HONG KONG OBSERVATORY

Technical Note No. 93

CLIMATOLOGY OF SHA TIN
1985-1996

by

M.C. NG & M.S. WONG

Published April 1998

Prepared by

Hong Kong Observatory
134A Nathan Road
Kowloon
Hong Kong

551.506.1:551.582(512.317)

CONTENTS

FIGURES

FIGURES (cont'd)

TABLES

摘要

本報告是沙田自動氣象站在 1985 - 1996 期間的氣候摘要。除列出標準氣候圖表外，亦將沙田的記錄與橫瀾島的風記錄及天文台的氣溫記錄作出比較。

Abstract

This note gives a climatological summary for Sha Tin Automatic Weather Station during 1985-1996. In addition to standard climatological tables and diagrams, comparisons of wind with Waglan Island and temperature with Hong Kong Observatory are also made.

1. INTRODUCTION

Automatic weather stations were set up in Hong Kong to meet increasing demands for regional meteorological data for engineering projects in areas under development and to improve weather services. There are 27 such stations in operation at present. Sha Tin Automatic Weather Station is amongst the first of these stations with a history of more than 10 years. This note is to give a climatological summary for this station.

2. HISTORY OF THE STATION

Sha Tin Automatic Weather Station has been in operation since 1 October 1984. It was originally located inside the racecourse about 1 km southwest of Sha Tin Hoi. The position of the barometer, placed inside the recording room, is 22°24'17"N, 114°12'24"E with height 8.0 m above mean sea-level. In 1985, the Instruments Compound was resited to the present exercise area about 50 m away from the original site. It is surrounded by sloping hills on three sides but is most exposed to the northeast. Figures 1 and 2 show its location while Figures 3(a) and (b) show the Instruments Compound viewed from different directions.

The high hills around the station are :

Ma On Shan	(702 m)	5 km to E
Buffalo Hill	(606 m)	4 km to SE
Tate's Cairn	(577 m)	5 km to S
Lion Rock	(495 m)	6 km to SSW
Beacon Hill	(452 m)	7 km to SW
Needle Hill	(532 m)	5 km to WSW
Tai Mo Shan	(957 m)	9 km to W
Grassy Hill	(647 m)	4 km to WNW
Kau To Shan	(399 m)	1.8 km to WNW

3. DATA

The data used in this note are hourly records measured at Sha Tin Automatic Weather Station between January 1985 and December 1996. A total of 105 192 observations was loaded into the Oracle database of the Hong Kong Observatory and analyzed using SQL (Structured Query Language). It should be noted that there are periods of incomplete data due to equipment or transmission failure. During the period July 1986 - September 1988, only preliminary quality checks have been made due to staff resource constraints.

4. INSTRUMENTS AND METHODS OF OBSERVATION

At automatic weather stations, measurements of wind, dry-bulb and wet-bulb temperatures, dew point, relative humidity, atmospheric pressure and rainfall are recorded by automatic instruments and data are transmitted to the Hong Kong Observatory at one-minute intervals via telephone circuits. The following paragraphs describe the instruments and methods of observation used in Sha Tin during the years 1985-1996.

(a) Atmospheric pressure

Atmospheric pressure was measured by a Setra Systems digital barometer, model 361B.

Height above floor	= 1.0 m
Height above mean sea-level	= 8.0 m

(b) Air temperature, dew point and relative humidity

Dry-bulb and wet-bulb temperatures were measured by a Rosemount platinum resistance thermometer system, model EL3418, with its sensing elements placed in a Stevenson screen box. Values of dew-point temperature and relative humidity were calculated from the dry-bulb and wet-bulb temperatures.

Daily maximum and minimum temperatures were extracted from 1-minute data in each day.

(c) Wind

Winds had been measured by a Mark V wind monitoring system with the cup center 16 m above mean sea-level until November 1991 when it was replaced by a Teledyne wind monitoring system with the cup center at the same height. Hourly mean wind was computed from the 1-minute data in the hour (Yeung et al 1987).

(d) Rainfall

Rainfall was recorded with a Casella tilting bucket rain-gauge with a step size of 0.5 mm.

5. ANALYSIS

(a) Monthly and annual wind roses

The total number of occurrences of concurrent wind speed and direction is computed for each month. Wind directions are grouped into ranges of 30° and wind speeds in m/s into categories as follows : 0.3-3.3, 3.4-7.9, 8.0-13.8 and >13.8. The percentage frequencies are plotted in the form of wind roses in Figures 4-6.

Since the station is most exposed to the northeast, the occurrence of northeasterlies is relatively frequent. From Table 1, we see that northeasterlies prevail from October to January. The annual prevailing direction, like Hong Kong Observatory, Waglan Island and Cheung Chau, is also easterly (Lui 1991, Ng 1997).

(b) Diurnal variation of wind

Hourly vector mean winds are computed for each month. These are shown in Table 2 and plotted in Figures 7-8. It can be noted that from September to May, winds begin to veer around noon until late afternoon when they start to back again. No regular change in direction is observed in June and July. An interesting situation occurs in August when there is a significant degree of backing in the early morning, followed by a rapid veering to the original direction around noon. Maximum wind speeds occur around noon from September to February. No noticeable maximum is observed in March and April. From May to August, maximum speeds shift to around late afternoon.

(c) Climatological summary

Monthly values of meteorological elements are summarized in Table 1. Readers are reminded that data are subject to loss because of equipment or transmission failure. The effect on rainfall is significant due to missing records during major rainstorms (particularly in May 1989 and August 1995). The mean monthly and annual rainfall totals for Sha Tin Treatment Works and Chinese University of Hong Kong are also shown for reference (Ng and Wong, 1996).

(d) Tables of hourly means of meteorological elements

Hourly means in each month for the following elements are shown in Tables 3-7.

(i) mean sea-level pressure
(ii) air temperature
(iii) wet-bulb temperature
(iv) dew point
(v) relative humidity

(e) Graphs showing the diurnal variation of meteorological elements

Monthly graphs for the elements in (d) above are plotted in Figures 9-13 to show the diurnal variations.

(f) Gust factor

Gust factor is defined as the ratio of hourly instantaneous maximum gust to hourly mean wind. Using the regression equation of gust(G) on hourly mean wind(M), gust factor(GF) can be obtained. If the regression equation is written as

$$G = a\,M + b$$

then $$GF = a + b/M$$

Regression equations for winds in different quadrants and their corresponding gust factors are shown below :

$G = 1.69\,M + 2.11$,	$r=0.82$	(direction between 050° and 130° , east)
$G = 1.61\,M + 1.89$,	$r=0.87$	(direction between 140° and 220° , south)
$G = 1.28\,M + 1.87$,	$r=0.88$	(direction between 230° and 310° , west)
$G = 1.76\,M + 1.76$,	$r=0.86$	(direction between 320° and 040° , north)

where r is the correlation coefficient.

Hourly mean wind (m/s)	Gust factor			
	East	South	West	North
5	2.11	1.99	1.66	2.11
10	1.90	1.80	1.47	1.94
15	1.83	1.73	1.41	1.88
20	1.79	1.70	1.38	1.85
25	1.77	1.68	1.36	1.83

(g) Extreme values of temperature, rainfall and gust

The top 20 extreme values of maximum and minimum temperatures, maximum gust and maximum hourly, daily and monthly rainfall are listed in Table 8. The extreme values recorded at the Hong Kong Observatory during the same period are also given on the last line for comparison.

For the occurrence of extreme maximum temperatures, the top one was due to a low pressure area on the southeast of Taiwan and 14 others were due to the subsidence ahead of tropical cyclones. The rest were due to ridges, southwest monsoon, a low pressure area near Hainan and a tropical depression in the South China coastal area. Extreme minimum temperatures were due to cold surges in winter times.

The heaviest rainfall at Sha Tin, as characteristic of Hong Kong, was brought by tropical cyclones and monsoon troughs.

The occurrence of maximum gusts, except the case on 19 April 1995 (Rank 14) when a very active trough traversed the South China coastal area, were recorded during the passage of tropical cyclones. They were Tess, Fred, Koryn, Becky, Sibyl and Sally in September 1985, August 1991, June 1993, September 1993, October 1995 and September 1996 respectively. It should be remarked that no tropical cyclones hit the territory directly during 1985-1996.

(h) Comparison of wind with Waglan Island

Difference in wind direction between Sha Tin and Waglan Island, grouped by four quadrants (as in (f) above), are measured by the angle veering or backing from the prevailing direction of Waglan Island. These differences are shown in Figure 14. All four histograms have a bell-shaped distribution, showing good correlation. The wind direction at Sha Tin is most often within 30° of that at Waglan Island, backing with respect to Waglan Island in the case of westerlies but veering in other quadrants.

Regression equations of hourly wind speeds at Sha Tin against those at Waglan Island in different quadrants with the speed at Waglan Island exceeding 5 m/s are shown below:

East	:	$V_{SHA} = 0.16\ V_{WGL} + 0.61$	($r = 0.42$)
South	:	$V_{SHA} = 0.27\ V_{WGL} + 0.82$	($r = 0.38$)
West	:	$V_{SHA} = 0.27\ V_{WGL} + 1.17$	($r = 0.37$)
North	:	$V_{SHA} = 0.28\ V_{WGL} + 0.20$	($r = 0.62$)

Scatter diagrams with associated regression lines are shown in Figures 15-18. It can be seen that the scatters are large and the linear relationships can only be regarded as fair, as reflected by the small values of correlation coefficients.

Since Sha Tin is much sheltered, its wind speed is only 20% of that at Waglan Island with easterlies and 30% from other wind directions.

(i) Comparison of temperature with Hong Kong Observatory

Regression equations of daily maximum, minimum and mean temperatures at Sha Tin against those at the Observatory are shown below:

daily maximum temperature	: $T_{SHA} = 1.02\ T_{HKO} - 0.05$	($r = 0.99$)
daily minimum temperature	: $T_{SHA} = 1.07\ T_{HKO} - 2.58$	($r = 0.98$)
daily mean temperature	: $T_{SHA} = 1.04\ T_{HKO} - 1.43$	($r = 0.99$)

Excellent linear relationships can be seen in the scatter diagrams with associated regression lines shown in Figures 19-21.

The daily maximum temperature is about 0.5 °C higher than that of the Observatory in summer while the daily minimum temperature is about 2 °C lower in winter.

REFERENCES

1.	Chen, T.Y.	1975	Comparison of Surface Winds in Hong Kong, Hong Kong Observatory Technical Note No. 41
2.	Lui, W.H.	1991	Preliminary Analysis of Wind Data Recorded by Automatic Weather Stations in Hong Kong, Hong Kong Observatory Technical Note (Local) No. 59
3.	Ng, M.C.	1997	Climatology of Cheung Chau 1971-1991, Hong Kong Observatory Technical Note No. 89
4.	Ng, M.C.	1997	Climatology of Waglan Island 1968-1988, Hong Kong Observatory Technical Note No. 91
5.	Ng, M.C. and K.P. Wong	1996	30-Year Mean Rainfall in Hong Kong 1961-1990, Hong Kong Observatory Technical Note No. 88
6.	Yeung, K.H., K.K. Ng and L.K. Yau	1987	A Solar-powered Automatic Weather Station, Hong Kong Observatory Technical Note No. 75

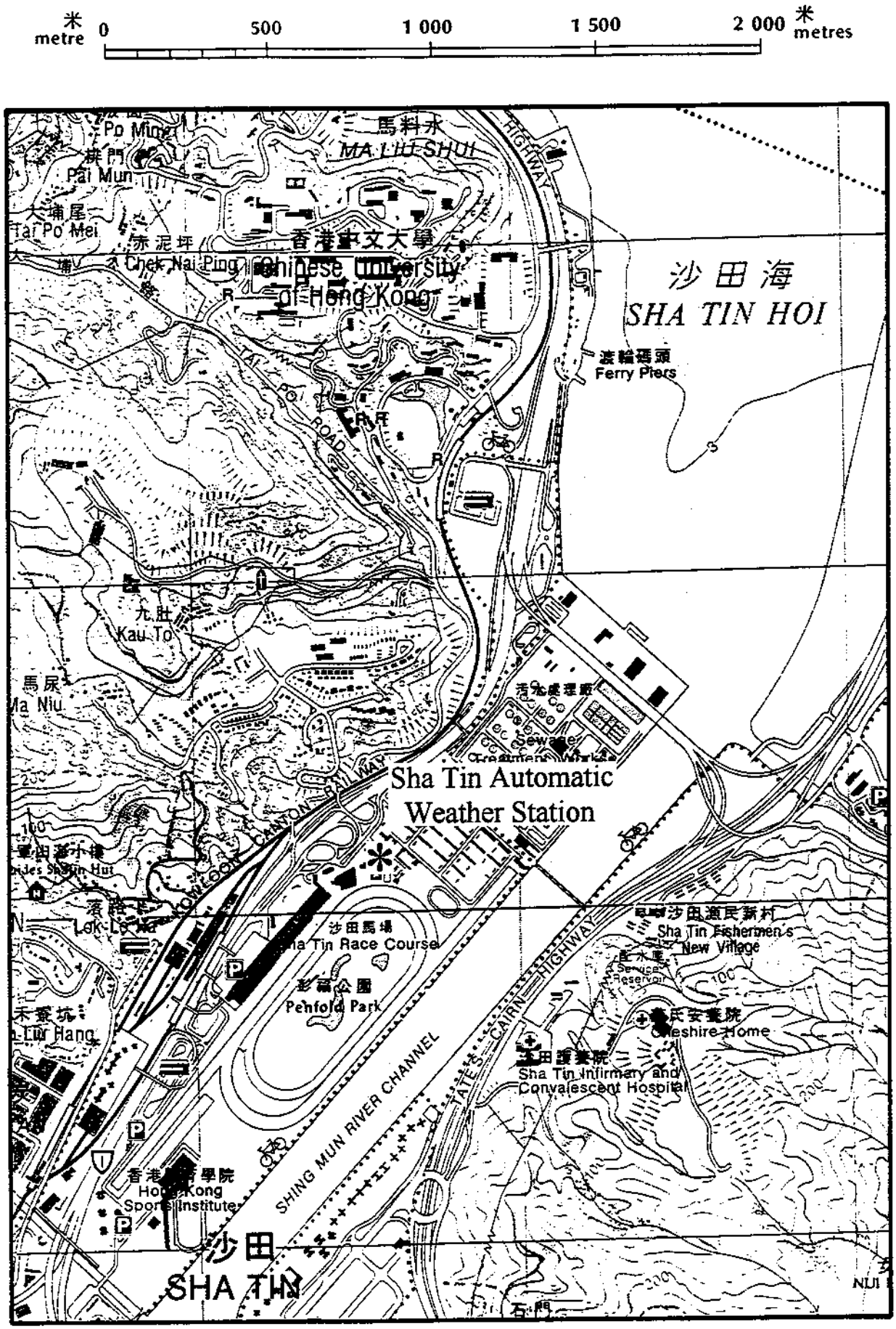
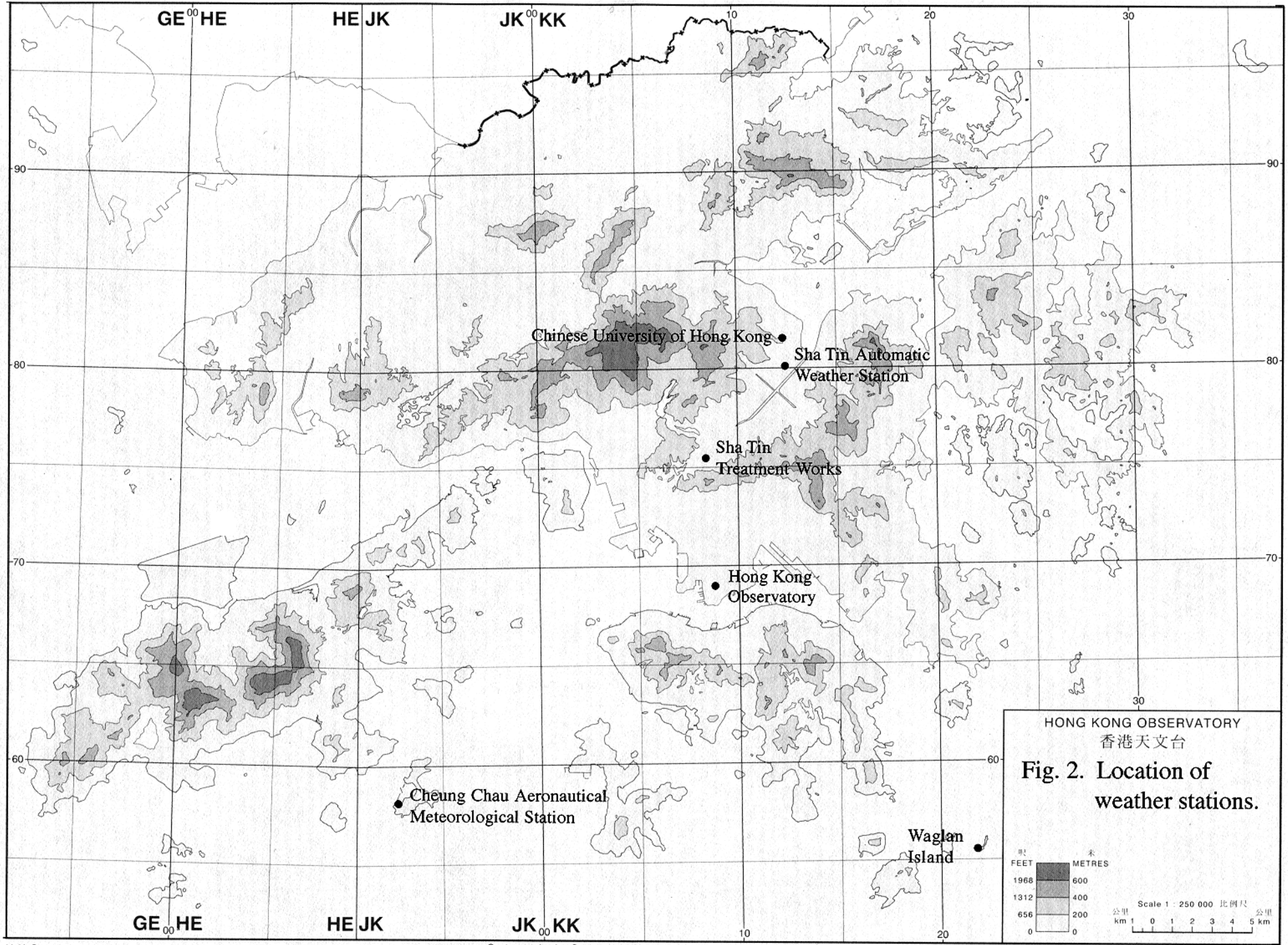


Fig. 1. Location of Sha Tin Automatic Weather Station



H.K.O.128 (97)
Cartography by Survey and Mapping Office, Lands Department.
地政總署測繪處繪製

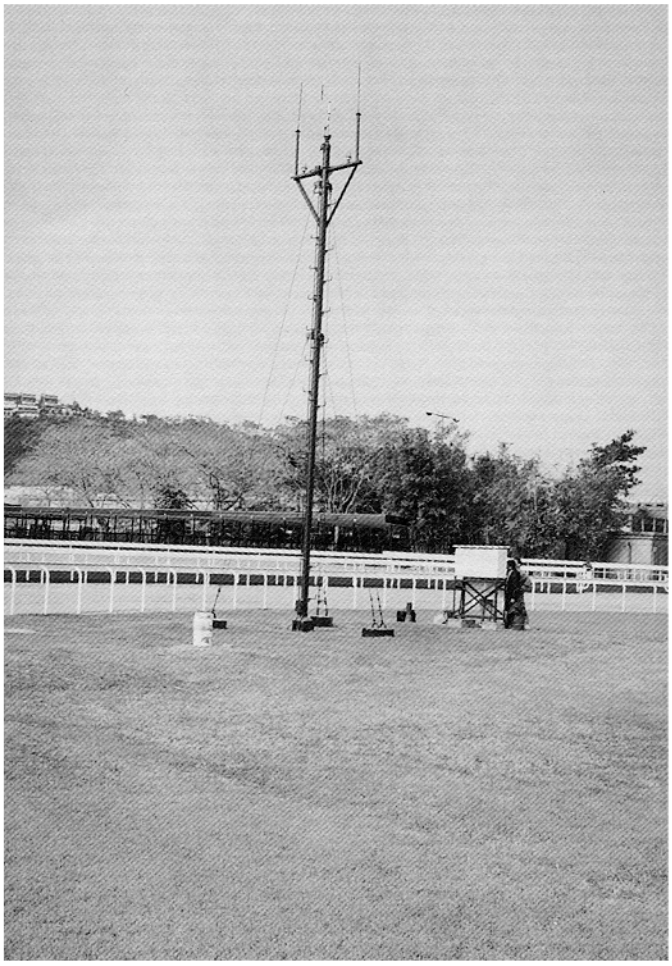


Fig. 3(a). Instruments Compound of Sha Tin looking towards the North.

Fig. 3(b). Instruments Compound of Sha Tin looking towards the South.

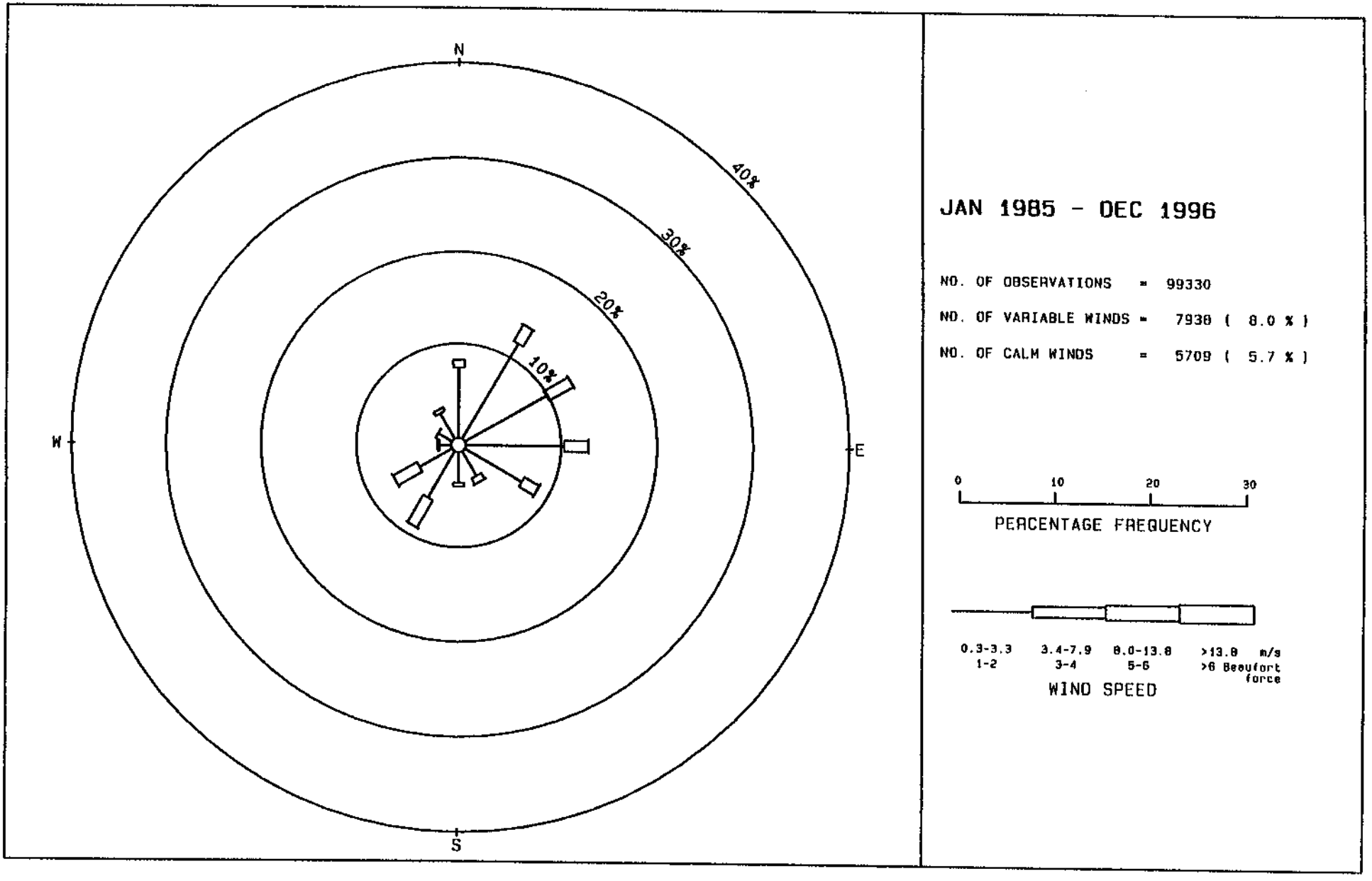


Fig.4. Annual wind rose for Sha Tin, 1985-1996.

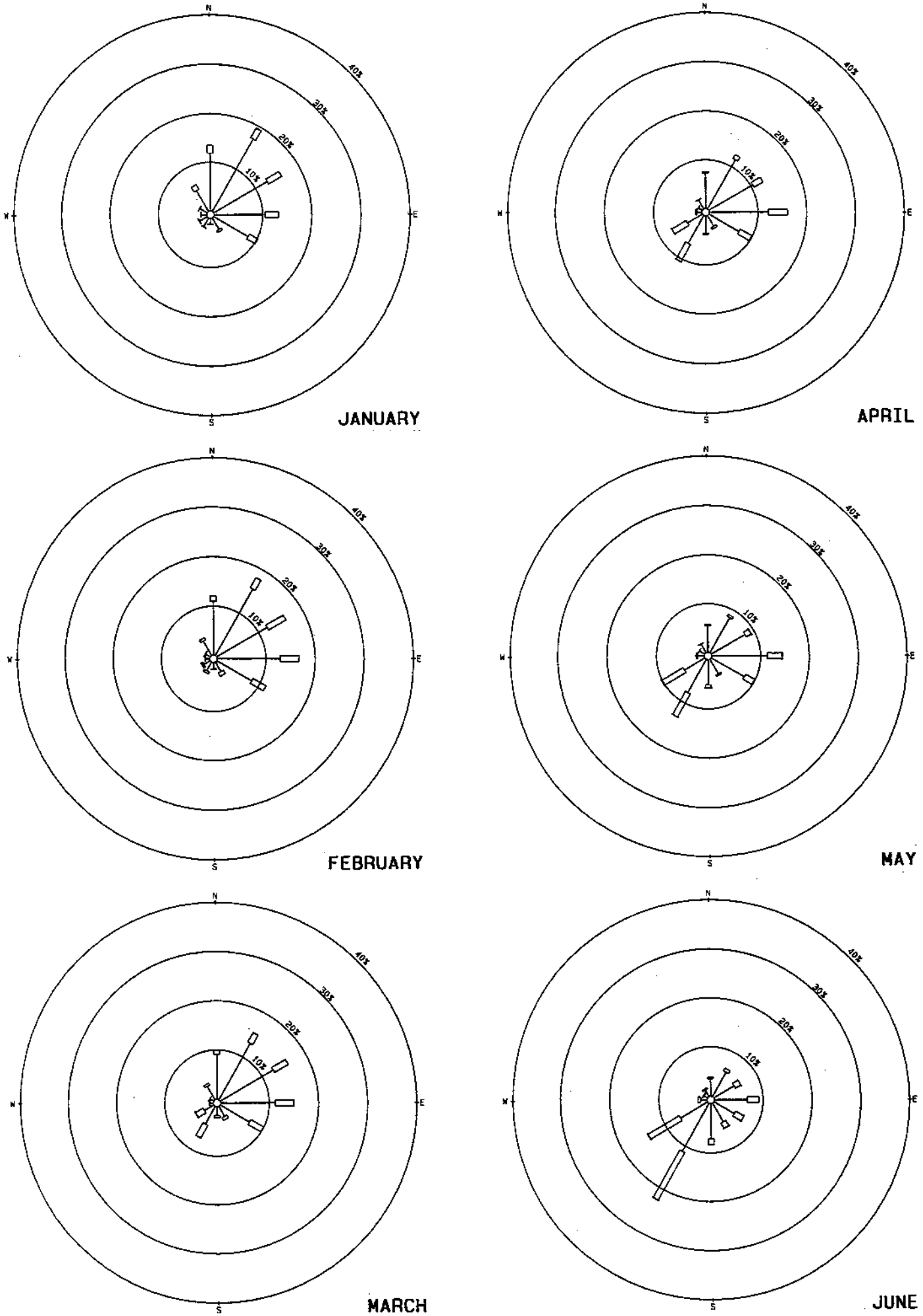
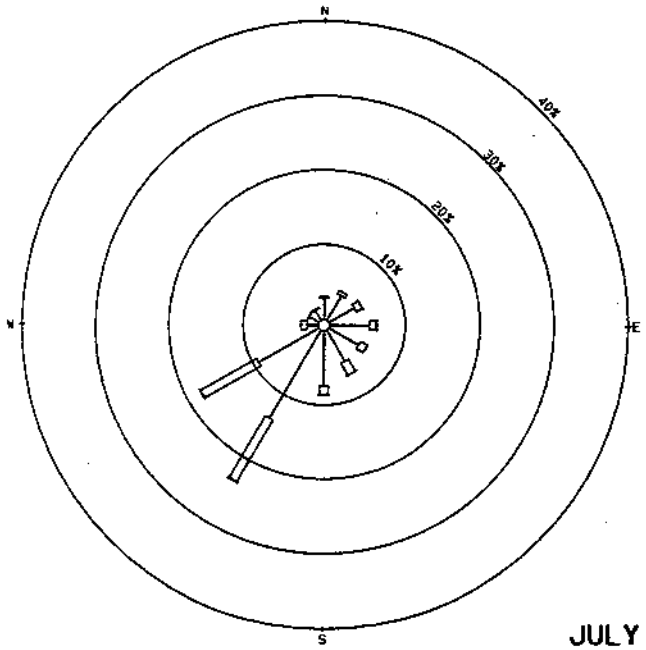
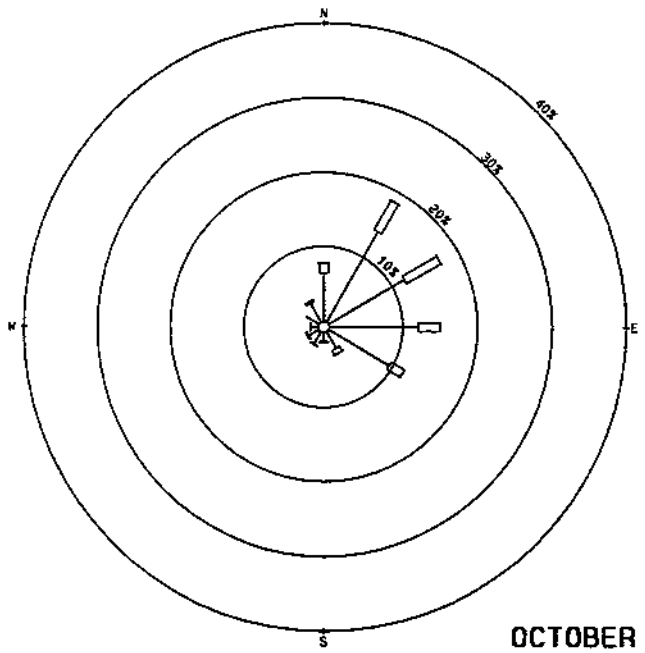
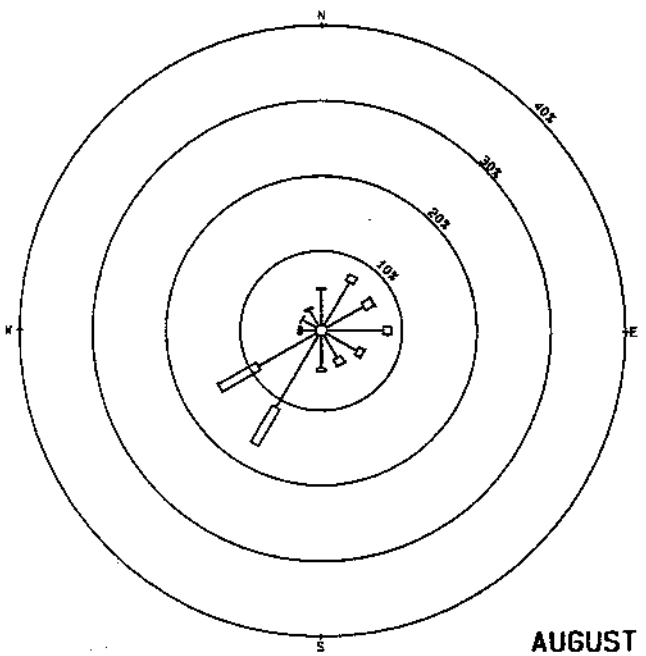
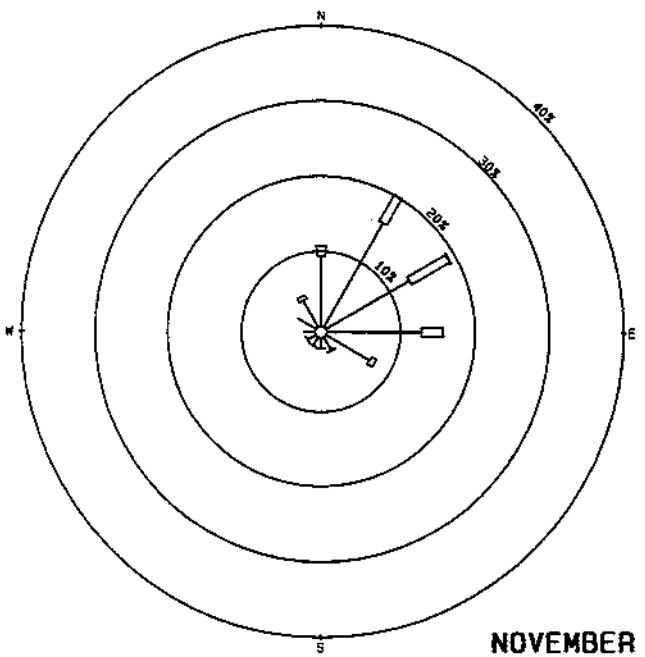


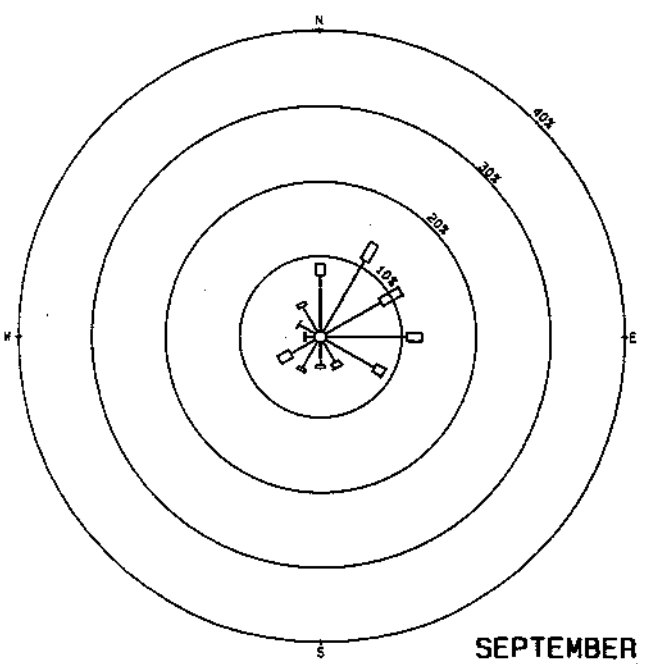
Fig. 5. Monthly wind roses from January to June for Sha Tin, 1985-1996.











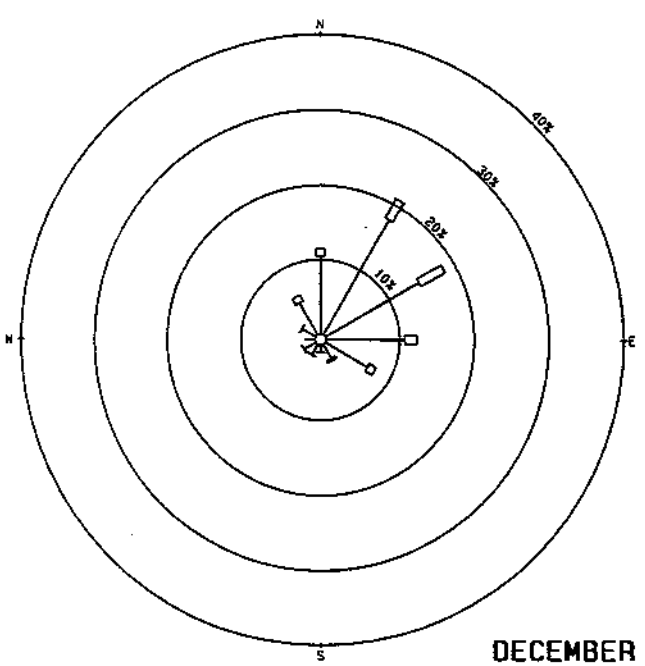


Fig. 6. Monthly wind roses from July to December for Sha Tin, 1985-1996.

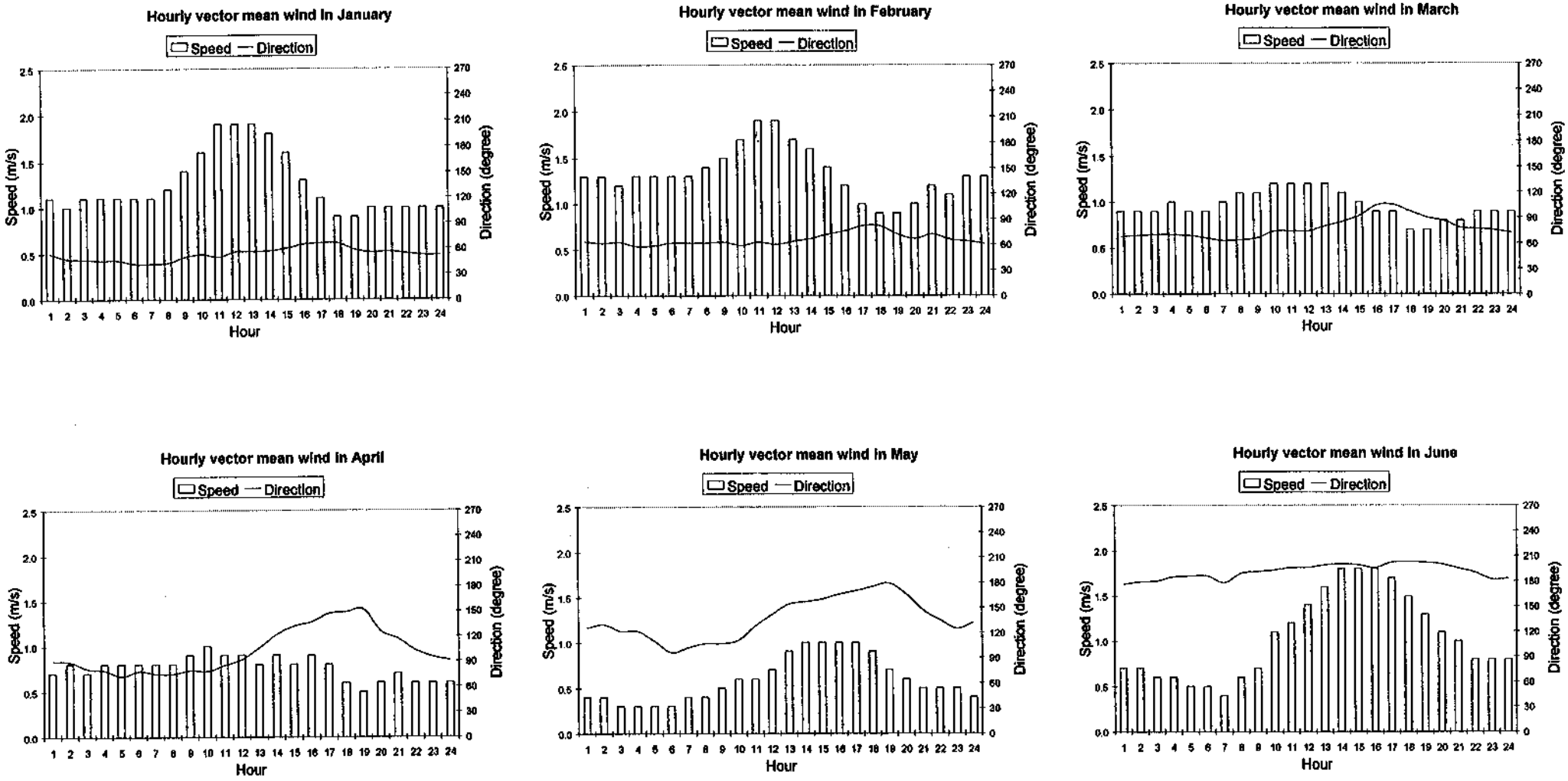


Fig. 7. Hourly vector mean wind from January to June at Sha Tin, 1985-1996.

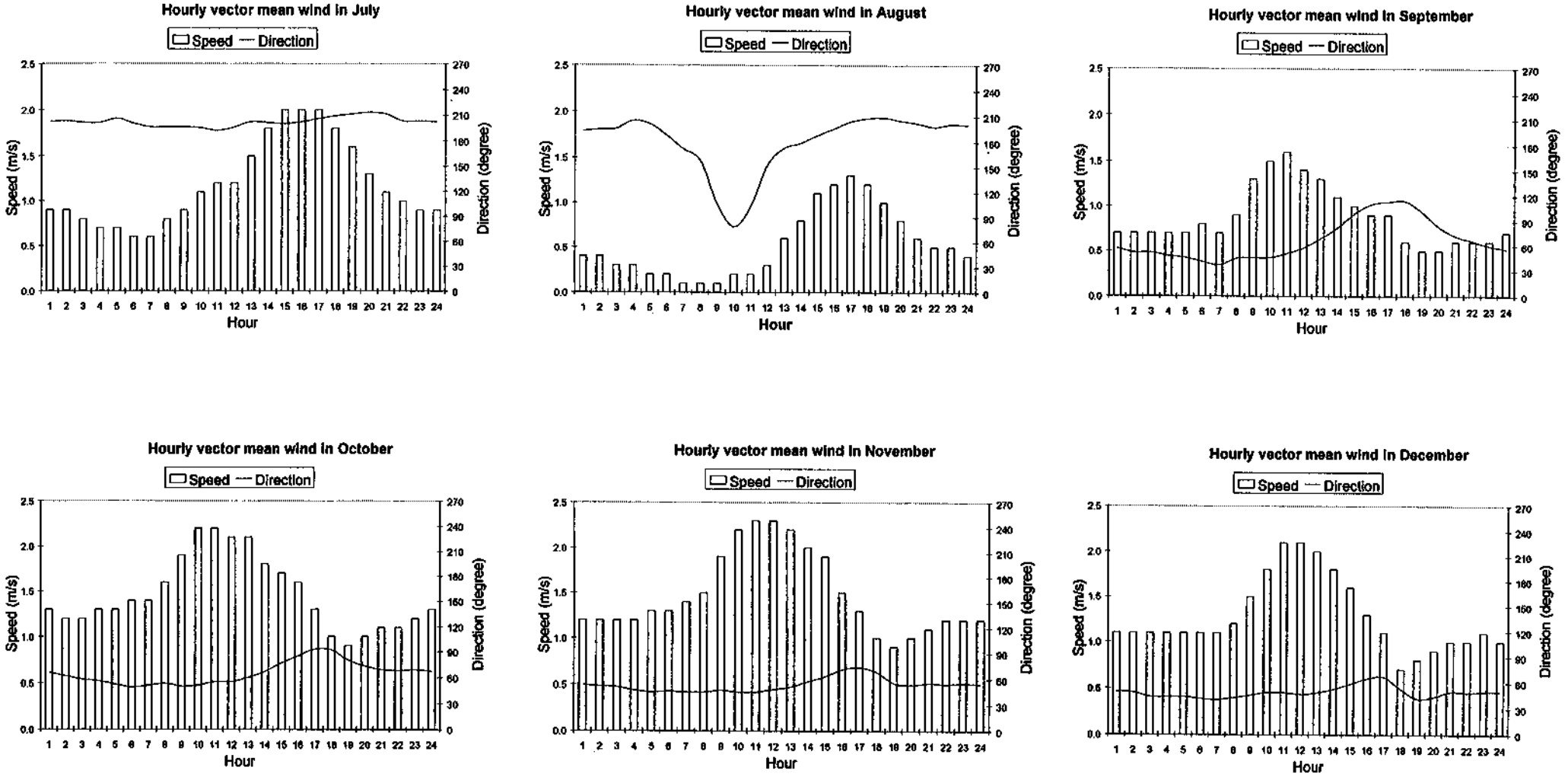


Fig. 8. Hourly vector mean wind from July to December at Sha Tin, 1985-1996.

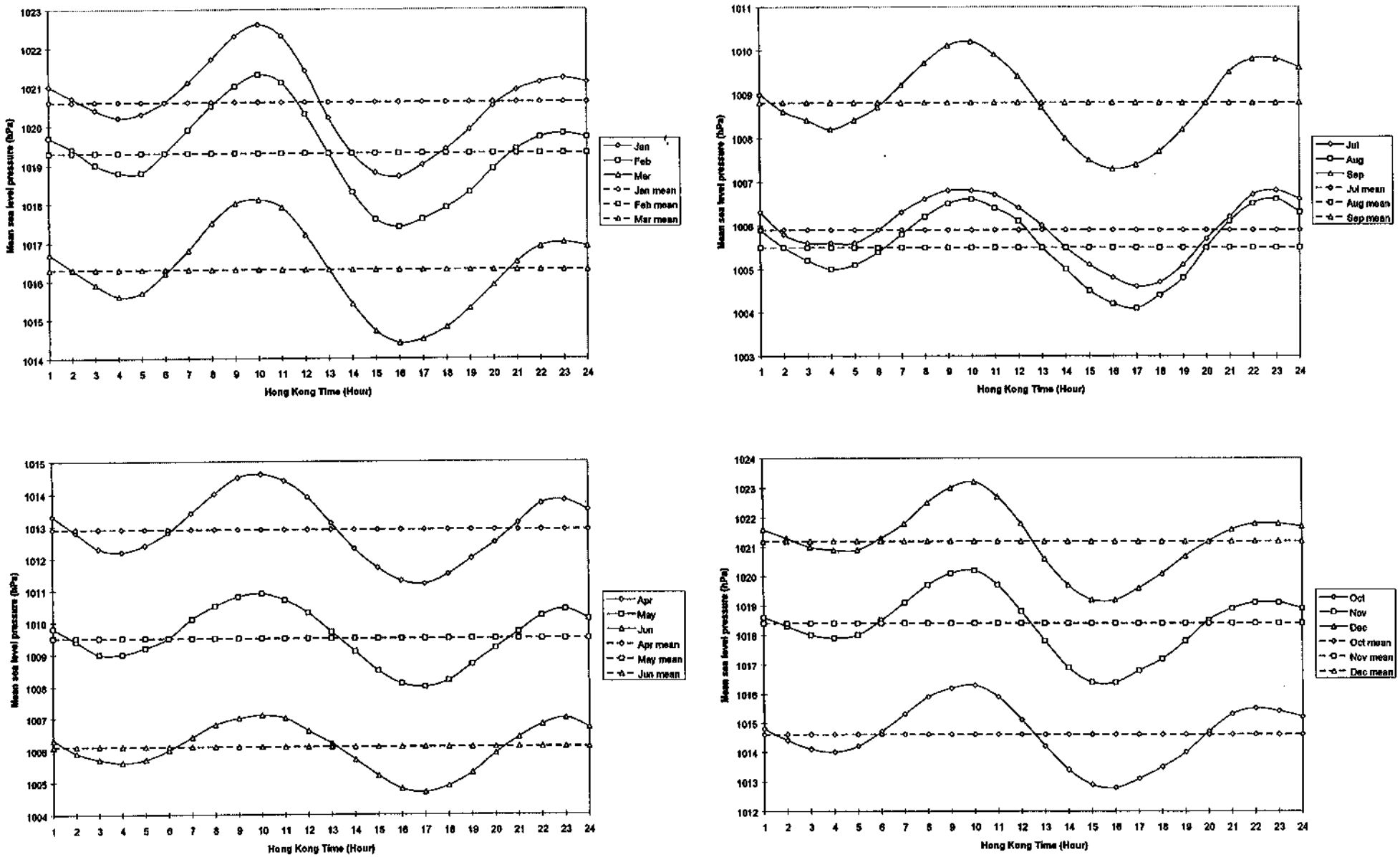


Fig. 9. Diurnal variation of mean sea-level pressure at Sha Tin, 1985-1996.

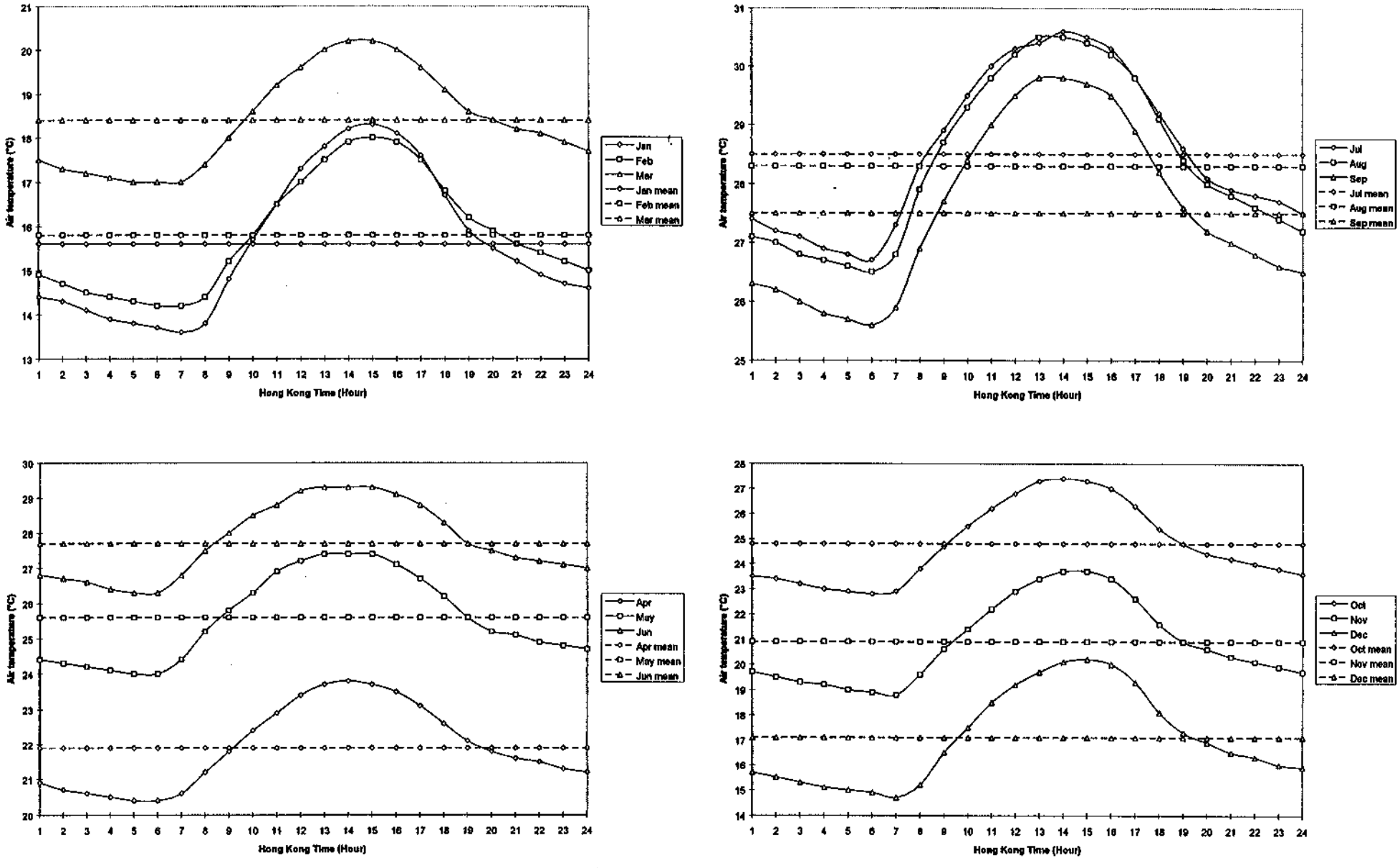


Fig. 10. Diurnal variation of air temperature at Sha Tin, 1985-1996.

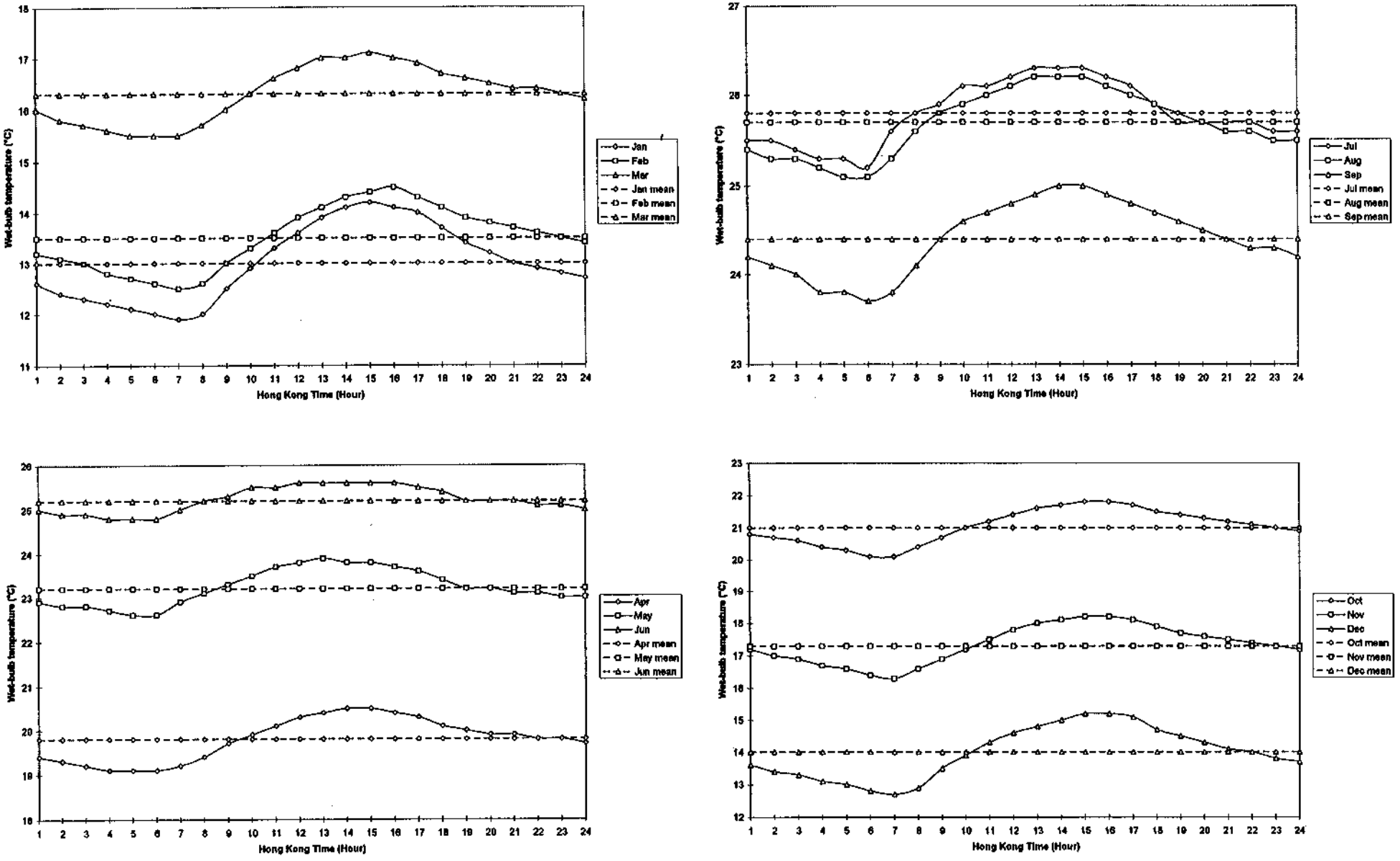


Fig. 11. Diurnal variation of wet-bulb temperature at Sha Tin, 1985-1996.

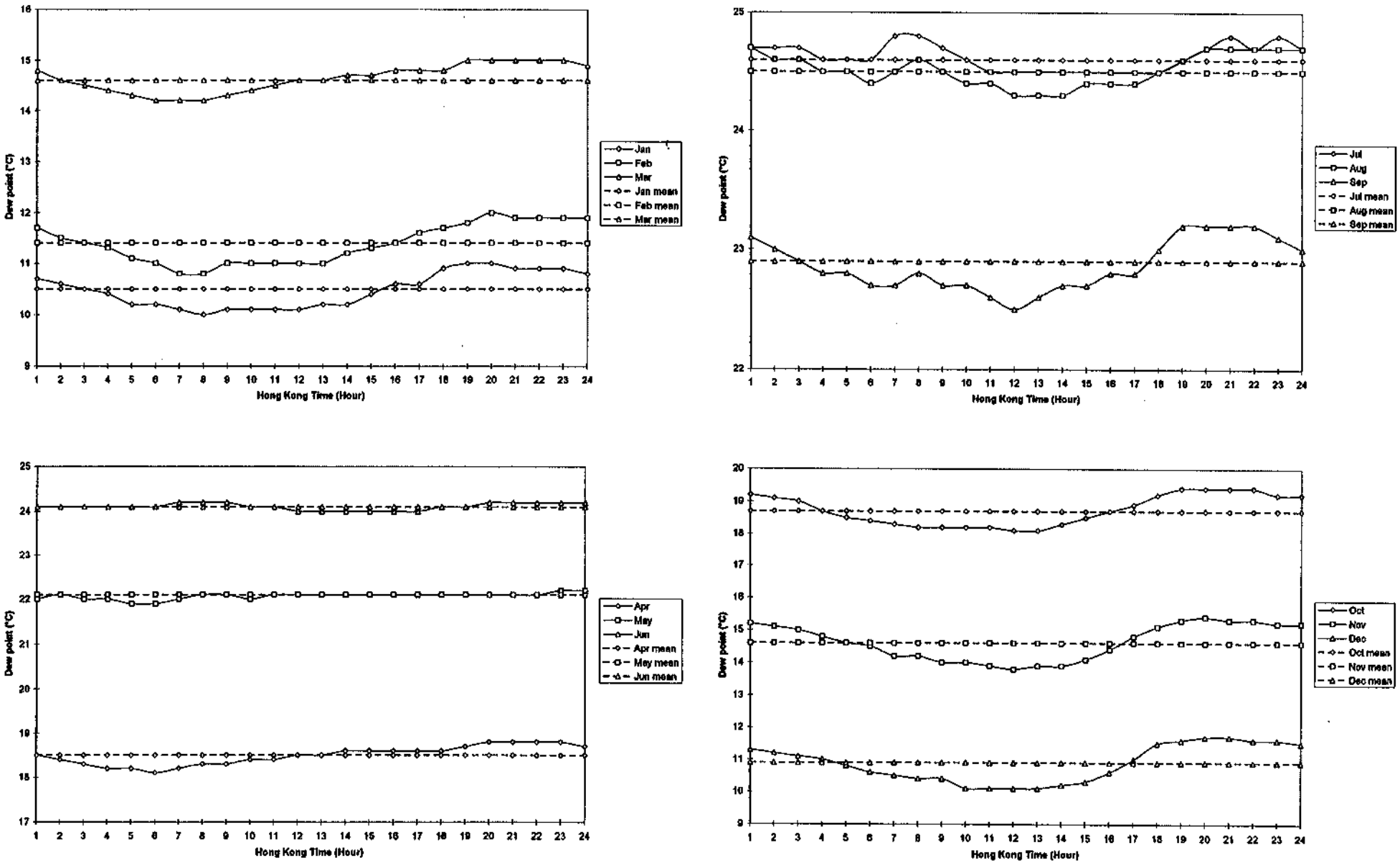


Fig. 12. Diurnal variation of dew point at Sha Tin, 1985-1996.

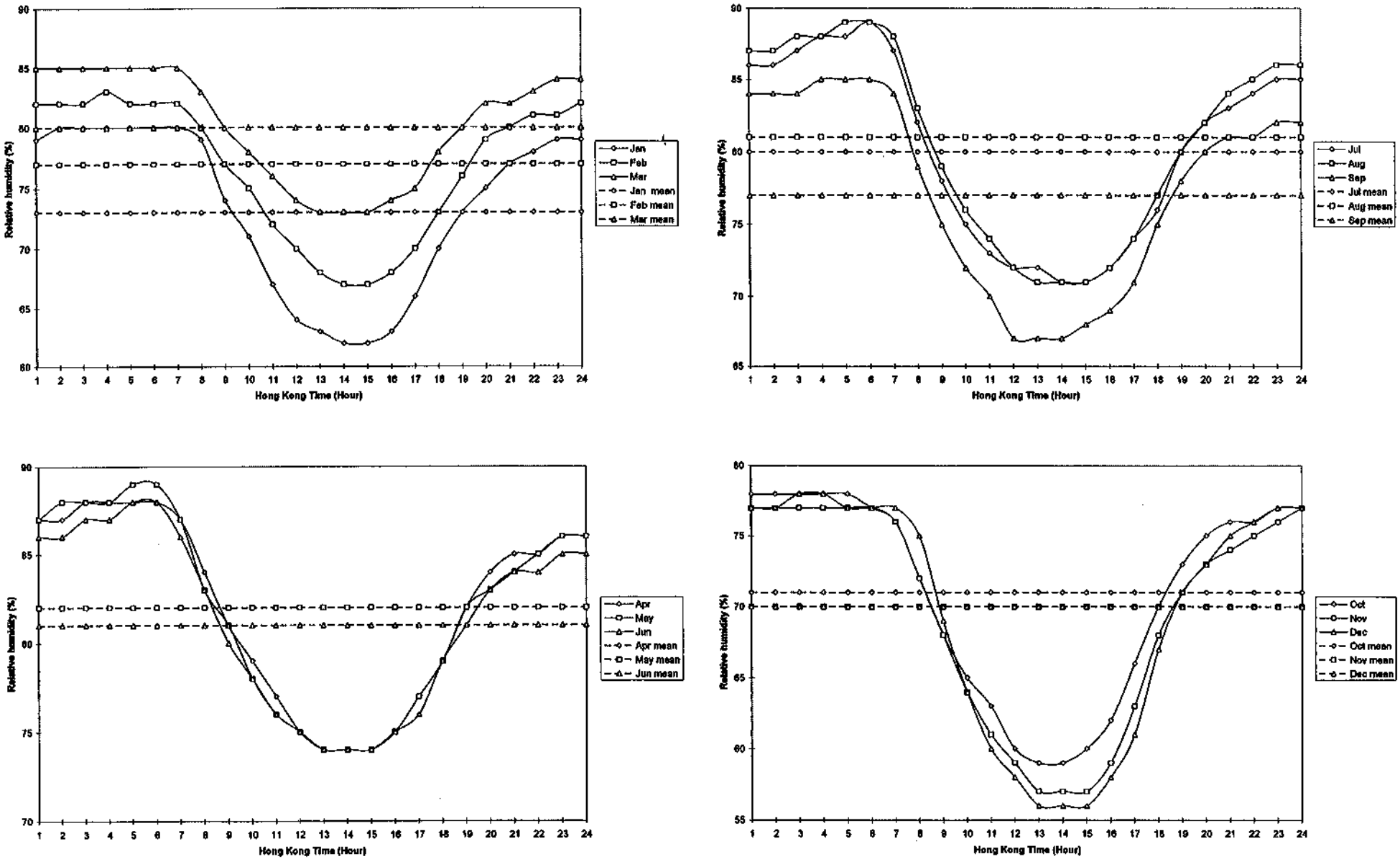


Fig. 13. Diurnal variation of relative humidity at Sha Tin, 1985-1996.

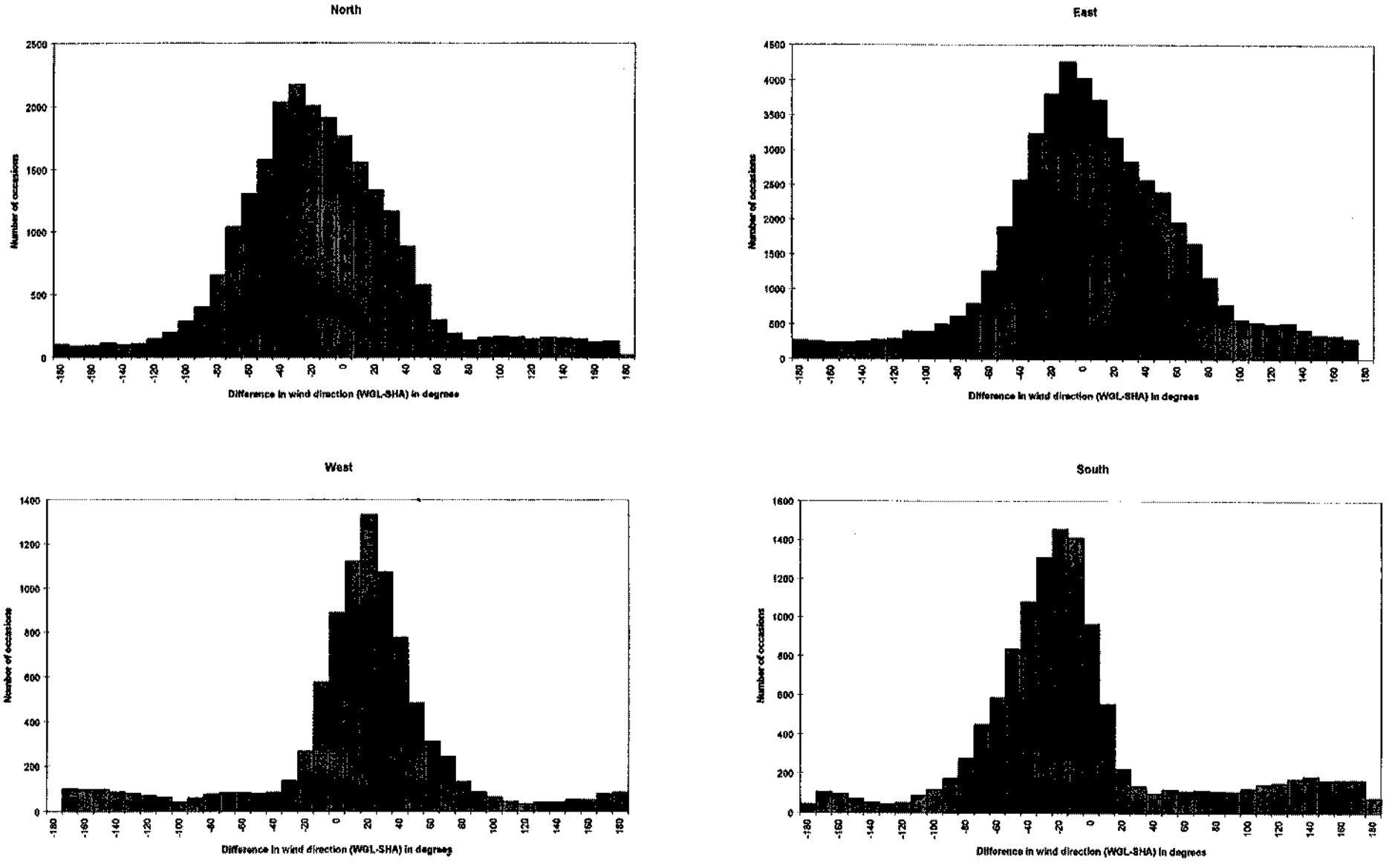


Fig. 14 Frequency distribution of the difference in hourly mean wind directions between Waglan Island (WGL) and Sha Tin (SHA), grouped according to the wind direction at Waglan Island (WGL-SHA)

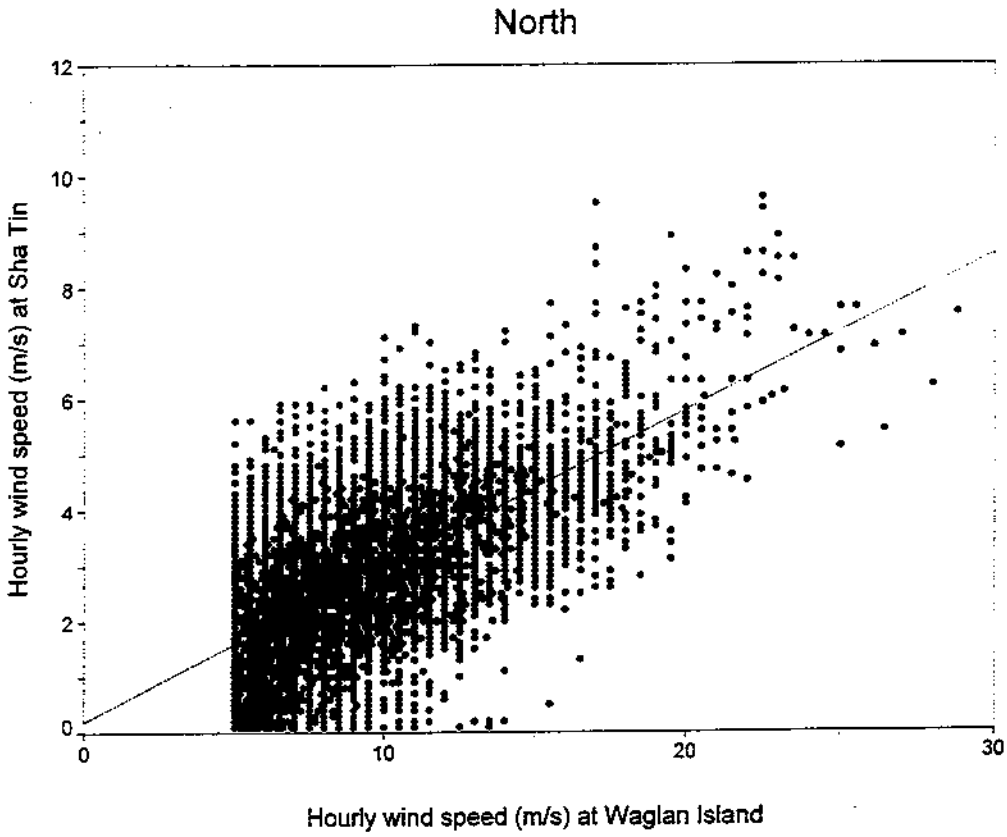


Fig. 15. Comparison of hourly wind speeds between Sha Tin and Waglan Island, with northerlies at Waglan.

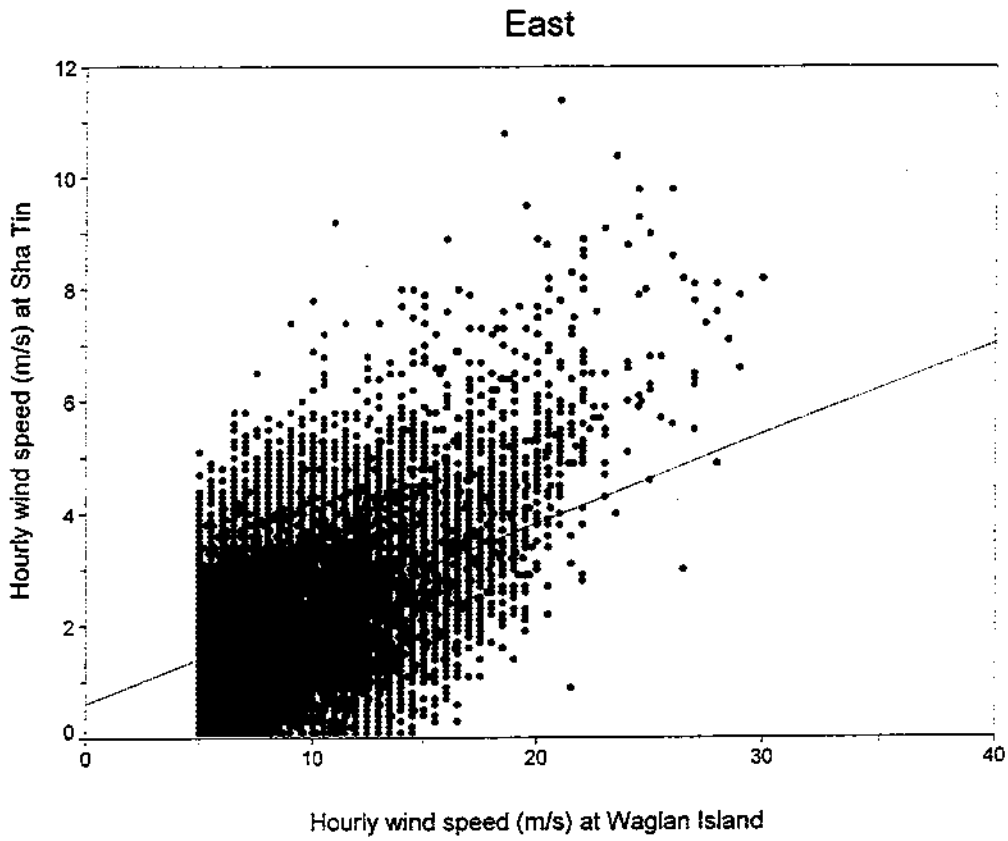


Fig. 16. Comparison of hourly wind speeds between Sha Tin and Waglan Island, with easterlies at Waglan.

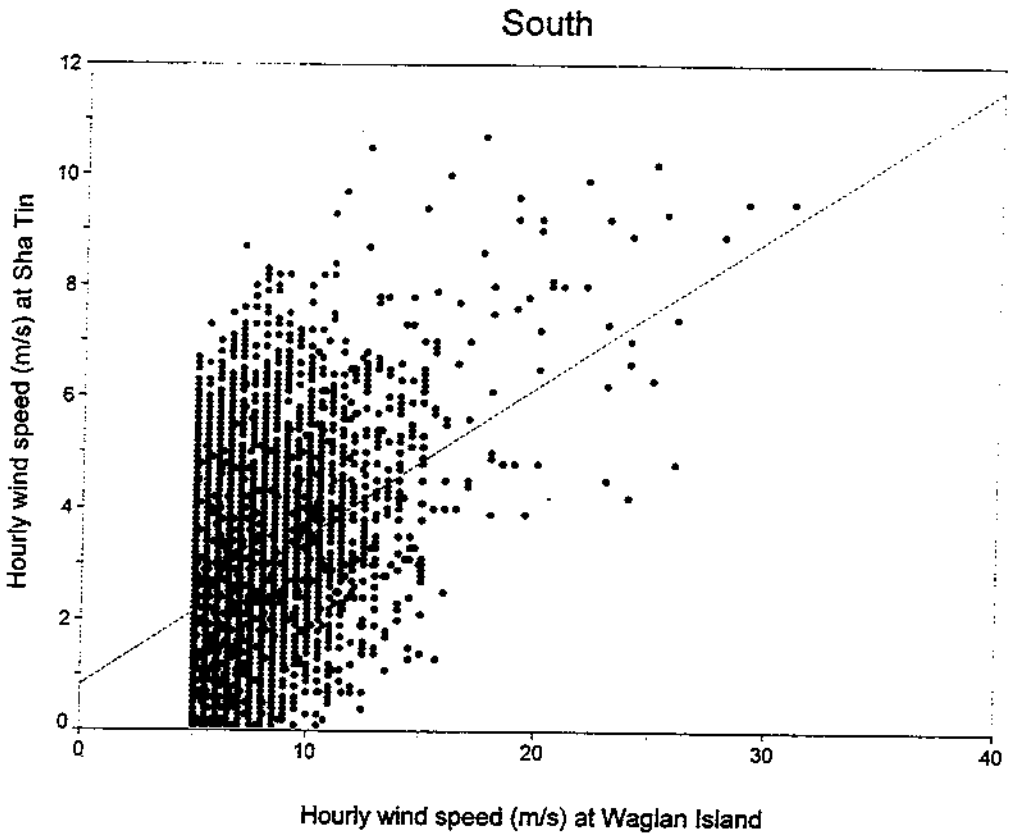


Fig. 17. Comparison of hourly wind speeds between Sha Tin and Waglan Island, with southerlies at Waglan.

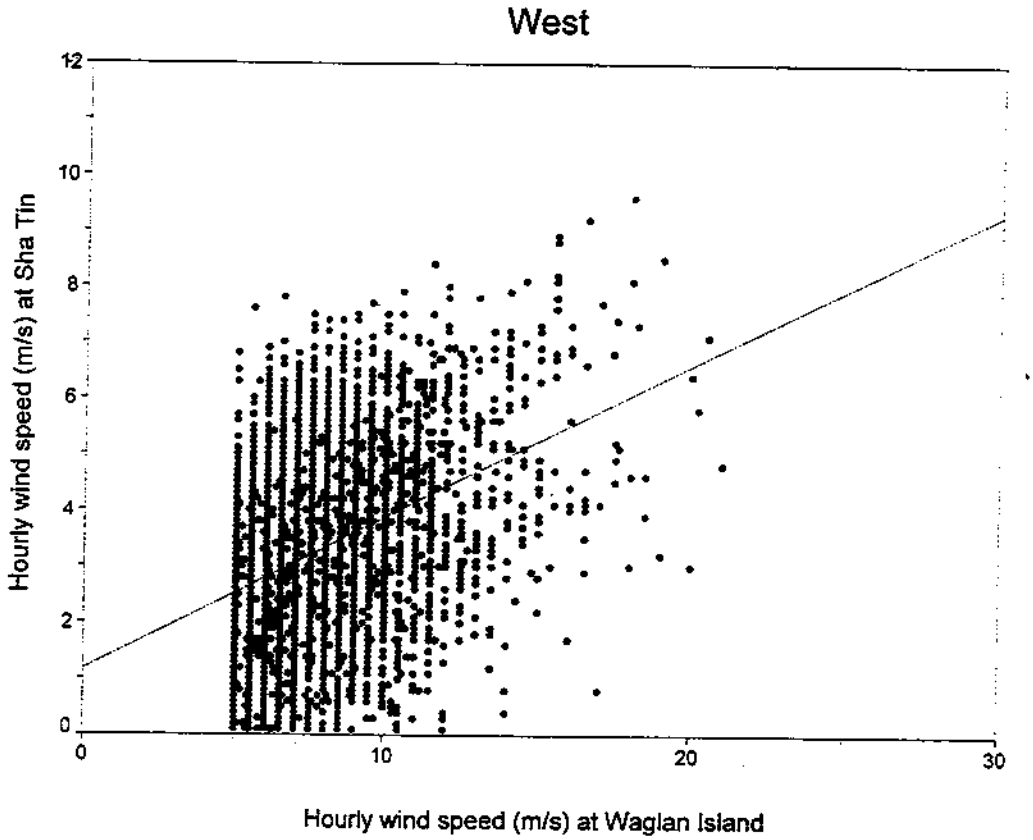


Fig. 18. Comparison of hourly wind speeds between Sha Tin and Waglan Island, with westerlies at Waglan .

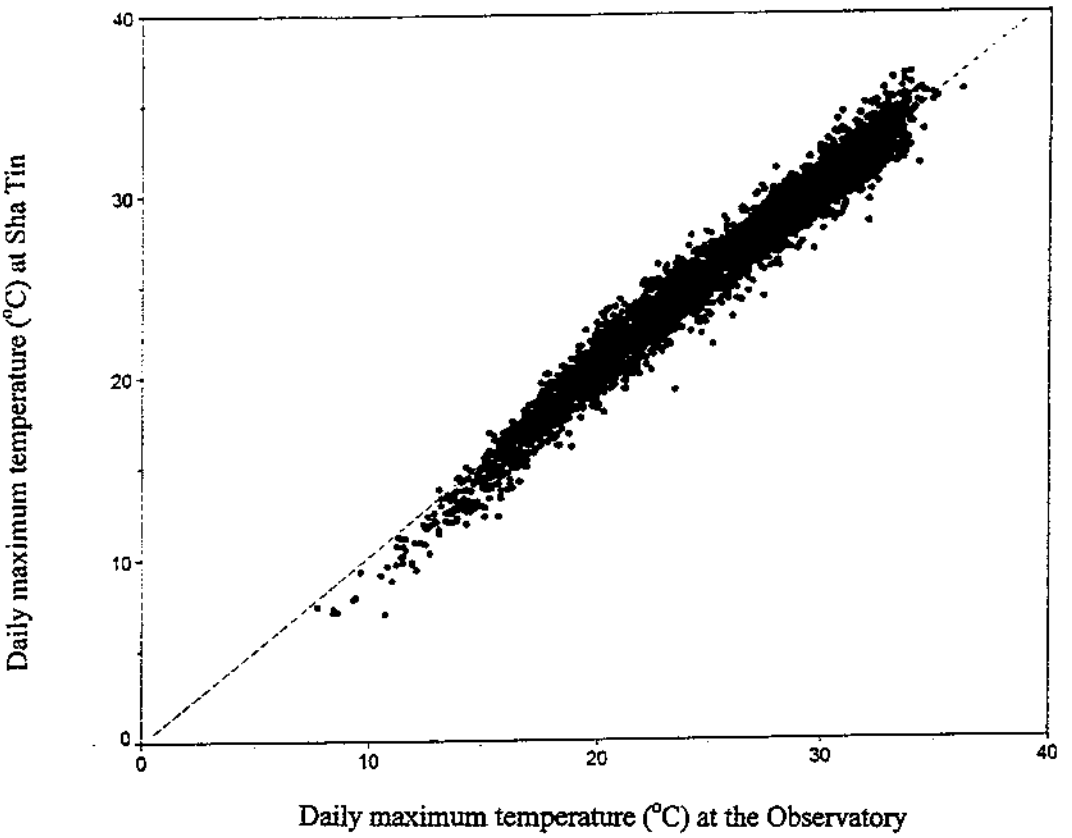


Fig. 19. Comparison of daily maximum temperatures between Sha Tin and the Observatory.

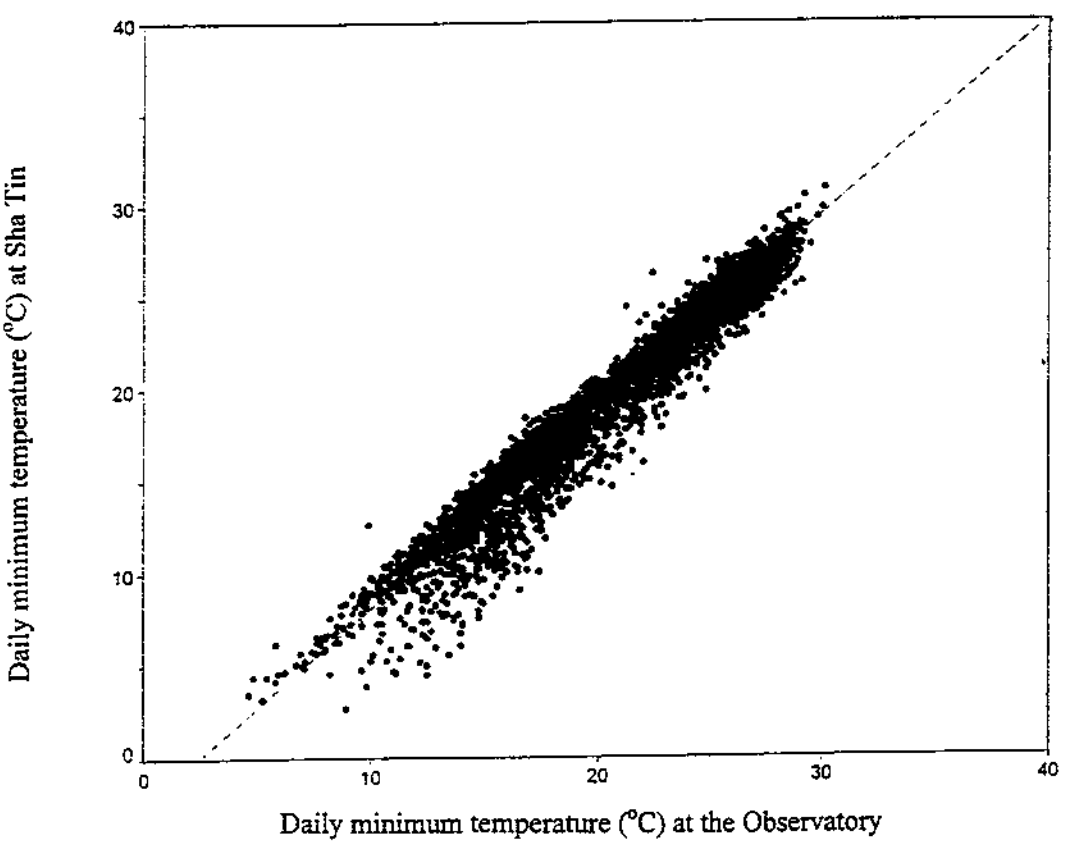


Fig. 20. Comparison of daily minimum temperatures between Sha Tin and the Observatory.

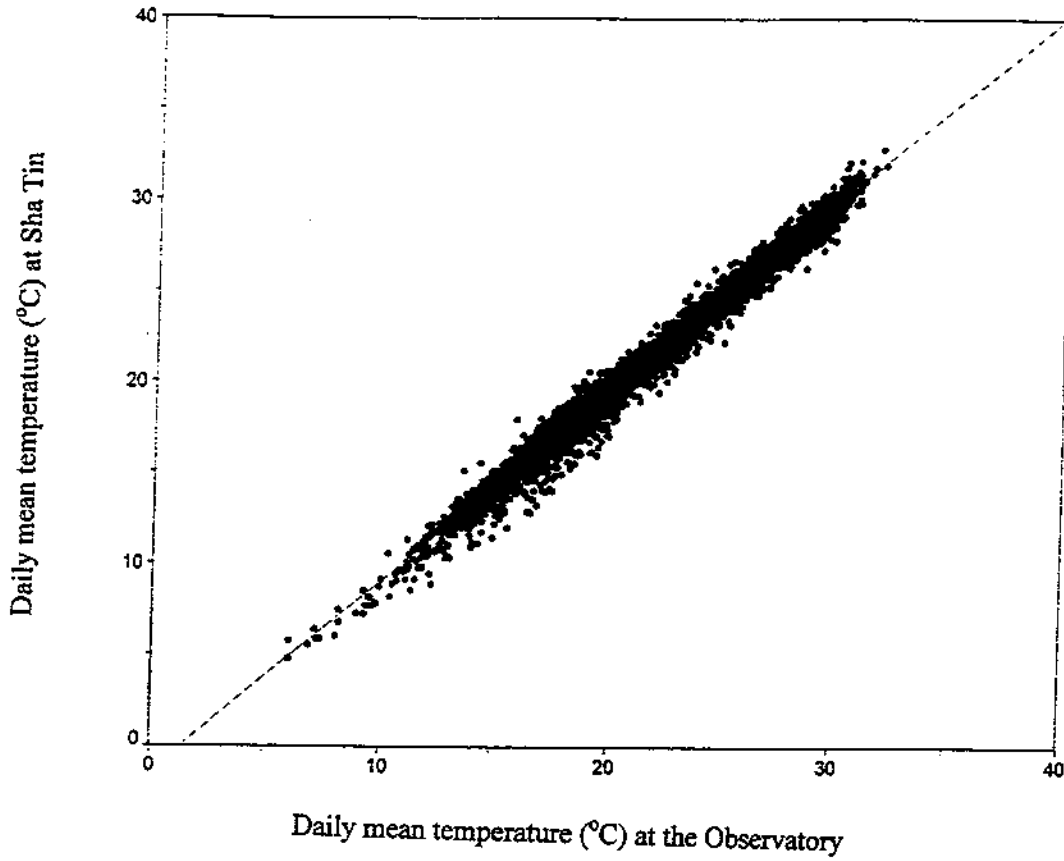


Fig. 21. Comparison of daily mean temperatures between Sha Tin and the Observatory.

TABLE 1.

CLIMATOLOGICAL SUMMARY FOR SHA TIN, 1985-1996

Month	Air Temperature							Wet Bulb Temperature	Dew Point	Relative Humidity
	24-hour Mean	Mean Daily		Absolute Extremes						
		Maximum	Minimum	Maximum	Date	Minimum	Date			
	°C	°C	°C	°C		°C		°C	°C	%
January	15.6	19.1	12.6	26.3	22/01/88	2.7	29/01/93	13.0	10.5	73
February	15.8	18.9	13.3	27.5	15/02/96	4.2	21/02/96	13.5	11.4	77
March	18.4	21.2	15.9	29.0	15/03/88	4.4	01/03/86	16.3	14.6	80
April	21.9	24.8	19.6	31.3	23/04/87	10.2	03/04/96	19.8	18.5	82
May	25.6	28.5	23.3	33.4	31/05/88	18.5	03/05/91	23.2	22.1	82
June	27.7	30.4	25.6	35.2	28/06/90	19.9	04/06/88	25.2	24.1	81
July	28.5	31.6	25.9	36.7	09/07/88	21.3	30/07/89	25.8	24.6	80
August	28.3	31.6	25.8	36.6	17/08/90	22.4	24/08/93	25.7	24.5	81
September	27.5	30.7	24.9	36.3	01/09/90	19.5	23/09/95	24.4	22.9	77
October	24.8	28.1	22.0	32.2	09/10/94	14.4	30/10/88	21.0	18.7	71
November	20.9	24.4	17.9	31.1	01/11/96	6.3	30/11/87	17.3	14.6	70
December	17.1	20.9	13.7	28.7	09/12/90	3.2	29/12/91	14.0	10.9	70
Year	22.7	25.9	20.1	36.7	09/07/88	2.7	29/01/93	20.0	18.1	77

TABLE 1. (cont'd)

Month	Rainfall					Number of Days with Rainfall					Number of Hours with Rainfall			
	Total mm	Total# mm	Total## mm	Maximum Daily mm	Maximum Hourly mm	>=0.5 mm	>=10.0 mm	>=25.0 mm	>=50.0 mm	>=100.0 mm	>=0.5 mm	>=10.0 mm	>=25.0 mm	>=50.0 mm
January	16.0	22.4	24.3	35.0	6.0	5.25	0.17	0.08	-	-	18.08	-	-	-
February	39.5	46.4	52.7	49.0	32.5	5.92	1.58	0.25	-	-	22.25	0.42	0.08	-
March	64.6	80.1	76.6	97.5	45.0	8.67	1.50	1.00	0.25	-	31.00	1.25	0.17	-
April	154.3	184.3	152.7	99.0	47.5	11.25	3.50	2.08	1.17	-	46.58	4.42	0.58	-
May*	210.7	320.0	313.1	192.5	95.0	13.50	5.08	2.25	1.00	0.17	63.08	4.83	1.25	0.17
June	359.9	394.5	404.5	305.0	69.0	17.08	7.75	4.33	2.08	0.67	96.08	9.33	2.08	0.50
July	362.3	364.5	330.8	248.5	64.0	15.08	7.83	4.58	1.75	0.67	87.67	9.83	1.83	0.50
August*	397.8	409.3	459.2	168.0	69.0	18.17	9.33	5.25	2.58	0.83	100.33	11.17	1.33	0.25
September	219.7	284.8	295.8	295.5	58.0	14.25	5.25	2.67	1.08	0.25	61.33	5.33	0.92	0.08
October	78.8	151.9	161.4	172.5	53.0	4.67	1.58	1.00	0.50	0.08	23.50	1.83	0.25	0.08
November	42.2	44.4	36.6	81.5	22.0	4.17	1.17	0.50	0.17	-	22.58	0.17	-	-
December	41.3	27.6	27.4	115.0	24.0	4.25	0.75	0.50	0.17	0.08	25.00	0.50	-	-
Year	1986.8	2330.2	2335.1	305.0	95.0	122.25	45.50	24.50	10.75	2.75	597.50	49.08	8.50	1.58

* : rainfall data missing during major rainstorms
\# : mean total rainfall for Chinese University of Hong Kong
\#\# : mean total rainfall for Sha Tin Treatment Works

TABLE 1. (cont'd)

Month	Mean Sea Level Pressure hPa	Prevailing Wind Direction degrees	Wind Speed m/s	Maximum Gust m/s	Number of Days with Maximum Temperature				
					>=30°C	>=33°C	>=34°C	>=35°C	>=36°C
January	1020.6	030	1.9	15.0	-	-	-	-	-
February	1019.3	090	2.0	16.1	-	-	-	-	-
March	1016.3	080	2.1	17.4	-	-	-	-	-
April	1012.9	090	2.0	24.1	2.08	-	-	-	-
May	1009.5	090	2.0	23.6	10.83	0.50	-	-	-
June	1006.1	220	2.4	27.6	18.50	2.67	0.75	0.17	-
July	1005.9	220	2.2	23.3	25.25	6.25	2.42	1.00	0.17
August	1005.5	220	1.8	25.5	24.42	7.08	2.58	1.25	0.17
September	1008.8	090	1.8	29.3	18.50	4.25	1.00	0.33	0.08
October	1014.6	040	2.0	27.7	4.83	-	-	-	-
November	1018.4	040	2.0	23.2	0.25	-	-	-	-
December	1021.2	040	1.8	16.5	-	-	-	-	-
Year	1013.2	090	2.0	29.3	104.66	20.75	6.75	2.75	0.42

TABLE 2.

HOURLY VECTOR MEAN WIND AT SHA TIN, 1985-1996

HOUR	JAN		FEB		MAR		APR		MAY		JUN		JUL		AUG		SEP		OCT		NOV		DEC	
	dir	spd	dir	spd	dir	spd	dir	spd	dir	spd	dir	spd	dir	spd	dir	spd	dir	spd	dir	spd	dir	spd	dir	spd
0100	54	1.1	64	1.3	68	0.9	90	0.7	126	0.4	176	0.7	202	0.9	193	0.4	57	0.7	66	1.3	53	1.2	50	1.1
0200	48	1.0	62	1.3	69	0.9	89	0.8	130	0.4	179	0.7	203	0.9	195	0.4	52	0.7	62	1.2	52	1.2	49	1.1
0300	47	1.1	63	1.2	70	0.9	81	0.7	122	0.3	180	0.6	201	0.8	196	0.3	52	0.7	58	1.2	51	1.2	44	1.1
0400	46	1.1	58	1.3	70	1.0	79	0.8	122	0.3	185	0.6	201	0.7	205	0.3	48	0.7	56	1.3	47	1.2	44	1.1
0500	46	1.1	59	1.3	69	0.9	72	0.8	110	0.3	186	0.5	206	0.7	201	0.2	46	0.7	52	1.3	45	1.3	44	1.1
0600	42	1.1	62	1.3	66	0.9	78	0.8	96	0.3	186	0.5	200	0.6	188	0.2	41	0.8	49	1.4	46	1.3	42	1.1
0700	42	1.1	62	1.3	63	1.0	75	0.8	102	0.4	178	0.4	196	0.6	172	0.1	37	0.7	51	1.4	45	1.4	41	1.1
0800	43	1.2	62	1.4	64	1.1	75	0.8	107	0.4	189	0.6	196	0.8	158	0.1	45	0.9	53	1.6	45	1.5	43	1.2
0900	50	1.4	63	1.5	66	1.1	79	0.9	107	0.5	191	0.7	196	0.9	106	0.1	46	1.3	50	1.9	47	1.9	46	1.5
1000	53	1.6	59	1.7	74	1.2	78	1.0	111	0.6	193	1.1	195	1.1	79	0.2	46	1.5	51	2.2	45	2.2	49	1.8
1100	50	1.9	63	1.9	74	1.2	85	0.9	128	0.6	196	1.2	192	1.2	103	0.2	51	1.6	55	2.2	45	2.3	49	2.1
1200	56	1.9	60	1.9	74	1.2	92	0.9	142	0.7	196	1.4	196	1.2	153	0.3	58	1.4	55	2.1	48	2.3	47	2.1
1300	56	1.9	64	1.7	80	1.2	106	0.8	154	0.9	199	1.6	202	1.5	173	0.6	69	1.3	60	2.1	51	2.2	49	2.0
1400	57	1.8	67	1.6	85	1.1	122	0.9	157	1.0	200	1.8	201	1.8	179	0.8	82	1.1	67	1.8	57	2.0	53	1.8
1500	60	1.6	72	1.4	92	1.0	132	0.8	160	1.0	199	1.8	200	2.0	188	1.1	99	1.0	77	1.7	63	1.9	59	1.6
1600	65	1.3	76	1.2	104	0.9	137	0.9	166	1.0	196	1.8	202	2.0	196	1.2	110	0.9	85	1.6	71	1.5	65	1.3
1700	66	1.1	82	1.0	105	0.9	147	0.8	170	1.0	202	1.7	206	2.0	204	1.3	113	0.9	93	1.3	73	1.3	67	1.1
1800	66	0.9	82	0.9	97	0.7	149	0.6	175	0.9	203	1.5	209	1.8	208	1.2	114	0.6	92	1.0	68	1.0	53	0.7
1900	58	0.9	72	0.9	90	0.7	152	0.5	179	0.7	202	1.3	211	1.6	209	1.0	101	0.5	80	0.9	55	0.9	42	0.8
2000	55	1.0	67	1.0	86	0.8	126	0.6	166	0.6	200	1.1	213	1.3	205	0.8	83	0.5	73	1.0	53	1.0	44	0.9
2100	56	1.0	72	1.2	78	0.8	117	0.7	147	0.5	195	1.0	211	1.1	202	0.6	72	0.6	69	1.1	55	1.1	50	1.0
2200	54	1.0	66	1.1	77	0.9	103	0.6	135	0.5	190	0.8	203	1.0	198	0.5	66	0.6	68	1.1	54	1.2	49	1.0
2300	52	1.0	64	1.3	75	0.9	95	0.6	125	0.5	182	0.8	203	0.9	201	0.5	60	0.6	69	1.2	55	1.2	50	1.1
2400	52	1.0	61	1.3	72	0.9	91	0.6	132	0.4	183	0.8	202	0.9	200	0.4	56	0.7	67	1.3	54	1.2	50	1.0

`dir` : vector wind direction (degree)
`spd` : vector wind speed (m/s)

TABLE 3.

HOURLY MEAN OF MEAN SEA-LEVEL PRESSURE (hPa) AT SHA TIN, 1985-1996

HOUR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
0100	1021.0	1019.7	1016.7	1013.3	1009.8	1006.3	1006.3	1005.9	1009.0	1014.8	1018.6	1021.6
0200	1020.7	1019.4	1016.3	1012.8	1009.4	1005.9	1005.8	1005.5	1008.6	1014.4	1018.3	1021.3
0300	1020.4	1019.0	1015.9	1012.3	1009.0	1005.7	1005.6	1005.2	1008.4	1014.1	1018.0	1021.0
0400	1020.2	1018.8	1015.6	1012.2	1009.0	1005.6	1005.6	1005.0	1008.2	1014.0	1017.9	1020.9
0500	1020.3	1018.8	1015.7	1012.4	1009.2	1005.7	1005.6	1005.1	1008.4	1014.2	1018.0	1020.9
0600	1020.6	1019.3	1016.2	1012.8	1009.5	1006.0	1005.9	1005.4	1008.7	1014.7	1018.5	1021.3
0700	1021.1	1019.9	1016.8	1013.4	1010.1	1006.4	1006.3	1005.8	1009.2	1015.3	1019.1	1021.8
0800	1021.7	1020.5	1017.5	1014.0	1010.5	1006.8	1006.6	1006.2	1009.7	1015.9	1019.7	1022.5
0900	1022.3	1021.0	1018.0	1014.5	1010.8	1007.0	1006.8	1006.5	1010.1	1016.2	1020.1	1023.0
1000	1022.6	1021.3	1018.1	1014.6	1010.9	1007.1	1006.8	1006.6	1010.2	1016.3	1020.2	1023.2
1100	1022.3	1021.1	1017.9	1014.4	1010.7	1007.0	1006.7	1006.4	1009.9	1015.9	1019.7	1022.7
1200	1021.4	1020.3	1017.2	1013.9	1010.3	1006.6	1006.4	1006.1	1009.4	1015.1	1018.8	1021.8
1300	1020.2	1019.3	1016.3	1013.1	1009.7	1006.2	1006.0	1005.5	1008.7	1014.2	1017.8	1020.6
1400	1019.3	1018.3	1015.4	1012.3	1009.1	1005.7	1005.5	1005.0	1008.0	1013.4	1016.9	1019.7
1500	1018.8	1017.6	1014.7	1011.7	1008.5	1005.2	1005.1	1004.5	1007.5	1012.9	1016.4	1019.2
1600	1018.7	1017.4	1014.4	1011.3	1008.1	1004.8	1004.8	1004.2	1007.3	1012.8	1016.4	1019.2
1700	1019.0	1017.6	1014.5	1011.2	1008.0	1004.7	1004.6	1004.1	1007.4	1013.1	1016.8	1019.6
1800	1019.4	1017.9	1014.8	1011.5	1008.2	1004.9	1004.7	1004.4	1007.7	1013.5	1017.2	1020.1
1900	1019.9	1018.3	1015.3	1012.0	1008.7	1005.3	1005.1	1004.8	1008.2	1014.0	1017.8	1020.7
2000	1020.5	1018.9	1015.9	1012.5	1009.2	1005.9	1005.7	1005.5	1008.8	1014.7	1018.5	1021.2
2100	1020.9	1019.4	1016.5	1013.1	1009.7	1006.4	1006.2	1006.1	1009.5	1015.3	1018.9	1021.6
2200	1021.1	1019.7	1016.9	1013.7	1010.2	1006.8	1006.7	1006.5	1009.8	1015.5	1019.1	1021.8
2300	1021.2	1019.8	1017.0	1013.8	1010.4	1007.0	1006.8	1006.6	1009.8	1015.4	1019.1	1021.8
2400	1021.1	1019.7	1016.9	1013.5	1010.1	1006.7	1006.6	1006.3	1009.6	1015.2	1018.9	1021.7
MEAN	1020.6	1019.3	1016.3	1012.9	1009.5	1006.1	1005.9	1005.5	1008.8	1014.6	1018.4	1021.2

TABLE 4.

HOURLY MEAN OF AIR TEMPERATURE (°C) AT SHA TIN, 1985-1996

HOUR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
0100	14.4	14.9	17.5	20.9	24.4	26.8	27.4	27.1	26.3	23.5	19.7	15.7
0200	14.3	14.7	17.3	20.7	24.3	26.7	27.2	27.0	26.2	23.4	19.5	15.5
0300	14.1	14.5	17.2	20.6	24.2	26.6	27.1	26.8	26.0	23.2	19.3	15.3
0400	13.9	14.4	17.1	20.5	24.1	26.4	26.9	26.7	25.8	23.0	19.2	15.1
0500	13.8	14.3	17.0	20.4	24.0	26.3	26.8	26.6	25.7	22.9	19.0	15.0
0600	13.7	14.2	17.0	20.4	24.0	26.3	26.7	26.5	25.6	22.8	18.9	14.9
0700	13.6	14.2	17.0	20.6	24.4	26.8	27.3	26.8	25.9	22.9	18.8	14.7
0800	13.8	14.4	17.4	21.2	25.2	27.5	28.3	27.9	26.9	23.8	19.6	15.2
0900	14.8	15.2	18.0	21.8	25.8	28.0	28.9	28.7	27.7	24.7	20.6	16.5
1000	15.7	15.8	18.6	22.4	26.3	28.5	29.5	29.3	28.4	25.5	21.4	17.5
1100	16.5	16.5	19.2	22.9	26.9	28.8	30.0	29.8	29.0	26.2	22.2	18.5
1200	17.3	17.0	19.6	23.4	27.2	29.2	30.3	30.2	29.5	26.8	22.9	19.2
1300	17.8	17.5	20.0	23.7	27.4	29.3	30.4	30.5	29.8	27.3	23.4	19.7
1400	18.2	17.9	20.2	23.8	27.4	29.3	30.6	30.5	29.8	27.4	23.7	20.1
1500	18.3	18.0	20.2	23.7	27.4	29.3	30.5	30.4	29.7	27.3	23.7	20.2
1600	18.1	17.9	20.0	23.5	27.1	29.1	30.3	30.2	29.5	27.0	23.4	20.0
1700	17.6	17.5	19.6	23.1	26.7	28.8	29.8	29.8	28.9	26.3	22.6	19.3
1800	16.7	16.8	19.1	22.6	26.2	28.3	29.2	29.1	28.2	25.4	21.6	18.1
1900	15.9	16.2	18.6	22.1	25.6	27.7	28.6	28.4	27.6	24.8	20.9	17.3
2000	15.5	15.9	18.4	21.8	25.2	27.5	28.1	28.0	27.2	24.4	20.6	16.9
2100	15.2	15.6	18.2	21.6	25.1	27.3	27.9	27.8	27.0	24.2	20.3	16.5
2200	14.9	15.4	18.1	21.5	24.9	27.2	27.8	27.6	26.8	24.0	20.1	16.3
2300	14.7	15.2	17.9	21.3	24.8	27.1	27.7	27.4	26.6	23.8	19.9	16.0
2400	14.6	15.0	17.7	21.2	24.7	27.0	27.5	27.2	26.5	23.6	19.7	15.9
MEAN	15.6	15.8	18.4	21.9	25.6	27.7	28.5	28.3	27.5	24.8	20.9	17.1

TABLE 5.

HOURLY MEAN OF WET-BULB TEMPERATURE (°C) AT SHA TIN, 1985-1996

HOUR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
0100	12.6	13.2	16.0	19.4	22.9	25.0	25.5	25.4	24.2	20.8	17.2	13.6
0200	12.4	13.1	15.8	19.3	22.8	24.9	25.5	25.3	24.1	20.7	17.0	13.4
0300	12.3	13.0	15.7	19.2	22.8	24.9	25.4	25.3	24.0	20.6	16.9	13.3
0400	12.2	12.8	15.6	19.1	22.7	24.8	25.3	25.2	23.8	20.4	16.7	13.1
0500	12.1	12.7	15.5	19.1	22.6	24.8	25.3	25.1	23.8	20.3	16.6	13.0
0600	12.0	12.6	15.5	19.1	22.6	24.8	25.2	25.1	23.7	20.1	16.4	12.8
0700	11.9	12.5	15.5	19.2	22.9	25.0	25.6	25.3	23.8	20.1	16.3	12.7
0800	12.0	12.6	15.7	19.4	23.1	25.2	25.8	25.6	24.1	20.4	16.6	12.9
0900	12.5	13.0	16.0	19.7	23.3	25.3	25.9	25.8	24.4	20.7	16.9	13.5
1000	12.9	13.3	16.3	19.9	23.5	25.5	26.1	25.9	24.6	21.0	17.2	13.9
1100	13.3	13.6	16.6	20.1	23.7	25.5	26.1	26.0	24.7	21.2	17.5	14.3
1200	13.6	13.9	16.8	20.3	23.8	25.6	26.2	26.1	24.8	21.4	17.8	14.6
1300	13.9	14.1	17.0	20.4	23.9	25.6	26.3	26.2	24.9	21.6	18.0	14.8
1400	14.1	14.3	17.0	20.5	23.8	25.6	26.3	26.2	25.0	21.7	18.1	15.0
1500	14.2	14.4	17.1	20.5	23.8	25.6	26.3	26.2	25.0	21.8	18.2	15.2
1600	14.1	14.5	17.0	20.4	23.7	25.6	26.2	26.1	24.9	21.8	18.2	15.2
1700	14.0	14.3	16.9	20.3	23.6	25.5	26.1	26.0	24.8	21.7	18.1	15.1
1800	13.7	14.1	16.7	20.1	23.4	25.4	25.9	25.9	24.7	21.5	17.9	14.7
1900	13.4	13.9	16.6	20.0	23.2	25.2	25.8	25.7	24.6	21.4	17.7	14.5
2000	13.2	13.8	16.5	19.9	23.2	25.2	25.7	25.7	24.5	21.3	17.6	14.3
2100	13.0	13.7	16.4	19.9	23.1	25.2	25.7	25.6	24.4	21.2	17.5	14.1
2200	12.9	13.6	16.4	19.8	23.1	25.1	25.7	25.6	24.3	21.1	17.4	14.0
2300	12.8	13.5	16.3	19.8	23.0	25.1	25.6	25.5	24.3	21.0	17.3	13.8
2400	12.7	13.4	16.2	19.7	23.0	25.0	25.6	25.5	24.2	20.9	17.2	13.7
MEAN	13.0	13.5	16.3	19.8	23.2	25.2	25.8	25.7	24.4	21.0	17.3	14.0

TABLE 6.

HOURLY MEAN OF DEW POINT (°C) AT SHA TIN, 1985-1996

HOUR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
0100	10.7	11.7	14.8	18.5	22.0	24.1	24.7	24.7	23.1	19.2	15.2	11.3
0200	10.6	11.5	14.6	18.4	22.1	24.1	24.7	24.6	23.0	19.1	15.1	11.2
0300	10.5	11.4	14.5	18.3	22.0	24.1	24.7	24.6	22.9	19.0	15.0	11.1
0400	10.4	11.3	14.4	18.2	22.0	24.1	24.6	24.5	22.8	18.7	14.8	11.0
0500	10.2	11.1	14.3	18.2	21.9	24.1	24.6	24.5	22.8	18.5	14.6	10.8
0600	10.2	11.0	14.2	18.1	21.9	24.1	24.6	24.4	22.7	18.4	14.5	10.6
0700	10.1	10.8	14.2	18.2	22.0	24.2	24.8	24.5	22.7	18.3	14.2	10.5
0800	10.0	10.8	14.2	18.3	22.1	24.2	24.8	24.6	22.8	18.2	14.2	10.4
0900	10.1	11.0	14.3	18.3	22.1	24.2	24.7	24.5	22.7	18.2	14.0	10.4
1000	10.1	11.0	14.4	18.4	22.0	24.1	24.6	24.4	22.7	18.2	14.0	10.1
1100	10.1	11.0	14.5	18.4	22.1	24.1	24.5	24.4	22.6	18.2	13.9	10.1
1200	10.1	11.0	14.6	18.5	22.1	24.0	24.5	24.3	22.5	18.1	13.8	10.1
1300	10.2	11.0	14.6	18.5	22.1	24.0	24.5	24.3	22.6	18.1	13.9	10.1
1400	10.2	11.2	14.7	18.6	22.1	24.0	24.5	24.3	22.7	18.3	13.9	10.2
1500	10.4	11.3	14.7	18.6	22.1	24.0	24.5	24.4	22.7	18.5	14.1	10.3
1600	10.6	11.4	14.8	18.6	22.1	24.0	24.5	24.4	22.8	18.7	14.4	10.6
1700	10.6	11.6	14.8	18.6	22.1	24.0	24.5	24.4	22.8	18.9	14.8	11.0
1800	10.9	11.7	14.8	18.6	22.1	24.1	24.5	24.5	23.0	19.2	15.1	11.5
1900	11.0	11.8	15.0	18.7	22.1	24.1	24.6	24.6	23.2	19.4	15.3	11.6
2000	11.0	12.0	15.0	18.8	22.1	24.2	24.7	24.7	23.2	19.4	15.4	11.7
2100	10.9	11.9	15.0	18.8	22.1	24.2	24.8	24.7	23.2	19.4	15.3	11.7
2200	10.9	11.9	15.0	18.8	22.1	24.2	24.7	24.7	23.2	19.4	15.3	11.6
2300	10.9	11.9	15.0	18.8	22.2	24.2	24.8	24.7	23.1	19.2	15.2	11.6
2400	10.8	11.9	14.9	18.7	22.2	24.2	24.7	24.7	23.0	19.2	15.2	11.5
MEAN	10.5	11.4	14.6	18.5	22.1	24.1	24.6	24.5	22.9	18.7	14.6	10.9

TABLE 7.

HOURLY MEAN OF RELATIVE HUMIDITY (%) AT SHA TIN, 1985-1996

HOUR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
0100	79	82	85	87	87	86	86	87	84	78	77	77
0200	80	82	85	87	88	86	86	87	84	78	77	77
0300	80	82	85	88	88	87	87	88	84	78	77	78
0400	80	83	85	88	88	87	88	88	85	78	77	78
0500	80	82	85	88	89	88	88	89	85	78	77	77
0600	80	82	85	88	89	88	89	89	85	77	77	77
0700	80	82	85	87	87	86	87	88	84	76	76	77
0800	79	80	83	84	83	83	82	83	79	72	72	75
0900	74	77	80	81	81	80	78	79	75	68	68	69
1000	71	75	78	79	78	78	75	76	72	65	64	64
1100	67	72	76	77	76	76	73	74	70	63	61	60
1200	64	70	74	75	75	75	72	72	67	60	59	58
1300	63	68	73	74	74	74	72	71	67	59	57	56
1400	62	67	73	74	74	74	71	71	67	59	57	56
1500	62	67	73	74	74	74	71	71	68	60	57	56
1600	63	68	74	75	75	75	72	72	69	62	59	58
1700	66	70	75	77	77	76	74	74	71	66	63	61
1800	70	73	78	79	79	79	76	77	75	70	68	67
1900	73	76	80	82	82	81	80	80	78	73	71	71
2000	75	79	82	84	83	83	82	82	80	75	73	73
2100	77	80	82	85	84	84	83	84	81	76	74	75
2200	78	81	83	85	85	84	84	85	81	76	75	76
2300	79	81	84	86	86	85	85	86	82	77	76	77
2400	79	82	84	86	86	85	85	86	82	77	77	77
MEAN	73	77	80	82	82	81	80	81	77	71	70	70

TABLE 8.

EXTREME VALUES OF TEMPERATURE, RAINFALL AND GUST AT SHA TIN, 1985-1996

Rank	Daily Temperature				Maximum Rainfall						Maximum Gust	
	Maximum °C	Date	Minimum °C	Date	Hourly mm	Time	Daily mm	Date	Monthly mm	Month	Hourly m/s	Time
1	36.7	09/07/88	2.7	29/01/93	95.0	06 01/05/93	305.0	11/06/93	877.0	Aug-95	29.3	10 06/09/85
2	36.6	17/08/90	3.2	29/12/91	69.0	19 27/08/92	295.5	26/09/93	835.0	Jun-93	28.5	10 17/09/93
3	36.4	18/07/88	3.5	28/12/91	69.0	15 11/06/93	248.5	22/07/94	809.5	Jul-94	27.7	04 03/10/95
4	36.3	01/09/90	3.9	16/01/92	64.0	07 09/07/85	192.5	01/05/93	748.0	Jun-92	27.6	16 27/06/93
5	36.1	19/08/90	4.2	21/02/96	63.0	12 16/06/93	188.5	18/07/92	727.5	Aug-88	26.3	15 27/06/93
6	35.9	16/07/87	4.4	01/03/86	62.5	05 22/07/94	182.5	16/06/93	695.0	Aug-94	26.3	06 17/09/93
7	35.8	13/07/87	4.4	16/01/93	58.5	06 11/06/93	180.5	30/07/87	691.5	Sep-93	26.0	20 02/10/95
8	35.8	26/08/90	4.5	31/01/93	58.0	16 11/06/93	174.5	12/07/86	664.0	Aug-85	25.8	01 09/09/96
9	35.8	26/07/96	4.6	28/01/93	58.0	20 26/09/93	172.5	05/10/95	640.5	Jul-87	25.5	22 15/08/91
10	35.7	18/08/90	4.6	30/01/93	57.5	07 01/05/93	168.0	12/08/95	579.0	Jul-86	25.5	05 03/10/95
11	35.6	23/08/90	4.6	20/02/96	56.5	02 30/07/87	164.5	11/08/86	537.5	Jul-95	25.3	03 06/09/85
12	35.6	19/07/91	4.7	17/01/92	55.5	03 20/06/92	161.0	19/07/88	522.5	May-93	25.2	07 17/09/93
13	35.6	10/07/94	4.7	18/01/93	53.5	10 13/08/95	150.5	11/05/86	436.5	May-87	24.3	09 17/09/93
14	35.5	10/07/86	4.8	17/12/85	53.0	01 30/07/87	143.0	25/06/85	411.0	Jun-86	24.1	19 19/04/95
15	35.5	15/08/89	4.9	17/01/93	53.0	13 30/06/90	136.0	09/07/85	404.5	Sep-85	24.1	13 02/10/95
16	35.4	16/07/89	5.0	01/02/90	53.0	19 05/10/95	131.0	06/09/85	397.0	Jun-90	24.0	19 02/10/95
17	35.4	31/08/90	5.0	31/12/95	52.5	07 21/08/91	127.5	30/06/90	380.5	Aug-86	23.8	13 27/06/93
18	35.4	12/09/91	5.1	15/01/93	52.0	06 20/07/91	124.5	31/08/95	367.5	Jul-92	23.7	19 05/09/85
19	35.3	14/08/89	5.2	08/01/86	50.5	08 12/07/86	124.0	12/07/95	366.5	Oct-95	23.7	05 06/09/85
20	35.3	30/08/92	5.3	07/01/86	49.5	14 16/05/87	123.0	29/07/87	342.0	Jun-94	23.7	07 06/09/85
*	36.1	18/08/90	4.6	28/12/91	109.9	07 08/05/92	324.1	08/05/92	1147.2	Jul-94	37.5	16 27/06/93

* : extreme values recorded at the Hong Kong Observatory during 1985-1996