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COMPARISON OF WEATHER CONDITIONS
AT THE COAST
NEAR PALFFYODDEN AND IN LISBETDALEN
(SØRKAPP LAND, SPITSBERGEN) SUMMER 1983

stawowy

ABSTRACT: The paper shows decisive influence of the orography and distance from the sea on the climatic differences between the areas mentioned above.

Key words: Arctic, Spitsbergen, Sørkapp Land, temperature, humidity, winds, mountainous valley, sea coast.

Introduction

Observations were carried out at two stations (fig. 1):

1. "Palffyodden" situated 1 km to the north-west from the cap on the flat raised marine terrace 10 m a.s.l.

2. "Lisbetdalen" situated in the central part of the valley, at the foot of Savitsjtoppen, 3 km from the fiord coast, at about 100 m a.s.l. and 35 m above the bottom of the valley.

In both stations temperature and relative humidity were measured by means of August's psychrometer at 8.00 and 20.00 GMT, maximum and minimum daily temperatures, temperature and relative humidity were measured by a thermohydrograph, daily sum of rainfall by Helmann's ombrometer, direction and velocity of the wind by Robinson's hand anemometer. All the measurements were taken at the hours mentioned above. Observations were made from July 11th to August 21st with only short breaks when the instruments temporarily failed (fig. 2, 3).

Both stations mentioned above were situated there because of three following facts:

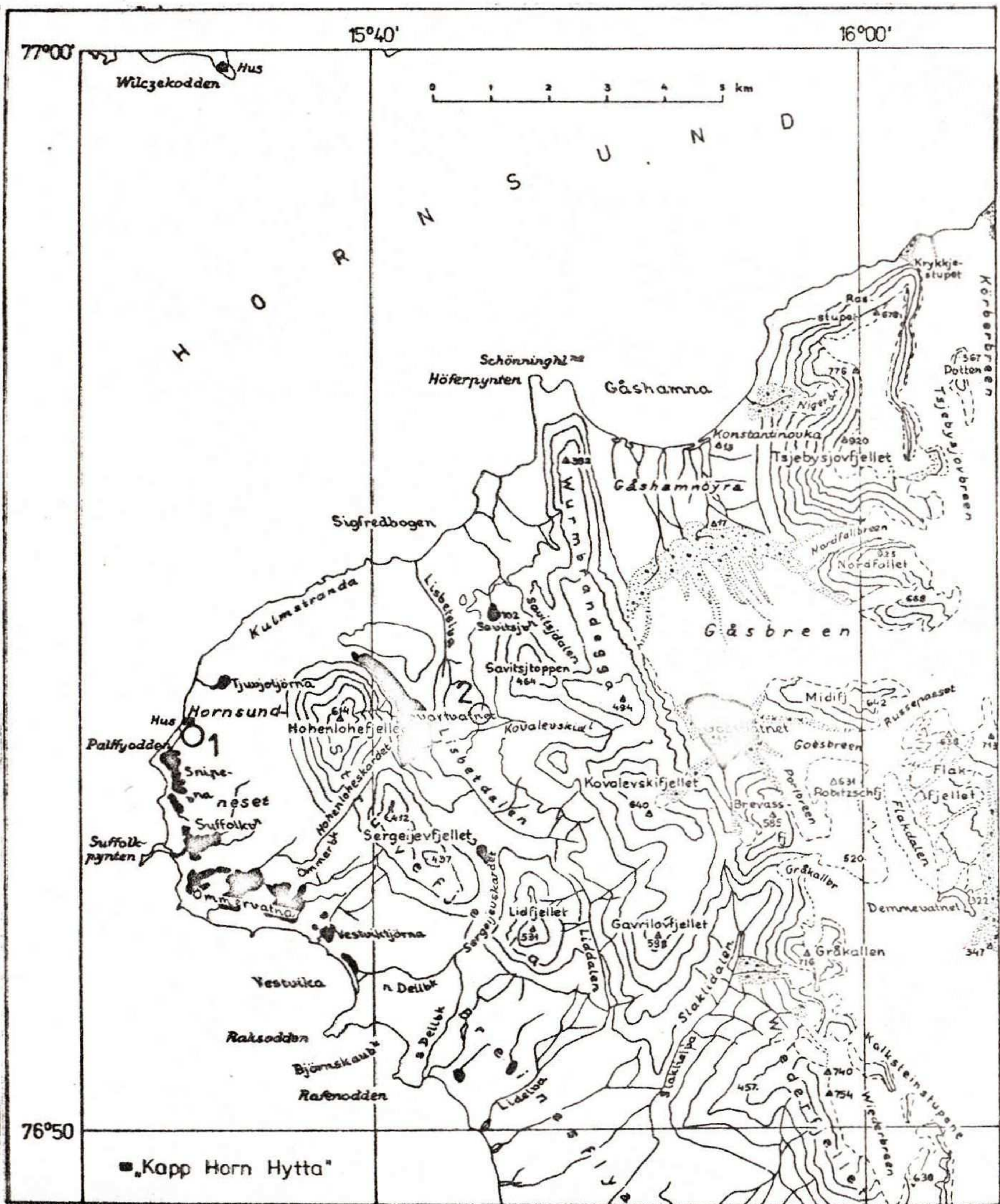


Fig.1. Situation of the observation posts: 1 - Palffyodden, 2 - Lisbetdalen.

1. Lack of glaciation of the mountains (some of them high over 600 m a.s.l.) adjacent to Lisbetdalen what is exceptional phenomenon in Spitsbergen.

2. Very small number of meteorological observations made inside bigger valleys in the southern Spitsbergen.

3. Intensive clashing of influences of marine currents (the warm current from the south-west and the cold one from the east) climatic conditions of Sørkapp Land.

Results of the meteorological investigations

Winds

The shielding of the Lisbet valley by the mountains from the east and west and partly from the south modifies the winds in this area. This modification refers to the direction of the winds (except for the winds from the north and the south ones). The evidence is the fact that there are no winds from the south-west or south-east and east direction (fig. 2, 3) because these winds are modified by the orography of the terrain once they reach the valley. There are no eastern winds on the coastal plain which is shielded by the mountains from the east. The north-eastern winds of the foehn type are warm and generally dry in comparison with other winds (Kalicki 1985, Suchanek 1985, Ziaja 1985). They have originally been eastern winds perpendicular to the land barrier of Sørkapp Land and they have changed direction as a consequence of the orography (position of the mountain ridges and Hornsund Fiord). The generally gentle winds from the western direction and the strong winds from the southern direction (fig. 2, 3) bring humid air.

The velocity of the winds was similar at both stations throughout the summer though it was different depending on particular weather conditions. Lack of the data doesn't allow establishing any principles of these changes.

Temperature

A few characteristic periods have been distinguished by comparing the mean daily and extremal temperatures at the two stations (fig. 2).

From July 15th to July 20th the mean daily temperatures at Palffyodden were higher than the ones at Lisbetdalen. During this period the warm winds from the north-east, north-west and west appeared at Palffyodden. The partial shield of Lisbetdalen from these winds reduced

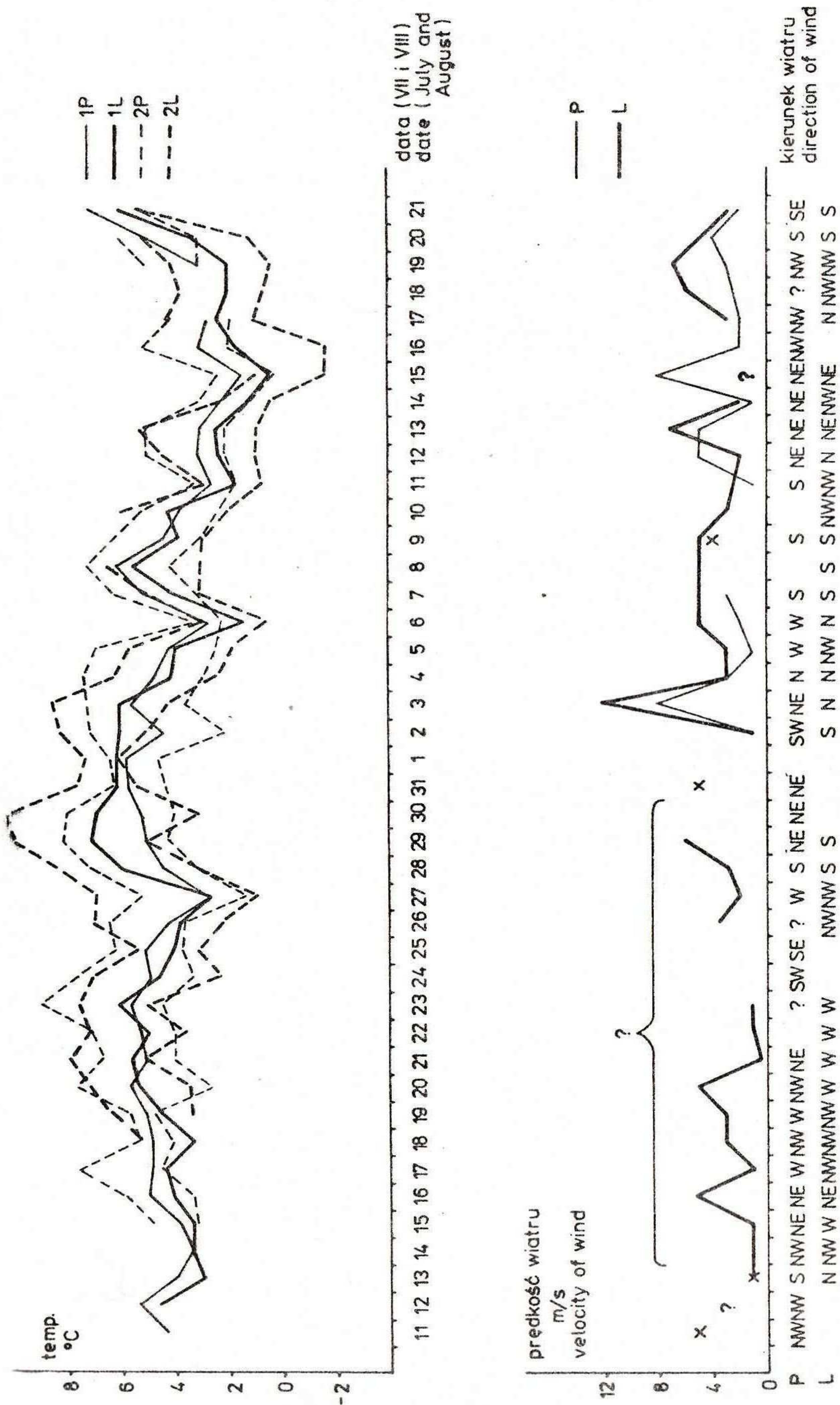


Fig. 2. Mean daily temperatures (1P, 1L), daily maximum and minimum temperatures (2P, 2L) at Palffyodden and Lisbetdalen, directions and mean daily velocities of winds at Palffyodden (P) and Lisbetdalen (L).

the level of the mean daily temperature. The height above sea level and shade in Lisbetdalen exerted also a certain influence. The situation similar to the one mentioned above took place from July 24th to July 26th. At that time the gentle south-western and western winds occurred at Palffyodden whereas it was calm at Lisbetdalen.

From July 28th to August 2nd the mean daily and extremal temperatures were higher at Lisbetdalen than Palffyodden. The warm and strong (mean daily velocity 5-10 m/s) north-eastern winds prevailed at that time. The higher temperature at Lisbetdalen can be explained by two facts: the distance from the sea and the shielding from its influence.

In the middle of summer according to the well-known principle, the sea is colder than the land and so the air at the coast is colder than in the interior of the land. On July 29th and 30th the maximal daily temperatures were highest (i.e. about 10° at Lisbetdalen and about 8° at Palffyodden). Like each year (Kalicki 1985, Suchanek 1985, Ziaja 1985) these temperatures were caused by the inflow of the warm air brought with the strong north-eastern wind of the foehn character. Shielding of Lisbetdalen in the mountains could not stop the inflow of the warm air to the valley.

Table 1

Elements of the climate during the time of investigations
at the two stations.

Elements of the climate	Stations	
	Palffyodden	Lisbetdalen
mean daily temperature (°C)	4,1	3,9
maximum temperature (°C)	8,9	10,1
minimum temperature (°C)	0,2	-1,7
mean daily humidity (%)	89,9	84,6
sum of rainfalls (mm)	19,2	30,5
days with rainfalls	23	26
mean daily velocity of wind (m/s)	3,0	2,9
days with calm	4	9

From August 4th to August 17th (except August 10th) the mean daily temperatures and extremal daily temperatures at Palffyodden were higher than at Lisbetdalen. This difference continued both at the time of the most frequent north-eastern winds and during the western, north-western and northern winds at Palffyodden (at Lisbetdalen the winds blowed from the northern half of the horizon) because of the position of the

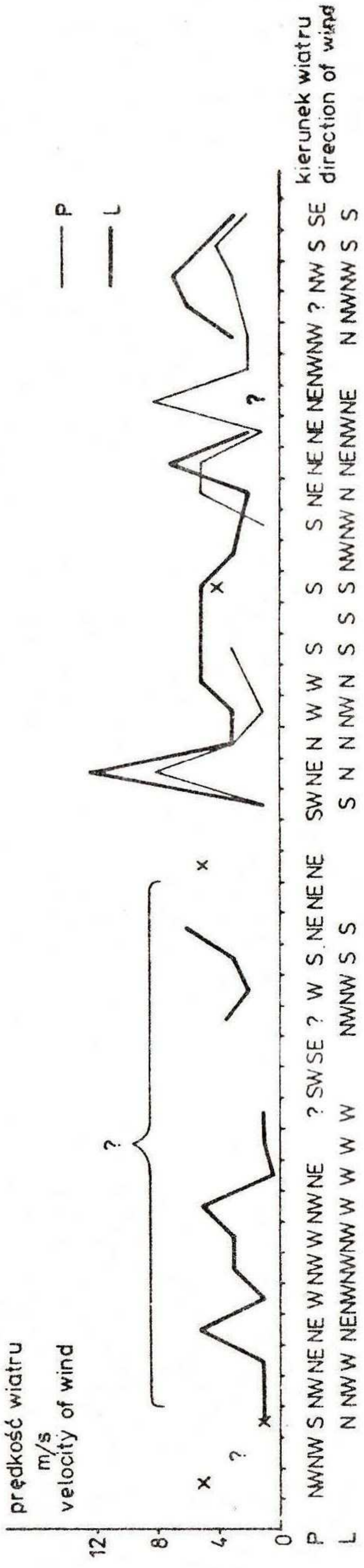
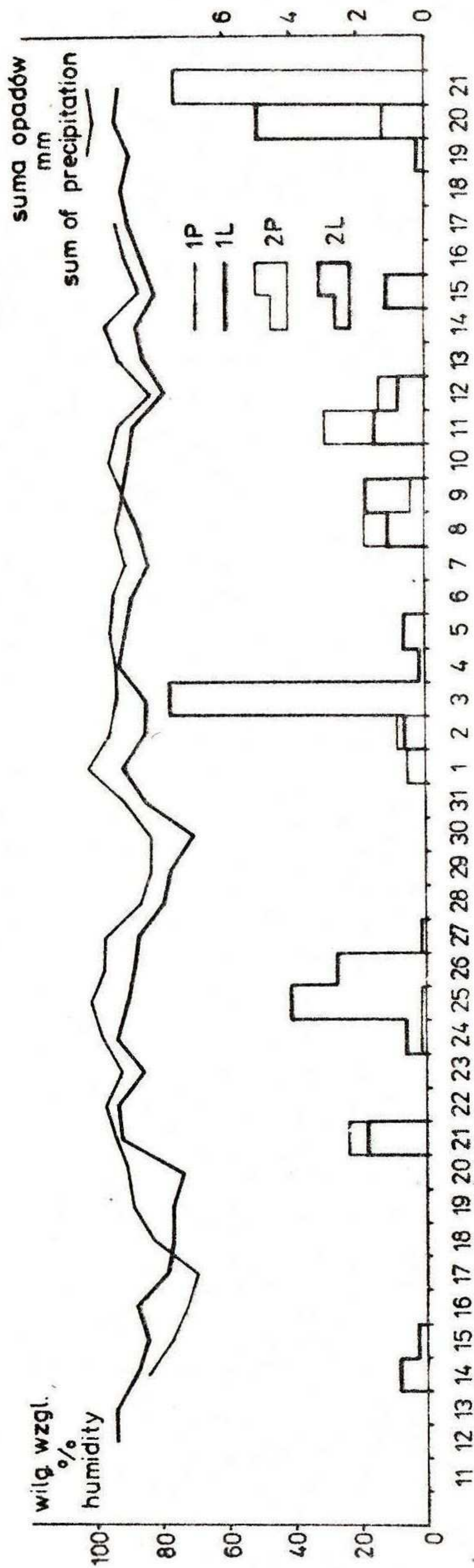


Fig. 3. Mean daily relative humidity of air at Palfyyodden (1P) and Lisbetdalen (1L), daily sums of rainfalls at Palfyyodden (2P) and Lisbetdalen (2L), directions and mean daily velocities of winds at Palfyyodden (P) and Lisbetdalen (L).

mountain ranges. The situation same the one mentioned above took place at the time of the southern winds and during calm at Palffyodden (at Lisbetdalen there were southern winds then). Undoubtedly the important causes for the temperatures being distinctly higher at the coast than in the valley were height above sea level and the shadow in the valley. Apart from this - the shorter the time to the end of the summer the bigger warming of the coast by the masses of warmed up sea-water. From August 19th to August 21th the situation similar to the one mentioned above occurred.

The mean daily temperature during the all period of the investigations was at the coast 0.2°C higher than in the valley, so the height gradient of this temperature amounted to 0.2°C per 100 m. But the amplitude of the extremal temperatures at the coast was about 3°C lower than in the valley. It confirms principles of the temperature differences between the coast and the interior of the land. The course of the mean daily temperatures (fig. 2) also confirms the thesis that the variability of the temperatures from day to day in the central part of the valley was bigger than that at the coast.

Relative humidity

Throughout the whole period of the investigations (except for 4 days in the middle of July) the relative humidity of the air at Lisbetdalen was lower than at Palffyodden (fig. 3, tab. 1). This was the consequence of the distance and the screening of the valley from the sea. The fact that the biggest (over a dozen or so %) amplitudes of the mean daily humidity took place on the days with the winds from the sea, namely from the western half of horizon to which the coast is exposed, but from which the valley is screened, confirms this thesis.

Precipitation

It should be noted that the sum of the precipitation at Lisbetdalen was about 50 % higher than at Palffyodden (tab. 1). The differences on particular days were even higher (fig. 3). The data obtained don't explain these differences satisfactorily. Undoubtedly the height of 100 m a.s.l. of the station at Lisbetdalen has a certain though rather small influence on this phenomenon.

Recapitulation

The differences described above of the local climate between the coast near Palffyodden and the central part of the Lisbet Valley are caused by the position of the mountain ridges in the neighbourhood of the valley and its distance a few km from the sea.

Under the influence of the orography the directions of the winds are modified on short distances. Before this modification they result from the general atmospheric circulation in the region of Svalbard.

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PORÓWNANIE WARUNKÓW POGODOWYCH WYBRZEŻA OKOLIC PALFFYODDEN I DOLINY LISBET (SØRKAPP LAND, SPITSBERGEN) W LECIE 1983

Streszczenie

Różnice klimatu lokalnego między wybrzeżem w rejonie Palffyodden a wnętrzem Doliny Lisbet są spowodowane układem pasm górskich otaczających dolinę oraz jej kilkukilometrowym oddaleniem od morza. Pod wpływem orografii zmieniają się, często na niewielkich odległościach, kierunki wiatrów, wynikające pierwotnie z ogólnej cyrkulacji atmosferycznej nad Svalbardem.