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The meteorological conditions of the area on the Gås Bay (South Spitsbergen) determined by the investigations in the summers of 1978 and 1979

ABSTRACT: In the summers of 1978 and 1979 meteorological observations and measurements were carried out in South Spitsbergen. These investigations gave a characteristic of the summer meteorological conditions in the forefield of the Gås Glacier. Some regularities were found to exist in the distribution of air temperature and other meteorological elements.

Key words: Spitsbergen, meteorological conditions

1. Introduction

In the summers of 1978 and 1979 two successive expeditions of Silesian University worked in South Spitsbergen, carrying out a wide programme of geographic investigations (Jania 1979, Jania and Pulina 1980, Kamiński 1980a). The meteorological observations and measurements taken at that time were part of these investigations (Kamiński 1979, 1980b).

Geographical investigations in Spitsbergen have had a long tradition (Szupryczyński 1978). So have meteorological observations and measurements. The first observations were made by the Nordenskiold expedition in 1872–73 on the Ny Frisland Peninsula and in 1899–1900 a Swedish-Russian expedition set two meteorological stations in West Spitsbergen. The first permanent meteorological stations were established in Spitsbergen in the early 20th century (Svalbard Radio—Longyearbyen in 1911, Green Horbour—Barentsburg in 1912 and Isfjord Radio in 1933). The early meteorological investigations in Spitsbergen were reviewed by Troitskij et al. (1975). Steffensen (1969) gave a review of the results from the Svalbard meteorological stations. The interest in the meteorological conditions in Spitsbergen has increased since

the 1930s. At that time investigations were performed, for example, by Swedish—Norwegian expeditions headed by H.W. Ahlmann (Eriksson 1933), German (Pillewitzer 1939, Voigt 1966), Russian (Markin 1974, Troitskij et all. 1975). and also Polish expeditions (Siedlecki 1968, Baranowski 1971, 1975, Szupryczyński 1979, Lankauf 1979, Kamiński 1979, 1980 b).

Despite the rather large number of meteorological investigation there are only a few synthetic scientific elaborations on the climate in Spitsbergen or its particular parts. Among the general publications regarding the climate of the whole Arctic it is interesting to note the chapter on the climate conditions in the Arctic Basin in volume 14 of the World Survey Climatology (Orvig 1973) and monography of Dolgin (Dolgin 1971). The climate in Spitsbergen was discussed in a chapter of the mongraphy "Oledineneniye" Spitsbergena (Svalbards) by Troitskij et al. (1975). Much space was devoted to the climate in Spitsbergen in works of Hisdal, Schytt and Knothe (Pereyma, in press). There are also a paper on the complex of the meteorological processes in the Arctic (Petterssen 1956) and a large number of elaborations of particular climate elements and atmospheric processes in the Arctic, concerned in part with Spitsbergen (Brikeland and Schon 1938, Vowinckel and Orvig 1964, 1967, Prik 1964, Chernigovsky 1967, Steffensen 1969). Data on the Spitsbergen climate were also given by Corbel (Dutkiewicz 1967).

In Polish scientific literature there is also a number of papers about the climate in Spitsbergen, particularly its part on the Hornsund Fiord (Baranowski 1968, 1975, 1977, Baranowski and Głowicki 1975, Pereyma 1981, 1983, Szczepankiewicz-Szmyrka 1981a, 1981b, Gerstmann 1981, Kamiński 1979, 1980b (and Oscar II Land Leszkiewicz 1977, Wójcik, Marciniak, Przybylak 1981) and also many others. Some meteorological data were also given by Czeppe (1961) and Dutkiewicz (1967).

Of this rather large number of publications the papers with information about the meteorological conditions and climate of South Spitsbergen are only a very small part (Markin 1974, Dutkiewicz 1967, Kamiński 1979, 1980b). Unelaborated observation data from the summer seasons of 1979 and 1980 were given by Kamiński 1982 a and b). A paper of Pereyma (Pereyma, 1983) can at present be the fullest source of information about the climate in this area; it is essentially concerned, however, with the northern shore of the Hornsund Fiord.

The aim the present investigations was to characterized the meteorological conditions at a chosen point in South Spitsbergen and to collect material which could later serve to determine the relationship between the behaviour of the basic meteorological elements in South Spitsbergen and that in the other parts of the island under long-term observation. This would provide in the future a full characteristic of the climate in this area. This paper presents the first part of the investigation programme.

2. Area, material and methods

The investigations were carried out in the "summer seasons" of 1978 and 1979 (6 July — 16 September, 1978 and 1 July — 6 September, 1979). In the case the summer seasons was arbitrary, since, under the criterion established by Baranowski (1968) for distinguishing the seasons of the year in the Arctic, the periods given above also comprise the early Arctic

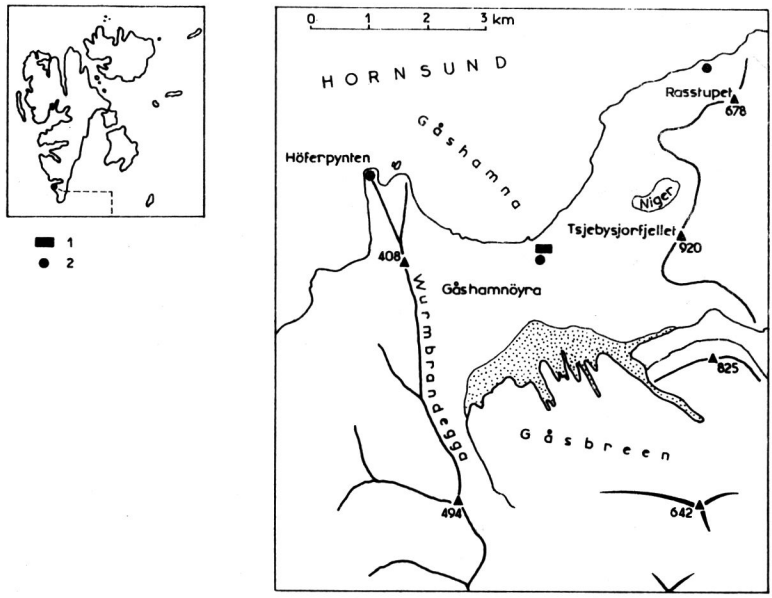

Fig. 1. The investigation area of the Expeditions of the Silesian University
1—the base station Gåshmnöyra, 2—the points of meteorological observations

autumn. The essential part of the investigation period, in July and August, came within the Arctic summer. The investigations were carried out in the southern part of West Spitsbergen, the area on the Gås Bay at Hornsund. The geographical environment of Spitsbergen was described, for example, by Baird (1967) and Troitskij et al. (1975). Some information regarding the climate on the Gås Bay was given by Dutkiewicz (1967). The general characteristics of the climate in this area were discussed by Troitskij et al. (1975). This climate is characterized as one affected to a large extent by cyclons moving from Iceland to Karskie Sea. The mean annual temperature is $-4.0\,^{\circ}C$, the mean summer one, in turn, is 3.0—5.0 °C. The precipitation total is about 400 mm per year.

Meteorological measurements and observations were carried out at a station located on the plain before the front of the Gås Glacier. The station was at the following geographical coordinates, $\lambda = 15^{\circ}\,30'E$ and $\varphi = 77^{\circ}00'N$, 4 m over the sea level. Fig. 1 show the immediate vicinity of the station.

Moreover, for comparison, some meteorological measurements were also taken at two points of the Hornsund shore, Cape Höfer and the foot of the Rasstupet (Fig. 1). The range of the meteorological investigations in 1978–1979 was discussed by Kamiński (1979, 1980b). All the measurements were taken with standard equipment used by Polish Meteorological Service. The observation material collected was verified in order to eliminate the possible errors and subsequently tabulated for further an analysis. A large part of the observation material has been published (Kamiński, 1982, a, b,).

3. The results of the investigations

3.1 A general meterological characterization. In the course of the investigations the meteorological conditions were affected by the dominating circulation N, NE and E. The winds from these directions constituted 43 per cent of all cases in the period under consideration. It is also interesting to note the characteristic large amount of calm, 18 per cent of observations (Table I, Fig. 2). This

Table I.

The frequency of the wind directions in per cent. Sörkappland — Gäshamnöyra

observation period	wind direction	N	NE	E	SE	S	SW	W	NW	C
July	1978	14	18	4	0	13	8	7	9	27
August	1978	16	9	5	2	27	9	9	3	20
September	1978	28	6	6	6	23	5	5	5	16
July	1979	5	39	7	12	13	7	5	2	10
August	1979	6	26	19	18	11	2	3	1	14
September	1979	12	17	17	0	4	0	4	0	46
mean		12	21	9	8	16	6	6	4	18

distribution of wind direction results from the general atmospheric circulation and the local conditions in this part of the island, above all from the orientation of the axis of the fiord. At Horsund there is a large agreement between the course of the axis of the fiord and the dominating eastern circulation. The stability of this direction is a factor which facilitates the downflow of large amounts of cold air from dozen-odd glaciers terminating in the fiord.

Comparison of the mean values of meteorological elements in the investigation periods (Tables II, III) shows that they differ in terms of absolute values and the duration of the summer season. In 1978 July, August and the first pentad of September were included in the Arctik summer (the mean 24-hour air temperature above 2.5°C). In 1979 the

Arctik summer lasted only until the fifth five-day period pentad of August (Table IV). Analysis of Tables II and III shows that July 1978 differed from July 1979 in terms of temperature and air humidity but that these months were similar in precipitation and cloudiness. Precipitation in July differed between the two years (with a higher amount in 1978), so did the wind speed (being less in 1978) and cloudiness (distinctly less in 1979). The temperature of the ground surface was distinctly higher in July 1979.

3.2 Air temperature. The air temperature in the summer of 1978 had smooth behaviour and, despite its large vatiation from day to day, varied about 4.0 °C (Table IV). The mean 24-hour air temperature of more than 5.0 °C occurred 16 times over that period, whereas the longest continuous period with this temperature lasted only 4 days (from 21 to 24 August), Table IV. The mean five-day period pentad air temperature varied from −0.8 °C in the third five-day period pentad of September to 5.7 °C in the fifth five-day period pentad of August and 5.2 °C and 5.1 °C in the sixth pentad of July and the first five-day period pentad of August (Table II). In the period under consideration the difference between the highest and lowest mean five-day period pentad air temperature was 6.5 °C. When only the period of the Arctic summer is considered, the coldest part was then the second five-day period pentad of July (2.9 °C) and the fifth pentad of August the warmest (5.7 °C). The difference between the warmest and

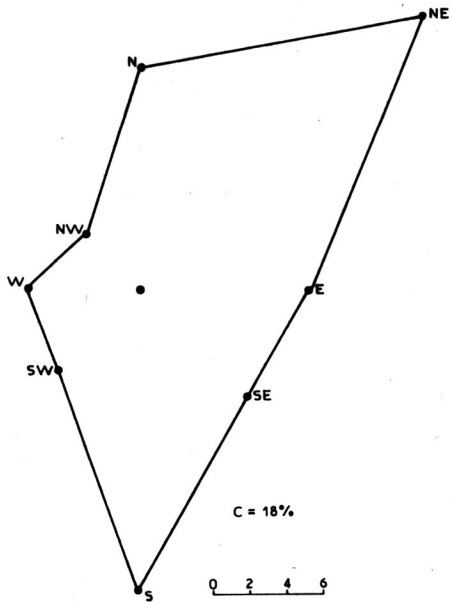

Fig. 2. Frequeney of mind direction. The mean for the period August September in 1978 and 1979

coldest five-day period pentads of the Arctic summer is 2.8 °C. Despity the low differentiation of the mean 24-hour temperatures in particular five-day period pendats, it is possible to destinguish in the summer of 1978 four warmer periods when the mean 24-hour air temperature exceeded 4–5 °C, reaching 7.1 °C. Between these culminations the temperature dropped to about 2–3 °C (Table IV).

At that time the highest air temperature varied from 2.4 °C in the third five-day period pentad of September to 9.2 °C in sixth five-day period pentad of August; it was also high in the fifth five-day period pentad of August (9.0 °C), in the sixth five-day period pentad of July and the second five-day period pentad of August (8.0 °C). In Arctic summer it varied less, from 5.0 °C in the third five-day period pentad of July to 9.2 °C in the sixth five-day period of August (Table II). The lowest air temperature varied from −4.0 °C in the third five-day period pentad of August to 3.0 °C in the first and second five-day period pentad of August. The amplitude between the extreme air temperatures was then 13.2 °C. In the Arctic summer, which lasted to 7 September, it was less, i.e. 8.2 °C (Table II).

Similar behaviour was characteristic of the air temperature in 1979. In the summer season, which was shorter, i.e. till 25 August, the behaviour of the air temperature was also smooth and, despite its variation from day to day, it varied about 5.0 °C. Thus, it was warmer than the respective season in the previous year. In the investigation period in 1979 the mean 24-hour air temperature exceeded 5.0 °C 28 times and the longest continuous period with this temperature lasted 9 days, from 13 to 21 July (Table IV). The mean pentad air temperature varied from 0.7 °C in the first pentad of August to 8.3 °C in the third pentad of August (Table III), The difference between the highest and lowest mean five-day period pentad air temperatures was 7.6 °C. In the Arctic year of 1979 the first five-day period pentad of August was the coldest (2.8 °C) and the thir five-day period pentad of that month was the warmest (8.3 °C). In 1979 the difference between the mean temperature of the warmest five-day period pentad of the Arctik year and that of the coldest one was 5.5 °C.

Despite the low differentiation in the mean 24-hour air temperature in the period under consideration, it is possible to distinguish 5 warmer periods when the mean 24 hour air temperature exceeded 5.0 °C, even reaching 7.8 and 9.0 °C (Table IV). In the Arctic summer of 1979 the highest air temperature varied from 6.5 °C in the second pentad of August to 17.0 °C in third pentad of that month (Table III). The lowest air temperature varied from −4.5 °C in the fifth pentad of August to 4.5 °C in the fourth pentad of July. In the period the amplitude between the extreme air temperatures was 21.5 C. It was the same in the Arctic summer (Table IV).

From registration, the distribution of the air temperature air 24-hours was determined (Table V). The results indicate that in the Arctic summer

Table II.

The pentad and monthly values of selected meteorological elements. Sörkappland — Gashamnöyra

meteorological element	month-pentad																
	July							August							September		
	1	2	3	4	5	6	m	1	2	3	4	5	6	m	1	2	3
mean 24—hour air temperature, in °C	–	2.9	3.6	4.1	3.6	5.2	3.9	5.1	4.8	3.1	3.2	5.7	4.1	4.3	3.2	1.5	−0.8
absolute maximum air temperature, in °C	–	5.4	5.0	6.2	6.0	8.0	8.0	7.2	8.0	5.8	5.0	9.0	9.2	9.2	7.8	4.0	2.4
absolute minimum air temperature, in °C	–	1.7	2.4	2.8	0.4	1.4	0.4	3.0	3.0	0.3	1.0	2.5	2.0	0.3	1.0	−1.7	−4.0
precipitation total, in mm	.	.	.	.	.	19.2	19.2	14.4	3.7	9.2	2.8	14.2	2.6	46.9	5.9	6.6	–
mean 24—hour wind speed, in m/s	–	2.7	0.8	0.6	1.2	2.2	1.5	2.2	2.2	2.0	1.3	3.1	2.2	2.1	1.7	1.5	1.4
cloudines (0—1)	–	10	10	9	4	8	7	9	10	7	9	9	9	9	10	6	6
relative air humidity, in %	–	88	85	85	86	86	86	70	92	91	93	88	85	86	85	79	75
mean 24—hour temperature of ground surface, in °C	–	–	–	9.0	9.1	8.1	8.7	7.1	6.3	5.0	5.1	5.5	4.4	5.6	3.7	1.5	−1.0

Table III.

The pentad and monthly values of selected meteorological elements. Sörkappland — Gåshamnöyra 1979

meteorological	month — pentad														
	July						August						September		
	1	2	3	4	5	m	1	2	3	4	5	6	m	2	3
mean 24—hour air temperature, in °C	6.4	6.0	5.8	7.6	5.0	6.0	2.8	4.0	8.3	5.0	3.5	0.8	4.7	–	–
absolute maximum air temperature, in °C	12.0	11.6	12.6	12.4	10.2	12.6	8.1	6.5	17.0	9.5	7.6	5.8	17.0	–	–
absolute minimum air temperature, in °C	2.2	1.0	3.6	4.5	1.0	0.5	0.5	0.5	−0.4	1.1	−4.5	−0.8	−4.5	–	–
precipitation total, in mm	.	3.0	12.8	.	.	17.5	3.9	4.5	2.6	11.4	.	4.8	27.2	–	–
mean wind speed, in m/s	2.2	3.8	–	1.8	2.3	2.9	2.7	2.8	2.1	0.7	4.5	7.4	3.2	–	–
cloudiness (0—10)	8	8	5	5	2	6	9	8	8	9	4	8	7	–	–
relative air humidity, in %	–	–	86	74	74	80	84	87	89	92	79	90	90	–	–
mean 24—hour temperature of the ground surface, in °C	–	–	12.3	12.9	10.1	10.8	5.2	6.1	5.7	6.2	4.2	2.4	5.0	–	–

Table IV.

The mean 24—hour and extreme air temperatures. Sörkappland — Gåshamnöyra

year	1978									1979								
date	July			August			September			July			August			September		
	t	max.	min.	t	max.	min.	t	max.	min.	t	max.	min.	t	max.	min.	t	max.	min.
1	–	–	–	4.5	5.2	4.0	2.1	3.0	1.2	–	–	–	1.6	3.8	0.5	0.7	2.9	−0.2
2	–	–	–	5.6	6.6	3.0	1.6	2.2	1.0	–	–	–	2.0	8.1	0.6	1.0	2.4	−0.6
3	–	–	–	5.7	7.2	4.1	2.7	3.8	1.0	6.9	11.6	2.2	2.2	3.2	0.9	0.0	1.5	−0.6
4	–	–	–	6.0	6.5	5.4	6.0	7.8	2.4	7.1	12.0	2.2	3.1	4.6	2.4	0.4	2.1	−1.5
5	–	–	–	3.9	4.4	3.4	3.4	4.2	2.4	5.2	8.1	2.2	5.2	6.5	4.0	1.2	2.9	0.1
6	3.7	5.4	2.8	4.3	4.7	4.7	3.6	4.0	2.8	4.6	7.0	2.2	4.7	6.5	3.5	0.5	1.4	−0.2
7	3.0	3.4	2.6	4.0	5.7	3.0	2.6	4.0	0.6	5.0	8.5	1.6	5.1	6.3	3.2	–	–	–
8	2.3	2.1	2.0	4.4	6.6	3.1	2.2	3.6	1.2	6.8	10.6	2.0	2.8	3.5	0.5	–	–	–
9	2.5	3.0	1.7	6.8	8.0	5.3	−0.4	0.6	−1.7	5.6	10.2	1.0	3.4	4.6	2.4	–	–	–
10	2.8	3.1	2.5	4.3	5.6	3.7	−0.3	–	–	8.1	11.6	5.2	4.0	6.4	2.0	–	–	–
11	3.3	4.0	2.4	3.6	4.2	2.9	−0.1	2.4	−1.4	7.8	10.9	5.0	3.7	6.5	1.6	–	–	–
12	4.1	5.0	3.7	2.4	3.0	1.8	−0.4	0.5	−1.4	4.7	12.6	4.2	3.8	5.9	2.0	–		–
13	3.7	4.8	2.7	1.7	2.7	0.3	−0.5	0.1	−0.9	5.0	6.4	4.0	2.0	7.0	−0.4	–	–	–
14	3.2	4.2	2.6	2.5	4.0	0.3	−1.6	−0.3	−2.7	5.2	9.1	3.6	5.1	6.1	2.9	–	–	–
15	3.7	4.7	2.9	5.2	5.8	4.2	−1.4	1.4	−4.0	6.2	9.0	3.7	9.1	17.0	2.7	–	–	–
16	3.4	4.4	2.8	4.6	4.8	4.2	−0.2	0.8	−1.6	6.5	11.2	5.2	6.7	9.5	3.5	–	–	–
17	3.9	4.9	3.2	3.1	4.0	1.8	–	–	–	7.1	9.9	5.2	5.5	7.9	2.2	–	–	–
18	3.6	4.2	3.1	1.7	2.6	1.0	–	–	–	7.4	9.1	5.2	4.3	6.6	2.1	–	–	–
19	4.3	5.2	3.3	2.5	3.2	1.9	–	–	–	8.4	12.4	5.4	5.1	7.3	2.9	–	–	–
20	5.3	6.2	4.0	3.9	5.0	2.6	–	–	–	8.8	10.9	4.5	3.4	5.6	1.1	–	–	–
21	3.8	5.3	2.8	5.5	7.8	4.0	–	–	–	6.3	9.0	3.1	2.7	4.4	0.9	–	–	–
22	4.6	6.0	3.3	5.0	6.0	2.8	–	–	–	4.3	6.6	1.9	3.0	7.6	−4.5	–	–	–
23	4.0	5.4	2.6	6.3	9.0	2.5	–	–	–	2.9	6.1	1.0	4.4	6.8	1.1	–	–	–
24	3.8	6.0	1.1	7.1	8.0	4.8	–	–	–	5.3	9.5	3.0	3.8	4.9	1.4	–	–	–
25	1.8	4.6	0.4	4.4	5.8	3.0	–	–	–	6.3	10.2	1.7	3.2	5.6	0.0	–	–	–
26	5.3	7.8	2.6	3.8	4.6	3.0	–	–	–	6.2	8.3	4.9	0.7	2.1	−0.8	–	–	–
27	4.6	7.8	1.4	3.0	3.1	2.6	–	–	–	4.9	7.8	3.1	0.8	2.6	1.0	–	–	–
28	5.9	8.0	4.0	5.8	9.2	3.0	–	–	–	4.2	5.6	2.5	1.4	5.8	0.5	–	–	–
29	4.2	5.9	3.8	5.5	7.4	4.0	–	–	–	3.0	4.5	2.0	0.6	4.9	0.0	–	–	–
30	5.5	7.3	3.5	3.6	3.9	3.2	–	–	–	3.5	5.8	1.5	0.4	4.2	−0.1	–	–	–
31	5.9	6.9	5.5	2.9	4.3	2.0	–	–	–	2.0	4.4	0.5	0.6	1.5	0.0	–	–	–

it behaves regularly with one minimum at 2–3 hours GMT and one maximum at 12 hours GMT. Regular 24-hour behaviour of the air temperature was observed both inthe summer seasons of 1978 and 1979 and in the early autumn of 1978. It can be expected that this disstribution is typical of this area in the polar day.

3.3. Temperature of the ground surface and of the air at the ground surface. In the summer season the mean 24-hour temperature of the ground surface tended to be higher than the air temperature at a height of 2 m over the ground (Table VI). In the period till 29 July, 1978 this difference was

Table V.

The 24-hour behaviour of the mean periodical temperatures. The mean hour values in °C. GMT Sörkappland — Gåshamnöyra

hours / Observation period	7 — 31 July 1978	1 — 27 August 1978	5 — 16 September 1978	14 — 31 July 1979	1 — 31 August 1979	mean
1	3.2	3.6	−0.2	4.9	3.0	2.9
2	3.1	3.6	−0.1	4.7	2.9	2.8
3	3.2	3.6	−0.1	4.6	2.8	2.8
4	3.3	3.6	−0.1	4.8	2.8	2.9
5	3.3	3.7	0.0	4.8	3.0	3.0
6	3.4	3.8	0.5	5.1	3.1	3.2
7	3.8	3.7	0.7	5.5	3.4	3.4
8	4.2	4.0	0.0	5.6	3.8	3.5
9	4.2	4.2	0.7	5.7	3.8	3.7
10	4.5	4.5	0.8	6.0	4.0	4.0
11	4.5	4.9	0.8	6.2	4.1	4.1
12	4.7	5.1	1.4	6.4	4.2	4.4
13	4.7	4.8	1.6	6.2	4.2	4.3
14	4.8	4.9	1.4	6.2	4.3	4.3
15	4.7	4.6	1.2	6.2	4.2	4.2
16	4.7	4.5	1.1	6.0	4.1	4.1
17	4.8	4.5	0.8	5.9	4.1	4.0
18	4.6	4.4	0.4	5.6	3.9	3.8
19	4.3	4.2	0.1	5.5	3.7	3.6
20	4.0	4.0	0.0	5.2	3.7	3.4
21	3.8	4.0	−0.3	5.0	3.6	3.2
22	3.6	3.8	−0.4	5.0	3.4	3.1
23	3.7	3.8	−0.2	3.2	3.4	3.0
24	3.8	3.7	0.0	3.1	3.3	2.9

contained between 3.7 and 6.2 °C. In the remaining period it was below 3.5 °C. In 1979 the period with a relatively high difference was similarly long. From the beginning of July to 3 August 1979 it varied from 2.9 to 7.5 °C.

In the other days following 3 August it tended to be lower than 3.0 °C. At times the mean 24 hour temperature of the fround surface was lower than the mean 24-hour air temperature (Table VI). The behaviour of the mean five-day period pentad temperatures of the ground surface in the two

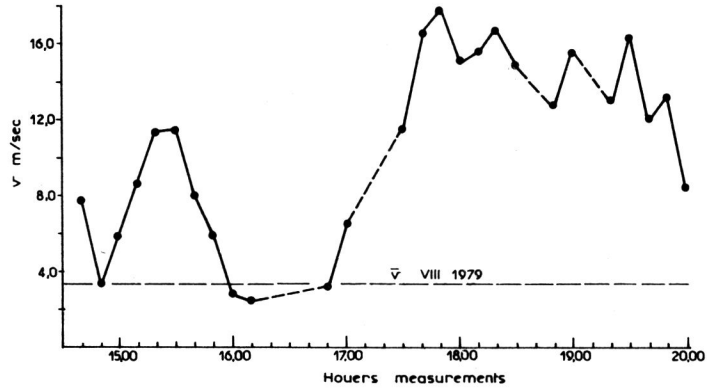

Fig. 3. The speed distribution of the foehn wind on 15 August, 1979 (the mean speeds from 10– minute periods)

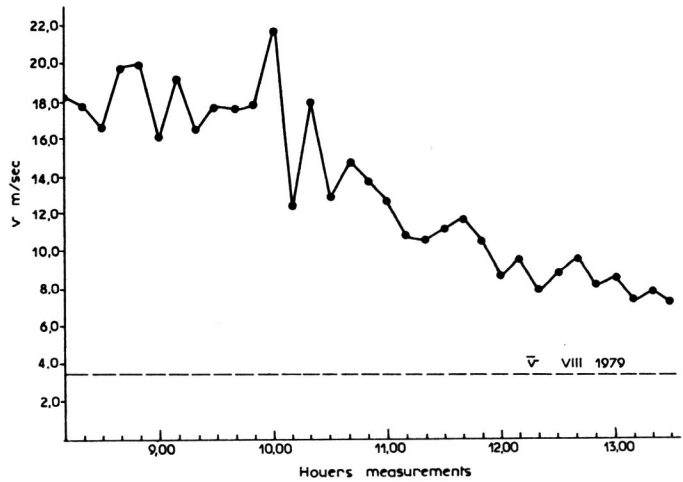

Fig. 4. The speed distribution of the bora wind on 29 August, 1979 (the mean speeds from 10-minute periods)

years showed a regular decrease in the temperature of the ground surface, from the last five-day period pentad of July on. The pentads with the highest mean 24-hour air temperature did not correspond to the pentads with the highest mean 24-hour temperature of the ground surface (Table II, III) This indicates that various factors affect the temperature of the two media. The temperature of the ground is decidedly affected by the behaviour of the components of the thermal balance. In the case of the air temperature it is the factor of circulation, also local one, that dominates. In the cass

Table VI.

The mean 24-hour temperature of the ground surface (t) in °C and the temperature differences (Δt) between the mean 24-hour air temperature of the ground surface and the mean 24-hour air temperature, in C. Sörkappland — Gåshamnöyra.

date	1978						1979					
	July		August		September		July		August		September	
	to	Δt	to	Δt	to	Δt	to	Δt	to	Δt	to	Δt
1	–	–	6.3	1.8	3.6	1.5	–	–	4.4	2.8	0.8	0.1
2	–	–	9.0	3.4	3.4	1.8	–	–	5.1	3.1	1.7	0.7
3	–	–	7.2	1.5	3.0	0.3	–	–	5.6	3.4	1.3	1.3
4	–	–	6.5	0.5	4.5	−1.5	–	–	5.4	2.3	1.8	1.4
5	–	–	6.5	2.6	3.9	0.5	–	–	5.6	0.4	1.9	0.7
6	–	–	7.2	2.9	3.6	0.0	–	–	7.5	2.8	1.5	1.0
7	–	–	6.2	2.2	2.5	−0.1	–	–	6.4	1.3	–	–
8	–	–	5.9	1.5	2.4	0.2	–	–	6.5	3.7	–	–
9	–	–	6.7	−0.1	−0.3	0.1	–	–	5.6	1.6	–	–
10	–	–	5.5	1.2	−0.5	−0.2	–	–	5.6	1.6	–	–
11	–	–	5.9	2.3	−0.8	−0.7	14.8	7.0	5.2	1.5	–	–
12	–	–	5.5	3.1	0.1	0.5	12.2	7.5	5.0	1.2	–	–
13	–	–	4.6	2.9	−0.6	−0.1	11.4	6.4	4.2	2.2	–	–
14	8.2	5.0	3.6	1.1	−1.6	0.0	11.0	5.8	5.9	0.8	–	–
15	8.0	4.3	5.2	0.0	−2.2	−0.8	12.0	5.8	8.4	−0.7	–	–
16	8.0	4.6	5.4	0.8	−0.9	−0.7	13.3	6.8	7.1	0.4	–	–
17	8.8	4.9	5.3	2.2	–	–	13.8	6.7	6.2	0.7	–	–
18	7.4	3.8	5.1	3.4	–	–	11.6	4.2	5.4	1.1	–	–
19	11.2	6.9	4.4	1.9	–	–	13.8	5.4	6.1	1.0	–	–
20	9.8	4.5	5.4	1.5	–	–	12.0	3.2	6.3	2.9	–	–
21	8.9	5.1	5.6	0.1	–	–	10.7	4.4	4.0	1.3	–	–
22	9.7	5.1	6.0	1.0	–	–	9.8	5.5	3.5	0.5		–
23	9.4	5.4	5.4	−0.9	–	–	9.7	6.8	4.7	0.3	=	–
24	9.3	5.5	5.9	−1.2	–	–	9.2	3.9	4.0	0.2	–	–
25	8.0	6.2	4.6	0.2	–	–	11.2	4.9	5.0	1.8	–	–
26	10.3	5.0	4.9	1.1	–	–	9.1	2.9	3.0	2.3	–	–
27	8.4	3.8	4.8	1.8	–	–	8.7	3.8	4.2	3.4	–	–
28	9.6	3.7	5.2	−0.6	–	–	7.3	3.1	4.2	2.8	–	–
29	8.6	4.4	4.5	−1.0	–	–	6.8	3.8	1.8	1.2	–	–
30	6.1	0.6	3.8	0.2	–	–	6.6	3.1	0.8	0.4	–	–
31	5.7	−0.2	3.4	0.5	–	–	4.6	2.6	0.4	−0.2	–	–

The extreme temperatures of the ground surface (t). the minimum air temperature 5 cm overground and the difference between the extreme temperatures of the ground surface and the air (Δt), in °C, Sörkappland — Gåshamnöyra

date	maximum temperature						minimum temperature						minimum temperature 5 cm overground		
	July		August		September		July		August		September		July	August	Septem.
	t	Δt	t	Δt	t	Δt	t	Δt	t	Δt	t	Δt			
1	–	–	12.2	8.4	4.7	1.8	–	–	0.1	−0.4	−1.2	1.0	–	0.6	−0.5
2	–	–	10.5	2.4	9.0	6.6	–	–	2.5	1.9	−1.4	0.8	–	0.0	−0.6
3	–	–	13.3	10.0	4.4	2.9	–	–	2.2	1.3	−0.7	0.1	–	1.0	−2.5
4	–	–	8.3	3.7	5.8	3.7	–	–	3.4	1.0	−1.0	−0.5	–	2.6	−2.5
5	–	–	9.0	2.5	6.5	3.6	–	–	3.9	−0.1	0.0	0.1	–	3.7	−2.5
6	–	–	14.7	8.2	5.4	4.0	–	–	3.8	0.3	−0.1	−0.1	–	3.1	−0.9
7	–	–	12.6	6.3	–	–	–	–	3.0	−0.2	–	–	–	2.5	–
8	–	–	14.0	10.5	–	–	–	–	2.1	1.6	–	–	–	2.0	–
9	–	–	6.2	1.6	–	–	–	–	3.7	0.7	–	–	–	1.8	–
10	–	–	14.5	8.1	–	–	–	–	2.0	0.0	–	–	7.2	1.3	–
11	–	–	14.5	8.0	–	–	–	–	1.7	0.1	–	–	6.2	0.8	–
12	–	–	9.5	3.6	–	–	–	–	4.0	2.0	–	–	5.5	2.4	–
13	17.0	12.0	17.6	10.6	–	–	–	–	3.9	4.3	–	–	5.0	0.9	–
14	22.7	17.5	9.8	3.7	–	–	–	–	4.4	1.5	–	–	5.0	1.5	–
15	23.4	17.2	20.5	3.5	–	–	6.4	3.7	2.3	−0.4	–	–	4.5	1.6	–
16	25.9	19.4	11.0	1.5	–	–	8.3	3.1	6.5	3.0	–	–	6.2	1.9	–
17	26.0	18.9	12.3	4.4	–	–	7.8	2.6	4.7	2.5	–	–	5.5	2.6	–
18	21.0	13.6	10.6	4.0	–	–	7.6	2.4	4.5	2.4	–	–	6.0	2.6	–
19	26.8	19.4	14.4	7.1	–	–	7.4	2.0	4.2	1.3	–	–	6.4	2.8	–
20	15.3	6.9	15.6	10.0	–	–	10.1	5.6	3.9	2.8	–	–	6.6	−0.5	–
21	19.2	10.4	10.6	6.2	–	–	7.0	3.9	0.9	0.0	–	–	3.0	−1.6	–
22	21.5	15.2	12.0	4.4	–	–	3.8	1.9	−0.9	3.6	–	–	1.0	2.0	–
23	20.6	16.3	14.1	7.3	–	–	3.9	2.9	1.1	0.0	–	–	0.6	−0.9	–
24	18.0	15.1	8.5	3.6	–	–	5.1	2.1	2.5	0.9	–	–	4.0	2.5	–
25	22.6	17.3	11.6	6.0	–	–	6.8	5.1	1.5	1.5	–	–	3.0	−2.0	–
26	17.4	11.2	14.0	11.9	–	–	6.4	1.5	−1.0	0.2	–	–	4.9	−3.0	–
27	13.2	8.3	9.2	6.6	–	–	5.4	2.3	2.4	1.4	–	–	4.0	1.4	–
28	13.2	9.0	10.6	4.8	–	–	5.6	3.1	2.1	1.6	–		2.9	0.9	–
29	10.5	7.5	4.0	−0.9	–	–	5.0	3.0	1.5	1.5	–	–	2.0	−0.2	–
30	21.0	17.5	3.5	−0.7	–	–	3.9	2.4	0.0	−0.1	–	–	1.4	0.0	–
31	14.2	12.2	4.6	3.1	–	–	3.4	2.9	−1.1	1.1	–	–	0.1	−0.5	–

of the groud, this caused the lack of an increase in the temperature at the end of August, which could be seen in the air temperature. It was found that at 2 m over the ground the mean 24-hour air temperature was lower than the mean 24-hour temperature of the ground, by about 5.0 °C in July, by 1.2–1.4 °C in August and by less than 1.0 °C in September.

Table VIII.

The mean 24-hour values of the relative air humidity in per cent. Sörkappland — Gåshamnöyra

date	1978			1979		
	July	August	September	July	August	September
1	–	92	94	–	78	65
2	–	77	92	–	77	71
3	–	86	80	–	87	96
4	–	92	71	–	88	91
5	–	97	88	–	88	78
6	93	97	86	–	84	94
7	87	91	85	–	84	–
8	85	92	84	–	86	–
9	84	86	74	–	93	–
10	90	95	64	–	88	–
11	88	93	71	85	84	–
12	76	93	81	88	94	–
13	86	91	71	84	93	–
14	89	91	70	87	90	–
15	85	87	82	88	83	–
16	84	89	82	80	90	–
17	82	90	–	74	92	–
18	94	93	–	76	96	–
19	86	93	–	72	91	–
20	77	98	–	69	91	–
21	88	94	–	63	84	–
22	81	84	–	73	80	–
23	83	84	–	81	77	–
24	83	86	–	88	72	–
25	91	92	–	64	80	–
26	72	88	–	79	97	–
27	82	96	–	88	96	–
28	88	80	–	83	83	–
29	93	74	–	84	84	–
30	92	87	–	84	92	–
31	92	87	–	86	85	–

The bahaviour of the extreme temperatures of the ground surface, however, showed a good agreement with the analogous air temperatures. The maximum temperatures of the ground surface were much higher and the minimum temperatures lower than the corresponding ait temperatures (Table VII). In the case of the maximum temperature the differences were

Table IX.

The 24-hour and monthly precipitation totals, in mm. Sörkappland — Gåshamnöyra

date	1978			1979		
	July	August	September	July	August	September
1	.	.	.	.	.	.
2	.	.	.	.	0.5	.
3	.	0.1	.	.	.	.
4	.	14.3	.	.	0.1	.
5	.	.	5.9	.	3.3	.
6	.	0.3	0.3	3.0	.	.
7	.	.	.	.	.	—
8	.	1.3	6.3	.	.	—
9	.	0.5	.	.	4.5	—
10	.	1.6	.	.	.	—
11	.	0.6	.	.	0.6	—
12	.	.	.	.	.	—
13	.	.	—	.	0.7	—
14	.	0.3	—	.	1.3	—
15	.	8.3	—	12.8	.	—
16	.	1.2	—	.	5.0	—
17	.	.	—	.	4.2	—
18	.	.	—	.	2.2	—
19	.	.	—	.	.	—
20	.	1.6	—	.	.	—
21	.	11.0	—	.	.	—
22	.	2.2	—	.	.	—
23	.	.	—	.	.	—
24	.	0.1	—	.	.	—
25	.	0.9	—	.	.	—
26	.	0.3	—	.	.	—
27	.	1.7	—	.	.	—
28	.	.	—	.	0.5	—
29	2.0	.	—	.	.	—
30	15.0	0.6	—	0.7	3.4	—
31	2.2	.	—	1.0	1.4	—
total	19.2	46.9	—	17.5	27.2	—

11.2 °C in July, 5.5 °C in August and 3.8 °C in September. In the case of the minimum temperature they were respectively 2.8 °C, 1.2 °C and 0.4 °C. Also, the minimum air temperature at 5 cm over the ground was higher than the corresponding temperature at 2 m (Table IV and VII). This temperature system indicated a normal thermal stratification in the air layer at the ground. The temperature inwersions at the ground were rare in summer.

3.4. Relative air humidity. The mean monthly and five-day period pentad values of this element (Table II and III) show a small differentiation and high absolute values. In the investigation period in 1978 the relative air humidity was about 85–86 per cent (July, August and the first five-day

period pentad of September. It was lower in the second and third five-day period pentad of September. A minimum value was found in the first five-day period pentad of August (70 per cent) and a maximum one was in the fourth five-day period pentad of that month (93 per cent). Table II. In 1979 the case was slightly different. In July the air humidity was much lower than the previous year, i.e. 80 per cent. In August it was similar to that in 1978 (Table III). The lowest relative humidity was observed in the fourth and fifth five-day period pentad of July (74 per cent), whereas the highest came in the fourth five-day period pentad of August (92 per cent), Table III.

Table X.

The mean 24-hour and monthly values of cloudiness (0—10). Sörkappland — Gåshamnöyra

date	1978			1979		
	July	August	September	July	August	September
1	–	10	10	–	8	9
2	–	6	10	–	8	5
3	–	10	8	8	9	10
4	–	10	10	6	10	10
5	–	10	10	10	10	10
6	8	10	7	10	8	–
7	10	9	7	9	10	–
8	10	10	7	10	9	–
9	10	10	5	8	10	–
10	10	10	3	1	3	–
11	10	9	5	0	4	–
12	8	7	9	1	10	–
13	10	0	4	10	5	–
14	10	0	4	8	10	–
15	10	10	7	6	4	–
16	10	9	8	2	9	–
17	9	9	–	2	10	–
18	10	10	–	5	10	–
19	5	9	–	7	8	–
20	10	10	–	9	8	–
21	9	10	–	2	2	–
22	6	6	–	0	1	–
23	0	10	–	0	2	–
24	1	10	–	8	8	–
25	2	10	–	2	7	–
26	3	10	–	9	4	–
27	6	10	–	9	10	–
28	10	9	–	10	7	–
29	10	10	–	10	10	–
30	10	8	–	10	10	–
31	10	9	–	8	10	–
m̄	7	9	–	6	7	–

Table XI.

The mean 24-hour wind speeds, in m/s. Sörkappland — Gåshamnöyra

date	1978			1979		
	July	August	September	July	August	September
1	–	2.1	1.1	–	3.2	7.5
2	–	1.3	0.6	–	1.6	1.0
3	–	2.8	1.5	1.9	2.1	0.3
4	–	4.2	4.6	2.6	3.4	0.8
5	–	0.5	0.7	2.2	3.2	1.2
6	3.7	0.1	1.1	6.1	3.8	–
7	2.1	1.9	1.4	3.6	3.4	–
8	4.0	1.5	2.2	4.8	2.2	–
9	2.6	3.8	2.4	1.8	1.3	–
10	1.2	3.7	1.3	2.5	3.4	–
11	1.2	1.6	0.8	–	4.0	–
12	1.6	1.3	1.2	–	0.8	–
13	0.0	1.1	2.1	–	0.6	–
14	0.9	1.5	0.4	–	2.4	–
15	0.5	4.0	2.7	–	2.6	–
16	0.6	1.6	4.1	–	2.3	–
17	1.3	2.1	–	1.4	1.5	–
18	0.4	0.8	–	1.4	1.3	–
19	1.0	1.3	–	0.8	1.2	–
20	0.8	0.5	–	3.1	0.9	–
21	0.8	2.8	–	5.7	3.4	–
22	1.1	3.0	–	2.0	2.2	–
23	1.4	4.3	–	1.6	5.2	–
24	1.3	3.7	–	1.0	9.2	–
25	1.2	2.8	–	1.4	2.4	–
26	1.2	1.2	–	3.2	1.2	–
27	2.1	0.3	–	2.2	1.5	–
28	1.3	1.9	–	2.8	4.4	–
29	1.1	8.0	–	1.5	10.5	–
30	2.5	0.7	–	1.1	15.2	–
31	5.1	0.8	–	0.8	11.8	–

In general, it can be stated that the behaviour of the mean 24-hour values of the relative humidity was greatly monotonous, which is typical of areas with prevailing advection of sea air masses. The domination of the advection of sea air masses is also evidenced by the high value of the relative humidity. Nevertheless, there were periods with distinctly lower relative air humidity. In 1978 the humidity was about 71–72 per cent, whereas in 1979 there was a 6-day period (17–22 July) with relative humidity of 63–76 per cent. The periods of lower humidity were related to the foehn processes. In the investigation period the lowest mean 24-hour relative ait humidity was 63 per cent; the highest, 97 per cent (Table VIII).

3.5. Precipitation. Analysis of Tables II, III and IX shows that there is relatively little precipitation in the summer months. The total for July and August, 1978 was 66 mm compared to 45 mm the next year. This is about 20 per cent of the annual precipitation total in West Spitsbergen. The precipitation in the summer season is rather not uniformly distributed. In July 1978 the whole monthly total (19.2 mm) came in the last three days of the month (Table IX). In August there was precipitation in all the pentads for 18 days, 46.9 mm in all (Table IX). In terms of precipitation, July 1979 was similar to that of the previous year and so was August, although there was much less precipitation then (27.2 mm), Table III. The number of days with precipitation was smaller in August than in the previous year and there was also a 10-day period without precipitation, from the middle of the fourth to the middle of the sixth five-day period pentad of August

Table XII.

The mean hour values of the air temperature (t), in °C, the relative air humidity (f), in per cent, and the wind speed (v), in m/s, at the points Gåshamnöyra and Höferpynten and the differences (Δ) between the elements mentioned. Sörkappland 1979

date/hour	Gåshamnöyra			Höferpynten			Δ		
	t °C	f %	v m/s	t °C	f %	v m/s	Δt	Δf	Δv
30 July/12°°	4.0	83	–	3.2	86	–	0.8	– 3	–
13	5.2	75	0.8	2.3	87	6.8	2.9	–12	– 2.1
14	5.2	75	3.8	1.8	87	12.8	3.4	–12	– 9.0
15	4.8	75	1.2	1.2	87	14.0	3.6	–12	–12.8
16	4.0	80	2.0	1.2	87	12.0	2.8	– 7	–10.0
17	2.8	82	0.8	1.3	83	11.6	1.5	– 1	–10.8
18	2.6	89	0.0	1.6	78	8.4	1.0	11	– 8.4
31 July/12°°	2.4	86	–	1.2	83	4.2	1.2	3	–
13	3.0	83	0.0	1.5	83	4.2	1.5	0	– 4.2
14	2.0	89	1.4	1.8	83	3.2	0.2	6	– 1.8
15	2.2	86	1.2	2.2	82	1.8	0.0	4	– 0.6
16	3.2	83	0.8	2.6	81	4.8	0.6	2	– 4.0
17	3.2	79	2.4	2.4	75	6.8	0.8	4	– 4.4
18	3.4	76	4.4	2.8	72	6.2	0.6	4	– 1.8
5 August/20°°	5.1	83	–	4.0	88	–	0.9	– 5	–
6 August/20	4.5	82	3.8	3.1	84	3.4	1.4	– 2	0.4
7 August/20	5.8	82	3.6	3.0	93	4.4	2.8	–11	– 0.8
8 August/20	2.1	87	1.6	2.0	85	2.2	0.1	2	– 0.6
9 August/20	3.3	95	1.0	1.7	94	11.2	1.6	1	–10.2
10 August/20	4.9	79	2.4	2.9	84	12.8	2.0	– 5	–10.4
11 August/20	4.3	84	3.2	3.2	84	–	1.1	0	–
12 August/20	5.4	99	0.8	3.8	97	5.6	1.6	2	– 4.6
13 August/20	5.0	75	0.0	2.5	89	1.6	2.5	–14	– 1.6

Table XIII.

The mean hour values of the air temperature (t), in °C, the relative air humidity (f), in per cent, and the wind speed (v), in m/s, at the points Gåshamnöyra and the shore under the Rasstupet and the differences (Δ), between the elements mentioned. Sörkappland 1979

date/hour	Gåshamnöyra			shore under the Rasstupet			Δ		
	t °C	f %	v m/s	t °C	f %	v m/s	Δt	Δf	Δv
2 August/14°°	1.8	74	–	1.8	82	–	0.0	– 8	–
15	2.0	78	0.8	1.9	84	0.8	0.1	– 6	0.0
16	2.4	70	1.8	1.7	85	3.4	0.7	–15	–1.6
17	2.4	70	2.6	1.6	87	2.6	0.8	–17	0.0
18	2.7	74	0.8	1.3	89	3.8	1.4	–15	–3.0
19	2.4	79	1.6	2.4	77	3.4	0.0	2	–1.8
20	2.4	77	3.6	2.7	77	3.0	–0.3	0	0.6
21	1.0	96	2.8	2.1	82	4.2	–1.1	14	–1.4
22	1.6	85	2.8	2.2	91	3.8	–0.6	– 6	–1.0
23	1.6	85	1.6	1.9	85	3.2	–0.3	0	–1.6
24	2.2	82	1.4	2.7	72	1.8	0.8	10	–0.4
3 August/ 1°°	2.5	80	1.6	1.4	91	4.4	1.1	–11	–2.8
2	1.6	89	1.6	1.6	87	3.6	0.0	2	–3.0
3	2.2	82	1.6	2.5	73	4.4	–0.3	9	–2.8
4	1.8	85	1.6	2.1	80	4.4	–0.3	5	–2.8
5	1.4	92	1.4	1.6	99	4.8	–0.2	7	–3.4
6	1.2	89	0.8	1.0	92	6.4	0.2	– 3	–5.6
7	1.8	82	1.0	3.1	74	4.6	–1.3	8	–3.6
8	2.4	86	0.0	1.7	90	4.0	0.7	– 4	–4.0
9	1.1	96	0.8	1.7	90	4.4	–0.6	6	–3.6
10	2.4	95	1.2	1.3	94	3.4	1.4	1	–2.2
11	1.4	94	1.2	1.0	96	3.4	0.4	– 2	–2.2
12	1.3	96	1.4	0.5	99	3.6	0.8	– 3	–2.2
13	1.5	92	1.6	0.6	99	4.0	0.9	– 7	–2.4
14	2.2	84	1.4	2.5	84	5.4	–0.3	0	–4.0

(Table IX). The precipitation in the second half of the summer season (August) was found to be greater than in July.

3.6. Cloudiness, In the period under consideration the mean pentad value of cloudiness varied from 4 to 10 in 1978 and from 2 to 9 in 1979 (Table II). The mean 24-hour value of cloudiness given in Table X indicate large variations from day to day. In terms of cloud types, the clouds St, Sc and Ac, i.e. of the lower and medium strata, were found to dominate. This type of cloudiness is conditioned by cyclonal activity.

3.7. Wind speed. The mean 24-hour wind speed was varied (Table XI) It reach 5.1 m/s in 1978 and 11.8 m/s in 1979 (Table XI). It should be stated, however, that the mean wind speed measured at any point of the area under investigation does not reflect correctly its varied character.

The area on the Gås Bay characterized by large spatial and temporal variations in the wind speed. Descending winds of the foehn or bora type are quite frequent here. It was found that on the Gås Plain southeast winds are close to the foehn in character. A classical case of the foehn occurred on 15 August, 1979. There was then a decrease in the relative air, humidity and an increase in temperature, which are typical of the foehn. The mean speed of the foehn on 15 August, 1979 is given in Fig. 3. North, northeast, east winds resemble the bora in their effects. This is confirmed by the observations made in 1978 and 1979. The speed of these winds is usually greater than that of the foehn (Fig. 4).

The spatial variation of the wind speed within the area in question is well illustrated by the results of measurements taken at two points of the shore (the foot of the Rasstupet and Cape Höfer) and at the base station on the Gås Plain (Tables XII and XIII). It follows from short-term measurements that the Gås Plain is characterized by a lower wind speed than points situated directly on the shore of the fiord. This indicates a greatr anemological variation in the area investigated and a low representativeness of the measurements taken at one point.

3.8 Variation of temperature and humidity. Short term comparative investigations carried out at two points on the shore of the fiord indicate some variation in the air temperature in the area in question. There is, however, a lack of distinct variation in the relative air humidity which is quite obvious in viev of the situation of all the points at a short distance from the shore of the fiord and the prevailing advection of sea air masses. The temperature variation is most conspicuous at point at Cåpe Höfer. The point at the foot of the Rasstupet, far within the fiord, does not show any greater differences from the base station on the Gås Palin (Tables XII and XIII).

4. Discussion of results

The investigations permitted a characterization of the meteorological conditions in the summer season at a chosen point in South Spitsbergen. In view of the short period of observations, it is impossible to discuss the climate of this area.

In view of the small number of papers on the meteorological conditions in the area in question, it is very difficult to evaluate the results obtained and to compare them with the data in the literature. It seems quite easy to evaluate the distribution of wind directions in the period discussed. They show a close relation to the general atmospheric circulation and the local factor, particularly the relief of the surface of the Earth. This has been confirmed by the results of investigations carried out in other parts of

Spitsbergen (Troitskij et al. 1975, Leszkiewicz 1977, Pereyma, 1983). The effect of the local factor on the behaviour of the wind directions is also confirmed by comparison of the results obtained with the data given by Gerstmann (1981). The dominance of the northeast wind was also confirmed by the investigations of Baranowski (1968). This fact was also indicated by Makarewicz (Pereyma, 1983) and confirmed by the data given by Dutkiewicz (1967). The considerable amount of atmospheric calm is also closely related to the local conditions. Pereyma (in press) estimates its amount at only about 10 per cent compared to 1.1 per cent according to Gerstmann (1981).

Analysis of the absolute values of the mean monthly air temperatures indicates that they are close to those observed in the area in 1958 and 1959 (Dutkiewicz 1967). At the same time, their comparison with the temperatures in other parts of Spitsbergen (Pereyma, in press) shows that they can be defined as moderate, which is typical not only of Southeast Spitsbergen, as Wagner has found (Pereyma, in press), but also of the northern part of Sörkappland. Moreover, the temperatures there are higher than those given by Markin (1974) for the Sörkapp station ($\lambda = 16°30'$E, Gr, $\varphi = 76°30'$N) and close to those found on the Aksel Island ($\lambda = 14°50'$E, Gr, $\varphi = 77°42'$N). They are also close to the mean long-term temperature of July and August at Isfjord Radio (Orvig 1973) and the temperatures which Baranowski gave for the Hornsund area (1968). Some slight differentiation in temperature among the particular summer sea seasons, typical of the Arctic, has been confirmed by other workers (Baranowski 1968, Pereyma, 1983). The investigations also confirmed the considerable air temperature differences among short time periods. In the pentad means these differences reach 3.0°C. This fact was also mentioned by Pereyma (1983) as typical of the Hornsund area. In view of the small variation in the mean 24-hour temperatures, this area is not different from those described by Baranowski (1968) and Pereyma (1983). There were also some warmer periods, which Baranowski (1968) described previously, when the mean air temperature exceeded 5.0°C in 24-hours. This phenomenon can be recognized as typical of South Spitsbergen.

In evaluating the 24-hour air temperature distribution it should be noted that this distribution is regular and distinct, although it is difficult, on the basin of summer observations, to decide whetner it belongs to the "Fram" type, as Baranowski 1968 claimed or, rather closer to a type defined by Simpson by the term "McMurdo" (Baranowski 1968). It can be expected that the cyclic nature of the 24-hour air temperature distribution will be more distinct in spring. The maxima and minima of the 24-hour air temperature occur at times typical of the Arctic, which were established by other workers (Baranowski 1968).

The almost total lack of data in the literature on the temperature

of the ground surface presents any critical approach to the regularities found. It can only be recognized that the observation of Baranowski (1968) that in the period without snow cover the temperatures of the ground surface is higher than that of the air has been confirmed. There were also somo exceptions from this rule. Analysis of the extreme temperature of the ground surface indicates that the decrease of the minimum temperature below zero Centigrade, a phenomenon know from the literature as typical of the forefield of mountain glaciers, does not occur in the area in question. In the Arctic day this is prevented by the continuous supply of the solar radiation energy to the ground surface. However, the large amplitudes between the extreme temperatures of the ground surface may indicate the cooling effect of the glaciers nearby, particularly the Gås Glacier.

Observations of the relative air humidity did not show anything particularly interesting. The hypothesis of the high relative air humidity in the Arctic summer was confirmed. In relation to the Hornsund area this phenomenon was mentioned by Baranowski (1968) and Pereyma (1983). The small variation in the mean 24-hour values of the relative air humidity found in different parts of summer is en effect of the prevailing advection of sea air masses. There were also periods of lower relative air humidity, related to the foehn processes thus, the same phenomenon as one found by Pereyma (1983) on the northern shore of Hornsund.

The precipitation totals found can be estimated as low. It is also interesting to note, as other workers have, Pereyma (in press), that most of it occurs in the second part of the summer season. The dominance of the August precipitation over the July one was also mentioned by Baranowski (1968). This is also confirmed by the data given by Markin (1974) and Ornig (1973). However, these totals are lower than those given by Ornig and different from the values measured at Hornsund in 1957–1960 (Baranowski 1968). It should be stated that the Gåshamnöyra of precipitation of the whole South Spitsbergen.

The mean wind speeds observed do not represent well the complex character of this phenomenon. This has been noted by most investigators of the climate of Spitsbergen. Apart from a large amount of calm, there are fast descending winds. On the basis of his investigations in 1957–1960, Makarewicz found that in Spitsbergen the number of days with descending winds can be as large as 12 days a month (Pereyma, 1983). The observations of the present author confirmed this fact. At the same time, it should be noted that the problem of the descending winds has been treated by many workers in a simplified way (Baranowski 1968, Pereyma, 1983). It follows from observations that there are two wind types here: southeast winds resembling the foehns and north, northeast and east winds, of the bora type. There are also descending winds from the southwest, south and west, which lack any definite character. It is unjustified to treat all the winds as foehns.

The short observation period and the small number of points prevent a wider discussion of the differentiation in the area in terms of heat, humidity and anemology. The lack of access to the materials of the German expedition (Pillewitzer 1939) prevents en evaluation and comparison of the results. The investigations of this type, which provide in effect the possibility of making topoclimate maps, are useful and should be continued.

5. Conclusions

1. The mean monthly air temperatures in the forefield of the Gås Glacier can, in terms of the conditions in Spitsbergen, be defined as moderate.
2. The mean 24-hour air temperature in the summer season varies about 4.0–5.0 °C, with large variation in the mean pentad temperatures.
3. A characteristic feature of the heat regime in South Spitsbergen is the occurrence of several day's periods with a mean 24-hour air temperature exceeding 5.0 °C.
4. The mean 24-hour temperature of the ground surface is higher than the analogous air temperature. A normal vertical stratification of the air temperature was found in the layer at the ground and temperature inversions at the ground are infrequent.
5. The relative air humidity shows higher absolute values and small time variation.
6. The anomological relations are characterized by the dominance of north, northeast and east winds, a large amount of calm, a low mean wind speed and the occurrence of fast descending winds.

6. Summary

In the summer seasons of 1978 and 1979 expeditions of Silesian University worked in South Spitsbergen, carryinf out a wide programme of geographical investigations. Meteorological observations and measurements were part of the programme (Kamiński 1979, 1980b). These investigations permitted a characterization of the meteorological conditions in the course of the two successive years (Tables II and III). It was found that in the period investigated the meteorological conditions were in 43 per cent of the cases affected by the north, northeast and east circulation. At the same time, this area is characterized by a relatively large amount of atmospheric calm (Table I, Fig. 2). In the summer seasons of the two years the air temperature had regular behaviour and, despite its considerable variation from day to day, varied about 4.0–5.0 °C (Table IV). Several days' periods were found to occur with a mean 24-hour temperature exceeding 5.0 °C. The amplitudes between the extreme temperatures reach 21.5 °C (Table IV). The 24-hour behaviour of the air temperature is regular, with a minimum at 2–3 hours GMT and maximum at 12 hours GMT (Table V). The temperature of the ground surface and air 5 cm overground is higher than the air temperature at 2 m overground (Table VI). There are exceptions from this fact in the case of minimum temperatures, when the minimum air temperature is higher than the analogous temperature of the ground surface (Table VII).

The behaviour of the mean 24-hour values of the relative humidity is hidhly monotonous, which is typical of the area with prevailing advection of sea air masses. There are also periods with lower relative air humidity, related to the foehn processes (Table VIII).

The precipitation is small and higher in August than in July (Table IX). The mean

24-hour cloudiness varies between 2 and 9 (on the scale 0–10) and its values in the period in question indicate the variability of this element (Table X). The mean 24-hour wind speed is varied, reaching 11.8 m/s (Table XI). There are often descending winds of the foehn and bora types. Some spatial differentiation of the wind speed and also variations in the temperature and relative humidity of the air were found in the area under investigation (Tables XII and XIII).

7. Резюме

Летом 1978 и 1979 года в южном Шпицбергене работали экспедиции Сленского университета реализируя широкую программу географических исследований. Одним из элементов этих исследований были метеорологические наблюдения и измерения (Kamiński 1979, 1980). Они позволили дать характеристику метеорологических условий за два года подряд (табл. II, III). Установлено, что эти условия создавались в 43% случаев под влиянием циркуляции С, СВ и В, а одновремен но для исследуемой территории были характерен часто выступающий атмосферный штиль (табль. 1, рис. 2). Ход температуры воздуха летом в одном и другом году был ровный, ок. 4—5,0°С (табл. IV), не смотря на большие дневные колебания. Наблюдались продолжающиеся несколько дней периоды со средней суточной температурой выше 5,0°С. Амплитуда экстремальных температур воздуха достигает 21,5°С (табль. IV). Суточный ход температуры воздуха регулярен, минимум наблюдается в 2—3ч GMT, максимум в 12 ч GMT (табл. У). Температура поверхности грунта и воздуха 5 см над грунтом выше температуры воздуха на высоте 2 метров (табль. VI). Изменения случаются при минимальных температурах, когда минимальная температура воздуха выше аналогичной температуры поверхности грунта (табль. VII).

Ход средних суточных величин относительной влажности очень монотонный, что является типичным для территорий с преобладанием адвекции морских масс воздуха. Случаются периоды с пониженной относительной влажностью воздуха, что связано с фёновыми явлениями (табль. VIII).

Атмосферные осадки невелики, в августе больше чем в июле (табль. IV). Средняя суточная облачность колеблется от 2 до 9 (по шкале 0—10) и ее величины в исследуемый период показывают изменчивость этого элемента (табл. X). Средняя суточная скорость ветра разная и достигает 11,8 м (табл. XI). Наблюдаются часто ветры типа фёна и бора. Установлено, что на исследуемой территории скорости ветра неодинаковы, что относится также к температурам и относительной влажности воздуха (табл. XII, XIII).

8. Streszczenie

W okresach letnich 1978 i 1979 pracowały na Południowym Spitsbergenie Wyprawy Uniwersytetu Śląskiego, realizując szeroki program badań geograficznych. Obserwacje i pomiary meteorologiczne to jeden z elementów tych badań (Kamiński 1979, 1980b). Badania pozwoliły na dokonanie charakterystyki warunków meteorologicznych w okresach dwóch kolejnych lat (Tab. II, III). Stwierdzono, że warunki meteorologiczne w rozpatrywanym okresie czasu kształtowały się w 43% przypadków pod wpływem cyrkulacji N, ME i E. Jednocześnie badany obszar charakteryzuje się względnie dużą ilością cisz atmosferycznych (Tab. I, rys. 2).

Temperatura powietrza w okresach letnich obydwu lat miała wyrównany przebieg i mimo znacznej zmienności z dnia na dzień oscylowała wokół 4–5.0°C (Tab. IV) Stwierdzono występowanie kilkudniowych okresów ze średnią temperaturą dobową wyższą od 5.0°C. Amplitudy temperatur skrajnych powietrza dochodzą do 21.5°C (Tab. IV). Dobowy przebieg temperatury powietrza jest regularny, minimum przypada w godzinach 2–3 GMT, maksimum o godzinie 12 GMT (Tab. V). Temperatura powierzchni gruntu i powietrza 5 cm nad gruntem jest wyższa od temperatury powietrza na wysokości 2 metrów (Tab. VI). Odstępstwa od stwierdzonego faktu występują w przypadku temperatur minimalnych, kiedy to temperatura minimalna powietrza jest wyższa niż analogiczna temperatura powierzchni gruntu (Tab. VII).

Przebieg średnich dobowych wartości wilgotności względnej odznacza się dużą monotonią, co jest typowe dla obszarów z przewagą adwekcji morskich mas powietrza. Występują również okresy o obniżonej wilgotności względnej powietrza, związane z procesami fenowymi (Tab. VIII).

Opad atmosferyczny jest niewielki i w sierpniu wyższy niż w lipcu (Tab. IX). Średnie zachmurzenie dobowe waha się od 2 do 9 (w skali 0–10) a jego wartości w badanym okresie wskazują na zmienność tego elementu (Tab. X). Średnia dobowa prędkość wiatru jest zróżnicowana i dochodzi do 11.8 m/sek (Tab. XI). Obserwuje się częste wiatry spadowe typu fenowego i bora. Stwierdzono pewne przestrzenne zróżnicowanie prędkości wiatru w obrębie badanego obszaru a także zróżnicowanie temperatury i wilgotności względnej powietrza (Tab. XII, XIII).

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