THE VARIATION OF BRIGHT SUNSHINE IN THE ANTARCTIC PENINSULA, 1945–66

By BRIAN D. GILES§

ABSTRACT. Published and manuscript data are presented in the form of annual, seasonal and monthly amounts of effective and relative sunshine at British stations in the Antarctic Peninsula. From these data the various means, extremes and standard deviations are calculated. The duration and the diurnal variation of sunshine are also considered. It is noted that sunshine amounts do not necessarily vary directly with latitude; local topography and the positions of the stations in relation to the Antarctic Peninsula are more important factors.

SUNSHINE records have been maintained at the British stations in the Antarctic Peninsula since the inception of the Falkland Islands Dependencies Survey in 1944. There are now nearly 20 years of records for some stations and this paper presents a simple climatological summary of the data for the period 1945–66.

The stations used in the present analysis are listed in Table I. They extend from Cape Geddes (lat. 60°42′S.) in the South Orkney Islands to Stonington Island (lat. 68°11′S.) in Marguerite Bay. A full description of some of these stations has been given by Pepper (1954) together with maps of their environs at scales ranging from 1 : 15,000 to 1 : 150,000. The stations at Horseshoe Island, the Loubet Coast and Adelaide Island were opened in 1955, 1956 and 1962, respectively, and therefore no detailed descriptions of the sites have been published. However, a large-scale map of Horseshoe Island has been published (D.O.S. 310, Series D 811, 1 : 25,000). Maps of Deception Island and Hope Bay, at a larger scale than those in Pepper

TABLE I. DETAILS OF FALKLAND ISLANDS DEPENDENCIES SURVEY AND BRITISH ANTARCTIC SURVEY STATIONS RECORDING SUNSHINE, 1945–66

Station	*Position* lat. S.	long. W.	*Period*	*Number of months*	*Sources of data*
Cape Geddes	60°42′	44°35′	Apr. 1946–Feb. 1947	11	1946–47*
Signy Island	60°43′	45°36′	Apr. 1947–Dec. 1964	212	1947–50;* 1951–54;† 1955–64‡
Admiralty Bay	62°03′	58°24′	Mar. 1948–Dec. 1960	154	1948–50;* 1951–54;† 1955–60‡
Deception Island	62°59′	60°34′	Feb. 1947–Dec. 1966	239	1947–50;* 1951–55;† 1956–66‡
Hope Bay	63°24′	56°59′	May 1945–Dec. 1947 May 1952–Dec. 1960	30 104	1945–47* 1952–54;† 1955–60‡
Port Lockroy	64°50′	63°31′	Intermittently from Jan. 1946 to Dec. 1950	20	1946–50*
Argentine Islands	65°15′	64°16′	May 1947–Dec. 1965	213	1947–50;* 1951–54;† 1955–65‡
Loubet Coast (Detaille Island)	66°54′	66°48′	Jul. 1956–Dec. 1958	30	1956–58†
Adelaide Island	67°46′	68°55′	May 1962–Dec. 1965	44	1962–65‡
Horseshoe Island	67°48′	67°19′	Sep. 1955–Feb. 1960	54	1955–60‡
Marguerite Bay (Stonington Island)	68°11′	67°01′	Feb.–Mar. 1947	2	1947*

* Pepper (1954).
† Falkland Islands Dependencies Survey (1951, 1952, 1955, 1956).
‡ Manuscript data at the Meteorological Office, Bracknell, Berkshire.

§ Department of Geography, University of Birmingham, Birmingham 15.

(1954), have been published in the same series. The station at the Argentine Islands was moved from Winter Island to a more open site on Galindez Island in 1954 (see D.O.S. 210, 1 : 10,000). The largest available map of the Loubet Coast is on Admiralty Chart 3213 at a scale of 1 : 7,500. The only published map of Adelaide Island is D.O.S. 610, Series D 510, 1 : 200,000.

From the point of view of sunshine records, the most important factor is the loss of records due to topography. This is particularly the case at Deception Island, where the island rim prevents any sunshine record from 20 May to 25 July. At the Argentine Islands, the original station on Winter Island was rather sheltered although the sunshine recorder was installed on the open summit between 1947 and 1949. In 1950, it was moved back to the vicinity of the station hut with a resultant restriction of exposure, particularly to the east and west. The exposure was greatly improved with the change of site to Galindez Island in 1954. The actual loss of sunshine at the present site varied from 10–60 min. in the morning to about 10 min. in

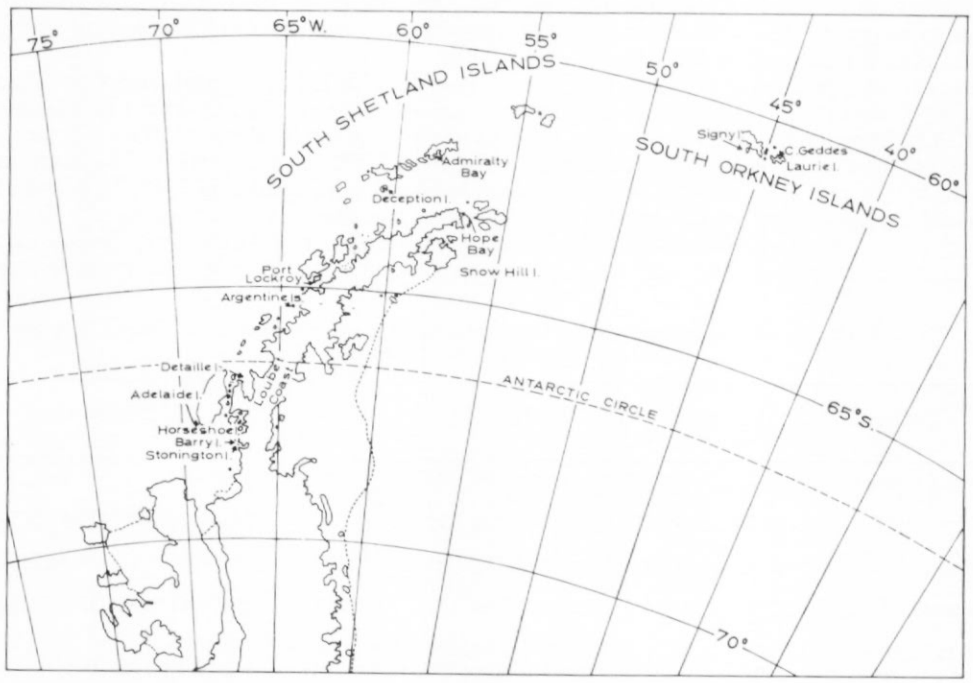

Fig. 1. Map of the Antarctic Peninsula showing the positions of stations mentioned in the text.

the evening. At Hope Bay, the main obstruction is to the west, where Mount Taylor and Twin Peaks block late afternoon sunshine. The station at Admiralty Bay was poorly sited with mountains up to 610 m. preventing low-altitude sunshine on all sides except due south. This explains why sunshine was recorded in June in only 4 out of 13 years, although the theoretical length of day is about 5 hr. The station at Horseshoe Island is on a promontory on the north coast with a good exposure in all directions except south-east, where Mount Searle rises to 537 m. at a distance of about 2·4 km. The Loubet Coast station on Detaille Island lies at the mouth of Lallemand Fjord. The poorest exposure is to the east, where the 2,100 m. plateau of the Loubet Coast is about 26 km. away. The Adelaide Island station is at the southern end of the island with apparently good exposures to the east, south and west. To the north and north-west, the land slopes steadily upwards for 20 km. to a height of 610 m. In the north-east, Mount Gaudry (2,320 m.) and Mount Ditte (1,400 m.) are 29 and 14·5 km. away, respectively. The positions of all the stations are given on the map of British Antarctic Territory (D.O.S. 813, Series 3203, 1963) and in Fig. 1.

Data

At all the stations, sunshine was recorded by Campbell-Stokes sunshine recorders. The main problem connected with this instrument has been the loss of records at various times due to hoar frost covering the sphere, the dislodging of the sphere in high winds and the shading effect of the ends of the sunshine cards in summer. The last effect is peculiar to stations near or south of the Antarctic Circle and this can be overcome by installing a south-facing sunshine recorder.

Data from three sources have been combined in this paper. Falkland Islands and Dependencies Meteorological Service (1951, 1952, 1955, 1956) and Pepper (1954) have given monthly and annual mean values of sunshine; together they cover the period 1945–54. For the years 1955–66 the manuscript sunshine returns have been used. This has made possible the analysis of diurnal variations for seven stations for periods of between 6 and 11 years.

Servicio Meteorològico Nacional, Argentina (1951) has given detailed sunshine data for Laurie Island for 1903–50, and this has been included for comparison. Similarly, the short-term results obtained by Bodman (1908) and Fleming and others (1938) have been incorporated together with figures quoted by Burdecki (1957).

The data are presented in terms of total or effective sunshine and relative sunshine. Effective sunshine is the amount actually recorded and it excludes all estimates for losses due to the causes outlined above. Relative sunshine should be expressed as the ratio of the effective sunshine to the maximum sunshine recorded at a station on cloudless days. From a practical point of view, this is impossible for the Antarctic Peninsula stations since in the period covered insufficient cloudless days have occurred throughout the year. The alternative, which is followed here, is to define relative sunshine as the ratio of the effective sunshine to the theoretically possible sunshine which can be calculated quite easily by interpolation in tables such as those given by Marvin and Kimball (1931). Table II gives the mean duration of theoretical sunshine at the seven stations with the longest records.

Table II. Mean theoretical duration of sunshine (hr.)

Station	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
Signy Island	18·1	15·5	12·7	9·8	7·3	5·8	6·5	8·8	11·5	14·4	17·2	19·0
Admiralty Bay	18·4	15·7	12·7	9·7	7·0	5·3	6·1	8·6	11·5	14·5	17·5	19·5
Deception Island	18·9	15·9	12·7	9·6	6·7	4·9	5·7	8·5	11·5	14·7	17·9	20·1
Hope Bay	19·0	15·9	12·7	9·6	6·6	4·7	5·6	8·4	11·5	14·7	17·9	20·3
Argentine Islands	20·0	16·3	12·8	9·3	6·0	3·7	4·8	8·0	11·4	14·9	18·7	22·0
Loubet Coast	21·5	16·7	12·9	9·1	5·3	2·0	3·8	7·6	11·3	15·1	19·5	23·9
"lat. 68°S."	22·3	17·0	12·9	9·0	4·8	0·5	2·8	7·4	11·3	15·3	20·2	24·0

Monthly mean values have been calculated for each station over the whole period of its record. Seasonal and annual means have been derived from these monthly means but only complete seasons and years have been used. Season is defined in two ways: first, as the summer and winter half-years which run from October to March and from April to September, respectively; secondly, as summer, autumn, winter and spring which are based on 3 months' data centred at December, March, June and September, respectively. Standard deviations have been calculated and extreme values are also given.

The stations at Adelaide and Horseshoe Islands are only 80 km. and 2 min. of latitude apart. Since the period of observation at each station is short, they have been combined and called "lat. 68°S.".

TABLE III. MEAN TOTAL SUNSHINE (hr.)

Station	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	*Summer* Oct.–Mar.	*Winter* Apr.–Sep.	*Year*	*Number of years*
Laurie Island	47·6	38·3	34·0	25·2	17·1	9·7	18·3	44·1	65·8	69·1	54·8	62·7	306·5	180·2	486·7	48
Cape Geddes	37·2	17·6	—	47·7	28·8	32·1	27·3	22·9	100·2	72·5	25·8	57·3	(210·4)	259·0	(469·4)	1
Signy Island	74·0	49·1	39·1	29·4	21·5	14·4	27·4	49·5	57·2	66·1	69·5	60·6	358·4	199·4	557·8	18
Admiralty Bay	109·5	78·9	55·1	32·6	10·9	1·8	10·4	37·9	64·9	80·7	111·9	118·7	554·8	158·5	713·3	13
Deception Island	91·5	68·1	42·8	20·6	4·1	0	1·3	19·7	44·2	70·5	94·7	106·1	473·7	89·7	563·4	20
Hope Bay	151·8	108·1	100·9	69·2	35·0	22·9	30·2	67·4	112·1	132·8	160·8	157·2	811·6	336·8	1148·4	12
Port Lockroy	213·6	91·0	70·8	26·3	34·7	—	—	38·9	52·9	95·0	103·7	130·6	704·7	(152·8)	(857·5)	2
Argentine Islands	118·2	87·7	61·7	39·6	21·5	7·8	14·5	47·0	58·9	74·7	108·9	137·3	588·5	189·3	777·8	18
Loubet Coast	156·3	122·3	57·3	37·5	28·1	2·9	16·3	36·9	60·5	99·5	85·0	207·8	728·2	182·2	910·4	2½
"lat. 68°S."	162·7	111·2	65·5	49·9	13·1	0	0·4	36·4	57·5	92·2	146·6	174·0	752·3	157·3	909·6	8
Marguerite Bay	—	92·3	43·1	—	—	—	—	—	—	—	—	—	—	—	—	1

RESULTS

Annual sunshine

The mean annual sunshine varies from 486·7 hr. at Laurie Island to 1,148·4 hr. at Hope Bay and 910·4 hr. at the Loubet Coast. The results for 11 stations are given in Table III. There is a steady increase from north to south with Hope Bay as an exception. This station is less than 0·5° of latitude south of Deception Island and therefore it has the same theoretical duration of sunshine in each month, but Hope Bay has nearly twice as much effective sunshine as Deception Island. From Table IV it can be seen that Hope Bay has recorded more than 300 hr. of sunshine in a year (1959: 1,393 hr.) than "lat. 68°S." (1965: 1,089 hr.), and its minimum sunshine (1954: 991 hr.) is greater than the minima of all the other stations. The reason for these high sunshine values at Hope Bay is to be found in its position. It is the only station situated on the eastern side of the Antarctic Peninsula which acts as a barrier to depressions and their associated clouds. All the other stations lie either to the west or north of the peninsula and are affected by the depressions passing from the Pacific to the Atlantic through Drake Passage (see, for example, Alt and others (1959), Taljaard and Van Loon (1962, 1963), Davidova (1964) and Taljaard (1964)).

Fig. 2 shows how variable the amount of sunshine is at the stations from year to year. Slight discrepancies in values between Table IV and Fig. 2 are due to the fact that, in the figure,

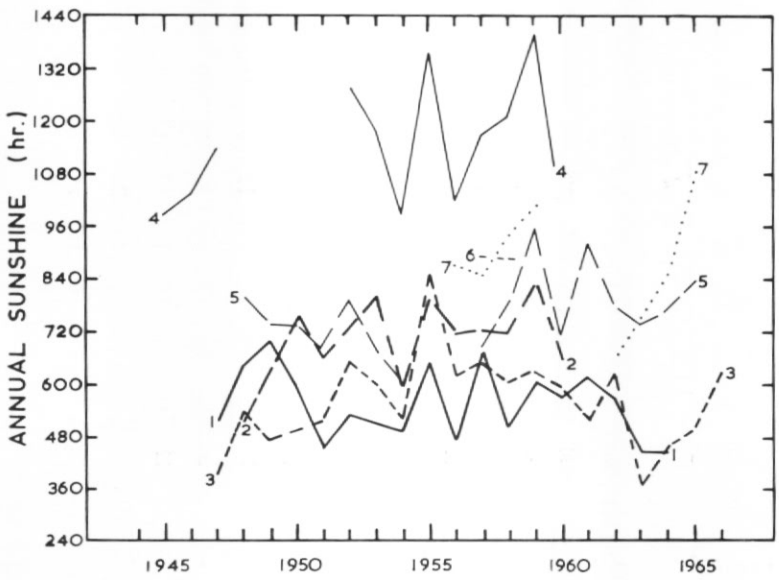

Fig. 2. Annual sunshine (hr.) at seven stations, 1944–66 (for key see Fig. 3).

values for incomplete years have been adjusted and included so that general trends are shown. The adjusted value is calculated by dividing the total sunshine recorded in a year by the number of months for which records were available and multiplying the result by 12.

The curves for all the stations follow the same pattern with Admiralty Bay and Deception Island being out of phase on some occasions. For example, high values were recorded at four stations in 1952 but a year later at Admiralty Bay. Similarly, the low value at Deception Island in 1962 is in contrast to high values at Signy Island and the Argentine Islands. The figure shows that 1952, 1955 and 1957–59 were good years, while 1951, 1954 and 1963–64 were poor years years for sunshine.

Table IV also shows the annual values of relative sunshine. These again show an improvement from north to south with Hope Bay and Admiralty Bay as exceptions. Hope Bay is the only station which records over 25 per cent of its possible sunshine in a year, and Admiralty

TABLE IV. ANNUAL SUNSHINE, 1944–66

Station	1944	1945	1946	1947	1948	1949	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966
											Total sunshine (hr.)												
Laurie Island	506	443	467	396	445	532	413																
Signy Island					643	696		455	529	508	494	648	471	671	505	605	569	613	572	446	448		
Admiralty Bay						634	756	659	736	803	597	817	718	725	719	827	658						
Deception Island					532	475	495	520	653	600	521	868	619	650	574	628	591	521	626	370	455	501	626
Hope Bay			1032							1180	991	1312	994	1168	1207	1393	1094						
Argentine Islands						735		679	792	677	611	881		689	789	952	711	921	785	737	768	834	
Loubet Coast														893	888								
"lat. 68°S."													874	853	944	1008				764	864	1089	
											Relative sunshine (per cent)												
Laurie Island	15	12	16	10	11	14	10																
Signy Island					15	16		10	12	11	11	15	11	15	11	14	13	14	13	10	10		
Admiralty Bay						14	17	15	17	18	13	18	16	16	16	19	15						
Deception Island					12	11	11	12	15	13	12	19	14	15		14	13	12	14	8	10	11	14
Hope Bay			23							26	22	30	23	26	27	31							
Argentine Islands						16		15	18	15	14	20		15	18	21	16	21	17	16	17	19	
Loubet Coast														20	20								
"lat. 68°S."													19	19	21	23							

TABLE V. MEAN RELATIVE SUNSHINE (per cent)

Station	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.	*Summer* Oct.–Mar.	*Winter* Apr.–Sept.	*Year*
A. *Calculated from Table I data*															
Cape Geddes	6·1	4·1	—	16·5	12·8	18·6	13·6	8·4	29·0	16·3	5·0	9·8	(8·3)	17·1	11·6
Signy Island	13·2	11·2	10·0	10·0	9·6	8·3	13·6	18·1	16·5	14·9	13·5	10·3	12·2	13·2	12·6
Admiralty Bay	19·1	17·8	14·0	11·2	5·1	1·1	5·5	14·2	18·8	17·9	21·3	19·6	18·6	10·8	15·9
Deception Island	15·5	15·2	10·8	7·1	2·0	0	0·7	7·4	12·9	15·5	17·7	17·0	15·3	6·2	12·4
Hope Bay	25·8	24·3	25·5	24·1	17·1	16·2	17·3	25·5	32·6	29·2	29·9	25·0	26·6	24·2	26·1
Argentine Islands	19·0	19·1	15·6	14·1	11·6	7·0	9·7	18·9	17·2	16·2	19·5	20·2	18·6	14·6	17·4
Loubet Coast	23·4	26·1	14·3	13·7	17·1	4·8	13·8	15·6	19·3	21·2	13·6	28·1	21·6	16·0	20·6
"lat. 68°S."	23·6	23·3	16·4	18·6	8·7	0	0·4	15·8	16·9	19·4	24·1	23·4	22·2	14·6	20·5
B. *Data from other sources (see text)*															
Laurie Island	9·3	9·8	9·9	10·1	10·8	15·2	13·2	22·5	21·8	17·6	11·2	12·0	11·6	15·6	13·5
Snow Hill Island	20·2	27·3	13·7	28·5	19·9	10·3	14·5	35·4	29·6	28·0	27·1	32·4	24·8	23·0	23·9
Argentine Islands	20·5	—	—	20·4	13·3	16·2	25·0	22·5	23·7	9·4	13·4	15·9	(14·8)	20·2	17·5
Barry Island	31·5	31·8	17·1	20·0	0	0	0	20·3	17·6	33·6	15·8	28·7	26·4	9·7	18·1
C. *Data from Burdecki (1956)*															
Signy Island	15·9	9·4	9·1	9·0	11·9	11·8	14·4	17·2	17·0	15·1	12·8	10·4	12·1	13·5	12·8
Admiralty Bay	19·3	19·0	13·1	10·9	5·9	0·9	3·4	13·3	18·7	15·8	20·5	20·8	18·1	8·9	13·5
Deception Island	15·1	15·7	10·4	7·5	1·5	0	0·7	9·1	12·6	13·6	16·0	15·0	14·3	5·2	9·8
Argentine Islands	19·8	22·3	15·4	13·6	13·0	4·9	5·7	13·5	17·0	15·3	19·3	18·1	18·4	11·3	14·8

Bay generally has values similar to the Argentine Islands, about 3 per cent higher than either Signy Island or Deception Island. It is interesting to compare the various values shown in Table V. Burdecki (1957) did not state the length of time on which his figures were based but they are almost certainly for only 6 or 7 years. This could explain why his values for Admiralty Bay, Deception Island and the Argentine Islands are much lower than those in Table VA. The various sources for Table VB are: Servicio Meteorològico Nacional, Argentina (1951) for Laurie Island (lat. 60°45′S., long. 44°43′W.), Bodman (1908) for Snow Hill Island (lat. 64°22′S., long. 56°50′W.), and Fleming and others (1938) for the Argentine Islands (Winter Island) and Barry Island (lat. 68°08′S., long. 67°06′W.). Apart from Laurie Island, the data are for short periods of up to 2 years. The results of Fleming and others (1938) for the Argentine Islands (April 1935 to January 1936) are very similar to those in Table VA but their results for Barry Island (March 1936 to February 1937) are a little lower than for "lat. 68°S.". Bodman's (1908) Snow Hill Island values (March 1902 to November 1903) compare favourably with those for Hope Bay.

Seasonal sunshine

The distribution of effective sunshine in the summer and winter half years is shown in Table III. In summer there is a general increase from about 300 hr. in the north to 750 hr. in the south with Admiralty Bay and Hope Bay showing variations in this trend. The summer value for Port Lockroy is rather high but it should be remembered that the data were only intermittently recorded. The winter figures do not show any particular latitudinal variation. Similar mean amounts of sunshine (190 hr.) are recorded at Laurie Island, Signy Island, the Argentine Islands and the Loubet Coast. Admiralty Bay and "lat. 68°S." record practically the same amount (158 hr.), although they are separated by 5° of latitude. Hope Bay and Deception Island are again in contrast with 337 hr. and 90 hr., respectively, for the reasons already mentioned.

The effective sunshine in the two parts of the year can also be considered as percentages of the annual amount. In this case three groups of stations can be discerned. First, Laurie Island and Signy Island in the extreme north have 63 per cent in summer and 37 per cent in winter. Secondly, Admiralty Bay and Deception Island receive 78 and 84 per cent of their effective sunshine in summer. This is due to their topographical situations. In summer the Sun's altitude is sufficiently high for most of the day to be above the local relief and sunshine is only lost in early morning and late evening. In winter the local relief assumes a much greater importance with lower solar altitudes. Thirdly, for the remaining stations there is an increase from north to south which is a feature of their latitudinal positions. The percentage of effective sunshine in summer varies from 71 at Hope Bay to 82 at "lat. 68°S.".

Table V gives the mean relative sunshine for the two halves of the year. The data from Burdecki show a lower percentage in both seasons than the data in Table VA. The difference is greater in winter than in summer. For example, for the Argentine Islands, Burdecki's data are only 0·2 per cent lower in summer but 3·3 per cent lower in winter; for Admiralty Bay the figures are 0·5 and 1·9 per cent. For Signy Island, in winter, Burdecki's data are higher than in Table VA. The three short-term stations (Table VB) only show vague similarities with comparable stations in Table VA, while the Laurie Island results show that this station actually receives a higher percentage of relative sunshine in winter. This fact is confirmed by the data for Signy Island and Cape Geddes. All of the stations, except these three in the South Orkney Islands, have more relative sunshine in summer. This is due to the same reasons as those mentioned above in connection with effective sunshine. Deception Island has the greatest seasonal difference in relative sunshine (9·1 per cent more in summer than in winter) and Hope Bay has the smallest difference (2·4 per cent). In summer, Hope Bay, the Loubet Coast and "lat 68°S." receive over 20 per cent of mean relative sunshine, Admiralty Bay and the Argentine Islands receive nearly 19 per cent, Deception Island has 15 per cent and Signy Island has only 12 per cent. In winter, only Hope Bay has over 20 per cent, Deception Island has only 6 per cent and the other stations have between 10 and 17 per cent.

Monthly sunshine

Mean monthly values of effective sunshine are given in Table III and the data for seven

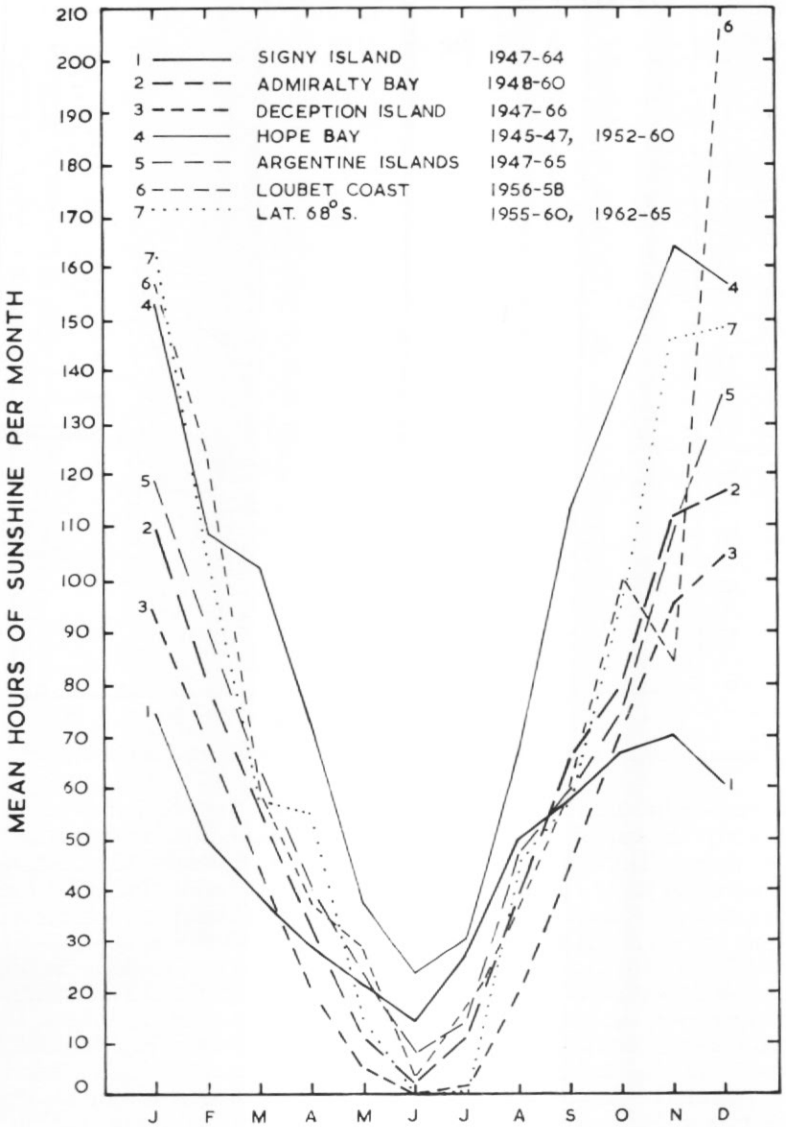

Fig. 3. Mean monthly sunshine (hr.) at seven stations.

stations are illustrated in Fig. 3. Excluding Cape Geddes and Marguerite Bay, for which there are less than 12 months of records, all stations have least sunshine in June. At the majority of stations most sunshine is recorded in December; however, Port Lockroy and Signy Island have a maximum in January, Hope Bay in November and Laurie Island in October. Laurie Island, Signy Island and the Loubet Coast are the only stations where November, December and January are not the 3 sunniest months. At the Loubet Coast, November instead of February is the sunniest month, and at the two South Orkney Islands stations more sunshine is recorded in the spring months of September and October.

There are a number of differences between the shapes of the curves shown in Fig. 3. There is a steady decrease in monthly sunshine from summer to winter at four stations but at the other three (Hope Bay, the Loubet Coast and "lat. 68°S.") the decrease is arrested during the

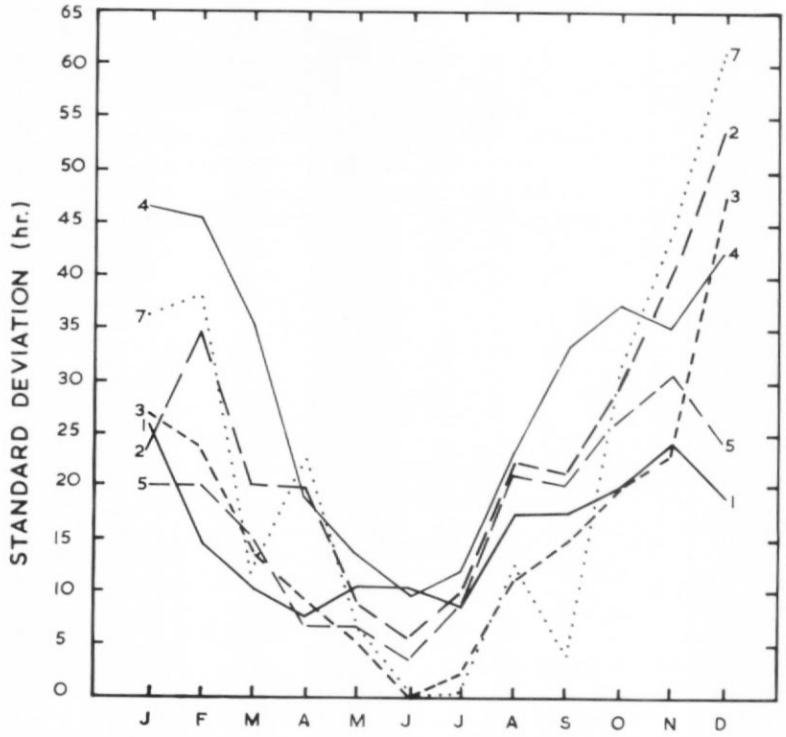

Fig. 4. Standard deviation (hr.) of mean monthly sunshine at six stations (for key see Fig. 3).

autumn. The increase in sunshine from winter to summer is very similar at all of the stations until October when the curves diverge. There is no simple latitudinal variation in sunshine from month to month. Hope Bay has most sunshine in the months March–November. The least sunshine occurs at Signy Island during October–March, and at Deception Island between April and June, and in August and September. In spite of being the southernmost station, "lat. 68°S." only has more sunshine than the other stations in January.

The mean does not give any information on the variability of sunshine in any particular month. The simplest measure of variability is the extreme range, i.e. the difference between the maximum and minimum recorded, but a better one is the standard deviation. The latter has been calculated for seven stations and is shown diagrammatically in Fig. 4. Table VI gives the maximum, minimum and standard deviation for each month for each station except the Loubet Coast. This station was excluded because its $2\frac{1}{2}$ years of records were not representative.

The main feature of Fig. 4 is that the monthly standard deviations are lower in winter than in summer and less variable for the more northerly stations throughout the year. Hope Bay has the highest standard deviations in 8 months of the year, being exceeded by "lat. 68°S." in April, Signy Island in June, the Argentine Islands and "lat. 68°S." in November, and by these two stations and Deception Island in December. "lat. 68°S." has the most complex standard deviations with comparatively high values in February, April, August and December. It is not always the month with the most sunshine that has the highest standard deviation. This does occur at Signy Island, Deception Island and the Argentine Islands, but at the other four stations the sunniest month is not the most variable. Of the three highest standard deviations at each station, the month of December is included for all stations except Signy Island. For Deception Island and Hope Bay, December, January and February are the three most variable months; for the Argentine Islands and "lat. 68°S.", November, December and February are most variable; for the three most northerly stations, October is more variable than February.

TABLE VI. EXTREMES AND STANDARD DEVIATION OF TOTAL SUNSHINE (hr.)

Station	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.
						Maximum						
Laurie Island	87	75	68	59	38	40	48	84	125	115	120	120
Signy Island	126·5	77·1	57·3	41·2	49·0	34·4	40·6	99·1	93·3	105·1	147·5	94·6
Admiralty Bay	159·0	108·5	80·6	49·0	27·9	12·1	35·0	101·5	103·5	138·9	156·6	173·6
Deception Island	151·3	115·4	73·8	53·5	24·8	0	9·3	48·7	82·8	128·7	131·4	229·4
Hope Bay	256·0	187·6	149·7	106·6	53·5	41·1	56·2	115·8	168·2	207·9	227·1	204·6
Argentine Islands	156·7	141·4	98·0	90·0	45·9	22·5	38·1	92·1	112·7	138·7	178·5	233·5
"lat. 68°S."	231·1	173·0	77·3	92·9	29·9	0	1·4	52·2	62·4	150·3	223·5	271·2
						Minimum						
Laurie Island	8	13	2	6	3	0	2	20	29	37	19	18
Signy Island	21·8	24·4	22·9	14·8	3·1	0	12·4	26·3	30·2	27·9	41·7	19·5
Admiralty Bay	85·5	30·8	23·6	22·7	2·8	0	1·2	10·2	31·8	42·7	81·0	68·2
Deception Island	38·1	30·8	23·7	9·9	0	0	0	6·4	15·3	39·1	52·5	34·1
Hope Bay	90·3	36·4	25·6	34·9	15·5	12·0	17·6	34·7	58·7	74·1	116·1	75·0
Argentine Islands	80·7	32·9	29·0	8·4	2·0	1·8	0	8·7	20·1	17·6	49·4	32·2
"lat. 68°S."	126·2	42·7	39·7	21·4	5·7	0	0	10·1	49·7	41·8	96·5	84·8
						Standard deviation						
Laurie Island	20·6	14·1	13·8	10·5	9·1	8·3	10·5	13·9	19·7	19·4	20·4	20·0
Signy Island	25·6	14·5	10·2	7·5	10·5	10·2	8·5	17·3	17·4	19·9	24·3	18·7
Admiralty Bay	20·1	19·9	15·2	6·8	6·8	3·6	8·6	21·2	20·4	26·6	31·0	24·1
Deception Island	26·7	23·6	13·6	9·3	5·2	0	2·3	11·0	14·7	19·8	23·0	47·6
Hope Bay	46·3	45·3	35·3	18·8	13·4	9·6	12·1	23·5	33·3	37·4	35·2	42·5
Argentine Islands	23·5	34·5	20·0	19·6	8·8	5·4	9·5	22·3	21·2	29·6	40·2	53·6
"lat. 68°S."	36·1	38·0	11·7	22·6	7·6	0	0·5	12·7	3·9	30·7	44·1	62·6

The maximum sunshine recorded in a single month was at "lat. 68°S." with 271 hr. in December. In the other 11 months, Hope Bay has the highest maxima. The second largest amount of sunshine in any month was recorded at either "lat. 68°S." or the Argentine Islands from September to April, and at the three northern stations in the winter months. In October and November, maximum values are over 100 hr. at all stations; in December, the four southern stations have recorded over 200 hr. Only Hope Bay and "lat. 68°S." have recorded over 200 hr. in other months. The lowest maximum possible is, of course, 0 hr. This has occurred at Deception Island and "lat. 68°S." in June. These two stations have the lowest recorded maxima from May to September; during the rest of the year they are replaced by the South Orkney Islands stations.

Hope Bay is the only station which has not recorded 0 hr. as the minimum in a month. The other stations have at least 1 month with a minimum of 0 hr. At the Argentine Islands this is July; at Deception Island there are 3 months—May, June and July; at "lat. 68°S." there are 2 months—June and July; at the remaining three northern stations it is only June. From November to April, Laurie Island has the lowest minima; in the 3 winter months Deception

Island has the lowest minima, and in spring Deception Island and the Argentine Islands have recorded the least amount. Signy Island has the second lowest minima from October to March, and the Argentine Islands in April, May, August and September. The highest minima are at Hope Bay from April to November and at "lat. 68°S." in the other 4 months. The second highest minima occur at the same two stations during 6 months of the year but at the Argentine Islands (March and June), Admiralty Bay (April and October) and Signy Island (July and August) for the rest of the year.

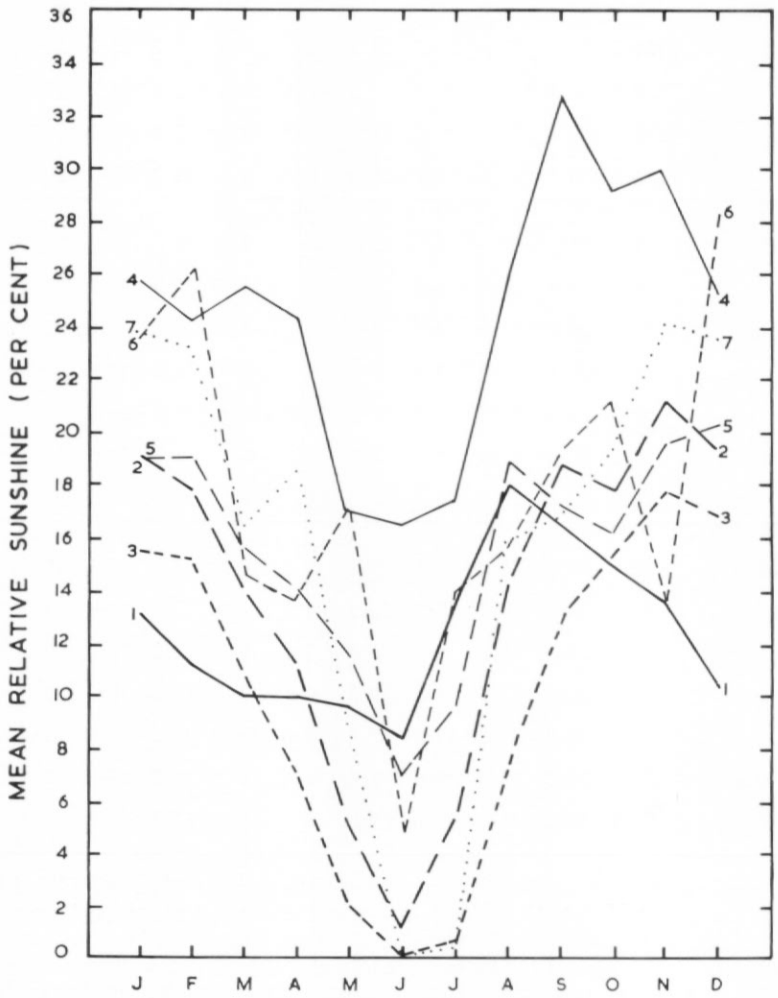

Fig. 5. Mean monthly relative sunshine (per cent) at seven stations (for key see Fig. 3).

The greatest absolute range of monthly sunshine is at the Argentine Islands in December with 201 hr. This is the month with the largest range at all stations except Signy Island (November) and Hope Bay (January). The second largest range occurs in 1 of the other 2 summer months at the other stations, excluding Admiralty Bay (October) and Hope Bay (February). The smallest range occurs at Signy Island or Admiralty Bay between October and April, and at "lat. 68°S." in the other 5 months. June has the smallest range at all stations except those in the South Orkney Islands where it occurs in April or May.

Table V shows the mean relative sunshine for each month and this is plotted in Fig. 5. Only

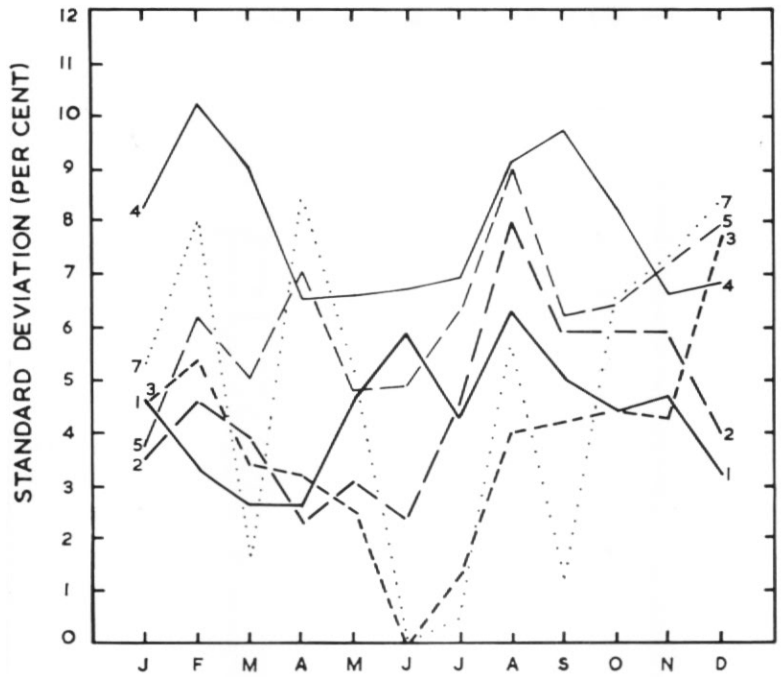

Fig. 6. Standard deviation (per cent) of mean monthly relative sunshine at six stations (for key see Fig. 3).

Laurie Island and Cape Geddes do not have the least relative sunshine in June. The 2 worst months for relative sunshine are June and July at the four southerly stations but May replaces July at Signy Island and Admiralty Bay. Laurie Island contrasts with the other stations in having its lowest relative sunshine in late summer. Admiralty Bay, Deception Island and "lat. 68°S." have most relative sunshine in the 3 summer months. At the two South Orkney Islands stations August to October have most, while at Hope Bay it is late spring and at the Argentine Islands February has more than January. The curves shown in Fig. 5 are more complex than those in Fig. 3. Only Admiralty Bay, Deception Island and the Argentine Islands show a steady decrease from summer to winter. At Signy Island, the curve flattens during March–June, while at Hope Bay and the two southern stations there is an improvement in March, April and May, respectively, before the final decline to June. After mid-winter there is a rapid increase in relative sunshine at all stations to a maximum in spring and early summer. This maximum occurs as a double peak at Admiralty Bay, the Argentine Islands and the Loubet Coast. Hope Bay has most relative sunshine in all months except December and February, when the Loubet Coast has most. Signy Island has least relative sunshine in the same months as it has least effective sunshine.

Fig. 6 shows that the standard deviation for relative sunshine is highly variable throughout the year without any particular seasonal trend. At most stations, February and August have high standard deviations. The high values are later in the spring at Hope Bay and Deception Island.

A comparison of the monthly values between the three sets of data given in Table V shows general agreement. A Student's "*t*" test was carried out between the four stations quoted by Burdecki and the same four stations in Table VA. No significant difference was found at the 10 per cent level. Similarly, there was no significant difference between Laurie Island (Table VB) and Signy Island (Table VA). The values in Table VC were subtracted from those in Table VA to obtain a positive or negative difference. For Admiralty Bay and Deception Island this difference was positive for 8 months, and for the Argentine Islands for 9 months. Signy Island showed a negative difference, i.e. Burdecki's values are higher, in 7 months. In January

(negative), March and November (both positive), the sign of the difference was the same at all stations. If Signy Island is excluded, then in 8 months all stations have the same sign. The magnitude of the difference, ignoring the sign, shows that Deception Island has 8 months with a difference of less than 0·6 per cent, Admiralty Bay and the Argentine Islands have 4 months and Signy Island 3 months. The Argentine Islands have 6 months with a difference of over 1·0 per cent and the other three stations have 4 months.

Differences were also calculated by subtracting the values quoted by Fleming and others and Bodman from the values for equivalent stations in Table VA. Naturally, the agreement was poorer because the three stations had very short periods of observations. Snow Hill Island had a positive difference, i.e. it had less relative sunshine in the short period, compared with Hope Bay in 7 months of the year. At the Argentine Islands, October, November and December had positive differences and at Barry Island positive differences occurred in May, July and November. Ignoring the sign, the differences were large and only Barry Island had

TABLE VII. EXTREMES AND STANDARD DEVIATION OF RELATIVE SUNSHINE (per cent)

Station	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.
						Maximum						
Laurie Island	17	19	20	24	24	62	35	43	41	29	25	23
Signy Island	22·6	17·8	14·6	14·0	21·7	19·9	20·2	36·3	27·0	23·6	28·6	16·1
Admiralty Bay	27·8	24·8	20·5	16·8	12·9	7·6	18·5	37·9	30·0	30·9	29·8	28·7
Deception Island	25·8	26·0	18·7	18·5	12·0	0	5·2	18·1	24·0	28·6	24·5	36·8
Hope Bay	44·8	42·1	37·9	37·2	26·1	29·1	32·2	44·5	49·0	45·7	42·3	32·5
Argentine Islands	25·2	31·0	24·7	32·1	24·8	20·4	25·5	37·0	32·9	30·0	31·9	34·3
"lat. 68°S."	33·5	36·4	19·3	34·5	20·0	0	1·6	22·7	18·4	31·7	36·8	36·5
						Minimum						
Laurie Island	2	3	1	2	2	0	1	10	10	9	4	3
Signy Island	3·9	5·6	5·8	5·0	1·4	0	6·2	9·6	8·7	6·3	8·1	3·3
Admiralty Bay	15·0	7·0	6·0	7·8	1·3	0	0·6	3·8	9·2	9·5	9·8	11·3
Deception Island	6·5	6·9	6·0	3·4	0	0	0	2·4	4·4	8·6	9·8	5·5
Hope Bay	15·3	8·2	6·5	12·2	7·6	8·5	10·1	13·3	17·1	16·3	21·6	11·9
Argentine Islands	13·0	7·2	7·3	3·0	1·1	1·6	0	3·5	5·9	3·8	8·8	4·7
"lat. 68°S."	18·3	9·0	9·9	8·0	3·8	0	0	4·4	14·6	8·8	15·9	11·4
						Standard deviation						
Laurie Ialand	4·0	3·6	4·0	4·3	5·8	12·9	7·3	7·2	6·5	4·9	4·2	2·5
Signy Island	4·6	3·3	2·6	2·6	4·7	5·9	4·2	6·3	5·0	4·4	4·7	3·2
Admiralty Bay	3·5	4·6	3·9	2·3	3·1	2·3	4·5	8·0	5·9	5·9	5·9	4·0
Deception Island	4·5	5·4	3·4	3·2	2·5	0	1·3	4·0	4·2	4·4	4·3	7·6
Hope Bay	8·3	10·2	9·0	6·5	6·6	6·7	6·9	9·1	9·7	8·2	6·6	6·8
Argentine Islands	3·8	6·2	5·0	7·0	4·8	4·9	6·3	9·0	6·2	6·4	7·2	7·9
"lat. 68°S."	5·3	8·0	1·6	8·4	5·1	0	0·5	5·6	1·2	6·5	7·3	8·4

TABLE VIII. MEAN FREQUENCY OF SUNSHINE DURATION (days)

Station	*Number of months*	*Daily duration* (hr.)																								
		0	0·1–1·0	1·1–2·0	2·1–3·0	3·1–4·0	4·1–5·0	5·1–6·0	6·1–7·0	7·1–8·0	8·1–9·0	9·1–10·0	10·1–11·0	11·1–12·0	12·1–13·0	13·1–14·0	14·1–15·0	15·1–16·0	16·1–17·0	17·1–18·0	18·1–19·0	19·1–20·0	20·1–21·0	21·1–22·0	22·1–23·0	23·1–24·0
		Summer (October–March)																								
Signy Island	60	63·5	41·4	17·6	13·8	12·3	7·6	7·6	5·1	3·7	2·8	2·4	1·4	0·8	0·4	0·5	0·6	0·4	0·1							
Admiralty Bay	35	49·3	24·4	18·2	20·1	11·8	10·8	9·1	9·6	6·2	6·5	5·1	3·8	2·2	1·9	1·9	0·9	0·2								
Deception Island	63	58·0	34·4	18·2	14·5	11·5	9·7	7·3	6·2	3·2	5·1	5·1	2·8	2·2	1·3	1·0	0·9	0·3	0·3							
Hope Bay	33	52·1	13·8	10·7	8·2	10·5	8·5	10·9	8·7	7·3	9·5	7·3	6·7	6·9	7·6	5·3	3·5	3·8	0·7							
Argentine Islands	65	69·8	27·2	12·1	10·0	9·1	6·8	5·2	4·9	5·1	4·5	3·2	5·2	4·7	3·8	2·4	2·1	2·2	1·7	1·2	0·6	0·2				
Loubet Coast	15	71·1	20·3	12·0	10·7	5·1	6·7	3·5	7·5	6·0	2·3	5·5	3·1	6·7	4·4	4·0	4·4	2·4	2·4	1·5	2·0	0·4				
"lat. 68°S."	48	48·8	28·8	13·6	15·6	8·3	9·3	6·8	5·5	6·5	5·3	4·5	5·3	3·5	4·0	3·7	2·4	3·7	1·5	1·1	1·0	1·6	0·3	0·4	0·4	0·1
		Winter (April–September)																								
Signy Island	60	104·0	28·0	16·3	9·4	8·0	5·9	4·3	3·0	2·0	0·9	0·7	0·3	0·1	0·1											
Admiralty Bay	36	117·5	20·7	16·7	8·3	6·0	3·3	4·2	3·5	1·8	0·3	0·7														
Deception Island	64	141·0	16·7	9·9	5·8	3·7	2·2	1·8	0·9	0·6	0·2	0·2														
Hope Bay	31	95·9	14·9	14·3	10·8	11·2	8·9	7·0	7·4	5·0	3·5	2·9	1·2													
Argentine Islands	62	112·2	21·4	10·9	10·4	6·9	5·1	5·7	4·2	2·8	2·0	0·9	0·2	0·3												
Loubet Coast	15	122·1	20·1	6·1	8·9	8·4	4·0	4·0	3·2	2·4	1·6	1·6	0	0·8												
"lat. 68°S."	48	127·3	16·0	10·5	7·5	4·7	5·4	5·3	2·9	2·0	0·9	0·4	0·1													
		Year																								
Signy Island	120	167·5	69·4	33·9	23·2	20·3	13·5	11·9	8·1	5·7	3·7	3·1	1·7	0·9	0·5	0·5	0·6	0·4	0·1							
Admiralty Bay	71	166·8	45·1	34·9	28·4	17·8	14·1	16·3	13·1	8·0	6·8	5·8	3·8	2·2	1·9	1·9	0·9	0·2								
Deception Island	127	199·0	51·1	28·1	20·3	15·2	11·9	9·1	7·1	3·8	5·3	5·3	2·8	2·2	1·3	1·0	0·9	0·3	0·3							
Hope Bay	64	148·0	28·7	25·0	19·0	21·7	17·4	17·9	16·1	12·3	13·0	10·2	7·9	6·9	7·6	5·3	3·5	3·8	0·7							
Argentine Islands	127	182·0	48·6	23·0	20·4	16·0	11·9	10·9	9·1	7·9	6·5	4·1	5·4	5·0	3·8	2·4	2·1	2·2	1·7	1·2	0·6	0·2				
Loubet Coast	30	193·0	40·4	18·1	19·6	13·5	10·7	7·5	10·7	8·4	3·9	7·1	3·1	7·5	4·4	4·0	4·4	2·4	2·4	1·5	2·0	0·4				
"lat. 68°S."	96	176·1	44·8	24·1	23·1	13·0	14·7	12·1	8·4	8·5	6·2	4·9	5·4	3·5	4·0	3·7	2·4	3·7	1·5	1·1	1·0	1·6	0·3	0·4	0·4	0·1

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Argentine Islands 9 months, the Loubet Coast 6 months, and "lat. 68°S." 6 months. Within the 2 hr. limit, the number of months at each station is: Signy Island 5, Admiralty Bay 6, Hope Bay 9, the Argentine Islands 11, the Loubet Coast 8 and "lat. 68°S." 10. The main conclusion is that at the four southern stations the theoretically possible sunshine can be obtained in any month of the year but it is least likely in the summer.

Diurnal variation of sunshine

Hourly records of sunshine were used to analyse the diurnal variation of sunshine. The results are based on the following periods for each station:

Laurie Island	1929–48 (Servicio Meteorològico Nacional, Argentina, 1951, table IX)
Signy Island	January 1955–December 1964
Admiralty Bay	January 1955–December 1960
Deception Island	January 1955–December 1966, excluding 1962
Hope Bay	January 1955–December 1960
Snow Hill Island	April 1902–October 1903 (Bodman, 1908, table VI)
Argentine Islands	January 1955–December 1965
Loubet Coast	November 1956–December 1958
"lat. 68°S."	September 1955–February 1960, May 1962–December 1965.

The total sunshine recorded at each hour of the day in each month was summed and divided by the product of the number of months and the number of days in the month to obtain the mean amount of sunshine in each hour of the day for each month (unit = hr.). The monthly mean diurnal variation so calculated is given in Table X for seven stations and the seasonal mean diurnal variation is given in Table XI for nine stations. The results are rather complex and so the data from Table XI are presented in Fig. 9.

Hope Bay has most sunshine during the greater part of the day in all seasons. In autumn, Snow Hill Island has a greater amount for 1 hr., otherwise the Hope Bay hourly values are only exceeded by other stations in individual months—by the Loubet Coast in December, February and August. "lat. 68°S." has the second largest amount during most of the day in summer but in the other three seasons it is displaced by Snow Hill Island. The least sunshine occurs at Laurie Island in summer and autumn, and at Deception Island in winter and spring. Low hourly values also occur at Signy Island in summer and at Deception Island in autumn.

Winter is the simplest season, although the stations do not show a strictly latitudinal variation. The Loubet Coast and the Argentine Islands have hourly values almost as high as Signy Island and higher than both Admiralty Bay and Deception Island which are 3° of latitude to the north. Highest values are recorded at 11–12 hr. at Signy Island, Admiralty Bay and "lat. 68°S.", an hour later at the other stations except Laurie Island when the peak occurs at 13–14 hr. In July, Signy Island has more sunshine than Hope Bay in the morning and only slightly less in the afternoon. The earliest records of sunshine occur at 8–9 hr. at all stations except "lat. 68°S." (9–10 hr.) and Deception Island (10–11 hr.). Most stations cease recording at 15–16 hr.; Deception Island ceases an hour earlier and Laurie Island an hour later.

Spring and autumn are again rather dissimilar. There is a much wider spread in the station curves in autumn. Admiralty Bay is the only station without a peak between 11 and 14 hr. in spring. In autumn, this station, the Argentine Islands and the Loubet Coast have peaks between 8 and 11 hr. Earliest records are generally at 4–5 hr. in both seasons; it is much later at Snow Hill Island and a little earlier at Hope Bay in spring, "lat. 68°S." and the Argentine Islands in autumn. Latest records are generally at 19–20 hr., an hour earlier at Laurie Island (both seasons) and an hour later at "lat. 68°S." (both seasons), the Argentine Islands (spring) and the Loubet Coast (autumn). At all stations, spring values exceed autumn values from mid-morning to mid-afternoon. At Signy Island, spring values also exceed summer values from 9 to 14 hr. "lat. 68°S." is an exception in having higher autumn values. The autumn curves damp out a number of variations found at some stations in February and March. Three maxima occur at the Loubet Coast (8–9, 13–14 and 15–18 hr.), two at the Argentine Islands (10–11 and 14–15 hr.) and Admiralty Bay (10–11 hr. and in the afternoon), while the other stations have a more irregular shape. In April the curves are far more regular.

In both winter and spring, the curves have a "Gaussian" or "normal" shape but in summer

has the longest period of sunshine recorded—5 days in 6 years with over 16 hr. All 3 summer months have over 45 days in the same period with more than 10 hr. Like Deception Island, at Hope Bay there is a slightly higher value for no sunshine in July than in June.

The three southern stations show fewer variations. The Loubet Coast has a more complex pattern than the other two but this is a result of the short period of observation. There is an absence of days in the first 3 months of the year with a duration of 10·1 to 11·0 hr. sunshine, but they have several days of longer duration. Both December and January have days exceeding 16 hr. sunshine, while February has more days of over 12 hr. than October. June stands out from the other months with its average of 28·5 days without sunshine compared with an average of 20 days in April, May, July and August. None of the other stations have such a sunless June when compared with their other winter months.

The Argentine Islands are similar to Hope Bay with a more even distribution of days in each duration period; they differ in having more days per month without sunshine. January has had the longest duration when on 2 days in 11 years over 19 hr. was recorded. Over 18 hr. has been received in November (1 day) and December (6 days). A comparison between March and September shows that the autumn month has recorded the longest duration but the spring month has more days of over 4 hr. duration—an average of 6·6 days as opposed to 5·7 days.

9 years of records were used for "lat. 68°S.", the only station to record over 23 hr. in a day. January and November have had 2 days with over 20 hr. and December has had 4 days. This is the most symmetrical diagram of the seven with a rapid and fairly even increase from June to both January and December. Because of its latitude, no sunshine is recorded in June, less than 1 hr. duration in July but up to 5 hr. in May.

These seven diagrams give a general impression that at all stations there are more days with small sunshine durations in autumn, whereas in spring the days tend to have a longer duration. Of the 3 summer months, November and December usually have more sunshine than January. It is the latter month which has the longest duration at Signy Island and the Argentine Islands. In winter, June is always the least sunny and May tends to be sunnier than July. Since mid-summer and mid-winter are in the third week of December and June, it is not surprising that May and November do better than January and July.

It is interesting to compare the data on the diagrams with the mean duration of theoretical sunshine given in Table II. This shows how often relative sunshine of 100 per cent is likely to be obtained. Two criteria may be considered: duration within 1 or 2 hr. of the mean value. The results are shown in Table IX. Deception Island has not recorded sunshine at either level. The remaining six stations have recorded sunshine to within 1 hr. of the monthly mean theoretical sunshine in August, and four of them have done so in June. Signy Island and "lat. 68°S." are the only two stations which are not within the 1 hr. limit in May and July. In March, September and October, five stations are within the 2 hr. limit, Signy Island or Admiralty Bay or "lat. 68°S." being the exceptions. Put in another way, one finds that within the 1 hr. limit Signy Island has 4 months, Admiralty Bay 3 months, Hope Bay 6 months, the

TABLE IX. MONTHS IN WHICH RECORDED SUNSHINE IS WITHIN 1 hr. [x] OR 2 hr. [(x)] OF THE MEAN THEORETICAL DURATION

Station	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.
Signy Island						x	x	x	x	(x)		
Admiralty Bay			(x)		x	(x)	x	x		(x)		
Deception Island												
Hope Bay		(x)	x	x	x	x	x	x	(x)	(x)		
Argentine Islands	(x)	(x)	x	x	x	x	x	x	x	x	x	
Loubet Coast			(x)	x	x	x	x	x	x	(x)		
"lat. 68°S."	(x)	(x)	x	x	x	(x)		x	(x)		x	x

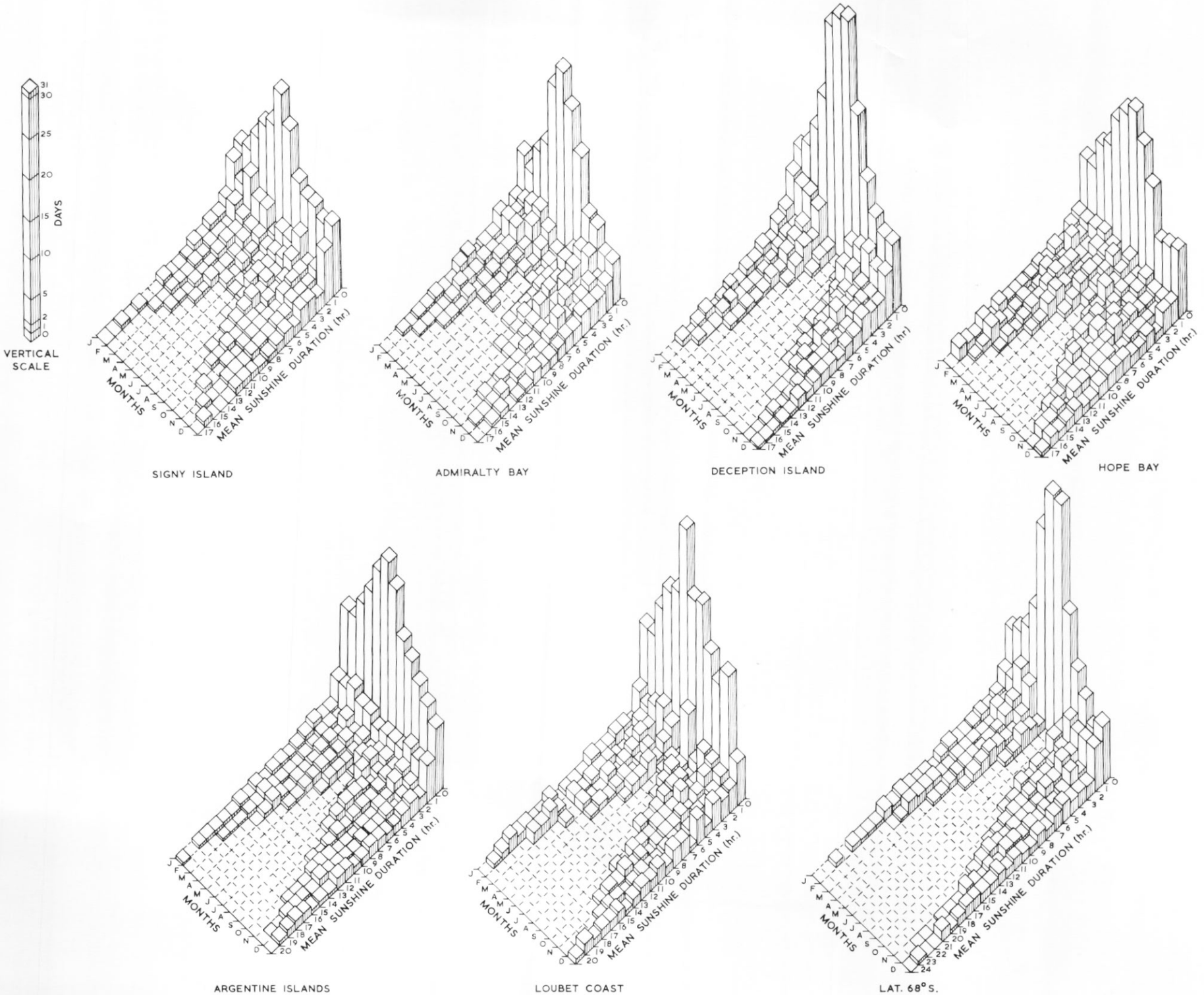

Fig. 8. Stereograms showing the number of days in each month with specified sunshine durations at seven stations.

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divided into three groups. Hope Bay has more days with a longer duration than the others up to 12 hr. duration, when it joins the second group comprising "lat. 68°S.", the Loubet Coast and the Argentine Islands. Admiralty Bay is similar to this second group up to 5 hr. duration after which its curve takes on the shape of Signy Island and Deception Island. Only Deception Island and the Loubet Coast have over 50 per cent of the year with no sunshine. Hope Bay has about 40 per cent and the other stations between 45 and 50 per cent.

In the summer half-year no sunshine is recorded at any of the stations on at least 25 per cent of the days. "lat. 68°S." has the smallest number of sunless days and it is closely followed by Admiralty Bay and Hope Bay. These three have 70 per cent of days with some sunshine, whereas the Argentine Islands and the Loubet Coast have around 60 per cent. Only Hope Bay has 50 per cent of days with a duration of up to 4 hr.; at the other stations the 50 per cent level is reached at durations of up to 2 hr. The length of duration increases from north to south but only "lat. 68°S." has recorded up to 24 hr. sunshine during the summer. The longest duration at the Loubet Coast and the Argentine Islands is 20 hr.; at Hope Bay, Deception Island and Signy Island, 17 hr.; at Admiralty Bay, 16 hr. The three northerly stations have 99 per cent of the days with less than 14 hr. duration, Hope Bay and the Argentine Islands with less than 18 hr., and the two southerly stations less than 20 hr.

In winter all stations show no sunshine record on over 50 per cent of the days. Deception Island has the largest number of sunless days because of its topography, and Hope Bay has the least. The longest duration does not show a latitudinal variation because, although Signy Island has recorded up to 13 hr., the Argentine Islands and the Loubet Coast have recorded up to 12 hr. Admiralty Bay and Deception Island show the shortest duration—up to 10 hr.

The diagrams in Fig. 8 are bivariate frequency polygons or stereograms. They show the monthly mean frequencies of sunshine duration for each station. In these diagrams the figures for duration indicate the upper limit, i.e. 1 hr. means those days when 0·1 to 1·0 hr. of sunshine was recorded, 2 hr. means those days with a duration of 1·1 to 2·0 hr., etc. The years on which the diagrams are based are as follows:

Signy Island	1955–64	Argentine Islands	1955–65
Admiralty Bay	1955–60	Loubet Coast	1956–58
Deception Island	1956–66	"lat. 68°S."	1955–59, 1962–65
Hope Bay	1955–60		

A general discussion of Fig. 8 is unnecessary as the main points have already been mentioned. They do show, however, differences in detail at individual stations. At Signy Island, the longest duration occurs in January when 1 day in the 10 years examined had over 16 hr. More days of over 10 hr. occur in October (9), November (10) and December (11). In these 4 months there is a break between the longest days and the remainder. This break is between 11 and 13 hr. in January, 12 and 13 hr. in October, 13 and 14 hr. in November, 13 and 15 hr. in December. There are more days of longer duration between June and December than between December and June. In a four-season year, autumn has more days with a short duration than spring.

The diagram for Admiralty Bay shows that the longest duration is in November (over 15 hr.), that July is sunnier than May, and that March with 11 days in 6 years has more days with over 8 hr. sunshine than September (4 days). In contrast to this, more days tend to have a shorter duration in autumn, when there is a concentration between 1 and 3 hr., than in spring when the concentration is between 2 and 6 hr.

At Deception Island the topographic effect stands out particularly clearly in the 3 winter months when the maximum duration is only 3 hr. in May, 2 hr. in July and 0 hr. in June. In fact, May has 11 days, June 30 days and July 22 days when the Sun is below the local horizon. Because there is one more day in July than in June, it has a slightly higher value for no sunshine. Both November and December have days recorded with over 16 hr. sunshine but January has not reached 15 hr. Late spring days average a longer duration than early autum days, although in autumn there is a double concentration at 1 to 4 hr. and 9 to 11 hr.; in spring the concentration is mainly at 4 to 8 hr.

Hope Bay differs from the other stations in its small number of days with no sunshine in each month and the much more even distribution of days for each duration period. December

values of less than 1·0 per cent in 4 months. The highest differences were at Hope Bay in March, the Argentine Islands in July, and Barry Island in October.

Table VII gives the extremes and standard deviation for relative sunshine. The highest relative sunshine was 62 per cent at Laurie Island in June but this was the only time when over half the possible sunshine in a month was recorded. Laurie Island has also reported the highest relative sunshine in July. In December the highest value was at Deception Island and in the other 9 months it was at Hope Bay. Only two stations, Laurie Island and Hope Bay, recorded over 40 per cent in a month. The lowest maxima of relative sunshine are for the same stations as those of effective sunshine except that Signy Island replaces Laurie Island in February. The highest and lowest minima are similarly the same stations as for effective sunshine.

The same is true for the absolute range of relative sunshine for 9 months of the year. In May, the Argentine Islands replace Signy Island, and in December the Argentine Islands are replaced by Deception Island in having a greater range. August shows the greatest range at Signy Island, Admiralty Bay and the Argentine Islands. At the other stations there is variation in the month: June (Laurie Island), December (Deception Island), February (Hope Bay) and April ("lat. 68°S."). The smallest range is in June only at Admiralty Bay, Deception Island and "lat. 68°S."; it is in January at Laurie Island and the Argentine Islands, March at Signy Island, and May at Hope Bay.

Duration of sunshine

In Table VIII the mean frequency of sunshine duration is tabulated for the year, and for the summer and winter half-years for seven stations. The annual mean frequency of sunshine is shown in Fig. 7 as a cumulative frequency curve for each station. From this the number of

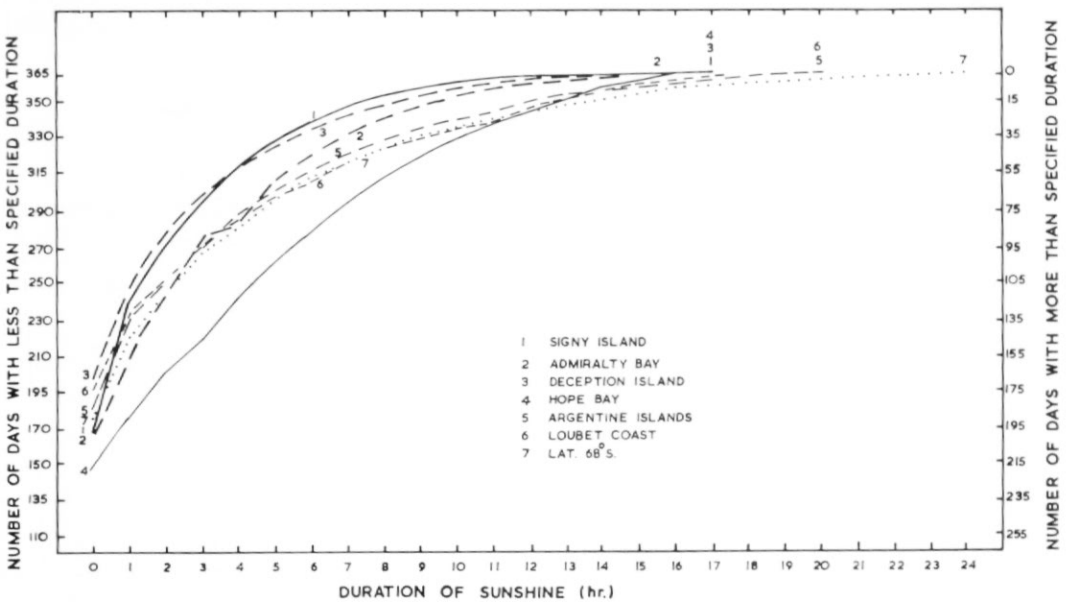

Fig. 7. Annual cumulative frequency curves of the duration of sunshine (hr.) at seven stations.

days per year with a specified duration can be obtained. For example, in a year 8 hr. or more of sunshine can be expected on 58 days at Hope Bay, 41 days at "lat. 68°S." and the Loubet Coast, 37 days at the Argentine Islands, 25 days at Admiralty Bay, 19 days at Deception Island and 12 days at Signy Island. Similarly, the number of days per year with less than 4 hr. are 242 at Hope Bay, 282 at "lat. 68°S." and Admiralty Bay, 285 at the Loubet Coast, 288 at the Argentine Islands and 313 at Deception Island and Signy Island. The stations can be

TABLE X. MONTHLY MEAN DIURNAL VARIATION OF SUNSHINE

Station	Month	Local apparent time																						
		0–	1–	2–	3–	4–	5–	6–	7–	8–	9–	10–	11–	12–	13–	14–	15–	16–	17–	18–	19–	20–	21–	22–	23–
Signy Island	Jan.			·00	·02	·06	·09	·12	·15	·15	·16	·17	·18	·19	·18	·17	·15	·13	·11	·07	·03	·00			
	Feb.					·01	·05	·07	·09	·11	·17	·19	·19	·19	·22	·19	·16	·15	·10	·05	·01				
	Mar.						·00	·02	·06	·11	·14	·17	·16	·16	·16	·15	·11	·07	·02	·00					
	Apr.								·01	·06	·13	·14	·15	·17	·15	·12	·07	·02	·00						
	May									·00	·05	·12	·14	·12	·09	·04	·01								
	Jun.										·01	·08	·11	·10	·05	·01									
	Jul.									·00	·05	·18	·22	·21	·18	·04	·01								
	Aug.							·00	·02	·11	·21	·26	·25	·26	·25	·19	·09	·02							
	Sep.						·00	·03	·10	·14	·19	·23	·22	·22	·21	·19	·16	·09	·02						
	Oct.					·01	·06	·09	·12	·15	·18	·22	·23	·22	·21	·19	·16	·16	·09	·02					
	Nov.				·00	·04	·08	·10	·14	·16	·18	·22	·25	·23	·22	·19	·18	·15	·12	·08	·02				
	Dec.			·00	·01	·06	·07	·10	·12	·13	·17	·18	·19	·19	·18	·15	·14	·11	·09	·09	·06	·01			
Admiralty Bay	Jan.				·02	·05	·11	·16	·21	·26	·29	·30	·31	·27	·26	·23	·26	·23	·27	·22	·14	·03	·01		
	Feb.					·01	·07	·14	·19	·23	·27	·28	·26	·25	·24	·22	·23	·25	·21	·09	·01				
	Mar.						·01	·05	·12	·16	·19	·21	·20	·21	·23	·22	·15	·12	·03						
	Apr.								·01	·07	·12	·19	·16	·16	·15	·14	·02								
	May									·00	·02	·07	·09	·08	·04	·01	·00								
	Jun.										·01	·02	·02	·02	·01	·00									
	Jul.									·00	·01	·07	·15	·16	·05	·02	·01								
	Aug.								·01	·08	·15	·21	·22	·23	·23	·12	·03	·01							
	Sep.							·02	·13	·23	·30	·31	·30	·26	·26	·24	·06	·03							
	Oct.					·00	·07	·15	·17	·21	·25	·27	·27	·29	·29	·29	·27	·25	·16	·05	·00				
	Nov.					·07	·15	·21	·23	·26	·26	·28	·27	·25	·28	·29	·28	·29	·28	·26	·12	·01			
	Dec.				·00	·01	·03	·12	·20	·27	·31	·31	·31	·31	·34	·35	·34	·32	·27	·23	·10	·03	·01		
Deception Island	Jan.				·01	·05	·08	·12	·15	·17	·20	·24	·24	·25	·26	·24	·23	·23	·22	·16	·08	·01			
	Feb.					·01	·06	·11	·14	·18	·21	·20	·21	·21	·22	·22	·21	·21	·18	·12	·02				
	Mar.							·00	·05	·10	·14	·15	·17	·17	·17	·17	·17	·10	·04	·00					
	Apr.									·00	·05	·08	·09	·12	·13	·11	·08	·01							
	May											·00	·01	·04	·03	·01									
	Jun.																								
	Jul.												·00	·01	·01										
	Aug.										·02	·06	·11	·14	·13	·08	·04	·00							
	Sep.								·00	·06	·16	·17	·20	·20	·21	·21	·18	·08	·01						
	Oct.					·00	·03	·07	·13	·17	·19	·22	·23	·24	·25	·26	·25	·19	·14	·06	·00				
	Nov.				·00	·03	·09	·13	·17	·20	·21	·25	·28	·27	·27	·29	·27	·28	·23	·19	·07	·00			
	Dec.				·02	·09	·12	·15	·19	·22	·28	·30	·31	·32	·31	·29	·29	·28	·23	·21	·16	·03			
Hope Bay	Jan.				·00	·14	·25	·29	·34	·36	·36	·37	·40	·38	·39	·40	·41	·40	·37	·33	·24	·02	·00		
	Feb.					·01	·17	·28	·30	·32	·32	·35	·33	·37	·33	·32	·32	·32	·30	·21	·01				
	Mar.						·00	·09	·21	·27	·29	·29	·31	·30	·30	·31	·29	·24	·14	·01					
	Apr.							·01	·06	·19	·24	·27	·29	·30	·31	·27	·21	·06	·01						
	May									·01	·11	·21	·26	·26	·25	·14	·01								
	Jun.										·01	·15	·24	·25	·12	·01									
	Jul.									·00	·05	·16	·22	·21	·19	·06									
	Aug.								·01	·12	·25	·31	·32	·32	·32	·31	·17	·01							
	Sep.							·02	·18	·28	·31	·35	·38	·39	·39	·36	·35	·28	·06						
	Oct.					·00	·08	·21	·29	·37	·37	·39	·45	·44	·43	·41	·39	·37	·30	·13	·01				
	Nov.					·08	·27	·33	·37	·37	·41	·44	·41	·41	·42	·42	·42	·38	·37	·35	·20	·01			
	Dec.				·01	·21	·26	·24	·32	·34	·35	·38	·39	·37	·37	·40	·42	·40	·39	·37	·32	·05			
Argentine Islands	Jan.			·00	·05	·10	·15	·18	·22	·23	·23	·24	·25	·26	·27	·26	·23	·23	·23	·19	·16	·11	·03		
	Feb.				·00	·03	·10	·15	·19	·21	·23	·25	·24	·22	·22	·24	·25	·22	·19	·15	·06				
	Mar.						·00	·06	·12	·15	·17	·19	·19	·20	·20	·20	·19	·15	·07	·01	·00				
	Apr.								·02	·11	·14	·20	·19	·15	·15	·13	·09	·04	·00						
	May									·00	·05	·10	·13	·13	·09	·07	·01								
	Jun.											·03	·08	·09	·03										
	Jul.										·01	·10	·18	·20	·12	·02									
	Aug.								·01	·07	·21	·29	·29	·29	·27	·25	·15	·03							
	Sep.						·00	·02	·07	·15	·20	·22	·23	·24	·25	·24	·20	·13	·05	·01	·00				
	Oct.					·01	·06	·13	·17	·20	·22	·24	·24	·25	·25	·22	·21	·19	·15	·09	·02	·00			
	Nov.				·03	·09	·14	·18	·23	·23	·26	·28	·28	·28	·28	·29	·29	·29	·24	·21	·15	·06	·01		
	Dec.			·01	·09	·16	·21	·25	·28	·30	·30	·33	·34	·34	·33	·32	·31	·29	·27	·27	·24	·19	·07	·01	
Loubet Coast	Jan.				·05	·14	·19	·21	·25	·28	·27	·32	·33	·33	·35	·35	·32	·35	·36	·35	·31	·22	·05	·01	
	Feb.					·03	·18	·24	·32	·34	·34	·30	·31	·32	·35	·29	·30	·32	·33	·29	·11	·01			
	Mar.						·01	·06	·12	·21	·19	·20	·15	·15	·17	·14	·19	·17	·10	·00					
	Apr.							·03	·10	·17	·17	·18	·16	·16	·14	·11	·05								
	May									·00	·07	·16	·18	·18	·16	·14	·02								
	Jun.												·03	·05	·01										
	Jul.											·04	·15	·17	·09	·02									
	Aug.									·02	·11	·20	·26	·33	·29	·23	·17	·05							
	Sep.							·03	·05	·11	·13	·15	·16	·21	·23	·21	·19	·15	·04						
	Oct.					·01	·11	·21	·26	·26	·27	·29	·30	·31	·33	·32	·31	·29	·24	·15	·06				
	Nov.				·02	·06	·09	·11	·16	·16	·18	·21	·20	·19	·21	·20	·21	·21	·21	·20	·16	·08	·01		
	Dec.	·00	·00	·00	·17	·23	·29	·32	·35	·36	·40	·42	·46	·46	·47	·43	·45	·42	·40	·35	·29	·24	·12	·03	·01
"lat. 68°S."	Jan.	·01	·02	·04	·13	·17	·21	·27	·29	·31	·34	·35	·34	·35	·34	·33	·32	·31	·29	·27	·23	·17	·11	·03	·01
	Feb.				·00	·01	·10	·21	·26	·29	·27	·29	·32	·36	·35	·33	·31	·30	·28	·20	·08	·02			
	Mar.						·00	·04	·13	·19	·22	·23	·25	·25	·22	·18	·17	·13	·09	·02					
	Apr.								·00	·11	·24	·27	·27	·27	·23	·17	·09	·02							
	May										·02	·08	·12	·11	·07	·02	·00								
	Jun.																								
	Jul.											·00	·01	·00	·00	·00									
	Aug.									·02	·12	·20	·22	·22	·21	·15	·04	·01							
	Sep.							·01	·06	·14	·23	·26	·26	·26	·25	·21	·15	·07	·02	·00					
	Oct.					·00	·03	·11	·16	·21	·24	·28	·30	·30	·29	·27	·26	·23	·17	·10	·03	·00			
	Nov.		·00	·01	·06	·12	·19	·26	·27	·30	·33	·35	·34	·35	·37	·35	·35	·33	·28	·24	·16	·11	·03	·01	·00
	Dec.	·03	·04	·05	·14	·20	·25	·27	·31	·32	·33	·35	·39	·39	·37	·33	·32	·33	·32	·28	·23	·15	·13	·07	·03

A value of ·00 indicates that sunshine has been recorded in that hour.

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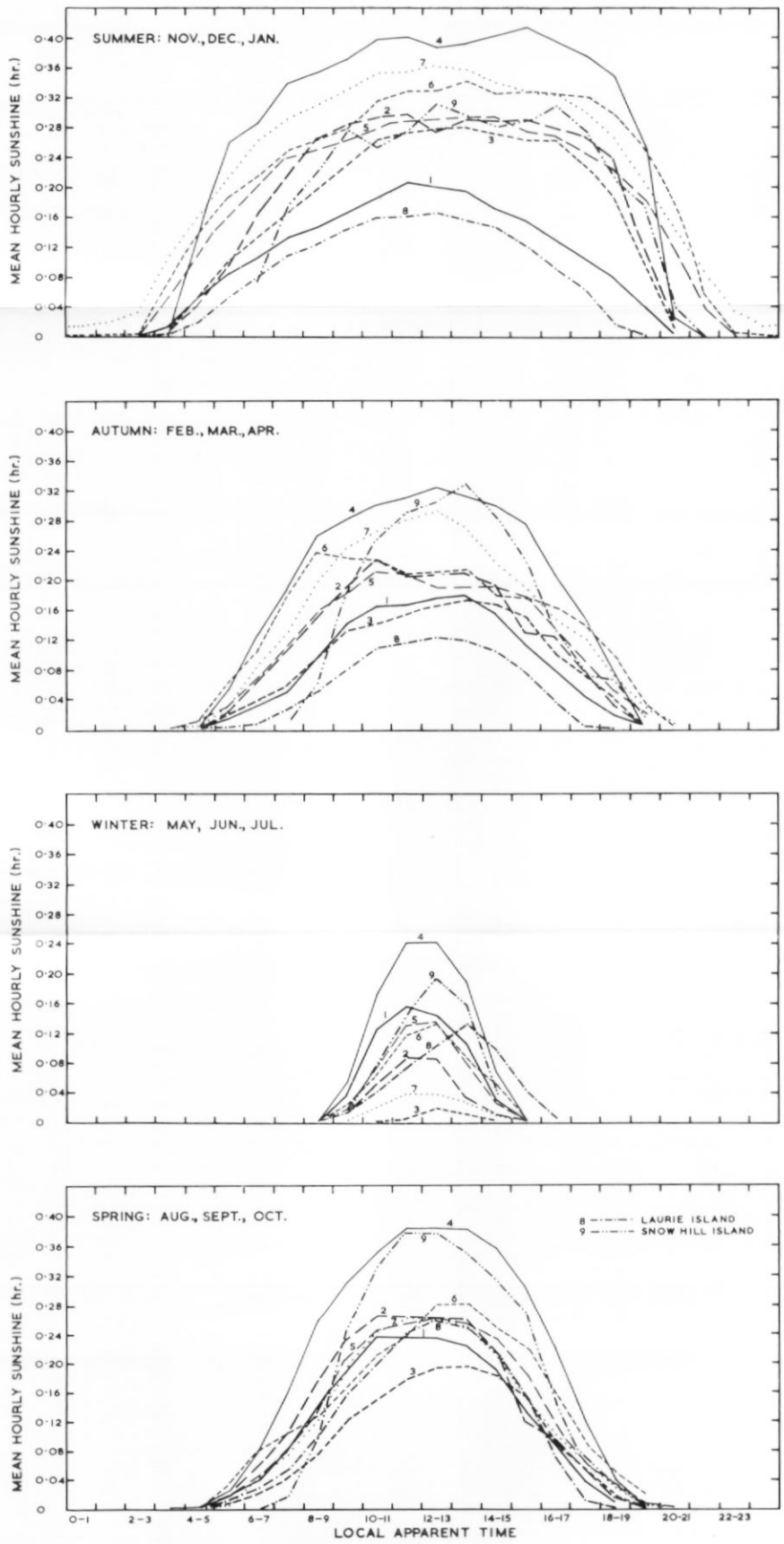

Fig. 9. Diurnal variation of sunshine in the four seasons at nine stations (for key see Fig. 3).

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ACKNOWLEDGEMENTS

I am grateful to both the Director-General of the Meteorological Office and his staff at Bracknell, and the London staff of the British Antarctic Survey, for providing manuscript data. I should like to thank Dr. R. J. Adie for his help during the preparation of the paper and for arranging the fair drawing of the figures.

MS. received 15 October 1967

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Island, the Argentine Islands and the Loubet Coast are the only stations to change position between summer and autumn. From autumn to spring the two east Graham Land stations remain in the top two places and Deception Island falls to the bottom position.

Finally, Table XIII is an attempt to show the importance of sunshine recorded in the middle of the day compared with that received in early morning and late evening. The middle of the day is defined as 08–16 hr. in summer, 09–15 hr. in autumn and spring, and 10–14 hr. in winter. Stations record approximately the same percentage of sunshine in the middle of the day in both summer and autumn. The values vary from 75 per cent of the daily average at Laurie Island to 50 per cent at the southern stations. The importance of early and late sunshine is greatest at Hope Bay, the Argentine Islands, the Loubet Coast and "lat. 68°S.". Spring percentages of mid-day sunshine are higher than autumn percentages at all stations except Laurie Island. They vary from about 10 per cent at the three southern stations to about 1 per cent at Signy Island and Snow Hill Island. In winter, early and late sunshine is of importance only at Laurie Island. The other stations receive 80 to 90 per cent of their sunshine between 10 and 14 hr. Deception Island, in fact, receives all of its winter sunshine in these hours.

TABLE XIII. MEAN SUNSHINE IN THE MIDDLE OF THE DAY BOTH IN HOURS AND AS A PERCENTAGE OF MEAN DAILY SUNSHINE

Station	*Summer*		*Autumn*		*Winter*		*Spring*	
	08–16 hr.	Per cent	09–15 hr.	Per cent	10–14 hr.	Per cent	09–15 hr.	Per cent
Laurie Island	1·20	73	0·66	76	0·34	65	1·33	75
Signy Island	1·44	66	0·98	69	0·53	87	1·31	70
Admiralty Bay	2·29	61	1·23	64	0·26	93	1·50	70
Deception Island	2·06	62	0·93	61	0·04	100	1·03	69
Hope Bay	3·13	56	1·83	58	0·84	87	2·17	64
Snow Hill Island	2·21	63	1·65	73	0·55	90	2·00	75
Argentine Islands	2·24	54	1·17	58	0·43	90	1·46	67
Loubet Coast	2·52	52	1·27	51	0·41	84	1·44	61
"lat. 68°S."	2·74	52	1·57	61	0·13	87	1·42	70

CONCLUSION

The sunshine data for seven British stations in the Antarctic Peninsula over the 20 year period, 1945–65, are analysed in this paper. The outstanding feature is the emergence of Hope Bay as the station which receives most sunshine throughout the year. This is the only station, apart from the nearby Snow Hill Island, which is situated on the east coast of Graham Land. The other stations are located on the north or west of the Antarctic Peninsula but their sunshine amounts rarely vary directly with latitude. Local topography is more important, particularly at Deception Island. From this point of view, detailed surveys of the local horizon at each station would be useful to allow a comparison of sunshine records with the altitude of the Sun. Admiralty Bay quite often compares favourably with the Argentine Islands which are 3° of latitude farther south. From the point of view of other activities, it is interesting to note that in summer, autumn and spring over 40 per cent of sunshine is received early and late in the day at the more southerly stations. Yet this amount shows a decrease between the Loubet Coast and "lat. 68°S.". It would be useful to have data from even farther south to see whether this trend continues or whether the Marguerite Bay stations are slightly anomalous.

TABLE XII. MEAN MORNING AND AFTERNOON SUNSHINE (hr.)

Station	*Summer*			*Autumn*			*Winter*			*Spring*			*Year*		
	a.m.	p.m.	day	a.m.	p.m.	day	a.m.	p.m.	day	a.m.	p.m.	day	a.m.	p.m.	day
Laurie Island	0·87	0·77	1·64	0·40	0·47	0·87	0·14	0·38	0·52	0·81	0·97	1·78	0·55	0·65	1·20
Signy Island	1·10	1·08	2·18	0·67	0·75	1·42	0·32	0·29	0·61	0·95	0·92	1·87	0·76	0·76	1·52
Admiralty Bay	1·67	2·09	3·76	0·95	0·98	1·93	0·15	0·13	0·28	1·12	1·02	2·14	0·97	1·06	2·03
Deception Island	1·43	1·89	3·32	0·65	0·88	1·53	0·01	0·03	0·04	0·60	0·89	1·49	0·67	0·92	1·59
Hope Bay	2·57	3·01	5·58	1·53	1·64	3·17	0·47	0·50	0·97	1·57	1·81	3·38	1·54	1·74	3·28
Snow Hill Island	1·29	2·22	3·51	0·80	1·46	2·26	0·21	0·40	0·61	1·08	1·58	2·66	0·08	1·11	2·25
Argentine Islands	1·88	2·24	4·12	0·98	1·05	2·03	0·23	0·25	0·48	1·01	1·16	2·17	1·02	1·17	2·19
Loubet Coast	2·07	2·77	4·84	1·26	1·23	2·49	0·21	0·28	0·49	0·98	1·37	2·35	1·13	1·41	2·54
"lat. 68°S."	2·46	2·76	5·22	1·23	1·35	2·58	0·08	0·07	0·15	0·95	1·08	2·03	1·18	1·32	2·50

and autumn they are more "platykurtic". In summer the stations form three groups. Laurie Island and Signy Island have least sunshine and the most symmetrical shape. Hope Bay and "lat. 68°S." record most sunshine throughout most of the day and they are joined by the Loubet Coast in the late afternoon. The third group consists of the remaining stations. Latest records vary approximately latitudinally with Laurie Island finishing at 19–20 hr. and the two southern stations recording in all 24 hr. Of the earliest records, those at Hope Bay, Snow Hill Island, Admiralty Bay and Deception Island are delayed because of local topography.

In a year the average number of hours of sunshine in a day increases from 1·20 hr. at Laurie Island to 3·28 hr. at Hope Bay, and 2·5 hr. at the two southern stations. Table XII shows the average daily, morning (before 12 noon) and afternoon values for the year and for the four seasons. Considering the annual values, all stations record less sunshine in the morning than in the afternoon. In the morning, Snow Hill Island has the lowest and Hope Bay the highest average, the difference between them being 1 hr.; in the afternoon, Laurie Island has the least. Apart from these, Signy Island and Deception Island are a little lower than the other five stations. The Loubet Coast has more hours of sunshine than "lat. 68°S." due to a higher afternoon average. Admiralty Bay has an average almost as high as the Argentine Islands in spite of its more northerly latitude and its average is about 0·5 hr. more than Deception Island and Signy Island.

The averages of the nine stations are shown in ranking order in Fig. 10 for mornings,

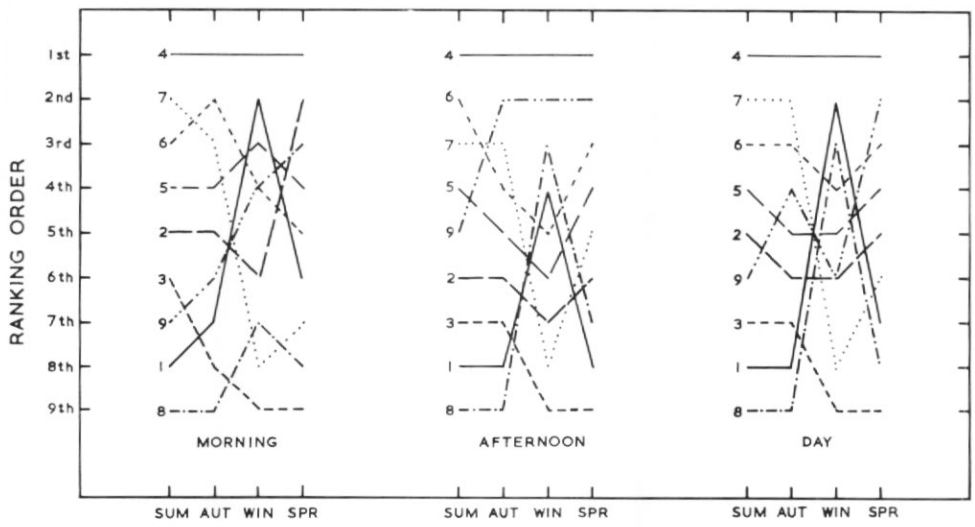

Fig. 10. Changes in ranking order of nine stations, based on their morning, afternoon and daily mean sunshine values (for key see Figs. 3 and 9).

afternoons and the whole day. The outstanding feature is Hope Bay with the highest average for all three periods. The daily averages show that the Argentine Islands and Admiralty Bay lower their ranking from summer to autumn because of an improvement in the position of Snow Hill Island; the other stations retain their rank. The two northerly stations greatly improve their position in winter to the detriment of all the other stations except Hope Bay but lose it again in spring, a feature due to their afternoon sunshine. The morning averages show a greater interchange in the ranking order of the stations for each season. Deception Island declines from sixth position in summer to ninth in winter while Snow Hill Island improves from seventh to third. The other stations, excluding Hope Bay as usual, vary considerably in position particularly in winter when Laurie Island, Signy Island and the Argentine Islands have higher rankings than at the equinoxes. In the afternoon, Snow Hill

TABLE XI. SEASONAL MEAN DIURNAL VARIATION OF SUNSHINE

Station	*Season*	*Local apparent time* 0–	1–	2–	3–	4–	5–	6–	7–	8–	9–	10–	11–	12–	13–	14–	15–	16–	17–	18–	19–	20–	21–	22–	23–
Laurie Island	Summer			·00	·01	·02	·05	·09	·11	·13	·15	·16	·16	·17	·16	·15	·12	·09	·06	·02	·00				
	Autumn					·00	·00	·01	·03	·05	·08	·11	·12	·12	·12	·11	·08	·04	·01	·00					
	Winter									·00	·02	·04	·07	·10	·13	·10	·04	·01							
	Spring					·00	·01	·03	·06	·10	·16	·20	·24	·26	·25	·22	·16	·07	·01	·00					
Signy Island	Summer			·00	·01	·05	·08	·11	·14	·15	·17	·19	·21	·20	·19	·17	·15	·13	·11	·08	·04	·00			
	Autumn					·00	·02	·03	·05	·09	·14	·17	·17	·17	·18	·15	·11	·08	·04	·02	·00				
	Winter									·00	·04	·13	·16	·14	·11	·03	·00								
	Spring					·00	·02	·04	·08	·14	·19	·24	·24	·23	·22	·19	·14	·09	·04	·01					
Admiralty Bay	Summer				·01	·04	·10	·16	·21	·26	·29	·30	·30	·28	·29	·29	·29	·28	·27	·24	·12	·02	·01		
	Autumn					·00	·03	·07	·11	·15	·19	·23	·21	·21	·21	·19	·13	·13	·08	·03	·00				
	Winter									·00	·01	·05	·09	·09	·03	·01	·00								
	Spring					·00	·02	·06	·10	·17	·23	·27	·26	·26	·26	·22	·12	·10	·05	·01	·00				
Deception Island	Summer				·01	·05	·10	·13	·17	·20	·23	·26	·27	·28	·28	·27	·27	·26	·23	·19	·10	·01			
	Autumn					·00	·02	·04	·06	·10	·13	·14	·15	·17	·17	·17	·15	·10	·07	·04	·01				
	Winter											·00	·01	·02	·01	·00									
	Spring					·00	·01	·02	·04	·08	·12	·15	·18	·19	·19	·19	·15	·09	·05	·02	·00				
Hope Bay	Summer				·00	·15	·26	·29	·34	·36	·37	·40	·40	·39	·39	·41	·41	·40	·38	·35	·25	·03	·00		
	Autumn					·00	·06	·13	·19	·26	·28	·30	·31	·32	·31	·30	·27	·21	·15	·07	·01				
	Winter									·00	·06	·17	·24	·24	·19	·07	·00								
	Spring					·00	·03	·08	·16	·26	·31	·35	·38	·38	·38	·36	·30	·22	·12	·04	·00				
Snow Hill Island	Summer							·08	·18	·22	·28	·25	·28	·31	·30	·28	·29	·31	·28	·24	·17	·04	·00		
	Autumn								·01	·06	·19	·25	·29	·31	·33	·29	·23	·14	·07	·07	·02				
	Winter										·01	·06	·14	·19	·16	·05									
	Spring							·00	·02	·10	·25	·33	·38	·38	·35	·31	·27	·15	·09	·03	·00				
Argentine Islands	Summer			·00	·05	·12	·17	·21	·24	·25	·26	·28	·29	·29	·29	·29	·28	·27	·25	·22	·19	·12	·04	·00	
	Autumn				·00	·01	·03	·07	·11	·16	·18	·21	·21	·19	·19	·19	·18	·14	·09	·05	·02				
	Winter									·00	·02	·07	·13	·14	·08	·03	·00								
	Spring					·01	·02	·05	·08	·14	·21	·25	·26	·26	·25	·23	·19	·12	·07	·03	·01	·00			
Loubet Coast	Summer	·00	·00	·00	·08	·14	·19	·22	·25	·26	·28	·32	·33	·33	·34	·33	·33	·33	·32	·30	·25	·18	·06	·01	·00
	Autumn					·01	·06	·11	·18	·24	·23	·23	·21	·21	·22	·18	·18	·17	·14	·10	·04	·00			
	Winter									·00	·02	·07	·12	·13	·09	·05	·01								
	Spring					·00	·04	·08	·11	·13	·17	·21	·24	·28	·28	·25	·22	·16	·09	·05	·02				
"lat. 68°S."	Summer	·01	·02	·03	·11	·16	·21	·26	·29	·31	·33	·35	·36	·36	·36	·34	·33	·32	·30	·27	·21	·14	·09	·03	·01
	Autumn				·00	·01	·03	·08	·13	·20	·24	·26	·28	·29	·27	·23	·19	·15	·12	·07	·03	·01			
	Winter										·01	·03	·04	·04	·02	·01	·00								
	Spring					·00	·01	·04	·07	·12	·19	·24	·26	·26	·25	·21	·15	·10	·07	·03	·01	·00			

A value of ·00 indicates that sunshine has been recorded in that hour.