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CLIMATIC EVALUATION OF 3 ALTERNATIVE SKI JUMP SITES CONCERNING OL - 1994

By ØYVIND JOHNSEN

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CLIMATIC EVALUATION OF 3 ALTERNATIVE SKI JUMP SITES CONCERNING OL - 1994

UTARBEIDET AV

ØYVIND JOHNSEN

OPPDRAGSGIVER

LILLEHAMMER KOMMUNE

V/IKB LILLEHAMMER A/S

OPPDRAGSNR.

SAMMENDRAG

The wind conditions in the Lillehammer area are generally calm. Because of various wind conditions, the Balberg-alternative is the least attractive one.
The other two alternatives are relatively equal with Bergebakken as the presumingly best one.

UNDERSKRIFT

....

SAKSBEHANDLER

Bjørn Aune
FAGSJEF

THIS REPORT IS AN ENGLISH VERSION OF THE NORWEGIAN REPORT.

MADE BY BJØRN AUNE AND TOVE LANGGÅRD

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CLIMATIC EVALUATION OF 3 SKI JUMP SITES:

ALT 1: BALBERGBAKKEN ALT 2: BERGEBAKKEN
ALT 3: LYSGARDSBAKKEN

1. Data:
Relatively few winddata exist from the Lillehammer area. The Norwegian Meteorological Institute has since 1932 operated 3 weather-stations, and all of them have been located south of the centre of Lillehammer:

NAME:	YEARS:
Lillehammer II,	1932-69, 226 m a.s.l.
Lillehammer III,	1969-81, 271 m a.s.l.
Lillehammer-Sætherengen,	1982- , 241 m a.s.l.

The map on page 4 shows the position of the last two stations. None of the stations give a completely correct picture of the wind-conditions in and around the three proposed ski jump sites. The wind-data can, however, be used with certain reservations. The pages 7 - 16 show the wind-distribution in January, February and March at the stations Lillehammer-Sætherengen and Lillehammer III.

Page 4 shows a map over the area. Wind-arrows have been drawn over areas where the wind mainly follows the terrain.

2. EVALUATION.
The wind-distributions at the two stations are partly different, both concerning wind force and wind direction. Lillehammer III has a marked easterly component which Lillehammer-Sætherengen does not have. This is because Lillehammer III was situated more to the south and was influenced by anabatic wind from the east. Otherwise the stations do have the same trend with main wind directions from north to north-east and from south-east to south. It is therefore most natural to pay the greatest attention to the observations from Lillehammer-Sætherengen.

The wind conditions in the Lillehammer area are generally calm, see the pages 17 - 20. Calm periodes of several days are followed by shorter periodes of 1 - 2 days with light wind.
Strong gusts are rather rare, and probably happen only in connection with passing fronts. Wind forces stronger than gentle breeze, 5 m/s, are relatively exceptional, especially in the southern areas. North of Lillehammer centre, and especially up towards Balberg, the wind conditions probably are more uneven.

The eastern shore of lake Mjøsa is cut by several valleys. It is therefore natural that the light wind follows these valleys, often deviating from the main wind directions. Stronger winds from the north or from the south will mainly run parallell to the slopes of the hills north-east of Lillehammer centre.
The range of hills east of Lillehammer are accumulation-areas for cold air during the winter. The cold air will with uneven intervals, drain down towards lower levels. These events occur especially at the end of periodes with calm, clear and cold weather. The cold air gives wind from north-east to south-east, but the wind only seldom will be strong.

2.1 BALBERGBAKKEN

This ski jump site is located in a very broken terrain. The predominant wind will be from north-west and north-east, rarely from south. The terrain gives opportunity for unexpected gusts. The wind will very often come down the ski jump site or from the side. This will destroy a possible uplift. The wind will be more uneven over Balbergbakken than further south in the valley.
There are possibilities for cases with fog or low clouds.

2.2 BERGEBAKKEN

This ski jump site will be situated in open terrain on an even slope of the hill with forest on both sides.
The wind conditions are steady in this area, but wind can occur along the slope of the hill, side-wind. Wind from south-east can give a certain lift up the ski jump site. The drainage of cold air from higher levels in the north-east will reduce the uplift, but not too seriously. The side-wind can be reduced by letting the existing forest stand as close to the ski jump site as possible.

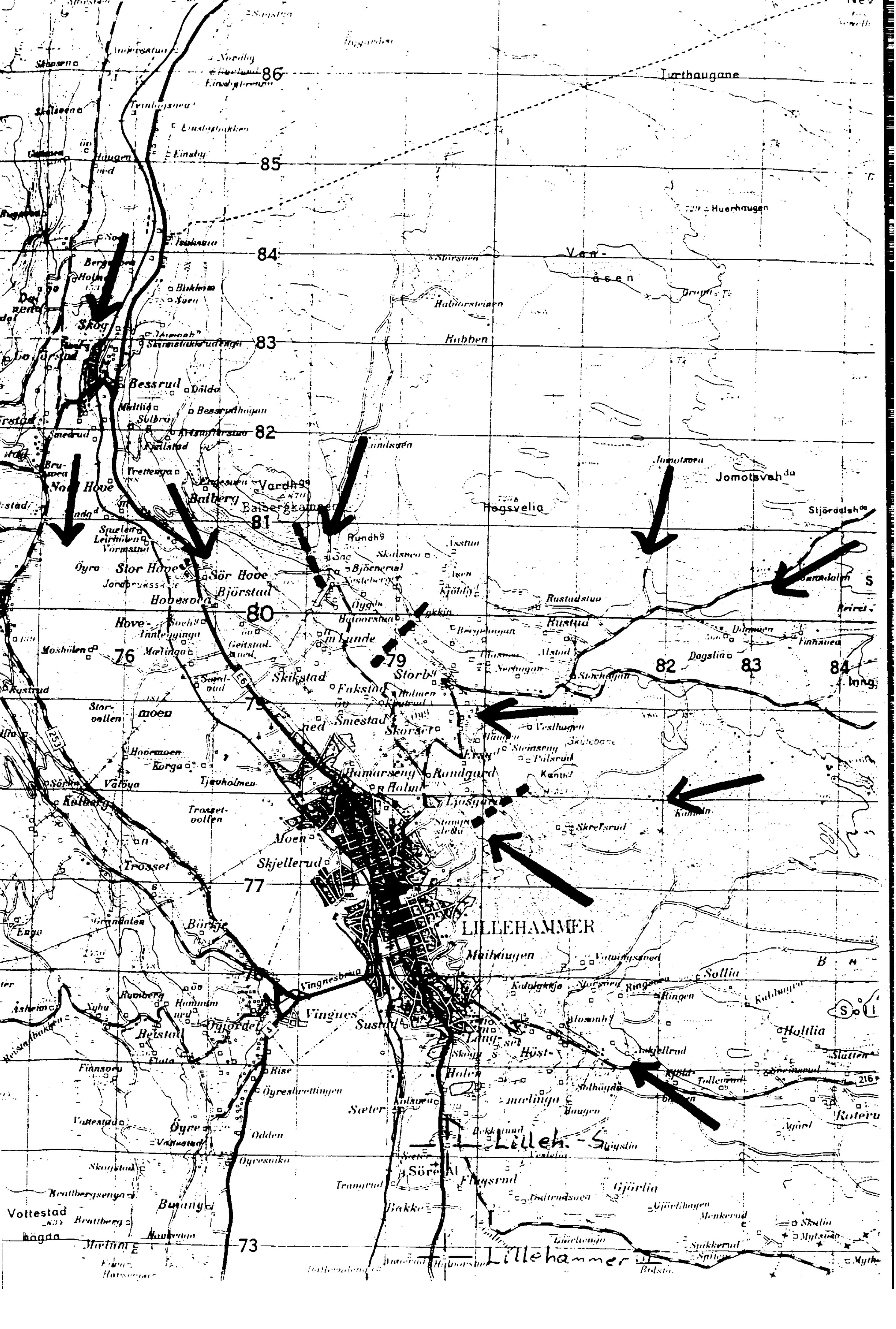
2.3 LYSGARDSBAKKEN

This ski jump site will be situated on a round slope of the hill with forest on both sides. The area is otherwise even with relatively steady wind conditions. The ski jump site will have wind from north-west to north and from south-east to south. The wind will mainly blow along the slopes of the hills at the ski jump site, side-wind. Wind from the southern sector can give a certain uplift. Wind from north-east down the ski jump site is cold air from the levels in north-east and east. This wind will be moderate in force, but lead to less or no uplift. The side-wind can be prevented by letting existing forest stand as close as possible to the ski jump site.

3. CONCLUSION

All three alternatives are possible according to known wind conditions. But Balbergbakken however seems to be the least attractive alternative when considering the uneven wind conditions which can be expected at the ski jump site.

The other two alternatives are likeworthy, with light wind conditions. If one should separate these two ski jump sites, Bergebakken most probably will have safest conditions of the two.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Torthaugane
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Ven-
åsen
Rubben
Skog
Bessrud
Nord Hove
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Vardh
Hogsvelia
Jomotsveh
Stor Hove
Sör Hove
Björstad
Hove-
Lunde
Rustad
Dagslia
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COMMENTS ON THE WIND STATISTICS

The basic observations.

Most of the weather stations in Norway make observations 3 times per day : 07(08), 13 and 19 Norwegian time. About 20 % of the stations also make observations at 01 o'clock and some stations at intermediate points in time. The wind observations dealt with in this paper are only those, which have been made at morning, midday and evening during the period 1961-1975 (for 19 stations the period 1966-1975). The present paper contains 155 weather stations, the majority of which estimates the wind force. 46 of the stations are equipped with an autographic wind speed recorder, and 31 stations with an autographic wind direction recorder. 38 of the stations have no wind vane/sleeve at all. Even though some of the stations record the mean wind speed in m/sec, these values are transformed into a Beaufort-number on which all the computations are done. Likewise the observations of maximum wind force between the hours of observation are computed on Beaufort numbers, which represent 10 minute means.

The tables concerning frequencies of concurrent wind forces and wind directions.

At the Norwegian weather stations the observed wind force is a 10 minute mean. This also applies to the observed maximum wind force.
All frequencies are given in percent of the total number of observations and rounded off to the nearest tenth. An open space in the table means no observations at all in the interval in question. 0,0 means a few observations but less than 0,05 percent. This is valid with one exception: C=0.0 in the heading stands for a few observations or no observations of calm weather.

Explanation of symbols.

HRS	hours of observation in GMT
N	total number of observations
C	frequency of calm
VM	mean wind velocity in m/sec
FM	mean wind force in Beaufort
DD	wind direction in dekadegrees, rounded off to the nearest of 12 main directions: 35-01, 02-24 etc.
F	wind force in Beaufort
ND	frequency of each wind direction DD
FDM	mean wind force in Beaufort for each wind direction DD
NF	frequency of each wind force F

The formulas.

n_F	Number of observations with force F
n_D	- " - " - " - " - direction DD
$n_{F,D}$	- " - " - " - " - direction DD and force F
FDFREK	frequency of wind force F from direction DD
v'	central value in m/sec in each Beaufort interval (see below)

F	1	2	3	4	5	6	7	8	9	10	11	12
v'	0.90	2.44	4.41	6.72	9.30	12.30	15.47	18.96	22.59	26.40	30.58	35.04

$$N = \sum_{F=0}^{12} n_F$$

$$C = n_{F=0}/N$$

$$VM = 1/N \cdot \sum_{F=1}^{12} (n_F \cdot v')$$

$$FM = 1/N \cdot \sum_{F=1}^{12} (n_F \cdot F)$$

$$FDFREK = n_{F,D}/N$$

$$ND = n_D/N$$

$$FDM = 1/n_D \cdot \sum_{F_D=1}^{12} (n_{F,D} \cdot F)$$

$$NF = n_F/N$$

B E A U F O R T S C A L E

Beaufort force	10-min mean wind speed at 10 m above ground [m/sec]	Description	
		English	Norwegian
0	0.0- 0.2	Calm	Stille
1	0.3- 1.5	Light air	Flau vind
2	1.6- 3.3	Light breeze	Svak vind
3	3.4- 5.4	Gentle breeze	Lett bris
4	5.5- 7.9	Moderate breeze	Laber bris
5	8.0-10.7	Fresh breeze	Frisk bris
6	10.8-13.8	Strong breeze	Liten kuling
7	13.9-17.1	Near gale	Stiv kuling
8	17.2-20.7	Gale	Sterk kuling
9	20.8-24.4	Strong gale	Liten storm
10	24.5-28.4	Storm	Full storm
11	28.5-32.6	Violent storm	Sterk storm
12	> 32.6	Hurricane	Orkan

1268 LILLEHAMMER - SÆTHERENGEN

JANUARY 1982-1989

HRS. 00,06,12,18 GMT N= 806 C=63.0 % VM= 0.8 M/S FM=0.7 B

DD	F: 1	2	3	4	5	6	7	8	9	10	11	12	ND	FDM
36N	1.4	1.0	0.3		0.1	0.2							3.2	2.2
03	6.9	9.2	0.2		0.1								16.5	1.6
06	0.7	1.0											1.7	1.6
09E	0.1	0.1											0.2	1.5
12	0.4	0.5	0.1										1.0	1.8
15	1.6	2.9	1.4	0.1	0.1								6.1	2.1
18S	1.7	2.5	0.6										4.8	1.8
21	0.5	2.0											2.5	1.8
24		0.2	0.2										0.5	2.5
27W		0.1											0.1	2.0
30		0.2											0.2	2.0
33														
NF	13.4	19.7	3.1	0.1	0.4	0.2								

FREQUENCY OF MAX WIND FORCE BETWEEN THE HOURS OF OBSERVATION

													C
19-01	22.6	31.0	4.5	0.6	0.6								40.6
01-07	20.3	28.1	7.8	0.5	0.9	0.5							41.9
07-13	18.9	25.3	5.1		0.9	0.5							49.3
13-19	13.8	23.5	6.9		1.8	0.5							53.5

1268 LILLEHAMMER - SÆTHERENGEN

FEBRUARY 1982-1989

HRS. 00,06,12,18 GMT N= 735 C=72.1 % VM= 0.6 M/S FM=0.5 B

DD	F: 1	2	3	4	5	6	7	8	9	10	11	12	ND	FDM
36N	2.4	1.6	1.1	0.3									5.4	1.9
03	5.0	4.9	0.7		0.1								10.7	1.6
06	0.4	0.1											0.5	1.3
09E	0.1	0.1											0.3	1.5
12		0.8	0.1										1.0	2.1
15	0.8	3.7	1.1										5.6	2.0
18S	1.2	1.5	0.1										2.9	1.6
21		1.2											1.2	2.0
24														
27W														
30														
33			0.3										0.3	3.0
NF	10.1	14.0	3.4	0.3	0.1									

FREQUENCY OF MAX WIND FORCE BETWEEN THE HOURS OF OBSERVATION

													C
19-01	17.7	17.0	5.0	2.1									58.2
01-07	16.2	20.2	7.6	1.0	0.5								54.5
07-13	17.7	18.2	5.1		0.5								58.6
13-19	14.6	19.2	5.6	0.5	0.5								59.6

1268 LILLEHAMMER - SÆTHERENGEN

MARCH 1982-1989

HRS. 00.06.12.18 GMT N= 806 C=62.3 % VM= 0.7 M/S FM=0.6 B

DD	F: 1	2	3	4	5	6	7	8	9	10	11	12	ND	FDM
36N	3.6	3.6	0.7										7.9	1.6
03	5.6	2.5	0.6										8.7	1.4
06	0.4	0.5											0.9	1.6
09E	0.1												0.1	1.0
12	2.4	2.0	0.7	0.1		0.2							5.5	1.9
15	4.1	4.6	0.2										8.9	1.6
18S	1.9	0.5	0.2										2.6	1.4
21	1.6	0.1											1.7	1.1
24														
27W														
30														
33	0.5	0.5	0.4										1.4	1.9
NF	20.1	14.3	3.0	0.1		0.2								

FREQUENCY OF MAX WIND FORCE BETWEEN THE HOURS OF OBSERVATION

							C
19-01	26.5	15.5	5.2			0.6	52.3
01-07	27.6	21.2	4.6	0.5	0.5		45.6
07-13	29.0	21.7	5.1			0.5	43.8
13-19	28.6	24.0	5.5			0.5	41.5

1268 LILLEHAMMER - SÆTHERENGEN

APRIL 1982-1989

HRS. 00.06.12.18 GMT N= 780 C=60.4 % VM= 0.8 M/S FM=0.7 B

DD	F: 1	2	3	4	5	6	7	8	9	10	11	12	ND	FDM
36N	4.2	5.6	2.8		0.3								12.9	2.0
03	5.8	4.0	2.1										11.8	1.7
06	0.3												0.3	1.0
09E	0.1												0.1	1.0
12	0.8	0.8											1.5	1.5
15	1.5	2.3	0.4										4.2	1.7
18S	1.9	3.1	0.3										5.3	1.7
21	1.3	1.0											2.3	1.4
24	0.1												0.1	1.0
27W														
30														
33	0.3	0.5	0.3										1.0	2.0
NF	16.3	17.3	5.8		0.3									

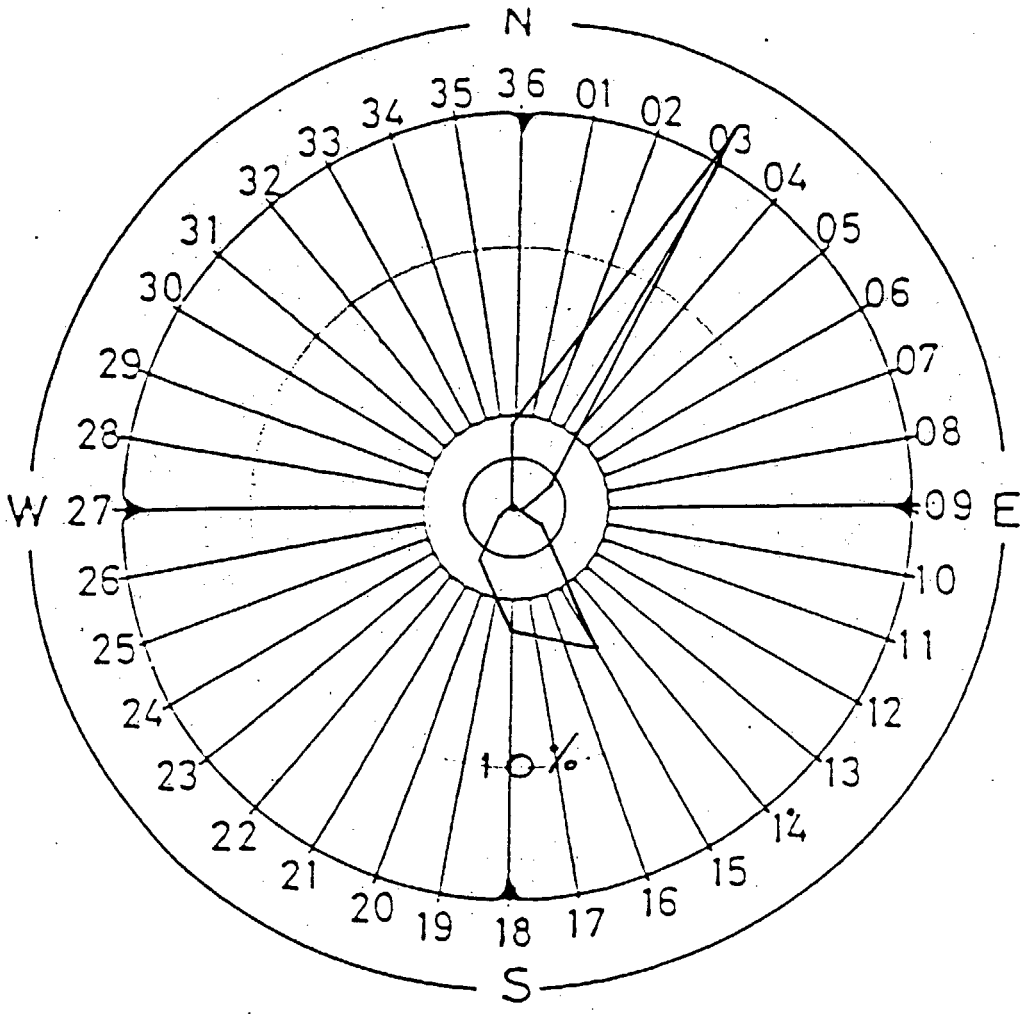
FREQUENCY OF MAX WIND FORCE BETWEEN THE HOURS OF OBSERVATION

							C
19-01	25.3	22.0	8.7	0.7	0.7		42.7
01-07	24.8	21.4	7.1		0.5		46.2
07-13	21.9	22.4	11.0		0.5		44.3
13-19	23.8	27.1	10.5		1.0		37.6

LILLEHAMMER - SÆTHERENGEN

PERIODE : 1982 - 1989

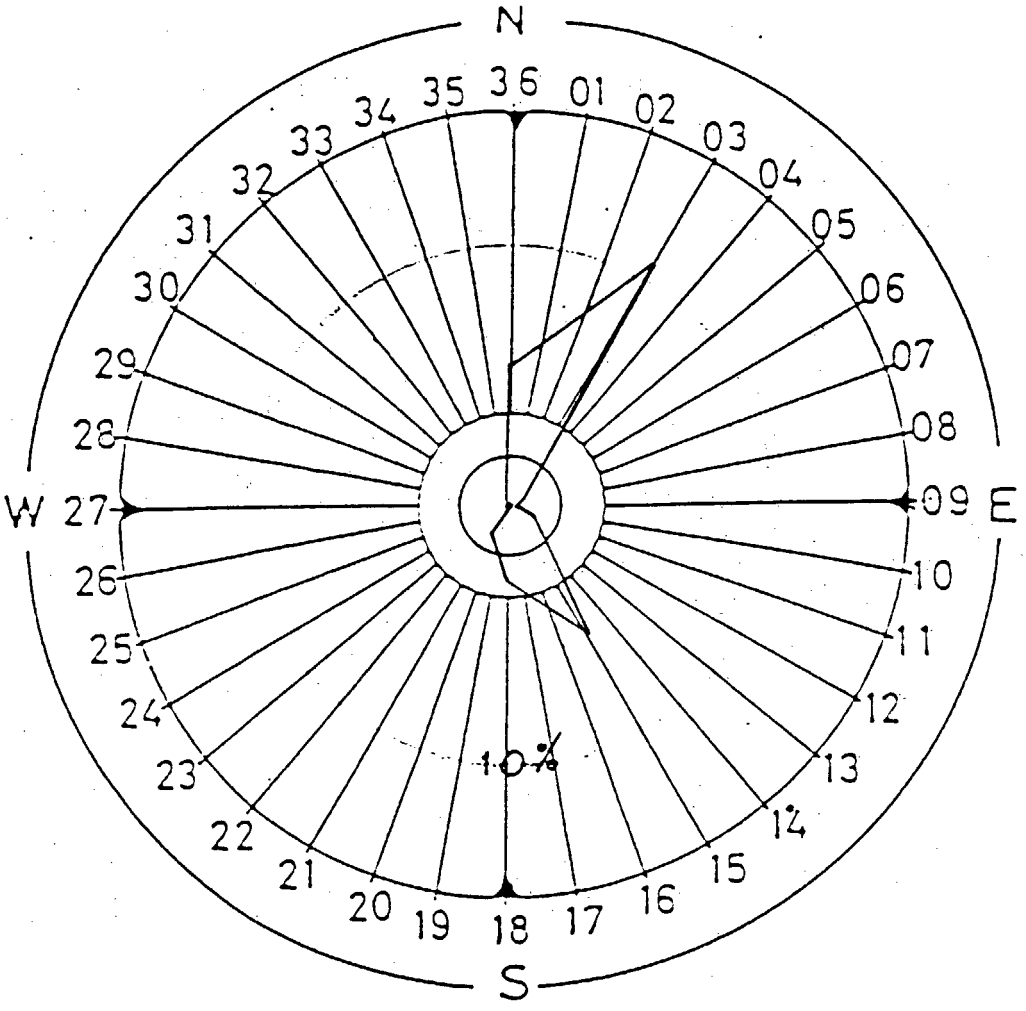
WIND DISTRIBUTION IN JANUARY



LILLEHAMMER - SÆTHERENGEN

PERIODE : 1982 - 1989

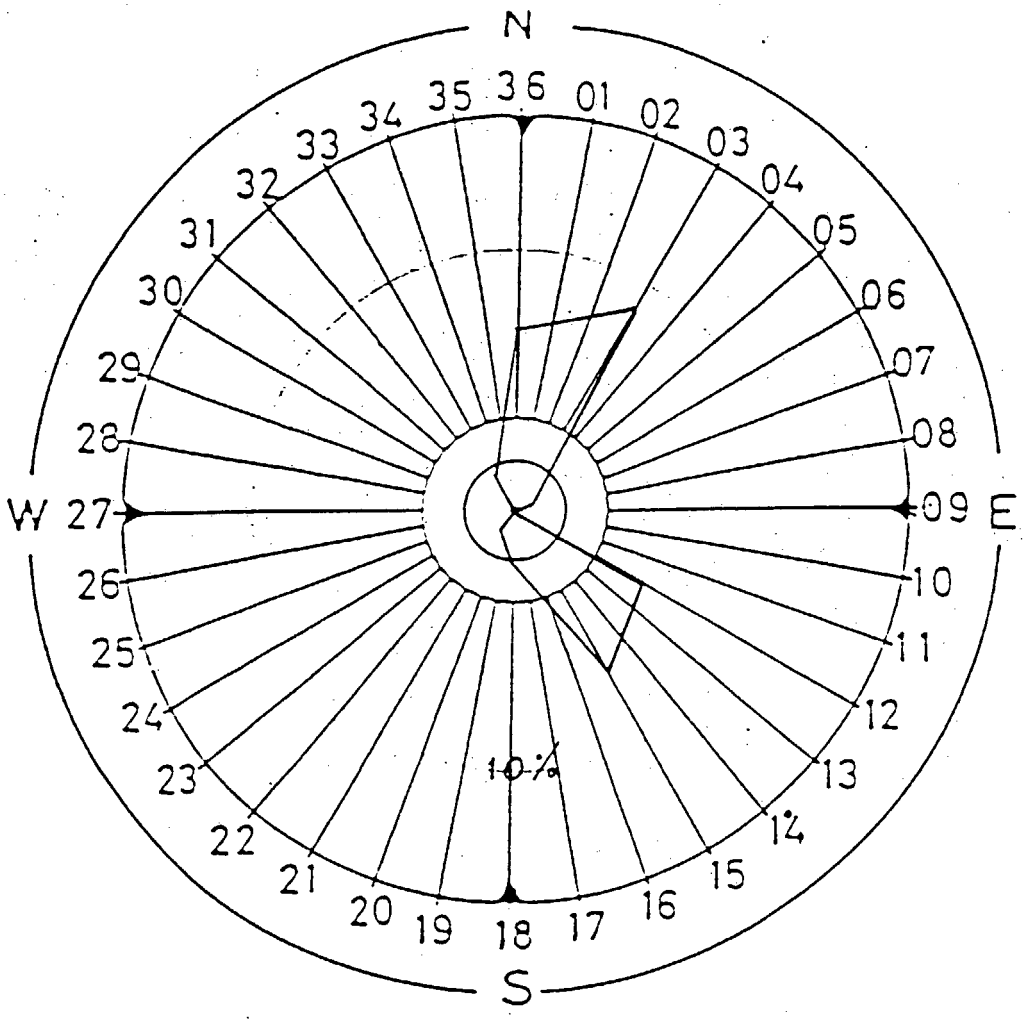
WIND DISTRIBUTION IN FEBRUARY



LILLEHAMMER - SÆTHERENGEN

PERIODE : 1982 - 1989

WIND DISTRIBUTION IN MARCH



1264 LILLEHAMMER III

JANUARY 1969-1981

HRS. 00.06.12.18 GMT N= 1116 C= 0.6 % VM= 1.2 M/S FM=1.2 B

DD	F: 1	2	3	4	5	6	7	8	9	10	11	12	ND	FDM
36N	5.0	3.7	0.8	0.3	0.3	0.3							10.3	1.8
03	10.7	1.6	0.2		0.1								12.5	1.2
06	11.4	1.3											12.7	1.1
09E	27.5	2.4											29.9	1.1
12	5.1	0.3											5.4	1.1
15	11.7	1.8											13.5	1.1
18S	6.6	1.9	0.3										8.8	1.3
21	1.6	0.2	0.1										1.9	1.2
24	1.7	0.2											1.9	1.1
27W	0.7	0.2	0.1										1.0	1.4
30	0.4	0.1											0.4	1.2
33	0.6	0.4											1.0	1.4
NF	83.1	14.0	1.4	0.3	0.4	0.3								

FREQUENCY OF MAX WIND FORCE BETWEEN THE HOURS OF OBSERVATION

													C
19-01													
01-07	71.2	22.8	3.2	0.8	0.8	0.8							0.3
07-13	77.2	19.1	2.2	0.3	0.5	0.5							0.3
13-19	74.5	21.5	2.2		1.1	0.5							0.3

1264 LILLEHAMMER III

FEBRUARY 1969-1981

HRS. 00.06.12.18 GMT N= 1017 C= 0.4 % VM= 1.2 M/S FM=1.2 B

DD	F: 1	2	3	4	5	6	7	8	9	10	11	12	ND	FDM
36N	6.5	2.0	0.9	0.3									9.6	1.5
03	14.8	1.7	0.2										16.7	1.1
06	12.7	0.6											13.3	1.0
09E	23.5	1.3	0.1										24.9	1.1
12	6.6	0.3											6.9	1.0
15	10.9	0.9	0.2										12.0	1.1
18S	7.0	0.6	0.4										8.0	1.2
21	1.8												1.8	1.0
24	1.8	0.2											2.0	1.1
27W	0.7	0.6	0.2	0.1	0.2	0.1							1.9	2.4
30	0.3	0.1											0.4	1.3
33	1.5	0.5		0.2	0.1								2.3	1.7
NF	88.0	8.7	2.0	0.6	0.3	0.1								

FREQUENCY OF MAX WIND FORCE BETWEEN THE HOURS OF OBSERVATION

													C
19-01													
01-07	81.4	14.2	2.7	0.6	1.2								
07-13	77.6	17.4	3.2	0.9	0.6	0.3							
13-19	79.9	15.3	3.2	0.9	0.3				0.3				

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1264 LILLEHAMMER III

MARCH 1969-1981

HRS. 00.06.12.18 GMT N= 1116 C= 0.1 % VM= 1.3 M/S FM=1.2 B

DD	F: 1	2	3	4	5	6	7	8	9	10	11	12	ND	FDM
36N	6.4	2.8	1.1	0.1	0.4	0.1							10.8	1.7
03	9.5	0.6											10.1	1.1
06	8.5	0.8											9.3	1.1
09E	20.4	1.0	0.1										21.5	1.1
12	5.7	0.5											6.3	1.1
15	14.4	1.9	0.4										16.7	1.2
18S	8.6	2.3	0.4										11.4	1.3
21	2.9	0.5	0.1										3.5	1.2
24	3.5	0.7	0.3										4.5	1.3
27W	2.3	0.2	0.3										2.8	1.3
30	0.7	0.3											1.0	1.3
33	1.4	0.1	0.4	0.1				0.1					2.2	1.9
NF	84.4	11.7	3.0	0.2	0.4	0.1		0.1						

FREQUENCY OF MAX WIND FORCE BETWEEN THE HOURS OF OBSERVATION

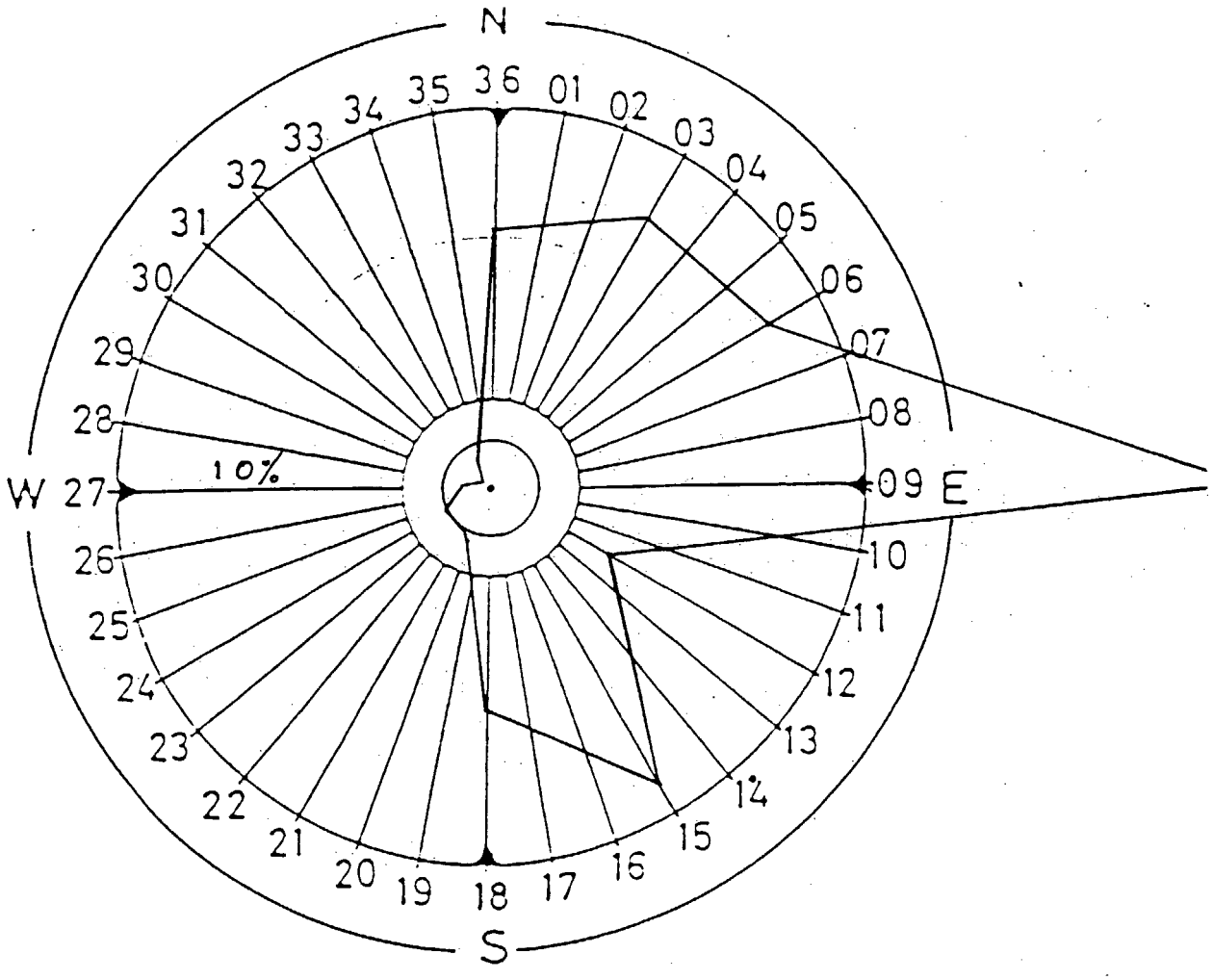
C

19-01							
01-07	78.0	16.1	4.3	0.5	0.8	0.3	
07-13	73.4	20.2	5.4	0.3	0.5		0.3
13-19	72.6	19.1	6.7	0.5	0.5	0.3	0.3

LILLEHAMMER III

PERIODE : 1969 - 1981

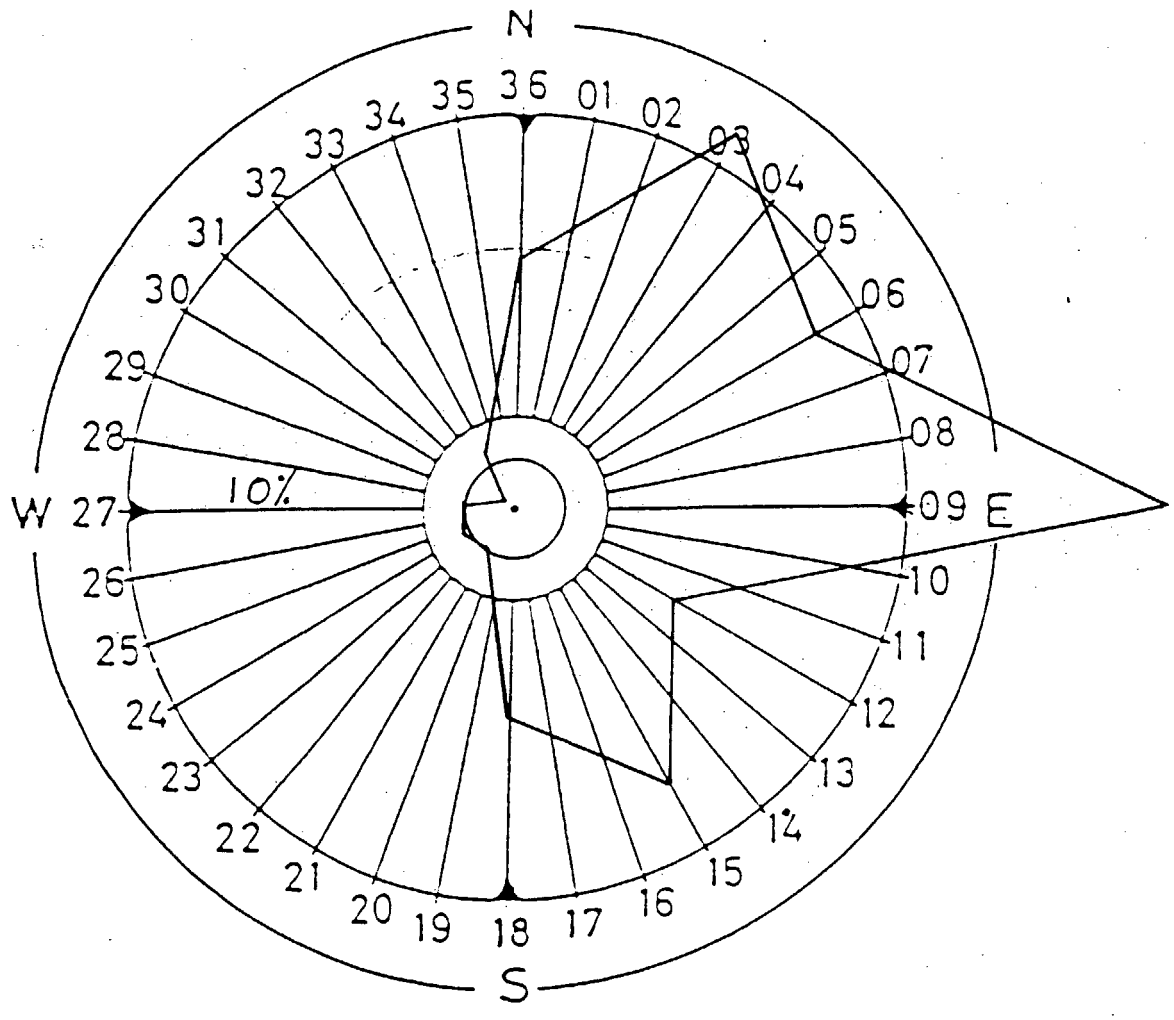
WIND DISTRIBUTION IN JANUARY



LILLEHAMMER III

PERIODE : 1969 - 1981

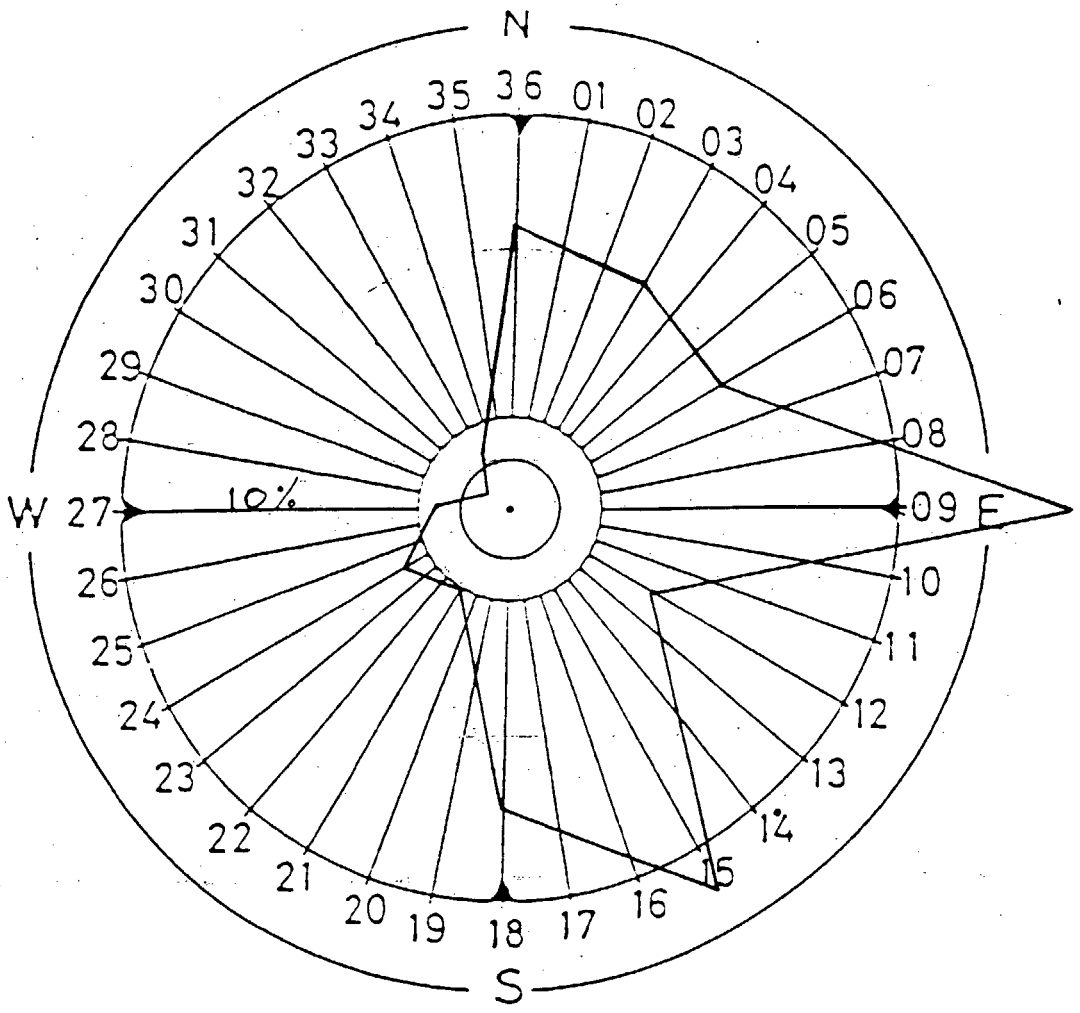
WIND DISTRIBUTION IN FEBRUARY



LILLEHAMMER III

PERIODE : 1969 - 1981

WIND DISTRIBUTION IN MARCH



1268 LILLEHAMMER-SÆTHERENGEN

Duration of strong wind : 28 days beginning in 1983.06

HOURS OF OBSERVATION: 01,07,13,19

NUMBER OF WINDY PERIODS (MAX.WIND FORCE OF EVERY DAY IN THE PERIOD IS GREATER THAN OR EQUAL TO 2 B)

AND THEIR DURATIONS IN DAYS FOR THE PERIOD 1982 - 1989. PERIODS WITH MORE THAN 24 CONSECUTIVE DAYS ARE PRINTED ABOVE

DAYS	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
1	6	6	4	5	2	2		1		1					1									
2	9	9	4	1	1	2						1						1						
3	7	6	7	2	1				1															
4	1	8	4	2	1			1			1	1		1										
5	3	7	8	2	1	5	1	1	1					1										
6	1	5	2	1	3	1		1	1	1	1													1
7	3	2		4	2	1		2	1	2	1				2	1								
8	1	12	3	1	1	2	1		2								1							
9	5	6	7	2	2		1	3		1	1		1											
10	4	3	2	1			1	4		1	2	1										1		
11	5	5	4		1	1				1														
12	7	11	5				1			1														

WINTER	22	26	13	6	3	4	1	1		2		1			1			1						
SPRING	11	21	19	6	3	5	1	2	2		1	1		2										
SUMMER	5	19	5	6	6	4	1	3	4	3	2				2	1	1							1
AUTUMN	14	14	13	3	3	1	2	7		3	3	1	1									1		
TOTAL	52	80	50	21	15	14	5	13	6	9	6	3	1	2	3	1	1	1				1		1

MONTH	1	2	3	4	5	6	7	8	9	10	11	12
NO. OF YEARS	7	7	6	6	6	6	6	6	6	6	6	7

1268 LILLEHAMMER-SÆTHERENGEN

HOURS OF OBSERVATION: 01,07,13,19

NUMBER OF WINDY PERIODS (MAX.WIND FORCE OF EVERY DAY IN THE PERIOD IS GREATER THAN OR EQUAL TO 3 B)

AND THEIR DURATIONS IN DAYS FOR THE PERIOD 1982 - 1989. PERIODS WITH MORE THAN 24 CONSECUTIVE DAYS ARE PRINTED ABOVE

DAYS	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
1	8	6	1	2																				
2	7	6	1		2																			
3	4	2	1																					
4	3	4	5		1																			
5	3	10	1		1																			
6	5	9		1																				
7	6	3	4																					
8	4	7	1																					
9	3	8	7		1																			
10	7	8	3		2	1																		
11	4	6	1	1																				
12	4	7	1																					

WINTER	19	19	3	2	2	
SPRING	10	16	7		2	
SUMMER	15	19	5	1		
AUTUMN	14	22	11	1	3	1
TOTAL	58	76	26	4	7	1

MONTH	1	2	3	4	5	6	7	8	9	10	11	12
NO. OF YEARS	7	7	6	6	6	6	6	6	6	6	6	7

1264 LILLEHAMMER III

Duration of strong wind : 28 days beginning in 1979.08

HOURS OF OBSERVATION: 01,07,13,19

NUMBER OF WINDY PERIODS (MAX.WIND FORCE OF EVERY DAY IN THE PERIOD IS GREATER THAN OR EQUAL TO 2 B)

AND THEIR DURATIONS IN DAYS FOR THE PERIOD 1969 - 1981. PERIODS WITH MORE THAN 24 CONSECUTIVE DAYS ARE PRINTED ABOVE

DAYS	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
1	8	12	7	5	3	2	2	1	1	1														
2	22	9	7	3	2		2				1													
3	16	15	10	4	3	3	1		1															
4	13	16	13	5	2	1	2					1					1		1					
5	17	6	11	3	2	4	2		2	1	1			1			1							
6	13	8	7	5		2		2		2	1	2	1									1		
7	20	12	8	4	2	2		2			2	1										1		
8	12	14	4	6	1	1	1	3			1	2												
9	9	13	4	3	1	2	2			2	1		2	2										
10	14	11	9	3		3	2	1									1							
11	10	17	10	6	3	2	1	2																
12	14	17	7	4	2	4	1	1		1	2													

WINTER	44	38	21	12	7	6	5	2	1	2	3													
SPRING	46	37	34	12	7	8	5		3	1	1	1		1			2		1					
SUMMER	45	34	19	15	3	5	1	7		2	4	5	1									2		
AUTUMN	33	41	23	12	4	7	5	3		2	1		2	2			1							
TOTAL	168	150	97	51	21	26	16	12	4	7	9	6	3	3			3		1			2		

MONTH	1	2	3	4	5	6	7	8	9	10	11	12
NO. OF YEARS	12	12	12	12	12	12	12	11	11	12	12	12

1264 LILLEHAMMER III

HOURS OF OBSERVATION: 01,07,13,19

NUMBER OF WINDY PERIODS (MAX.WIND FORCE OF EVERY DAY IN THE PERIOD IS GREATER THAN OR EQUAL TO 3 B)

AND THEIR DURATIONS IN DAYS FOR THE PERIOD 1969 - 1981. PERIODS WITH MORE THAN 24 CONSECUTIVE DAYS ARE PRINTED ABOVE

DAYS	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
1	8	9	1		1																			
2	3	4	3	1																				
3	8	13	1		1																			
4	12	12	5	1	1																			
5	3	6	2		1																			
6	11	8	5	1																				
7	7	10	3	1																				
8	4	8	3	2																				
9	12	14	5	1		1	1																	
10	6	14	3		2																			
11	15	9	2	2																				
12	14	11	3	2																				

WINTER	25	24	7	3	1							
SPRING	23	31	8	1	3							
SUMMER	22	26	11	4								
AUTUMN	33	37	10	3	2	1	1					
TOTAL	103	118	36	11	6	1	1					

MONTH	1	2	3	4	5	6	7	8	9	10	11	12
NO. OF YEARS	12	12	12	12	12	12	12	11	11	12	12	12

COUNTY	LATITUDE	LONGITUDE	HS	HB	PERIOD
LILLEHAMMER	61 6	10 29	241	242.4	1982.10 - 1989.01

NORMALS AND EKSTREMS

TEMPERATURE

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR
NORMALS OF AIR TEMPERATURE 1931-60													
HIGHEST RECORDED MONTHLY AND ANNUAL MEAN AIR TEMPERATURE	- 1.8	- 4.4	- 0.7	4.4	10.2	16.8	16.2	14.6	10.1	5.6	1.0	- 3.0	
YEAR OF OCCASION	1989	1988	1986	1984	1984	1988	1983	1983	1988	1987	1986	1984	
LOWEST RECORDED MONTHLY AND ANNUAL MEAN AIR TEMPERATURE	-16.2	-12.6	- 6.8	0.7	7.5	10.8	14.5	11.3	6.4	2.3	- 5.6	-11.4	
YEAR OF OCCASION	1987	1985	1987	1986	1987	1987	1984	1986	1986	1988	1985	1985	
HIGHEST RECORDED MONTHLY AND ANNUAL MAXSIMUM AIR TEMPERATURE	9.9	5.0	9.4	20.5	26.0	31.8	30.5	28.6	22.0	19.5	12.0	8.2	31.8
YEAR OF OCCASION	1989	1987	1986	1984	1988	1988	1983	1983	1983	1985	1984	1988	1988
LOWEST RECORDED MONTHLY AND ANNUAL MINIMUM AIR TEMPERATURE	-31.0	-28.4	-22.0	-10.6	- 2.0	1.4	3.4	2.5	- 3.3	- 8.8	-18.6	-22.9	-31.0
YEAR OF OCCASION	1987	1985	1987	1986	1984	-1983	1983	1987	1986	1988	1985	1985	1987

PRECIPITATION

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR
NORMALS OF PRECIPITATION 1931-60													
GREATEST RECORDED MONTHLY AND ANNUAL AMOUNT OF PRECIPITATION (MM)	83	75	72	52	105	144	145	147	153	176	97	106	
YEAR OF OCCASION	1988	1988	1985	1983	1983	1987	1988	1985	1988	1984	1987	1986	
SMALLEST RECORDED MONTHLY AND ANNUAL AMOUNT OF PRECIPITATION (MM)	9	2	18	22	20	20	19	27	34	25	9	12	
YEAR OF OCCASION	1989	1986	1983	1987	1985	1983	1987	1983	1986	1985	1983	1987	
GREATEST RECORDED AMOUNT OF PRECIPITATION IN 24 HOURS (MM)	17	11	20	18	19	21	37	27	60	50	32	22	60
YEAR OF OCCASION	1984	1988	1988	1988	1984	1986	1985	1988	1988	1984	1987	1986	1988
GREATEST RECORDED SNOWDEPTH IN CM	92	89	113	109	38					4	31	63	113
YEAR OF OCCASION	1986	1988	1988	1988	1988					1988	1987	1985	1988

- in front of year of occasion. means that this value has occured later

THE NORWEGIAN METEOROLOGICAL INSTITUTE CLIMATE DEPARTMENT

1264 LILLEHAMMER III

COUNTY	LATITUDE	LONGITUDE	HS	HB	PERIOD
LILLEHAMMER	61 5	10 29	271	270.9	1969.10 - 1981.07

NORMALS AND EKSTREMS

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TEMPERATURE

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR
NORMALS OF AIR TEMPERATURE 1931-60	- 8.9	- 7.6	- 3.1	2.5	8.4	12.5	15.1	13.7	8.7	3.3	- 1.3	- 5.4	3.2
HIGHEST RECORDED MONTHLY AND ANNUAL MEAN AIR TEMPERATURE	- 2.4	- 3.6	1.2	4.6	10.0	16.0	16.5	15.9	9.7	4.7	- 0.5	- 2.4	4.3
YEAR OF OCCASION	1973	1971	1973	1974	1981	1970	-1972	1975	1975	1977	-1975	1972	1970
LOWEST RECORDED MONTHLY AND ANNUAL MEAN AIR TEMPERATURE	-14.3	-14.1	- 5.3	0.1	6.7	10.6	12.3	11.5	6.4	0.6	- 7.5	-13.6	1.4
YEAR OF OCCASION	1979	1970	1980	1977	1979	1981	1970	1979	1976	1973	1980	1978	1979
HIGHEST RECORDED MONTHLY AND ANNUAL MAXSIMUM AIR TEMPERATURE	10.0	12.2	13.1	17.0	26.5	34.0	30.7	33.0	22.5	19.5	13.2	10.0	34.0
YEAR OF OCCASION	1981	1981	1973	1974	1978	1970	1977	1975	1975	1969	1971	1975	1970
LOWEST RECORDED MONTHLY AND ANNUAL MINIMUM AIR TEMPERATURE	-31.0	-28.0	-23.5	-14.0	- 5.0	- 0.7	0.5	- 0.5	- 5.5	-14.5	-22.5	-31.0	-31.0
YEAR OF OCCASION	1979	1980	1979	1977	1981	1977	1979	1978	1976	1980	1980	1979	-1978

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PRECIPITATION

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR
NORMALS OF PRECIPITATION 1931-60	45	31	23	41	42	78	100	91	77	71	68	58	725
GREATEST RECORDED MONTHLY AND ANNUAL AMOUNT OF PRECIPITATION (MM)	117	62	112	72	94	144	162	123	165	173	112	68	829
YEAR OF OCCASION	1975	1974	1979	1979	1972	1972	1980	1979	1974	1980	1977	1972	1974
SMALLEST RECORDED MONTHLY AND ANNUAL AMOUNT OF PRECIPITATION (MM)	11	9	8	1	3	34	49	5	30	8	24	12	555
YEAR OF OCCASION	1981	1979	1976	1974	1970	1975	-1975	1976	1972	1973	1978	1970	1976
GREATEST RECORDED AMOUNT OF PRECIPITATION IN 24 HOURS (MM)	18	22	34	22	29	31	63	40	34	52	50	16	63
YEAR OF OCCASION	1975	1974	1979	1979	1973	1973	1980	1978	1973	1980	1977	1979	1980
GREATEST RECORDED SNOWDEPTH IN CM	86	105	103	91	18				5	48	72	76	105
YEAR OF OCCASION	1980	1980	1980	1980	1981				1973	1980	1980	1980	1980

- in front of year of occasion. means that this value has occured later