period from spectral analysis.

4.2 Relations between different wave periods defined from spectral analysis

Spectral peak wave period T_p is generally assumed as 1.3 times average wave period T_{02} (Massel, 1996). From the record of spectral analysis data (Appendix) the following relations were found for investigated site:

The average wave period

$$T_{02} = 0.95 T_z - 0.05 \quad \text{with the correlation factor } R^2 = 98\% \quad (4.1)$$

(T_z is zero crossing wave period)

The average wave period of significant wave:

$$T_H = 1.35 * T_{02} - 0.34 \quad \text{with the correlation factor } R^2 = 90\% \quad (4.2)$$

and

The average wave period of 10% maximum waves H_{10} :

$$T_{H10} = 1.37 * T_{02} - 0.32 \quad \text{with the correlation factor } R^2 = 81\% \quad (4.3)$$

Obtained relations are close to Krylov findings ($T_p = 1.25 * T_{02}$) (in Massel, 1996)

5. WAVE PREDICTION FOR SHALLOW WATERS

The linear theory suggests that the sea-bottom influences the surface waves when the water depth is $d < L/2$ (L is wave length). Change of the depth, the presence of islands, coastal headlands, etc, considered in shoaling, refraction and diffraction processes means that prediction of wave parameters in shallow water differs from forecasting in deep waters. The empirical prediction models are very useful when a quick estimation of wave climate is needed and when more sophisticated numerical models are not available. The most popular empirical models for wind generated waves in shallow waters are: (Sverdrup-Munk-Bretschneider (SBM) method, Shore Protection Manual (SPM) method, and could be also suggested Krylov's method developed in Soviet Union, widely used in Eastern Europe and unknown in Western literature. Recently Massel (1996) described the Krylov method in some details. SPM method was revised by Hurdle and Stive (1989) and this method will be discussed in this report. In any of the suggested methods the basic is information about wind, depth and fetch.

In the first approach the models usually relate wind direction with fetch. Therefore the analysed set of wave records has been divided into sectors connected with wind direction (see Chap 2), not with wave-recorded direction.

Using all this information some analysis of applicability of revised SPM model and Krylov's model for Keppel Bay conditions will be presented in the next chapters.

5.1. Revised SPM method

In the last edition of Shore Protections Manual (SPM, 1984) the set of curves has been presented for fetch-limited shallow-water forecasting. The given curves and formulae differ from initially recommended SMB method in previous editions of SPM (1973, 1975, 1977) by introducing an adjusted wind-speed factor U_A , where:

$$U_A = 0.71U_{10}^{1.23} \quad (5.1)$$

Where U_{10} is wind velocity measured at 10 m elevation

The original SPM formulae have a step change in the results in the transition between deep-water conditions and shallow water conditions. Hurdle and Stive (1989) proposed an alternative formulation, which asymptotically matches the SPM expressions in deep and shallow waters, for small and large fetch lengths

The revised equations are:

Non-dimensional wave heights:

$$\frac{gH_{m0}}{U_A^2} = 0.25 * \tanh \left[0.6 \left(\frac{gd}{U_A^2} \right)^{0.75} \right] * \tanh^{0.5} \left\{ \frac{4.3 * 10^{-5} * \left(\frac{gF}{U_A^2} \right)}{\tanh^2 \left[0.6 \left(\frac{gd}{U_A^2} \right)^{0.75} \right]} \right\} \quad (5.2)$$

and non-dimensional wave period:

$$\frac{gT_p}{U_A} = 8.3 * \tanh \left[0.76 \left(\frac{gd}{U_A^2} \right)^{0.375} \right] * \tanh^{1/3} \left\{ \frac{4.1 * 10^{-5} * \left(\frac{gF}{U_A^2} \right)}{\tanh^3 \left[0.76 \left(\frac{gd}{U_A^2} \right)^{0.375} \right]} \right\} \quad (5.3)$$

and

$$\frac{gt_{lim}}{U_A} = 65.9 * \left(\frac{gF}{U_A^2} \right)^{0.667} \quad (5.4)$$

Where

H_{m0} is significant wave height

T_p is peak period

d is water depth

F is fetch,

g is gravitational acceleration, and

t_{lim} is time limit used to evaluate effective fetch in relation to the particular duration of a storm.

5.2. Krylov's method

Krylov (in Massel, 1996) presented his formulae based on experimental data corresponding to a wind velocity range from 7 to 18 m/s and wind fetch from 1 to 560 km. Using the observations in many water basins of moderate and small depths, Krylov proposed the following formula for the non-dimensional mean wave height at arbitrary water depth:

$$\frac{g\bar{H}}{U^2} = 0.16 \left\{ 1 - \left[1 + 6 \cdot 10^{-3} \left(\frac{gF}{U^2} \right)^{0.5} \right]^{-2} \right\} * \tanh \left\{ 0.625 \left(\frac{gd}{U^2} \right)^{0.8} \left[1 - \left(1 + 6 \cdot 10^{-3} \left(\frac{gF}{U^2} \right)^{0.5} \right)^{-2} \right]^{-1} \right\} \quad (5.5)$$

and non-dimensional mean wave period

$$\frac{g\bar{T}}{U} = 19.478 * \left(\frac{g\bar{H}}{U^2} \right)^{0.625} \quad (5.6)$$

Significant wave heights and period are suggested as

$$H_{m0} = 1.6 \bar{H} \quad \text{and} \quad T_p = 1.25 \bar{T} \quad (5.7)$$

And time limit is:

$$t_{lim} = 2F/U \quad (5.8)$$

Krylov is using directly wind velocity in his equations and not wind factor U_A .

Both methods (SPM and Krylov), for predicting waves in finite depth of water, from given values of uniform wind speed U , selected fetch F , and duration time t , Eq (5.8) should be applied first to calculate the limiting duration (t_{lim}) specified by given wind velocity and fetch. If the storm duration (t) is sufficiently long compared to the calculated limiting duration (t_{lim}), then wave height and period can be estimated directly from Eqs (5.2) and (5.3) or (5.5) and (5.6) respectively. In the case of $t < t_{lim}$, the wave conditions to be determined are duration limited. An effective fetch F , should be calculated from Eqs (5.4) or (5.8) based on the given duration (t), from which the new fetch value will be estimated.

5.3. Recorded data versus empirical predictions

Wave data from Datawell buoy was subdivided into 3 sectors (see Chap 2.) based on wind direction. They are:

Sector I called Northeast: $350^0 - 70^0$
 Sector II called East: $71^0 - 110^0$
 Sector III called Southeast $111^0 - 170^0$

Dimensionless relations were calculated and compared with theoretical calculations. Figures 5.1 to 5.3 show a dimensionless relationship between wave heights and fetch. Both methods, generally, overestimate wave height and practically for dimensionless fetch $gF/U^2 > 80,000$ dimensionless wave highs become equal to 0.25 following SPM revised method or about 0.23 following Krylov method (about 10% difference in wave heights prediction).

Similar analysis was carried out for wave period using Eqs (5.3) or (5.6) and results are shown in Figures 5.4 to 5.6. Both methods generally show very similar results that rather overestimate recorded wave periods. In the case of Krylov's method the peak wave period was calculated based on found relationship shown in Eq (4.3). For dimensionless fetch exceeding 80,000 the dimensionless peak wave periods, gT/U , are considered as equal of about 8.0.

Analysis of discrepancy between empirical formulae and measurements expressed as an error: $R = (\text{model} - \text{measurements})/\text{model}$ is summarised in Table 5.1 and shown in Figures 5.7 and 5.8

Table 5.1
Range of discrepancy between empirical and observed data for Keppel Bay region

	Discrepancy R in %														
Range of error -->	< -150	-150 to -101	-100 to -76	-75 to -51	-50 to -41	-40 to -31	-30 to -21	-20 to -11	-10 to +10	+11 to +20	+21 to +30	+31 to +40	+41 to 50	+50 to +75	Total
Model	Hm0														
SPM revised	0.8	1.0	0.0	1.0	1.0	1.8	3.4	4.4	40.3	19.0	13.0	10.6	2.9	0.8	100.0
Krylov	1.0	0.8	0.8	1.6	1.0	0.8	1.8	3.1	16.6	25.7	23.1	16.9	4.9	1.8	100.0
	Wave period														
SPM revised	1.0	0.8	0.5	1.3	0.3	1.3	1.6	1.3	5.5	8.1	27.8	41.0	9.1	0.5	100.0
Krylov	0.8	1.3	0.8	1.0	0.8	1.3	1.6	1.3	6.2	15.6	42.1	22.6	4.4	0.3	100.0

Figure 5.7 indicates that SPM revised method ie, application of Hurdle and Stive formulae overestimate wave height in 87% of cases, and in 60% the difference in relation to measured values is in the range of -10 to +20%. Krylov's method overestimate wave heights in 89% of cases and in 42% the difference in relation to measured values is in the range of -10 to +20% and in 82 % the range of errors could be up to +40%.

The result of the analysis of the discrepancy between theories and measurements in relation to the wave periods, similar to this one presented for wave height is shown in Figure 5.8. In 91% of cases Krylov's method and SPM revised method overestimate wave period. Overestimation of wave periods was up to 40% over recorded ones in almost 70% cases.

This short analysis indicates that both methods (SPM revised as well as Krylov) overestimate prediction of wave height and periods for the Keppel Bay region. The most probable overestimation of wave parameters could be up to 40% higher than recorded.

5.4 Vincent and Hughes formula

According to Vincent and Hughes (1985), the significant wave height in the depth-controlled wave train is given by:

$$\frac{gH_{m0}}{U^2} = 0.210 * \left(\frac{gd}{U^2} \right)^{0.75} \quad (5.9)$$

They also argue that the maximum wave period at which the growth of shallow water waves would stop is determined by:

$$\frac{gT_{\max}}{U} = 6.98 * \left(\frac{gd}{U^2} \right)^{0.5} \quad (5.10)$$

Their formula is basically restricted to very shallow water when the wave motion is totally controlled by the water depth and waves are basically non-dispersive. It means that waves speed depends on the water depth only, not on the frequency. Direct application of their formula to recorded data shows no relation (Figure 5.9). It means that in analyse set of wave data some waves are dispersive. Therefore it is proposed introduction of some correction factor β due to wave dispersion and modified the formula to:

$$\frac{gH_{m0}}{U^2} = 0.21 * \beta * \left(\frac{gd}{U^2} \right)^{0.75} \quad (5.11)$$

where

$$\beta = 1 - A * \tanh^n \left(\frac{d}{gT_{02}^2} \right) \quad (5.12)$$

The coefficients A and n have to be found from the field data. It can be see that when wave are propagated in a very shallow water, $d/gT_{02}^2 \rightarrow 0$ and $\tanh(d/gT_{02}^2) \rightarrow 0$. Thus coefficient $\beta \rightarrow 1$ and proposed formula approaches to the Vincent formula. When water depth is not so small with respect to the wave length, $\tanh(d/gT_{02}^2) > 0$ and β is less than 1.

Linear regression analysis was carried out on the set of recorded data allow to estimate coefficients A and n.

The equation has a form

$$\frac{gH_{m0i}}{U_i^2} = 0.21 \left[1 - A \tanh^n \left(\frac{d_i}{gT_{02i}^2} \right) \right] \left(\frac{gd_i}{U_i^2} \right)^{0.75} \quad (5.13)$$

where $i = 1, 2, \dots, N$ are recorded data

$$\text{Let } B_i = \tanh\left(\frac{d_i}{gT_{02i}^2}\right) \quad \text{and} \quad D_i = 1 - \frac{\frac{gH_{m0i}}{U_i^2}}{0.21\left(\frac{gd_i}{U_i^2}\right)^{0.75}}$$

The Eq (5.13) can be expressed as:

$$D_i = A * B_i^n \quad (5.14)$$

Error of which should be minimise, i.e.:

$$SSE = \sum_{i=1}^N (\log D_i - \log A - n \log B_i)^2 \rightarrow \min \quad (18)$$

SSE becomes minimum when $\frac{\partial SSE}{\partial A} = 0$ and $\frac{\partial SSE}{\partial n} = 0$

Solving the following set of two equations is obtained

$$\log A = \frac{\sum_{i=1}^N \log D_i - n \sum_{i=1}^N \log B_i}{N} \quad (5.15)$$

and

$$n = \frac{\sum_{i=1}^N \log B_i \log D_i - \log A \sum_{i=1}^N \log B_i}{\sum_{i=1}^N \log B_i^2} \quad (5.16)$$

Solving simultaneously Eqs (5.15) and (5.16) for whole N numbers of record data gives the values of $A = 0.893$ and $n = 0.366$. Modified relation between dimensionless wave heights and dimensionless water depth is shown in Figure 5.10.

Dimensionless relation between mean wave period and water depth for recorded data H had been established as

$$\frac{gT_{02}}{U} = 2.9 * \left(\frac{gd}{U^2}\right)^{0.375} \quad (5.17)$$

The relation (Eq. 5.17) represents average expected mean wave period for a given depth as it can be seen in Figure 5.11. Discrepancy of this estimation shown in Table 5.2 indicates that Eq. (5.17) estimate average wave period with the 90% accuracy in the range of $\pm 20\%$.

Table 5.2

Difference between Eq (5.17) presenting average wave period and observed data

Range of error [%]	<-20	-20 to -10	-10 to +10	+10 to +20	>+20	Total
% of observations	7.4	17.4	58.1	14.9	2.2	100.0

The relationship (Eq. 5.17) is similar with SPM relationship suggested for shallow water (in Massel, 1996). SPM relation represented peak wave period:

$$\frac{gT_p}{U} \approx 6.31 * \left(\frac{gd}{U^2} \right)^{0.375} \quad (5.18)$$

Evaluating wave period from Eq. (5.17) and introducing into Eq. (5.12), the correction factor β will be equal:

$$\beta = 1 - 0.893 * \tanh^{0.366} \left(0.119 * \left(\frac{gd}{U^2} \right)^{0.25} \right) \quad (5.19)$$

It brings Eq. (5.11) to the final form describing dimensionless wave height as a function of water depth for Keppel Bay conditions for any wind direction. This equation is presented in Figure 5.10. 86% data is within the error of $\pm 10\%$ and 98% within the error of $\pm 20\%$ (Table 5.3).

Table 5.3

Difference between Eq (5.11) presenting predicted significant wave heights and observed data

Range of error [%]	<-20	-20 to -10	-10 to +10	+10 to +20	>+20	Total
% of observations	1.5	4.2	86.1	7.7	0.5	100.0

In summary the analysis shows that for the conditions of Keppel Bay with limited depth means that not all approaching waves could be considered as shallow waves. The modified equation of Vincent and Hughes represents recorded wave heights data with high accuracy. Therefore the modified formula presented by Eq (5.11) with corrected factor shown in Eq. (5.19) are recommended in forecasting analysis of wave height:

$$\frac{gH_{m0}}{U^2} = 0.21 * \left[1 - 0.893 \tanh^{0.366} \left(0.119 * \frac{gd}{U^2} \right)^{0.25} \right] * \left(\frac{gd}{U^2} \right)^{0.75} \quad (5.20)$$

Mean wave period with the accuracy of $\pm 20\%$ can be evaluated based on Eq. (5.17). Peak period T_p is recommended to assume as (see Chap 4.2):

$$T_p = 1.36 * T_{02} \quad (5.21)$$

where T_{02} is an average recorded wave period.

6. FORECASTING WAVE CONDITIONS

The possibility of properly forecasting wave conditions is fundamental in designing a process for beach protection. Applications of Eq (3.1) forecasting wind conditions, and next Eq (5.20) forecasting wave conditions, were tested against some hindcasting analysis conducted by BPA for the Capricorn Coast in their report (BPA, 1979). The results of calculations are shown in Table 6.1 and graphically in Figure 6.1. The calculations were done for a depth $d = 24$ m LAT representing mean depth where Datawell Waverider Buoy is installed. Next wave heights were transferred to deep water condition to compare with BPA results.

Considering different method to evaluate H_{sig} in BPA report and H_{m0} in this analysis the results are well in agreement. It confirms that empirical formula (5.20) can be used in numerical analysis for the Keppel Bay conditions.

Table 6.1
Wave parameters at different return periods

ARI (years)	1	5	10	20	50	100
Wind velocity[m/s] (Eq. 3.1b)	15.4	23.8	28.7	34.6	44.3	53.4
H_{m0} [m] (Eq. 5.20)	3.0	3.9	4.4	4.9	5.7	6.3
T [sec] (Eq.5.17)	4.5	5.1	5.3	5.6	5.9	6.2
Deep water H_{m0} [m]	3.0	3.9	4.4	4.9	5.8	6.5
BPA H_{sig} (6 hrs) [m]	3.2	4.2	4.6	5	5.5	6
BPA H_{sig} (12hrs) [m]	3.1	3.9	4.2	4.6	5	5.2

7. SWELL WAVES

Having four years of wave data recorded every hour, an additional short analysis of predominant swell waves' direction was undertaken. The knowledge of predominant direction is important in discussion about stabilization of the coastline by its reshaping. This report summarises only available data based on existing wave data records.

Swell waves are low in height compared to their length, i.e., their wave steepness (H/L) is small. They approach the coastline from long distances and having long periods (compare with local storm waves) cause a positive process by supplying bottom sediment to the coast. Swell information is important for getting an idea about coastline reshaping by nature. The effect of swell waves is to modify the configuration of the coast, through which irregular beach outlines in plan may be simplified into a succession of curved sandy beaches between protruding rocky headlands.

Previous swell data for the period 1972 to 1981, is only available from Cape Capricorn Station. Its short analysis is presented in Table 7.1. The results show that the dominant swell direction in a far open sea is from the sector E to SE.

Table 7.1
Cape Capricorn station: number of daily observations presented as
state of swell versus direction of swell (1972 – 1981)

State of swell	N	NE	E	SE	S	SW	W	NW	Still	Total	%
0									530	530	14.6
1	372	199	640	519	47	21	10	30		1838	50.7
2	68	30	178	320	8	1	1	5		611	16.9
3	35	16	154	302	2			2		511	14.1
4	3	3	32	73						111	3.1
5	1		5	12						18	0.5
6				1						1	0.0
7			1							1	0.0
8				1						1	0.0
9											0.0
Total	479	248	1010	1228	57	22	11	37	530	3622	
%	13.2	6.8	27.9	33.9	1.6	0.6	0.3	1.0	14.6	100.0	

Note: State of swell in open sea is classified as follows

- 0 No swell
- 1 Short or average length low swell
- 2 Long low swell
- 3 Short swell of moderate height
- 4 Average swell of moderate height
- 5 Long swell of moderate height
- 6 Short heavy swell
- 7 Average length heavy swell
- 8 Long heavy swell
- 9 Confused swell

With the available wave data from Datawell Waverider Buoy (period 1996 – 2000) located at the edge of the Keppel Bay, the evaluation of swell directions nearer to the coastline was available. Almost 3400 records of waves, having a peak period longer than 9 sec, has been extracted from the Waverider Buoy records. The record was analysed next and averaged for the time period when direction of recorded wave varied within the range of $\pm 5^0$. The final averaged set of swell wave directions is presented in Appendix. The graphical presentation for consecutive years is shown in Figures 7.1 to 7.5. Average swell waves direction in a particular year is shown in Table 7.2. It indicates a very consistent predominant swell direction in the range of 65^0 to 70^0

Table 7.2
Average swell direction recorded by Waverider

Year	Average swell direction [Deg from N]
1996	70
1997	68
1998	70
1999	67
2000	65

This data indicates that the dominant swell changes direction from the sector E – SE (ie., average about 110^0 from N) generally recorded at Cape Capricorn station to ENE recorded by Datawell Buoy 25 km off the Emu-Park beach.

8. SUMMARY

Coastal engineers frequently use simplified methods of wave prediction in shallow water. Wind velocity and fetch, as well as water depth are basic data in evaluating wave heights and period. On Keppel Bay, Queensland, Datawell Waverider Buoy has been recording wave data since 1996. Available wind data from the nearest weather station located on Rundle Island, together with the wave data from the Waverider Buoy allowed the accurate analysis of predicted empirical methods, at least for the Keppel Bay region.

The report discussed the following problems: wind data analysis (Chap 3), relation between Waverider Buoy analysis and FFT spectral analysis (Chap 4.), and relation between Waverider data and empirical formulae (Chap 5). Based on this analysis proposed formula for wave prediction for Keppel Bay was developed and discussed in Chap 6. Finally, the swell waves dominant direction was discussed.

Dominant wind direction for Keppel Bay is from the sea sector. Wind analysis based on long term available data was concluded with the formula for probable maximum annual wind (Eq.3.1).

Relations between wave data records analysed by instrument, and results of the FFT spectral analysis carried out on the same recorded raw data, showed that:

- Significant wave height H_{m0} from buoy is about 10% higher than H_{m0} from spectral analysis, and about 20% higher than significant wave height, H_s , defined as average of highest 1/3 of zero up-crossing wave heights.
- Average wave periods are similar, however, wave period based on buoy analysis is about 5 % higher than wave period from spectral analysis.
- Peak wave periods are inconclusive because different time intervals were taken for FFT analysis compare with instrument program.
- Relations between peak periods and average periods of waves can be assumed as $T_p = 1.36 T_{02}$

Two empirical models were compared with recorded data from Datawell Waverider Buoy:

- SPM model revised by Hurdle and Stive and;
- Krylov's model.

Both models overestimate wave height and practically for dimensionless fetch $gF/U^2 > 80,000$ dimensionless wave heights become equal to 0.25 following SPM revised method or about 0.23 following Krylov's method. Analyses carried out for wave period generally show very similar results for both models which overestimate recorded wave periods. Krylov's model evaluates mean wave period. The peak wave periods were next recalculated based on Eq (4.3). For dimensionless fetch exceeding 80,000 the dimensionless peak wave periods, gT/U are considered as equal of about 8.0.

As indicated in Figure 5.7, the SPM revised method i.e., application of Hurdle and Stive formulae overestimate wave height in 87% of cases, and in 60% the difference in relation to measured values is in the range of -10 to +20%. Krylov's method overestimate wave heights in 89% of cases and in 42% the difference in relation to measured values is in the range of -10 to +20% and in 82 % the range of errors could be up to +40%.

The result of discrepancy analysis between models and measurements in relation to the wave periods, similar to this one presented for wave heights, is shown in Figure 5.8. In 91% of cases Krylov's method and SPM revised method overestimate wave period. In up to 70% cases overestimation is up to 40% over recorded ones.

This analysis indicates that both predicted formulae (Hurdle and Stive as well as Krylov) overestimate prediction of wave height and periods for the Keppel Bay region. The most probable overestimation of calculated values of wave parameters could be up to 40% of recorded ones.

Vincent and Hughes suggested formulae for evaluation of wave heights and periods for depth-controlled wave train. This approach was adopted to the present study and their formula describing wave height was modified by introducing correction factor due to wave dispersion. The final form of developed equation is shown in Eq (5.20) representing $\pm 10\%$ discrepancy for 86% of analysed recorded data.

Finally Eq (3.1) predicted probable wind, together with Eqs (5.20) and (5.17) predicted wave heights and periods can be used in the forecasting analysis for Keppel Bay area.

Short analysis of dominant swell waves' direction indicates influence of refraction process on long waves approaching the Keppel Bay. The dominant swell changes direction from the sector E – SE generally recorded at Cape Capricorn station to ENE (65^0 to 70^0 from N) recorded by Datawell buoy 25 km off the Emu-Park beach. Dominant swell direction requires more detailed analysis in each section of the Capricorn Coast if a particular beach restoration is to be considered.

9. ACKNOWLEDGEMENT

In the analyses presented in this report, the wave data records were obtained from the Environmental Protection Agency and wind data from Bureau of Meteorology, Melbourne. The right to use this data is acknowledged.

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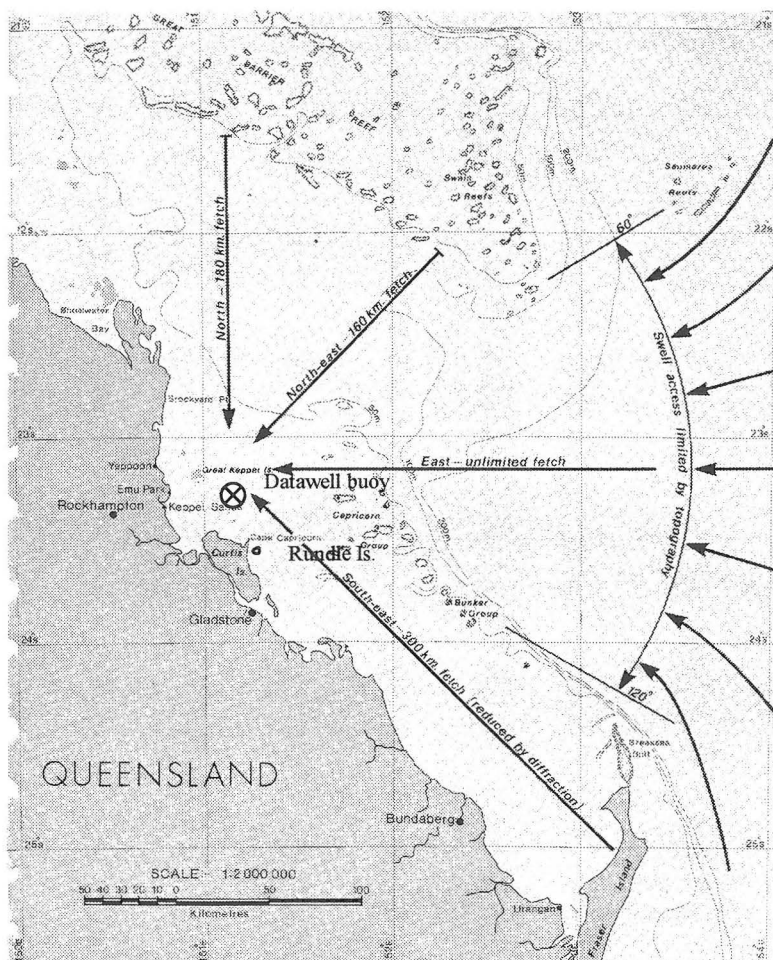


Figure 3.1 Locality Plan

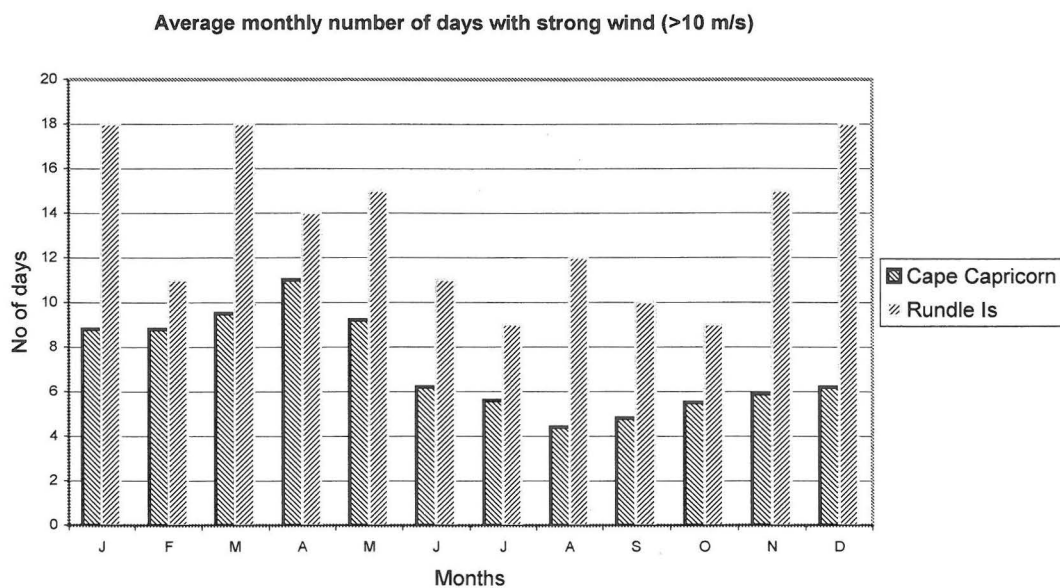


Figure 3.2 Average Monthly No of Days with Wind > 10 m/s for Keppel Bay Area

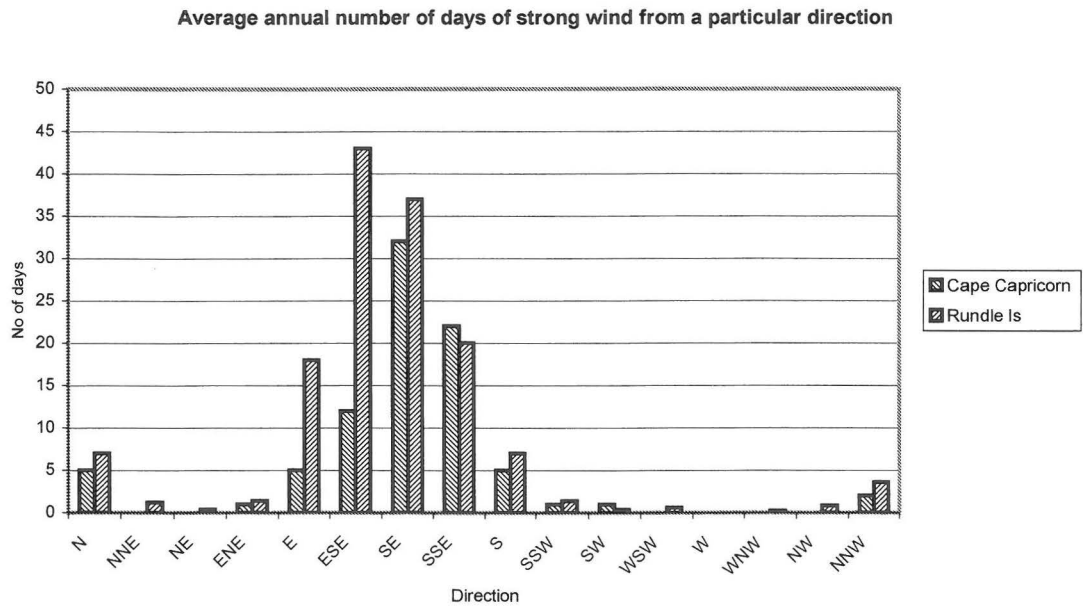


Figure 3.3 Average Annual Numbers of Strong Wind Days (>10 m/s) from Different Directions

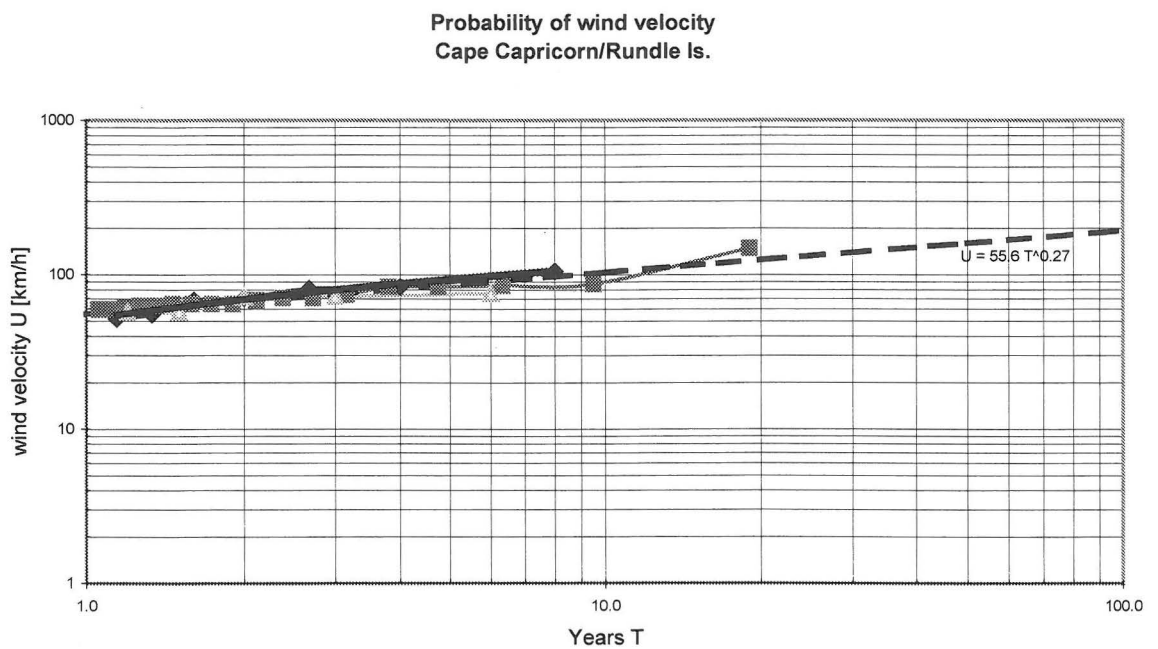


Figure 3.4 Maximum Wind Velocity for Return Period T in Keppel Sands Region

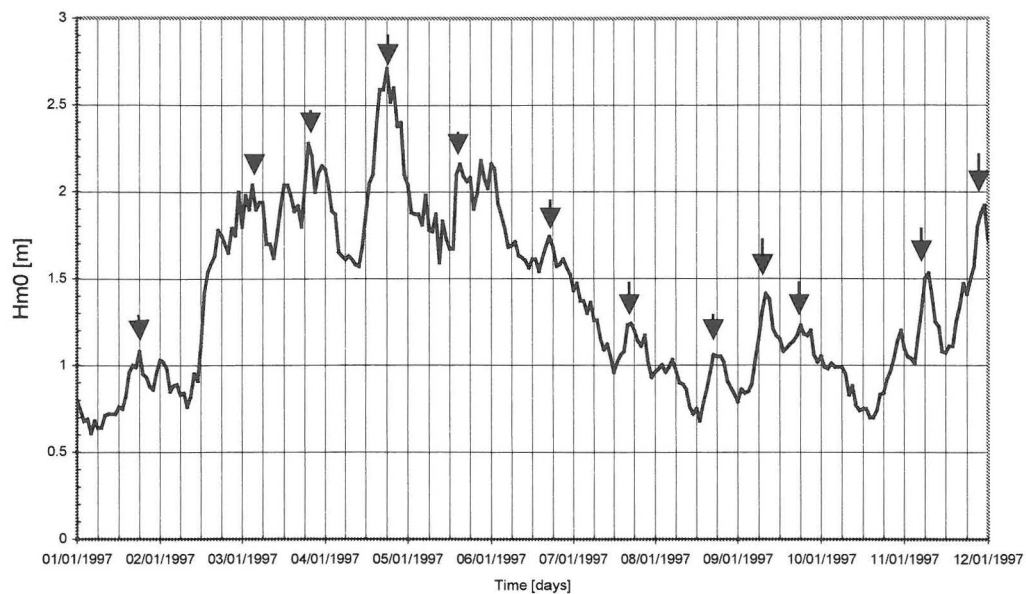


Figure 4.1 Example of wave records with selected waves for analysis

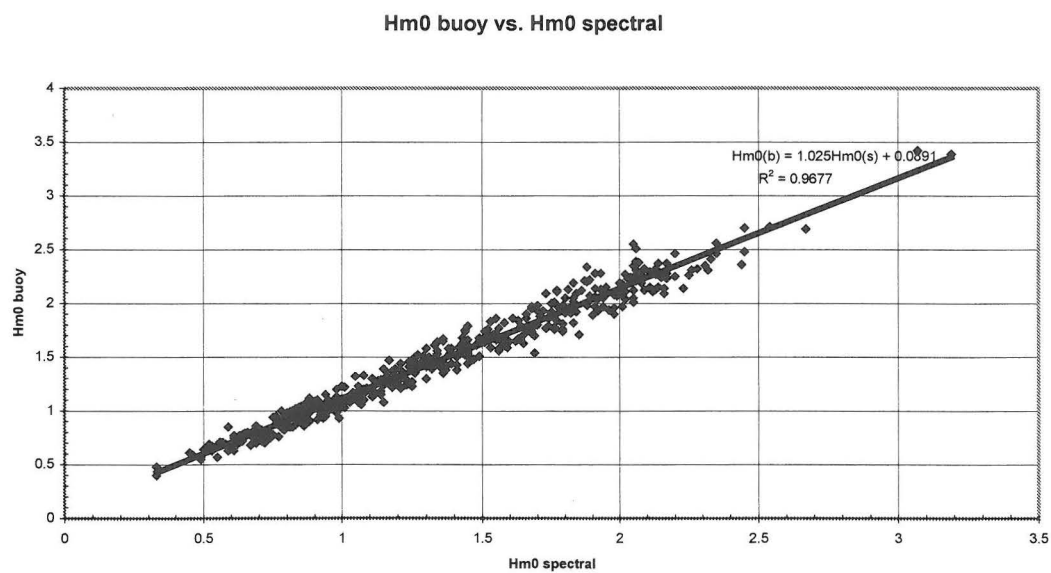


Figure 4.2 Significant wave heights H_{m0} ; relation between buoy record and spectral analysis

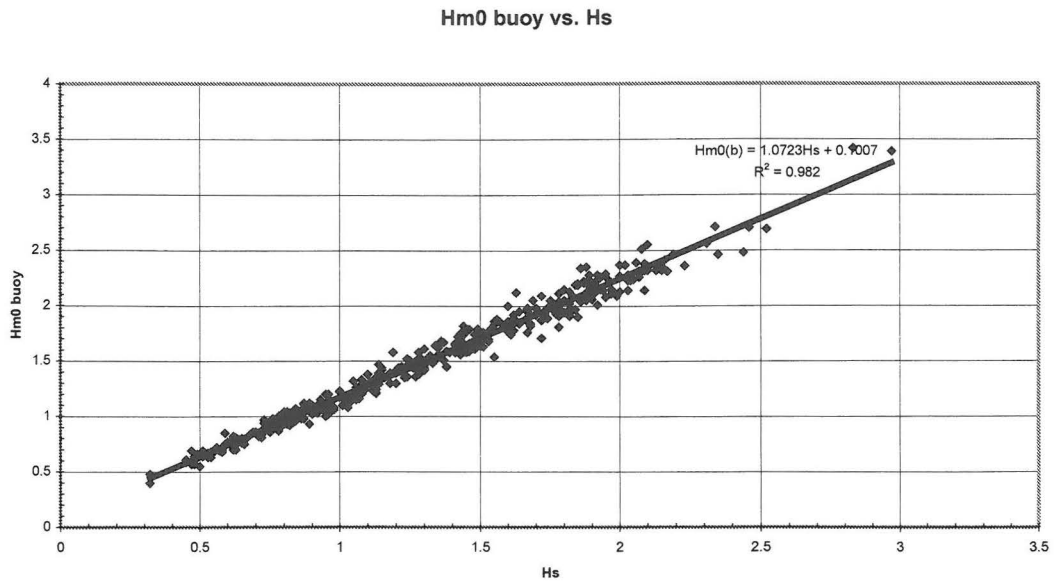


Figure 4.3 Significant wave heights H_{m0} from buoy record vs significant H_s from spectral analysis

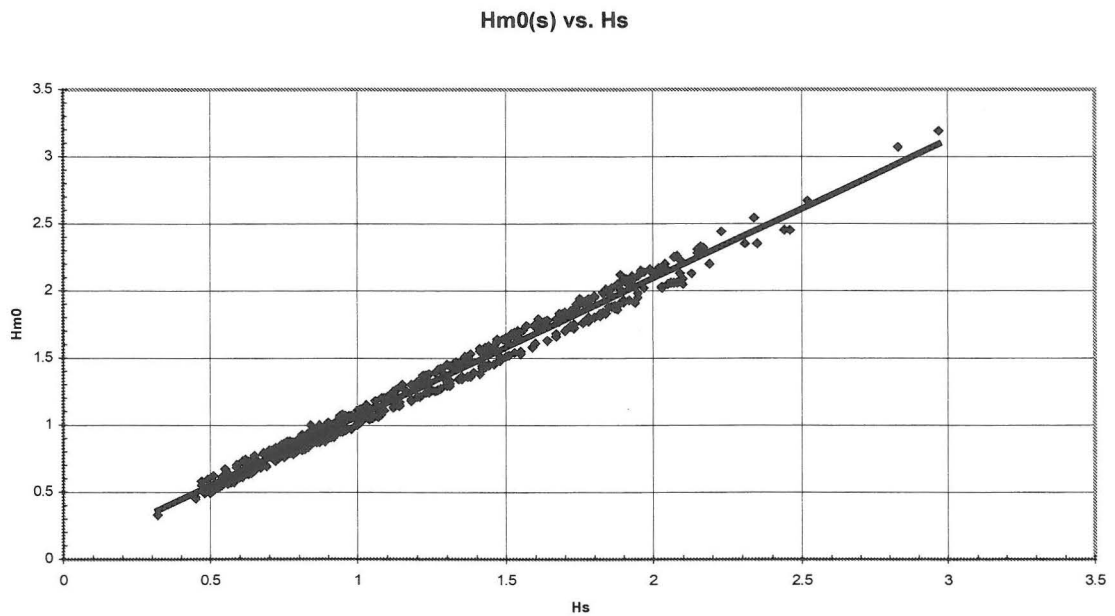


Figure 4.4. Significant wave heights H_{m0} from spectral analysis vs. significant H_s from spectral analysis

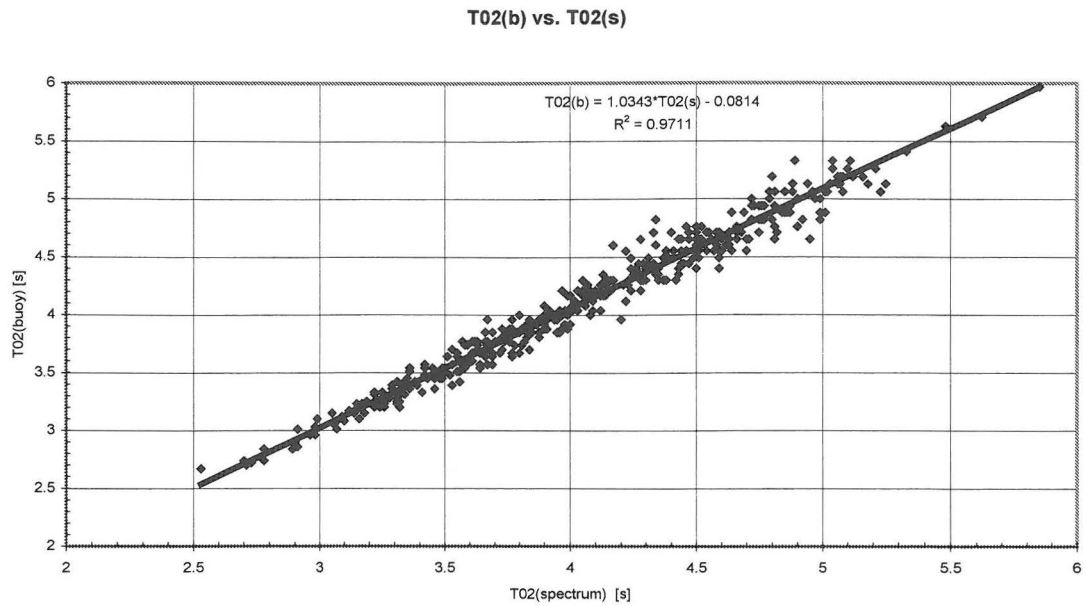


Figure 4.5. Average period T_{02} from buoy record vs. average period T_{02} from spectral analysis

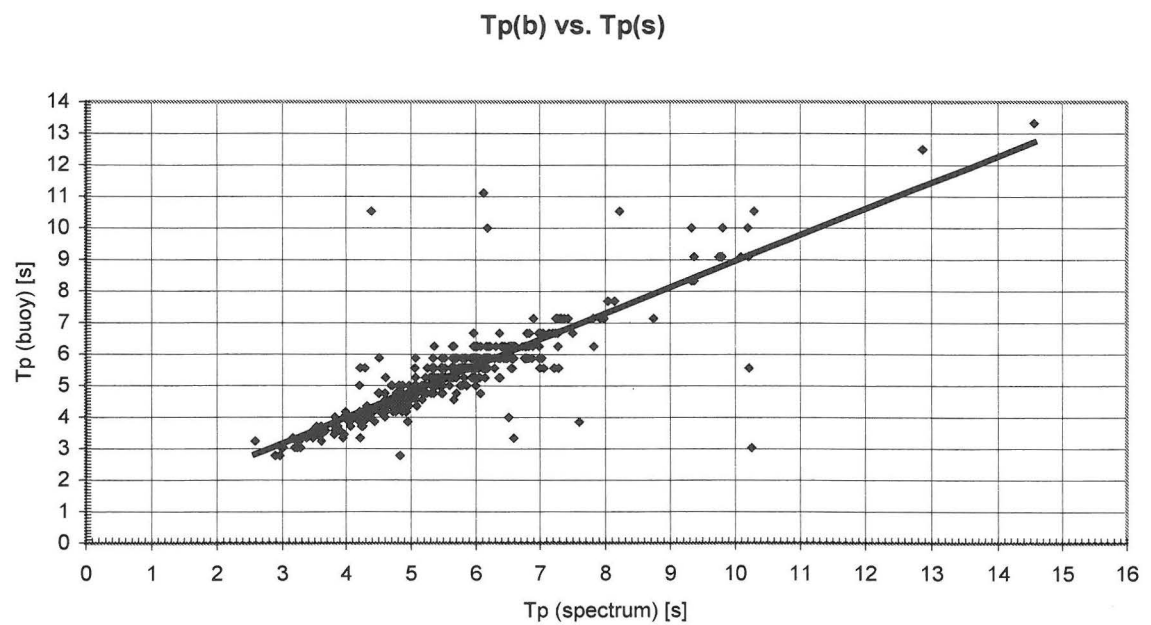


Figure 4.6. Peak periods from buoy record vs. peak period from spectral analysis

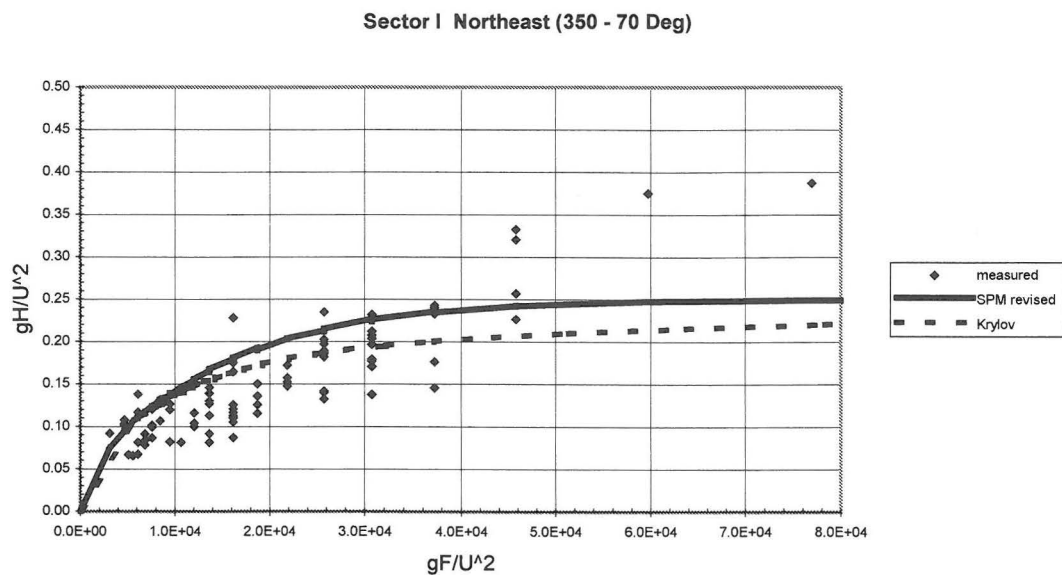


Figure 5.1. Wave – fetch relation recorded and predicted by empirical models for sector I

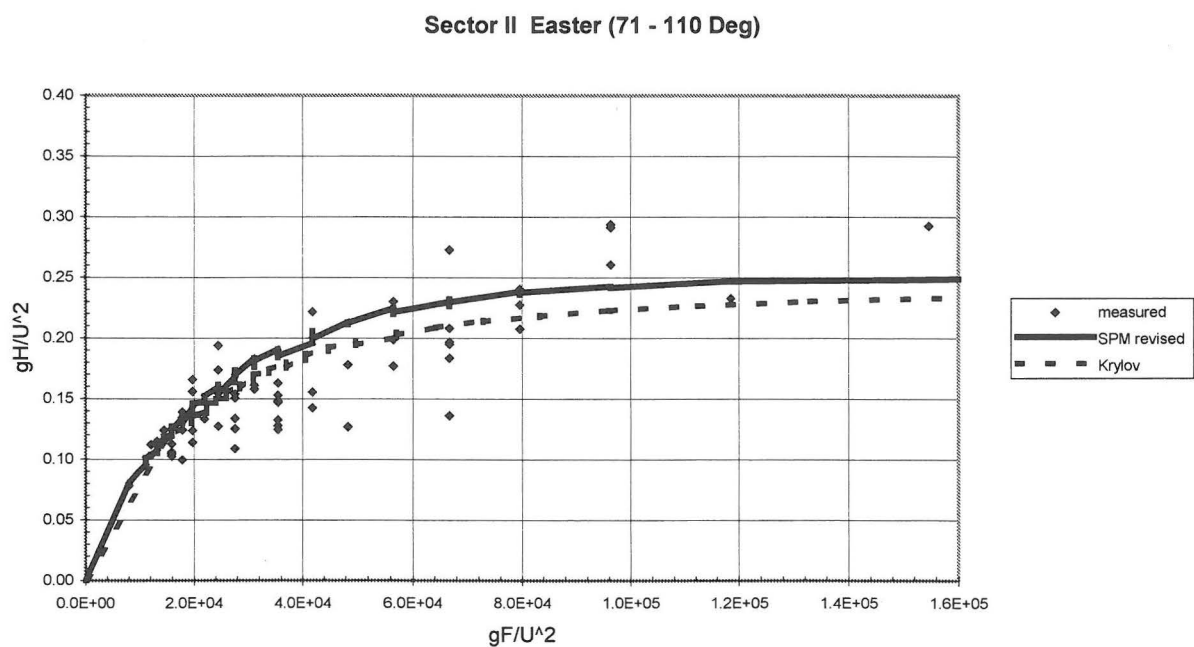


Figure 5.2 Wave – fetch relation recorded and predicted by empirical model for sector II

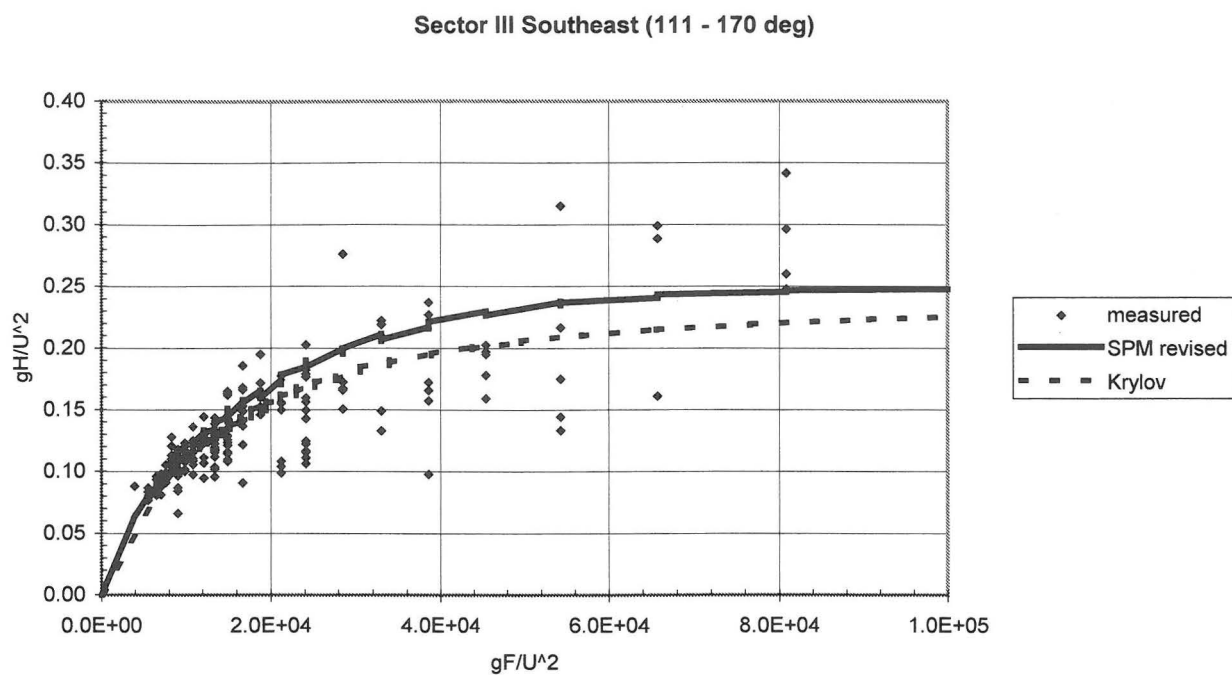


Figure 5.3 Wave – fetch relation recorded and predicted by empirical methods for sector III (SE)

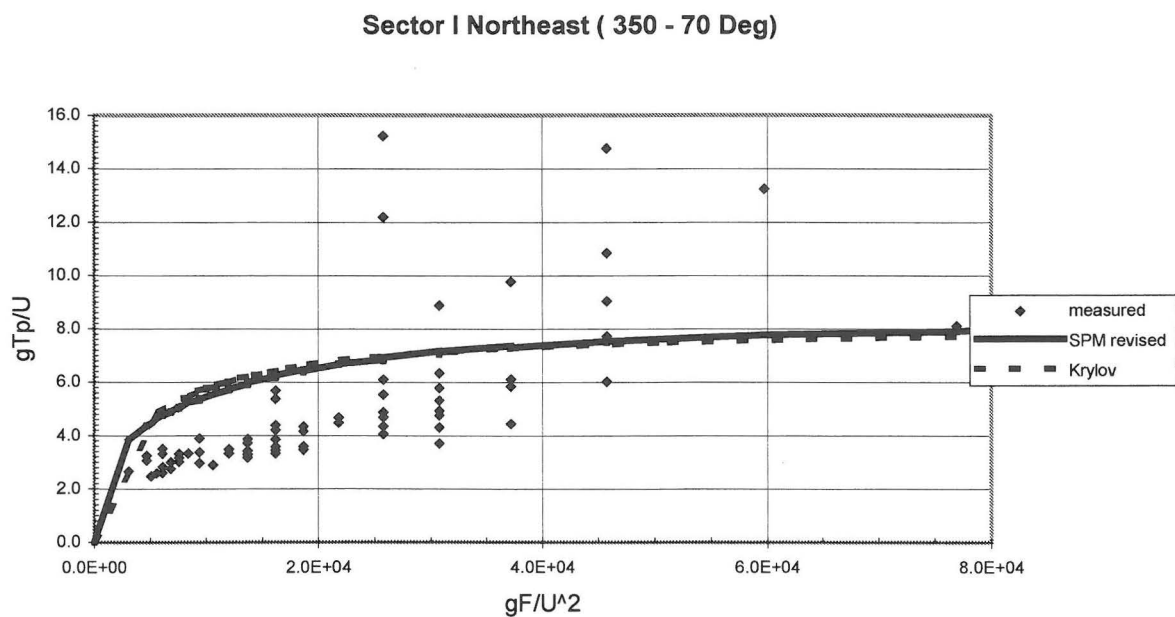


Figure 5.4 Wave period – fetch relation recorded and predicted by empirical methods for sector I (NE)

Sector II East (71 - 110 Deg)

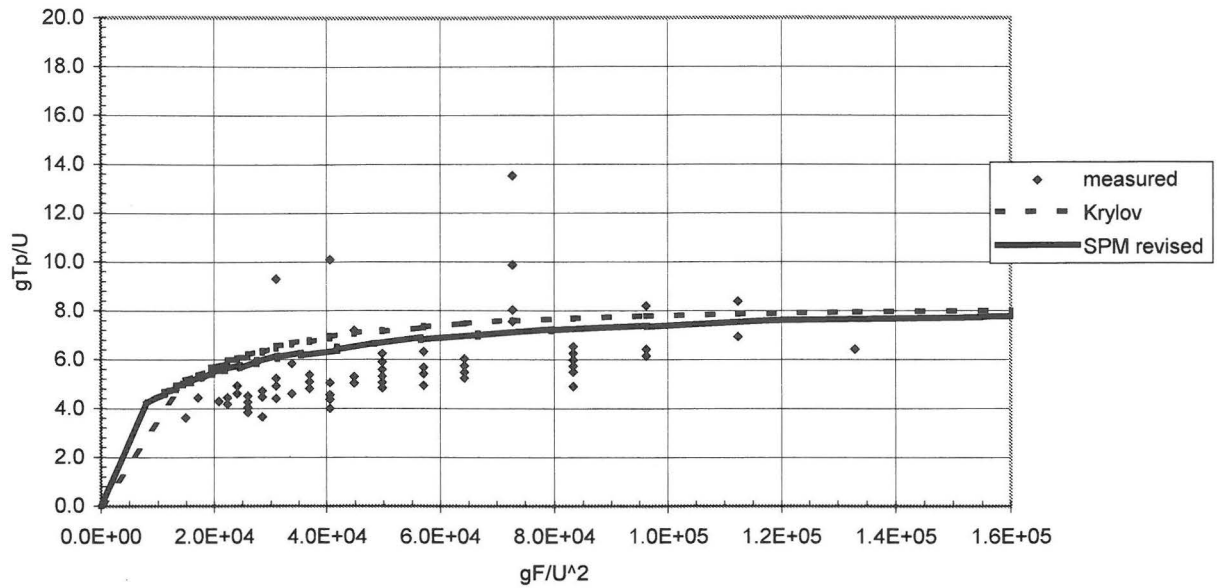


Figure 5.5 Wave period – fetch relation recorded and predicted by empirical methods for sector II (E)

Sector III Southeast (111 - 170 deg)

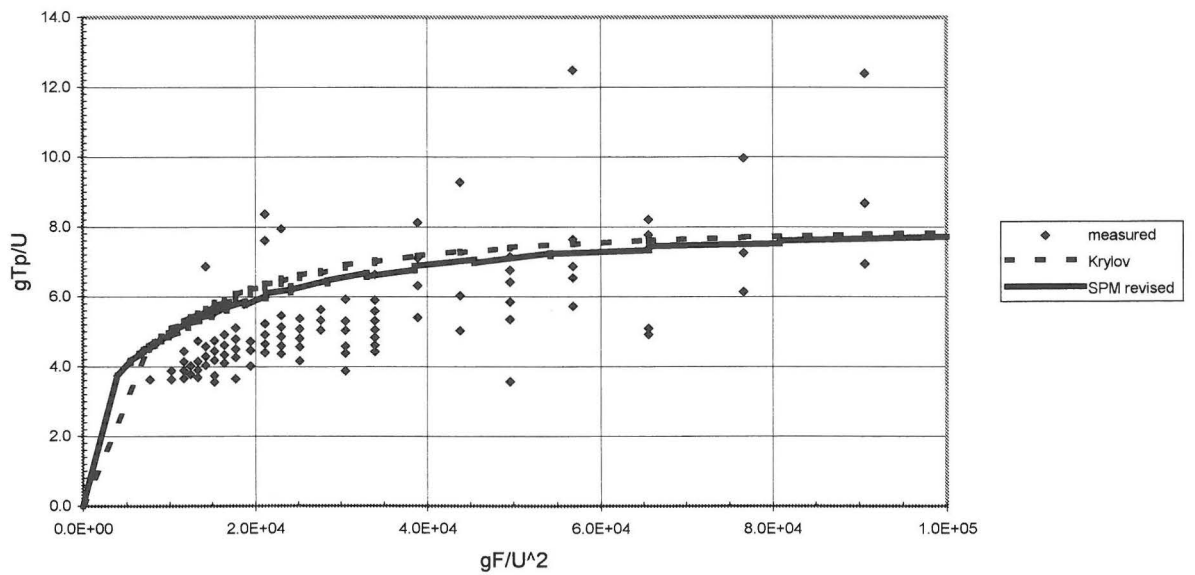


Figure 5.6 Wave period – fetch relation recorded and predicted by empirical methods for sector III (SE)

Accuracy of wave heights, H_{m0} , prediction

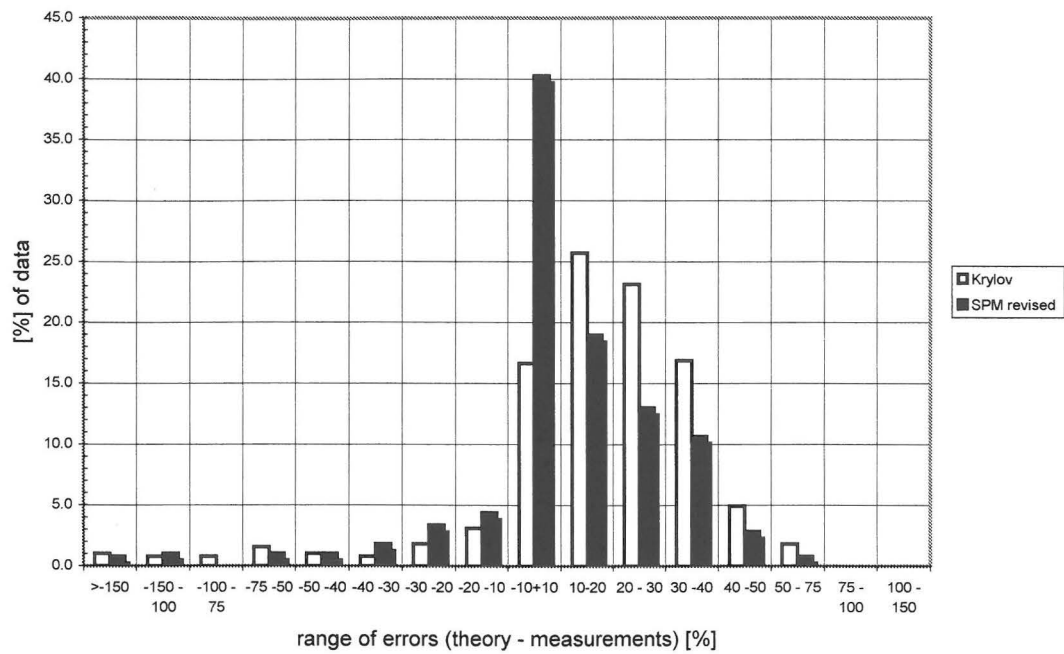


Figure 5.7 Discrepancy between recorded and empirically calculated significant wave height H_{m0}

Accuracy of wave period T_p prediction

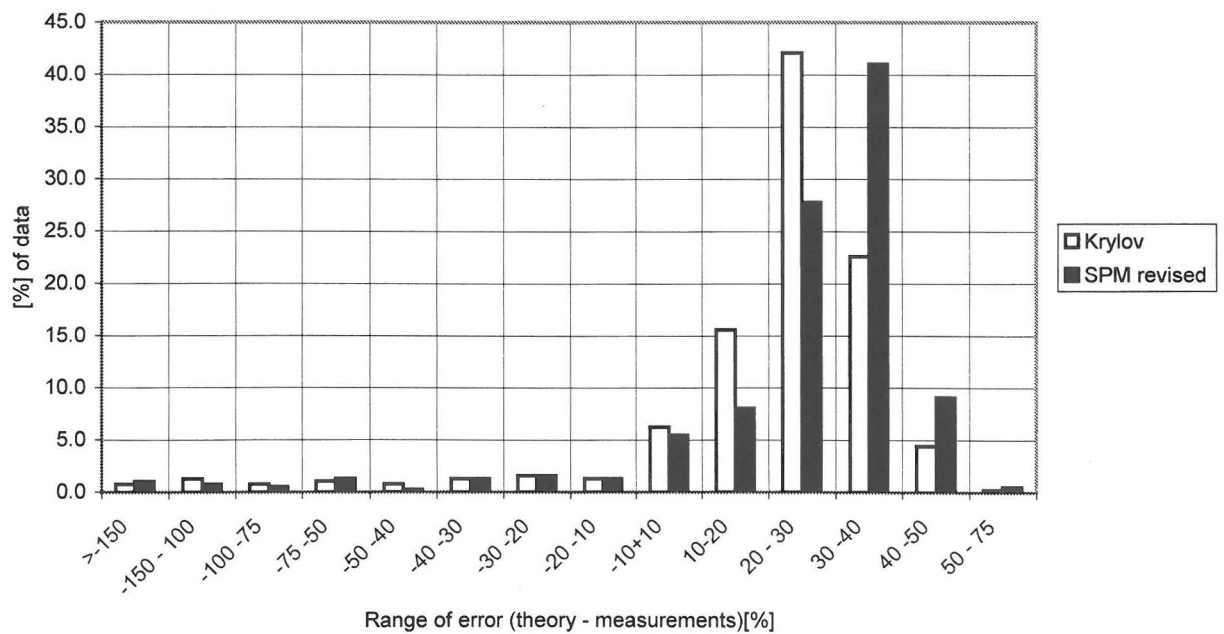


Figure 5.8 Discrepancy between recorded and empirically calculated wave periods T_p

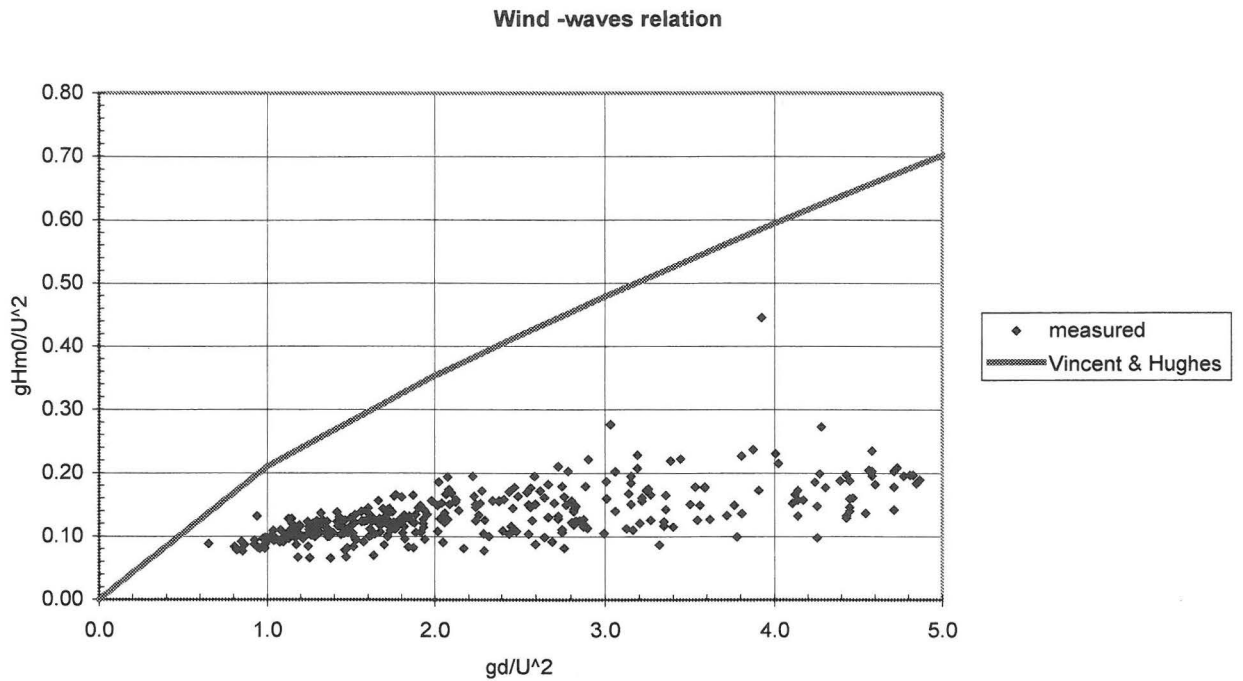


Figure 5.9. Wind –wave relation recorded and compared with the Vincent & Hughes formula

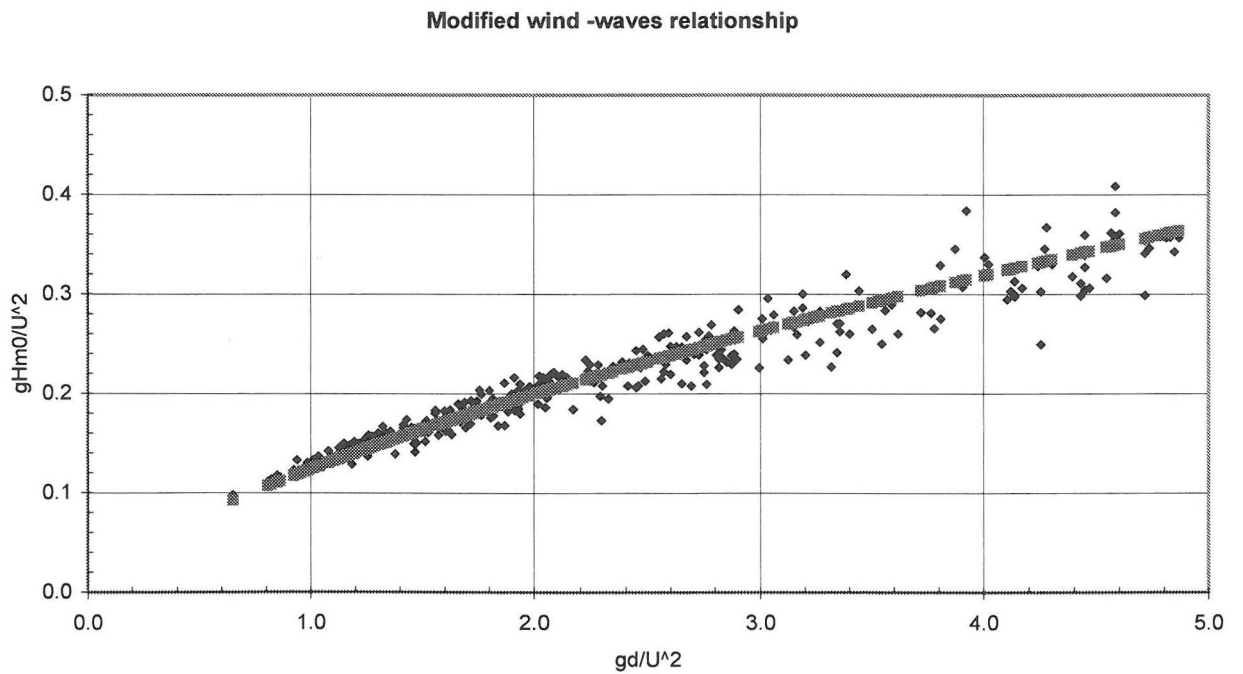


Figure 5.10 Modified wind wave relation (Eq. 5.11) compared with recorded data

Observed mean wave period T02

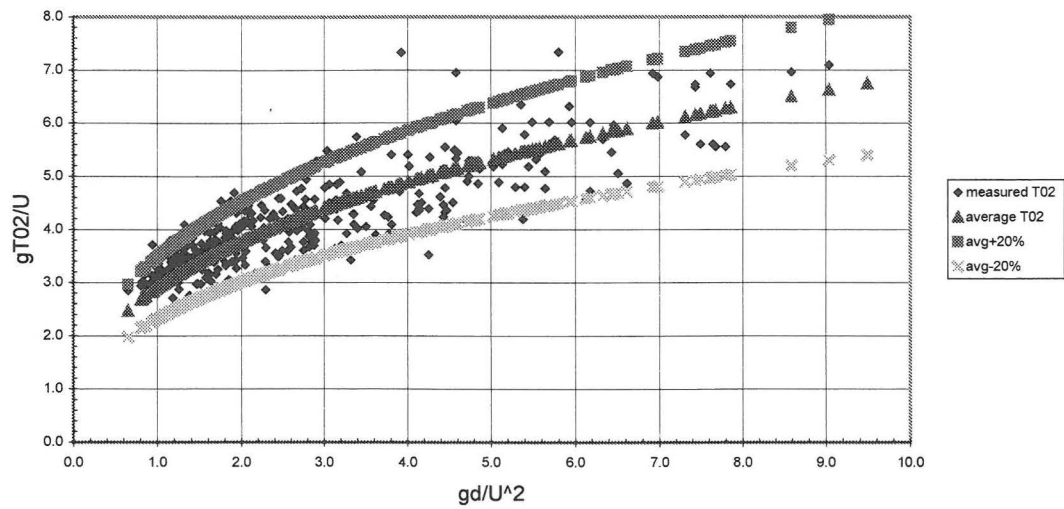


Figure 5.11 Recorded relation for mean wave period T_{02}

Prediction of significant wave heights

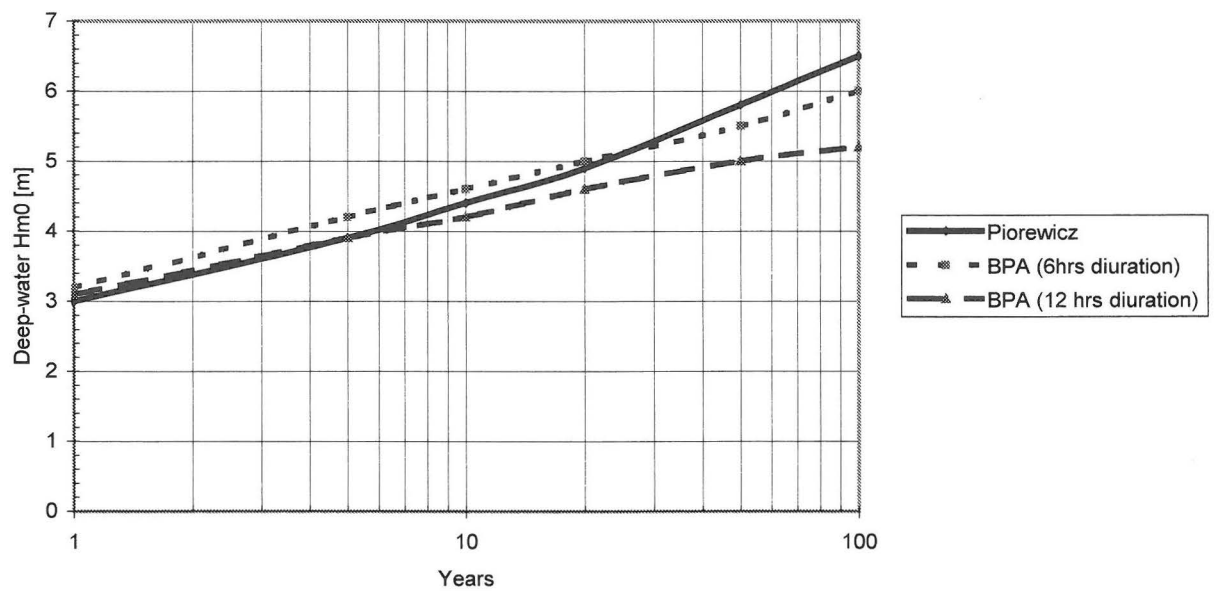


Figure 6.1 Significant wave heights prediction by Eq(5-20) compared with analysis of BPA(1979)

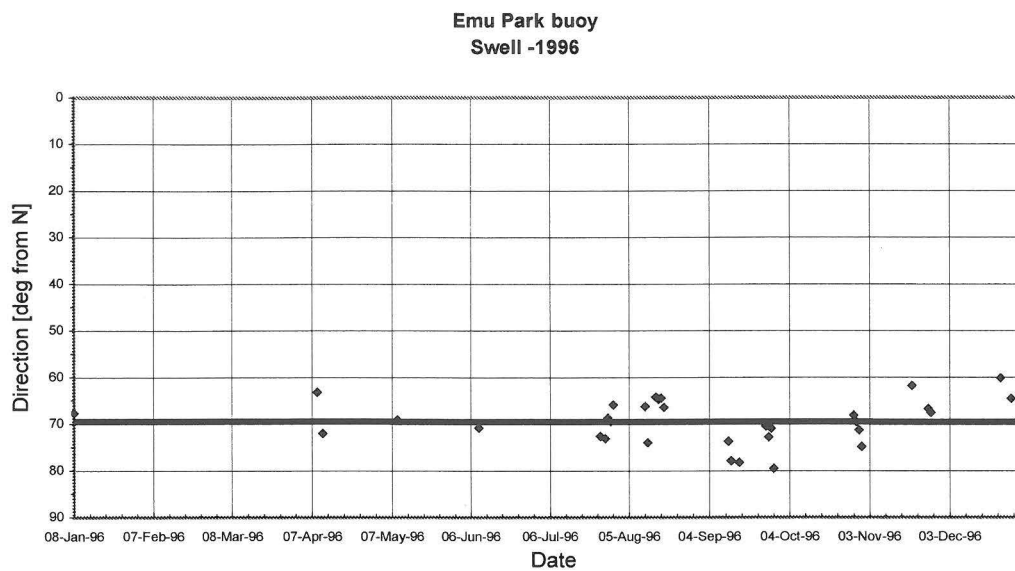


Figure 7.1 Average swell wave direction observed in 1996 year

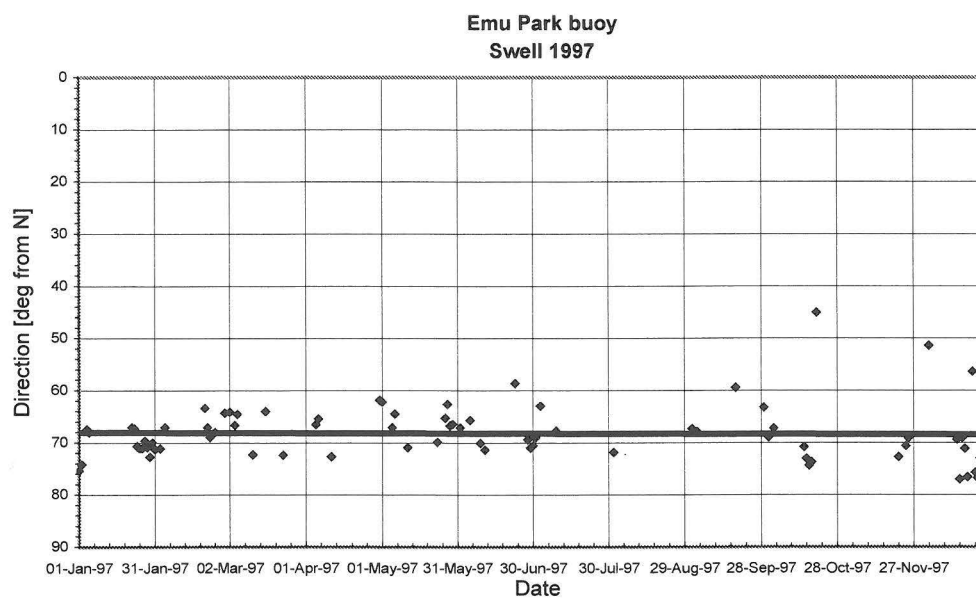


Figure 7.2 Average swell wave direction observed in 1997 year

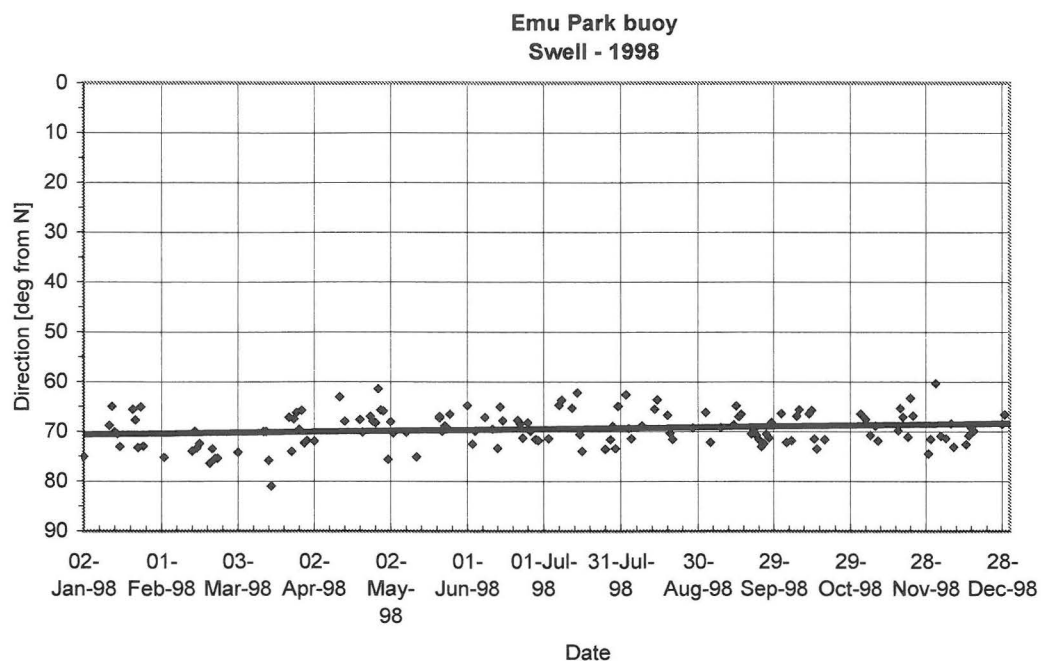


Figure 7.3 Average swell wave direction observed in 1998 year

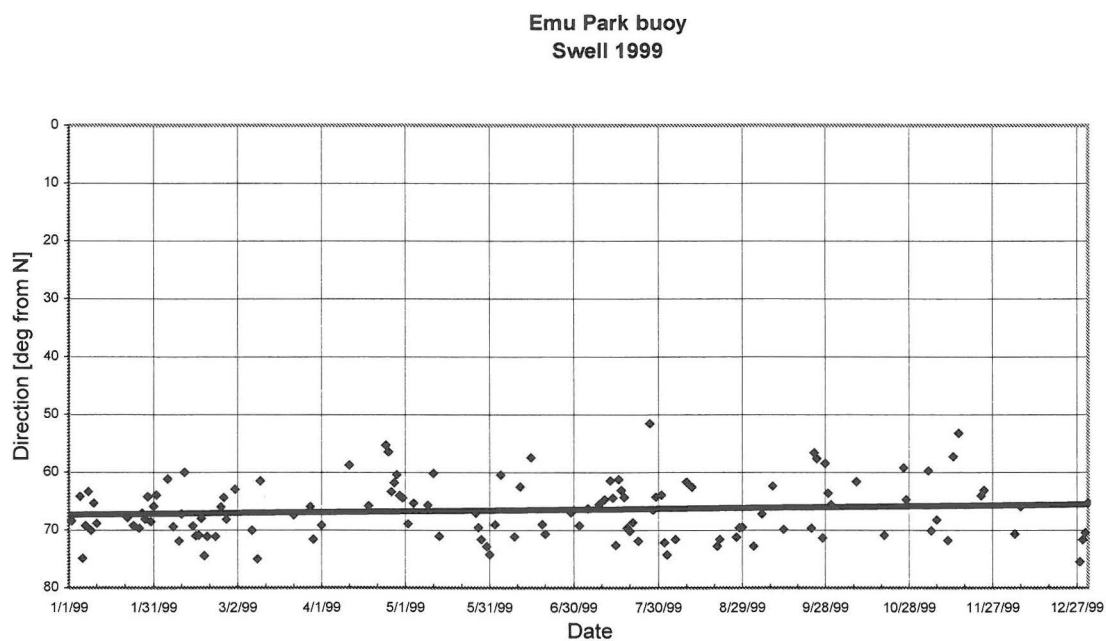


Figure 7.4 Average swell wave direction observed in 1999 year

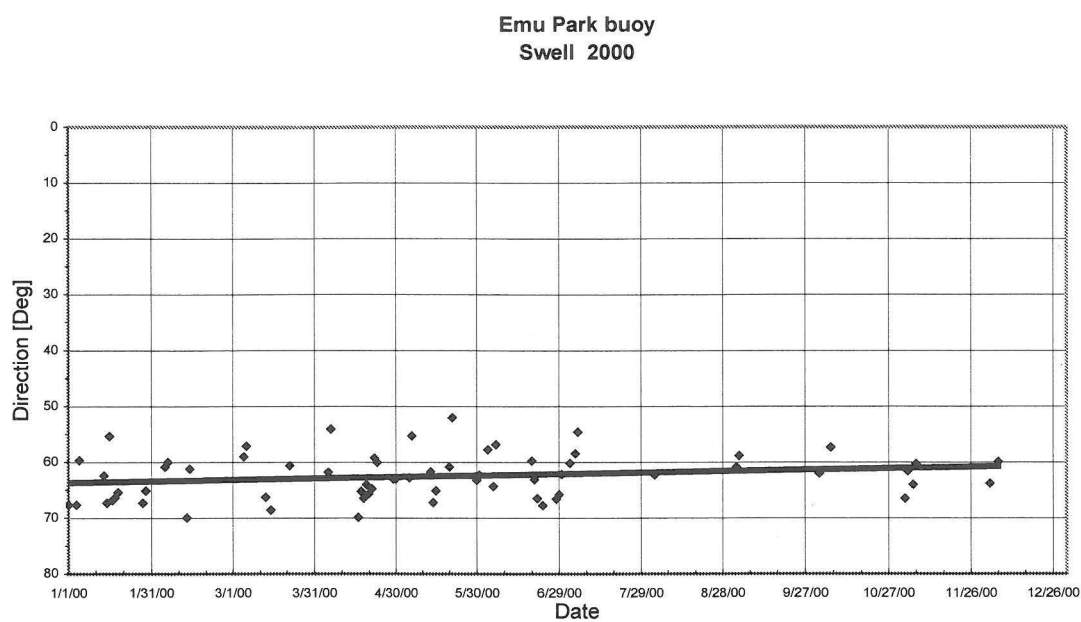


Figure 7.5 Average swell wave direction observed in 2000 year

APPENDIX

Table A-1. List of used Emu Park Datawell wave records, FFT wave data, and Rundle Is. wind data selected for analysis

Table A-2. List of swell waves averaged for recorded days used in swell direction analysis for the period 1996 - 2000

Table - List of Wave parameters in *Datawell record and FFT spectral analysis*

Wave Parameter	Description
Dd/mm/yyyy	Day of start of record/ Month of start of record/ Year of start of record
Hr: mn	Hour of start of record (Australian Eastern Standard Time (0 to 24)) ; Minutes of start of record
Hm0	Significant wave height from buoy analysis on heave data
T02	Average period from buoy analysis on heave data
Tp	Period at the peak spectral energy from buoy analysis on heave data
Hs	Significant wave height defined as average of highest 1/3 of zero up-crossing wave heights
Ths	The average period of the highest 1/3 of zero up-crossing wave heights
Hrms	Root mean square wave height from the time domain
Hmax	The maximum zero up-crossing wave height in a record
Tc	The crest period
Tz	The zero crossing period from the time domain
H10	Average of the highest 10% of all waves in a record
TH10	The period of the H10 waves
Thmax	Period of maximum height, zero up-crossing
Tzmax	The maximum zero crossing in a record
Hm0	Estimate of the significant wave height from frequency domain $4\sqrt{m_0}$
T02	Average period from spectral moments 0 and 2, defined by $\sqrt{m_0 / m_2}$
Tp	Period at the peak spectral energy

* **Note: All wave height parameters are expressed in metres, and all period parameters are in seconds.**

Table A-1. List of used Emu Park Datowell wave records, FFT wave data, and Rundle Is. wind data selected for analysis

Date	Datowell record				FFT Spectral analysis													Rundle Is.: wind data						Tide	Depth	
	Hmo	T02	Tpeak	Dir	Hs	Ths	Hrms	Hmax	Tc	Tz	H10	Th10	Thmax	Tzmax	Hm0	T02	Tp	mth	day	hr	km/h	dir	m/s			m
27/07/1996 15:00	2.69	5.71	7.69	63.93	2.52	7.11	1.77	4.32	4.45	5.72	3.22	7.32	7.09	10.19	2.67	5.62	8.14	1996	7	27	15	27.7	90	14.9	1.7	23.7
03/08/1996 15:00	0.82	3.25	4.00	350.56	0.71	3.90	0.50	1.17	3.09	3.45	0.89	3.79	3.72	5.78	0.79	3.26	4.14	1996	8	3	15	24.1	340	6.7	2.2	24.2
11/08/1996 15:00	1.52	4.17	5.56	98.16	1.31	5.10	0.94	1.92	3.56	4.30	1.59	5.16	5.18	8.08	1.44	4.07	5.35	1996	8	11	15	33.5	110	9.3	1.2	23.2
19/08/1996 15:00	1.08	3.33	4.17	206.3	0.93	3.82	0.66	1.67	3.11	3.51	1.18	3.76	3.86	6.06	1.03	3.31	3.99	1996	8	19	15	35.3	200	9.8	2.2	24.2
25/08/1996 15:00	1.13	3.54	4.55	116.04	0.97	4.39	0.69	1.92	3.10	3.75	1.22	4.48	5.03	6.87	1.07	3.50	4.99	1996	8	25	15	37.1	110	10.3	2.8	24.8
26/08/1996 00:00	1.15	4.26	5.26	93.43	1.06	5.03	0.74	1.69	3.68	4.37	1.30	5.10	5.39	7.73	1.14	4.21	5.61	1996	8	26	0	22.3	100	6.2	1.2	23.2
30/08/1996 15:00	0.76	2.84	3.33	3.12	0.65	3.47	0.48	1.42	2.68	3.07	0.84	3.37	4.00	6.83	0.77	2.89	3.16	1996	8	30	15	35.3	300	9.8	0.5	22.5
12/09/1996 15:00	1.21	3.70	4.76	348.06	1.13	4.42	0.80	1.78	3.36	3.94	1.41	4.47	4.30	6.61	1.21	3.67	4.79	1996	9	12	15	44.3	340	12.3	0.6	22.6
07/12/1996 06:00	0.91	3.54	4.17	76.33	0.79	4.41	0.57	1.37	3.17	3.74	0.99	4.51	4.70	7.00	0.88	3.49	4.21	1996	12	7	6	29.5	120	8.2	3.5	25.5
15/12/1996 09:00	1.58	4.17	5.26	89.34	1.45	5.29	1.01	2.40	3.44	4.35	1.84	5.37	5.37	8.03	1.56	4.12	5.66	1996	12	15	9	37.1	130	10.3	2.3	24.3
21/12/1996 18:00	2.31	4.82	6.25	103.33	2.17	5.95	1.54	4.38	4.01	5.10	2.78	6.32	5.95	8.37	2.32	4.80	6.60	1996	12	21	18	61.2	80	17.0	3.0	25.0
24/12/1996 21:00	1.98	4.65	5.56	83.24	1.74	5.80	1.23	2.62	3.78	4.82	2.18	5.91	5.53	9.16	1.88	4.60	5.62	1996	12	24	21	46.4	10	12.9	3.4	25.4
27/12/1996 21:00	2.14	4.88	6.25	95.95	2.03	6.08	1.45	4.22	4.11	5.15	2.56	5.92	6.02	8.81	2.16	4.84	6.00	1996	12	27	21	51.8	30	14.4	2.8	24.8
01/01/1997 18:00	1.08	4.00	4.76	98.59	0.91	4.82	0.65	1.83	3.46	4.29	1.10	4.78	5.31	10.96	1.00	3.94	5.19	1997	1	1	18	25.9	110	7.2	2.1	24.1
03/01/1997 19:00	2.28	5.06	5.88	101.29	2.03	6.19	1.45	3.59	4.09	5.26	2.45	6.37	5.99	9.14	2.17	5.01	6.77	1997	1	3	18	51.8	20	14.4	2.2	24.2
04/01/1997 18:00	2.71	5.41	6.25	101.45	2.34	6.62	1.64	4.33	4.09	5.34	2.92	6.92	6.78	9.95	2.54	5.33	7.82	1997	1	4	18	61.2	30	17.0	3.0	25.0
05/01/1997 21:00	2.18	5.13	5.88	96.47	1.89	6.46	1.37	3.25	4.07	5.62	2.34	6.21	6.59	10.83	2.01	5.07	6.58	1997	1	5	21	51.8	40	14.4	2.1	24.1
06/01/1997 17:00	1.74	4.49	9.09	76.56	1.53	6.17	1.08	2.62	3.45	4.76	1.95	6.25	5.86	11.11	1.68	4.49	10.09	1997	1	6	21	42.5	130	11.8	2.0	24.0
07/01/1997 17:00	1.24	5.06	10.00	71.54	1.12	8.16	0.77	1.89	3.21	5.56	1.43	8.52	10.09	12.28	1.23	5.02	9.81	1997	1	7	18	25.9	40	7.2	2.2	24.2
08/01/1997 17:00	1.06	3.88	9.09	69.29	0.94	6.37	0.66	1.39	3.09	4.39	1.14	7.00	7.44	10.46	1.07	3.99	9.78	1997	1	8	18	20.5	360	5.7	2.6	24.6
09/01/1997 08:00	1.41	3.96	5.00	104.42	1.22	5.12	0.87	2.07	3.31	4.18	1.55	5.22	5.89	10.27	1.37	3.94	4.97	1997	1	9	9	33.5	120	9.3	4.6	26.6
09/01/1997 21:00	1.20	4.17	10.53	63.4	0.95	5.31	0.68	1.72	3.37	4.21	1.19	5.71	7.02	11.41	1.08	3.99	4.39	1997	1	9	21	27.7	80	7.7	3.8	25.8
11/01/1997 07:00	1.53	4.17	5.26	105.94	1.32	5.24	0.93	2.81	3.42	4.34	1.73	5.30	5.99	8.86	1.45	4.12	5.64	1997	1	11	6	35.3	120	9.8	1.0	23.0
11/01/1997 23:00	1.92	4.49	5.56	100.53	1.62	5.47	1.15	3.08	3.83	4.64	2.04	5.54	5.28	8.86	1.75	4.41	5.83	1997	1	12	0	44.3	120	12.3	3.5	25.5
12/01/1997 22:00	2.19	4.71	5.88	94.19	1.91	5.69	1.37	4.06	3.83	4.81	2.44	5.74	5.93	7.95	2.08	4.59	6.36	1997	1	12	21	50	110	13.9	2.6	24.6
14/01/1997 00:00	2.35	4.88	6.25	103.78	2.15	6.07	1.54	3.17	4.08	5.07	2.61	6.13	6.34	8.37	2.31	4.87	6.19	1997	1	14	0	53.6	110	14.9	3.3	25.3
14/01/1997 22:00	2.07	4.65	5.56	93.02	1.83	5.81	1.30	3.74	3.80	4.89	2.34	5.86	5.18	8.80	1.99	4.63	5.68	1997	1	14	21	44.3	100	12.3	1.5	23.5
15/01/1997 20:00	1.68	4.71	5.56	80.03	1.36	5.43	0.98	2.46	3.59	4.55	1.69	5.55	5.06	10.62	1.51	4.33	5.64	1997	1	15	21	38.9	110	10.8	1.1	23.1
18/01/1997 04:00	1.38	3.88	5.26	77.99	1.28	5.02	0.91	3.16	3.30	4.15	1.70	5.11	5.21	7.46	1.41	3.97	5.31	1997	1	18	3	40.7	110	11.3	2.6	24.6
19/01/1997 01:00	1.84	4.71	5.56	91.17	1.68	5.67	1.18	2.91	3.74	4.80	2.15	5.81	5.72	8.51	1.77	4.55	5.65	1997	1	19	0	42.5	120	11.8	1.1	23.1
19/01/1997 17:00	2.35	4.94	5.88	101.66	1.88	5.95	1.33	3.73	3.76	4.95	2.50	6.04	5.01	8.65	2.05	4.72	6.76	1997	1	19	15	55.4	120	15.4	2.0	24.0
21/01/1997 17:00	2.23	4.94	5.56	90.37	2.04	6.18	1.46	3.20	3.95	5.28	2.63	6.14	6.52	10.37	2.17	4.87	7.00	1997	1	21	18	44.3	120	12.3	2.7	24.7
22/01/1997 20:00	1.48	4.44	5.00	87.56	1.33	5.51	0.94	2.31	3.55	4.53	1.73	5.60	7.10	10.23	1.47	4.33	4.87	1997	1	22	21	35.3	110	9.8	3.5	25.5
24/01/1997 20:00	1.10	3.67	4.55	105.54	0.94	4.94	0.67	2.04	3.22	4.00	1.18	5.23	4.28	9.19	1.06	3.77	5.07	1997	1	24	21	33.5	90	9.3	3.0	25.0
26/01/1997 05:00	1.17	3.96	4.55	95.59	1.01	5.24	0.71	1.84	3.36	4.18	1.25	5.12	5.34	9.96	1.12	3.94	4.82	1997	1	26	6	22.3	160	6.2	1.2	23.2
26/01/1997 23:00	1.10	3.85	4.35	97.32	0.90	4.52	0.64	1.57	3.14	3.84	1.16	4.68	5.37	8.98	1.02	3.66	4.50	1997	1	27	0	25.9	100	7.2	3.0	25.0
31/01/1997 20:00	1.07	4.40	12.50	75.81	0.84	6.45	0.61	1.50	3.24	4.72	1.08	7.53	6.11	13.32	1.00	4.33	12.87	1997	1	31	18	25.9	60	7.2	2.2	24.2
03/02/1997 18:00	1.95	4.60	5.88	101.52	1.64	5.66	1.17	3.03	3.81	4.82	2.04	5.74	5.88	10.71	1.78	4.50	6.01	1997	2	3	18	50	110	13.9	3.3	25.3
04/02/1997 13:00	1.51	4.44	5.56	100.11	1.34	5.33	0.95	2.14	3.73	4.55	1.61	5.47	4.79	8.96	1.45	4.27	6.01	1997	2	4	12	38.9	110	10.8	1.0	23.0
05/02/1997 23:00	1.52	4.55	5.26	90	1.29	5.42	0.92	2.45	3.90	4.79	1.72	5.37	5.92	8.08	1.38	4.59	5.40									

16/02/1997 23:00	0.77	3.67	4.00	54.05		0.65	4.46	0.47	1.24	3.19	3.89	0.83	4.43	4.89	8.59	0.72	3.64	3.82		1997	2	16	21	25.9	110	7.2		1.5	23.5
19/02/1997 03:00	2.04	4.65	5.56	104.34		1.86	5.87	1.33	3.18	3.79	4.91	2.30	6.02	6.09	9.93	2.02	4.63	5.81		1997	2	19	3	51.8	110	14.4		1.9	23.9
19/02/1997 21:00	2.26	5.13	6.25	103.53		2.07	6.37	1.50	3.34	4.31	5.34	2.66	6.53	6.09	10.16	2.25	5.03	6.99		1997	2	19	21	61.2	120	17.0		3.2	25.2
20/02/1997 19:00	2.36	5.13	11.11	68.88		2.23	6.76	1.59	4.00	3.95	5.44	2.90	6.92	6.67	12.21	2.44	5.18	6.12		1997	2	20	21	42.5	100	11.8		3.1	25.1
24/02/1997 20:00	0.87	3.23	4.35	44.46		0.72	4.08	0.52	1.30	3.02	3.44	0.89	4.24	3.45	6.94	0.83	3.23	4.71		1997	2	24	21	29.5	100	8.2		2.8	24.8
28/02/1997 12:00	1.24	3.74	5.00	107.62		1.09	4.52	0.77	1.85	3.18	3.85	1.38	4.63	4.84	6.70	1.20	3.67	4.82		1997	2	28	12	40.7	110	11.3		3.3	25.3
09/03/1997 20:00	3.42	5.63	7.14	101.2		2.83	6.78	2.01	4.70	4.31	5.61	3.58	7.08	6.87	10.86	3.07	5.48	7.31		1997	3	9	18	70.2	120	19.5		3.3	25.3
19/03/1997 03:00	1.79	4.65	5.26	85.92		1.61	5.99	1.14	2.69	3.71	4.86	2.05	5.95	6.06	9.77	1.74	4.56	5.33		1997	3	19	3	33.5	140	9.3		2.6	24.6
23/03/1997 04:00	1.04	3.74	4.76	115.42		0.87	4.50	0.62	1.42	3.16	3.76	1.10	4.59	3.93	7.08	0.98	3.59	5.21		1997	3	23	3	25.9	90	7.2		1.4	23.4
26/03/1997 06:00	2.27	4.94	6.67	92.5		2.00	6.14	1.40	3.58	3.79	5.06	2.52	6.11	5.94	9.64	2.13	4.77	6.80		1997	3	26	6	48.2	90	13.4		1.7	23.7
29/03/1997 22:00	1.31	3.85	5.00	84.66		1.11	4.71	0.78	2.17	3.25	3.99	1.39	4.81	4.72	7.07	1.22	3.79	4.71		1997	3	29	21	33.5	80	9.3		3.0	25.0
05/04/1997 06:00	1.04	3.77	5.56	68.16		0.81	4.99	0.57	1.35	3.07	3.92	1.02	5.30	5.37	8.41	0.90	3.63	5.67		1997	4	5	6	25.9	120	7.2		3.5	25.5
09/04/1997 08:00	1.97	4.60	5.88	88.97		1.76	5.72	1.24	3.42	3.76	4.68	2.22	5.65	5.91	8.11	1.91	4.50	6.38		1997	4	9	6	44.3	120	12.3		2.9	24.9
11/04/1997 10:00	1.54	3.96	4.55	104.83		1.55	5.10	1.13	2.93	3.77	4.56	1.92	5.17	5.03	8.39	1.69	4.20	5.07		1997	4	11	9	44.3	90	12.3		2.8	24.8
13/04/1997 14:00	1.62	4.40	5.88	97.5		1.35	5.42	0.95	2.45	3.64	4.46	1.70	5.71	5.88	7.80	1.48	4.31	5.69		1997	4	13	12	42.5	100	11.8		2.9	24.9
14/04/1997 00:00	1.59	4.21	5.26	101.51		1.46	5.36	1.04	2.10	3.69	4.63	1.78	5.26	5.70	7.66	1.59	4.28	5.96		1997	4	14	0	42.5	110	11.8		3.0	25.0
16/04/1997 15:00	1.35	4.04	5.26	94.52		1.13	4.95	0.80	2.09	3.34	4.13	1.46	5.15	5.24	7.60	1.26	3.96	5.49		1997	4	16	12	37.1	110	10.3		2.3	24.3
22/04/1997 17:00	1.55	4.17	5.00	93.96		1.32	5.21	0.93	2.29	3.49	4.36	1.66	5.27	5.87	7.86	1.45	4.09	5.32		1997	4	22	18	35.3	90	9.8		1.7	23.7
23/04/1997 18:00	1.76	4.44	5.26	98.16		1.67	5.65	1.17	2.92	3.55	4.72	2.09	5.76	5.16	8.85	1.79	4.47	5.36		1997	4	23	18	42.5	100	11.8		2.5	24.5
26/04/1997 22:00	1.78	4.30	5.00	103.13		1.62	5.60	1.15	3.51	3.69	4.52	2.11	5.78	5.84	7.69	1.76	4.38	5.76		1997	4	26	21	46.4	100	12.9		3.6	25.6
28/04/1997 18:00	2.26	5.19	5.88	91.16		1.93	6.56	1.37	3.54	4.07	5.31	2.48	6.61	6.05	10.93	2.08	5.08	6.19		1997	4	28	15	50	90	13.9		1.5	23.5
30/04/1997 12:00	2.04	4.94	5.56	92.75		1.78	6.58	1.27	2.84	3.95	5.14	2.18	6.46	6.61	10.89	1.92	4.77	7.22		1997	4	30	9	42.5	120	11.8		2.0	24.0
01/05/1997 15:00	1.80	4.49	5.26	96.01		1.54	5.58	1.08	2.59	3.58	4.50	1.98	5.65	5.90	9.10	1.70	4.38	5.70		1997	5	1	15	46.4	100	12.9		3.1	25.1
02/05/1997 14:00	1.77	4.55	5.88	93.7		1.53	5.87	1.09	2.59	3.63	4.91	1.87	6.00	4.81	9.40	1.66	4.44	6.47		1997	5	2	15	46.4	100	12.9		2.7	24.7
03/05/1997 16:00	1.74	4.35	5.56	96.84		1.61	5.81	1.13	2.80	3.57	4.51	2.04	5.97	5.61	9.31	1.79	4.43	6.11		1997	5	3	15	46.4	100	12.9		2.4	24.4
04/05/1997 01:00	1.77	5.13	5.56	92.35		1.60	6.68	1.13	3.15	3.94	5.33	2.01	7.04	6.27	10.36	1.73	5.06	10.22		1997	5	4	0	38.9	120	10.8		0.8	22.8
05/05/1997 17:00	1.63	4.65	10.53	65.17		1.44	6.32	1.02	2.22	3.54	4.75	1.77	6.63	8.34	12.03	1.59	4.47	8.22		1997	5	5	18	37.1	90	10.3		2.3	24.3
15/05/1997 03:00	1.35	4.04	5.88	95.96		1.16	5.31	0.82	2.09	3.40	4.27	1.50	5.35	5.45	8.30	1.26	4.03	6.15		1997	5	15	3	31.3	60	8.7		3.1	25.1
16/05/1997 17:00	1.66	4.88	7.14	59.12		1.46	6.51	1.03	2.26	3.76	5.10	1.85	7.06	7.90	10.03	1.59	4.85	7.98		1997	5	16	15	35.3	220	9.8		3.0	25.0
22/05/1997 07:00	1.07	3.77	4.17	100.87		0.84	4.63	0.60	1.41	3.20	3.87	1.03	4.67	4.84	8.29	0.94	3.62	4.76		1997	5	22	6	25.9	130	7.2		2.9	24.9
23/05/1997 22:00	1.18	3.64	4.17	105.28		1.03	4.56	0.73	1.99	3.31	3.93	1.33	4.33	4.11	7.73	1.14	3.69	4.93		1997	5	23	21	42.5	110	11.8		4.2	26.2
25/05/1997 07:00	0.99	4.00	5.26	106.68		0.84	5.04	0.59	1.29	3.34	4.13	1.04	5.00	5.16	7.89	0.93	3.90	4.61		1997	5	25	9	24.1	150	6.7		1.5	23.5
11/06/1997 20:00	1.67	4.71	5.26	94.58		1.50	5.97	1.07	2.73	3.82	4.81	1.91	5.97	6.19	10.05	1.63	4.54	6.06		1997	6	11	21	42.5	140	11.8		1.8	23.8
20/06/1997 17:00	2.24	4.71	6.25	87.19		1.89	5.81	1.35	3.71	3.73	4.80	2.38	5.92	6.01	8.61	2.06	4.54	6.02		1997	6	20	18	57.2	130	15.9		1.8	23.8
21/06/1997 17:00	1.93	4.65	5.88	90.61		1.77	5.76	1.26	2.93	3.77	4.75	2.17	5.89	6.00	9.00	1.92	4.52	5.97		1997	6	21	15	50	130	13.9		1.0	23.0
26/06/1997 13:00	1.03	3.85	4.76	100.12		0.92	4.95	0.66	1.62	3.41	4.17	1.15	5.14	5.24	7.96	1.01	3.88	5.49		1997	6	26	12	25.9	140	7.2		3.2	25.2
01/09/1997 08:00	1.00	4.30	7.14	68.91		0.83	5.81	0.59	1.47	3.50	4.57	1.07	6.17	5.41	9.29	0.93	4.28	7.27		1997	9	1	9	18.4	60	5.1		3.3	25.3
02/09/1997 20:00	0.95	3.74	6.67	65.63		0.83	5.14	0.59	1.56	3.23	4.07	1.07	5.42	6.82	8.89	0.94	3.78	7.05		1997	9	2	21	22.3	350	6.2		3.3	25.3
05/09/1997 20:00	1.42	3.96	5.00	346.93		1.15	4.90	0.83	1.87	3.44	4.08	1.47	4.90	4.27	7.17	1.30	3.91	5.79		1997	9	5	21	35.3	320	9.8		2.2	24.2
08/09/1997 20:00	0.85	3.17	4.00	347.34		0.71	3.71	0.51	1.33	2.96	3.31	0.88	3.81	3.63	6.37	0.81	3.14	4.21		1997	9	8	21	25.9	320	7.2		1.6	23.6
12/09/1997 23:00	1.71	4.65	5.88	104.09		1.72	5.70	1.23	3.23	4.04	4.98	2.17	5.84	5.57	8.56	1.85	4.71	6.13		1997	9	12	21	50	130	13.9		1.1	23.1
21/09/1997 19:00	1.43	3.88	4.55	347.54		1.22	4.55	0.87	2.38	3.35	3.97	1.54	4.45	4.43	7.26	1.36	3.73	5.17		1997	9	21	18	38.9	350	10.8		1.0	23.0
24/09/1997 19:00	1.51	4.08	5.26	347.32		1.37	4.81	0.96	2.59	3.48	4.11	1.76	4.94	5.22	7.34	1.49	4.01	5.43		1997	9	24	18	38.9	350	10.8		2.7	24.7
26/09/1997 16:00	1.38	3.88	4.76	342.2		1.23	4.66	0.88	1.80	3.49	4.07	1.52	4.75	4.85	6.41	1.37	3.90	5.21		1997	9	26	15	46.4	350	12.9		3.0	25.0
29/09/1997 22:00	2.01	4.65	5.88	113.21		1.92	6.08	1.35	3.37	4.08	5.15	2.46	6.07	6.43	8.46	2.05	4.95	6.79		1997	9	29	21	50	120	13.9		3.0	25.0
01/10/1997 06:00	1.14	3.77	4.35	77.44		0.96	4.81	0.68	1.90	3.21	3.94	1.19	5.09	4.82	7.78	1.07	3.71	4.83		1997	10	1	6	22.3	80	6.2		2.2	24.2
04/10/1997 21:00	2.24	4.65	5.88	103.95		1.92	5.55	1.36	3.76	3.89	4.84	2.48	5.65	6.02	7.87	2.04	4.50	5.64		1997	10	4	21	51.8	120	14.4			

16/10/1997 18:00	0.86	3.10	3.45	4.3		0.75	3.64	0.53	1.45	2.86	3.31	0.93	3.81	3.72	7.48	0.86	3.16	3.55		1997	10	16	18	29.5	360	8.2		2.3	24.3	
17/10/1997 20:00	0.75	3.01	3.33	0.4		0.63	3.47	0.45	1.08	2.92	3.20	0.79	3.47	4.30	6.92	0.73	3.07	3.47		1997	10	17	21	25.9	330	7.2		2.9	24.9	
18/10/1997 21:00	0.92	3.36	4.17	336.01		0.82	3.99	0.58	1.46	3.05	3.44	1.05	3.98	3.93	6.80	0.91	3.36	4.39		1997	10	18	21	27.7	340	7.7		2.8	24.8	
27/10/1997 17:00	1.30	3.85	4.76	88.57		1.18	5.18	0.84	2.75	3.23	4.15	1.50	5.24	4.76	8.52	1.30	3.85	4.87		1997	10	27	18	33.5	100	9.3		3.0	25.0	
07/11/1997 04:00	1.08	3.64	4.55	109.03		0.95	4.42	0.68	1.72	3.30	3.83	1.21	4.55	4.20	7.48	1.06	3.66	4.94		1997	11	7	3	38.9	140	10.8		2.4	24.4	
10/11/1997 02:00	1.35	3.85	4.76	91.37		1.23	4.87	0.87	1.96	3.36	4.00	1.50	4.86	4.75	7.03	1.36	3.83	4.96		1997	11	10	3	33.5	100	9.3		1.9	23.9	
12/11/1997 21:00	1.04	3.64	4.17	1.96		0.80	4.45	0.58	1.47	3.22	3.82	0.99	4.53	4.60	6.93	0.90	3.55	4.61		1997	11	12	21	27.7	340	7.7		3.0	25.0	
14/11/1997 21:00	1.27	3.77	4.35	3.6		1.12	4.50	0.81	1.75	3.57	4.04	1.38	4.45	4.04	7.03	1.25	3.82	4.82		1997	11	14	21	31.3	360	8.7		3.9	25.9	
16/11/1997 17:00	1.29	3.54	4.17	0.27		1.08	4.03	0.77	1.95	3.20	3.62	1.37	4.07	4.38	6.53	1.20	3.42	4.38		1997	11	16	18	33.5	360	9.3		0.7	22.7	
17/11/1997 20:00	1.14	3.48	4.17	343.41		0.96	4.11	0.68	1.60	3.15	3.68	1.20	4.06	4.20	6.81	1.05	3.46	4.52		1997	11	17	21	35.3	340	9.8		2.1	24.1	
18/11/1997 21:00	1.03	3.36	4.00	0.93		0.81	3.85	0.58	1.36	3.08	3.47	0.96	3.87	4.03	5.78	0.92	3.29	4.13		1997	11	18	21	29.5	350	8.2		2.0	24.0	
20/11/1997 05:00	1.96	4.55	6.25	110.09		1.83	5.86	1.30	3.23	3.99	4.93	2.26	5.76	5.77	8.86	1.98	4.70	6.79		1997	11	20	3	55.4	150	15.4		1.8	23.8	
21/11/1997 23:00	2.41	5.06	6.67	102.82		2.16	6.27	1.53	3.60	4.00	5.18	2.68	6.23	7.42	9.95	2.33	4.96	6.37		1997	11	21	21	57.2	120	15.9		1.8	23.8	
23/11/1997 01:00	1.89	4.55	5.56	102.66		1.74	5.98	1.23	3.29	3.83	4.80	2.19	5.98	6.36	9.46	1.90	4.64	6.14		1997	11	23	0	40.7	140	11.3		2.8	24.8	
24/11/1997 00:00	1.70	4.35	5.56	101.59		1.53	5.43	1.07	3.04	3.65	4.32	1.96	5.59	5.75	7.85	1.69	4.35	5.81		1997	11	24	0	42.5	130	11.8		1.6	23.6	
30/11/1997 20:00	1.23	3.64	4.17	357.81		1.12	4.39	0.80	1.72	3.37	3.82	1.40	4.40	4.83	6.55	1.25	3.66	4.72		1997	11	30	21	33.5	340	9.3		2.9	24.9	
01/12/1997 17:00	0.98	3.28	4.00	349.89		0.87	3.89	0.62	1.40	3.11	3.49	1.07	3.91	3.86	7.01	0.98	3.28	3.99		1997	12	1	18	35.3	330	9.8		0.8	22.8	
02/12/1997 20:00	1.41	3.88	4.76	346.41		1.23	4.56	0.88	2.05	3.47	4.02	1.52	4.66	4.06	6.95	1.35	3.81	5.06		1997	12	2	21	42.5	340	11.8		2.4	24.4	
03/12/1997 18:00	1.44	3.77	4.76	349.36		1.15	4.51	0.82	1.91	3.35	3.86	1.45	4.53	5.37	7.18	1.28	3.70	5.04		1997	12	3	18	42.5	360	11.8		1.0	23.0	
04/12/1997 11:00	1.65	4.21	5.88	111.99		1.41	5.47	1.01	2.48	3.56	4.41	1.74	5.70	5.70	7.87	1.57	4.24	6.88		1997	12	4	12	44.3	120	12.3		3.8	25.8	
07/12/1997 23:00	0.74	3.15	3.57	21.18		0.59	3.66	0.43	1.00	2.85	3.25	0.73	3.70	3.50	9.77	0.70	3.05	3.47		1997	12	7	21	25.9	10	7.2		1.5	23.5	
11/12/1997 03:00	2.24	4.65	6.25	113.47		1.96	5.84	1.42	4.00	3.86	4.85	2.42	6.12	5.84	9.04	2.15	4.60	6.78		1997	12	11	3	53.6	140	14.9		1.6	23.6	
13/12/1997 04:00	1.52	4.21	5.88	91.77		1.24	5.05	0.89	2.48	3.43	4.25	1.57	5.22	5.78	7.56	1.38	3.97	5.07		1997	12	13	0	35.3	120	9.8		1.4	23.4	
19/12/1997 18:00	0.70	3.08	3.57	22.26		0.62	3.61	0.45	1.18	2.87	3.29	0.79	3.63	3.38	7.43	0.72	3.10	3.60		1997	12	19	18	25.9	10	7.2		1.4	23.4	
23/12/1997 21:00	0.57	2.86	3.03	1.86		0.47	3.54	0.34	0.95	2.70	3.09	0.60	3.43	2.97	8.36	0.55	2.91	3.01		1997	12	23	21	22.3	360	6.2		2.0	24.0	
26/12/1997 07:00	1.02	3.51	4.17	93.32		0.90	4.45	0.64	1.61	3.19	3.78	1.13	4.52	4.49	7.59	0.99	3.55	4.92		1997	12	26	6	29.5	120	8.2		3.8	25.8	
29/12/1997 04:00	1.56	4.26	5.56	83		1.43	5.23	1.01	2.32	3.60	4.39	1.79	5.40	5.73	6.99	1.56	4.21	5.33		1997	12	29	3	31.3	110	8.7		1.6	23.6	
30/12/1997 04:00	2.25	4.94	6.25	104.58		2.04	5.87	1.46	3.71	4.08	5.05	2.55	6.01	6.49	8.76	2.20	4.77	6.59		1997	12	30	3	48.2	140	13.4		0.7	22.7	
30/12/1997 20:00	2.15	4.60	5.88	101.39		1.97	5.71	1.38	3.82	3.89	4.65	2.49	5.56	5.84	7.86	2.14	4.58	6.36		1997	12	30	18	53.6	110	14.9		2.9	24.9	
01/01/1998 21:00	2.12	4.60	5.56	86.57		1.91	5.81	1.35	3.06	3.83	4.90	2.34	5.89	6.99	9.96	2.09	4.63	5.47		1998	1	1	21	46.4	100	12.9		2.8	24.8	
02/01/1998 21:00	1.77	4.40	4.76	96.87		1.53	5.64	1.09	2.52	3.59	4.58	1.92	5.68	4.73	8.97	1.68	4.31	4.85		1998	1	2	21	37.1	110	10.3		2.2	24.2	
03/01/1998 22:00	1.86	4.49	5.26	85.51		1.57	5.64	1.12	2.66	3.67	4.59	1.95	5.66	7.25	9.35	1.74	4.39	5.32		1998	1	3	21	33.5	110	9.3		2.1	24.1	
04/01/1998 23:00	2.05	4.65	5.56	101.38		1.69	5.62	1.20	3.33	3.71	4.67	2.07	5.81	5.96	9.06	1.83	4.44	5.94		1998	1	4	21	53.6	110	14.9		2.3	24.3	
06/01/1998 23:00	2.29	4.94	6.25	95.52		1.95	6.20	1.40	3.28	3.86	5.12	2.37	6.23	6.53	10.10	2.11	4.77	6.56		1998	1	6	21	53.6	110	14.9		1.2	23.2	
08/01/1998 01:00	2.13	4.82	6.25	101.75		2.00	5.93	1.40	3.54	4.01	4.99	2.52	6.06	6.59	8.18	2.13	4.77	6.54		1998	1	8	3	31.3	140	8.7		1.4	23.4	
09/01/1998 00:00	1.72	4.71	5.26	85.07		1.42	5.51	1.00	2.62	3.78	4.55	1.80	5.78	6.45	8.75	1.55	4.47	5.82		1998	1	9	0	33.5	110	9.3		0.9	22.9	
11/01/1998 04:59	2.31	4.82	5.88	86.77		2.08	5.82	1.47	4.40	3.91	4.78	2.63	5.83	6.34	8.50	2.26	4.72	5.67		1998	1	11	6	38.9	90	10.8		2.7	24.7	
11/01/1998 22:59	2.37	5.19	6.25	88.15		2.02	6.26	1.45	3.91	4.22	5.42	2.50	6.35	6.18	11.12	2.17	5.16	6.16		1998	1	11	21	51.8	100	14.4		2.2	24.2	
12/01/1998 23:59	2.15	5.13	5.88	88.24		1.80	5.94	1.29	3.11	4.02	5.16	2.36	5.89	6.00	10.69	1.95	4.94	6.16		1998	1	13	0	44.3	100	12.3		2.1	24.1	
13/01/1998 20:59	1.88	4.44	5.26	91.53		1.56	5.77	1.12	3.07	3.60	4.74	2.01	5.85	6.95	9.99	1.71	4.44	5.29		1998	1	13	21	38.9	100	10.8		3.3	25.3	
15/01/1998 20:00	1.11	4.65	8.33	76.96		0.87	6.53	0.62	1.60	3.15	4.61	1.13	7.16	7.02	10.80	1.00	4.28	9.37		1998	1	15	21	16.6	40	4.6		3.6	25.6	
17/01/1998 09:00	1.22	3.85	5.00	64.33		1.06	4.73	0.75	1.87	3.27	3.94	1.33	4.72	3.85	7.86	1.18	3.69	4.21		1998	1	17	9	29.5	110	8.2		2.6	24.6	
21/01/1998 00:00	1.58	4.17	5.56	69.53		1.28	5.40	0.92	2.36	3.54	4.42	1.60	5.47	6.04	8.57	1.42	4.14	7.06		1998	1	21	0	33.5	120	9.3		2.3	24.3	
22/01/1998 01:00	2.15	5.19	9.09	68.04		1.93	7.25	1.38	2.75	4.00	5.48	2.41	7.39	8.68	11.11	2.11	5.12	9.75		1998	1	22	0	40.7	130	11.3		2.4	24.4	
24/01/1998 01:00	2.11	5.00	5.88	84.79		1.89	6.37	1.37	2.75	3.92	5.26	2.35	6.69	6.78	10.95	2.12	4.99	6.00		1998	1	24	0	40.7	120	11.3		1.5	23.5	
26/01/1998 23:00	0.96	3.96	4.55	61.69		0.84	4.75	0.60	1.33	3.54	4.25	1.04	4.79	4.64	8.34	0.92	3.95	4.94		1998	1	26	21	25.9	30	7.2		2.3	24.3	
29/01/1998 11:00	1.06	3.85	4.76	36.79		0.98	4.79	0.70	1.62	3.																				

11/02/1998 08:00	0.85	3.88	5.56	79.85		0.72	5.18	0.52	1.27	3.21	4.08	0.90	5.38	7.47	9.88	0.82	3.76	6.55		1998	2	11	6	20.5	20	5.7		4.0	26.0
13/02/1998 20:00	0.75	3.20	3.23	100.35		0.61	4.40	0.44	0.94	2.87	3.50	0.74	4.55	7.54	9.51	0.73	3.22	3.61		1998	2	13	21	16.6	110	4.6		2.4	24.4
28/02/1998 06:00	1.86	4.49	5.00	94.65		1.61	5.74	1.13	2.42	3.72	4.60	1.95	5.73	6.39	9.24	1.76	4.39	5.39		1998	2	28	6	38.9	110	10.8		1.6	23.6
28/02/1998 21:00	2.19	4.65	5.26	99.43		1.85	5.85	1.31	3.07	3.66	4.81	2.33	5.85	5.78	8.59	2.00	4.51	5.61		1998	2	28	21	46.4	110	12.9		3.4	25.4
01/03/1998 21:00	2.05	4.40	5.26	101.24		1.88	5.76	1.36	2.96	3.72	4.80	2.36	5.73	5.18	9.30	2.05	4.43	5.49		1998	3	1	21	50	110	13.9		3.0	25.0
02/03/1998 21:00	1.94	4.40	5.88	105.44		1.80	5.53	1.29	3.24	3.66	4.70	2.29	5.53	6.05	9.11	1.96	4.43	5.48		1998	3	2	21	42.5	100	11.8		2.4	24.4
04/03/1998 01:00	2.05	4.65	5.88	100.76		1.75	5.71	1.24	3.64	3.62	4.63	2.14	5.81	5.99	8.35	1.94	4.47	6.57		1998	3	4	0	46.4	120	12.9		3.8	25.8
09/03/1998 06:00	1.10	3.60	4.76	103.39		0.95	4.43	0.67	1.84	3.18	3.67	1.20	4.66	4.95	8.00	1.08	3.57	4.51		1998	3	9	6	31.3	90	8.7		3.9	25.9
12/03/1998 00:00	1.82	4.76	5.88	96.15		1.68	5.98	1.21	3.64	4.19	5.05	2.07	5.92	6.40	8.87	1.83	4.90	6.44		1998	3	12	0	38.9	130	10.8		2.3	24.3
21/03/1998 22:00	1.77	4.44	4.76	94.3		1.45	5.51	1.04	2.24	3.63	4.69	1.80	5.50	5.37	10.31	1.56	4.29	5.35		1998	3	21	21	38.9	110	10.8		2.0	24.0
23/03/1998 01:00	1.67	4.55	5.26	85.47		1.47	5.80	1.06	2.56	3.59	4.78	1.80	5.92	5.69	9.44	1.64	4.46	5.94		1998	3	23	0	35.3	110	9.8		2.0	24.0
24/03/1998 00:00	1.43	4.55	5.00	88.05		1.27	5.91	0.92	2.38	3.63	4.84	1.64	5.89	6.01	10.17	1.41	4.50	5.36		1998	3	24	0	27.7	120	7.7		1.4	23.4
26/03/1998 02:00	1.97	5.19	5.56	98.8		1.78	6.76	1.26	3.05	3.81	5.45	2.25	6.82	6.87	11.81	1.94	5.06	5.98		1998	3	26	0	48.2	140	13.4		1.0	23.0
31/03/1998 07:00	0.78	3.60	4.00	62.18		0.65	4.51	0.47	1.06	3.16	3.78	0.81	4.46	3.95	8.86	0.75	3.56	4.34		1998	3	31	6	18.4	90	5.1		0.9	22.9
02/04/1998 22:00	1.89	4.44	5.88	98.79		1.62	5.58	1.14	2.79	3.70	4.56	2.04	5.75	5.71	7.98	1.76	4.45	5.93		1998	4	2	21	42.5	140	11.8		2.3	24.3
03/04/1998 10:00	1.90	4.40	5.88	106.32		1.85	5.60	1.31	3.20	3.90	4.87	2.29	5.63	6.11	8.02	1.98	4.59	6.49		1998	4	3	9	50	160	13.9		1.9	23.9
04/04/1998 23:00	2.37	5.13	6.25	108.65		2.00	6.24	1.42	3.42	4.02	5.17	2.52	6.22	6.34	9.13	2.14	4.88	6.55		1998	4	4	21	55.4	120	15.4		1.8	23.8
05/04/1998 14:00	2.09	4.82	6.25	94.48		1.99	5.84	1.43	3.31	3.93	4.98	2.59	6.01	6.37	10.92	2.16	4.76	5.97		1998	4	5	12	46.4	130	12.9		2.0	24.0
12/04/1998 22:00	1.07	3.85	5.88	66.92		0.89	4.78	0.63	1.48	3.36	4.09	1.12	5.05	4.70	8.01	0.98	3.85	4.51		1998	4	12	21	27.7	80	7.7		4.0	26.0
15/04/1998 03:00	2.14	5.13	6.67	106.55		2.09	6.38	1.51	3.25	4.36	5.52	2.58	6.36	5.97	9.06	2.23	5.25	7.50		1998	4	15	3	48.2	130	13.4		1.8	23.8
18/04/1998 21:00	1.97	4.55	6.25	109.34		1.84	5.81	1.31	3.10	3.99	4.76	2.25	5.64	5.84	9.05	2.01	4.60	6.62		1998	4	18	21	46.4	140	12.9		2.1	24.1
20/04/1998 00:00	1.65	4.21	5.26	98.1		1.47	5.24	1.05	2.45	3.54	4.37	1.83	5.55	4.99	8.06	1.62	4.15	5.99		1998	4	20	0	37.1	140	10.3		2.6	24.6
22/04/1998 19:00	0.93	3.67	2.78	9.68		0.80	4.62	0.57	1.18	3.39	4.11	0.96	4.76	4.68	8.38	0.87	3.80	4.83		1998	4	22	18	24.1	20	6.7		3.5	25.5
27/04/1998 09:00	0.63	3.05	3.85	108.5		0.49	3.83	0.35	0.90	2.69	3.24	0.62	3.87	3.92	8.01	0.59	3.06	4.06		1998	4	27	9	22.3	160	6.2		3.9	25.9
07/05/1998 05:00	0.82	3.23	7.14	70.49		0.62	4.59	0.44	1.14	2.78	3.52	0.78	4.92	8.06	8.60	0.71	3.26	7.37		1998	5	7	6	20.5	170	5.7		3.3	25.3
10/05/1998 08:00	0.86	3.64	5.00	108.89		0.70	4.45	0.51	1.24	3.18	3.74	0.90	4.53	4.71	6.65	0.80	3.51	4.81		1998	5	10	6	35.3	190	9.8		3.5	25.5
11/05/1998 18:00	1.45	3.96	4.55	95.63		1.22	4.84	0.86	2.05	3.37	4.06	1.50	4.88	4.90	6.60	1.33	3.84	4.82		1998	5	11	18	37.1	100	10.3		2.5	24.5
14/05/1998 11:00	1.92	4.71	5.56	80.62		1.70	5.87	1.20	3.20	4.08	4.92	2.13	6.04	5.84	9.14	1.84	4.75	5.94		1998	5	14	9	44.3	100	12.3		3.1	25.1
15/05/1998 07:00	1.74	4.55	6.67	69.15		1.53	5.75	1.11	2.88	3.73	4.86	1.89	6.01	6.12	8.88	1.68	4.50	6.98		1998	5	15	6	40.7	100	11.3		1.7	23.7
16/05/1998 22:00	1.08	3.74	4.76	96.69		1.03	5.20	0.73	1.78	3.17	4.06	1.30	5.41	6.55	8.59	1.15	3.78	4.60		1998	5	16	21	33.5	140	9.3		2.8	24.8
21/05/1998 22:00	0.80	2.96	3.23	208.55		0.63	3.39	0.45	1.20	2.76	3.07	0.80	3.38	3.26	6.94	0.73	2.96	3.26		1998	5	21	21	27.7	220	7.7		3.1	25.1
23/05/1998 07:00	0.68	3.25	10.00	70.08		0.51	4.58	0.37	0.85	2.70	3.51	0.64	5.62	8.12	11.80	0.62	3.19	9.33		1998	5	23	6	29.5	190	8.2		3.9	25.9
25/05/1998 09:00	0.68	3.03	3.03	197.33		0.55	3.65	0.40	0.86	2.71	3.16	0.66	3.56	3.40	10.12	0.67	2.98	10.26		1998	5	25	9	35.3	190	9.8		3.8	25.8
27/05/1998 08:00	1.72	4.40	5.88	98.02		1.52	5.53	1.06	2.38	3.66	4.37	1.88	5.74	4.98	7.04	1.68	4.35	5.99		1998	5	27	6	44.3	150	12.3		2.9	24.9
31/05/1998 11:00	1.79	4.55	5.26	85.5		1.49	5.51	1.07	3.09	3.67	4.58	1.94	5.58	5.73	8.58	1.64	4.38	5.97		1998	5	31	9	42.5	140	11.8		1.9	23.9
08/06/1998 10:00	0.80	3.51	5.00	106.15		0.62	4.58	0.44	1.03	3.08	3.69	0.75	4.63	4.47	7.94	0.70	3.50	5.44		1998	6	8	9	24.1	180	6.7		2.9	24.9
19/06/1998 01:00	1.98	4.71	6.25	104.52		1.67	5.90	1.18	2.90	3.85	4.88	2.11	5.87	6.29	9.41	1.79	4.68	6.73		1998	6	19	0	50	150	13.9		2.2	24.2
20/06/1998 02:00	2.21	4.88	5.56	95.23		1.91	5.98	1.35	3.16	3.82	4.87	2.43	6.06	5.99	8.39	2.06	4.64	6.29		1998	6	20	3	38.9	130	10.8		2.1	24.1
21/06/1998 04:00	1.76	4.71	5.56	79.25		1.61	5.96	1.18	2.55	3.83	5.13	1.94	5.93	5.61	8.91	1.76	4.66	5.80		1998	6	21	3	31.3	70	8.7		2.6	24.6
23/06/1998 07:00	1.39	4.21	4.55	225.32		1.20	4.86	0.86	2.17	3.72	4.30	1.52	5.06	4.69	8.13	1.32	4.15	4.98		1998	6	23	6	29.5	220	8.2		3.1	25.1
26/06/1998 08:00	0.94	3.54	4.55	109		0.77	4.40	0.55	1.48	3.02	3.76	0.97	4.57	4.65	7.27	0.86	3.45	4.73		1998	6	26	6	33.5	180	9.3		2.3	24.3
30/06/1998 14:00	1.17	3.48	3.85	252.1		1.00	4.08	0.71	1.73	3.28	3.66	1.28	4.06	4.01	5.91	1.11	3.52	4.44		1998	6	30	18	31.3	240	8.7		2.9	24.9
03/07/1998 13:00	1.61	4.30	5.56	102.67		1.43	5.36	1.03	2.70	3.71	4.58	1.76	5.15	5.29	7.98	1.58	4.30	5.77		1998	7	3	12	40.7	140	11.3		2.3	24.3
12/07/1998 20:00	1.66	4.21	5.26	106.64		1.41	5.10	1.01	2.54	3.56	4.27	1.78	5.19	5.36	8.16	1.55	4.05	5.61		1998	7	12	18	50	130	13.9		2.5	24.5
15/07/1998 12:00	0.75	3.81	13.33	64.79		0.62	5.54	0.45	1.07	3.01	4.27	0.77	6.38	5.46	13.54	0.74	3.88	14.56		1998	7	15	12	16.6	170	4.6		2.9	24.9
18/07/1998 03:00	1.13	4.00	5.00	83.63		1.03	4.97	0.73	1.80	3.57	4.31	1.28	5.06	5.17	7.81	1.11	4.08	5.08		1998	7	18	3	20.5	130	5.7		3.2	25.2
21/07/1998 15:00	0.84	3.92	4.00	48.26		0.72	5.09	0.51	1.35	3.30	4.14	0.91	5.08	4.80	7.72	0.79	3.90	6.51		1998	7	21	15	13	60	3.6		1.2	23.2
2																													

29/07/1998 09:00	0.81	3.31	3.70	215.74		0.63	3.76	0.45	1.06	2.99	3.32	0.77	3.69	4.05	8.59	0.73	3.22	3.87		1998	7	29	9	29.5	200	8.2		1.7	23.7
30/07/1998 21:00	0.75	3.08	3.57	203.79		0.59	3.63	0.42	1.07	2.85	3.26	0.73	3.56	3.20	10.68	0.68	3.07	3.56		1998	7	30	21	20.5	240	5.7		2.0	24.0
04/08/1998 14:00	1.50	4.76	7.69	74.14		1.27	6.12	0.91	2.10	3.65	4.82	1.56	6.48	6.18	9.22	1.41	4.46	8.04		1998	8	4	15	29.5	140	8.2		1.2	23.2
08/08/1998 13:00	0.69	2.74	3.03	224.17		0.47	2.97	0.34	1.03	2.52	2.81	0.60	3.05	6.14	8.28	0.58	2.70	2.98		1998	8	8	15	37.1	240	10.3		1.3	23.3
16/08/1998 04:00	1.02	3.57	3.85	92.68		0.86	4.72	0.62	1.58	3.17	3.85	1.09	4.75	4.10	8.24	0.97	3.59	4.95		1998	8	16	3	35.3	140	9.8		3.1	25.1
21/08/1998 06:00	1.29	4.00	5.56	79.95		1.12	5.04	0.79	1.93	3.34	4.17	1.38	4.95	4.80	9.25	1.23	3.90	5.25		1998	8	21	6	31.3	140	8.7		2.2	24.2
25/08/1998 10:00	1.59	4.12	5.56	101.85		1.38	5.23	1.01	2.39	3.55	4.46	1.71	5.16	5.34	8.46	1.53	4.09	5.06		1998	8	25	9	42.5	140	11.8		3.1	25.1
28/08/1998 10:00	3.39	5.97	7.14	82.32		2.97	7.51	2.08	5.44	4.29	5.93	3.86	7.82	6.69	11.86	3.19	5.85	7.81		1998	8	28	9	57.2	110	15.9		2.2	24.2
05/09/1998 23:00	0.72	3.15	3.70	14.93		0.56	3.81	0.40	0.92	2.96	3.24	0.71	3.79	3.45	6.82	0.64	3.18	3.53		1998	9	5	21	33.5	350	9.3		2.4	24.4
08/09/1998 06:00	2.12	4.82	6.25	98.91		1.63	5.60	1.16	2.56	3.59	4.64	2.07	5.63	5.78	8.11	1.77	4.34	5.66		1998	9	8	6	46.4	120	12.9		0.6	22.6
09/09/1998 19:00	2.32	5.00	5.88	92.91		2.15	6.15	1.54	3.62	4.01	5.27	2.75	6.24	5.39	11.44	2.28	4.90	6.18		1998	9	9	21	50	130	13.9		1.5	23.5
10/09/1998 11:00	2.12	4.65	5.88	83.62		1.88	6.39	1.33	2.89	3.89	5.07	2.33	6.47	6.10	10.85	2.05	4.81	6.05		1998	9	10	12	50	110	13.9		3.7	25.7
14/09/1998 19:00	0.93	3.25	4.00	344.37		0.81	4.50	0.58	1.46	2.89	3.66	1.02	4.60	4.58	10.51	0.93	3.32	3.96		1998	9	14	18	31.3	10	8.7		2.7	24.7
15/09/1998 11:00	0.98	3.10	3.45	214.28		0.76	3.51	0.54	1.27	2.81	3.17	0.95	3.43	3.21	8.76	0.88	2.99	3.61		1998	9	15	12	29.5	220	8.2		1.2	23.2
18/09/1998 06:00	2.08	4.60	5.88	86.29		1.89	5.82	1.35	3.03	3.85	4.95	2.35	5.94	4.91	8.16	2.01	4.62	6.12		1998	9	18	6	44.3	90	12.3		2.8	24.8
21/09/1998 03:00	1.44	4.35	4.76	92.91		1.26	5.34	0.90	2.47	3.70	4.52	1.59	5.36	6.00	9.21	1.39	4.34	5.31		1998	9	21	3	25.9	90	7.2		0.6	22.6
22/09/1998 20:00	2.00	4.71	5.56	86.52		1.60	6.04	1.13	3.53	3.73	4.83	2.08	6.30	6.05	10.05	1.75	4.58	5.46		1998	9	22	18	38.9	120	10.8		3.0	25.0
25/09/1998 09:00	1.38	3.92	4.55	216.1		1.10	4.68	0.78	1.81	3.41	4.06	1.38	4.71	4.99	8.24	1.21	3.85	4.63		1998	9	25	9	38.9	210	10.8		2.5	24.5
27/09/1998 07:00	0.84	3.48	9.09	79.93		0.68	4.89	0.49	0.99	2.92	3.80	0.82	5.46	7.53	8.85	0.79	3.47	9.80		1998	9	27	6	25.9	180	7.2		1.5	23.5
28/09/1998 13:00	1.26	3.96	5.00	87.79		1.06	4.72	0.75	2.11	3.15	3.93	1.36	4.82	4.25	7.00	1.18	3.67	4.69		1998	9	28	12	33.5	140	9.3		2.9	24.9
01/10/1998 02:00	1.42	4.00	5.56	82.95		1.30	4.95	0.92	2.07	3.45	4.18	1.63	4.93	4.96	7.45	1.30	3.95	5.49		1998	10	1	3	31.3	110	8.7		2.3	24.3
02/10/1998 02:00	1.44	4.21	5.00	91.07		1.26	5.28	0.88	2.15	3.58	4.28	1.57	5.22	5.62	8.00	1.25	4.12	6.00		1998	10	2	3	31.3	110	8.7		1.2	23.2
07/10/1998 03:00	0.98	3.31	4.00	350.99		0.84	4.05	0.61	1.48	3.06	3.58	1.06	4.05	3.75	6.07	0.86	3.32	4.31		1998	10	7	3	38.9	340	10.8		0.3	22.3
08/10/1998 10:00	0.97	3.39	4.35	106.54		0.82	4.19	0.59	1.35	3.00	3.56	1.01	4.20	4.22	6.26	0.83	3.29	4.64		1998	10	8	9	35.3	160	9.8		4.0	26.0
10/10/1998 12:00	1.07	3.57	4.17	222.55		0.91	4.00	0.65	1.56	3.21	3.62	1.16	4.01	4.19	6.34	0.92	3.42	4.58		1998	10	10	12	33.5	230	9.3		3.8	25.8
13/10/1998 08:00	1.15	3.74	4.35	355.64		0.93	4.37	0.66	1.67	3.23	3.79	1.18	4.47	4.33	6.29	0.94	3.63	4.82		1998	10	13	6	33.5	330	9.3		1.6	23.6
17/10/1998 06:00	1.10	3.60	4.35	94.58		0.92	4.66	0.65	1.49	3.15	3.86	1.16	4.58	4.10	6.95	0.91	3.61	5.09		1998	10	17	6	24.1	80	6.7		3.3	25.3
20/10/1998 09:00	0.95	3.77	4.55	0.23		0.75	4.56	0.54	1.27	3.30	3.85	0.94	4.60	4.59	6.94	0.76	3.66	4.71		1998	10	20	9	31.3	310	8.7		3.8	25.8
21/10/1998 04:00	1.43	4.00	5.00	111.84		1.30	4.95	0.93	3.11	3.42	4.24	1.66	4.95	5.01	8.25	1.32	3.97	5.06		1998	10	21	3	40.7	140	11.3		0.6	22.6
22/10/1998 05:00	2.14	4.76	5.88	102.66		1.94	5.74	1.35	3.38	3.88	4.66	2.50	5.89	5.95	8.21	1.91	4.66	6.29		1998	10	22	3	50	130	13.9		0.8	22.8
24/10/1998 23:00	1.23	3.92	4.76	94.66		1.07	4.96	0.75	1.93	3.28	4.04	1.35	4.89	5.38	7.98	1.06	3.84	5.05		1998	10	24	21	35.3	110	9.8		3.3	25.3
27/10/1998 09:00	0.85	3.15	3.33	229.4		0.59	3.93	0.42	1.02	2.91	3.40	0.73	3.80	3.64	7.67	0.59	3.14	6.59		1998	10	27	9	24.1	280	6.7		1.8	23.8
29/10/1998 13:00	1.63	4.17	5.26	98.79		1.42	5.16	1.01	2.32	3.48	4.37	1.84	5.29	4.97	8.49	1.43	4.09	5.51		1998	10	29	12	38.9	120	10.8		2.5	24.5
03/11/1998 02:00	2.01	5.06	5.88	102.48		1.76	6.08	1.25	3.30	3.95	5.04	2.23	6.04	5.94	9.02	1.76	4.81	6.02		1998	11	3	0	44.3	120	12.3		0.1	22.1
04/11/1998 04:00	1.86	4.71	6.25	101.77		1.55	5.87	1.09	2.74	3.71	4.75	1.92	5.95	5.96	9.03	1.55	4.50	6.22		1998	11	4	6	40.7	140	11.3		0.4	22.4
11/11/1998 01:00	1.74	4.55	5.88	84.71		1.44	5.53	1.02	2.58	3.53	4.55	1.80	5.49	5.22	7.94	1.44	4.22	6.17		1998	11	11	0	35.3	120	9.8		2.3	24.3
14/11/1998 19:00	0.69	3.17	3.03	348.44		0.51	4.04	0.37	0.82	2.76	3.29	0.63	4.28	6.44	8.35	0.52	3.12	3.19		1998	11	14	18	22.3	10	6.2		3.5	25.5
17/11/1998 05:00	1.06	3.57	4.55	112.52		0.91	4.47	0.64	1.66	3.10	3.73	1.14	4.51	3.98	8.02	0.91	3.57	4.82		1998	11	17	3	35.3	150	9.8		2.4	24.4
18/11/1998 22:00	1.07	3.57	4.00	94.08		0.88	4.57	0.63	1.75	3.18	3.96	1.10	4.67	4.78	10.37	0.89	3.67	4.60		1998	11	18	21	14.8	90	4.1		3.4	25.4
20/11/1998 04:00	1.56	4.71	6.25	106.77		1.35	5.74	0.95	2.08	3.56	4.58	1.70	5.64	6.06	8.88	1.34	4.40	6.77		1998	11	20	3	33.5	140	9.3		0.7	22.7
22/11/1998 06:00	1.10	3.96	4.76	36.44		0.94	4.94	0.67	1.62	3.39	4.14	1.17	5.02	5.09	8.85	0.95	3.84	4.77		1998	11	22	6	20.5	40	5.7		1.1	23.1
24/11/1998 18:00	1.29	3.70	4.35	351.86		1.14	4.41	0.81	2.03	3.30	3.88	1.47	4.35	4.14	6.86	1.14	3.67	4.89		1998	11	24	18	44.3	350	12.3		1.4	23.4
27/11/1998 02:00	2.06	4.65	5.88	112.6		1.90	5.84	1.35	3.27	3.89	5.00	2.32	5.88	6.18	8.79	1.91	4.70	5.98		1998	11	27	0	53.6	130	14.9		2.8	24.8
30/11/1998 15:00	1.10	3.67	4.55	29.58		0.95	4.35	0.67	1.47	3.39	3.90	1.15	4.40	4.79	8.35	0.95	3.72	4.81		1998	11	30	15	18.4	100	5.1		2.1	24.1
02/12/1998 20:00	2.09	4.65	6.25	106.61		1.72	5.59	1.22	2.56	3.69	4.66	2.11	5.76	5.29	8.06	1.73	4.43	6.42		1998	12	2	18	50	110	13.9		3.9	25.9
05/12/1998 21:00	0.97	3.45	3.70	342.13		0.82	4.06	0.58	1.35	3.03	3.54	1.02	4.21	4.16	8.62	0.82	3.43	4.24		1998	12	5	21	31.3	350	8.7		3.2	25.2
10/12/1998 00:00	1.82	4.44	5.26	99.34		1.59	5.62	1.12	2.62	3.61	4.51	1.97	5.55	5.71	8.25	1.58	4.31	5.48		1998	12	10	0	42.5	110	11.8	</		

19/12/1998 20:00	1.20	3.74	4.55	341.65		0.96	4.48	0.69	1.61	3.32	3.84	1.20	4.40	4.42	8.05	0.98	3.58	4.86		1998	12	19	18	48.2	350	13.4		3.2	25.2
23/12/1998 00:00	2.48	5.06	7.14	106.31		2.44	6.32	1.73	4.86	4.35	5.45	3.12	6.57	6.67	9.28	2.45	5.23	7.43		1998	12	23	0	57.2	130	15.9		3.1	25.1
27/12/1998 19:00	1.23	3.77	4.55	349.12		1.00	4.35	0.71	2.68	3.26	3.70	1.27	4.41	3.69	6.09	1.00	3.57	4.70		1998	12	27	18	42.5	350	11.8		2.1	24.1
01/01/1999 18:00	1.39	4.21	6.25	71.21		1.14	5.48	0.81	1.82	3.29	4.39	1.44	5.52	5.91	10.09	1.15	4.03	6.59		1999	1	1	18	27.7	80	7.7		2.2	24.2
03/01/1999 23:00	1.03	3.70	4.17	101.12		0.82	4.68	0.59	1.43	3.17	3.94	1.02	4.66	4.99	9.47	0.84	3.73	4.28		1999	1	3	21	33.5	120	9.3		3.5	25.5
05/01/1999 22:00	1.93	4.55	6.25	79.67		1.73	5.52	1.22	3.33	3.69	4.63	2.20	5.65	5.68	7.61	1.72	4.41	5.66		1999	1	5	21	48.2	110	13.4		2.7	24.7
06/01/1999 23:00	1.98	4.60	5.56	100.91		1.70	5.71	1.20	3.51	3.71	4.81	2.18	5.80	5.98	8.87	1.70	4.52	5.88		1999	1	6	21	48.2	120	13.4		2.9	24.9
08/01/1999 00:00	1.66	4.30	5.26	94.97		1.44	5.51	1.02	3.06	3.46	4.47	1.82	5.59	5.09	8.93	1.45	4.23	5.46		1999	1	8	0	42.5	120	11.8		2.6	24.6
11/01/1999 18:00	0.95	3.39	4.17	340.51		0.81	4.11	0.58	1.64	3.06	3.54	1.02	4.09	4.20	8.02	0.82	3.39	4.42		1999	1	11	18	27.7	350	7.7		3.0	25.0
15/01/1999 23:00	2.32	5.19	6.67	104.68		2.09	6.37	1.51	3.96	4.16	5.42	2.60	6.59	6.02	9.17	2.13	5.07	7.14		1999	1	15	21	61.2	120	17.0		2.2	24.2
16/01/1999 19:00	2.38	4.82	5.88	104.2		2.09	5.89	1.46	3.68	3.97	4.88	2.73	5.85	5.92	8.76	2.07	4.75	6.18		1999	1	16	18	53.6	130	14.9		2.8	24.8
17/01/1999 21:00	2.56	5.06	6.25	104.91		2.31	6.21	1.66	4.08	4.25	5.43	2.89	6.26	5.91	9.64	2.35	5.08	6.83		1999	1	17	21	61.2	140	17.0		3.5	25.5
19/01/1999 20:00	2.28	4.88	6.25	96.34		1.92	6.15	1.36	3.62	3.81	5.00	2.45	6.33	5.85	9.73	1.93	4.69	6.53		1999	1	19	18	50	120	13.9		2.6	24.6
21/01/1999 22:00	2.24	4.76	5.88	98.72		2.05	5.96	1.45	3.29	3.90	5.05	2.56	5.82	5.62	8.44	2.05	4.81	6.59		1999	1	21	21	55.4	120	15.4		3.1	25.1
23/01/1999 01:00	1.76	4.55	5.56	100.21		1.51	5.83	1.08	2.68	3.68	4.72	1.90	5.99	6.22	10.75	1.52	4.54	6.04		1999	1	23	0	40.7	120	11.3		3.5	25.5
26/01/1999 02:00	1.10	3.92	4.35	86.33		0.94	4.95	0.68	1.49	3.34	4.17	1.17	5.07	3.87	9.09	0.95	3.83	4.32		1999	1	26	0	24.1	110	6.7		2.7	24.7
29/01/1999 21:00	1.04	3.77	4.55	340.73		0.83	4.62	0.60	1.52	3.23	3.95	1.04	4.76	5.27	10.28	0.85	3.67	4.81		1999	1	29	21	25.9	340	7.2		3.4	25.4
01/02/1999 22:00	0.77	3.20	3.70	85.8		0.63	3.95	0.45	1.16	2.98	3.45	0.79	3.97	4.69	8.17	0.63	3.24	4.26		1999	2	1	6	20.5	100	5.7		3.8	25.8
04/02/1999 07:00	1.61	4.40	5.88	102.13		1.48	5.41	1.05	3.15	3.57	4.63	1.87	5.59	5.79	9.36	1.48	4.30	5.95		1999	2	4	6	40.7	150	11.3		1.5	23.5
06/02/1999 20:00	1.08	3.96	4.35	93.7		0.98	4.76	0.69	1.63	3.39	4.05	1.24	4.76	4.75	11.84	0.97	3.91	4.48		1999	2	6	18	31.3	110	8.7		1.6	23.6
07/02/1999 16:00	1.30	4.04	5.00	106.21		1.20	5.24	0.86	2.24	3.55	4.40	1.49	5.15	5.38	11.16	1.21	4.12	5.49		1999	2	7	15	50	150	13.9		2.7	24.7
11/02/1999 22:00	2.27	5.26	6.67	96.55		2.03	6.45	1.43	4.08	4.10	5.36	2.62	6.61	6.82	10.02	2.02	5.21	7.28		1999	2	11	21	51.8	120	14.4		1.9	23.9
18/02/1999 22:00	1.00	3.74	4.00	339.66		0.81	4.74	0.58	1.26	3.29	4.01	0.98	4.65	4.49	9.35	0.82	3.81	4.37		1999	2	18	21	25.9	350	7.2		3.7	25.7
20/02/1999 00:00	2.32	5.00	6.67	111.45		2.13	6.18	1.51	4.14	4.02	5.12	2.69	6.29	6.78	9.92	2.13	4.97	7.00		1999	2	20	0	50	120	13.9		3.9	25.9
22/02/1999 01:00	1.58	4.30	5.56	104.57		1.39	5.70	0.99	2.13	3.59	4.57	1.75	6.03	5.48	8.90	1.39	4.35	6.57		1999	2	22	3	33.5	160	9.3		3.5	25.5
26/02/1999 04:00	0.68	3.20	3.85	107.7		0.58	4.22	0.42	0.94	2.93	3.55	0.69	4.07	3.80	8.79	0.59	3.26	4.04		1999	2	26	3	20.5	110	5.7		3.4	25.4
28/02/1999 07:00	1.18	3.70	4.76	88.23		1.05	4.59	0.75	1.82	3.47	4.10	1.28	4.63	4.76	8.37	1.06	3.84	5.20		1999	2	28	6	37.1	90	10.3		4.1	26.1
03/03/1999 22:00	0.78	3.45	3.70	346.57		0.64	4.16	0.46	1.23	2.91	3.48	0.83	4.36	3.19	7.31	0.64	3.35	3.60		1999	3	3	21	24.1	360	6.7		3.8	25.8
07/03/1999 07:00	1.04	3.67	5.56	98.56		0.86	4.70	0.62	1.36	3.21	3.90	1.05	4.61	5.00	9.00	0.88	3.61	4.22		1999	3	7	6	27.7	130	7.7		1.6	23.6
10/03/1999 03:00	1.84	4.60	6.67	100.42		1.64	5.86	1.15	3.07	3.66	4.72	2.08	5.98	6.38	9.50	1.63	4.52	7.20		1999	3	10	3	46.4	150	12.9		3.0	25.0
12/03/1999 01:00	1.91	4.49	5.56	92.55		1.78	5.95	1.27	2.69	3.88	4.89	2.19	6.08	5.64	8.75	1.80	4.59	6.10		1999	3	12	0	44.3	120	12.3		2.2	24.2
16/03/1999 04:00	0.95	3.70	5.56	66.91		0.77	4.94	0.56	1.75	3.12	3.91	0.99	4.83	4.52	8.50	0.79	3.53	4.29		1999	3	16	3	24.1	100	6.7		1.8	23.8
18/03/1999 05:00	1.52	4.21	5.00	95.78		1.28	5.13	0.90	2.24	3.48	4.25	1.63	5.18	5.16	8.49	1.27	4.08	5.47		1999	3	18	6	29.5	160	8.2		1.6	23.6
19/03/1999 21:00	1.50	3.96	5.26	94.85		1.25	4.91	0.89	2.56	3.34	4.08	1.58	5.21	4.74	7.44	1.26	3.84	5.22		1999	3	19	21	42.5	110	11.8		3.7	25.7
23/03/1999 23:00	2.08	4.71	6.25	109.02		1.95	5.88	1.38	2.95	3.91	4.96	2.38	5.84	5.41	9.14	1.95	4.63	6.07		1999	3	23	21	57.2	130	15.9		2.6	24.6
25/03/1999 00:00	1.98	4.55	5.26	101.81		1.78	5.68	1.25	3.41	3.70	4.64	2.31	5.87	6.38	9.02	1.77	4.51	6.14		1999	3	25	0	38.9	150	10.8		2.6	24.6
26/03/1999 02:00	1.87	4.49	5.88	103.16		1.72	5.49	1.23	2.72	3.71	4.61	2.10	5.50	5.56	8.53	1.74	4.37	5.71		1999	3	26	0	46.4	120	12.9		2.7	24.7
27/03/1999 01:00	1.61	4.44	5.56	94.8		1.30	5.63	0.94	2.49	3.66	4.65	1.58	5.79	5.48	8.04	1.33	4.27	6.13		1999	3	27	0	33.5	160	9.3		1.6	23.6
30/03/1999 06:00	1.44	4.08	5.56	101.15		1.21	5.10	0.85	2.36	3.29	4.20	1.55	5.21	4.55	8.14	1.21	3.90	5.81		1999	3	30	6	24.1	130	6.7		3.1	25.1
31/03/1999 06:00	1.75	4.40	5.88	87.86		1.43	5.50	1.02	3.02	3.53	4.37	1.82	5.43	5.50	7.82	1.44	4.24	5.79		1999	3	31	6	40.7	140	11.3		2.6	24.6
02/04/1999 01:00	1.45	4.44	5.56	100.02		1.25	5.49	0.89	2.24	3.80	4.60	1.57	5.59	5.50	8.38	1.26	4.47	6.11		1999	4	2	3	42.5	140	11.8		2.4	24.4
03/04/1999 21:00	1.64	4.17	5.56	101.93		1.34	5.06	0.95	2.93	3.38	4.21	1.66	5.16	5.12	7.84	1.34	4.00	5.64		1999	4	3	21	42.5	150	11.8		3.2	25.2
08/04/1999 01:00	1.97	4.71	5.88	105.47		1.67	5.57	1.19	2.48	3.83	4.78	2.01	5.70	5.47	7.99	1.68	4.47	6.35		1999	4	8	3	48.2	110	13.4		3.1	25.1
09/04/1999 10:00	1.68	4.40	5.56	103.21		1.43	5.26	1.01	2.53	3.61	4.50	1.78	5.35	5.66	8.24	1.43	4.26	5.82		1999	4	9	9	40.7	130	11.3		1.8	23.8
10/04/1999 20:00	2.13	4.88	5.88	98.81		1.82	6.19	1.28	3.42	4.04	5.10	2.28	6.39	6.12	8.89	1.81	4.86	6.55		1999	4	10	18	57.2	130	15.9		2.3	24.3
11/04/1999 14:00	2.12	4.76	5.88	105.04		1.88	5.76	1.32	3.22	3.71	4.72	2.34	5.86	5.93	8.51	1.86	4.52	5.66		1999	4	11	12	55.4	130	15.4		1.9	23.9
12/04/1999 15:00	2.02	4.71	6.25	94.14		1.82	5.75	1.29	3.33	3.70	4.78	2.26	5.90	6.15	12.22	1.83	4.58	5.36		1999	4	12	15	48.2	130	13.4			

28/04/1999 07:00	0.59	2.74	2.78	146.67		0.45	3.15	0.33	0.87	2.50	2.91	0.57	3.21	2.92	11.07	0.46	2.78	2.96		1999	4	28	6	27.7	180	7.7		3.7	25.7
02/05/1999 08:00	0.80	3.42	4.55	111.45		0.65	4.27	0.46	1.09	3.03	3.51	0.82	4.32	4.30	7.54	0.66	3.34	4.76		1999	5	2	6	27.7	200	7.7		3.0	25.0
03/05/1999 06:00	1.51	4.49	5.26	107.76		1.31	5.71	0.91	2.35	3.64	4.58	1.66	5.73	6.27	8.79	1.29	4.31	6.38		1999	5	3	6	40.7	170	11.3		1.7	23.7
03/05/1999 21:00	1.83	4.30	5.56	106.73		1.55	5.26	1.08	3.50	3.54	4.39	2.01	5.22	5.08	9.12	1.53	4.16	5.81		1999	5	3	21	48.2	130	13.4		3.1	25.1
04/05/1999 21:00	2.39	4.94	6.25	105.39		2.06	6.08	1.45	3.28	4.00	4.89	2.63	6.04	6.11	8.92	2.06	4.73	6.89		1999	5	4	21	51.8	140	14.4		2.8	24.8
05/05/1999 20:00	2.46	5.06	6.25	104.2		2.19	6.12	1.56	4.14	3.93	5.15	2.81	6.35	6.46	9.42	2.20	4.88	6.51		1999	5	5	18	61.2	140	17.0		1.8	23.8
06/05/1999 23:00	2.23	4.82	5.88	100.47		2.03	6.27	1.44	4.10	3.98	5.11	2.67	6.42	6.52	9.57	2.03	4.92	7.03		1999	5	6	21	51.8	130	14.4		3.0	25.0
08/05/1999 15:00	1.97	4.82	10.00	75.94		1.82	6.71	1.29	3.08	3.87	5.33	2.30	6.86	6.10	13.21	1.82	4.99	10.20		1999	5	8	15	42.5	140	11.8		2.8	24.8
10/05/1999 21:00	1.97	4.94	5.88	101.79		1.78	6.03	1.26	3.19	3.99	4.96	2.20	6.20	6.61	9.20	1.79	4.75	6.99		1999	5	10	21	50	160	13.9		1.9	23.9
14/05/1999 09:00	0.66	3.23	3.33	101.85		0.49	4.60	0.36	0.79	2.89	3.76	0.60	5.01	4.01	9.76	0.51	3.31	4.22		1999	5	14	9	24.1	150	6.7		3.8	25.8
27/05/1999 14:00	0.86	4.00	10.53	67.94		0.69	5.88	0.49	1.16	3.12	4.29	0.89	6.98	9.74	11.45	0.69	3.97	10.30		1999	5	27	12	20.5	130	5.7		0.9	22.9
28/05/1999 22:00	1.68	4.55	5.56	101.05		1.48	5.68	1.05	2.82	3.91	4.77	1.92	5.66	5.68	8.35	1.49	4.57	6.16		1999	5	28	21	38.9	130	10.8		3.5	25.5
29/05/1999 18:00	1.58	4.12	5.00	105.5		1.41	5.13	0.98	2.49	3.41	4.17	1.79	5.23	5.14	8.10	1.38	4.02	5.36		1999	5	29	18	40.7	120	11.3		2.5	24.5
01/06/1999 23:00	1.65	4.35	5.56	110.96		1.35	5.39	0.96	2.26	3.58	4.49	1.68	5.38	5.61	9.16	1.36	4.25	5.53		1999	6	1	21	46.4	130	12.9		3.8	25.8
03/06/1999 20:00	1.81	4.30	5.88	103.17		1.78	5.48	1.27	3.05	3.71	4.74	2.20	5.53	5.78	9.05	1.79	4.42	5.85		1999	6	3	18	48.2	110	13.4		2.9	24.9
04/06/1999 20:00	1.79	4.30	4.76	100.75		1.46	5.43	1.03	2.42	3.47	4.41	1.78	5.29	5.35	8.17	1.45	4.15	6.07		1999	6	4	21	46.4	130	12.9		1.6	23.6
05/06/1999 20:00	1.46	4.04	5.00	104.14		1.24	5.12	0.87	2.14	3.43	4.19	1.55	5.08	5.18	7.99	1.24	3.98	5.17		1999	6	5	18	44.3	130	12.3		1.6	23.6
09/06/1999 02:00	1.38	4.08	5.00	102.49		1.18	5.42	0.84	1.78	3.37	4.41	1.45	5.33	5.43	8.66	1.19	4.06	5.59		1999	6	9	0	33.5	140	9.3		2.8	24.8
11/06/1999 09:00	0.94	3.57	5.00	104.06		0.83	4.81	0.59	1.32	3.16	3.92	1.02	5.01	4.91	8.03	0.83	3.64	5.20		1999	6	11	9	25.9	170	7.2		2.9	24.9
13/06/1999 23:00	0.67	3.01	3.57	351.38		0.53	3.51	0.38	0.94	2.71	3.06	0.66	3.54	3.58	8.16	0.53	2.91	3.90		1999	6	13	21	31.3	330	8.7		3.6	25.6
15/06/1999 23:00	0.48	2.67	3.23	211.49		0.32	2.94	0.23	0.51	2.44	2.79	0.41	2.85	3.25	8.85	0.33	2.53	2.59		1999	6	15	21	20.5	240	5.7		4.5	26.5
17/06/1999 12:00	0.71	3.74	4.76	108.14		0.56	4.69	0.40	1.03	3.19	3.86	0.70	4.70	4.82	7.41	0.56	3.67	5.47		1999	6	17	12	7.6	210	2.1		3.3	25.3
18/06/1999 13:00	0.64	3.60	4.55	114.07		0.51	4.30	0.36	0.87	3.25	3.78	0.65	4.37	4.83	8.32	0.51	3.61	4.75		1999	6	18	12	14.8	120	4.1		3.2	25.2
20/06/1999 13:00	0.61	2.84	3.45	118.12		0.45	3.34	0.32	0.73	2.63	2.95	0.57	3.35	3.43	6.27	0.45	2.78	3.97		1999	6	20	12	24.1	150	6.7		2.6	24.6
23/06/1999 05:00	1.10	3.54	4.76	100.81		0.96	4.50	0.69	1.65	3.22	3.77	1.21	4.59	4.03	7.00	0.97	3.58	5.09		1999	6	23	3	33.5	160	9.3		3.2	25.2
24/06/1999 04:00	1.24	4.00	5.56	105.97		1.13	5.21	0.81	2.12	3.47	4.32	1.41	5.29	5.32	8.23	1.15	3.99	5.91		1999	6	24	3	31.3	190	8.7		2.8	24.8
25/06/1999 04:00	1.50	4.26	5.88	105.42		1.31	5.26	0.93	2.46	3.45	4.36	1.62	5.33	5.79	8.97	1.31	4.12	5.83		1999	6	24	3	31.3	190	8.7		2.3	24.3
26/06/1999 18:00	1.49	3.92	5.26	102.87		1.31	4.92	0.94	2.27	3.43	4.15	1.63	5.03	4.62	8.26	1.33	3.87	5.35		1999	6	26	18	40.7	120	11.3		3.2	25.2
27/06/1999 15:00	1.86	4.44	5.88	107.39		1.60	5.35	1.14	2.75	3.50	4.50	2.00	5.57	5.52	9.11	1.61	4.27	6.22		1999	6	27	15	48.2	160	13.4		1.1	23.1
29/06/1999 17:00	2.70	5.26	10.00	71.91		2.46	6.61	1.74	4.31	4.10	5.49	3.05	6.63	6.85	10.33	2.45	5.21	6.18		1999	6	29	15	51.8	140	14.4		1.8	23.8
02/07/1999 04:00	0.99	3.36	8.33	66.31		0.79	4.58	0.57	1.57	2.96	3.75	0.97	4.73	3.48	10.44	0.81	3.46	9.33		1999	7	2	3	25.9	210	7.2		1.2	23.2
03/07/1999 21:00	1.93	4.44	5.56	102.64		1.70	5.30	1.20	2.78	3.53	4.46	2.15	5.46	5.34	8.78	1.70	4.27	6.18		1999	7	3	21	44.3	140	12.3		2.6	24.6
04/07/1999 22:00	1.95	4.60	5.88	98.34		1.67	5.73	1.19	2.85	3.78	4.71	2.09	5.67	5.07	8.64	1.68	4.34	5.34		1999	7	4	21	46.4	140	12.9		2.6	24.6
07/07/1999 14:00	1.68	4.35	5.26	95.87		1.53	5.44	1.09	2.90	3.50	4.55	1.93	5.48	5.58	10.02	1.54	4.26	5.47		1999	7	7	15	42.5	130	11.8		2.9	24.9
10/07/1999 05:00	1.28	4.12	7.14	72.2		1.12	5.96	0.80	2.04	3.38	4.58	1.42	6.13	5.28	8.89	1.13	4.22	7.33		1999	7	10	3	31.3	170	8.7		3.2	25.2
12/07/1999 06:00	1.05	4.30	5.56	92.65		0.87	5.66	0.62	1.44	3.43	4.54	1.09	5.60	5.38	10.05	0.88	4.17	5.66		1999	7	12	6	24.1	190	6.7		2.5	24.5
15/07/1999 04:00	0.77	2.72	3.03	223.23		0.60	3.04	0.43	1.01	2.61	2.81	0.76	3.08	2.95	7.28	0.61	2.73	3.23		1999	7	15	3	33.5	220	9.3		0.9	22.9
16/07/1999 16:00	0.64	2.70	2.78	202.76		0.48	3.09	0.35	0.99	2.55	2.94	0.60	3.16	3.01	10.72	0.50	2.71	2.89		1999	7	16	18	14.8	240	4.1		1.5	23.5
20/07/1999 03:00	0.40	3.12	9.09	66.71		0.32	4.86	0.23	0.58	2.48	3.56	0.42	6.64	8.85	11.80	0.33	3.09	10.21		1999	7	20	3	11.2	270	3.1		3.1	25.1
21/07/1999 10:00	0.68	3.25	4.35	111.73		0.54	4.34	0.39	0.83	2.90	3.56	0.69	4.50	5.42	8.43	0.55	3.31	4.61		1999	7	21	6	25.9	190	7.2		1.4	23.4
23/07/1999 19:00	1.02	3.48	4.35	95.91		0.83	4.28	0.59	1.50	3.14	3.68	1.08	4.37	4.27	7.03	0.83	3.49	4.57		1999	7	23	18	33.5	140	9.3		3.4	25.4
24/07/1999 14:00	1.09	3.42	3.33	210.23		0.89	4.29	0.63	1.55	3.19	3.72	1.12	4.14	3.42	7.81	0.90	3.56	3.95		1999	7	24	15	27.7	210	7.7		1.6	23.6
27/07/1999 03:00	2.19	5.06	7.14	101.9		1.84	6.43	1.29	3.40	3.90	5.01	2.35	6.59	5.94	10.25	1.83	4.79	6.90		1999	7	27	3	53.6	160	14.9		0.9	22.9
29/07/1999 06:00	1.90	4.94	5.56	96.62		1.67	6.67	1.18	3.24	3.67	5.06	2.07	6.87	7.28	12.46	1.66	4.81	6.01		1999	7	29	6	44.3	140	12.3		2.1	24.1
02/08/1999 09:00	1.16	3.85	4.76	106.46		1.07	4.95	0.76	2.06	3.22	4.04	1.35	4.97	4.70	7.80	1.08	3.75	4.95		1999	8	2	9	31.3	140	8.7		2.3	24.3
03/08/1999 12:00	1.00	3.48	4.55	96.23		0.78	4.36	0.55	1.33	3.02	3.58	0.95	4.51	4.61	7.34	0.78	3.42	4.61		1999	8	3	12	27.7	120	7.7		2.9	24.9
05/08/1999 00:00	1.74	4.30	5.56	106.88		1.48	5.13	1.07	2.78	3.61	4.38	1.80	5.19	4.96	7.95	1.51	4.15	5.79		1999	8	5	0	42.5	140</				

14/08/1999 19:00	0.69	3.70	7.14	69.92		0.57	5.05	0.41	0.90	3.01	3.88	0.71	5.62	3.16	8.56	0.57	3.63	7.25		1999	8	14	18	11.2	340	3.1		1.2	23.2
15/08/1999 11:00	1.08	3.77	4.76	108.05		0.87	4.79	0.62	1.66	3.22	3.88	1.10	5.03	5.84	7.53	0.87	3.76	5.08		1999	8	15	9	44.3	190	12.3		3.2	25.2
16/08/1999 21:00	1.10	3.64	4.55	97.39		1.01	4.71	0.72	2.01	3.33	3.99	1.29	4.69	4.75	7.41	1.02	3.77	4.72		1999	8	16	21	25.9	100	7.2	3.0	25.0	
18/08/1999 23:00	1.30	4.04	6.25	69.25		1.09	5.03	0.78	2.38	3.38	4.11	1.36	5.15	5.24	9.14	1.11	3.92	6.58		1999	8	18	21	27.7	110	7.7	2.3	24.3	
23/08/1999 01:00	2.21	5.00	6.67	97.08		1.87	5.98	1.32	3.50	3.89	4.92	2.41	5.89	5.92	8.45	1.87	4.72	5.97		1999	8	23	0	50	120	13.9	1.1	23.1	
28/08/1999 07:00	0.71	5.06	7.14	77.86		0.58	7.12	0.40	0.98	3.37	5.11	0.78	7.49	7.64	10.49	0.57	4.85	8.74		1999	8	28	6	13	210	3.6	2.1	24.1	
31/08/1999 09:00	2.11	4.65	5.56	104.4		1.78	6.04	1.25	3.49	3.64	4.82	2.33	6.19	6.05	10.29	1.77	4.58	6.15		1999	8	31	9	53.6	130	14.9	2.4	24.4	
01/09/1999 23:00	1.86	4.55	5.88	85.79		1.67	6.05	1.17	2.49	3.52	4.75	2.06	6.08	6.65	10.36	1.66	4.46	5.52		1999	9	1	21	37.1	130	10.3	2.7	24.7	
04/09/1999 01:00	1.32	4.30	5.00	94.43		1.05	5.57	0.74	1.72	3.32	4.39	1.29	5.54	6.37	9.40	1.05	4.05	5.49		1999	9	4	3	33.5	160	9.3	2.5	24.5	
07/09/1999 08:00	0.57	4.30	9.09	67.44		0.48	6.71	0.34	0.77	3.26	4.77	0.61	7.57	8.28	10.98	0.49	4.37	9.37		1999	9	7	6	9.4	350	2.6	3.3	25.3	
08/09/1999 16:00	1.61	4.21	5.56	109.41		1.44	5.25	1.03	2.68	3.55	4.46	1.84	5.27	5.24	7.73	1.45	4.10	5.74		1999	9	8	15	40.7	120	11.3	1.5	23.5	
11/09/1999 04:00	0.98	3.60	3.85	2.91		0.86	4.48	0.62	1.52	3.17	3.84	1.08	4.41	3.97	9.41	0.87	3.57	4.27		1999	9	11	3	25.9	330	7.2	0.4	22.4	
11/09/1999 23:00	1.36	4.00	5.26	106.76		1.27	5.05	0.89	2.07	3.57	4.17	1.60	5.10	4.84	7.39	1.26	4.08	5.53		1999	9	11	21	42.5	140	11.8	3.9	25.9	
14/09/1999 20:00	0.81	3.15	3.57	2.77		0.67	3.72	0.48	1.37	2.86	3.24	0.86	3.67	3.72	7.20	0.68	3.14	3.68		1999	9	14	18	33.5	350	9.3	1.8	23.8	
16/09/1999 09:00	0.75	3.33	3.70	21.48		0.61	4.00	0.43	0.97	2.94	3.46	0.75	3.91	4.63	8.40	0.61	3.25	3.82		1999	9	16	9	20.5	350	5.7	2.2	24.2	
17/09/1999 20:00	1.02	3.45	4.00	358.84		0.90	4.13	0.64	1.42	3.17	3.73	1.10	4.07	4.12	7.28	0.91	3.49	4.34		1999	9	17	18	35.3	360	9.8	2.0	24.0	
19/09/1999 13:00	1.13	3.81	5.56	102.54		1.04	4.82	0.75	2.35	3.39	4.17	1.33	4.90	4.79	7.55	1.06	3.88	5.36		1999	9	19	15	33.5	90	9.3	2.1	24.1	
21/09/1999 03:00	2.11	4.88	5.88	92.75		1.97	6.45	1.43	3.11	4.17	5.43	2.45	6.32	6.19	9.55	2.02	5.01	6.83		1999	9	21	3	37.1	140	10.3	2.1	24.1	
23/09/1999 06:00	1.47	4.17	5.26	93.93		1.14	5.54	0.83	1.87	3.40	4.53	1.42	5.80	6.41	9.58	1.17	4.13	5.07		1999	9	23	6	35.3	150	9.8	3.1	25.1	
28/09/1999 05:00	2.31	5.33	6.25	98.74		2.07	6.50	1.46	3.38	4.00	5.25	2.64	6.64	6.30	9.65	2.06	5.11	6.79		1999	9	28	6	46.4	120	12.9	0.4	22.4	
29/09/1999 22:00	2.07	4.88	5.56	85.67		1.88	6.60	1.33	3.45	3.87	5.28	2.35	6.48	6.09	10.87	1.89	4.99	7.29		1999	9	29	21	38.9	100	10.8	2.8	24.8	
04/10/1999 19:00	1.00	3.57	3.85	10.23		0.95	4.51	0.67	1.54	3.27	3.87	1.17	4.69	4.62	9.69	0.95	3.69	4.06		1999	10	4	18	33.5	360	9.3	3.6	25.6	
07/10/1999 04:00	1.64	4.26	5.26	98.48		1.50	5.29	1.07	3.21	3.64	4.40	1.96	5.39	4.47	7.56	1.51	4.23	6.36		1999	10	7	6	40.7	120	11.3	1.3	23.3	
08/10/1999 06:00	1.21	3.77	4.76	93.42		1.08	4.82	0.77	2.17	3.28	3.93	1.38	4.76	4.86	7.43	1.09	3.74	5.70		1999	10	8	6	29.5	110	8.2	2.6	24.6	
12/10/1999 19:00	0.81	3.12	3.45	355.52		0.67	3.59	0.49	1.12	2.91	3.32	0.84	3.61	3.32	5.97	0.69	3.09	3.81		1999	10	12	18	31.3	350	8.7	1.1	23.1	
15/10/1999 19:00	0.63	2.90	3.23	16.66		0.53	3.29	0.38	0.87	2.76	3.05	0.67	3.26	2.92	7.01	0.53	2.90	3.22		1999	10	15	18	24.1	40	6.7	1.6	23.6	
17/10/1999 01:00	1.02	3.67	4.55	82.83		0.96	4.53	0.68	1.78	3.28	3.90	1.20	4.46	4.04	6.90	0.96	3.72	4.63		1999	10	17	0	29.5	110	8.2	2.4	24.4	
18/10/1999 01:00	1.22	3.88	4.55	82.67		1.00	4.85	0.71	1.67	3.32	3.98	1.27	5.22	4.55	7.15	1.01	3.77	5.66		1999	10	18	0	29.5	100	8.2	2.2	24.2	
19/10/1999 23:00	0.79	3.33	3.33	7.83		0.64	4.19	0.46	1.12	2.86	3.48	0.78	4.32	4.38	8.20	0.65	3.22	3.37		1999	10	19	21	29.5	350	8.2	1.3	23.3	
21/10/1999 06:00	0.95	3.51	4.17	102.64		0.83	4.37	0.61	1.42	3.03	3.65	1.04	4.42	4.68	7.46	0.86	3.36	4.59		1999	10	21	6	27.7	120	7.7	3.2	25.2	
22/10/1999 05:00	1.05	3.45	4.55	95.08		0.87	4.51	0.63	1.50	3.11	3.75	1.08	4.50	4.88	8.16	0.90	3.48	4.94		1999	10	22	3	33.5	110	9.3	2.9	24.9	
24/10/1999 22:00	0.94	3.42	4.00	354.9		0.73	3.91	0.53	1.48	3.10	3.53	0.92	3.88	3.86	7.50	0.75	3.31	4.14		1999	10	24	21	22.3	340	6.2	3.2	25.2	
25/10/1999 19:00	0.81	3.25	3.57	99.11		0.72	4.04	0.51	1.15	2.91	3.39	0.90	4.19	5.23	8.26	0.73	3.22	3.60		1999	10	25	18	24.1	50	6.7	2.7	24.7	
26/10/1999 19:00	0.69	2.96	3.03	35.45		0.58	3.61	0.43	1.10	2.71	3.12	0.73	3.87	3.98	8.59	0.60	2.98	3.28		1999	10	26	18	22.3	30	6.2	2.2	24.2	
27/10/1999 20:00	0.87	3.20	3.70	22.96		0.78	3.89	0.56	1.41	3.09	3.43	0.99	3.93	3.97	7.18	0.79	3.32	4.07		1999	10	27	21	31.3	10	8.7	2.1	24.1	
28/10/1999 19:00	0.95	3.51	4.35	66.87		0.81	4.32	0.57	1.50	3.13	3.59	1.00	4.32	4.67	8.61	0.81	3.50	4.54		1999	10	28	18	24.1	30	6.7	1.0	23.0	
30/10/1999 08:00	1.02	3.77	4.35	81.03		0.83	4.66	0.60	1.54	3.13	3.98	1.03	4.78	4.77	8.66	0.85	3.61	4.96		1999	10	30	6	22.3	90	6.2	1.3	23.3	
03/11/1999 00:00	2.32	5.26	6.67	106.73		2.10	6.49	1.48	3.67	3.98	5.22	2.72	6.43	5.84	9.42	2.09	5.04	7.24		1999	11	3	0	51.8	140	14.4	0.8	22.8	
04/11/1999 02:00	2.09	4.82	5.88	101.28		1.83	5.78	1.30	3.01	3.82	5.02	2.24	6.07	5.44	9.02	1.84	4.75	6.01		1999	11	4	0	46.4	110	12.9	1.0	23.0	
07/11/1999 21:00	0.89	3.42	4.00	351.2		0.76	4.12	0.55	1.37	3.05	3.62	0.95	4.11	4.14	7.63	0.78	3.38	4.13		1999	11	7	21	27.7	350	7.7	3.7	25.7	
09/11/1999 03:00	1.12	4.17	5.56	354.86		0.89	5.22	0.62	1.55	3.40	4.16	1.13	5.28	4.97	7.80	0.88	4.05	5.67		1999	11	9	3	13	250	3.6	0.6	22.6	
10/11/1999 07:00	0.98	3.39	4.55	108.29		0.84	4.15	0.60	1.55	2.99	3.58	1.03	4.04	4.01	7.39	0.85	3.33	4.68		1999	11	10	6	33.5	160	9.3	2.3	24.3	
12/11/1999 02:00	1.17	4.04	5.00	88.96		1.02	4.97	0.74	1.78	3.49	4.29	1.29	4.96	4.71	8.60	1.04	4.09	5.33		1999	11	12	0	33.5	90	9.3	2.1	24.1	
13/11/1999 00:00	1.20	3.92	4.76	84.49		1.08	4.89	0.77	1.95	3.48	4.14	1.38	4.93	4.64	7.80	1.08	4.00	5.20		1999	11	13	0	31.3	100	8.7	2.8	24.8	
14/11/1999 00:00	0.91	3.57	4.17	72.12		0.75	4.50	0.54	1.30	3.15	3.81	0.95	4.60	5.05	10.79	0.77	3.53	4.53		1999	11	14	0	22.3	70	6.2	2.8	24.8	
16/11/1999 18:00	1.41	3.85	4.76	354.6		1.23	4.52	0.88	2.46	3.42	4.05	1.57	4.44	4.74	6.40	1.24	3.80	4.50		1999	11	16	18	44.3	350	12.3	2.3	24.3	
18/11/1999 02:00	1.72	4.35	5.88	106.9		1.51	5.42	1.07	2.60	3.66	4.49	1.91	5.48	5.75	7.91	1.52	4.28	6.00		1999	11	18	0	40.7	110	11.3	2.1	24.1	
20/11/1999 02:00	1.91	4.49	5.56	82.25		1.73	5.68	1.24	3.00	3.80	4.79	2.18	5.59	5.41	7.42	1.75	4.51												

03/12/1999 01:00	1.67	4.49	5.26	95.19		1.37	5.67	0.96	2.44	3.44	4.43	1.68	5.53	5.96	8.12	1.36	4.24	6.04		1999	12	3	0	37.1	100	10.3		1.0	23.0
04/12/1999 02:00	1.37	4.21	5.26	92.95		1.18	5.45	0.83	2.04	3.40	4.35	1.46	5.50	5.26	8.31	1.18	4.16	5.54		1999	12	4	3	27.7	160	7.7		1.0	23.0
06/12/1999 06:00	1.33	4.00	5.56	79.46		1.08	4.93	0.76	1.97	3.25	3.99	1.38	4.85	4.80	8.53	1.08	3.80	5.32		1999	12	6	6	31.3	140	8.7		3.0	25.0
08/12/1999 06:00	1.60	4.30	5.26	94.1		1.42	5.30	1.02	2.69	3.50	4.42	1.81	5.26	4.86	9.14	1.44	4.14	5.66		1999	12	8	6	35.3	110	9.8		2.5	24.5
11/12/1999 19:00	1.32	3.81	4.55	344.76		1.13	4.50	0.82	2.25	3.44	4.01	1.43	4.46	4.41	6.48	1.16	3.73	4.97		1999	12	11	18	50	350	13.9		1.3	23.3
13/12/1999 19:00	2.46	5.26	6.25	98.48		2.35	6.13	1.66	4.62	4.33	5.30	3.05	6.11	6.24	8.74	2.35	5.10	6.45		1999	12	13	18	53.6	110	14.9		1.4	23.4
15/12/1999 21:00	2.20	5.00	5.88	98.16		1.85	6.08	1.33	3.63	3.92	5.07	2.30	6.03	6.66	8.75	1.88	4.79	6.80		1999	12	15	21	48.2	120	13.4		1.3	23.3
18/12/1999 19:00	1.39	3.88	4.76	351.51		1.18	4.85	0.84	2.00	3.49	4.16	1.45	4.93	5.55	7.29	1.19	3.97	5.24		1999	12	18	18	40.7	350	11.3		3.0	25.0
19/12/1999 14:00	1.53	4.26	5.00	111.09		1.34	5.18	0.95	2.11	3.40	4.34	1.66	5.20	4.64	8.63	1.34	4.07	5.86		1999	12	19	15	35.3	120	9.8		1.4	23.4
21/12/1999 02:00	2.51	5.33	6.67	100.23		2.08	5.99	1.46	3.36	4.10	4.89	2.62	6.20	6.05	9.60	2.06	4.89	7.01		1999	12	21	3	50	110	13.9		0.6	22.6
23/12/1999 20:00	1.36	3.81	4.17	92.08		1.24	4.92	0.89	2.39	3.34	4.10	1.56	4.98	4.73	7.28	1.26	3.83	4.86		1999	12	23	21	37.1	90	10.3		2.9	24.9
25/12/1999 21:00	2.05	4.49	6.25	89.3		1.80	5.72	1.27	3.12	3.69	4.65	2.27	5.81	5.57	9.51	1.80	4.49	5.98		1999	12	25	21	42.5	110	11.8		2.6	24.6
27/12/1999 09:00	2.34	5.00	5.88	61.66		1.86	6.08	1.33	3.41	3.84	5.09	2.38	5.92	5.89	8.94	1.88	4.72	5.98		1999	12	27	9	46.4	60	12.9		2.0	24.0
29/12/1999 23:00	0.88	3.31	3.70	354.23		0.75	4.04	0.54	1.27	2.99	3.52	0.92	4.01	4.01	9.23	0.76	3.31	3.61		1999	12	29	21	37.1	330	10.3		1.5	23.5

Table A-2. List of swell waves averaged for recorded days used in swell direction analysis

Date	Avg dir	Date	Avg dir	Date	Avg dir	Date	Avg dir	Date	Avg dir
	Deg from N		Deg from N		Deg from N		Deg from N		Deg from N
1/8/96	68	1/01/1997	75	2/01/1998	75	1/2/99	68	01/01/00	68
4/9/96	63	2/01/1997	74	12/01/1998	69	1/5/99	64	01/04/00	68
4/11/96	72	4/01/1997	67	13/01/1998	65	1/6/99	75	01/05/00	60
5/9/96	69	5/01/1997	68	14/01/1998	70	1/7/99	69	01/14/00	62
6/9/96	71	22/01/1997	67	15/01/1998	70	1/8/99	63	01/15/00	67
25/07/1996	73	23/01/1997	67	16/01/1998	73	1/9/99	70	01/16/00	55
27/07/1996	73	24/01/1997	71	21/01/1998	66	1/10/99	65	01/17/00	67
28/07/1996	69	25/01/1997	71	22/01/1998	68	1/11/99	69	01/18/00	66
29/07/1996	69	26/01/1997	71	23/01/1998	73	1/22/99	68	01/19/00	65
30/07/1996	66	27/01/1997	70	24/01/1998	65	1/24/99	69	01/28/00	67
8/11/96	66	28/01/1997	71	31/01/1998	73	1/26/99	70	01/29/00	65
8/12/96	74	29/01/1997	73	2/02/1998	75	1/27/99	67	02/05/00	61
15/08/1996	64	30/01/1997	70	13/02/1998	74	1/28/99	68	02/06/00	60
16/08/1996	65	31/01/1997	71	14/02/1998	70	1/29/99	64	02/13/00	70
17/08/1996	64	2/02/1997	71	15/02/1998	73	1/30/99	69	02/14/00	61
18/08/1996	66	4/02/1997	67	16/02/1998	72	1/31/99	66	03/05/00	59
9/11/96	74	20/02/1997	63	20/02/1998	76	2/1/99	64	03/06/00	57
9/12/96	78	21/02/1997	67	21/02/1998	73	2/5/99	61	03/13/00	66
15/09/1996	78	22/02/1997	69	22/02/1998	75	2/7/99	69	03/15/00	69
25/09/1996	70	23/02/1997	68	23/02/1998	75	2/9/99	72	03/22/00	61
26/09/1996	73	24/02/1997	68	2/03/1998	74	2/10/99	67	04/05/00	62
27/09/1996	71	28/02/1997	64	13/03/1998	70	2/11/99	60	04/06/00	54
28/09/1996	80	2/03/1997	64	14/03/1998	70	2/14/99	69	04/16/00	70
28/10/1996	68	4/03/1997	67	15/03/1998	76	2/15/99	71	04/17/00	65
29/10/1996	70	5/03/1997	65	16/03/1998	81	2/16/99	71	04/18/00	66
30/10/1996	71	11/03/1997	72	23/03/1998	67	2/17/99	68	04/19/00	64
31/10/1996	75	16/03/1997	64	24/03/1998	74	2/18/99	74	04/20/00	66
19/11/1996	62	23/03/1997	72	25/03/1998	68	2/19/99	71	04/21/00	65
25/11/1996	67	5/04/1997	67	26/03/1998	66	2/22/99	71	04/22/00	59
26/11/1996	68	6/04/1997	65	27/03/1998	70	2/23/99	67	04/23/00	60
22/12/1996	60	11/04/1997	73	28/03/1998	66	2/24/99	66	04/29/00	63
26/12/1996	65	30/04/1997	62	29/03/1998	72	2/25/99	64	04/30/00	63
29/12/1996	69	1/05/1997	62	30/03/1998	72	2/26/99	68	05/05/00	63
30/12/1996	69	5/05/1997	67	2/04/1998	72	3/1/99	63	05/06/00	55
31/12/1996	75	6/05/1997	64	12/04/1998	63	3/7/99	70	05/13/00	62
		11/05/1997	71	14/04/1998	68	3/9/99	75	05/14/00	67
		23/05/1997	70	20/04/1998	68	3/10/99	62	05/15/00	65
		26/05/1997	65	21/04/1998	70	3/15/99	62	05/20/00	61
		27/05/1997	63	24/04/1998	67	3/22/99	67	05/21/00	52
		28/05/1997	67	25/04/1998	68	3/23/99	69	05/30/00	63
		29/05/1997	66	26/04/1998	68	3/28/99	66	05/31/00	62
		1/06/1997	67	27/04/1998	61	3/29/99	72	06/03/00	58
		5/06/1997	66	28/04/1998	66	4/1/99	69	06/05/00	64
		9/06/1997	70	29/04/1998	66	4/11/99	59	06/06/00	57
		11/06/1997	71	1/05/1998	76	4/18/99	66	06/19/00	60
		23/06/1997	59	2/05/1998	68	4/24/99	55	06/20/00	63
		28/06/1997	69	8/05/1998	70	4/25/99	56	06/21/00	66
		29/06/1997	71	12/05/1998	70	4/26/99	63	06/23/00	68
		30/06/1997	71	20/05/1998	75	4/27/99	62	06/28/00	67
		1/07/1997	69	22/05/1998	67	4/28/99	60	06/29/00	66
		3/07/1997	63	23/05/1998	67	4/29/99	64	06/30/00	62
		9/07/1997	68	24/05/1998	70	4/30/99	64	07/03/00	60
		1/08/1997	72	25/05/1998	69	5/2/99	69	07/05/00	58
		1/09/1997	67	1/06/1998	69	5/4/99	65	07/06/00	55
		3/09/1997	68	3/06/1998	67	5/9/99	66	08/03/00	62
		18/09/1997	59	4/06/1998	65	5/11/99	60	09/02/00	61
		29/09/1997	63	8/06/1998	73	5/13/99	71	09/03/00	59
		1/10/1997	69	11/06/1998	70	5/26/99	67	10/02/00	62
		3/10/1997	67	13/06/1998	67	5/27/99	70	10/06/00	57
		15/10/1997	71	14/06/1998	69	5/28/99	72	11/02/00	66
		16/10/1997	73	15/06/1998	73	5/30/99	73	11/03/00	62
		17/10/1997	74	21/06/1998	65	5/31/99	74	11/05/00	64
		18/10/1997	74	22/06/1998	68	6/2/99	69	11/06/00	60
		20/10/1997	45	23/06/1998	68	6/4/99	60	12/03/00	64
		21/11/1997	73	25/06/1998	68	6/9/99	71	12/06/00	60
		24/11/1997	71	26/06/1998	71	6/11/99	63		
		25/11/1997	69	28/06/1998	68	6/15/99	57		
		3/12/1997	51	29/06/1998	70	6/19/99	69		
		14/12/1997	69	3/07/1998	72	6/20/99	71		
		15/12/1997	77	7/07/1998	72	6/29/99	67		
		16/12/1997	69	8/07/1998	71	6/30/99	67		

17/12/1997	71	12/07/1998	65	7/2/99	69
18/12/1997	77	14/07/1998	64	7/5/99	66
20/12/1997	56	15/07/1998	65	7/9/99	66
21/12/1997	76	16/07/1998	62	7/11/99	65
22/12/1997	77	25/07/1998	71	7/13/99	61
23/12/1997	73	27/07/1998	74	7/14/99	64
24/12/1997	72	28/07/1998	74	7/15/99	73
25/12/1997	72	29/07/1998	72	7/16/99	61
		30/07/1998	69	7/17/99	63
		2/08/1998	73	7/18/99	64
		3/08/1998	65	7/19/99	70
		4/08/1998	63	7/20/99	70
		8/08/1998	69	7/21/99	69
		13/08/1998	71	7/23/99	72
		14/08/1998	69	7/27/99	52
		18/08/1998	66	7/28/99	67
		19/08/1998	64	7/29/99	64
		20/08/1998	67	7/29/99	64
		28/08/1998	70	7/31/99	64
		2/09/1998	72	8/1/99	72
		4/09/1998	69	8/2/99	74
		8/09/1998	66	8/5/99	72
		13/09/1998	72	8/9/99	62
		14/09/1998	69	8/11/99	63
		15/09/1998	69	8/20/99	73
		16/09/1998	65	8/21/99	72
		20/09/1998	67	8/27/99	71
		21/09/1998	67	8/28/99	70
		23/09/1998	70	8/29/99	69
		24/09/1998	70	09/01/99	70
		25/09/1998	71	09/02/99	73
		26/09/1998	72	09/05/99	67
		27/09/1998	73	09/09/99	62
		28/09/1998	72	09/13/99	70
		29/09/1998	71	09/23/99	70
		2/10/1998	71	09/24/99	57
		4/10/1998	68	09/25/99	58
		6/10/1998	66	09/27/99	71
		8/10/1998	72	09/28/99	58
		9/10/1998	72	09/29/99	64
		13/10/1998	67	09/30/99	66
		14/10/1998	66	10/9/99	62
		15/10/1998	66	10/19/99	71
		16/10/1998	66	10/26/99	59
		19/10/1998	71	10/27/99	65
		2/11/1998	74	11/4/99	60
		4/11/1998	72	11/5/99	70
		6/11/1998	66	11/7/99	68
		8/11/1998	68	11/11/99	72
		9/11/1998	71	11/13/99	57
		17/11/1998	69	11/15/99	53
		18/11/1998	72	11/23/99	64
		19/11/1998	70	11/24/99	63
		21/11/1998	65	12/5/99	71
		22/11/1998	67	12/7/99	66
		23/11/1998	71	12/28/99	75
		29/11/1998	63	12/29/99	72
		30/11/1998	67	12/30/99	70
		2/12/1998	74	12/31/99	65
		4/12/1998	72		
		6/12/1998	60		
		8/12/1998	71		
		9/12/1998	71		
		14/12/1998	68		
		15/12/1998	73		
		16/12/1998	73		
		17/12/1998	71		
		28/12/1998	69		
		29/12/1998	70		
		30/12/1998	69		
		31/12/1998	67		