

2

*A Wind and Wave  
Climatology  
of the  
Strait of Georgia*

*D. A. Faulkner*

Report No. PAES 82-2

Scientific Services Division  
Atmospheric Environment Service, Pacific Region  
Environment Canada  
Vancouver, Canada

October 15, 1982

A Wind and Wave Climatology  
of the Strait of Georgia

D.A. Faulkner

Report No. PAES 82-2

Scientific Services Division  
Atmospheric Environment Service, Pacific Region  
Environment Canada  
Vancouver, Canada

October 15, 1982

This report has received limited distribution. Reference to it is permitted if the words "unpublished manuscript" are part of the bibliographic entry.

A Wind and Wave Climatology of  
the Strait of Georgia

Abstract

This report is a compilation and discussion of the available wind and wave data for the Strait of Georgia, British Columbia, Canada. Measured wave data are augmented with synthesized data.

## A Wind and Wave Climatology of the Strait of Georgia

### 1. Introduction

The Strait of Georgia -- so-named by Captain Vancouver to honour George III -- is an inland salt-water sea separating Vancouver Island from the British Columbia mainland (See Figure 1). Oriented northwest to southeast, it stretches 120 nautical miles (222 km) from Quadra Island in the north to Orcas Island in the south. It is only 18 nautical miles (33 km) wide. To the southwest is the Vancouver Island range with peaks to 2100 m; on the northeast shore the mountains rise steeply with peaks reaching over 4000 m. Deep fjords, chief among which are the Howe Sound, Jervis, Toba and Bute Inlets, cut deep channels into this shore. In the south, the Strait opens eastward to the Fraser lowlands which include the Fraser River and its delta. The western shore rises more gradually over the Nanaimo lowlands. Many small islands comprising the Gulf Islands of B.C. and San Juan Islands of Washington form the southwestern and southern edge of the Strait.

The Strait averages about 80 fathoms (146m) in depth and reaches a maximum of 230 fathoms (420m) near the southern end of Texada Island. Some inlets are much deeper; Jervis Inlet, for example, drops to a depth of 400 fathoms (732m).

For a more complete description of the physical geography of the Strait the reader is referred to the excellent article by Barker (1974).

Because it is sheltered, and because it is close to the urban centres of Vancouver, Victoria and other cities and towns, the Strait is a favourite locale for pleasure boating and sports fishing. As well, the Strait is the location of a great deal of economic activity, much of it related to forestry and fishing. The waters of the Strait are fished for salmon, herring, crustaceans and other species. The Strait serves as a transportation route for log booms, for barges loaded with sulphur or sawdust, for cruise ships and ferries, and for ships carrying coal to Japan, wheat to China or other countries. Other activities take place on or under its waters, for example laying cables and pipes from the mainland to Vancouver island.

All of the above activities are sensitive to weather, in particular to winds and waves. It is surprising therefore that no publication describing the climate of the Strait of Georgia exists. It is to overcome this lack that this study was undertaken.

This report looks first at the features which control the climate of the Strait of Georgia. Following that are two sections describing the wind and wave climate of the Strait. Tables of data are included as Appendices. Much of the data is a compilation of information available elsewhere, mainly in the Atmospheric Environment Service (AES) archives. However, wave climate data are sparse and they are augmented in this report by synthesized data.

## 2. Climate Controls

Two semi-permanent atmospheric pressure systems control the climate of the Strait of Georgia; the Pacific Anticyclone (or Pacific High) and the Aleutian Low. Mean positions of these features in January and July are shown in Figures 2 and 3.

In winter, the Aleutian Low (centred near  $50^{\circ}\text{N}$   $180^{\circ}\text{W}$ , Figure 2) reaches its greatest intensity. At the same time, the Pacific High (centred Near  $30^{\circ}\text{N}$ ,  $138^{\circ}\text{W}$ ) is at its weakest. The prevailing gradient of pressure along the coast then is from southeast to northwest.

Winter is also the time of frequent and intense extratropical cyclone development in the Pacific. Many of these storms are born in the eastern Pacific, then move rapidly northeastward along the preferred tracks as shown in Figure 2 but are blocked by the coastal mountain ranges. Others migrate from the western Pacific but are also blocked by the mountains. The fronts associated with the cyclones are less inhibited by the mountains and are generally swept out of the cyclones as the latter stall. The fronts bring copious amounts of rain to the B.C. coast; strong winds frequently accompany them.

In summer, the Pacific Anticyclone strengthens and moves northward while the Aleutian Low weakens. In Figure 3, it is seen that the mean July position of the centre of the Pacific Anticyclone is near  $37^{\circ}\text{N}$ ,  $152^{\circ}\text{W}$ . At the same time the Pacific High is building, pressures over the North American continent decrease with the result that the pressure gradient (from high to low pressure) is directed to the east over the Strait of Georgia. At this time of year, the frequency of Pacific storms decreases and as can be seen from Figure 3, the preferred storm track moves northward. Hence Pacific storms reaching the B.C. Coast are infrequent and in general the frontal systems crossing the southern B.C. Coast are relatively inactive.

Location and terrain have an influence on B.C. coastal climate equal to that of the major pressure systems. The vast Pacific Ocean with its immense heat capacity maintains a relatively stable temperature regime all along the North American west coast. It also is a source region of abundant moisture. Moist winds (aloft) blowing from the Pacific drop most of their moisture on the western slopes of the Vancouver Island, Olympic and Coast Ranges, leaving the Strait of Georgia in a rain shadow.

The northwest-southeast orientation of the Strait forces surface winds to blow in generally northwest or southeast directions. As well, the Coast Range and Interior B.C. ranges block the westward flow of Arctic air in winter, although on occasion when a Polar anticyclone develops over the B.C. Interior, cold air rushes out to the coast through the fjords of the Coast Range. These "outflow" winds which are known locally as "Squamishes" named after the town at the head of Howe Sound where they are common, extend into and across the Strait of Georgia. However, topography then tends to back the winds into the northwest, and speeds lessen as the channel broadens.

### 3. The Wind Climate

Wind data from two main sources are used in this report:

- (i) ship reports, and
- (ii) anemometer records from observing sites on land.

The U.S. National Climate Centre at Asheville, N.C. maintains an archive of ship reports for the northern Hemisphere. Recently, the Atmospheric Environment Service (AES) of Environment Canada procured magnetic tape copies of the records. Reports from the Strait of Georgia were analysed using a computer program 'MAST' written for AES. These reports, a total of 7599 in all dating back to 1857, are thus an important data source.

The ship reports have limitations. Firstly, they tend to be biased towards "fair weather" (since crews obviously attempt to avoid hazardous conditions); they are biased toward daylight hours and toward summer months. The latter is evident from Table 1. As well, many of the "measurements" of wind speed, etc., are visual estimates. No doubt, many of the observers are experienced in estimating wind speed and wave height, nevertheless we must recognize this as an obvious source of measurement error.

Measurements of wind speed and direction are made and recorded at a number of airports, lighthouses and marine radio stations on the shore of the Strait of Georgia. A list of the main stations used in this report is given in Table II and the locations are indicated in Figure 1.

Two anemometer types are employed to measure winds at these stations; the U2A and the 45B. Both are standard three-cup anemometers. The U2A records "instantaneous" speeds on a strip chart but archived records are generally one-minute means recorded on the hour. The 45B is an integrating type and speeds from 45B stations are one-hour means. (Note. A Weather Measure propeller anemometer was used briefly at Tsawwassen Ferry. Speeds from it were one-minute means).

Shore-based observations are un-biased but, unfortunately, are not necessarily representative of the water area. The lower frictional resistance of air passing over a water surface, as compared to a land surface, generally means higher speeds over water. Hsu (1981) indicates the increase in speeds for light winds (less than 12 kt) may be 20 to 150 percent; for stronger winds (greater than 20 kt) it is likely to be 10-20 percent. On the other hand, higher surface temperatures over land, at least in summer leads to greater instability over land and may result in increased surface wind speeds. Thirdly, water to land temperature differences give rise to land and sea breezes which are recorded on shore but are not representative of the winds some distance from shore.

9

Distribution of Ship Reports  
in the Strait of Georgia by months  
for the Period 1857-1979

Table 1

<u>Month</u>	<u>Number of Reports</u>
January	285
February	211
March	350
April	704
May	863
June	1259
July	947
August	815
September	503
October	666
November	788
December	208
Total	7599

Table II - Anemometer Locations

Station	Latitude, Longitude	Station Elevation (m)	Anemometer Type	Period of Record
Comox	49° 43'N 124° 54'W	24	45B U2A	1953-59 1959-79
Ballenas Island	49° 21'N 124° 11'W	11	45B	1966-79
Merry Island	49° 28'N 123° 54'W	6	45B	1963-79
Entrance Island	48° 47'N 123° 3'W	38	45B	1969-79
Sandheads Lightstation	49° 6'N 123° 18'W	0	45B	1967-79
Tsawwassen Ferry	49° 0'N 123° 8'W	3	45B Weather Measure U2A	1961-74 1974-75 1975-79
Saturna Island Light	48° 47'N 123° 3'W	38	45B	1968-79
Squamish FMC	49° 41'N 123° 10'W	3	45B	1971-76

Wind direction is also influenced by terrain. As stated earlier, winds tend to be channelled or blocked by valleys and ridges, thus directions on shore can differ from those over the water.

The general wind climate of the Strait of Georgia is evident from Figures 4-8, seasonal and annual wind roses based on the analysis of ship reports. The same data are presented in tables in Appendix A. It is obvious that the prevailing directions are southeasterly and northwesterly although easterly and westerly winds are frequent as well. The prevailing direction in winter is southeasterly, in summer it reverses to northwesterly. The stronger winds (35 kt or greater) are likely to be from the southeast or east but, as we will see later, extreme winds may be northwesterly, westerly, or on rare occasions, northeasterly.

For a more detailed analysis of the wind climate of the Strait, we must look at the records from shore stations. Analyses of seasonal and annual winds for seven Georgia Strait stations are provided in Appendix A. (Analyses for Squamish are included since it is the only station for which data from one of the inlets are available). The tables give frequency of occurrence by speed and direction.

(i) Winds in Winter (December - February)

In winter, the prevailing winds are easterly or southeasterly in all but the southern end of the Strait reflecting the large-scale pressure gradient and the northwest-southeast orientation of the valley in which the Strait is located. A pattern frequently repeated is as follows: A Pacific frontal system in a generally north-south line approaches the coast from the west. As it does so, easterly or southeasterly winds freshen reaching their peak, often gale strength or greater, just ahead of the front. After the frontal passage, winds veer to the south or southwest, slacken and gradually return to their usually easterly or southeasterly direction. However, if the front is accompanied by a very sharp trough of low pressure, as is often the case, after the frontal passage winds may veer sharply to the northwest and strengthen quickly to gale force. After blowing from the northwest for a few hours, perhaps a day, they gradually abate and slowly revert to easterly. We find then that the strongest recorded winds at most stations are southeasterly, but in some months the strongest winds are northwesterly. (See Appendix B for listings of maximum speeds).

In winter, the air over the land mass of the mainland of western Canada is generally colder than the air over the water. The cold air tends to drain seaward through the valleys and fjords of the Coast ranges. The prevailing northerlies at Squamish (see Appendix A) are an indication of this drainage wind. Such winds no doubt occur in other inlets (Toba and Jervis in particular) but no data are available to confirm this.

The air over the land becomes coldest when an Arctic air mass floods southward to cover the prairie provinces and spills out to the

coast through mountain passes. At such times, an intense ridge of high pressure or a cell of high pressure develops in the B.C. Interior with a strong pressure gradient perpendicular to the coastline. The cold air then rushes out through fjords to the sea and strong northerlies or northeasterlies ("Squamishes") develop. These strong northerlies also develop in valleys of tributaries of the Fraser River (such as Harrison Lake) and the cold air flows out through the Fraser Valley and over the waters of the southern Strait. This occurs so frequently, particularly in January, that the prevailing wind direction in the southern Strait (note Saturna Island) is northeasterly. This together with northerly or easterly winds on the eastern shore of Puget Sound has led authors such as Harris and Rattray (1954) to conclude there is a small-scale cyclonic circulation in winter with its centre over the San Juan Islands.

(ii) Winds in Spring (March - May)

In March, the large-scale gradient is still such that winds in the Strait of Georgia reflect the winter pattern save that northeasterlies in the southern part of the Strait are infrequent. By May however, the Pacific High begins to re-build and the storm frequency and intensity decrease markedly. A harbinger of the coming summer, winds in Juan de Fuca Strait are more frequently westerly.

Prevailing winds in spring are southeasterly or easterly everywhere except in the southern end of the Strait. There, the air entering from Juan de Fuca Strait turns to the left giving predominantly southerly winds. Near the shore-line of Vancouver Island, the westerly and northwesterly winds increase in frequency until they predominate in late spring.

Inspection of the tables of Appendix B will show that the strongest winds of the year may occur as late as March. One particularly violent wind storm occurred during Easter 1975 (March 30) as a cold front swept southward from the northern Gulf of Alaska. Southeasterly winds with winds generally less than 20 knots shifted abruptly to northwest behind the cold front and, at times, reached speeds of over 60 knots.

(iii) Summer (June - August)

The Pacific High attains its greatest strength in mid-summer, thus one would expect prevailing winds to be northwesterly over much of the B.C. coast. And while this is generally true, there are notable exceptions. Since air is constrained to move through channels open to it, summer winds in Juan de Fuca Strait are predominantly westerly. As in late spring, these winds turn northerly as they round the tip of Vancouver Island and a southwesterly flow prevails in the southern extremity of the Strait of Georgia.

It will be noted that the prevailing winds near the Vancouver Island shore are westerly or northwesterly, those near the mainland shore southeasterly. This suggests, as in the winter case, a small-scale

- 7 -

counter-clockwise (i.e. cyclonic) circulation. However, it must be remembered that summer is the time of year when sea and land-breezes are most common and these local circulations overcome the usually weak large-scale circulations to determine the prevailing wind directions. Emslie (1971, 1972) has discussed these local summer circulations and indicates that the land-breezes, although weak, tend to persist and hence appear as prevailing winds.

At times, the large-scale gradient is strong enough that the local sea and land breezes cannot over come it. At such times, the winds tend to be northwesterly throughout the Strait. For example, at Sandheads in summer (see Appendix A) the prevailing wind is southeast. However, if we consider only stronger winds, 17 kt or greater, say, the prevailing direction is northwest.

#### (iv) Autumn (September - November)

Rather quickly in October the Pacific Anticyclone weakens, the Aleutian Low deepens and by late October winter storms start to batter the coast once more. The summer wind pattern continues into September but the transition to a winter one is rapid thereafter. Thus the wind roses tend to reflect both the summer and winter winds.

#### (v) Peak Winds

Appendix B contains listings of the strongest wind speeds recorded at Strait of Georgia stations. Also included are return periods of extreme wind speeds, regardless of direction, estimated using the so-called "Gumbel analysis" (Kendall, 1959).

Strongest winds occur as an intense Pacific depression moves into the northern Gulf of Alaska and generally just in advance of an approaching frontal system. Thus, referring to Appendix B, we see that strongest recorded winds at most stations are from the south to east quadrant. Strong northwesterly winds may also develop after the passage of a frontal system and in many cases strongest recorded winds are from the west to northwest octant. Very rarely are strong winds observed from other directions although in some Januaries the strongest winds at Saturna are northeasterly.

#### (vi) Wind Speed Distributions

For some applications, it is useful to know the frequency with which the wind speed, regardless of direction, is within a certain range, exceeds a certain value or is less than a particular value. Probability distributions of wind speeds may be used for this purpose. It has been found that the Weibull distribution may be used for this purpose (Davenport, 1967; Hennessey, 1977). Using a least squares regression method, Weibull distribution curves for the Strait of Georgia stations have been determined. Probability tables for these sites are given in Appendix C.

#### 4. Wind-Wave Climate

Wave measurements in the Strait of Georgia are rare. Indeed, the author is aware of only two series of measurements taken off Roberts Bank ( $49^{\circ}01'05''N$ ,  $123^{\circ}16'7''W$ ) and off Sturgeon Bank ( $49^{\circ}10'12''N$ ,  $123^{\circ}18'46''W$ ) with a Waverider Accelerometer Buoy. Analyses of these records were provided by the Marine Environmental Data Service (MEDS) of Fisheries and Marine Service, Ottawa. Significant wave height exceedance diagrams and peak period histograms from these records are reproduced as Figures 9-12.

Wave height estimates are included in the ship weather reports. Analyses of these are presented as tables in Appendix D even though we have only a small number (913) of them for the period 1857-1979. An annual "wave rose", i.e. a diagram depicting frequency of wave height by direction is included as Figure 13.

(Reports of swell - on 223 occasions - have been ignored since the author believes that true swell, i.e. long-period waves which travel vast distances over the oceans, does not enter the Strait of Georgia).

To augment this meagre amount of wave information, synthesized data were developed using a method adapted from Richards and Phillips (1970). A sketch of the method follows:

- (i) Mean over-water winds for several points in Georgia Strait were estimated using data from a nearby land station - no speed corrections were applied.
- (ii) Fetches were estimated from a map.
- (iii) With a computer program the significant wave heights for a fully-aroused sea were calculated using the Bretschneider (1970, 1973) deep-water wind-wave relationships.
- (iv) The effects of fetch width were incorporated using the Saville (1953) weighting scheme.

Polar diagrams of significant wave heights for 10 points in Georgia Strait are included in Appendix D. These diagrams indicate the most probable significant wave height by season and wind direction.

It must be remembered that the method used does not take into account water depth, tides or currents, nor does it account for refraction, diffraction and reflection of waves.

As would be expected, highest waves are with northwesterly or southeasterly winds since maximum fetch lengths are in those directions. In the northern Strait, highest waves are with southeasterly winds, in the southern Strait they occur about evenly with northwest and southeast

- 9 -

winds. Notable also are the fairly high waves which develop near the mouth of the Fraser River when westerly or southwesterly winds blow. These usually occur immediately after the passage of a cold or occluded front.

A more detailed analysis of waves at two points, one off Vancouver, the other off Parksville was carried out using available wind spectrum data. Mathematical formulae previously discussed were used in this analysis, and again the assumption of a fully-aroused sea was made. Results are given in Appendix D, Figures D-12 to D-19 in which the frequency of occurrence of significant wave heights is plotted. At the point off Vancouver, highest significant wave height appears to be 2.75 metres. This agrees reasonably well with information provided by the Marine Environmental Data Service indicating the maximum recorded there was about 2.4 metres.

References:

- Barker, Mary L., 1974: Water Resources and Related Land Uses Strait of Georgia - Puget Sound Basin. Lands Directorate, Dept. of the Environment, Ottawa, Geophysical Paper No. 56. 55 pp.
- Bretschneider, C.L., 1970: Wave forecasting relations for wave generation. Look Lab/Hawaii, Vol. 1, No.3
- Bretschneider, C.L., 1973: Prediction of waves and currents. Look Lab/Hawaii, Vol. 3, No.1.
- Davenport, A.G., 1967: Dependence of wind loads on meteorological parameters. Proceedings of Wind Effects on Buildings and Structures Conference. September 11-15, 1967. Vol 1, p. 19
- Emslie, J.H., 1971: English Bay weather. Pacific Yachting, June 1971. 20-25.
- Emslie, J.H., 1972: Summer winds at Ballenas Island. Pacific Yachting, June 1972. 18-19.
- Harris, Russel G., and Maurice Rattray, Jr. 1954: The Surface Winds Over Puget Sound and the Strait of Juan de Fuca and their Oceanographic Effects. University of Washington Tech. Report 37. 101 pp.
- Hennessey, J.P., 1977: Some aspects of wind power statistics. J. Appl. Meteor. 16(2), 119-128.
- Hsu, S.A., 1981: Models for estimating offshore winds from onshore meteorological measurements. Boundary-Layer Meteor., 20(3), 341-351.
- Kendall, G.R., 1959: Statistical analysis of extreme values. First Canadian Hydrology Conference, Symposium on Spillway Design Floods, Ottawa Canada, November 4-5, 1959. Sponsored by National Research Council, Sub-Committee on Hydrology.
- Richards, T.L., and D.W. Phillips, 1970: Synthesized Winds and Wave Heights for the Great Lakes. Canada. Dept. of transport, Meteorolgical Br., Toronto. Climatological Studies Number 17. 53 pp.
- U.S. Navy, 1958: Marine Climatic Atlas of the World. Vol. II North Pacific Ocean. NAVAER 50-1C-529. Available from Superintendent of Documents, U.S. Government Printing Office, Washington, D.C.

Acknowledgement

The author expresses his thanks to David Guenther and Susan Chan who did much of the programming; to Ron McLaren who drafted several of the diagrams and to Lori Nicholson who typed the manuscript.

List of Figures

Figure 1. Location Chart

Figure 2. Normal mean sea level pressure pattern in January. Arrows indicate the principal tracks. Pressure units are hectopascals (or millibars). Source, U.S. Navy (1958).

Figure 3. Same as Figure 2 but for July.

Figure 4. Wind roses for Strait of Georgia - winter (December to February) based on ship reports 1857-1979.

Figure 5. Same as Figure 4 - spring (March to May)

Figure 6. Same as Figure 4 - summer (June to August)

Figure 7. Same as Figure 4 - autumn (September to November)

Figure 8. Same as Figure 4 - annual

Figure 9. Significant and maximum wave height exceedance diagrams for Roberts Bank (Source: Marine Environmental Data Service - MEDS)

Figure 10. Peak period histogram for Roberts Bank (Source: MEDS)

Figure 11. Same as Figure 8 but for Sturgeon Bank (Source: MEDS)

Figure 12. Same as Figure 9 but for Sturgeon Bank (Source: MEDS)

Figure 13. Wave rose for Strait of Georgia based on ship reports 1857-1979 - annual.

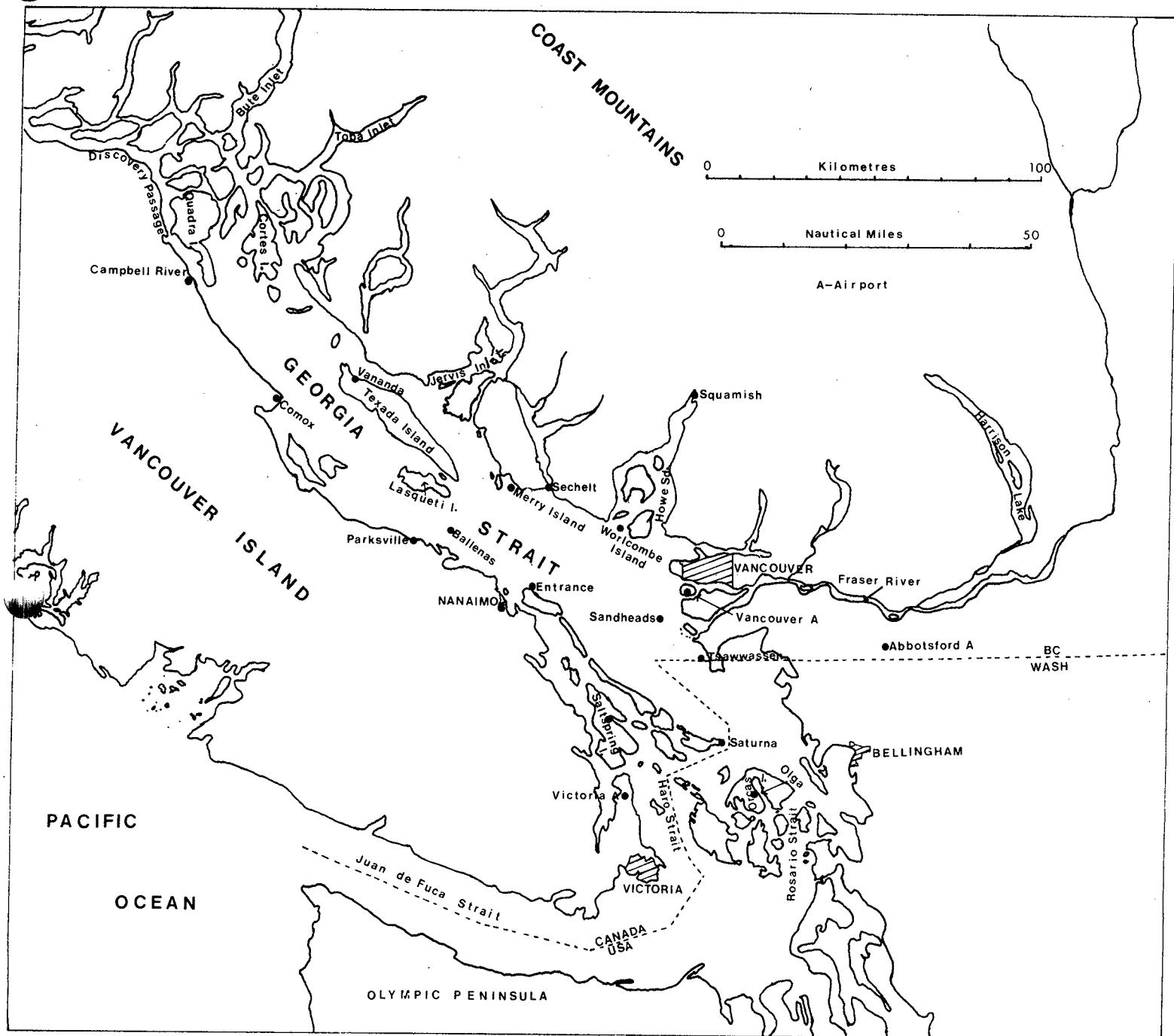


FIGURE 1

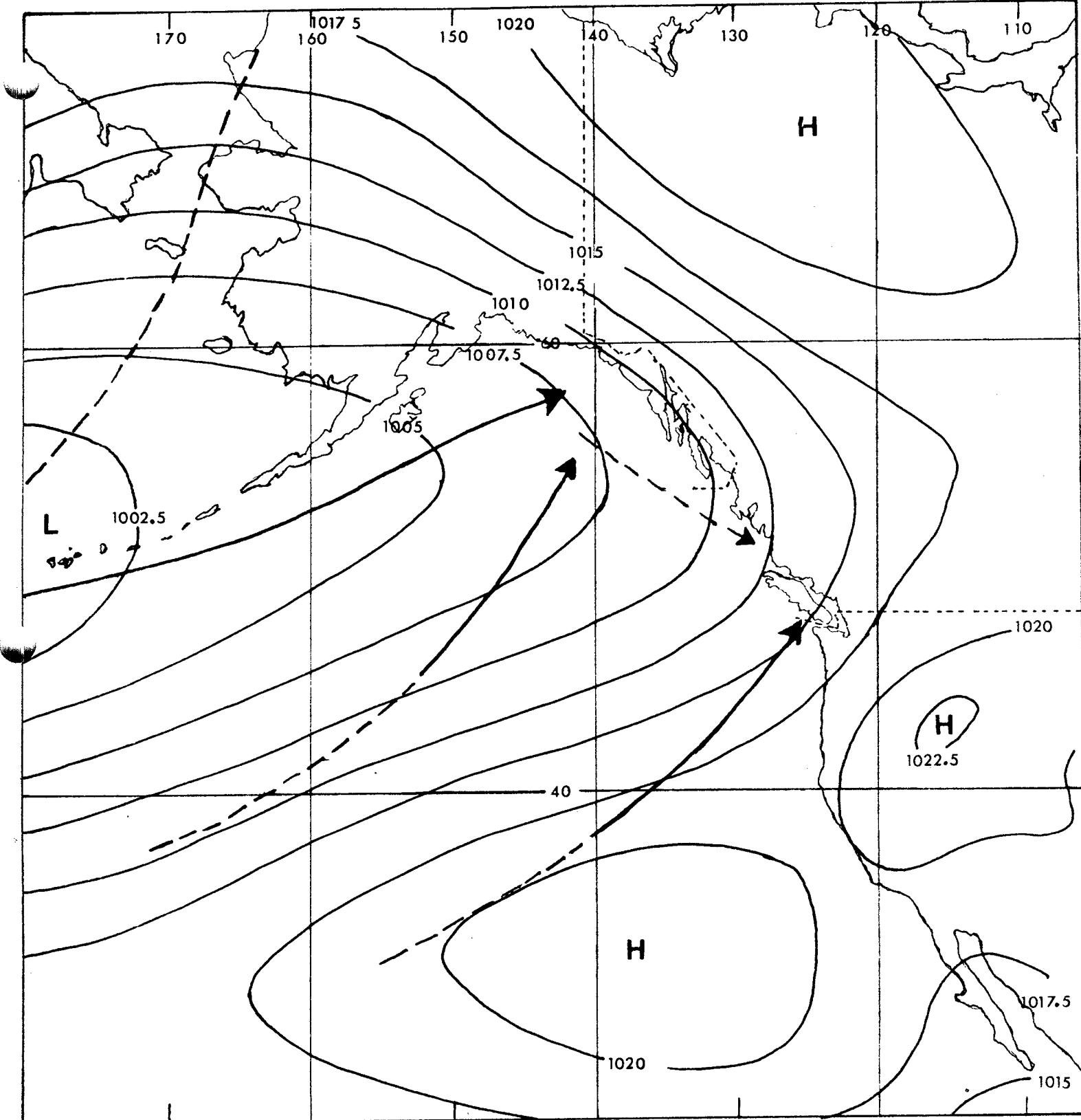


FIGURE 2

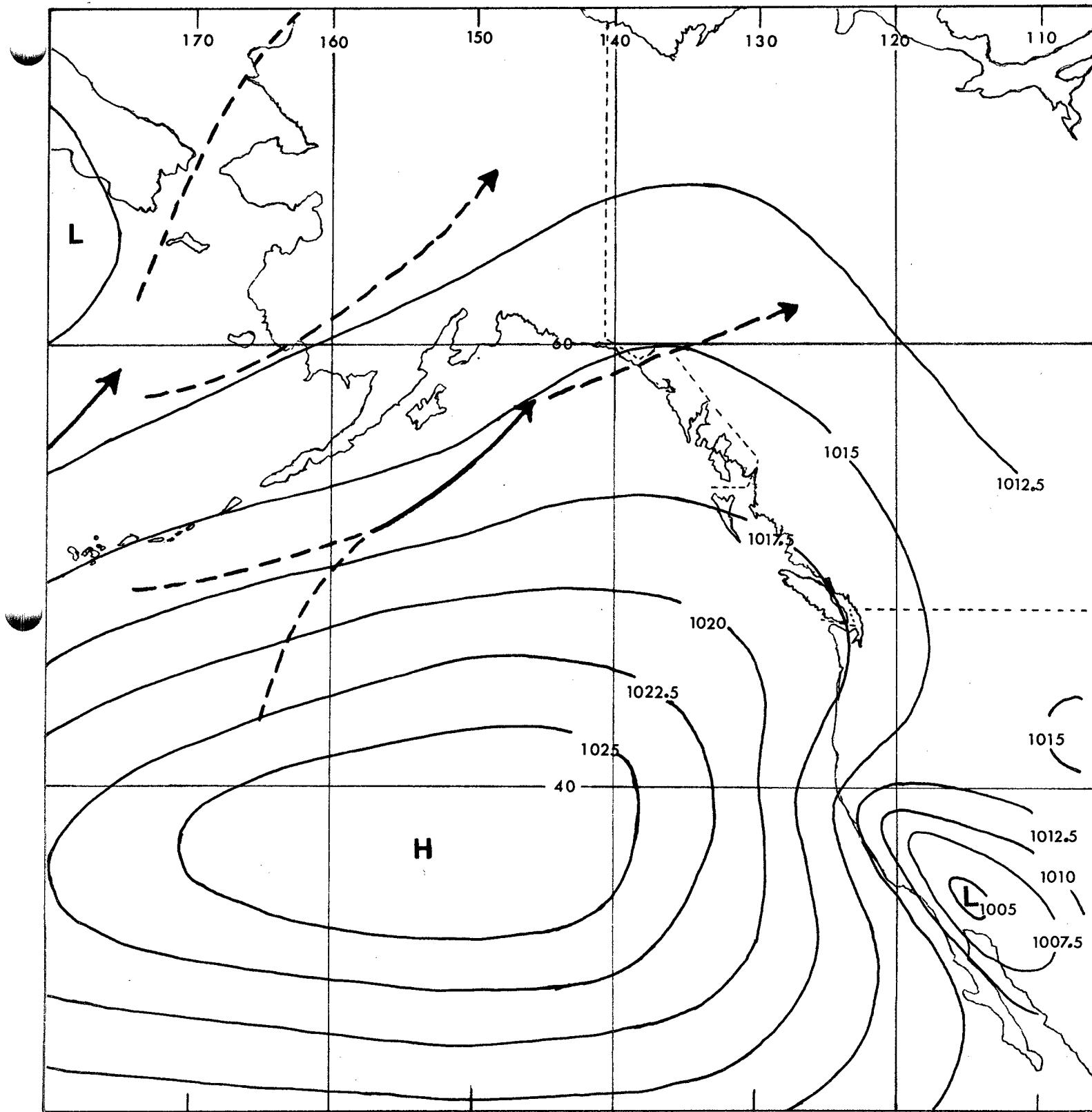


FIGURE 3

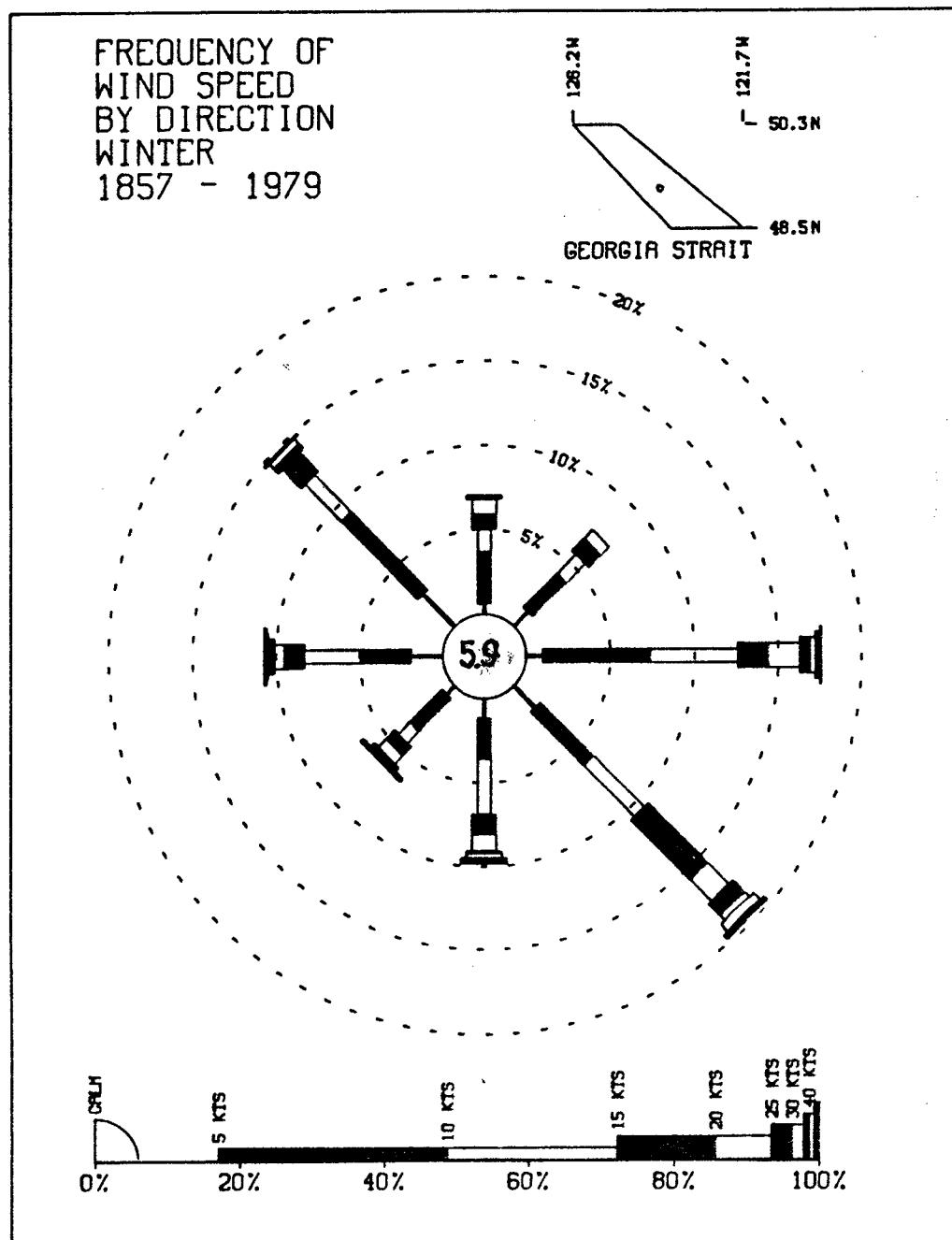


FIGURE 4

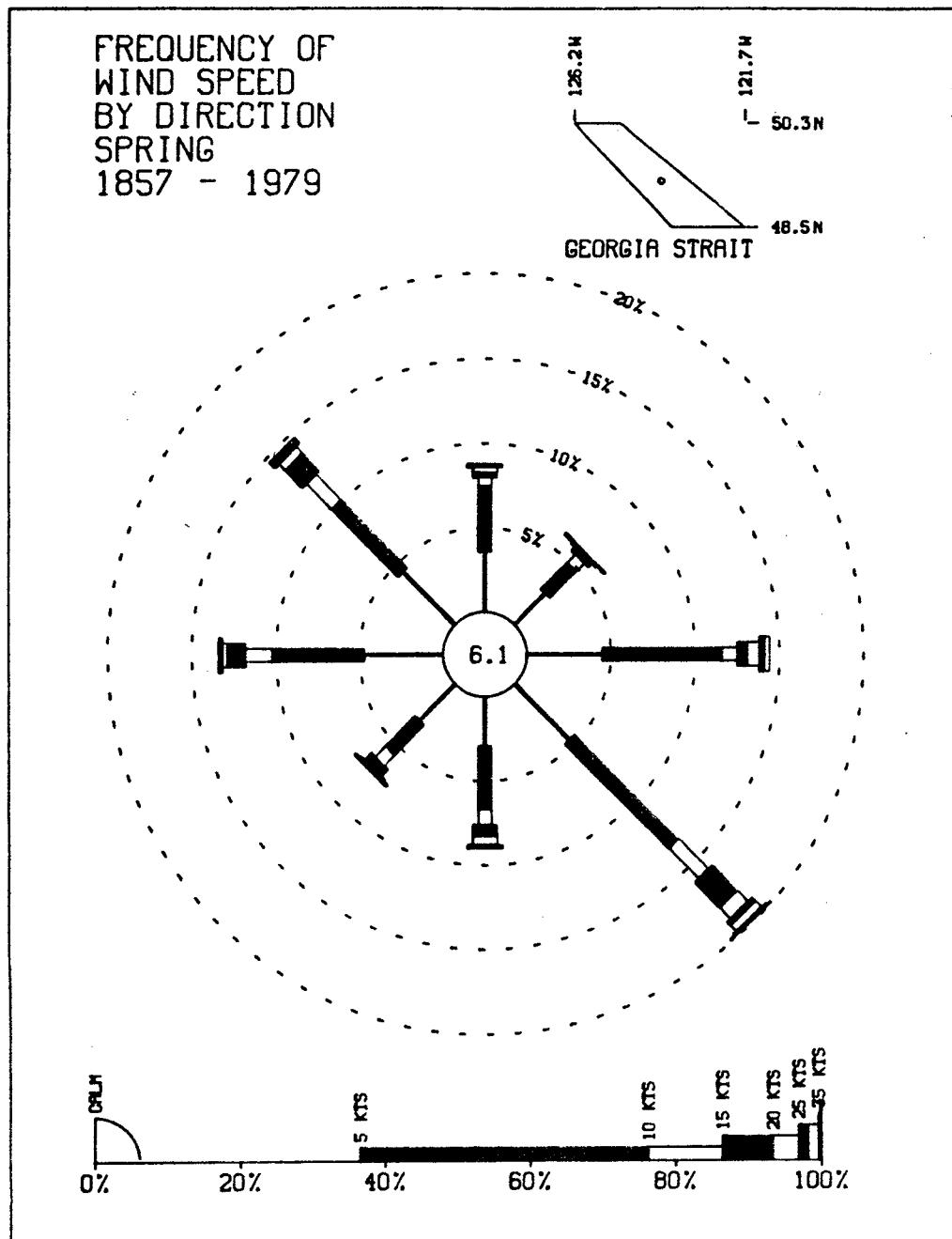


FIGURE 5

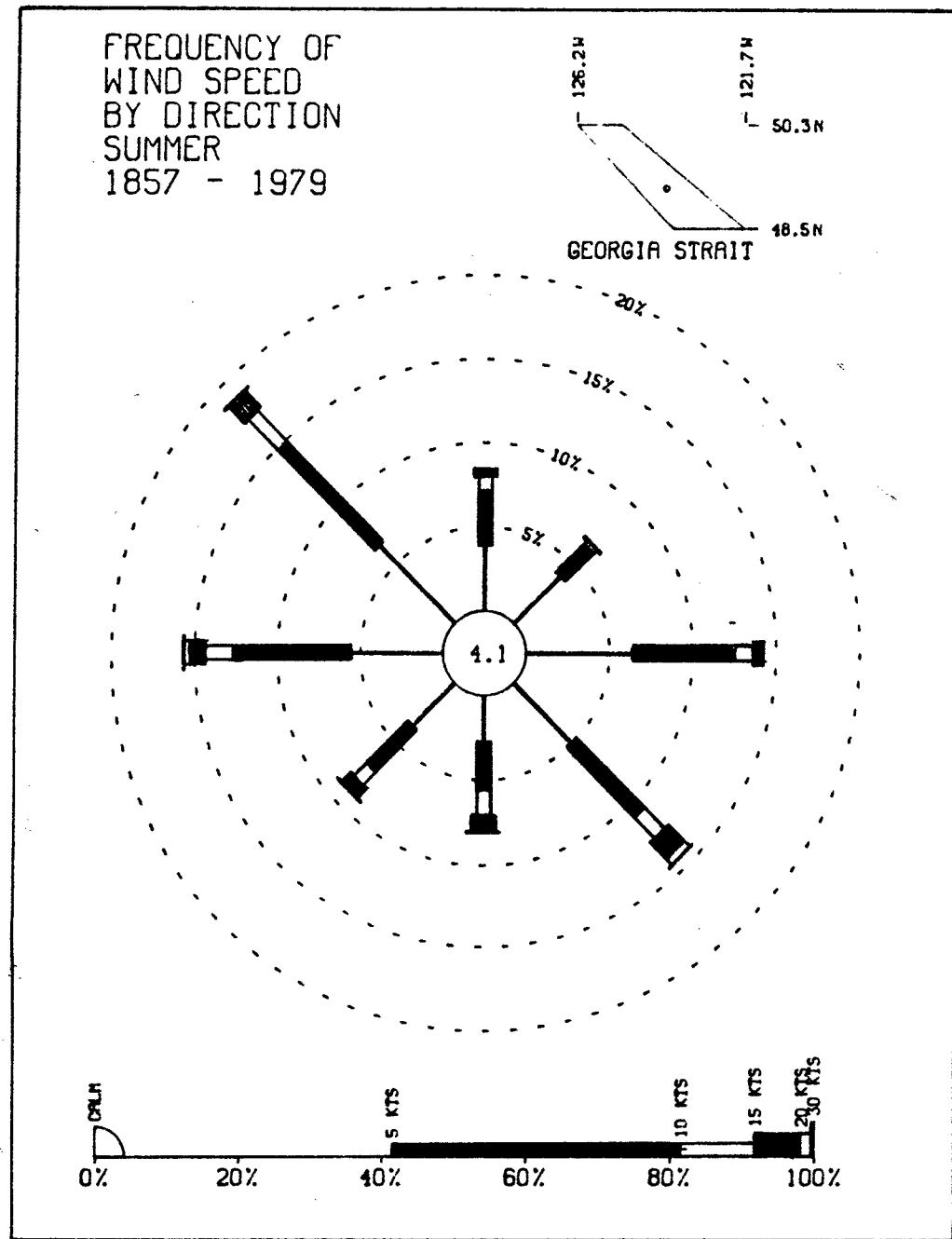


FIGURE 6

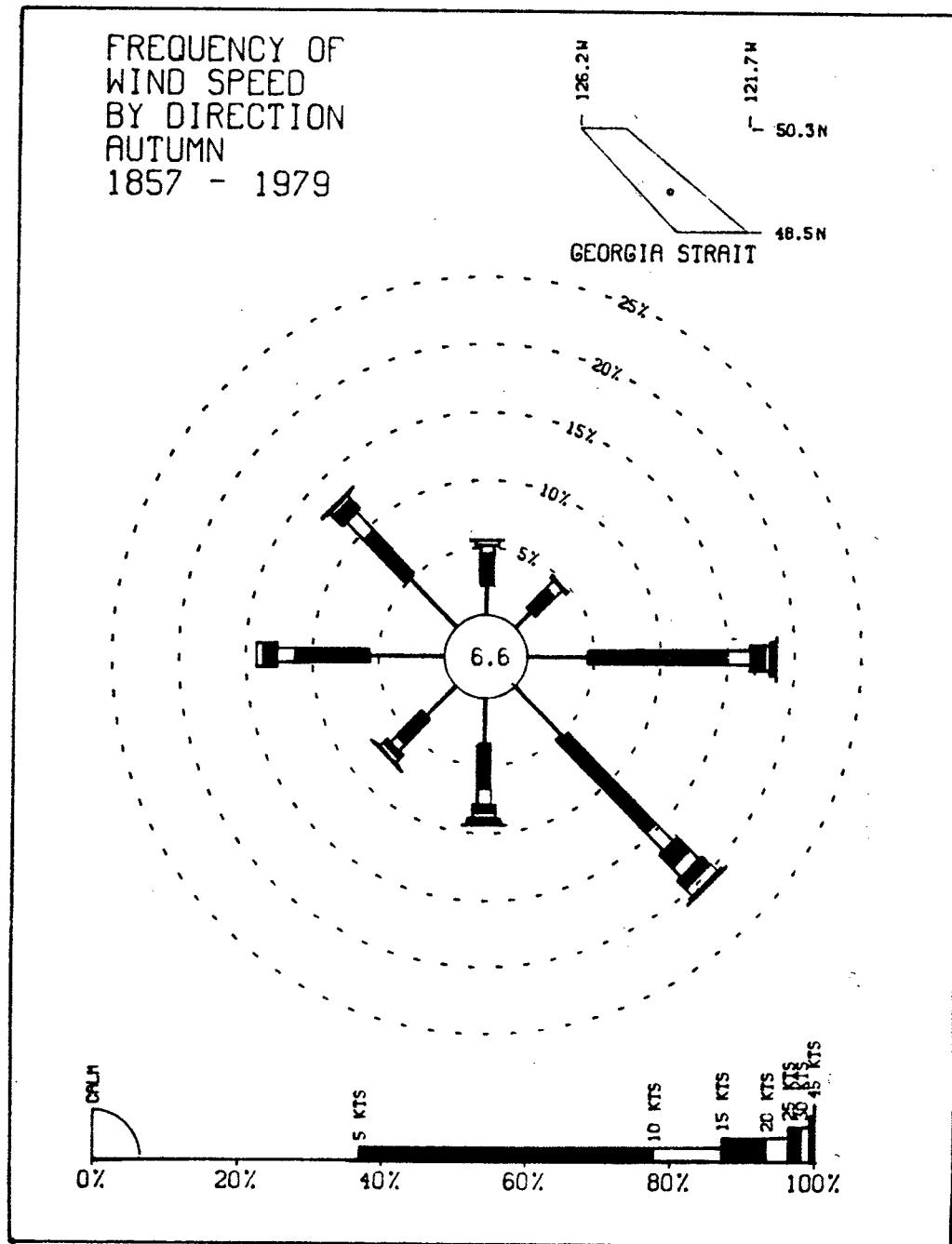


FIGURE 7

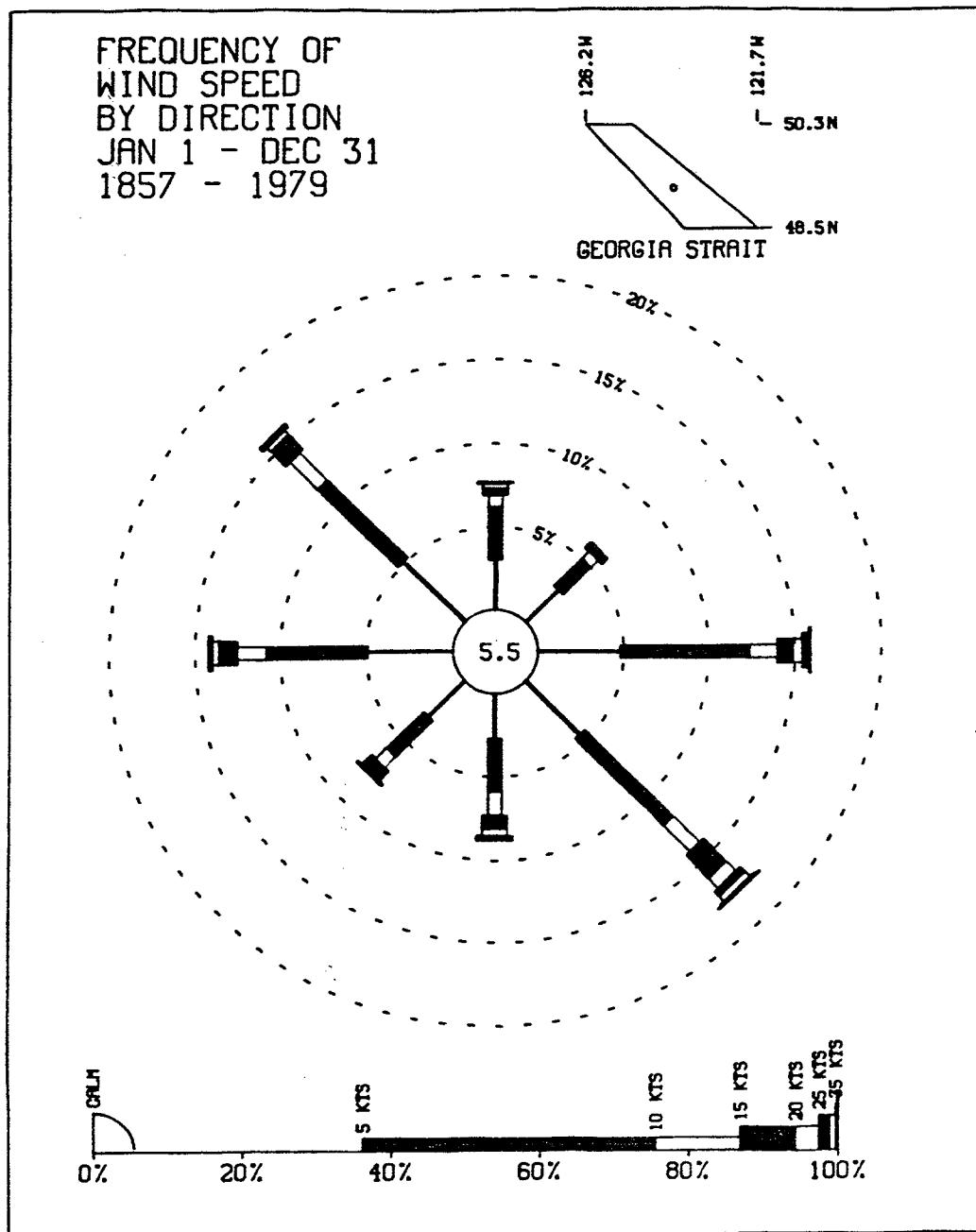


FIGURE 8

ROBERTS BANK, B.C.  
FEBRUARY 7, 1974 TO NOVEMBER 1, 1974.  
NUMBER OF OBSERVATIONS 1192

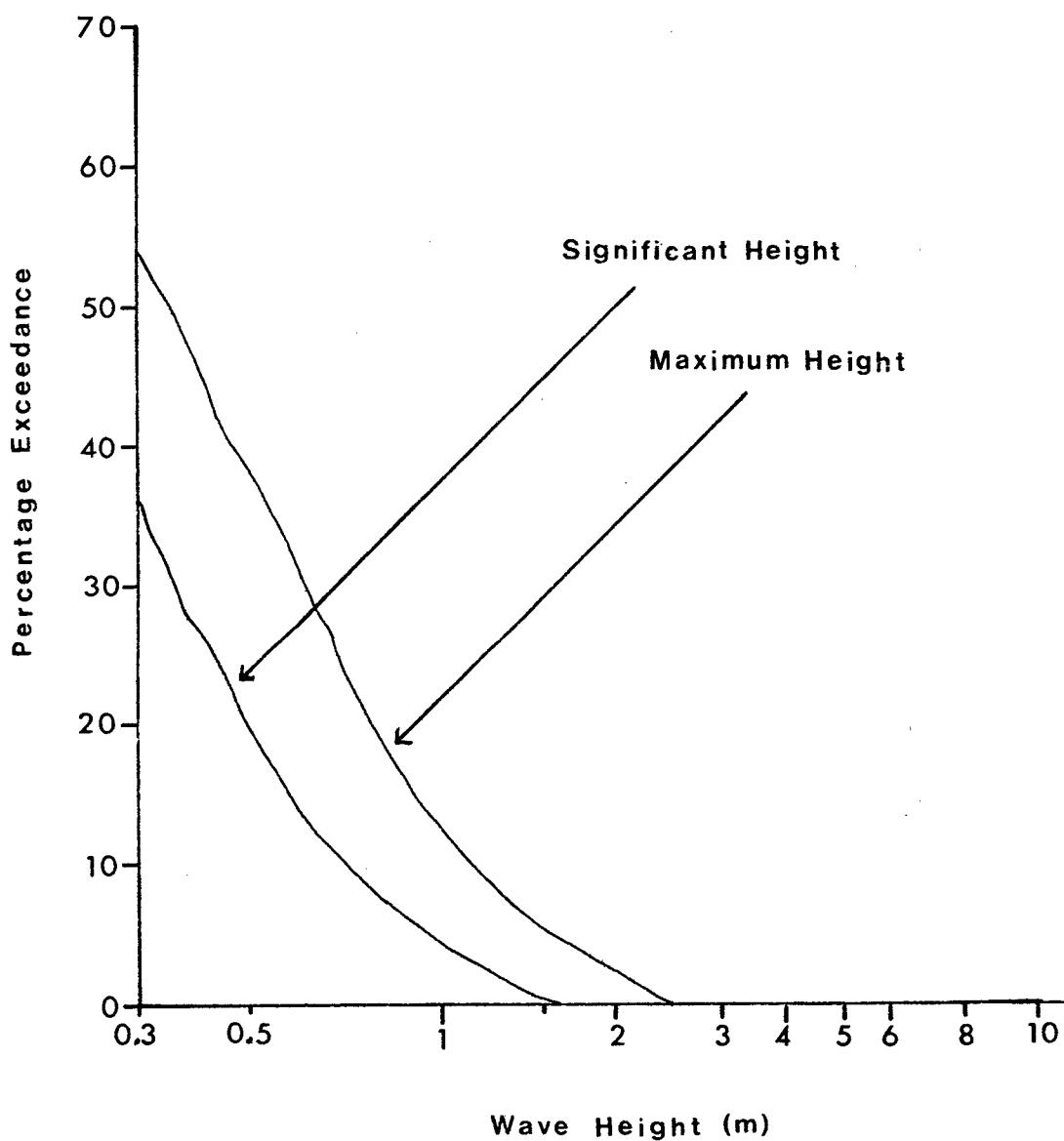


FIGURE 9

ROBERTS BANK, B.C.  
FEBRUARY 7, 1974 TO NOVEMBER 1, 1974.  
NUMBER OF OBSERVATIONS 1192

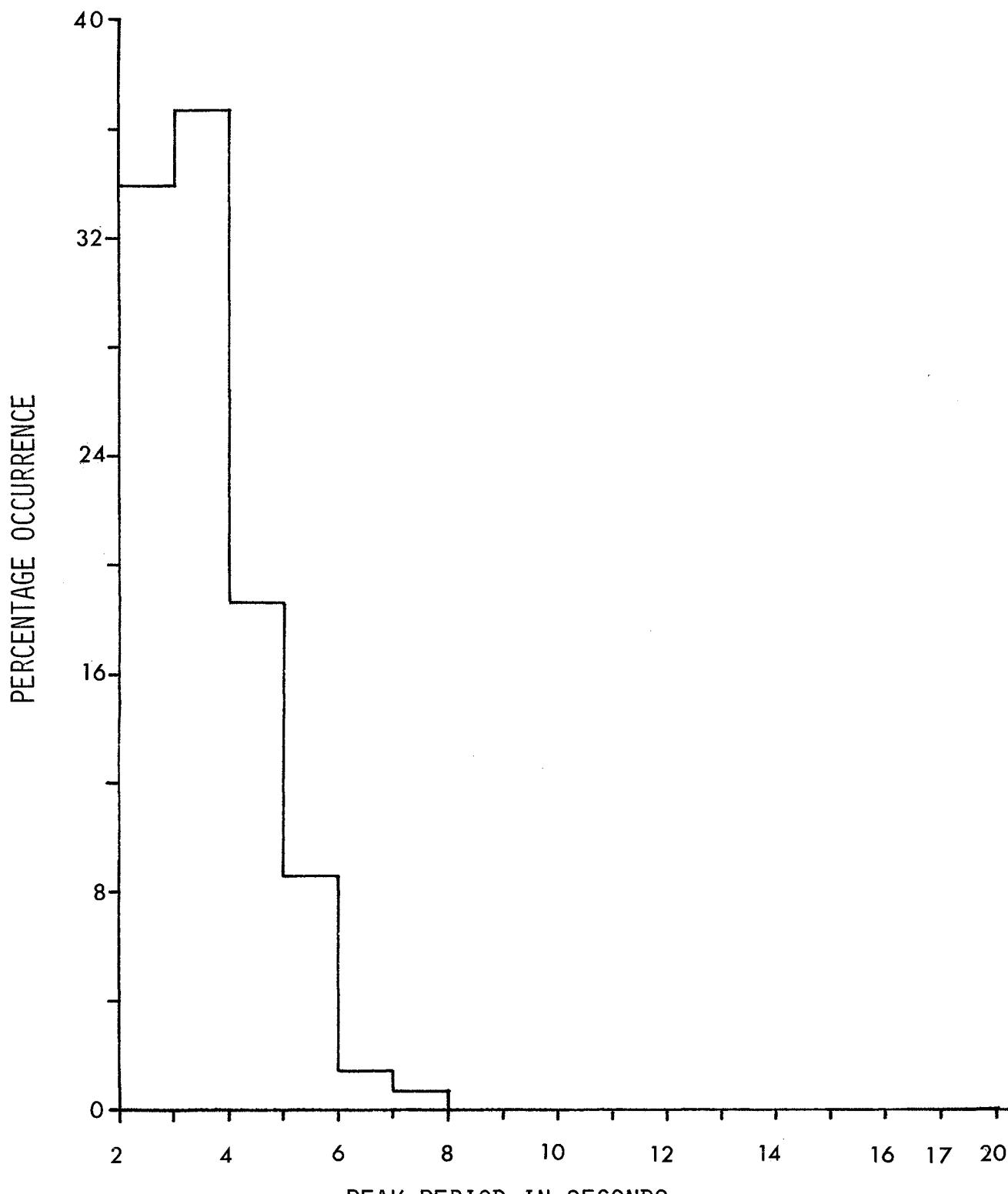


FIGURE 10

STURGEON BANK, B.C.  
FEBRUARY 7, 1974 TO MARCH 5, 1975.  
NUMBER OF OBSERVATIONS 1776

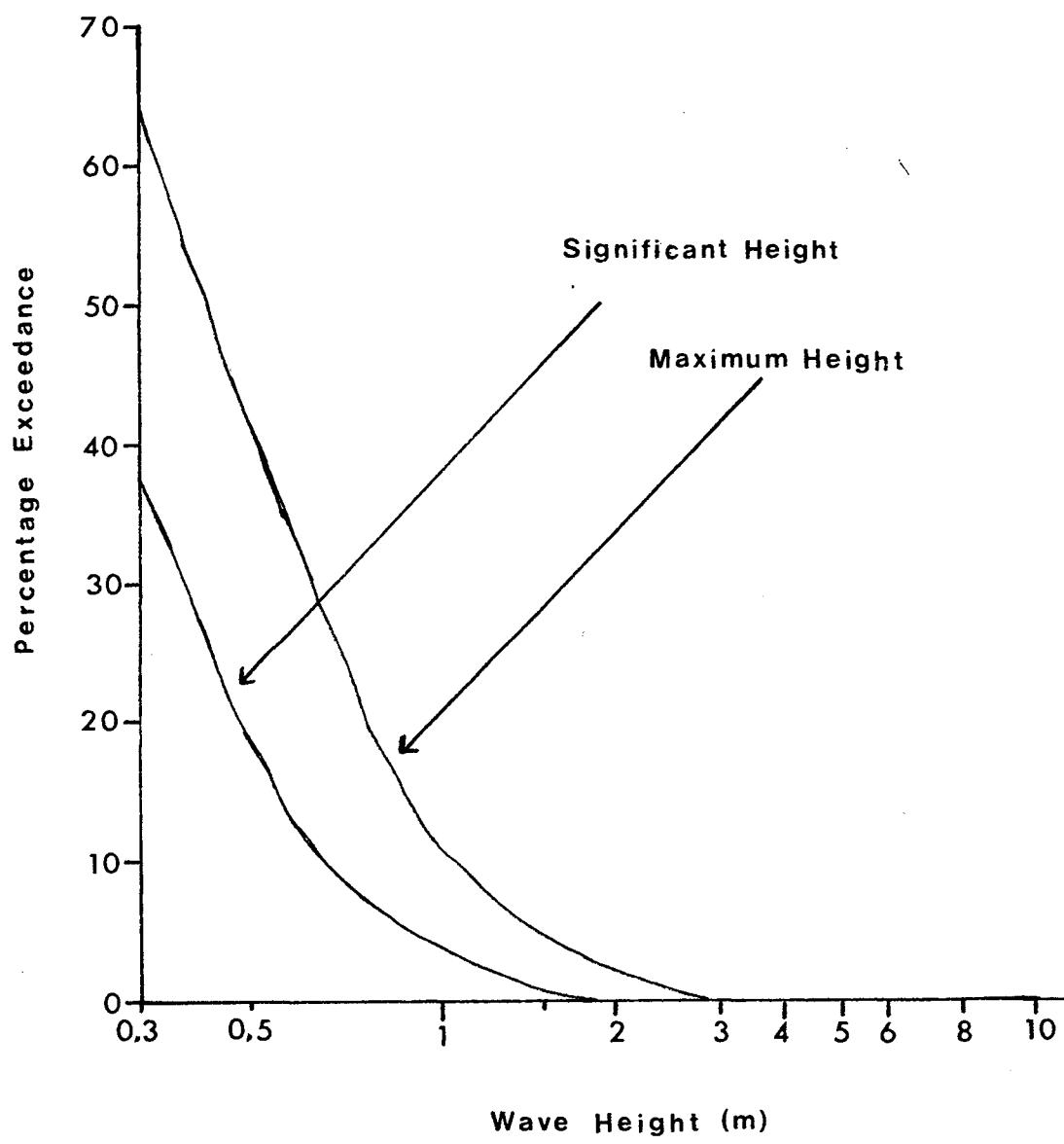


FIGURE 11.

STURGEON BANK, B.C.  
FEBRUARY 7, 1974 TO MARCH 5, 1975.  
NUMBER OF OBSERVATIONS 1776

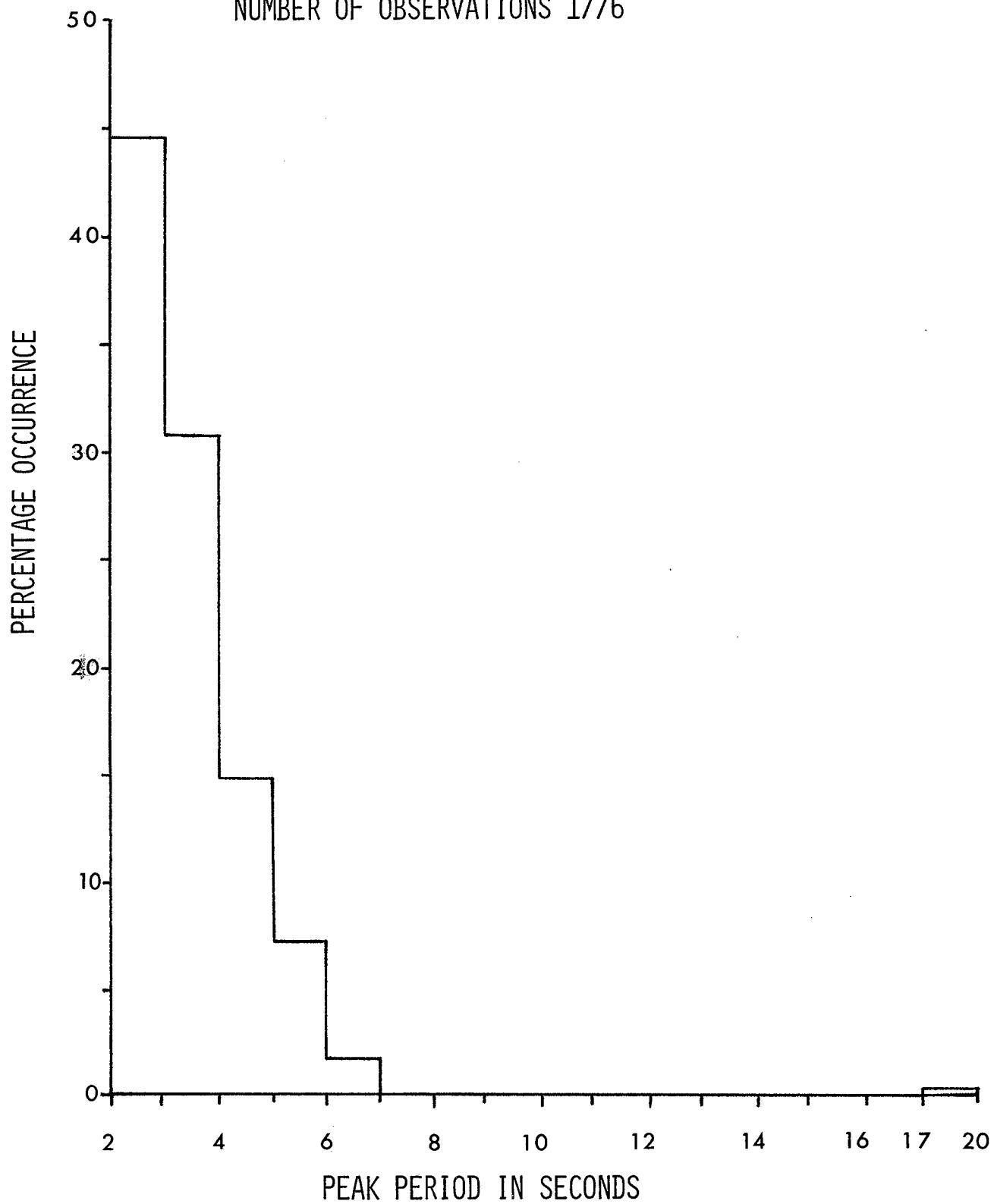


FIGURE 12.

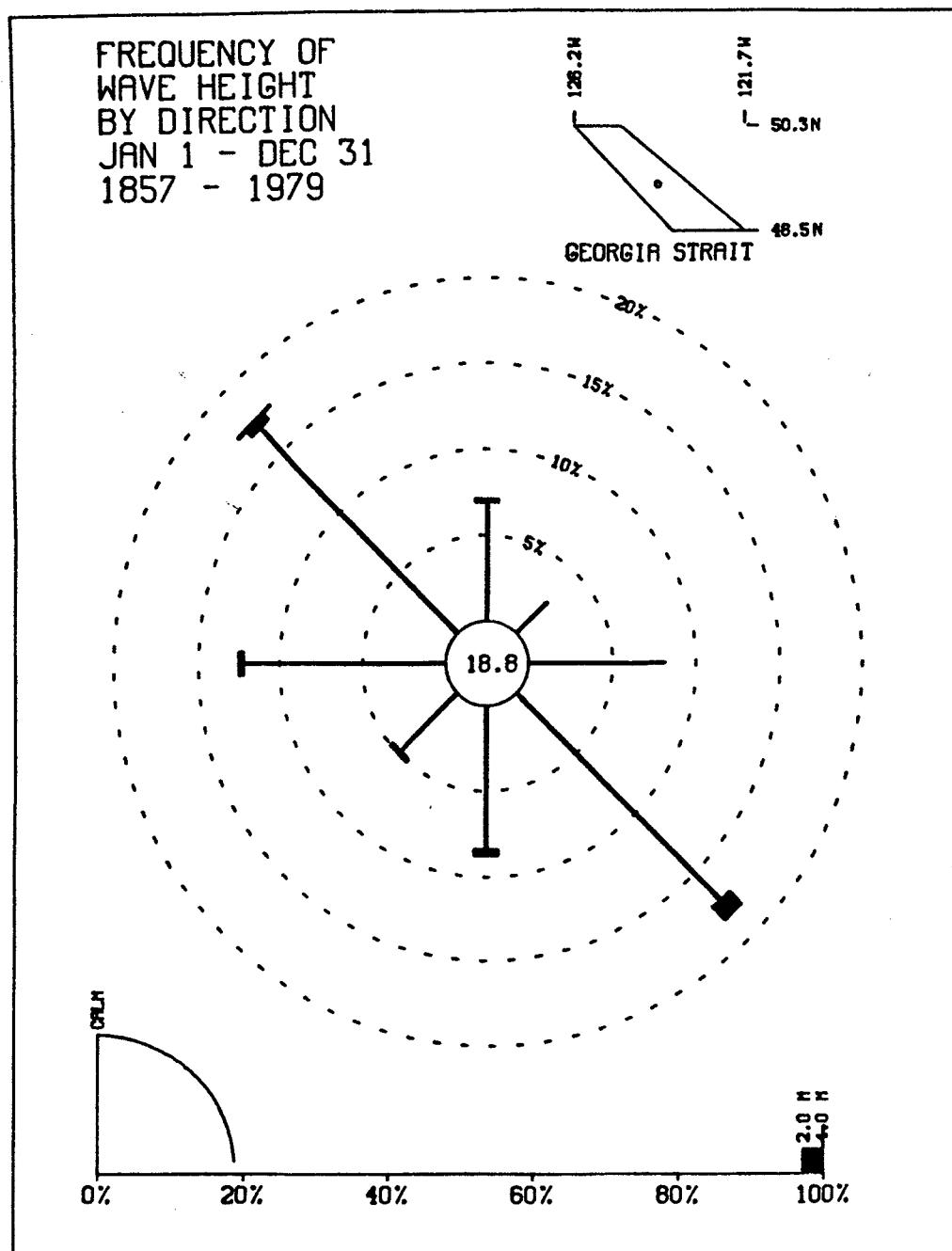


FIGURE 13

## Appendix A

### Wind Frequency Analyses

## PERCENTAGE FREQUENCY OF WIND SPEED BY DIRECTION

LOCATION: GEORGIA STRAIT									WINTER	1857 - 1979	
WIND SPEED (KNOTS)	N	NE	E	SE	S	SW	W	NW	TOTAL FREQ.	EXCEED. FREQ.	
0- 4	.6	1.2	1.0	1.8	1.2	.7	1.9	2.7	17.1	100.0	
5- 9	3.1	2.8	6.4	4.5	2.4	2.7	3.0	6.5	31.3	82.9	
10-14	1.3	1.6	5.2	4.3	3.3	1.0	3.4	3.1	23.3	51.6	
15-19	.9	1.0	1.8	5.0	1.2	.7	1.2	1.5	13.4	28.3	
20-24	.9	.7	1.9	1.8	1.0	.7	.6	.1	7.9	15.0	
25-29	.1		.6	1.0	.1	.3	.3	.4	3.0	7.1	
30-34	.1		.3	.4	.3		.1	.4	1.8	4.2	
35-39			.3		.3		.1		.7	2.4	
40-44				.6				.1	.7	1.6	
45-49				.1	.3		.1		.6	.9	
50-54							.1	.1	.3	.3	
TOTAL	7.1	7.4	17.7	19.7	9.8	6.5	10.8	15.0			
PERCENT CALM	5.9								TOTAL NUMBER OF OBSERVATIONS	674	

## PERCENTAGE FREQUENCY OF WIND SPEED BY DIRECTION

LOCATION: GEORGIA STRAIT									SPRING	1857 - 1979	
WIND SPEED (KNOTS)	N	NE	E	SE	S	SW	W	NW	TOTAL FREQ.	EXCEED. FREQ.	
0- 4	3.6	2.6	4.5	4.6	2.9	3.0	4.7	4.4	36.8	100.0	
5- 9	3.9	2.2	7.1	8.8	3.8	2.5	5.5	5.7	39.7	63.2	
10-14	.5	.7	.9	2.5	.9	.9	1.6	2.1	10.3	23.5	
15-19	.3	.1	.6	2.1	.7	.5	1.1	1.5	6.8	13.2	
20-24	.3	.2	.7	.9	.5	.1	.3	.5	3.5	6.4	
25-29	.1	.1	.3	.3	.1		.1	.3	1.3	2.9	
30-34	.1		.3	.5	.1	.1	.1	.2	1.3	1.6	
35-39				.1		.1			.1	.3	
40-44									0	.1	
45-49									0	.1	
50-54				.1					.1	.1	
TOTAL	8.8	5.9	14.3	19.9	9.0	7.2	13.5	14.8			
PERCENT CALM	6.5								TOTAL NUMBER OF OBSERVATIONS	1496	

NOTE- AN ASTERISK INDICATES LESS THAN 0.5 PERCENT

36

PERCENTAGE FREQUENCY OF WIND SPEED BY DIRECTION

LOCATION: GEORGIA STRAIT									SUMMER	1857 - 1979	
WIND SPEED (KNOTS)	N	NE	E	SE	S	SW	W	NW	TOTAL FREQ.	EXCEED. FREQ.	
0- 4	3.9	3.9	6.4	4.9	2.7	3.5	5.5	6.5	41.5	100.0	
5- 9	3.3	2.4	6.2	5.9	2.9	3.6	7.2	8.4	40.0	58.5	
10-14	.8	.2	1.0	1.7	1.4	1.0	1.6	2.5	10.3	18.5	
15-19	.4	.2	.7	1.4	.8	.7	1.0	1.2	6.3	8.2	
20-24	.1		*	.4	.2	.1	.3	.2	1.3	1.9	
25-29	*		*	.1	.1	.1		.1	.4	.6	
30-34				*				.1	.2	.2	
35-39										0	
40-44										0	
45-49										0	
50-54										0	
TOTAL	8.6	6.7	14.4	14.4	8.1	9.0	15.7	18.8			
PERCENT CALM	4.4								TOTAL NUMBER OF OBSERVATIONS	2257	

PERCENTAGE FREQUENCY OF WIND SPEED BY DIRECTION

LOCATION: GEORGIA STRAIT									AUTUMN	1857 - 1979	
WIND SPEED (KNOTS)	N	NE	E	SE	S	SW	W	NW	TOTAL FREQ.	EXCEED. FREQ.	
0- 4	2.2	1.6	4.5	5.2	3.3	3.1	5.6	5.0	37.2	100.0	
5- 9	2.4	2.1	10.6	9.5	3.4	2.7	3.7	4.6	41.0	62.8	
10-14	.5	.7	1.6	1.8	1.1	.6	1.3	1.8	9.3	21.8	
15-19	.1	.2	1.1	1.4	.7	.5	1.1	1.1	6.2	12.5	
20-24	.3	.1	.3	.9	.3	.3	.5	.3	2.9	6.4	
25-29	.1		.4	.9	.3			.1	1.8	3.5	
30-34			.1	.7	.2	.1			1.1	1.6	
35-39			.1	.1				.1	.2	.5	
40-44				.1	.1	.1			.3	.3	
45-49				.1					.1	.1	
50-54										0	
TOTAL	5.6	4.7	18.6	20.6	9.3	7.2	14.3	12.9			
PERCENT CALM	6.8								TOTAL NUMBER OF OBSERVATIONS	1523	

NOTE- AN ASTERISK INDICATES LESS THAN 0.5 PERCENT

## PERCENTAGE FREQUENCY OF WIND SPEED BY DIRECTION

WIND SPEED (KNOTS)	YEAR								1857 - 1979	
	N	NE	E	SE	S	SW	W	NW	TOTAL FREQ.	EXCEED. FREQ.
0- 4	3.0	2.7	4.8	4.5	2.7	3.0	4.9	5.1	36.4	100.0
5- 9	3.2	2.3	7.6	7.4	3.2	3.0	5.9	6.6	39.2	63.6
10-14	.7	.6	1.6	2.2	1.4	.9	1.7	2.3	11.5	24.4
15-19	.4	.3	.9	1.9	.8	.6	1.1	1.3	7.2	12.9
20-24	.3	.2	.5	.8	.4	.2	.4	.3	3.0	5.7
25-29	.1	*	.3	.4	.2	.1	.1	.2	1.3	2.7
30-34	*	*	.1	.4	.1	*	.1	.1	.9	1.4
35-39			.1	*	*	*	*	*	.2	.5
40-44				.1	*	*	*	*	.2	.3
45-49				*	.1	*			.1	.2
50-54		*		*		*	*	*	.1	.1
TOTAL	7.7	6.1	15.8	17.9	8.8	7.8	14.2	15.9		

PERCENT CALM 5.9

TOTAL NUMBER OF OBSERVATIONS 5950

NOTE- AN ASTERISK INDICATES LESS THAN 0.5 PERCENT

PERCENT FREQUENCY WIND SPEEDS BY DIRECTION

## BALLENAS LIGHTSTATION

LATITUDE 49 21 NORTH

LONGITUDE 124 11 WEST

**ELEVATION**

ANEROMETER HEIGHT 12M AGL

ANEMOMETER TYPE:- 45B 03/1966-12/1979

1966-1979

SPEED(KT)	1-3	4-6	7-10	11-16	17-21	22-27	28-33	34-40	41-47	48-55	56-63	64+	TOTAL	MEAN SPEED	STANDARD DEVIATION
NORTH	.4	.2	.1	.1	.4	*							.6	6.0	5.2
NORTHEAST	.7	.5	.5	.2	*	*							1.9	6.8	4.0
EAST	1.6	2.1	3.7	4.4	2.8	2.6	1.5	.5	.1				19.3	15.2	9.1
SOUTHEAST	1.9	4.8	8.6	10.5	5.9	3.4	.8	.2	*				36.1	13.3	7.1
SOUTH	1.2	.5	.1										1.7	3.3	1.6
SOUTHWEST	3.8	6.5	3.8	.8	*	*							14.9	5.7	2.8
WEST	3.6	4.3	5.0	3.5	1.3	.5	.1	*					18.3	8.8	5.7
NORTHWEST	.5	.6	1.3	1.7	1.1	.8	.4	.1					6.5	14.8	8.1
TOTAL	13.6	19.4	23.1	21.0	11.3	7.4	2.8	.8	.1				99.5	11.4	7.7

### PERCENT CALMS

TOTAL NUMBER OF OBSERVATIONS 25240

MAXIMUM RECORDED SPEED 43 KI

DIRECTION OF MAXIMUM WIND 110 DEG

MEAN WEST TO EAST COMPONENT -2.7 KT  
MEAN SOUTH TO NORTH COMPONENT 2.6 KT

MEAN VECTOR WIND 134/ 3.7 KT

NOTE— AN ASTERISK(\*) INDICATES PERCENTAGE GREATER THAN ZERO BUT LESS THAN 0.05 PERCENT

PREPARED BY SCIENTIFIC SERVICES DIVISION, ATMOSPHERIC ENVIRONMENT SERVICE, VANCOUVER, B.C. APR 29, 1981

## PERCENT FREQUENCY WIND SPEEDS BY DIRECTION

BALLENAS LIGHTSTATION

LATITUDE 49 21 NORTH LONGITUDE 124 11 WEST ELEVATION 11M ANEMOMETER HEIGHT 12M AGL

ANEMOMETER TYPE:- 45B 03/1966-12/1979

MAR - MAY

1966-1979

SPEED(KT)	1-3	4-6	7-10	11-16	17-21	22-27	28-33	34-40	41-47	48-55	56-63	64+	TOTAL	MEAN SPEED	STANDARD DEVIATION
NORTH	.6	.3	.1	*									1.0	4.0	2.9
NORTHEAST	.7	.4	.4	.1									1.6	5.1	2.9
EAST	2.6	3.9	5.6	5.3	2.7	1.3	.4	.2	*				22.1	11.5	7.3
SOUTHEAST	2.1	3.8	5.5	6.0	2.8	1.1	.4	.1	*				21.7	11.5	6.7
SOUTH	1.3	.4	*	*	*								1.8	3.2	1.7
SOUTHWEST	3.7	5.6	4.2	.7	*								14.3	5.8	2.8
WEST	4.1	5.5	9.2	9.4	2.5	.7	*	*	*	*	*		31.3	9.9	5.4
NORTHWEST	.9	.8	1.1	1.3	.8	.6	.2	.1					3.8	12.8	8.5
TOTAL	16.0	20.7	26.3	22.7	8.8	3.7	1.1	.5	.1	*			99.6	9.9	6.8

PERCENT CALMS .4

TOTAL NUMBER OF OBSERVATIONS 26783

MAXIMUM RECORDED SPEED 50 KT

DIRECTION OF MAXIMUM WIND 270 DEG

MEAN WEST TO EAST COMPONENT -1.0 KT  
MEAN SOUTH TO NORTH COMPONENT 1.6 KT

MEAN VECTOR WIND 149/ 1.9 KT

NOTE- AN ASTERISK(+) INDICATES PERCENTAGE GREATER THAN ZERO BUT LESS THAN 0.05 PERCENT

PREPARED BY SCIENTIFIC SERVICES DIVISION, ATMOSPHERIC ENVIRONMENT SERVICE, VANCOUVER, B.C. APR 29, 1981

## PERCENT FREQUENCY WIND SPEEDS BY DIRECTION

BALLENAIS LIGHTSTATION

LATITUDE 49 21 NORTH      LONGITUDE 124 11 WEST      ELEVATION 11M      ANEMOMETER HEIGHT 12M AGL

ANEMOMETER TYPE/- 45B 03/1966-12/1979

JUN - AUG

1966-1979

SPEED(KT)	1-3	4-6	7-10	11-16	17-21	22-27	28-33	34-40	41-47	48-55	56-63	64+	TOTAL	MEAN SPEED	STANDARD DEVIATION
NORTH	.6	.2	.1	*									.8	3.4	2.1
NORTHEAST	.7	.3	.2	*									1.2	4.3	2.8
EAST	3.1	4.5	7.4	6.3	2.4	.4	*	*					24.1	9.9	5.4
SOUTHEAST	1.8	3.4	5.0	4.6	1.2	.1	*						16.1	9.5	4.9
SOUTH	1.1	.2	*	*									1.4	2.8	1.4
SOUTHWEST	2.9	3.5	2.7	.6	.1								9.7	5.8	3.1
WEST	3.5	5.9	12.5	15.1	4.2	.4							41.6	10.6	4.9
NORTHWEST	.9	.9	1.1	1.1	.4	.1	*						4.5	9.3	6.7
TOTAL	14.6	18.8	29.0	27.7	8.3	1.0	*	*					99.6	9.5	5.2

PERCENT CALMS .4

TOTAL NUMBER OF OBSERVATIONS 29296

MAXIMUM RECORDED SPEED 38 KT

DIRECTION OF MAXIMUM WIND 98 DEG

MEAN WEST TO EAST COMPONENT .7 KT  
MEAN SOUTH TO NORTH COMPONENT .8 KT

MEAN VECTOR WIND 222/ 1.8 KT

NOTE- AN ASTERISK(\*) INDICATES PERCENTAGE GREATER THAN ZERO BUT LESS THAN 0.05 PERCENT

PREPARED BY SCIENTIFIC SERVICES DIVISION, ATMOSPHERIC ENVIRONMENT SERVICE, VANCOUVER, B.C. APR 29, 1981

PERCENT FREQUENCY WIND SPEEDS BY DIRECTION  
BALLENAS LIGHTSTATION  
LATITUDE 49 21 NORTH      LONGITUDE 124 11 WEST      ELEVATION 11M      ANEMOMETER HEIGHT 12M AGL  
ANEMOMETER TYPE: - 458 03/1966-12/1979

	SEP - NOV										1966-1979				
SPEED(KT)	1-3	4-6	7-10	11-16	17-21	22-27	28-33	34-40	41-47	48-55	56-63	64+	TOTAL	MEAN SPEED	STANDARD DEVIATION
NORTH	.5	.1	.1	.1	*								.8	4.4	3.9
NORTHEAST	.5	.4	.2	.1	*								1.2	5.2	3.4
EAST	2.2	2.8	4.1	4.8	2.4	1.8	.7	.2	*				19.0	12.7	8.1
SOUTHEAST	1.8	3.5	6.4	9.1	4.2	2.2	.4	.1	*				27.7	12.9	6.7
SOUTH	1.0	.3	*	*		*							1.3	3.8	1.7
SOUTHWEST	3.5	5.3	3.8	.6	*								13.3	5.7	2.7
WEST	4.3	6.9	10.6	7.3	1.5	.4	*						31.0	8.8	4.7
NORTHWEST	.8	.7	1.0	1.3	.7	.4	.1	*	*				4.0	11.8	7.2
TOTAL	14.7	20.0	26.2	23.2	8.8	4.8	1.2	.4	*				99.3	18.2	6.6

PERCENT CALMS .7 TOTAL NUMBER OF OBSERVATIONS 27092  
 MAXIMUM RECORDED SPEED 44 KT DIRECTION OF MAXIMUM WIND 140 DEG  
 MEAN WEST TO EAST COMPONENT .9 KT  
 MEAN SOUTH TO NORTH COMPONENT 1.1 KT  
 MEAN VECTOR WIND 219/ 1.4 KT

NOTE- AN ASTERISK(\*) INDICATES PERCENTAGE GREATER THAN ZERO BUT LESS THAN 0.05 PERCENT

PREPARED BY SCIENTIFIC SERVICES DIVISION, ATMOSPHERIC ENVIRONMENT SERVICE, VANCOUVER, B.C., APR 29, 1981

PERCENT FREQUENCY WIND SPEEDS BY DIRECTION  
BALLENAS LIGHTSTATION  
LATITUDE 49 21 NORTH      LONGITUDE 124 11 WEST      ELEVATION 11M      ANEMOMETER HEIGHT 12M AGL  
ANEMOMETER TYPE I - 45B 03/1966-12/1979

	ANNUAL										1966-1979				
SPEED(kt)	1-3	4-6	7-10	11-16	17-21	22-27	28-33	34-40	41-47	48-55	56-63	64+	TOTAL	MEAN SPEED	STANDARD DEVIATION
NORTH	.5	.2	.1	*	*	*							.9	4.4	3.6
NORTHEAST	.7	.4	.3	.1	*	*							1.5	5.2	3.4
EAST	2.4	3.3	5.3	5.2	2.6	1.5	.6	.2	*				21.2	12.1	7.7
SOUTHEAST	1.9	3.8	6.3	7.4	3.5	1.7	.4	.1	*				25.1	12.2	6.7
SOUTH	1.2	.4	*	*	*	*							1.6	3.1	1.6
SOUTHWEST	3.4	5.2	3.6	.7	*	*							13.0	5.7	2.8
WEST	3.9	5.7	9.5	9.0	2.4	.5	*	*	*	*	*		38.9	9.7	5.2
NORTHWEST	.8	.7	1.1	1.3	.7	.5	.2	*	*				5.4	12.3	7.6
TOTAL	14.7	19.7	26.2	23.0	9.2	4.1	1.2	.4	*	*			99.5	10.2	6.6

**TOTAL NUMBER OF OBSERVATIONS** 188891

MAXIMUM RECORDED SPEED 50 KT DIRECTION OF MAXIMUM WIND 270 DEG

MEAN WEST TO EAST COMPONENT -1.1 KT  
 MEAN SOUTH TO NORTH COMPONENT 4.2 KT

**MEAN VECTOR WIND 166/ 4.3 KT**

NOTE- AN ASTERISK(\*) INDICATES PERCENTAGE GREATER THAN ZERO BUT LESS THAN 0.05 PERCENT

PREPARED BY SCIENTIFIC SERVICES DIVISION, ATMOSPHERIC ENVIRONMENT SERVICE, VANCOUVER, B.C. APR 29, 1981

## PERCENT FREQUENCY WIND SPEEDS BY DIRECTION

COMOX A

LATITUDE 49 43 NORTH      LONGITUDE 124 54 WEST      ELEVATION 24M      ANEMOMETER HEIGHT 10M AGL

ANEMOMETER TYPE:- 45B 09/1944-09/1959 U2A 10/1959-12/1979

DEC - FEB

1953-1979

SPEED(kt)	1-3	4-6	7-10	11-16	17-21	22-27	28-33	34-40	41-47	48-55	56-63	64+	TOTAL	MEAN SPEED	STANDARD DEVIATION
NORTH	1.3	1.3	1.1	.7	.1	*							4.6	6.8	4.3
NORTHEAST	.4	.3	.1	*									.7	3.9	1.8
EAST	.8	.7	.6	.8	.9	.4	.1	*	*				4.4	12.2	8.1
SOUTHEAST	.9	1.3	2.9	6.8	6.1	2.7	.6	.2	*				21.4	15.7	6.8
SOUTH	3.2	2.6	2.9	2.6	.5	.1	*	*					12.0	8.0	5.2
SOUTHWEST	1.9	1.1	.4	.1	*	*							3.4	4.2	2.6
WEST	9.3	6.9	1.9	.4	*	*	*						18.6	4.3	2.3
NORTHWEST	3.7	3.7	2.8	1.7	.3	*							12.2	6.6	4.2
TOTAL	21.5	17.9	12.7	13.1	7.9	3.3	.7	.2	*				77.3	9.8	6.9

PERCENT CALMS 22.7

TOTAL NUMBER OF OBSERVATIONS 59064

MAXIMUM RECORDED SPEED 45 KT

DIRECTION OF MAXIMUM WIND 110 DEG

MEAN WEST TO EAST COMPONENT -1.2 KT  
MEAN SOUTH TO NORTH COMPONENT 2.1 KT

MEAN VECTOR WIND 151/ 2.4 KT

NOTE- AN ASTERISK(\*) INDICATES PERCENTAGE GREATER THAN ZERO BUT LESS THAN 0.05 PERCENT

PREPARED BY SCIENTIFIC SERVICES DIVISION, ATMOSPHERIC ENVIRONMENT SERVICE, VANCOUVER, B.C. MAY 21, 1981

33

## PERCENT FREQUENCY WIND SPEEDS BY DIRECTION

COMOX A

LATITUDE 49 43 NORTH LONGITUDE 124 54 WEST ELEVATION 24M ANEMOMETER HEIGHT 10M AGL

ANEMOMETER TYPE:- 45B 09/1944-09/1959 U2A 10/1959-12/1979

MAR - MAY

1953-1979

SPEED(KT)	1-3	4-6	7-10	11-16	17-21	22-27	28-33	34-40	41-47	48-55	56-63	64+	TOTAL	MEAN SPEED	STANDARD DEVIATION
NORTH	2.0	3.7	5.1	2.4	.2	*							13.5	7.7	3.8
NORTHEAST	1.1	1.6	.4	*									3.1	4.6	1.8
EAST	1.7	3.0	2.3	1.2	.5	.2	*	*	*				9.0	7.9	5.4
SOUTHEAST	1.2	2.0	4.2	6.8	3.2	1.1	.3	.1	*				18.8	12.9	6.3
SOUTH	2.4	2.3	3.0	2.3	.4	*	*	*					10.4	7.9	4.6
SOUTHWEST	1.3	.9	.6	.2	*								3.0	5.0	3.2
WEST	6.1	5.0	1.5	.2	*	*							12.9	4.4	2.2
NORTHWEST	3.3	4.2	3.6	1.8	.3	*	*	*					13.3	6.8	4.1
TOTAL	19.0	22.7	20.7	15.0	4.7	1.4	.3	.1	*				83.9	8.0	5.4

PERCENT CALMS 16.1

TOTAL NUMBER OF OBSERVATIONS 58613

MAXIMUM RECORDED SPEED 43 KT

DIRECTION OF MAXIMUM WIND 140 DEG

MEAN WEST TO EAST COMPONENT -1.1 KT

MEAN SOUTH TO NORTH COMPONENT 1.3 KT

MEAN VECTOR WIND 140/ 1.7 KT

NOTE- AN ASTERISK(\*) INDICATES PERCENTAGE GREATER THAN ZERO BUT LESS THAN 0.05 PERCENT

PREPARED BY SCIENTIFIC SERVICES DIVISION, ATMOSPHERIC ENVIRONMENT SERVICE, VANCOUVER, B.C. MAY 21, 1981

## PERCENT FREQUENCY WIND SPEEDS BY DIRECTION

COMOX A

LATITUDE 49 43 NORTH LONGITUDE 124 54 WEST ELEVATION 24M ANEMOMETER HEIGHT 10M AGL

ANEMOMETER TYPE:- 45B 09/1944-09/1959 U2A 10/1959-12/1979

JUN - AUG

1953-1979

SPEED(KT)	1-3	4-6	7-10	11-16	17-21	22-27	28-33	34-40	41-47	48-55	56-63	64+	TOTAL	MEAN SPEED	STANDARD DEVIATION
NORTH	2.4	6.1	9.4	2.8	.1								20.8	7.4	3.2
NORTHEAST	1.1	2.0	.5	*									3.6	4.7	1.7
EAST	1.7	3.6	2.8	.9	.2	*	*						9.2	6.7	3.7
SOUTHEAST	1.3	2.4	4.6	4.6	1.2	.1	*	*					14.2	10.0	4.8
SOUTH	1.8	1.9	1.8	1.0	.1	*							6.6	6.7	4.0
SOUTHWEST	.7	.5	.2	.1	*		*						1.5	4.6	3.1
WEST	5.2	4.2	1.2	.1	*								10.6	4.2	1.9
NORTHWEST	4.6	6.7	5.7	1.7	.1	*							18.8	6.2	3.2
TOTAL	18.8	27.3	26.0	11.3	1.7	.1	*	*					85.3	6.9	3.9

PERCENT CALMS 14.7

TOTAL NUMBER OF OBSERVATIONS 89616

MAXIMUM RECORDED SPEED 35 KT

DIRECTION OF MAXIMUM WIND 140 DEG

MEAN WEST TO EAST COMPONENT -.3 KT  
MEAN SOUTH TO NORTH COMPONENT -.3 KT

MEAN VECTOR WIND 49/.4 KT

NOTE- AN ASTERISK(\*) INDICATES PERCENTAGE GREATER THAN ZERO BUT LESS THAN 0.05 PERCENT

PREPARED BY SCIENTIFIC SERVICES DIVISION, ATMOSPHERIC ENVIRONMENT SERVICE, VANCOUVER, B.C. MAY 21, 1981

## PERCENT FREQUENCY WIND SPEEDS BY DIRECTION

COMOX A

LATITUDE 49 43 NORTH      LONGITUDE 124 54 WEST      ELEVATION 24M      ANEMOMETER HEIGHT 10M AGL

ANEMOMETER TYPE:- 45B 09/1944-09/1959 U2A 10/1959-12/1979

SEP - NOV

1953-1979

SPEED(KT)	1-3	4-6	7-10	11-16	17-21	22-27	28-33	34-40	41-47	48-55	56-63	64+	TOTAL	MEAN SPEED	STANDARD DEVIATION
NORTH	2.7	3.5	2.8	.9	.1	*							10.0	6.2	3.4
NORTHEAST	1.2	.8	.1	*	*								2.1	3.7	1.7
EAST	1.6	1.4	.8	.8	.6	.2	.1	*	*				5.4	8.6	7.0
SOUTHEAST	1.4	1.8	3.5	6.3	4.0	1.7	.4	.1	*	*			19.1	13.7	6.8
SOUTH	2.6	2.4	2.8	2.2	.4	.1	*	*					10.5	7.0	4.9
SOUTHWEST	1.3	.6	.2	.1		*							2.1	4.0	2.5
WEST	7.2	5.1	1.3	.2	*	*							13.9	4.1	2.2
NORTHWEST	4.2	4.1	2.5	1.2	.2	*							12.2	5.8	3.7
TOTAL	22.2	19.7	14.0	11.6	5.2	2.1	.4	.1	*	*			75.2	7.9	6.1

PERCENT CALMS 24.8

TOTAL NUMBER OF OBSERVATIONS 58968

MAXIMUM RECORDED SPEED 50 KT

DIRECTION OF MAXIMUM WIND 140 DEG

MEAN WEST TO EAST COMPONENT -.2 KT

MEAN SOUTH TO NORTH COMPONENT -.0 KT

MEAN VECTOR WIND 88/ .2 KT

NOTE- AN ASTERISK(\*) INDICATES PERCENTAGE GREATER THAN ZERO BUT LESS THAN 0.05 PERCENT

PREPARED BY SCIENTIFIC SERVICES DIVISION, ATMOSPHERIC ENVIRONMENT SERVICE, VANCOUVER, B.C. MAY 21, 1981

## PERCENT FREQUENCY WIND SPEEDS BY DIRECTION

COMOX A

LATITUDE 49 43 NORTH      LONGITUDE 124 54 WEST      ELEVATION 24M      ANEMOMETER HEIGHT 10M AGL

ANEMOMETER TYPE:- 45B 09/1944-09/1959 U2A 10/1959-12/1979

SPEED(KT)	ANNUAL												1953-1979		
	1-3	4-6	7-10	11-16	17-21	22-27	28-33	34-40	41-47	48-55	56-63	64+	TOTAL	MEAN SPEED	STANDARD DEVIATION
NORTH	2.1	3.7	4.6	1.7	.1	*							12.3	7.2	3.5
NORTHEAST	.9	1.1	.3	*	*								2.4	4.4	1.6
EAST	1.5	2.2	1.6	.9	.5	.2	*	*	*	*			7.0	8.3	6.1
SOUTHEAST	1.2	1.9	3.8	6.1	3.6	1.4	.3	.1	*	*			18.3	13.4	6.6
SOUTH	2.5	2.3	2.6	2.0	.3	.1	*	*	*				9.9	7.7	4.8
SOUTHWEST	1.3	.7	.3	.1	*	*	*						2.5	4.5	2.9
WEST	6.9	5.3	1.5	.2	*	*	*						14.0	4.3	2.2
NORTHWEST	3.9	4.7	3.7	1.6	.2	*	*						14.1	6.4	3.8
TOTAL	20.4	21.9	18.4	12.7	4.9	1.7	.4	.1	*	*			80.4	7.9	5.6

PERCENT CALMS -0.1

TOTAL NUMBER OF OBSERVATIONS 237261

MAXIMUM RECORDED SPEED 50 KT

DIRECTION OF MAXIMUM WIND 140 DEG

MEAN WEST TO EAST COMPONENT -1.9 KT  
MEAN SOUTH TO NORTH COMPONENT 1.9 KT

MEAN VECTOR WIND 136/ 2.7 KT

NOTE- AN ASTERISK(\*) INDICATES PERCENTAGE GREATER THAN ZERO BUT LESS THAN 0.05 PERCENT

PREPARED BY SCIENTIFIC SERVICES DIVISION, ATMOSPHERIC ENVIRONMENT SERVICE, VANCOUVER, B.C. MAY 21, 1981

PERCENT FREQUENCY WIND SPEEDS BY DIRECTION  
ENTRANCE ISLAND  
LATITUDE 48 47 NORTH      LONGITUDE 123 3 WEST      ELEVATION 38M      ANEMOMETER HEIGHT 18M AGL  
ANEMOMETER TYPE/- 45B 10/1969-12/1979

SPEED(KT)	DEC - FEB												1968-1979		
	1-3	4-6	7-10	11-16	17-21	22-27	28-33	34-40	41-47	48-55	56-63	64+	TOTAL	MEAN SPEED	STANDARD DEVIATION
NORTH	.7	.5	.4	.1	.1	*							1.9	5.9	4.6
NORTHEAST	.5	.4	.4	.4	.2	*							1.8	8.6	5.8
EAST	1.4	1.5	4.0	6.0	3.8	2.5	.4	.1	*				19.8	14.3	7.2
SOUTHEAST	1.8	2.8	8.1	9.4	4.5	2.4	.6	.1					29.7	12.9	6.5
SOUTH	2.5	2.5	2.8	1.5	.4	.1	*						9.7	7.4	4.7
SOUTHWEST	1.1	1.3	1.3	.5	.1	*							4.3	6.6	3.9
WEST	4.1	4.6	3.3	3.2	1.4	.5	.1						17.1	8.5	6.0
NORTHWEST	1.6	1.6	3.7	4.6	2.2	1.1	.4	.1	*				15.3	12.7	7.3
TOTAL	13.7	15.1	23.9	25.8	12.6	6.6	1.5	.3	*				99.6	11.4	6.9

PERCENT CALMS .4

TOTAL NUMBER OF OBSERVATIONS 21916

MAXIMUM RECORDED SPEED 42 KT

DIRECTION OF MAXIMUM WIND 320 DEG

MEAN WEST TO EAST COMPONENT -2.3 KT  
MEAN SOUTH TO NORTH COMPONENT 1.9 KT

MEAN VECTOR WIND 130/ 3.0 KT

NOTE- AN ASTERISK(\*) INDICATES PERCENTAGE GREATER THAN ZERO BUT LESS THAN 0.05 PERCENT

PREPARED BY SCIENTIFIC SERVICES DIVISION, ATMOSPHERIC ENVIRONMENT SERVICE, VANCOUVER, B.C. APR 28, 1981

PERCENT FREQUENCY WIND SPEEDS BY DIRECTION

ENTRANCE ISLAND

LATITUDE 48 47 NORTH LONGITUDE 123 3 WEST ELEVATION 38M ANEMOMETER HEIGHT 10M AGL

ANEMOMETER TYPE:- 45B 10/1969-12/1979

MAR - MAY

1968-1979

SPEED(KT)	1-3	4-6	7-10	11-16	17-21	22-27	28-33	34-40	41-47	48-55	56-63	64+	TOTAL	MEAN SPEED	STANDARD DEVIATION
NORTH	1.5	.9	.6	.1	*								3.2	4.9	3.0
NORTHEAST	.9	.4	.1	.1	*	*							1.6	4.4	3.2
EAST	2.1	2.4	4.9	5.7	2.1	.9	.3	.1					18.4	11.4	6.5
SOUTHEAST	2.8	3.5	6.6	7.1	2.7	1.0	.2	*					23.7	10.9	6.1
SOUTH	2.5	1.8	2.3	1.1	.2	*							7.8	6.7	4.2
SOUTHWEST	1.2	1.0	1.7	.6	.1	*							4.5	7.0	4.0
WEST	4.5	4.7	4.0	3.7	2.9	.8	.1	*					20.7	9.6	6.7
NORTHWEST	1.9	1.7	3.9	6.6	3.6	1.5	.3	.1					19.6	13.2	6.8
TOTAL	17.3	16.5	24.1	24.9	11.5	4.2	.9	.2					99.5	10.4	6.5

PERCENT CALMS .5

TOTAL NUMBER OF OBSERVATIONS 21899

MAXIMUM RECORDED SPEED 39 KT

DIRECTION OF MAXIMUM WIND 320 DEG

MEAN WEST TO EAST COMPONENT -.4 KT  
MEAN SOUTH TO NORTH COMPONENT .5 KT

MEAN VECTOR WIND 143/ .6 KT

NOTE- AN ASTERISK(\*) INDICATES PERCENTAGE GREATER THAN ZERO BUT LESS THAN 0.05 PERCENT

PREPARED BY SCIENTIFIC SERVICES DIVISION, ATMOSPHERIC ENVIRONMENT SERVICE, VANCOUVER, B.C. APR 28, 1981

## PERCENT FREQUENCY WIND SPEEDS BY DIRECTION

ENTRANCE ISLAND

LATITUDE 48 47 NORTH      LONGITUDE 123 3 WEST      ELEVATION 38M      ANEMOMETER HEIGHT 18M AGL

ANEMOMETER TYPE:- 45B 10/1969-12/1979

JUN - AUG

1968-1979

SPEED(KT)	1-3	4-6	7-10	11-16	17-21	22-27	28-33	34-40	41-47	48-55	56-63	64+	TOTAL	MEAN SPEED	STANDARD DEVIATION
NORTH	1.6	.9	.6	.1	*								3.2	4.6	2.8
NORTHEAST	1.0	.2	.1	*	*								1.3	3.5	2.4
EAST	3.2	3.6	7.0	6.8	.7	.1	*	*	*				21.5	9.1	4.6
SOUTHEAST	4.0	4.5	6.7	5.7	.8	*							21.8	8.4	4.6
SOUTH	2.5	1.2	.7	.3	*								4.8	4.6	3.3
SOUTHWEST	1.1	.6	.5	.2	*								2.4	5.2	3.8
WEST	4.3	3.7	3.8	3.8	2.6	.8	*						18.9	9.7	6.6
NORTHWEST	2.0	2.3	5.0	9.3	5.7	1.1	*						25.4	12.9	5.9
TOTAL	19.7	17.0	24.4	26.2	9.8	2.1	.1	*					99.3	9.5	5.8

PERCENT CALMS .7

TOTAL NUMBER OF OBSERVATIONS 21770

MAXIMUM RECORDED SPEED 34 KT

DIRECTION OF MAXIMUM WIND 90 DEG

MEAN WEST TO EAST COMPONENT .3 KT

MEAN SOUTH TO NORTH COMPONENT -.6 KT

MEAN VECTOR WIND 332/ .7 KT

NOTE- AN ASTERISK(\*) INDICATES PERCENTAGE GREATER THAN ZERO BUT LESS THAN 0.05 PERCENT

PREPARED BY SCIENTIFIC SERVICES DIVISION, ATMOSPHERIC ENVIRONMENT SERVICE, VANCOUVER, B.C. APR 28, 1981

## PERCENT FREQUENCY WIND SPEEDS BY DIRECTION

## ENTRANCE ISLAND

LATITUDE 48 47 NORTH      LONGITUDE 123 3 WEST      ELEVATION 30M      ANEMOMETER HEIGHT 18M AGL

ANEMOMETER TYPE:- 45B 10/1969-12/1979

SEP - NOV

1968-1979

SPEED(KT)	1-3	4-6	7-10	11-16	17-21	22-27	28-33	34-40	41-47	48-55	56-63	64+	TOTAL	MEAN SPEED	STANDARD DEVIATION
NORTH	1.2	.4	.4	.1	*								2.1	4.8	3.7
NORTHEAST	.5	.3	.2	.2	*	*							1.3	6.2	4.6
EAST	1.7	1.6	3.4	4.6	2.3	1.4	.3	.1					15.4	12.7	7.2
SOUTHEAST	2.9	3.3	7.2	7.8	3.5	1.3	.1	*					26.1	11.3	6.1
SOUTH	2.8	1.7	1.4	.7	.1	*							6.9	5.9	4.2
SOUTHWEST	1.1	.7	.8	.4	*								3.1	5.9	3.8
WEST	6.0	6.1	4.0	4.0	2.2	.6	*						22.9	8.4	6.1
NORTHWEST	2.3	2.6	5.2	7.8	2.8	.8	.1	*					21.7	11.4	5.9
TOTAL	18.7	16.8	22.7	25.6	11.0	4.0	.5	.1					99.4	10.1	6.4

PERCENT CALMS .6

TOTAL NUMBER OF OBSERVATIONS 22744

MAXIMUM RECORDED SPEED 40 KT

DIRECTION OF MAXIMUM WIND 320 DEG

MEAN WEST TO EAST COMPONENT .9 KT

MEAN SOUTH TO NORTH COMPONENT -.3 KT

MEAN VECTOR WIND 288/ 1.0 KT

NOTE- AN ASTERISK(\*) INDICATES PERCENTAGE GREATER THAN ZERO BUT LESS THAN 0.05 PERCENT

PREPARED BY SCIENTIFIC SERVICES DIVISION, ATMOSPHERIC ENVIRONMENT SERVICE, VANCOUVER, B.C. APR 28, 1981

J

PERCENT FREQUENCY WIND SPEEDS BY DIRECTION  
ENTRANCE ISLAND  
LATITUDE 48 47 NORTH      LONGITUDE 123 3 WEST      ELEVATION      38M      ANEMOMETER HEIGHT 10M AGL  
ANEMOMETER TYPE:- 43B 10/1969-12/1979

SPEED(KT)	ANNUAL												1968-1979		
	1-3	4-6	7-10	11-16	17-21	22-27	28-33	34-40	41-47	48-55	56-63	64+	TOTAL	MEAN SPEED	STANDARD DEVIATION
NORTH	1.2	.7	.5	.1	*	*							2.6	5.0	3.8
NORTHEAST	.7	.3	.2	.2	.1	*							1.5	5.8	4.8
EAST	2.1	2.3	4.8	5.7	2.2	1.2	.3	.1	*				10.7	11.8	6.7
SOUTHEAST	2.9	3.5	7.2	7.5	2.9	1.2	.2	*					25.4	11.1	6.2
SOUTH	2.6	1.8	1.8	.9	.2	*	*						7.3	6.4	4.3
SOUTHWEST	1.1	.9	1.1	.4	*	*							3.6	6.4	3.9
WEST	4.7	4.8	3.7	3.7	2.3	.7	.1	*					19.9	9.0	6.4
NORTHWEST	1.9	2.1	4.5	7.1	3.6	1.1	.2	.1	*				20.5	12.5	6.4
TOTAL	17.4	16.3	23.8	25.6	11.2	4.2	.8	.2	*				99.5	10.4	6.8

PERCENT CALMS      .5      TOTAL NUMBER OF OBSERVATIONS      88329  
MAXIMUM RECORDED SPEED      42 KT      DIRECTION OF MAXIMUM WIND      320 DEG  
MEAN WEST TO EAST COMPONENT      -.8 KT  
MEAN SOUTH TO NORTH COMPONENT      1.1 KT  
MEAN VECTOR WIND 144/ 1.4 KT

NOTE- AN ASTERISK(+) INDICATES PERCENTAGE GREATER THAN ZERO BUT LESS THAN 0.05 PERCENT

PREPARED BY SCIENTIFIC SERVICES DIVISION, ATMOSPHERIC ENVIRONMENT SERVICE, VANCOUVER, B.C.      APR 29, 1981

PERCENT FREQUENCY WIND SPEEDS BY DIRECTION  
MERRY ISLAND  
LATITUDE 49 28 NORTH      LONGITUDE 123 54 WEST      ELEVATION      6M      ANEMOMETER HEIGHT 12M AGL  
ANEMOMETER TYPE:- 45B 06/1962-12/1979

SPEED(KT)	DEC - FEB												1963-1979		
	1-3	4-6	7-10	11-16	17-21	22-27	28-33	34-40	41-47	48-55	56-63	64+	TOTAL	MEAN SPEED	STANDARD DEVIATION
NORTH	5.6	3.9	1.8	.4	.1	*							11.8	4.6	3.0
NORTHEAST	1.2	.5	.3	.2	*	*	*						2.3	5.3	4.8
EAST	3.0	3.8	6.9	8.5	6.3	5.3	2.5	.9	.1				37.4	15.3	8.8
SOUTHEAST	1.4	1.7	3.4	4.5	3.2	2.5	1.0	.4	*				18.4	15.2	8.6
SOUTH	.7	.4	.5	.5	.1	*							2.2	7.4	5.1
SOUTHWEST	.6	.3	.3	.2	*	*							1.5	6.2	4.9
WEST	1.4	1.1	.5	.2	*	*							3.3	5.0	3.6
NORTHWEST	5.3	6.4	5.2	3.2	1.4	.6	.1	*	*				22.3	8.1	5.9
TOTAL	19.4	18.2	18.9	17.7	11.2	8.6	3.7	1.4	.1				99.0	11.5	8.6

PERCENT CALMS      1.0      TOTAL NUMBER OF OBSERVATIONS      36543  
MAXIMUM RECORDED SPEED      46 KT      DIRECTION OF MAXIMUM WIND      140 DEG  
MEAN WEST TO EAST COMPONENT      -4.7 KT  
MEAN SOUTH TO NORTH COMPONENT      .3 KT  
MEAN VECTOR WIND      94/ 4.8 KT

NOTE- AN ASTERISK(\*) INDICATES PERCENTAGE GREATER THAN ZERO BUT LESS THAN 0.05 PERCENT

PREPARED BY SCIENTIFIC SERVICES DIVISION, ATMOSPHERIC ENVIRONMENT SERVICE, VANCOUVER, B.C. APR 29, 1981

PERCENT FREQUENCY WIND SPEEDS BY DIRECTION  
MERRY ISLAND  
LATITUDE 49 28 NORTH      LONGITUDE 123 54 WEST      ELEVATION      6M      ANEMOMETER HEIGHT 12M AGL  
ANEMOMETER TYPE:- 45B 06/1962-12/1979

SPEED(KT)	MAR - MAY												1963-1979		
	1-3	4-6	7-10	11-16	17-21	22-27	28-33	34-40	41-47	48-55	56-63	64+	TOTAL	MEAN SPEED	STANDARD DEVIATION
NORTH	3.9	1.8	.8	.2	*	*	*						6.7	4.1	3.0
NORTHEAST	.8	.3	.2	.1	*	*							1.4	4.4	3.9
EAST	2.3	2.8	5.5	6.2	4.3	2.6	.8	.3	*				25.0	13.6	7.9
SOUTHEAST	1.9	2.7	4.8	5.6	3.9	1.9	.5	.2	*				21.5	13.2	7.5
SOUTH	1.5	1.0	.7	.4	.1	*	*						3.8	5.9	4.3
SOUTHWEST	1.7	1.8	.8	.3	*								4.6	5.2	3.1
WEST	1.9	2.3	2.2	.4	*	*							6.9	5.9	3.2
NORTHWEST	6.6	7.9	7.5	3.5	1.6	.7	.1	*					27.9	7.8	5.6
TOTAL	20.7	20.7	22.4	16.6	9.9	5.3	1.5	.6	*				97.8	9.9	7.3
PERCENT CALMS	2.2												TOTAL NUMBER OF OBSERVATIONS 37417		
MAXIMUM RECORDED SPEED	46 KT												DIRECTION OF MAXIMUM WIND 90 DEG		
MEAN WEST TO EAST COMPONENT	-3.1 KT														
MEAN SOUTH TO NORTH COMPONENT	.2 KT														
MEAN VECTOR WIND	94/ 3.1 KT														

NOTE- AN ASTERISK(\*) INDICATES PERCENTAGE GREATER THAN ZERO BUT LESS THAN 0.05 PERCENT

PREPARED BY SCIENTIFIC SERVICES DIVISION, ATMOSPHERIC ENVIRONMENT SERVICE, VANCOUVER, B.C. APR 29, 1981

## PERCENT FREQUENCY WIND SPEEDS BY DIRECTION

MERRY ISLAND

LATITUDE 49 28 NORTH LONGITUDE 123 54 WEST ELEVATION 6M ANEMOMETER HEIGHT 12M AGL

ANEMOMETER TYPE:- 45B 06/1962-12/1979

JUN - AUG

1963-1979

SPEED(KT)	1-3	4-6	7-10	11-16	17-21	22-27	28-33	34-40	41-47	48-55	56-63	64+	TOTAL	MEAN SPEED	STANDARD DEVIATION
NORTH	2.9	.9	.4	.1	*	*							4.5	3.7	3.0
NORTHEAST	.7	.2	.1	*	*								1.1	3.8	3.3
EAST	3.3	3.7	6.5	4.5	1.9	.9	.1	*					20.9	9.8	6.1
SOUTHEAST	2.7	4.7	7.9	8.0	4.1	1.2	.1	*					28.7	11.2	6.0
SOUTH	1.9	1.2	.5	.2	*								3.7	4.5	2.8
SOUTHWEST	1.7	2.3	.9	.1	*								5.0	4.9	2.4
WEST	2.4	3.2	3.4	.4									9.3	5.8	2.7
NORTHWEST	6.2	7.4	7.4	3.0	.7	.1							24.8	6.9	4.2
TOTAL	22.0	23.5	27.1	16.2	6.8	2.2	.2	*					98.0	8.3	5.6

PERCENT CALMS 2.0

TOTAL NUMBER OF OBSERVATIONS 37294

MAXIMUM RECORDED SPEED 37 KT

DIRECTION OF MAXIMUM WIND 90 DEG

MEAN WEST TO EAST COMPONENT -1.4 KT  
MEAN SOUTH TO NORTH COMPONENT .8 KT

MEAN VECTOR WIND 119/ 1.6 KT

NOTE- AN ASTERISK(\*) INDICATES PERCENTAGE GREATER THAN ZERO BUT LESS THAN 0.05 PERCENT

PREPARED BY SCIENTIFIC SERVICES DIVISION, ATMOSPHERIC ENVIRONMENT SERVICE, VANCOUVER, B.C. APR 29, 1981

## PERCENT FREQUENCY WIND SPEEDS BY DIRECTION

MERRY ISLAND

LATITUDE 49 28 NORTH      LONGITUDE 123 54 WEST      ELEVATION      6M      ANEMOMETER HEIGHT 12M AGL

ANEMOMETER TYPE:- 45B 06/1962-12/1979

SEP - NOV

1963-1979

SPEED(KT)	1-3	4-6	7-10	11-16	17-21	22-27	28-33	34-40	41-47	48-55	56-63	64+	TOTAL	MEAN SPEED	STANDARD DEVIATION
NORTH	5.5	3.0	1.2	.1	*								9.8	4.0	2.4
NORTHEAST	1.0	.3	.2	*	*								1.5	3.9	2.9
EAST	2.9	3.4	6.4	7.3	5.1	4.0	1.8	.6	*				31.5	14.4	6.5
SOUTHEAST	1.7	1.8	3.0	4.4	3.2	2.0	.6	.1	*				16.8	14.0	7.8
SOUTH	1.0	.4	.3	.2	.1		*						1.9	5.3	4.3
SOUTHWEST	1.4	.8	.2	.1	*								2.5	4.0	2.6
WEST	2.3	1.9	1.2	.1	*	*							5.5	4.8	2.8
NORTHWEST	8.4	10.1	7.1	2.6	.9	.3	.1	*					29.5	6.6	4.6
TOTAL	24.3	21.5	19.4	14.9	9.4	6.3	2.5	.7	*				99.1	9.9	7.8

PERCENT CALMS .9

TOTAL NUMBER OF OBSERVATIONS 34190

MAXIMUM RECORDED SPEED 47 KT

DIRECTION OF MAXIMUM WIND 90 DEG

MEAN WEST TO EAST COMPONENT -1.5 KT  
MEAN SOUTH TO NORTH COMPONENT .2 KT

MEAN VECTOR WIND 97/ 1.5 KT

NOTE- AN ASTERISK(\*) INDICATES PERCENTAGE GREATER THAN ZERO BUT LESS THAN 0.05 PERCENT

PREPARED BY SCIENTIFIC SERVICES DIVISION, ATMOSPHERIC ENVIRONMENT SERVICE, VANCOUVER, B.C. APR 29, 1981

25

PERCENT FREQUENCY WIND SPEEDS BY DIRECTION  
MERRY ISLAND  
LATITUDE 49 28 NORTH      LONGITUDE 123 54 WEST      ELEVATION      6M      ANEMOMETER HEIGHT 12M AGL  
ANEMOMETER TYPE:- 45B 06/1962-12/1979

SPEED(KT)	ANNUAL												1963-1979		
	1-3	4-6	7-10	11-16	17-21	22-27	28-33	34-40	41-47	48-55	56-63	64+	TOTAL	MEAN SPEED	STANDARD DEVIATION
NORTH	4.5	2.4	1.0	.2	*	*	*						8.1	4.2	2.9
NORTHEAST	.9	.3	.2	.1	*	*	*						1.6	4.5	4.0
EAST	2.9	3.4	6.3	6.6	4.4	3.2	1.3	.4	*				28.6	13.7	8.3
SOUTHEAST	1.9	2.8	4.8	5.6	3.6	1.9	.6	.2	*				21.5	13.1	7.5
SOUTH	1.3	.7	.5	.3	.1	*	*						2.9	5.6	4.2
SOUTHWEST	1.4	1.3	.5	.2	*	*							3.4	5.0	3.1
WEST	2.0	2.1	1.8	.3	*	*							6.3	5.5	3.0
NORTHWEST	6.6	7.9	6.8	3.1	1.1	.4	.1	*	*				26.1	7.3	5.1
TOTAL	21.5	21.0	22.0	16.4	9.3	5.6	2.0	.7	.1				98.5	9.9	7.5

PERCENT CALMS      1.5      TOTAL NUMBER OF OBSERVATIONS 145444  
 MAXIMUM RECORDED SPEED      47 KT      DIRECTION OF MAXIMUM WIND      90 DEG  
 MEAN WEST TO EAST COMPONENT      -7.5 KT  
 MEAN SOUTH TO NORTH COMPONENT      1.1 KT  
 MEAN VECTOR WIND      98/ 7.6 KT

NOTE- AN ASTERISK(\*) INDICATES PERCENTAGE GREATER THAN ZERO BUT LESS THAN 0.05 PERCENT

PREPARED BY SCIENTIFIC SERVICES DIVISION, ATMOSPHERIC ENVIRONMENT SERVICE, VANCOUVER, B.C. APR 29, 1981

## PERCENT FREQUENCY WIND SPEEDS BY DIRECTION

SANDHEADS LIGHTSTATION

LATITUDE 49° 6' NORTH      LONGITUDE 123° 18' WEST      ELEVATION 0M      ANEMOMETER HEIGHT 18M ASL

ANEMOMETER TYPE:- 45B 05/1967-12/1979

DEC - FEB

1967-1979

SPEED(KT)	1-3	4-6	7-10	11-16	17-21	22-27	28-33	34-40	41-47	48-55	56-63	64+	TOTAL	MEAN SPEED	STANDARD DEVIATION
NORTH	1.9	1.4	1.3	.5	.1	.1	*	*					5.2	6.3	4.7
NORTHEAST	1.5	1.3	1.4	1.0	.2	*							5.5	7.4	4.8
EAST	3.6	5.2	12.6	13.8	3.9	1.0	*						40.3	10.8	5.2
SOUTHEAST	1.4	1.2	1.9	3.2	2.8	2.1	.6	.3	*				13.6	15.5	8.7
SOUTH	.9	.6	1.1	2.8	2.4	.9	.1	*					8.9	14.4	6.8
SOUTHWEST	.5	.5	.7	1.1	.6	.2	*	*	*				3.6	11.6	6.8
WEST	1.4	1.1	1.4	1.9	1.3	.8	.2	*					8.1	12.4	8.1
NORTHWEST	1.4	1.8	3.6	3.5	1.6	1.0	.4	.2	*				13.5	12.3	7.6
TOTAL	12.6	13.1	24.2	27.6	12.9	6.2	1.5	.6	.1				98.6	11.7	7.0

PERCENT CALMS 1.4

TOTAL NUMBER OF OBSERVATIONS 26697

MAXIMUM RECORDED SPEED 44 KT

DIRECTION OF MAXIMUM WIND 140 DEG

MEAN WEST TO EAST COMPONENT -2.9 KT  
MEAN SOUTH TO NORTH COMPONENT 1.0 KT

MEAN VECTOR WIND 110/ 3.1 KT

NOTE- AN ASTERISK(\*) INDICATES PERCENTAGE GREATER THAN ZERO BUT LESS THAN 0.05 PERCENT

PREPARED BY SCIENTIFIC SERVICES DIVISION, ATMOSPHERIC ENVIRONMENT SERVICE, VANCOUVER, B.C., MAY 1, 1981

2

## PERCENT FREQUENCY WIND SPEEDS BY DIRECTION

SANDHEADS LIGHTSTATION

LATITUDE 49° 6' NORTH    LONGITUDE 123° 18' WEST    ELEVATION 0M    ANEMOMETER HEIGHT 10M ASL

ANEMOMETER TYPE:- 458 05/1967-12/1979

MAR - MAY

1967-1979

SPEED(KT)	1-3	4-6	7-10	11-16	17-21	22-27	28-33	34-40	41-47	48-55	56-63	64+	TOTAL	MEAN SPEED	STANDARD DEVIATION
NORTH	1.2	1.0	1.0	.3	*								3.6	5.8	3.4
NORTHEAST	1.5	1.2	1.0	.4	.1	*							4.1	5.9	4.0
EAST	2.9	3.8	7.8	6.2	1.3	.4	*						22.5	9.5	5.0
SOUTHEAST	1.5	2.3	5.3	5.9	2.1	1.1	.3	.1	*				18.7	11.9	6.5
SOUTH	2.0	2.3	3.0	3.0	1.2	.4	.1	*					12.1	9.8	6.1
SOUTHWEST	1.2	1.1	1.4	1.7	.6	.1	*						6.2	9.5	5.8
WEST	2.4	2.7	2.7	2.9	1.6	.9	.2	.1	*				13.4	10.8	7.5
NORTHWEST	1.5	2.0	4.2	5.7	3.0	1.1	.3	.1	*	*			17.9	12.9	7.0
TOTAL	14.3	16.4	26.4	26.1	9.8	4.1	.9	.3	.1	*			98.4	10.5	6.5

PERCENT CALMS 1.6

TOTAL NUMBER OF OBSERVATIONS 27240

MAXIMUM RECORDED SPEED 53 KT

DIRECTION OF MAXIMUM WIND 320 DEG

MEAN WEST TO EAST COMPONENT -.6 KT

MEAN SOUTH TO NORTH COMPONENT .6 KT

MEAN VECTOR WIND 135/ .9 KT

NOTE- AN ASTERISK(\*) INDICATES PERCENTAGE GREATER THAN ZERO BUT LESS THAN 0.05 PERCENT

PREPARED BY SCIENTIFIC SERVICES DIVISION, ATMOSPHERIC ENVIRONMENT SERVICE, VANCOUVER, B.C. MAY 1, 1981

b

## PERCENT FREQUENCY WIND SPEEDS BY DIRECTION

## SANDHEADS LIGHTSTATION

LATITUDE 49° 6' NORTH    LONGITUDE 123° 18' WEST    ELEVATION 0M    ANEMOMETER HEIGHT 18M ASL

ANEMOMETER TYPE:- 45B 05/1967-12/1979

JUN - AUG

1967-1979

SPEED(KT)	1-3	4-6	7-10	11-16	17-21	22-27	28-33	34-40	41-47	48-55	56-63	64+	TOTAL	MEAN SPEED	STANDARD DEVIATION
NORTH	1.1	.8	.8	.4	.1	.1							3.3	6.8	5.1
NORTHEAST	.9	.8	.5	.1	*	*							2.3	5.4	3.6
EAST	2.9	4.1	8.2	6.3	.8	.1							22.3	8.9	4.4
SOUTHEAST	2.2	4.0	9.4	8.1	1.5	.2	*						25.4	9.8	4.5
SOUTH	3.5	3.3	3.3	1.6	.3	*							12.1	6.8	4.3
SOUTHWEST	1.6	.9	.7	.4	.1	*	*						3.8	6.2	4.6
WEST	2.7	2.8	2.4	1.8	.8	.5	.1	*					10.9	8.6	6.3
NORTHWEST	1.5	1.9	4.2	6.2	3.7	1.3	.1	*					18.9	12.7	6.2
TOTAL	16.4	18.6	29.5	24.9	7.4	2.1	.2	*					99.1	9.3	5.4

PERCENT CALMS .9

TOTAL NUMBER OF OBSERVATIONS 27927

MAXIMUM RECORDED SPEED 34 KT

DIRECTION OF MAXIMUM WIND 270 DEG

MEAN WEST TO EAST COMPONENT -.3 KT  
MEAN SOUTH TO NORTH COMPONENT .6 KT

MEAN VECTOR WIND 151/ .7 KT

NOTE- AN ASTERISK(\*) INDICATES PERCENTAGE GREATER THAN ZERO BUT LESS THAN 0.05 PERCENT

PREPARED BY SCIENTIFIC SERVICES DIVISION, ATMOSPHERIC ENVIRONMENT SERVICE, VANCOUVER, B.C. MAY 1, 1981

## PERCENT FREQUENCY WIND SPEEDS BY DIRECTION

SANDHEADS LIGHTSTATION

LATITUDE 49° 6' NORTH LONGITUDE 123° 18' WEST ELEVATION 0M ANEMOMETER HEIGHT 10M ASL

ANEMOMETER TYPE:- 458 05/1967-12/1979

SEP - NOV

1967-1979

SPEED(KT)	1-3	4-6	7-10	11-16	17-21	22-27	28-33	34-40	41-47	48-55	56-63	64+	TOTAL	MEAN SPEED	STANDARD DEVIATION
NORTH	2.0	1.5	1.3	.7	.1	*							5.5	6.1	4.0
NORTHEAST	1.5	1.0	.9	.5	.1								4.1	6.3	4.4
EAST	3.6	4.1	8.8	8.1	2.4	.6	*						27.6	10.0	5.4
SOUTHEAST	2.0	2.0	4.0	4.6	2.4	1.3	.4	.1	*				16.8	12.2	7.2
SOUTH	1.8	1.2	1.5	2.3	1.3	.4	.1	*					8.6	10.8	7.0
SOUTHWEST	1.1	.5	.8	1.0	.2	.1	*	*					3.6	8.6	5.8
WEST	2.4	2.1	2.2	1.9	1.3	.8	.2	*	*				11.1	10.5	7.7
NORTHWEST	2.3	3.4	6.1	6.3	2.3	.9	.2	*	*				21.6	10.9	6.2
TOTAL	16.6	15.9	25.6	25.4	10.1	4.1	.9	.2	*				98.8	10.3	6.4

PERCENT CALMS 1.2

TOTAL NUMBER OF OBSERVATIONS 28207

MAXIMUM RECORDED SPEED 46 KT

DIRECTION OF MAXIMUM WIND 140 DEG

MEAN WEST TO EAST COMPONENT .1 KT

MEAN SOUTH TO NORTH COMPONENT -.2 KT

MEAN VECTOR WIND 328/.2 KT

NOTE- AN ASTERISK(\*) INDICATES PERCENTAGE GREATER THAN ZERO BUT LESS THAN 0.05 PERCENT

PREPARED BY SCIENTIFIC SERVICES DIVISION, ATMOSPHERIC ENVIRONMENT SERVICE, VANCOUVER, B.C. MAY 1, 1981

61

## PERCENT FREQUENCY WIND SPEEDS BY DIRECTION

SANDHEADS LIGHTSTATION

LATITUDE 49° 6 NORTH      LONGITUDE 123° 18 WEST      ELEVATION 0M      ANEMOMETER HEIGHT 18M ASL

ANEMOMETER TYPE:- 45B 05/1967-12/1979

SPEED(KT)	ANNUAL												1967-1979		
	1-3	4-6	7-10	11-16	17-21	22-27	28-33	34-40	41-47	48-55	56-63	64+	TOTAL	MEAN SPEED	STANDARD DEVIATION
NORTH	1.5	1.2	1.1	.5	.1	*	*	*					4.4	6.2	4.3
NORTHEAST	1.3	1.1	.9	.5	.1	*							4.0	6.4	4.4
EAST	3.2	4.3	9.3	8.6	2.1	.5	*						28.1	10.0	5.1
SOUTHEAST	1.8	2.4	5.2	5.5	2.2	1.2	.3	.1	*				18.7	11.9	6.8
SOUTH	2.1	1.9	2.3	2.4	1.3	.4	.1	*					10.4	10.1	6.6
SOUTHWEST	1.1	.7	.9	1.0	.4	.1	*	*	*				4.3	9.0	6.1
WEST	2.2	2.2	2.2	2.1	1.2	.7	.2	*	*				10.9	10.4	7.5
NORTHWEST	1.7	2.3	4.6	5.4	2.7	1.1	.3	.1	*	*			18.0	12.1	6.7
TOTAL	15.0	16.0	26.4	26.0	10.0	4.1	.9	.3	*	*			98.7	10.4	6.4

PERCENT CALMS 1.3

TOTAL NUMBER OF OBSERVATIONS 110071

MAXIMUM RECORDED SPEED 53 KT

DIRECTION OF MAXIMUM WIND 320 DEG

MEAN WEST TO EAST COMPONENT -2.9 KT  
MEAN SOUTH TO NORTH COMPONENT 1.6 KT

MEAN VECTOR WIND 119/ 3.4 KT

NOTE- AN ASTERISK(\*) INDICATES PERCENTAGE GREATER THAN ZERO BUT LESS THAN 0.05 PERCENT

PREPARED BY SCIENTIFIC SERVICES DIVISION, ATMOSPHERIC ENVIRONMENT SERVICE, VANCOUVER, B.C. MAY 1, 1981

PERCENT FREQUENCY WIND SPEEDS BY DIRECTION  
SATURNA ISLAND LIGHT  
LATITUDE 48 47 NORTH      LONGITUDE 123 3 WEST      ELEVATION 38M      ANEMOMETER HEIGHT 18M AGL  
ANEMOMETER TYPE:- 45B 03/1968-10/1979

SPEED(KT)	DEC - FEB												1968-1979		
	1-3	4-6	7-10	11-16	17-21	22-27	28-33	34-40	41-47	48-55	56-63	64+	TOTAL	MEAN SPEED	STANDARD DEVIATION
NORTH	1.3	1.7	2.7	.9	.2	.2	.1	*					7.1	8.4	5.7
NORTHEAST	.9	1.6	4.1	4.6	2.5	2.6	1.1	.3					17.6	15.1	8.2
EAST	.8	1.6	3.8	3.5	1.3	.5	.1	*					11.6	11.3	5.8
SOUTHEAST	.7	.9	2.6	4.6	3.3	2.5	1.3	.8	.2				16.8	17.6	9.0
SOUTH	.8	1.4	3.2	4.1	3.0	1.8	.5	.2	.1	*			15.1	14.8	8.0
SOUTHWEST	1.2	2.6	3.6	2.2	.8	.3	.1	*					10.8	9.5	5.8
WEST	1.8	1.0	.4	.1	*								3.4	4.3	2.5
NORTHWEST	3.7	6.1	6.4	1.0	*								17.2	6.2	2.8
TOTAL	11.2	16.9	26.8	21.1	11.1	7.8	3.2	1.4	.3	*			99.6	12.1	8.0

PERCENT CALMS .4

TOTAL NUMBER OF OBSERVATIONS 22151

MAXIMUM RECORDED SPEED 51 KT

DIRECTION OF MAXIMUM WIND 180 DEG

MEAN WEST TO EAST COMPONENT -2.8 KT  
MEAN SOUTH TO NORTH COMPONENT 1.8 KT

MEAN VECTOR WIND 122/ 3.3 KT

NOTE- AN ASTERISK(\*) INDICATES PERCENTAGE GREATER THAN ZERO BUT LESS THAN 0.05 PERCENT

PREPARED BY SCIENTIFIC SERVICES DIVISION, ATMOSPHERIC ENVIRONMENT SERVICE, VANCOUVER, B.C. APR 29, 1981

## PERCENT FREQUENCY WIND SPEEDS BY DIRECTION

SATURNA ISLAND LIGHT

LATITUDE 48 47 NORTH      LONGITUDE 123 3 WEST      ELEVATION 38M      ANEMOMETER HEIGHT 18M AGL

ANEMOMETER TYPE:- 45B 03/1968-10/1979

MAR - MAY

1968-1979

SPEED(KT)	1-3	4-6	7-10	11-16	17-21	22-27	28-33	34-40	41-47	48-55	56-63	64+	TOTAL	MEAN SPEED	STANDARD DEVIATION
NORTH	1.6	1.4	.7	.1	*								3.9	4.9	3.0
NORTHEAST	1.1	.9	.9	.9	.3	.1	*						4.1	8.5	5.9
EAST	1.2	1.2	1.6	1.1	.4	.2	*						5.7	8.6	5.7
SOUTHEAST	2.2	1.3	2.4	3.2	1.7	1.2	.7	.4	.1	*			13.1	13.5	9.2
SOUTH	3.2	3.9	6.7	5.9	1.9	.7	.1	.1	*				22.4	10.0	6.0
SOUTHWEST	4.5	5.9	8.2	3.0	.6	.2	*	*					22.3	7.3	4.3
WEST	2.3	1.3	.5	*	*								4.1	4.1	2.3
NORTHWEST	6.4	7.9	7.4	1.3	*								23.0	5.9	2.9
TOTAL	22.5	23.7	28.5	15.5	4.8	2.4	.9	.4	.1	*			98.7	8.3	6.0

PERCENT CALMS 1.3

TOTAL NUMBER OF OBSERVATIONS 26334

MAXIMUM RECORDED SPEED 52 KT

DIRECTION OF MAXIMUM WIND 140 DEG

MEAN WEST TO EAST COMPONENT -.6 KT  
MEAN SOUTH TO NORTH COMPONENT 1.9 KT

MEAN VECTOR WIND 162/ 2.0 KT

NOTE- AN ASTERISK(\*) INDICATES PERCENTAGE GREATER THAN ZERO BUT LESS THAN 0.05 PERCENT

PREPARED BY SCIENTIFIC SERVICES DIVISION, ATMOSPHERIC ENVIRONMENT SERVICE, VANCOUVER, B.C. APR 29, 1981

## PERCENT FREQUENCY WIND SPEEDS BY DIRECTION

SATURNA ISLAND LIGHT

LATITUDE 48 47 NORTH LONGITUDE 123 3 WEST ELEVATION 38M ANEMOMETER HEIGHT 18M AGL

ANEMOMETER TYPE:- 458 03/1968-10/1979

JUN - AUG

1968-1979

SPEED(KT)	1-3	4-6	7-10	11-16	17-21	22-27	28-33	34-40	41-47	48-55	56-63	64+	TOTAL	MEAN SPEED	STANDARD DEVIATION
NORTH	1.6	.8	.2		*								2.5	3.7	2.1
NORTHEAST	.7	.4	.3	.1	*	*							1.5	5.1	3.6
EAST	1.1	1.1	.9	.2	*	*							3.4	5.8	3.4
SOUTHEAST	1.9	1.7	1.7	1.4	.3	.1	*	*					7.2	7.9	5.3
SOUTH	4.1	6.5	10.4	6.9	1.5	.1							29.5	8.7	4.5
SOUTHWEST	4.2	8.3	15.7	4.9	.2	*							33.4	7.6	3.3
WEST	2.0	1.0	.3	*									3.3	3.8	2.1
NORTHWEST	4.3	8.1	5.7	.9	*								19.0	5.9	2.7
TOTAL	20.0	27.7	35.2	14.4	2.1	.3	*	*					99.8	7.3	4.0

PERCENT CALMS .2

TOTAL NUMBER OF OBSERVATIONS 26449

MAXIMUM RECORDED SPEED 34 KT

DIRECTION OF MAXIMUM WIND 140 DEG

MEAN WEST TO EAST COMPONENT 1.2 KT  
MEAN SOUTH TO NORTH COMPONENT 2.4 KT

MEAN VECTOR WIND 206/ 2.7 KT

NOTE- AN ASTERISK(\*) INDICATES PERCENTAGE GREATER THAN ZERO BUT LESS THAN 0.05 PERCENT

PREPARED BY SCIENTIFIC SERVICES DIVISION, ATMOSPHERIC ENVIRONMENT SERVICE, VANCOUVER, B.C. APR 29, 1981

59

## PERCENT FREQUENCY WIND SPEEDS BY DIRECTION

SATURNA ISLAND LIGHT

LATITUDE 48 47 NORTH      LONGITUDE 123 3 WEST      ELEVATION 38M      ANENOMETER HEIGHT 18M AGL

ANENOMETER TYPE:- 45B 03/1968-10/1979

SEP - NOV

1968-1979

SPEED(KT)	1-3	4-6	7-10	11-16	17-21	22-27	28-33	34-40	41-47	48-55	56-63	64+	TOTAL	MEAN SPEED	STANDARD DEVIATION
NORTH	1.7	1.4	1.2	.3	.2	.1	*						4.9	6.3	4.7
NORTHEAST	.9	1.2	1.8	1.9	.9	.5	.3	*					7.5	12.1	7.5
EAST	1.1	1.4	2.1	1.6	.6	.3	.1						7.1	9.7	6.1
SOUTHEAST	1.2	1.3	2.3	3.3	1.9	1.8	1.0	.3	.1				13.2	15.4	9.1
SOUTH	2.7	3.4	5.8	4.6	1.7	.9	.2	.1	*				19.5	10.5	6.7
SOUTHWEST	3.0	4.7	5.9	1.8	.4	.1	*	*					15.9	7.3	4.1
WEST	2.9	1.6	.7	*									5.2	4.0	2.1
NORTHWEST	5.5	10.0	9.7	1.1	*								26.4	6.1	2.6
TOTAL	18.9	25.0	29.5	14.7	5.8	3.7	1.6	.5	.1				99.6	9.0	6.6

PERCENT CALMS .4

TOTAL NUMBER OF OBSERVATIONS 24564

MAXIMUM RECORDED SPEED 45 KT

DIRECTION OF MAXIMUM WIND 140 DEG

MEAN WEST TO EAST COMPONENT .8 KT

MEAN SOUTH TO NORTH COMPONENT 1.1 KT

MEAN VECTOR WIND 216/ 1.4 KT

NOTE- AN ASTERISK(\*) INDICATES PERCENTAGE GREATER THAN ZERO BUT LESS THAN 0.05 PERCENT

PREPARED BY SCIENTIFIC SERVICES DIVISION, ATMOSPHERIC ENVIRONMENT SERVICE, VANCOUVER, B.C. APR 29, 1981

## PERCENT FREQUENCY WIND SPEEDS BY DIRECTION

SATURNA ISLAND LIGHT

LATITUDE 48 47 NORTH      LONGITUDE 123 3 WEST      ELEVATION 38M      ANEMOMETER HEIGHT 18M AGL

ANEMOMETER TYPE:- 45B 03/1968-10/1979

SPEED(KT)	ANNUAL												1968-1979		
	1-3	4-6	7-10	11-16	17-21	22-27	28-33	34-40	41-47	48-55	56-63	64+	TOTAL	MEAN SPEED	STANDARD DEVIATION
NORTH	1.6	1.3	1.1	.3	.1	.1	*	*					4.5	6.3	4.8
NORTHEAST	.9	1.0	1.7	1.8	.9	.7	.3	.1					7.2	12.8	8.1
EAST	1.1	1.3	2.0	1.5	.5	.2	*	*					6.7	9.6	5.9
SOUTHEAST	1.5	1.3	2.2	3.1	1.7	1.3	.7	.4	.1	*			12.4	14.4	9.2
SOUTH	2.8	3.9	6.7	5.4	2.0	.8	.2	.1	*	*			22.0	10.4	6.4
SOUTHWEST	3.3	5.5	8.6	3.0	.5	.1	*	*					21.1	7.7	4.1
WEST	2.2	1.2	.5	*	*								4.0	4.1	2.2
NORTHWEST	5.0	8.1	7.3	1.1	*								21.5	6.0	2.7
TOTAL	18.4	23.6	30.1	16.2	5.7	3.3	1.3	.6	.1	*			99.4	9.0	6.5

PERCENT CALMS .6      TOTAL NUMBER OF OBSERVATIONS 99498

MAXIMUM RECORDED SPEED 52 KT      DIRECTION OF MAXIMUM WIND 140 DEG

MEAN WEST TO EAST COMPONENT -.5 KT

MEAN SOUTH TO NORTH COMPONENT 5.2 KT

MEAN VECTOR WIND 175/ 5.3 KT

NOTE- AN ASTERISK(\*) INDICATES PERCENTAGE GREATER THAN ZERO BUT LESS THAN 0.05 PERCENT

PREPARED BY SCIENTIFIC SERVICES DIVISION, ATMOSPHERIC ENVIRONMENT SERVICE, VANCOUVER, B.C. APR 29, 1981

PERCENT FREQUENCY WIND SPEEDS BY DIRECTION  
SQUAMISH FMC CHEMICALS

LATITUDE 49 41 NORTH      LONGITUDE 123 10 WEST      ELEVATION      3M      ANEMOMETER HEIGHT      9M AGL

ANEMOMETER TYPE:- U2A 04/1971-05/1976

DEC - FEB

1971-1976

SPEED(KT)	1-3	4-6	7-10	11-16	17-21	22-27	28-33	34-40	41-47	48-55	56-63	64+	TOTAL	MEAN SPEED	STANDARD DEVIATION
NORTH	15.5	12.6	11.9	3.8	1.1	.8	.6	.2					46.5	6.7	5.7
NORTHEAST	2.0	.7	.8	1.5	1.1	1.2	.6	.1					8.0	13.9	10.0
EAST	.7	.4	.2	.1	.1	.1							1.6	6.5	6.5
SOUTHEAST	.6	.4	.2	.2	*								1.4	5.9	4.3
SOUTH	3.5	3.3	2.8	2.6	2.0	.7	.3	.1	.1	.1			15.6	10.5	8.5
SOUTHWEST	.5	.5	1.9	2.2	.5	.2	*	.1	.1	.1	*		6.0	11.9	7.1
WEST	1.7	2.5	1.8	.6	.1								6.8	6.3	3.6
NORTHWEST	1.9	1.8	2.2	.9	.2		.1	*					7.1	7.1	5.3
TOTAL	26.4	22.2	21.8	11.9	5.2	2.9	1.6	.6	.2	.1			92.9	8.3	7.1

PERCENT CALMS      7.1

TOTAL NUMBER OF OBSERVATIONS      7020

MAXIMUM RECORDED SPEED      50 KT

DIRECTION OF MAXIMUM WIND      180 DEG

MEAN WEST TO EAST COMPONENT      .7 KT  
MEAN SOUTH TO NORTH COMPONENT      -1.6 KT

MEAN VECTOR WIND 337/ 1.7 KT

NOTE- AN ASTERISK(\*) INDICATES PERCENTAGE GREATER THAN ZERO BUT LESS THAN 0.05 PERCENT

PREPARED BY SCIENTIFIC SERVICES DIVISION, ATMOSPHERIC ENVIRONMENT SERVICE, VANCOUVER, B.C.      MAY 7, 1981

## PERCENT FREQUENCY WIND SPEEDS BY DIRECTION

SQUAMISH FMC CHEMICALS

LATITUDE 49 41 NORTH LONGITUDE 123 10 WEST ELEVATION 3M ANEMOMETER HEIGHT 9M AGL

ANEMOMETER TYPE:- U2A 04/1971-05/1976

MAR - MAY

1971-1976

SPEED(KT)	1-3	4-6	7-10	11-16	17-21	22-27	28-33	34-40	41-47	48-55	56-63	64+	TOTAL	MEAN SPEED	STANDARD DEVIATION
NORTH	11.1	9.3	5.9	.7	*								27.0	4.7	2.8
NORTHEAST	4.6	1.0	1.0	.8	.3	*							7.7	5.1	4.9
EAST	1.1	.6	.9	1.3	.4	.1							4.3	9.3	6.1
SOUTHEAST	1.0	.9	.4	.6	.5	.2							3.6	9.2	6.9
SOUTH	5.5	5.8	6.5	4.8	1.4	.3	*						24.4	8.1	5.2
SOUTHWEST	2.1	1.2	6.1	9.0	2.2	.1	*						20.9	11.2	4.9
WEST	1.3	.5	.9	.5	.1	*							3.2	6.3	4.8
NORTHWEST	1.3	.6	.4	.1									2.4	4.1	2.6
TOTAL	27.9	19.9	22.2	17.7	5.0	.8	*						93.5	7.5	5.3

PERCENT CALMS 6.5

TOTAL NUMBER OF OBSERVATIONS 10431

MAXIMUM RECORDED SPEED 30 KT

DIRECTION OF MAXIMUM WIND 180 DEG

MEAN WEST TO EAST COMPONENT .4 KT

MEAN SOUTH TO NORTH COMPONENT .3 KT

MEAN VECTOR WIND 232/ .5 KT

NOTE- AN ASTERISK(\*) INDICATES PERCENTAGE GREATER THAN ZERO BUT LESS THAN 0.05 PERCENT

PREPARED BY SCIENTIFIC SERVICES DIVISION, ATMOSPHERIC ENVIRONMENT SERVICE, VANCOUVER, B.C. MAY 7, 1981

## PERCENT FREQUENCY WIND SPEEDS BY DIRECTION

SQUAMISH FMC CHEMICALS

LATITUDE 49 41 NORTH      LONGITUDE 123 10 WEST      ELEVATION      3M      ANEMOMETER HEIGHT      9M AGL

ANEMOMETER TYPE:- U2A 04/1971-05/1976

JUN - AUG

1971-1976

SPEED(kt)	1-3	4-6	7-10	11-16	17-21	22-27	28-33	34-40	41-47	48-55	56-63	64+	TOTAL	MEAN SPEED	STANDARD DEVIATION
NORTH	10.1	5.2	3.2	.4	.1								19.1	4.2	2.9
NORTHEAST	3.6	1.0	.3	.1									5.1	3.3	2.5
EAST	1.3	.7	1.1	.1									3.3	5.3	3.0
SOUTHEAST	.8	.6	.5	.3	*								2.2	6.2	4.1
SOUTH	6.0	6.5	8.2	4.6	.7	.1	*						26.2	7.4	4.4
SOUTHWEST	1.6	.9	5.5	12.4	5.8	1.1	*						27.4	13.4	5.2
WEST	1.2	.8	.9	1.7	.4	.1							5.1	9.4	5.9
NORTHWEST	2.0	.7	.3	.1	.1	*							3.2	4.4	4.4
TOTAL	26.6	16.4	20.0	19.9	7.1	1.4	.1						91.5	6.2	5.6

PERCENT CALMS      8.5

TOTAL NUMBER OF OBSERVATIONS      9435

MAXIMUM RECORDED SPEED      30 KT

DIRECTION OF MAXIMUM WIND      230 DEG

MEAN WEST TO EAST COMPONENT      1.9 KT  
MEAN SOUTH TO NORTH COMPONENT      2.4 KT

MEAN VECTOR WIND 219/ 3.1 KT

NOTE- AN ASTERISK(\*) INDICATES PERCENTAGE GREATER THAN ZERO BUT LESS THAN 0.05 PERCENT

PREPARED BY SCIENTIFIC SERVICES DIVISION, ATMOSPHERIC ENVIRONMENT SERVICE, VANCOUVER, B.C.      MAY 7, 1981

02

## PERCENT FREQUENCY WIND SPEEDS BY DIRECTION

SQUAMISH FMC CHEMICALS

LATITUDE 49 41 NORTH LONGITUDE 123 10 WEST ELEVATION 3M ANEMOMETER HEIGHT 9M AGL

ANEMOMETER TYPE:- U2A 04/1971-05/1976

SEP - NOV

1971-1976

SPEED(kt)	1-3	4-6	7-10	11-16	17-21	22-27	28-33	34-40	41-47	48-55	56-63	64+	TOTAL	MEAN SPEED	STANDARD DEVIATION
NORTH	16.8	10.5	7.7	.8	.2	.1							36.1	4.7	3.1
NORTHEAST	4.7	1.5	1.1	1.5	.3	.1							9.2	6.0	5.4
EAST	2.9	2.0	.8	*									5.7	4.1	2.1
SOUTHEAST	1.4	1.4	1.2	.3	*								4.2	5.7	3.2
SOUTH	3.7	3.7	4.9	3.2	.5	.1							16.1	7.6	4.5
SOUTHWEST	1.1	.8	3.2	4.9	1.5	.2							11.6	11.6	5.1
WEST	1.1	.6	.4	.5	*	*	*						2.7	6.9	6.1
NORTHWEST	4.0	2.5	1.8	.1	*	*	*						8.5	4.5	2.8
TOTAL	35.6	23.0	21.1	11.2	2.5	.5	.1						94.1	6.2	4.6

PERCENT CALMS 5.9

TOTAL NUMBER OF OBSERVATIONS 8062

MAXIMUM RECORDED SPEED 32 KT

DIRECTION OF MAXIMUM WIND 270 DEG

MEAN WEST TO EAST COMPONENT .8 KT

MEAN SOUTH TO NORTH COMPONENT .9 KT

MEAN VECTOR WIND 224/ 1.2 KT

NOTE- AN ASTERISK(\*) INDICATES PERCENTAGE GREATER THAN ZERO BUT LESS THAN 0.05 PERCENT

PREPARED BY SCIENTIFIC SERVICES DIVISION, ATMOSPHERIC ENVIRONMENT SERVICE, VANCOUVER, B.C. MAY 7, 1981

11

## PERCENT FREQUENCY WIND SPEEDS BY DIRECTION

SQUAMISH FMC CHEMICALS

LATITUDE 49 41 NORTH      LONGITUDE 123 10 WEST      ELEVATION

3M

ANEMOMETER HEIGHT

9M AGL

ANEMOMETER TYPE:- U2A 04/1971-05/1976

ANNUAL

1971-1976

SPEED(KT)	1-3	4-6	7-10	11-16	17-21	22-27	28-33	34-40	41-47	48-55	56-63	64+	TOTAL	MEAN SPEED	STANDARD DEVIATION
NORTH	13.0	9.2	6.8	1.3	.3	.2	.1	*					30.9	5.3	4.1
NORTHEAST	3.8	1.0	.8	.9	.4	.3	.1	*					7.4	6.9	7.3
EAST	1.5	.9	.8	.4	.1	*							3.8	6.3	4.9
SOUTHEAST	1.0	.8	.6	.4	.2	*							2.9	7.1	5.3
SOUTH	4.8	5.0	5.9	3.9	1.1	.3	.1	*	*	*	*	*	21.2	8.1	5.6
SOUTHWEST	1.4	.9	4.4	7.6	2.7	.4	*	*	*	*	*	*	17.5	12.3	5.3
WEST	1.3	1.0	1.0	.8	.2	*	*						4.3	7.4	5.2
NORTHWEST	2.2	1.3	1.1	.2	.1	*	*	*					5.0	5.2	4.1
TOTAL	29.0	20.2	21.3	15.6	5.0	1.3	.4	.1	*	*			93.0	7.6	5.7

PERCENT CALMS      7.0

TOTAL NUMBER OF OBSERVATIONS      34948

MAXIMUM RECORDED SPEED      50 KT

DIRECTION OF MAXIMUM WIND      180 DEG

MEAN WEST TO EAST COMPONENT      2.5 KT

MEAN SOUTH TO NORTH COMPONENT      2.1 KT

MEAN VECTOR WIND 231/ 3.2 KT

NOTE- AN ASTERISK(\*) INDICATES PERCENTAGE GREATER THAN ZERO BUT LESS THAN 0.05 PERCENT

PREPARED BY SCIENTIFIC SERVICES DIVISION, ATMOSPHERIC ENVIRONMENT SERVICE, VANCOUVER, B.C.      MAY 7, 1981

## PERCENT FREQUENCY WIND SPEEDS BY DIRECTION

TSAWWASSEN FERRY

LATITUDE 49° 0' NORTH LONGITUDE 123° 8' WEST ELEVATION 3M ANEMOMETER HEIGHT 17M ASL

ANEMOMETER TYPE:- 45B 05/1961-06/1974 \*\*\* 06/1974-10/1975 U2A 10/1975-11/1975

DEC - FEB

1963-1975

SPEED(KT)	1-3	4-6	7-10	11-16	17-21	22-27	28-33	34-40	41-47	48-55	56-63	64+	TOTAL	MEAN SPEED	STANDARD DEVIATION
NORTH	3.1	2.3	.9	.2	*	*	*						6.6	4.8	3.6
NORTHEAST	2.5	2.6	2.7	2.9	1.0	.3	*	*					12.0	9.1	5.7
EAST	2.5	4.0	8.2	7.9	2.7	.8	.1	*	*				26.3	10.7	5.6
SOUTHEAST	1.1	1.6	3.2	4.8	3.2	2.4	.8	.3	.1				17.4	15.2	8.1
SOUTH	.7	.9	1.9	4.2	3.0	1.4	.2	.1	*				12.4	14.9	6.8
SOUTHWEST	.5	.7	1.6	2.1	.8	.1	*	*					5.8	11.3	5.5
WEST	1.5	1.2	1.7	1.4	.8	.4	.1	*					7.2	10.2	7.1
NORTHWEST	1.9	2.4	2.7	2.2	1.2	.9	.3	.1	*	*			11.7	11.0	7.9
TOTAL	13.9	15.6	22.9	25.8	12.8	6.2	1.6	.5	.1	*			99.5	11.5	7.1

PERCENT CALMS .5

TOTAL NUMBER OF OBSERVATIONS 23508

MAXIMUM RECORDED SPEED 48 KT

DIRECTION OF MAXIMUM WIND 320 DEG

MEAN WEST TO EAST COMPONENT -2.7 KT  
MEAN SOUTH TO NORTH COMPONENT 1.8 KT

MEAN VECTOR WIND 123/ 3.3 KT

NOTE- AN ASTERISK(\*) INDICATES PERCENTAGE GREATER THAN ZERO BUT LESS THAN 0.05 PERCENT

PREPARED BY SCIENTIFIC SERVICES DIVISION, ATMOSPHERIC ENVIRONMENT SERVICE, VANCOUVER, B.C. MAY 20, 1981

## PERCENT FREQUENCY WIND SPEEDS BY DIRECTION

TSAWASSEN FERRY

LATITUDE 49° 0 NORTH      LONGITUDE 123° 8 WEST      ELEVATION      3M      ANEMOMETER HEIGHT 17M ASL  
 ANEMOMETER TYPE:- 45B 05/1961-06/1974 \*\*\* 06/1974-10/1975 U2A 10/1975-11/1975

MAR - MAY

1963-1975

SPEED(KT)	1-3	4-6	7-10	11-16	17-21	22-27	28-33	34-40	41-47	48-55	56-63	64+	TOTAL	MEAN SPEED	STANDARD DEVIATION
NORTH	1.8	1.7	1.1	.3	*	*							4.9	5.5	3.4
NORTHEAST	2.5	2.4	1.5	.8	.1	*							7.2	6.1	3.9
EAST	1.8	3.0	4.6	3.4	1.1	.2	*	*	*				14.1	9.3	5.2
SOUTHEAST	1.8	3.5	7.4	6.0	2.3	.9	.3	.1					22.3	11.1	6.2
SOUTH	2.8	3.3	4.5	3.6	1.4	.4	.1	*					16.0	9.4	5.9
SOUTHWEST	1.6	1.8	2.4	2.4	.4	*	*						8.6	8.7	4.9
WEST	2.5	2.9	2.6	1.9	.7	.2	.1	*					10.9	8.4	5.8
NORTHWEST	1.6	2.6	4.3	4.0	1.8	.8	.2	.1			*		15.4	11.2	6.7
TOTAL	16.4	21.0	26.4	22.4	7.9	2.6	.7	.2	*		*		99.5	9.4	5.9

PERCENT CALMS .5

TOTAL NUMBER OF OBSERVATIONS 24576

MAXIMUM RECORDED SPEED 63 KT

DIRECTION OF MAXIMUM WIND 320 DEG

MEAN WEST TO EAST COMPONENT -.9 KT  
MEAN SOUTH TO NORTH COMPONENT 1.4 KT

MEAN VECTOR WIND 146° 1.6 KT

NOTE- AN ASTERISK(\*) INDICATES PERCENTAGE GREATER THAN ZERO BUT LESS THAN 0.05 PERCENT

PREPARED BY SCIENTIFIC SERVICES DIVISION, ATMOSPHERIC ENVIRONMENT SERVICE, VANCOUVER, B.C. MAY 20, 1981

hl

## PERCENT FREQUENCY WIND SPEEDS BY DIRECTION

TSAWASSEN FERRY

LATITUDE 49° 0' NORTH      LONGITUDE 123° 8' WEST      ELEVATION      3M      ANEMOMETER HEIGHT 17M ASL  
 ANEMOMETER TYPE:- 458 05/1961-06/1974 \*\*\* 06/1974-10/1975 U2A 10/1975-11/1975

JUN - AUG

1963-1975

SPEED(KT)	1-3	4-6	7-10	11-16	17-21	22-27	28-33	34-40	41-47	48-55	56-63	64+	TOTAL	MEAN SPEED	STANDARD DEVIATION
NORTH	1.5	1.1	.5	.1	*								3.2	4.6	2.8
NORTHEAST	.8	.8	.3	.1	*								2.0	4.9	3.0
EAST	1.6	2.2	3.6	1.9	.2	*							9.5	8.0	4.1
SOUTHEAST	3.5	6.4	15.2	10.4	1.2	*							36.7	9.1	4.0
SOUTH	4.0	5.0	5.6	2.4	.4	*							17.4	7.0	4.0
SOUTHWEST	1.9	1.5	1.1	.4	.1	*							5.0	5.6	3.5
WEST	3.4	3.5	2.4	1.4	.4	.1	*						11.2	6.7	4.6
NORTHWEST	1.5	2.4	3.8	4.1	1.9	.6	*						14.4	10.9	5.9
TOTAL	18.3	22.9	32.5	20.9	4.1	.8	*						99.4	8.2	4.6

PERCENT CALMS .6

TOTAL NUMBER OF OBSERVATIONS 22741

MAXIMUM RECORDED SPEED 32 KT

DIRECTION OF MAXIMUM WIND 320 DEG

MEAN WEST TO EAST COMPONENT -.5 KT  
MEAN SOUTH TO NORTH COMPONENT 1.7 KT

MEAN VECTOR WIND 165/ 1.8 KT

NOTE- AN ASTERISK(\*) INDICATES PERCENTAGE GREATER THAN ZERO BUT LESS THAN 0.05 PERCENT

PREPARED BY SCIENTIFIC SERVICES DIVISION, ATMOSPHERIC ENVIRONMENT SERVICE, VANCOUVER, B.C. MAY 20, 1981

## PERCENT FREQUENCY WIND SPEEDS BY DIRECTION

TSAWASSEN FERRY

LATITUDE 49° 0' NORTH      LONGITUDE 123° 8' WEST      ELEVATION      3M      ANEMOMETER HEIGHT 17M ASL  
 ANEMOMETER TYPE:- 45B 05/1961-06/1974 \*\*\* 06/1974-10/1975 U2A 10/1975-11/1975

SEP - NOV

1963-1975

SPEED(kt)	1-3	4-6	7-10	11-16	17-21	22-27	28-33	34-40	41-47	48-55	56-63	64+	TOTAL	MEAN SPEED	STANDARD DEVIATION
NORTH	2.7	1.9	1.0	.1	.1	*							5.7	4.6	3.0
NORTHEAST	2.3	1.8	1.5	1.2	.2	*							7.0	6.8	4.6
EAST	3.1	2.8	4.9	4.9	1.3	.3	*						17.3	9.5	5.5
SOUTHEAST	3.1	3.8	6.9	5.6	3.0	1.2	.4	.1	*	*			24.0	11.0	6.8
SOUTH	2.2	2.1	2.8	3.7	1.4	.5	.1	*					12.9	10.4	6.3
SOUTHWEST	1.6	1.0	1.4	1.4	.3	.1							5.7	8.1	5.2
WEST	3.2	2.0	1.9	1.6	.7	.3	.1	*					9.8	8.1	6.3
NORTHWEST	3.5	3.8	4.2	3.3	1.4	.6	.1	.1	*				16.9	9.2	6.3
TOTAL	21.6	19.2	24.6	21.7	8.3	3.0	.7	.2	*	*			99.3	9.2	6.2

PERCENT CALMS .7

TOTAL NUMBER OF OBSERVATIONS 20605

MAXIMUM RECORDED SPEED 50 KT

DIRECTION OF MAXIMUM WIND 140 DEG

MEAN WEST TO EAST COMPONENT -.1 KT

MEAN SOUTH TO NORTH COMPONENT .7 KT

MEAN VECTOR WIND 172/ .7 KT

NOTE- AN ASTERISK(\*) INDICATES PERCENTAGE GREATER THAN ZERO BUT LESS THAN 0.05 PERCENT

PREPARED BY SCIENTIFIC SERVICES DIVISION, ATMOSPHERIC ENVIRONMENT SERVICE, VANCOUVER, B.C. MAY 20, 1981

92

## PERCENT FREQUENCY WIND SPEEDS BY DIRECTION

TSAWWASSEN FERRY

LATITUDE 49° 0 NORTH      LONGITUDE 123° 8 WEST      ELEVATION      3M      ANEMOMETER HEIGHT 17M ASL  
 ANEMOMETER TYPE/- 45B 05/1961-06/1974 \*\*\* 06/1974-10/1975 U2A 10/1975-11/1975

SPEED(KT)	ANNUAL												1963-1975		
	1-3	4-6	7-10	11-16	17-21	22-27	28-33	34-40	41-47	48-55	56-63	64+	TOTAL	MEAN SPEED	STANDARD DEVIATION
NORTH	2.3	1.7	.8	.2	*	*	*						5.1	4.9	3.3
NORTHEAST	2.0	1.9	1.5	1.3	.3	.1	*	*					7.1	7.5	5.1
EAST	2.2	3.0	5.3	4.5	1.3	.3	*	*	*				16.8	9.7	5.4
SOUTHEAST	2.3	3.8	8.1	6.7	2.4	1.1	.4	.1	*	*			25.0	11.1	6.4
SOUTH	2.4	2.8	3.7	3.5	1.6	.6	.1	*	*				14.7	10.1	6.3
SOUTHWEST	1.4	1.3	1.6	1.6	.4	.1	*	*					6.3	8.6	5.2
WEST	2.6	2.4	2.2	1.6	.7	.3	.1	*					9.8	8.2	6.0
NORTHWEST	2.1	2.8	3.8	3.4	1.6	.7	.2	.1	*	*	*		14.6	10.6	6.7
TOTAL	17.4	19.7	27.1	22.7	8.3	3.2	.8	.2	*	*	*		99.4	9.6	6.2

PERCENT CALMS .6

TOTAL NUMBER OF OBSERVATIONS 91430

MAXIMUM RECORDED SPEED 63 KT      DIRECTION OF MAXIMUM WIND 320 DEG

MEAN WEST TO EAST COMPONENT -3.0 KT

MEAN SOUTH TO NORTH COMPONENT 4.1 KT

MEAN VECTOR WIND 144° 5.0 KT

NOTE- AN ASTERISK(\*) INDICATES PERCENTAGE GREATER THAN ZERO BUT LESS THAN 0.05 PERCENT

PREPARED BY SCIENTIFIC SERVICES DIVISION, ATMOSPHERIC ENVIRONMENT SERVICE, VANCOUVER, B.C. MAY 20, 1981

## Appendix B

### Extreme Wind Speed Listings and Analyses

MAXIMUM WINDSPEED AND ITS DIRECTION  
RECORDED MONTHLY AND ANNUALLY

STATION : BALLENAS LIGHTSTATION

LATITUDE 49	21	NORTH	LONGITUDE 124	11	WEST	ELEVATION	11	M
ANEMOMETER TYPE:- 45B 03/1966-12/1979					ANEMOMETER HT 12M AGL			

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
66	MISG	MISG	MISG	270/37	270/29	90/26	90/24	90/27	90/27	90/35	90/39	320/36	MISG
67	MISG	320/30	90/36	90/33	90/24	270/25	90/23	320/26	320/28	90/39	90/34	140/43	MISG
68	90/41	90/35	90/37	320/35	MISG	140/26	90/23	90/23	270/31	90/32	90/33	90/42	MISG
69	140/32	140/41	320/37	90/39	90/27	90/23	90/31	90/23	320/28	90/36	140/37	90/43	90/43
70	90/30	90/34	90/41	90/33	320/30	320/25	320/25	320/27	140/29	90/38	320/43	90/40	320/43
71	90/42	320/38	140/43	90/33	90/31	90/38	270/23	90/24	90/25	90/44	140/43	90/40	90/44
72	320/37	320/34	MISG	MISG	270/19	270/23	270/26	270/23	90/37	270/28	90/37	MISG	MISG
73	MISG	140/27	90/35	90/26	320/29	90/24	270/23	270/22	140/25	140/29	140/44	90/38	MISG
74	140/40	140/36	90/38	90/31	270/24	270/25	90/30	270/24	320/31	270/25	90/36	90/36	140/40
75	90/42	320/37	270/50	320/37	90/39	90/25	270/26	90/29	270/30	90/40	90/40	90/31	270/50
76	140/34	140/35	320/40	320/36	140/32	90/30	320/25	140/23	320/23	140/30	MISG	MISG	MISG
77	MISG	MISG	MISG	MISG	MISG	MISG	270/22	90/22	90/24	90/31	90/40	90/37	MISG
78	270/29	90/30	90/38	90/30	90/32	270/26	90/21	90/26	90/27	140/29	90/29	90/37	90/38
79	MISG	90/43	90/28	90/42	90/32	320/29	MISG	MISG	MISG	90/38	MISG	MISG	MISG

REMARKS : SPEEDS ARE GIVEN IN KNOTS, PRECEDED BY DIRECTION IN DEGREES.  
RECORDS FOR MONTHS WITH LESS THAN 600 OBSERVATIONS ARE CODED AS MISSING.  
ANNUAL MAXIMUM IS ALSO CODED AS MISSING IF ONE OF ITS MONTHS HAS A MISSING RECORD.

GUMBEL EXTREME VALUE ANALYSIS OF  
WIND SPEEDS

STATION : BALLENAS LIGHTSTATION

LATITUDE 49 21 NORTH      LONGITUDE 124 11 WEST      ELEVATION 11 M  
ANEMOMETER TYPE:- 45B 03/1966-12/1979      ANEMOMETER HT 12M AGL

NUMBER OF YEARS USED IN ANALYSIS : 6

PERIOD(YR)	EXTREMES(KNOTS)	95% CONFIDENCE		50% CONFIDENCE	
		39.79	45.30	41.60	43.49
2.0	42.54				
5.0	47.60	41.33	53.87	45.44	49.75
10.0	50.95	42.00	59.90	47.87	54.02
20.0	54.16	42.58	65.74	50.18	58.14

PREPARED BY SCIENTIFIC SERVICES DIVISION, ATMOSPHERIC ENVIRONMENT SERVICE, VANCOUVER, B.C. MAY 14, 1981

MAXIMUM WINDSPEED AND ITS DIRECTION  
RECORDED MONTHLY AND ANNUALLY

STATION : COMOX A

YEAR	ANEMOMETER TYPE:- 45B 09/1944-09/1959 U2A												ANEMOMETER HT	10M AGL					
	LATITUDE 49	43 NORTH	LONGITUDE 124	54 WEST	ELEVATION	24 M	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
53	140/26	140/30	140/43	140/22	140/26	110/28	110/22	140/23	160/28	160/28	140/35	160/30	160/43						
54	140/39	140/30	320/21	140/28	140/23	160/21	140/24	110/16	140/23	110/35	110/28	140/31	140/39						
55	140/28	140/26	140/35	110/35	140/24	320/23	140/24	110/17	140/23	140/30	140/30	110/30	110/35						
56	110/38	140/28	140/43	140/21	140/21	140/23	320/17	340/19	140/23	140/28	110/35	140/31	140/43						
57	110/24	140/31	140/39	140/24	140/17	110/23	140/30	140/17	140/35	110/24	140/26	140/43	140/43						
58	140/28	110/28	110/30	140/30	290/23	140/21	340/22	110/23	140/28	110/30	140/35	140/30	140/35						
59	140/34	110/45	140/38	140/29	320/26	110/30	340/22	140/22	110/34	110/26	140/28	110/43	110/45						
60	140/37	140/41	140/30	140/35	140/27	140/22	340/18	110/22	110/23	110/30	140/35	140/29	140/41						
61	140/36	140/34	110/32	110/23	140/23	140/19	160/18	140/26	340/26	110/33	110/34	110/34	140/36						
62	110/28	140/27	140/28	110/30	140/25	140/35	340/17	140/19	140/30	110/37	140/50	140/35	140/50						
63	140/26	140/34	160/30	140/26	140/22	140/26	110/26	110/17	140/20	140/33	140/32	180/30	140/34						
64	140/42	140/30	140/35	140/28	140/23	140/22	140/22	140/22	160/23	140/30	140/33	140/37	140/42						
65	140/33	140/26	140/26	140/22	160/25	340/19	140/19	140/17	140/21	140/34	140/31	140/38	140/38						
66	140/30	140/23	140/36	180/22	140/23	140/23	140/18	140/22	140/24	140/32	140/35	140/35	140/36						
67	140/33	110/26	140/33	110/26	180/19	110/22	140/21	140/17	140/26	140/34	140/28	140/43	140/43						
68	140/35	110/30	140/30	140/26	140/26	140/26	340/19	140/22	140/26	140/30	140/35	140/39	140/39						
69	140/33	140/37	140/24	110/31	140/29	140/17	140/28	140/25	110/26	140/30	110/39	140/38	110/39						
70	140/29	110/30	110/37	140/30	140/29	140/21	140/22	140/17	110/23	140/35	140/29	140/40	140/40						
71	150/35	130/28	130/35	140/23	340/17	130/31	120/19	120/24	160/27	120/37	130/37	120/34	120/37						

72	130/30	140/31	130/30	120/30	140/21	140/18	140/21	130/16	120/30	330/20	130/30	120/37	120/37
73	110/40	130/26	120/30	340/20	130/28	120/26	210/30	130/20	130/21	140/26	130/37	110/37	110/40
74	130/31	140/32	120/35	140/36	100/23	120/22	130/21	330/19	130/23	130/23	130/31	130/32	140/36
75	110/30	120/28	120/32	300/28	100/27	120/23	330/20	130/23	130/18	120/34	130/33	130/35	130/35
76	140/33	140/29	140/36	120/26	130/34	140/22	130/22	140/24	140/19	130/31	140/30	120/32	140/36
77	120/25	130/32	130/36	130/27	130/27	130/25	150/18	140/20	130/20	140/30	130/32	140/25	130/36
78	310/18	150/27	140/26	140/25	150/24	140/22	140/16	140/23	140/26	140/22	140/28	140/37	140/37
79	140/32	140/35	140/29	140/36	150/21	140/21	150/25	130/21	130/26	140/33	150/28	150/30	140/36

REMARKS : SPEEDS ARE GIVEN IN KNOTS, PRECEDED BY DIRECTION IN DEGREES.  
 RECORDS FOR MONTHS WITH LESS THAN 600 OBSERVATIONS ARE CODED AS MISSING.  
 ANNUAL MAXIMUM IS ALSO CODED AS MISSING IF ONE OF ITS MONTHS HAS A MISSING RECORD.

GUMBEL EXTREME VALUE ANALYSIS OF  
WIND SPEEDS

STATION : COMOX A

LATITUDE 49. 43 NORTH      LONGITUDE 124. 54 WEST      ELEVATION 24 M  
ANEMOMETER TYPE:- 45B 09/1944-09/1959 U2A      ANEMOMETER HT 10M AGL

NUMBER OF YEARS USED IN ANALYSIS : 27

PERIOD(YR)	EXTREMES(KNOTS)	95% CONFIDENCE		50% CONFIDENCE	
		38.36	37.09    39.63	37.92    38.80	41.35    43.05
2.0	38.36	37.09	39.63	37.92	38.80
5.0	42.20	39.73	44.67	41.35	43.05
10.0	44.75	41.34	48.15	43.58	45.92
20.0	47.19	42.85	51.52	45.70	48.68

PREPARED BY SCIENTIFIC SERVICES DIVISION, ATMOSPHERIC ENVIRONMENT SERVICE, VANCOUVER, B.C.      MAY 21, 1981

MAXIMUM WINDSPEED AND ITS DIRECTION  
RECORDED MONTHLY AND ANNUALLY

STATION : ENTRANCE ISLAND

LATITUDE 48° 47' NORTH      LONGITUDE 123° 3' WEST      ELEVATION 38 M  
ANEMOMETER TYPE:- 45B 10/1969-12/1979      ANEMOMETER HT 18M AGL

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
	MISG	90/30	90/38	MISG									
70	MISG	MISG	320/36	320/37	270/33	320/29	320/25	270/28	320/27	140/36	320/40	140/37	MISG
71	90/37	320/37	90/37	140/30	270/31	90/34	270/23	140/26	270/26	90/39	90/38	90/35	90/39
72	320/42	270/33	90/30	320/39	270/23	270/28	270/29	320/23	90/32	270/30	270/29	90/30	320/42
73	140/36	90/23	140/33	320/30	270/33	90/26	270/29	270/23	320/23	140/29	90/39	140/32	90/39
74	90/35	140/33	90/34	320/31	320/25	320/27	90/27	320/23	320/35	320/26	140/30	320/31	320/35
75	90/41	320/33	320/38	320/32	320/36	320/26	320/28	320/28	320/26	90/31	90/30	140/30	90/41
76	140/29	140/27	320/37	320/31	140/37	320/23	320/23	140/22	MISG	140/24	320/30	320/32	MISG
77	140/24	140/33	140/34	90/26	90/27	270/30	320/22	270/25	320/24	140/29	90/33	90/35	90/35
78	90/28	140/27	90/27	140/28	90/29	MISG	320/25	320/26	140/24	320/29	320/27	320/36	MISG
79	320/35	90/35	320/25	140/36	320/26	320/31	320/28	320/23	140/23	140/32	90/28	320/38	320/38

REMARKS : SPEEDS ARE GIVEN IN KNOTS, PRECEDED BY DIRECTION IN DEGREES.  
RECORDS FOR MONTHS WITH LESS THAN 600 OBSERVATIONS ARE CODED AS MISSING.  
ANNUAL MAXIMUM IS ALSO CODED AS MISSING IF ONE OF ITS MONTHS HAS A MISSING RECORD.

GUMBEL EXTREME VALUE ANALYSIS OF  
WIND SPEEDS

STATION : ENTRANCE ISLAND

LATITUDE 48 47 NORTH LONGITUDE 123 3 WEST ELEVATION 38 M  
ANEMOMETER TYPE:- 45B 10/1969-12/1979 ANEMOMETER HT 18M AGL

NUMBER OF YEARS USED IN ANALYSIS : 7

PERIOD(YR)	EXTREMES(KNOTS)	95% CONFIDENCE		50% CONFIDENCE	
		36.42	39.81	37.53	38.70
2.0	38.11				
5.0	41.35	37.58	45.12	40.05	42.64
10.0	43.49	38.14	48.84	41.65	45.33
20.0	45.55	38.64	52.46	43.17	47.92

PREPARED BY SCIENTIFIC SERVICES DIVISION, ATMOSPHERIC ENVIRONMENT SERVICE, VANCOUVER, B.C. MAY 14, 1981

MAXIMUM WINDSPEED AND ITS DIRECTION  
RECORDED MONTHLY AND ANNUALLY

STATION : MERRY ISLAND

LATITUDE 49	28 NORTH	LONGITUDE 123	54 WEST	ELEVATION	6 M
ANEMOMETER	TYPE:- 45B	06/1962-12/1979		ANEMOMETER	HT 12M AGL

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
63	140/33	140/34	140/34	90/30	140/30	320/27	90/30	140/26	140/24	140/40	90/39	90/37	140/40
64	90/42	90/38	140/41	140/30	320/32	90/25	90/28	140/30	320/38	140/34	140/37	140/42	140/42
65	140/40	320/36	90/30	90/34	140/38	140/26	140/31	140/33	140/22	90/37	90/36	140/46	140/46
66	90/37	90/32	140/40	320/29	140/32	140/29	140/25	140/32	140/30	180/33	90/41	90/34	90/41
67	90/35	320/33	140/31	90/29	140/23	140/24	140/23	320/23	140/33	90/38	90/33	140/46	140/46
68	90/41	90/41	90/40	90/28	90/30	320/28	140/23	MISG	MISG	140/37	90/40	320/32	MISG
69	MISG	MISG	MISG	90/36	90/30	140/28	140/33	140/28	140/30	140/32	140/39	140/45	MISG
70	140/34	140/36	140/37	140/40	360/30	140/25	140/30	140/28	90/34	140/44	140/33	90/43	140/44
71	90/43	90/41	90/46	90/40	140/31	90/37	140/24	90/26	90/28	90/42	140/41	90/37	90/46
72	320/38	320/35	90/32	90/32	90/28	320/23	90/30	140/22	90/30	140/29	90/34	90/41	90/41
73	90/42	90/27	140/42	320/29	90/34	90/33	140/25	90/26	140/27	140/36	90/47	90/42	90/47
74	140/40	90/41	90/38	90/32	90/32	90/29	90/28	140/24	90/35	140/29	90/37	90/39	90/41
75	140/38	320/37	140/40	140/31	140/35	140/30	140/22	90/35	90/39	90/43	90/43	90/36	90/43
76	MISG	90/37	140/38	90/34	90/39	140/30	140/25	140/30	140/27	90/33	140/33	90/40	MISG
77	90/28	140/39	140/39	140/32	140/39	140/31	90/25	140/26	90/28	90/35	90/39	90/33	90/39
78	90/31	140/37	90/33	140/32	90/30	90/26	90/22	90/34	140/34	140/33	140/30	140/43	140/43
79	140/34	140/38	140/31	140/40	90/27	90/28	90/28	140/27	90/33	140/37	90/31	90/38	140/40

REMARKS : SPEEDS ARE GIVEN IN KNOTS, PRECEDED BY DIRECTION IN DEGREES.  
RECORDS FOR MONTHS WITH LESS THAN 600 OBSERVATIONS ARE CODED AS MISSING.  
ANNUAL MAXIMUM IS ALSO CODED AS MISSING IF ONE OF ITS MONTHS HAS A MISSING RECORD.

GUMBEL EXTREME VALUE ANALYSIS OF  
WIND SPEEDS

STATION : MERRY ISLAND

LATITUDE 49 28 NORTH LONGITUDE 123 54 WEST ELEVATION 6 M  
ANEMOMETER TYPE:- 45B 06/1962-12/1979 ANEMOMETER HT 12M AGL

NUMBER OF YEARS USED IN ANALYSIS : 14

PERIOD(YR)	EXTREMES(KNOTS)	95% CONFIDENCE		50% CONFIDENCE	
		41.22	43.63	42.01	42.84
2.0	42.42	42.81	47.74	44.43	46.12
5.0	45.28	43.73	50.61	45.98	48.35
10.0	47.17	44.57	53.38	47.46	50.49
20.0	48.98				

PREPARED BY SCIENTIFIC SERVICES DIVISION, ATMOSPHERIC ENVIRONMENT SERVICE, VANCOUVER, B.C. MAY 14, 1981

MAXIMUM WINDSPEED AND ITS DIRECTION  
RECORDED MONTHLY AND ANNUALLY

STATION : SANDHEADS LIGHTSTATION

	LATITUDE 49° 6' NORTH					LONGITUDE 123° 18' WEST			ELEVATION	0 M
	ANEMOMETER TYPE:- 45B 05/1967-12/1979								ANEMOMETER HT	18M ASL

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
67	MISG	MISG	MISG	MISG	180/26	320/27	320/27	320/24	320/31	140/33	320/33	140/44	MISG
68	140/42	180/27	90/27	320/35	270/24	270/26	320/30	270/23	270/36	270/30	140/37	320/35	140/42
69	140/30	140/37	320/46	320/30	270/26	270/25	140/26	140/30	270/31	140/29	140/34	140/43	320/46
70	270/34	90/25	270/34	270/37	270/30	320/30	320/26	270/30	320/31	140/33	320/42	140/41	320/42
71	270/40	320/42	140/42	140/30	320/35	90/21	320/25	140/25	320/26	270/35	140/31	320/30	140/42
72	320/37	180/36	270/26	270/39	320/24	320/27	320/26	320/24	140/29	270/30	320/30	180/31	270/39
73	140/43	320/22	140/33	270/27	270/29	140/24	320/27	320/23	270/23	140/25	140/37	140/35	140/43
74	180/29	140/29	140/30	320/32	140/28	320/27	320/25	320/27	270/34	270/30	140/31	140/37	140/37
75	140/33	320/38	320/53	320/37	320/41	320/32	320/32	140/33	270/32	140/37	140/46	140/43	320/53
76	140/29	360/38	320/43	270/41	140/35	230/29	270/28	320/26	320/23	270/31	320/41	270/37	320/43
77	320/29	140/41	140/42	320/30	140/30	270/34	180/24	320/26	320/30	180/34	140/38	270/32	140/42
78	230/29	320/28	140/28	270/34	270/30	320/34	360/27	90/26	270/27	320/34	270/34	140/40	140/40
79	320/40	180/32	320/26	140/27	320/26	270/32	270/23	MISG	180/17	140/33	140/26	320/38	MISG

REMARKS : SPEEDS ARE GIVEN IN KNOTS, PRECEDED BY DIRECTION IN DEGREES.  
RECORDS FOR MONTHS WITH LESS THAN 600 OBSERVATIONS ARE CODED AS MISSING.  
ANNUAL MAXIMUM IS ALSO CODED AS MISSING IF ONE OF ITS MONTHS HAS A MISSING RECORD.

GUMBEL EXTREME VALUE ANALYSIS OF  
WIND SPEEDS

STATION : SANDHEADS LIGHTSTATION

LATITUDE 49 6 NORTH      LONGITUDE 123 18 WEST      ELEVATION 0 M  
ANEMOMETER TYPE:- 45B 05/1967-12/1979      ANEMOMETER HT 18M ASL

NUMBER OF YEARS USED IN ANALYSIS : 11

PERIOD(YR)	EXTREMES(KNOTS)	95% CONFIDENCE		50% CONFIDENCE	
		39.96	44.22	41.36	42.82
2.0	42.09				
5.0	46.73	42.28	51.19	45.20	48.26
10.0	49.80	43.55	56.05	47.65	51.95
20.0	52.75	44.73	60.77	49.99	55.51

PREPARED BY SCIENTIFIC SERVICES DIVISION, ATMOSPHERIC ENVIRONMENT SERVICE, VANCOUVER, B.C. MAY 14, 1981

MAXIMUM WINDSPEED AND ITS DIRECTION  
RECORDED MONTHLY AND ANNUALLY

STATION 1 SATURNA ISLAND LIGHT

LATITUDE 48	47	NORTH	LONGITUDE 123	3 WEST	ELEVATION	38 M
ANEMOMETER TYPE:- 45B 03/1968-10/1979				ANEMOMETER HT	18M AGL	

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
68	MISG	MISG	140/35	230/31	230/28	180/22	180/17	140/19	140/27	140/33	140/42	140/43	MISG
69	140/34	140/44	140/17	140/17	140/10	180/23	140/23	140/34	140/32	140/35	180/43	180/50	180/50
70	MISG	50/31	180/38	180/36	230/17	180/21	180/23	140/23	50/33	140/37	140/40	MISG	MISG
71	MISG	MISG	140/47	140/43	140/43	140/28	180/24	140/30	180/21	140/39	140/43	140/36	MISG
72	50/37	180/51	140/26	140/37	140/27	180/22	180/23	180/19	140/39	180/26	140/40	50/39	180/51
73	140/45	50/37	140/43	180/26	140/35	140/28	140/22	180/22	140/28	140/33	140/44	140/44	140/45
74	50/38	140/37	140/40	140/35	140/29	180/25	140/23	180/20	180/26	230/19	140/37	180/39	140/40
75	140/38	50/34	140/43	140/33	140/38	180/23	180/21	140/26	140/41	140/44	140/40	180/30	140/44
76	MISG	140/38	140/42	180/30	140/40	140/26	140/22	180/23	230/18	140/30	140/37	180/43	MISG
77	140/23	140/38	140/52	140/26	140/37	230/24	180/21	180/23	180/22	140/45	180/43	180/36	140/52
78	140/36	180/33	180/41	180/26	180/27	180/22	180/21	140/27	140/33	230/30	50/37	140/46	140/46
79	50/34	140/46	180/31	140/41	180/22	140/25	180/24	180/21	180/30	140/41	MISG	MISG	MISG

REMARKS : SPEEDS ARE GIVEN IN KNOTS, PRECEDED BY DIRECTION IN DEGREES.  
RECORDS FOR MONTHS WITH LESS THAN 600 OBSERVATIONS ARE CODED AS MISSING.  
ANNUAL MAXIMUM IS ALSO CODED AS MISSING IF ONE OF ITS MONTHS HAS A MISSING RECORD.

GUMBEL EXTREME VALUE ANALYSIS OF  
WIND SPEEDS

STATION : SATURNA ISLAND LIGHT

LATITUDE 48 47 NORTH LONGITUDE 123 3 WEST ELEVATION 38 M

ANEMOMETER TYPE:- 45B 03/1968-10/1979 ANEMOMETER HT 18M AGL

NUMBER OF YEARS USED IN ANALYSIS : ?

PERIOD(YR)	EXTREMES(KNOTS)	95% CONFIDENCE		50% CONFIDENCE	
		43.62	49.08	45.41	47.29
2.0	46.35				
5.0	51.55	45.50	57.60	49.47	53.63
10.0	54.99	46.40	63.59	52.04	57.95
20.0	58.30	47.20	69.40	54.48	62.11

PREPARED BY SCIENTIFIC SERVICES DIVISION, ATMOSPHERIC ENVIRONMENT SERVICE, VANCOUVER, B.C. MAY 14, 1981

MAXIMUM WINDSPEED AND ITS DIRECTION  
RECORDED MONTHLY AND ANNUALLY

STATION : SQUAMISH FMC CHEMICALS

LATITUDE 49 41 NORTH LONGITUDE 123 10 WEST ELEVATION 3 M

ANEMOMETER TYPE:- U2A 04/1971-05/1976 ANEMOMETER HT 9M AGL

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
71	MISG	MISG	MISG	90/23	90/27	MISG	MISG	230/24	MISG	360/20	270/32	360/28	MISG
72	180/39	180/48	180/24	230/30	230/30	230/26	230/30	MISG	MISG	50/26	230/11	MISG	MISG
73	MISG	MISG	MISG	230/19	180/27	230/22	180/23	230/25	180/21	180/18	180/26	MISG	MISG
74	MISG	MISG	MISG	MISG	230/23	230/26	230/25	230/25	230/26	230/22	180/23	180/33	MISG
75	180/24	180/29	180/30	180/27	180/24	180/26	230/24	MISG	MISG	MISG	180/23	360/31	MISG
76	MISG	MISG	180/24	MISG									

REMARKS : SPEEDS ARE GIVEN IN KNOTS, PRECEDED BY DIRECTION IN DEGREES.

RECORDS FOR MONTHS WITH LESS THAN 600 OBSERVATIONS ARE CODED AS MISSING.

ANNUAL MAXIMUM IS ALSO CODED AS MISSING IF ONE OF ITS MONTHS HAS A MISSING RECORD.

/WINDM : 02 UN 0347228

MAXIMUM WINDSPEED AND ITS DIRECTION  
RECORDED MONTHLY AND ANNUALLY

STATION : TSWWASSEN FERRY

LATITUDE 49° 0' NORTH      LONGITUDE 123° 8' WEST      ELEVATION 3 M  
ANEMOMETER TYPE:- 458 05/1961-06/1974 \*\*\* 0      ANEMOMETER HT 17M ASL

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
63	320/38	140/27	320/38	140/24	90/25	320/30	320/28	140/23	320/21	140/50	320/46	140/35	140/50
64	140/46	320/48	140/40	320/33	MISG	MISG	MISG	140/24	320/35	140/35	MISG	140/37	MISG
65	MISG	MISG	MISG	MISG	MISG	320/28	140/21	180/22	320/24	180/32	140/40	180/38	MISG
66	180/37	320/31	140/38	320/29	180/32	320/25	320/29	320/28	320/22	140/32	320/34	320/35	140/38
67	MISG	MISG	140/30	140/25	320/23	MISG	MISG	270/32	140/35	140/34	90/46	140/42	MISG
68	MISG	140/30	140/27	270/33	140/23	270/24	270/29	270/22	270/37	140/29	140/37	140/35	MISG
69	140/33	140/38	140/25	140/30	270/23	140/24	140/23	140/26	270/23	140/37	140/43	320/33	140/43
70	MISG	270/24	270/28	320/37	320/27	320/26	140/23	320/22	320/27	140/35	320/39	140/40	MISG
71	140/38	140/37	90/41	140/34	320/31	140/23	320/25	320/22	320/28	320/32	320/35	140/31	90/41
72	MISG	320/32	140/24	320/37	180/27	MISG	320/26	MISG	MISG	320/30	MISG	MISG	MISG
73	140/39	50/27	90/36	MISG	MISG	MISG	MISG	MISG	MISG	180/27	MISG	180/39	MISG
74	140/30	MISG	MISG	MISG	MISG	MISG	90/23	MISG	270/33	320/28	MISG	MISG	MISG
75	90/31	MISG	MISG	320/35	320/37	140/30	MISG						

REMARKS : SPEEDS ARE GIVEN IN KNOTS, PRECEDED BY DIRECTION IN DEGREES.  
RECORDS FOR MONTHS WITH LESS THAN 600 OBSERVATIONS ARE CODED AS MISSING.  
ANNUAL MAXIMUM IS ALSO CODED AS MISSING IF ONE OF ITS MONTHS HAS A MISSING RECORD.

GUMBEL EXTREME VALUE ANALYSIS OF  
WIND SPEEDS

STATION : TSAUWASSEN FERRY

LATITUDE 49° 0' NORTH      LONGITUDE 123° 8' WEST      ELEVATION 3 M  
ANEMOMETER TYPE:- 45B 05/1961-06/1974 \*\*\* 0      ANEMOMETER HT 17M ASL

NUMBER OF YEARS USED IN ANALYSIS : 4

PERIOD(YR)	EXTREMES(KNOTS)	95% CONFIDENCE		50% CONFIDENCE	
		38.51	46.54	41.14	43.90
2.0	42.52				
5.0	49.36	39.40	59.33	45.94	52.79
10.0	53.89	39.44	68.34	48.93	58.86
20.0	58.24	39.41	77.07	51.76	64.72

PREPARED BY SCIENTIFIC SERVICES DIVISION, ATMOSPHERIC ENVIRONMENT SERVICE, VANCOUVER, B.C. MAY 20, 1981

**Appendix C**  
**Probability Wind Distribution Tables**

96

### Application of the Weibull Probability Distribution to Wind Speeds

The Weibull cumulative probability function is of the form:

$$P(v) = e^{-(\frac{v}{c})^k} \quad (1)$$

where

P = probability

v = wind speed

c = constant = scale parameter

k = constant = shape parameter

It has been observed that this distribution can be fitted well to a wind speed distribution without regard to direction. (See, for example, Hennessey, 1977). In order to do this, the parameters c and k must be determined.

The Weibull wind speed distribution has applications in determining extreme wind probabilities, in other aspects of engineering design and in wind-power prospecting.

The attached analysis, prepared by A.E.S., Pacific Region, Scientific Services Division, is based on a least squares regression fit to determine the parameters c and k.

To estimate the probability of a wind equalling or exceeding a particular value V, evaluate equation (1) using appropriate shape and scale parameters from the second and third columns of the following analyses. (Note that c -- but not k -- has the units of knots, hence if you wish to calculate P(V) and V is in other units, c must be converted to the same units).

WEIBULL WIND SPEED DISTRIBUTION

(I) CUMULATIVE WEIBULL PROBABILITIES GIVEN FOR WINDSPEEDS IN KNOT

STATION : BALLENAS LIGHTSTATION                    1966-1977

MONTH	PARAMETERS		SPEEDS(KNOT) EQUAL TO OR GREATER THAN												MEAN SPEED
	SHAPE	SCALE	0.0	6.0	12.0	18.0	24.0	30.0	36.0	42.0	48.0	54.0	60.0	66.0	
JAN	1.90	14.1	1.000	.821	.479	.203	.064	.015	.003	.000	.000	.000	.000	.000	13.5
FEB	2.05	13.1	1.000	.818	.434	.147	.032	.004	.000	.000	.000	.000	.000	.000	11.7
MAR	1.90	14.2	1.000	.823	.482	.206	.065	.015	.003	.000	.000	.000	.000	.000	13.0
APR	2.60	13.0	1.000	.875	.445	.098	.007	.000	.000	.000	.000	.000	.000	.000	11.4
MAY	2.16	11.7	1.000	.790	.349	.080	.009	.000	.000	.000	.000	.000	.000	.000	10.6
JUN	2.19	11.7	1.000	.793	.348	.077	.008	.000	.000	.000	.000	.000	.000	.000	11.2
JUL	2.02	10.9	1.000	.741	.297	.064	.007	.000	.000	.000	.000	.000	.000	.000	11.0
AUG	2.19	10.8	1.000	.759	.283	.047	.003	.000	.000	.000	.000	.000	.000	.000	10.7
SEP	2.19	11.6	1.000	.789	.339	.072	.007	.000	.000	.000	.000	.000	.000	.000	10.4
OCT	1.76	12.7	1.000	.767	.407	.160	.048	.011	.002	.000	.000	.000	.000	.000	12.3
NOV	1.92	13.9	1.000	.819	.469	.191	.056	.012	.002	.000	.000	.000	.000	.000	13.1
DEC	1.79	14.6	1.000	.815	.494	.233	.087	.026	.006	.001	.000	.000	.000	.000	14.3
ANNUAL	1.94	13.1	1.000	.802	.431	.158	.040	.007	.001	.000	.000	.000	.000	.000	10.4

(II) WINDSPEEDS IN KNOT GIVEN FOR CUMULATIVE WEIBULL PROBABILITIES

STATION : BALLENAS LIGHTSTATION                    1966-1977

MONTH	PARAMETERS		CUMULATIVE WEIBULL PROBABILITIES										MEAN SPEED	
	SHAPE	SCALE	.001	.100	.200	.300	.400	.500	.600	.700	.800	.900	1.000	
JAN	1.90	14.1	38.9	21.8	18.1	15.5	13.5	11.6	9.9	8.2	6.4	4.3	0.0	13.5
FEB	2.05	13.1	33.6	19.7	16.5	14.4	12.6	11.0	9.5	7.9	6.3	4.4	0.0	11.7
MAR	1.90	14.2	39.1	21.9	18.2	15.6	13.5	11.7	10.0	8.2	6.4	4.3	0.0	13.0
APR	2.60	13.0	27.3	17.9	15.6	14.0	12.6	11.3	10.1	8.8	7.3	5.5	0.0	11.4
MAY	2.16	11.7	28.7	17.2	14.6	12.8	11.3	9.9	8.6	7.3	5.9	4.1	0.0	10.6
JUN	2.19	11.7	28.3	17.1	14.5	12.7	11.2	9.9	8.6	7.3	5.9	4.2	0.0	11.2
JUL	2.02	10.9	28.4	16.5	13.8	11.9	10.4	9.1	7.8	6.5	5.2	3.6	0.0	11.0
AUG	2.19	10.8	26.1	15.8	13.4	11.8	10.4	9.1	7.9	6.7	5.4	3.9	0.0	10.7
SEP	2.19	11.6	27.9	16.9	14.4	12.6	11.1	9.8	8.5	7.2	5.8	4.2	0.0	10.4
OCT	1.76	12.7	38.2	20.5	16.7	14.2	12.1	10.4	8.7	7.1	5.4	3.6	0.0	12.3
NOV	1.92	13.9	37.9	21.4	17.8	15.3	13.2	11.5	9.8	8.1	6.4	4.3	0.0	13.1
DEC	1.79	14.6	42.9	23.2	19.0	16.2	13.9	11.9	10.0	8.2	6.3	4.1	0.0	14.3
ANNUAL	1.94	13.1	35.6	20.2	16.8	14.4	12.5	10.9	9.3	7.7	6.0	4.1	0.0	10.4

PREPARED BY SCIENTIFIC SERVICES DIVISION, ATMOSPHERIC ENVIRONMENT SERVICE, VANCOUVER, B.C.      MAY 29, 1981

## WEIBULL WIND SPEED DISTRIBUTION

## (I) CUMULATIVE WEIBULL PROBABILITIES GIVEN FOR WINDSPEEDS IN KNOT

STATION : COMOX A 1958-1974

MONTH	PARAMETERS	SHAPE	SCALE	0.0	6.0	12.0	18.0	SPEEDS(KNOT)					MEAN SPEED	
				24.0	30.0	36.0	42.0	48.0	54.0	60.0	66.0			
JAN	.94	5.8	1.000	.357	.137	.054	.022	.009	.004	.002	.001	.000	.000	7.7
FEB	.93	5.6	1.000	.347	.132	.052	.021	.009	.004	.001	.001	.000	.000	7.6
MAR	.99	6.8	1.000	.412	.171	.071	.030	.012	.005	.002	.001	.000	.000	8.4
APR	1.17	6.7	1.000	.415	.139	.042	.012	.003	.001	.000	.000	.000	.000	8.2
MAY	1.24	6.2	1.000	.383	.104	.024	.005	.001	.000	.000	.000	.000	.000	7.2
JUN	1.30	6.4	1.000	.402	.105	.022	.004	.001	.000	.000	.000	.000	.000	7.4
JUL	1.34	6.2	1.000	.385	.090	.016	.002	.000	.000	.000	.000	.000	.000	7.1
AUG	1.15	5.2	1.000	.311	.075	.016	.003	.001	.000	.000	.000	.000	.000	6.1
SEP	1.02	4.9	1.000	.289	.081	.022	.006	.002	.000	.000	.000	.000	.000	6.0
OCT	.89	5.4	1.000	.334	.131	.054	.023	.010	.004	.002	.001	.000	.000	7.2
NOV	.93	5.7	1.000	.350	.136	.055	.023	.009	.004	.002	.001	.000	.000	7.7
DEC	.95	6.7	1.000	.408	.176	.077	.034	.015	.007	.003	.001	.001	.000	8.8
ANNUAL	1.07	6.0	1.000	.368	.123	.040	.012	.004	.001	.000	.000	.000	.000	6.5

## (II) WINDSPEEDS IN KNOT GIVEN FOR CUMULATIVE WEIBULL PROBABILITIES

STATION : COMOX A 1958-1974

MONTH	PARAMETERS	SHAPE	SCALE	.001	.100	.200	.300	.400	.500	.600	.700	.800	.900	1.000	MEAN SPEED
				44.9	14.0	9.6	7.1	5.3	3.9	2.9	2.0	1.2	.5	0.0	
JAN	.94	5.8	44.9	44.9	14.0	9.6	7.1	5.3	3.9	2.9	2.0	1.2	.5	0.0	7.7
FEB	.93	5.6	44.8	13.8	9.4	6.9	5.1	3.8	2.7	1.9	1.1	.5	0.0	7.6	
MAR	.99	6.8	47.4	15.7	10.9	8.2	6.2	4.7	3.4	2.4	1.5	.7	0.0	8.4	
APR	1.17	6.7	35.1	13.7	10.1	7.9	6.2	4.9	3.8	2.8	1.9	1.0	0.0	8.2	
MAY	1.24	6.2	29.5	12.2	9.1	7.2	5.8	4.6	3.6	2.7	1.9	1.0	0.0	7.2	
JUN	1.30	6.4	28.4	12.2	9.3	7.4	6.0	4.9	3.9	2.9	2.0	1.1	0.0	7.4	
JUL	1.34	6.2	26.4	11.6	8.9	7.1	5.8	4.7	3.8	2.9	2.0	1.2	0.0	7.1	
AUG	1.15	5.2	28.1	10.8	7.9	6.2	4.9	3.8	2.9	2.1	1.4	.7	0.0	6.1	
SEP	1.02	4.9	32.2	11.0	7.7	5.8	4.5	3.4	2.5	1.8	1.1	.5	0.0	6.0	
OCT	.89	5.4	47.4	13.8	9.2	6.7	4.9	3.6	2.5	1.7	1.0	.4	0.0	7.2	
NOV	.93	5.7	45.9	14.0	9.5	7.0	5.2	3.8	2.8	1.9	1.1	.5	0.0	7.7	
DEC	.95	6.7	51.0	16.1	11.1	8.2	6.1	4.6	3.3	2.3	1.4	.6	0.0	8.8	
ANNUAL	1.07	6.0	36.7	13.1	9.4	7.1	5.5	4.3	3.2	2.3	1.5	.7	0.0	6.5	

PREPARED BY SCIENTIFIC SERVICES DIVISION, ATMOSPHERIC ENVIRONMENT SERVICE, VANCOUVER, B.C. MAY 29, 1981

WEIBULL WIND SPEED DISTRIBUTION

(I) CUMULATIVE WEIBULL PROBABILITIES GIVEN FOR WINDSPEEDS IN KNOT

STATION : ENTRANCE ISLAND                                  1970-1977

MONTH	PARAMETERS		0.0	6.0	12.0	18.0	SPEEDS(KNOT) EQUAL TO OR GREATER THAN						MEAN SPEED	
	SHAPE	SCALE					24.0	30.0	36.0	42.0	48.0	54.0		
JAN	2.01	13.5	1.000	.821	.452	.167	.041	.007	.001	.000	.000	.000	.000	12.8
FEB	1.90	12.0	1.000	.764	.366	.114	.023	.003	.000	.000	.000	.000	.000	11.9
MAR	1.73	13.5	1.000	.783	.443	.193	.067	.019	.004	.001	.000	.000	.000	13.6
APR	1.89	11.9	1.000	.762	.365	.114	.024	.003	.000	.000	.000	.000	.000	11.6
MAY	2.00	11.6	1.000	.766	.344	.091	.014	.001	.000	.000	.000	.000	.000	11.6
JUN	2.03	11.5	1.000	.765	.337	.084	.012	.001	.000	.000	.000	.000	.000	10.9
JUL	1.91	11.1	1.000	.733	.311	.079	.012	.001	.000	.000	.000	.000	.000	11.2
AUG	1.86	10.3	1.000	.695	.267	.060	.008	.001	.000	.000	.000	.000	.000	11.2
SEP	1.92	10.9	1.000	.729	.301	.073	.011	.001	.000	.000	.000	.000	.000	10.7
OCT	1.83	11.6	1.000	.743	.346	.108	.023	.003	.000	.000	.000	.000	.000	10.5
NOV	1.73	12.7	1.000	.761	.405	.162	.050	.012	.002	.000	.000	.000	.000	11.3
DEC	1.95	14.1	1.000	.828	.481	.199	.059	.012	.002	.000	.000	.000	.000	13.0
ANNUAL	1.87	12.1	1.000	.763	.372	.121	.027	.004	.000	.000	.000	.000	.000	10.3

(II) WINDSPEEDS IN KNOT GIVEN FOR CUMULATIVE WEIBULL PROBABILITIES

STATION : ENTRANCE ISLAND                                  1970-1977

MONTH	PARAMETERS		.001	.100	.200	.300	.400	.500	.600	.700	.800	.900	1.000	MEAN SPEED
	SHAPE	SCALE												
JAN	2.01	13.5	35.3	20.4	17.1	14.8	12.9	11.2	9.6	8.1	6.4	4.4	0.0	12.8
FEB	1.90	12.0	33.1	18.6	15.4	13.2	11.4	9.9	8.4	7.0	5.4	3.7	0.0	11.9
MAR	1.73	13.5	41.3	21.9	17.8	15.0	12.9	10.9	9.2	7.5	5.7	3.7	0.0	13.6
APR	1.89	11.9	33.2	18.6	15.4	13.2	11.4	9.8	8.4	6.9	5.4	3.6	0.0	11.6
MAY	2.00	11.6	30.6	17.6	14.7	12.8	11.1	9.7	8.3	6.9	5.5	3.8	0.0	10.9
JUN	2.03	11.5	29.9	17.4	14.6	12.6	11.0	9.6	8.3	6.9	5.5	3.8	0.0	11.2
JUL	1.91	11.1	30.4	17.1	14.2	12.2	10.6	9.1	7.8	6.4	5.0	3.4	0.0	11.2
AUG	1.86	10.3	29.2	16.2	13.3	11.4	9.9	8.5	7.2	5.9	4.6	3.1	0.0	10.7
SEP	1.92	10.9	29.8	16.8	14.0	12.0	10.4	9.0	7.7	6.4	5.0	3.4	0.0	10.5
OCT	1.83	11.6	33.4	18.3	15.1	12.9	11.1	9.5	8.1	6.6	5.1	3.4	0.0	11.3
NOV	1.73	12.7	39.0	20.6	16.8	14.2	12.1	10.3	8.6	7.0	5.3	3.5	0.0	13.0
DEC	1.95	14.1	37.9	21.6	18.0	15.5	13.5	11.7	10.0	8.3	6.5	4.4	0.0	14.0
ANNUAL	1.87	12.1	33.9	18.9	15.6	13.3	11.5	9.9	8.4	7.0	5.4	3.6	0.0	10.3

PREPARED BY SCIENTIFIC SERVICES DIVISION, ATMOSPHERIC ENVIRONMENT SERVICE, VANCOUVER, B.C.                                  MAY 29, 1981

WEIBULL WIND SPEED DISTRIBUTION

(I) CUMULATIVE WEIBULL PROBABILITIES GIVEN FOR WINDSPEEDS IN KNOT

STATION : MERRY ISLAND

1958-1974

MONTH	PARAMETERS		SPEEDS(KNOT)												MEAN SPEED
	SHAPE	SCALE	0.0	6.0	12.0	18.0	24.0	30.0	36.0	42.0	48.0	54.0	60.0	66.0	
JAN	1.28	12.5	1.000	.677	.387	.203	.100	.046	.021	.009	.004	.001	.001	.000	13.1
FEB	1.24	11.5	1.000	.642	.350	.176	.083	.038	.016	.007	.003	.001	.000	.000	12.0
MAR	1.31	12.0	1.000	.669	.368	.182	.083	.036	.014	.006	.002	.001	.000	.000	13.1
APR	1.31	11.4	1.000	.651	.345	.164	.071	.029	.011	.004	.001	.000	.000	.000	12.0
MAY	1.30	9.4	1.000	.572	.254	.098	.034	.011	.003	.001	.000	.000	.000	.000	9.8
JUN	1.53	10.3	1.000	.645	.283	.096	.026	.006	.001	.000	.000	.000	.000	.000	10.6
JUL	1.47	9.9	1.000	.618	.263	.089	.025	.006	.001	.000	.000	.000	.000	.000	9.8
AUG	1.35	9.2	1.000	.570	.239	.084	.026	.007	.002	.000	.000	.000	.000	.000	9.6
SEP	1.22	9.3	1.000	.556	.256	.107	.042	.016	.006	.002	.001	.000	.000	.000	9.8
OCT	1.20	10.9	1.000	.613	.324	.159	.074	.033	.014	.006	.003	.001	.000	.000	12.1
NOV	1.29	12.3	1.000	.671	.378	.195	.094	.043	.019	.008	.003	.001	.000	.000	13.6
DEC	1.29	13.3	1.000	.698	.415	.226	.116	.056	.026	.012	.005	.002	.001	.000	15.0
ANNUAL	1.31	10.9	1.000	.633	.322	.145	.060	.023	.008	.003	.001	.000	.000	.000	10.2

(II) WINDSPEEDS IN KNOT GIVEN FOR CUMULATIVE WEIBULL PROBABILITIES

STATION : MERRY ISLAND

1958-1974

MONTH	PARAMETERS		CUMULATIVE WEIBULL PROBABILITIES										MEAN SPEED	
	SHAPE	SCALE	.001	.100	.200	.300	.400	.500	.600	.700	.800	.900	1.000	
JAN	1.28	12.5	56.5	24.0	18.1	14.4	11.7	9.4	7.4	5.6	3.9	2.2	0.0	13.1
FEB	1.24	11.5	54.7	22.6	16.9	13.4	10.8	8.6	6.7	5.0	3.4	1.9	0.0	12.0
MAR	1.31	12.0	52.2	22.6	17.2	13.8	11.2	9.1	7.2	5.5	3.8	2.2	0.0	13.1
APR	1.31	11.4	50.0	21.6	16.5	13.2	10.7	8.7	6.9	5.2	3.6	2.1	0.0	12.0
MAY	1.30	9.4	41.7	17.9	13.6	10.9	8.8	7.1	5.6	4.2	3.0	1.7	0.0	9.8
JUN	1.53	10.3	36.5	17.8	14.1	11.6	9.7	8.1	6.6	5.2	3.9	2.4	0.0	10.6
JUL	1.47	9.9	36.8	17.4	13.6	11.2	9.3	7.7	6.2	4.9	3.6	2.1	0.0	9.8
AUG	1.35	9.2	38.5	17.1	13.1	10.5	8.6	7.0	5.6	4.3	3.0	1.7	0.0	9.6
SEP	1.22	9.3	45.5	18.4	13.7	10.8	8.7	6.9	5.4	4.0	2.7	1.5	0.0	9.8
OCT	1.20	10.9	54.1	21.7	16.1	12.7	10.1	8.0	6.2	4.6	3.1	1.7	0.0	12.1
NOV	1.29	12.3	55.2	23.5	17.8	14.2	11.5	9.2	7.3	5.5	3.8	2.1	0.0	13.6
DEC	1.29	13.3	59.0	25.2	19.1	15.3	12.4	10.0	7.9	6.0	4.2	2.3	0.0	15.0
ANNUAL	1.31	10.9	47.6	20.6	15.7	12.6	10.2	8.2	6.5	5.0	3.5	2.0	0.0	10.2

PREPARED BY SCIENTIFIC SERVICES DIVISION, ATMOSPHERIC ENVIRONMENT SERVICE, VANCOUVER, B.C. MAY 29, 1981

WEIBULL WIND SPEED DISTRIBUTION

(I) CUMULATIVE WEIBULL PROBABILITIES GIVEN FOR WINDSPEEDS IN KNOT

STATION : SANDHEADS LIGHT STATION                    1968-1975

MONTH	PARAMETERS		SPEEDS(KNOT)												MEAN SPEED
	SHAPE	SCALE	0.0	6.0	12.0	18.0	24.0	30.0	36.0	42.0	48.0	54.0	60.0	66.0	
JAN	1.74	13.8	1.000	.790	.456	.204	.072	.021	.005	.001	.000	.000	.000	.000	14.2
FEB	1.46	11.1	1.000	.666	.326	.132	.046	.014	.004	.001	.000	.000	.000	.000	11.6
MAR	1.53	12.2	1.000	.713	.377	.164	.060	.019	.005	.001	.000	.000	.000	.000	12.5
APR	1.48	11.4	1.000	.680	.342	.142	.050	.016	.004	.001	.000	.000	.000	.000	10.2
MAY	1.74	10.8	1.000	.699	.304	.090	.019	.003	.000	.000	.000	.000	.000	.000	12.1
JUN	1.84	10.9	1.000	.718	.306	.082	.014	.002	.000	.000	.000	.000	.000	.000	10.6
JUL	1.85	10.9	1.000	.718	.303	.080	.014	.002	.000	.000	.000	.000	.000	.000	10.8
AUG	1.85	10.3	1.000	.691	.264	.060	.008	.001	.000	.000	.000	.000	.000	.000	10.0
SEP	1.70	10.7	1.000	.686	.295	.088	.019	.003	.000	.000	.000	.000	.000	.000	10.6
OCT	1.66	11.9	1.000	.726	.363	.136	.040	.009	.002	.000	.000	.000	.000	.000	12.3
NOV	1.85	13.4	1.000	.797	.441	.177	.053	.012	.002	.000	.000	.000	.000	.000	13.2
DEC	1.94	14.9	1.000	.843	.520	.238	.081	.021	.004	.001	.000	.000	.000	.000	14.6
ANNUAL	1.66	11.8	1.000	.724	.359	.134	.039	.009	.002	.000	.000	.000	.000	.000	10.3

(II) WINDSPEEDS IN KNOT GIVEN FOR CUMULATIVE WEIBULL PROBABILITIES

STATION : SANDHEADS LIGHT STATION                    1968-1975

MONTH	PARAMETERS		CUMULATIVE WEIBULL PROBABILITIES										MEAN SPEED	
	SHAPE	SCALE	.001	.100	.200	.300	.400	.500	.600	.700	.800	.900	1.000	
JAN	1.74	13.8	41.9	22.3	18.1	15.3	13.1	11.2	9.4	7.6	5.8	3.8	0.0	14.2
FEB	1.46	11.1	41.8	19.7	15.4	12.6	10.5	8.6	7.0	5.5	4.0	2.4	0.0	11.6
MAR	1.53	12.2	43.3	21.1	16.7	13.8	11.5	9.6	7.9	6.2	4.6	2.8	0.0	12.5
APR	1.48	11.4	42.3	20.1	15.8	13.0	10.8	8.9	7.3	5.7	4.1	2.5	0.0	12.1
MAY	1.74	10.8	33.0	17.5	14.3	12.1	10.3	8.8	7.4	6.0	4.6	3.0	0.0	10.2
JUN	1.84	10.9	31.3	17.2	14.2	12.1	10.4	9.0	7.6	6.2	4.8	3.2	0.0	10.6
JUL	1.85	10.9	31.0	17.1	14.1	12.1	10.4	8.9	7.6	6.2	4.8	3.2	0.0	10.8
AUG	1.85	10.3	29.2	16.1	13.3	11.4	9.8	8.4	7.1	5.9	4.6	3.0	0.0	10.0
SEP	1.70	10.7	33.3	17.4	14.1	11.9	10.1	8.6	7.2	5.8	4.4	2.8	0.0	10.6
OCT	1.66	11.9	38.0	19.6	15.8	13.3	11.3	9.5	7.9	6.4	4.8	3.1	0.0	12.3
NOV	1.85	13.4	38.1	21.0	17.3	14.8	12.8	11.0	9.3	7.7	5.9	4.0	0.0	13.2
DEC	1.94	14.9	40.4	23.0	19.1	16.4	14.3	12.4	10.6	8.8	6.9	4.7	0.0	14.6
ANNUAL	1.66	11.8	37.8	19.5	15.7	13.2	11.2	9.5	7.9	6.4	4.8	3.1	0.0	10.3

PREPARED BY SCIENTIFIC SERVICES DIVISION, ATMOSPHERIC ENVIRONMENT SERVICE, VANCOUVER, B.C.      MAY 29, 1981

WEIBULL WIND SPEED DISTRIBUTION

(I) CUMULATIVE WEIBULL PROBABILITIES GIVEN FOR WINDSPEEDS IN KNOT

STATION : SATURNA ISLAND LIGHT

1968-1975

MONTH	PARAMETERS		0.0	6.0	12.0	18.0	SPEEDS(KNOT) EQUAL TO OR GREATER THAN							MEAN SPEED	
	SHAPE	SCALE					24.0	30.0	36.0	42.0	48.0	54.0	60.0		
JAN	2.53	17.0	1.000	.931	.660	.313	.090	.015	.001	.000	.000	.000	.000	.000	16.4
FEB	1.60	12.7	1.000	.741	.402	.175	.063	.019	.005	.001	.000	.000	.000	.000	12.0
MAR	1.47	11.5	1.000	.682	.346	.146	.053	.017	.005	.001	.000	.000	.000	.000	11.2
APR	1.53	9.9	1.000	.629	.263	.083	.021	.004	.001	.000	.000	.000	.000	.000	9.3
MAY	1.72	9.7	1.000	.643	.234	.054	.008	.001	.000	.000	.000	.000	.000	.000	7.9
JUN	2.22	9.6	1.000	.704	.196	.018	.001	.000	.000	.000	.000	.000	.000	.000	8.5
JUL	2.81	9.6	1.000	.763	.150	.003	.000	.000	.000	.000	0.000	0.000	0.000	0.000	8.5
AUG	2.28	10.1	1.000	.734	.224	.023	.001	.000	.000	.000	.000	.000	.000	.000	8.2
SEP	2.06	10.3	1.000	.723	.257	.044	.003	.000	.000	.000	.000	.000	.000	.000	8.4
OCT	1.91	11.9	1.000	.762	.359	.108	.021	.003	.000	.000	.000	.000	.000	.000	10.2
NOV	2.09	15.0	1.000	.863	.533	.230	.068	.014	.002	.000	.000	.000	.000	.000	13.8
DEC	2.05	16.4	1.000	.881	.591	.299	.113	.032	.007	.001	.000	.000	.000	.000	15.5
ANNUAL	1.76	12.3	1.000	.753	.384	.142	.039	.008	.001	.000	.000	.000	.000	.000	9.4

(II) WINDSPEEDS IN KNOT GIVEN FOR CUMULATIVE WEIBULL PROBABILITIES

STATION : SATURNA ISLAND LIGHT

1968-1975

MONTH	PARAMETERS		.001	.100	.200	.300	.400	.500	.600	.700	.800	.900	1.000	MEAN SPEED
	SHAPE	SCALE												
JAN	2.53	17.0	36.4	23.6	20.5	18.3	16.4	14.7	13.0	11.3	9.4	7.0	0.0	16.4
FEB	1.60	12.7	42.5	21.4	17.1	14.3	12.1	10.1	8.4	6.7	5.0	3.1	0.0	12.0
MAR	1.47	11.5	42.9	20.3	15.9	13.1	10.9	9.0	7.3	5.7	4.2	2.5	0.0	11.2
APR	1.53	9.9	35.1	17.1	13.5	11.2	9.4	7.8	6.4	5.1	3.7	2.3	0.0	9.3
MAY	1.72	9.7	29.7	15.7	12.7	10.8	9.2	7.8	6.5	5.3	4.0	2.6	0.0	7.9
JUN	2.22	9.6	23.0	14.0	11.9	10.5	9.3	8.2	7.1	6.0	4.9	3.5	0.0	8.5
JUL	2.81	9.6	19.0	12.9	11.3	10.2	9.3	8.4	7.5	6.6	5.6	4.3	0.0	8.5
AUG	2.28	10.1	23.5	14.5	12.4	10.9	9.7	8.6	7.5	6.4	5.2	3.7	0.0	8.2
SEP	2.06	10.3	26.4	15.5	13.0	11.3	9.9	8.7	7.5	6.3	5.0	3.5	0.0	8.4
OCT	1.91	11.9	32.5	18.3	15.2	13.1	11.3	9.8	8.3	6.9	5.4	3.7	0.0	10.2
NOV	2.09	15.0	37.7	22.3	18.8	16.4	14.4	12.6	10.9	9.2	7.3	5.1	0.0	13.8
DEC	2.05	16.4	42.2	24.7	20.7	18.0	15.7	13.7	11.8	9.9	7.9	5.5	0.0	15.5
ANNUAL	1.76	12.3	37.0	19.8	16.1	13.7	11.7	10.0	8.4	6.8	5.2	3.4	0.0	9.4

PREPARED BY SCIENTIFIC SERVICES DIVISION, ATMOSPHERIC ENVIRONMENT SERVICE, VANCOUVER, B.C. MAY 29, 1981

WEIBULL WIND SPEED DISTRIBUTION

(I) CUMULATIVE WEIBULL PROBABILITIES GIVEN FOR WINDSPEEDS IN KNOT

STATION : TSWAWASSEN FERRY 1963-1975

MONTH	PARAMETERS		SPEEDS(KNOT)										MEAN SPEED		
	SHAPE	SCALE	0.0	6.0	12.0	18.0	24.0	30.0	36.0	42.0	48.0	54.0	60.0	66.0	
JAN	1.94	14.5	1.000	.834	.499	.217	.069	.016	.003	.000	.000	.000	.000	.000	14.2
FEB	1.73	12.0	1.000	.740	.368	.133	.036	.007	.001	.000	.000	.000	.000	.000	10.8
MAR	1.97	13.9	1.000	.825	.473	.190	.054	.011	.002	.000	.000	.000	.000	.000	11.9
APR	1.86	11.6	1.000	.746	.345	.104	.021	.003	.000	.000	.000	.000	.000	.000	11.1
MAY	2.10	11.1	1.000	.758	.306	.062	.006	.000	.000	.000	.000	.000	.000	.000	9.6
JUN	2.13	10.5	1.000	.739	.265	.043	.003	.000	.000	.000	.000	.000	.000	.000	9.8
JUL	1.93	9.9	1.000	.685	.235	.042	.004	.000	.000	.000	.000	.000	.000	.000	9.6
AUG	2.19	9.7	1.000	.703	.200	.020	.001	.000	.000	.000	.000	.000	.000	.000	8.9
SEP	1.83	9.4	1.000	.645	.209	.037	.004	.000	.000	.000	.000	.000	.000	.000	8.2
OCT	1.74	11.8	1.000	.737	.359	.125	.032	.006	.001	.000	.000	.000	.000	.000	11.0
NOV	1.91	12.8	1.000	.791	.415	.148	.037	.006	.001	.000	.000	.000	.000	.000	12.4
DEC	1.97	14.7	1.000	.843	.513	.227	.074	.017	.003	.000	.000	.000	.000	.000	14.3
ANNUAL	1.82	12.4	1.000	.766	.390	.139	.036	.007	.001	.000	.000	.000	.000	.000	9.6

(II) WINDSPEEDS IN KNOT GIVEN FOR CUMULATIVE WEIBULL PROBABILITIES

STATION : TSWAWASSEN FERRY 1963-1975

MONTH	PARAMETERS		CUMULATIVE WEIBULL PROBABILITIES										MEAN SPEED	
	SHAPE	SCALE	.001	.100	.200	.300	.400	.500	.600	.700	.800	.900	1.000	
JAN	1.94	14.5	39.1	22.2	18.5	15.9	13.8	12.0	10.2	8.5	6.7	4.5	0.0	14.2
FEB	1.73	12.0	36.6	19.4	15.8	13.4	11.4	9.7	8.1	6.6	5.0	3.3	0.0	10.8
MAR	1.97	13.9	37.2	21.2	17.7	15.3	13.3	11.5	9.9	8.2	6.5	4.4	0.0	11.9
APR	1.86	11.6	32.8	18.2	15.0	12.8	11.1	9.5	8.1	6.7	5.2	3.5	0.0	11.1
MAY	2.10	11.1	27.8	16.5	13.9	12.1	10.6	9.3	8.0	6.8	5.4	3.8	0.0	9.6
JUN	2.13	10.5	26.0	15.5	13.1	11.5	10.1	8.9	7.7	6.5	5.2	3.7	0.0	9.8
JUL	1.93	9.9	26.9	15.2	12.7	10.9	9.5	8.2	7.0	5.8	4.6	3.1	0.0	9.6
AUG	2.19	9.7	23.3	14.1	12.0	10.5	9.3	8.2	7.1	6.0	4.9	3.5	0.0	8.9
SEP	1.83	9.4	27.0	14.8	12.2	10.4	9.0	7.7	6.5	5.4	4.2	2.8	0.0	8.2
OCT	1.74	11.8	35.9	19.1	15.6	13.2	11.3	9.6	8.1	6.6	5.0	3.3	0.0	11.0
NOV	1.91	12.8	35.3	19.9	16.5	14.1	12.3	10.6	9.0	7.5	5.9	4.0	0.0	12.4
DEC	1.97	14.7	39.4	22.5	18.8	16.2	14.1	12.2	10.5	8.7	6.9	4.7	0.0	14.3
ANNUAL	1.82	12.4	35.9	19.6	16.1	13.7	11.8	10.1	8.6	7.0	5.4	3.6	0.0	9.6

PREPARED BY SCIENTIFIC SERVICES DIVISION, ATMOSPHERIC ENVIRONMENT SERVICE, VANCOUVER, B.C. MAY 29, 1981

## Appendix D

- (a) Tables of percentage wave height by direction based on ship reports 1857-1979
- (b) Figures D-1 to D-11. Wave Analyses for 10 points in the Strait of Georgia.  
(Figure D-1 gives the location of the points)
- (c) Figures D-12 to D-19. Significant wave height frequencies occurrence (see text for a description of the analysis method)

## PERCENTAGE FREQUENCY OF WAVE HEIGHT BY DIRECTION

LOCATION: GEORGIA STRAIT										SUMMER	1857 - 1979	
WAVE HEIGHT (m)	N	NE	E	SE	S	SW	W	NW		TOTAL FREQ.	EXCEED. FREQ.	
0.0-1.5	6.9	2.1	6.6	12.7	6.6	4.0	11.9	16.9		97.4	100.0	
1.5-3.0	.3			.5	.8	.5	.3			2.4	2.6	
3.0-4.5								.3		.3	.3	
4.5-6.0											0	
TOTAL	7.1	2.1	6.6	13.2	7.4	4.5	12.2	17.2				
PERCENT CALM OR INDETERMINATE	29.7								TOTAL NUMBER OF OBSERVATIONS	378		

## PERCENTAGE FREQUENCY OF WAVE HEIGHT BY DIRECTION

LOCATION: GEORGIA STRAIT										AUTUMN	1857 - 1979	
WAVE HEIGHT (m)	N	NE	E	SE	S	SW	W	NW		TOTAL FREQ.	EXCEED. FREQ.	
0.0-1.5	6.7	3.3	7.8	18.3	7.2	7.2	12.2	17.2		97.2	100.0	
1.5-3.0				.6	1.1		.6	.6		2.8	2.8	
3.0-4.5											0	
4.5-6.0											0	
TOTAL	6.7	3.3	7.8	18.9	8.3	7.2	12.8	17.8				
PERCENT CALM OR INDETERMINATE	17.2								TOTAL NUMBER OF OBSERVATIONS	180		

NOTE- AN ASTERISK INDICATES LESS THAN 0.5 PERCENT

## PERCENTAGE FREQUENCY OF WAVE HEIGHT BY DIRECTION

LOCATION: GEORGIA STRAIT										WINTER	1857 - 1979	
WAVE HEIGHT (m)	N	NE	E	SE	S	SW	W	NW		TOTAL FREQ.	EXCEED. FREQ.	
0.0-1.5	5.2	3.3	12.7	25.0	13.7	4.7	11.3	14.6	96.2	100.0		
1.5-3.0	.5			2.4			.5	.5	3.8	3.8		
3.0-4.5										0		
4.5-6.0										0		
TOTAL	5.7	3.3	12.7	27.4	13.7	4.7	11.8	15.1				
PERCENT CALM OR INDETERMINATE	5.7								TOTAL NUMBER OF OBSERVATIONS	212		

## PERCENTAGE FREQUENCY OF WAVE HEIGHT BY DIRECTION

LOCATION: GEORGIA STRAIT										SPRING	1857 - 1979	
WAVE HEIGHT (m)	N	NE	E	SE	S	SW	W	NW		TOTAL FREQ.	EXCEED. FREQ.	
0.0-1.5	9.1	2.1	5.6	16.8	7.0	4.2	14.0	20.3	97.2	100.0		
1.5-3.0				.7				.7		1.4	2.8	
3.0-4.5								.7		.7	1.4	
4.5-6.0								.7		.7	.7	
TOTAL	9.1	2.1	5.6	17.5	7.0	4.2	14.0	22.4				
PERCENT CALM OR INDETERMINATE	18.2								TOTAL NUMBER OF OBSERVATIONS	143		

NOTE- AN ASTERISK INDICATES LESS THAN 0.5 PERCENT

## PERCENTAGE FREQUENCY OF WAVE HEIGHT BY DIRECTION

LOCATION: GEORGIA STRAIT										YEAR	1857 - 1979	
WAVE HEIGHT (m)	N	NE	E	SE	S	SW	W	NW		TOTAL FREQ.	EXCEED. FREQ.	
0.0-1.5	6.9	2.6	8.2	17.2	8.4	4.8	12.2	16.9		97.0	100.0	
1.5-3.0	.2			1.1	.4	.2	.3	.3		2.6	3.0	
3.0-4.5										.2	.2	
4.5-6.0										.1	.1	
TOTAL	7.1	2.6	8.2	18.3	8.9	5.0	12.5	17.5				
PERCENT CALM OR INDETERMINATE	19.8								TOTAL NUMBER OF OBSERVATIONS	913		

NOTE- AN ASTERISK INDICATES LESS THAN 0.5 PERCENT

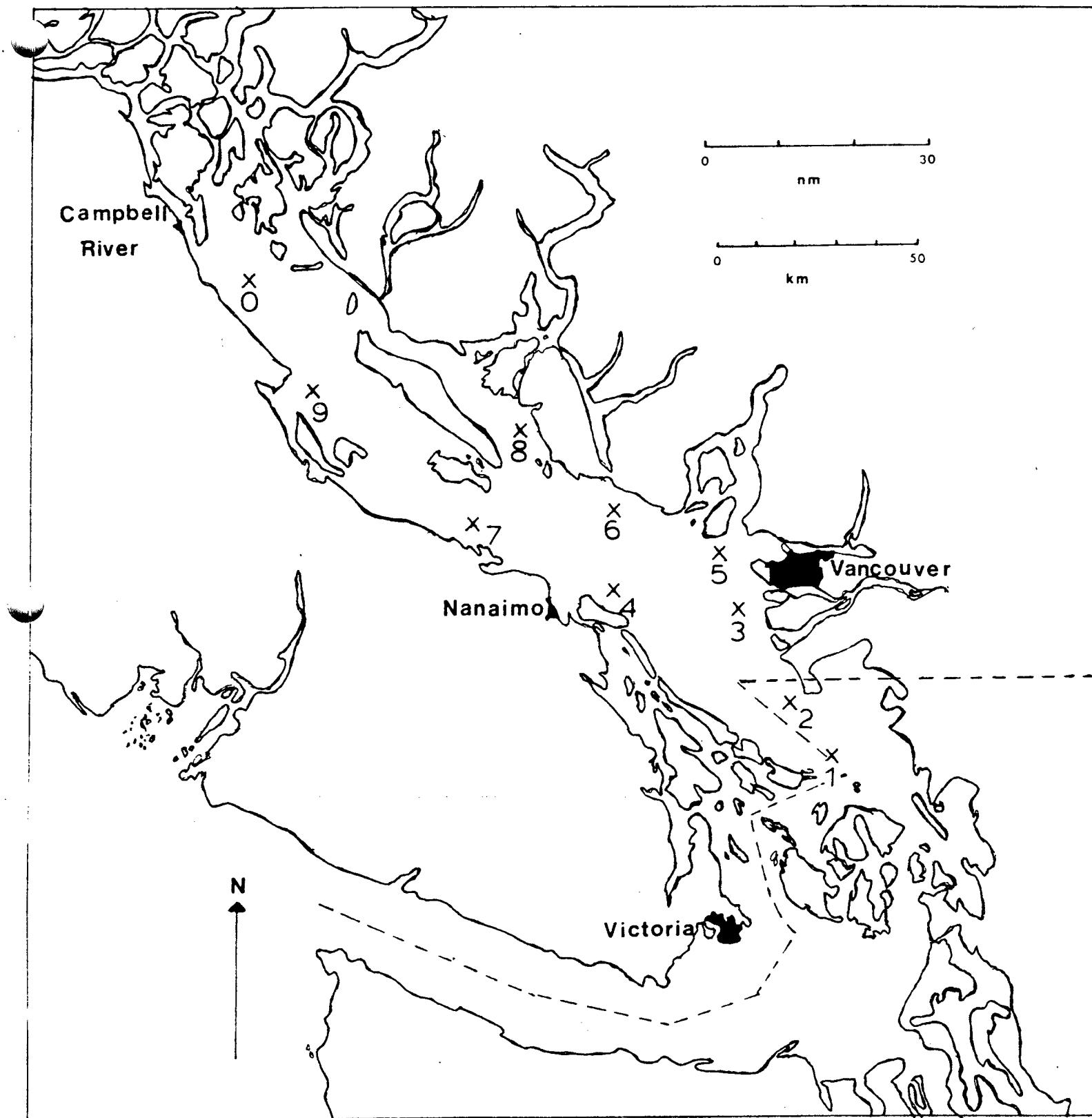
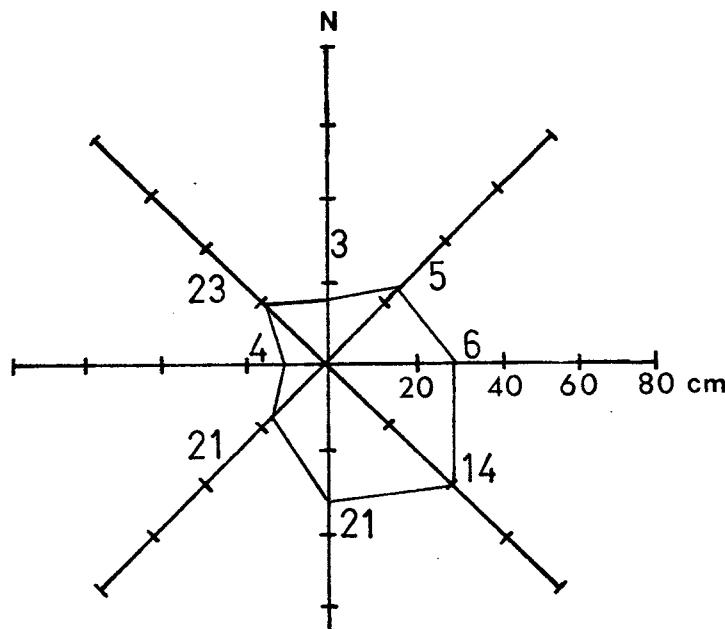
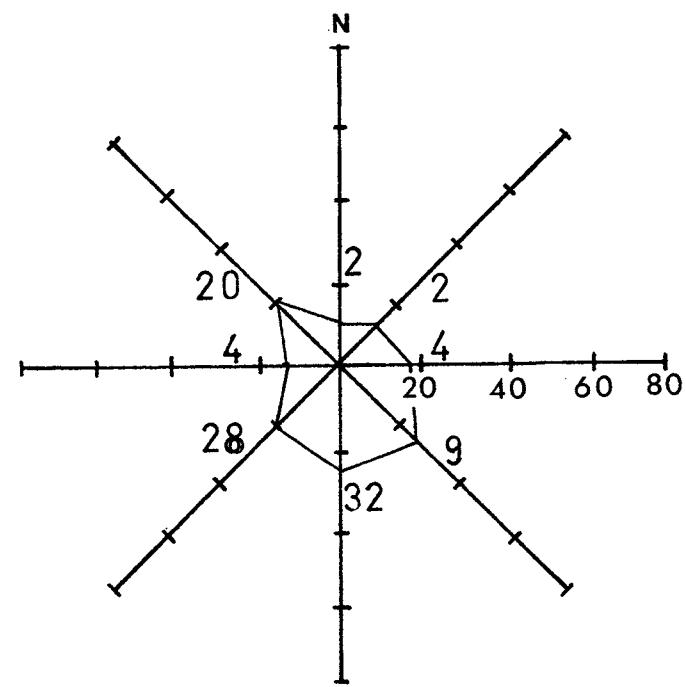


FIGURE D-1



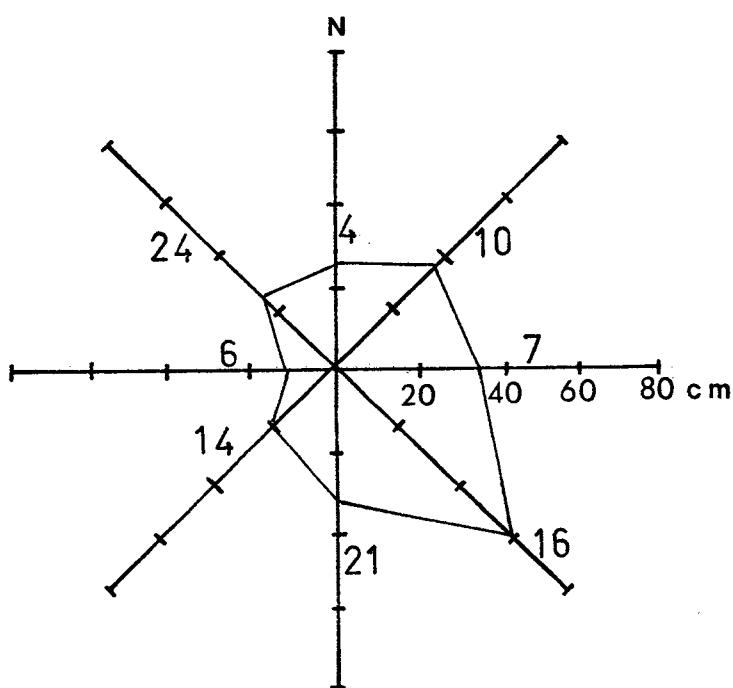
(a)

Spring



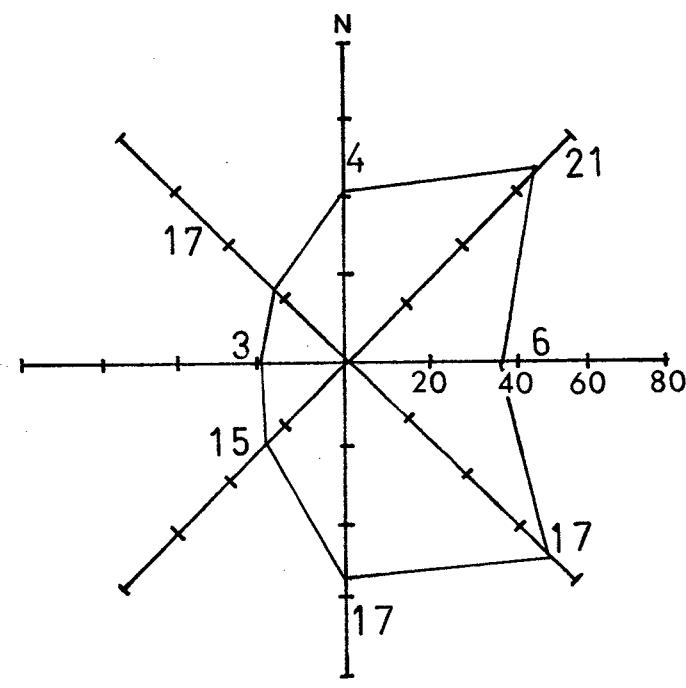
(b)

Summer



(c)

Fall

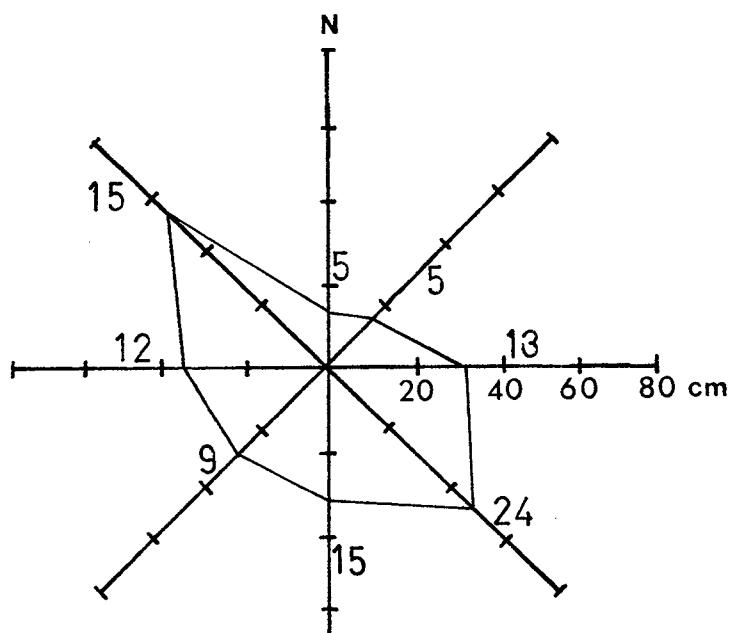


(d)

Winter

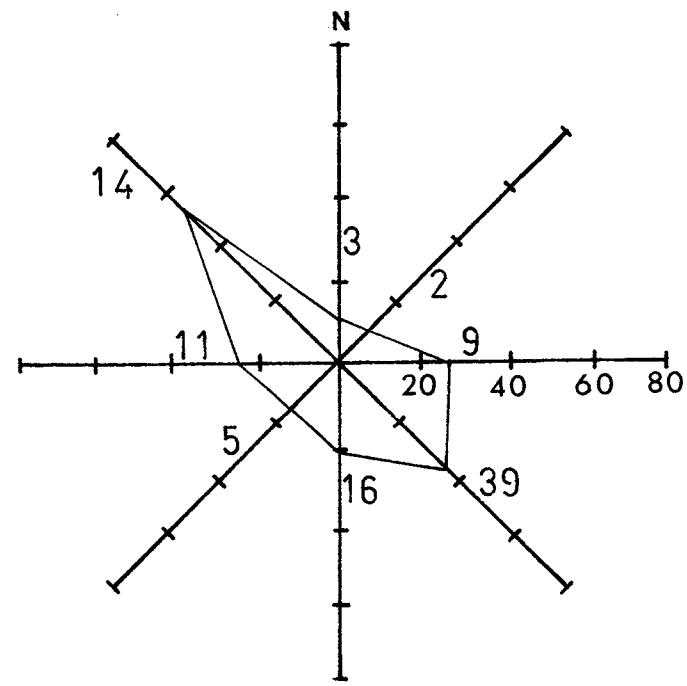
Station No. 1

FIGURE D-2



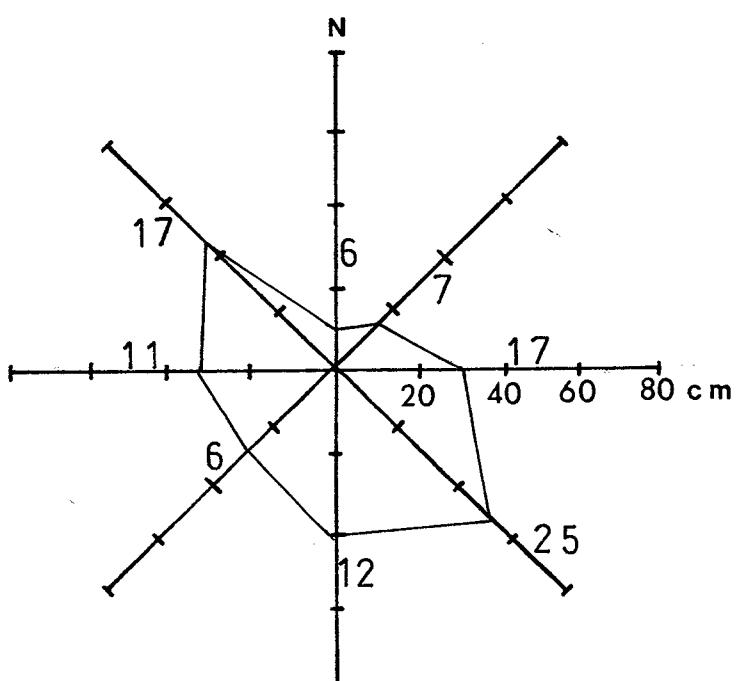
(a)

Spring



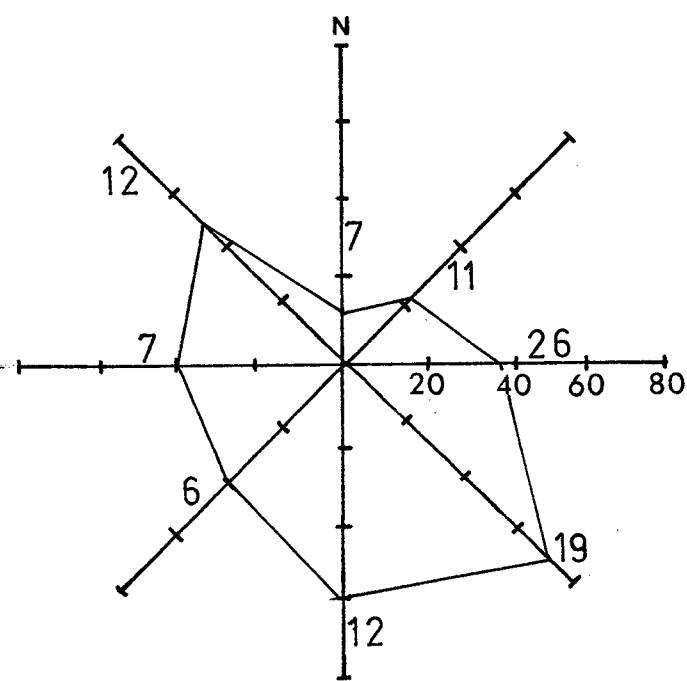
(b)

Summer



(c)

Fall

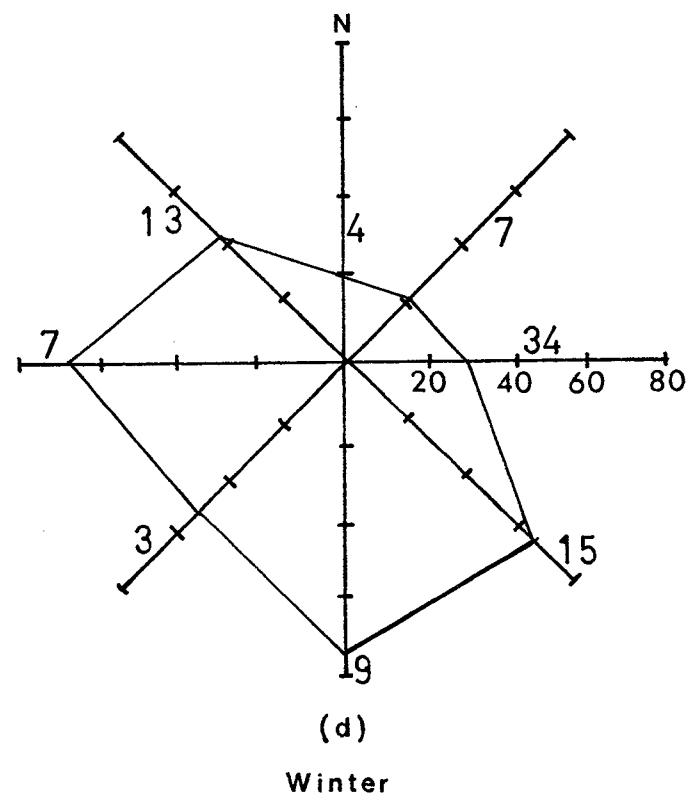
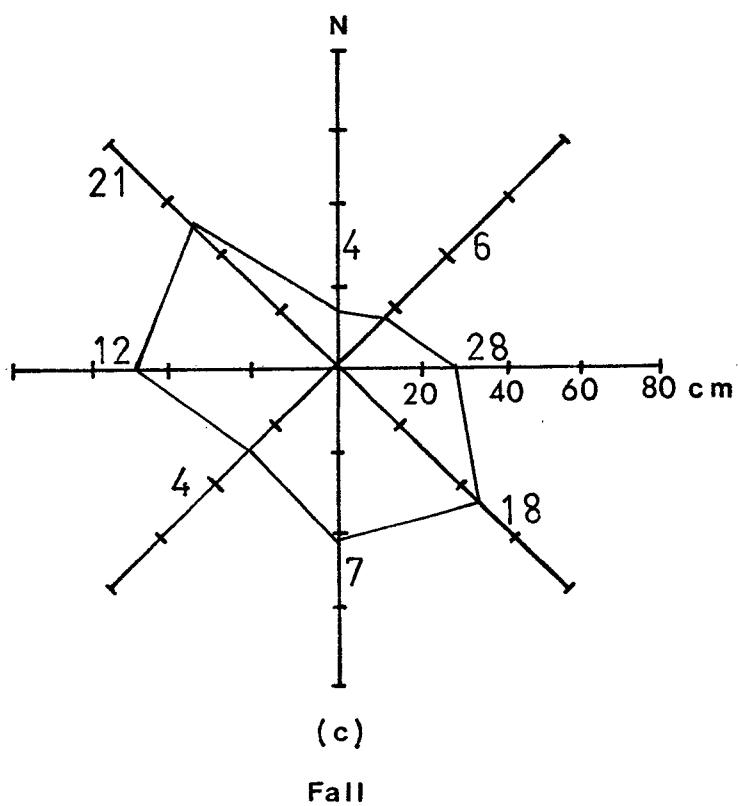
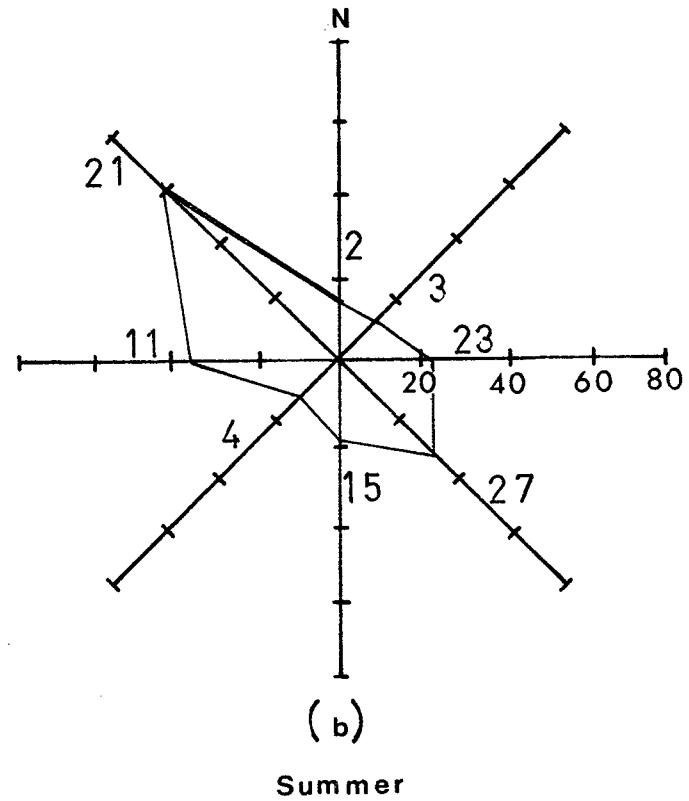
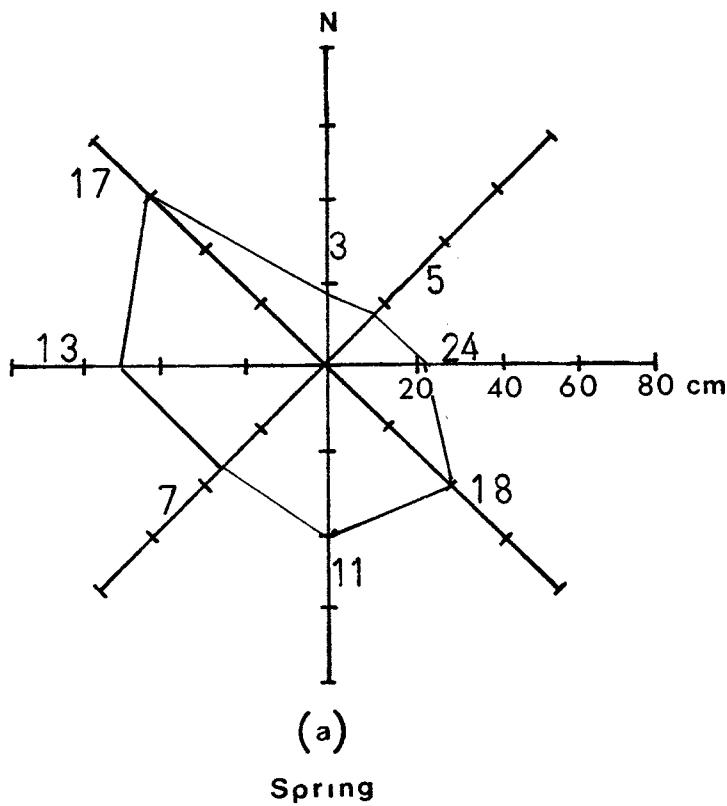


(d)

Winter

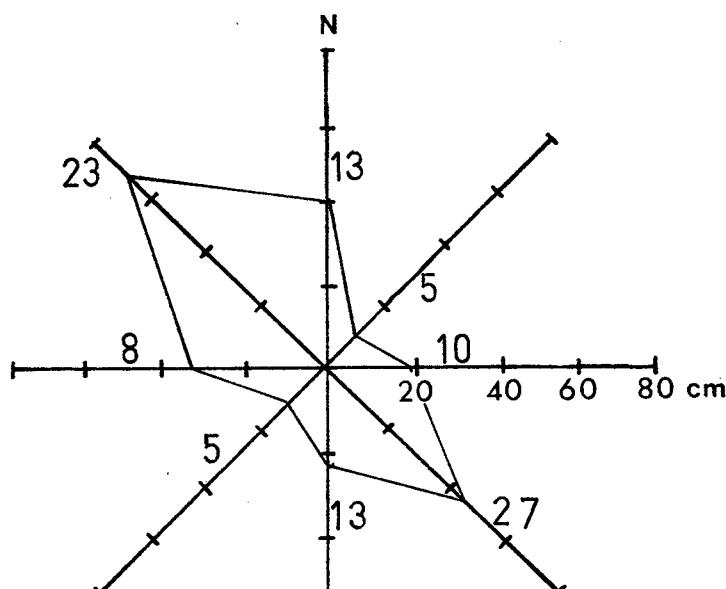
Station No. 2

FIGURE D-3



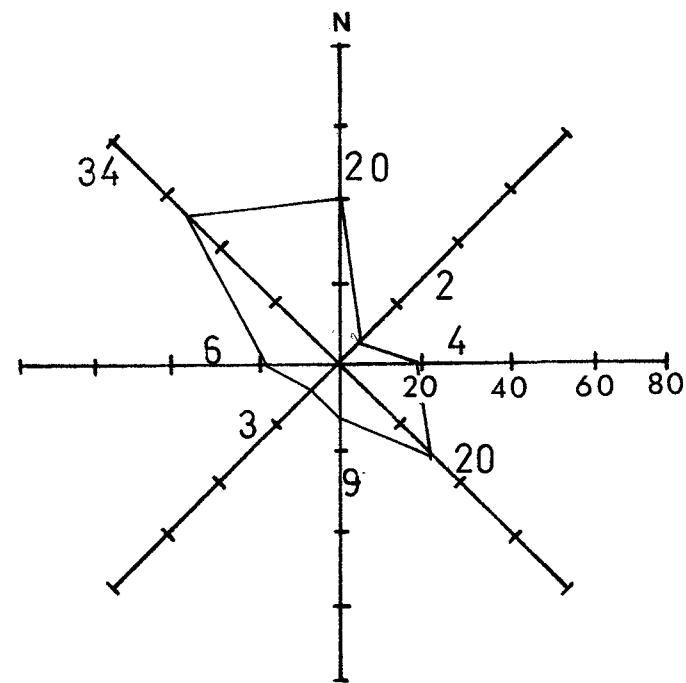
Station No. 3

FIGURE D-4



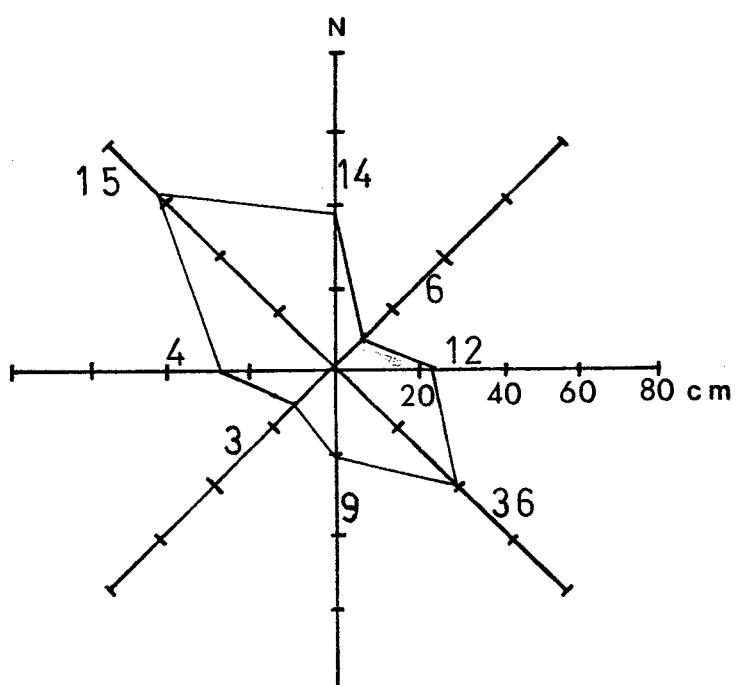
(a)

Spring



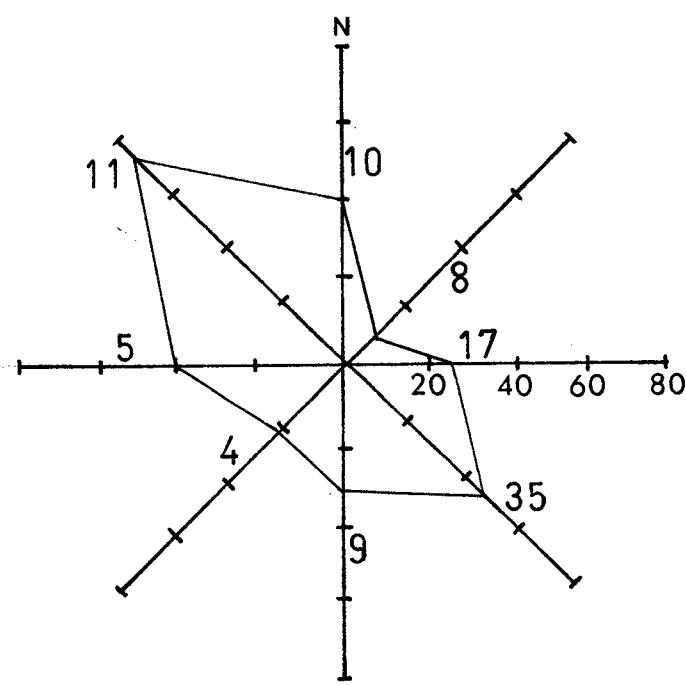
(b)

Summer



(c)

Fall

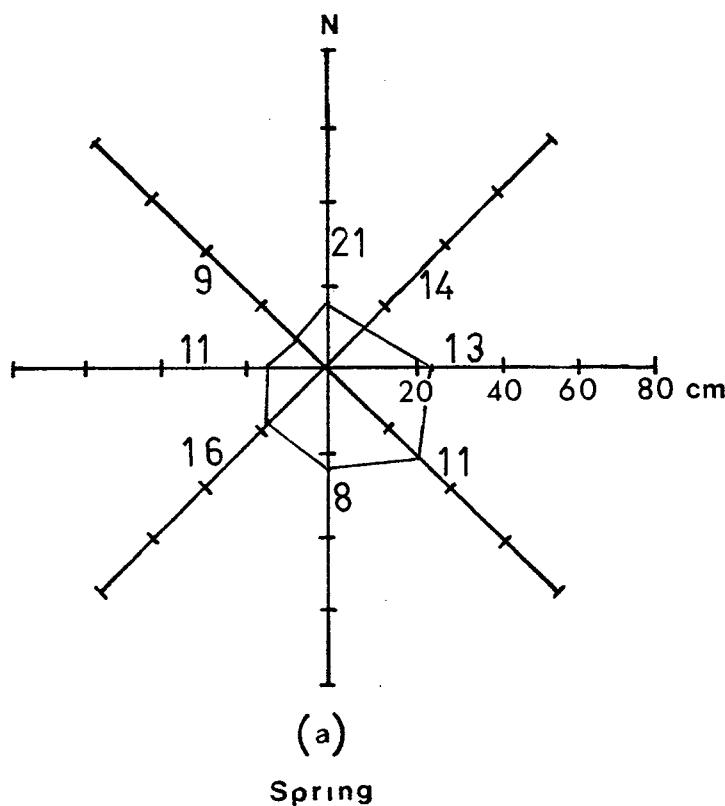


(d)

Winter

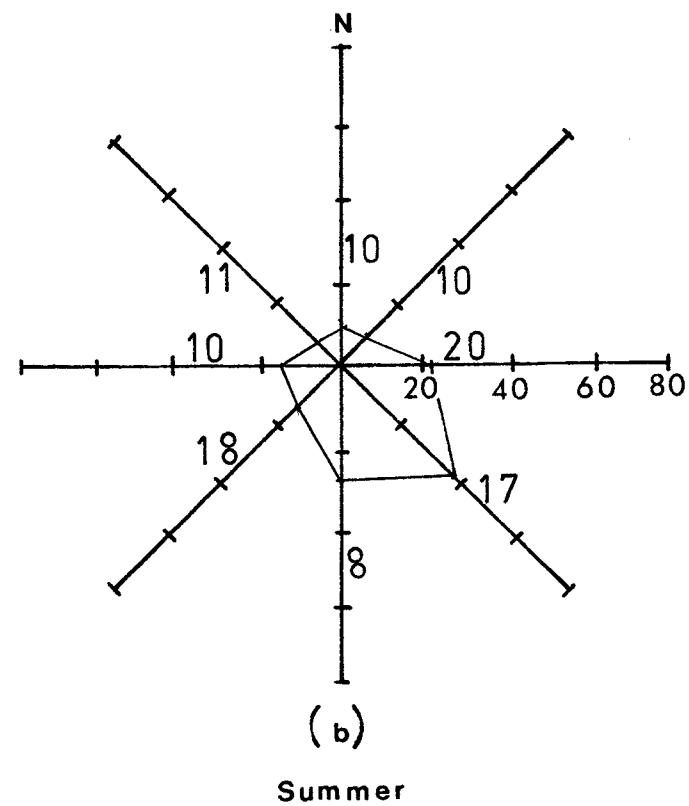
Station No. 4

FIGURE D-5



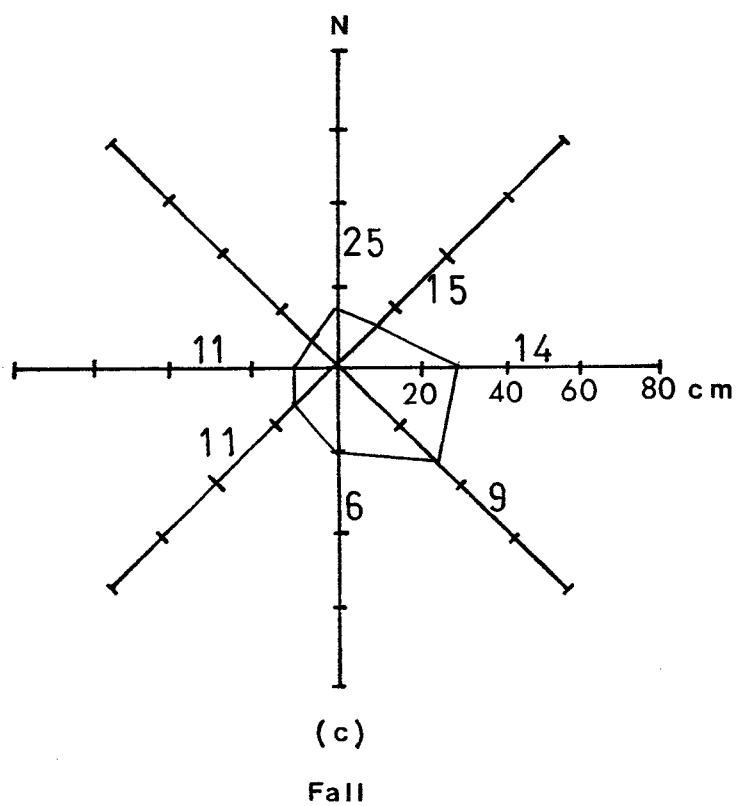
(a)

Spring



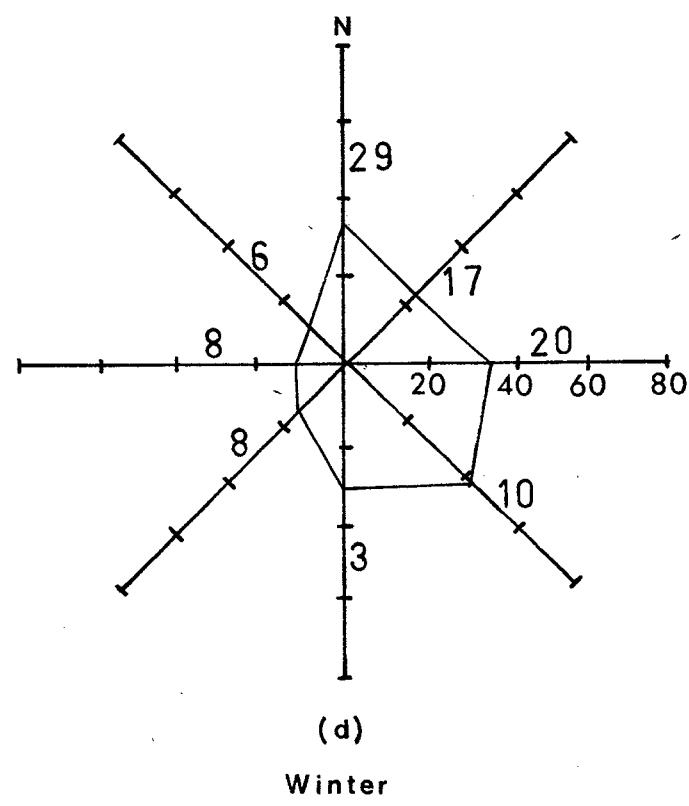
(b)

Summer



(c)

Fall

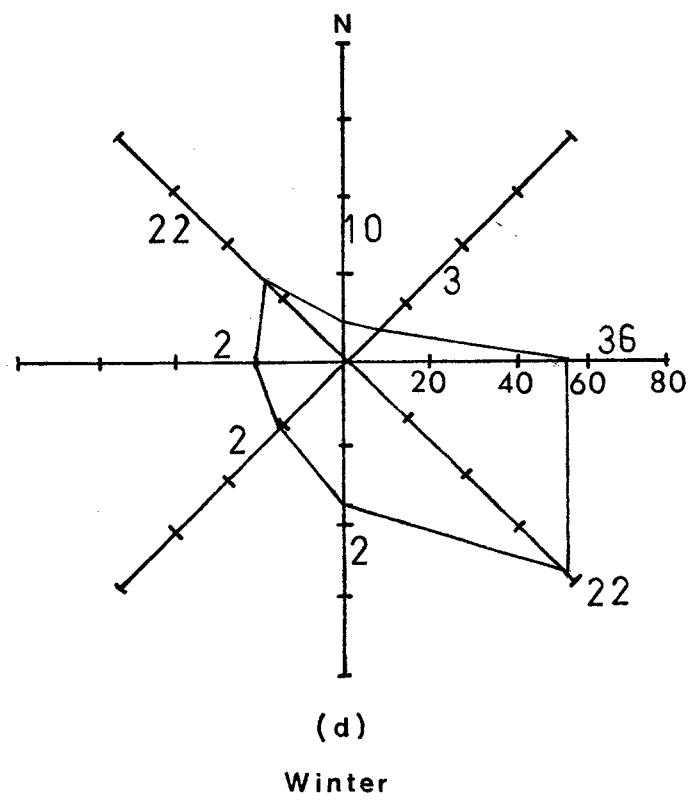
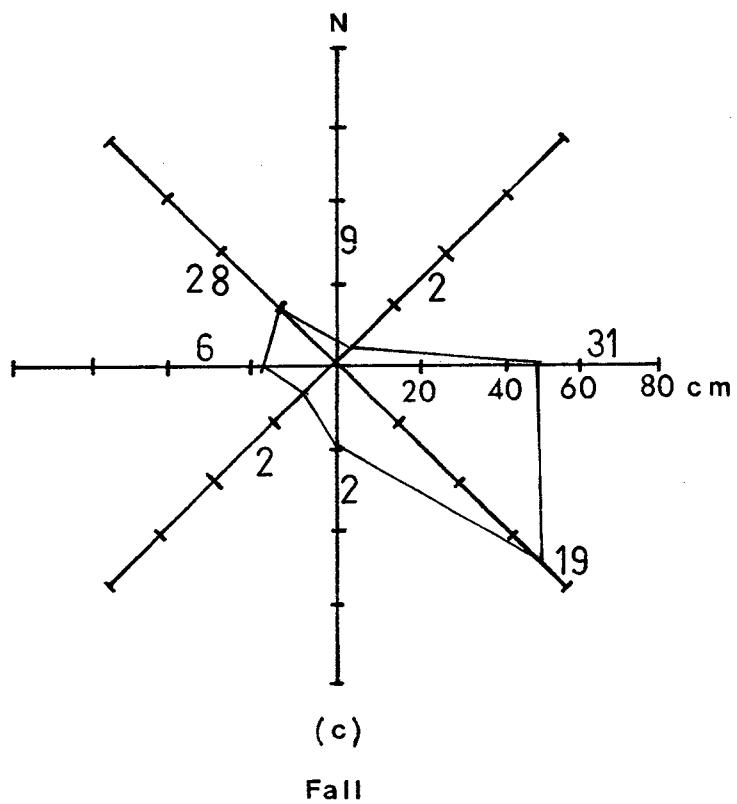
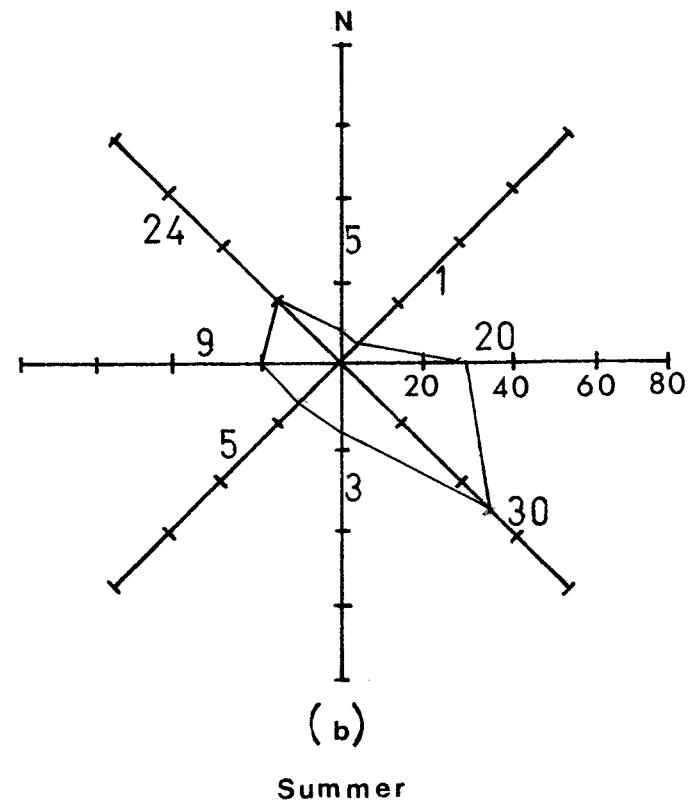
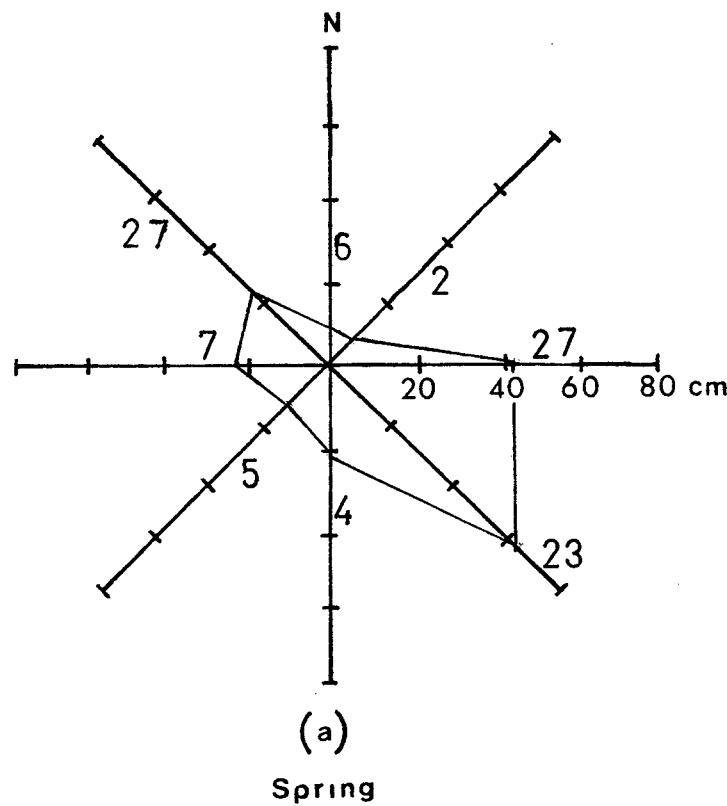


(d)

Winter

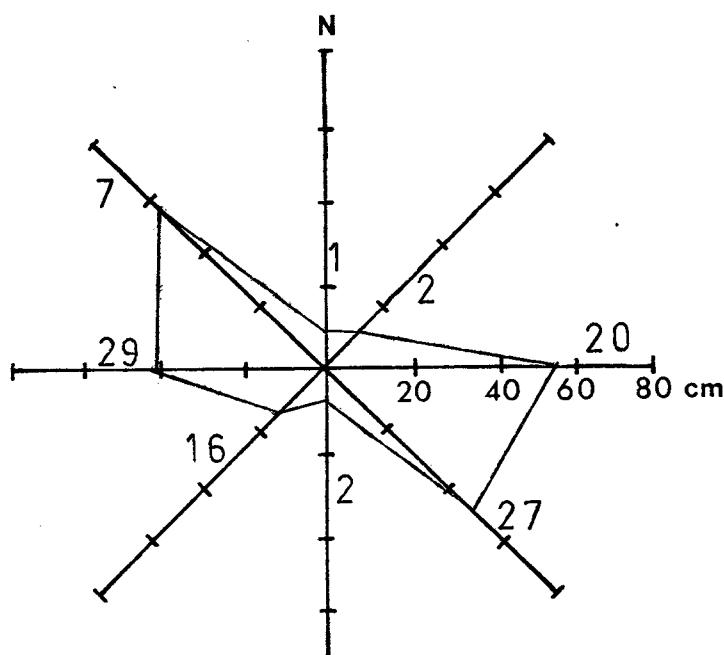
Station No. 5

FIGURE D-6



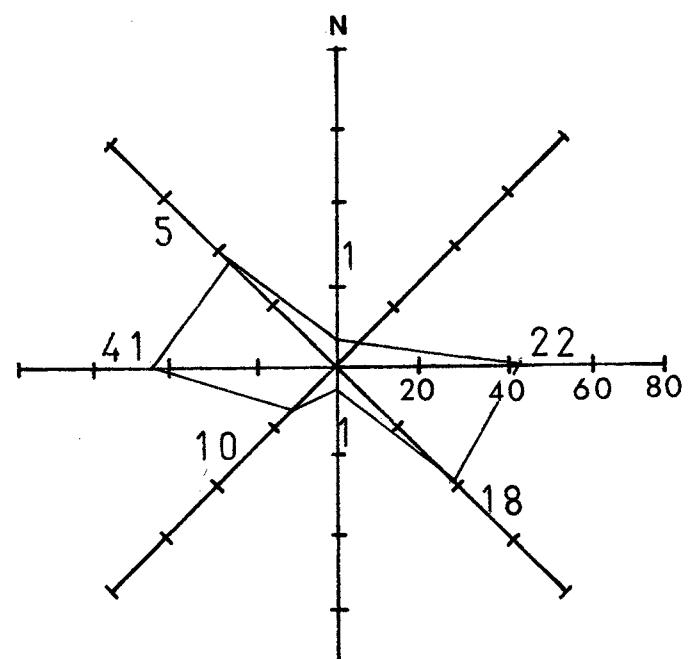
Station No. 6

FIGURE D-7



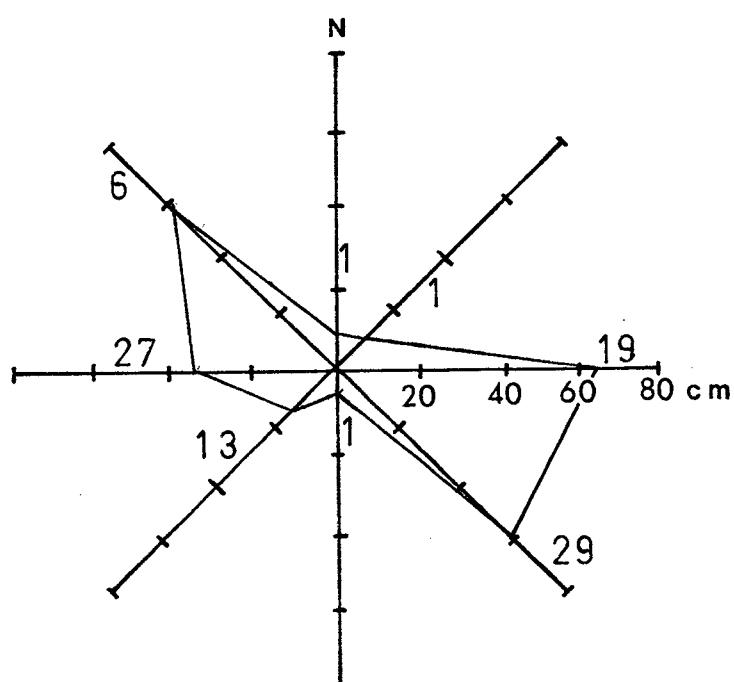
(a)

Spring



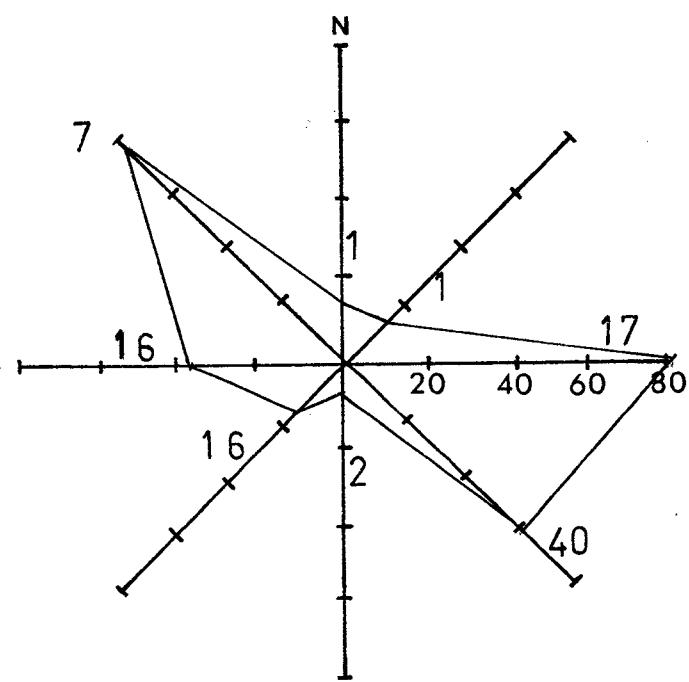
(b)

Summer



(c)

Fall

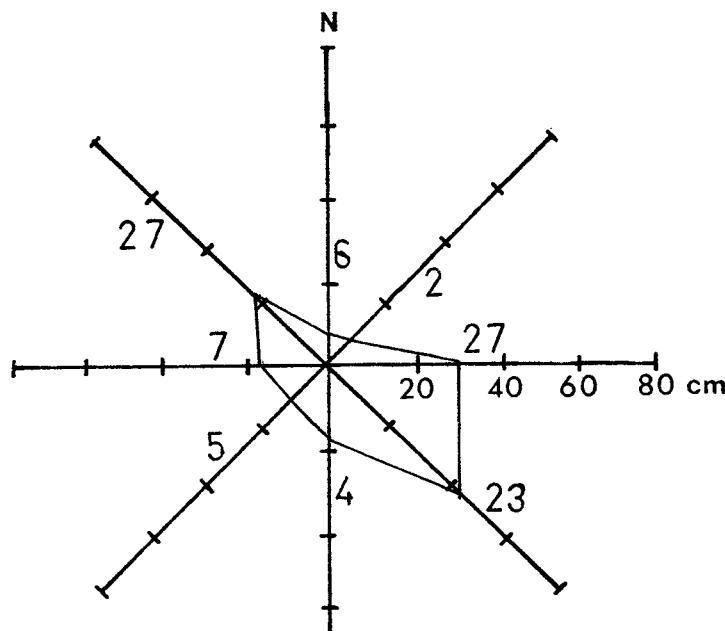


(d)

Winter

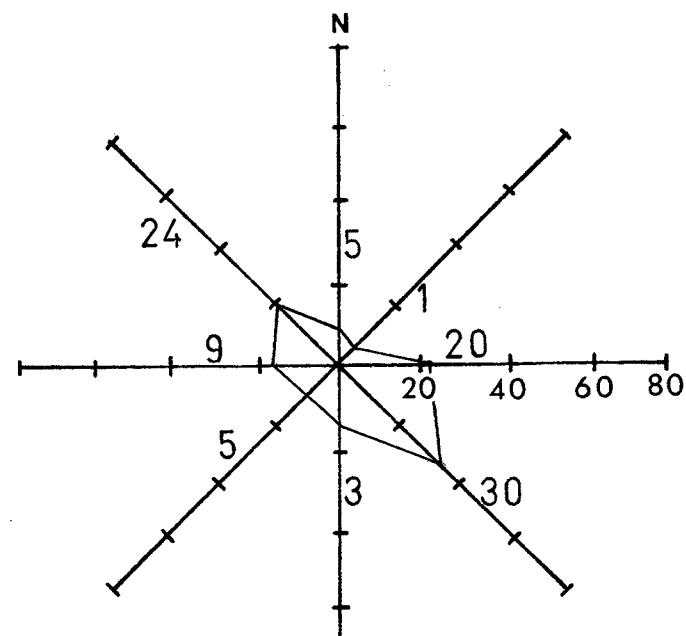
Station No. 7

FIGURE D-8



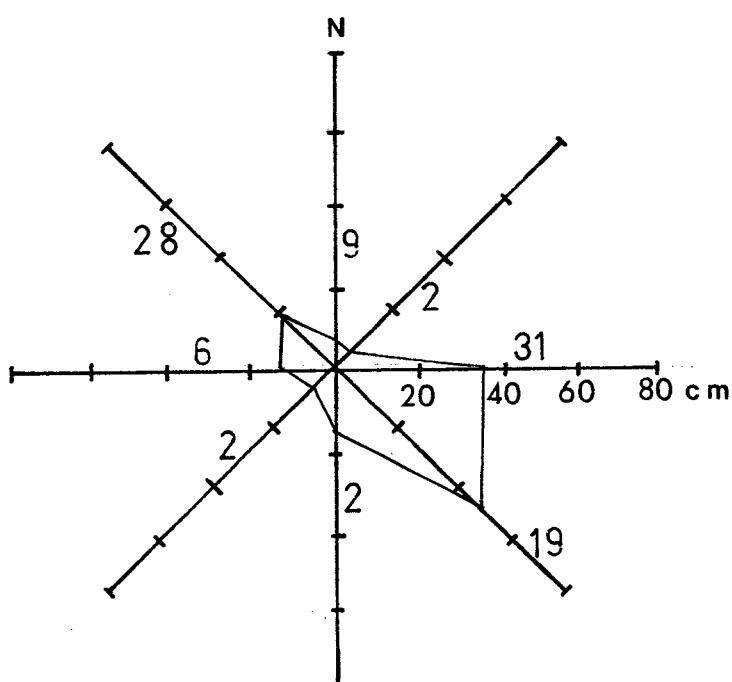
(a)

Spring



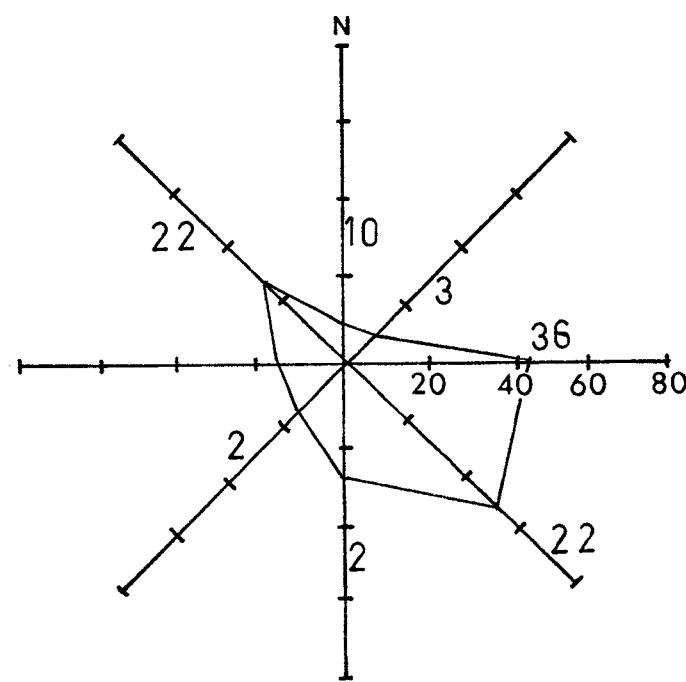
(b)

Summer



(c)

Fall

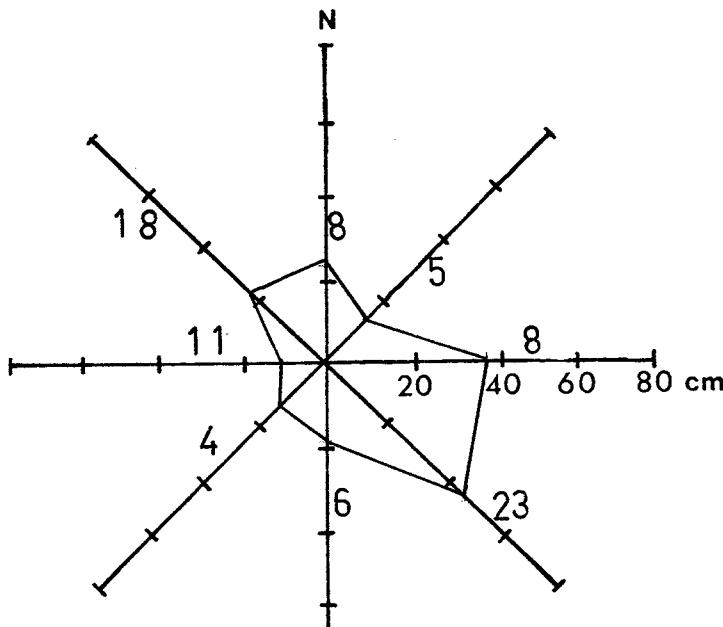


(d)

Winter

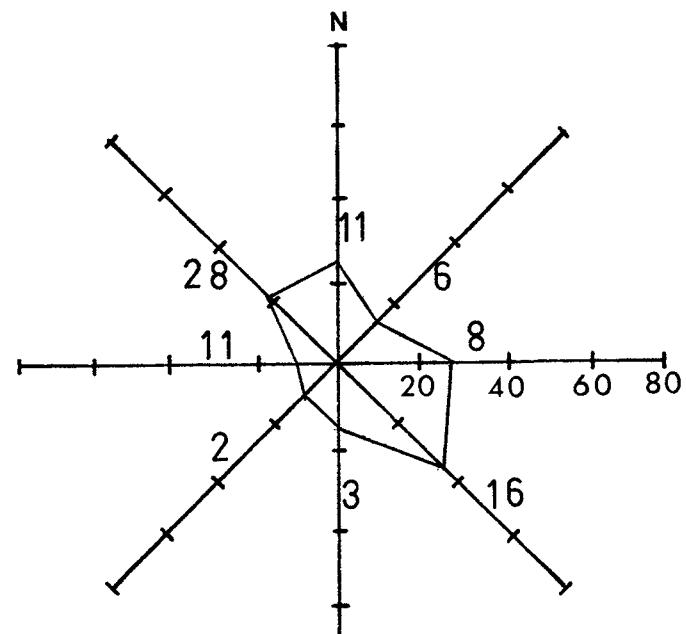
Station No. 8

FIGURE D-9



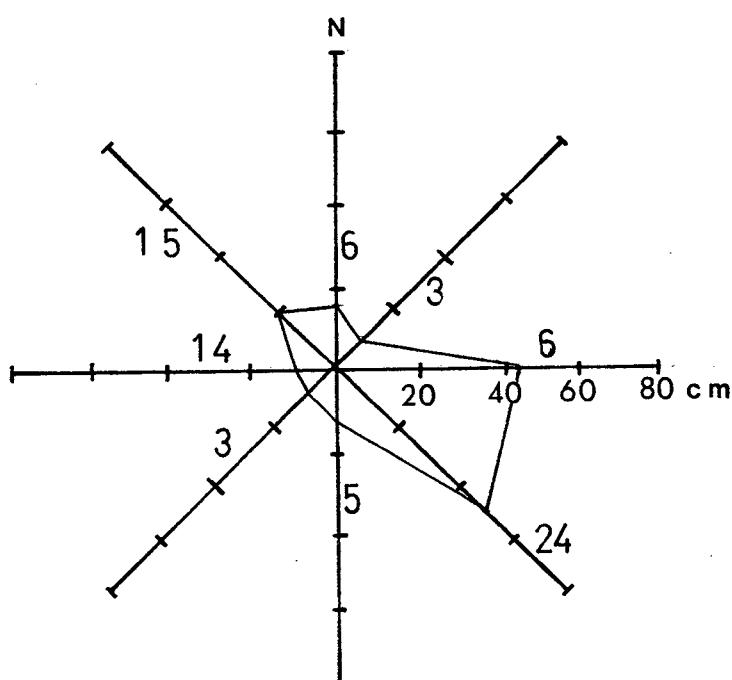
(a)

Spring



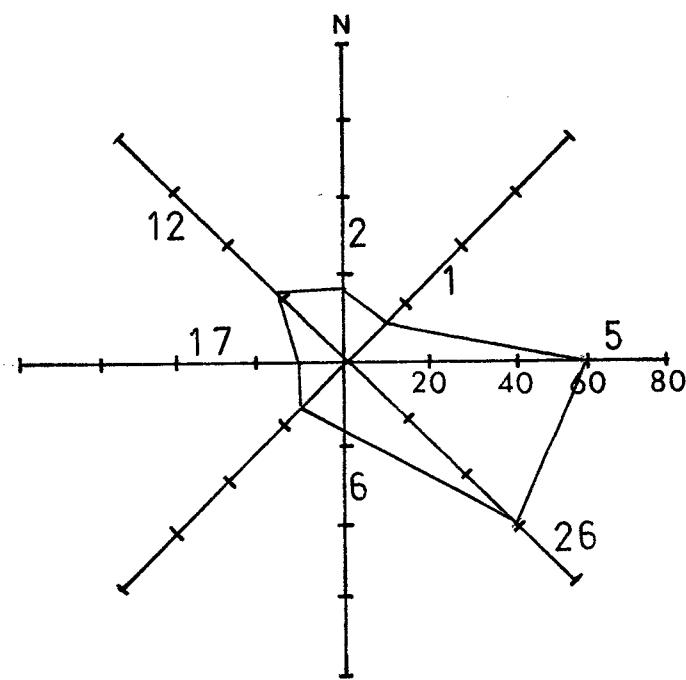
(b)

Summer



(c)

Fall

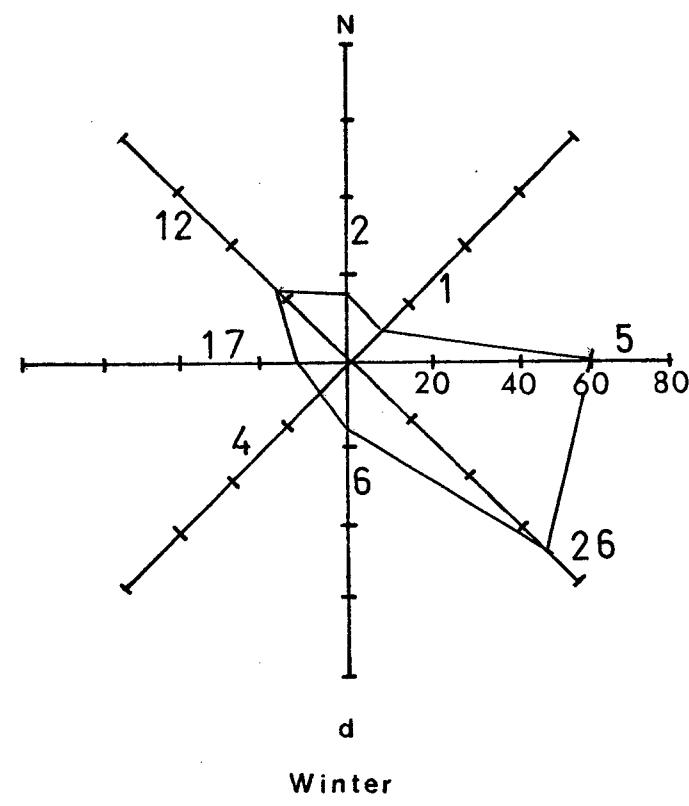
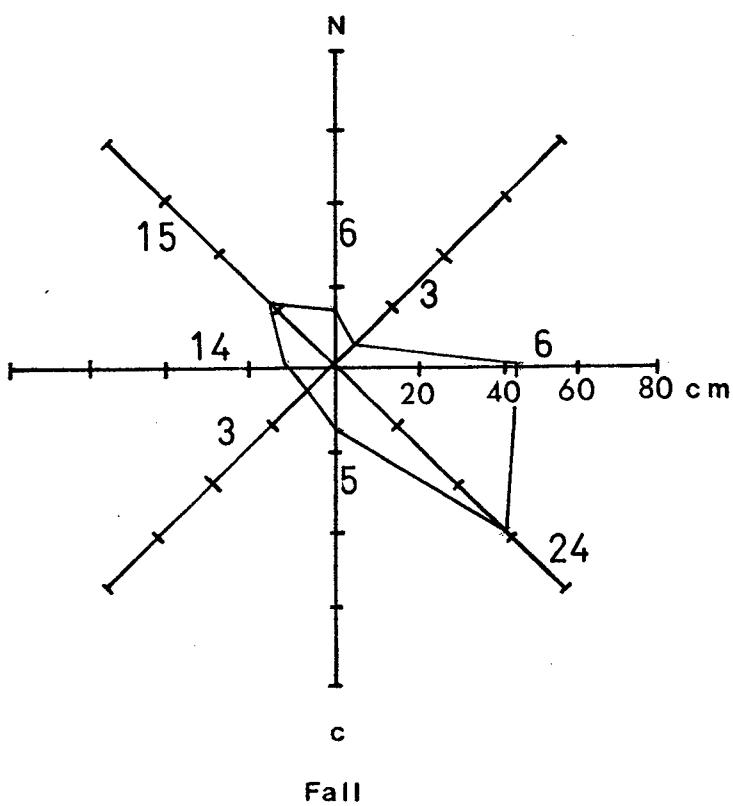
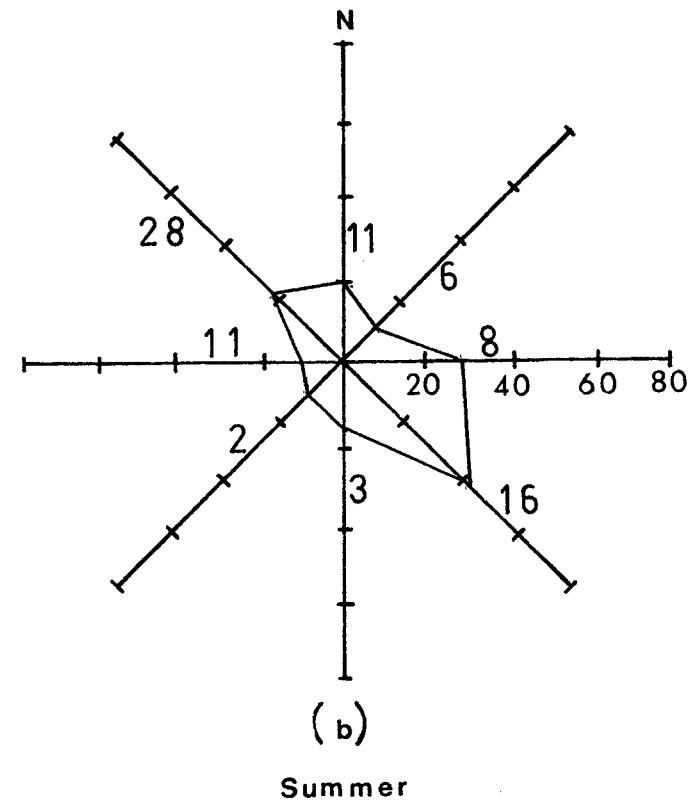
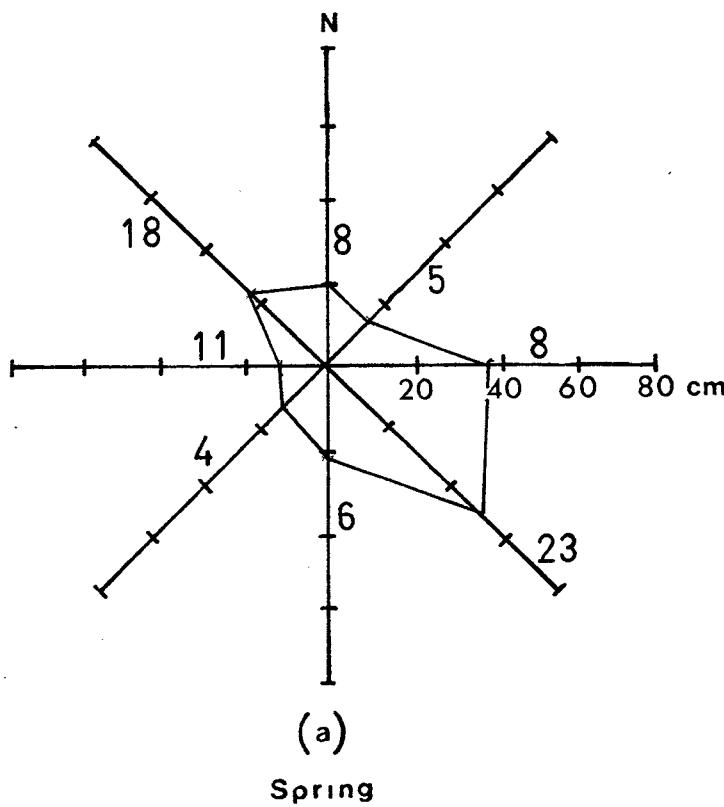


(d)

Winter

Station No. 9

FIGURE D-10



Station No. 0

FIGURE D-11

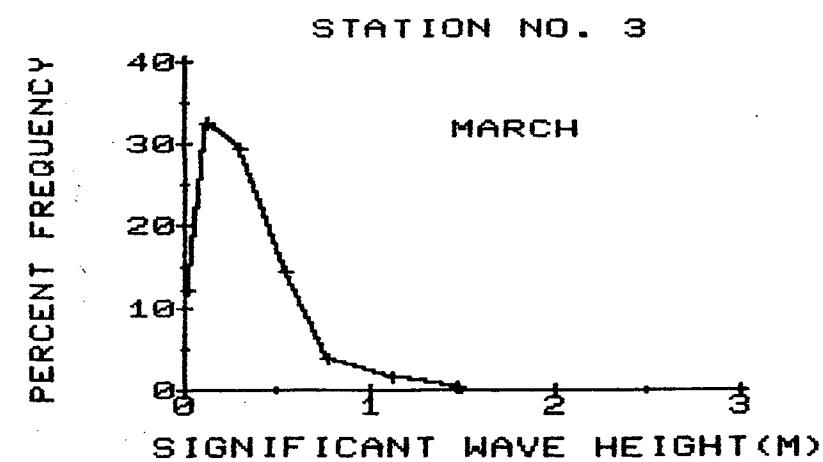
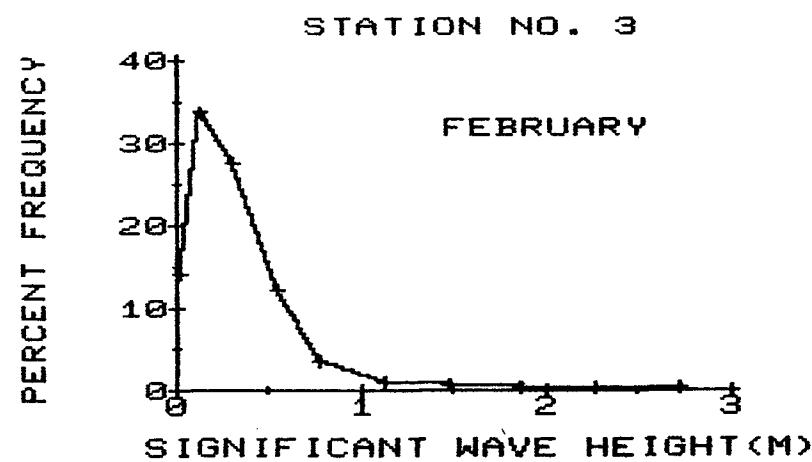
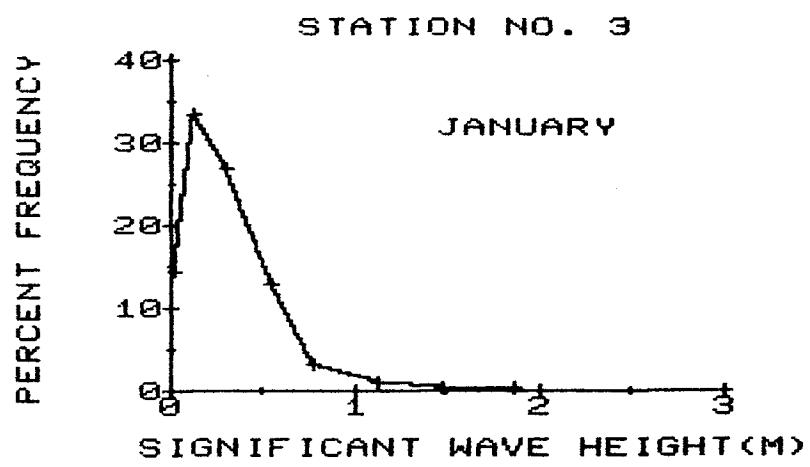


FIGURE D-12

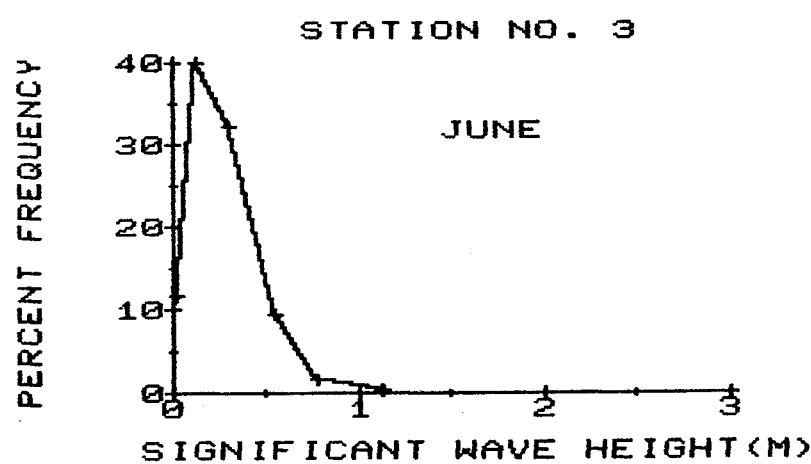
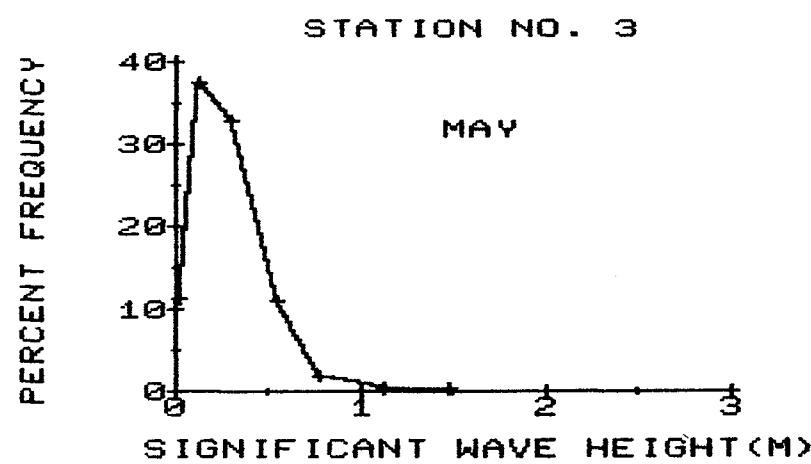
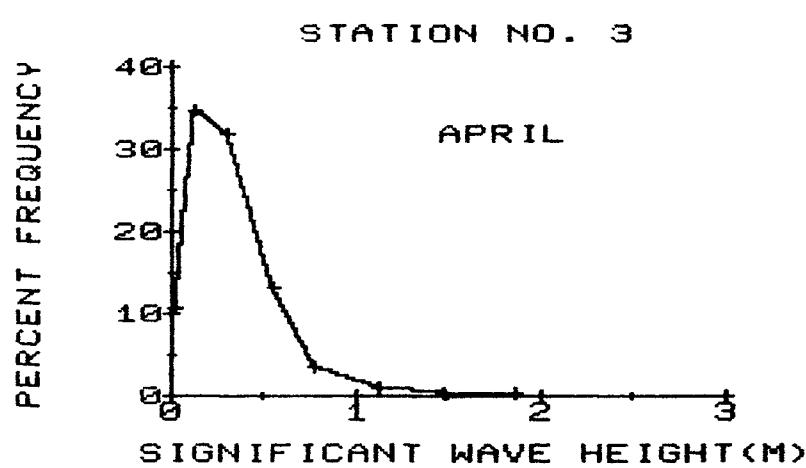


FIGURE D-13

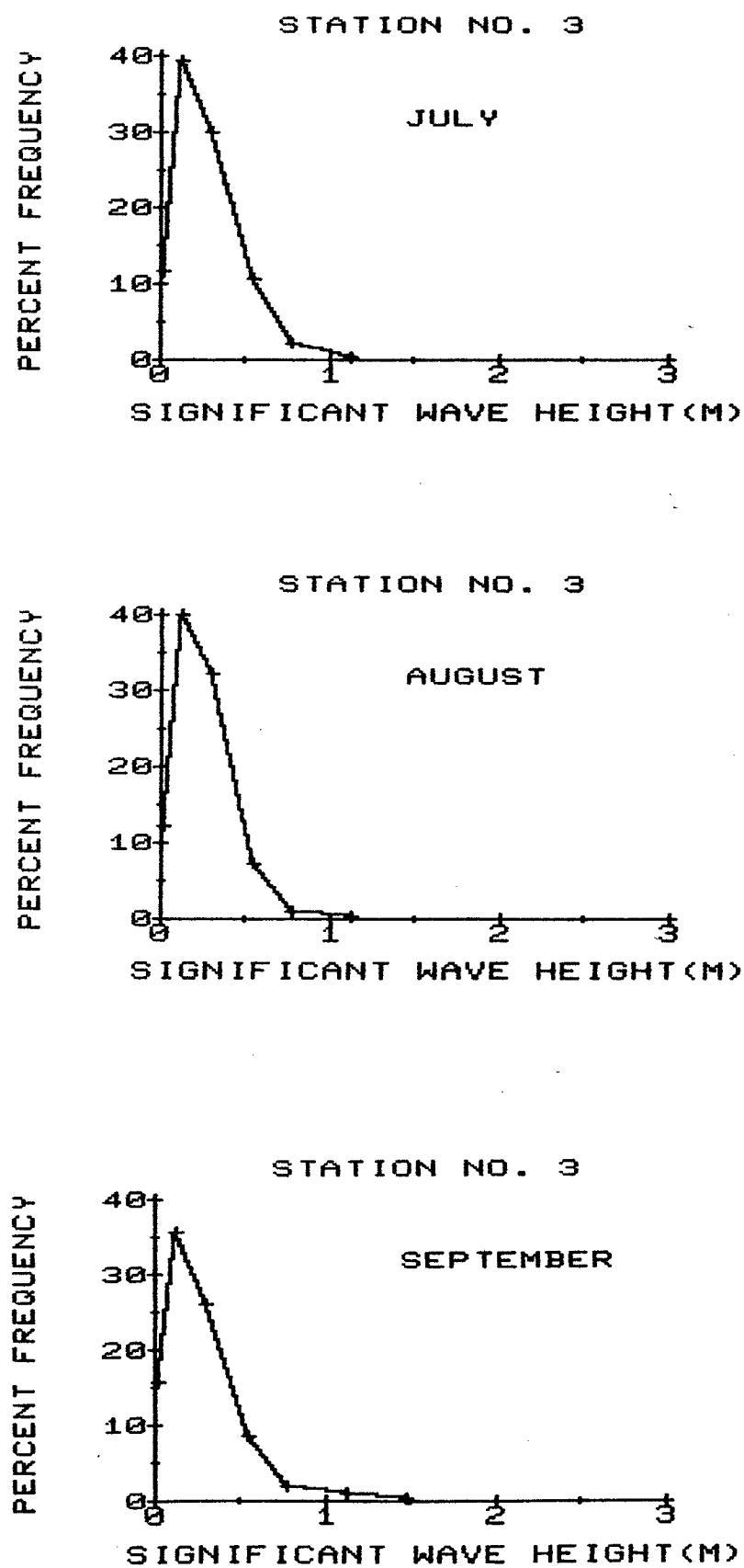


FIGURE D-14

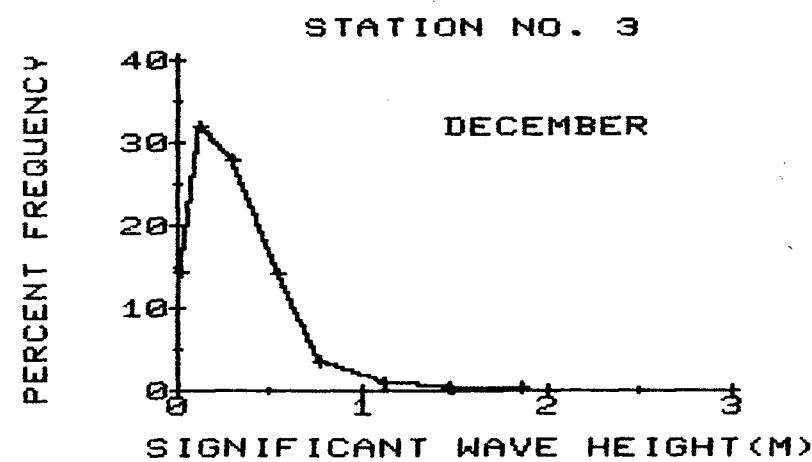
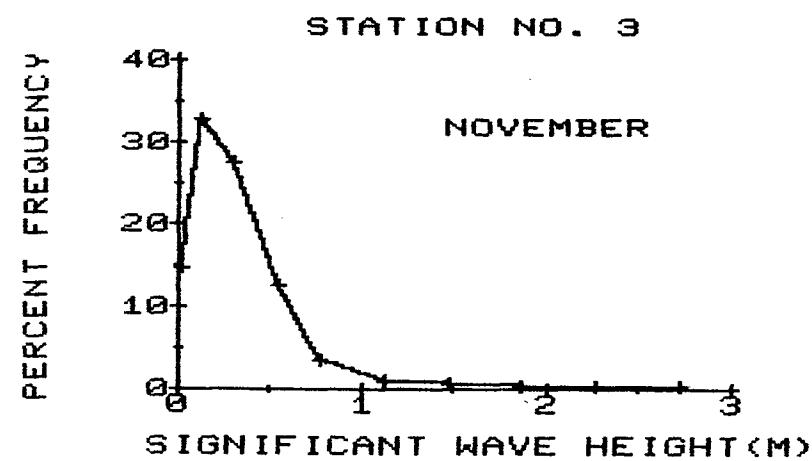
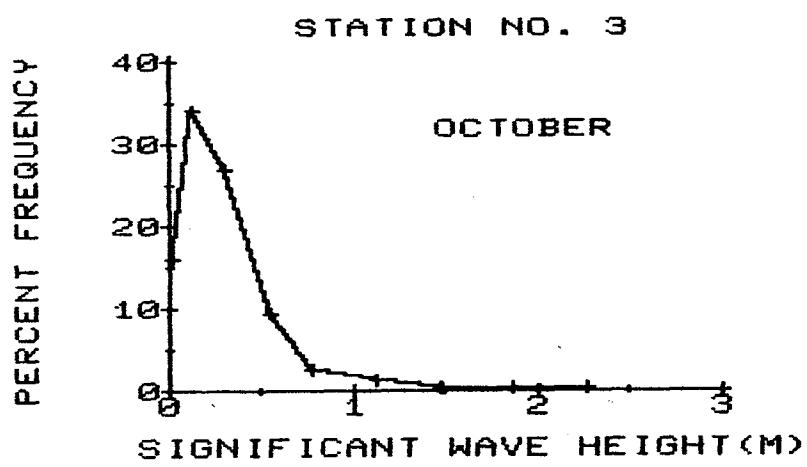


FIGURE D-15

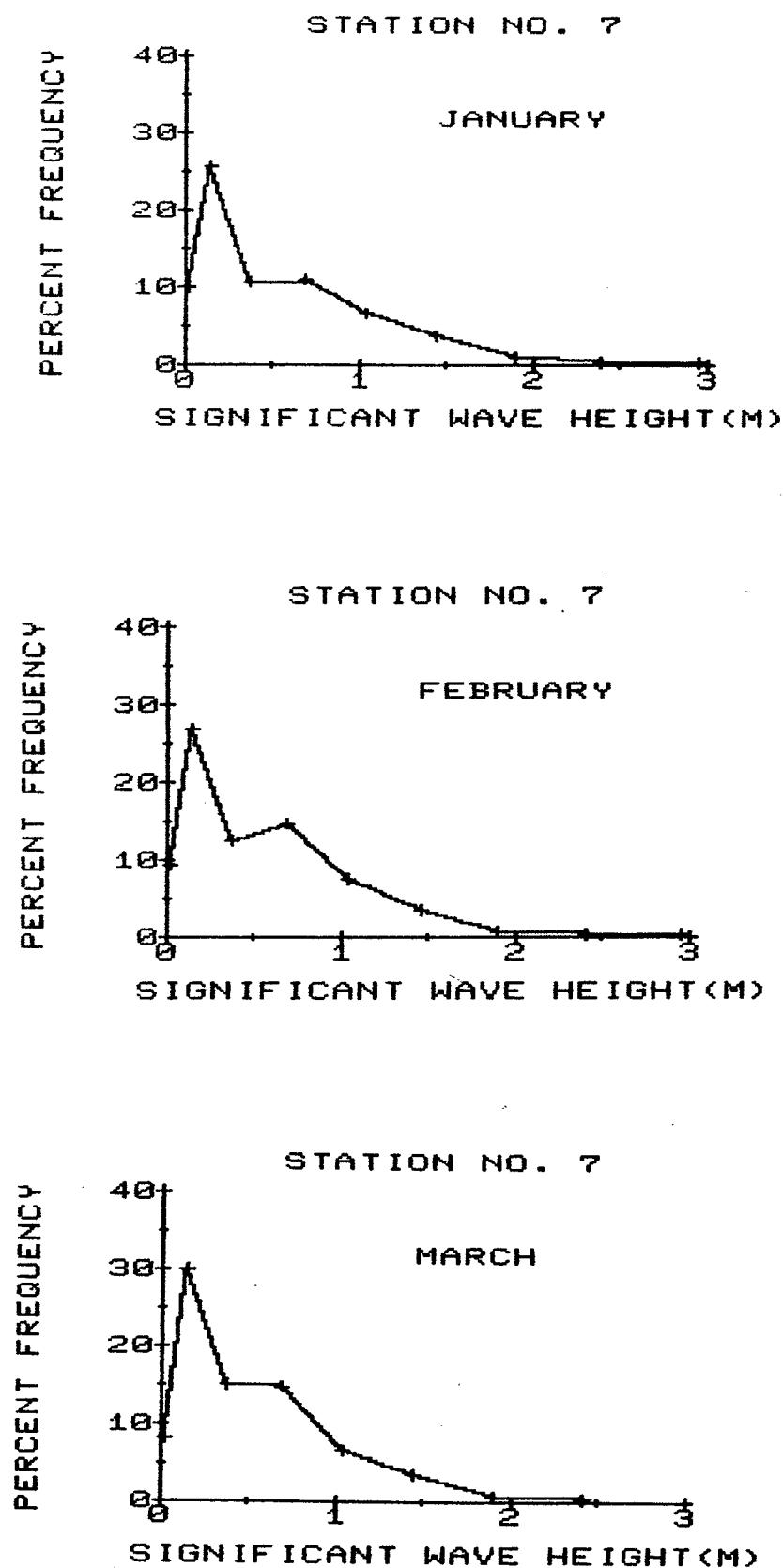


FIGURE D-16

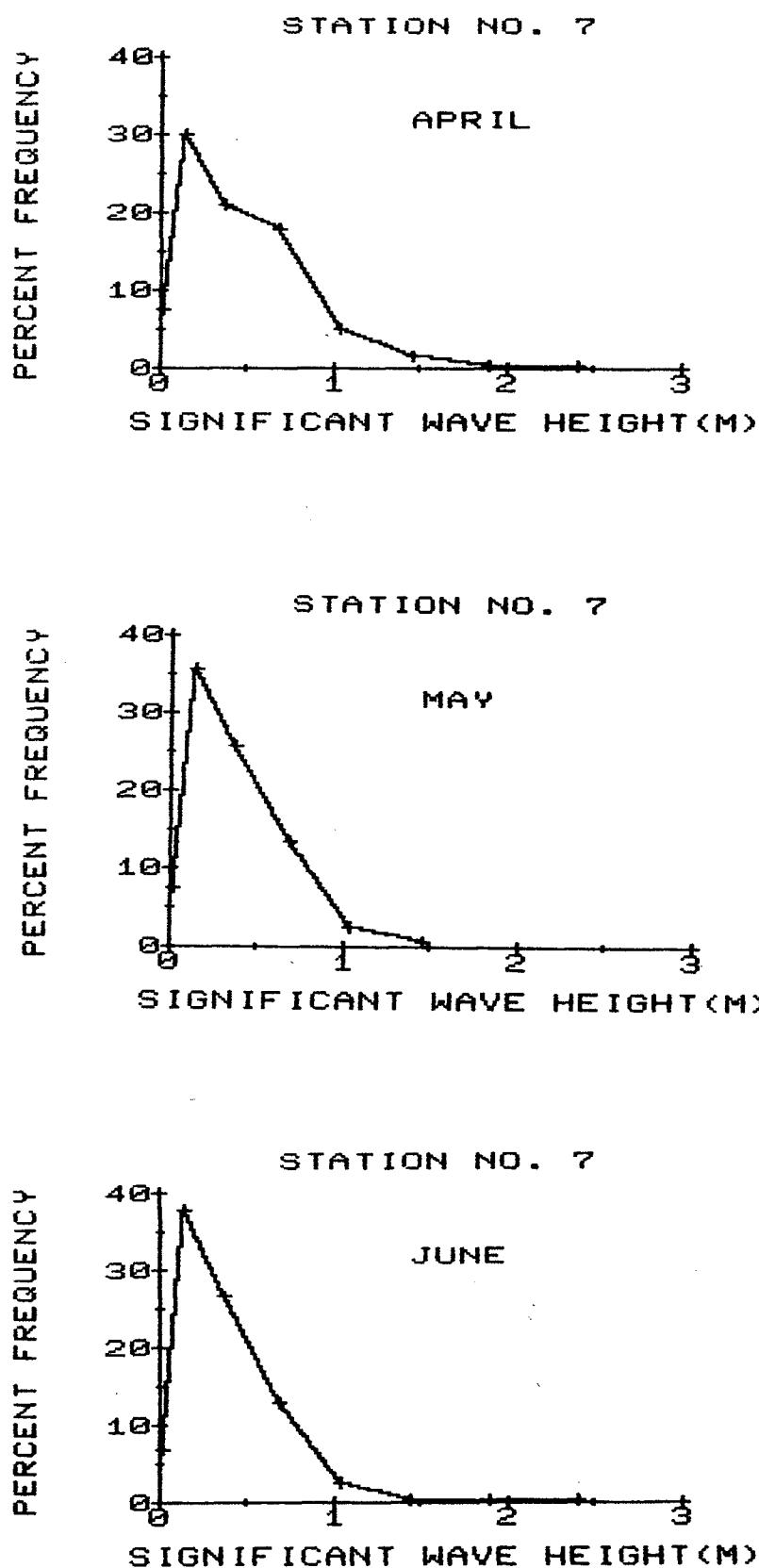


FIGURE D-17

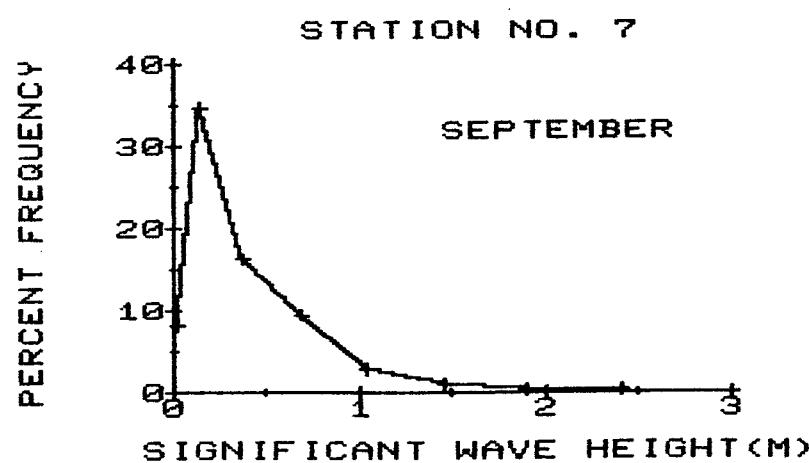
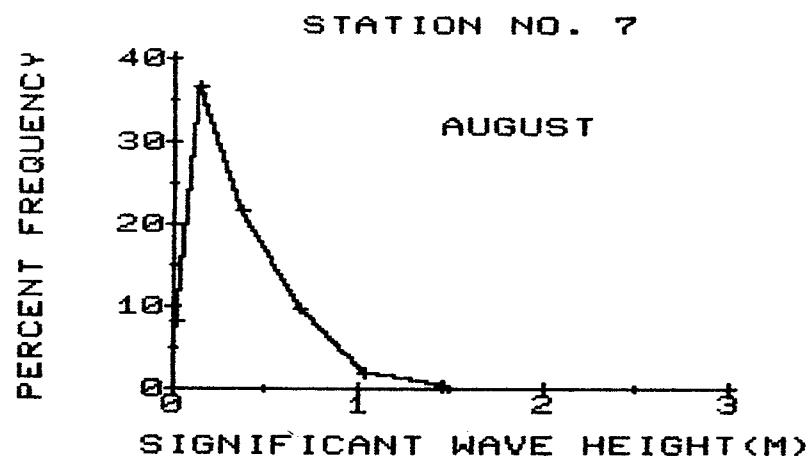
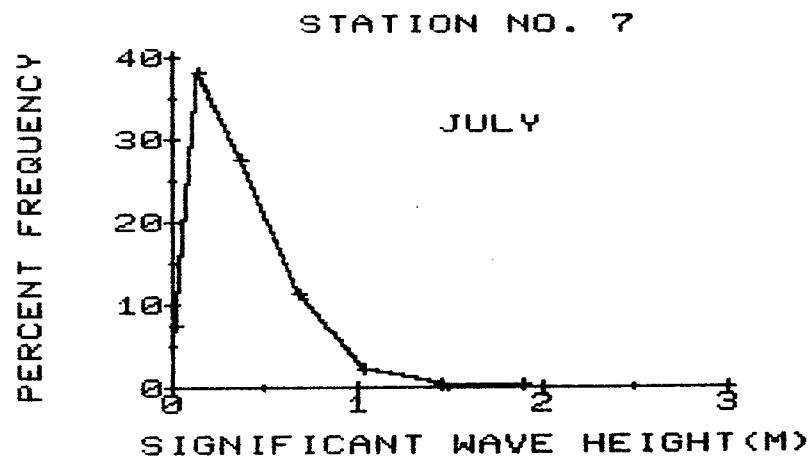


FIGURE D-18

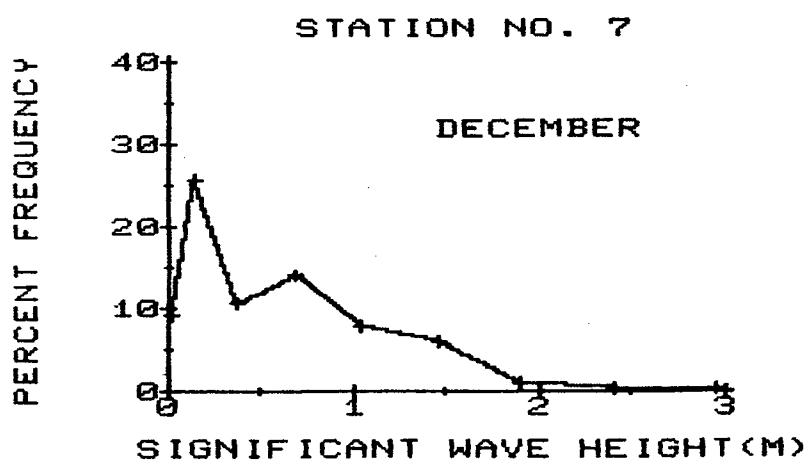
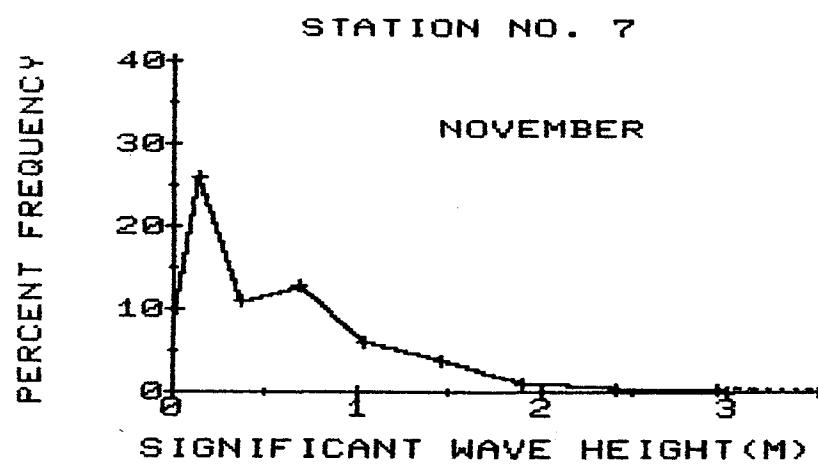
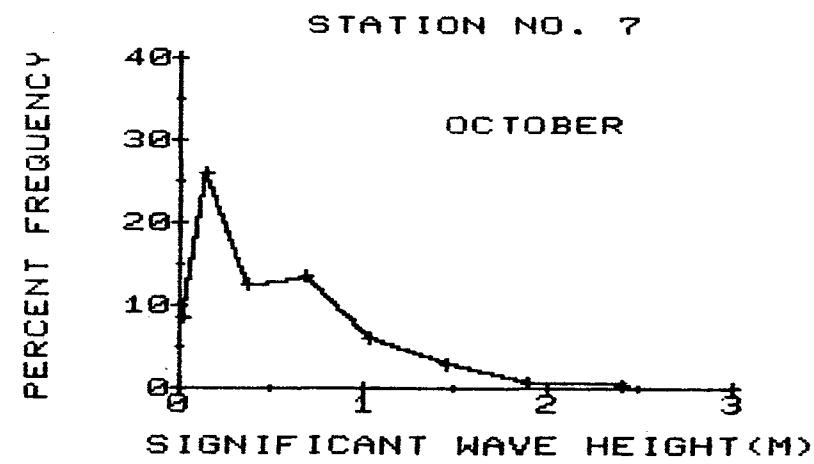


FIGURE D-19