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Jan RODZIK [1], Waldemar Stepko [2]
1. Institute of Earth Sciences,
M. Curie-Skłodowska University ul. Akademicka 19, Lublin
2. Institute of Meteorology and Water Management ul. Waszyngtona 42, 81-342 Gdynia

Climatic conditions in Hornsund (1978–1983)

ABSTRACT: On the basis of selected mean monthly climatic elements from the 5-year period of whole-year expedition of the Polish Academy of Sciences to Spitsbergen climatic conditions in Hornsund are presented. Thermal seasons of year have been distinguished and the weather course in the annual cycle is discussed.

KEY WORDS: Arctic, Spitsbergen, climate.

1. Introduction

The station in Hornsund is situated at the fiord's outlet, on its northern margin. It lies on a 10-meter sea terrace at the distance of 200 m from the shore of the Isbjörnhamna bay and of about 1 km of the Ariekammen ridge and the front of the Hansa Glacier (Fig. 1). Its geographic coordinates are: −77°00′ N and −15°33′ E.

The Hornsund region, being the area of the activity of the Polish polar expeditions, is one of those most thoroughly explored on Spitsbergen. There is, however, a lack of long-term series of observations required for the climatic characteristics. Well recognized is the weather course in the summer season (Pereyma 1983), whereas to the end of 1970ies there was only one series of whole-year observations from the period of wintering of 1957/58 (Baranowski 1968).

In July 1978 works of the base of the Polish Academy of Sciences in Hornsund were resumed and at the same time works of the Meteorological Station of the Institute of Meteorology and Water Management began. The worked out results of observations performed by some expeditions were published (Petelski 1980, Stepko and Rodzik, in press), whereas by

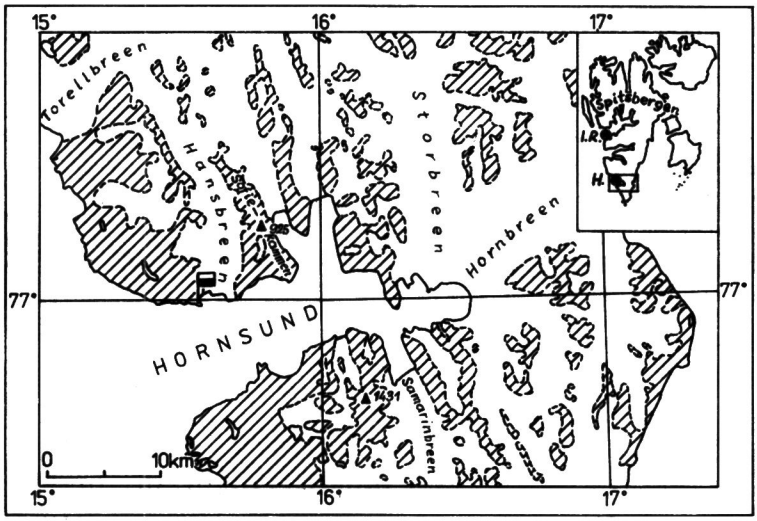

Fig. 1. Position of the Meteorological Station in Hornsund on the basis of the map of Svalbard 1: 500.000 (Norsk Polar Inst. Oslo 1979)

Pereyma (1983) a detailed study of the climate of this region based on the hitherto observations (till 1980) from Hornsund, the Werenskiold Glacier basin and other stations on Svalbard was presented.

The aim of the present work is to supplement the hitherto information with mean values of basic climatic elements from the five-year period of continuous observations in Hornsund.

2. Material and methods

A basis of the present work constituted the data of the Meteorological Annals of Hornsund of 1978–79, 1979/80, 1980-81 and 1982/83. The results of meteorological observations from the wintering of 1981/82 were obtained by courtesy of Messrs. K. Migała M. Sc. and M. Sobik M. Sc. from the Department of Climatology, University of Wrocław. Moreover, the authors made use of additional own observations performed during the wintering of 1982/83. The materials for comparison with the Isfjord Radio were taken from the periodicals: World Weather Records (1951–60) and Monthly Climatic Data for the World (1961–70).

The data contained in the Annals concern: temperature, air pressure and humidity, precipitation and sunshine sums, wind velocity, cloudiness and snow cover thickness. Mean monthly values from the 5-year period (Table I) were calculated for these elements. With regard to the arrangement

Table I

Mean monthly values of selected climatic elements in Hornsund in the 5-year period of July 1978 – July 1983

	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
Air pressure hPa	1006.4	1006.0	1010.4	1013.6	1018.6	1011.6	1012.6	1013.0	1008.8	1009.4	1001.6	1005.6
Air temperature °C	−14.2	−12.6	−11.3	−10.5	4.5	0.8	4.1	3.7	0.4	−3.6	−7.7	−12.3
Precipitation sum mm	20.4	41.7	29.4	30.4	18.6	26.5	37.5	63.3	50.0	37.4	34.7	16.3
Air humidiry %	70.8	77.0	75.0	76.2	77.6	81.6	85.4	87.4	81.6	75.4	74.2	72.2
Wind velocity $m.s.^{-1}$	6.5	6.7	7.4	6.3	4.7	3.6	3.4	4.1	4.3	4.7	5.8	5.6
Cloudiness %	60	72	62	68	72	81	76	86	78	75	66	56
Sunshine duration hs.	–	3.5	84.9	186.8	226.0	190.3	168.0	92.4	86.5	18.3	–	–
Snow cover cm	21.6	30.1	38.3	43.0	41.0	28.8	–	–	–	3.8	8.4	17.0

Remark: Cloudiness, sunshine duration and snow cover do not concern the season of 1981/82.

Table II

Mean annual values of selected climatic elements in Hornsund and Isfjord Radio

		Hornsund						Isfjord Radio		
		1978/79	1979/80	1980/81	1981/82	1982/83	1978–83	1951-60	1961-70	1951-70
Air pressure	hPa	1011.4	1011.4	1008.8	1010.4	1007.0	1009.8	1010.4	1010.4	1010.4
Air temperature	°C	−6.8	−4.2	−7.0	−5.2	−5.0	−5.6	−3.8	−5.9	−4.9
Precipitation sum	mm	372.9	298.3	503.9	483.1	372.9	406.2	384.4	486.0	435.2
Air humidity	%	77.2	77.6	75.8	80.0	78.8	77.9			
Wind velocity	$m.s^{-1}$	5.1	5.3	5.5	4.8	5.6	5.3			
Cloudiness	%	72	70	68	x	74	71			

Table III

Dates of beginning, end and duration of thermal year seasons in Hornsund

Year	Winter		Spring			Summer			Autumn			Winter
	End	Duration	Begin.	End	Duration	Begin.	End	Duration	Begin.	End	Duration	Begin.
1978							-Aug. 31		Sept. 1-	Sept. 18	18	Sept. 19
1979	May 30	254	May 31-	June 28	29	June 29-	Aug. 31	64	Sept. 1-	Nov. 9	70	Nov. 10
1980	May 18	191	May 19-	June 18	31	June 19-	Sept. 4	78	Sept. 5-	Oct. 9	35	Oct. 10
1981	May 14	217	May 15-	June 28	45	June 29-	Sept. 10	74	Sept. 11-	Oct. 30	50	Oct. 31
1982	May 29	211	May 30-	July 1	33	July 2-	Aug. 21	51	Aug. 22-	Oct. 9	49	Oct. 10
1983	May 18	221	May 19-	June 22	35	June 23						
1978-83	May 22	219	May 23-	June 26	35	June 27-	Sept. 1	67	Sept. 2-	Oct. 15	44	Oct. 16
Isfjord Radio												
1947-68	May 21	224	May 22-	June 21	31	June 22-	Sept. 2	73	Sept. 3-	Oct. 9	37	Oct. 10

of Annals containing the observation results from particular expeditions, the annual means (Table II) for the seasons of 1978/79. 1979/80 and 1980/81 comprise the period of July-June and for the seasons of 1981/82 and 1982/83 — the period of August-July (thus "fell off" July 1981, for which full data are lacking). In such a manner the hitherto works from Hornsund were presented up to now while covering with one observation season the whole winter period responsible for the character of the given year.

On the basis of mean monthly air temperatures (T_i) particular year seasons were determined according to the Baranowski's criterion (1968), viz.:

spring — -2.5° C $< T_i < 2.5^\circ$ C
summer — $T_i \geqslant 2.5^\circ$ C
autumn — -2.5° C $< T_i < 2.5^\circ$ C
winter — $T_i \leqslant -2.5^\circ$ C

Much attent on has been paid to the air temperature, the weather element most intensely felt and most often analyzed.

3. Air temperature and thermal year seasons

Mean air temperature in the period analyzed amounted to -5.6° C showing a rather great variability from year to year. from -4.2 C in 1979/80 to -7.0° C in 1980/81 (Table II). A pronounced effect on the annual mean exert temperatures of winter months undergoing considerable fluctuations in particular years (Fig. 2). The mean temperature of the coldest month, January, varied from -17.9° C (1981) to -8.9° C (1983), -14.2° C, on the average. The mean temperature of the warmest month,

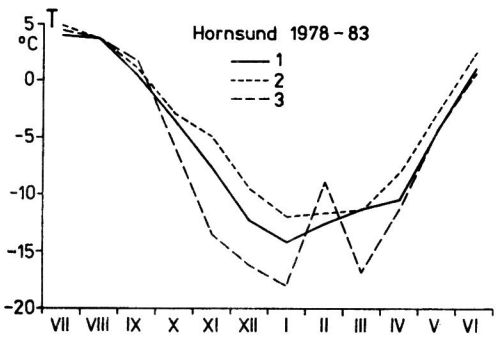

Fig. 2. Course of mean monthly temperatures in Hornsund: 1 — in the 5-year period 1978-1983, 2 — in the warmest season of the year 1979/80, 3 — in the coldest year 1980–81

July, is characterized by much less variability — from 2.6° C (1982) to 4.9° C, 4.1° C, on the average (Table I). The absolute temperature minimum (−35.9° C) was recorded in Hornsund on February 16, 1981, the absolute maximum (13.4° C) — on July 11, 1979.

The temperature course throughout a year is very unequal, both positive and negative temperatures can occur during the whole year (Fig. 3).

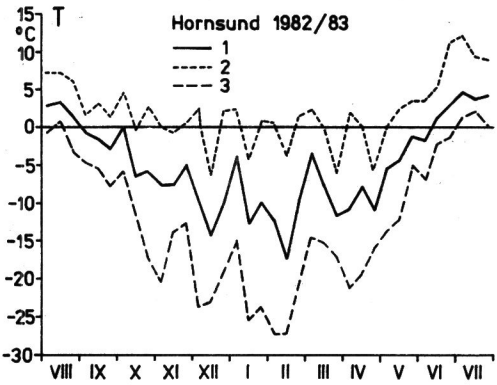

Fig. 3. Course of ten-day temperatures in Hornsund during the wintering of 1982/83: 1 — ten-day means, 2 — ten-day absolute maximum, 3 — ten-day absolute minimum

Characteristic are winter warmings up occurring distinctly also in the course of mean monthly temperature values (Fig. 2). In the course of year seasons a long duration of principal and a short one of transitory seasons deserves attention (Table III).

The longest year season is winter, characterizing by a compact period of mean daily temperatures of $T_i \leqslant -2.5°$ C. It begins usually in Hornsund on October 16 and ends on May 22. Hence the mean duration of this season amounts to 219 days, i.e. over 7 months. The longest winter of 1978/79 lasted from September 19 to May 30, i.e. as many as 254 days, the shortest. Of 1979/80-numbered only 191 days, from November 10 to May 18 (Table III). The most severe was, however, the winter of 1980/81 with the mean temperature of −14.1° C for the period of November-April the warmest winter, apart from the already mentioned winter 1979/80, was the winter of 1982/83 with the temperature −9.7° C. A good index is the number of extraordinarily severe days with $T_{max} \leqslant -15°$ C (Kosiba 1985). The highest number, ever 44, of such days occurred during the winter of 1980/81, the lowest, only 13, during the winter of 1982/83. For comparison: the winter of 1957/58 numbered 11 extraordinarily severe days and lasted only 161 days, from November 12 to April 21.

Spring begins in May 23 and lasts, on the average, 35 days, from

June 26, summer ($T_i \geqslant 2.5°$ C) — 67 days ending on September 1. The longest was the summer of 1980 (78 days), the summer of 1982, exceptionally short and cool, lasted 51 days, the mean temperature of July and August amounting only to 2.5° C. Autumn lasts, on the average, 44 days, from September 2 to October 15. The duration of this season undergoes considerable fluctuations, from 18 days in 1978 to 70 days in 1979 (Table III).

4. Characteristics of remaining climatic elements

In the analysis of variability of climatic elements from year to year in Hornsund distinguished itself the year 1982/83. In this year the lowest mean air pressure, the greatest cloudiness and wind velocity, thigh air humidity and the thickest snow cover occurred (Table II). They were caused by frequent occurrence of depressions over Spitsbergen during the relatively warm winter of 1982/83 (Stepko and Rodzik, in press). Otherwise the variability of particular elements from year to year is not high, except for precipitation, the amount of which varied from 298.3 mm in 1979/80 to 503.9 mm in 1980/81. The mean annual precipitation amount in the period under study was 406.2 mm. Mean values of the remaining climatic elements were accordingly: air pressure 1009.8 hPa, air humidity 77.9%, wind velocity 5.3 m. s^{-1}, cloudiness 71%, sunshine duration 1058.5 hours and snow cover thickness in the period of October-June 25.8 cm.

On the other hand, a very clear is the seasonal variability of climatic elements in Hornsund, visible in the course of mean monthly values (Fig. 4, 5), which is closely connected with the seasonal variability of pressure systems in Arctic. The lowest pressures occur in winter during the development of the Island-Karsha low-pressure trough, while the November minimum of 1001.6 hPa corresponds to the highest occurrence

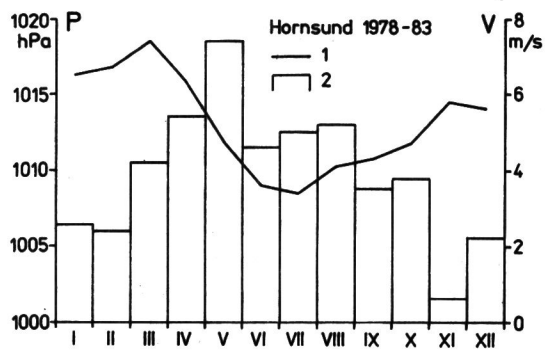

Fig. 4. Course of mean monthly values: 1 — of wind velocity (V) against the background of 2-mean air pressure (P) in Hornsund in the period 1978–1983

frequency of depressions over Spitsbergen early in winter (Baranowski 1968). The May maximum, instead, of 1018.6 hPa, expresses an intensification at that time of anticyclone circulation over Central Arctic.

Low wind velocities in summer fall for the period of activity of low-gradient, shallow pressure system, whereas high ones at mid-winter time are consequences of the Spitsbergen position in high-gradient pressure zone between the Island-Karsha trough and the developing Arctic and Greenland high-pressure areas (Vowinckel and Orvig 1970).

Due to such a position, north-eastern and northern circulation direction, particularly in the cold year season, predominates over Spitsbergen. Late in winter and in spring the SE and in summer the SW and NW directions

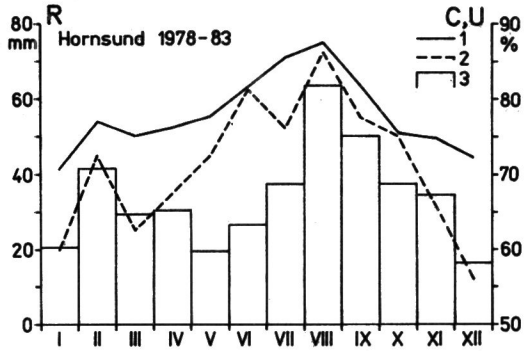

Fig. 5. Course of mean monthly values: 1 — of air humidity (U) and 2 — of cloudiness (C) against the background of 3 — mean precipitation sums (R) in Hornsund in the period 1978–1983

prevail (Gerstmann 1981). Meanwhile that were E, NE and W winds, which prevailed at the same time in Hornsund (Pereyma 1983). Thus the longitudinal direction prevailed during the decisive prevalence of the meridional circulation. This bears evidence of a very strong effect of the fiord on the wind direction observed at the Station.

A direct connection between the course of air humidity, cloudiness and precipitation amount occurs (Fig. 5). Two culminations can be observed there. The maximum occurs in August — precipitation 63.3 mm, cloudiness 86%, air humidity 87.4% (Table I). The secondary culmination which occurs in February is connected with warming up at the mid-winter time — in this period also the quickest increment of the snow cover thickness is observed. The precipitation-poorest month is December (16.3 mm), the respective secondary minimum occurs in May (18.6 mm).

Sunshine sums are connected with the day light. The polar night lasts in Hornsund from October 31 to February 12, the polar day — from April 22 to August 21. The sun reaches its peak in June and July,

but due to a great cloudiness in summer (Fig. 5) the longest sunshine period is recorded late in winter and in spring (Table I). The mean monthly sunshine sum in May amounted to 226 hours.

5. Weather course in the annual cycle

In the weather course, in spite of differences in particular years, certain regularities can be observed. Basing on the respective materials and works, let us try to display a typical weather course in the annual cycle.

Summer ($T_i \geqslant 2.5°$ C), the period of activity of most expeditions, is the year season most thoroughly recognized. Low-gradient systems of low pressure areas prevail at that time over Central Arctic (Vowinckel and Orvig 1979). The occurrence frequency of low pressure areas over Spitsbergen is rather high (Baranowski 1977), nevertheless no greater pressure fluctuations are observed in summer, wind velocity being there the least during a year (Fig. 5). Only the circulation from the *E* sector makes that in Hornsund in the summer season rather strong winds of the foehn character occur (Baranowski and Głowicki 1975, Pereyma 1983).

The strongest differences in the circulation character occur in summer. At the N and E circulation the summer is rather dry, whereas the W and S circulation results in fogs and high precipitation amounts (Petelski 1980, Szczepankiewicz-Szmyrka 1981). Such a situation is typical for the second part of summer, occurring also in autumn, and therefore precipitation is maximum in the period of August-September.

Summer is the period of positive temperatures-frosts occur sporadically, mainly early or late in summer, the maximum daily temperatures exceeding most often 5° C. The temperature variability from day to day is the lowest in a year, over 1° C. Low are also daily temperature amplitudes, to 3–4° C, on the average.

In autumn ($2.5° > T_i > -2.5°$C) during the circulation change to northern one, a gradual cooling down to winter temperatures is taking place (Fig. 3). Small snowfalls occur already at that time. The temperature drop is checked by the warmth emission during cooling of the fiord and freezing of water and soil (Baranowski 1968, Stepko and Rodzik, in press). Air temperature amplitudes are similar to those in summer, but the daily course of temperature is marked more clearly. The mean variability from day to day is about 1.5° C. Typical for autumn are days with frosts ($T_i > 0° \text{ C} > T_{min}$) and cool days ($T_{max} > 0° \text{ C} > T_i$), although severe days with $T_{max} < 0°$ C occur as well.

Thus autumn is the season of frequent temperature passages through 0° C,

while cooling is interrupted by a new influx of warm air. Such warmings up with high rainfall amounts occur late in autumn, resulting in a recession of the forming snow cover and thawing of active soil layer, the upper horizon of which froze during autumn colds.

Winter ($T_i \leqslant -2.5°$ C) in Hornsund begins usually with rapid cold. Then a quick freezing of cooled soil occurs and the freshly fallen snow does not melt any more. Warmth radiation through snow cover creates conditions for occurrence of permanent by-ground inversion of temperature characteristic for the polar zone (Baranowski 1968). Three periods in the weather course during this longest year season can be distinguished.

The first, covering several weeks early in winter, is characterized by the highest occurrence frequency of depressions wandering along pathway of low pressures between Scandinavia and Svalbard (Baranowski 1968, Petelski 1980). In this connection warmings up and great air pressure fluctuations occur in Hornsund ever several or dozen or so days. Since Spitsbergen lies at the northern, "serene" side of the route of cyclons, no especially high air humidities nor great cloudiness (Fig. 5) occur in that period. On the other hand, every subsequent passage of depression is accompanied in Hornsund by the wind strength growth. Characteristic is the period of coolings of very severe days with $T_{max} \leqslant -5°$ C. Daily temperature amplitudes are at the time wide, averaging to 5–6° C, the mean variability from day to day amounting to about 3° C.

The second part of winter lasts 4–5 months and begins in November or December with a rapid cooling. Characteristic for the winter period is the occurrence of extraordinarily severe days $T_{max} \leqslant -15°$ C. In this part of winter also warmings up with $T_{max} > 0°$ C occur, but the periods of cooling separating them are much longer. This is due to higher stability of pressure systems. Depressions are much deeper and reach the Francis Joseph Land causing the NE circulation, over Spitsbergen similar situation arises due to the occurrence of high pressure towards NE from Spitsbergen (Vowinckel and Orvig 1970).

Such flow direction within a high-gradient pressure area and under specific orographic conditions results in occurrence of very strong long-lasting east winds in Hornsund. Mean daily wind velocities can reach 20 m. s^{-1}, maximum gusts exceeding 40 m. s^{-1}. This is the period with the least number of calms in a year (Pereyma 1983, Stepko and Rodzik, in press) Strong winds cause snowstorms and modify the snow cover, which is very differentiated. Beside quite denuded places, snowdrifts of several meters in height occur (Pereyma 1983, Rodzik, in press).

In mid-winter an intensification of meridional air exchange can be observed in that part of Arctic (Baranowski 1968). It manifests itself with a considerable variability of mean daily air temperatures from day to day, which in the coldest month amounts, on the average, to 4–5° C

and its maximum value, both in growth and drop, can reach 15° C. In view of a weak daily rythm or the reverse rythm occurring during the polar night, this high variability of temperature from day to day results in wide daily temperature amplitudes in that part of winter (Baranowski 1968, Petelski 1980). They amount, on the average, in the coldest month to 8–10° C, and their maximum values can reach 20° C (Stepko and Rodzik, in press).

Great variability of temperature is accompanied by considerable fluctuations in pressure and humidity of air. Symptomatic is the fact that the lowest relative air humidity, below 40%, occurs in the period of lowest temperatures (Stepko and Rodzik, in press). No fogs have been recorded in Hornsund in the winter season. A rapid warmings up in this period of winter occur in consequence of blocking depressions by anticyclone over Scandinavia (Barry and Hare 1974) and their wanderings betwen Greenland and Spitsbergen as far as in the environs of pole. This results in inflow of warm air from above Atlantic with high precipitation amounts, often in the form of rain (Baranowski 1977, Stepko and Rodzik, in press).

The third part of winter covers its last weeks. At that time vanishes the activity of the Island-Karsha trough and a growth of the middle pressure area in Arctic ensues (Vowinckel and Orvig 1970). A growth of the air pressure occurs in Hornsund (Fig. 4), but without any rapid drops of this pressure. The high-pressure centres lie to N and E of Spitsbergen, what results in a change of circulation direction and wind direction from NE to E and SE (Gerstmann 1981, Stepko and Rodzik, in press). No very strong winds nor very frosty days are recorded at that time. The temperature variability from day to day and the daily amplitudes are like in the first part of winter, but the daily rythm is more distinctly marked. A great number of serene days, stabilized snow cover and the beginning polar day create favourable conditions for exploration of the island's interior.

Spring (May-June), similarly as autumn, is the period of frequent passages of temperature through 0° C. The warm air influx from S under the effect of high-pressure system from above Scandinavia and the Barents' Sea do not bring any more high precipitation amounts. The cloudiness and air humidity degree increase in that period, at a simultaneous decrease of the wind velocity, spring is the period of most frequent calms in a year (Pereyma 1983, Stepko and Rodzik, in press). In spite of strongly marked day rythm, the temperature amplitudes are little, of about 4° C, on the average; little also is the variability from day to day, amouting only to about 1° C.

Warming up is checked by using high amounts of warmth for snow- and ice-melt. still a short-time return of winter temperatures can occur

at that time. Only late in spring repeated warm air influx, often accompanied by rainfalls and fogs, takes place. A growth of the mean daily air temperatures of over 0° C, quick ablation of snow and thawing of uncovered soil ensue. Early in summer only single patches of snow remain laying on the tundra surface (Pereyma 1983, Rodzik, in press).

6. Recapitulation

Let us compare the results obtained with those from the similarly established Isfiörd Radio Station (Fig. 1) disposing of long-term series of observations. The mean annual temperature of the period 1914–1968 amounts to −4.9° C (Markin 1975). A great differentiation of temperatures occurs even in long periods. In the 20-year period 1951–1970 characterizing by identical mean temperature with many-year mean value, particular decades showed considerable differences in relation to temperature and precipitation (Table II). In spite of that, the mean pressure was identical, and therefore, it can be presumed that in case of climatic elements without great differences from year to year they would not deviate significantly from the many-year mean.

Baranowski (1977) calculated for temperature and precipitation the coefficient of correlation between Hornsund and Isfjörd Radio Station. It was not high for precipitation, still it was found that the precipitation sum in Hornsund was by about 30% lower in relation to the Isfjord Radio. On the other hand, between the mean monthly temperatures recorded at these stations a close relationship occurs. It follows from the regression equation that the mean annual temperature in Hornsund in the period 1951–1970 amounts to −5.2° C. Basing on these comparisons, it could be assumed that the 5-year period analyzed was cooler and more humid in relation to mean many-year conditions.

The comparison of the duration of particular year seasons in Hornsund and in the Isfjord Radio determined basing on the course of mean daily temperatures of 1947–1968 (Hisdal 1970), proves that in Hornsund transitory year seasons are longer. Winter and summer begin in Hornsund several days later, the beginning of the remaining seasons being similar (Table III). This is probably due to the position of Hornsund in the vicinity of the wandering route of depressions.

The comparing investigations carried out up to now in the Werenskiold glacier basin proved differentiation of climatic conditions over a small area. This differentiation can be most probably related, among other things, to the influence of sea, orography, glaciers and altitude a.s.l. (Baranowski 1957, Szczepankiewicz-Szmyrka 1981, Pereyma 1983). Therefore,

the presented values of climatic elements relate closely to a small area only. with approximate geographic conditions.

Baranowski (1968, 1977) and Pereyma (1983) stress a predominating role in the polar zone of atmospheric circulation as a climate-forming factor. It is marked, among other things, by influx of warm air masses inside the island during warmings up in winter. Since the air circulation does not change over such a small area, the weather course in the Hornsund Station can be regarded as representative for the whole region.

The present work corroborates the conclusions on the Hornsund climate drawn in the works carried out up to now (Baranowski 1968, Petelski 1980, Pereyma 1983, Stepko and Rodzik, in press). Therefore, we can restrict ourselves to mentioning the most important features connected with the position in the vicinity of main centres of pressure systems in Arctic. For Hornsund characteristic are:

— strong dependence of weather on the flow direction of air masses,

— very great differentiation of weather in winter, manifesting itself with rapid changes of pressure, air temperature and humidity and of strength of winds,

— decisive prevalence of winds from easter sector caused by the circulation direction and position of the fiord,

— seasonal changes of climatic elements constituting a reflection of seasonal variability of pressure systems in the region of Arctic.

Basing on the above characteristics and the numerical data for the 5-year period, the Hornsund climate can be defined as maritime one, with distinctly marked transitoriness between ice-free. relatively warm Atlantic waters and the ice-covered Arctic Sea.

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7. Резюме

Настоящая работа основывается на материале пятилетнего периода наблюдений (июль 1978—июль 1982 гг.) в станции Польской Академии Наук в Горнсунде. Это наиболее долгий период метеорологических наблюдений в районе Шпицбергена.

В анализируемый период наблюдались сравнительно большие колебания климатических элементов, как сезонные (рис. 3, 4, 5) так и из года в год (рис. 2). Это заметно обозначалось м.пр. в температуре воздуха и в атмосферных осадках. Средняя годичная температура колебалась в пределах от −4,2°C (1979—1980 гг.) до −7,0°C (1980—1981 гг.) Средняя температура всего периода составляла −5,6°C (табл. II). В годовом ходе максимум температуры проходилось на июль (4,1°C), а минимум — на январь (−14,2°C) (табл. I).

Средняя годичная сумма осадков составляла 406,2 мм. Самое большое количество осадков было в сезоне 1980—1981 гг. — 503,9 мм, а самое малое в сезоне 1979—1980 гг. — 298,3 мм (табл. II). Месяцем с наивысшей средней суммой осадков за пятилетие был август (63,3 мм), а с наименьшей — декабрь (16,3 мм). (табл. I).

На основании термического критерия были выделены четыре поры года (табл. III):

— осень ($2{,}5 > T_i > -2{,}5°$) с началом в первой декаде сентября,
— зиму ($T_i \leqslant -2{,}5$) с началом во второй декаде октября,
— весну ($2{,}5° > T_i > -2{,}5°$) с началом в третьей декаде мая,
— лето ($T_i \geqslant 2{,}5°C$) с началом в третьей декаде июня.

В годовом ходе погоды лето характеризовалось большим числом дней с осадками и туманами, а осень — частым прехождением температуры через 0°C. Зима является периодом более сильной меридиановой циркуляции воздуха; в первой части выступает самая большая в году частота атмосферных депрессий. Во второй части зимы наблюдаются значительные колебания пгоды, тогда как конец зимы является наиболее безоблачным периодом в году. Самая короткая пора года — весна, является периодом таяния снежного покрова. Характерным признаком климата Горнсунда является выступание сильных восточных ветров.

Сравнение с многолетним периодом наблюдений из Исфиорд Радио показало, что анализируемое пятилетие было несколько более холодными и влажным, чем гипотетические средние условия.

8. Streszczenie

Niniejsze opracowanie oparto na materiale z pięcioletniego okresu obserwacji (lipiec 1978–lipiec 1983) na stacji Polskiej Akademii Nauk w Hornsundzie. Jest to najdłuższy, ciągły okres obserwacji meteorologicznych w rejonie SW Spitsbergenu.

W analizowanym okresie wystąpiły stosunkowo duże wahania elementów klimatycznych, zarówno sezonowe (fig. 3, 4, 5), jak i z roku na rok (fig. 2). Zaznaczyło się to wyraźnie m.in. w temperaturrze powietrza i opadach atmosferycznych. Średnia roczna temperatura wahała się od −4.2° C (1979–80), do −7.0° C (1980–81). Średnia temperatura całego okresu wynosiła −5.6° C (tab. II). W przebiegu rocznym maksimum temperatury przypadało na lipiec (4.1° C), a minimum na styczeń (−14.2° C) (tab. I).

Średnia roczna suma opadów wynosiła 406.2 mm. Najwięcej — 503.9 mm — spadło w sezonie 1980–81, a najmniej — 298.3 mm — w sezonie 1979–80 (tab. II). Miesiącem z najwyższą średnią sumą opadów w pięcioleciu był sierpień (63.3 mm), a z najniższą grudzień (16.3 mm) (tab. I).

W oparciu o kryterium termiczne wyróżniono cztery pory roku (tab. III):
— jesień ($2.5° > T_i > -2.5°$) z początkiem w pierwszej dekadzie września
— zimę ($T_i \leqslant -2.5°$) z początkiem w drugiej dekadzie października
— wiosnę ($2.5° > T_i > -2.5°$) z początkiem w trzeciej dekadzie maja
— lato ($T_i \geqslant 2.5°$) z początkiem w trzeciej dekadzie czerwca.

W rocznym przebiegu pogody lato charakteryzuje się dużą ilością dni z opadem i mgłą, a jesień częstym przechodzeniem temperatury przez 0°. Zima jest okresem nasilenia południkowej cyrkulacji powietrza; w pierwszej części występuje największa w roku częstotliwość niżów. Wdrugiej części zimy występują duże wahania pogody, a koniec zimy jest najpogodniejszym okresem w roku. Najkrótsza pora roku, wiosna jest okresem tajania pokrywy śnieżnej. Charakterystyczną cechą klimatu Hornsundu jest występowanie silnych, wschodnich wiatrów.

Na podstawie porównania w wieloletnim okresem obserwacji z Isfjord Radio stwierdzono, że analizowane 5-lecie było nieco chłodniejsze i wilgotniejsze of hipotetycznych warunków średnich.

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