VEÐURSTOFA ÍSLANDS

Report
02029

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Additional Wind and Stability Observations at Sómastaðagerði in Reyðarfjörður V

June 2001 - May 2002

Report prepared for Fjárfestingarstofan - orkusvið

VÍ-TA06
Reykjavík
September 2002

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Contents

1. Introduction

Veðurstofa Íslands - The Icelandic Meteorological Office - has from May 1998 carried out wind and stability measurements using a 38 meter high mast at Sómastaðagerði in Reyðarfjörður, at the site for a planned aluminium smelter.

Five earlier Reports have been issued. The first, Wind and Stability Observations at Sómastaðagerði in Reyðarfjörður (VÍ-G99018-TA04), presents data for the period May 1998 - April 1999 (Ref. 1).

The second Report, Additional Wind and Stability Observations at Sómastaðagerði in Reyðarfjörður (VÍ-G00001-TA01), covers the six month period May 1999-October 1999 (Ref. 2).

The third, Additional Wind and Stability Observations at Sómastaðagerði in Reyðarfjörður II (VÍ-G00007-TA03), contains results of observations carried out during the six month period November 1999-April 2000 as well as comparison between the two 12 month periods May 1998-April 1999 and May 1999-April 2000 (Ref. 3).

The fourth Report, Additional Wind and Stability Observations at Sómastaðagerði III (VÍ-G00020-TA12), covers the period May-August 2000 (Ref. 4). As this Report was required already in September 2000, it covered a shorter period of time than the earlier ones. In addition to data from Sómastaðagerði, it included results from three automatic wind and temperature observing stations, Vattarnes, Ljósá and Kollaleira 2. These were installed in Reyðarfjörður early in June 2000 in accordance with a contract with Reyðarál hf. Furthermore, it also included some data for the automatic stations Seley, Eskifjörður and Oddsskarð.

Finally the fifth Report, Additional Wind and Stability Observations at Sómastaðagerði in Reyðarfjörður IV (Report 01017, VÍ-TA03), covers the period September 2000-May 2001 and in some cases the 12 month period June 2000-May 2001 (Ref. 5).

Three earlier Reports issued by Veðurstofa Íslands also contain meteorological information for the Reyðarfjörður area (Ref. 6-8).

The present Report covers the 12 month period June 2001-May 2002. For photos and location of observation sites and instrumentation see previous Report (Ref. 4).

A map of Reyðarfjörður is shown in Fig. 1. Present and former observation sites in the Reyðarfjörður area are shown on the map.

2. Wind Observations at Sómastaðagerði

The percentage frequency of the wind directions at 10.3 m above the ground at Sómastaðagerði is presented in Table 1 for each of the months June 2001-May 2002 as well as in the form of wind roses in Annexes 1-3. Mean frequencies for the whole 12 month period, for the 6 month winter and summer periods and for the 3 month high summer period are shown in Annex 4, and night and day values for the high summer months in Annex 5.

Table 1. Percentage frequency of wind directions at Sómastaðagerði, June 2001-May 2002.

		Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Year
N	**360**	0.8	1.0	0.6	1.1	2.2	1.0	1.7	2.0	1.7	3.4	1.4	1.3	1.5
	10	0.9	0.9	0.6	1.1	1.1	1.0	1.3	1.1	0.9	1.6	0.8	0.8	1.0
	20	0.4	0.7	0.6	1.2	1.1	1.1	1.2	1.1	0.9	0.9	0.7	0.6	0.9
	30	0.7	0.7	1.1	1.2	1.3	1.4	1.7	1.0	1.2	0.9	0.7	0.7	1.0
	40	0.9	1.4	1.5	1.8	1.9	1.6	2.1	1.7	0.9	1.2	1.4	1.2	1.5
	50	1.8	2.3	2.8	2.7	3.0	2.0	2.6	2.6	1.7	2.0	2.4	2.2	2.4
	60	4.5	6.2	7.3	4.6	5.4	4.0	3.4	5.2	2.7	4.1	6.6	6.2	5.0
	70	8.0	12.6	10.4	6.4	8.1	3.8	3.0	5.6	4.4	6.8	**11.9**	10.8	7.7
	80	**15.9**	**13.7**	**12.5**	8.8	5.0	2.2	1.5	6.9	3.6	5.1	10.8	**11.0**	8.1
E	**90**	15.6	10.4	9.2	4.1	3.1	1.3	1.2	4.9	2.8	2.7	5.6	7.1	5.7
	100	5.7	6.0	4.6	2.8	1.5	1.1	1.2	3.0	2.1	1.6	4.4	3.0	3.1
	110	2.2	3.4	2.8	2.5	1.9	0.7	1.0	2.8	1.2	0.7	3.4	0.9	2.0
	120	1.1	4.1	3.3	2.4	2.3	1.0	0.8	3.1	1.4	0.5	3.7	0.9	2.1
	130	0.7	1.7	1.5	1.3	2.3	0.6	0.6	1.7	0.6	0.4	2.2	0.8	1.2
	140	0.3	0.8	0.5	0.8	1.1	0.2	0.4	0.9	0.2	0.2	0.9	0.4	0.6
	150	0.2	0.5	0.3	0.7	0.8	0.1	0.5	0.4	0.3	0.1	0.6	0.4	0.4
	160	0.3	0.5	0.2	0.3	0.4	0.1	0.6	0.5	0.2	0.1	0.7	0.5	0.4
	170	0.4	0.4	0.3	0.4	0.4	0.2	0.5	0.2	0.4	0.2	0.7	0.3	0.4
S	**180**	0.1	0.3	0.2	0.4	0.3	0.2	0.6	0.5	0.4	0.2	0.9	0.4	0.4
	190	0.2	0.2	0.5	0.3	0.4	0.2	0.7	0.5	0.5	0.3	0.6	0.4	0.4
	200	0.2	0.3	0.3	0.5	0.5	0.4	0.7	0.6	0.6	0.3	0.5	0.5	0.5
	210	0.3	0.8	0.2	0.7	0.4	0.4	0.8	0.9	0.5	0.5	0.5	0.6	0.6
	220	0.6	0.6	0.4	1.2	0.6	0.3	0.7	1.5	0.6	1.5	0.7	0.7	0.8
	230	0.9	1.0	1.1	2.4	1.4	0.9	1.0	2.1	1.0	2.5	1.4	1.7	1.4
	240	1.9	2.2	2.4	4.4	3.4	1.7	2.2	3.5	2.0	4.5	1.9	3.9	2.8
	250	3.5	2.8	4.3	4.9	5.0	4.0	4.3	6.8	4.9	6.6	4.0	4.9	4.7
	260	4.4	3.8	6.2	3.9	8.0	8.4	6.6	**8.1**	10.3	8.9	5.9	5.4	6.6
W	**270**	4.8	4.5	4.7	5.9	**9.2**	12.2	10.6	7.4	**14.9**	**11.2**	4.8	8.4	**8.2**
	280	4.5	4.7	5.5	6.3	7.1	**16.0**	**13.7**	6.2	11.7	10.2	3.6	5.5	7.9
	290	5.0	2.4	3.6	**8.9**	5.9	13.0	12.6	4.3	8.9	6.9	4.7	3.3	6.6
	300	2.8	1.2	1.8	5.3	3.4	7.2	6.5	3.6	5.6	3.6	3.8	2.7	3.9
	310	2.2	0.9	0.9	2.2	3.5	4.4	4.5	2.2	3.5	2.9	2.0	2.4	2.6
	320	1.6	1.2	0.6	1.2	2.5	2.2	3.8	1.4	1.8	1.9	0.7	3.0	1.8
	330	1.6	0.7	0.5	1.0	1.5	2.0	2.4	1.7	1.9	1.1	0.7	2.5	1.5
	340	1.3	0.7	0.7	0.7	1.3	1.5	1.4	1.6	1.4	1.5	1.3	1.9	1.3
	350	1.3	0.9	0.6	1.2	1.3	1.2	1.7	2.1	2.0	2.3	2.4	1.5	1.5
Calm:		2.5	3.5	5.6	4.4	1.3	0.5	0.2	0.3	0.2	0.7	0.9	1.1	1.8

Calm is in Table 1 and elsewhere in this report defined as a 10-minute average wind speed below or equal to 0.2 m/s. Bold letters in the table indicate the highest value for each month.

For the year as a whole winds aligned with the fjord have, in agreement with the earlier reports, by far the highest frequency. E-erly and ENE-erly winds are dominant during the summer months, especially during the day, and W-erly and WNW-erly winds dominate during the winter months. In spite of the very strong topographical influence considerable variations are seen from time to time due to variable circulation patterns.

For the high summer months, June-August, the great diurnal variation of the main wind directions at Sómastaðagerði is clearly indicated by the two wind roses in Annex 5. The diurnal variation is also shown in more detail in Fig. 2 for six selected wind directions at Sómastaðagerði.

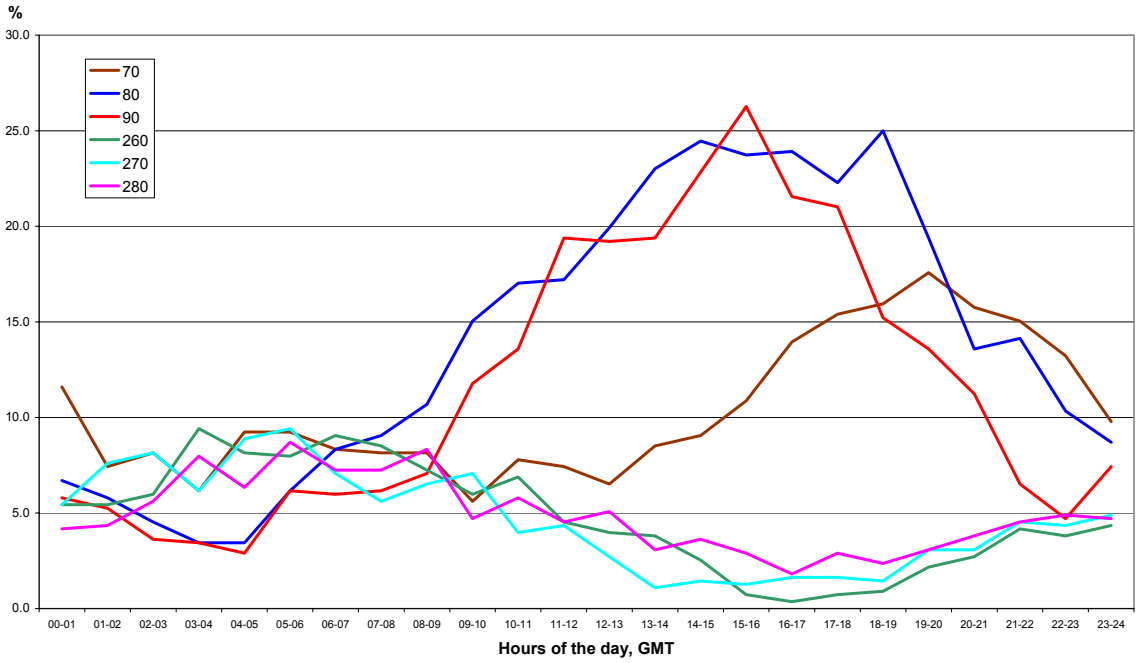

Fig. 2. Diurnal variation of percentage frequency for six selected wind directions, Sómastaðagerði, June-August 2001.

The easterly wind directions, 80° and 90°, are least frequent during middle of the night, increasing rapidly in the morning to a maximum in the afternoon. The east-northeasterly wind direction, 70°, peakes somewhat later, during the late afternoon and early evening.

The westerly winds vary less, but there is a maximum during night and a minimum during late afternoon.

The average 10-minute wind velocity at Sómastaðagerði for each of the months June 2001-May 2002 is presented in Table 2. For comparison averages for 6 other automatic weather stations in the Reyðarfjörður area are included. Observations are missing for Seley in April and May 2002.

Table 2. Average wind velocity at 10 m height at Sómastaðagerði and at 6 other automatic weather stations in the Reyðarfjörður area, June 2001-May 2002, m/s.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Sómastaðagerði	5.4	6.4	4.6	5.5	5.0	4.4	3.5	3.6	4.0	3.9	6.2	5.4	4.8
Ljósá	5.5	6.1	5.1	5.9	4.6	4.2	3.4	3.5	4.5	3.5	6.6	5.5	4.9
Kollaleira 2	4.6	5.8	4.6	5.3	4.7	3.9	3.0	3.0	3.4	3.4	5.4	4.7	4.3
Eskifjörður	4.9	6.3	4.4	5.6	5.5	4.8	3.4	3.6	4.1	4.1	5.7	5.7	4.8
Oddsskarð	6.5	6.3	5.1	6.3	5.0	3.7	3.4	3.8	4.3	5.2	6.9	5.7	5.2
Vattarnes	7.5	9.2	5.5	6.5	6.4	5.3	4.7	4.3	5.7	6.0	7.9	7.3	6.4
Seley	9.7	9.3	6.7	-	-	5.1	5.2	5.3	6.4	7.9	9.3	8.7	-

The average wind velocity at Sómastaðagerði for the 12 month period June 2001-May 2002 was 4.8 m/s. The lowest monthly mean was 3.5 m/s in July and the highest was 6.4 m/s in February. At each of the stations the 12 month mean velocity was slightly higher than for the previous 12 month period.

Table 3. Percentage frequency of 10-minute wind velocity for selected intervals, Sómastaðagerði, June 2001-May 2002.

m/s	0.0-0.9	1.0-1.9	2.0-2.9	3.0-3.9	4.0-4.9	0.0-4.9	5.0-9.9	10.0-14.9	15.0-19.9	20.0-24.9	>25.0
Jan	6.3	11.9	12.2	8.4	8.0	46.9	45.6	6.8	0.7		
Feb	5.3	8.8	8.7	8.6	8.5	39.8	40.6	17.6	2.0		
Mar	8.3	17.6	15.9	9.8	7.9	59.4	33.0	7.3	0.2		
Apr	6.5	11.3	11.5	9.3	10.0	48.6	41.2	9.6	0.7		
May	7.4	12.3	11.4	11.2	11.6	53.9	39.1	6.4	0.6		
Jun	11.5	13.8	10.0	11.6	13.1	59.9	34.6	5.5			
Jul	15.0	14.7	16.8	17.7	13.5	77.6	20.3	2.1			
Aug	17.2	13.0	12.6	14.5	14.9	72.2	26.9	1.0			
Sep	22.3	19.9	10.9	6.3	5.2	64.7	26.8	8.4	0.1		
Oct	10.6	18.3	15.3	12.4	11.1	67.6	30.3	2.1			
Nov	6.2	13.0	8.3	7.5	7.8	42.8	39.8	13.8	2.9	0.7	
Dec	4.4	15.5	10.6	8.7	9.5	48.7	39.6	10.6	0.9	0.2	
Year	10.1	14.2	12.0	10.5	10.1	56.8	34.8	7.6	0.7	0.1	

Of the 10-minute wind velocity observations at Sómastaðagerði during the 12 month period, 24.3 % were below 2.0 m/s, 56.8 % below 5.0 m/s and 91.6 % below 10.0 m/s. In September 2001 42.2 % of the 10-minute wind observations were below 2.0 m/s.

The highest 10-minute wind velocity observed at Sómastaðagerði during the 12 month period was 24.9 m/s on November 10th 2001, wind direction 265°. The highest recorded wind gust was 36.9 m/s on the same day. This yields a gust factor of 1.48.

The average wind velocity for each wind direction at Sómastaðagerði is presented in Table 4. For each month the highest average is indicated with bold letters.

Table 4. Average wind velocity for each wind direction,
Sómastaðagerði, June 2001-May 2002, m/s.

		Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Year
N	**360**	6.2	3.5	1.0	3.0	**5.8**	1.9	2.8	5.6	3.7	5.3	6.2	6.0	4.7
	10	3.2	1.8	1.0	1.8	1.5	1.3	2.3	1.9	2.6	4.9	1.4	4.3	2.4
	20	1.1	1.1	1.2	1.3	1.5	1.7	2.0	1.8	2.2	2.1	1.6	1.4	1.8
	30	1.4	1.2	1.3	1.0	1.5	1.8	1.9	1.8	2.4	2.2	1.3	1.7	1.8
	40	1.2	1.7	1.9	1.2	2.0	2.3	2.7	2.9	4.3	2.5	2.0	2.2	2.1
	50	1.9	2.1	2.1	2.0	2.5	3.1	3.1	3.9	3.9	3.3	3.3	3.0	2.9
	60	3.0	3.0	3.3	2.9	4.1	4.9	3.9	4.5	5.7	4.7	4.7	4.3	3.9
	70	3.9	3.8	3.9	3.9	5.0	5.0	4.3	5.1	7.2	5.6	5.4	5.0	4.8
	80	4.6	4.0	4.0	5.2	4.5	4.6	4.2	**7.0**	7.3	5.6	5.7	5.0	5.0
E	**90**	4.9	3.7	4.1	4.2	3.3	5.6	6.2	6.7	6.8	6.0	4.5	4.5	4.7
	100	3.5	3.0	4.2	3.0	3.3	4.5	6.5	5.6	6.3	6.0	5.1	4.1	4.2
	110	2.5	2.8	3.4	3.0	4.0	3.6	5.4	5.9	4.7	4.7	6.0	2.3	4.0
	120	2.2	4.0	4.1	3.6	4.8	5.2	4.3	6.1	4.4	4.5	4.9	1.8	4.2
	130	1.4	3.1	4.4	3.0	4.8	6.3	5.0	6.3	3.7	2.2	4.3	1.5	4.0
	140	1.1	2.2	2.7	2.4	4.3	2.6	3.5	5.2	3.3	2.0	3.8	1.5	3.3
	150	1.4	1.1	3.6	2.4	3.6	3.7	4.3	4.8	3.1	3.3	3.9	1.2	3.0
	160	1.5	1.4	1.3	2.1	2.4	4.2	5.2	4.2	2.1	1.5	2.8	1.2	2.8
	170	1.4	1.1	2.0	1.5	3.6	4.6	5.7	5.4	5.5	1.9	3.3	1.6	2.9
S	**180**	1.2	1.8	3.7	1.6	2.4	4.6	5.4	5.0	5.5	1.5	3.5	1.9	3.4
	190	1.3	2.7	3.7	1.3	2.0	3.9	4.3	4.6	6.0	1.3	2.6	1.9	3.3
	200	1.3	2.2	2.7	1.3	2.3	2.8	4.7	4.9	6.1	1.7	3.0	2.0	3.1
	210	1.3	2.0	2.9	1.5	2.3	4.9	4.5	6.5	5.3	1.7	2.0	2.3	3.4
	220	1.4	1.8	2.2	1.2	1.7	2.0	4.3	5.4	4.2	2.1	1.9	2.9	2.7
	230	2.2	1.5	2.0	1.7	2.2	3.3	3.1	5.3	4.0	2.2	2.0	2.9	2.7
	240	2.6	1.8	2.2	2.2	2.4	3.1	3.4	4.7	5.7	2.7	2.9	4.0	3.1
	250	3.4	3.0	3.7	2.5	3.0	5.6	5.5	6.3	7.4	4.1	5.5	4.0	4.6
	260	5.1	4.0	4.3	3.3	4.1	7.9	6.2	**7.0**	7.6	4.4	7.5	5.5	5.8
W	**270**	6.3	5.9	4.2	5.4	5.3	**8.3**	6.4	6.1	**8.2**	6.1	7.2	**7.5**	6.8
	280	7.5	**6.5**	5.9	6.5	4.8	8.0	6.8	5.6	7.6	**6.4**	7.4	7.3	**7.0**
	290	**7.6**	6.3	**6.3**	**8.0**	4.7	7.9	**7.0**	5.1	7.4	4.7	7.8	6.0	6.8
	300	6.4	4.6	4.1	7.9	4.2	6.2	5.7	5.1	6.0	3.8	7.8	6.3	6.0
	310	6.6	3.1	3.9	5.7	3.8	5.3	5.5	3.8	4.8	3.3	7.0	6.5	4.9
	320	5.1	3.0	2.3	4.1	4.0	4.9	5.6	3.0	3.4	2.8	5.8	6.3	4.5
	330	5.0	1.9	1.8	1.7	3.1	3.9	4.9	2.5	3.9	2.2	3.2	5.7	3.8
	340	5.3	1.9	1.5	1.8	3.0	3.7	4.0	2.9	2.7	3.1	6.7	7.0	4.0
	350	5.3	3.7	1.0	2.4	4.5	2.4	2.6	5.5	4.3	4.6	**9.4**	7.2	4.9

The highest value in the table is 9.4 m/s (April, wind direction 350°). Most of the highest average values have, however, been in W-erly or WNW-erly wind directions during this 12 month period.

The distribution of 10-minute wind velocity at Sómastaðagerði in the period June 2001-May 2002 is presented in Fig. 3.

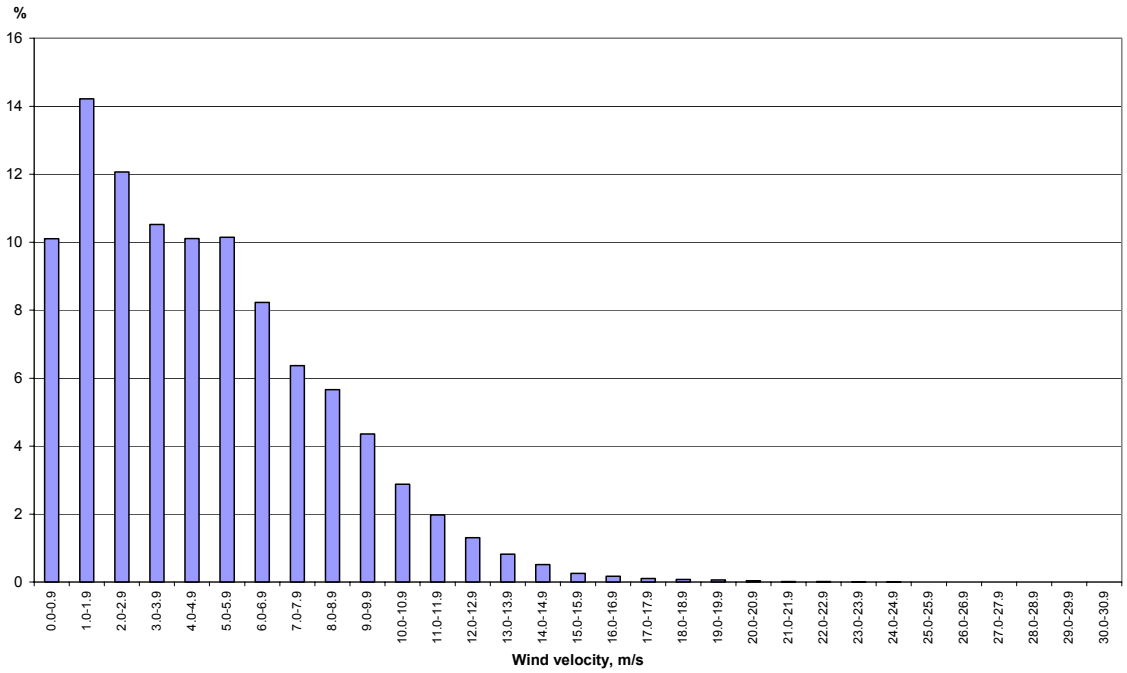

Fig. 3. Wind velocity distribution at Sómastaðagerði, 10-minute means, June 2001-May 2002, %.

The high frequency of very low velocities is evident at Sómastaðagerði. For comparison the corresponding wind velocity distribution for Vattarnes is shown in Fig. 4.

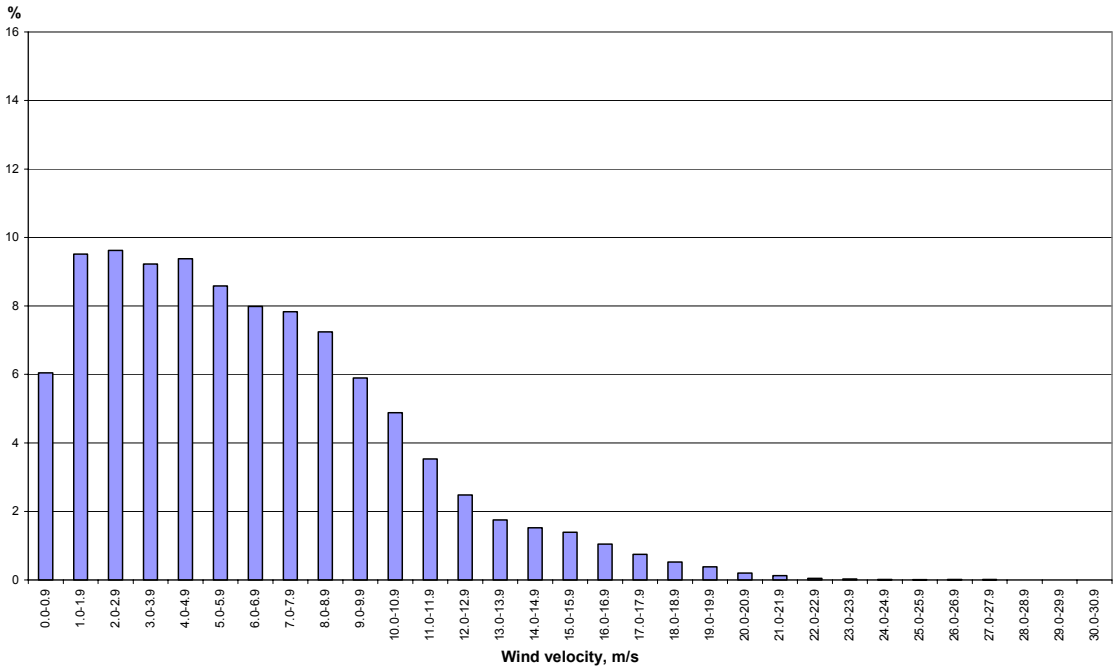

Fig. 4. Wind velocity distribution at Vattarnes, 10-minute means, June 2001-May 2002, %.

The difference between the wind climate at Sómastaðagerði in the inner part of Reyðarfjörður and at Vattarnes at the mouth of Reyðarfjörður is apparent.

The diurnal variation of wind velocity is considerable at Sómastaðagerði during summer. This variation is shown in Fig. 5 for the months June-September 2001 as well as for January and May 2002.

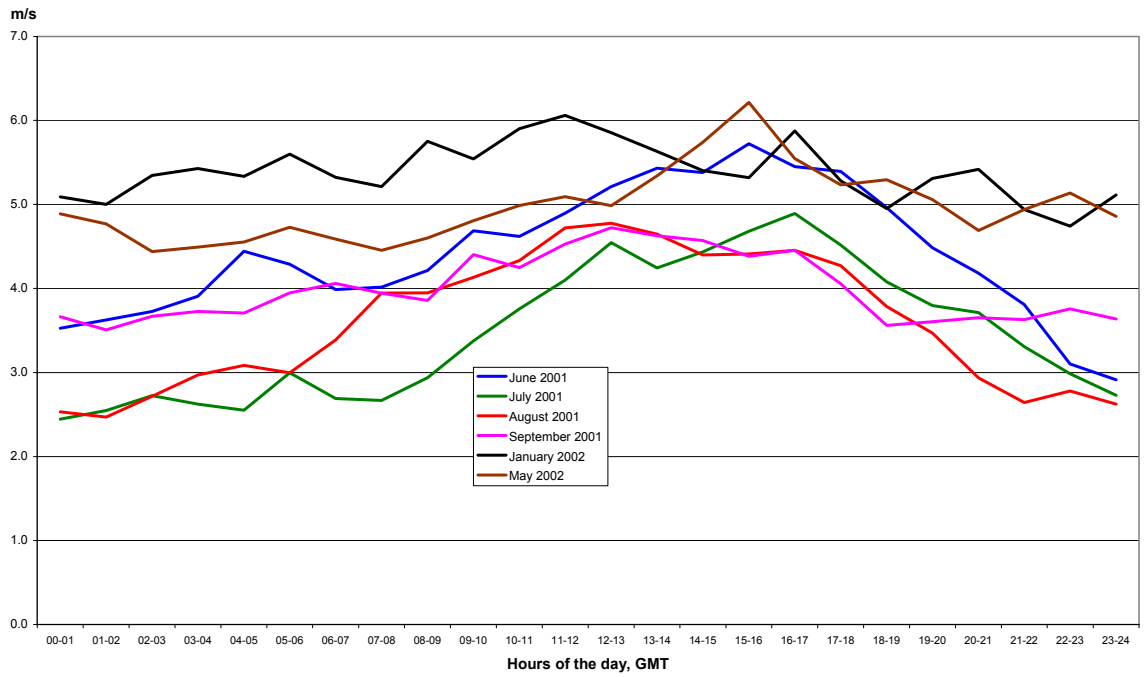

Fig. 5. Diurnal variation of wind velocity at Sómastaðagerði, June-September 2001, January and May 2002, m/s.

3. Wind observations at Ljósá, Kollaleira 2, Eskifjörður, Vattarnes, and Seley

For the months June 2001-May 2002 the percentage frequency of the wind directions and the average wind speed in each wind direction is presented for Ljósá in Annexes 6-8. Mean frequencies for the whole 12 month period, for the 6 month winter and summer periods and for the 3 month high summer period are shown in Annex 9. Night and day values for the high summer months are presented in Annex 10. Similarly values for Kollaleira 2 are to be found in Annexes 11-15, for Eskifjörður in Annexes 16-20, for Vattarnes in Annexes 21-25, and finally for Seley in Annexes 26-29. Unfortunately the anemometer at Seley broke down at the end of March 2002 and no wind data are therefore available for that station for April and May 2002.

Information on the monthly average wind velocity at the above stations is presented in Table 2.

Attention has earlier (Ref. 5) been drawn to the great difference between the wind roses for Sómastaðagerði and Ljósá on the one hand and for Vattarnes and Seley on the other hand. The prevalence of easterly winds at Sómastaðagerði and Ljósá during the summer half of the year is in contrast to Seley and Vattarnes at the mouth of the fjord. This is now confirmed by the additional observations presented in this report.

To maintain the frequent easterly winds in the inner part of the fjord during summer air must be descending over the outer part of the fjord. Accordingly the sea and land breeze circulation largely appears to take place inside Reyðarfjörður.

Attention is also drawn to the higher frequency of easterly winds at Ljósá (elevation 280 m) than at Sómastaðagerði (elevation 32 m) and Kollaleira 2 (elevation 43.5 m), indicating that the cold westerly winter and night outflow in Reyðarfjörður is not always very thick. Easterly winds are in those cases observed at Ljósá while westerly winds are blowing at Sómastaðagerði and Kollaleira 2.

The easterly sea breeze usually reaches higher than Ljósá and even higher than Oddsskarð (elevation 520 m).

4. Air Temperature and Stability Observations at Sómastaðagerði

Monthly average temperature at 3.0 m, 10.5 m and 36.5 m above the ground at Sómastaðagerði is presented in Table 5. The thermometers were calibrated on August 14th 2001 and August 17th 2002. At the 10.5 m and 36.5 m levels the thermometer corrections were unchanged from before, i.e. +0.1° C. At the 3.0 m height the correction was +0.2° C, slightly lower than in June 2000. The appropriate corrections have been applied in Table 5 and in Annexes 30-35.

For each month the stability variations from day to day are presented in Annexes 30-35. Stable air is seen to be prevalent below the 36.5 m level during the months October-March. On the other hand during the months April-September semi-regular stability variations from day to night are characteristic. The ground-based air layer is then frequently stable at night but neutral or unstable during the day.

Table 5. Monthly average temperature at 3.0 m, 10.5 m and 36.5 m above the ground at Sómastaðagerði during the period June 2001-May 2002, and average temperature difference between the 36.5 m and 3.0 m levels and between the 36.5 m and 10.5 m levels, °C.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Sómastaðagerði $T_{3.0}$	1.38	-2.37	-0.91	3.97	5.06	6.66	9.37	9.12	7.77	6.23	1.69	2.03	4.17
Sómastaðagerði $T_{10.5}$	1.67	-2.17	-0.70	4.03	4.99	6.50	9.28	9.09	7.95	6.40	2.04	2.51	4.30
Sómastaðagerði $T_{36.5}$	1.77	-2.17	-0.65	3.97	4.86	6.32	9.14	8.99	8.00	6.43	2.16	2.76	4.30
$T_{36.5} - T_{3.0}$	0.39	0.20	0.26	0.00	-0.20	-0.34	-0.23	-0.13	0.23	0.20	0.47	0.73	0.13
$T_{36.5} - T_{10.5}$	0.10	0.00	0.05	-0.06	-0.13	-0.18	-0.14	-0.10	0.05	0.03	0.12	0.25	0.00

Due to the small difference in height between the thermometer levels the averages in the table are given with two decimals. However, it should be pointed out that the second decimal is somewhat uncertain.

As seen in the table the mean temperature for the months September-March was higher at the 36.5 m level than at the 3.0 m level, indicating prevalent stability at ground level during these months.

For each of the months June-August 2001 and May 2002 the average diurnal variation of the vertical temperature gradient observed in the mast at Sómastaðagerði is

presented in Annexes 36 and 37. On the average for these months the lowest air layer beetween 36.5 m and the ground is seen to be stable during the night but neutral or unstable during the day.

5. Monthly Mean Temperature in the Reyðarfjörður Area

Monthly average temperatures at 3.0 m above the ground at Sómastaðagerði and at 2.0 m above the ground at six other weather stations in the Reyðarfjörður area are presented in Table 6 for the period June 2001- May 2002. Thermometer correction + 0.2° C has been applied at Sómastaðagerði but no correction at the other stations.

Table 6. Monthly average temperatures at 3.0 m above the ground at Sómastaðagerði and at 2.0 m above the ground at six other weather stations in the Reyðarfjörður area, June 2001-May 2002, °C.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Sómastaðagerði$_{3.0}$	1.4	-2.4	-0.9	4.0	5.1	6.7	9.4	9.1	7.8	6.2	1.7	2.0	4.2
Kollaleira	0.9	-3.0	-1.3	3.8	5.0	7.2	9.9	9.4	7.8	6.1	1.0	1.4	4.0
Kollaleira 2	0.8	-3.1	-1.3	3.8	5.0	6.9	9.6	9.2	7.8	5.9	1.1	1.4	3.9
Ljósá	-0.1	-4.1	-2.1	2.4	3.6	5.4	8.2	7.8	6.8	4.8	0.5	1.1	2.9
Vattarnes	2.0	-1.0	0.0	3.4	4.1	5.6	8.3	8.2	7.8	6.4	2.9	2.7	4.2
Eskifjörður	1.5	-2.4	-0.9	3.9	4.9	6.4	9.2	9.2	7.8	6.2	1.6	1.7	4.1
Oddsskarð	-1.9	-6.1	-4.0	0.3	1.9	3.9	6.5	6.1	5.6	3.0	-1.3	-0.7	1.1

Attention is drawn to the different elvation of the stations: Oddsskarð is 520 m above mean sea level, Ljósá 280 m, Kollaleira 41 m, Kollaleira 2 43 m, Sómastaðagerði 32 m, Vattarnes 6 m and Eskifjörður 2 m.

As seen in the table Vattarnes at the mouth of Reyðarfjörður had higher monthly mean temperatures than the other stations during October-March. On the other hand during April-August Vattarnes had lower monthly means than the lowland stations inside Reyðarfjörður.

6. Air Temperature Difference Kollaleira 2 - Vattarnes

The air temperature difference between the automatic stations Kollaleira 2 and Vattarnes are presented in Annexes 38-41.

The semi-regular diurnal variation of the temperature difference is especially apparent during the months May-August. This temperature difference is the driving force for the important sea and land breeze circulation in Reyðarfjörður during the summer.

The dominant westerly winds at Sómastaðagerði during winter are explained by the outflow of relatively cold air from the mainland, mountains and valleys, towards the warmer sea.

7. Simultaneous Observations of Wind Direction and Wind Velocity at Sómastaðagerði and Ljósá, and of the Temperature Difference Ljósá-Sómastaðagerði and Oddskarð-Eskifjörður, June 2001-May 2002.

For an overview of the meteorological factors which would mainly influence the dispersion of pollutants, emitted from an aluminium smelter at Sómastaðagerði, graphs are presented in Annexes 42-53 for each of the months June 2001-May 2002 showing simultaneous observations of wind direction at Sómastaðagerði and Ljósá (on top of the Annexes), of wind velocity at these stations (in the middle of each Annex), and of the temperature difference between Ljósá and Sómastaðagerði on the one hand and between Oddsskarð and Eskifjörður (at the bottom of the Annexes).

As pointed out in previous report (Ref.5), and as seen by the simultaneous observations of wind direction presented in this report, the easterly sea breeze usually reaches higher than the station Ljósá (elevation 280 m) and even higher than Oddsskarð (elevation 520 m) (Ref. 4).

On the other hand several periods have been observed with westerly winds at Sómastagerði and easterly winds at Ljósá, indicating that the common cold westerly outflow in Reyðarfjörður is not always very thick.

8. Remarks and Conclusions

From 1 May 1998 Veðurstofa Íslands has made wind, temperature and stability observations at Sómastaðagerði in Reyðarfjörður in order to provide meteorological data on which dispersion calculations for the planned aluminium smelter at Sómastaðagerði/Hraun can be based. Four years of observations are now available, and the observation programme is still ongoing.

A very valuable addition to the programme was the establishment in June 2000 of three automatic stations observing wind direction, wind velocity and air temperature in Reyðarfjörður: Kollaleira 2, Ljósá and Vattarnes. Two years of observations are now available for these stations. Observations are also available from other automatic stations in the Reyðarfjörður area: Eskifjörður, Oddsskarð and Seley. Important older observations are further available from Kollaleira, Leirur and and Eyri in Reyðarfjörður, from Mjóeyri in Eskifjörður and from Fagridalur.

Data from all these stations give together a relatively clear picture of the weather conditions and climate of Reyðarfjörður.

Reyðarfjörður is surrounded by mountains that reach more than 1000 m high and the wind is strongly influenced by the topography, as seen from the many wind roses presented in this and earlier reports. At Sómastaðagerði outgoing westerly winds dominate during the winter, but incoming easterly and east-northeasterly winds are overwhelmingly dominant during daytime in summer. During summer the easterly sea breeze sets in early in the morning and lasts until late afternoon, when the westerly land breeze usually takes over. As pointed out earlier the sea and land breeze circulation appears to take place largely inside Reyðarfjörður.

The prevalence of stable air and ground based inversions in Reyðarfjörður during winter and nights in summer is evident from the observations in the mast at Sómastaðagerði. This is confirmed by the observations of frequent positive temperature differences between Ljósá and Sómastaðagerði, and also between Oddsskarð and Eskifjörður. Obviously ground based inversions often reach higher than Ljósá and even higher than Oddsskarð.

The great and semi-regular diurnal variation during the summer of the stability of the air layer between 36.5 m and 3.0 m at Sómastaðagerði is clearly demonstrated in Annexes 30, 31 and 35.

The common westerly winds in Reyðarfjörður are favourable for blowing polluted air from the planned smelter out to sea. On the other hand the sea and land breeze circulation can possibly result in the same air blowing two or even three times over the smelter and the Búðareyri-town during the same day. In spite of good mixing during each circulation this would increase the concentration of pollution occurring at Búðareyri.

However, the most unfavourable conditions are probably periods with very low wind velocity and variable wind direction. Multiple entries of the same air over the smelter and the population center Búðareyri are then possible. Examples of unfavourable periods and single days are presented in Annexes 54-56.

Dispersion calculations have been carried out by the Norwegian Institute for Air Research (NILU), Kjeller, Norway (Ref. 9).

All observation data from the present observation network in the Reyðarfjörður area are stored in the computerized data base of the Icelandic Meteorological Office and can be obtained and used for further calculations as needed.

9. Stutt yfirlit á íslensku (Brief Summary in Icelandic)

Vegna áforma um álver í Reyðarfirði hefur Veðurstofa Íslands frá 1. maí 1998, eða um rúmlega fjögurra ára skeið, annast mælingar á vindátt, vindhraða og stöðugleika lofts í 38 metra háu mastri að Sómastaðagerði, hinum ráðgerða verksmiðjustað. Í byrjun júní 2000 voru til viðbótar settar upp sjálfvirkar veðurstöðvar sem mæla lofthita, vindátt og vindhraða að Kollaleiru við botn fjarðarins (Kollaleira 2), Vattarnesi við fjarðarmynnið og á mælistað sem kallaður hefur verið Ljósá í 280 m hæð yfir sjó á hjalla í fjallshlíðinni ofan og norðvestan við Sómastaðagerði. Hafa mælingar á þessum stöðum nú staðið um rúmlega tveggja ára skeið og gefið mikilvægar nýjar upplýsingar um vindafar í Reyðarfirði.

Greinargerð þessi nær til 12 mánaða tímabilsins júní 2001-maí 2002. Niðurstöður eldri mælinga á ofangreindum og öðrum mælistöðum í Reyðarfirði er, eins og gerð er grein fyrir í inngangskafla, að finna í fyrri skýrslum Veðurstofunnar (Ref. 1-8).

Í öðrum kafla þessarar skýrslu og viðaukum 1-5 er fjallað ítarlega um vindáttar- og vindhraðamælingar í Sómastaðagerði á 12 mánaða tímabilinu.

Í þriðja kafla og viðaukum 6-29 er fjallað um vindmælingar á mælistöðvunum Ljósá (á hjalla í 280 m hæð ofan við Sómastaðagerði), Kollaleiru 2 (við botn Reyðarfjarðar), Eskifirði (fyrir botni Eskifjarðar), Vattarnesi (við sunnanvert mynni Reyðarfjarðar) og Seley (um 5 km utan við norðanvert mynni Reyðarfjarðar).

Fjórði kafli fjallar í stuttu máli um hita- og stöðugleikamælingar lofts í mastrinu að Sómastaðagerði, en stöðugleikinn er sýndur dag fyrir dag í viðaukum 30-35 (sem hitamunur í 36.5 m og 3.0 m hæð, sem og í 36.5 m og 10.5 m hæð í mastrinu). Meðaldagssveifla stöðugleikans er svo sýnd fyrir mánuðina júní-ágúst 2001 og maí 2002 í viðaukum 36 og 37.

Í kafla 5 er sýndur meðallofthiti hvers mánaðar á tímabilinu júní 2001-maí 2002 á 7 veðurstöðvum á Reyðarfjarðarsvæðinu.

Í framhaldi af því er í kafla 6 fjallað um hitamun milli Kollaleiru 2 og Vattarness en lofthitamunur við botn og mynni Reyðarfjarðar hefur veigamikil áhrif á vindafar á Reyðarfjarðarsvæðinu. Þessi hitamunur er sýndur dag frá degi í viðaukum 38-41. Hlýrra er að jafnaði á Vattarnesi en á Kollaleiru að vetrarlagi en kaldara að sumarlagi. Hin mikla dagssveifla hitamunarins að sumarlagi endurspeglast í dagssveiflu hafgolu og landgolu í firðinum.

Kafli 7 fjallar um samtímaathuganir á vindátt og vindhraða að Sómastaðagerði og Ljósá og um hitamismun annars vegar á milli veðurstöðvanna Ljósár og Sómastaðagerðis en hins vegar milli veðurstöðvanna Oddsskarðs og Eskifjarðar. Eru samtímagildi fyrir hvern mánuð sýnd á línuritum í viðaukum 42-53. Línuritin eru hugsuð sem einfalt hjálpartæki til að finna óhagstæða veðurkafla með tilliti til dreifingar loftmengunar.

Í kafla 8 er fjallað í stuttu máli um aðstæður í Reyðarfirði og drepið á nokkrar niðurstöður mælinganna. Bent er á að Reyðarfjörður er umlukinn háum fjöllum og vindafar er mjög háð landslaginu og legu hæðarlína í landinu.

Að Sómastaðagerði eru vestlægir vindar ríkjandi að vetrinum og þeir eru einnig fremur algengir um blánóttina á sumrin. Austlæg hafgola ræður hins vegar ríkjum að deginum til að sumarlagi.

Vestlægar áttir eru hagkvæmar þar sem þær blása menguðu lofti út til sjávar og svo meðfram ströndinni. Hægar austlægar áttir eru hins vegar varasamar þar sem þær myndu flytja mengað loft frá álverinu yfir þéttbýlið á Búðareyri.

Í þessu sambandi er þess að geta að hringrás haf- og landgolu á sér greinilega stað innanfjarðar á Reyðarfirði. Sama loftið gæti því borist tvisvar eða jafnvel þrisvar yfir álverið og Búðareyri á sama degi. Gæti það valdið aukinni skammtíma mengun á Búðareyri, þótt veruleg þynning verði á mengunarefnunum á hinni löngu hringrás loftsins innan fjarðarins.

Hættulegri varðandi skammtíma mengun gætu þó reynst miklir hægviðriskaflar með breytilegri vindátt. Sama loftið gæti þá stöku sinnum borist margsinnis yfir álverið og svo yfir Búðareyri. Hafa áður verið sýnd dæmi af þessum toga og slík dæmi er einnig að finna í viðaukum 54-56.

Loks er þess að geta að öll athugunargögn frá núverandi veðurstöðvakerfi í Reyðarfirði eru geymd í tölvuvæddum gagnagrunni Veðurstofunnar og tiltæk til frekari úrvinnslu eftir því sem þörf kann að verða á.

10. References

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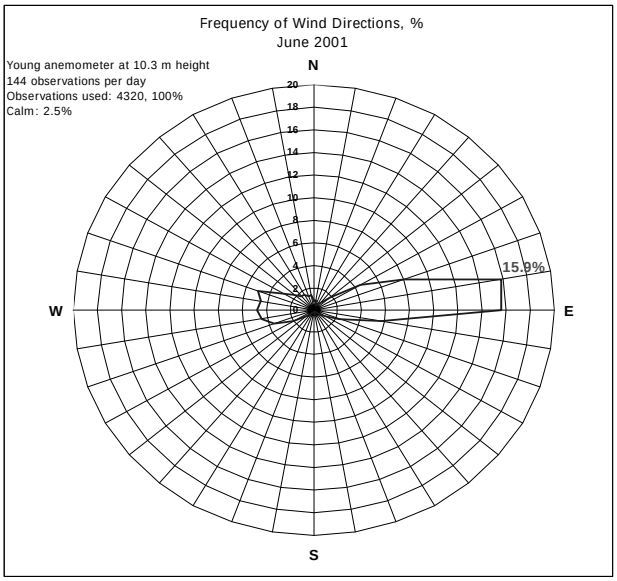
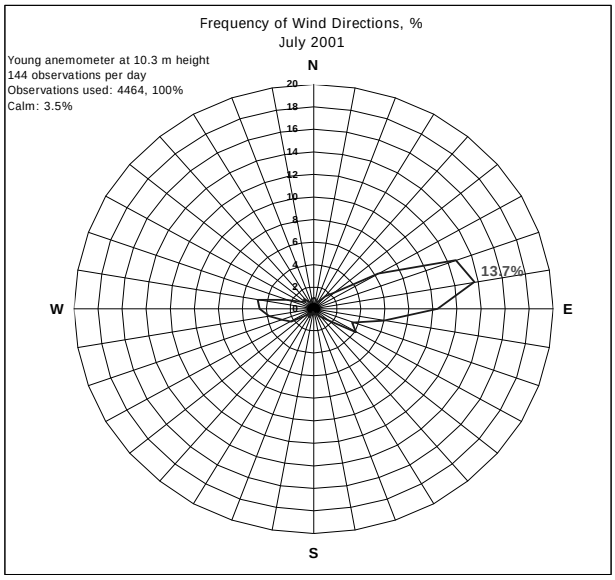
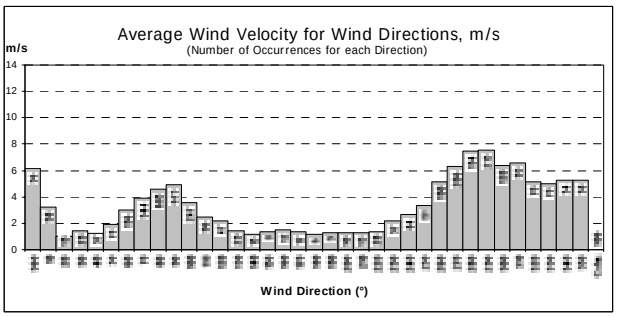
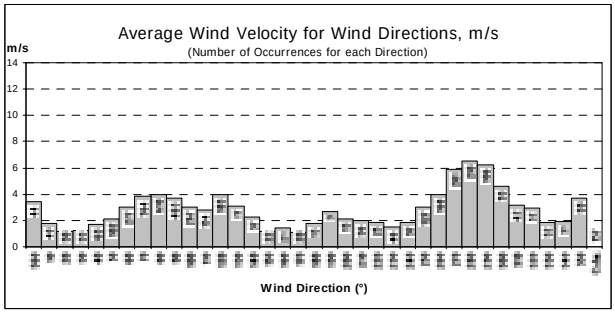
Annexes 1 - 56

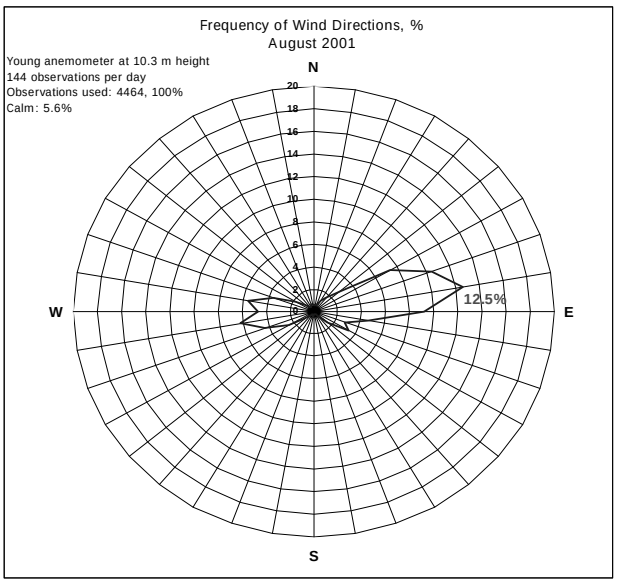
Sómastaðagerði

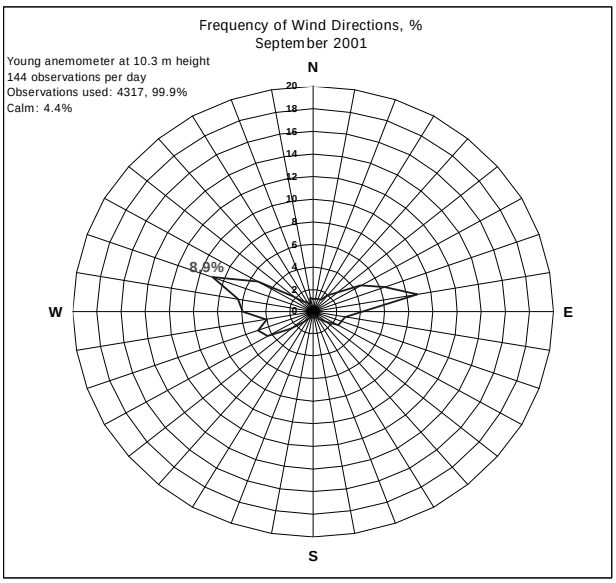


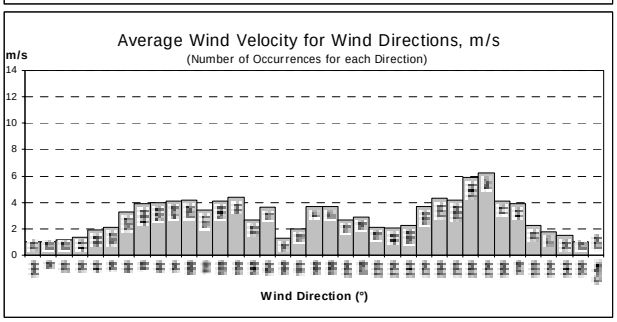


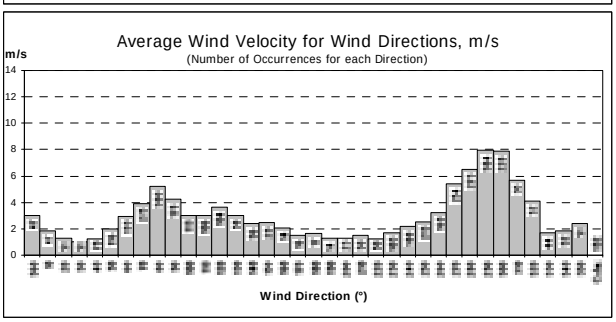






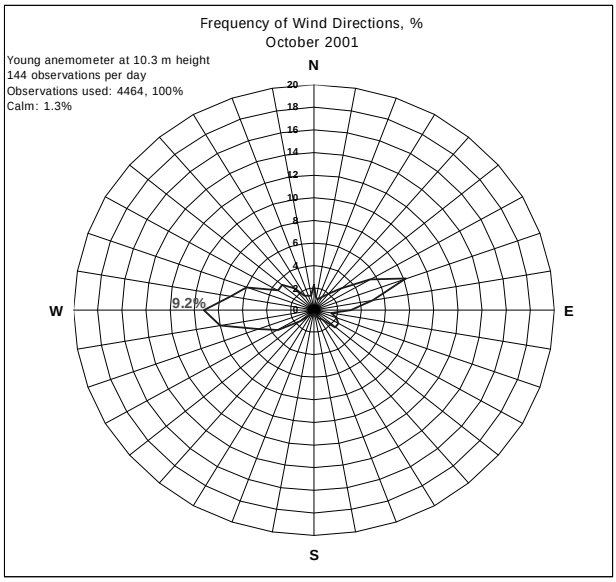


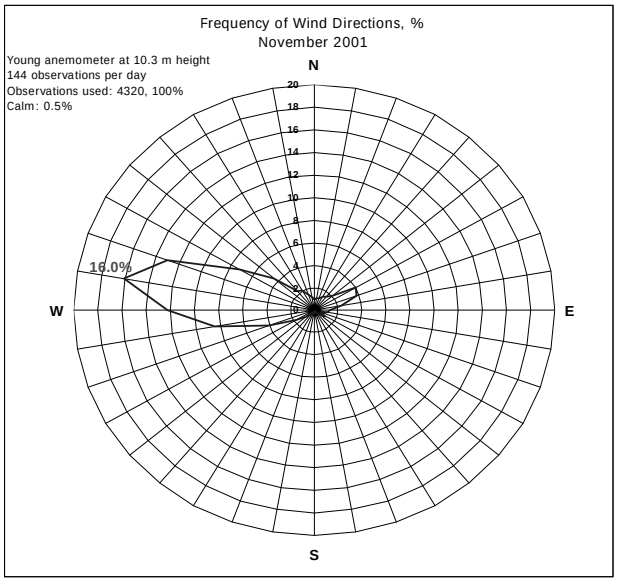


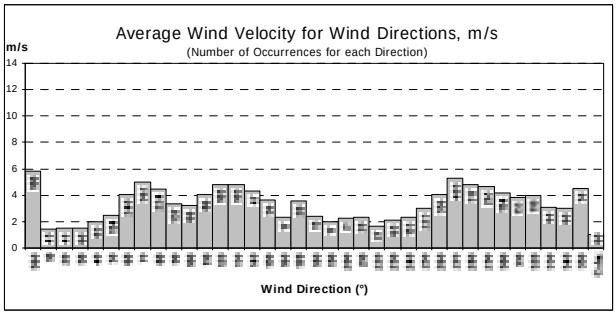


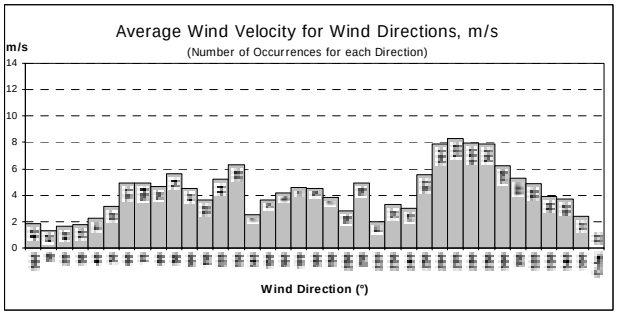
Annex 1

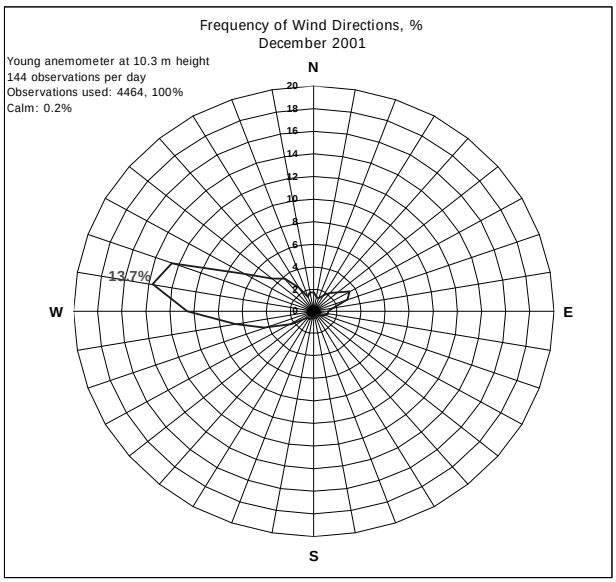
Sómastaðagerði

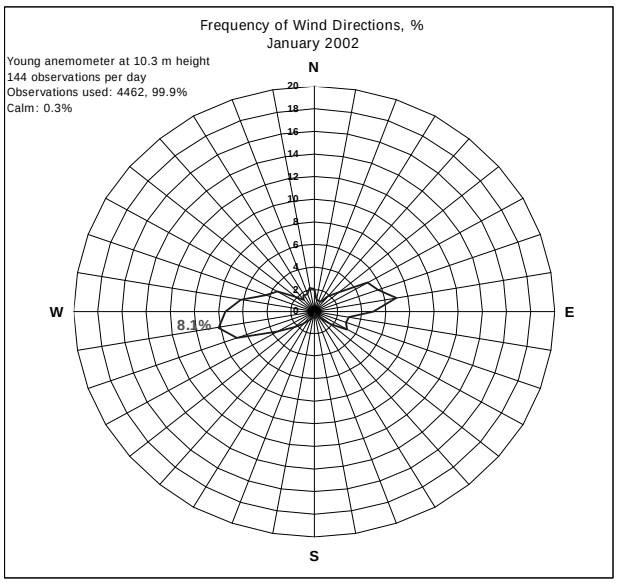


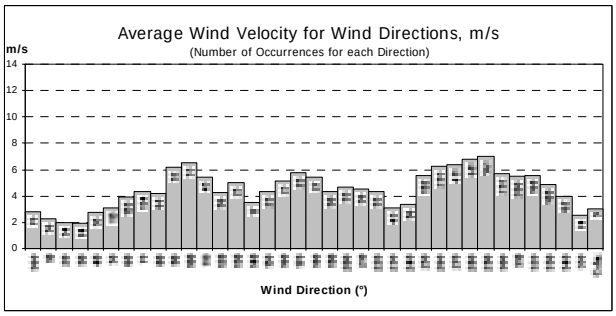


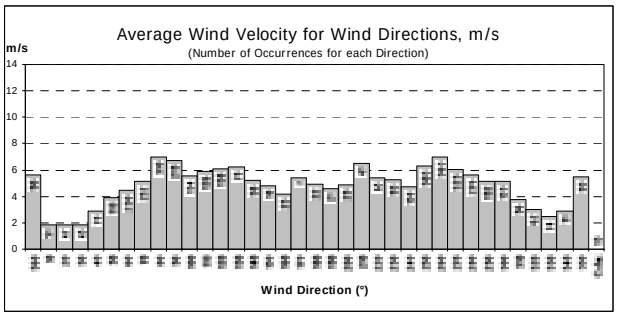






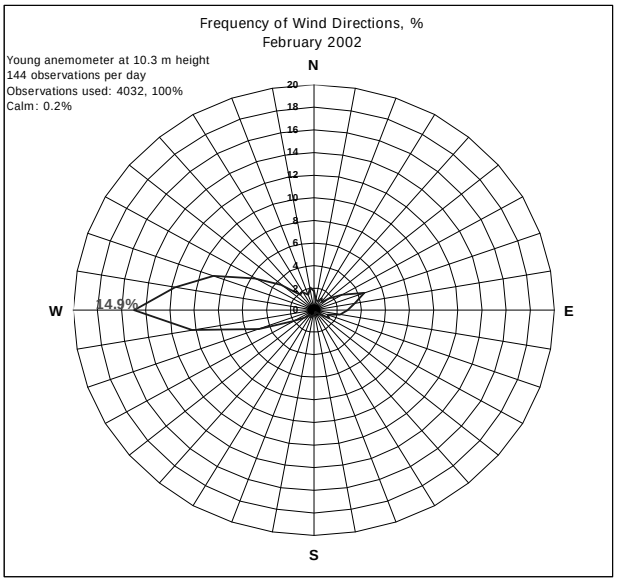


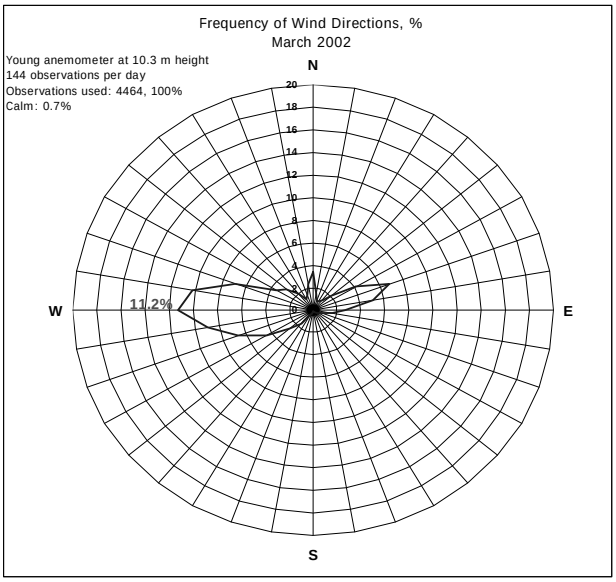


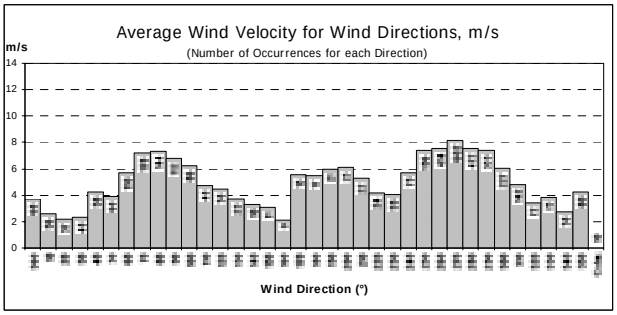


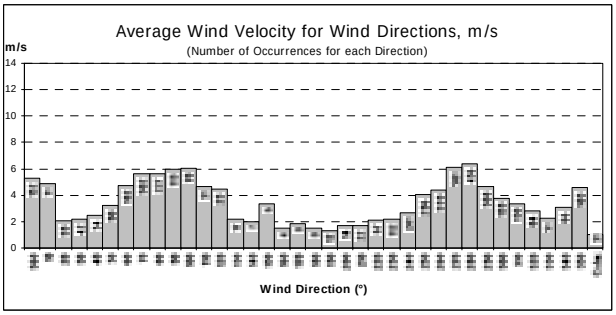
Annex 2

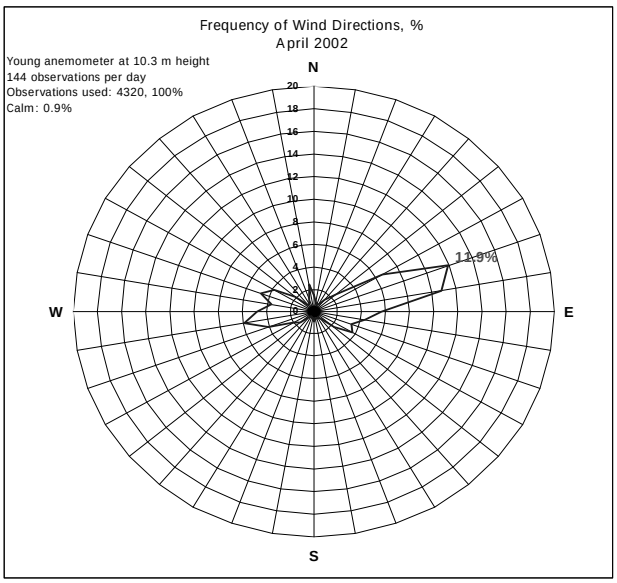
Sómastaðagerði

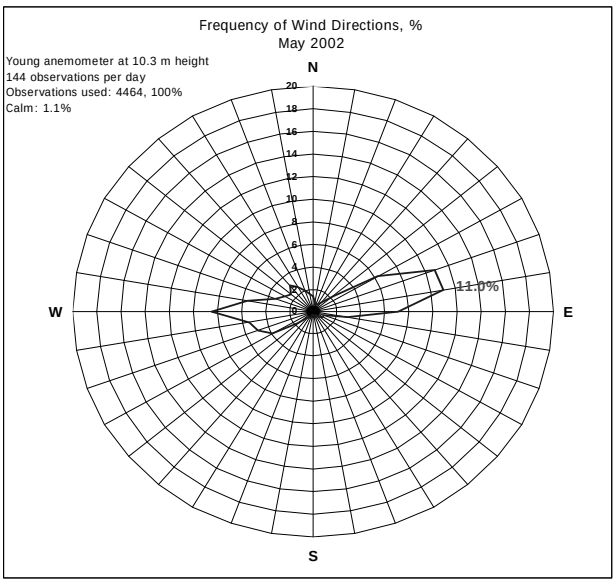


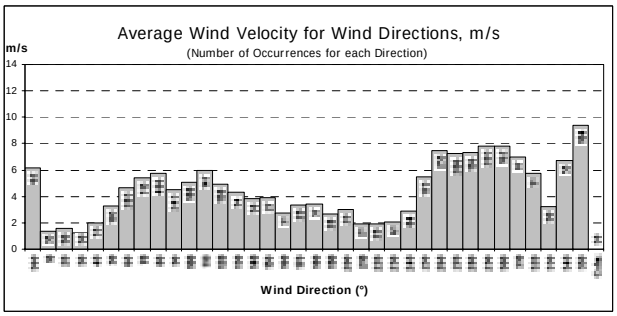


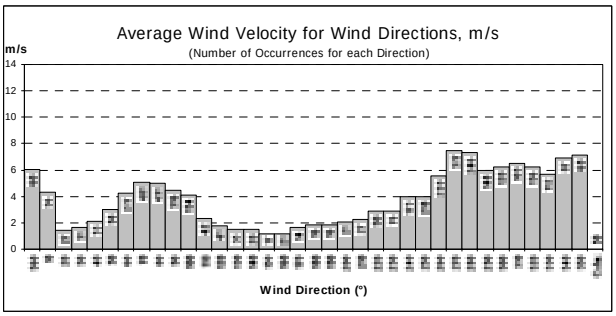






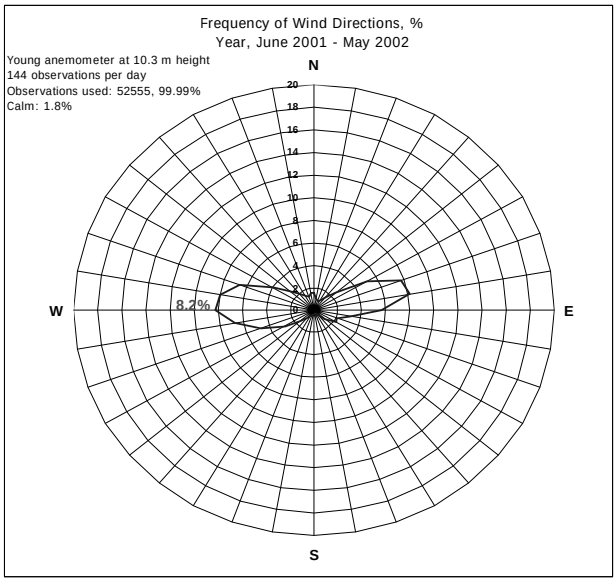


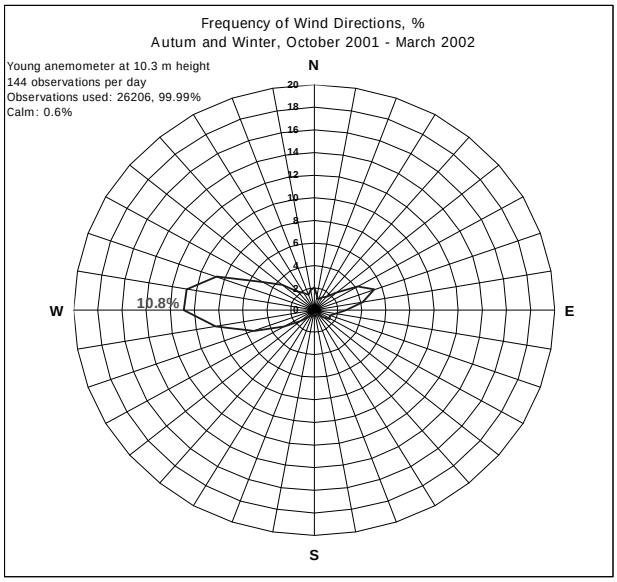


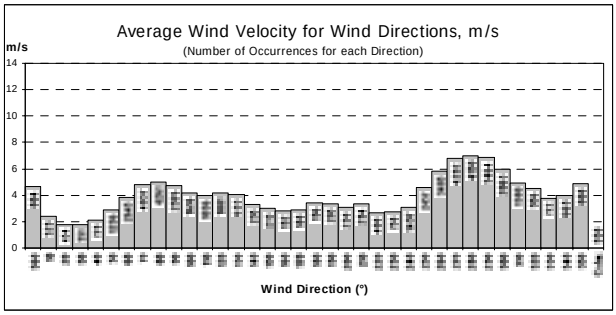


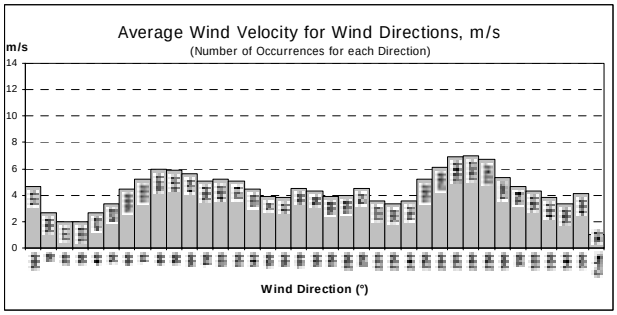
Annex 3

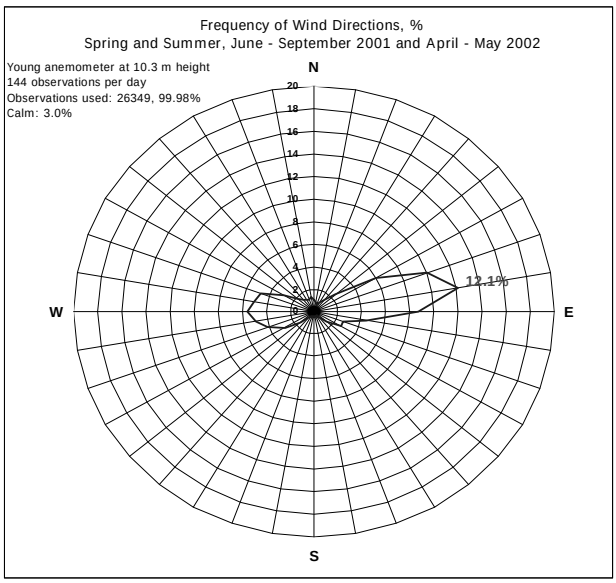
Sómastaðagerði

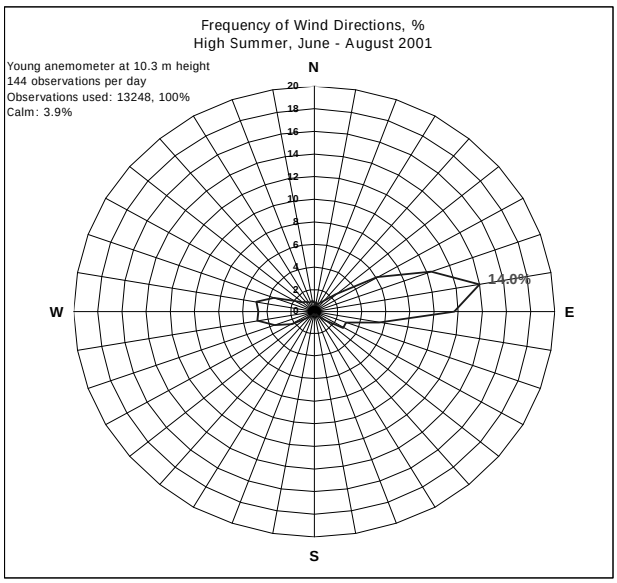


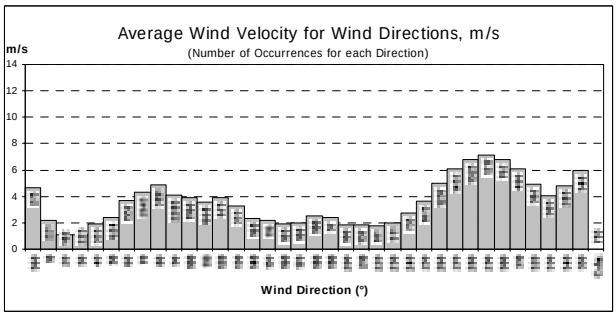


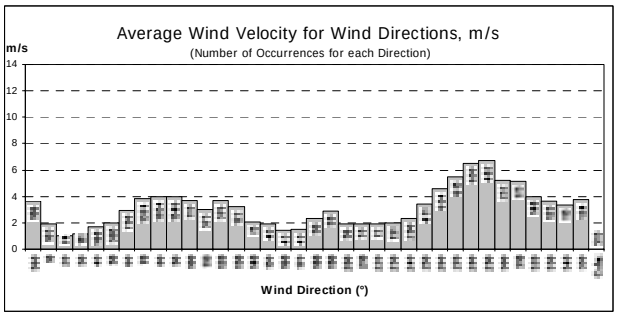






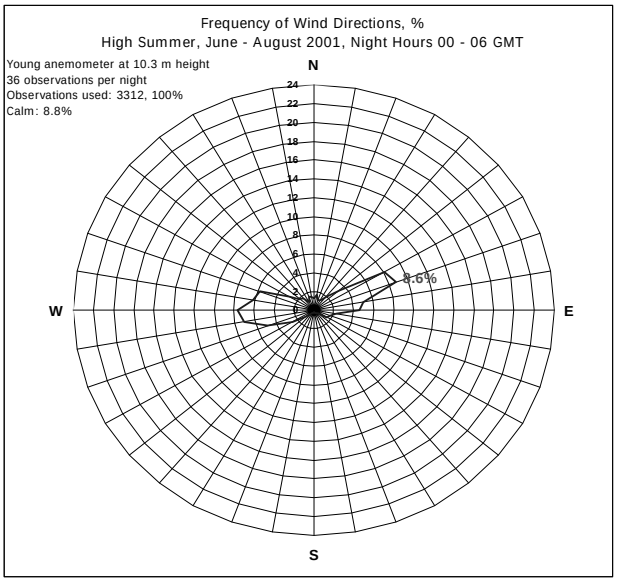


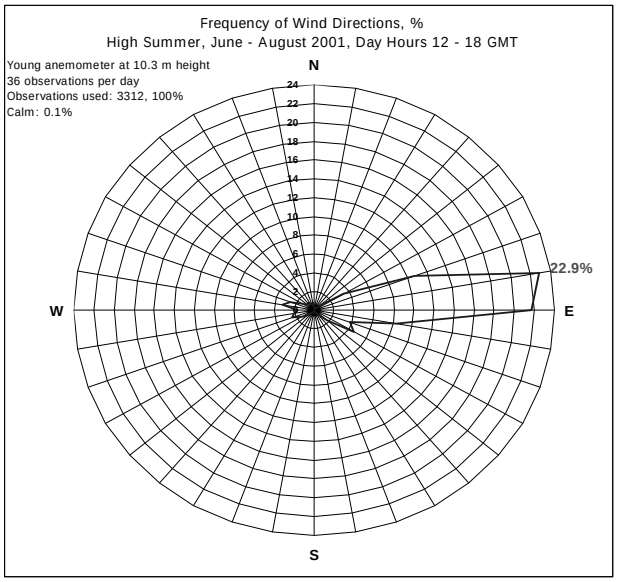


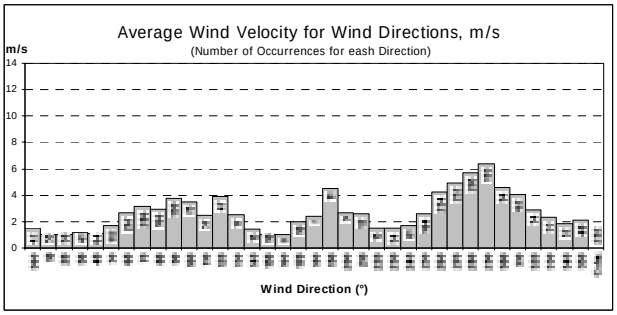


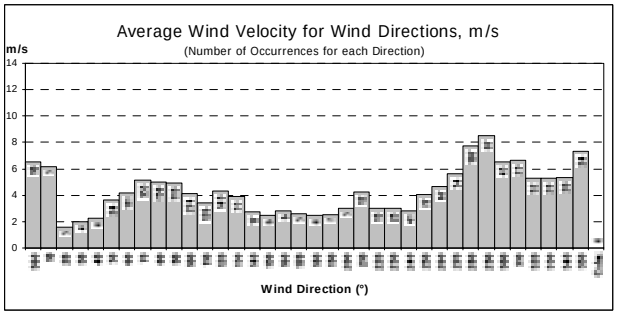
Annex 4

Sómastaðagerði



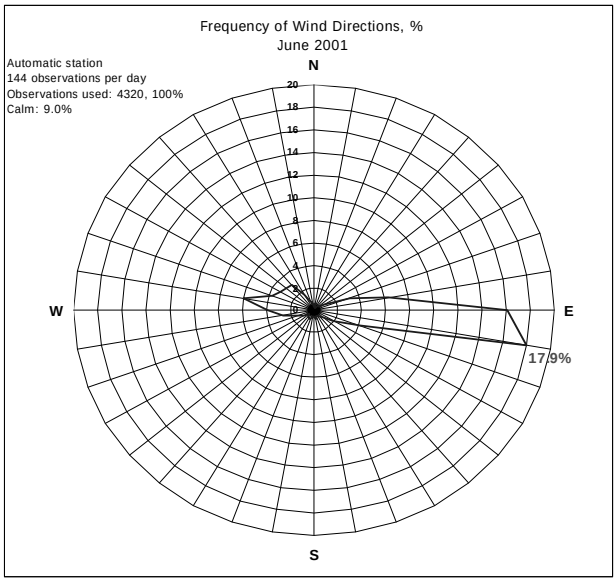


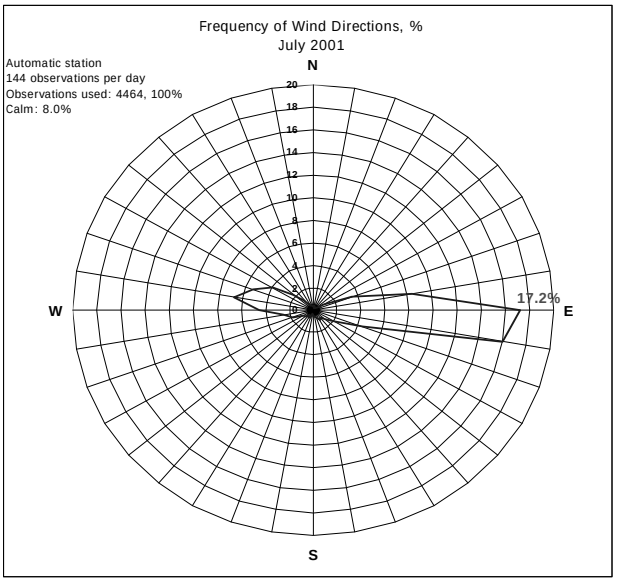


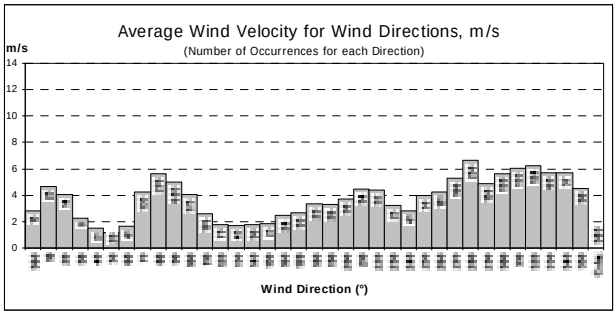


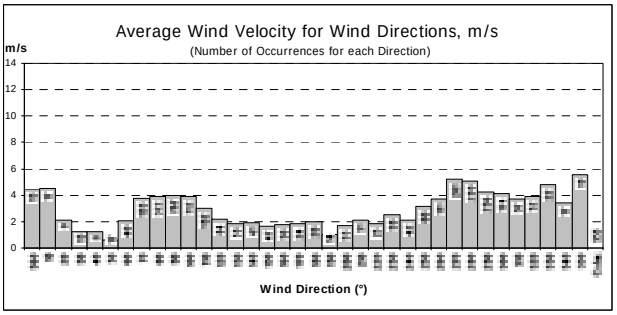
Annex 5

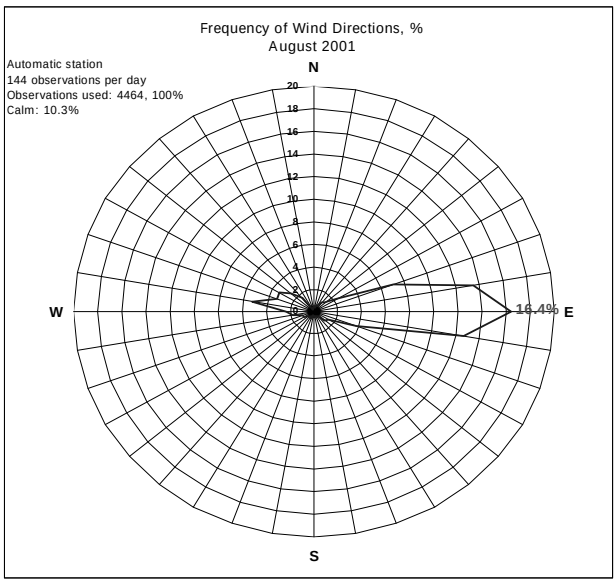
Ljósá

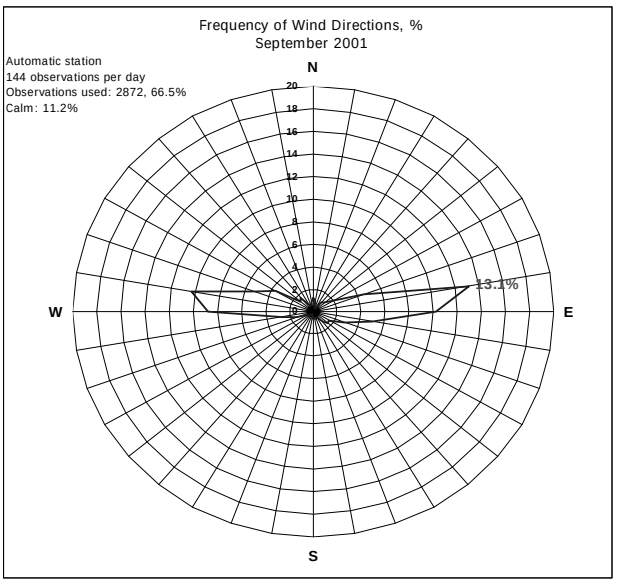


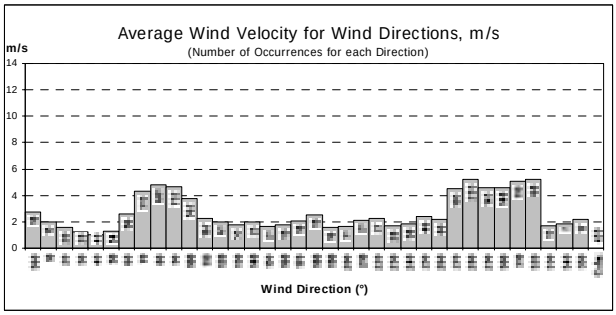


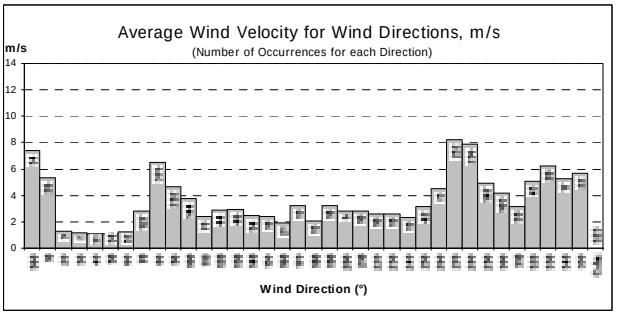






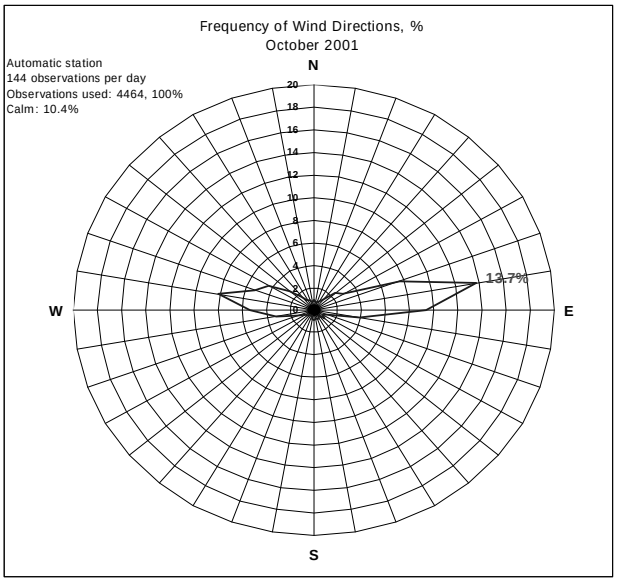


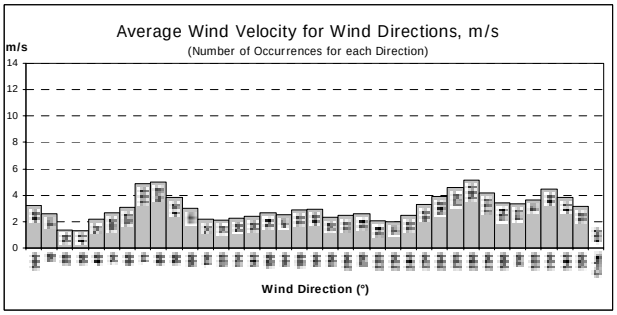


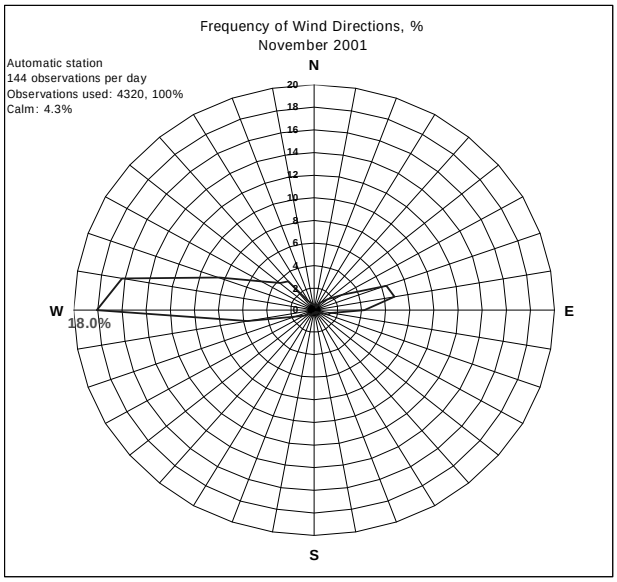


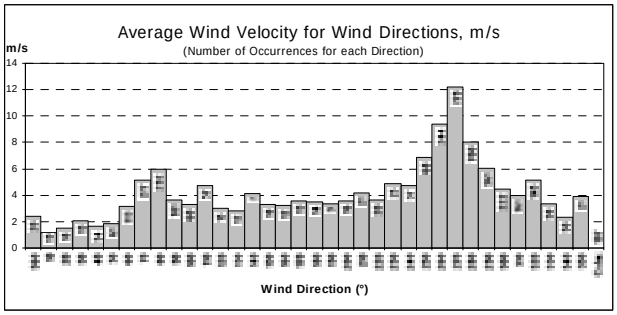
Annex 6

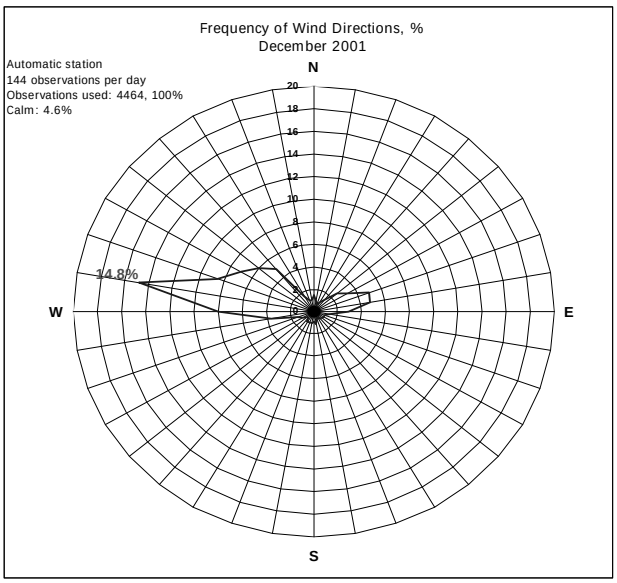
Ljósá

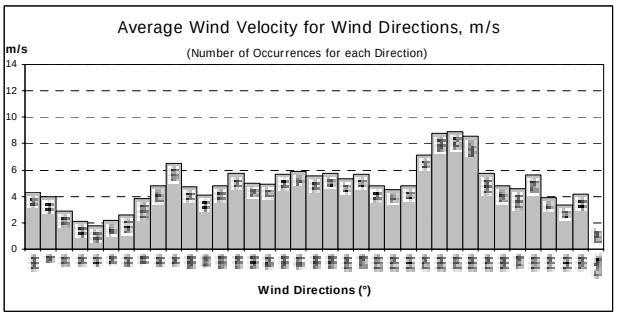


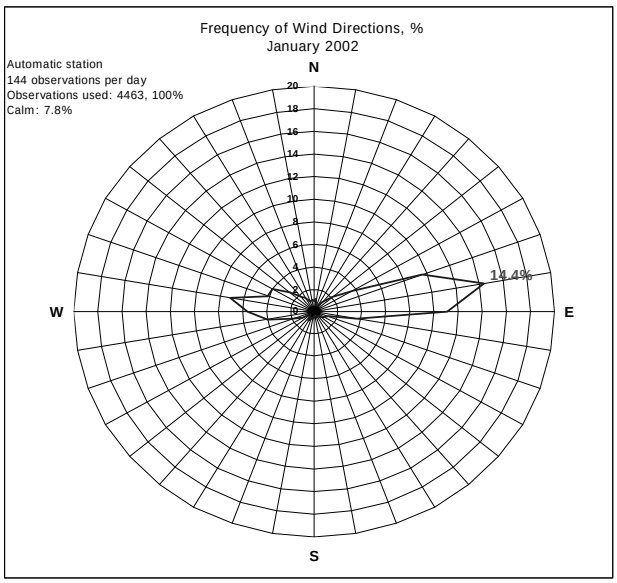


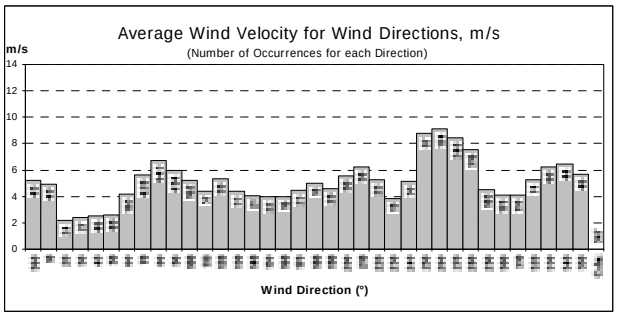






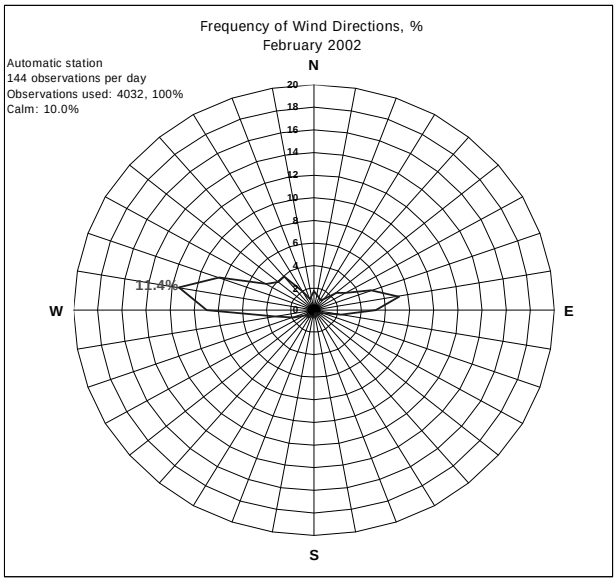


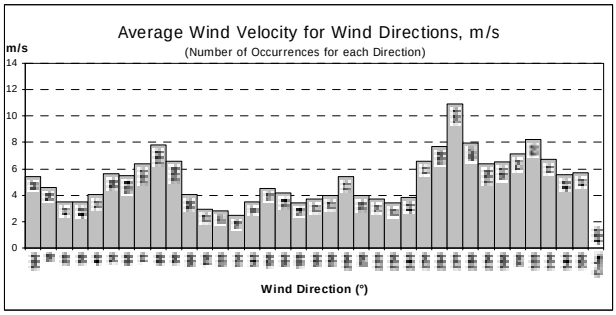


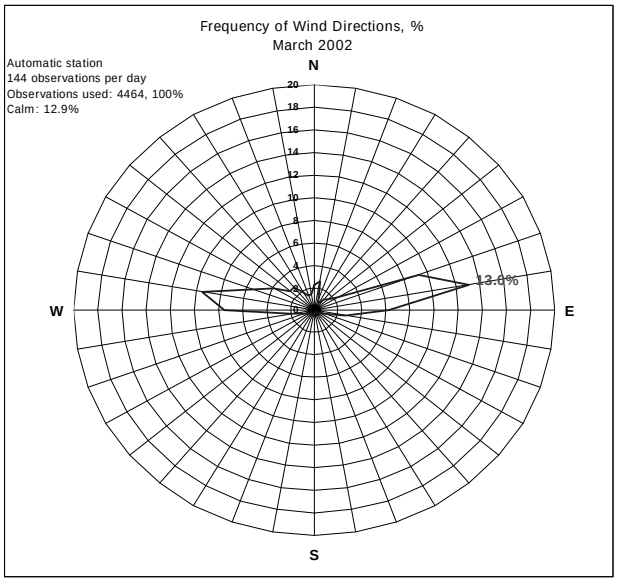


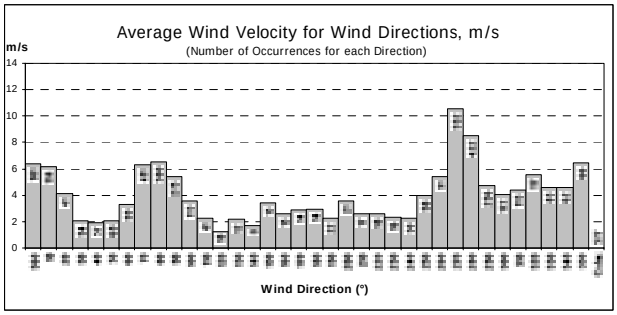
Annex 7

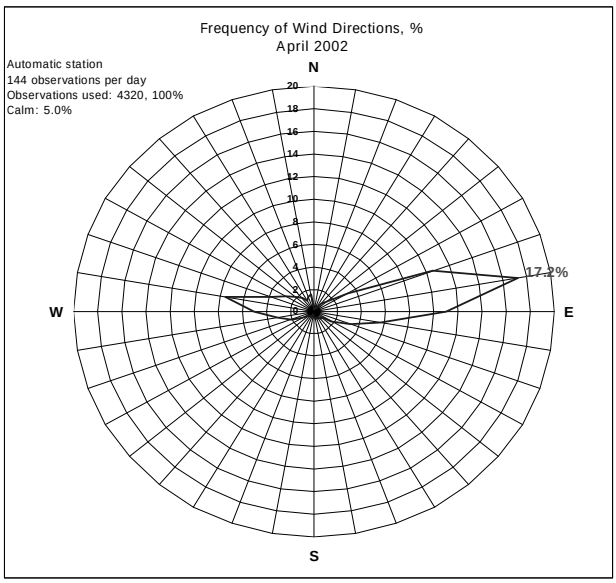
Ljósá

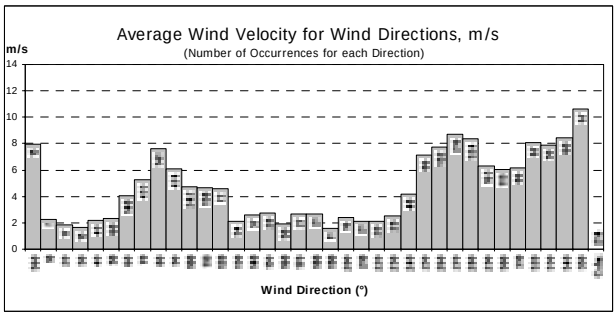


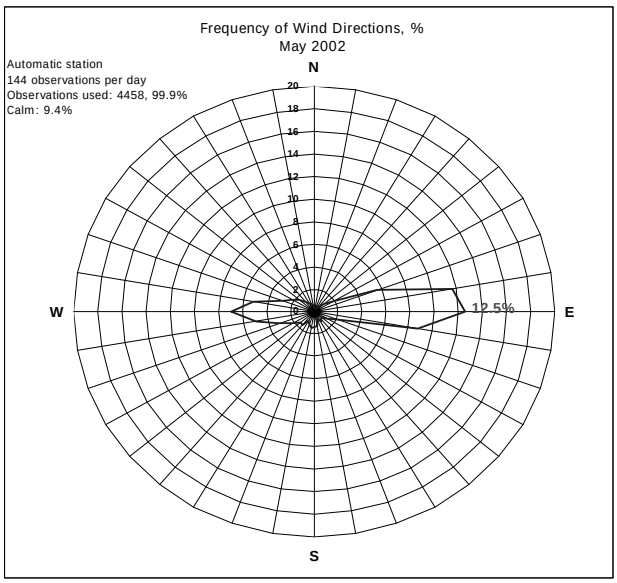


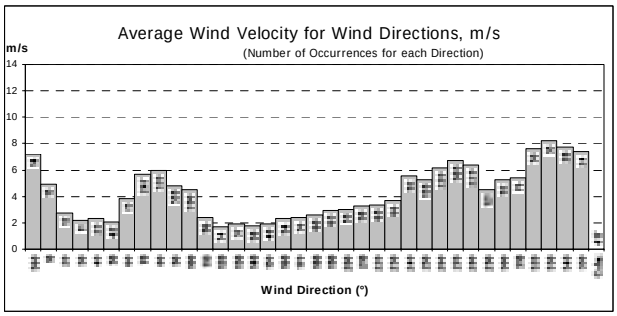






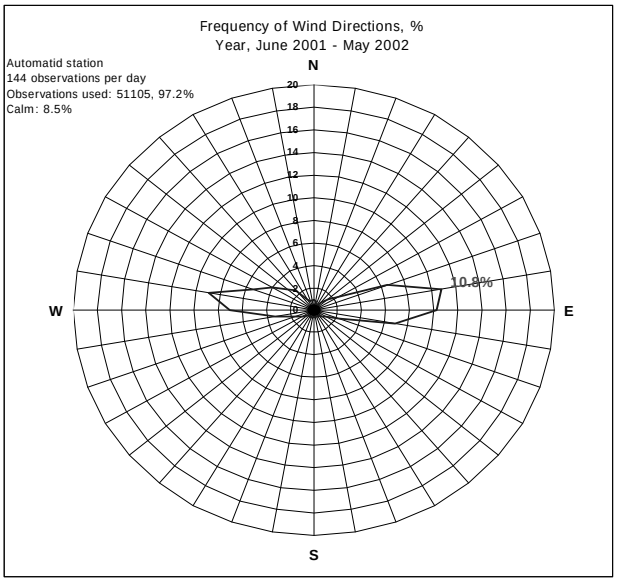


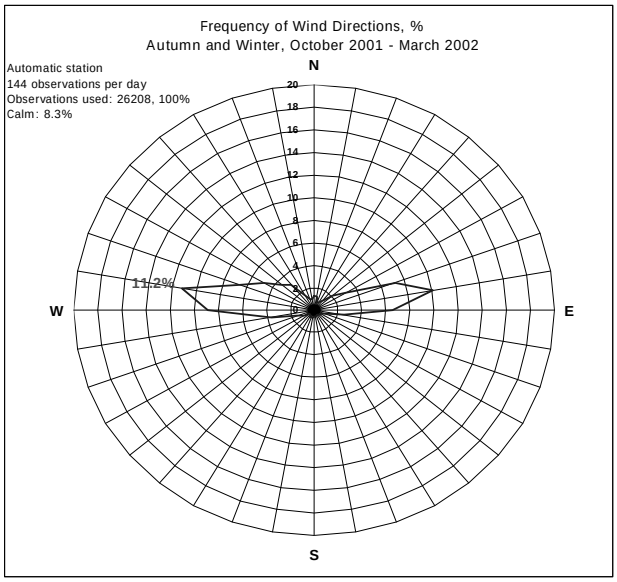


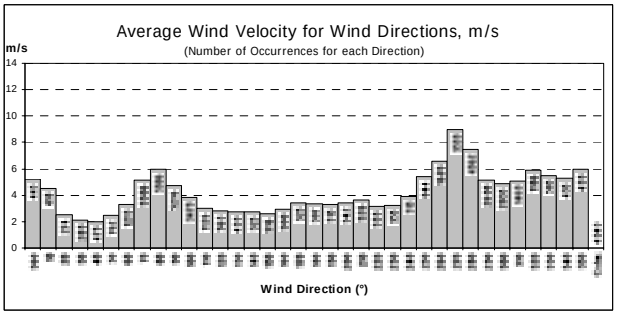


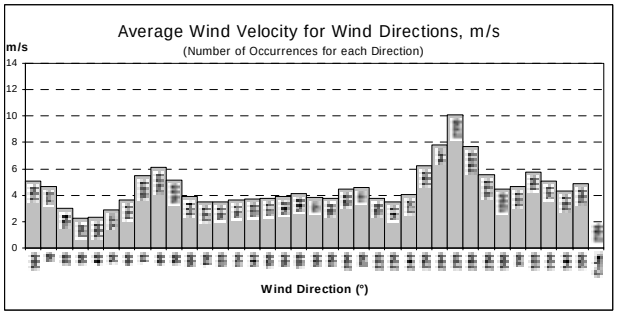
Annex 8

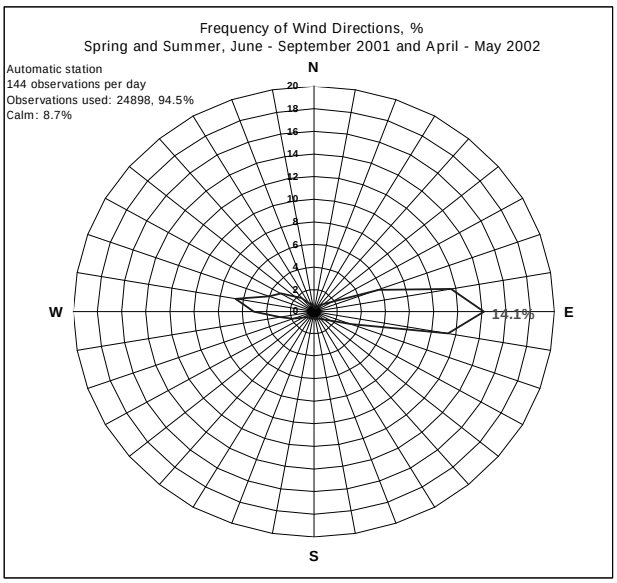
Ljósá

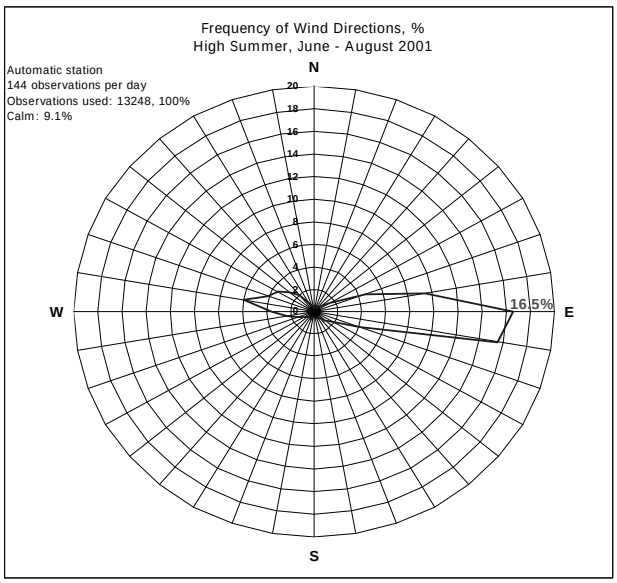

Frequency of Wind Directions, %
Year, June 2001 - May 2002
Automatid station
144 observations per day
Observations used: 51105, 97.2%
Calm: 8.5%
N
W
E
S
10.8%

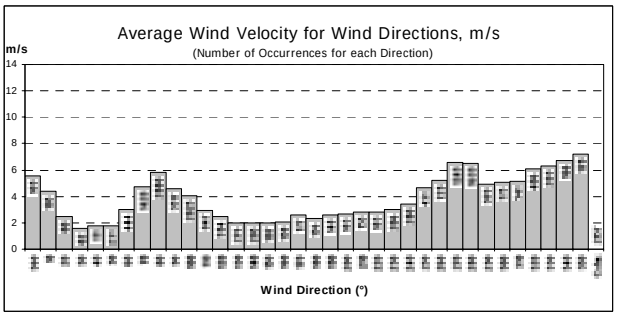

Frequency of Wind Directions, %
Autumn and Winter, October 2001 - March 2002
Automatic station
144 observations per day
Observations used: 26208, 100%
Calm: 8.3%
N
W
E
S
11.2%

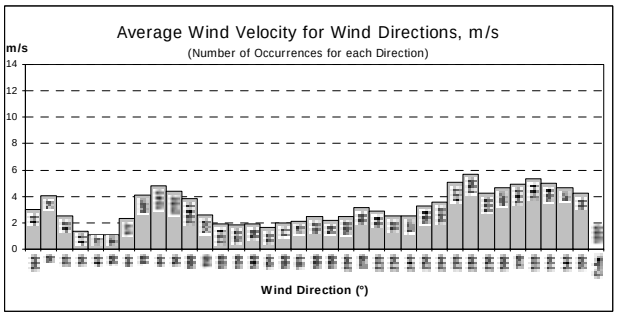

Average Wind Velocity for Wind Directions, m/s
(Number of Occurrences for each Direction)
m/s
Wind Direction (°)


Average Wind Velocity for Wind Directions, m/s
(Number of Occurrences for each Direction)
m/s
Wind Direction (°)

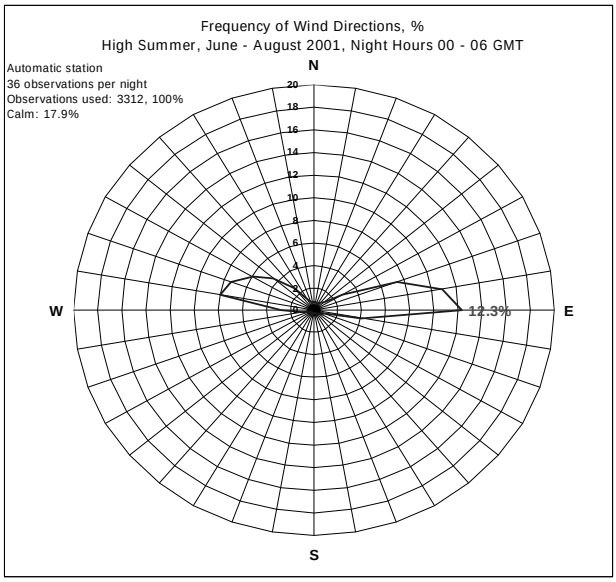

Frequency of Wind Directions, %
Spring and Summer, June - September 2001 and April - May 2002
Automatic station
144 observations per day
Observations used: 24898, 94.5%
Calm: 8.7%
N
W
E
S
14.1%

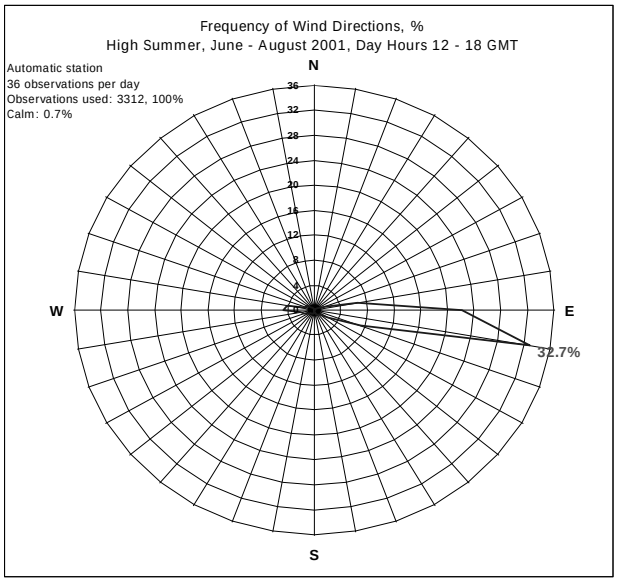

Frequency of Wind Directions, %
High Summer, June - August 2001
Automatic station
144 observations per day
Observations used: 13248, 100%
Calm: 9.1%
N
W
E
S
16.5%

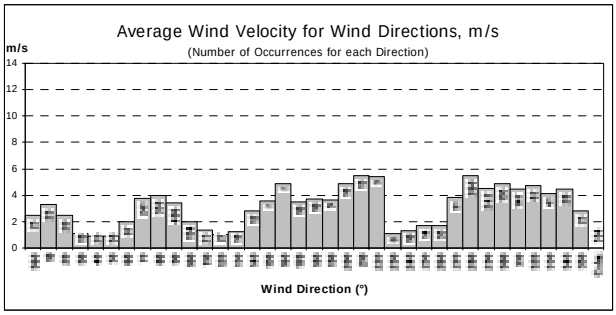

Average Wind Velocity for Wind Directions, m/s
(Number of Occurrences for each Direction)
m/s
Wind Direction (°)

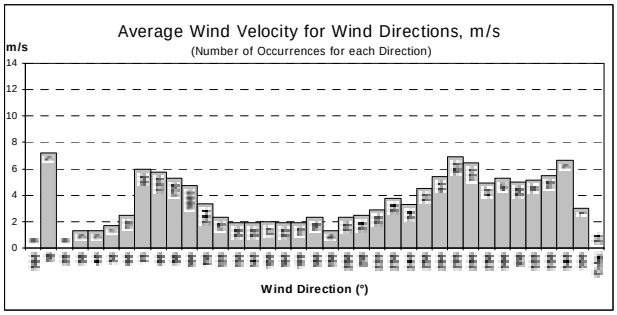

Average Wind Velocity for Wind Directions, m/s
(Number of Occurrences for each Direction)
m/s
Wind Direction (°)

Ljósá



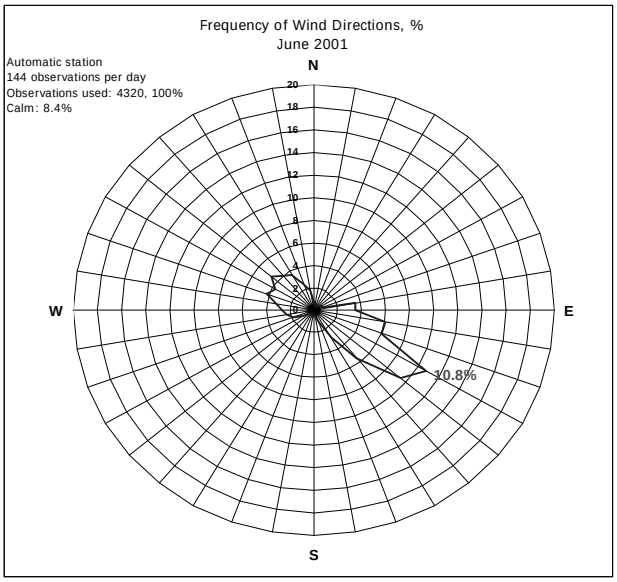


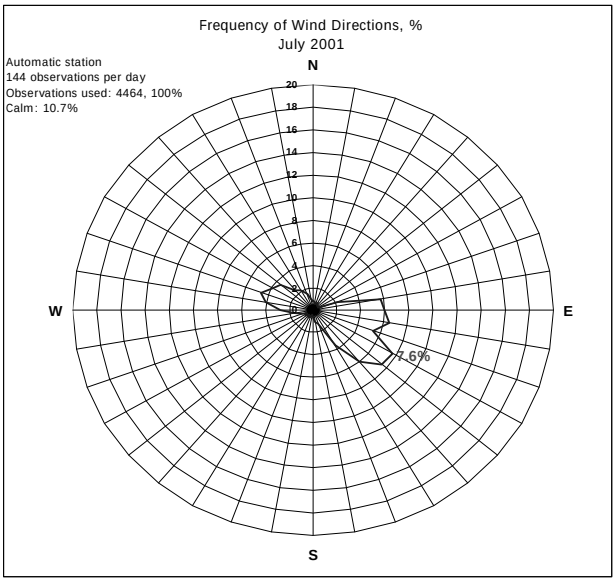


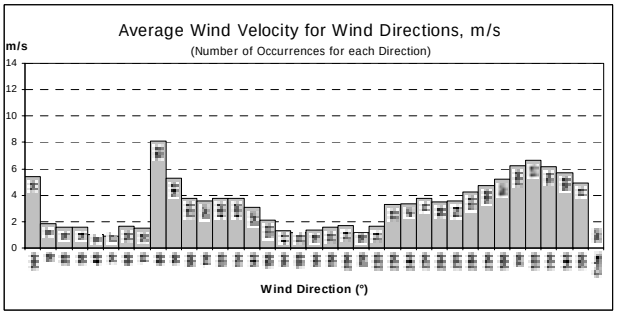


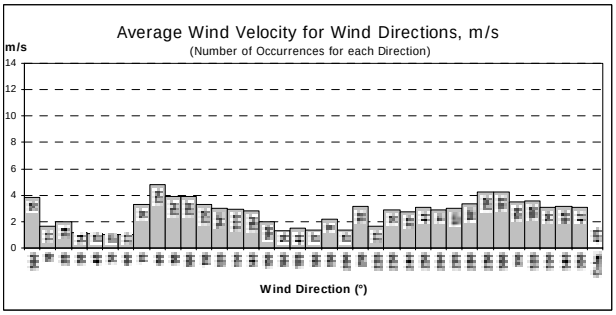
Annex 10

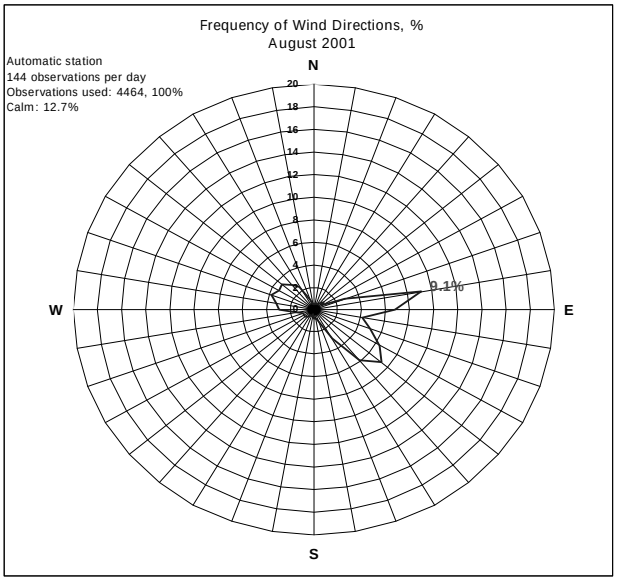
Kollaleira 2

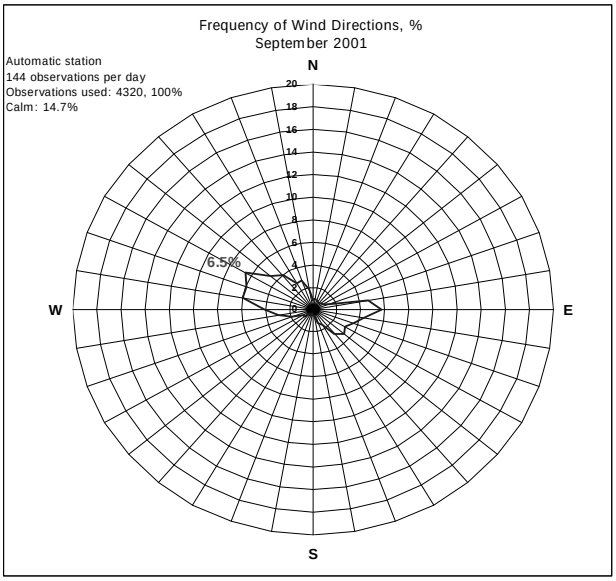


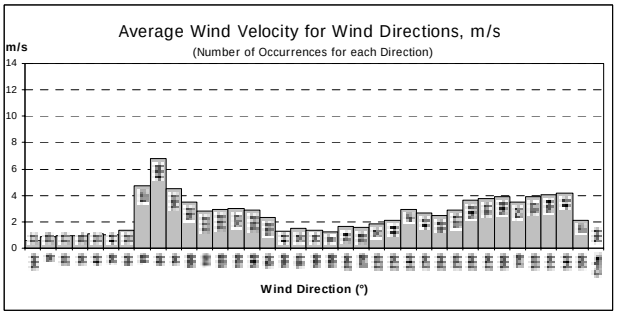


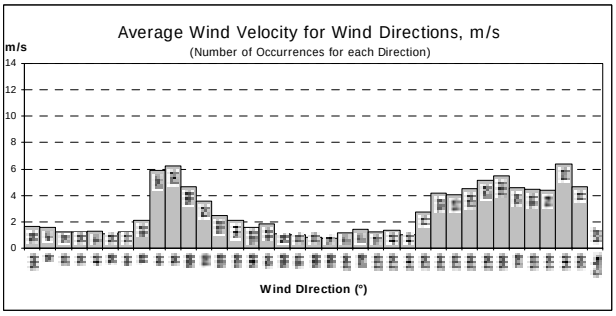




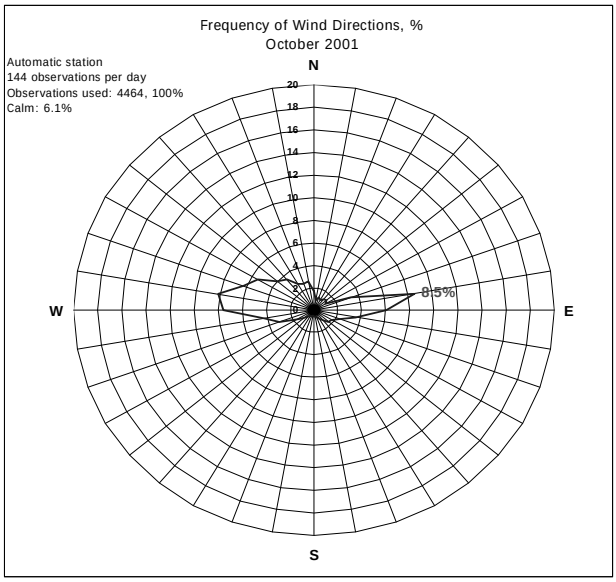


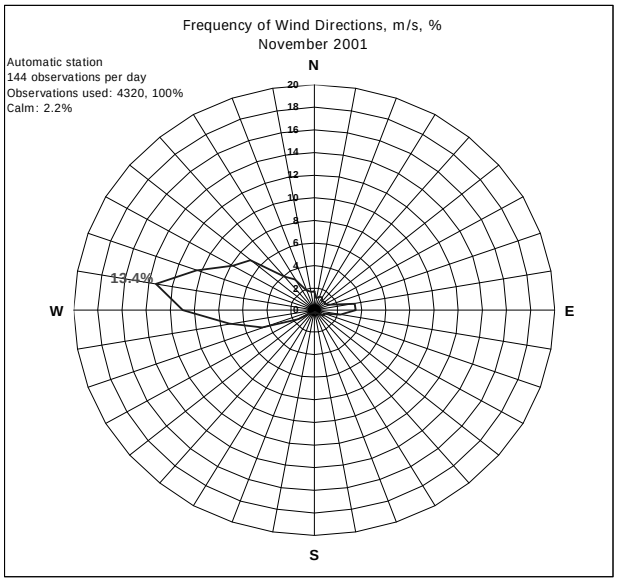


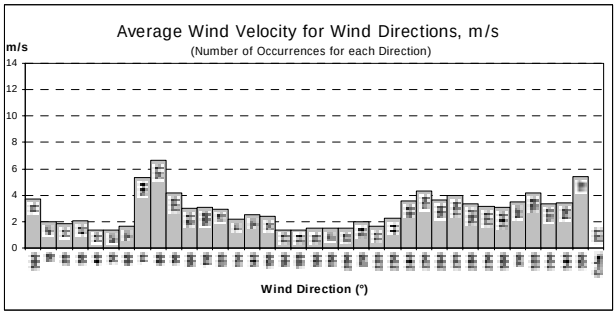


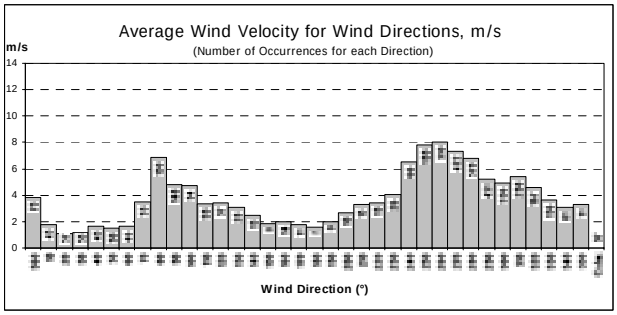


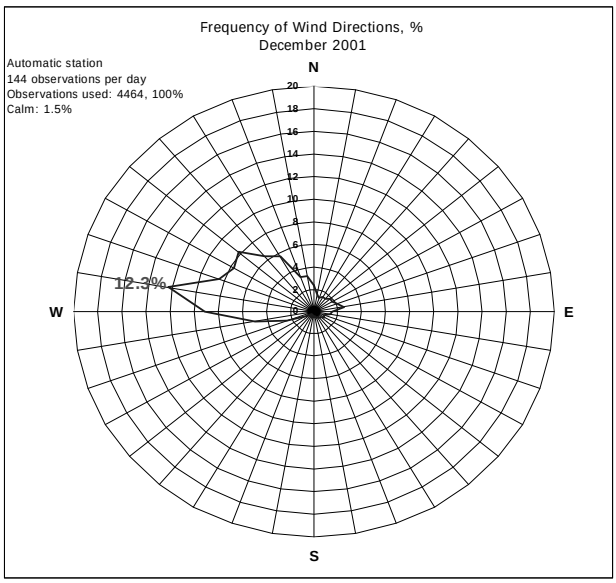
Kollaleira 2

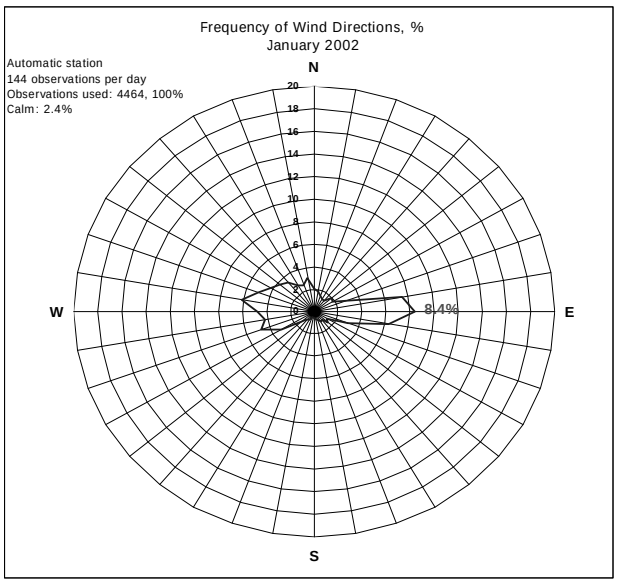


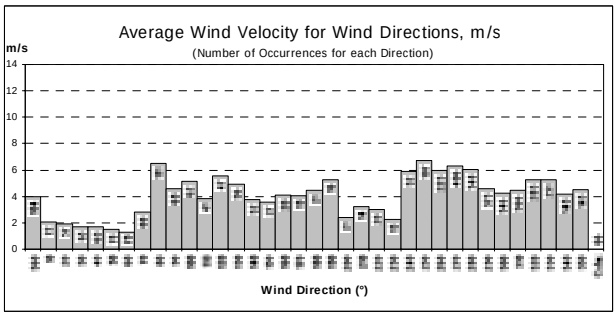


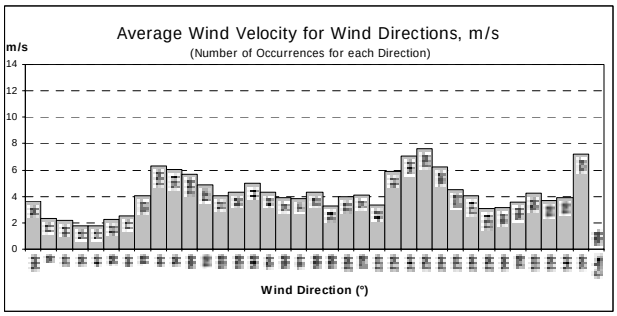






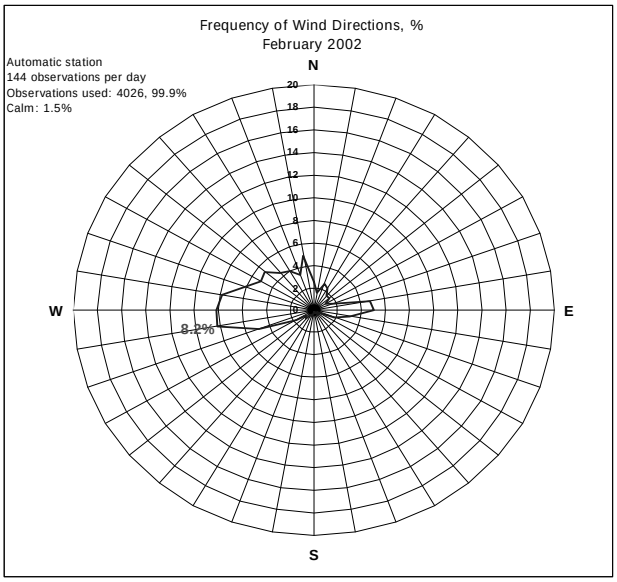


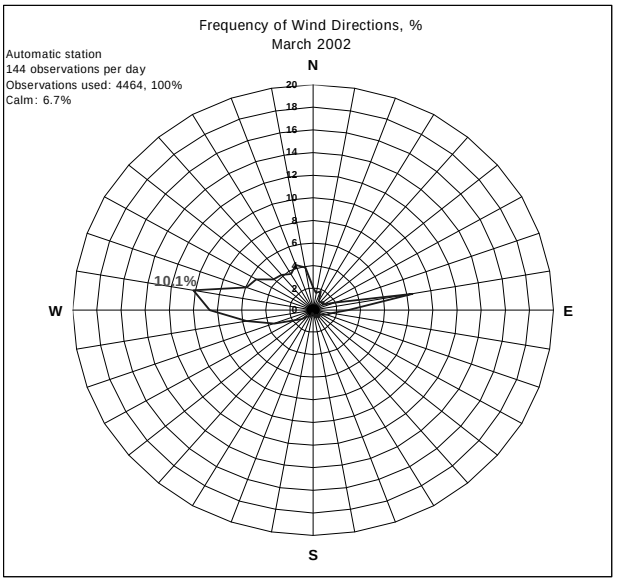


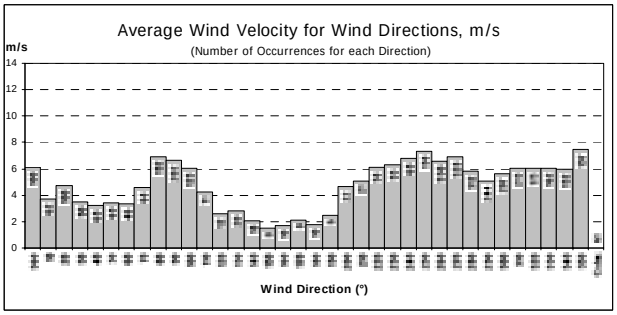


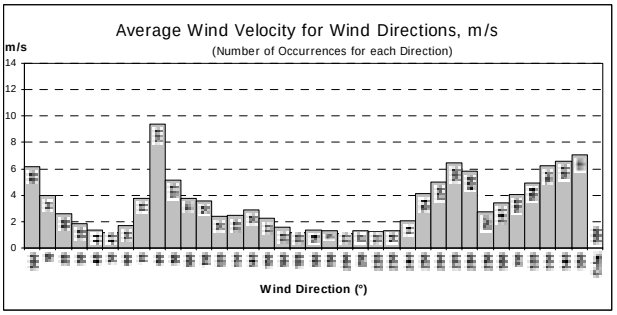
Annex 12

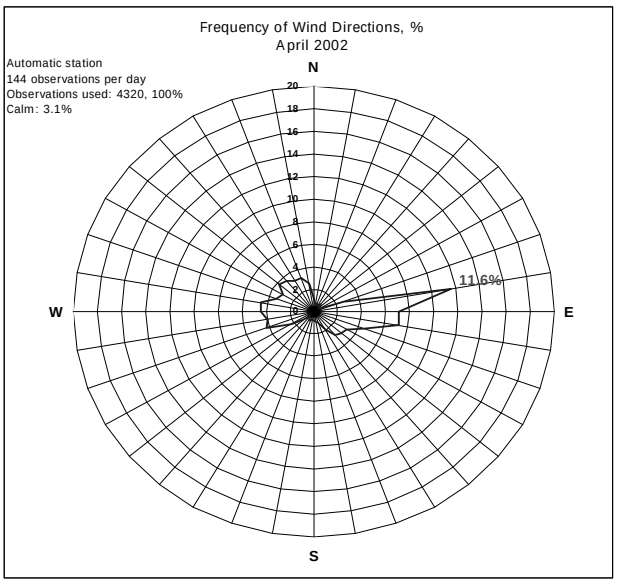
Kollaleira 2

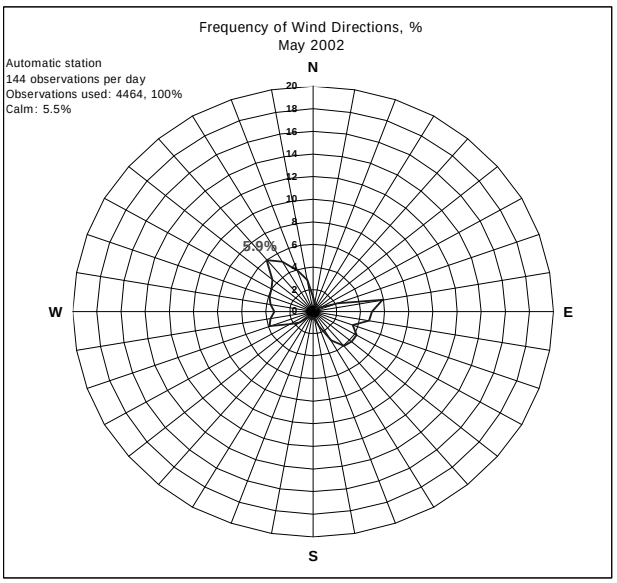


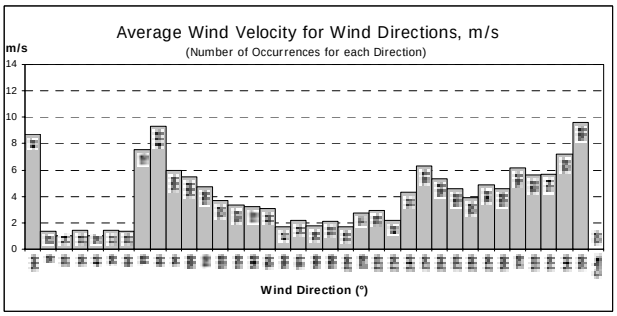


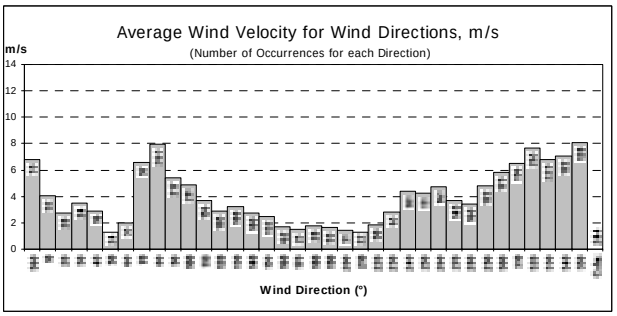




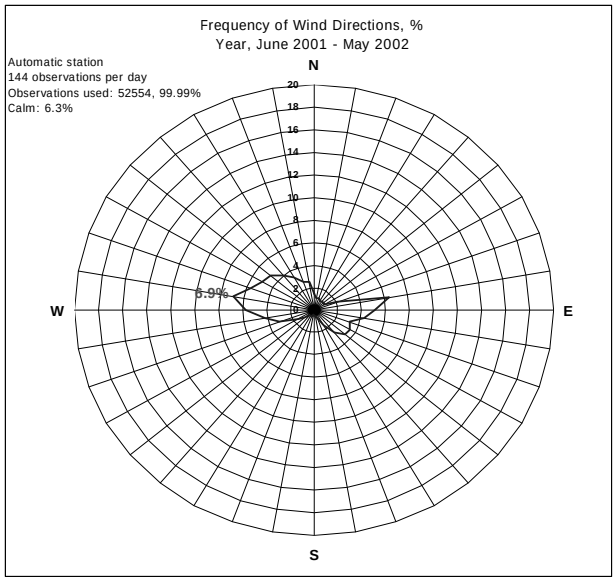


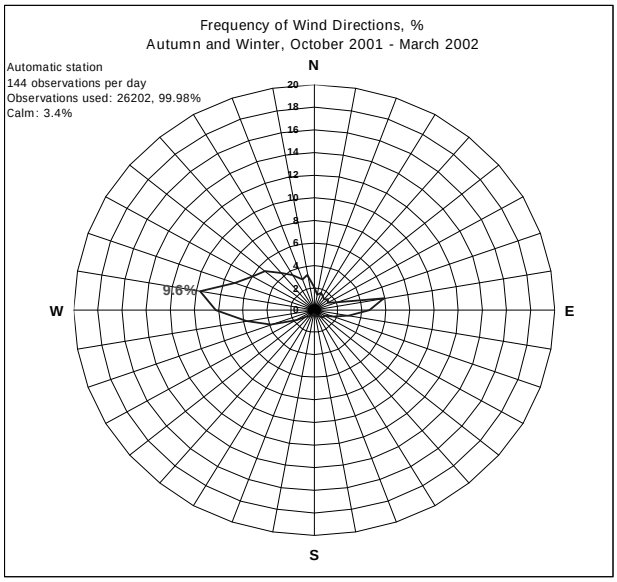


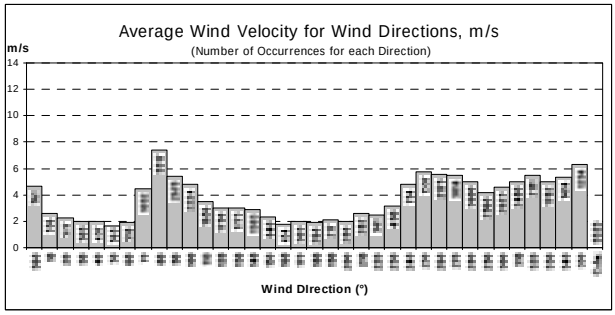


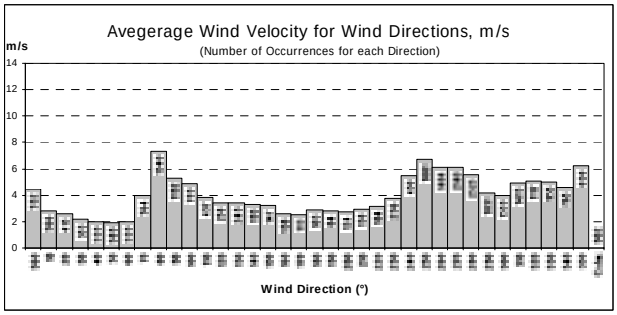


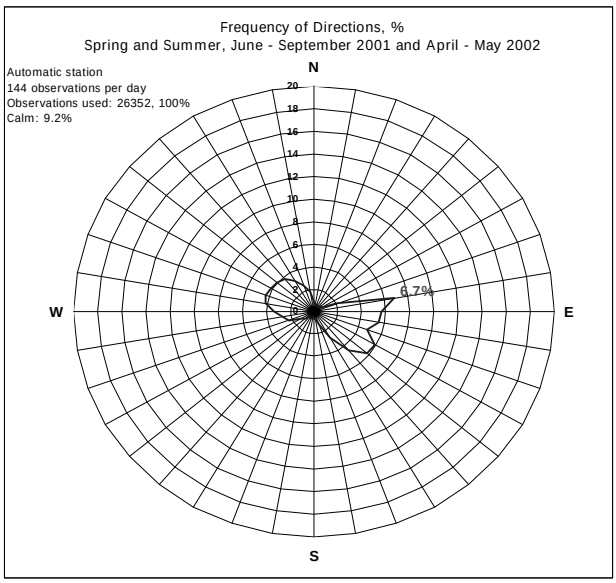
Kollaleira 2

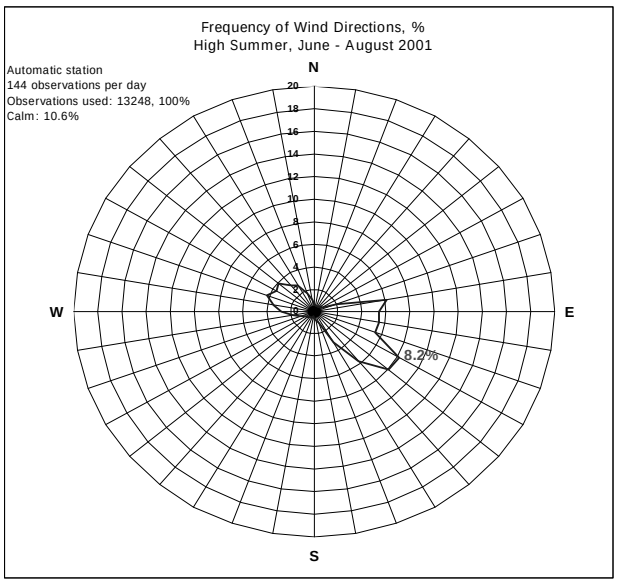


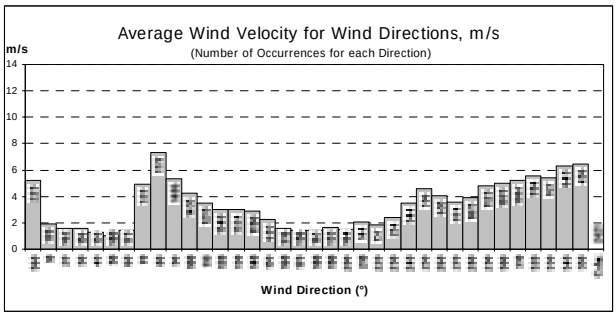


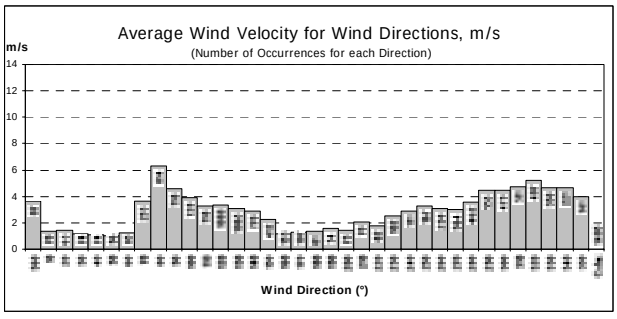






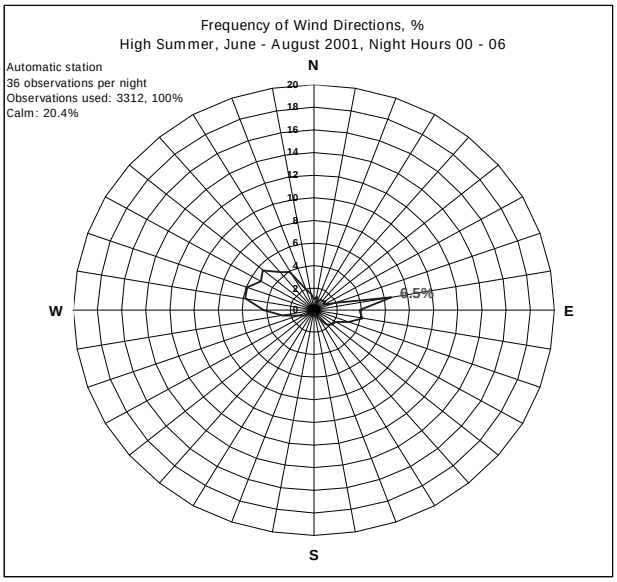


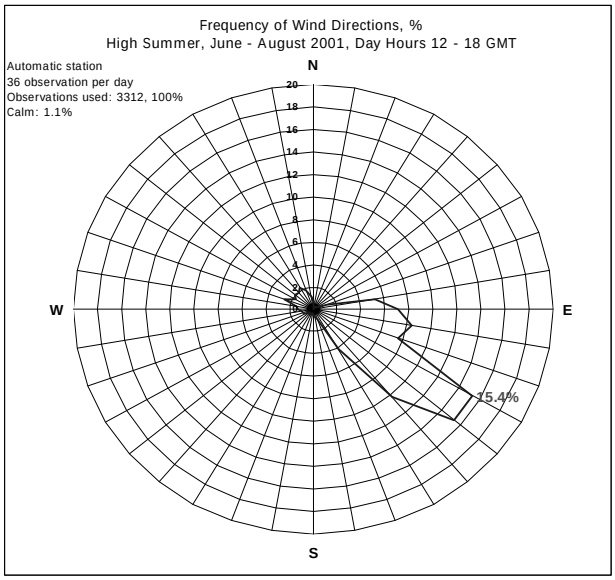


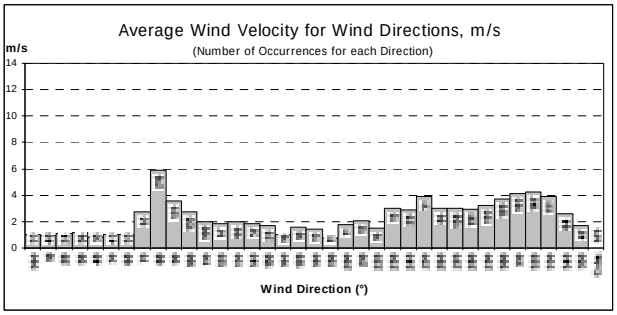


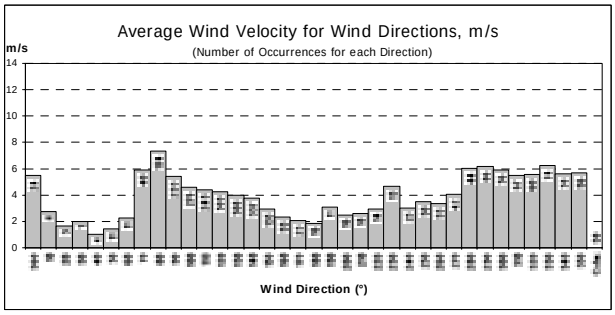
Annex 14

Kollaleira 2

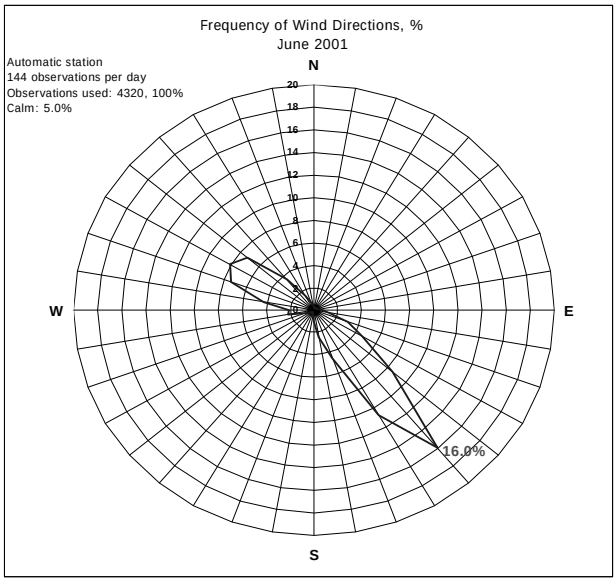


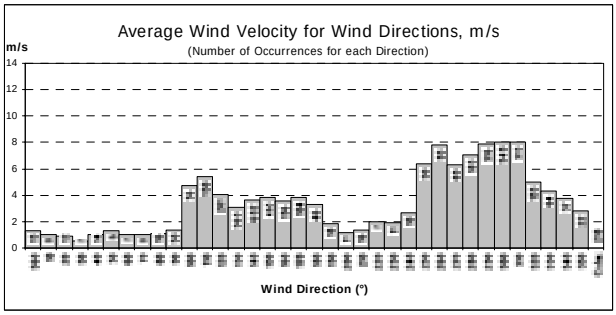


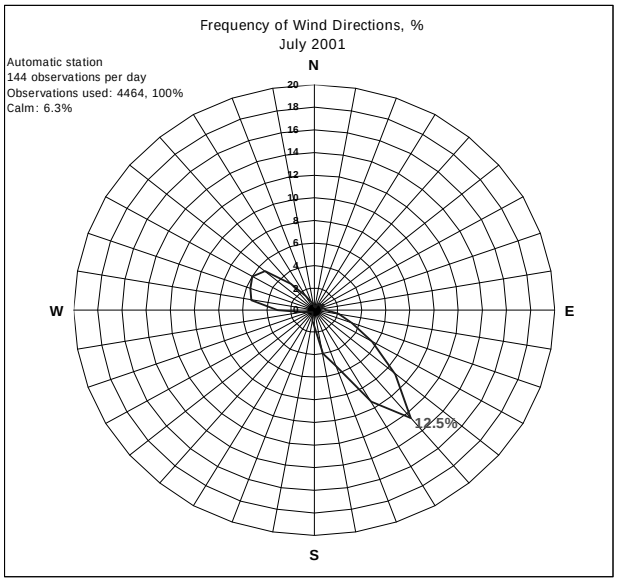


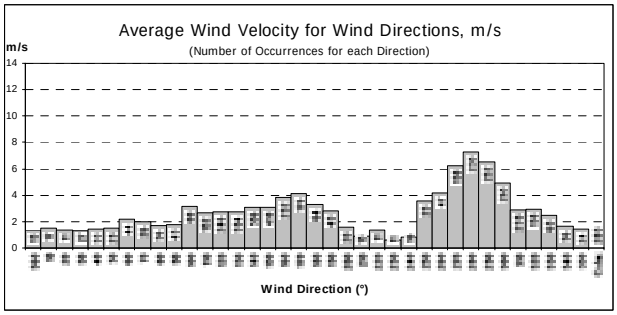


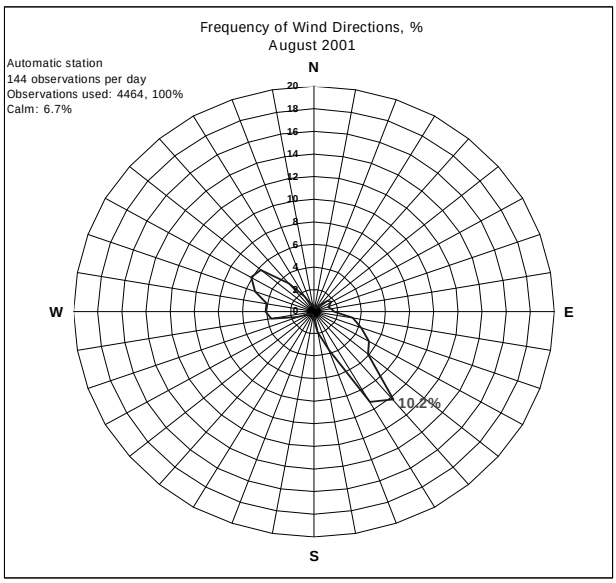
Eskifjörður

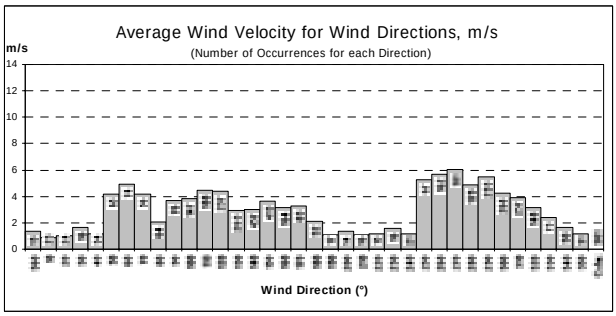


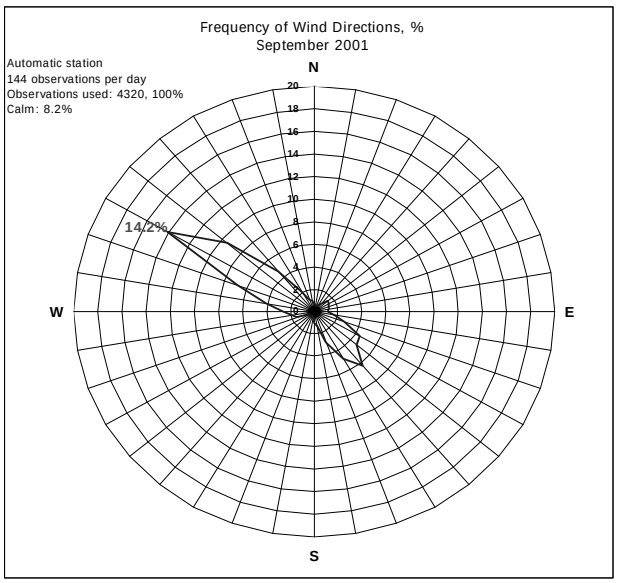


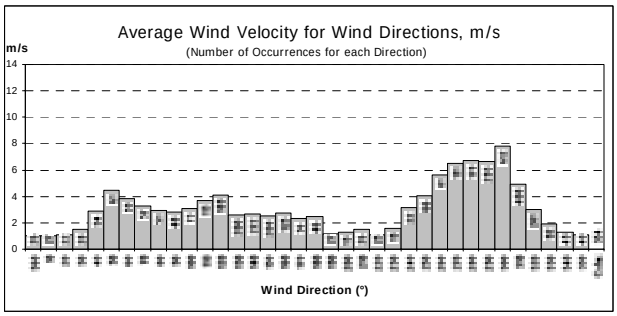






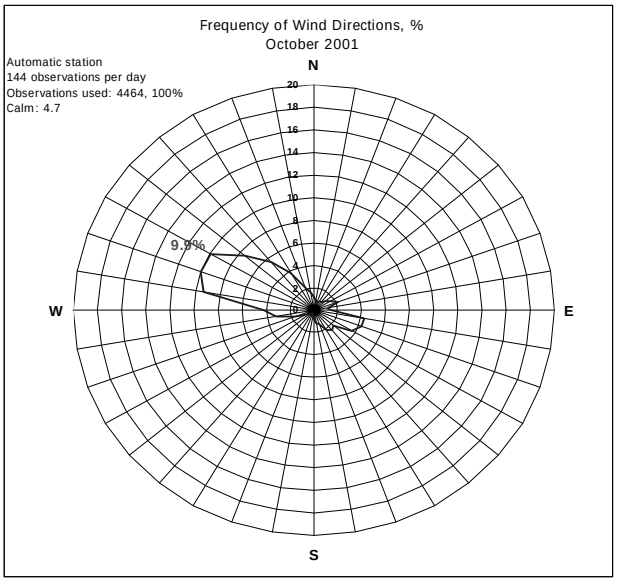


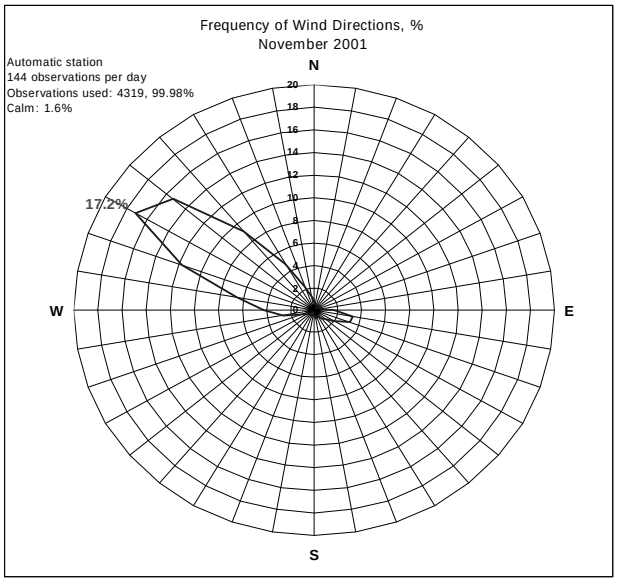


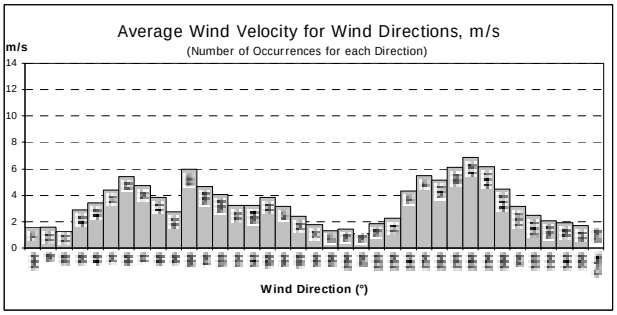


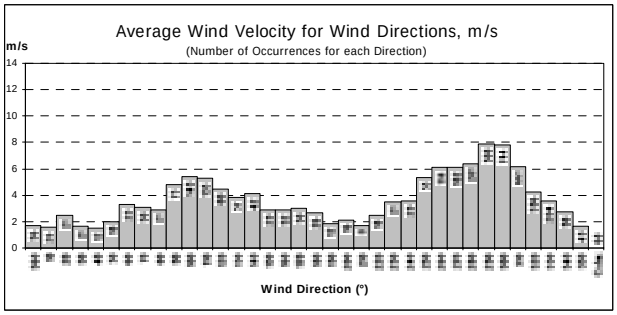
Annex 16

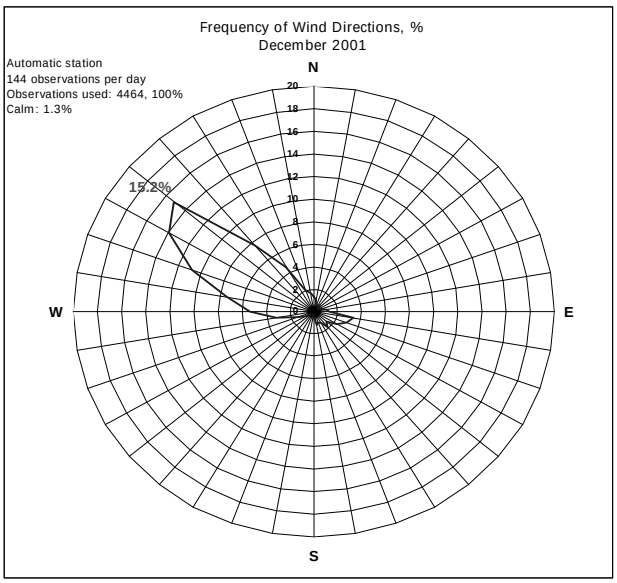
Eskifjörður

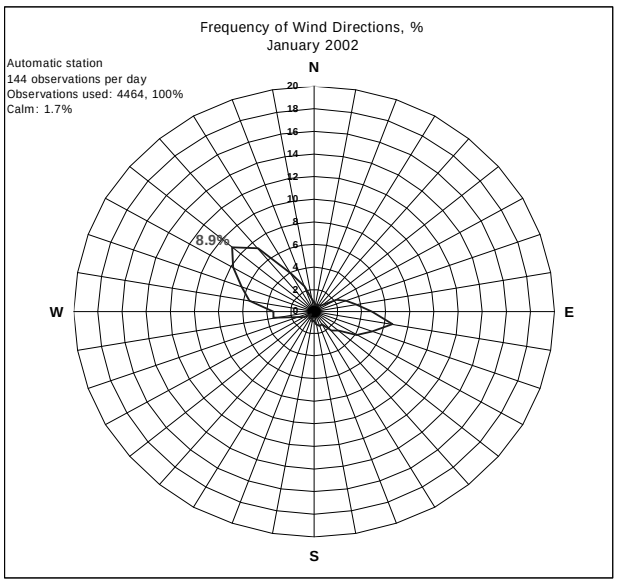


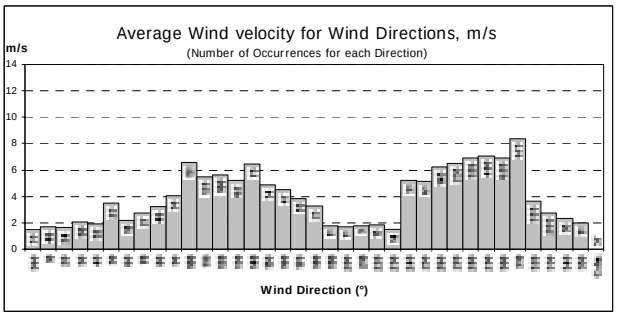


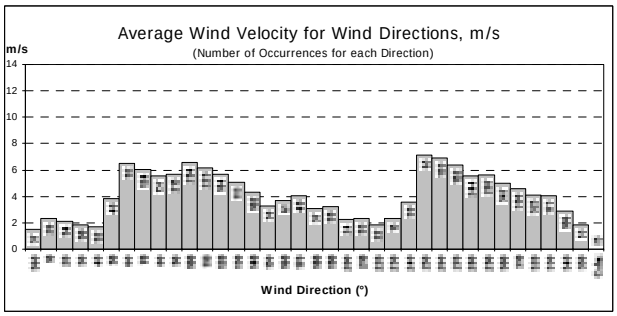






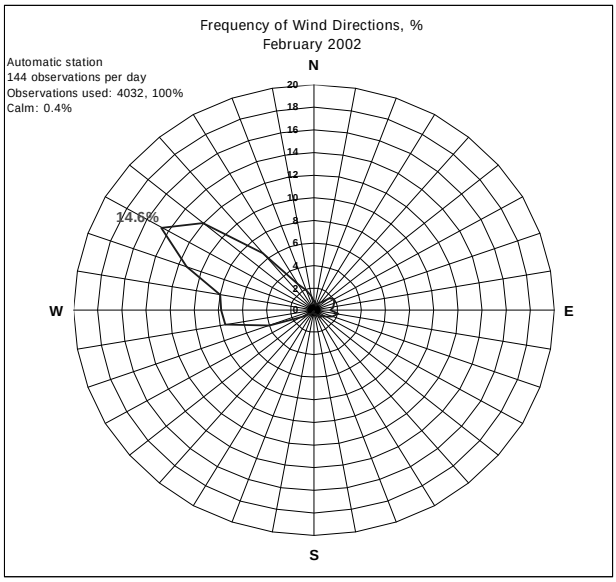


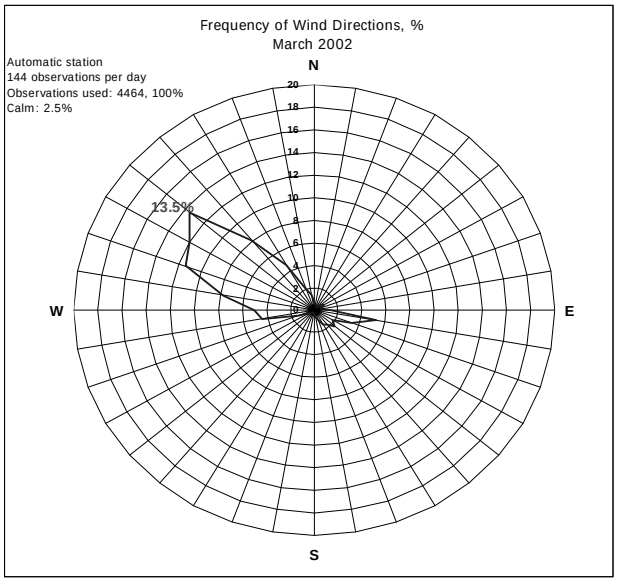


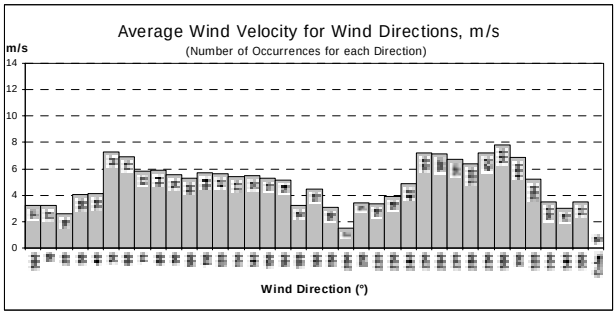


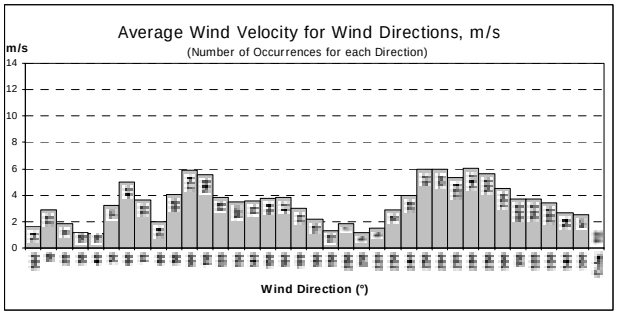
Annex 17

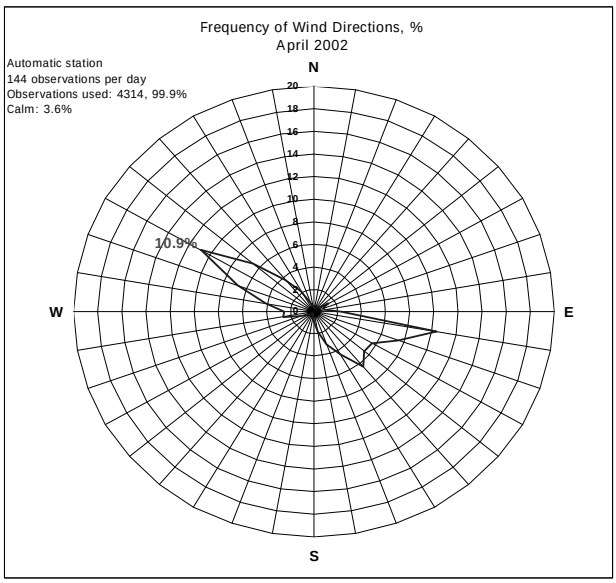
Eskifjörður

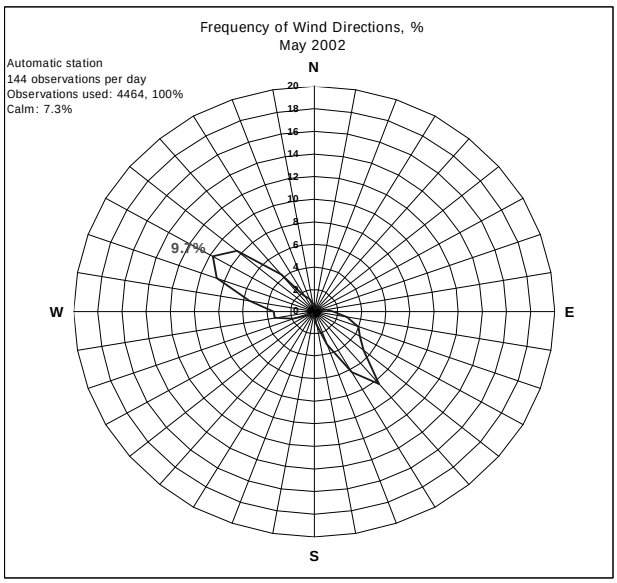


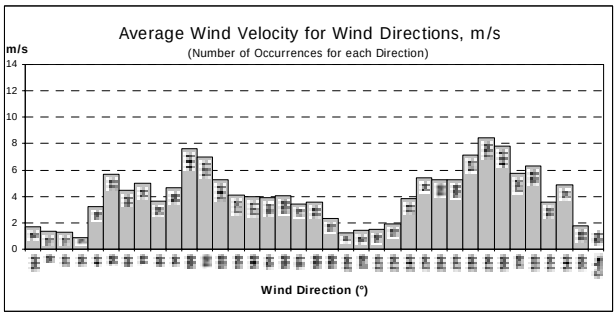


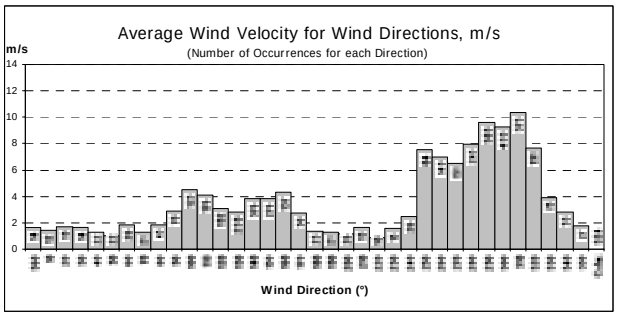






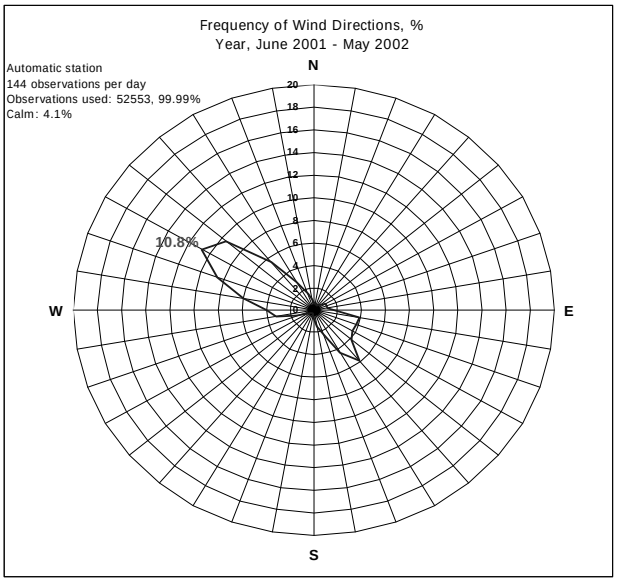


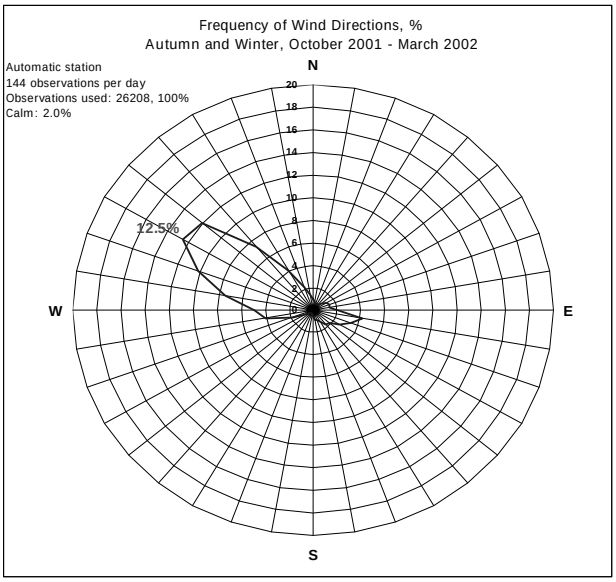


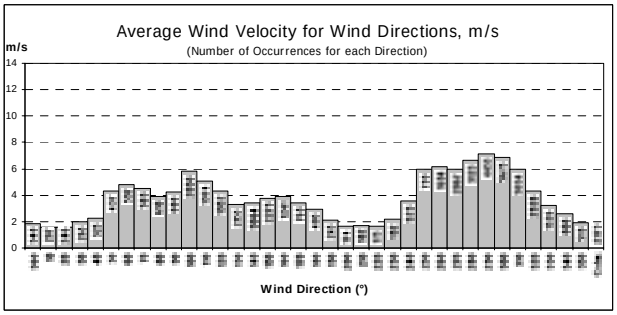


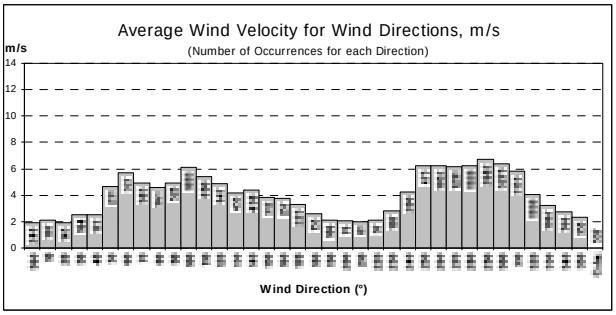
Annex 18

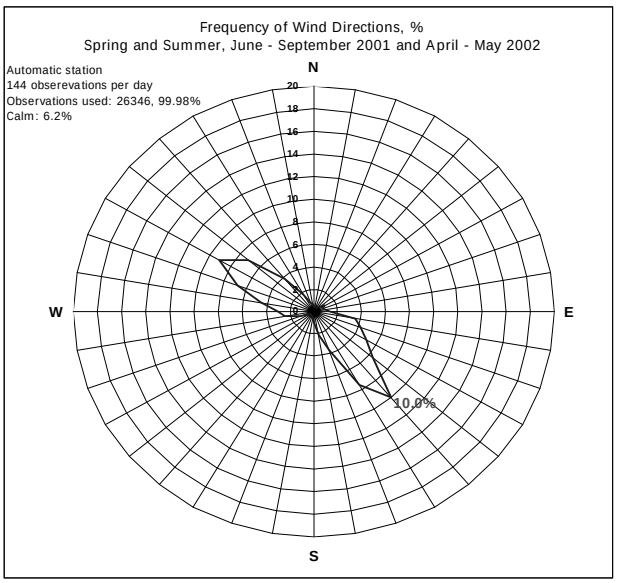
Eskifjörður

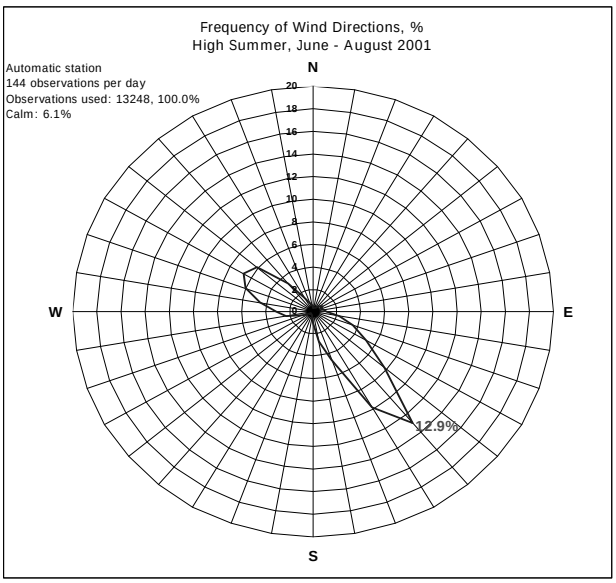


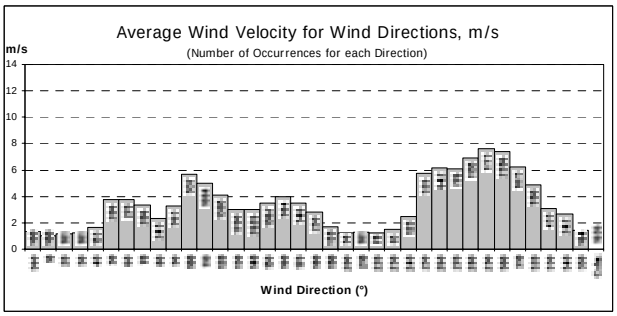


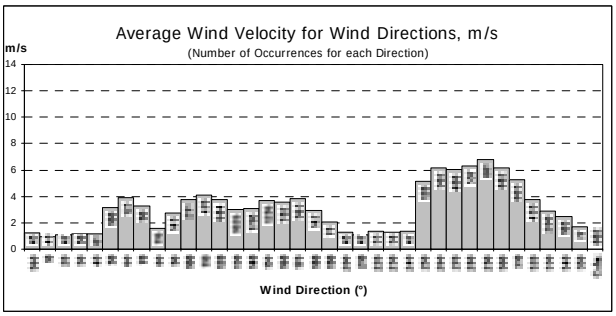






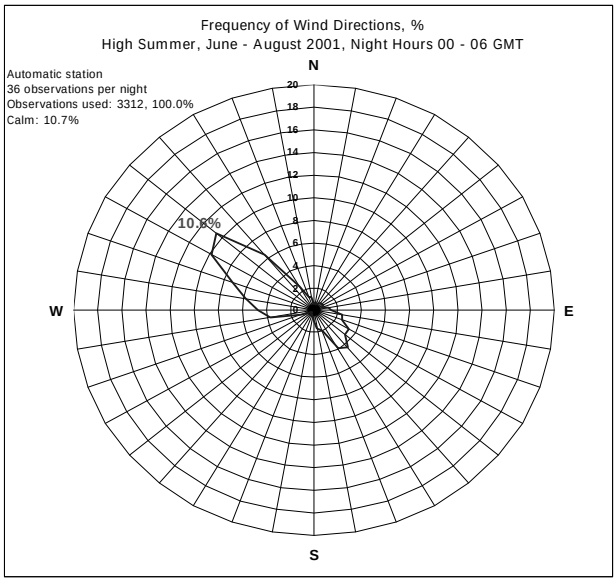


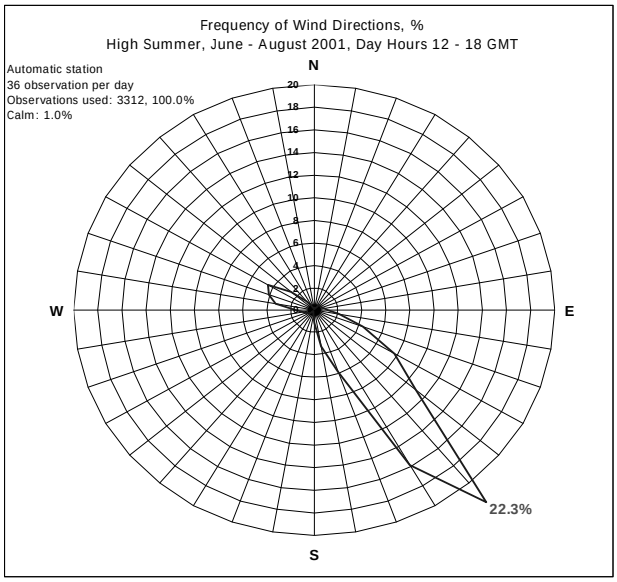


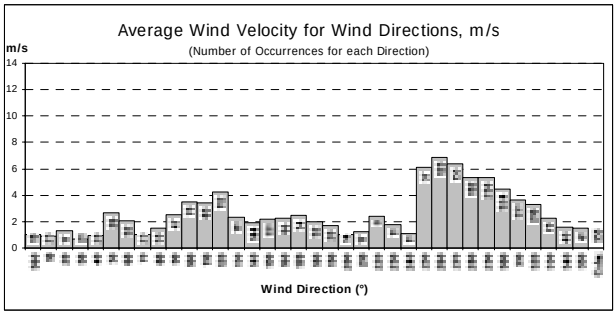


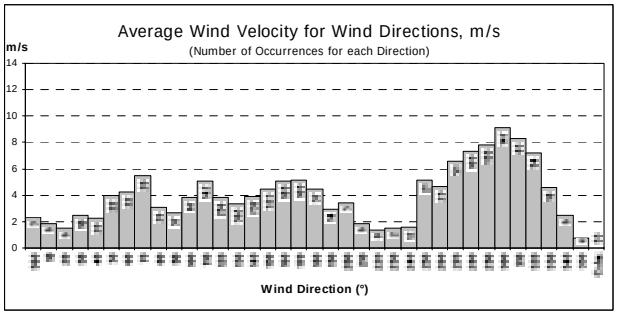
Annex 19

Eskifjörður



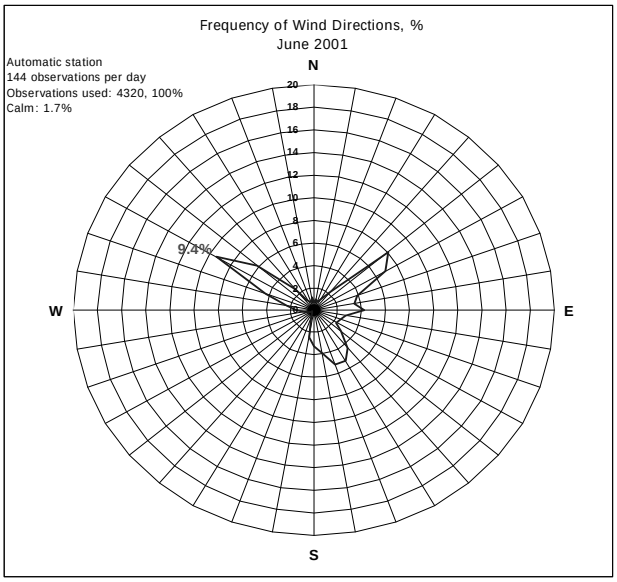


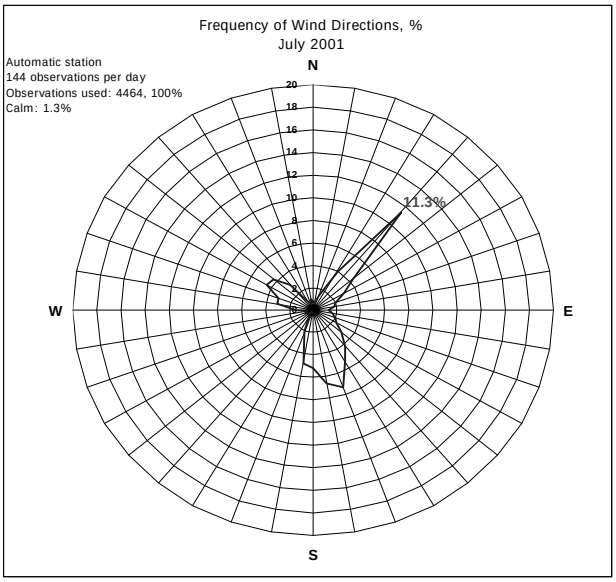


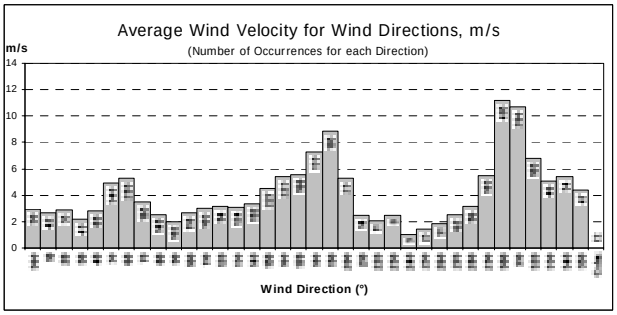


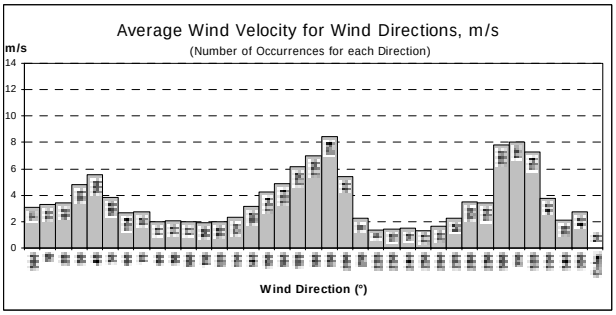
Annex 20

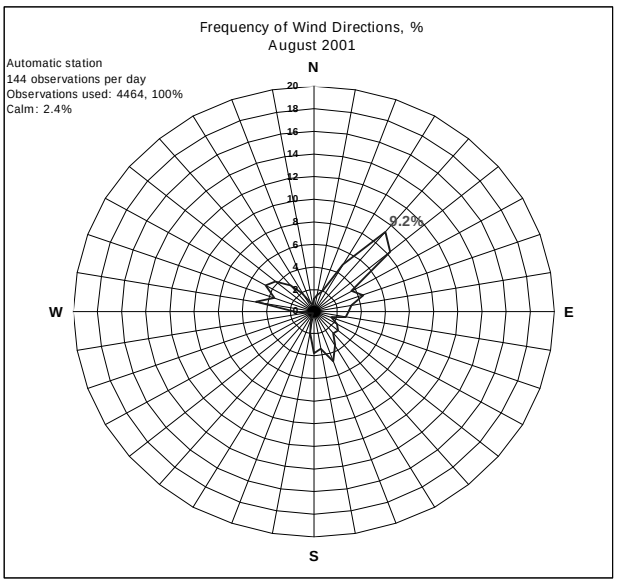
Vattarnes

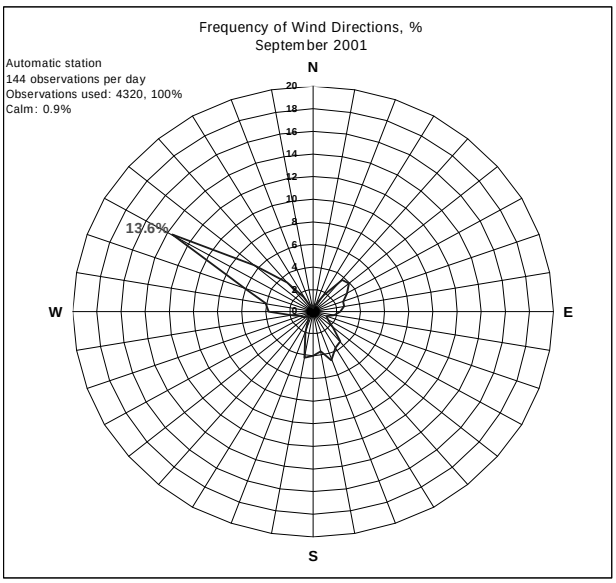

Frequency of Wind Directions, %
June 2001
Automatic station
144 observations per day
Observations used: 4320, 100%
Calm: 1.7%
N
W
E
S
9.4%

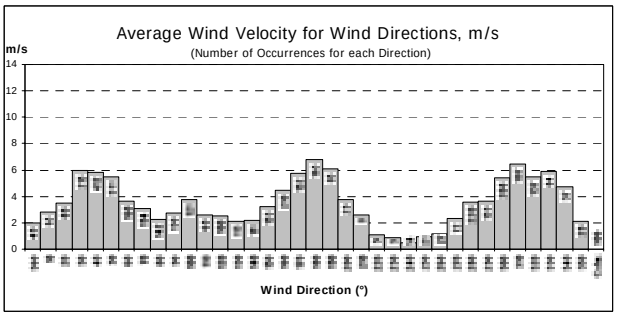

Frequency of Wind Directions, %
July 2001
Automatic station
144 observations per day
Observations used: 4464, 100%
Calm: 1.3%
N
W
E
S
11.3%

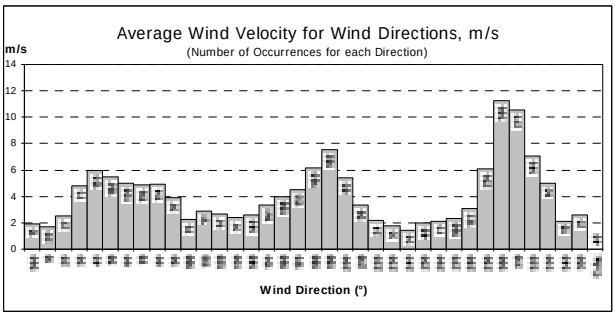

Average Wind Velocity for Wind Directions, m/s
(Number of Occurrences for each Direction)
m/s
Wind Direction (°)


Average Wind Velocity for Wind Directions, m/s
(Number of Occurrences for each Direction)
m/s
Wind Direction (°)

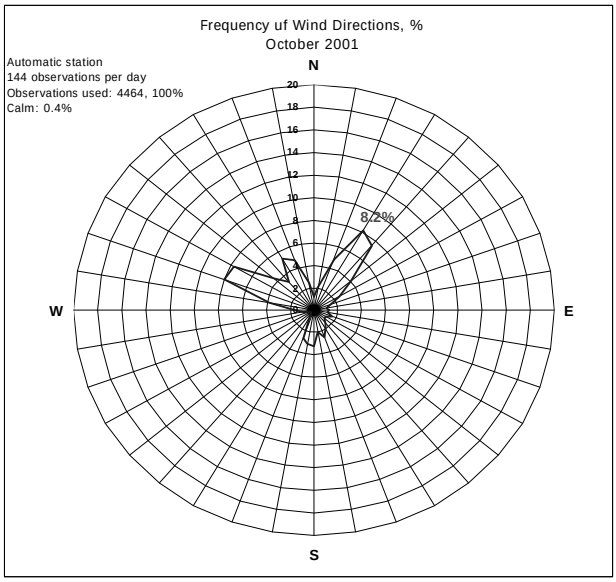

Frequency of Wind Directions, %
August 2001
Automatic station
144 observations per day
Observations used: 4464, 100%
Calm: 2.4%
N
W
E
S
9.2%

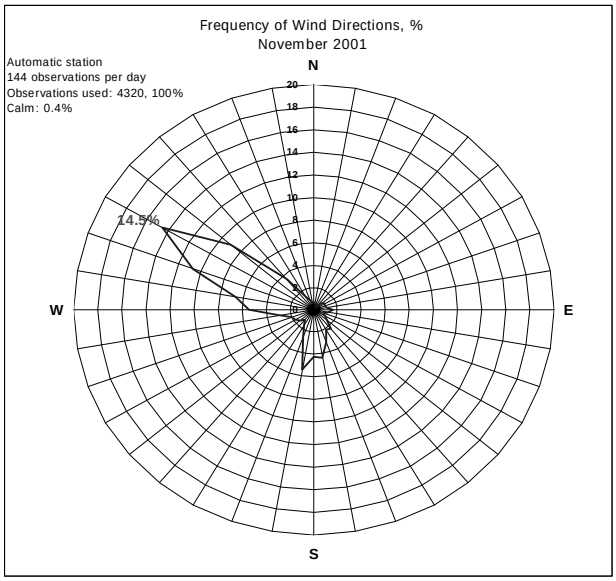

Frequency of Wind Directions, %
September 2001
Automatic station
144 observations per day
Observations used: 4320, 100%
Calm: 0.9%
N
W
E
S
13.6%

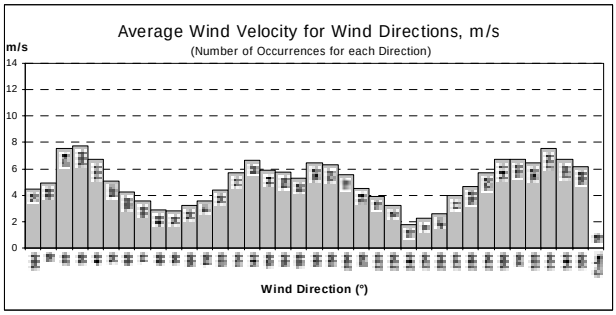

Average Wind Velocity for Wind Directions, m/s
(Number of Occurrences for each Direction)
m/s
Wind Direction (°)

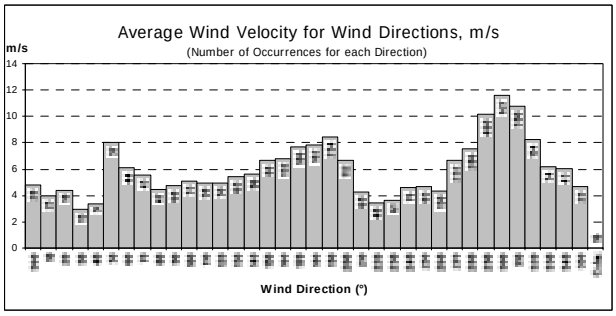

Average Wind Velocity for Wind Directions, m/s
(Number of Occurrences for each Direction)
m/s
Wind Direction (°)

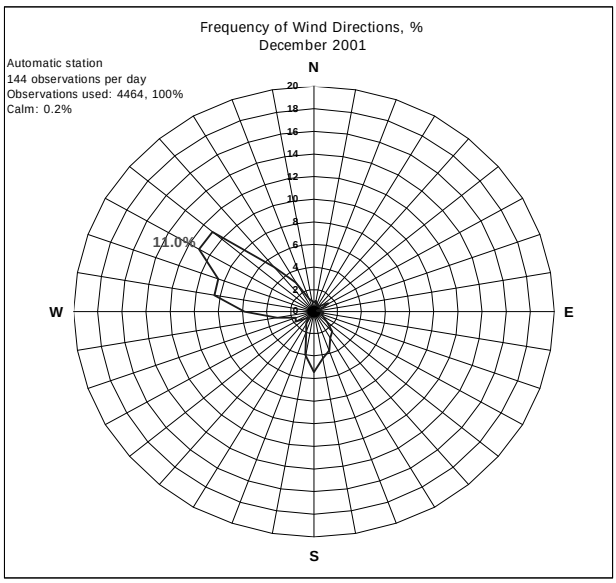
Vattarnes

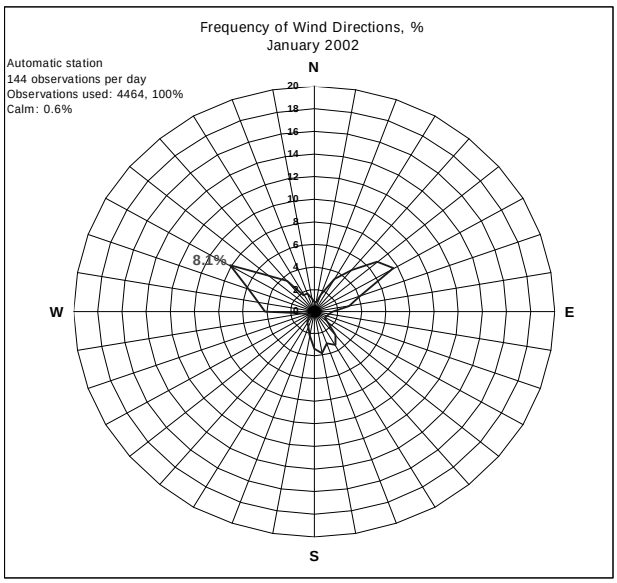


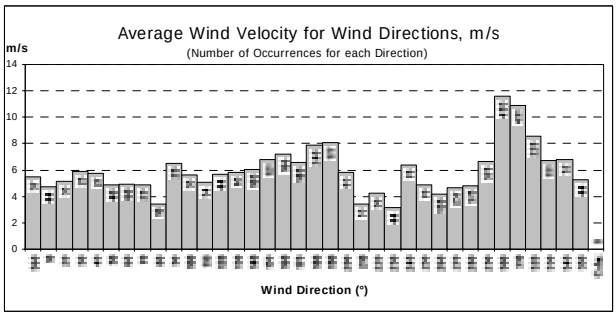


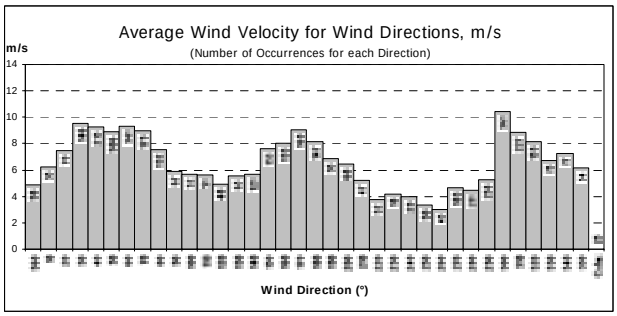






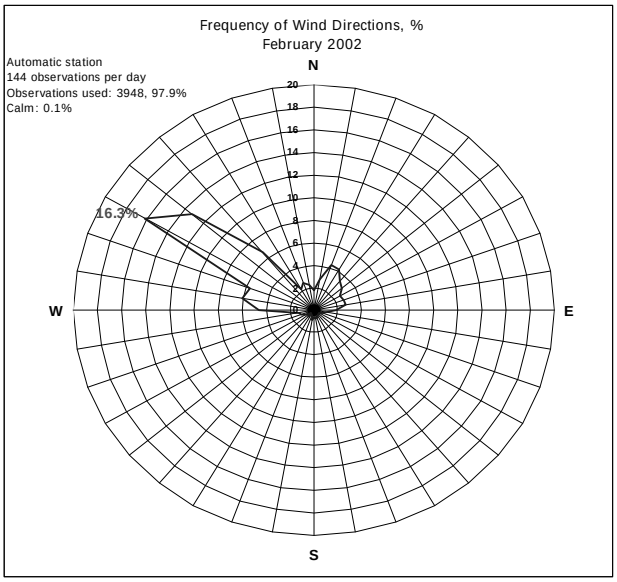


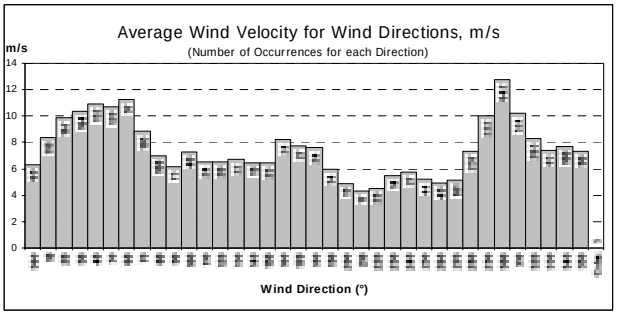


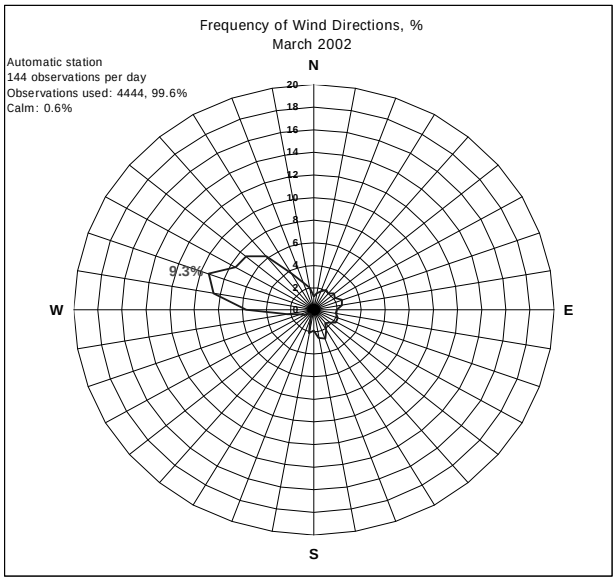


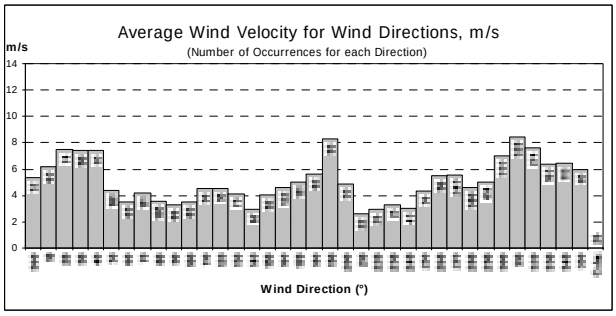
Annex 22

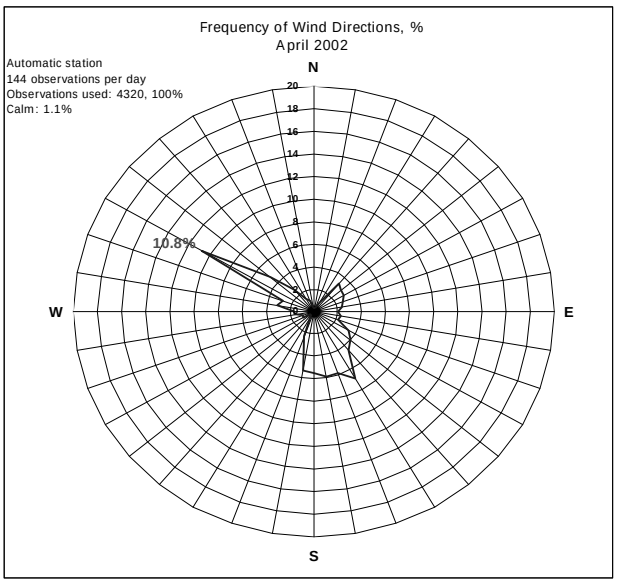
Vattarnes

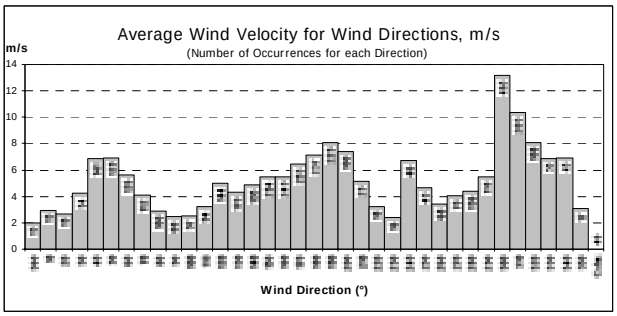

Frequency of Wind Directions, %
February 2002
Automatic station
144 observations per day
Observations used: 3948, 97.9%
Calm: 0.1%
N
E
S
W
16.3%

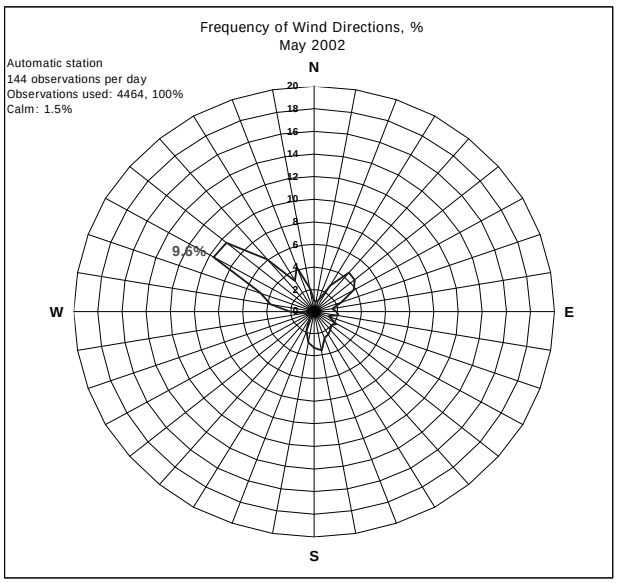

Average Wind Velocity for Wind Directions, m/s
(Number of Occurrences for each Direction)
m/s
Wind Direction (°)

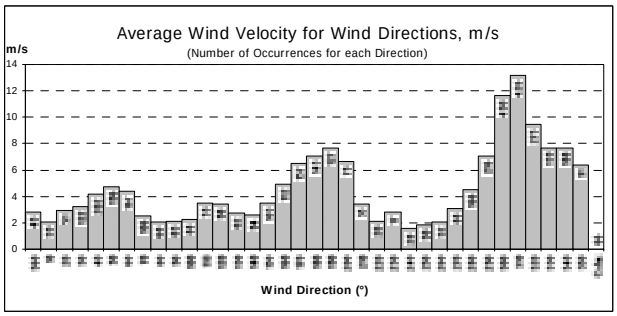

Frequency of Wind Directions, %
March 2002
Automatic station
144 observations per day
Observations used: 4444, 99.6%
Calm: 0.6%
N
E
S
W
9.3%


Average Wind Velocity for Wind Directions, m/s
(Number of Occurrences for each Direction)
m/s
Wind Direction (°)

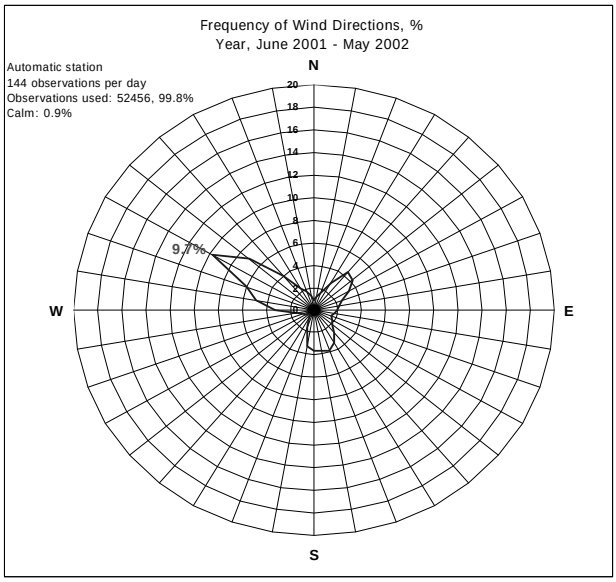

Frequency of Wind Directions, %
April 2002
Automatic station
144 observations per day
Observations used: 4320, 100%
Calm: 1.1%
N
E
S
W
10.8%

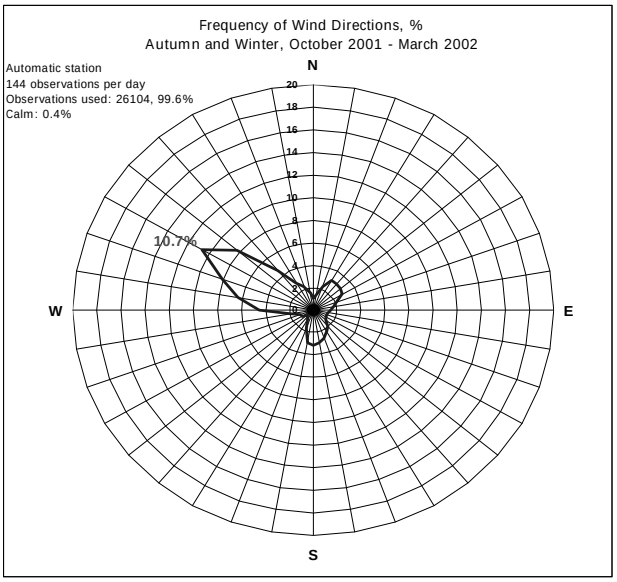

Average Wind Velocity for Wind Directions, m/s
(Number of Occurrences for each Direction)
m/s
Wind Direction (°)

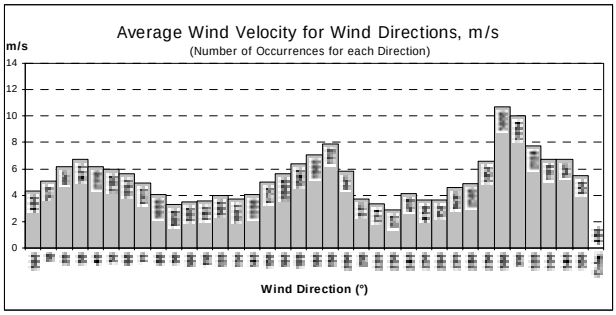

Frequency of Wind Directions, %
May 2002
Automatic station
144 observations per day
Observations used: 4464, 100%
Calm: 1.5%
N
E
S
W
9.6%

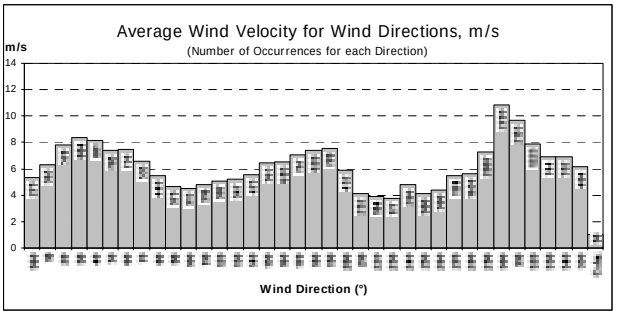

Average Wind Velocity for Wind Directions, m/s
(Number of Occurrences for each Direction)
m/s
Wind Direction (°)

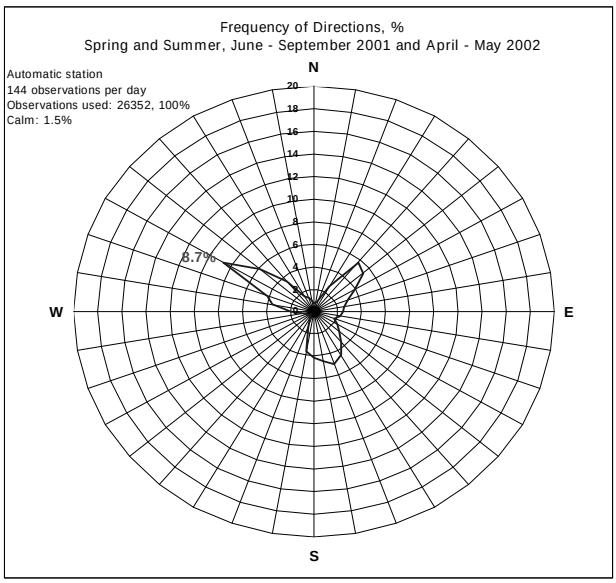
Vattarnes

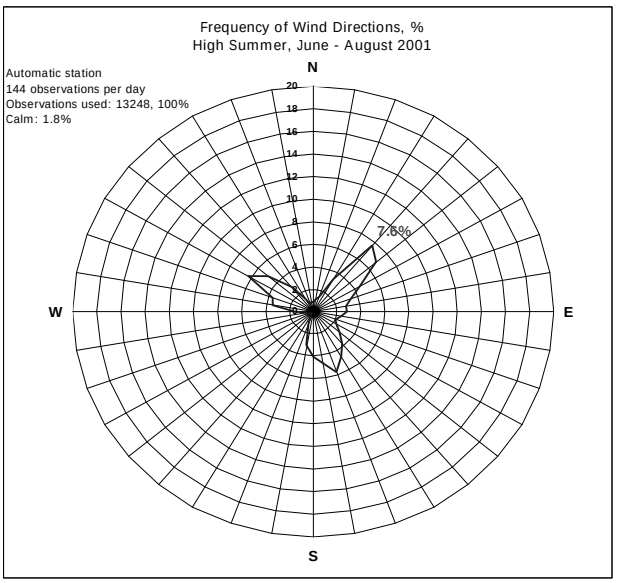


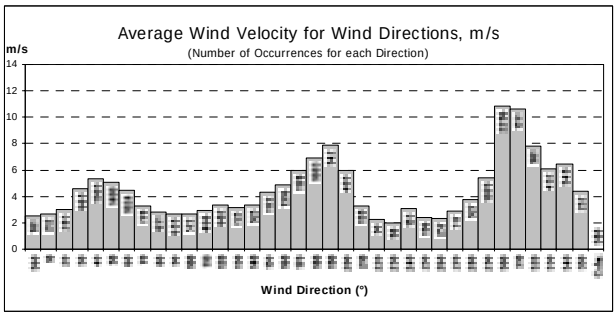


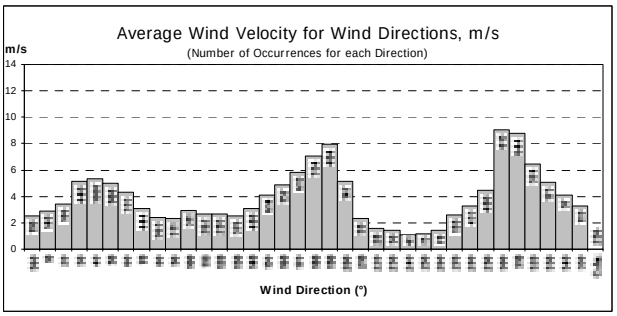






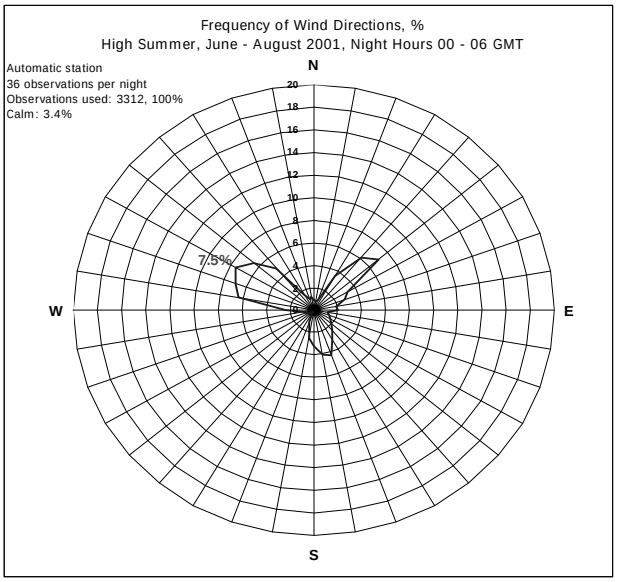


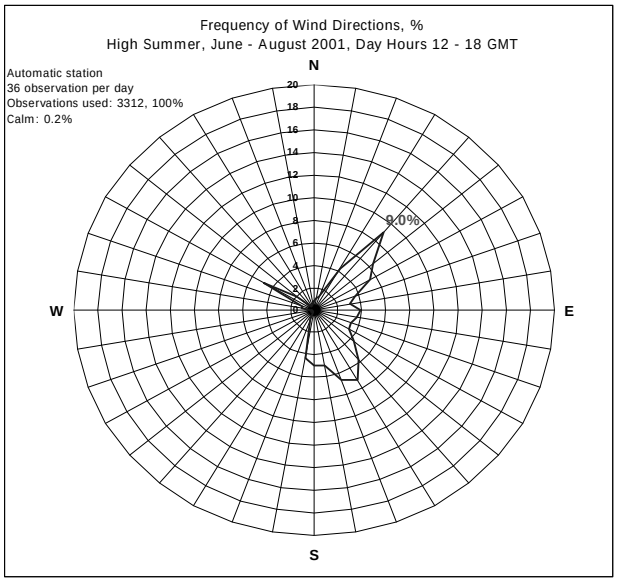


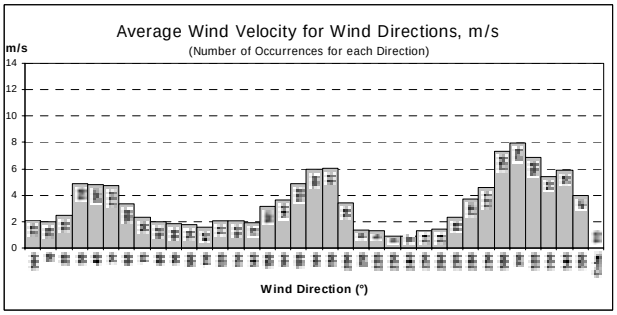


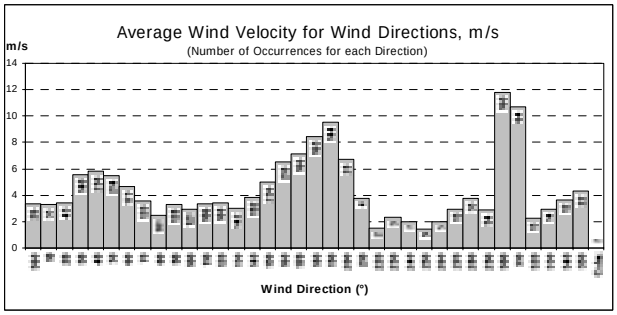
Annex 24

Vattarnes

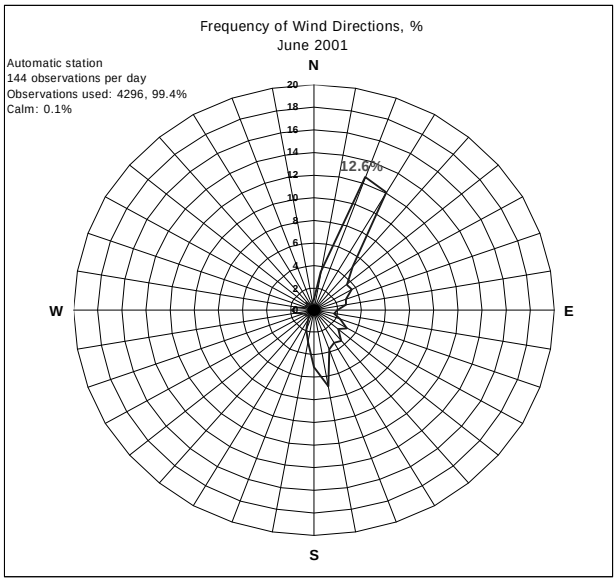

Frequency of Wind Directions, %
High Summer, June - August 2001, Night Hours 00 - 06 GMT
Automatic station
36 observations per night
Observations used: 3312, 100%
Calm: 3.4%
N
W
E
S
7.5%

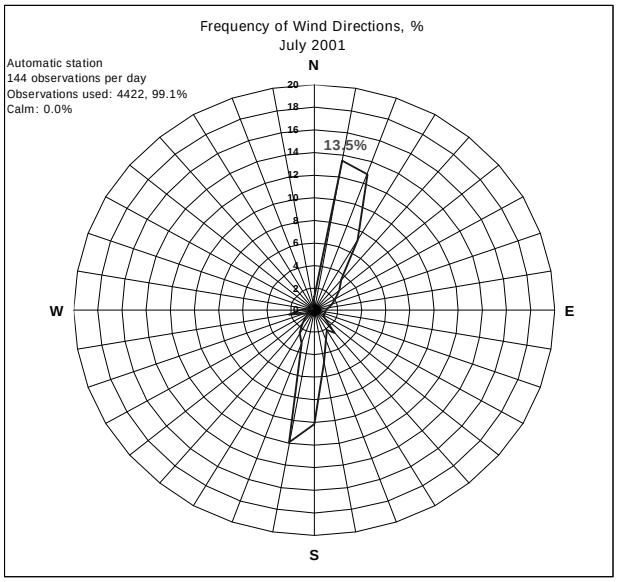

Frequency of Wind Directions, %
High Summer, June - August 2001, Day Hours 12 - 18 GMT
Automatic station
36 observation per day
Observations used: 3312, 100%
Calm: 0.2%
N
W
E
S
9.0%

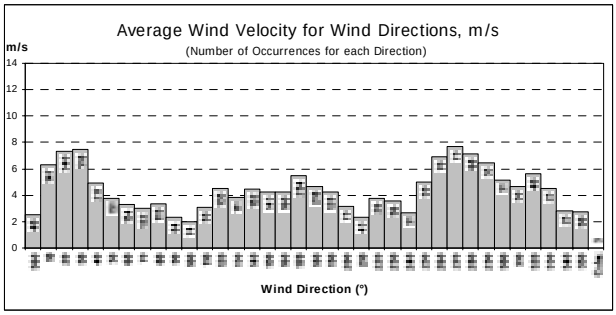

Average Wind Velocity for Wind Directions, m/s
(Number of Occurrences for each Direction)
m/s
Wind Direction (°)

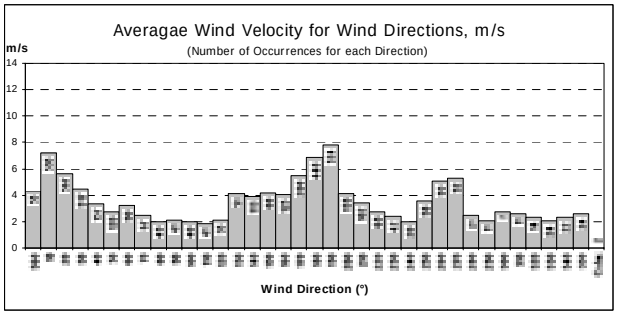

Average Wind Velocity for Wind Directions, m/s
(Number of Occurrences for each Direction)
m/s
Wind Direction (°)

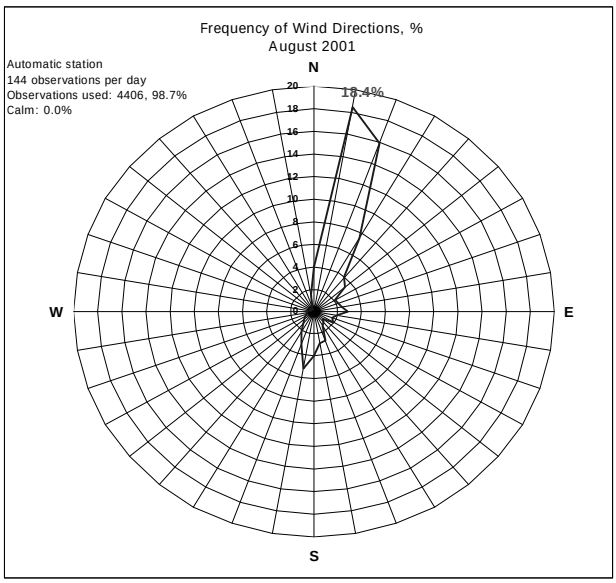
Seley

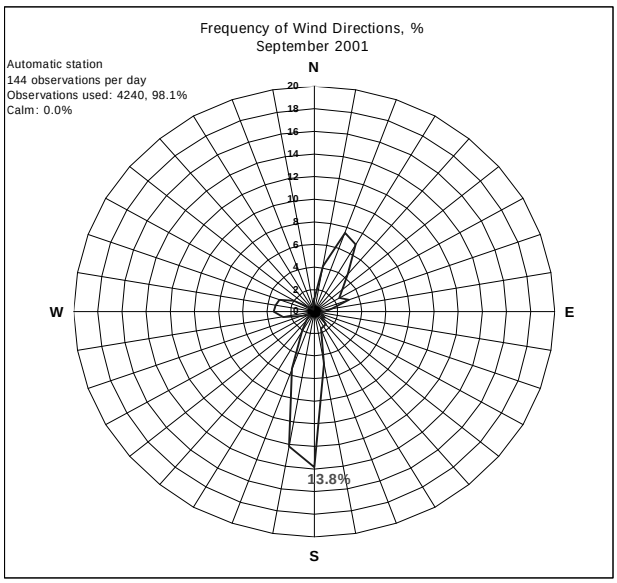


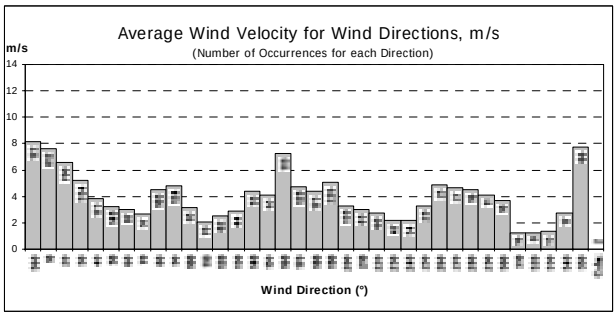


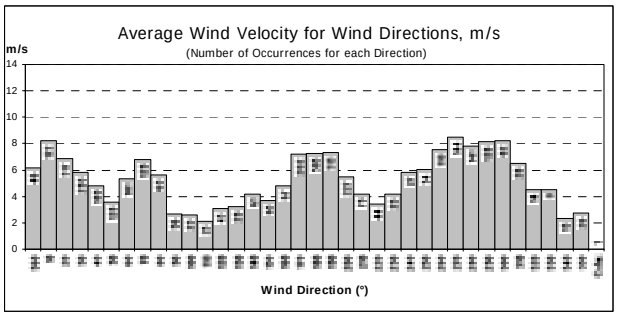












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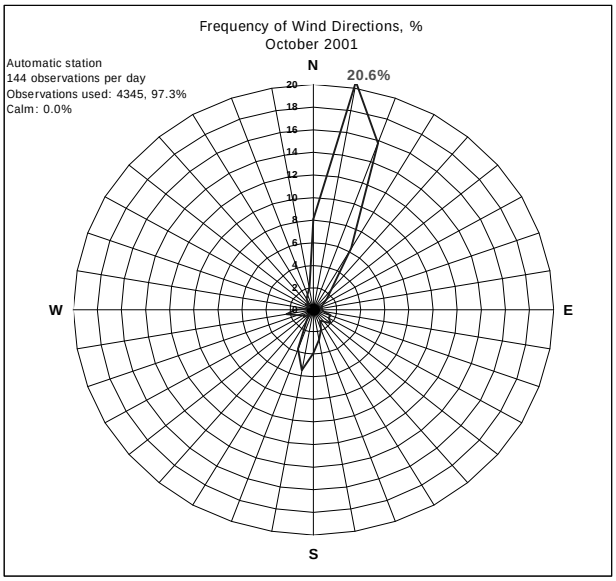
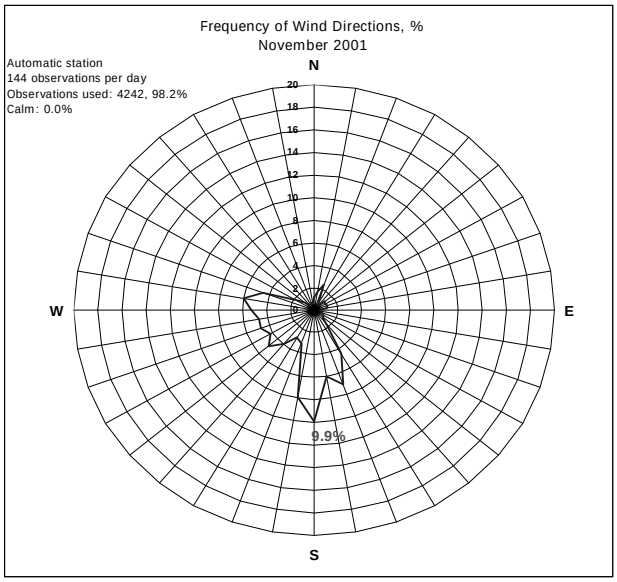
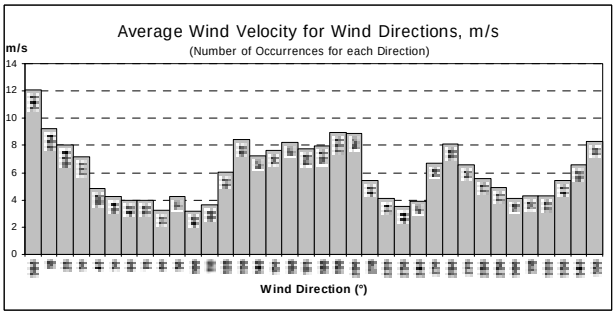
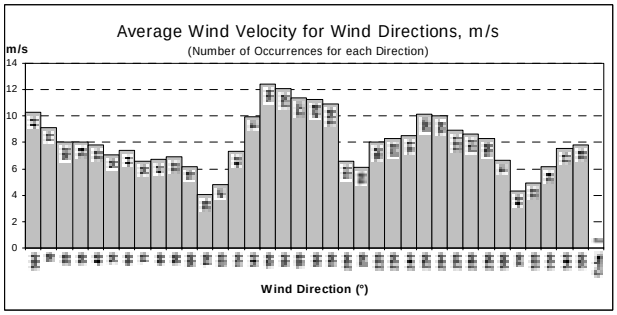
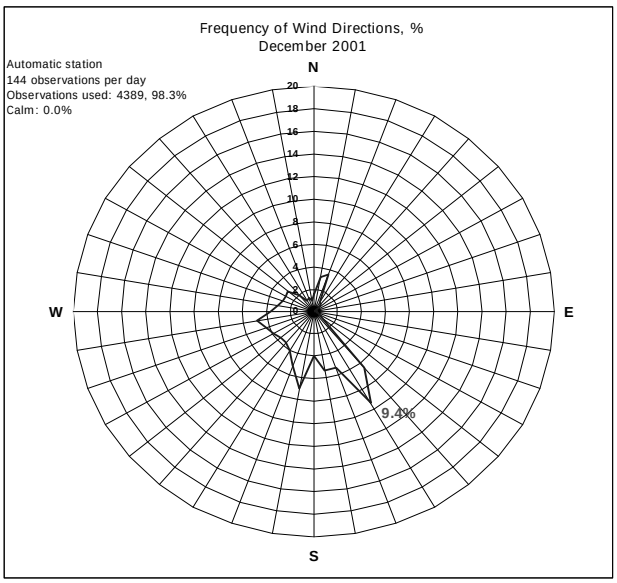
Seley

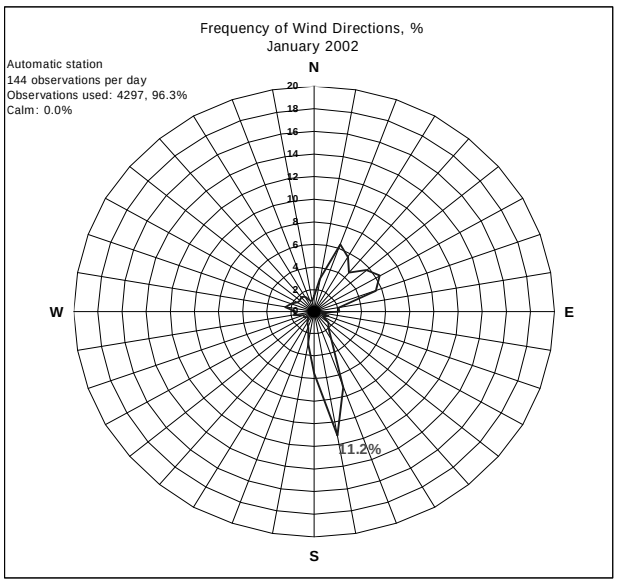

Frequency of Wind Directions, %
October 2001
Automatic station
144 observations per day
Observations used: 4345, 97.3%
Calm: 0.0%
N
E
S
W
20.6%

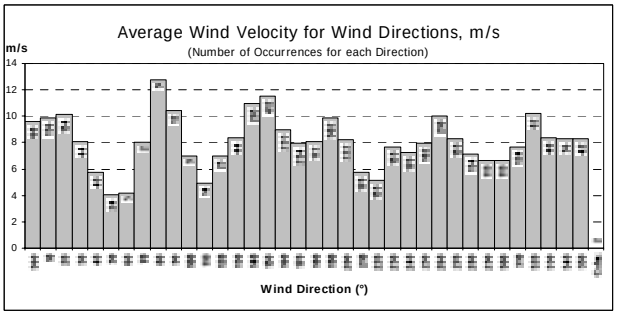

Frequency of Wind Directions, %
November 2001
Automatic station
144 observations per day
Observations used: 4242, 98.2%
Calm: 0.0%
N
E
S
W
9.9%

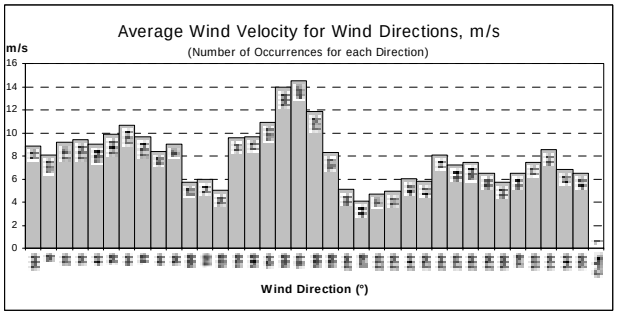

Average Wind Velocity for Wind Directions, m/s
(Number of Occurrences for each Direction)
m/s
Wind Direction (°)


Average Wind Velocity for Wind Directions, m/s
(Number of Occurrences for each Direction)
m/s
Wind Direction (°)

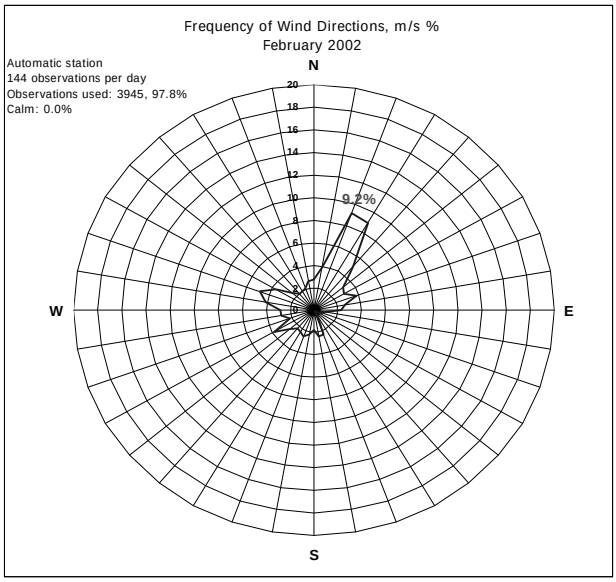

Frequency of Wind Directions, %
December 2001
Automatic station
144 observations per day
Observations used: 4389, 98.3%
Calm: 0.0%
N
E
S
W
9.4%

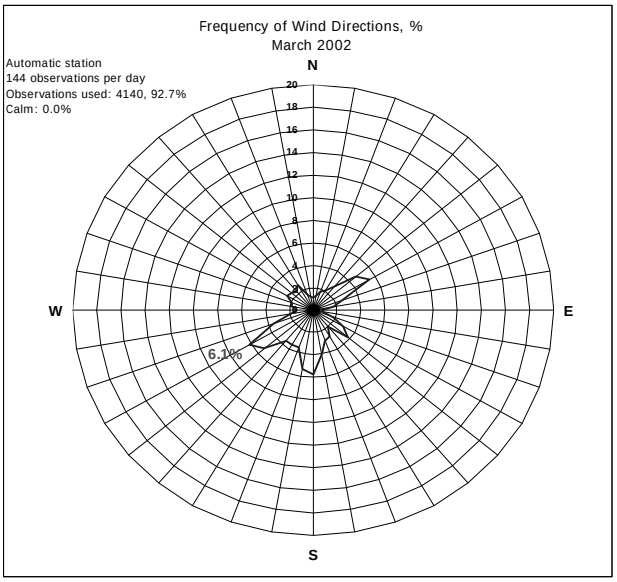

Frequency of Wind Directions, %
January 2002
Automatic station
144 observations per day
Observations used: 4297, 96.3%
Calm: 0.0%
N
E
S
W
11.2%

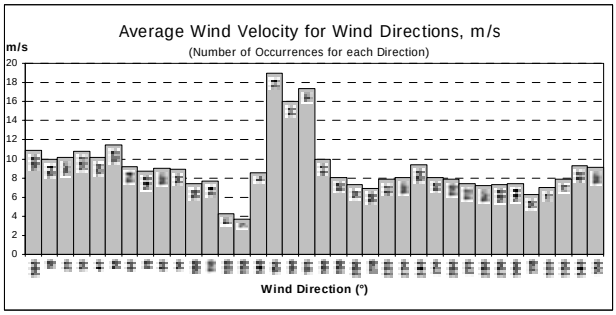

Average Wind Velocity for Wind Directions, m/s
(Number of Occurrences for each Direction)
m/s
Wind Direction (°)

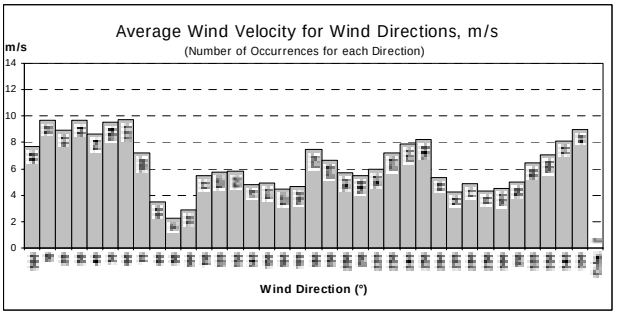

Average Wind Velocity for Wind Directions, m/s
(Number of Occurrences for each Direction)
m/s
Wind Direction (°)

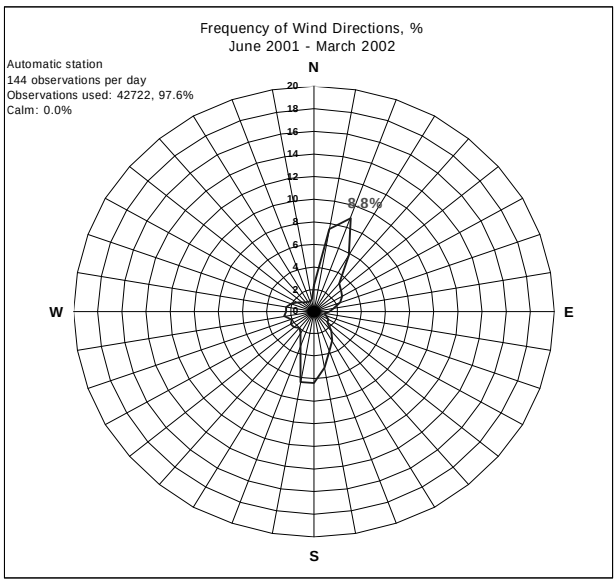
Seley

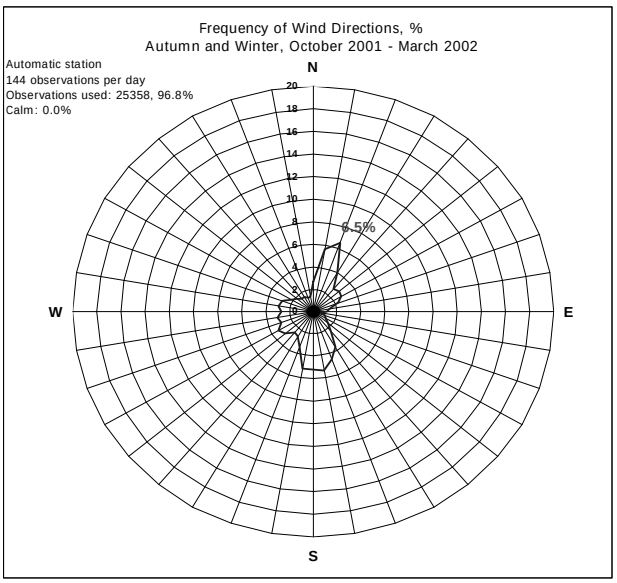


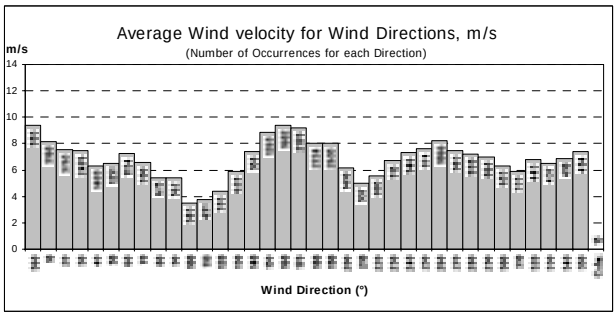


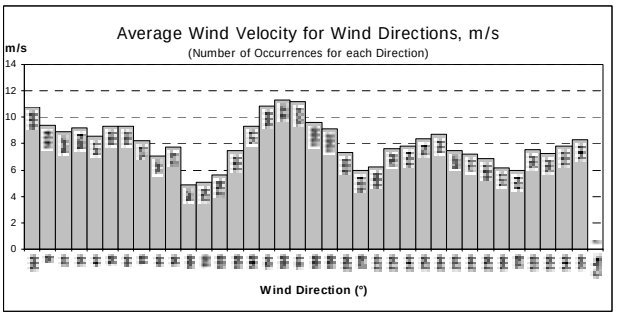












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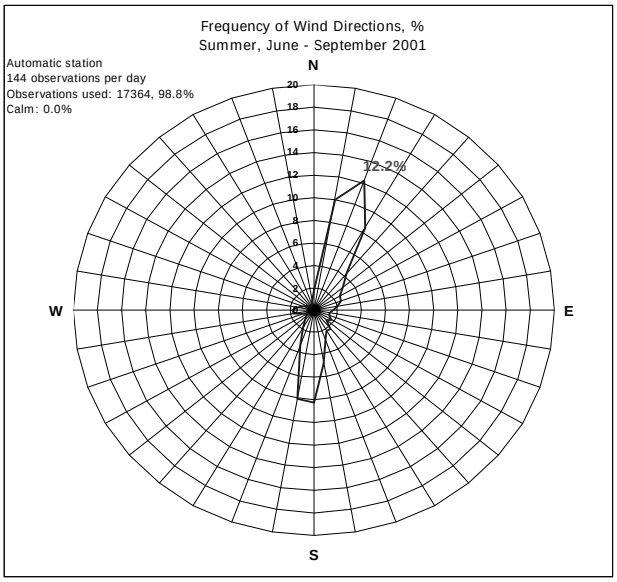
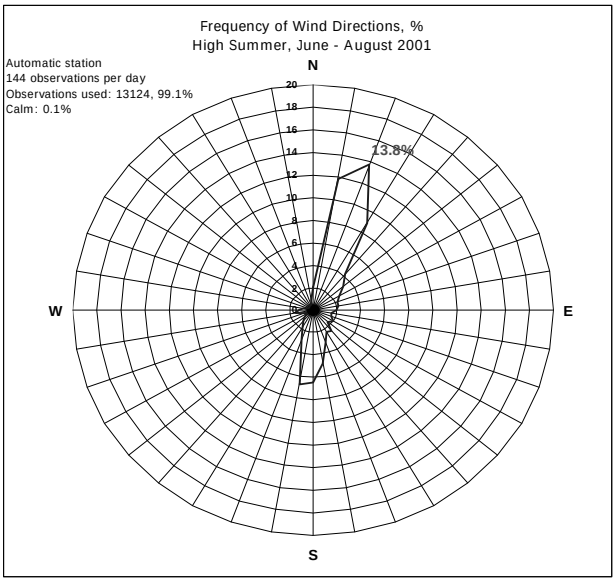
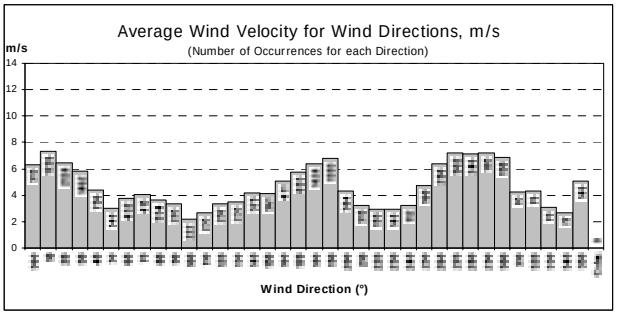
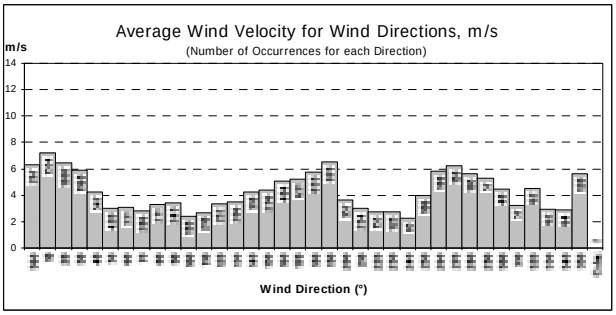
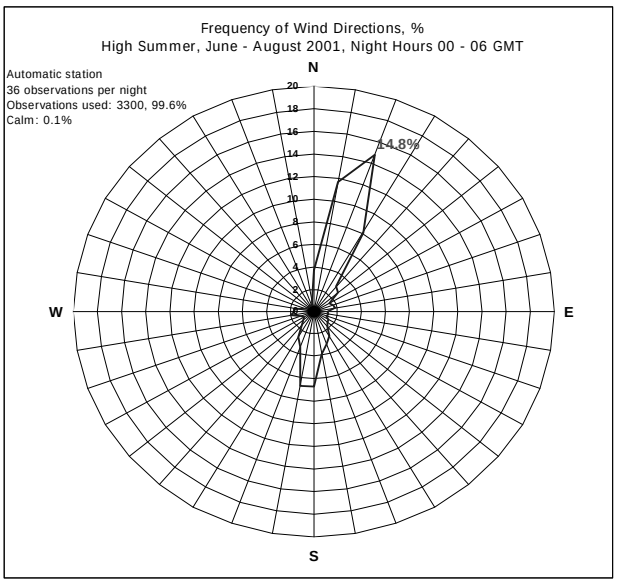
Seley

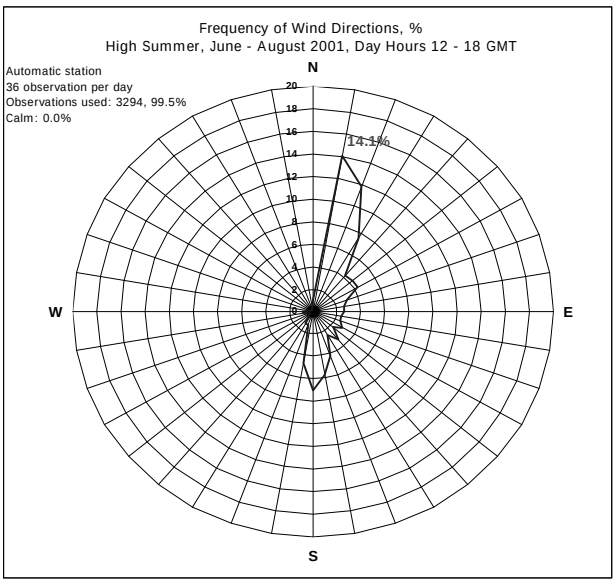

Frequency of Wind Directions, %
Summer, June - September 2001
Automatic station
144 observations per day
Observations used: 17364, 98.8%
Calm: 0.0%
N
W
E
S
12.2%

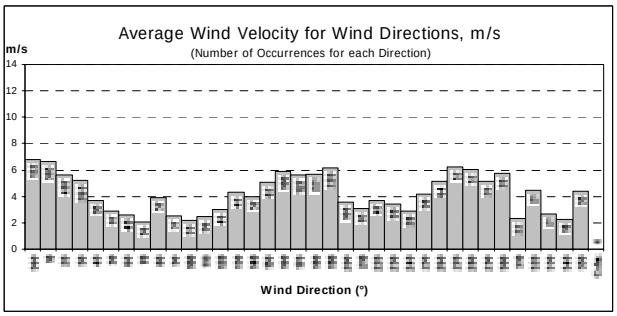

Frequency of Wind Directions, %
High Summer, June - August 2001
Automatic station
144 observations per day
Observations used: 13124, 99.1%
Calm: 0.1%
N
W
E
S
13.8%

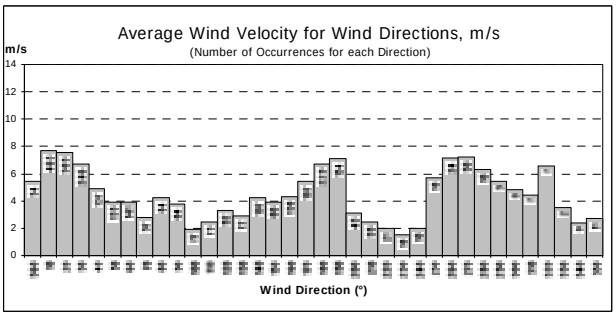

Average Wind Velocity for Wind Directions, m/s
(Number of Occurrences for each Direction)
m/s
Wind Direction (°)


Average Wind Velocity for Wind Directions, m/s
(Number of Occurrences for each Direction)
m/s
Wind Direction (°)

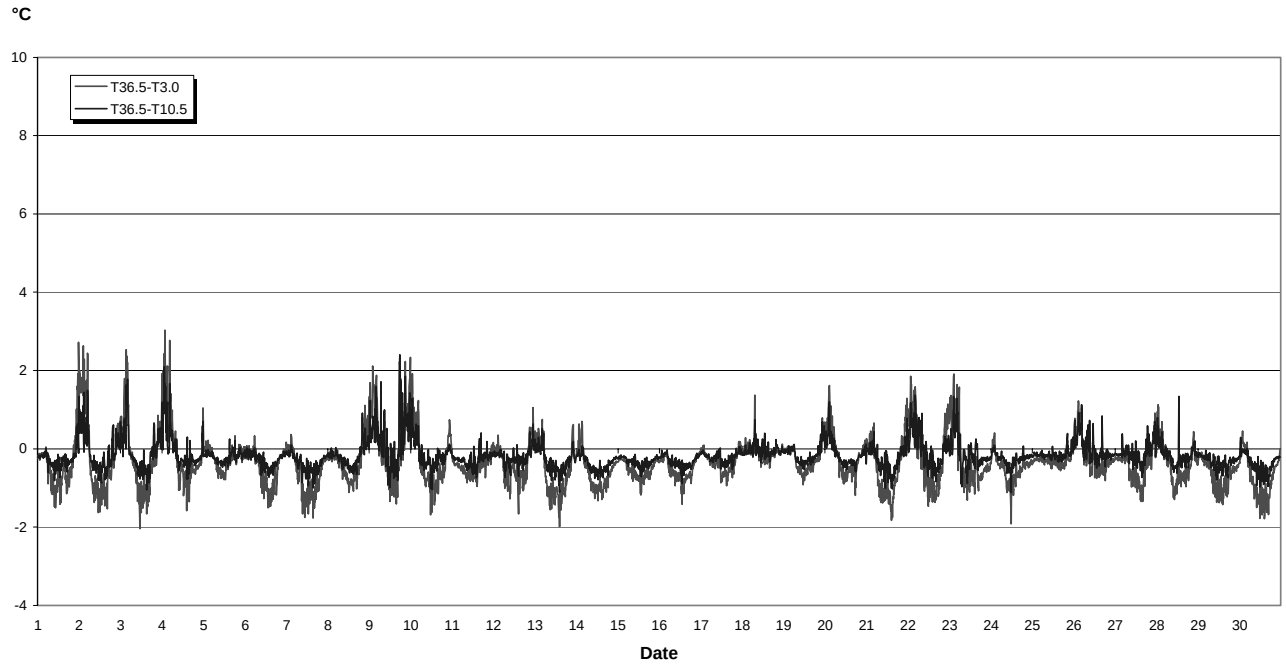

Frequency of Wind Directions, %
High Summer, June - August 2001, Night Hours 00 - 06 GMT
Automatic station
36 observations per night
Observations used: 3300, 99.6%
Calm: 0.1%
N
W
E
S
14.8%


Frequency of Wind Directions, %
High Summer, June - August 2001, Day Hours 12 - 18 GMT
Automatic station
36 observation per day
Observations used: 3294, 99.5%
Calm: 0.0%
N
W
E
S
14.1%

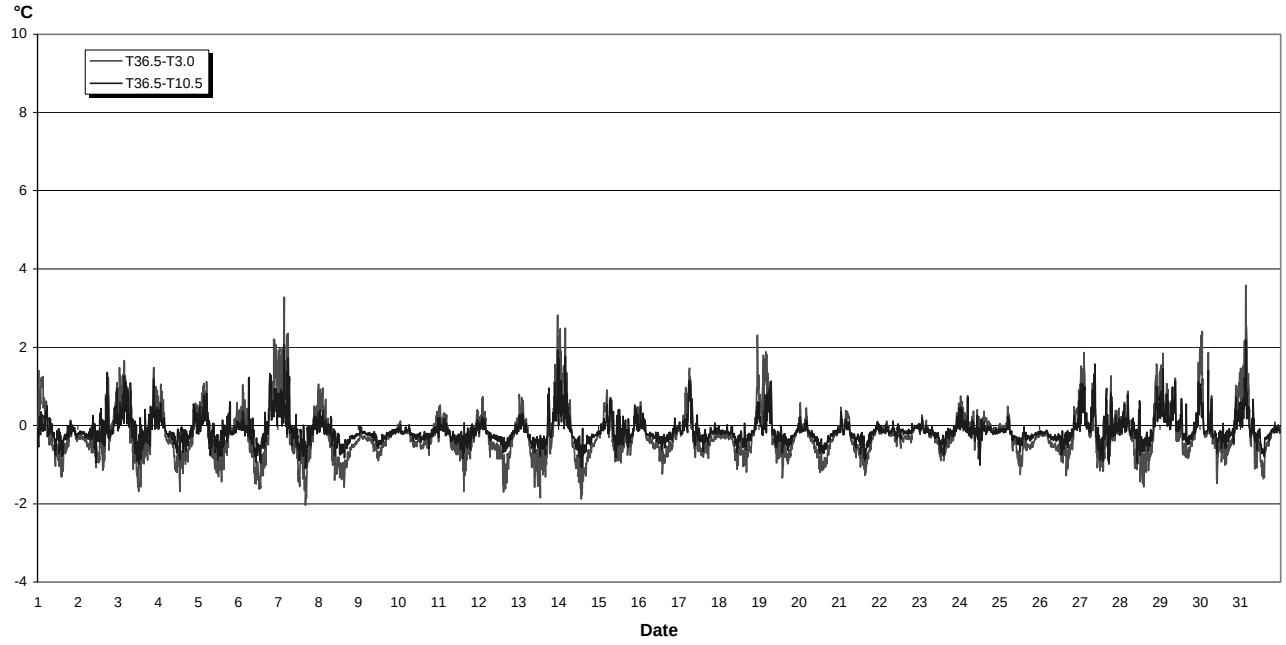

Average Wind Velocity for Wind Directions, m/s
(Number of Occurrences for each Direction)
m/s
Wind Direction (°)


Average Wind Velocity for Wind Directions, m/s
(Number of Occurrences for each Direction)
m/s
Wind Direction (°)

Sómastaðageröi
Vertical Temperature Gradient, °C
June 2001



Sómastaðageröi
Vertical Temperature Gradient, °C
July 2001



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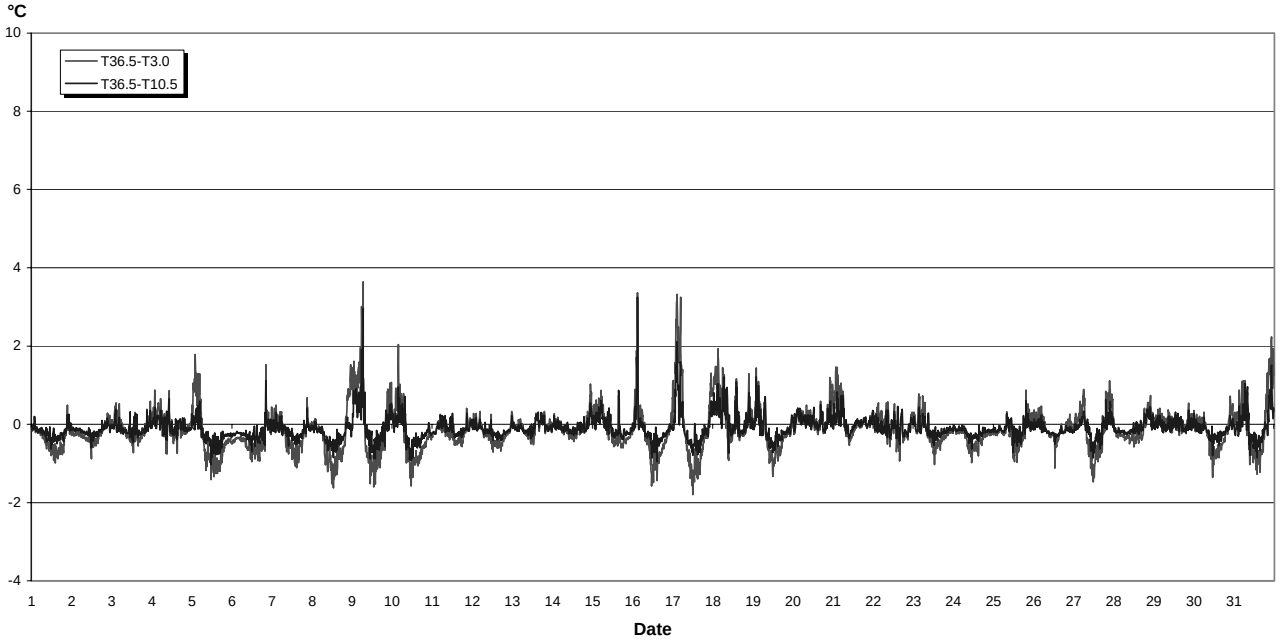
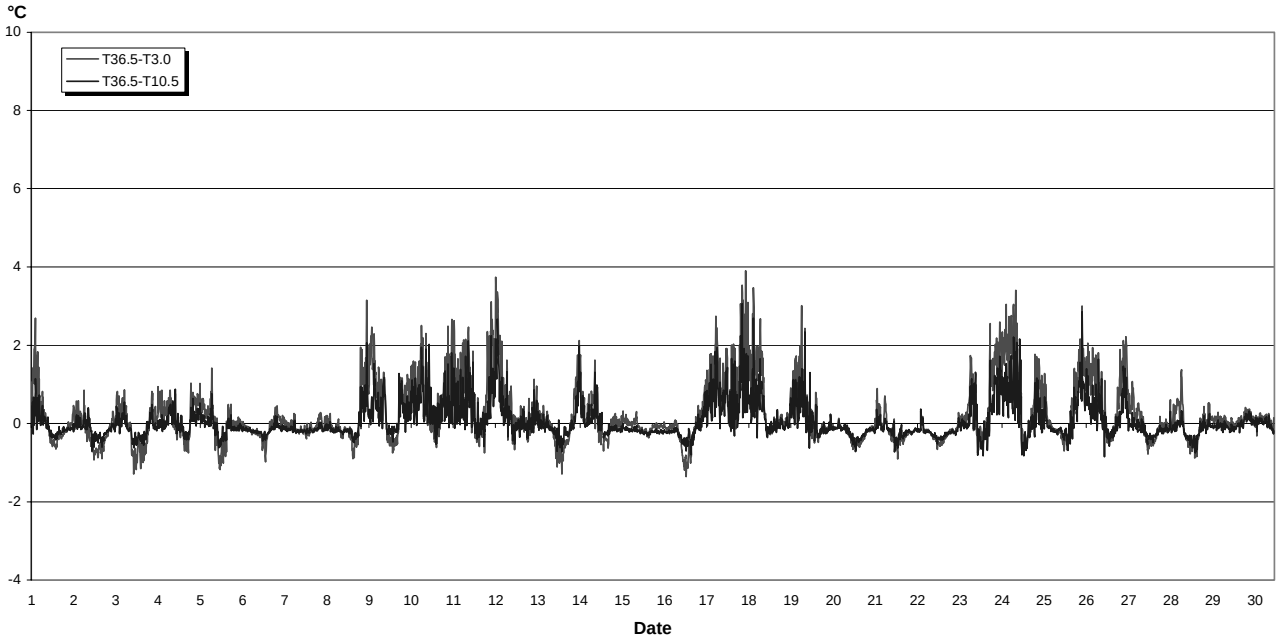
Sómastaðageröi
Vertical Temperature Gradient, °C
August 2001

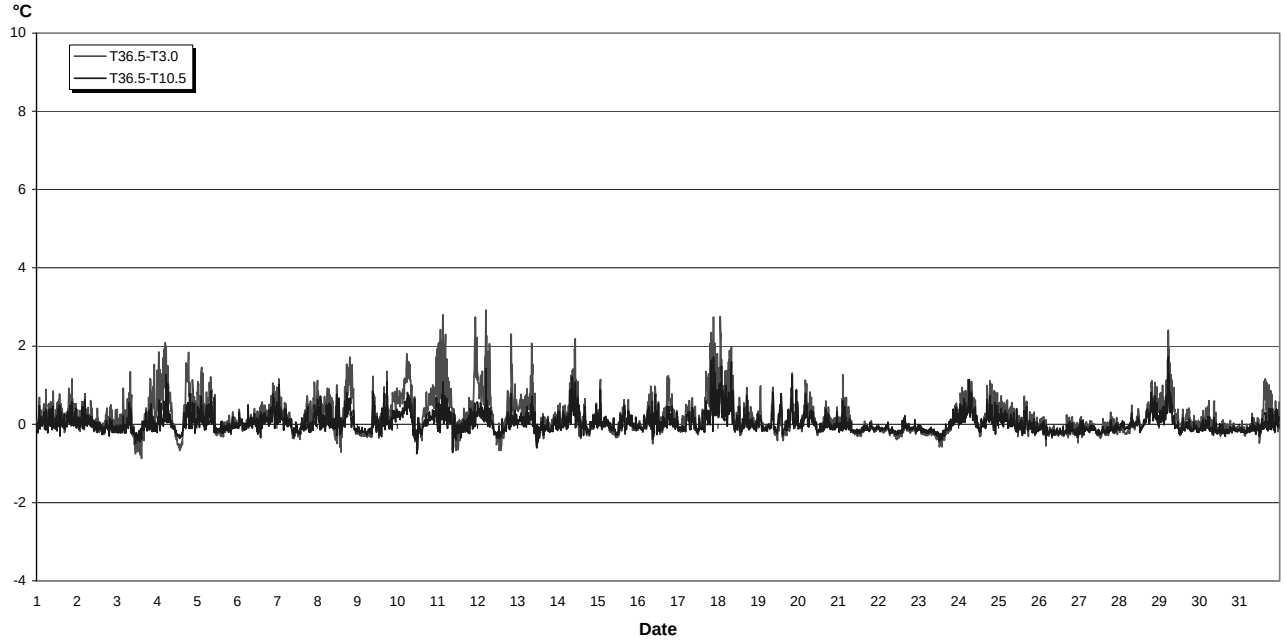


Sómastaðageröi
Vertical Temperature Gradient, °C
September 2001

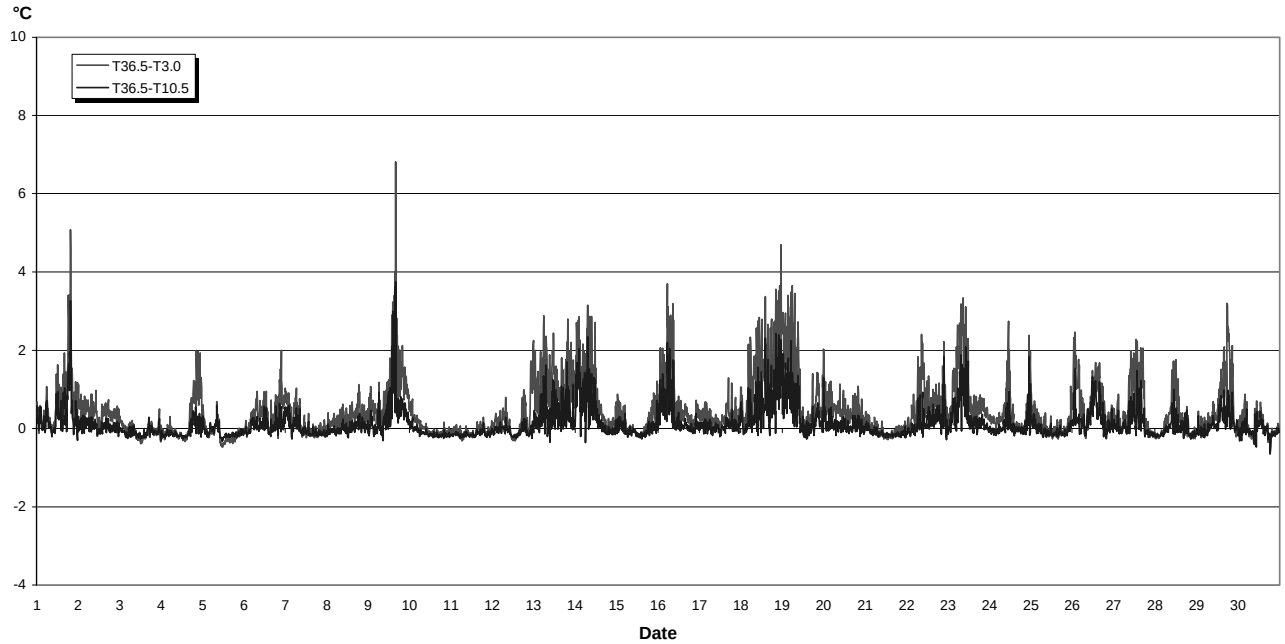


Annex 31

Sómastaðagerði
Vertical Temperature Gradient, °C
October 2001

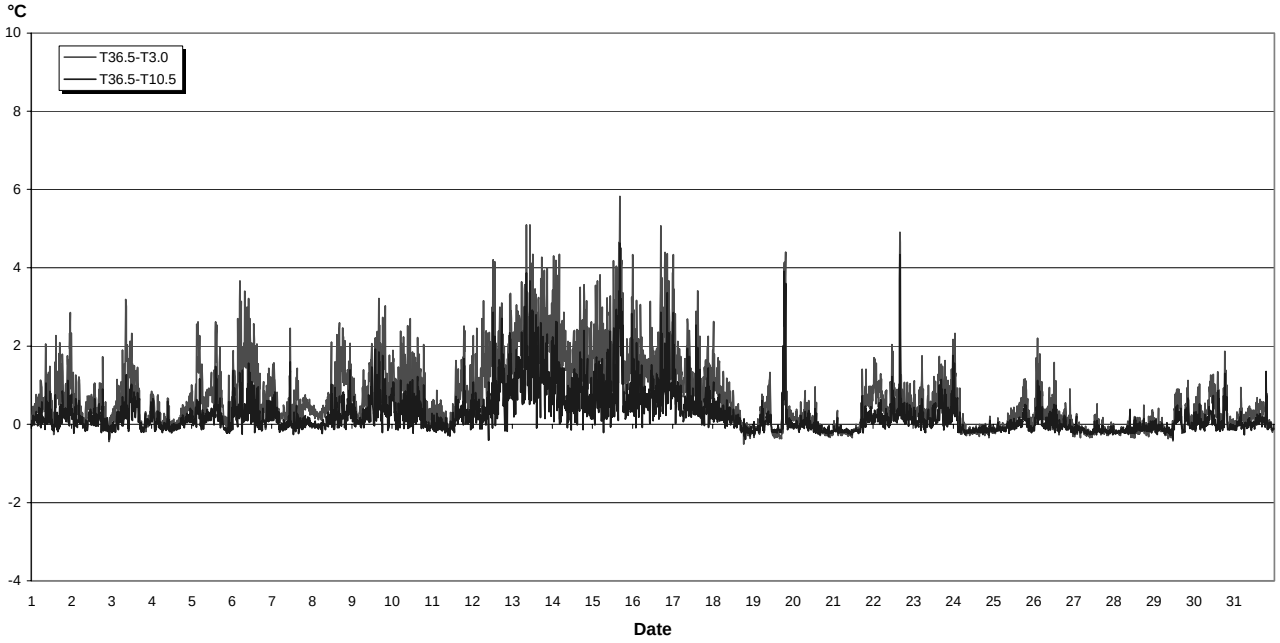


Sómastaðagerði
Vertical Temperature Gradient, °C
November 2001

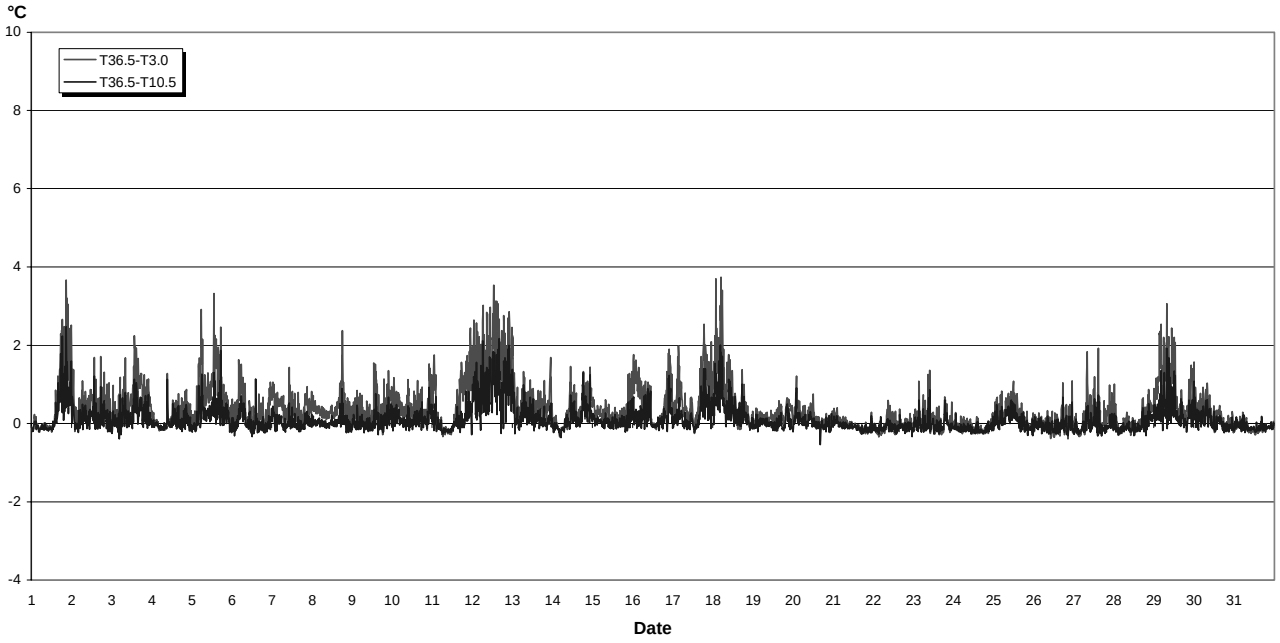


Annex 32

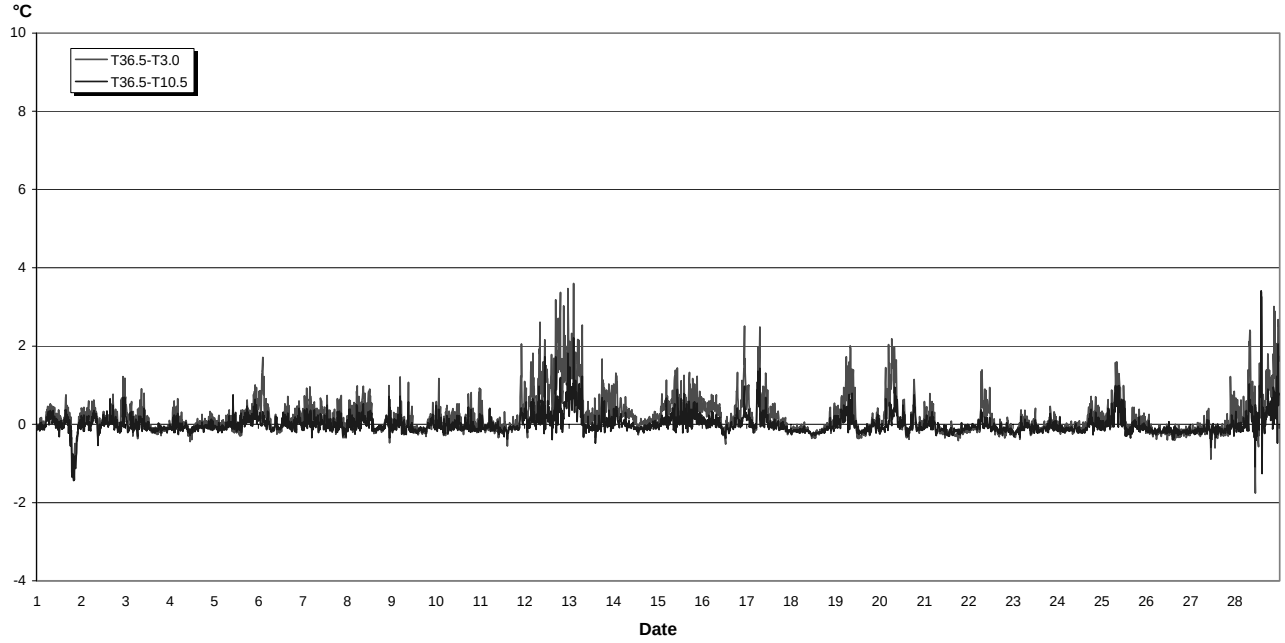
Sómastaðageröi
Vertical Temperature Gradient, °C
December 2001



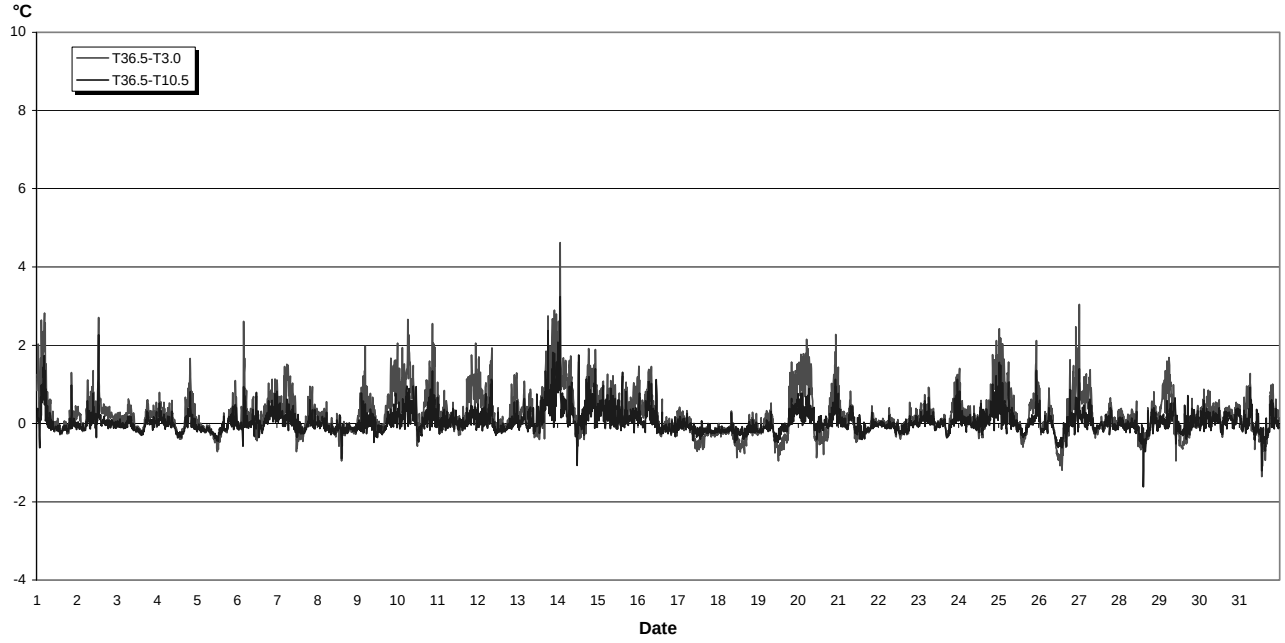
Sómastaðageröi
Vertical Temperature Gradient, °C
January 2002



Sómastaðagerði
Vertical Temperature Gradient, °C
February 2002

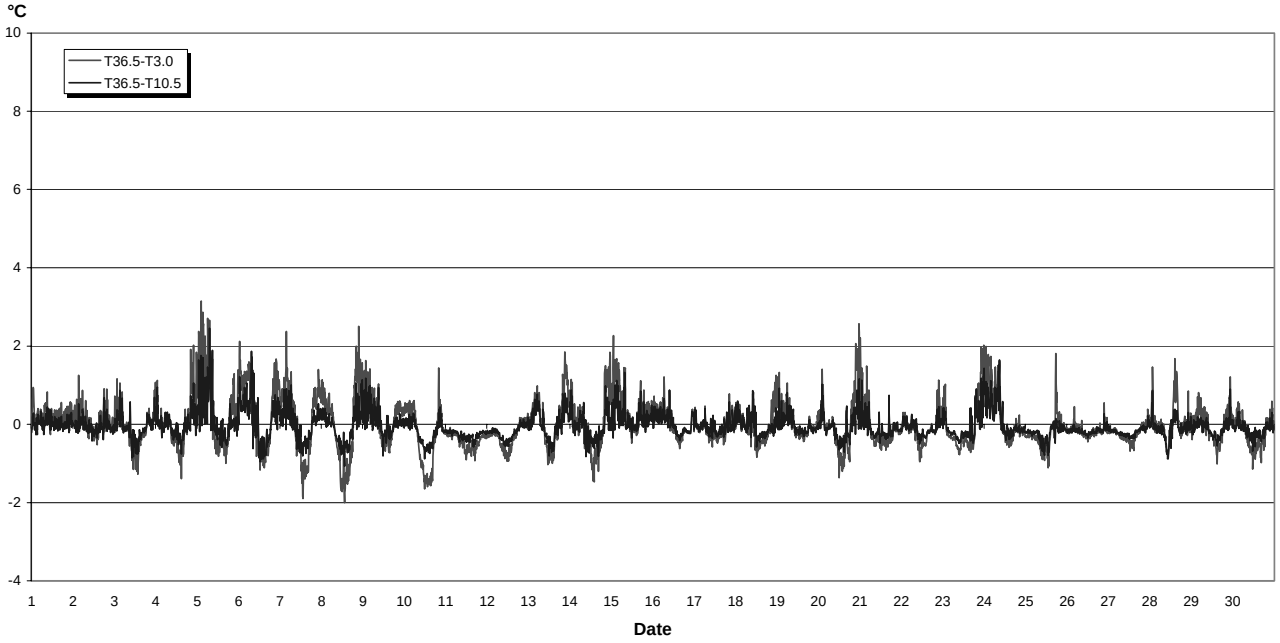


Sómastaðagerði
Vertical Temperature Gradient, °C
March 2002

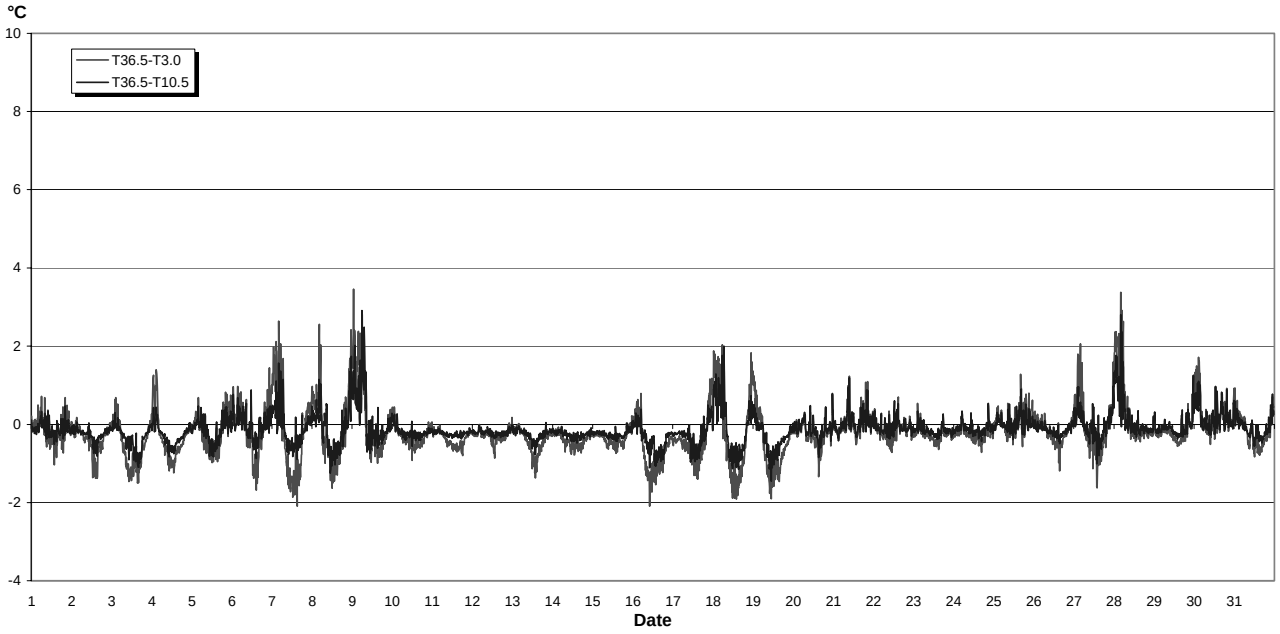


Annex 34

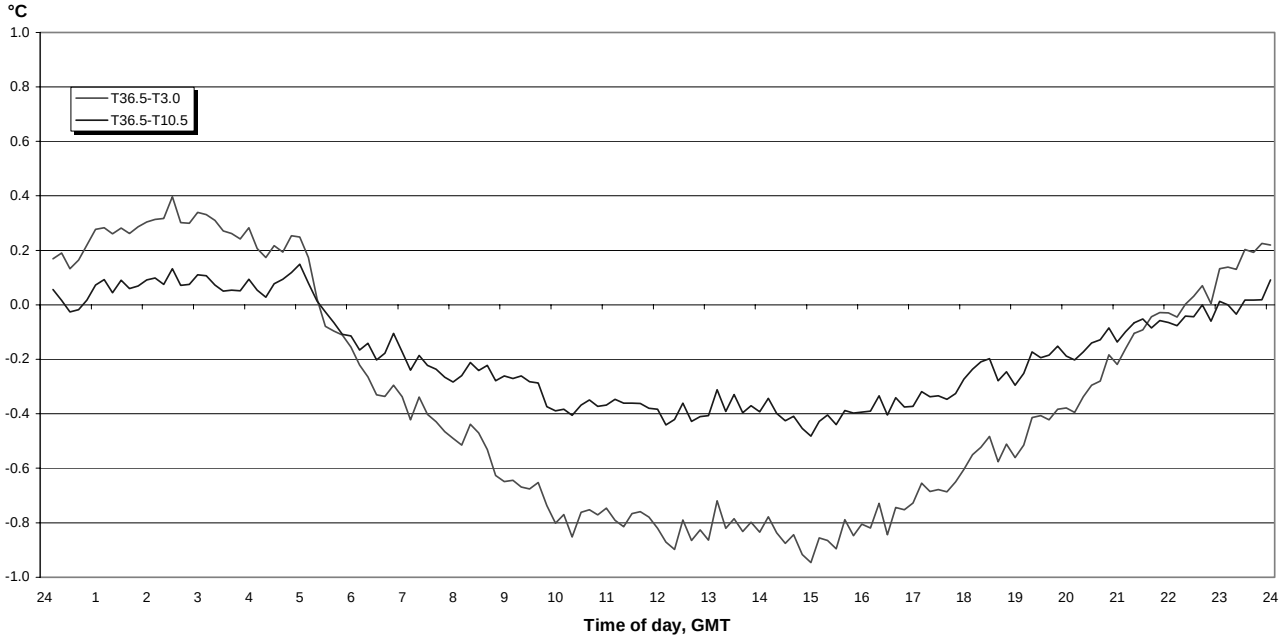
Sómastaðageröi
Vertical Temperature Gradient, °C
April 2002



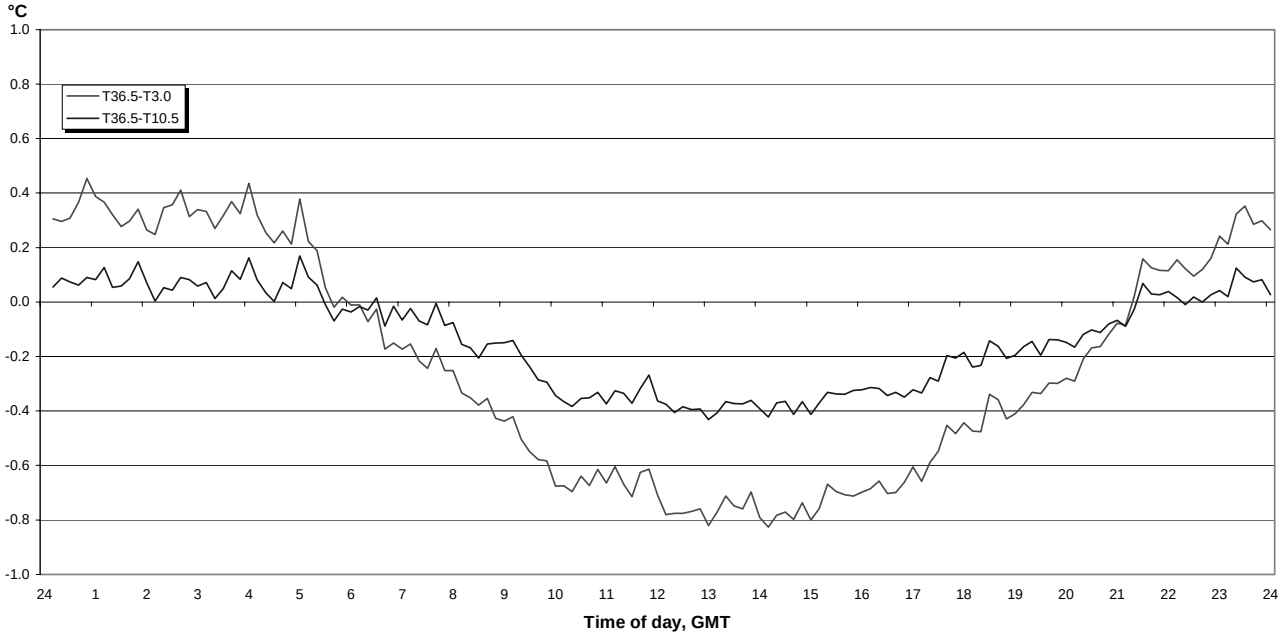
Sómastaðageröi
Vertical Temperature Gradient,°C
May 2002



Sómastaðagerði
Average Vertical Temperature Gradient, °C
June 2001



Sómastaðagerði
Average Vertical Temperature Gradient, °C
July 2001



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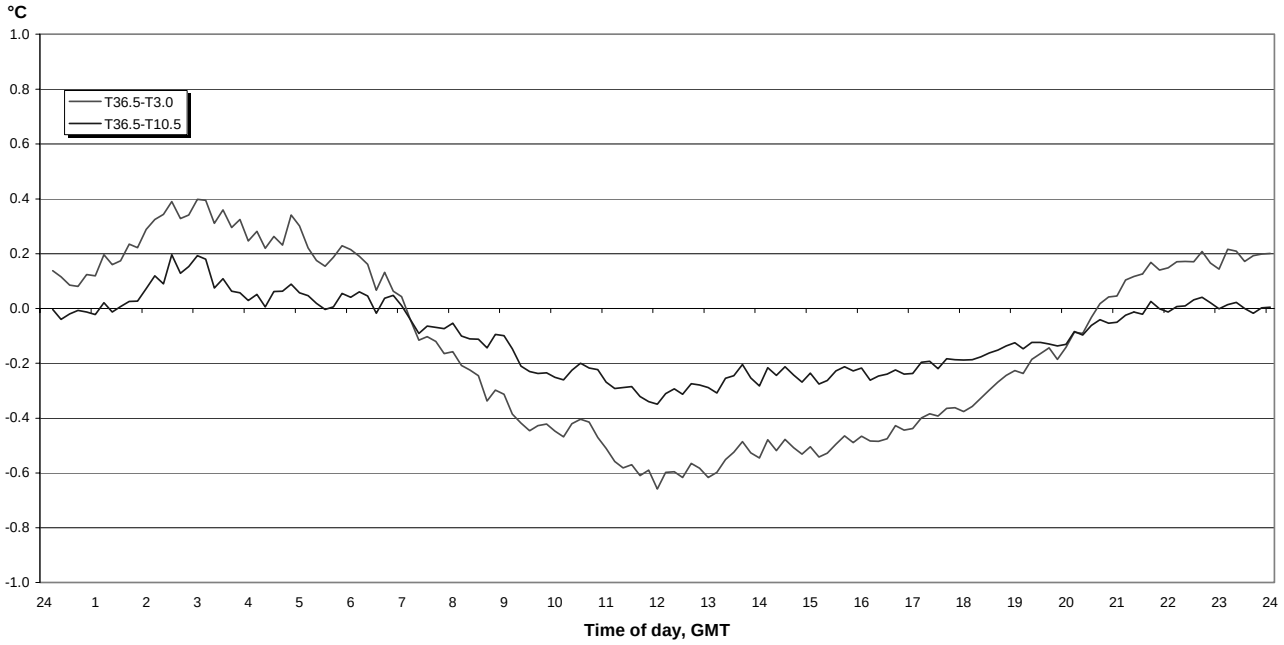
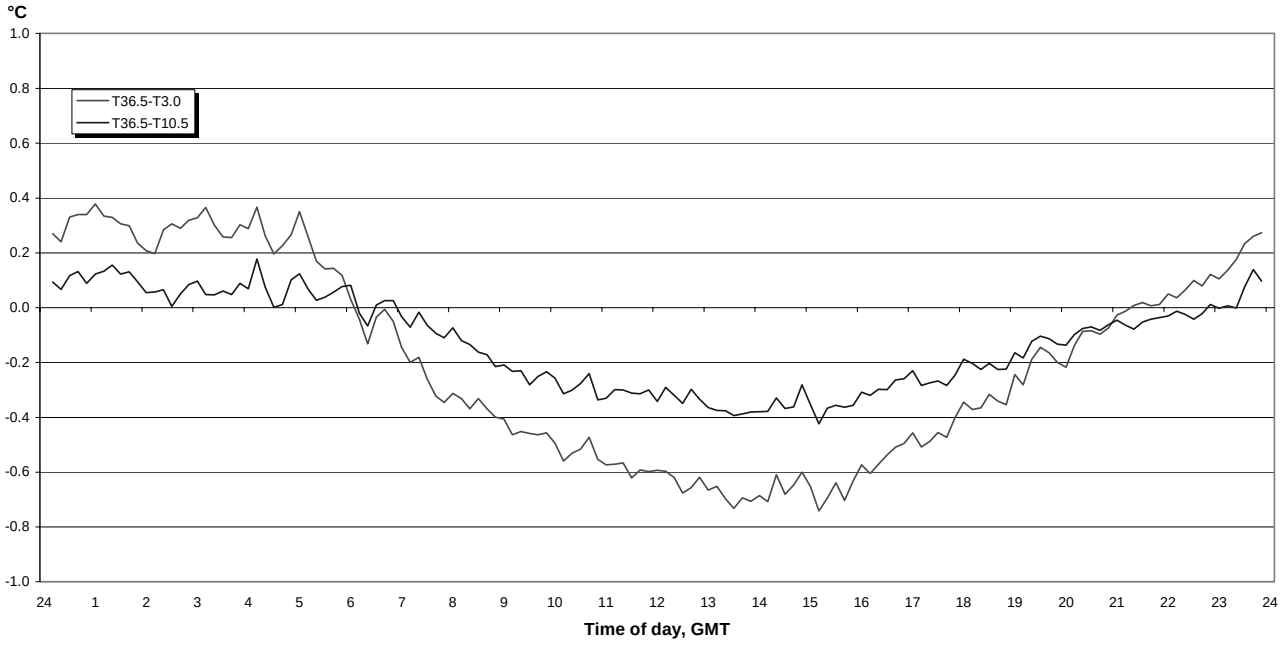
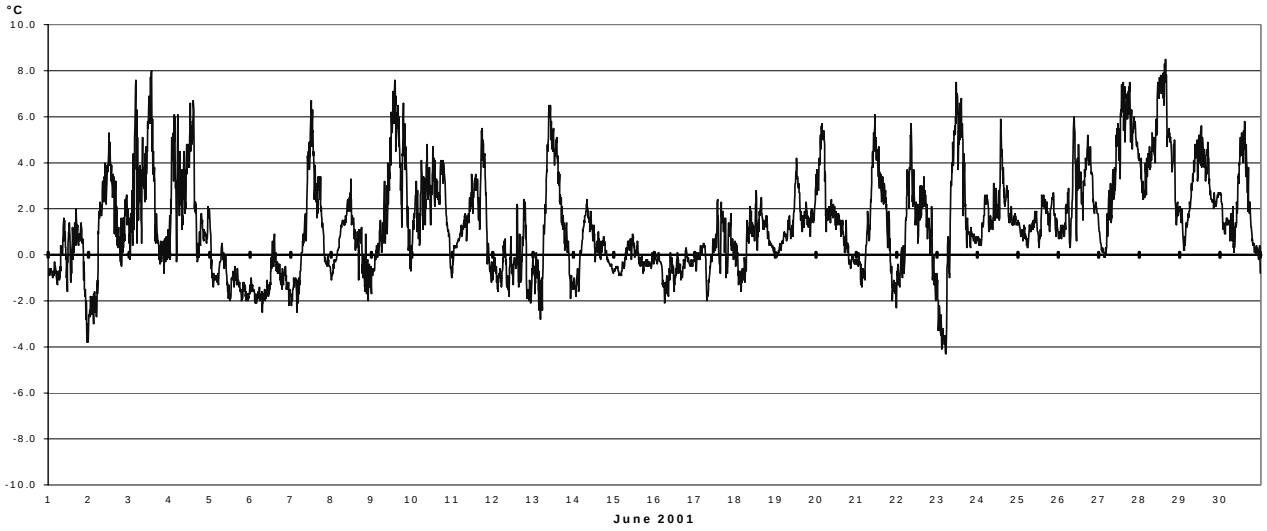
Sómastaðageröi
Average Vertical Temperature Gradient, °C
August 2001

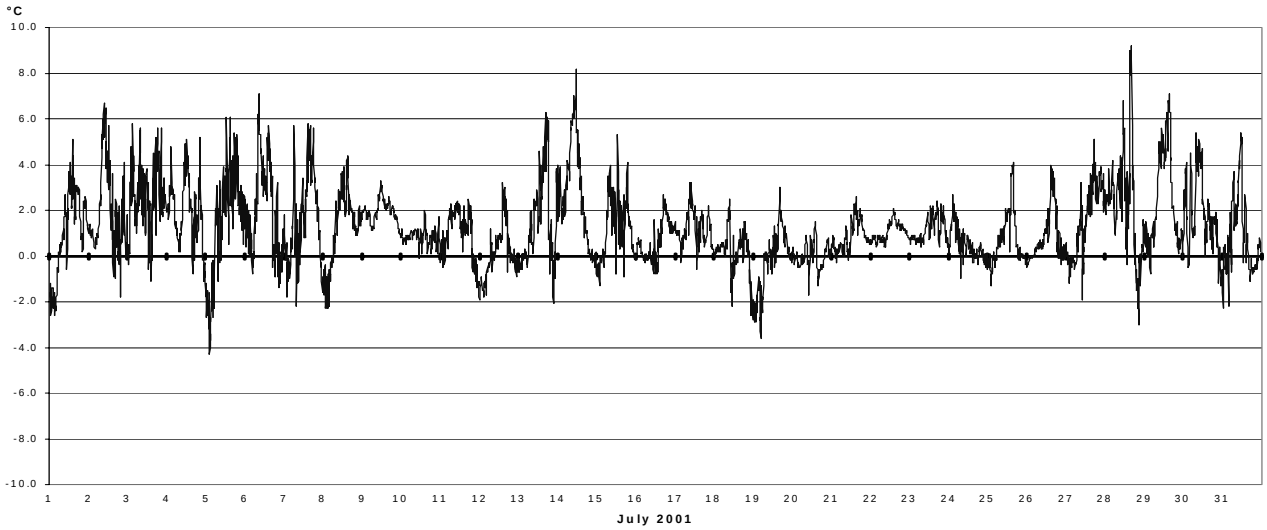


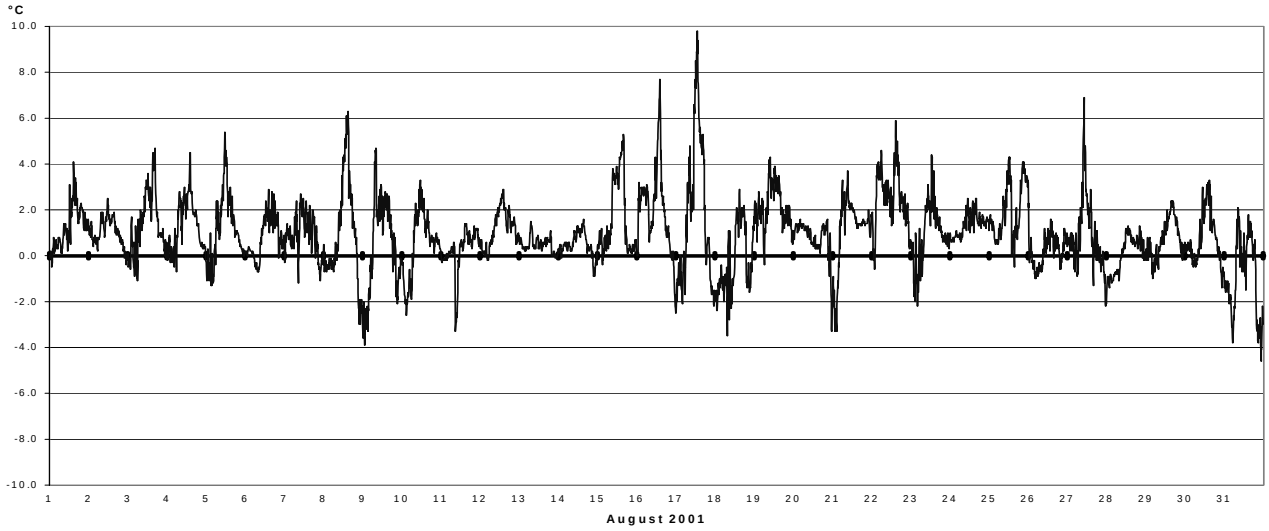
Sómastaðageröi
Average Vertical Temperature Gradient, °C
May 2002



Temperature Difference Kollaleira 2 - Vattarnes, °C

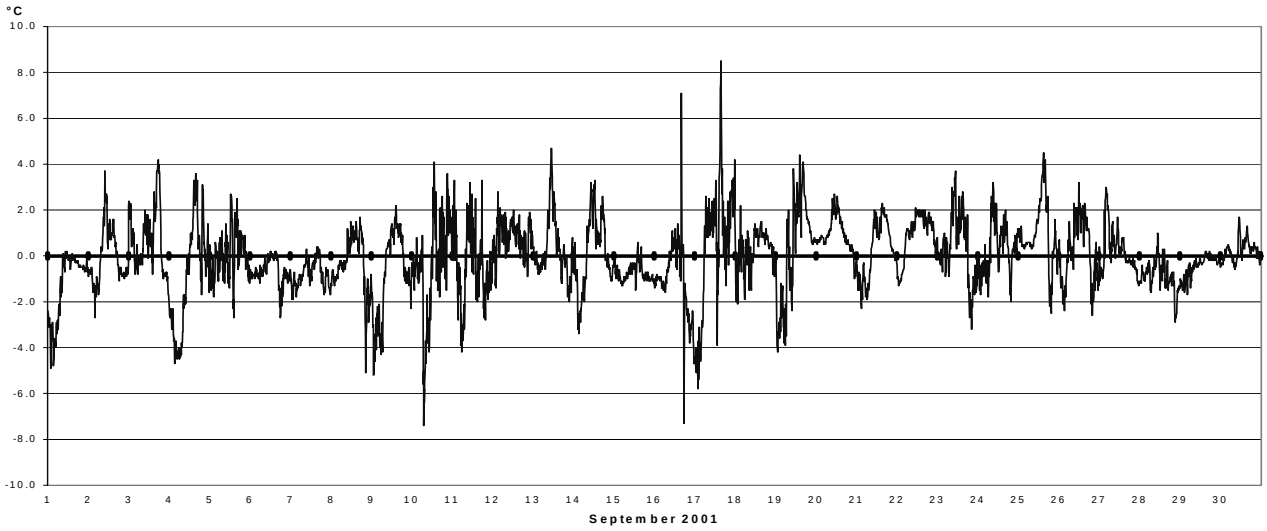


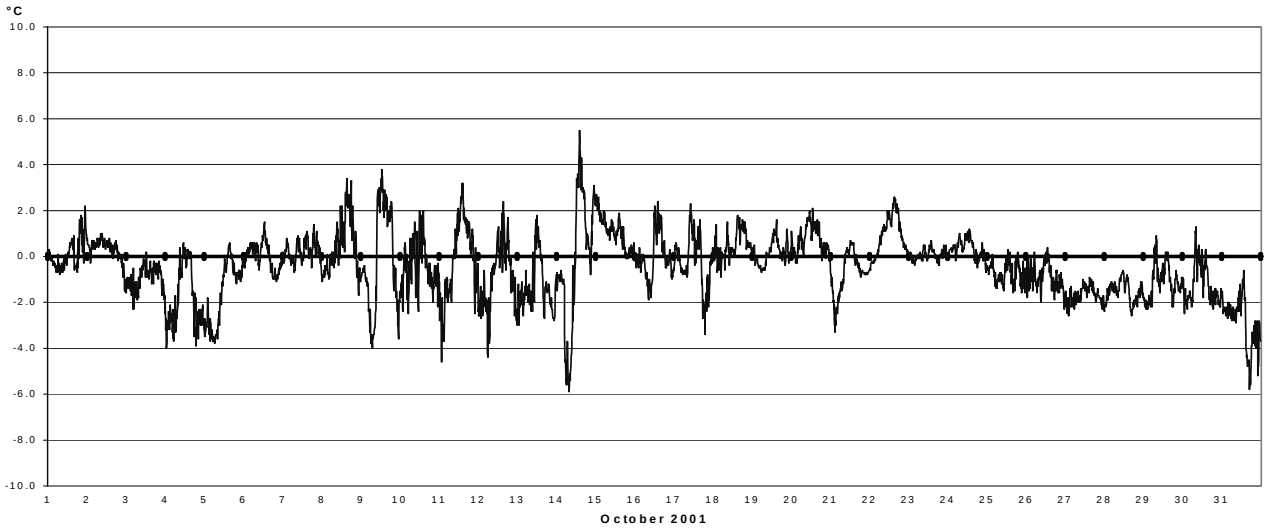


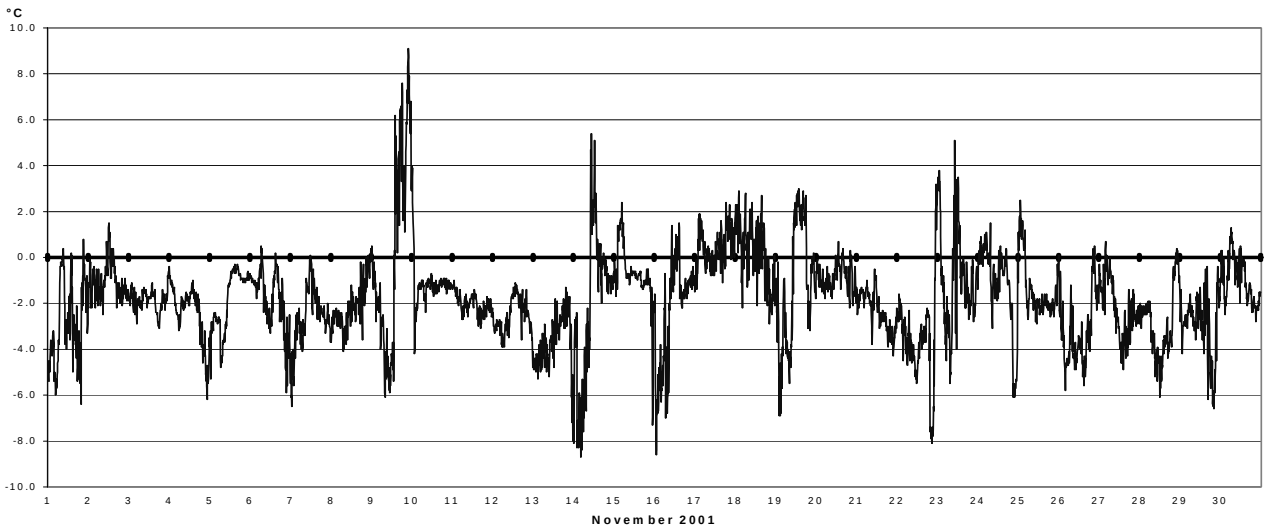


Annex 38

Temperature Difference Kollaleira 2 - Vattarnes, °C

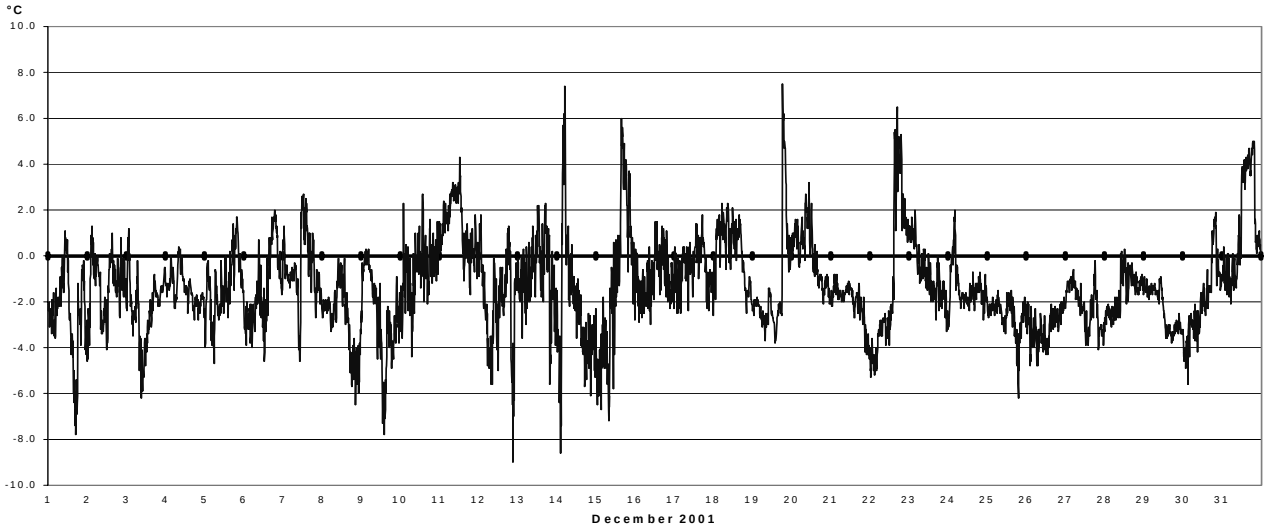


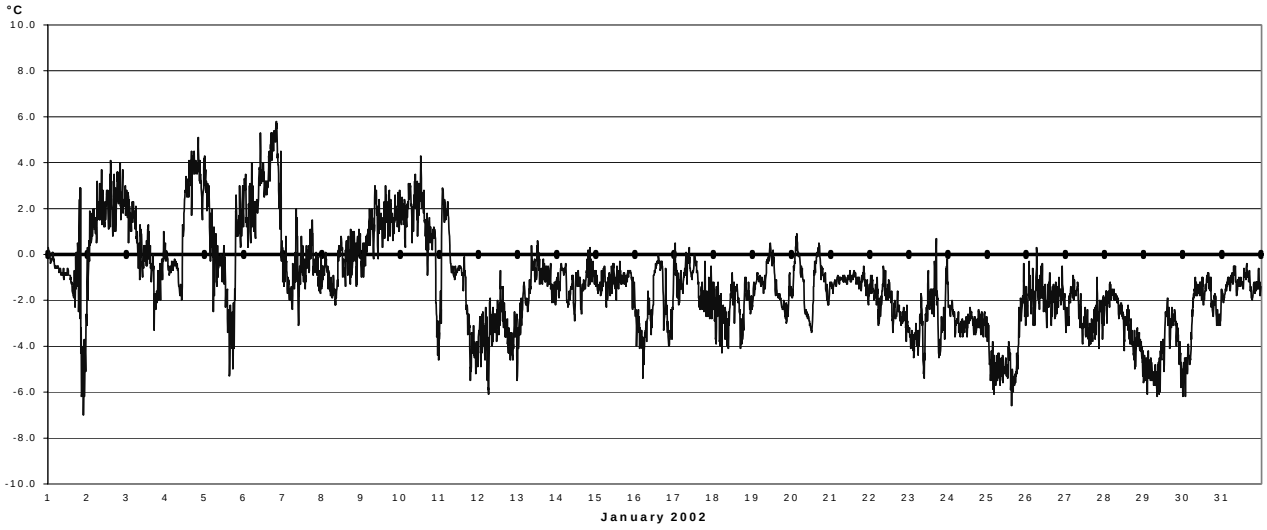


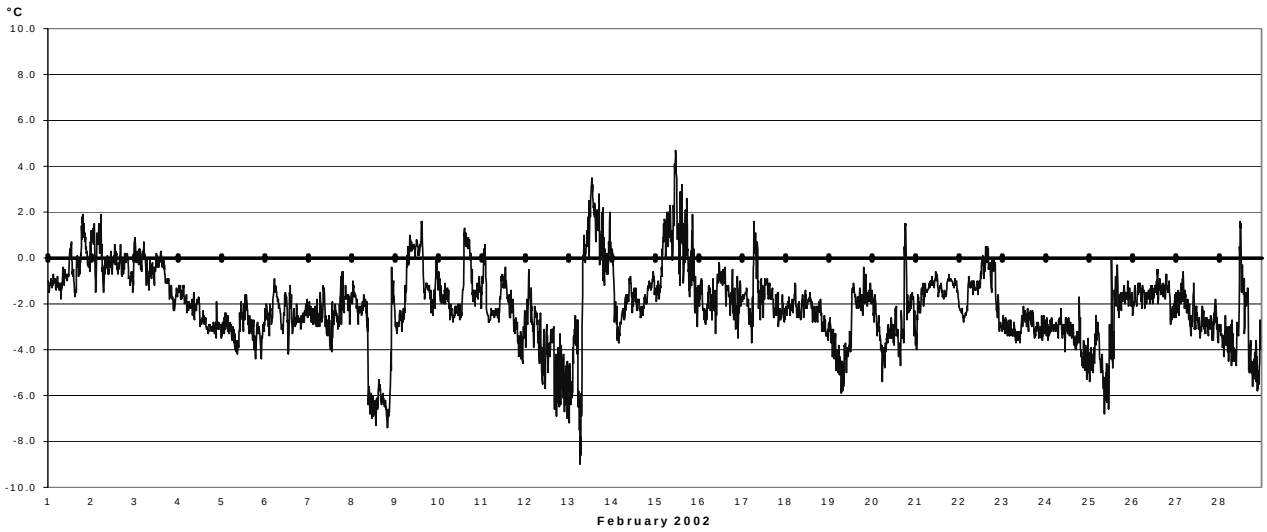


Annex 39

Temperature Difference Kollaleira 2 - Vattarnes, °C

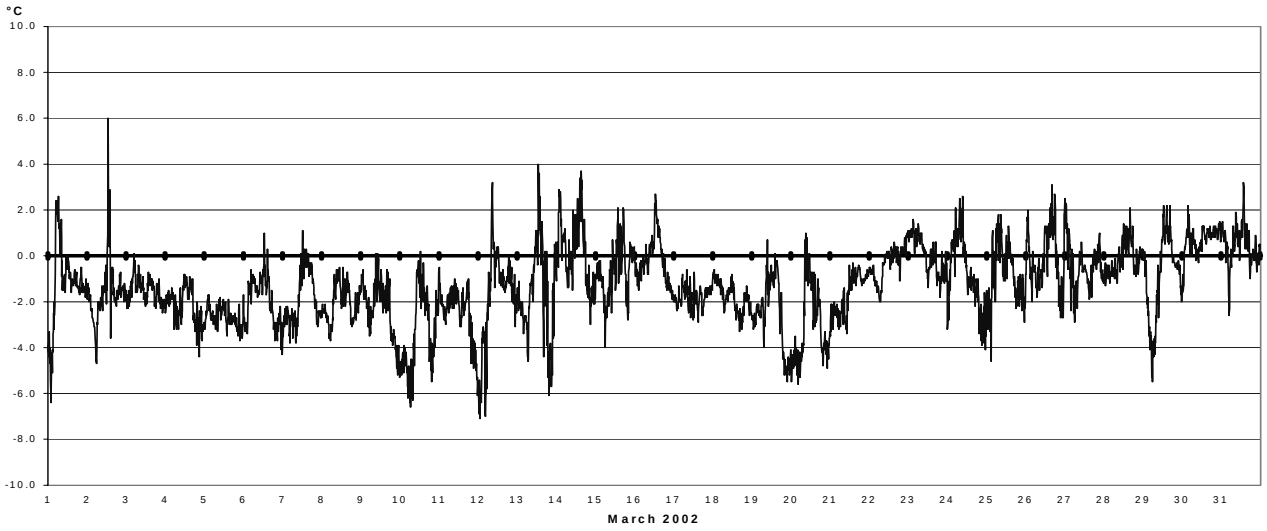


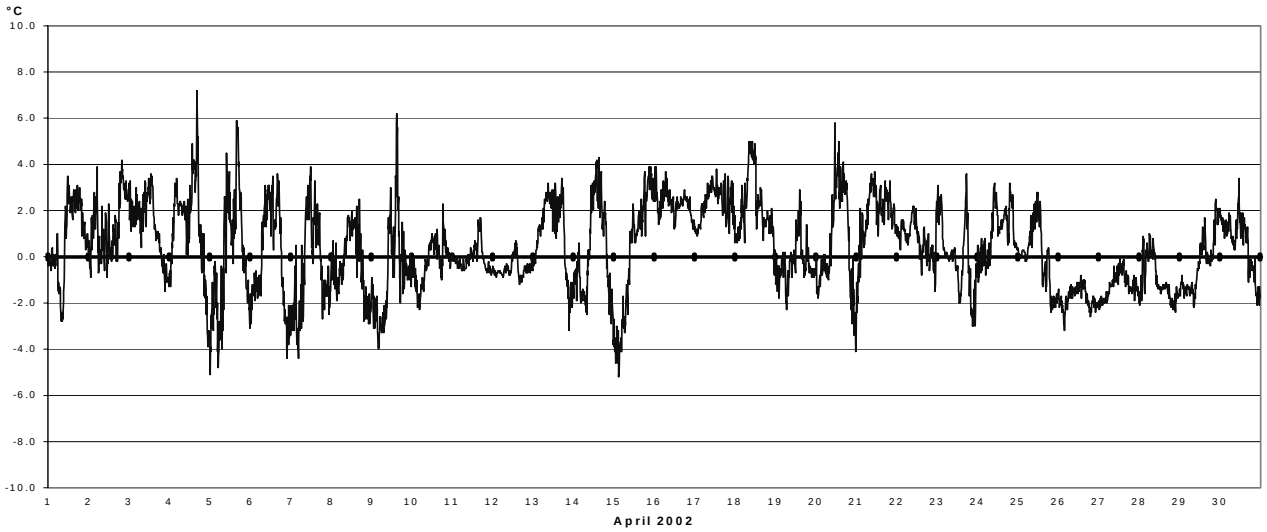


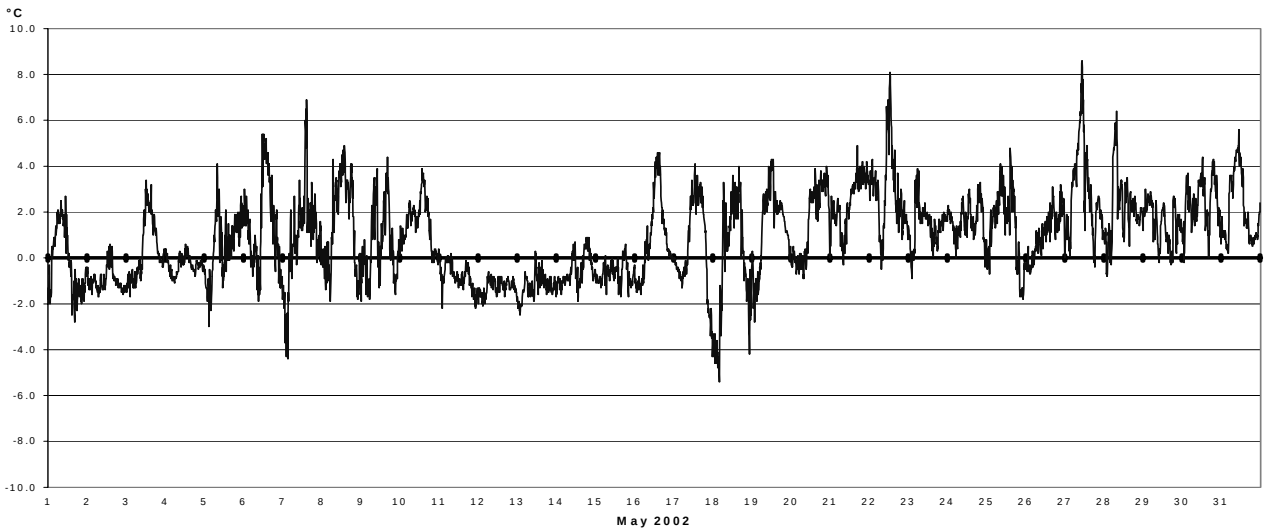


Annex 40

Temperature Difference Kollaleira 2 - Vattarnes, °C

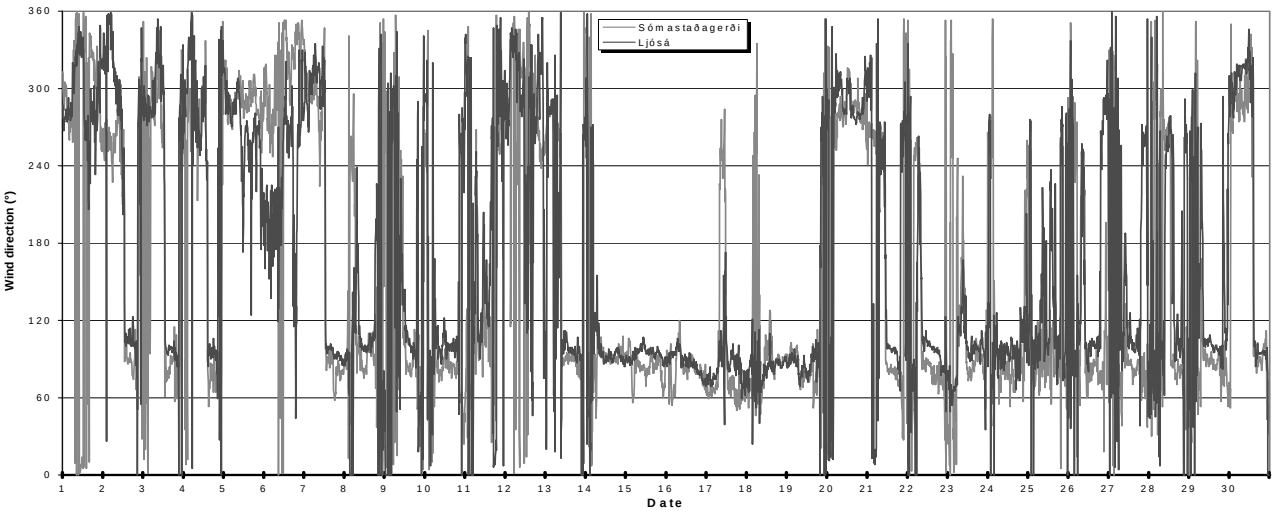


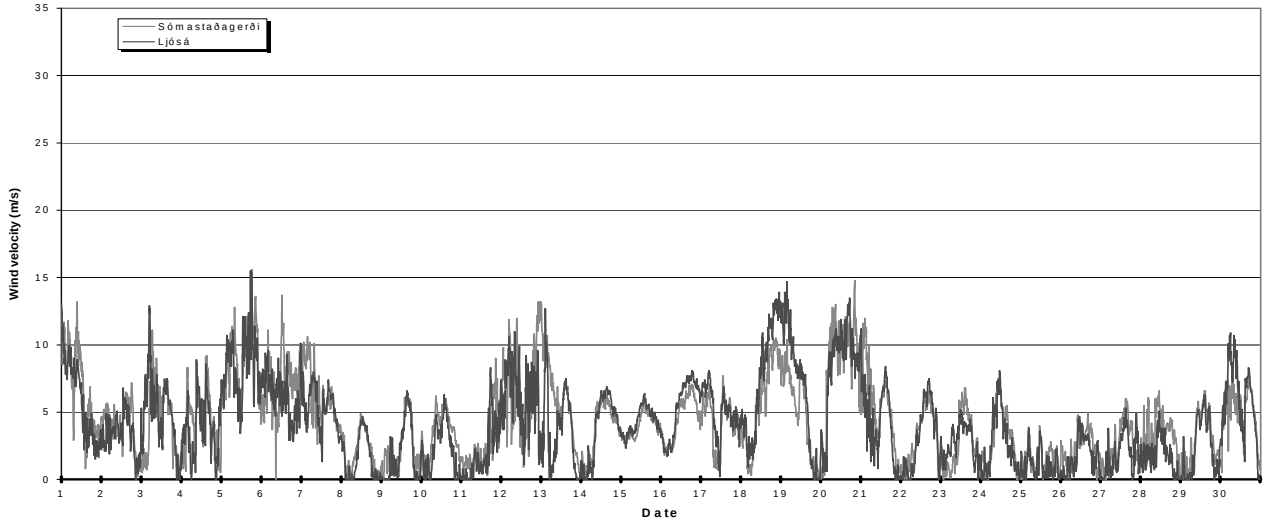


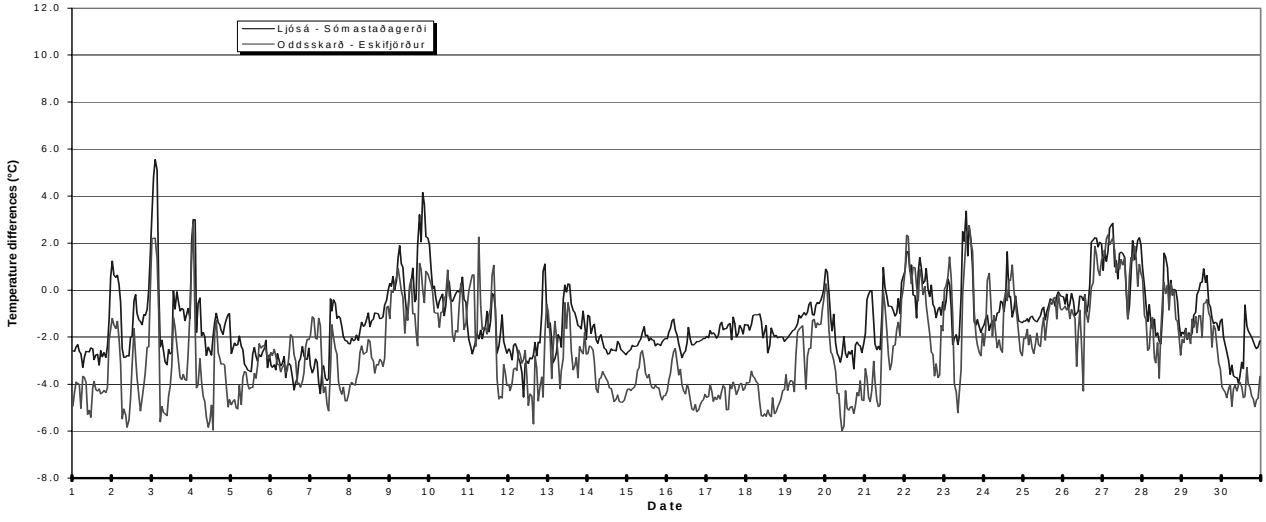


Annex 41

Simultaneous Observations of Wind Direction and Wind Velocity at Sómastaðagerði and Ljósá, and Temperature Difference Ljósá - Sómastaðagerði and Oddsskarð - Eskifjörður
June 2001

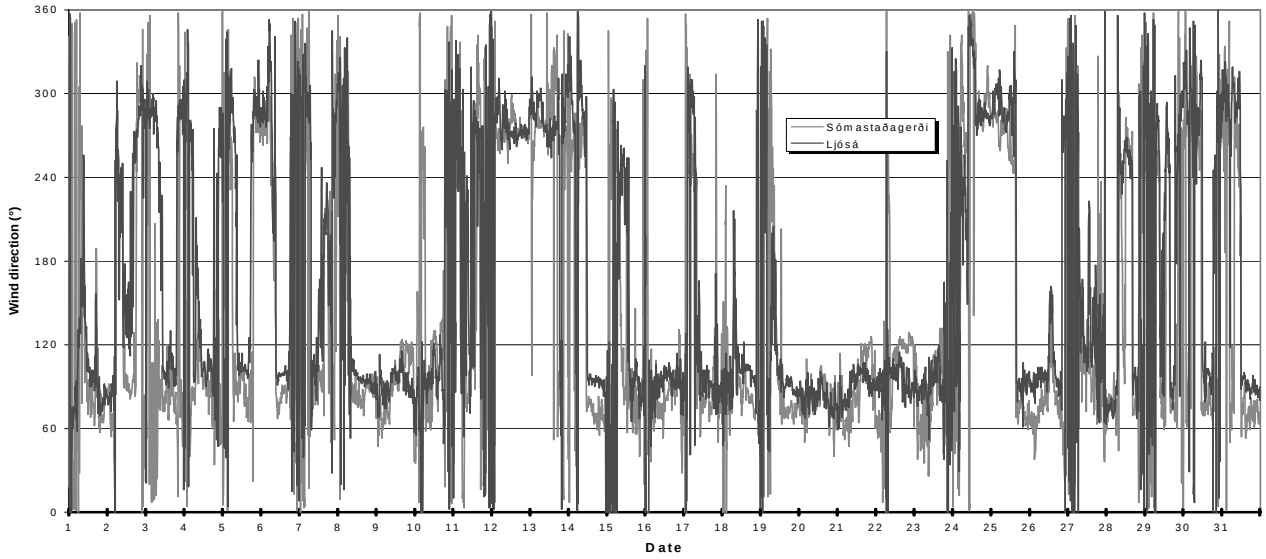


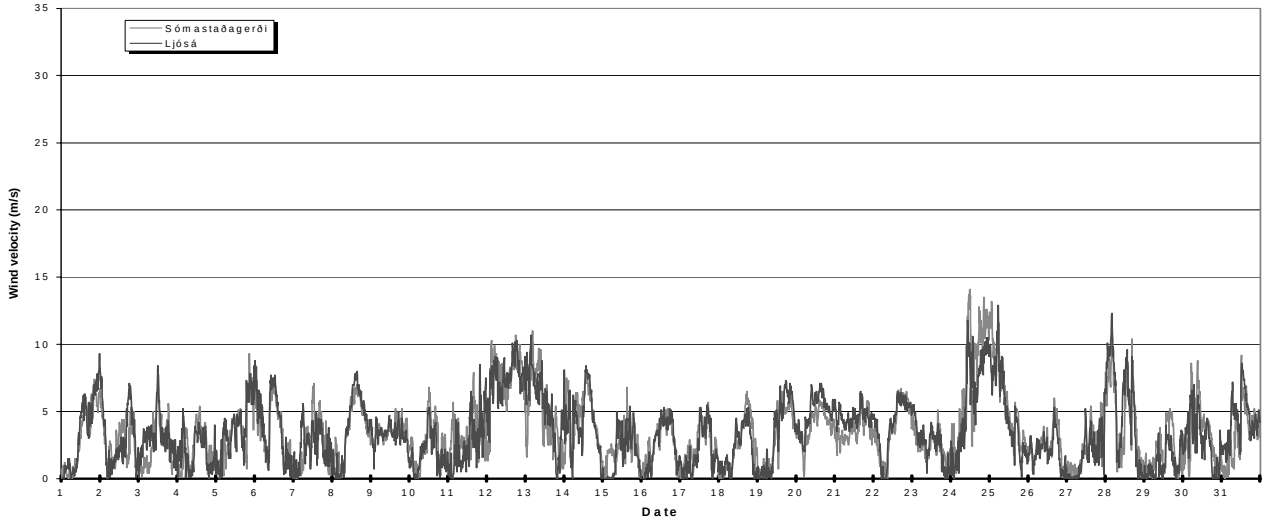


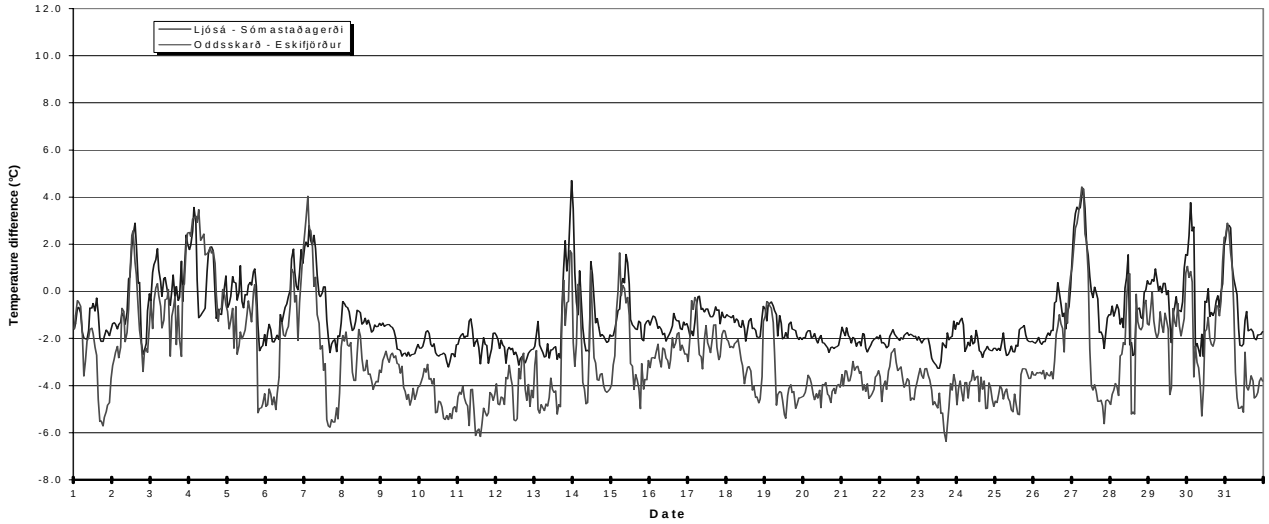


Annex 42

Simultaneous Observations of Wind Direction and Wind Velocity at Sómastaðagerði and Ljósá, and Temperature Difference Ljósá - Sómastaðagerði and Oddsskarð - Eskifjörður
July 2001

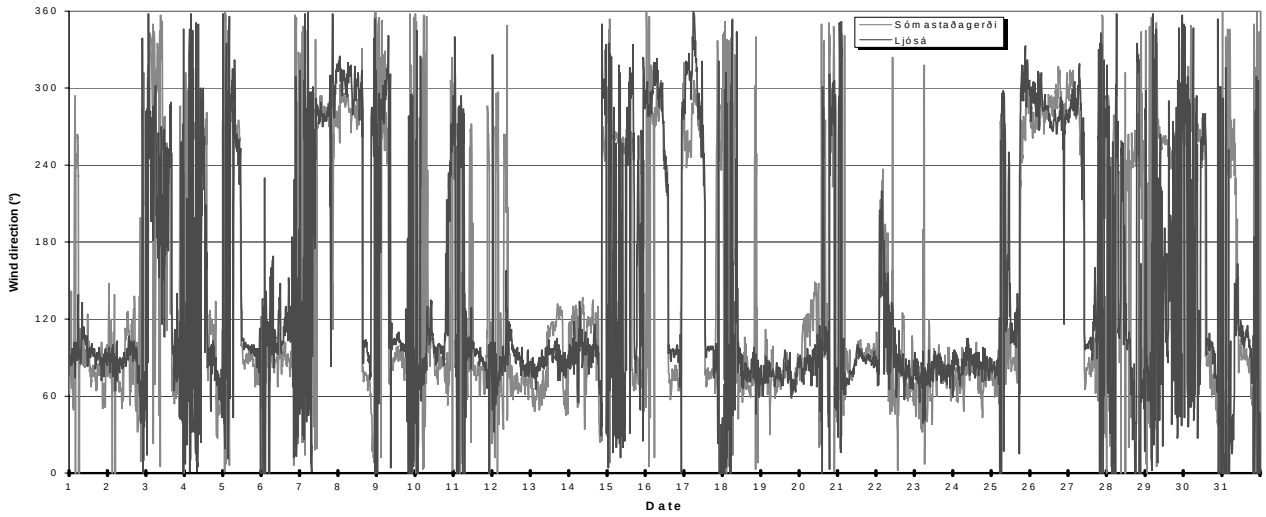


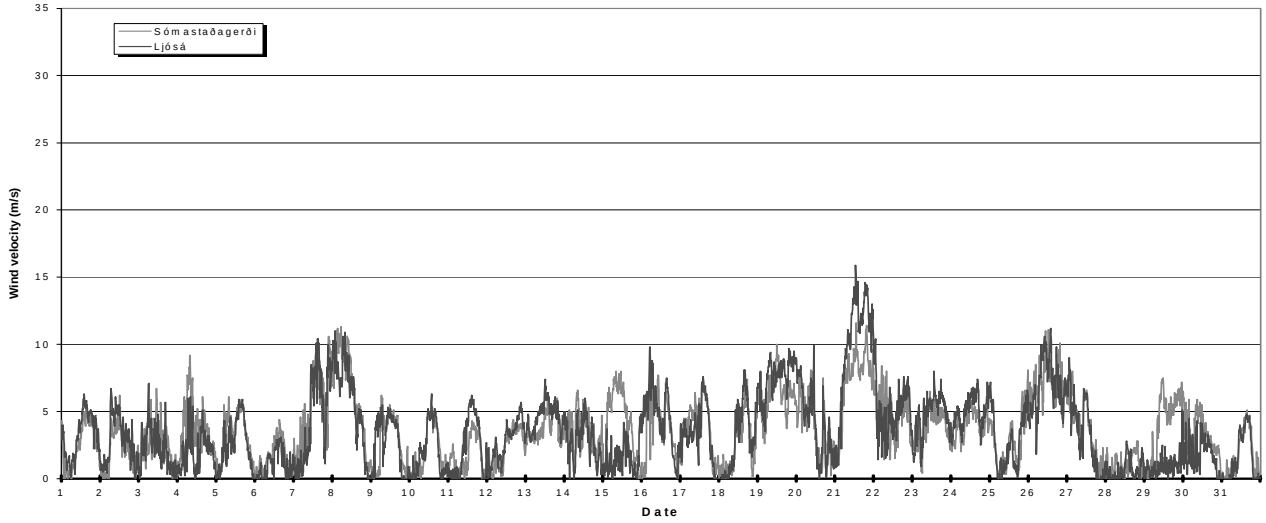


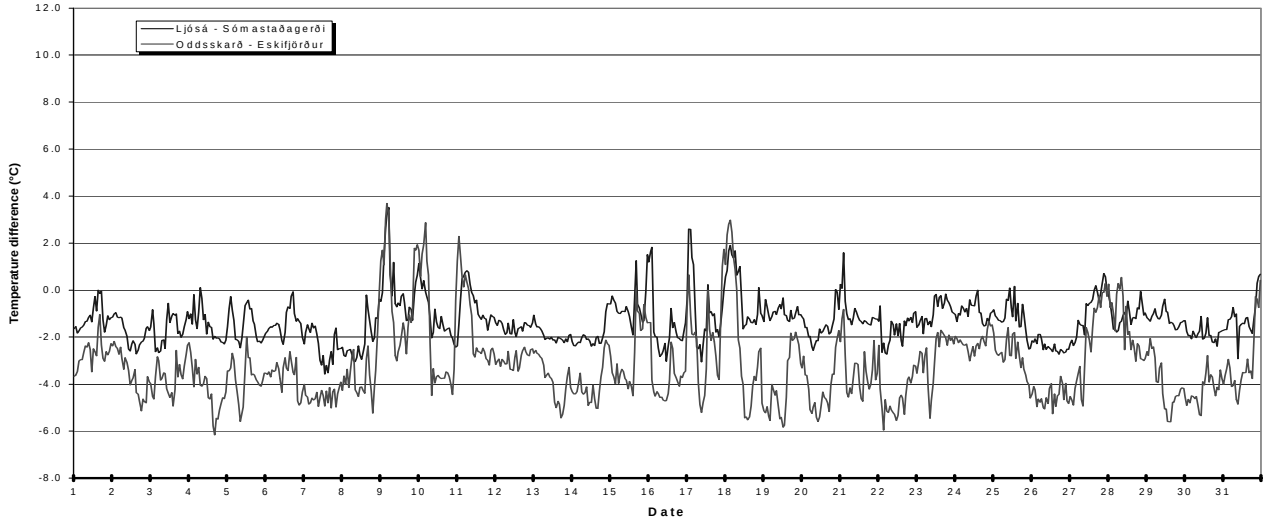


Annex 43

Simultaneous Observations of Wind Direction and Wind Velocity at Sómastaðagerði and Ljósá, and Temperature Difference Ljósá - Sómastaðagerði and Oddsskarð - Eskifjörður
August 2001

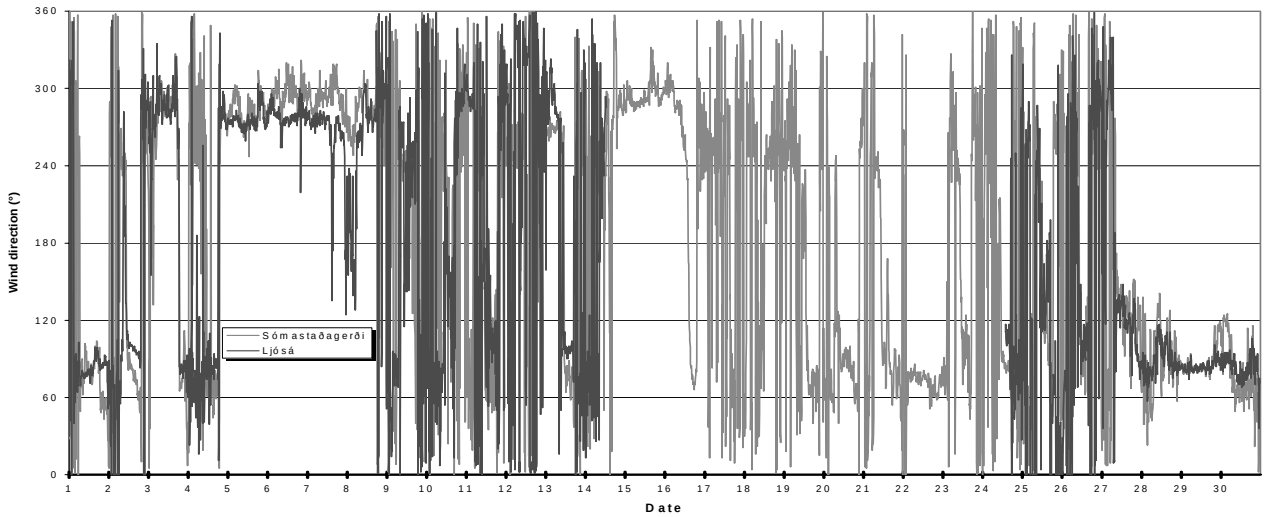


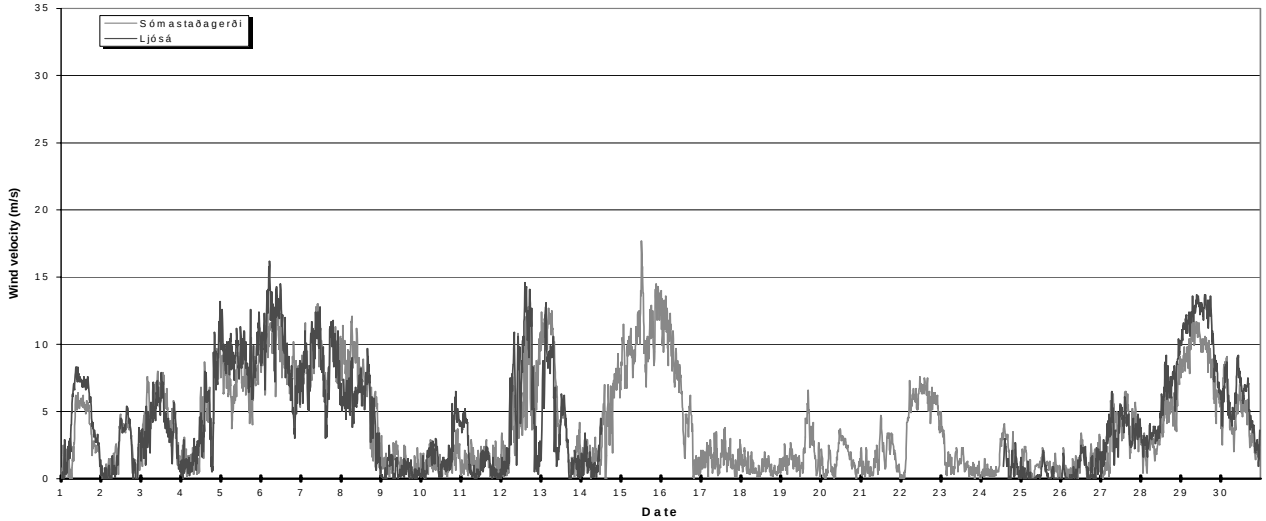


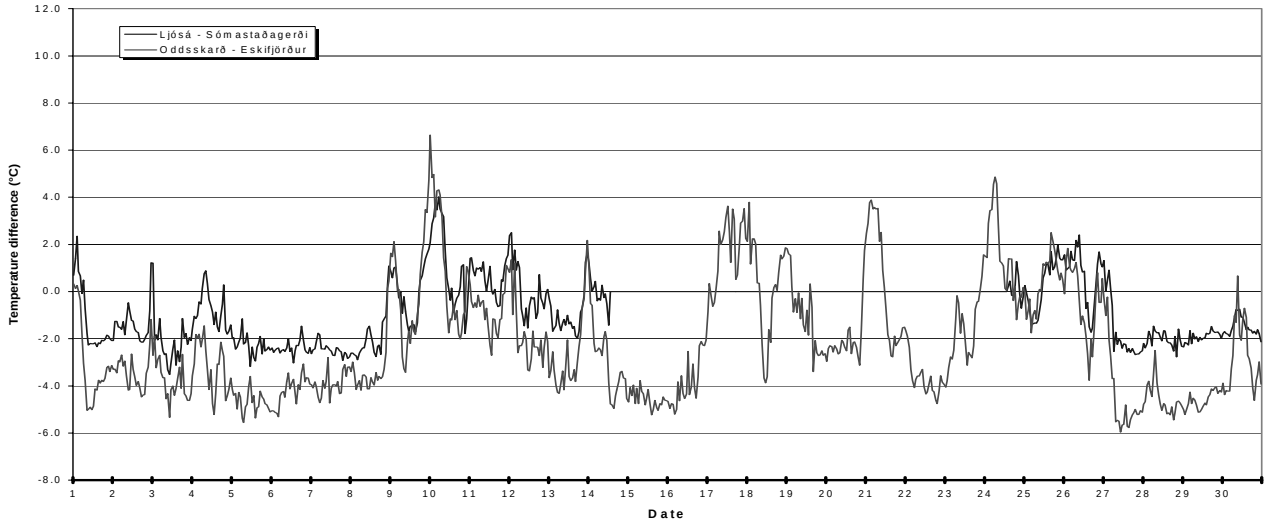


Annex 44

Simultaneous Observations of Wind Direction and Wind Velocity at Sómastaðagerði and Ljósá, and Temperature Difference Ljósá - Sómastaðagerði and Oddsskarð - Eskifjörður
September 2001

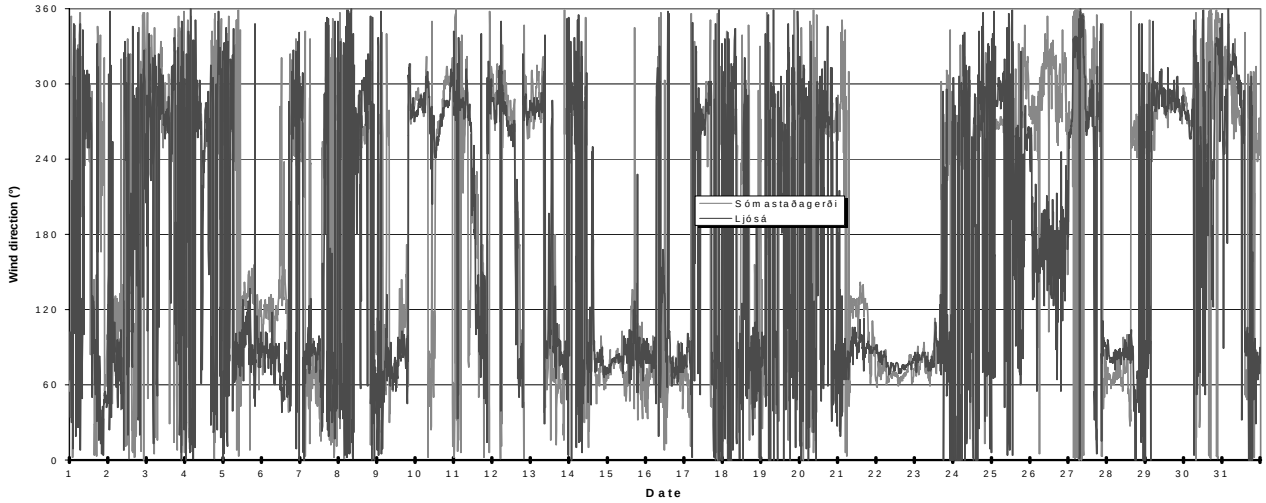


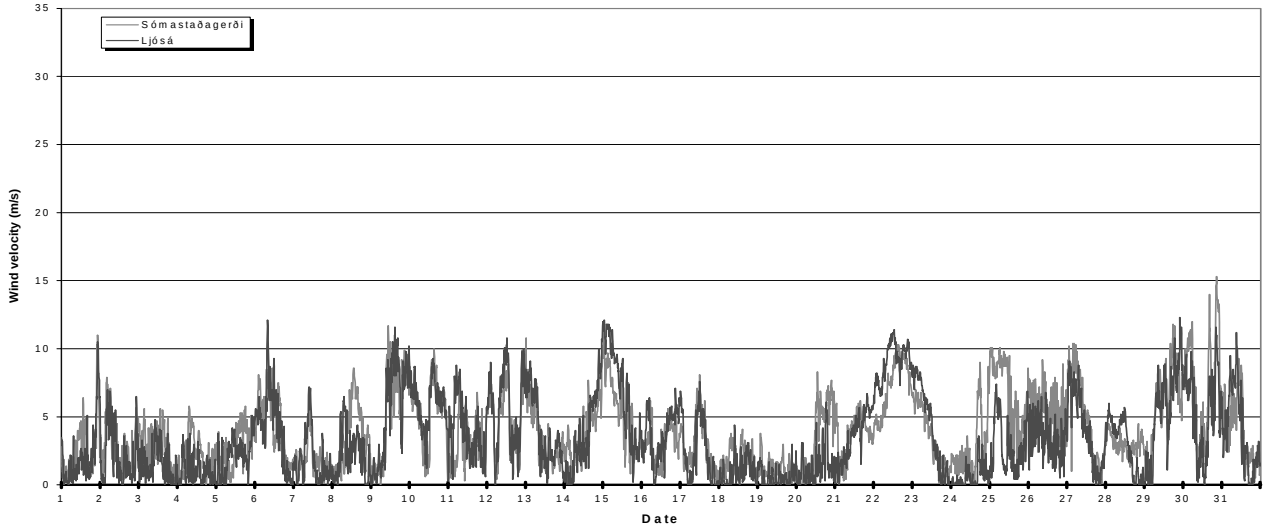


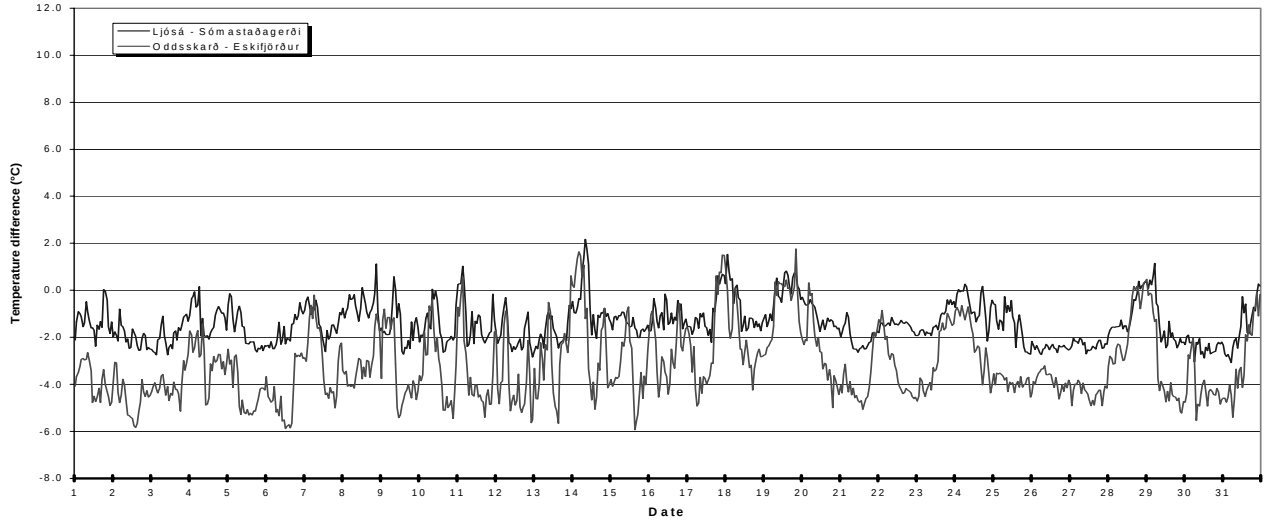


Annex 45

Simultaneous Observations of Wind Direction and Wind Velocity at Sómastaðagerði and Ljósá, and Temperature Difference Ljósá - Sómastaðagerði and Oddsskarð - Eskifjörður
October 2001

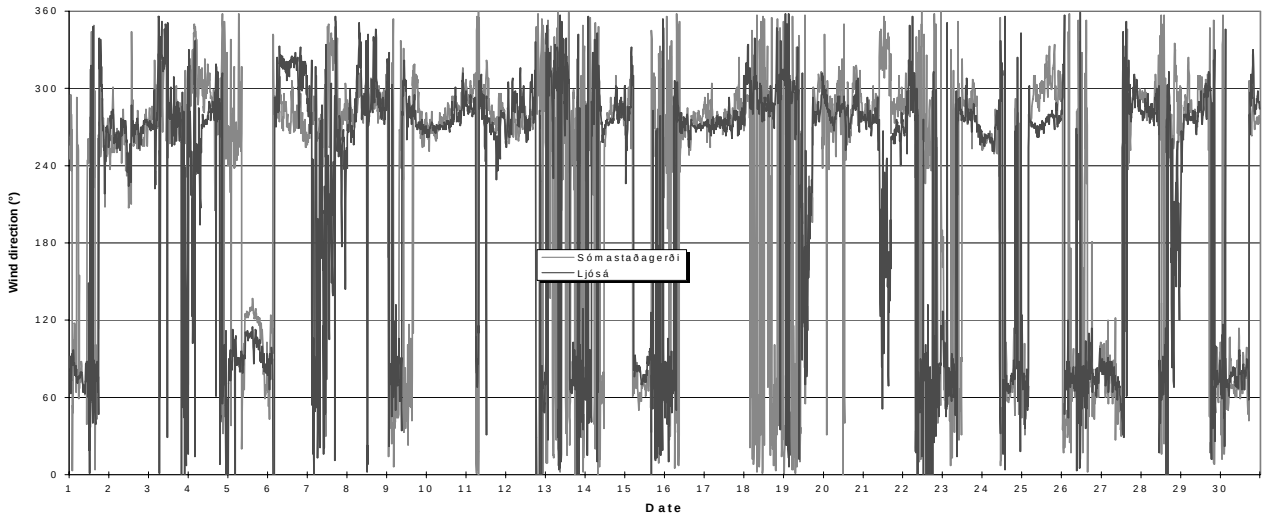


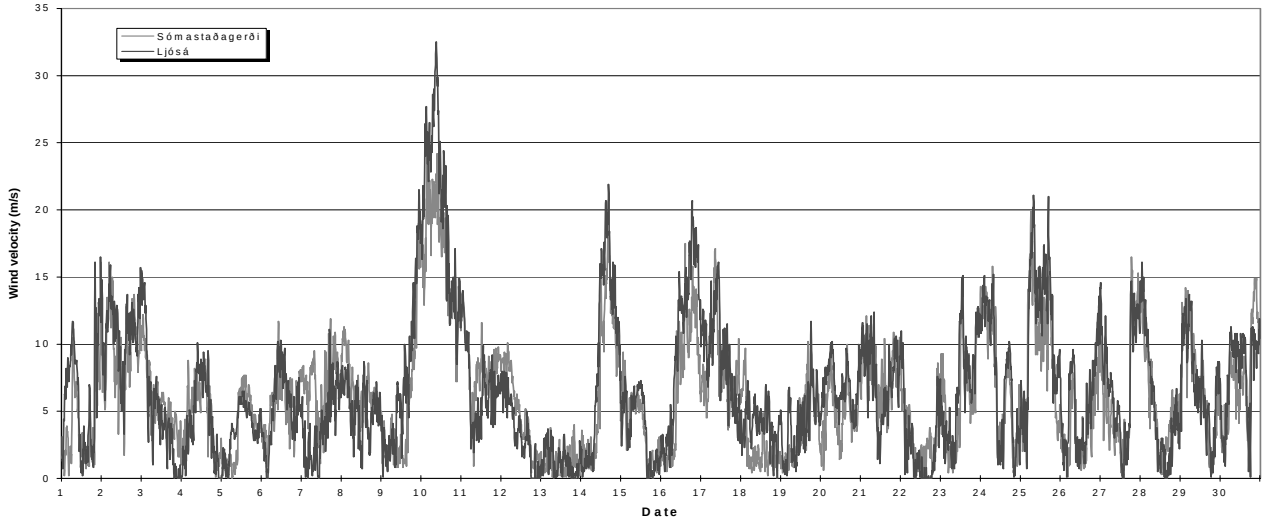


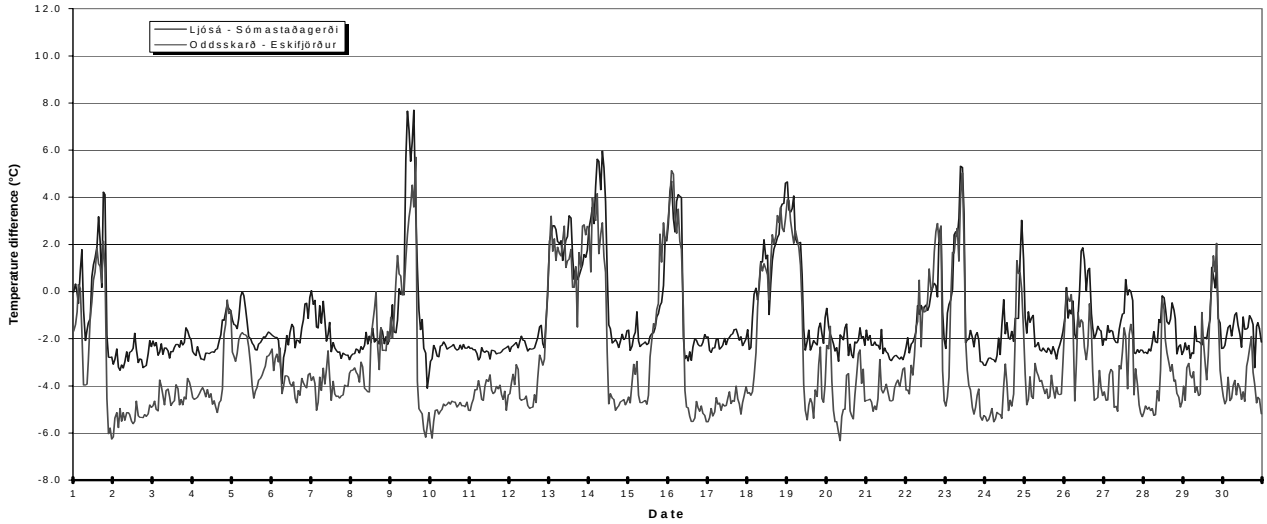


Annex 46

Simultaneous Observations of Wind Direction and Wind Velocity at Sómastaðagerði and Ljósá, and Temperature Difference Ljósá - Sómastaðagerði and Oddsskarð - Eskifjörður
November 2001

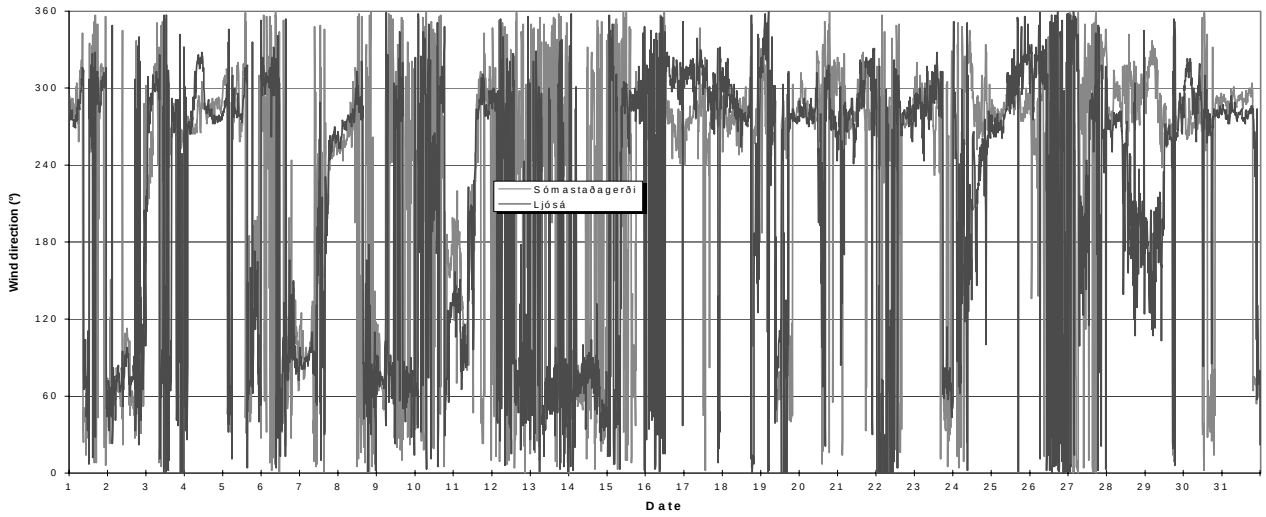


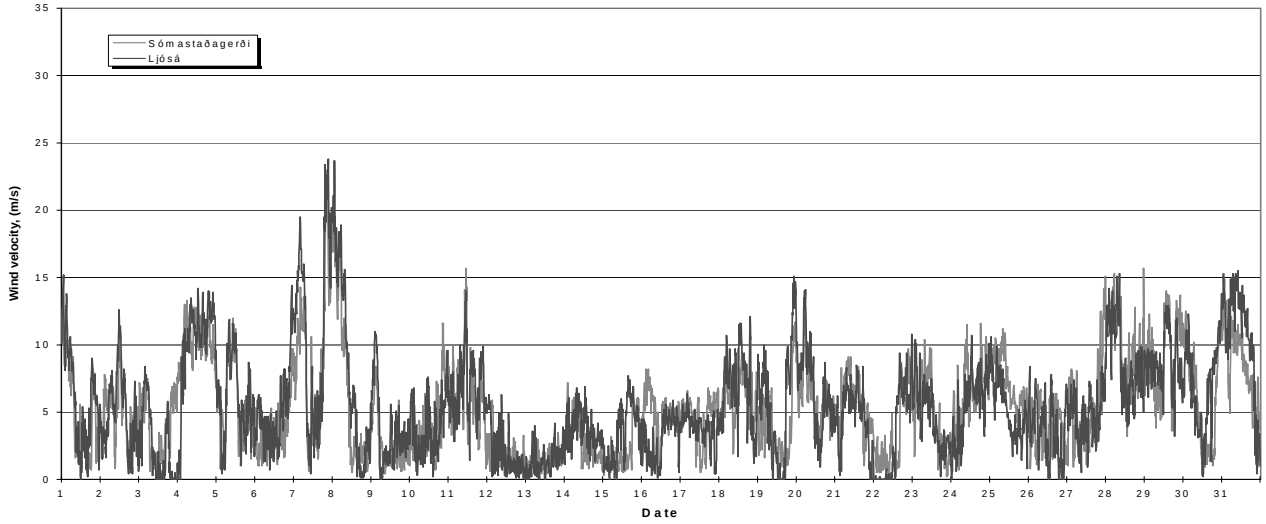


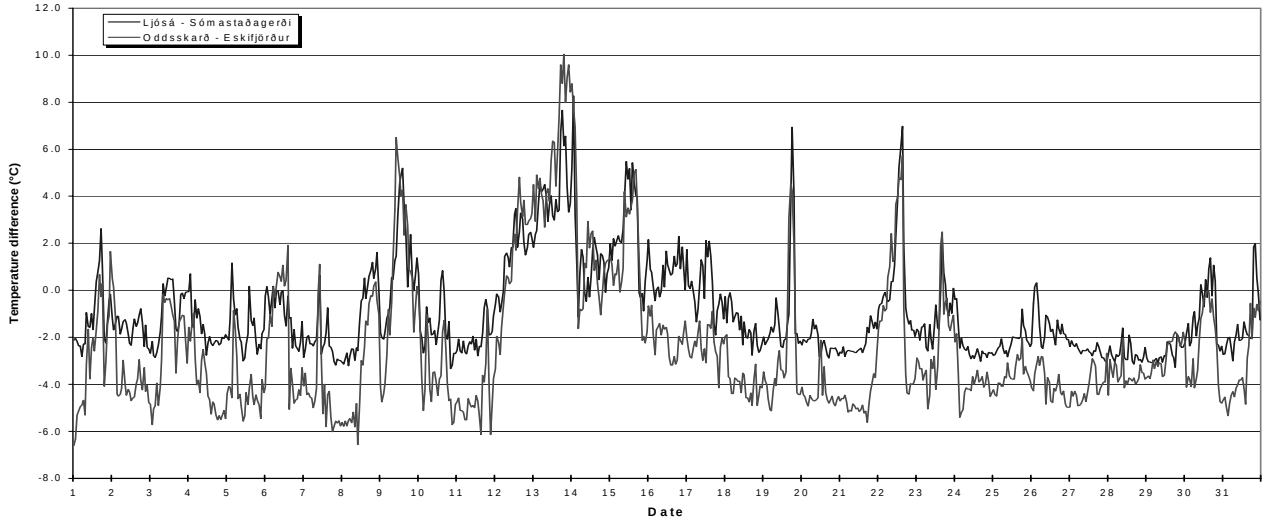


Annex 47

Simultaneous Observations of Wind Direction and Wind Velocity at Sómastaðagerði and Ljósá, and Temperature Difference Ljósá - Sómastaðagerði and Oddsskarð - Eskifjörður
December 2001

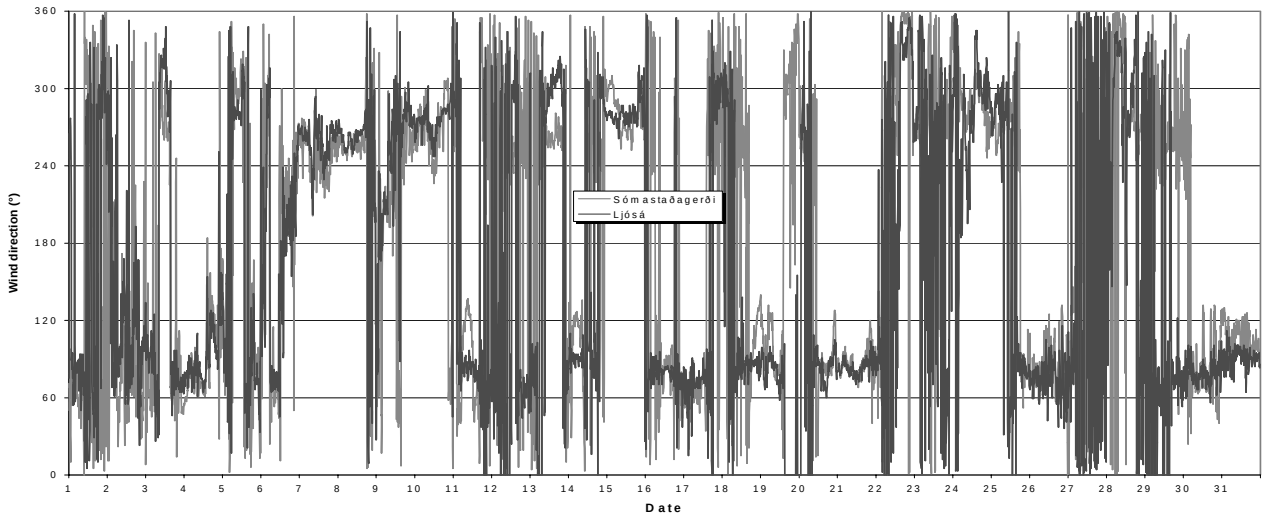


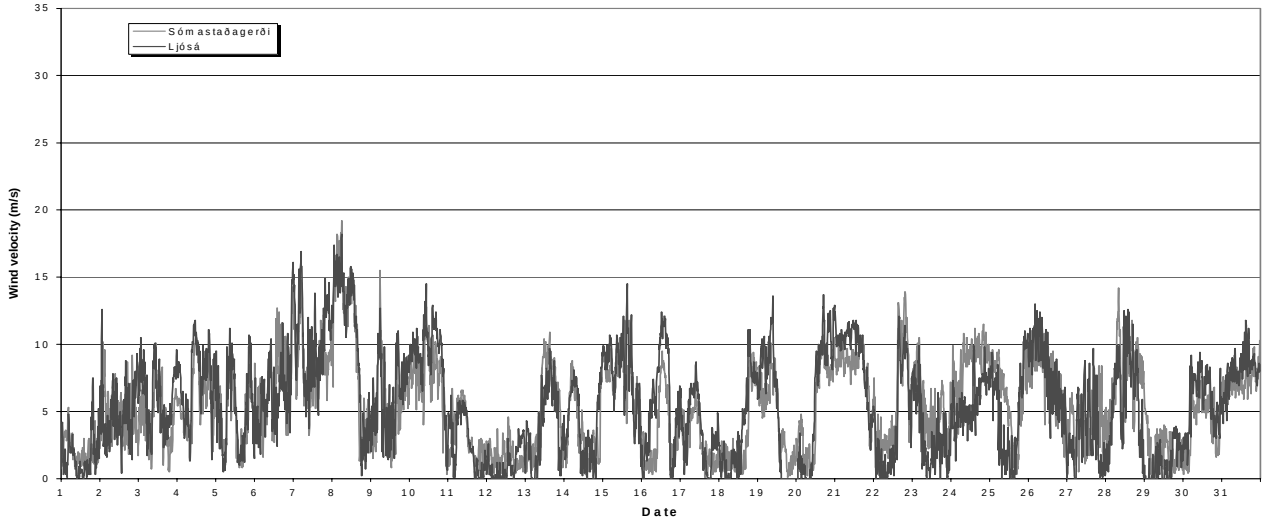


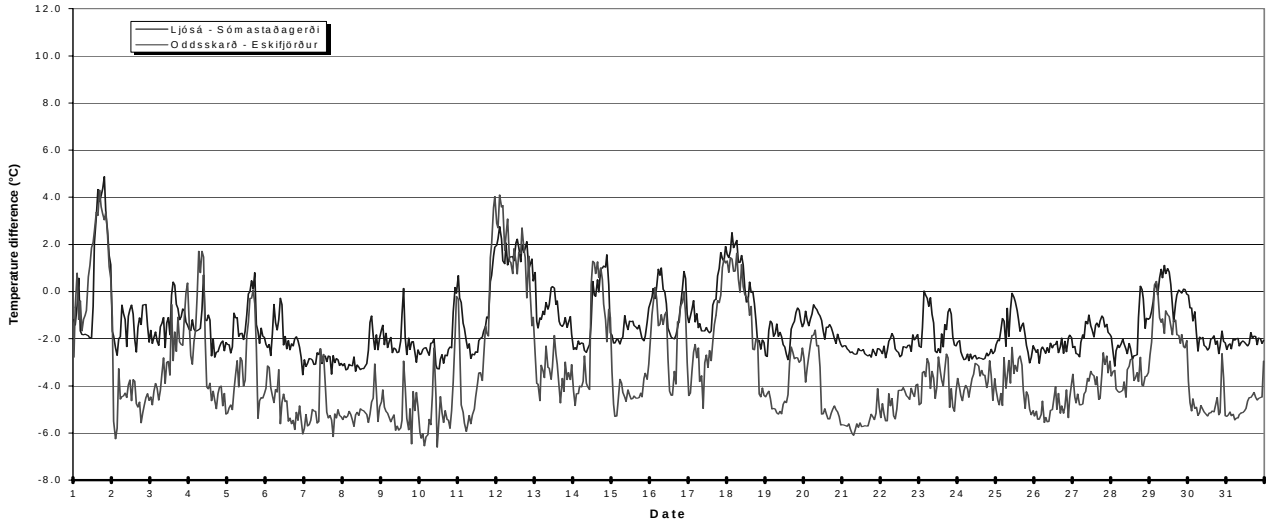


Annex 48

Simultaneous Observations of Wind Direction and Wind Velocity at Sómastaðagerði and Ljósá, and Temperature Difference Ljósá - Sómastaðagerði and Oddsskarð - Eskifjörður
January 2002

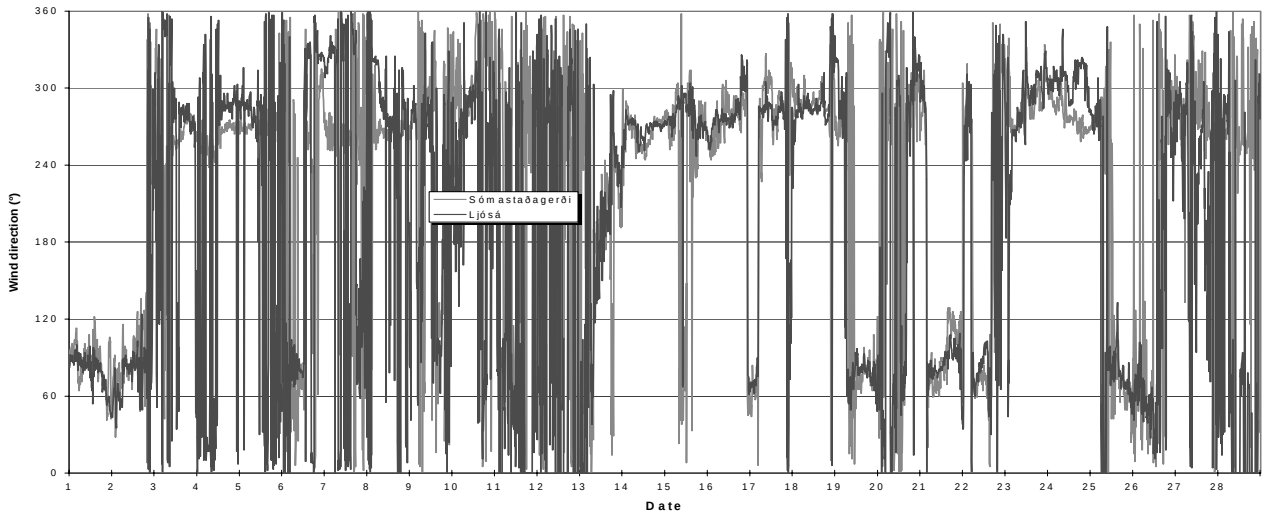


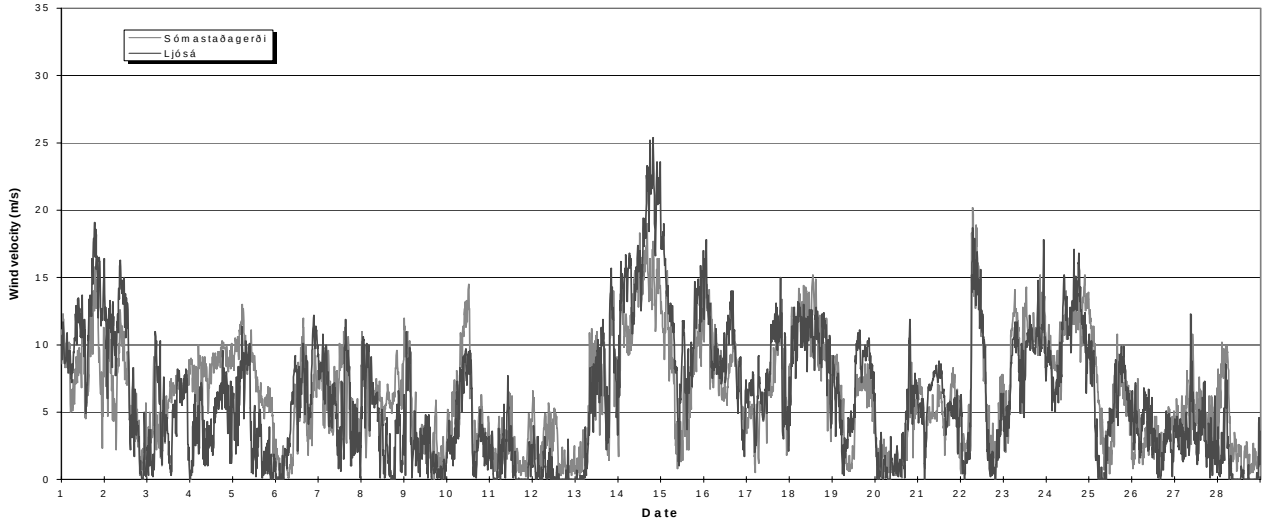


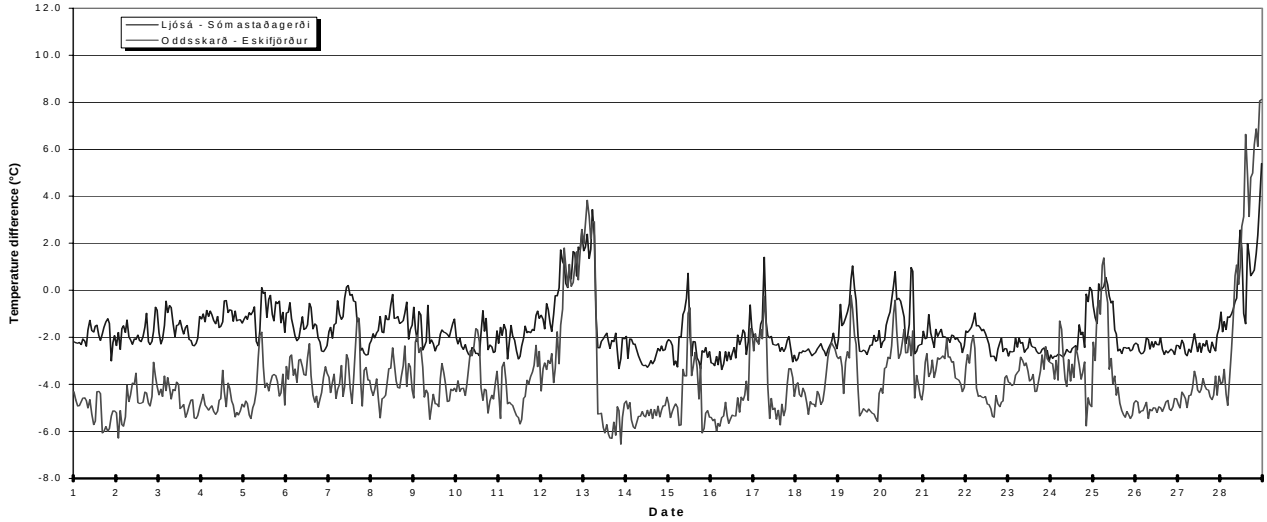


Annex 49

Simultaneous Observations of Wind Direction and Wind Velocity at Sómastaðagerði and Ljósá, and Temperature Difference Ljósá - Sómastaðagerði and Oddsskarð - Eskifjörður
February 2002

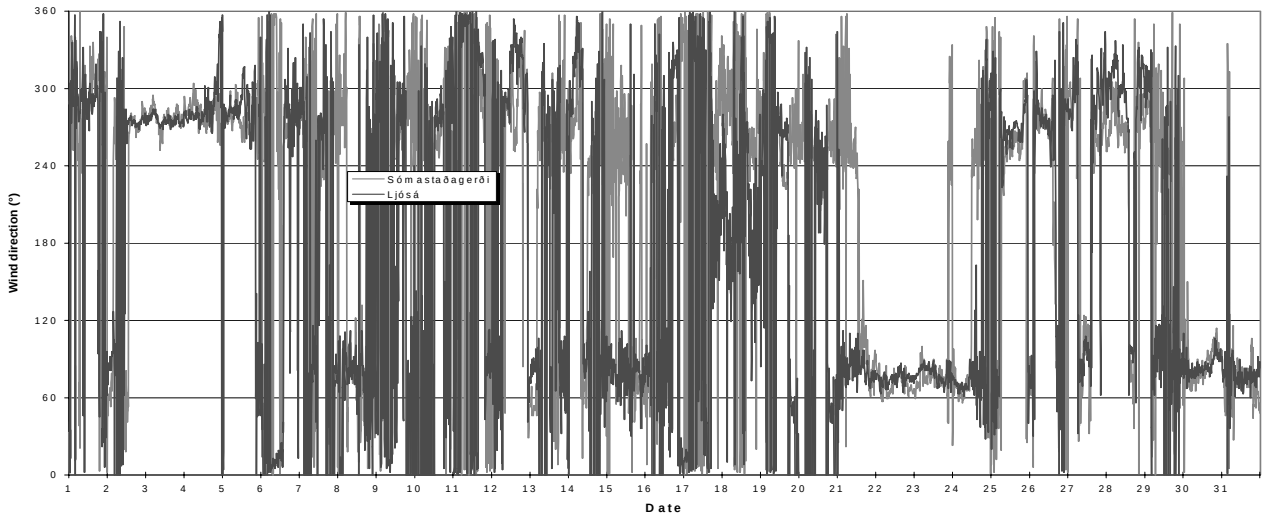


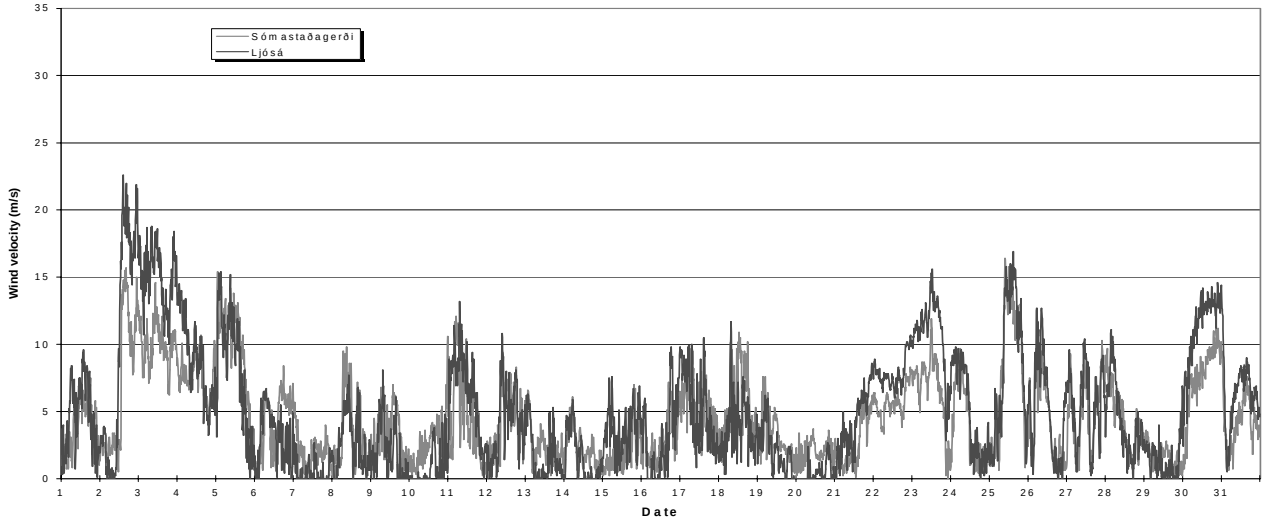


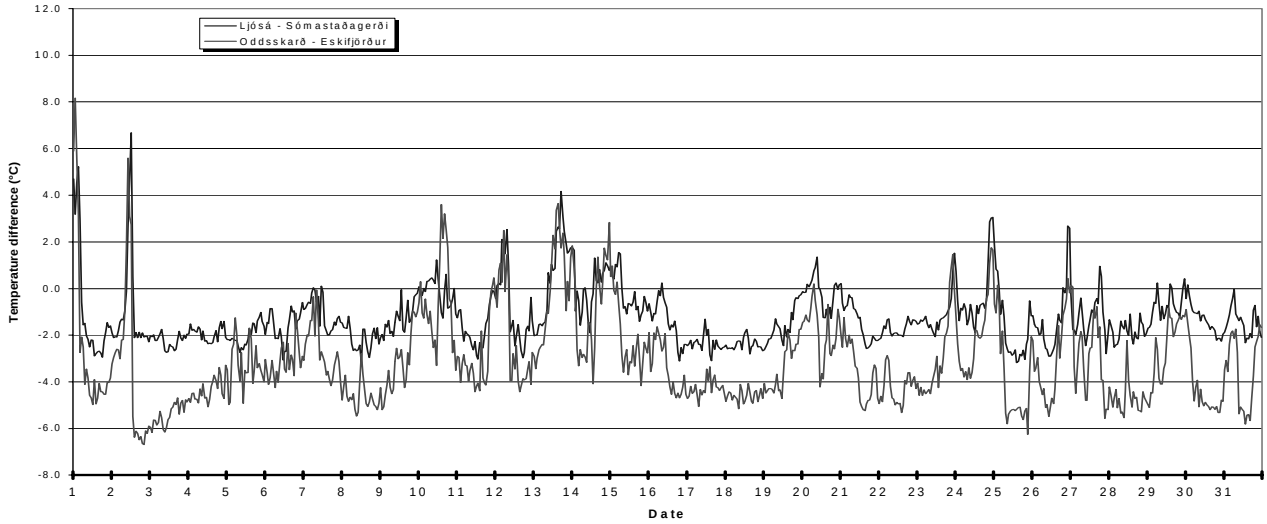


Annex 50

Simultaneous Observations of Wind Direction and Wind Velocity at Sómastaðagerði and Ljósá, and Temperature Difference Ljósá - Sómastaðagerði and Oddsskarð - Eskifjörður
March 2002

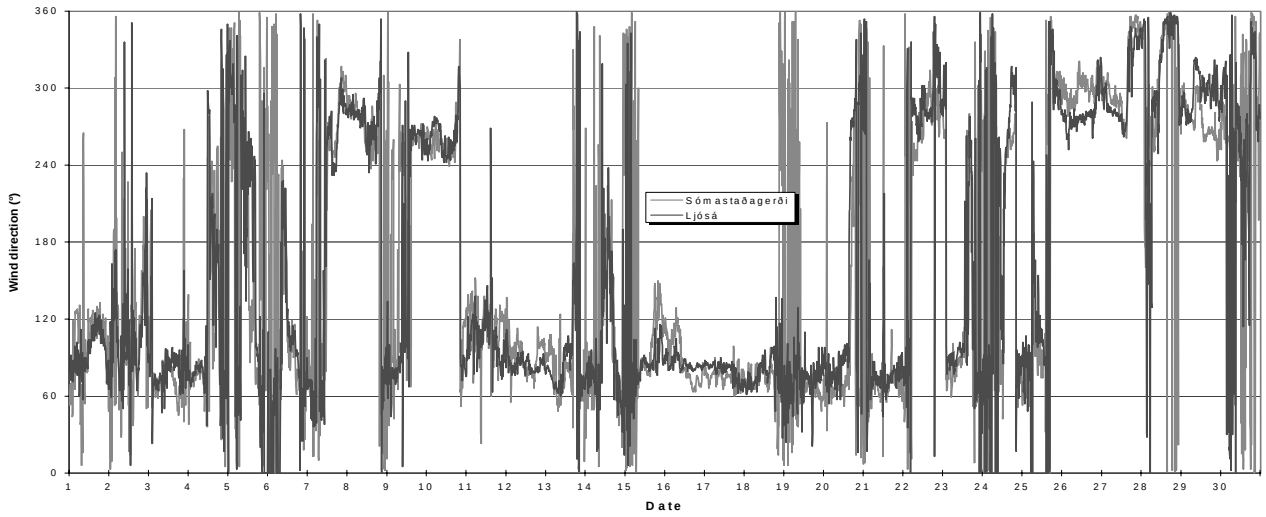


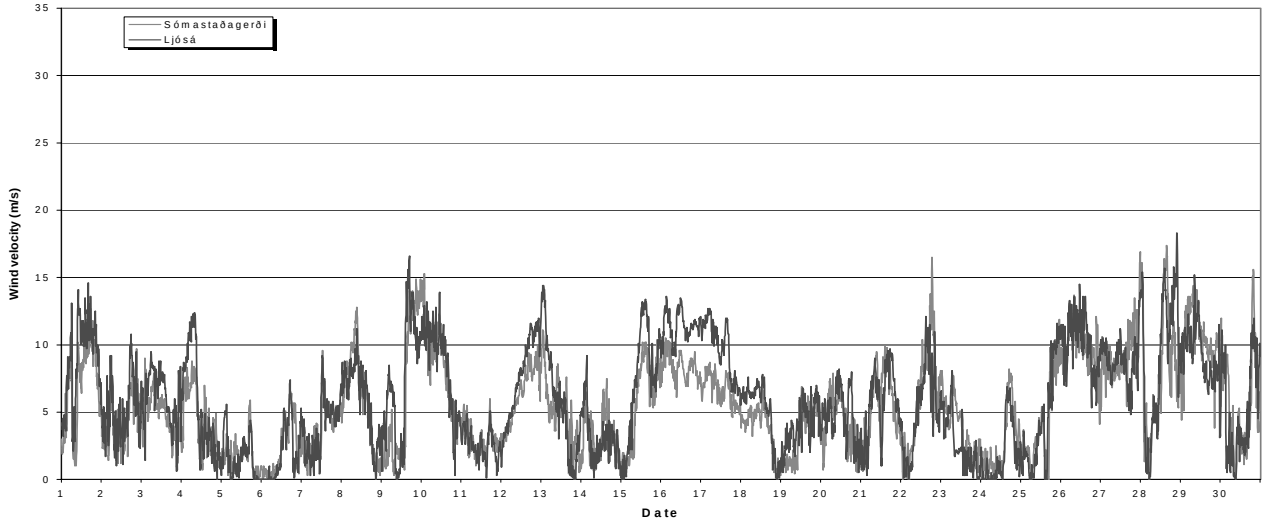


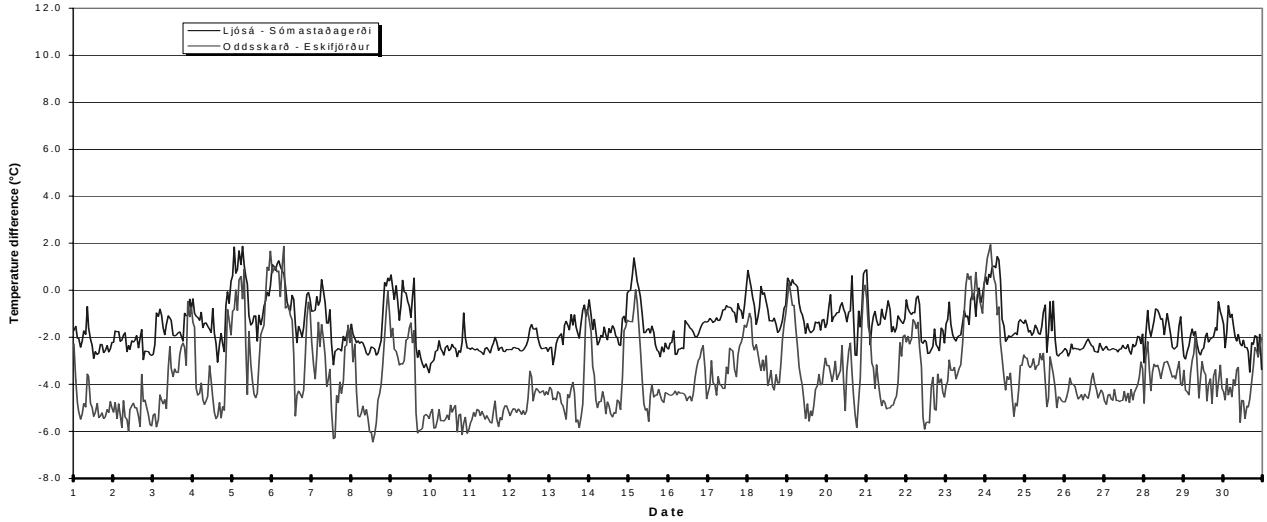


Annex 51

Simultaneous Observations of Wind Direction and Wind Velocity at Sómastaðagerði and Ljósá, and Temperature Difference Ljósá - Sómastaðagerði and Oddsskarð - Eskifjörður
April 2002

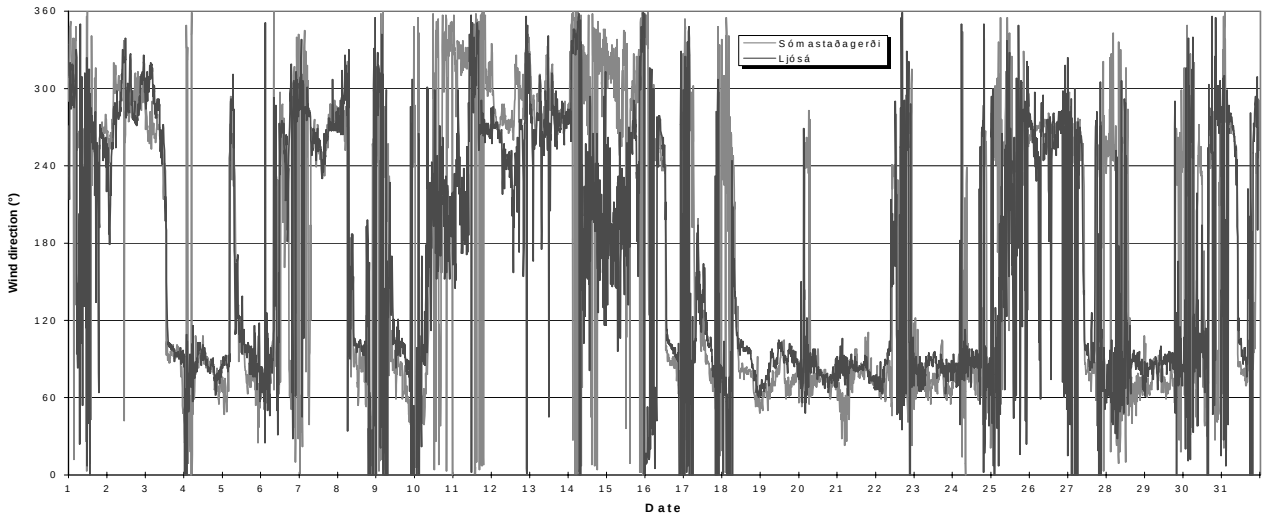


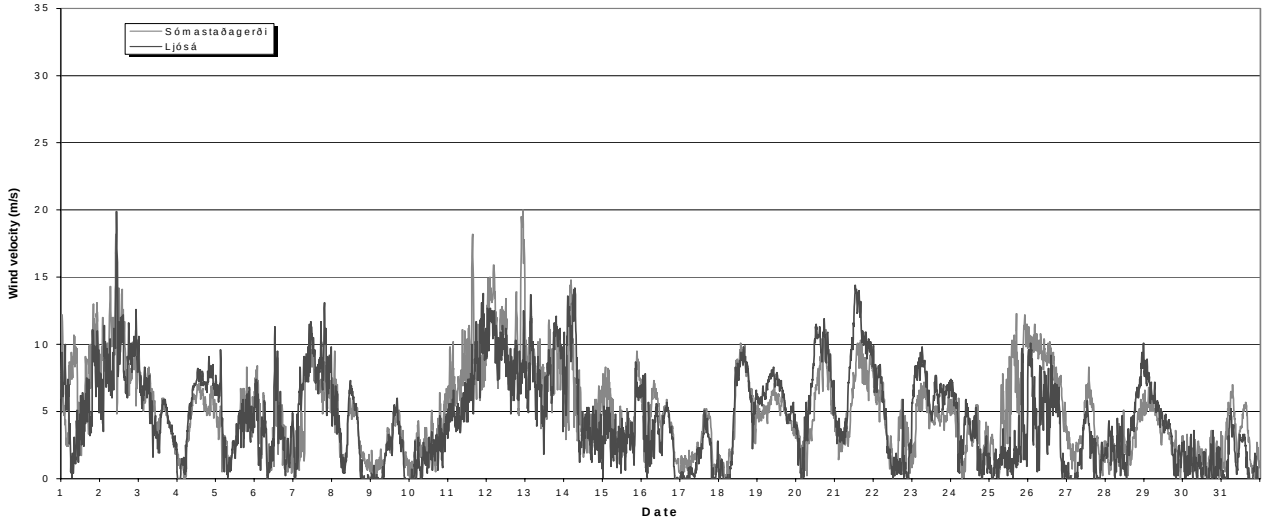


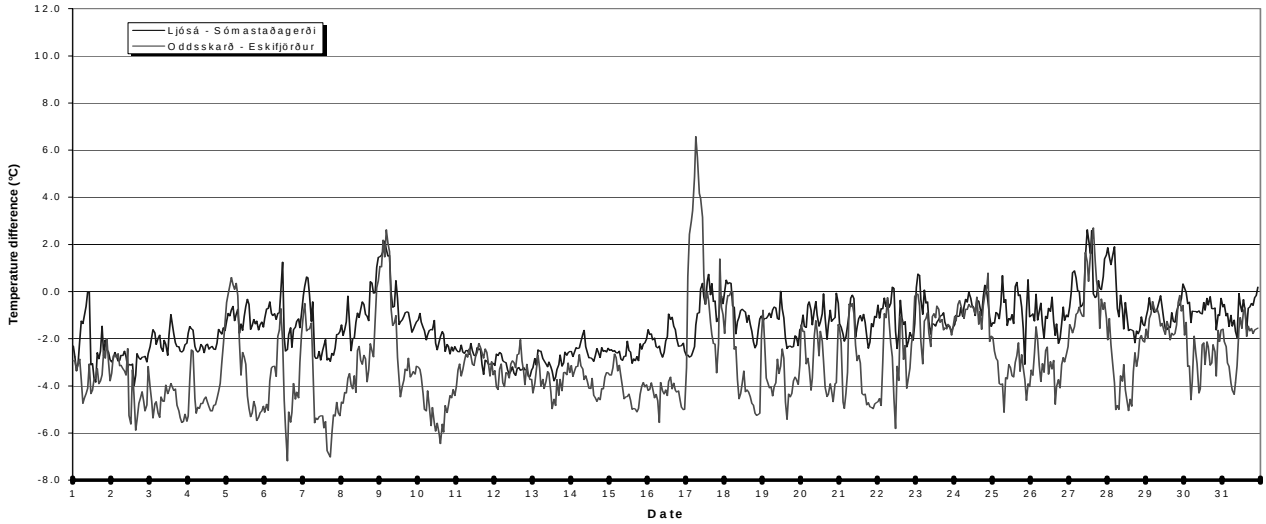


Annex 52

Simultaneous Observations of Wind Direction and Wind Velocity at Sómastaðagerði and Ljósá, and Temperature Difference Ljósá - Sómastaðagerði and Oddsskarð - Eskifjörður
May 2002

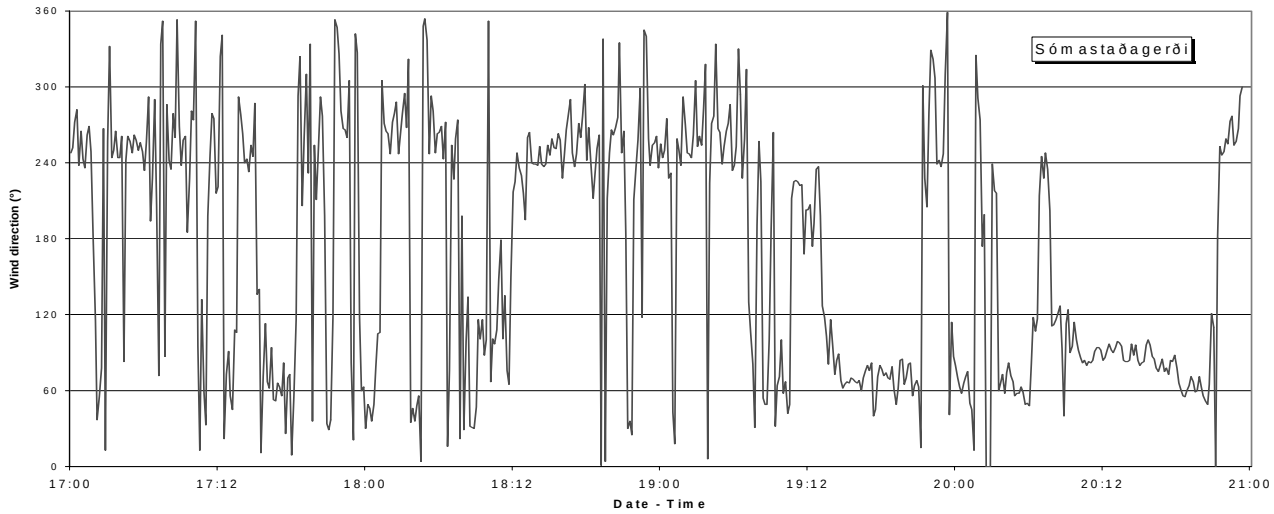


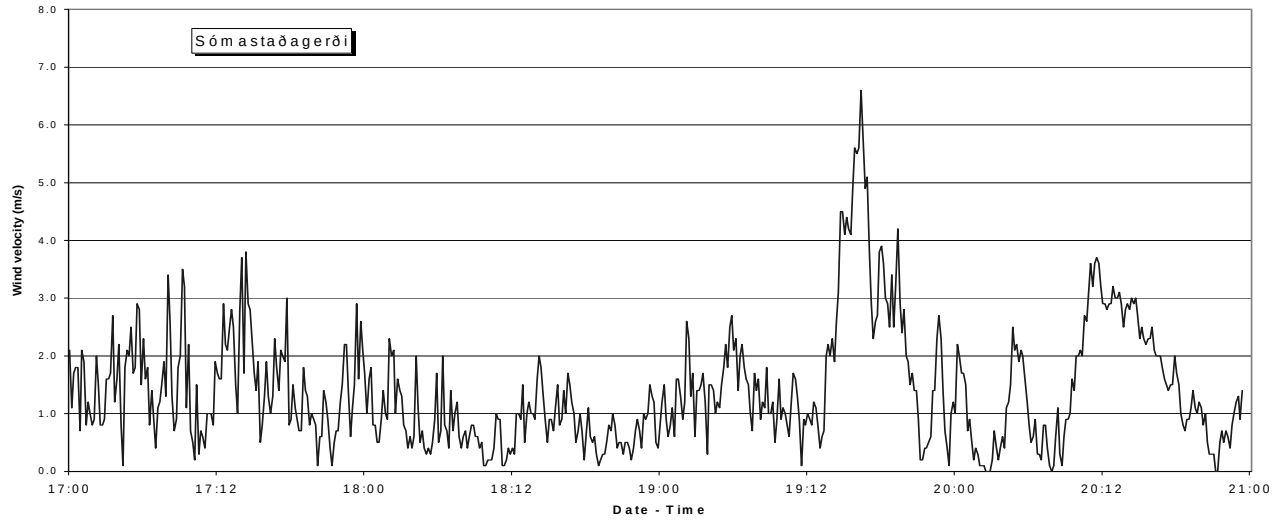


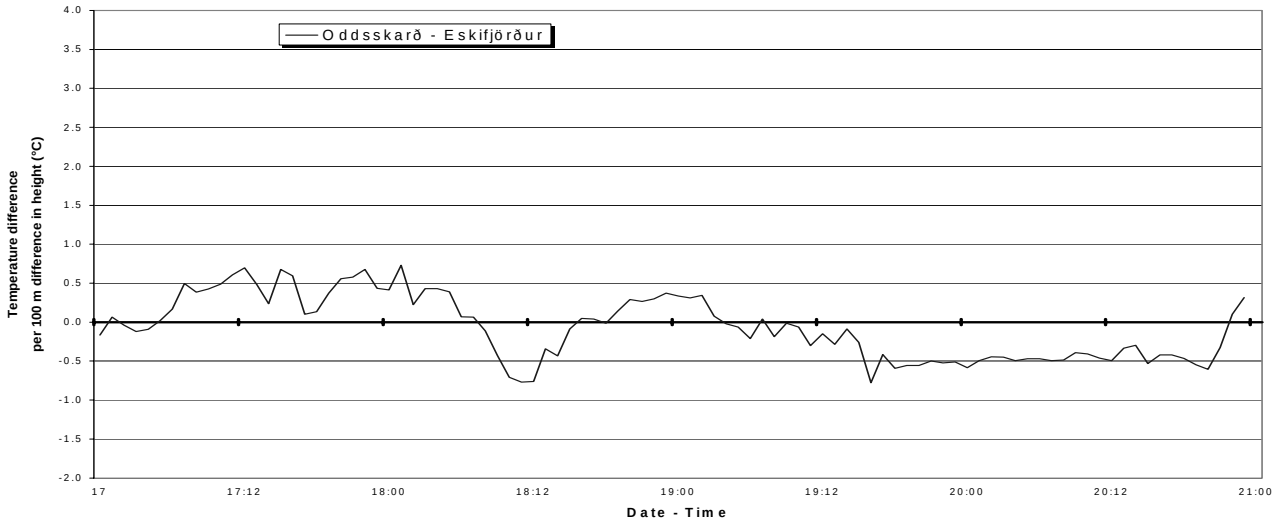


Annex 53

Wind Direction and Wind Velocity at Sómastaðagerði, and Vertical Temperature Difference per 100 m Difference in Height Oddsskarð - Eskifjörður
17 - 20 September 2001

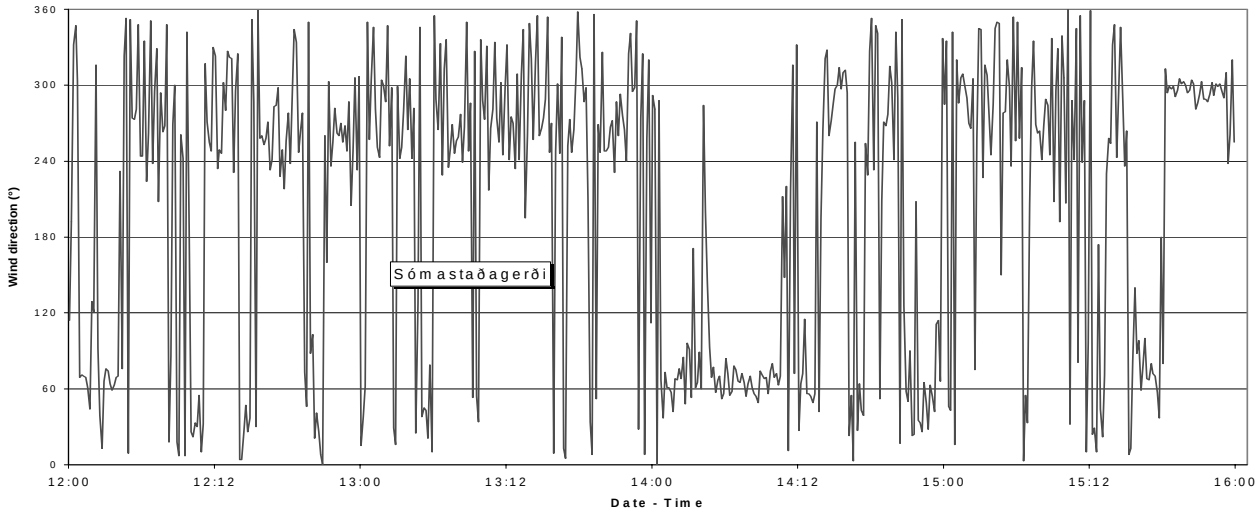


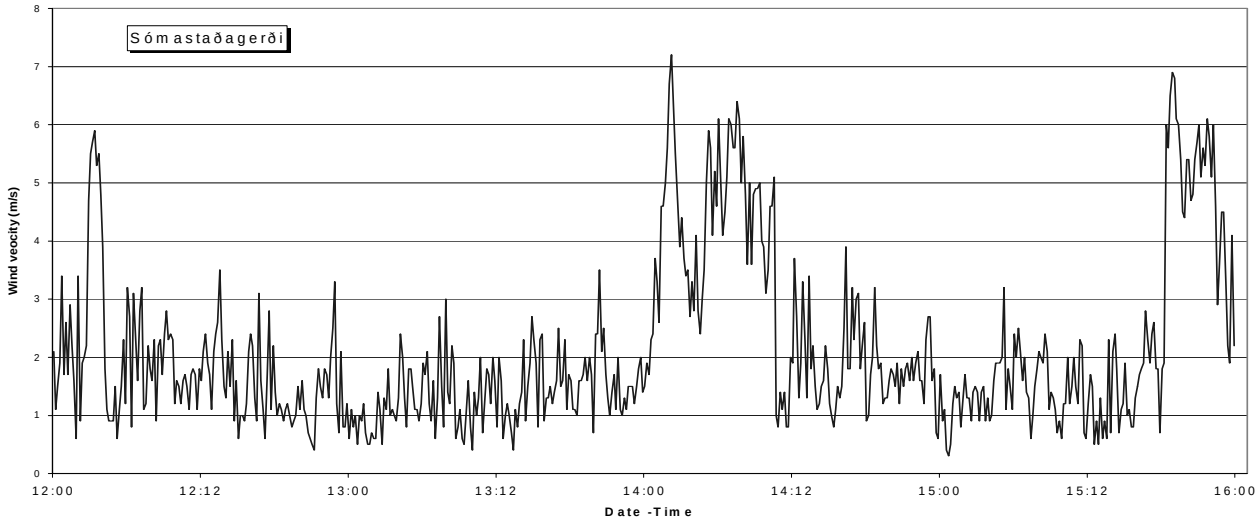


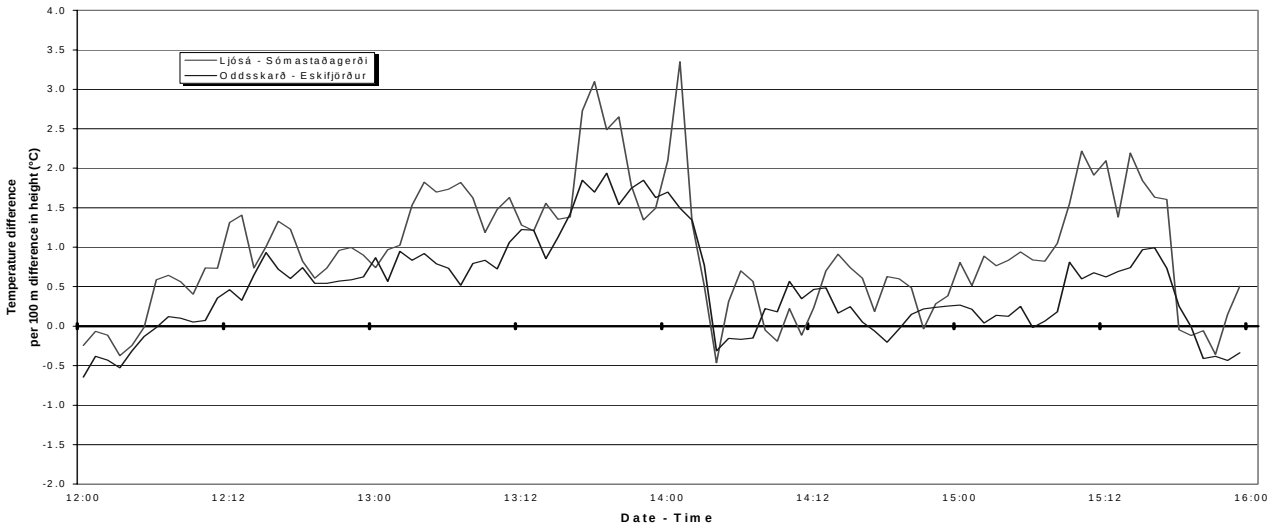


Annex 54

Wind Direction and Wind Velocity at Sómastaðagerði, and Vertical Temperature Difference per 100 m Difference in Height Ljósá - Sómastaðagerði and Oddsskarð - Eskifjörður
12 - 15 December 2001



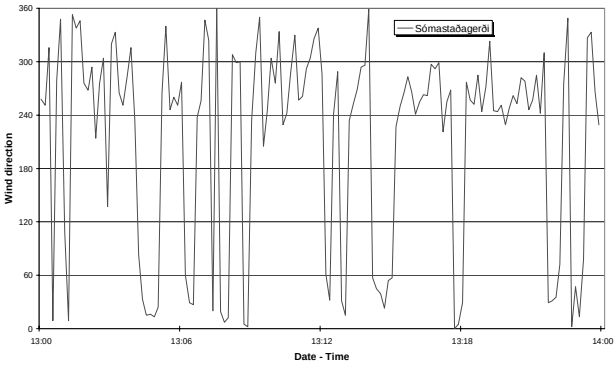


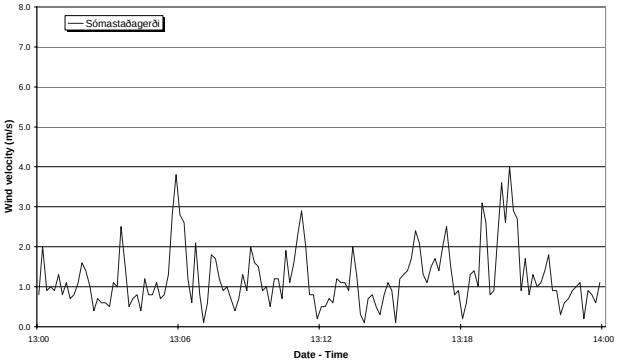


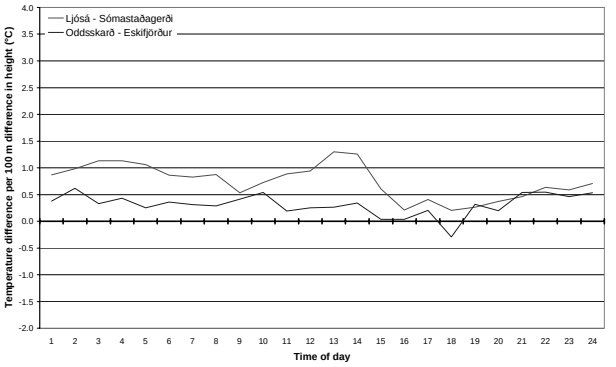
Annex 55

Wind Direction and Wind Velocity at Sómastaðagerði, and Vertical Temperature Difference per 100 m Difference in Height Ljósá - Sómastaðagerði and Oddsskarð - Eskifjörður

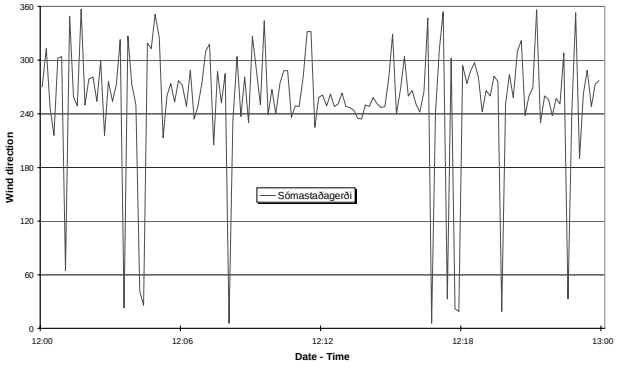
13 November 2001

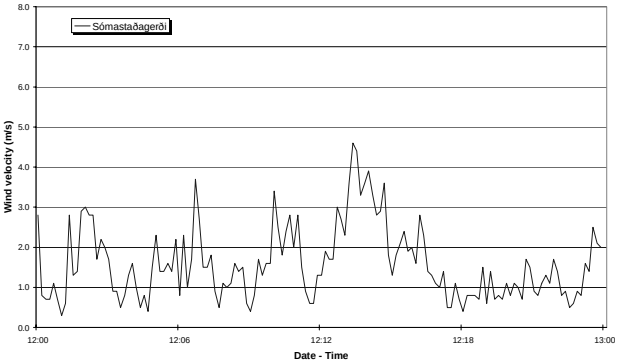


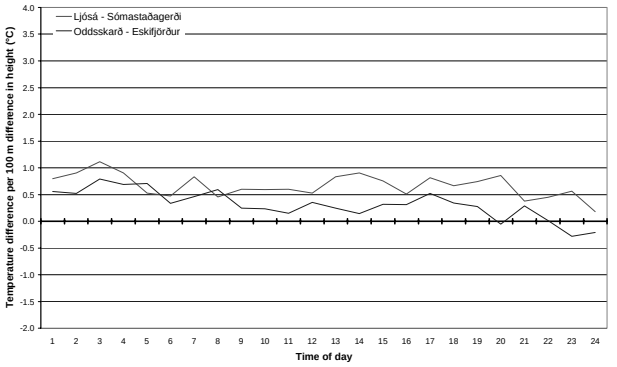




12 January 2002







Annex 56