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REVIEW OF 1928-29 SEA ICE AND METEOROLOGICAL DATA

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TITTEL

REVIEW OF 1928-29 SEA ICE AND METEOROLOGICAL DATA

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Through the meteorological data available for 1928-29, conditions relevant for the iceberg occurences on the coast of Finnmark, are documented. The parameters studied are the air pressure, wind speed, wind direction and the air temperature.

The documentation has revealed several anomalies in the parameters studied.

UNDERSKRIFT

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CONTENT

PREFACE

Iceberg occurrences along the coast of northern Norway are rare events. In the spring and summer of 1929, however, icebergs were reported to drift eastward in the sailing lead along the coast of Finnmark and the Kola Peninsula. Since then no icebergs have been observed that close to the coast. Going back in time, newspaper reports indicate, however, that a similar iceberg event also took place in 1881.

The present IDAP 90 project, called the Review of the 1928 - 29 Sea Ice and Meteorological Conditions in the Barents Sea focuses on literature study and data survey of iceberg drift and meteorological conditions that could produce the 1929 event.

This part report considers the meteorological conditions of 1928-29 for the Barents Sea area. It deals partly with meteorological observations from the area and partly with windfields deduced from the WMO pressure data set.

During this work, the authors are indebted to Magnar Reistad at Vervarslinga på Vestlandet in Bergen for valuable help. Monica Kristensen Solås is thanked for reading the manuscript.

SUMMARY AND CONCLUSIONS

Using meteorological data available for 1928-29, the conditions relevant for the iceberg occurrences on the coast of Finnmark, are documented. The parameters studied are the air pressure, wind speed, wind direction and the air temperature.

The documentation shows several anomalies in the parameters studied. Following the order of their occurrence, the most important seems to be :

- Positive temperature anomaly at the stations Jan Mayen, Vardø, Isfjord Radio and Bjørnøya in January and February 1928.

- Pronounced positive anomalies in the frequency of the wind directions NE and E for June and July 1928 in the Barents Sea.

- The stations Isfjord Radio, Bjørnøya and Vardø have a negative temperature anomaly for the months of October to December 1928 and January 1929. At Jan Mayen the temperature anomaly is positive for the same period.

- Positive anomalies in the frequencies of the wind directions S-SW in February 1929 are leading to a very pronounced positive temperature anomaly for the stations Jan Mayen, Isfjord Radio and Bjørnøya. At Vardø the positive anomaly in the wind direction is for the direction SE leading to a monthly mean temperature near the normal.

- Positive anomaly for the wind directions N-NE in March-April 1929 for the Barents Sea which leads to a pronounced negative temperature anomaly for these months for Isfjord Radio, Vardø and Bjørnøya.

- Wind speed modelled (gridpoint near Bjørnøya) and averaged on a monthly basis, is below the longtime average (1955-89) for the whole period 1928-29. The different basis for the wind modelling for the two periods may have influence on this result.

INTRODUCTION

The activities under IDAP 90 Barents Sea 1928-29 Project were carried out according to guidelines from the Ice Data Acquisition Program Committee (IDAP) and OKN through MOBIL Exploration Norway Inc. The Institutes responsible for the project were the Polar Research Institute (NP) and the Norwegian Meteorological Institute (DNMI).

The objectives of the Project are to

1) review the 1928-29 Barents Sea iceberg and meteorological observations,

2) document the source of icebergs that reached the coast of Finnmark and

3) document the meteorological conditions which produced this event.

The meteorological documentation is partly based on observations from the sparse meteorological network of 1928-29 and partly on wind data derived from the WMO-pressure data set.

1. ASSESSMENT OF WEATHER MAPS FROM DIFFERENT SOURCES AND THE WMO-PRESSURE DATASET

1.1 Norwegian weather maps

Weather maps produced in Tromsø

In 1928-1929 sea level weather maps were produced at 08h,14h and 19h. The northern boundary of the maps is between 77-88^{0}N. For the actual area, the observations exist from Jan Mayen, Bjørnøya ,Longyearbyen and coastal stations in Finnmark.

At 02h a circumpolar map was plotted, but this map does not generally contain data from more stations in the actual area.

Weather maps produced in Oslo and Bergen

The same maps as in Tromsø with the same amount of data, were produced in Oslo and Bergen. In Oslo the circumpolar maps at 02h were analysed.

The pressure analysis in the northern area had to be performed on a very sparse foundation. On one of the maps reviewed during this work, the meteorologist simply had given up the pressure analysis and instead noted on the map "God only knows what it looks like."

1.2 Other sources of weather maps

German weather maps

In 1928-1929 "Wetterbericht der Deutschen Seewarte" contains pressure maps. The unit applied is mm mercury. A circumpolar map for 02h is published daily. However, the principles due to the findings of the "Bergen School", were not introduced in the sample of maps examined.

It was concluded that these maps are not suitable as a main source of informations for this study.

U.S. Historical Weather Maps

These maps are reanalysed weather maps based on the most complete dataset available at the actual time. The data foundation in the arctic is sparse and the isobars are often given as broken lines in this area. One circumpolar map daily, valid for 12h GMT, is published.

This series of weather maps seems to be most valuable as a source of information for this study.

1.3 The WMO-pressure dataset

This dataset consists of gridded pressure data evolved from historical extractions of weather chart data. The grid applied is the Synoptic Climatological Contour Grid. In this grid, values are extracted at each 5 degrees of latitude from 85^{0}N to 15^0N and for each 10 degrees of longitude. Between 65^0N or 70^0N (depending on the year of extraction) and 80^0N, values were omitted at the 'odd' tens of longitude (eg.10^0E, 30^0E, etc.). At 85^0N values were extracted only at 0^0,90^0E,180^0,and 90^0W. The grid is given in fig. 1.3.1.

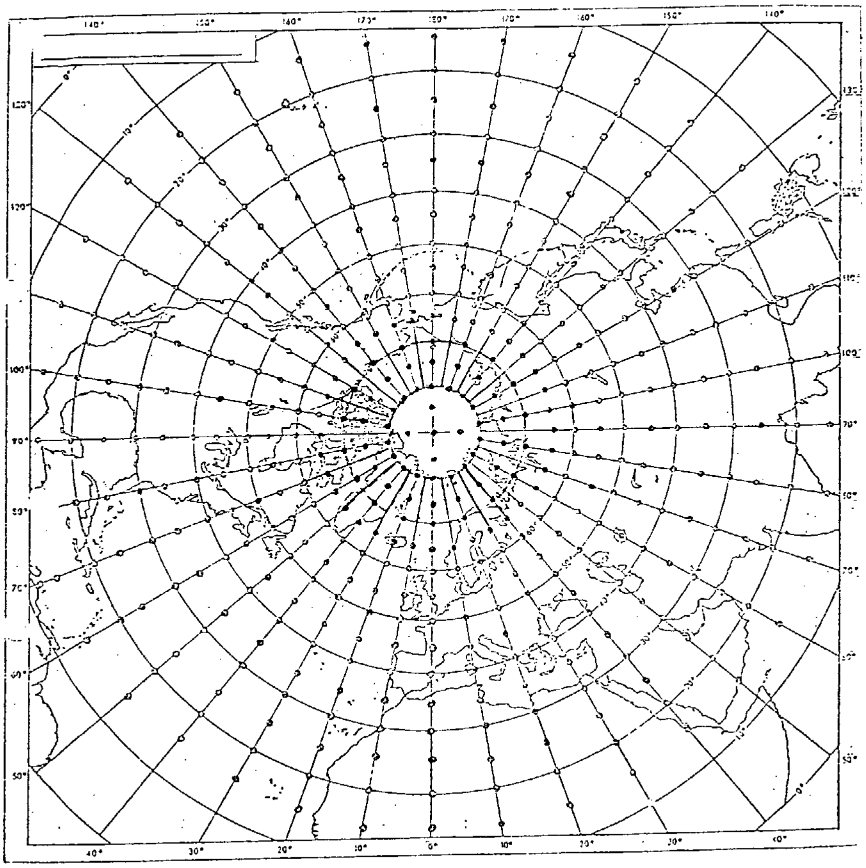

Fig.1.3.1 The Synoptic Climatological Contour Grid

The pressure data are usually given in tenths of mb. The WMO pressure data sets are based on different sources. For the years 1928-29 the Extended Forecast Division of the U.S Weather Bureau 1200 hour chart is referred to as the source.

When starting this study, several maps were plotted based on data from the WMO pressure data set. Comparisons with the respective U.S. Historical Weather Maps revealed good agreement. In fig 1.3.2 the U.S. Historical Weather Map and the pressure field generated from the WMO pressure data set for 01.01.1929 and 22.06.1929 are given as examples.

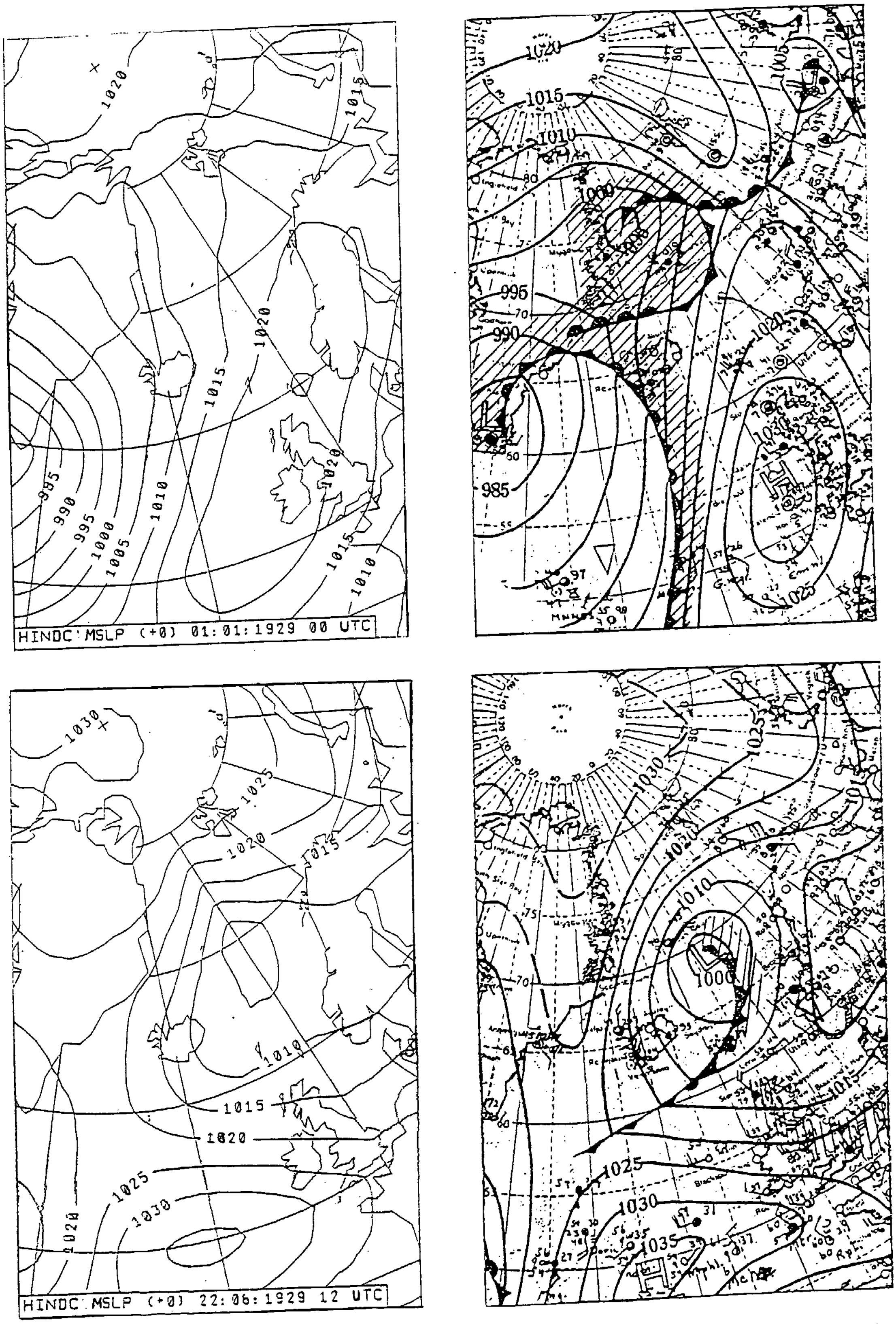

Fig.1.3.2 U.S.Historical Weather Map and the pressure field generated from the WMO pressure data set.

2. PRESSURE FIELDS

2.1 Method

As the U.S. Historical maps seem to be reproduced in a satisfactory manner by the pressure fields derived from the WMO pressure data set, the WMO data sets are used as a basis for this study.

Our aim is to locate possible climatological anomalies with relations to the 1929 iceberg occurrences on the coast of Finnmark. In this regard, the data for the years 1928 and 1929 have been analysed.

For each month, the averages of the air pressure have been computed in each grid point. For plotting purposes at DNMI, the standard Hindcast grid is applied. The mean pressure fields are therefore transformed to the "Hindcast" grid by interpolation. The Hindcast grid applied for the pressure field is given in fig. 2.1.1.

The mean pressure fields are plotted with 2.5 mb spacing between the isobars.

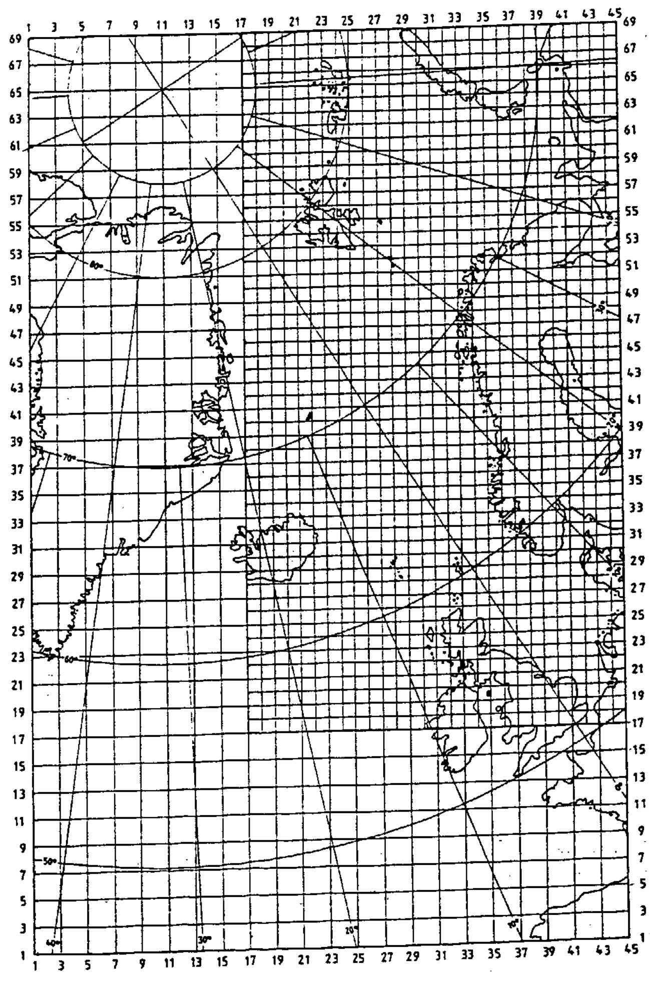

Fig. 2.1.1 The Hindcast grid applied for the wind- and pressure fields

2.2 Monthly pressure averages for 1928

The mean pressure fields for each month are given in fig.2.2.1, 2.2.2 and 2.2.3 with four months in each figure.

Both January and February were dominated by low pressure in the Iceland area. This indicates an advection of air from SW as predominant.

In March the low pressure area was situated further to the south resulting in a pressure pattern indicating relative calm conditions in the Barents Sea. April was much like March while the pressure pattern of May and June differ from the other months having a high pressure ridge in the Iceland area, instead of the usual Icelandic low. June and May have the same features. The pressure gradients, however, are greater in June than in May.

In July the mean pressure field shows a pronounced low pressure area east of Lofoten. This indicates E-SE as frequent wind direction in the Barents Sea area for this month.

August is dominated by a low pressure area south of Iceland, and high pressure in the polar basin. This indicates E-NE as predominant for the wind direction this month.

The monthly average of the pressure field for September 1928 indicates rather calm wind conditions, with direction W predominant in the southern part of the Barents Sea. In the northern part, wind from E probably was most frequent.

October was dominated by low pressure south of Iceland indicating E-NE as the most frequent wind direction in the Barents Sea.

In November, S-SE wind directions seem to have been predominant while the mean pressure field of December seems to have favoured calm conditions.

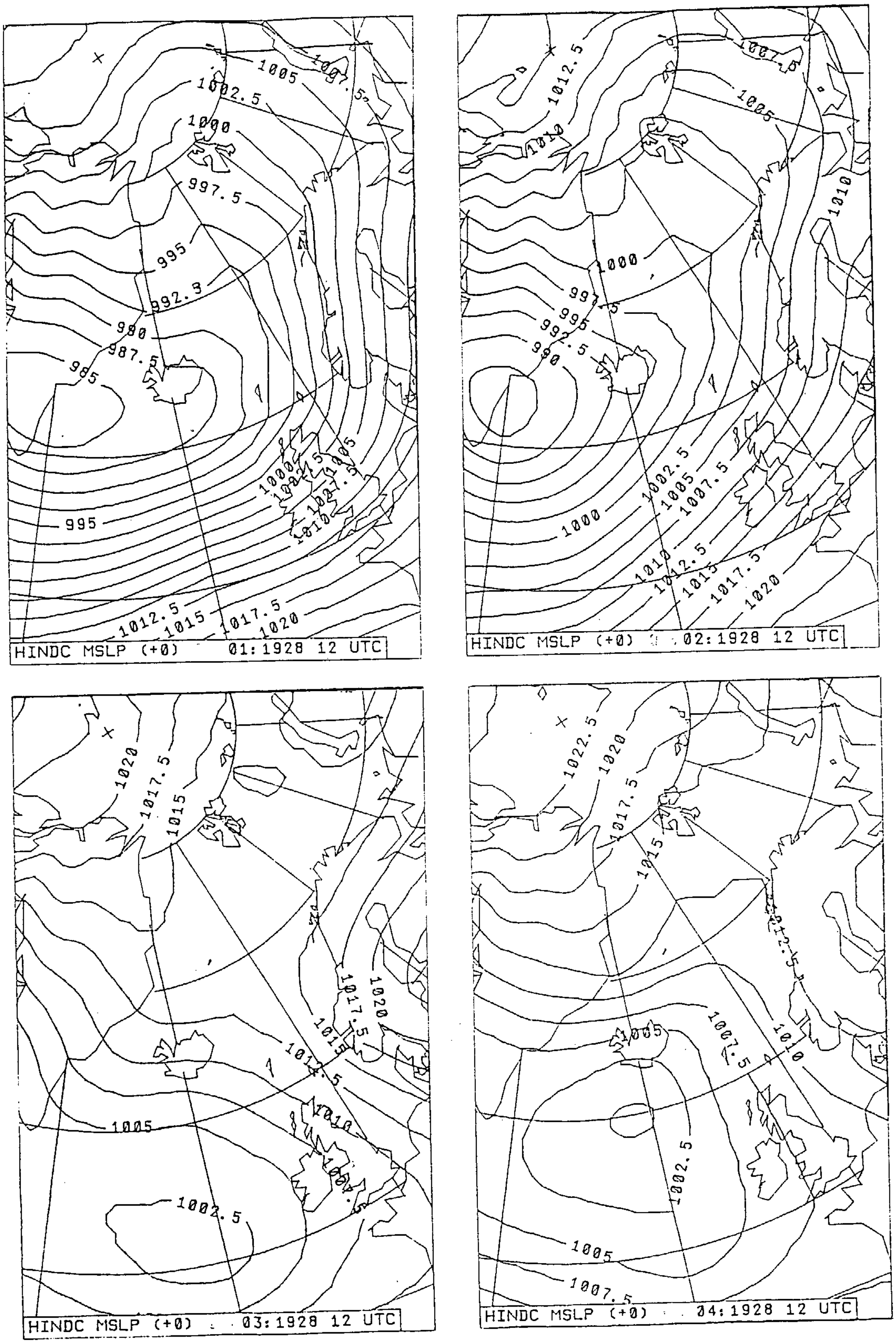

Fig.2.2.1 Monthly pressure averages for January, February, March and April 1928.

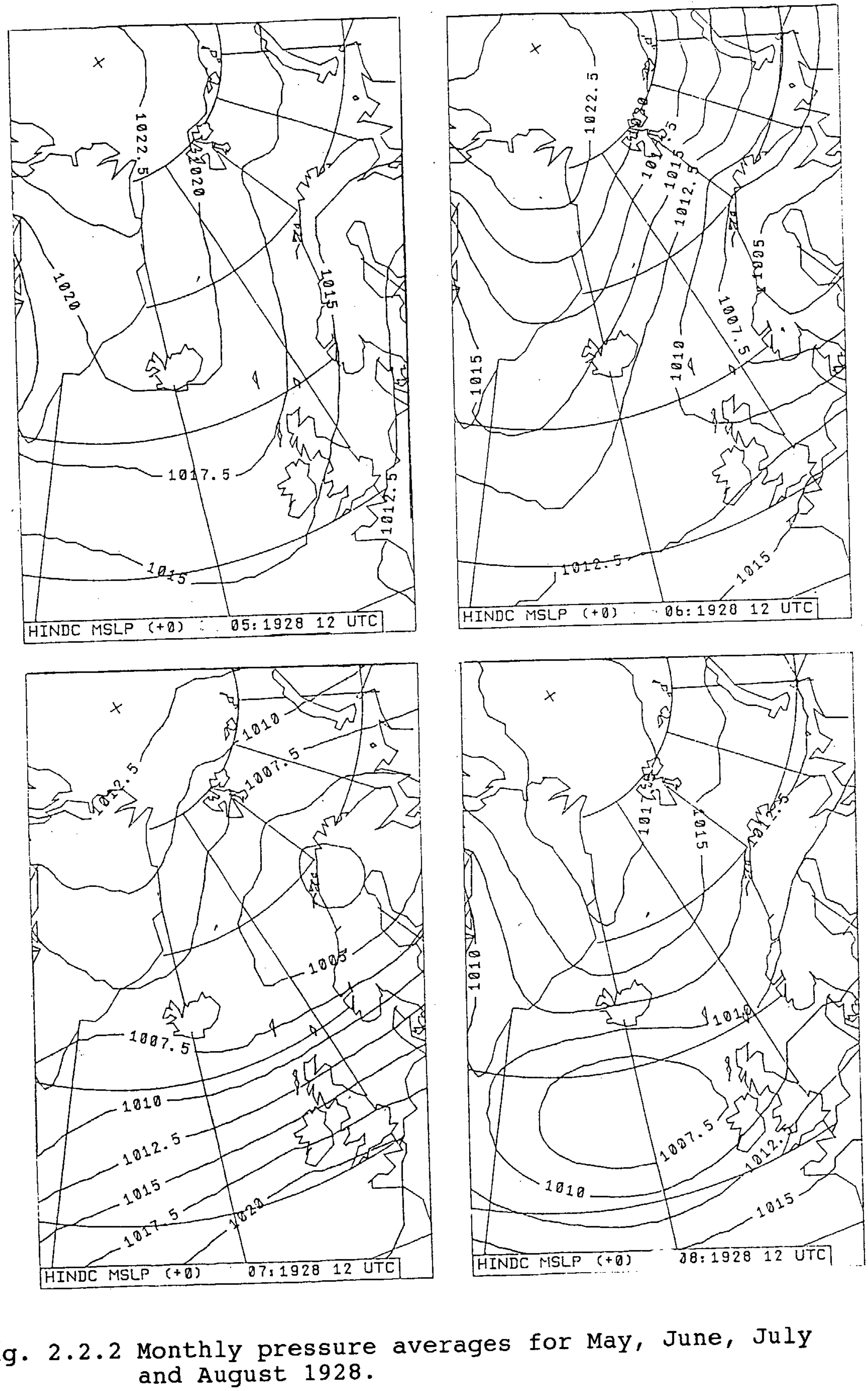

Fig. 2.2.2 Monthly pressure averages for May, June, July and August 1928.

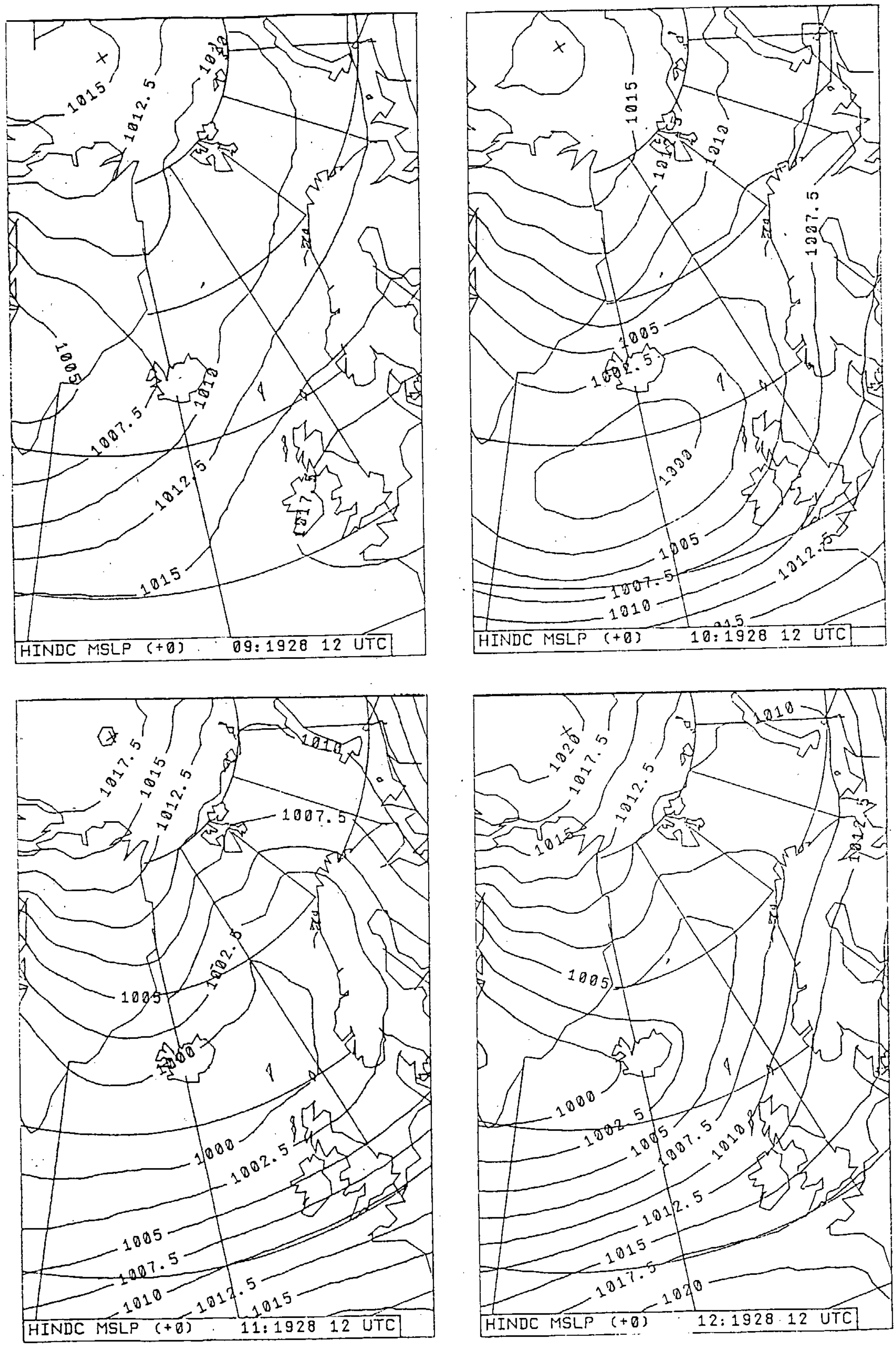

Fig.2.2.3 Monthly pressure averages for September, October, November and December 1928.

2.3 Monthly pressure averages for 1929

The mean pressure fields for each month are given in fig.2.3.1, 2.3.2 and 2.3.3 with four months in each figure.

The pattern of the mean pressure field in January indicates rather moderate wind speed in the Barents Sea area and NE-SE as a predominant direction.

In February the mean pressure field indicates SW-W as predominant wind direction for the area while the direction NE seems to have been most frequent in both March and April.

In May the mean pressure field indicates E-SE to have been the predominant wind directions and in June NE-E seems to have been most frequent.

The map for July indicates calm wind conditions for this month. In August the wind direction SE seems to have been predominant.

The patterns of the mean pressure maps for the months September to December have much in common, however, the maps for November and December have greater gradients. The directions in the sector SW-SE seem to have been the most frequent in these months.

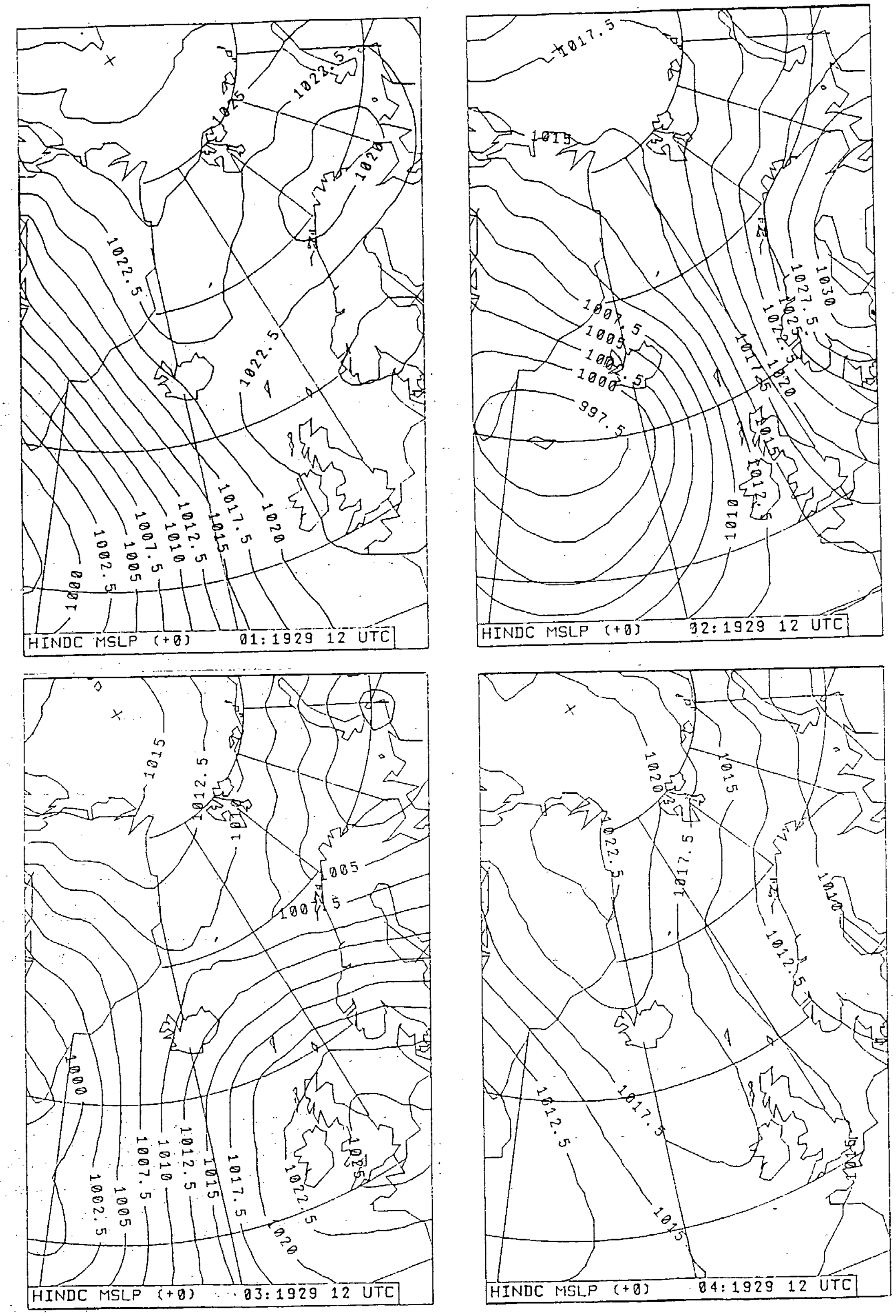

Fig. 2.3.1 Monthly pressure averages for January, February , March and April 1929.

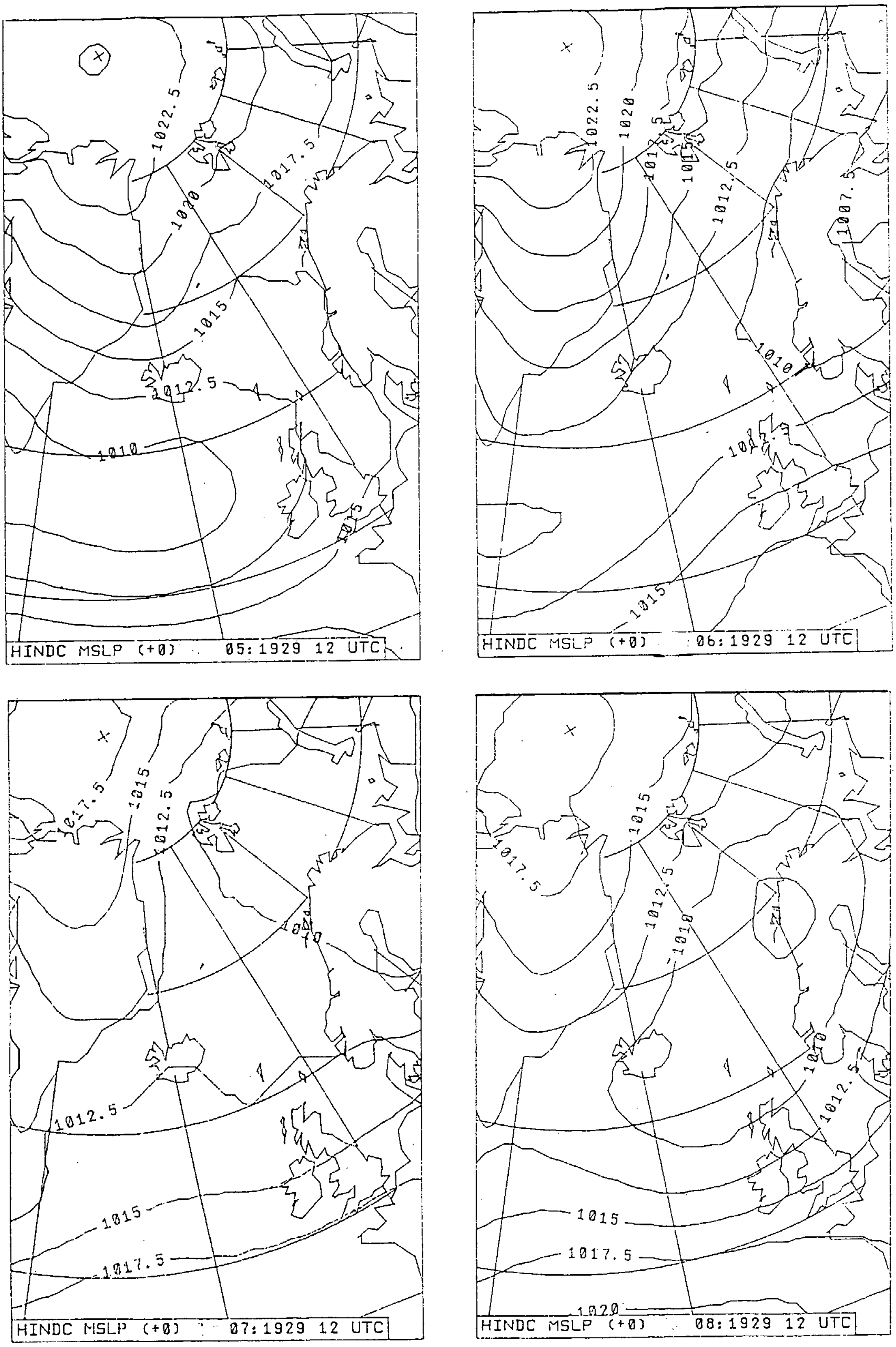

Fig. 2.3.2 Monthly pressure averages for May, June, July and August 1929.

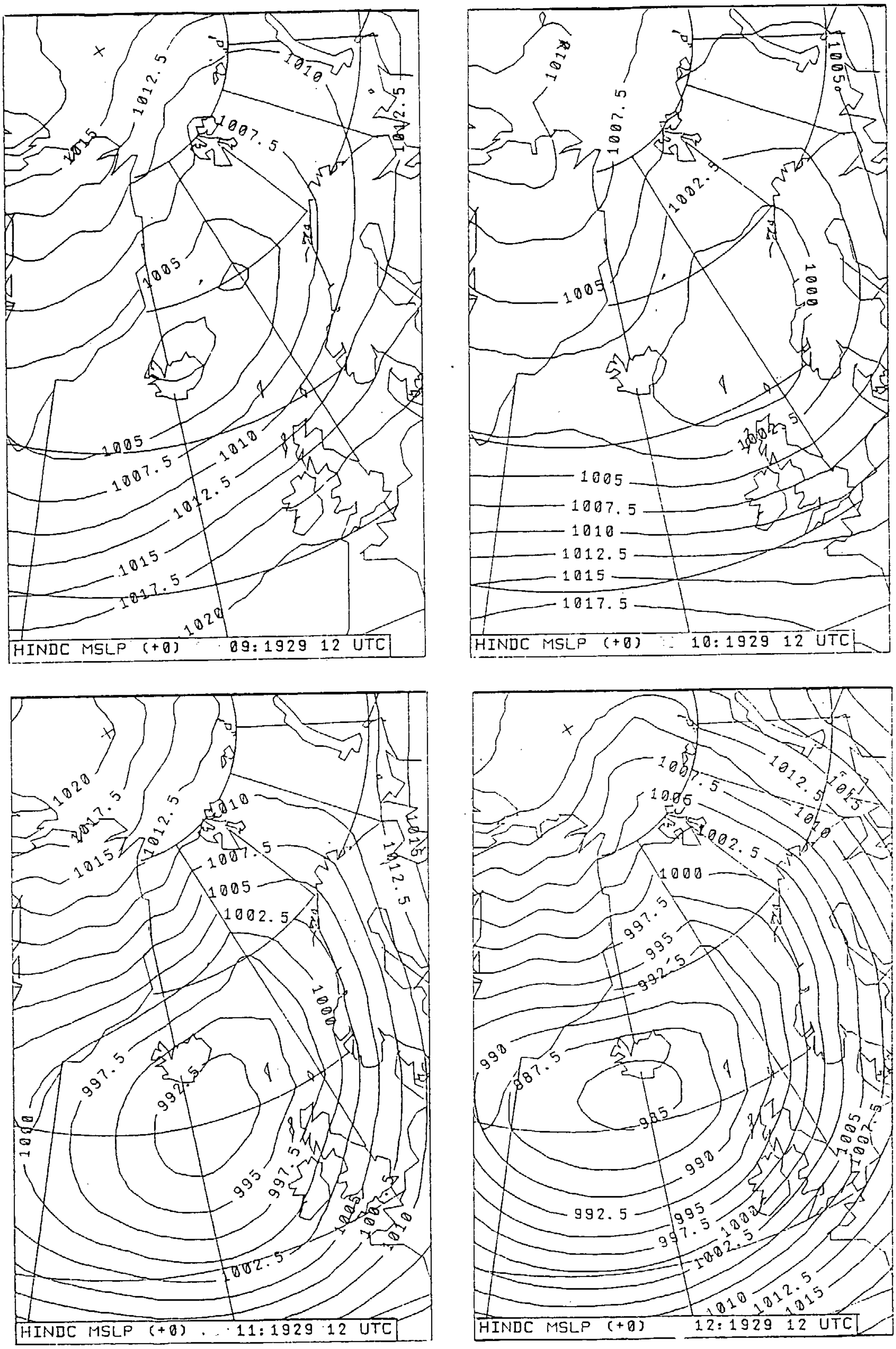

Fig. 2.3.3 Monthly averages for September, October, November and December 1929.

3. THE WIND FIELDS

3.1 U,V wind fields derived from the WMO-pressure fields

By means of the wind model implemented and developed at DNMI by Eide,Reistad and Guddal (1985) during the Hindcast project, U,V wind fields have been computed from the WMO-pressure fields. The computations start with an interpolation of the pressure field from the "synoptic Climatological Contour Grid" (fig.3.1.1) to the "Hindcast Grid" (fig.2.1.1). The pressure data set exists only once each 24 hour (12 UTC). Through an interpolation procedure, the U,V fields between the observing hours are computed. Thus the U,V fields are generated and stored with a time step of 6 hours. This is the same as in the Hindcast archive for the period 1955.1989.

In this study, frequency statistics that may reveal anomalies are important. Of main interest are the wind direction. Anomalies in the frequency distribution of the wind directions may directly or indirectly account for the drifting of icebergs to the coast of Finnmark.

In the Hindcast archive, time series of wind and waves for the period 1955-1989 are stored for about 100 gridpoints. Several of these are located in the Barents Sea. In fig.3.1.1 the gridpoints where longtime statistics can be easily generated, are given.

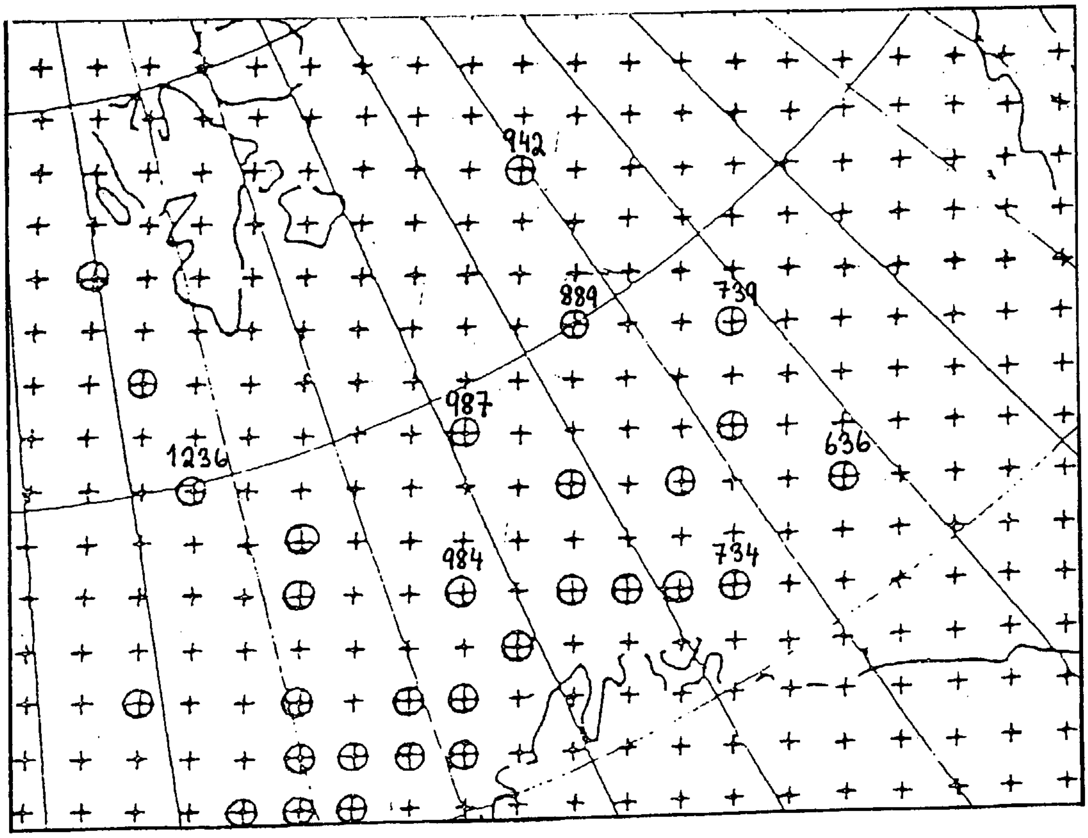

Fig.3.1.1 Section of the Hindcast grid for the Barents Sea. Longtime statistics may easily be generated in the gridpoints marked with ^{0}. The numbered gridpoints are used in this study.

The Hindcast grid for pressure and wind given in fig.2.1.1 differs from the grid applied for the wave model. The time series for 1955-1989 are stored for gridpoints in the wave grid. The coordinates of the selected points for the frequency study, may therefore differ slightly from the nearest gridpoint with the longtime statistics. However, the differences are small. We found it most correct to refer the statistics to the coordinates of points in the pressure- and windgrid. In tab.3.1.1 the coordinates, of which the statistics are referred to, and the number used for the point in the Hindcast grid are given together with its coordinates.

Tab. 3.1.1 The coordinates to which the wind statistics are referred, together with the nearest Hindcast point and its coordinates.

Coordinates referred to	Nearest Hindcast point	Coordinates of the nearest H. point
74.73° N,13.00° E	1236	74.90° N,13.05° E
74.44° N,24.30° E	987	74.45° N,25.94° E
72.46° N,23.00° E	984	72.61° N,23.10° E
77.40° N,34.37° E	942	77.40° N,34.37° E
74.87° N,32.65° E	889	74.99° N,32.83° E
73.84° N,37.14° E	739	73.84° N,38.94° E
71.70° N,32.44° E	734	71.10° N,32.68° E
71.60° N,37.44° E	636	71.46° N,38.42° E

In 1928 and 1929 the meteorological station at Bjørnøya was located at Tunheim, on the northeastern coast of the island. A simplified map of Bjørnøya is given in fig.3.1.2. For the wind directions in the sector N-E the station has a free exposure. The terrain may have some influence on the frequency distribution of the wind direction for the sector SE-NW. Miseryfjellet, 536 m a.s.l. is a main reason for this. The coordinates for the station at Tunheim in 1928-1929 was 74°28'N, 19°17'E. The nearest point where timeseries from the U,V field is generated, is 74.60°N and 20.59°E. This is NE of the observation station at Bjørnøya.

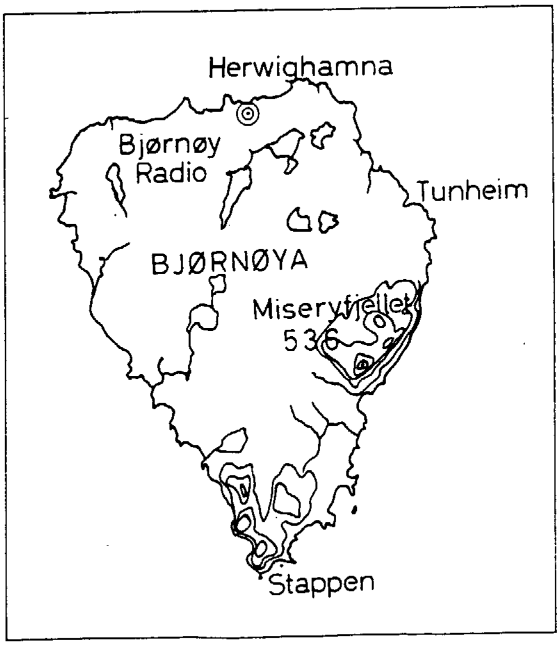

Fig.3.1.2 Bjørnøya

In fig.3.1.3 and fig.3.1.4, the frequency distributions of wind direction, for 1928 and 1929 respectively, for Bjørnøya and the nearest gridpoint, are presented. The observing frequency is three times each day.

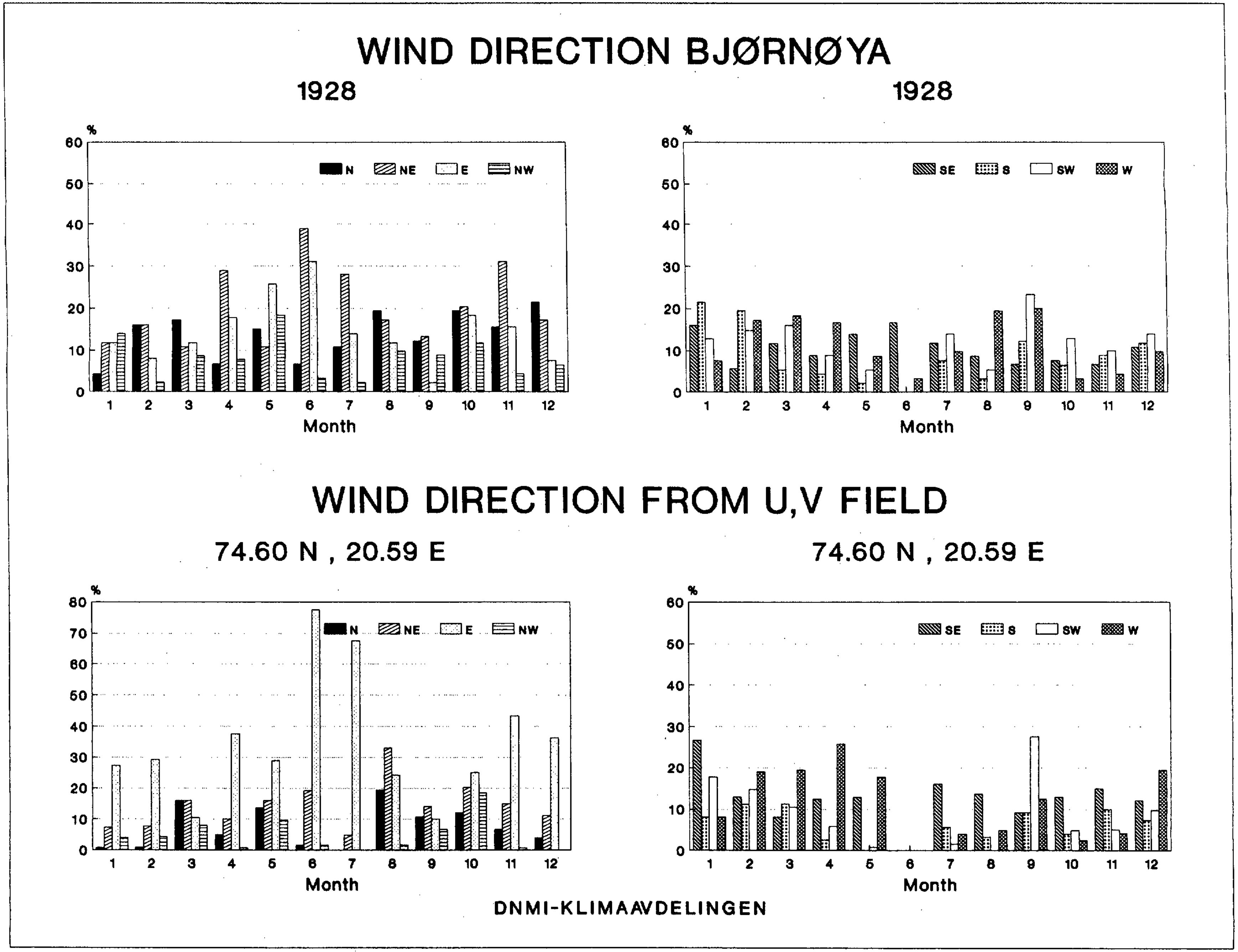

Fig.3.1.3 Frequency distribution of the wind direction in 1928 for the observing station at Bjørnøya and the nearest gr.p. 74.60^0 N, 20.59^0 E

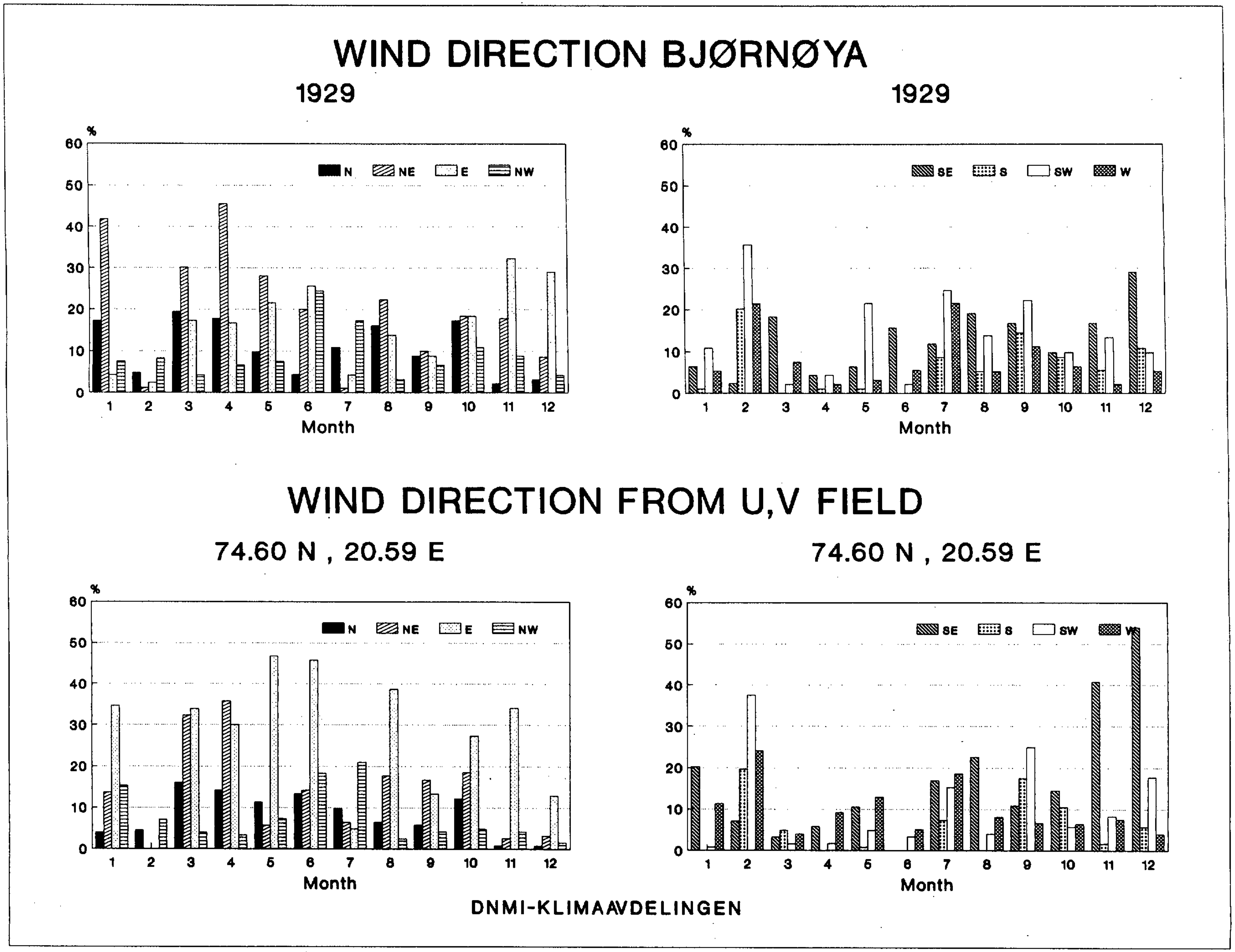

Fig.3.1.4 Frequency distribution of the wind direction in 1929 for the observing station at Bjørnøya and the nearest gr.p. 74.60^0 N, 20.59^0 E

As mentioned, the U,V field is interpolated between the defined pressure fields giving four values each day. There are certainly differences between the distributions in details, but the impression is that the main features are common. One difference is that the direction E is more frequent in the model data than in the observations, while the direction NE is more frequent in the observations than in the model-data. This difference may be an orographic effect of Bjørnøya. If the direction classes NE and E are grouped together, the difference between observations and model will be small for this direction interval.

Unfortunately, we do not have any point at sea where we can check the model results against observations. The results for Bjørnøya, however, indicate that the wind direction distribution generated from the model represents the real distribution in a realistic way.

Regarding the wind speed, the values from the model in the same point as above, are compared to the observations taken at Bjørnøya. The comparison is performed for the monthly means. Observations are averaged over the period 1961-1989 while the model data are averaged over the period 1955-1989. The wind observations are from Herwighamna ($74^0$31'N,$19^0$01'E) for this period. The results are summarised in tab.3.1.2. It shows that the model wind from the gridpoint (74.60^{0}N,20.59^{0}E) on the average is greater than the observed wind at Bjørnøya.

It is of interest how the wind speed in 1928-1929 was compared to the longtime average. In this regard the averages for the gridpoint (74.60^{0}N,20.59^{0}E) for 1928 and 1929 are given in tab.3.1.3 together with the anomaly relating to the period 1955-1989. The table indicates wind speed with negative anomaly for each month through 1928 and 1929. It is not possible to compare these directly with the wind observations in 1928-1929 which is registered in Beaufort classes. However, the wind modelling indicates that the monthly averages for the wind speed were below longtime averages through the years 1928-1929.

This result must be applied cautiously because it can be due to the different basis for the wind modelling in 1928-1929 compared to the period 1955-1989.

Tab. 3.1.2 Monthly averages of the wind speed at Bjørnøya based on the period 1961-1989 and monthly averages of the computed wind speed for the gridpoint at 74.60°N , 20.59°E based on the period 1955-1989. The unit is m/s.

	J	F	M	A	M	J	J	A	S	O	N	D
Bjørnøya (1961-1989)	8.6	8.6	8.3	7.4	6.3	6.2	5.9	5.8	6.7	7.7	8.7	8.4
74.60°N, 20.59°E (1955-1989)	11.6	11.3	10.9	9.4	7.9	7.3	7.0	7.3	8.4	9.5	10.6	11.1

Tab. 3.1.3 Monthly averages of the computed wind speed for the gridpoint at 74.60°N , 20.59°E for 1928 and 1929 and the anomaly relating to the average for the period 1955-1989. The unit is m/s.

	J	F	M	A	M	J	J	A	S	O	N	D
1928 mean	7.5	8.9	4.5	5.0	4.4	6.8	4.6	3.9	5.0	6.1	7.7	6.6
1928 anomaly	-4.1	-2.4	-6.4	-4.4	-3.5	-0.5	-2.4	-3.4	-3.4	-3.4	-2.9	-4.5
1929 mean	7.9	6.6	6.0	6.0	6.0	5.4	3.1	4.6	4.8	5.5	6.6	8.9
1929 anomaly	-3.7	-4.7	-4.9	-3.4	-1.9	-1.9	-3.9	-2.7	-3.6	-4.0	-4.0	-2.2

3.2 Frequency distribution of wind direction in selected gridpoints for 1928

The frequency distribution for each point referenced in 3.1 are given in the fig. 3.2.1-3.2.4. Observations of wind direction in 1928-1929 discriminates between the eight classes N, NE, E,..., NW and calm. To have the possibility to compare the results from model data to those of the observing stations, all frequency distributions of the wind direction have been computed with the old 45^0 partition. In the figures,the northern directions + E are presented together in one part of the figure, while the southern + W are presented in the other. The statistics for two points are given in each figure.

Fig. 3.2.1 presents the results for the point situated farthest to W and the point farthest to N. The frequency distributions show many common features. Most striking is the frequency of wind from NE-E in the months of June and July. A consequence of this is that the southern wind directions + W are almost lacking in the same months.

Fig. 3.2.2 gives the wind direction distribution of the points in the central part of the area. For the western of these points, the frequency of the direction E is very pronounced in June and July.

Another remarkable feature for the western of these central points is the high percentage of wind direction SE through the whole year, with an exception for the months of February, March and September.

Fig.3.2.3 gives the frequency distribution for winddirections for the points nearest to the coast of Norway. The statistics for the points nearest to the coast of Norway. The one at Tromsøflaket (72.40^0N, 23.00^0E) has statistics much in common with that of the nearest point (74.44^0N, 24.30^0E). This means that the wind direction E is dominating in the months of June and July, while the direction SE is very frequent through the whole year, with an exception for the months of January and February.

The other point lies outside the Varanger peninsula (71.70^0N, 32.44^0E). Through the year, the frequency of the northern wind directions is greater here than for the point at Tromsøflaket. A common feature is, however, the high frequency of the wind direction E in June and July. Of the southern wind directions, SE is frequent through the whole year with an exception for February, March and September. Different from the point at Tromsøflaket is the high frequency of the wind direction SW in the month of September.

In fig.3.2.4 the frequency distribution of the winddirection for the most eastern points with longtime statistics are presented. As for all the other points discussed, with an exception for the most western (74.73^0N,13.00^0E), the high frequency of the wind direction E is very pronounced in June and July. For the northern of these eastern points, the percentage of the wind direction NE is also very high in June. Different from the other points is a higher percentage of the wind direction SW through the year,with an exception for June where this wind direction is lacking. Worth noting is the high frequency of the wind direction SW in September. Comparison to the other points shows that this frequency increases eastwards in the area considered.

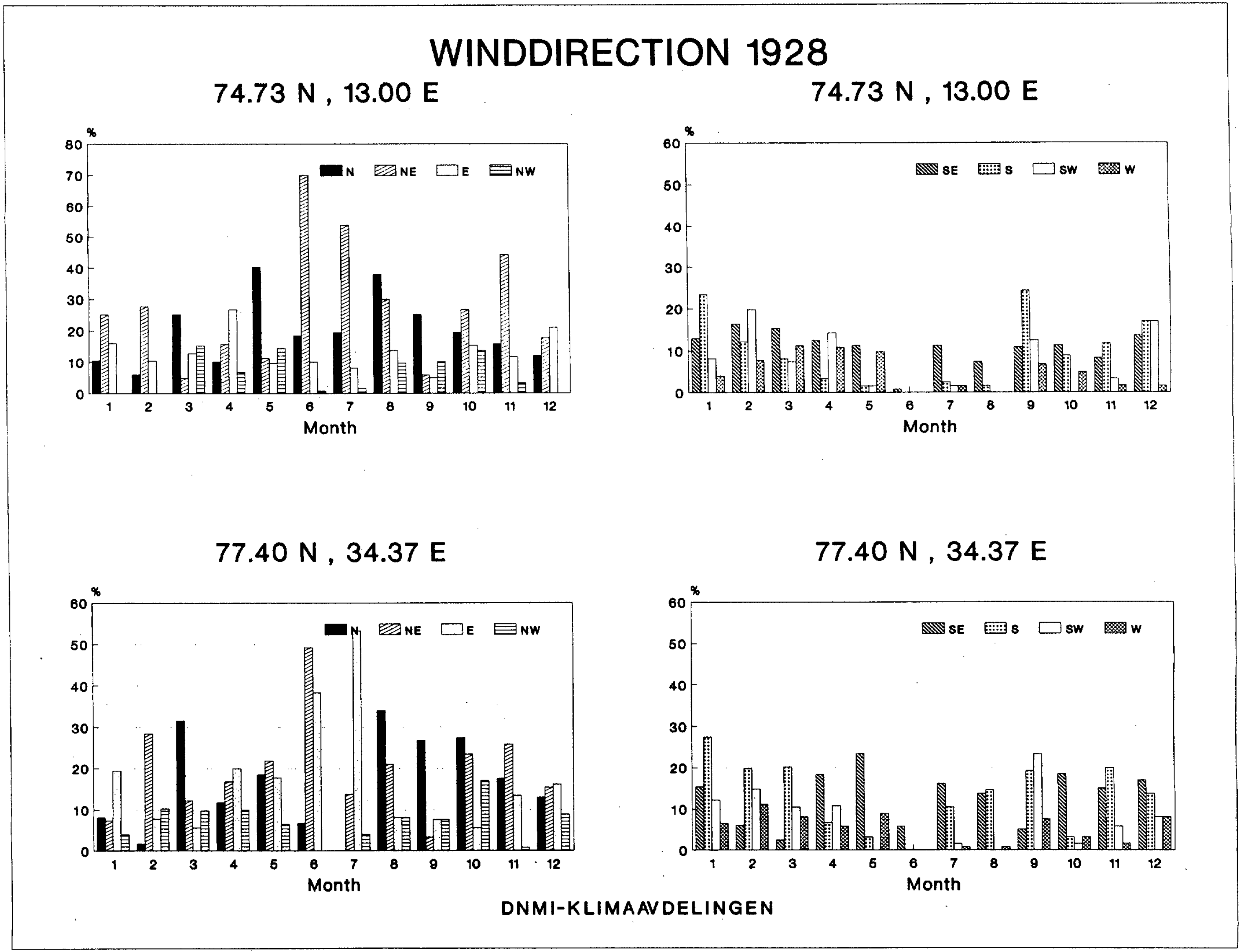

Fig.3.2.1 Frequency distribution of the wind direction in 1928 for the gridpoints at 74.73^{0}N,13.00^{0}E (1236) and 77.40^{0}N,34.37^{0}E (0942)

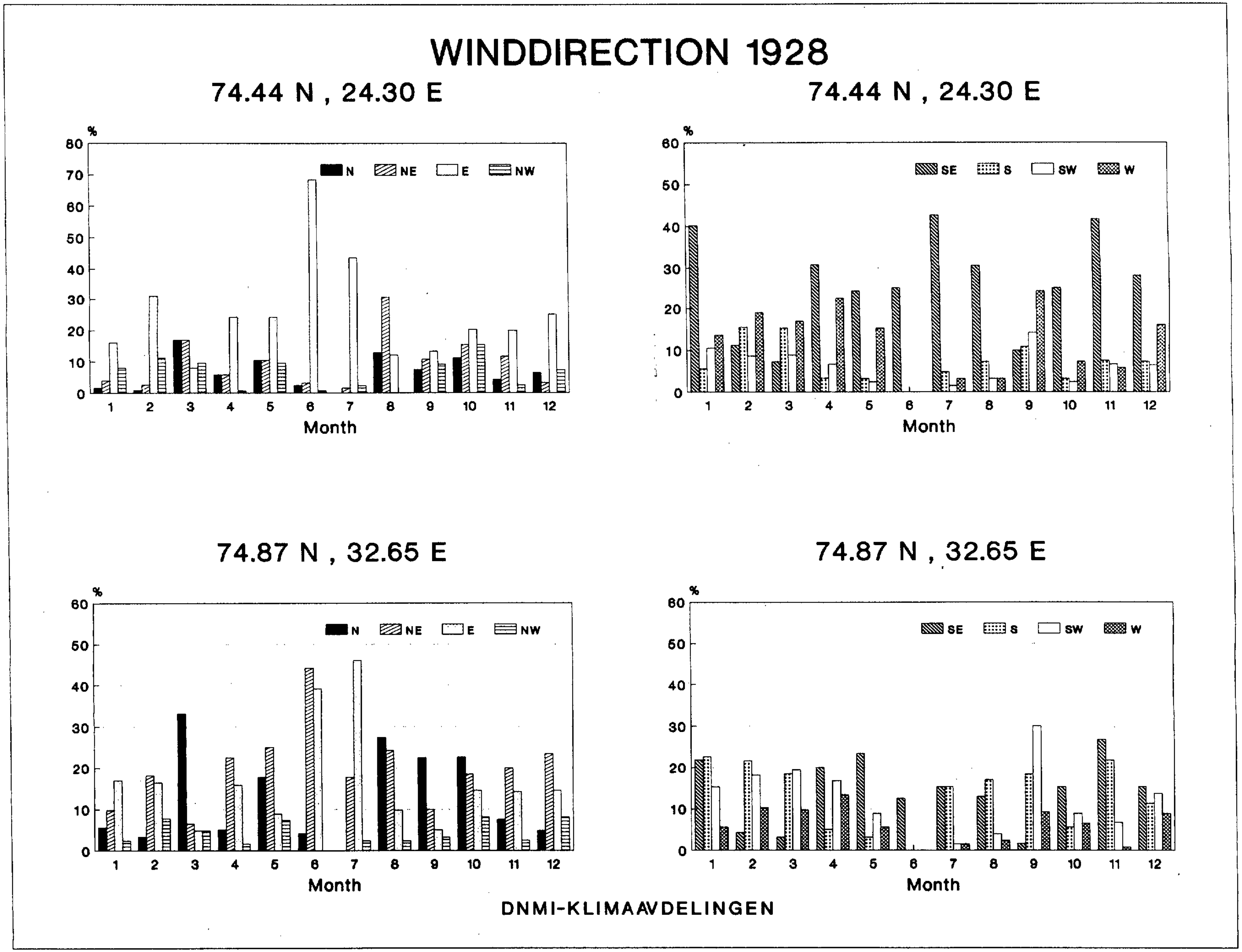

Fig.3.2.2 Frequency distribution of the wind direction in 1928 for the gridpoints at 74.44^{0}N,24.30^{0}E (0987) and 74.87^{0}N,32.65^{0}E (0889)

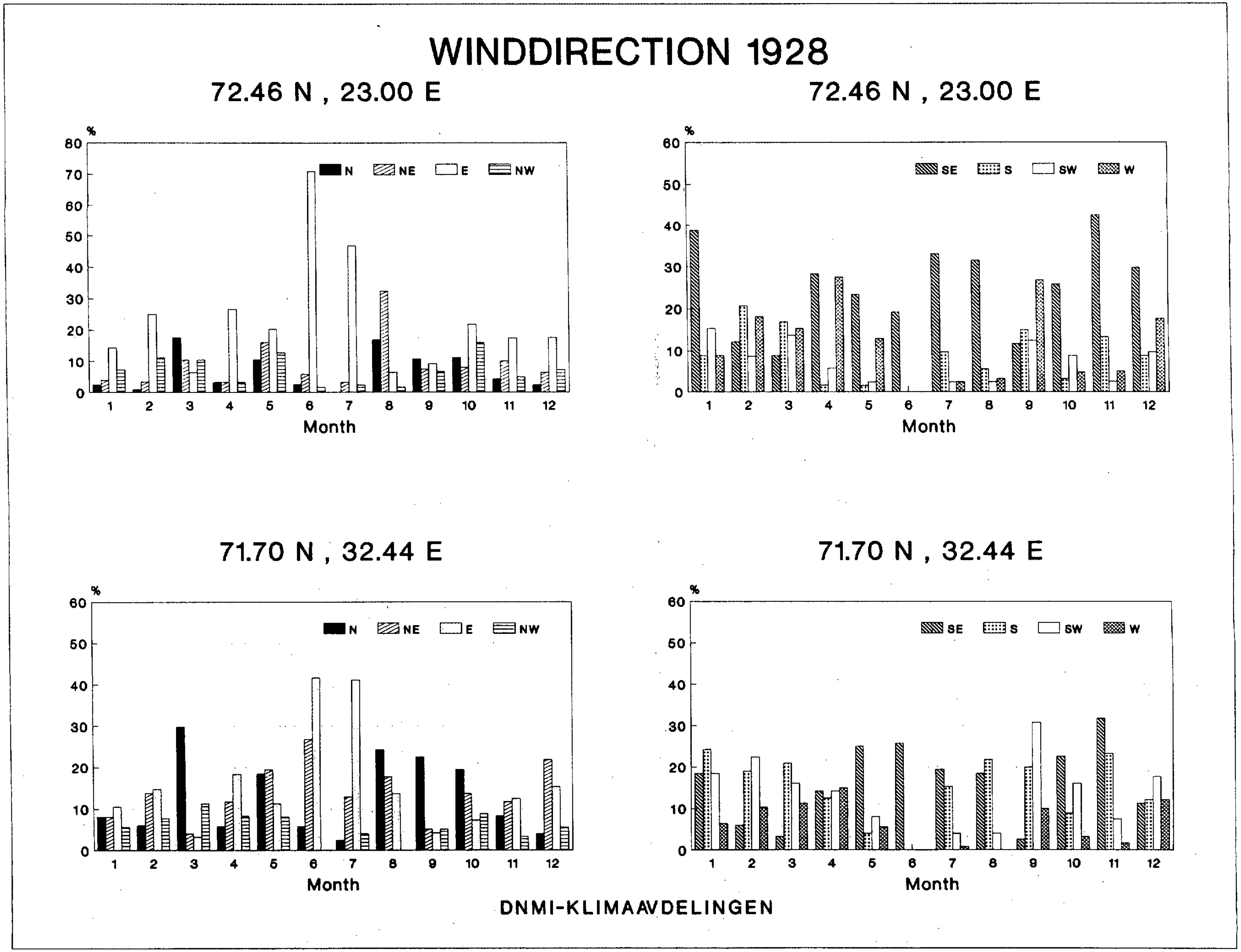

Fig.3.2.3 Frequency distribution of the wind direction in 1928 for the gridpoints at 72.46^0N,23.00^0E (0984) and 71.70^0N,32.44^0E (0734)

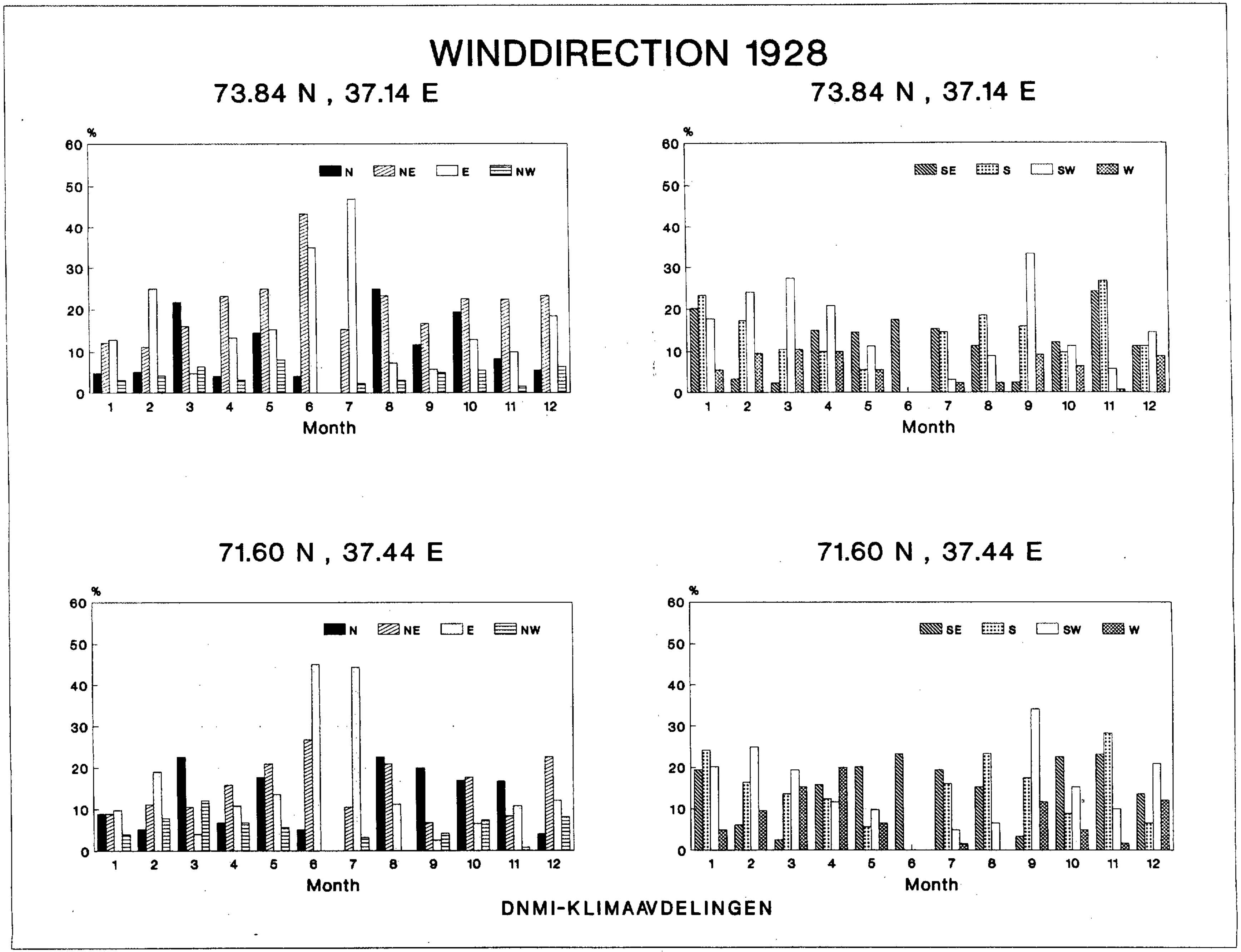

Fig.3.2.4 Frequency distribution of the wind direction in 1928 for the gridpoints at 73.84°N,37.14°E (0739) and 71.60°N,37.44°E (0636)

3.3 The departures in 1928 from the longtime average of wind directions based on the period 1955-1989

The differences between 1928 and the period 1955-1989 in the frequency distribution of wind directions are given, for each of the points referred to in 3.1, in fig. 3.3.1 ... 3.3.4. In the figures these differences are referred to as " Anomaly in wind direction".

As expected from the discussion in 3.2, the distributions of June and July show the greatest anomalies. For the point farthest to west (74.73^{0}N,13.00^{0}E) the direction NE shows the greatest anomaly. For the other points, both NE and E show great anomalies in June. In July the anomaly of the direction E is pronounced.

The overall impression of the figures 3.3.1-3.3.2 is that the frequency of the northern windirections + E show greater anomalies than the southern + W. These anomalies are also mostly positive while anomalies of the southern + W are mostly negative. This is especially so for the summer months.

Noteworthy is the positive anomaly in the wind direction SE in the western points (74.44^{0}N,24.30^{0}E) and (72.46^{0}N,23.00^{0}E) almost through the whole year.

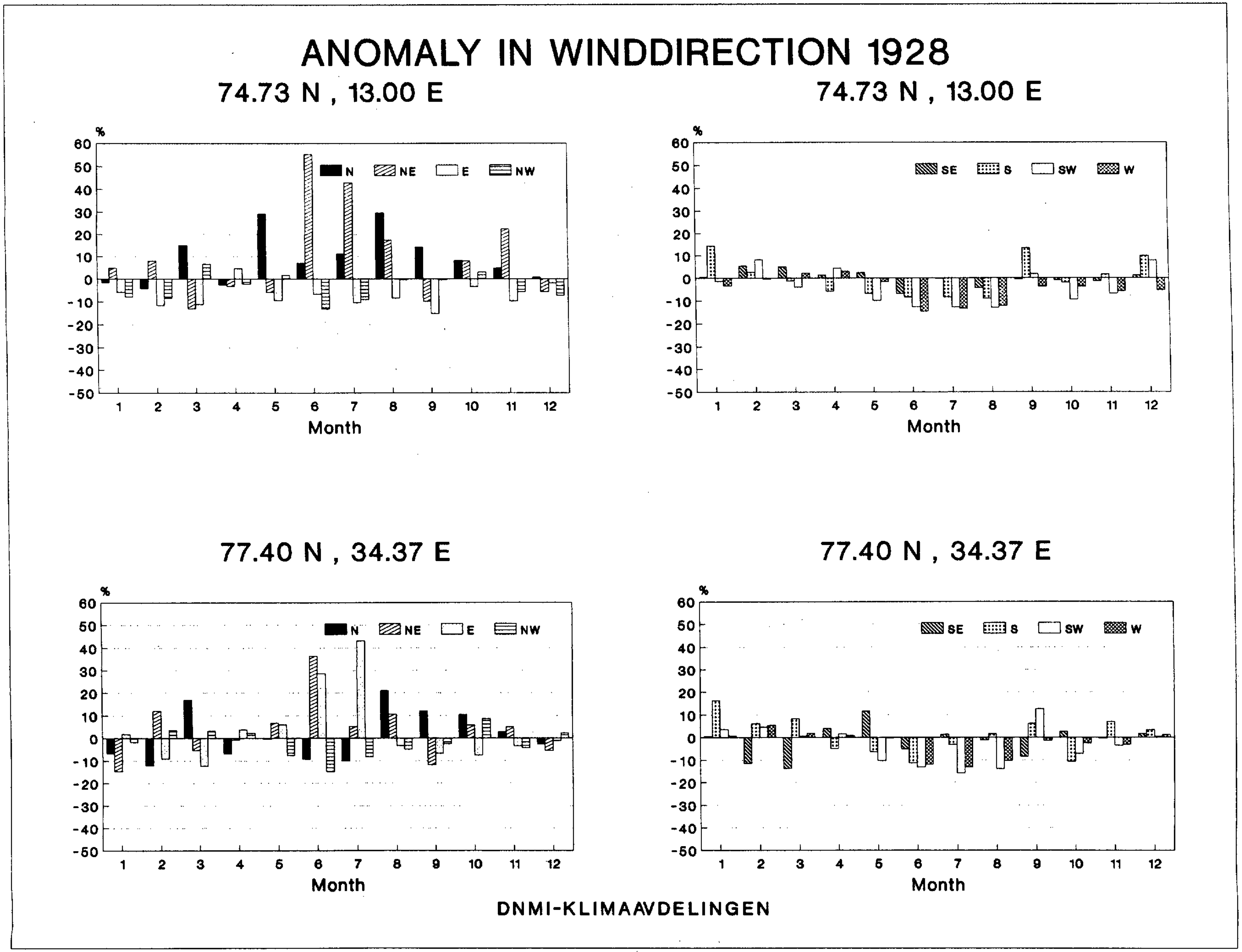

Fig.3.3.1 Anomaly in the frequency distribution of the wind direction in 1928 for the gridpoints at 74.73°N,13.00°E (1236) and 77.40°N,34.37°E (0942)

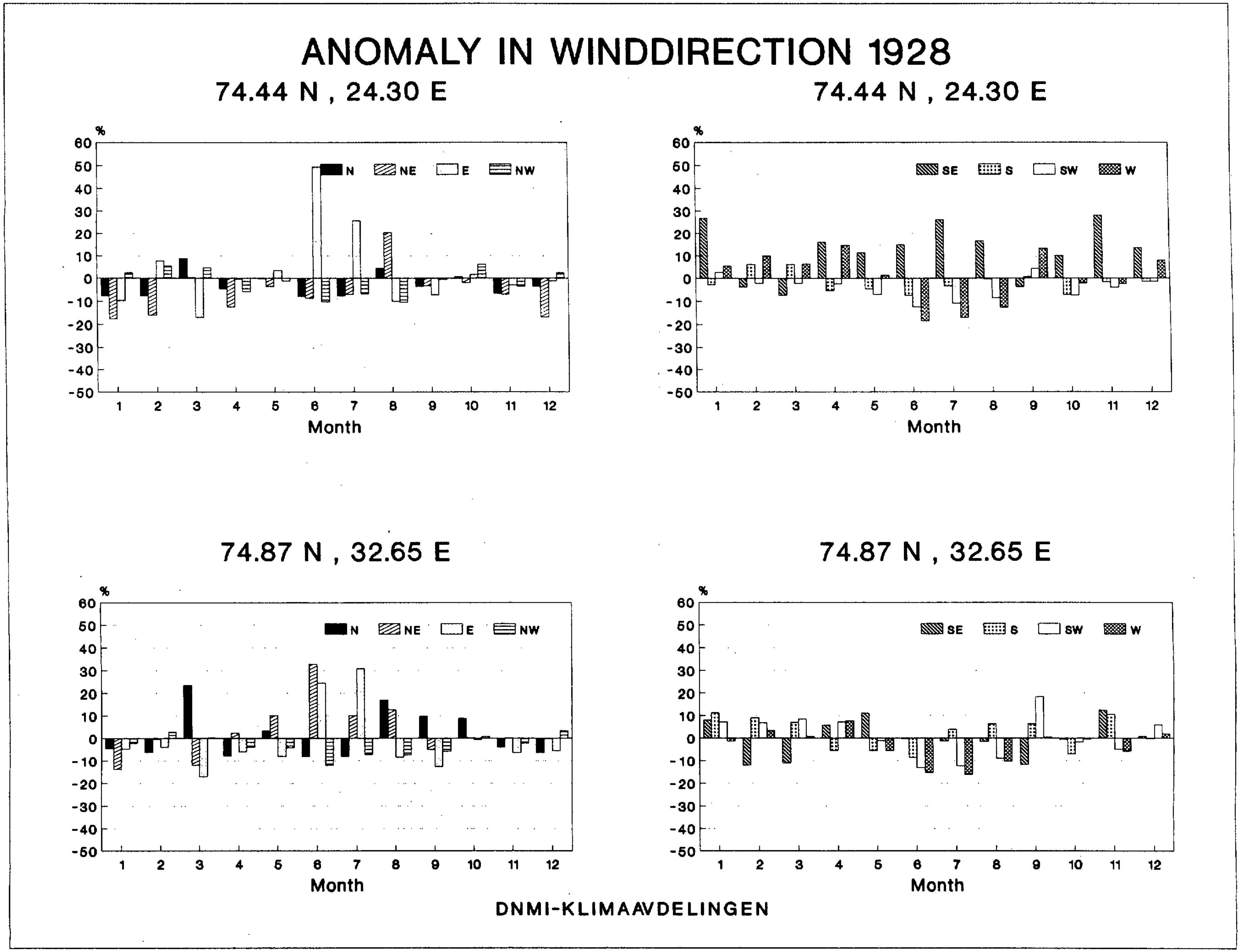

Fig.3.3.2 Anomaly in the frequency distribution of the wind direction in 1928 for the gridpoints at 74.44°N,24.30°E (0987) and 74.87°N,32.65°E (0889)

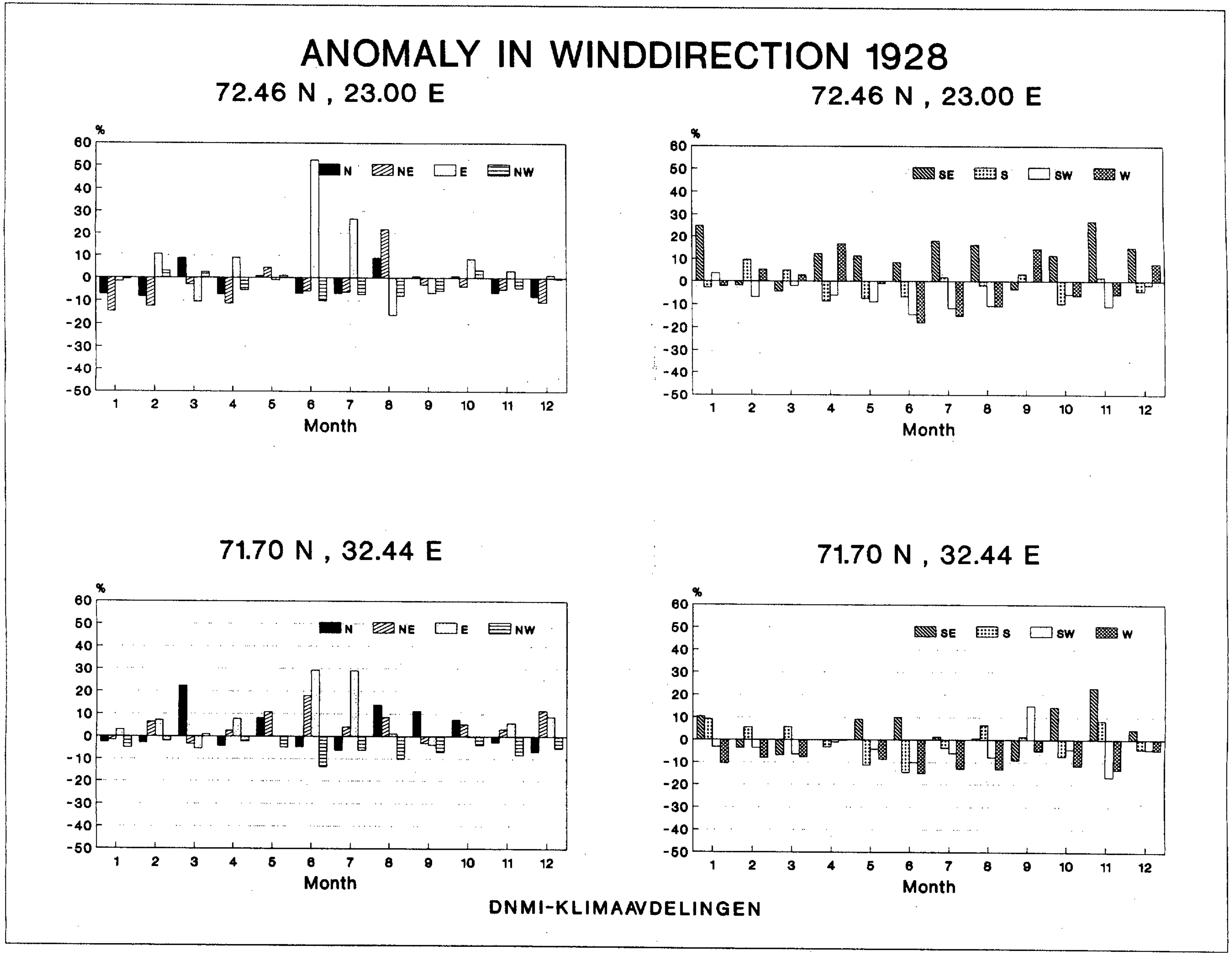

Fig.3.3.3 Anomaly in the frequency distribution of the wind direction in 1928 for the gridpoints at 72.46^0N,23.00^0E (0984) and 71.70^0N,32.44^0E (0734)

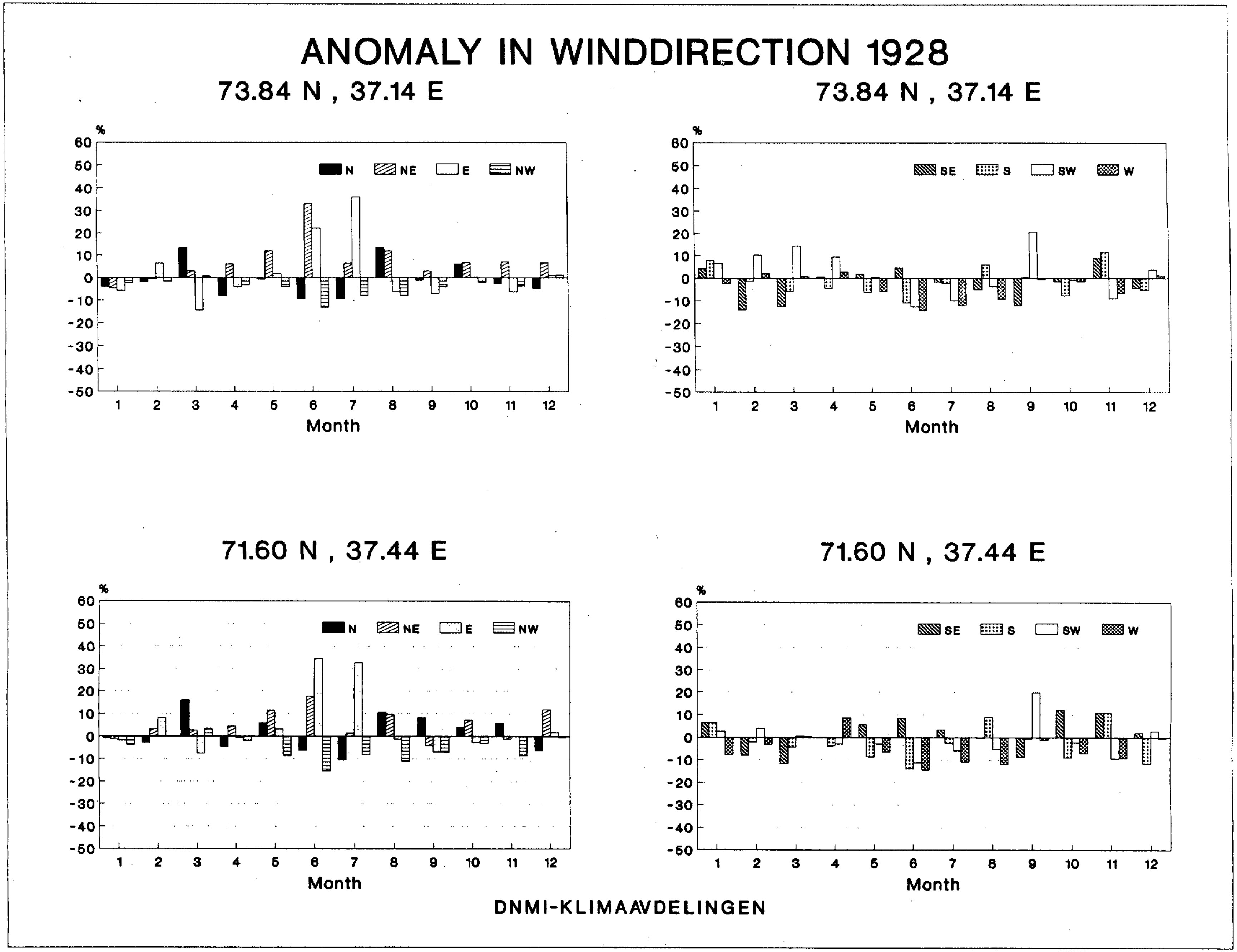

Fig.3.3.4 Anomaly in the frequency distribution of the wind direction in 1928 for the gridpoints at 73.84^{0}N,37.14^{0}E (0739) and 71.60^{0}N,37.44^{0}E (0636)

3.4 Frequency distribution of wind direction in selected gridpoints for 1929

The frequency distributions for each point referenced in 3.1 are given in the fig. 3.4.1 ... 3.4.4.

Fig.3.4.1 gives the frequency distributions of the wind directions for the points farthest to west and farthest to north amongst the points selected. It shows high frequency of northern wind directions and E both in the western and the northern part of the Barents Sea. This is especially so for the first half year, with an exception for February when wind from S and SW was very frequent.

The wind direction distributions for the points lying near the center of the area studied, are presented in fig. 3.4.2. The frequency of the northern wind directions and E is high in first half year with the same exception as mentioned above for February. In February, the southern directions are very frequent. W, SW, and S dominate the frequency distribution. There is also a shift in the wind direction, from W towards SW when going eastwards in the area, this month.

For the second half of the year, the frequencies of the southern wind directions and W are increasing relatively to the northern and E.

The impression from the figures 3.4.3 and 3.4.4 giving the frequency distributions for the two southern and the two eastern points is that the main features found in fig.3.4.1 and 3.4.2 are emphasized.

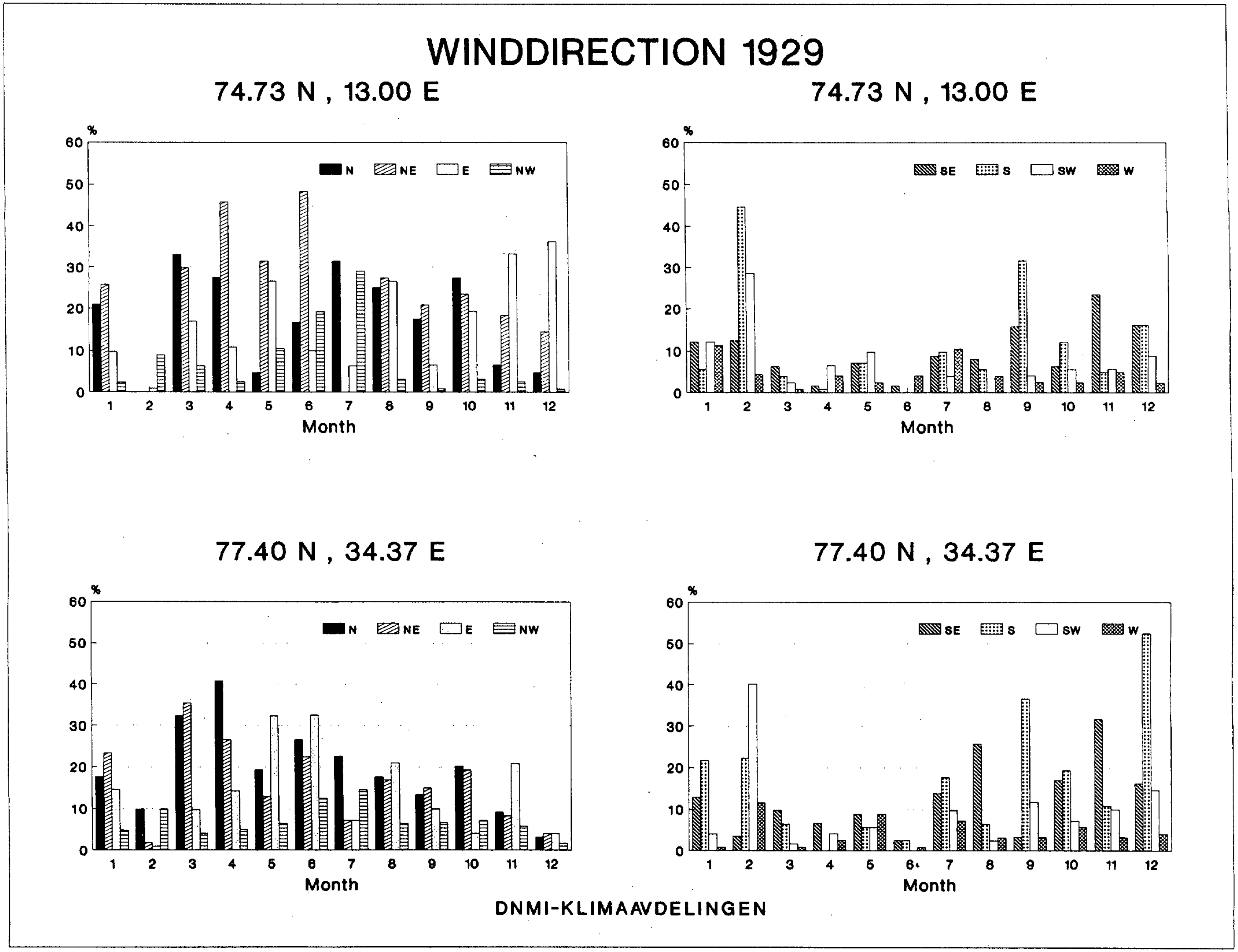

Fig.3.4.1 Frequency distribution of the wind direction in 1929 for the gridpoints at 74.73°N,13.00°E (1236) and 77.40°N,34.37°E (0942)

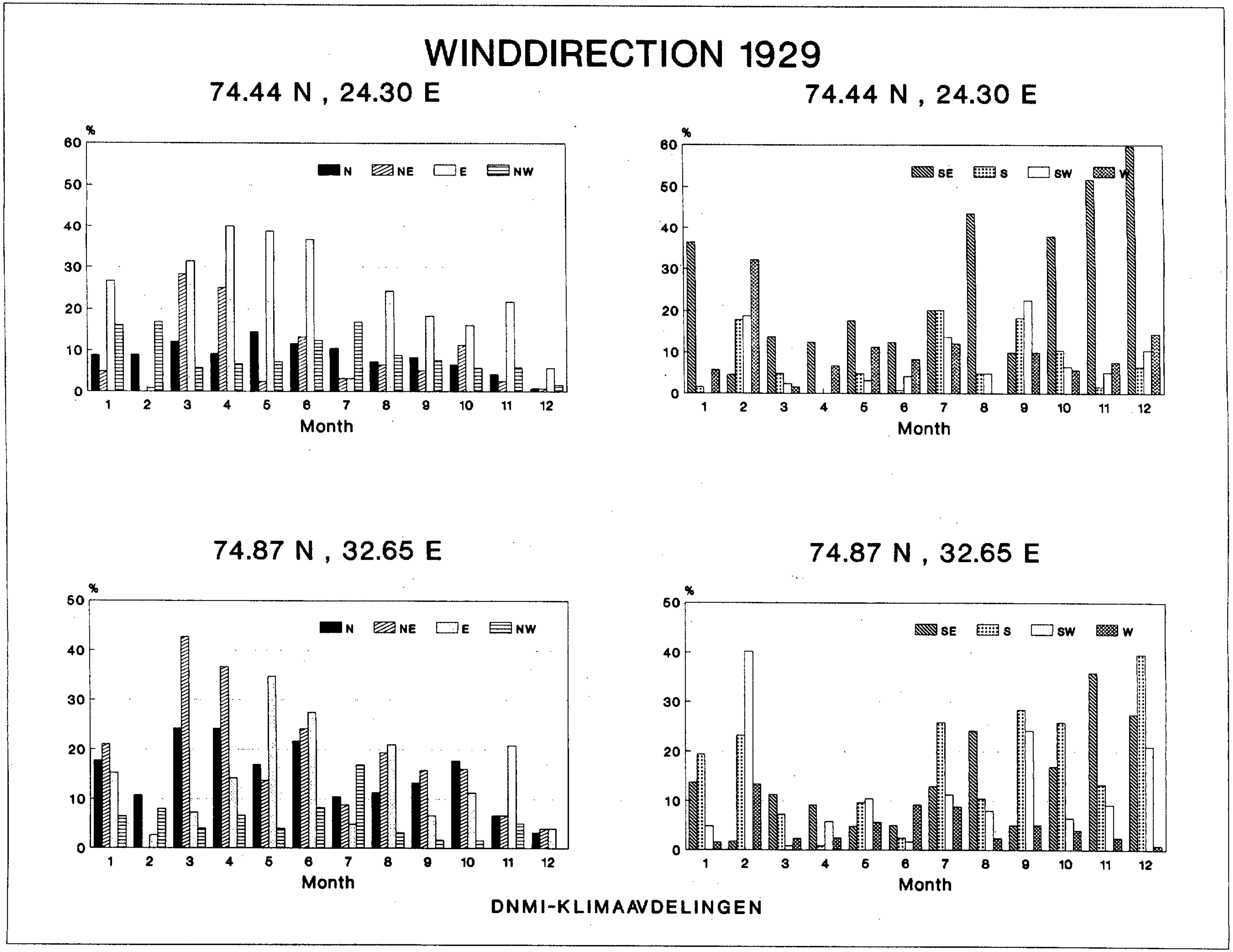

Fig.3.4.2 Frequency distribution of the wind direction in 1929 for the gridpoints at 74.44^{0}N,24.30^{0}E (0987) and 74.87^{0}N,32.65^{0}E (0889)

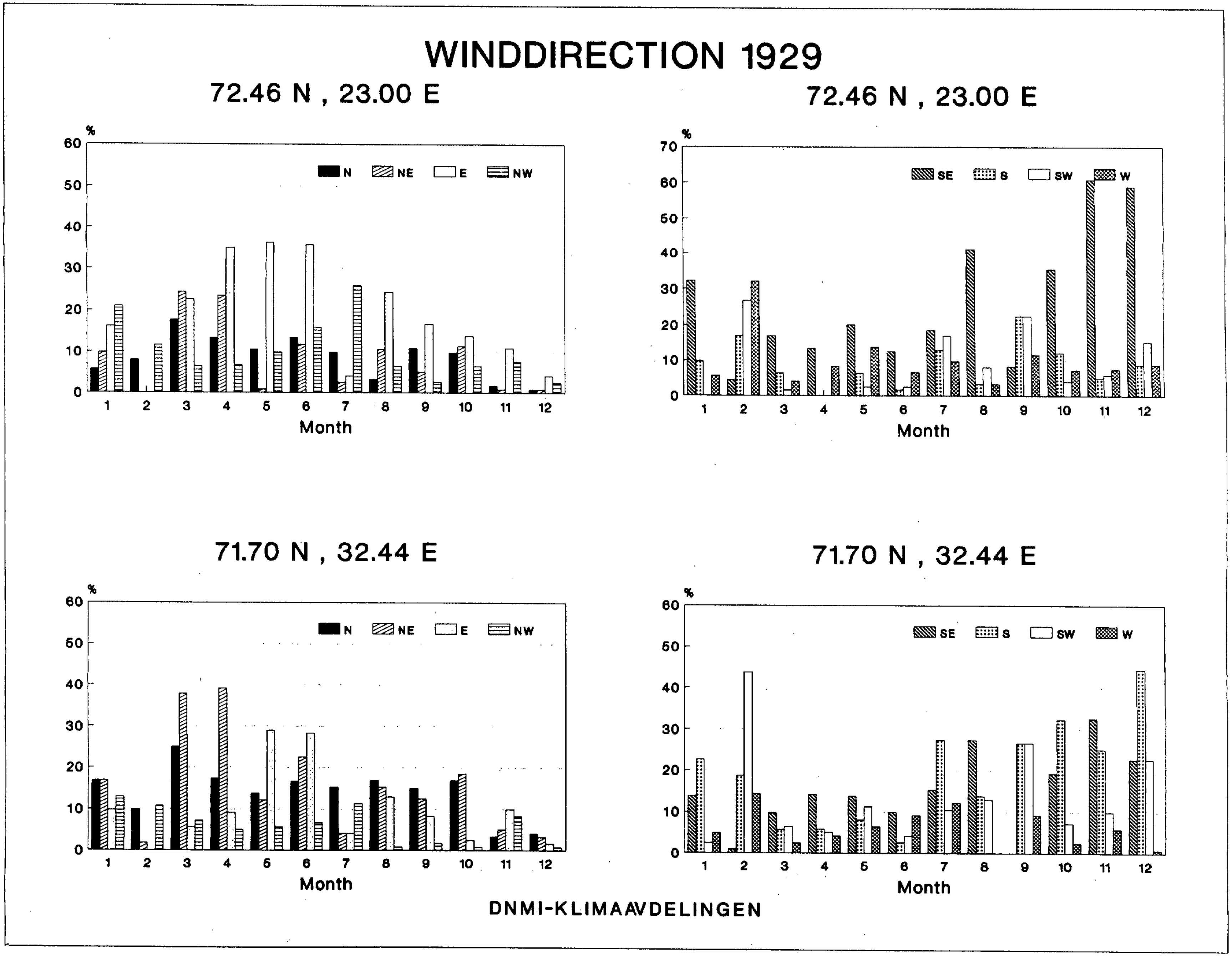

Fig.3.4.3 Frequency distribution of the wind direction in 1929 for the gridpoints at 72.46°N,23.00°E (0984) and 71.70°N,32.44°E (0734)

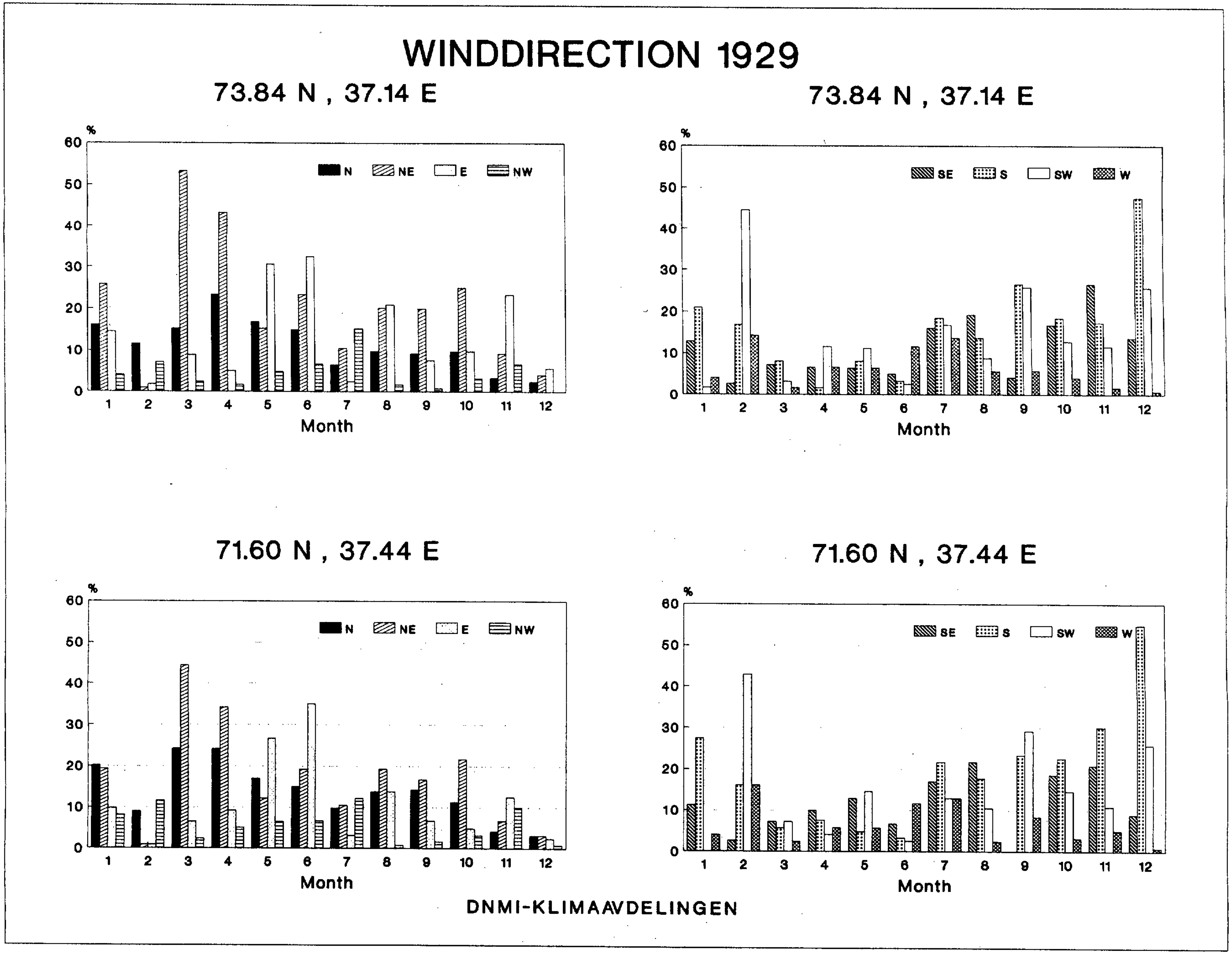

Fig.3.4.4 Frequency distribution of the wind direction in 1929 for the gridpoints at 73.84^{0}N,37.14^{0}E (0739) and 71.60^{0}N,37.44^{0}E (0636)

3.5 The departures of 1929 from the longtime average of wind directions based on the period 1955-1989

The figures 3.5.1 ... 3.5.4 give the anomalies in the frequency distributions of the points referred to in 3.1. The anomaly is here, as in 3.3, defined as the difference from the longtime mean based on the period 1955-1989.

The figures underline the features focused on for the frequency distributions of the wind direction in 3.4.

The high frequencies of N-NE wind directions in March-April lead to a positive anomaly. With an exception for February and January, the southern wind directions and W show negative anomalies the first half year of 1929. For July and the rest of the year, southern wind directions and W also show positive anomalies.

The anomalies for February are very pronounced with some variations in the wind direction distribution within the area studied. For the point farthest to west, the direction S shows the greatest anomaly. For the point farthest to north (77.40^0N ,34.47^0E) it is the direction SW which shows the greatest anomaly. From the other figures, it is found that the anomaly maximum shifts from W to SW when going eastward in the southern part of the Barents Sea.

Noteworthy is also that for all the points, with an exception for the one farthest to west, the direction SE shows a negative anomaly.

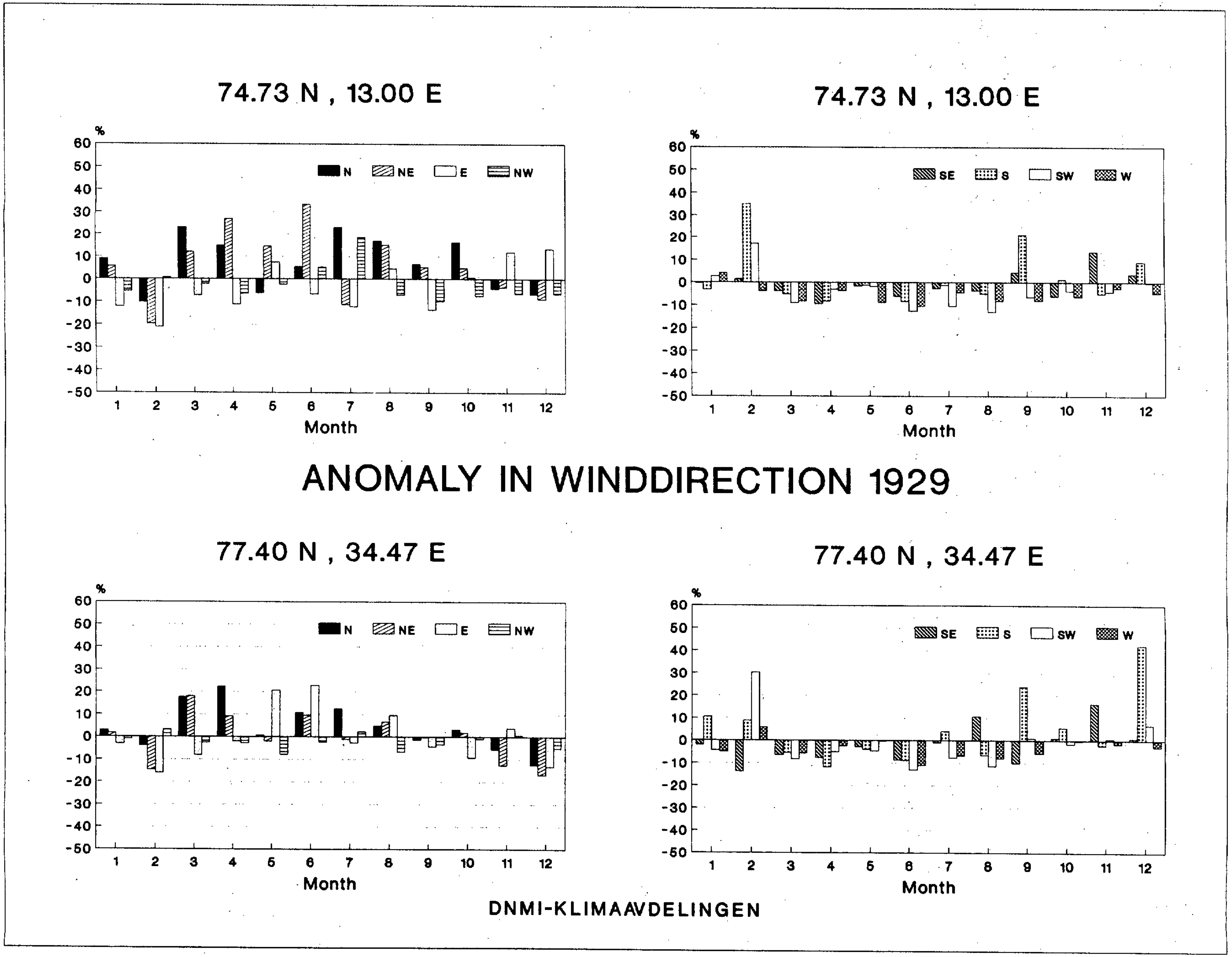

Fig.3.5.1 Anomaly in the frequency distribution of the wind direction in 1929 for the gridpoints at 74.73^{0}N,13.00^{0}E (1236) and 77.40^{0}N,34.37^{0}E (0942)

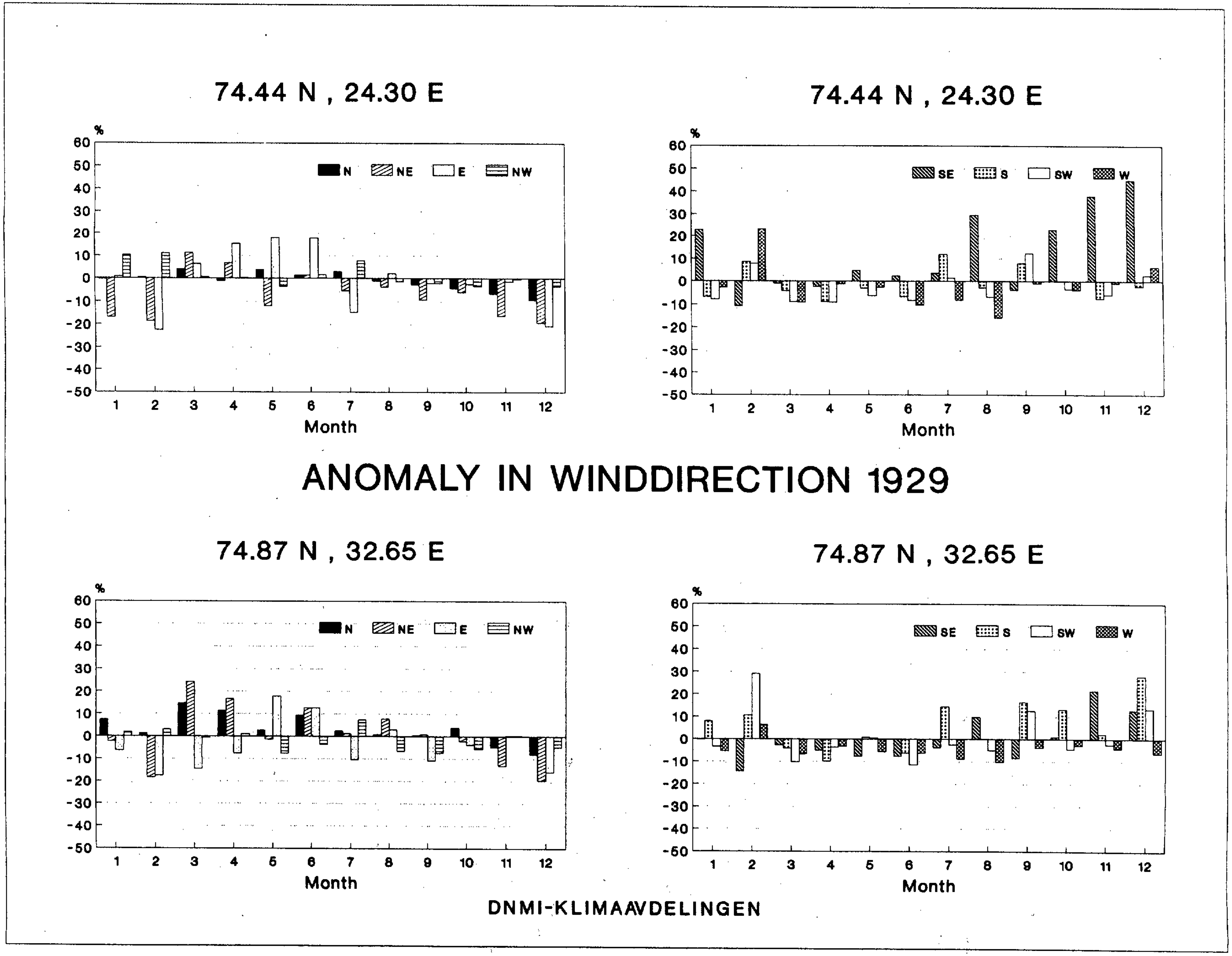

Fig.3.5.2 Anomaly in the frequency distribution of the wind direction in 1929 for the gridpoints at 74.44°N,24.30°E (0987) and 74.87°N,32.65°E (0889)

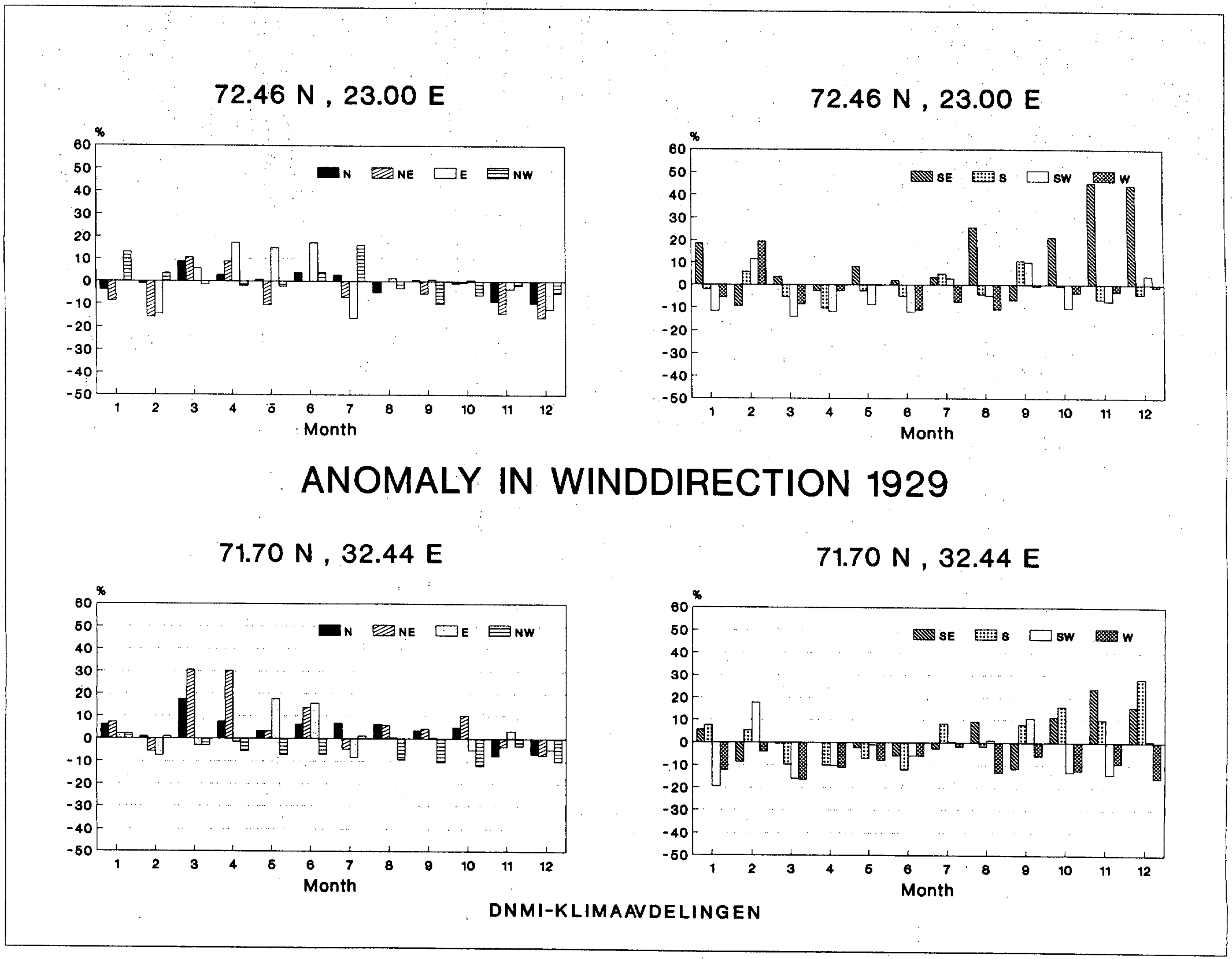

Fig.3.5.3 Anomaly in the frequency distribution of the wind direction in 1929 for the gridpoints at 72.46^{0}N,23.00^{0}E (0984) and 71.70^{0}N,32.44^{0}E (0734)

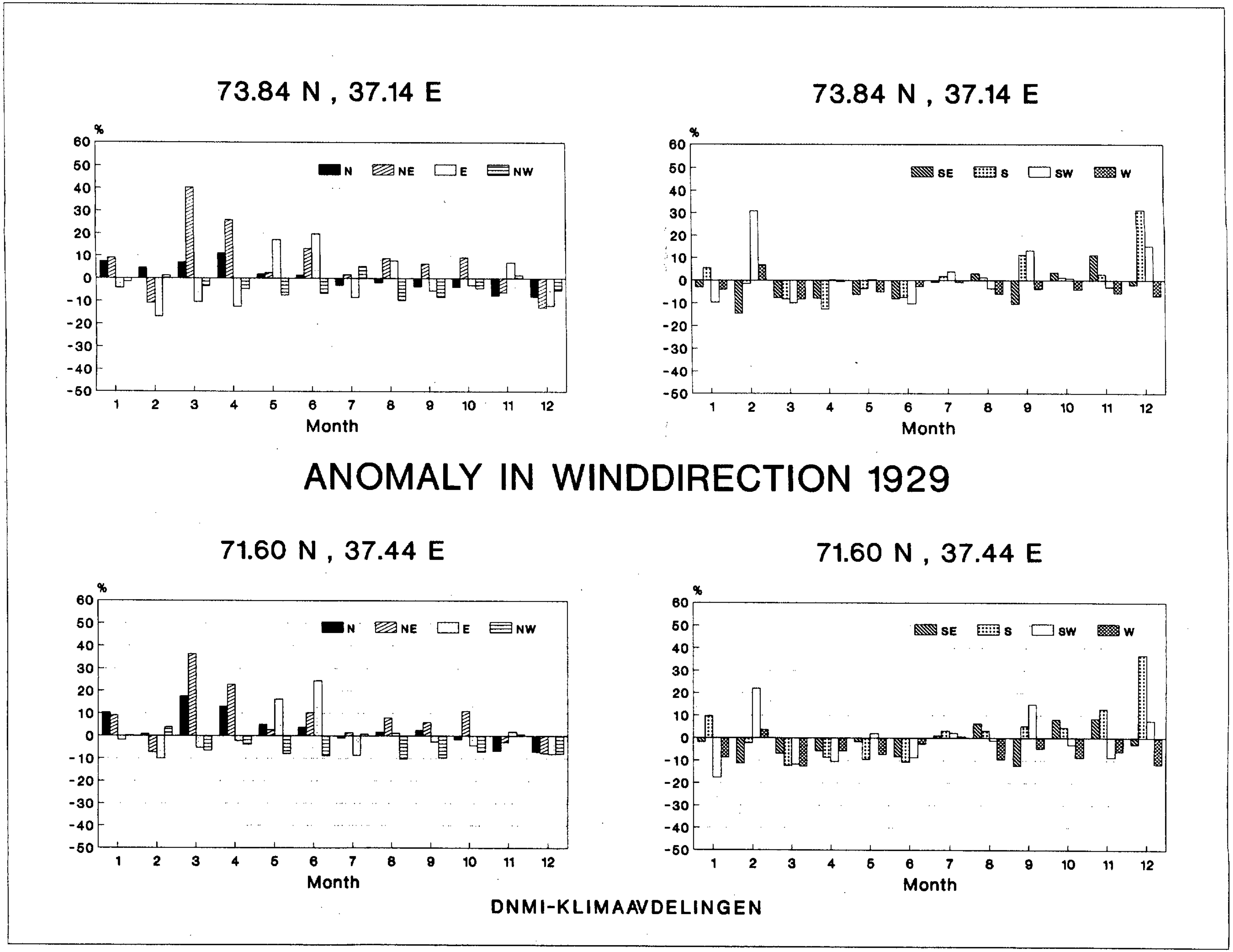

Fig.3.5.4 Anomaly in the frequency distribution of the wind direction in 1929 for the gridpoints at 73.84°N,37.14°E (0739) and 71.60°N,37.44°E (0636)

4. WIND DIRECTIONS IN 1928-1929 COMPARED TO LONGTIME AVERAGE AT JAN MAYEN, VARDØ AND BJØRNØYA

Jan Mayen

The frequency distributions for 1928 and 1929 of the wind directions are given in fig. 4.1.1 and 4.1.2. The northern directions N,NE,NW and the direction E are given in the left part of the figure while the southern directions S,SE,SW and the direction W are given in the right part.

To locate possible anomalies, the difference between the observed frequencies and those from a longtime average have been computed. For Jan Mayen, the longtime average is based on the period 1921-1940. The differences are given in the lower part of the figure.

The frequencies given are number of observations and during 1928 and 1929 three observations where taken each day.

During 1928 (Fig.4.1.1) wind from E shows the greatest departure from the longtime average. In April,August,September and October the departure is positive and in July negative. The frequencies of the southern wind and wind from W show small variations from the longtime average, with an exception in June for the direction SW.

In 1929 (Fig.4.1.2) the differences from the longtime averages are small for the directions SE-W. The differences are greater for directions NW-E. In 1929 as well, the frequencies for the direction E differ most from the longtime average. In February and November the differences are positive and in July negative.

Vardø

The frequency distribution for 1928 and 1929 for the wind direction is given in fig.4.1.3 and 4.1.4. In 1928 wind with the directions in the sector SE-W are most frequent with exception for the months May to August when wind directions in the sector NW-E are more frequent.

For Vardø the longtime average is based on the period 1931-1960.

In 1928 the departure from the longtime mean is marked for June when wind directions in the sector NE-E are clearly overrepresented while wind directions in the sector NW-N are less frequent than the longtime average. Another pronounced feature is the frequency of wind with the direction W in the period September to December, which is above the longtime average. This is especially so for December.

In 1929 the overrepresentation of wind direction from W continues in January and February. To a less degree this feature endures until the end of May. In this period the wind directions in the sector SE-SW are more or less underrepresented.

For wind directions in the sector NW-E, the direction NE and NW have the greatest departures from the longtime average with positive difference for NE in most of the months while the direction NW is underrepresented in varying degree through the whole year of 1929.

Bjørnøya

The frequency distribution for 1928 and 1929 of the wind direction is given in fig. 4.1.5 and fig. 4.1.6. The long-time mean for this station is based on the period 1920-40.

In 1928 the most pronounced feature is the overrepresentation of the directions NE and E in June. For the direction NE the overrepresentation lasts through July. Noteworthy is the underrepresentation of wind from E in September. The frequencies of the directions in the sector SE-W show some variations from those of the longtime average. For the winter months the departures are mostly positive. From May on and the rest of the year, the departures are mostly negative with an exception August for the direction W and in September for the directions S-W.

In 1929 there are marked differences from the longtime average both for wind directions in the sector NW-E and SE-W. In January the direction NE shows a pronounced positive anomaly. Together with a positive anomaly for the direction N this leads to a negative anomaly for the directions in the sector SE-W in January. In February this condition is almost reversed. The directions in the sector NW-E show negative anomalies while the directions S-W have positive anomalies. Most frequent wind direction is SW.

For the months March-June the main features are that wind directions in the sector NW-E have positive anomalies while wind directions in the sector SE-W are underrepresented. Exceptions are the wind direction SW in May, the directions S-W in July and SE-SW in September which are more frequent than the longtime mean.

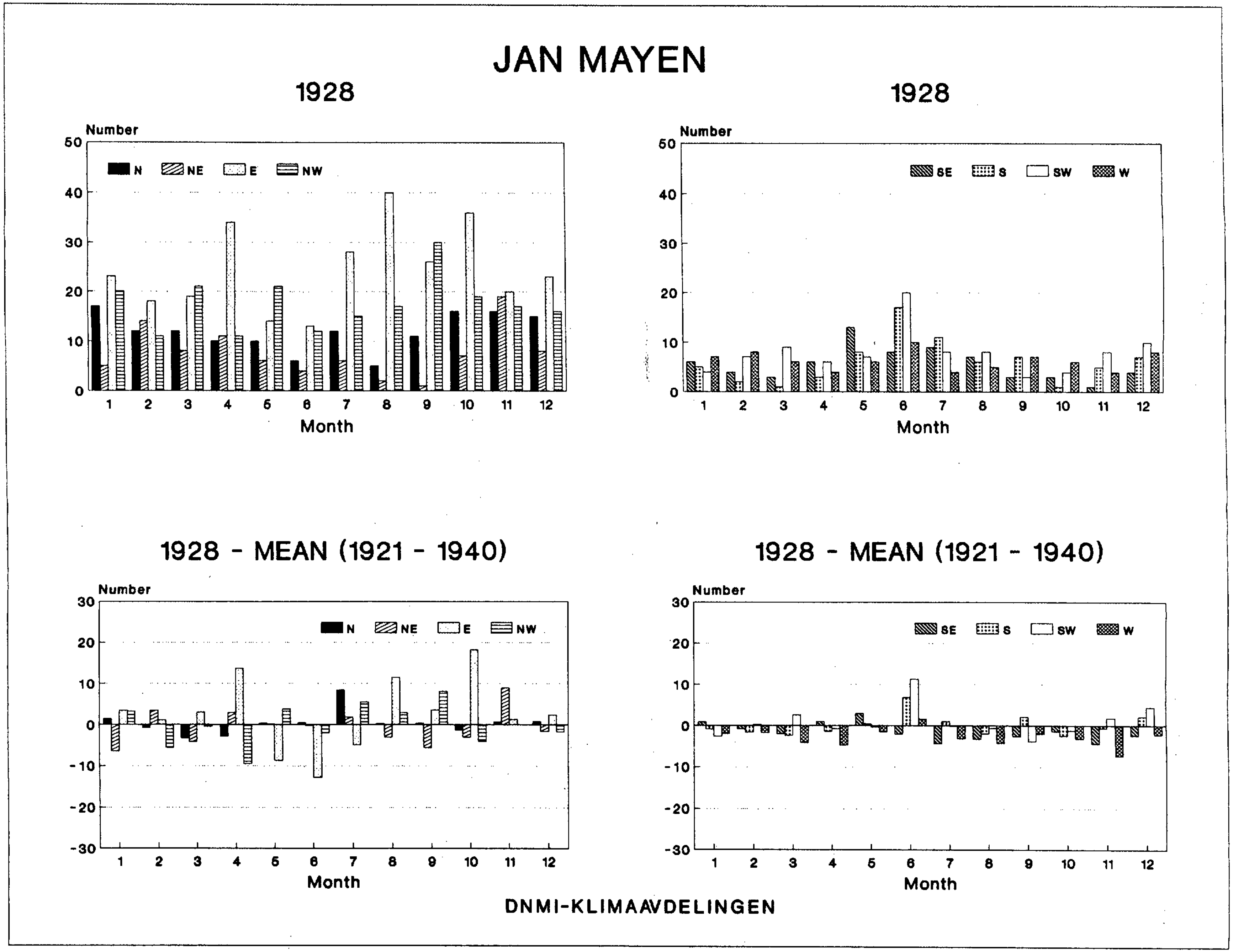

Fig.4.1.1 Number of occurrences of the wind directions N,NE,E,SE,S,SW,W and NW in 1928. Lower part gives the differences between the actual frequencies and a longtime mean for the same.

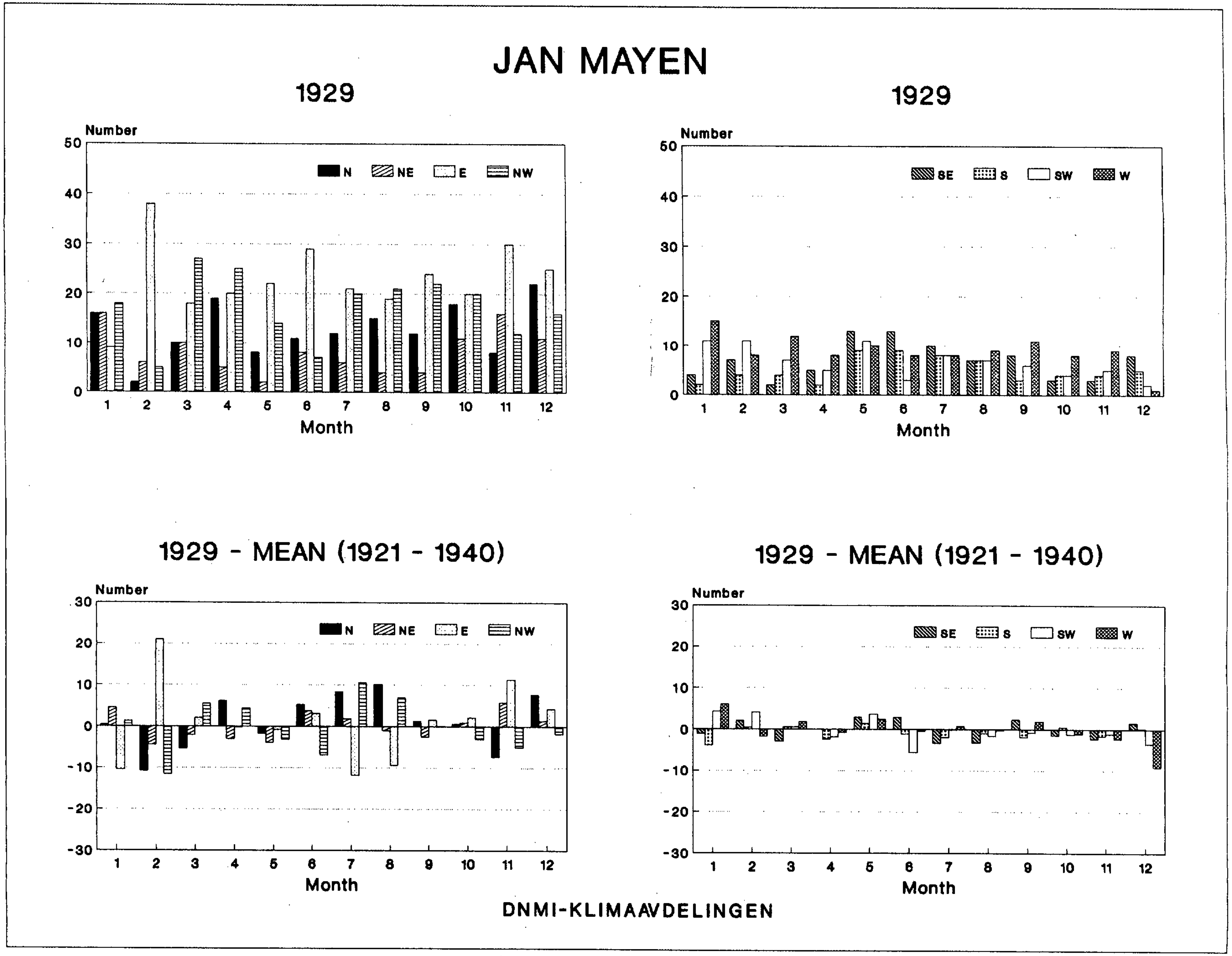

Fig.4.1.2 Number of occurrences of the wind directions N,NE,E,SE,S,SW,W and NW in 1929. Lower part gives the differences between the actual frequencies and a longtime mean for the same.

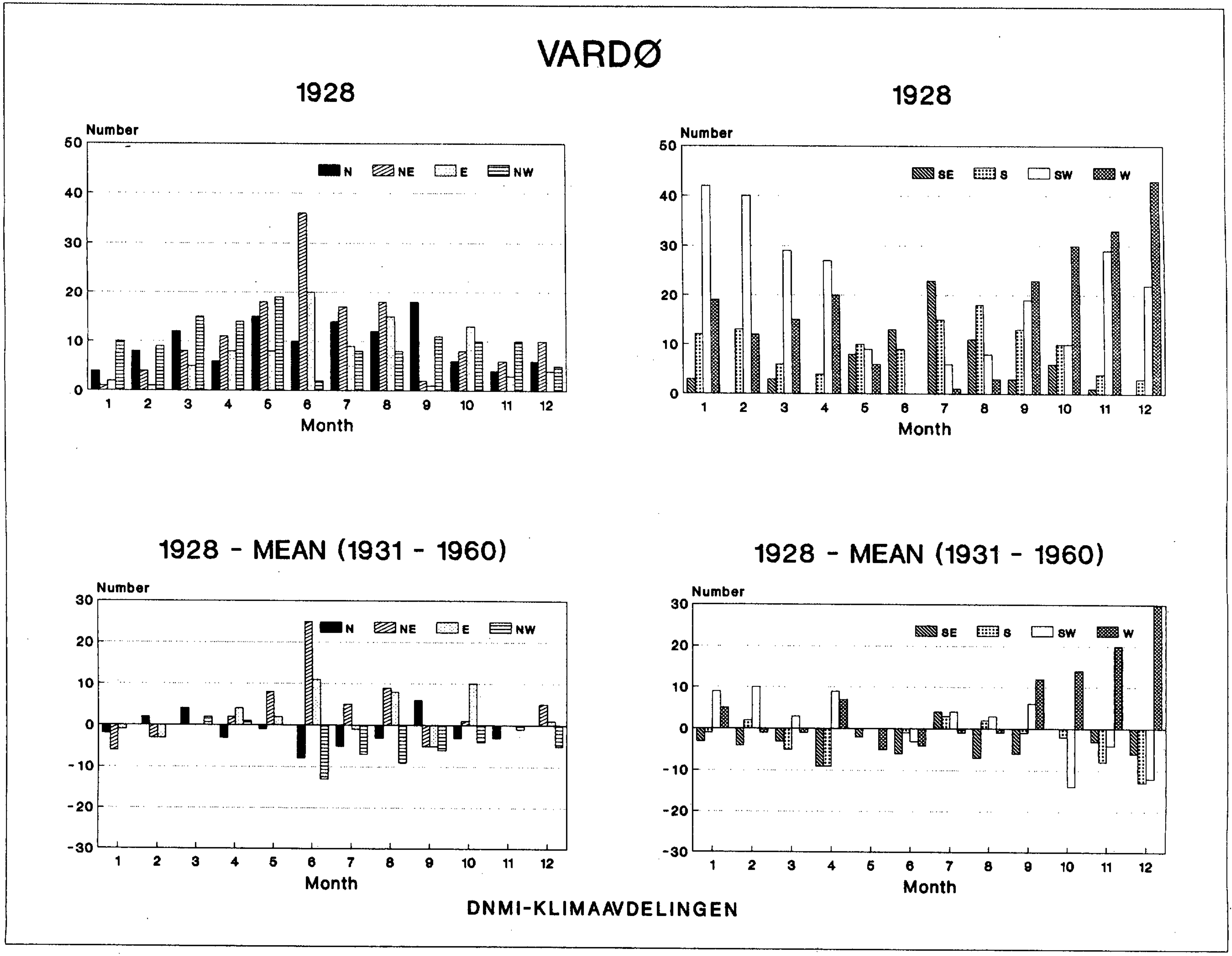

Fig.4.1.3 Number of occurrences of the wind directions N,NE,E,SE,S,SW,W and NW in 1928. Lower part gives the differences between the actual frequencies and a longtime mean for the same.

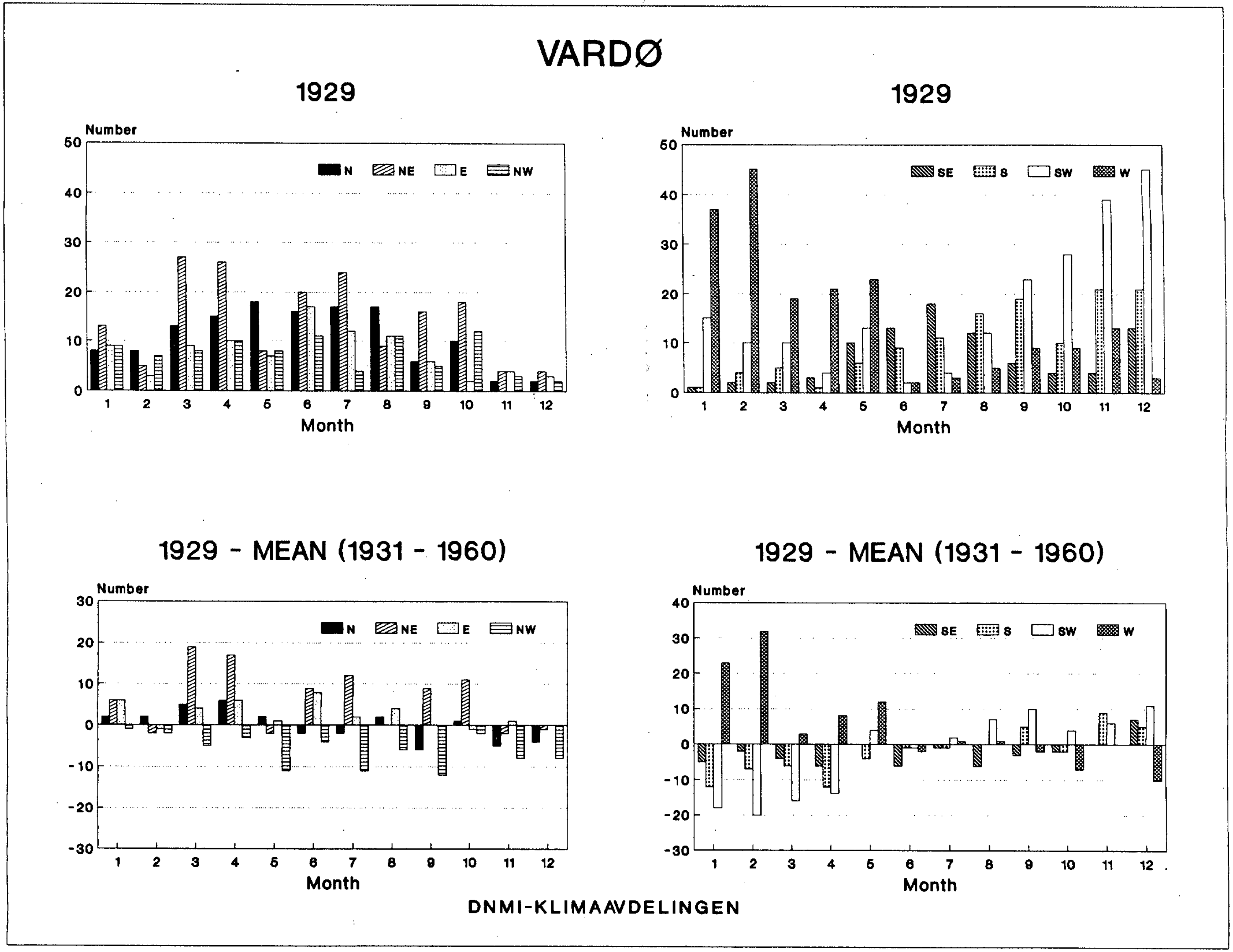

Fig.4.1.4 Number of occurrences of the wind directions N,NE,E,SE,S,SW,W and NW in 1929. Lower part gives the differences between the actual frequencies and a longtime mean for the same.

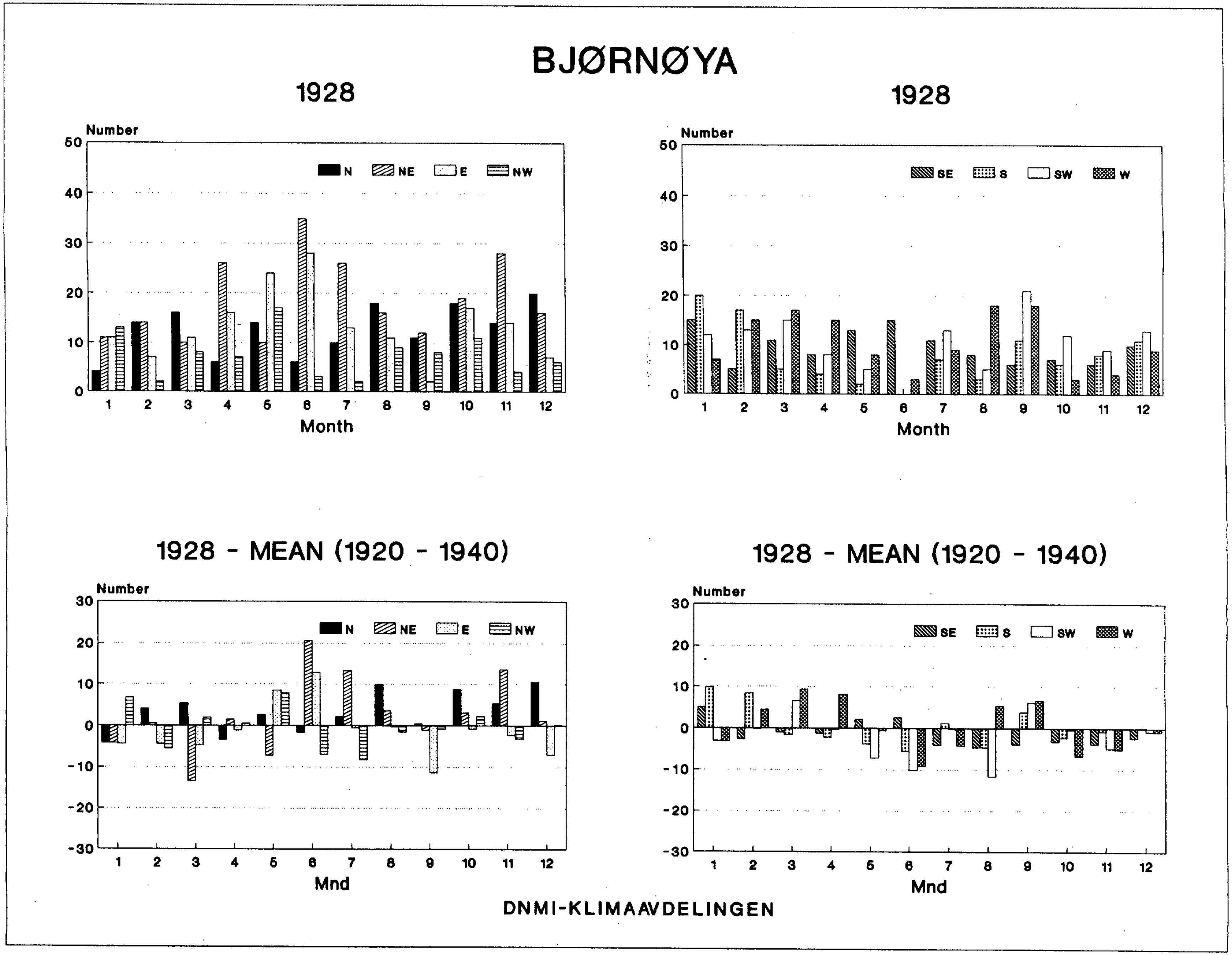

Fig.4.1.5 Number of occurrences of the wind directions N,NE,E,SE,S,SW,W and NW in 1928. Lower part gives the differences between the actual frequencies and a longtime mean for the same.

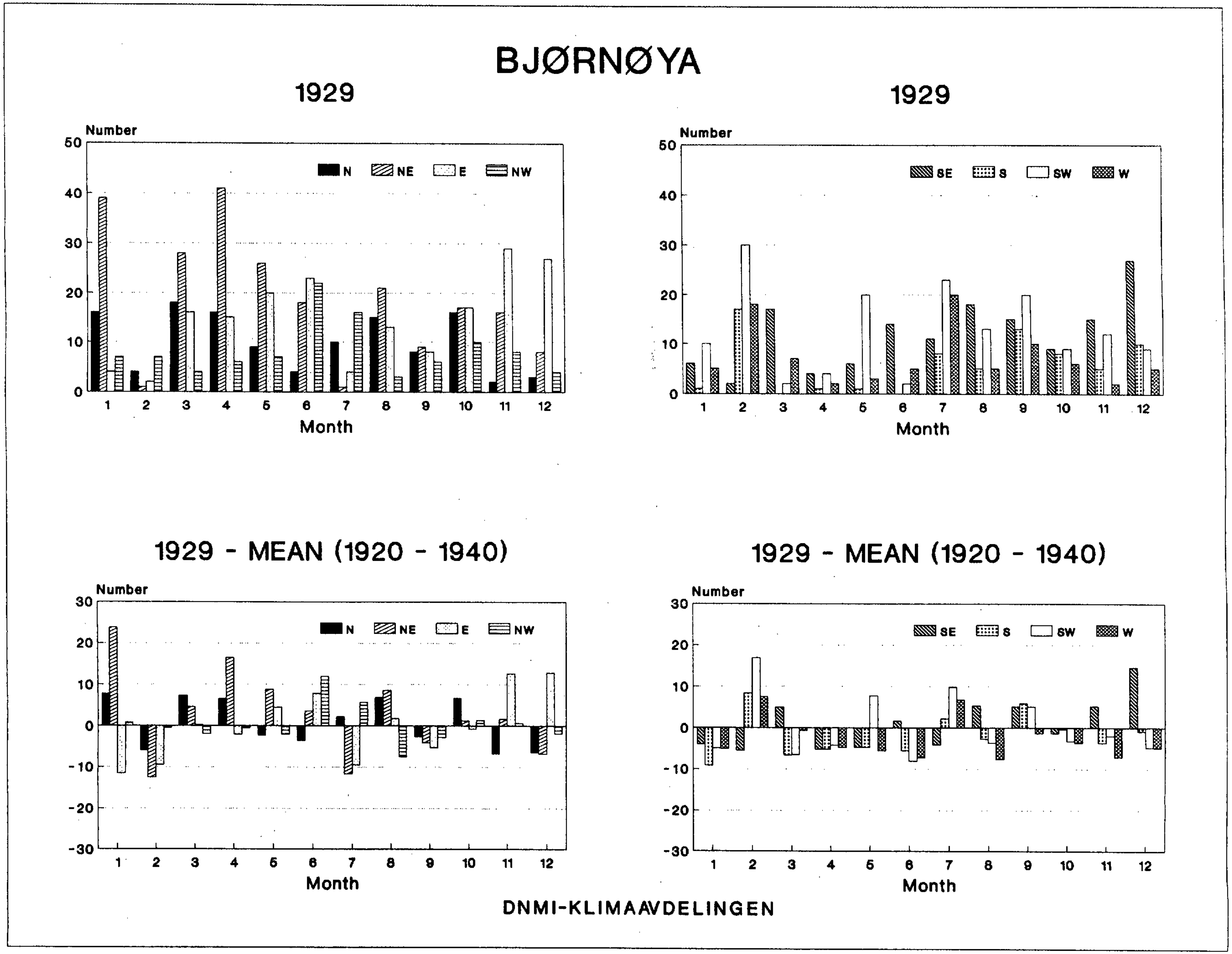

Fig.4.1.6 Number of occurrences of the wind directions N,NE,E,SE,S,SW,W and NW in 1929. Lower part gives the differences between the actual frequencies and a longtime mean for the same.

5. AIR TEMPERATURE

5.1 Air temperature at Jan Mayen, Vardø, Isfjord Radio and Bjørnøya in 1928 and 1929

The monthly means of the air temperature for 1928-1929 are given in the upper part of fig.5.1.1 for the observing stations at Jan Mayen, Vardø, Isfjord Radio and Bjørnøya. In the lower part of the figure, the monthly averages for the period 1931-1960 are subtracted from the same for 1928 and 1929.

The curves for the four stations have many features in common. A difference can be seen for Jan Mayen for the months of October 1928 - April 1929 when this station shows a positive anomaly when the others have a negative, with an exception for February. In February Isfjord Radio and Bjørnøya too have a very pronounced positive anomaly while Vardø is near the mean. As one recalls from the pattern of the mean pressure field for February 1929 given in fig.2.3.1 and the frequency distributions of the wind directions through 1929 in 3.4 and 3.5, the directions S-SW were overrepresented in February in the Barents Sea.

The anomaly curves for the spring 1929 are also in very good accordance with the frequency distributions of the winddirection in 3.4 and 3.5 showing a positive anomaly for the northern direction + E for these months. Noteworthy, though not so interesting for the aim of this study, is the positive anomaly in temperature towards the end of 1929. This is also in accordance with the anomalies found in the distribution of the wind direction discussed in 3.5.

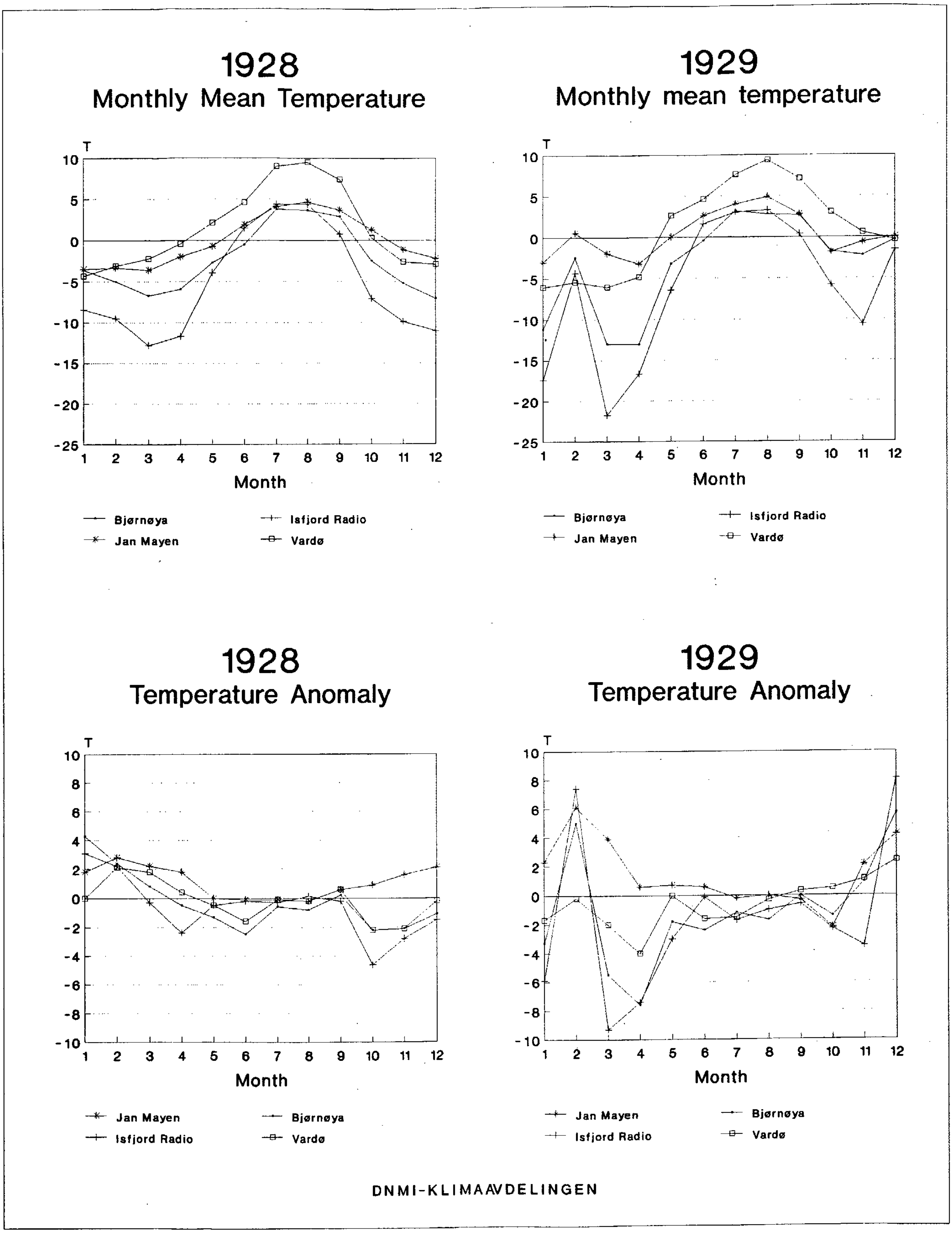

Fig.5.1.1 Monthly mean temperature for 1928 and 1929 (above) together with the difference from the 1931-60 normals for the same (below) for Jan Mayen, Isfjord Radio, Bjørnøya and Vardø.

6. RESULTS AND DISCUSSION

The review of the meteorological data from 1928 and 1929 is first of all a documentation of the weather conditions. Through this documentation, anomalies are revealed and these are given in detail in chapter 3, 4, and 5. The anomalies assumed to be of greatest importance can be summarised as :

1) Positive temperature anomaly in January and February 1928

2) Very pronounced positive anomalies in the frequencies of the wind directions NE and E for June and July 1928. In the western part for June, the anomaly for the direction NE is greatest. Going eastwards in the Barents Sea in June and for most of the Barents Sea in July, the anomaly is more pronounced for the wind direction E.

3) The stations Isfjord Radio, Bjørnøya and Vardø have a negative temperature anomaly for the months of October to December 1928 and January 1929. At Jan Mayen the temperature anomaly is positive for the same period.

4) Pronounced positive anomalies in the frequency of the wind directions S-SW in February 1929 are leading to a very pronounced positive temperature anomaly for the stations Jan Mayen, Isfjord Radio and Bjørnøya. At Vardø the positive anomaly in the wind direction is for the direction SE leading to a monthly mean temperature near the normal.

5) Positive anomaly for the wind directions N-NE in March-April 1929 for the Barents Sea which leads to a pronounced negative temperature anomaly for these months for Isfjord Radio, Vardø and Bjørnøya.

6) Wind speed modelled (gridpoint near Bjørnøya) and averaged on a monthly basis, is below the longtime average (1955-89) for the whole period 1928-29. The different basis for the wind modelling for the two periods may have influence on this result.

Hoel (1962), Vinje (1990) and the Russian report given as an Appendix are not and cannot be accurate when the time of the calving are specified. It is assumed that the icebergs encountered along the coast of Finnmark in the spring of 1929 obviously must have been released from the glaciers in the north some years earlier. Reports from Norwegian ships logs and observations from Russian ships "indicates that the production of a noticeable amount of icebergs may have started in 1925 in Zemlja Frantsa Iosifa" (Vinje 1990).

There is an uncertainty of the time scale relevant for this kind of study. During the meteorological part of the project, the mapping of the conditions in 1928 and 1929 were assumed to be satisfactory. To have a more complete understanding of the conditions leading to the occurences of the iceberg at the coast of Finnmark in 1929, perhaps a longer prehistory has to be studied.

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