

DNMI DET NORSKE METEOROLOGISKE INSTITUTT

klima

HANØYTANGEN , MAY 1994

Knut A. Iden

RAPPORT NR. 26/94 KLIMA



DNMI-REPORT

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HANØYTANGEN , MAY 1994

PREPARED BY

Knut A. Iden

ORDERED BY

KVÆRNER CONCRETE CONSTRUCTION
CONTRACT NO: KCC/PAC004/001

SUMMARY

Monthly summary based on the meteorological data measured at the building site of Kværner at Hanøytangen, Askøy near Bergen.

SIGNATURE

Knut A. Iden

Knut A. Iden
PROJ. RESPONSIBLE

Bjørn Aune

for Bjørn Aune
HEAD OF DIVISION

MONTHLY REPORT MAY 1994

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COMPLETION DATE : JULY 06 1994
REV 1. : AUGUST 15 1994

DSU : serial no. 6602
Received : JUNE 24 1994

Comments regarding the data :

The DSU serial no.6602 contains data for the period 06/5/94 to 08/6/94, however, no data were recorded from 31/5/94 to 8/6/94 as the cable from the mast to the storage unit was burnt off.

The DSU is read by the standard software (P3059) delivered from Aanderaa a/s. The calibration factors applied is provided by Aanderaa in a fax dated January 21 1994.

The processing is based on this data set and the following steps are conducted :

- . A SAS data set of the data for May is generated

In this step 10 min mean wind speed > 35 m/s and gust wind speed > 40 m/s are replaced with missing values. The wind speed in 30 m is also compared to the wind speed measured 18 m above the ground. If deviation is 10 m/s above or 5 m/s below the wind speed measured in 18 m, the wind speed in 30 m is replaced by missing value. The reason for this handling is there seem to be some disturbances connected to the measurements in the top of the mast (30 m above the ground).

The other meteorological parameters are checked to be inside reasonable intervals. The original data which is replaced due to the specified criterions are saved for an assessment. Appendix 2 gives a listing of these records.

- . Plots of the time series are generated and examined.
- . Un physical values (spikes) are eliminated.
- . Final plots of the time series are generated.
- . For wind speed and wind direction 10 min values are plotted. For the parameters air temperature (T), humidity (UU) and air pressure reduced to mean sea level (QFF), hourly means are plotted. The hourly mean for 11.00^h is defined by the measurements for 10.30^h, 10.40^h, 10.50^h, 11.00^h, 11.10^h and 11.20^h.
- . Distribution tables wind speed /direction are generated. 22.5° intervals are applied for the direction. N='348.76° - 11.25', NNE = '11.26 - 33.75' ...
- . Wind roses are generated.
- . Coefficient transfert tables are generated.
- . Duration table are generated.
- . Climatological summary table are updated.
- . Preliminary estimates for 10/100 year values for the wind are computed.

Logging each 10 minute

WIND

Parameter	Height	Cover.	Unit	Mean	ST.D.	Max	Dir ¹	D.:Hour	Min	Dir ¹	D.:Hour
Wind speed	30 m	99.6 %	m/s	4.7	2.9	14.1	185	06:0739	0.4	008	17:2107
Wind speed	18 m	99.9 %	m/s	4.5	2.8	14.1	N/A	06:0739	0.4	N/A	12:0707
Wind speed	10 m	99.9 %	m/s	4.3	2.7	14.3	180	06:0739	0.4	67	24:0337
Wind gust	30 m	99.6 %	m/s	6.3	3.6	20.1	185 ²	06:0739	0.4	125 ²	24:0307
Wind gust	18 m	99.9 %	m/s	6.1	3.6	19.2	N/A	06:0739	0.7	N/A	12:0717
Wind gust	10 m	99.9 %	m/s	6.1	3.6	18.9	165 ²	06:0609	0.7	67 ²	24:0337

OTHER METEOROLOGICAL DATA

Parameter	Height	Cover.	Unit	Mean	ST.D.	Max	D.:hour	Min	D.:hour
Air Temp.	2. m ³	99.6 %	C	9.5	3.2	22.7	12:1207	1.1	02:0339
Rel. Hum.	2. m ³	99.9 %	%	63	15.2	89	08:0717	19	26:1637
Air pr.	0. m ³	99.9 %	hPa	1016.0	5.5	1027.8	01:1549	1004.7	31:0637

- 1 Direction is referenced to True North (accuracy +- 2°)
- 2 Direction of gust wind is not measured. The mean wind direction for the ten minute period when it has occurred is applied.
- 3 Air temperature sensor and humidity sensor are placed in the mast 2 m above the reference point on the ground while the pressure sensor have the same height as the reference.

The reference point on the ground is located 15.64 m above the mean sea level (NGO).

The time for the logging this month is not 00,10,20,30... as should be the case. In the beginning of the month the logging is made 09,19,29.. Later in the month the logging is made 07,17,27 ... giving some problems to the computing of the hourly means strictly after the definition given.

On May 5 un-physical values are encountered for the air temperature in two different periods. From 07⁰⁰ - 08⁰⁰ the following values were measured : 13.0°C, 12.7°C, 23.8°C, 15.1°C ,10.5°C and 12.5 °C, and from 14⁰⁰ - 15⁰⁰ : 19.7°C, 15.5°C, 20.7°C, 19.0°C and 17.9°C. At Helligøy the air temperature varies in the interval 6.3°C-9.7°C on this day.

On May 16 08²⁷ - 08³⁷ and 16 10¹⁷ - 10³⁷ there are other periods with un-physical variation in air temperature.

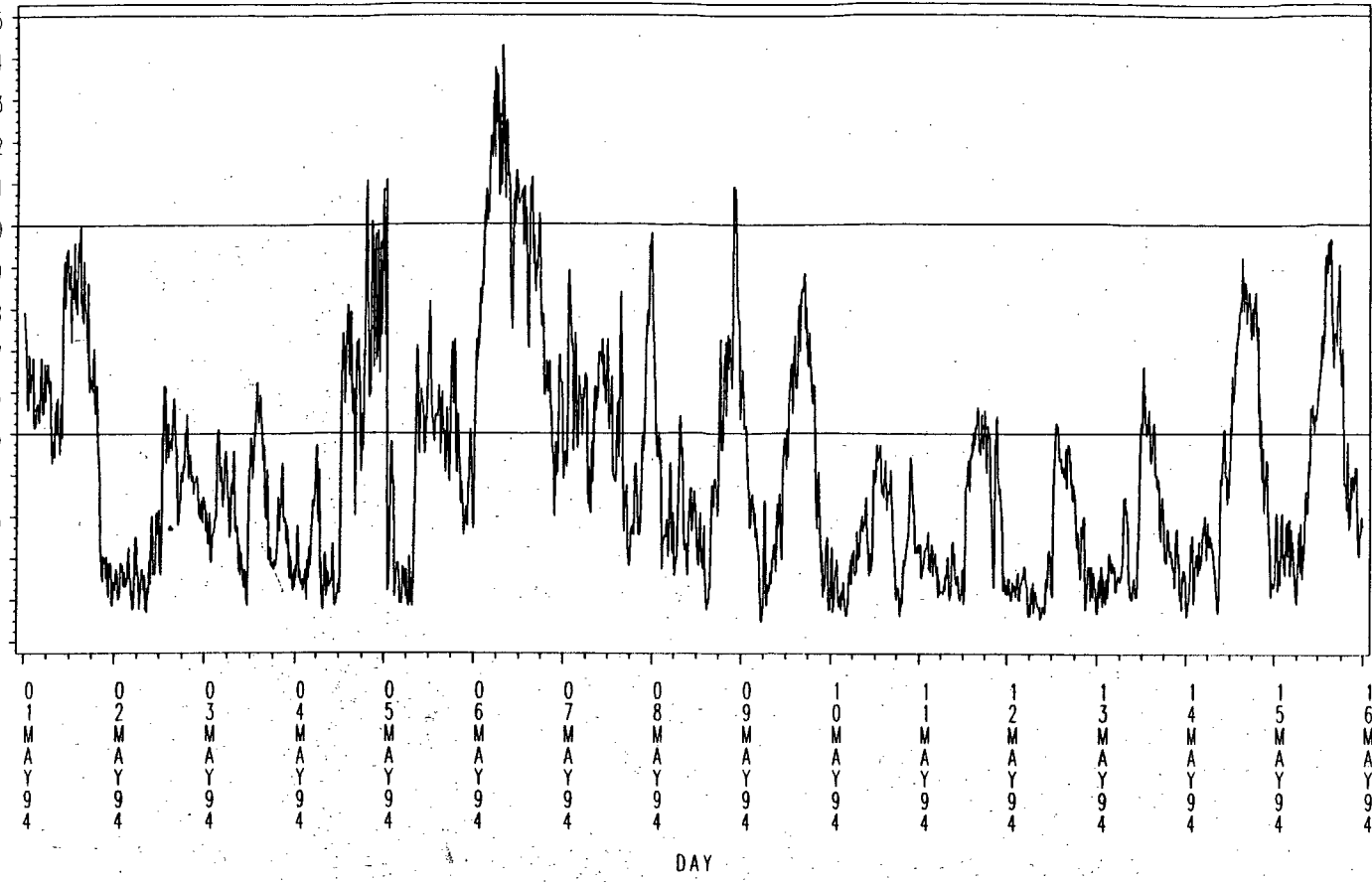
All the values mentioned are replaced with a missing value notation.

The minimum of the wind speed (0.4 m/s) has occurred several times this month. It is the first occurrence which is given in the table.

PLOT OF TIME SERIES

HANØYTANGEN 1994

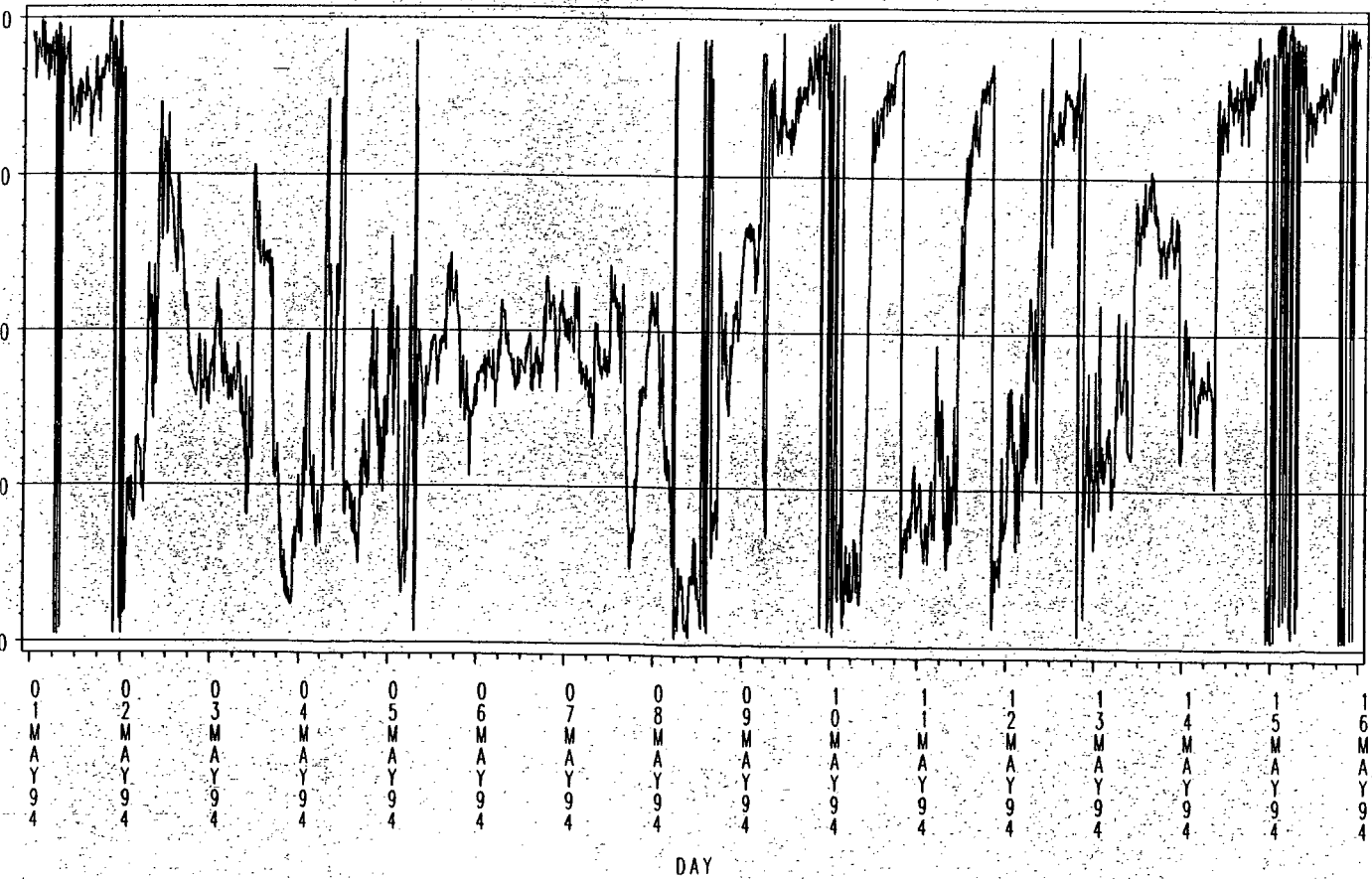
Wind speed 10 m above the ground (m/s)



DNMI - KLIMADELINGEN

HANØYTANGEN 1994

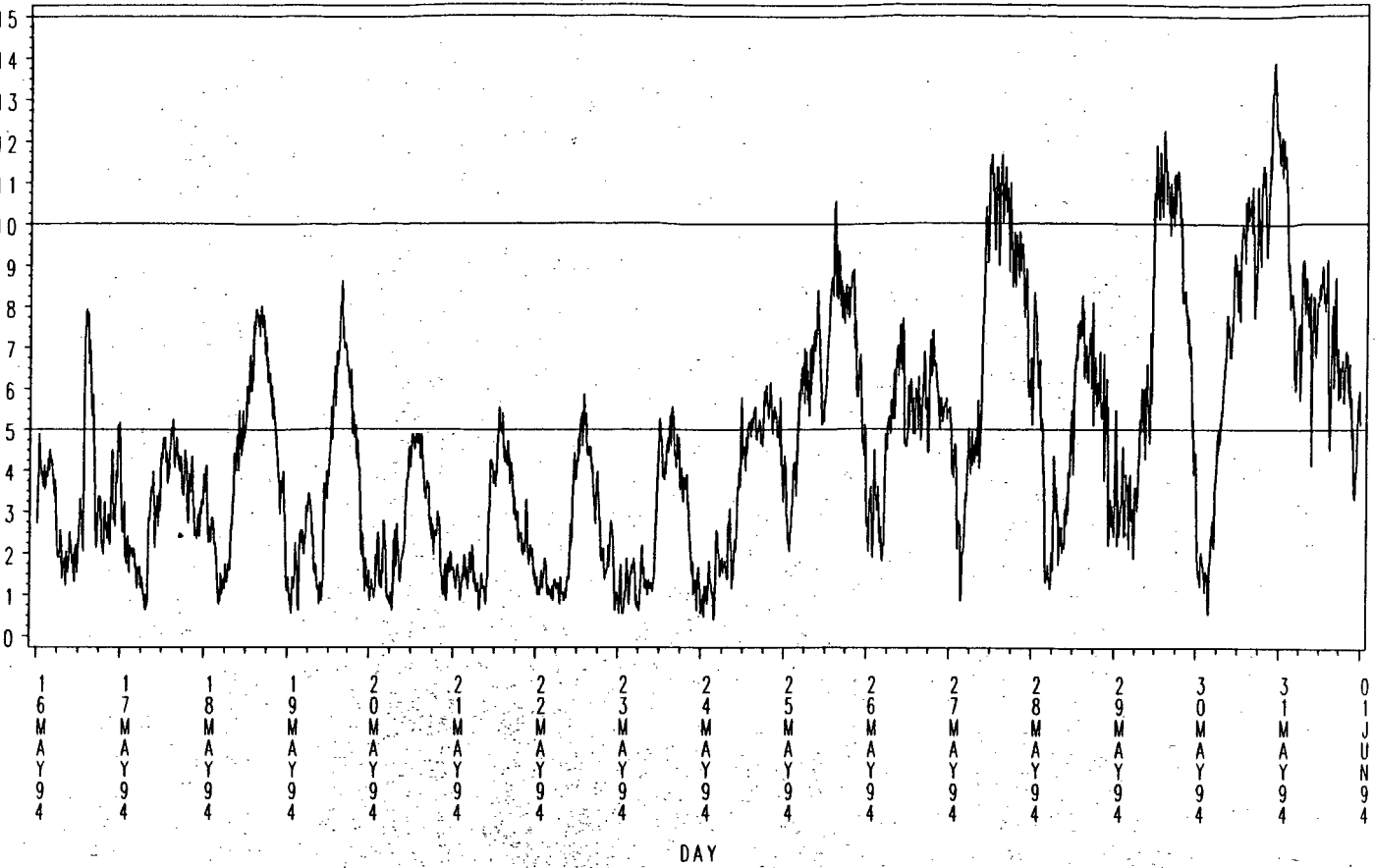
Wind direction 10 m above the ground



DNMI - KLIMADELINGEN

HANØYTANGEN 1994

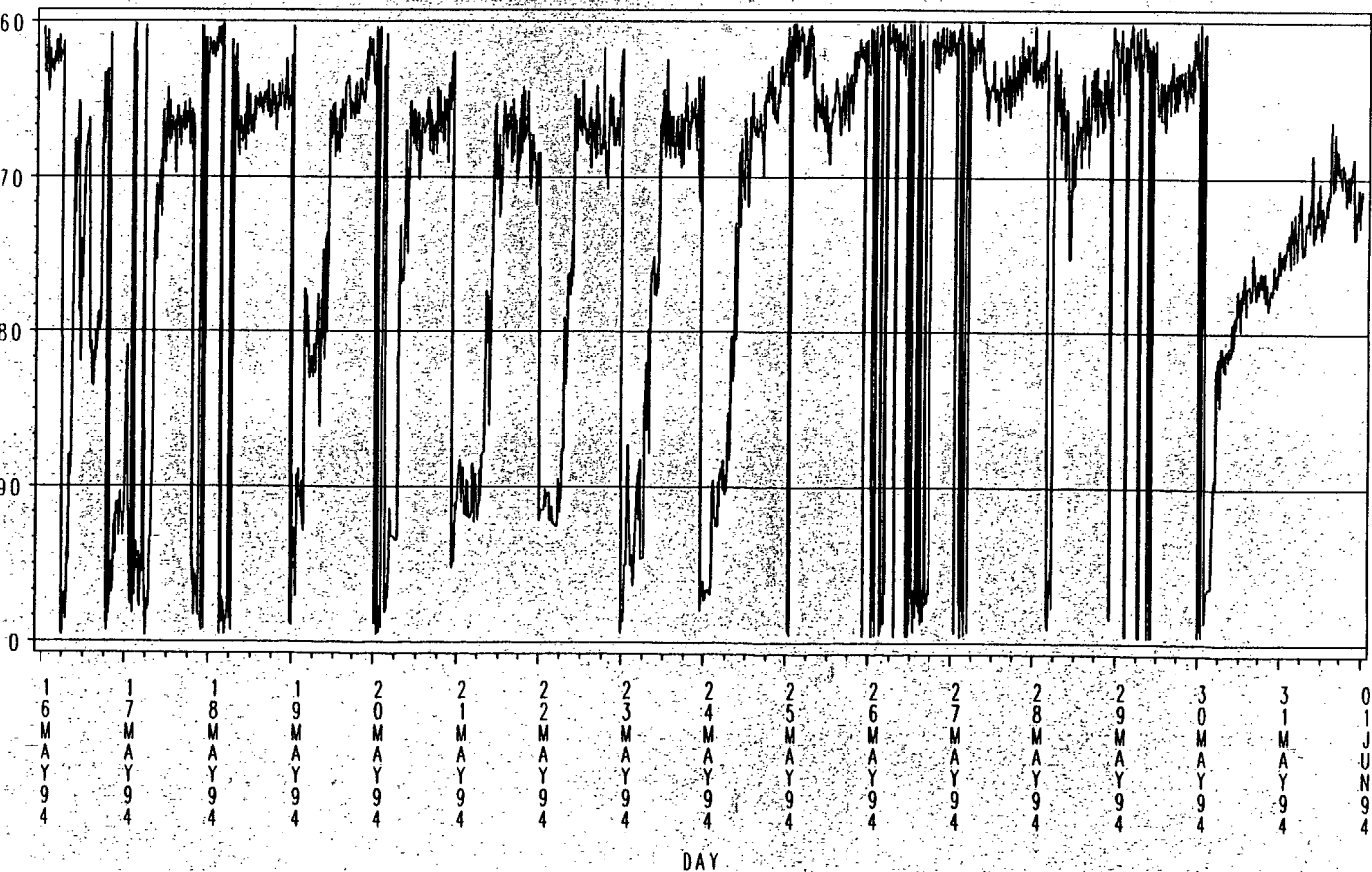
Wind speed 10 m above the ground (m/s)



DNMI - KLIMAÅVDELINGEN

HANØYTANGEN 1994

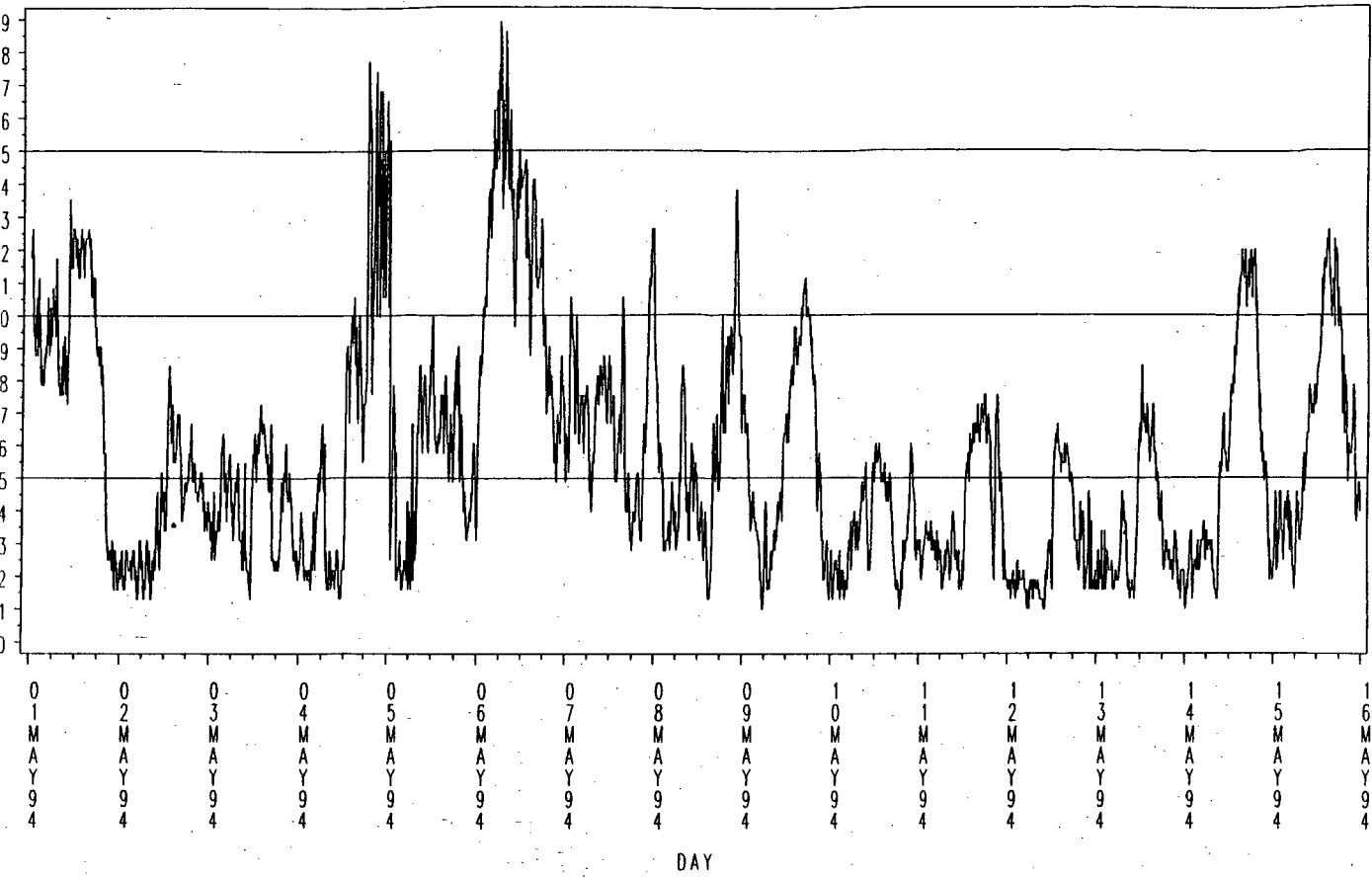
Wind direction 10 m above the ground



DNMI - KLIMAÅVDELINGEN

HANØYTANGEN 1994

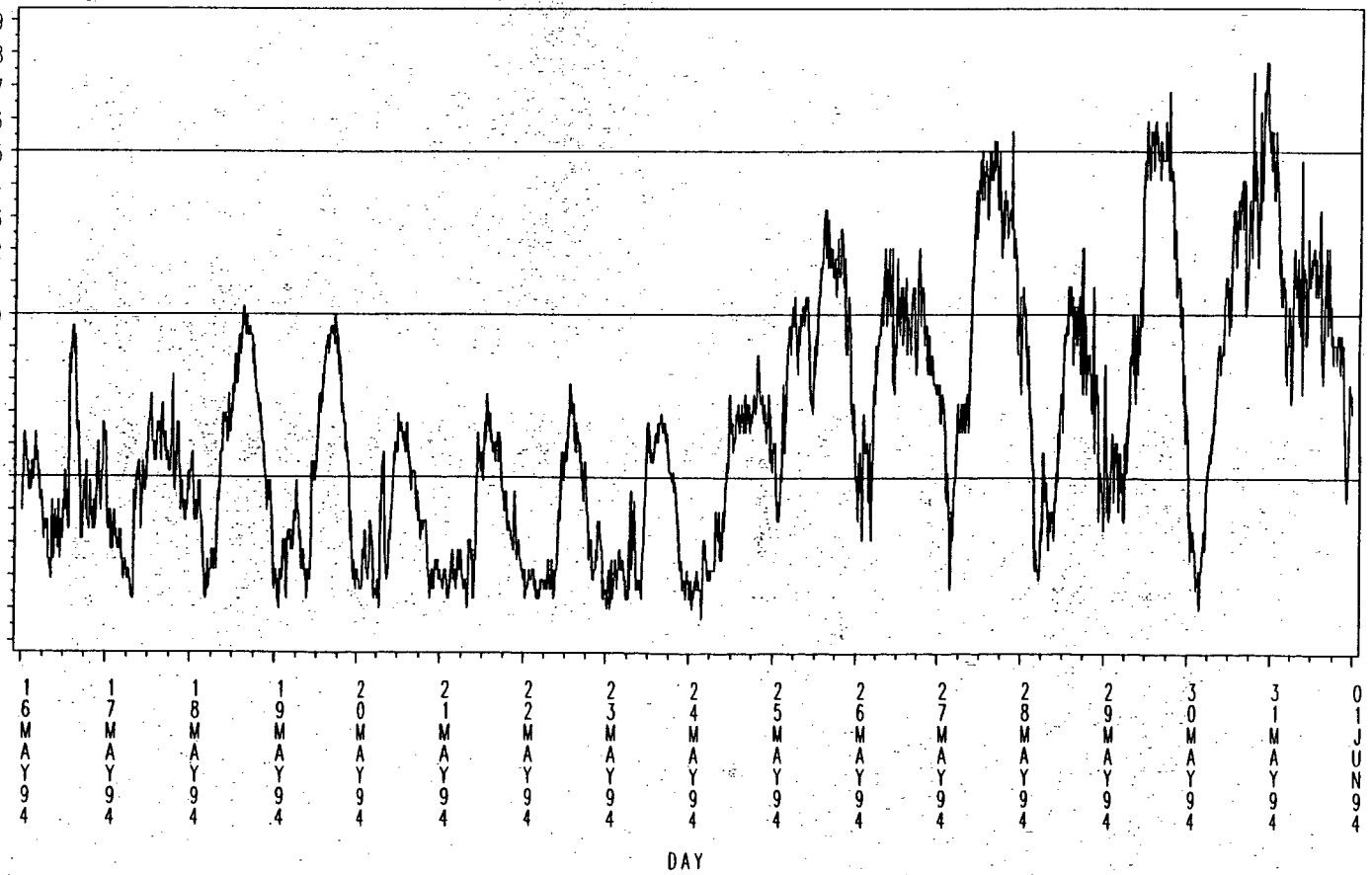
Gust wind speed 10 m above the ground (m/s)



DNMI - KLIMAARDELINGEN

HANØYTANGEN 1994

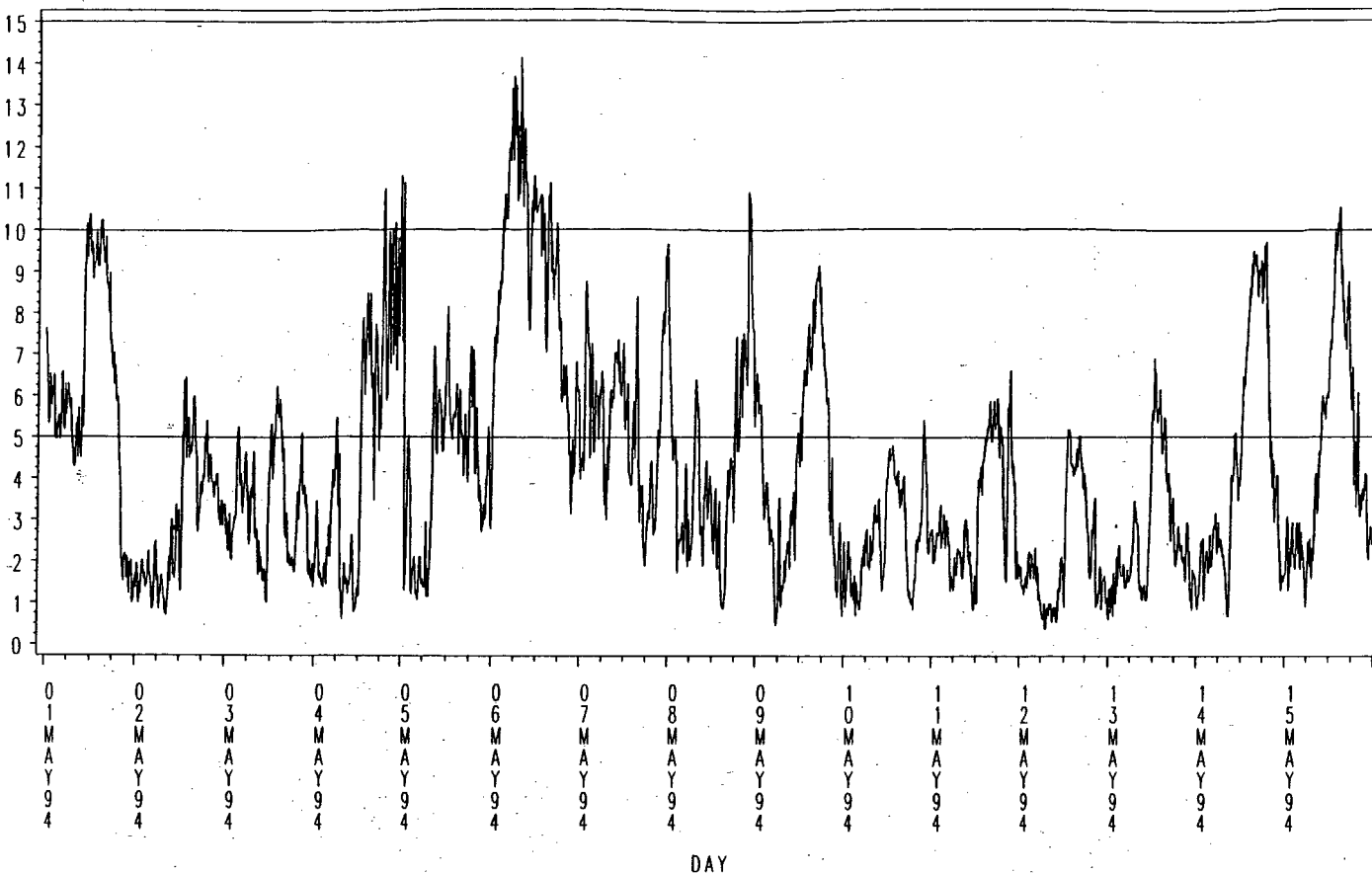
Gust wind speed 10 m above the ground (m/s)



DNMI - KLIMAARDELINGEN

HANØYTANGEN 1994

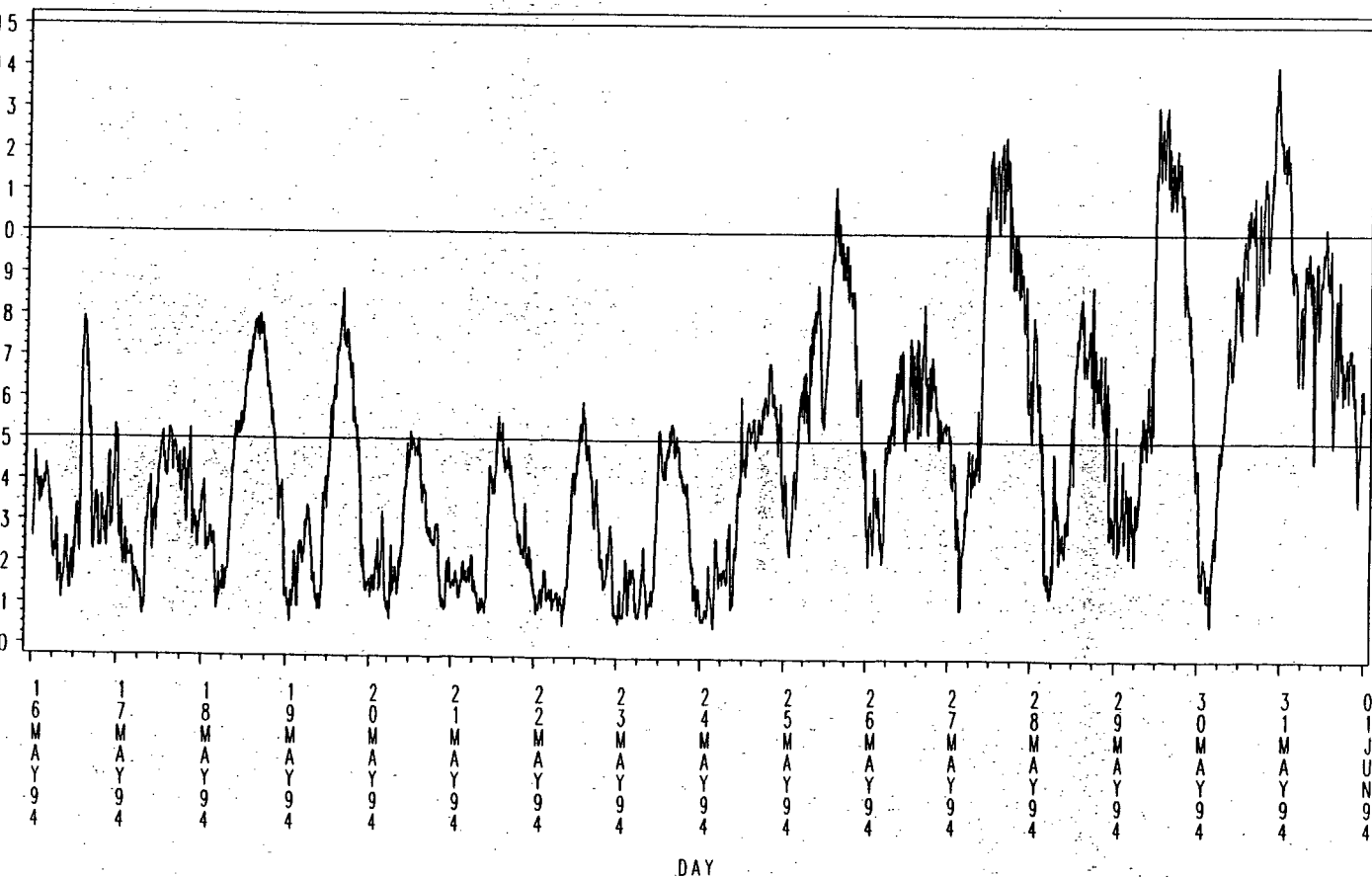
Wind speed 18 m above the ground (m/s)



DNMI - KLIMADELINGEN

HANØYTANGEN 1994

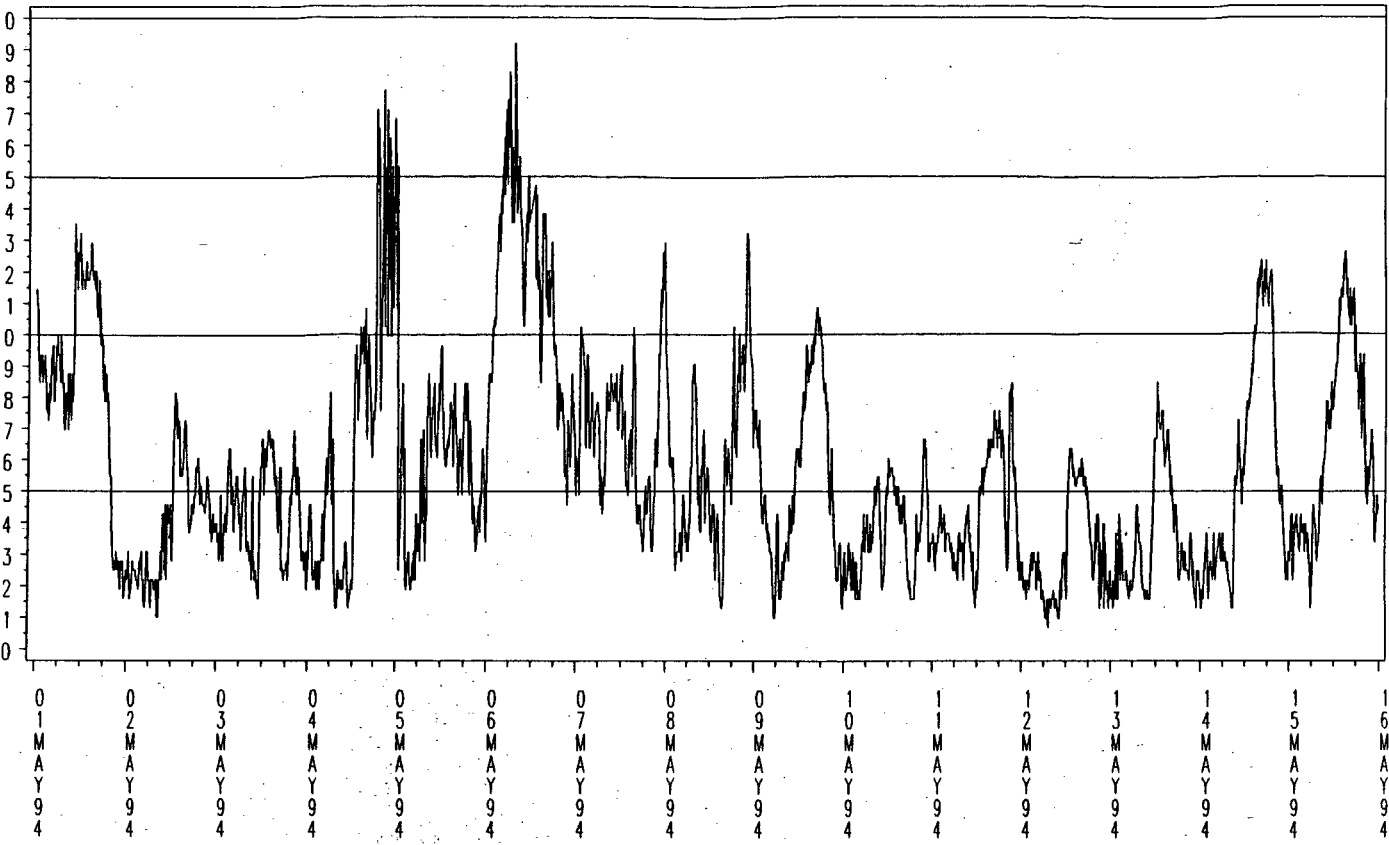
Wind speed 18 m above the ground (m/s)



DNMI - KLIMADELINGEN

HANØYTANGEN 1994

Gust wind speed 18 m above the ground (m/s)

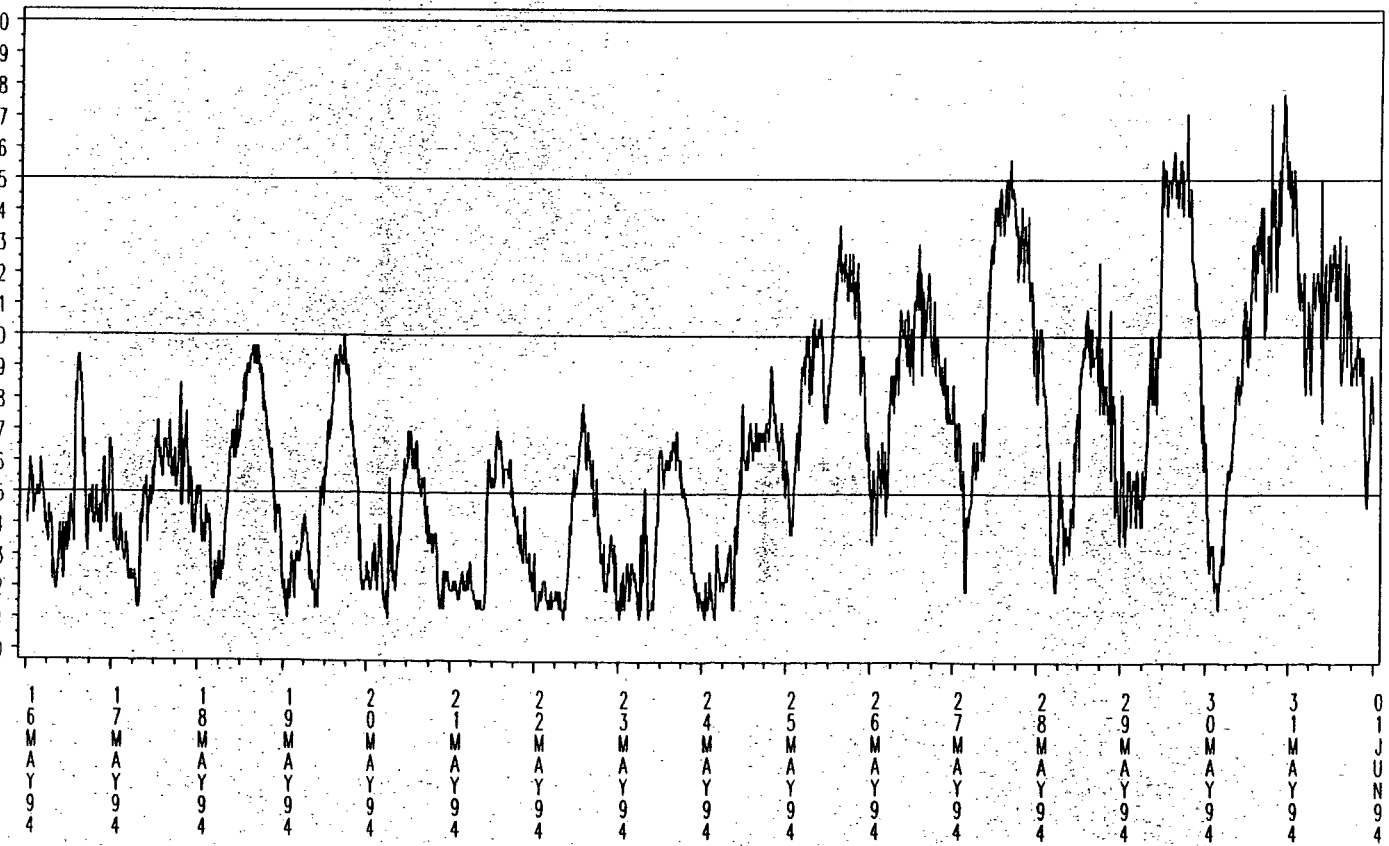


DAY

DNMI - KLIMADELINGEN

HANØYTANGEN 1994

Gust wind speed 18 m above the ground (m/s)

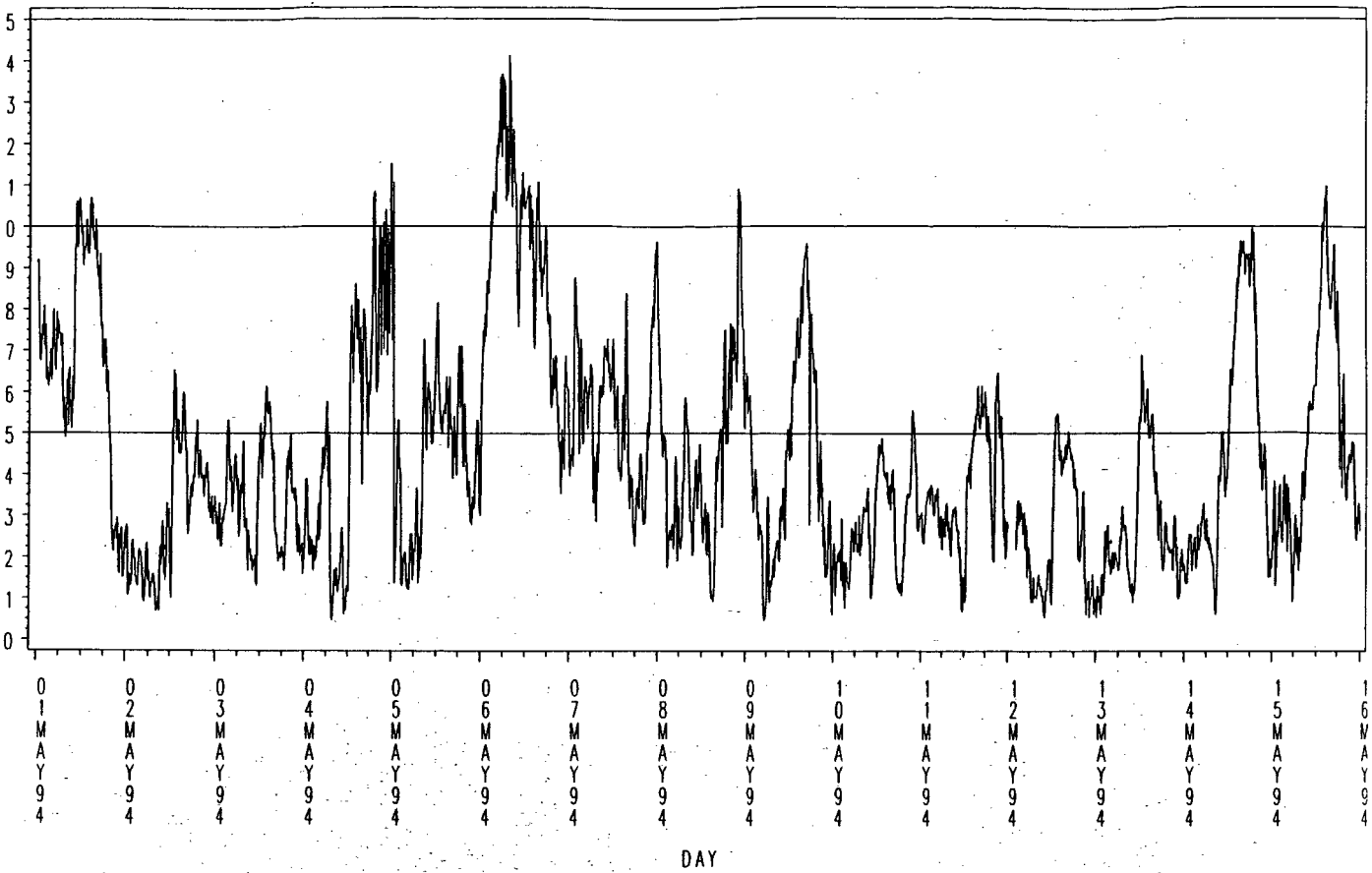


DAY

DNMI - KLIMADELINGEN

HANØYTANGEN 1994

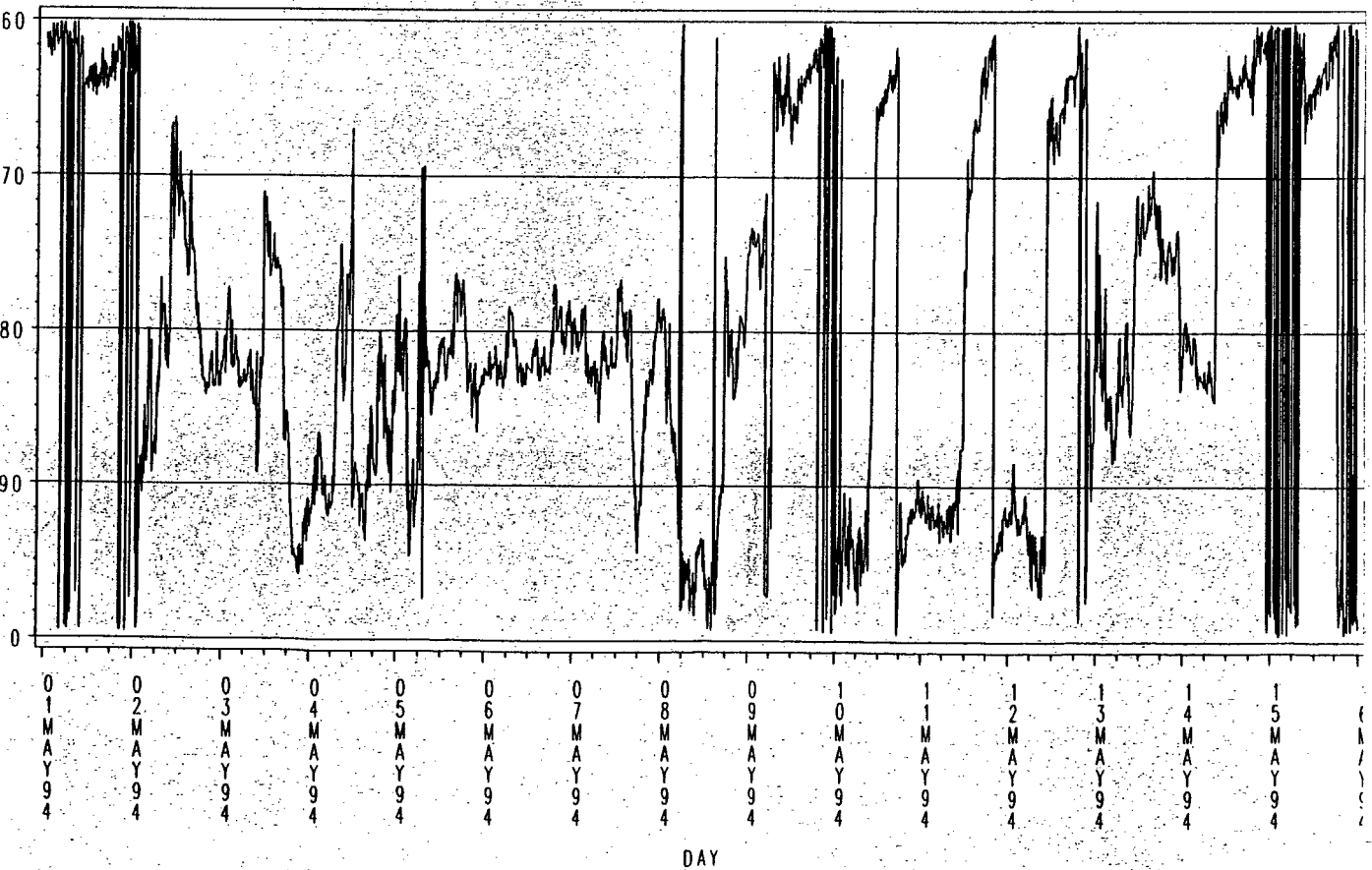
Wind speed 30 m above the ground (m/s)



DNMI - KLIMADELINGEN

HANØYTANGEN 1994

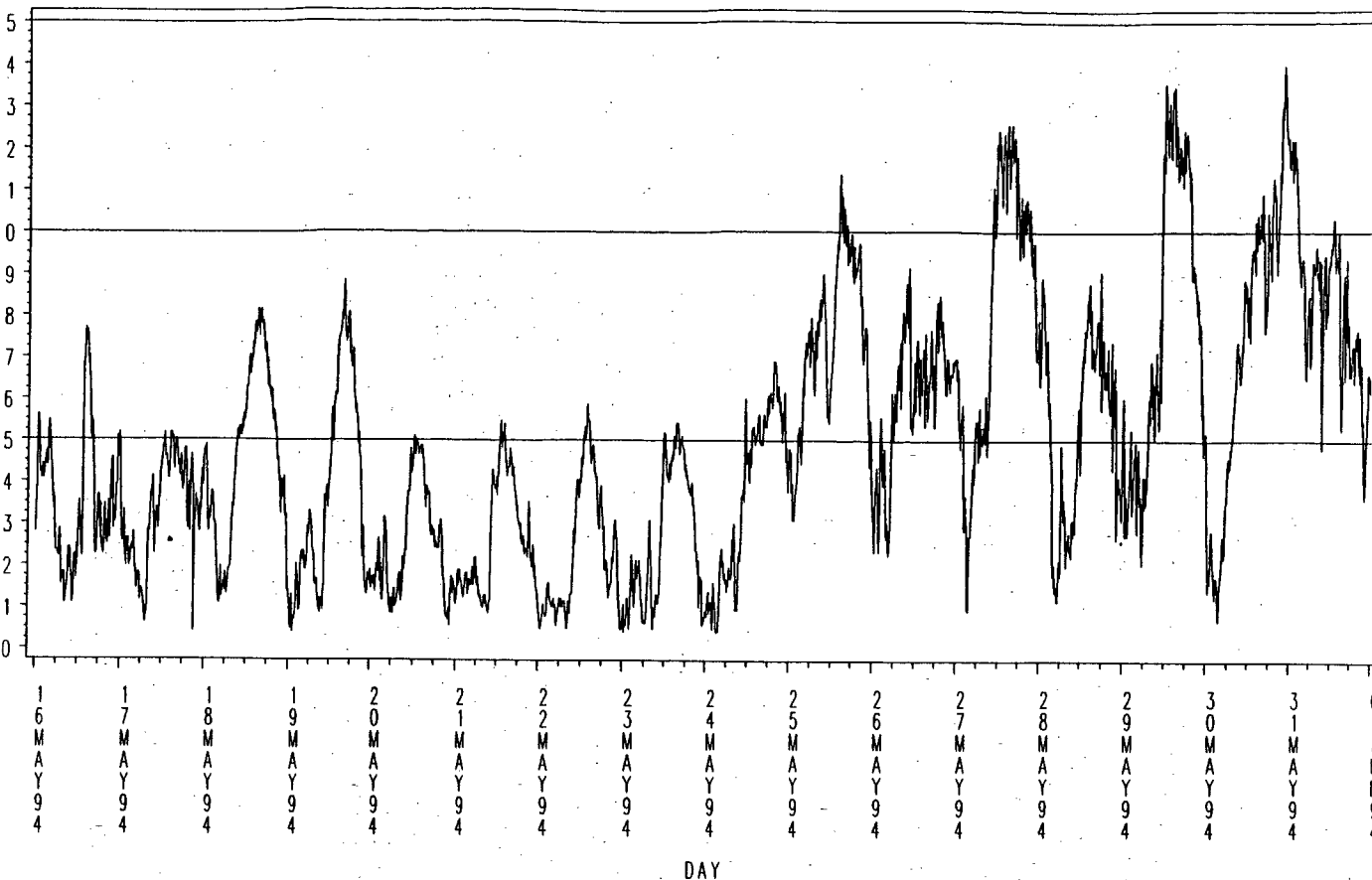
Wind direction 30 m above the ground



DNMI - KLIMADELINGEN

HANØYTANGEN 1994

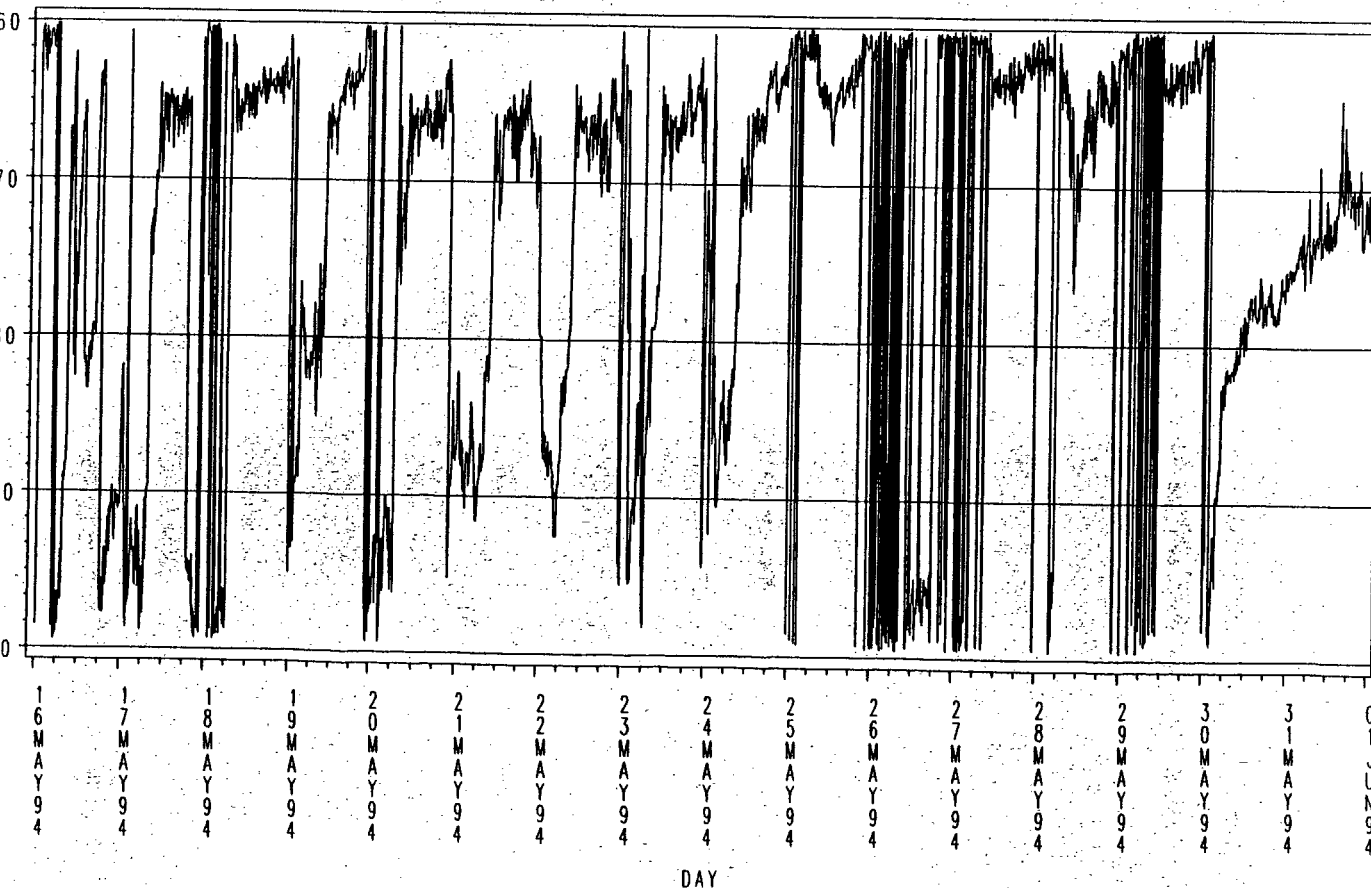
Wind speed 30 m above the ground (m/s)



DNMI - KLIMADELINGEN

HANØYTANGEN 1994

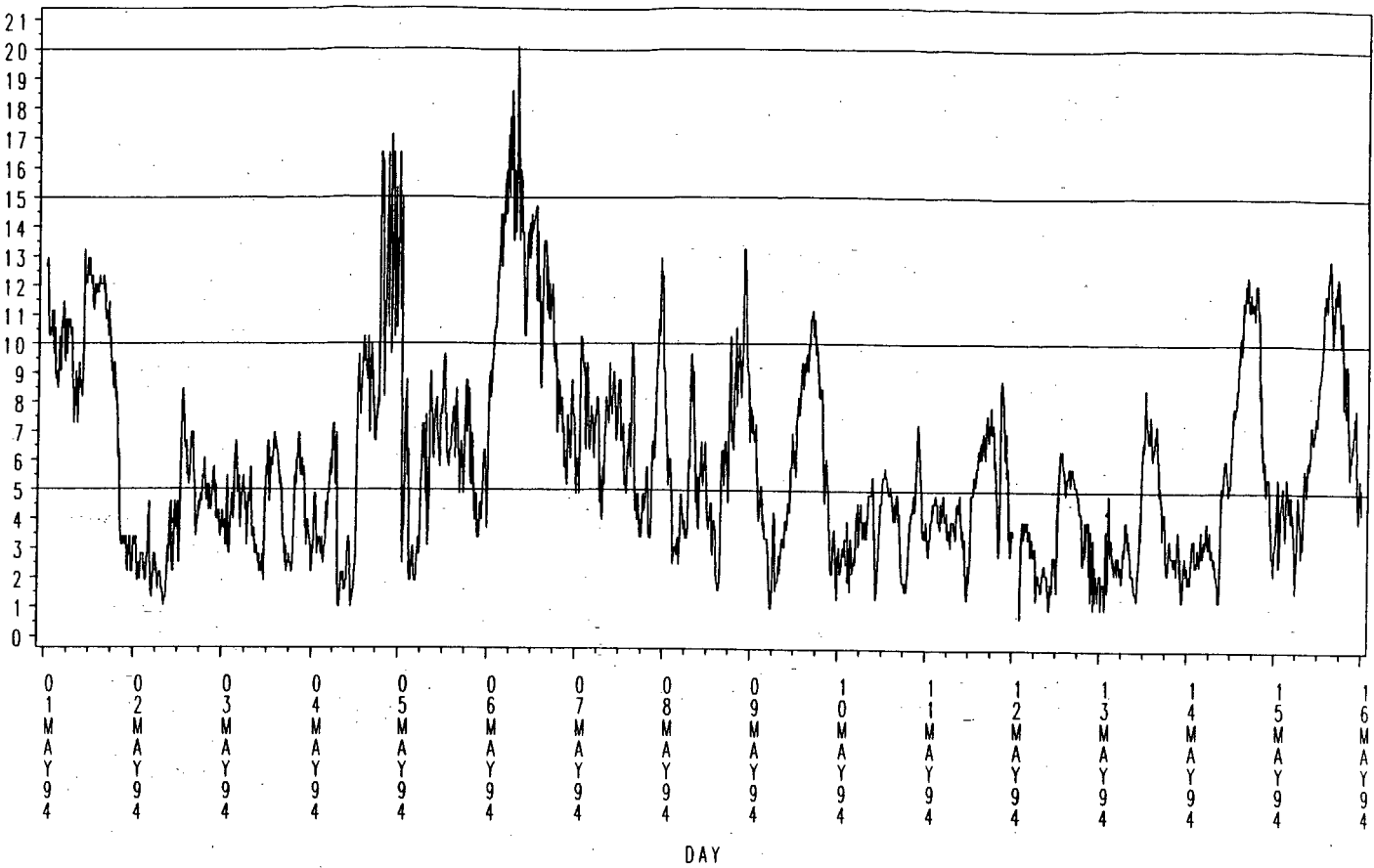
Wind direction 30 m above the ground



DNMI - KLIMADELINGEN

HANØYTANGEN 1994

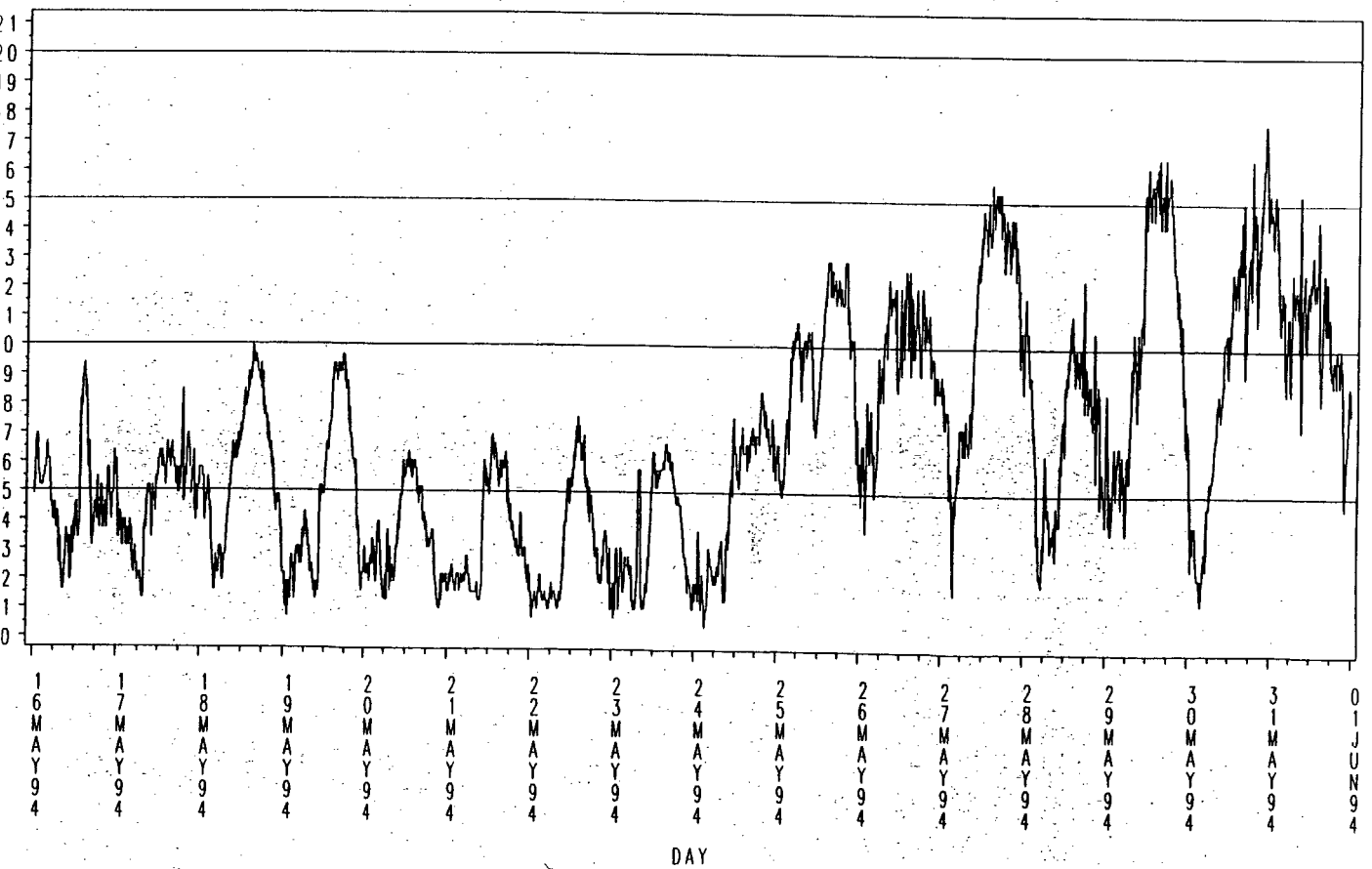
Gust wind speed 30 m above the ground (m/s)



DNMI - KLIMADELINGEN

HANØYTANGEN 1994

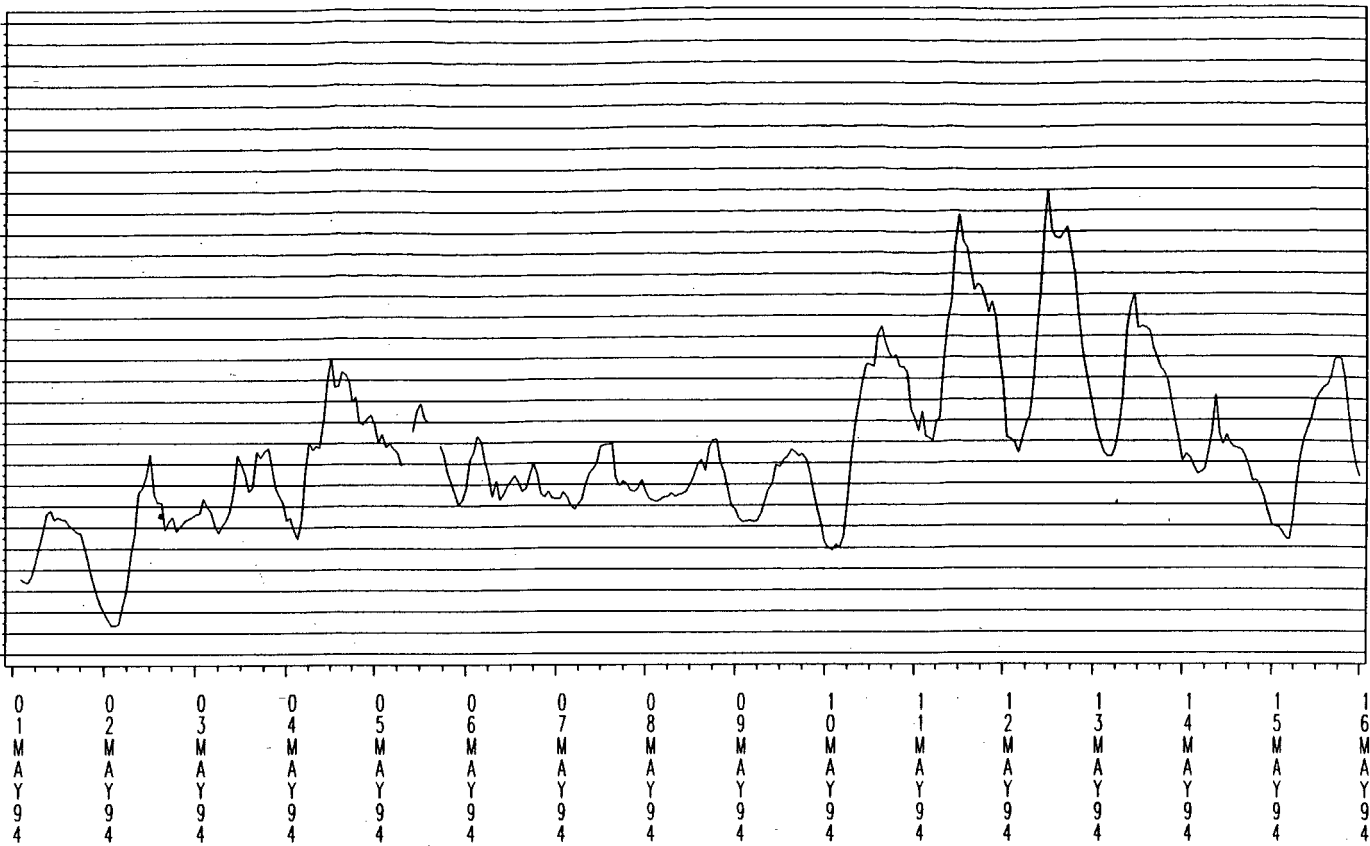
Gust wind speed 30 m above the ground (m/s)



DNMI - KLIMADELINGEN

HANØYTANGEN 1994

Air Temperature in degrees C (Hourly Means)

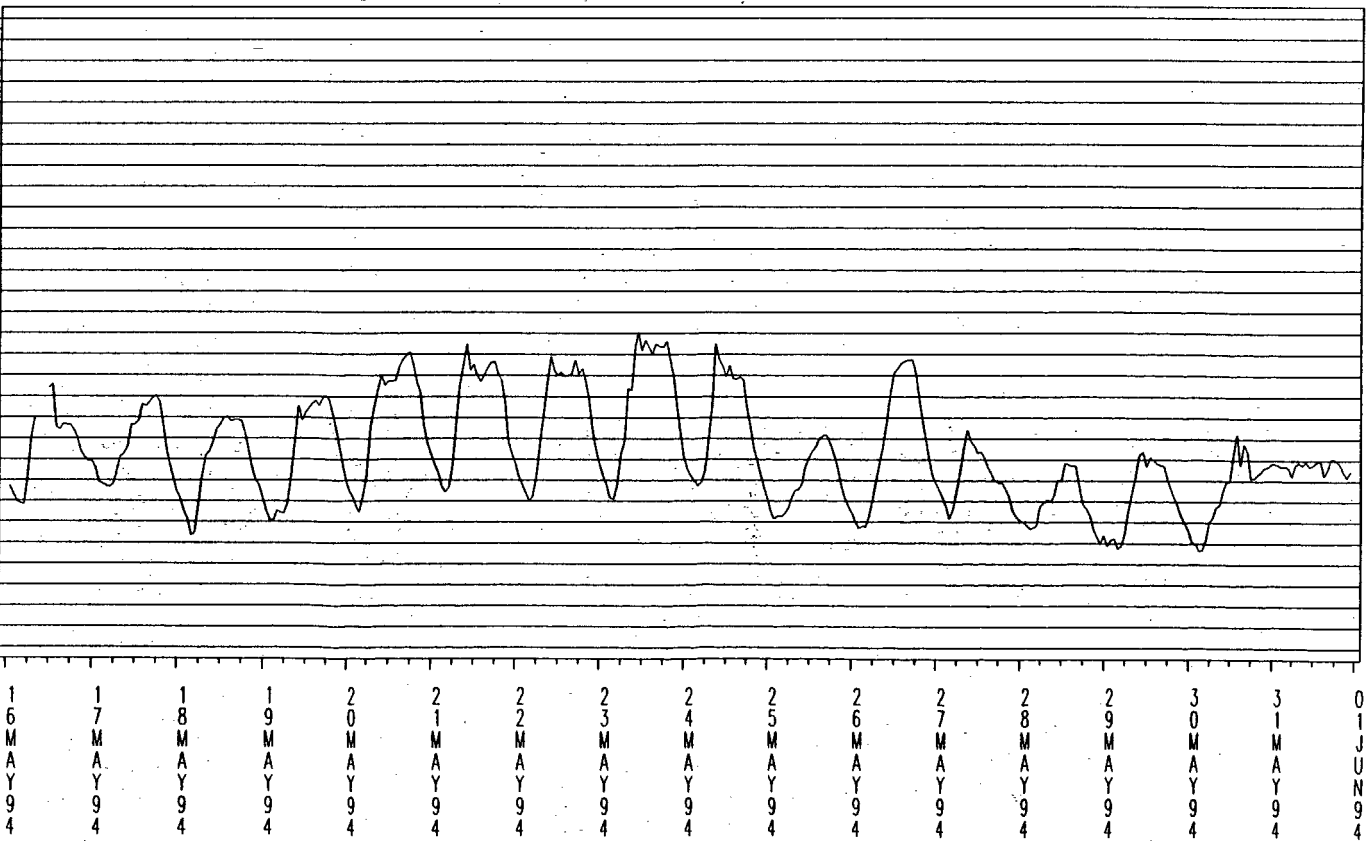


DAY

DNMI - KLIMAAVDELINGEN

HANØYTANGEN 1994

Air Temperature in degrees C (Hourly Means)

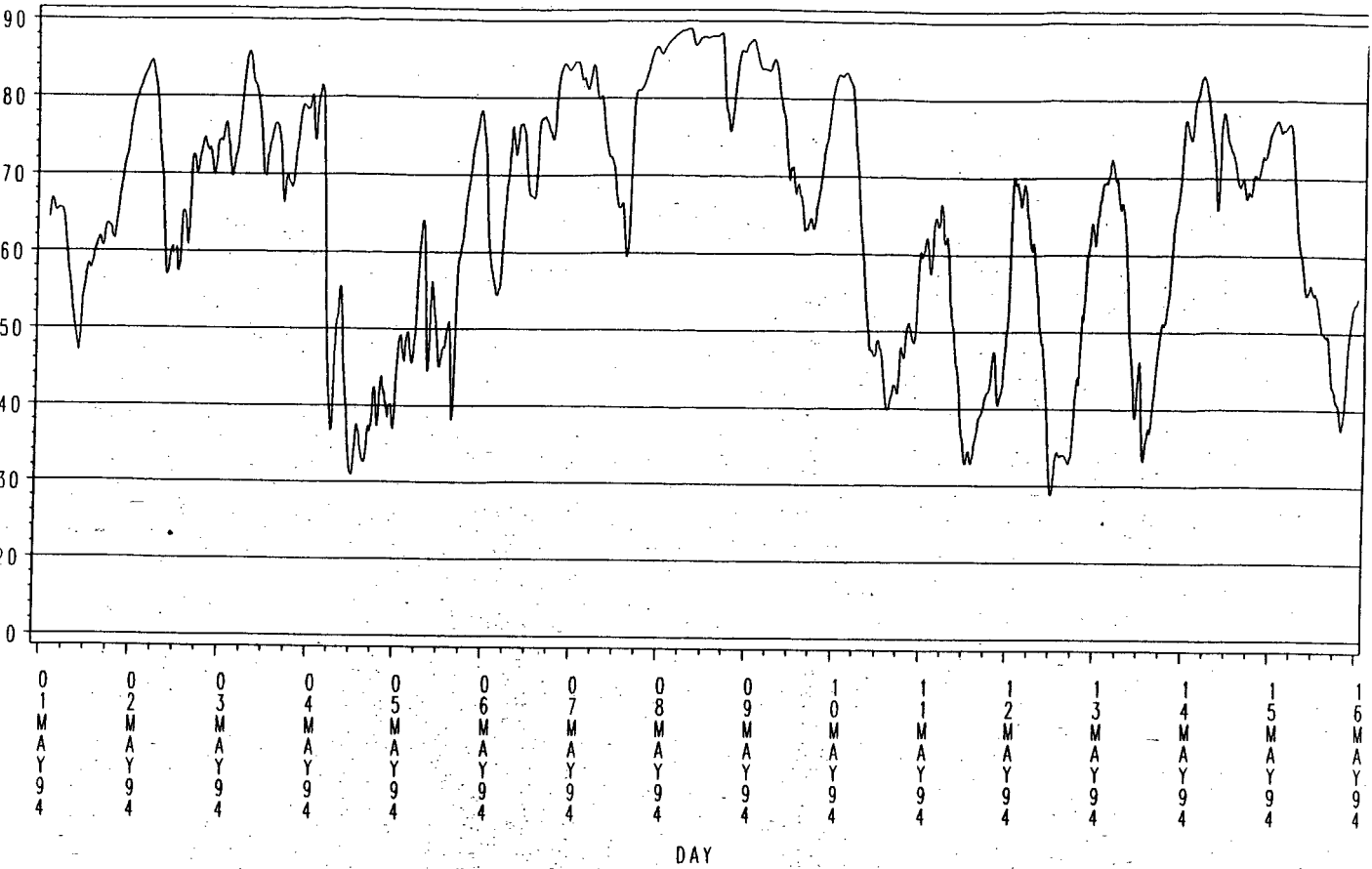


DAY

DNMI - KLIMAAVDELINGEN

HANØYTANGEN 1994

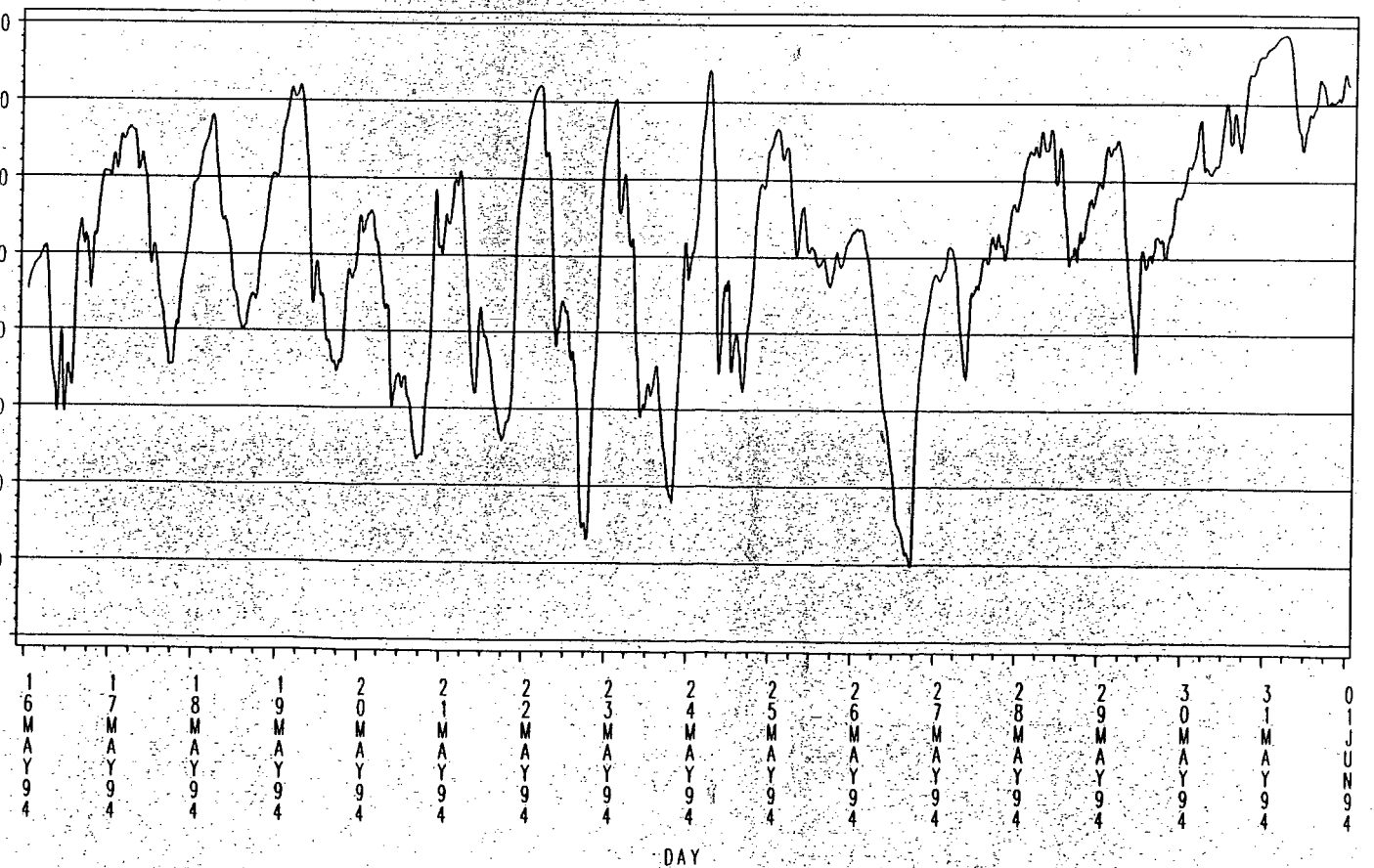
Air Humidity in % (Hourly Means)



DNMI - KLIMADELINGEN

HANØYTANGEN 1994

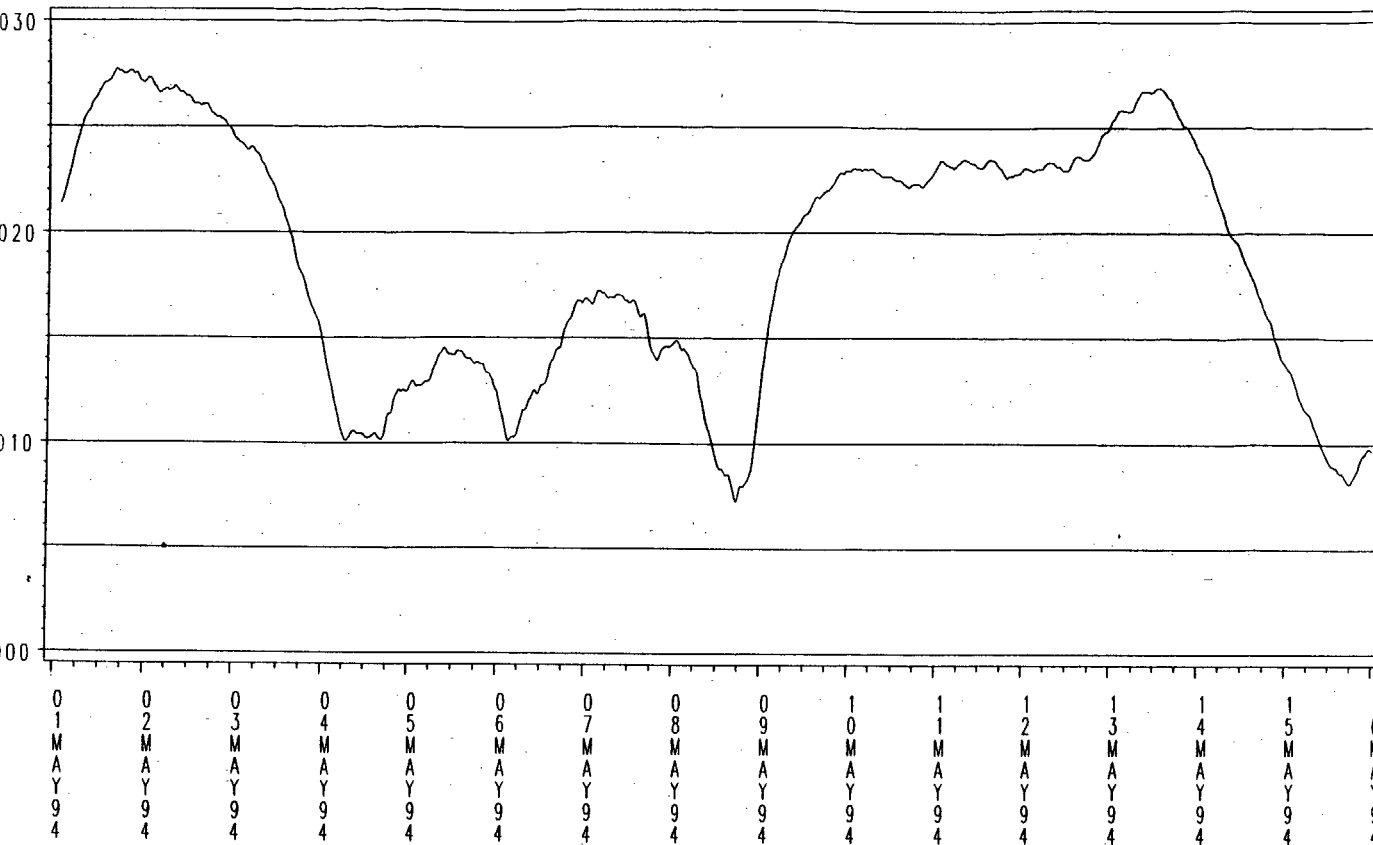
Air Humidity in % (Hourly Means)



DNMI - KLIMADELINGEN

HANØYTANGEN 1994

Air Pressure (QFF) in hPa (Hourly Means)

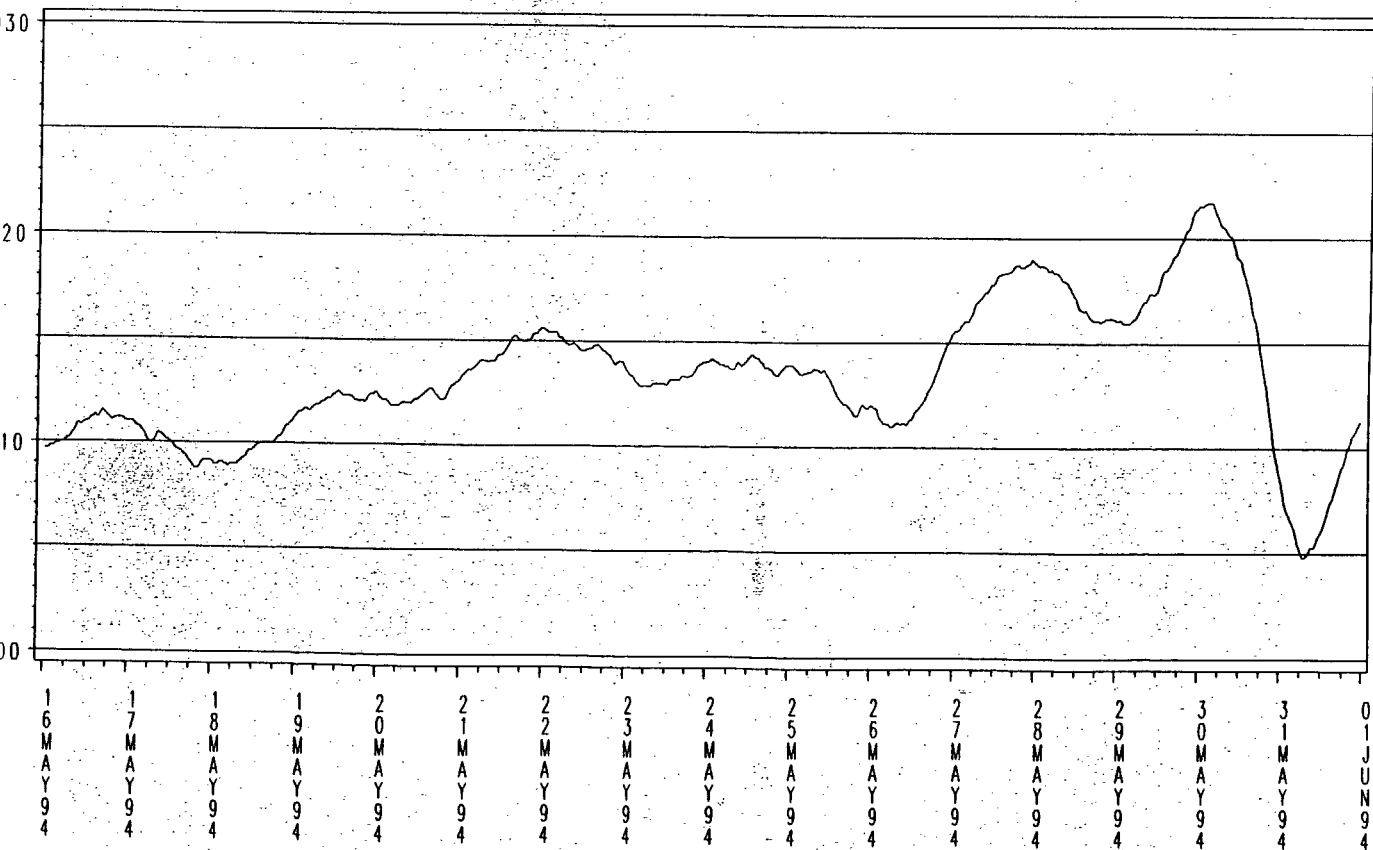


DAY

DNMI - KLIMAABDELINGEN

HANØYTANGEN 1994

Air Pressure (QFF) in hPa (Hourly Means)



DAY

DNMI - KLIMAABDELINGEN

DISTRIBUTION TABLES / WIND ROSES

The distribution table gives details about the distribution of the wind speed for a certain wind direction or the distribution of the wind directions for a certain wind speed.

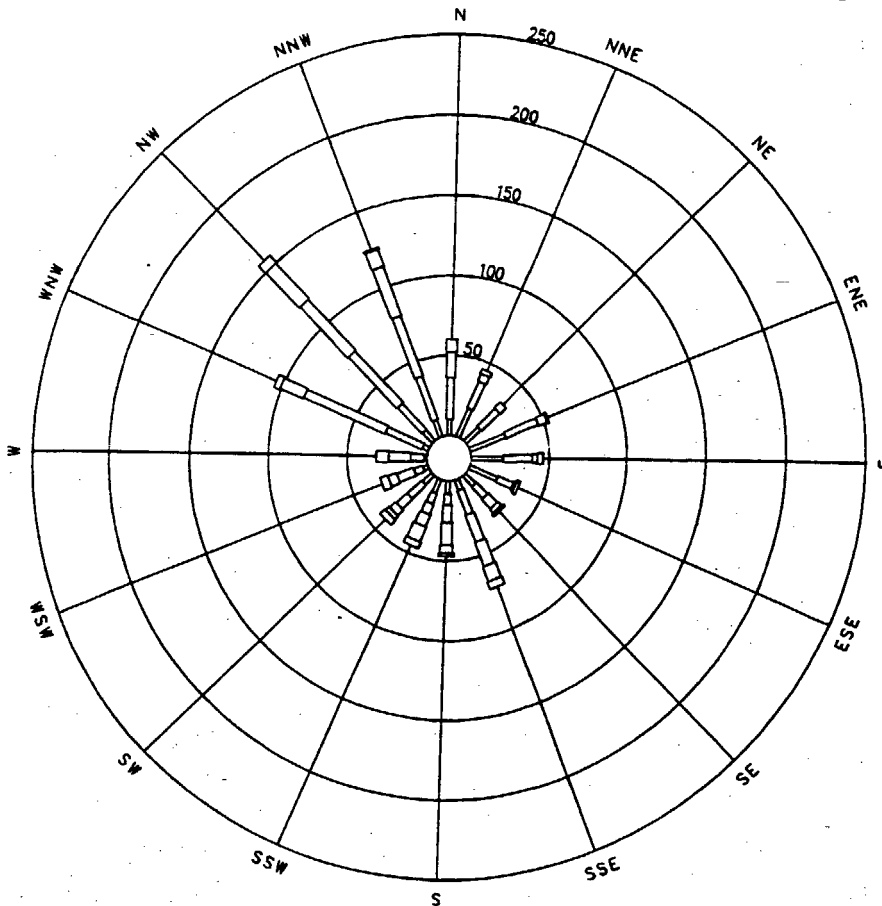
If for example, it is of interest to know the directions for which wind force 5 Beaufort have occurred this month, one has to look at the line for 5 Beaufort in the table.

If the information of the wind forces that have occurred this month for a certain direction is of interest, one has to look at the column for that specific direction.

The frequencies in the table are given per thousand (Prm) of the data available this month.

The wind rose is a graphic representation of the information given in the distribution table. The same number of classes is applied. No Beaufort value is given to the centre of the wind rose. Thus, the first class outside the centre is 0 Beaufort (0-0.2 m/s). Due to the calibration of the wind sensors, this class will always be empty at Hanøytangen.

HANOYTANGEN MAY 1994 WIND DISTRIBUTION 10 M

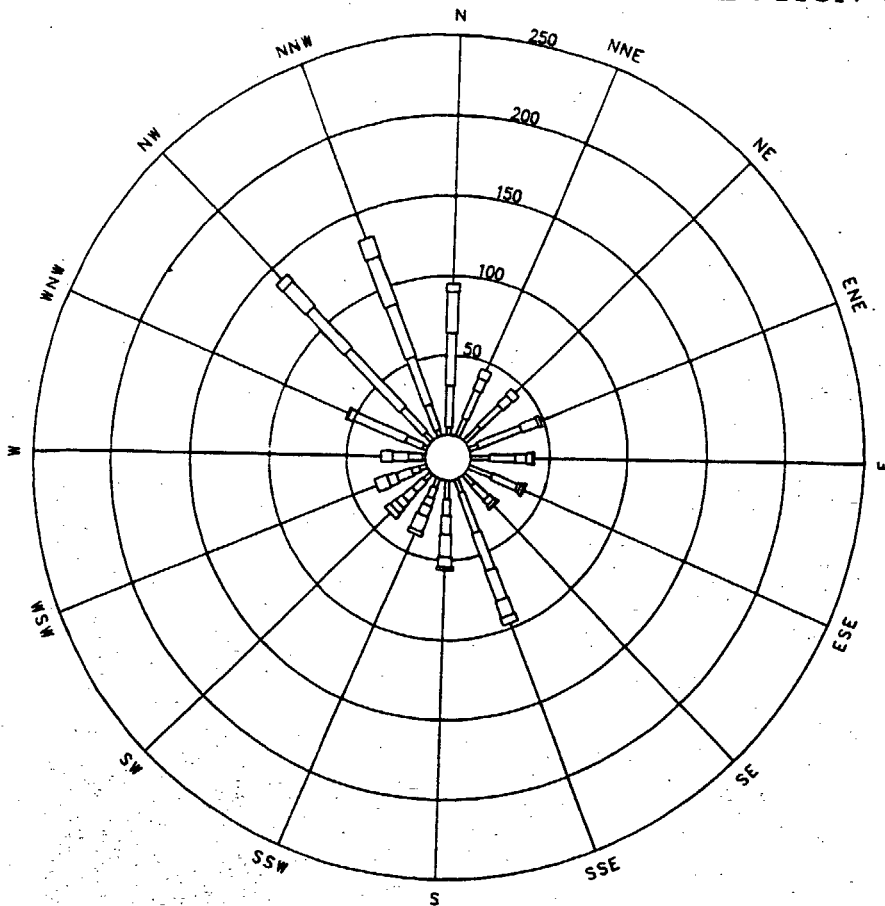


LENGTH : (NUMBER OF OBS/NUMBER OF DATA) * 1000
 WIDTH = SPEED (M/S / BEAUFORT SCALE)

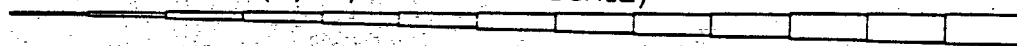
Wind direction (DD) / Wind speed (Beaufort and m/s) 10 m above the ground

Beaufort	DD																ALL
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
	Prm	Prm	Prm	Prm	Prm	Prm	Prm	Prm	Prm	Prm	Prm	Prm	Prm	Prm	Prm	Prm	
0	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
.2	10	19	12	24	20	19	9	7	8	9	8	3	2	4	9	11	181
1.5	26	18	16	22	19	11	10	16	7	7	12	6	8	25	22	29	262
3.3	16	5	5	6	3	1	8	18	11	7	9	11	14	56	44	40	261
5.4	8	3	0	1	4	1	3	16	14	8	5	6	8	16	44	33	176
7.9	0	.	.	.	0	2	1	10	5	10	3	5	0	4	31	11	87
10.7	.	.	.	.	.	.	1	5	2	4	4	.	.	0	6	1	27
13.8	.	.	.	.	.	.	.	.	0	0	.	.	.	.	.	.	0
17.1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
20.7	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
24.4	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
28.4	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
32.6	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
ALL	63	47	34	54	47	35	35	74	50	48	43	33	33	107	160	128	1000

HANOYTANGEN MAY 1994 WIND DISTRIBUTION 30 M



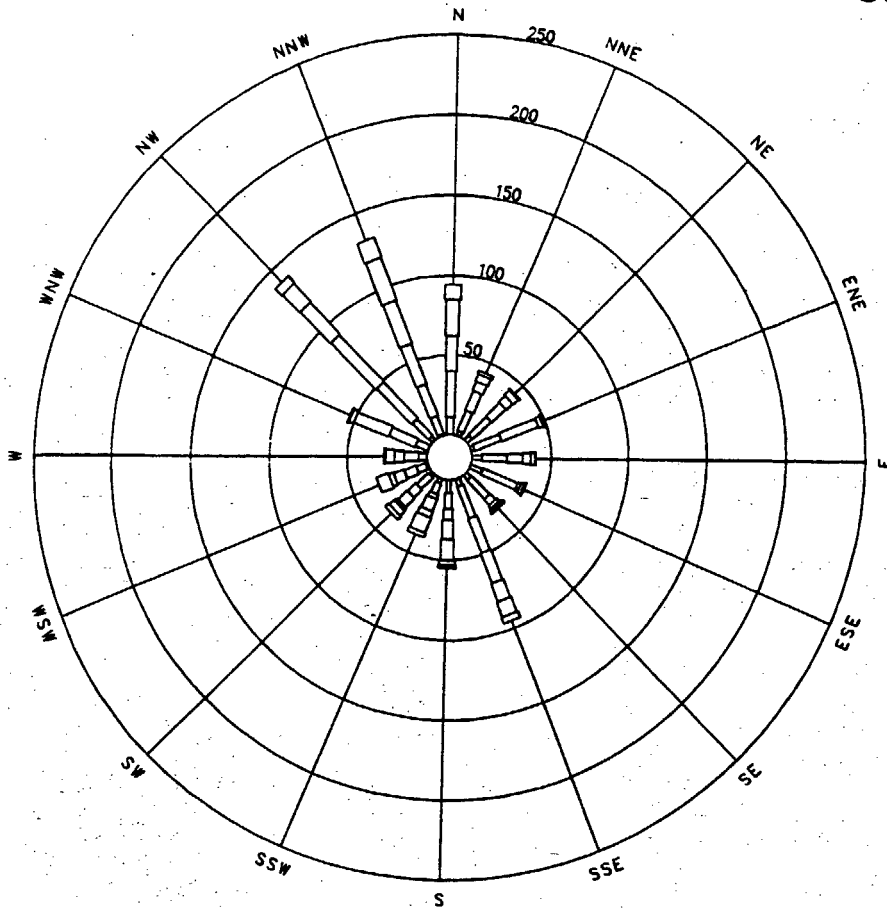
LENGTH : (NUMBER OF OBS/NUMBER OF DATA) * 1000
 WIDTH = SPEED (M/S / BEAUFORT SCALE)



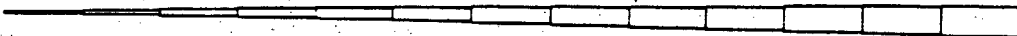
Wind direction (DD) / Wind speed (Beaufort and m/s) 30 m above the ground

Be- au- fo- rt	DD																ALL	
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW		
	Pcm	Pcm	Pcm	Pcm	Pcm	Pcm	Pcm	Pcm	Pcm	Pcm	Pcm	Pcm	Pcm	Pcm	Pcm	Pcm		
0	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
.2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
1	5	12	13	6	12	16	9	9	12	6	6	5	2	3	7	4	134	
1.5	2	26	19	18	29	16	17	12	27	10	7	9	5	9	12	21	17	262
3.3	3	33	8	8	11	7	2	4	25	12	5	8	10	10	35	50	32	266
5.4	4	26	6	5	2	4	2	2	20	14	7	5	6	7	4	36	35	187
7.9	5	5	.	.	0	1	1	1	11	6	10	4	8	0	1	21	32	109
10.7	6	.	.	.	.	.	.	0	5	2	3	4	.	.	.	6	13	36
13.8	7	.	.	.	.	.	.	.	0	0	.	.	.	.	.	.	.	0
17.1	8	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
20.7	9	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
24.4	10	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
28.4	11	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
32.6	12	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
ALL	98	46	47	50	43	40	31	99	60	41	38	35	30	56	143	135	1000	

HANOYTANGEN MAY 1994 GUST WIND DISTR. 30 M



LENGTH : (NUMBER OF OBS/NUMBER OF DATA) * 1000
 WIDTH = SPEED (M/S / BEAUFORT SCALE)



Wind direction (DD)/ Gust wind speed (m/s) 30 m above the ground.

m/s	DD																	ALL
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW		
	Prm	Prm	Prm	Prm	Prm	Prm	Prm	Prm	Prm	Prm	Prm	Prm	Prm	Prm	Prm	Prm		
0-.2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
0.3-1.5	0	3	4	2	6	8	4	5	8	3	2	1	0	0	3	1	58	
1.6-3.3	11	14	16	18	16	24	16	21	10	7	10	6	5	8	14	12	216	
3.4-5.4	29	13	12	25	10	2	5	23	7	3	7	8	9	18	32	21	230	
5.5-7.9	22	6	6	3	5	2	2	20	12	8	8	7	6	24	41	27	207	
8.0-10.7	23	5	4	1	3	1	1	12	13	4	2	3	6	3	28	29	145	
10.8-13.8	9	2	1	.	0	0	1	10	3	10	4	8	1	1	16	29	101	
13.9-17.1	0	.	.	.	0	0	1	4	2	3	3	0	.	0	6	13	37	
17.2-20.7	.	.	.	.	.	.	.	0	0	0	.	.	.	.	.	.	1
20.8-24.5	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
24.5-28.4	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
28.5-32.6	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
> 32.6	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
ALL	97	46	47	50	43	40	31	99	60	41	38	35	30	56	143	135	1000	

COEFFICIENT TRANSFERT TABLES

The tables are actually histograms of the quotient given in the heading of the tables, plotted horizontally. They give details about the distribution of the quotients.

The class interval is 0.5 and the frequencies for the actual class is plotted at the midpoint of the class. If the quotient is 1 the wind speed in the two heights considered have the same value.

The classes start at 0.75 (.725-.774) and end at 1.80 (1.775-1.825). Quotients below or above these limits are counted in these classes respectively.

The tables are giving the frequencies in the actual classes in percent and also as cumulative frequencies in percent.

F30 = Wind speed 30 m above the ground
F18 = Wind speed 18 m above the ground
F10 = Wind speed 10 m above the ground

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QUOTIENT F30/F18

F30/F18 Midpoint		Freq	Cum. Freq	Percent	Cum. Percent
0.75	**	83	83	1.87	1.87
0.80	*	33	116	0.74	2.61
0.85	*	56	172	1.26	3.87
0.90	**	116	288	2.61	6.48
0.95	*****	392	680	8.82	15.29
1.00	*****	1560	2240	35.09	50.38
1.05	*****	867	3107	19.50	69.88
1.10	*****	306	3413	6.88	76.77
1.15	*****	256	3669	5.76	82.52
1.20	*****	263	3932	5.92	88.44
1.25	****	191	4123	4.30	92.74
1.30	***	131	4254	2.95	95.68
1.35	*	59	4313	1.33	97.01
1.40	*	30	4343	0.67	97.68
1.45		18	4361	0.40	98.09
1.50		24	4385	0.54	98.63
1.55		18	4403	0.40	99.03
1.60		11	4414	0.25	99.28
1.65		6	4420	0.13	99.42
1.70		2	4422	0.04	99.46
1.75		2	4424	0.04	99.51
1.80		22	4446	0.49	100.00

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QUOTIENT F30/F10

F30/F10 Midpoint		Cum. Freq	Cum. Freq	Percent	Cum. Percent
0.75	*****	134	134	3.01	3.01
0.80	**	42	176	0.94	3.96
0.85	**	37	213	0.83	4.79
0.90	*****	116	329	2.61	7.40
0.95	*****	309	638	6.95	14.35
1.00	*****	788	1426	17.72	32.07
1.05	*****	728	2154	16.37	48.45
1.10	*****	663	2817	14.91	63.36
1.15	*****	528	3345	11.88	75.24
1.20	*****	338	3683	7.60	82.84
1.25	*****	198	3881	4.45	87.29
1.30	*****	109	3990	2.45	89.74
1.35	*****	101	4091	2.27	92.02
1.40	***	66	4157	1.48	93.50
1.45	**	49	4206	1.10	94.60
1.50	**	34	4240	0.76	95.37
1.55	**	32	4272	0.72	96.09
1.60	*	22	4294	0.49	96.58
1.65	*	18	4312	0.40	96.99
1.70	*	13	4325	0.29	97.28
1.75	*	11	4336	0.25	97.53
1.80	*****	110	4446	2.47	100.00

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QUOTIENT F18/F10

F18/F10 Midpoint		Freq	Cum. Freq	Percent	Cum. Percent
0.75	*	55	55	1.23	1.23
0.80	*	45	100	1.01	2.24
0.85	*	41	141	0.92	3.16
0.90	**	82	223	1.84	5.00
0.95	*****	546	769	12.25	17.25
1.00	*****	1383	2152	31.02	48.27
1.05	*****	972	3124	21.80	70.08
1.10	*****	571	3695	12.81	82.88
1.15	*****	307	4002	6.89	89.77
1.20	****	186	4188	4.17	93.94
1.25	**	97	4285	2.18	96.12
1.30	*	46	4331	1.03	97.15
1.35	*	42	4373	0.94	98.09
1.40	*	26	4399	0.58	98.68
1.45	*	26	4425	0.58	99.26
1.50		6	4431	0.13	99.39
1.55		9	4440	0.20	99.60
1.60		6	4446	0.13	99.73
1.65		7	4453	0.16	99.89
1.70		0	4453	0.00	99.89
1.75		3	4456	0.07	99.96
1.80		2	4458	0.04	100.00

OCCURRENCE TABLES

The content of the table is based on the hourly maxima (Fx) of the 10 min wind speed. First a period fulfilling the criterion $F_x < \text{Limit}$ is sought. The length of this period is divided by the length of the windows specified and may result in multiples of the actual window or zero if the length of the period is less than the length of the actual window. This procedure is repeated through the month and the number of the different windows are accumulated.

Observation Period :									Location :
From : 01/05/94	MAY		1994					Level : 10 m a.g.	
To : 31/05/94									Coordinates:
Coverage : 99.9 %	HANØYTANGEN								X = 71908
Number of data: 4458									Y = 47414
OCCURRENCE TABLE									
NUMBER OF WINDOWS FROM 6 TO 72 HOURS									
Wind Speed <= Beaufort	1	2	3	4	5	6	7	8	
Duration									
6 H	2	28	63	95	113	123	123	123	
12 H	0	11	24	42	55	61	61	61	
18 H	0	0	14	24	36	40	41	41	
24 H	0	0	5	14	25	30	30	30	
48 H	0	0	0	6	11	14	15	15	
72 H	0	0	0	2	7	9	10	10	
Remarks : Based on maximum 10mn wind speed within the interval period, in any direction, at 10 metres level									

CLIMATOLOGICAL SUMMARY

Observation Period :										Location:		
From : 01/05/94										Level: 2 m a.g.		
To : 31/05/94										HANØYTANGEN 1994		
Coverage : 99.5 - 99.9 %												
Number of data :4440 - 4458												
CLIMATOLOGICAL SUMMARY												
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Air Temperature												
Mean Day min.	0.2	-2.1	0.8	3.7	6.1							
Abs min	-4	-6.3	-5.1	0.3	1.1							
Mean Day max.	3.8	3.3	5.3	8.4	13.2							
Abs max.	6.7	6.4	10.5	14.9	22.7							
Mean	2.1	0.1	3	5.9	9.5							
Relative Humidity												
Mean Day min.	61	44	59	57	44							
Abs min.	44	27	29	30	19.3							
Mean Day max.	81	73	84	84	80							
Abs max.	89	90	89	91	89							
Mean	70	60	73	72	63							
Air pressure												
Mean Day min.	991.6	1016.7	993.4	1004.4	1013.7							
Abs min.	966.2	989.7	969.4	970.9	1004.7							
Mean Day max.	1003.5	1023.6	1004.7	1011.8	1018							
Abs max.	1019.6	1045.2	1024.3	1028.8	1027.8							
Mean	998	1020	999.1	1008.2	1016							
Coefficient Transfert												
from level 10 to 18	1.051	1.046	1.024	1.022	1.049							
from level 10 to 30	1.117	1.088	1.055	1.053	1.119							
from level 18 to 30	1.059	1.036	1.029	1.032	1.063							
Remarks:												
The summary is based on air temperature, humidity and pressure measured each 10 minute.												

ESTIMATES OF WIND SPEED WITH 10/100 YEAR RETURN PERIODS

The method for the estimation is described in the report 43/92 KLIMA, Climatological statistics for Hanøytangen near Bergen. At the end of May 1994 the parallel series between Hellisøy and Hanøytangen which is of importance for the estimation is very short. It covers the period 3.2-31.5.1994 with some gaps due to missing data at Hanøytangen. At Hellisøy the automatic weather station was out of operation regarding all parameters by the end of 1993. The wind speed measurements were functioning again from 3.2.1994. It must be emphasized that when May 1994 was specified as the first month of which 10/100 years should be presented, the starting of the parallel series was assumed to be September 1993.

The parallel series available at the end of May 1994 is short and the results must therefore be regarded as a first approximation.

Detailed discussion of the results must be postponed to a longer parallel series is available. However, the transfer coefficient for the direction where the extreme most probably will occur, is of the same magnitude as that used for the 10 min mean in the report 43/92 KLIMA. This preliminary result gives no reason to change the 10/100 years estimates given in this report.

The transfer coefficients for the gust wind is lower than the estimates used in the report 43/92 KLIMA. Thus the estimates for the gust wind in this report may seem to high.

Estimates of transfer coefficients based on data from Hellisøy (He) and Hanøytangen (Ha) for the period 3.2-31.5.1994.

V(Han., 10 min)/V(He., 10 min)						
V(Han., 3 sec.)/V(He., 10 min)						
030-129°	130-159°	160-199°	200-229°	230-299°	300-339°	340-029°
0.60	0.72	0.71	0.81	0.65	0.67	0.58
0.86	0.98	1.00	1.12	1.00	1.00	0.86

The estimates for the wind speed at Hellisøy given below and these new transfer coefficients are applied to compute the wind speed estimates for Hanøytangen.

Estimates of extreme values for the 10 min mean of the wind speed (V_{10}) with return periods 10 and 100 years valid for Hellisøy Fyr.

DIRECTION	SUMMER		WINTER	
	May - August		September - April	
	$V_{10}10$	$V_{10}100$	$V_{10}10$	$V_{10}100$
030-060°	12.3	14.7	19.2	21.7
070-100°	13.0	15.5	16.6	18.8
110-120°	18.1	21.6	24.4	27.6
130-150°	20.6	24.6	28.3	32.0
160-190°	23.8	28.4	30.5	34.4
200-220°	23.8	28.4	30.5	34.4
230-290°	21.6	25.8	27.6	31.2
300-330°	21.1	25.2	28.6	32.3
340-020°	21.6	25.8	28.3	32.3

Estimates of values for the 10 min mean wind speed (V_{10}) with return periods 10 and 100 years valid for Hanøytangen. The estimates are based on computations made for Hellisøy Fyr and the parallel series between Hellisøy Fyr and Hanøytangen for the period 3.2-31.5.1994.

DIRECTION	SUMMER		WINTER	
	May - August		September - April	
	$V_{10,10}$	$V_{10,100}$	$V_{10,10}$	$V_{10,100}$
030-060°	7.4	8.8	11.5	13.0
070-100°	7.8	9.3	10.0	11.3
110-120°	10.9	13.0	14.6	16.6
130-150°	14.8	17.7	20.4	23.0
160-190°	16.9	20.2	21.7	24.4
200-220°	19.3	23.0	24.7	27.9
230-290°	14.0	16.8	17.9	20.3
300-330°	14.1	16.9	19.2	21.6
340-020°	12.5	15.0	16.4	18.7

Estimates of values for the 3 sec. gust wind speed (V_g) with return periods 10 and 100 years valid for Hanøytangen. The estimates are based on computations made for Hellisøy Fyr and the parallel series between Hellisøy Fyr and Hanøytangen for the period 3.2-31.5.1994.

DIRECTION	SUMMER		WINTER	
	May - August		September - April	
	$V_g,10$	$V_g,100$	$V_g,10$	$V_g,100$
030-060°	10.6	12.6	16.5	18.7
070-100°	11.2	13.3	14.3	16.2
110-120°	15.6	18.6	21.0	23.7
130-150°	20.2	24.1	27.7	31.4
160-190°	23.8	28.4	30.5	34.4
200-220°	26.7	31.8	34.2	38.5
230-290°	21.6	25.8	27.6	31.2
300-330°	21.1	25.2	28.6	32.3
340-020°	18.6	22.1	24.3	27.8

Appendix 1

BEAUFORT SCALE OF WIND

BEAUFORT NUMBER	DESCRIPTIVE TERM	MEAN VELOCITY IN KNOTS	MEAN VELOCITY IN m/s
0	Calm	< 1	0 - 0.2
1	Light air	1 - 3	0.3 - 1.5
2	Light breeze	4 - 6	1.6 - 3.3
3	Gentle breeze	7 - 10	3.4 - 5.4
4	Moder. breeze	11 - 16	5.5 - 7.9
5	Fresh breeze	17 - 21	8.0 - 10.7
6	Strong breeze	22 - 27	10.8 - 13.8
7	Near gale	28 - 33	13.9 - 17.1
8	Gale	34 - 40	17.2 - 20.7
9	Strong gale	41 - 47	20.8 - 24.4
10	Storm	48 - 55	24.5 - 28.4
11	Violent storm	56 - 63	28.5 - 32.6
12	Hurricane	64 and over	32.7 and over

Appendix 2

Records where at least one of the parameters is outside the
criteria set in the automatic filter.

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RECORDS WITH PARAMETERS OUTSIDE THE CRITERIONS

OBS	AAR	MND	DAG	TIME	MIN	REF	F30	G30	DD30	F18	G18	F10	G10	DD10	T	UU	P
1	1994	5	10	2	17	645	2.94	72.02	37.45	1.22	2.19	0.85	1.59	29.07	4.80	83.37	1021.11
2	1994	5	12	0	7	645	25.47	3.46	67.81	1.89	2.49	1.22	1.59	74.79	12.16	55.82	1021.28
3	1994	5	12	0	17	645	57.69	57.69	74.79	1.89	2.79	1.52	1.89	79.33	11.79	58.45	1021.28
4	1994	5	12	7	27	645	51.13	39.34	76.53	1.89	2.19	1.52	1.89	125.05	10.50	65.74	1021.28
5	1994	5	12	0	37	645	19.95	57.69	71.65	1.44	1.89	1.15	1.59	146.68	10.03	69.79	1021.11
6	1994	5	12	0	47	645	48.14	48.14	68.51	1.44	2.19	1.22	1.89	114.23	10.03	71.42	1021.11
7	1994	5	12	0	57	645	31.43	5.32	69.90	1.37	2.19	1.00	1.30	121.56	10.03	70.20	1021.11
8	1994	5	12	1	7	645	48.14	48.14	76.19	1.44	2.19	1.00	1.59	126.09	10.31	69.59	1021.11
9	1994	5	12	1	17	645	43.37	0.77	97.47	1.22	1.59	1.22	1.89	148.78	10.22	69.39	1021.11
10	1994	5	12	1	27	645	48.14	50.53	104.11	1.37	1.89	1.44	1.89	148.43	10.13	69.79	1021.11
11	1994	5	12	1	37	645	9.95	12.34	88.75	1.44	2.19	1.22	2.19	118.07	10.31	70.20	1021.11
12	1994	5	12	1	47	645	48.14	48.14	75.84	1.59	2.19	1.22	1.59	106.20	10.59	68.17	1021.11
13	1994	5	12	1	57	645	48.22	48.14	82.47	1.67	2.19	1.37	1.89	115.97	10.31	67.36	1021.11
14	1994	5	12	2	7	645	16.14	0.70	71.65	1.52	1.89	1.22	1.59	118.41	9.76	69.79	1021.11
15	1994	5	17	21	7	645	0.40	0.40	8.83	3.83	5.77	3.09	5.17	348.41	9.29	59.26	1007.24