VEÐURSTOFA ÍSLANDS

Report
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Wind and Stability Observations in Reyðarfjörður

June 2002 - May 2003

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Wind and Stability Observations in Reyðarfjörður June 2002 - May 2003

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. From June 2000 wind and temperature observations have also been carried out at three automatic stations in Reyðarfjörður, Vattarnes, Ljósá and Kollaleira 2. Observations are also available from other automatic stations in the Reyðarfjörður area, in particular Eskifjörður owned by the Meteorological Office, Oddsskarð operated by the Public Roads Administration and Seley operated by the Icelandic Maritime Administration.

Six 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.

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).

Finally the sixth Report, Additional Wind and Stability Observations at Sómastaðagerði in Reyðarfjörður V (Report 02029, VÍ-TA06) covers the period June 2001-May 2002 (Ref. 6).

Three earlier Reports issued by Veðurstofa Íslands also contain meteorological information for the Reyðarfjörður area (Ref. 7-9).

The present Report covers the 12 month period June 2002-May 2003.

2. Observation Sites and Instrumentation

Sómastaðagerði

The 38 m observation mast at Sómastaðagerði is located on a low gravel platform (65° 02.0' N, 14° 06.7' W). Elevation of the platform: 32 m above mean sea level. Platinum resistance thermometers Logan 100PRT are used for air temperature observations at 3.0 m, 10.5 m and 36.5 m above the platform. For thermometer protection from radiation and precipitation 6-plate Gill radiation shields are used. For observations of wind direction and wind velocity a Wind Monitor-MA 05106, Marine Model, from R.M. Young is used at 10.3 and 36.1 m height. Two Gill UVW anemometers were previously in use at 10.8 m and 36.6 m. The horizontal components have now been removed, but the vertical components remain although not used in this report. A Vaisala temperature and relative humidity sensor HMP-35D is at 3.0 m height, but the data are not used in the report. A Measurement and Control Module CR10X from Campbell Scientific, Inc. is used for collecting and storing the observation data and transmitting them over a telephone line to the Meteorological Office in Reykjavík.

A recalibration of the temperature sensors on 17 August 2002 indicated the temperature correction, +0.2°C at 3.0 m height but +0.1°C at 10.5 and 36.5 m height at Sómastaðagerði. The same thermometer correction, +0.1°C, was observed at Vattarnes, Kollaleira 2 and Eskifjörður but no correction was required at Ljósá.

Vattarnes

The automatic station Vattarnes (64° 56.2' N, 13° 41.1' W) is located on a small peninsula extending northwards into the mouth of Reyðarfjörður. Ground elevation: 6 m above mean sea level. For observation of wind direction and wind speed a R.M. Young propeller anemometer of the same type as used at Sómastaðagerði is in use at 11.2 m above the ground. For temperature observations a platinum resistance thermometer Logan 100PRT with a 6-plate Gill radiation shield is used at 2.0 m above ground. A Measurement and Control Module CR10X from Campbell Scientific, Inc. is used for collecting and storing data and transmission to Reykjavík over a GSM communication module.

Ljósá

The automatic station, here called Ljósá (65° 02.6' N, 14° 09.7' W), is located on a promontory, named Slægjubrýr, in the hillside above and north of Framnes and approx. 1½ km NW of Sómastaðagerði. Ground elevation: 280 m above mean sea level. Anemometer, thermometer and radiation shield are of the same type as at Vattarnes as well as the instrumentation for data collection and transmission to Reykjavík. Height of anemometer above ground is 9.9 m and of thermometer 2.0 m. The station is powered by a solarpanel.

Kollaleira 2

The automatic station Kollaleira 2 (65° 02.2' N, 14° 14.4' W) measuring wind direction, wind speed, temperature and humidity is located at the manned weather station Kollaleira. Wind, temperature and data collection instrumentation is the same as at Vattarnes but data transmission is over a telephone line as at Sómastaðagerði. Ground elevation at the automatic station: 43.5 m a.m.s.l. Height of the anemometer above ground is 9.5 m and of thermometer 2.0 m.

Eskifjörður

The automatic station Eskifjörður (65° 04.6' N, 14° 02.2' W) is located at the end of the fjord Eskifjörður a short way west of the small town with the same name. Ground elevation: approx. 2 m a.m.s.l. Anemometer, thermometer, radiation shield and data collection equipment are of the same type as at Vattarnes. Data transmission is by telephone line. Humidity and precipitation are also measured at the station. Height of instruments above ground: anemometer 10.0 m, thermometer 2.0 m.

Oddsskarð

The automatic weather and road station Oddsskarð (65° 03.8' N, 13° 55.1' W) is located at 520 m height in the hillside of Eskifjörður at the road to the pass Oddsskarð. The station is owned by the Public Roads Administration. Height of anemometer 7.3 m and of thermometer 2.0 m above ground.

Seley

The automatic weather station Seley (64° 58.7' N, 13° 31.2' W) is located on an island approx. 5 km off Krossanes on the northern side of the mouth of Reyðarfjörður. The station is owned by the Icelandic Maritime Administration. Station ground elevation: 18 m a.m.s.l. The instruments at Seley are of the same type as at Vattarnes.

A map of Reyðarfjörður is shown in Fig. 1. Present and former observation sites in the Reyðarfjörður area are shown on the map. For photographs of the above stations see Fig. 2-9.

Fig. 4. **Young anemometer at 10.3 m height at Sómastaðagerði (left) and Gill vertical component at 10.8 m height (right).**
Photo: Sigvaldi Árnason, 2003.

Fig 5. **Vattarnes peninsula. View towards N.**
Photo: Hallgrímur Marinósson, 2000.

Fig 6. Automatic station Ljósá. View towards SW.
Photo: Þórður Arason, 2000.

Fig 7. Automatic station Kollaleira 2. View towards E.
Photo: Þórður Arason, 2000.

Fig 8. Automatic station Eskifjörður.
Photo: Þórður Arason, 2000.

Fig 9. Automatic station Oddsskarð. View towards SSE.
Photo: Hallgrímur Marinósson, 2000.

3. Wind Observations at Sómastaðagerði

3.1 Frequency of Wind Directions

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 2002-May 2003 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 period in Annex 5.

Table 1. Percentage frequency of wind directions at Sómastaðagerði, June 2002-May 2003.

		Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Year
N	360	1.2	0.8	0.9	0.9	1.9	0.7	2.2	5.1	0.8	2.1	0.6	3.7	1.8
	10	0.8	1.0	0.7	1.2	0.8	0.5	2.3	2.1	0.6	1.5	0.6	1.8	1.2
	20	0.9	1.1	0.8	1.0	0.8	0.4	1.8	1.7	1.1	1.1	1.0	1.0	1.1
	30	1.3	1.3	1.3	1.6	0.8	0.6	1.6	1.6	1.7	1.9	1.3	1.1	1.3
	40	1.6	2.1	1.7	2.5	1.2	0.9	2.0	1.8	2.2	2.0	2.3	1.6	1.8
	50	3.0	3.3	3.9	3.8	1.1	1.3	3.1	2.3	2.8	3.4	3.1	2.4	2.8
	60	6.3	5.9	6.9	7.1	3.6	3.1	6.2	3.0	5.2	4.7	6.0	4.2	5.2
	70	11.8	**12.4**	11.5	**10.6**	**9.7**	9.0	**7.7**	3.4	**6.8**	**7.2**	10.7	7.2	9.0
	80	**13.8**	11.8	**12.6**	9.6	7.1	15.3	5.4	2.6	**6.8**	5.2	**13.0**	10.5	**9.4**
E	90	9.6	7.6	9.1	6.4	5.9	**17.8**	3.9	2.8	6.0	3.7	9.4	**10.6**	7.7
	100	4.6	4.1	4.5	4.0	2.8	13.4	2.5	1.7	4.4	2.9	7.4	5.4	4.8
	110	3.3	3.0	2.7	2.4	2.7	7.3	2.4	0.9	4.1	2.2	5.4	3.3	3.3
	120	1.7	2.7	1.8	1.9	1.4	4.0	1.5	1.5	3.6	1.9	4.3	3.0	2.4
	130	1.3	1.2	0.9	1.0	0.3	1.1	1.2	1.2	3.5	1.8	2.6	1.4	1.4
	140	0.7	0.6	0.4	0.8	0.2	0.3	0.6	0.9	2.1	0.9	0.9	1.1	0.8
	150	0.7	0.7	0.4	0.6	0.2	0.1	0.5	0.5	1.2	0.7	0.6	1.0	0.6
	160	0.5	0.6	0.6	0.3	0.1	0.1	0.4	0.2	1.1	0.6	0.7	0.7	0.5
	170	0.3	0.6	0.6	0.4	0.2	0.1	0.4	0.2	1.3	0.8	0.3	0.4	0.5
S	180	0.5	0.5	0.5	0.4	0.3	0.2	0.4	0.2	1.3	1.0	0.3	0.3	0.5
	190	0.2	0.6	0.9	0.3	0.2	0.1	0.3	0.3	1.0	1.3	0.5	0.5	0.5
	200	0.4	0.7	0.7	0.6	0.2	0.2	0.4	0.2	1.2	1.5	0.4	0.7	0.6
	210	0.6	0.7	0.6	0.7	0.4	0.1	0.6	0.6	0.7	2.0	0.7	0.8	0.7
	220	1.2	0.9	1.0	1.5	0.8	0.2	0.8	0.5	1.0	2.3	1.0	1.3	1.0
	230	2.2	1.5	1.5	2.5	1.1	0.4	1.5	1.1	1.1	3.1	1.4	1.6	1.6
	240	4.1	2.7	2.8	5.0	2.4	0.8	3.7	2.6	1.2	4.0	2.4	2.4	2.8
	250	5.4	3.8	4.5	5.5	4.1	1.6	5.2	4.8	2.2	5.7	2.4	3.2	4.1
	260	5.4	5.1	6.1	5.6	7.5	2.7	6.2	6.9	4.2	5.5	3.6	3.9	5.3
W	270	6.7	6.3	6.7	4.0	9.5	3.7	7.3	9.1	5.6	6.4	3.6	5.7	6.2
	280	2.9	4.9	4.8	3.9	8.1	3.1	7.6	**9.4**	5.5	5.8	3.6	4.3	5.3
	290	1.6	2.6	1.9	2.9	6.4	2.6	5.5	9.2	5.9	4.5	3.2	2.6	4.1
	300	0.9	1.7	1.1	2.4	3.9	2.2	3.4	5.6	5.1	3.0	2.1	2.0	2.8
	310	0.5	1.8	0.6	1.4	3.2	1.6	2.6	3.4	3.3	2.9	1.5	1.8	2.0
	320	0.7	1.3	0.6	1.2	3.1	1.3	1.7	3.2	1.5	1.7	1.0	1.6	1.6
	330	0.6	1.1	0.6	0.7	3.0	0.9	1.8	2.7	1.2	1.4	0.8	1.6	1.4
	340	0.8	1.0	0.6	1.1	2.4	1.4	1.7	3.0	1.2	1.2	0.6	1.9	1.4
	350	0.9	0.9	0.4	0.8	1.8	0.9	2.1	3.1	1.3	1.6	0.4	2.4	1.4
Calm:		1.0	1.1	2.3	3.4	1.0	0.3	1.4	0.5	0.1	0.5	0.6	0.9	1.1

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 12 month period as a whole easterly winds have been unusually common.

For comparison corresponding information for the five year period June 1998-May 2003 is presented in Table 2 and Annexes 6-10.

Table 2. Percentage frequency of wind directions at Sómastaðagerði for the 5 year period June 1998-May 2003.

		Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Year
N	360	0.9	0.9	1.2	1.6	1.9	2.5	2.3	3.3	1.7	3.2	2.2	1.6	1.9
	10	0.9	0.9	0.9	1.1	1.0	1.3	1.5	1.5	1.0	1.5	1.2	1.0	1.2
	20	0.9	0.8	0.8	0.9	0.9	1.0	1.3	1.2	0.9	0.9	1.1	0.7	0.9
	30	1.1	1.0	1.3	1.3	1.2	1.1	1.4	1.3	1.2	1.1	1.0	0.9	1.2
	40	1.5	1.6	1.7	1.9	1.5	1.6	1.8	1.6	1.4	1.4	1.4	1.5	1.6
	50	2.6	2.7	3.4	3.2	2.4	2.3	2.5	2.4	2.1	2.4	2.1	2.4	2.5
	60	5.2	5.5	7.1	5.4	4.3	3.8	4.1	3.6	3.6	3.8	4.5	5.0	4.7
	70	9.1	10.5	11.9	8.3	6.7	4.9	4.4	4.1	4.9	5.0	6.7	8.7	7.1
	80	**14.4**	**12.4**	**12.2**	**8.7**	5.3	5.6	4.5	3.9	4.9	3.8	6.6	**10.0**	**7.7**
E	90	11.8	10.1	9.0	6.1	4.3	5.2	4.3	3.4	3.9	2.9	4.9	8.5	6.2
	100	5.6	5.2	4.8	4.3	2.3	3.7	2.4	2.7	2.7	1.9	3.6	5.1	3.7
	110	3.1	2.7	2.5	3.0	2.2	2.4	1.9	1.7	1.7	1.5	2.8	2.9	2.4
	120	2.5	2.6	2.1	2.6	1.7	1.8	1.4	1.7	1.3	1.2	2.8	1.9	2.0
	130	1.4	1.2	1.2	1.2	1.1	0.9	1.0	1.1	1.1	1.1	1.8	1.1	1.2
	140	0.7	0.8	0.7	0.7	0.6	0.4	0.5	0.6	0.7	0.5	0.8	0.7	0.6
	150	0.6	0.6	0.4	0.6	0.5	0.2	0.4	0.4	0.5	0.3	0.7	0.6	0.5
	160	0.4	0.5	0.4	0.4	0.3	0.2	0.4	0.4	0.4	0.3	0.5	0.6	0.4
	170	0.5	0.5	0.4	0.4	0.3	0.2	0.3	0.3	0.5	0.4	0.4	0.4	0.4
S	180	0.4	0.3	0.3	0.5	0.5	0.2	0.4	0.4	0.6	0.4	0.4	0.4	0.4
	190	0.3	0.3	0.5	0.5	0.4	0.2	0.4	0.5	0.6	0.5	0.5	0.5	0.4
	200	0.4	0.5	0.5	0.7	0.5	0.3	0.4	0.6	0.6	0.6	0.5	0.6	0.5
	210	0.6	0.6	0.5	0.6	0.7	0.4	0.5	0.8	0.6	0.7	0.7	0.8	0.6
	220	0.9	0.7	0.8	1.1	0.8	0.5	0.7	1.0	0.7	1.2	1.2	1.2	0.9
	230	1.6	1.3	1.4	2.0	1.5	1.1	1.0	1.6	1.2	2.0	2.7	1.9	1.6
	240	2.7	2.6	2.8	3.7	3.0	2.4	2.4	2.7	1.9	3.7	4.0	3.1	2.9
	250	4.1	3.8	3.8	5.2	5.1	4.1	4.3	5.1	3.5	5.7	5.1	4.2	4.5
	260	5.0	4.9	4.5	5.3	7.9	6.8	6.7	7.1	6.5	7.8	6.7	4.6	6.1
W	270	4.8	5.1	4.5	5.3	**9.2**	9.6	**10.6**	9.1	10.0	**11.6**	**7.4**	5.4	7.7
	280	3.8	4.8	4.2	4.6	9.2	**10.2**	10.3	**9.8**	**11.3**	9.9	6.2	4.6	7.4
	290	3.0	3.7	2.9	4.7	7.5	8.1	7.9	7.4	9.1	6.8	5.1	4.4	5.9
	300	1.8	2.2	1.7	3.2	3.9	4.7	4.8	4.8	5.9	4.0	3.0	3.2	3.6
	310	1.4	1.5	1.1	2.1	2.7	3.1	3.5	3.3	4.1	3.1	2.3	2.6	2.6
	320	1.1	1.2	0.9	1.8	2.1	2.3	2.5	2.4	2.5	2.0	1.7	2.1	1.9
	330	1.0	0.9	0.7	1.3	1.8	1.9	2.2	2.3	2.0	1.6	1.6	1.8	1.6
	340	0.9	0.8	0.9	1.2	1.5	1.9	1.8	2.2	1.7	1.7	1.6	1.7	1.5
	350	0.9	0.9	0.9	1.4	1.4	2.0	2.1	2.7	1.8	2.4	1.9	1.5	1.7
Calm:		2.0	3.6	4.9	3.1	1.7	1.3	1.1	0.9	0.6	1.4	2.6	1.8	2.1

As seen by Tables 1 and 2 and Annexes 1-10, winds aligned with the fjord have 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 usually dominate during the winter months. However, in spite of the very strong topographical influence, considerable variations are seen from time to time due to variable circulation patterns.

Year to year variations of the mean frequency of the wind directions are presented for the summer half of the year (April-September) in Fig. 10 and for the winter half (October-March) in Fig. 11.

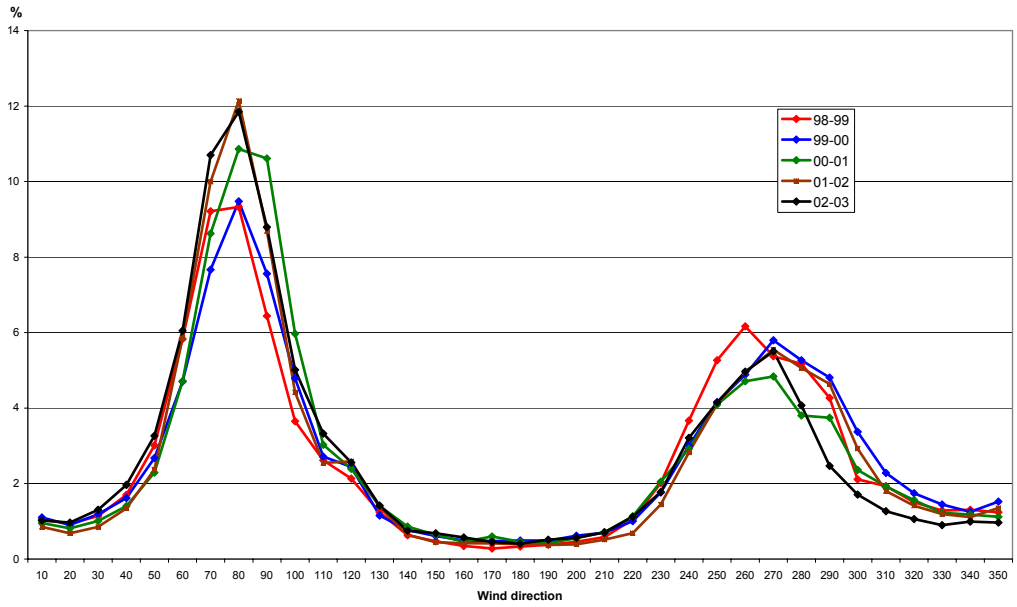

Fig. 10. Year to year frequency of wind directions during the summer half of the year (April-September). Each curve is for the months June-September of the former year indicated and the months April-May of the following year.

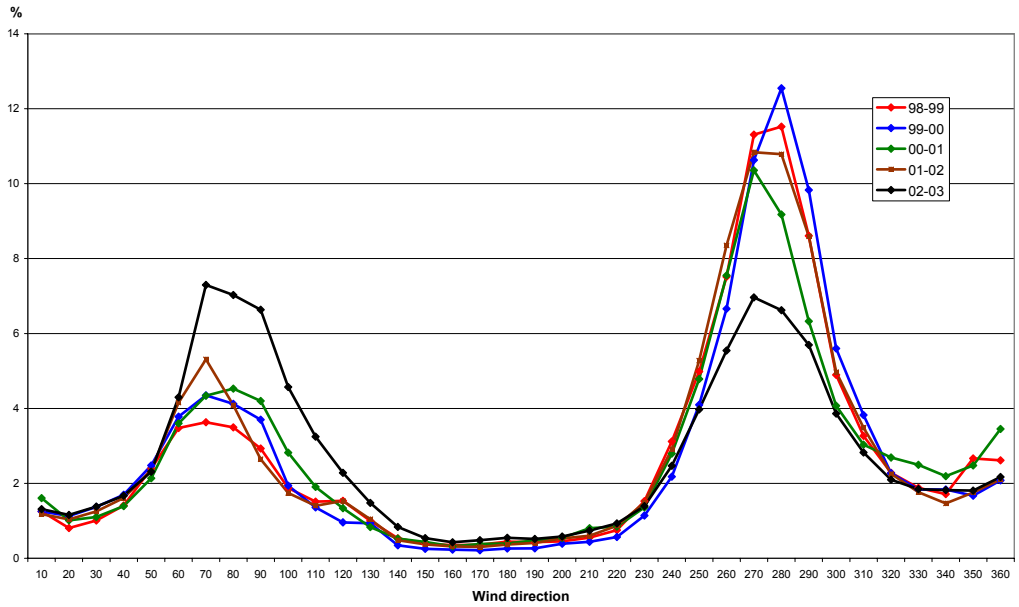

Fig. 11. Year to year frequency of wind directions during the winter half of the year (October-March).

The curve for the period October 2002 – March 2003 shows noticeably high frequency of E-erly and low frequency of W-erly winds. This was mainly due to November 2002 with unusually frequent E-erly winds as evident from Table 1. This month was the second warmest November from the establishment of the station Kollaleira in 1976 (average 4.2 °C) and had by far the highest precipitation amount (971.5 mm).

For the high summer months, June-August, the great diurnal variation of the main wind directions at Sómastaðagerði is clearly shown by the two wind roses

in Annexes 5 and 10. Furthermore it is shown in greater detail in Fig. 12 for four selected wind directions, both for the year 2002 and for the five year period 1998-2002. The directions selected are easterly (80° and 90°) and westerly (270° and 280°).

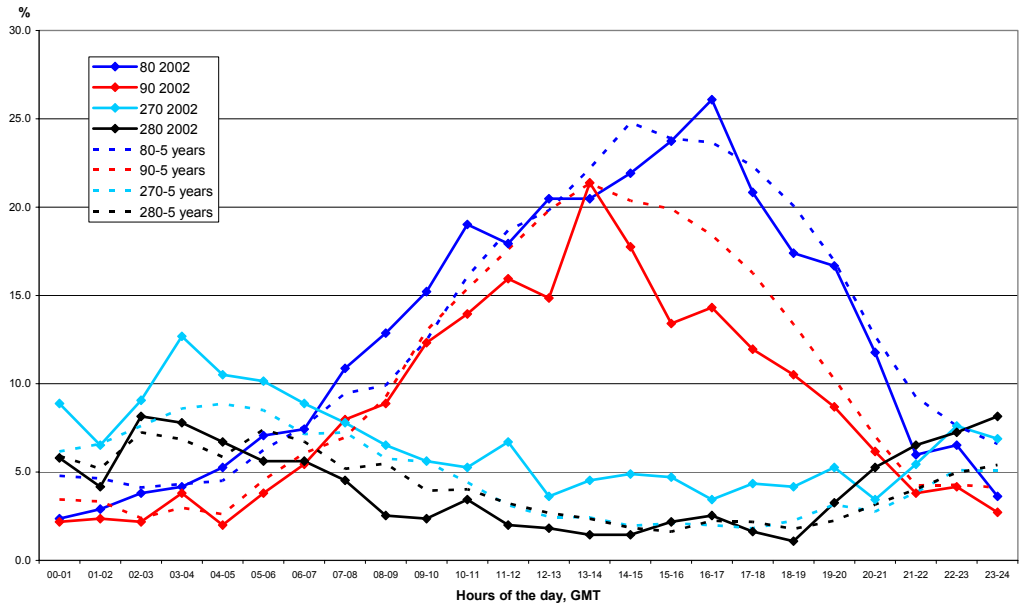

Fig. 12. Diurnal variation of percentage frequency for four selected wind directions at Sómastaðagerði, June-August, 2002 and 1998-2002.

During high summer the frequency of the easterly wind directions, 80° and 90°, has a minimum during the middle of the night, but increases rapidly in the morning to a dominating maximum in the afternoon. On the other hand the curves for the westerly wind directions, 270° and 280°, have a maximum during night and a minimum during the late afternoon. Calm and light variable winds are relatively common during the night.

3.2 Wind Velocity

The average 10-minute wind velocity at Sómastaðagerði for each of the months June 2002-May 2003 is presented in Table 3. For comparison averages for 6 other automatic weather stations in the Reyðarfjörður area are included. For Seley observations were missing in June and July 2002.

Table 3. Average wind velocity at 10 m height at Sómastaðagerði and at 6 other automatic weather stations in the Reyðarfjörður area, June 2002 - May 2003, m/s.

	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Year
Sómastaðagerði	4.0	3.6	3.4	3.0	5.7	6.1	3.6	4.6	6.0	4.1	4.3	4.0	4.3
Ljósá	3.4	3.4	3.1	3.1	6.1	7.7	4.2	4.5	7.1	4.7	4.3	3.9	4.6
Kollaleira 2	3.2	3.1	2.7	2.4	6.1	6.6	3.3	4.2	6.3	4.0	3.9	3.7	4.1
Eskifjörður	4.0	3.4	3.2	2.7	6.8	5.6	3.4	5.0	6.8	4.0	4.1	4.5	4.4
Oddsskarð	3.8	3.6	3.5	3.2	5.7	7.8	4.8	5.1	8.7	5.1	5.2	3.8	5.0
Vattarnes	5.1	4.5	5.1	3.8	7.5	7.5	5.1	6.8	7.8	5.8	5.9	5.4	5.8
Seley	-	-	6.0	5.4	7.0	8.2	6.5	7.4	9.4	8.3	7.0	5.9	-

The average wind velocity at Sómastaðagerði for the 12 month period June 2002-May 2003 was 4.3 m/s. The lowest monthly mean was 3.0 m/s in September and the highest was 6.1 m/s in November.

For Sómastaðagerði the corresponding values for the five year period June 1998 - May 2003 are presented in Table 4.

Table 4. Average wind velocity at 10 m height at Sómastaðagerði
June 1998 - May 2003, m/s.

	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Year
Sómastaðagerði	**4.0**	**3.6**	**3.2**	**3.8**	**4.8**	**5.3**	**4.9**	**5.2**	**6.5**	**4.9**	**4.3**	**4.2**	**4.6**

Percentage frequency of 10-minute wind velocity for selected intervals is presented in Table 5 for Sómastaðagerði for the 12 month period June 2002-May 2003.

Table 5. Percentage frequency of 10-minute wind velocity for selected intervals
Sómastaðagerði, June 2002-May 2003.

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	10.5	18.4	13.6	10.3	9.1	61.9	28.9	8.8	0.5		
Feb	4.2	9.6	8.5	9.1	10.1	41.4	44.2	12.2	2.1		
Mar	9.0	18.8	12.4	11.9	11.5	63.7	33.7	2.7	0.0		
Apr	8.1	16.2	15.1	12.2	10.8	62.4	33.3	3.5	0.7		
May	9.8	13.4	11.6	14.0	17.1	65.9	33.3	0.9			
Jun	9.0	16.7	14.4	14.2	13.9	68.2	27.9	3.8	0.1		
Jul	13.1	21.1	16.1	13.1	11.7	75.2	21.1	3.7	0.1		
Aug	14.6	18.6	15.2	13.6	11.2	73.2	25.9	0.9			
Sep	22.1	23.7	15.2	12.0	8.8	81.9	15.7	1.6	0.7	0.2	
Oct	8.8	12.5	9.6	7.1	6.2	44.2	41.4	14.5			
Nov	3.5	7.6	7.5	7.0	7.9	33.5	58.3	8.1			
Dec	17.6	24.6	11.4	8.0	7.0	68.6	28.4	2.7	0.2		
Year	10.9	16.8	12.6	11.0	10.5	61.8	32.6	5.2	0.4		

The highest 10-minute wind velocity observed at Sómastaðagerði during the 12 month period was 22.6 m/s on September 2, 2002, wind direction 257°. The highest recorded wind gust was 33.3 m/s on the same day. This yields a gust factor of 1.47.

For comparison the corresponding values for the five year period June 1998 - May 2003 are presented in Table 6.

Table 6. Percentage frequency of 10-minute wind velocity for selected intervals
Sómastaðagerði, June 1998 - May 2003.

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	8.6	14.2	11.9	10.0	9.0	53.7	35.5	9.1	1.4	0.3	
Feb	5.7	9.3	8.3	7.4	8.1	38.9	40.1	17.7	3.2	0.2	
Mar	9.1	15.2	13.4	10.7	9.3	57.8	31.9	8.8	1.2	0.3	0.1
Apr	11.9	16.0	14.4	11.0	9.4	62.7	30.7	5.9	0.7		
May	10.4	14.4	13.7	12.3	13.3	64.1	31.0	4.1	0.7	0.1	
Jun	10.8	14.4	13.6	14.2	13.5	66.5	30.5	2.9	0.1		
Jul	15.3	17.7	15.3	14.0	11.2	73.5	23.2	3.0	0.3		
Aug	19.3	17.9	14.5	13.0	11.9	76.6	22.2	1.2			
Sep	16.7	19.0	13.3	10.6	8.9	68.5	27.5	3.8	0.2		
Oct	10.7	14.8	12.6	10.3	9.7	58.1	31.5	8.9	1.4		
Nov	8.9	13.0	10.8	9.2	8.6	50.6	38.9	9.0	1.4	0.2	
Dec	10.1	16.1	10.7	8.2	7.7	52.8	38.8	7.9	0.5		
Year	12.2	15.1	12.6	10.9	10.1	60.9	31.5	6.7	0.9	0.1	

For the five year period the highest 10-minute wind velocity was 29.5 m/s on 6 March, 2000, wind direction 288°, and the highest gust recorded was 45.2 m/s the evening before, yielding a gust factor of 1.53.

For the period June 2002 - May 2003 the average wind velocity for each wind direction at Sómastaðagerði is presented in Table 7. For each month the highest average is indicated with bold letters.

Table 7. Average wind velocity at Sómastaðagerði for each wind direction during the 12 month period June 2002-May 2003, m/s.

		Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Year
N	360	4.3	1.8	1.3	1.4	4.6	2.0	1.4	6.5	1.5	3.5	1.0	**5.8**	4.1
	10	2.9	1.8	1.0	1.1	3.1	2.3	1.7	3.1	1.6	3.8	1.1	3.2	2.3
	20	2.6	1.1	1.0	1.1	1.5	1.5	1.5	1.6	1.7	2.5	1.5	1.6	1.8
	30	2.1	1.1	1.0	1.1	1.4	2.0	1.7	1.3	2.3	1.9	1.6	2.1	1.7
	40	2.6	1.8	1.3	1.2	1.5	2.5	2.1	2.0	2.9	2.3	2.2	1.9	2.0
	50	2.6	2.0	2.5	1.6	1.9	2.7	2.8	2.2	3.2	3.1	3.2	2.5	2.6
	60	3.1	3.2	3.3	2.7	6.3	4.2	4.3	3.1	4.4	4.1	4.4	3.8	3.8
	70	4.3	4.0	4.1	4.0	7.4	6.0	5.6	4.2	5.1	5.3	4.9	3.9	5.0
	80	4.4	3.8	4.0	3.8	7.6	7.5	6.2	5.7	6.3	4.8	5.2	4.9	5.1
E	90	3.8	2.8	3.5	3.5	**8.8**	**7.7**	**7.6**	**7.1**	7.8	4.9	4.6	4.8	5.4
	100	3.0	2.5	2.8	3.7	7.7	7.3	5.9	6.2	7.5	**5.4**	4.1	4.3	5.0
	110	3.1	2.2	2.3	3.3	8.1	6.7	6.1	4.9	6.8	3.8	4.5	4.0	4.9
	120	2.2	2.5	2.4	3.5	7.7	6.4	7.0	5.2	6.8	3.8	4.5	4.1	4.9
	130	2.0	2.6	1.6	1.6	2.8	6.0	6.7	4.9	6.9	4.0	4.5	2.8	4.4
	140	2.3	1.6	1.3	1.3	2.7	3.2	4.4	4.2	6.5	2.9	3.5	2.6	3.5
	150	2.1	1.3	1.1	1.1	2.5	3.3	4.0	3.7	6.1	3.1	3.3	1.7	2.9
	160	2.4	1.1	1.3	0.7	2.0	2.2	3.3	1.3	4.9	3.1	3.3	1.6	2.6
	170	1.5	1.2	1.2	1.8	2.4	1.3	3.1	3.0	5.9	4.2	1.8	1.7	3.0
S	180	1.9	1.7	2.8	1.1	3.3	1.3	2.8	2.7	5.9	4.4	2.2	1.5	3.1
	190	1.7	3.0	2.9	1.5	2.0	2.0	3.1	2.5	5.6	3.4	2.6	1.9	3.1
	200	1.6	2.0	2.9	1.6	1.0	1.9	1.8	2.4	5.9	3.9	1.4	2.1	2.9
	210	2.1	1.7	1.6	2.2	1.8	0.8	1.7	1.5	4.9	4.2	2.1	1.6	2.6
	220	1.9	1.6	2.1	2.1	1.9	2.4	1.4	2.2	4.2	3.7	1.9	1.9	2.3
	230	3.3	2.0	2.0	2.4	2.4	2.2	1.3	2.3	3.4	3.7	1.8	2.4	2.6
	240	4.7	2.8	2.6	2.2	2.0	2.2	1.9	2.4	4.1	3.8	2.1	2.7	3.0
	250	5.6	4.1	3.5	3.3	2.7	2.4	2.0	3.1	4.3	3.8	3.2	3.9	3.6
	260	6.1	5.7	4.9	4.5	5.4	4.0	2.3	4.0	7.4	4.1	5.2	5.2	4.8
W	270	**6.2**	6.5	**5.7**	**4.8**	6.4	5.4	3.5	5.3	**8.8**	5.1	5.5	5.3	**5.9**
	280	4.7	**6.7**	4.7	4.3	6.7	4.7	4.1	6.0	8.3	5.2	6.1	4.9	5.7
	290	4.0	5.8	4.3	3.9	6.4	3.8	4.0	6.5	7.5	4.6	6.4	4.9	5.6
	300	3.4	3.4	3.2	3.5	4.5	4.3	2.7	4.6	6.2	4.0	**6.5**	3.7	4.3
	310	2.3	2.9	2.3	3.5	4.7	4.4	2.2	4.1	5.6	3.5	5.4	4.0	4.0
	320	3.9	3.0	2.3	2.1	4.9	3.6	1.6	3.9	5.1	3.1	4.1	3.3	3.6
	330	3.2	2.3	2.4	1.7	4.7	3.3	1.8	4.2	3.8	2.4	2.9	2.9	3.1
	340	3.8	2.0	1.7	1.2	5.0	3.4	1.4	4.4	6.3	1.9	2.6	3.5	3.4
	350	4.6	2.1	2.2	1.3	4.1	2.4	1.1	4.9	3.3	2.8	1.5	4.7	3.3

The highest values in the Table are 8.8 m/s (October, wind direction 90°, and February, wind direction 270°). A majority of the highest average values have been in W-erly or WNW-erly wind directions during this 12 month period.

Corresponding averages for the period June 1998 - May 2003 are presented in Table 8.

Table 8. Average wind velocity at Sómastaðagerði for each wind direction during the 5 year period June 1998 - May 2003, m/s.

		Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Year
N	360	3.3	2.4	2.1	3.7	5.2	6.0	4.9	6.5	5.2	5.9	**6.5**	4.8	5.2
	10	2.3	1.8	1.0	1.7	2.7	2.9	2.3	2.9	3.0	3.2	3.3	2.3	2.5
	20	1.7	1.2	1.0	1.2	1.6	1.6	1.8	1.7	2.0	2.1	1.8	1.4	1.6
	30	1.6	1.2	1.1	1.2	1.5	1.7	1.8	1.7	2.2	2.0	1.7	1.6	1.6
	40	1.8	1.5	1.6	1.6	1.9	2.3	2.3	2.4	2.7	2.2	2.0	1.9	2.0
	50	2.1	1.9	2.3	2.1	2.5	3.0	3.2	3.5	3.3	3.0	3.0	2.5	2.6
	60	3.0	2.7	3.5	3.2	4.1	4.2	4.5	4.6	4.8	4.3	4.1	3.7	3.8
	70	4.0	3.7	4.2	4.2	5.2	5.5	5.6	5.5	6.1	5.4	4.7	4.4	4.7
	80	4.4	3.7	3.8	4.6	5.7	7.4	7.3	6.8	7.5	5.4	5.0	4.6	5.0
E	90	4.1	3.3	3.4	4.6	6.5	**7.6**	**8.2**	**7.4**	8.2	6.2	4.4	4.2	5.0
	100	3.4	2.7	3.0	4.5	5.3	6.8	6.3	7.2	7.5	5.7	4.2	3.9	4.6
	110	3.2	2.3	2.5	4.4	5.2	6.0	5.7	6.9	6.1	4.6	4.5	3.3	4.3
	120	3.3	2.7	2.8	4.4	5.0	5.8	5.9	6.2	5.8	4.2	4.5	3.1	4.3
	130	3.0	2.2	2.4	3.4	4.2	5.4	5.5	5.8	5.7	4.1	4.0	2.4	3.9
	140	2.6	1.6	1.6	2.2	3.4	3.5	3.9	4.7	5.3	3.3	3.2	2.3	3.0
	150	2.3	1.4	1.4	2.2	3.1	3.0	3.6	3.7	4.9	2.7	2.9	1.9	2.7
	160	2.1	1.3	1.1	2.4	3.1	3.3	3.9	3.7	4.3	2.5	2.6	1.8	2.6
	170	2.5	1.2	1.2	2.6	3.2	3.1	3.7	3.8	5.4	2.9	2.3	2.0	2.8
S	180	2.6	1.6	2.2	2.6	3.2	3.1	3.9	4.2	5.2	3.4	2.4	1.9	3.1
	190	2.7	2.2	2.5	2.5	3.5	3.2	4.0	4.4	5.4	2.8	2.2	2.1	3.2
	200	2.6	1.8	2.1	2.2	3.6	2.5	3.4	5.1	5.3	2.8	1.7	2.3	3.0
	210	2.5	2.0	1.9	2.0	3.2	2.3	3.1	4.7	4.6	3.1	1.9	2.4	2.9
	220	2.3	1.8	1.6	1.9	2.3	2.4	2.5	4.1	3.7	2.8	1.9	2.2	2.5
	230	2.7	2.1	1.7	2.0	2.2	2.3	2.2	3.5	3.2	2.9	2.2	2.5	2.4
	240	3.6	2.9	2.3	2.5	2.3	2.7	2.5	3.3	3.9	3.0	2.5	2.9	2.8
	250	5.0	4.5	2.9	3.6	3.2	3.9	3.5	4.5	5.4	3.7	3.3	3.5	3.9
	260	5.6	5.5	4.0	4.4	4.7	5.3	4.9	5.0	7.0	4.9	4.7	4.5	5.0
W	270	6.0	6.1	4.5	4.7	5.8	6.2	5.8	5.8	8.5	6.3	5.5	5.7	6.0
	280	5.8	7.3	5.2	5.0	6.6	6.4	5.8	6.7	**8.7**	6.4	6.0	6.1	6.5
	290	**6.5**	**7.5**	**5.8**	**6.2**	**7.7**	6.3	5.9	6.2	7.9	**6.5**	6.3	**7.4**	**6.7**
	300	5.6	5.2	4.0	5.2	5.5	5.1	4.8	4.7	6.5	6.4	5.7	7.0	5.5
	310	5.2	4.2	3.3	4.2	4.9	4.4	4.3	4.2	6.1	5.4	5.5	6.0	4.9
	320	4.0	3.4	2.8	3.7	4.1	4.4	4.1	4.2	5.8	4.3	5.0	5.3	4.4
	330	3.6	3.0	2.7	2.9	3.7	3.9	3.8	3.5	5.6	3.6	4.4	4.6	3.9
	340	3.6	2.6	2.5	2.6	3.4	3.9	3.2	3.9	5.1	3.8	4.5	4.6	3.8
	350	4.0	3.2	2.4	3.2	3.7	4.8	3.0	5.3	4.9	5.0	5.8	4.4	4.4

The highest average in the table is 8.7 m/s (February, wind direction 280°).

The average wind velocity at Sómastaðagerði as a function of wind direction during the summer half and the winter half of the 12 month period June 2002 - May 2003 as well as during the five year period June 1998 - May 2003 is presented in Fig. 13.

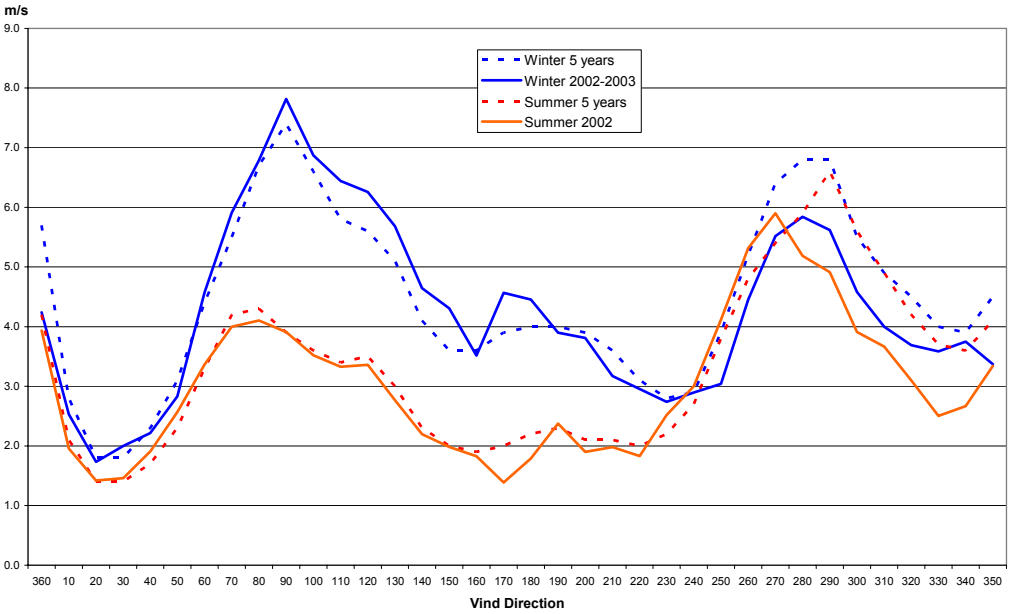

Fig 13. Average wind velocity at Sómastaðagerði for each wind direction during the summer half and the winter half of the periods June 2002 - May 2003 and June 1998 - May 2003.

The distribution of 10-minute wind velocity at Sómastaðagerði in August 2002 and February 2003 is presented in Fig. 14 and correspondingly for August, 1998-2002, and February, 1999-2003 in Fig. 15.

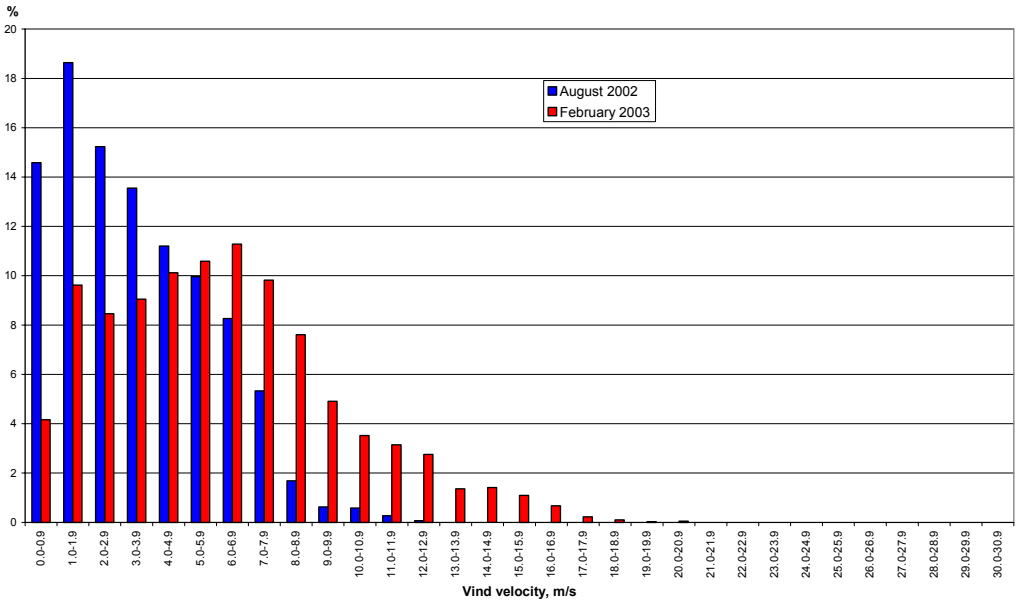

Fig. 14. Wind velocity distribution at Sómastaðagerði, 10-minute means, August 2002 and February 2003, %.

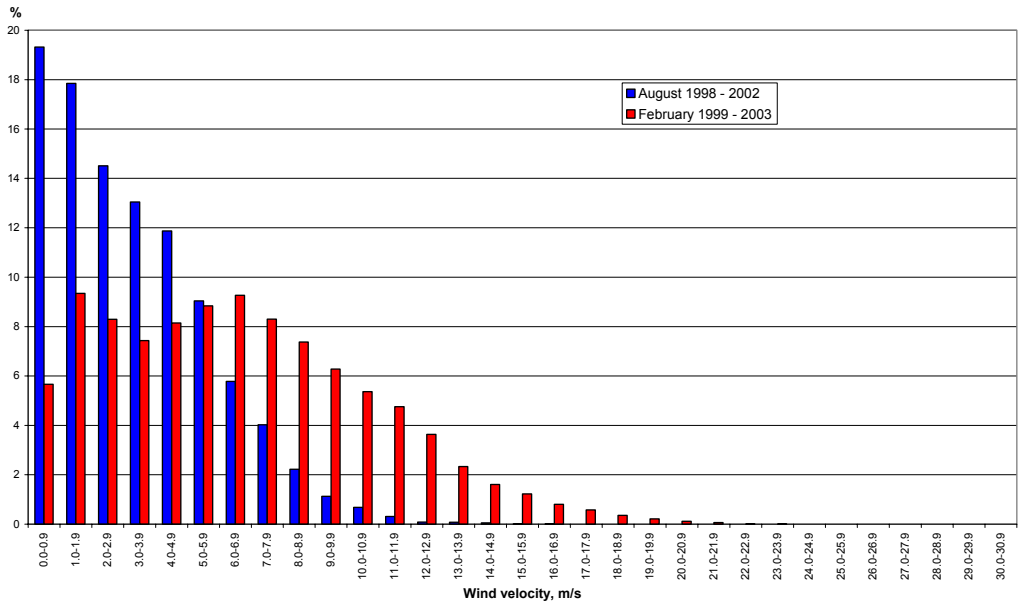

Fig. 15. Wind velocity distribution at Sómastaðagerði, 10-minute means, August, 1998-2002, and February, 1999-2003, %.

The diurnal variation of 10 minute wind velocity is considerable at Sómastaðagerði during summer. This variation is shown in Fig. 16 for the months June-September 2002.

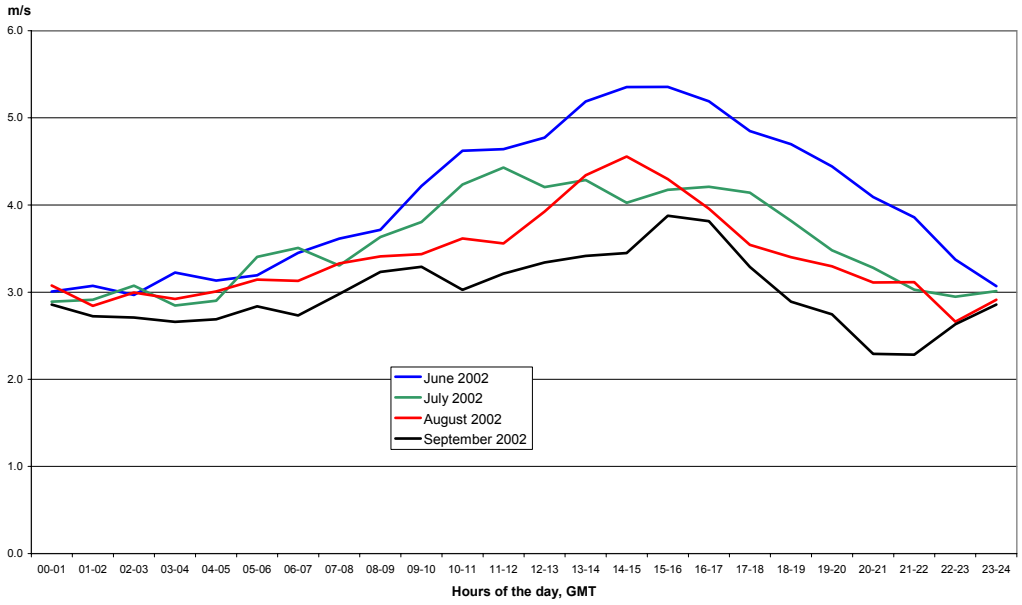

Fig. 16. Diurnal variation of wind velocity at Sómastaðagerði, June-September 2002, m/s.

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

For the months June 2002-May 2003 the percentage frequency of the wind directions and the average wind speed in each wind direction is presented for Ljósá in Annexes 11-13. 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 14. Night and day values for the high summer months are presented in Annex 15. Similarly values for Kollaleira 2 are to be found in Annexes 16-20, for Eskifjörður in Annexes 21-25, for Vattarnes in Annexes 26-30, and finally for Seley in Annexes 31-33. Unfortunately the anemometer at Seley broke down and wind data are not available for that station for June and July 2002.

Information on the monthly average wind velocity in the period June 2002 - May 2003 at the above stations is presented in Table 3.

Attention has earlier [Ref. 5 and 6] 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 once more 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.

5. 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 9. As already mentioned the thermometers were recalibrated on August 17, 2002. At the 3.0 m height the temperature correction was found to be +0.2 °C, but +0.1 °C at 10.5 and 36.5 m height. These corrections have been applied in Table 9.

For each month the stability variations from day to day are presented in Annexes 34-39. 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 9. Monthly average temperature at 3.0 m, 10.5 m and 36.5 m above the ground at Sómastaðagerði during the period June 2002-May 2003, 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.

	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Year
Sómastaðagerði $T_{3.0}$	8.41	9.83	9.78	8.13	4.51	4.30	3.42	-0.11	3.43	4.05	4.75	4.42	5.42
Sómastaðagerði $T_{10.5}$	8.29	9.78	9.73	8.25	4.66	4.43	3.88	0.28	3.79	4.26	4.75	4.31	5.54
Sómastaðagerði $T_{36.5}$	8.17	9.77	9.63	8.39	4.69	4.44	4.20	0.44	3.90	4.33	4.63	4.11	5.56
$T_{36.5}$ - $T_{3.0}$	-0.24	-0.06	-0.15	0.25	0.18	0.14	0.78	0.55	0.46	0.28	-0.13	-0.31	0.15
$T_{36.5}$ - $T_{10.5}$	-0.12	-0.01	-0.09	0.14	0.03	0.01	0.32	0.16	0.10	0.07	-0.12	-0.20	0.02

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 2002 and May 2003 the average diurnal variation of the vertical temperature gradient observed in the mast at Sómastaðagerði is presented in Annexes 40-41. On the average for these months the lowest air layer between 36.5 m and the ground is seen to be stable during the night but neutral or unstable during the day.

6. 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 10 for the period June 2002 - May 2003.

Table 10. 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 2002-May 2003, °C.

	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Year
Sómastaðagerði $T_{3.0}$	8.4	9.8	9.8	8.1	4.5	4.3	3.4	-0.1	3.4	4.1	4.8	4.4	5.4
Kollaleira	9.0	10.2	10.0	8.1	4.5	4.2	3.2	-0.7	3.1	3.9	4.9	4.8	5.4
Kollaleira 2	8.8	10.2	10.0	8.4	4.4	4.0	3.2	-0.7	2.9	3.9	4.9	4.5	5.4
Ljósá	7.9	9.2	8.8	7.9	3.1	2.6	2.9	-1.1	1.8	2.8	3.3	2.7	4.3
Vattarnes	6.4	8.4	8.8	7.7	5.0	4.9	4.5	1.3	3.6	4.2	4.4	4.2	5.3
Eskifjörður	8.3	9.9	10.0	8.1	4.7	5.0	3.2	-0.3	3.5	4.0	5.0	4.5	5.5
Oddsskarð	6.4	7.4	7.3	6.9	1.6	0.9	1.1	-3.1	-0.7	0.6	1.3	-0.5	2.4

Attention is drawn to the different elevation 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 has usually higher monthly mean temperatures than the other stations during October-March. On the other hand during April-September Vattarnes had lower monthly means than the lowland stations inside Reyðarfjörður.

7. Air Temperature Difference Kollaleira 2 - Vattarnes

The yearly and diurnal variations of the temperature difference between the automatic stations Kollaleira 2 and Vattarnes are of main importance for understanding the changes between the dominant easterly and westerly winds inside Reyðarfjörður. Diagrams showing day to day variation of the temperature difference between the two stations have been shown in earlier reports [Ref. 4, 5 and 6]. In Annex 42-45 we now in addition present diagrams for the period June 2002 - May 2003.

As earlier pointed out the semi-regular diurnal variation of this temperature difference is the driving force for the important sea and land breeze circulation in Reyðarfjörður. As seen from the Annexes the daily amplitude is frequently between 5° and 10° C during the summer.

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

8. Simultaneous Observations of the Temperature Difference Ljósá-Sómastaðagerði and Oddskarð-Eskifjörður, June 2002-May 2003.

For supplementing the stability observations in the mast at Sómastaðagerði graphs are presented in Annexes 46-51 for each of the months June 2002-May 2003 showing simultaneous observations of the temperature difference between Ljósá and Sómastaðagerði on the one hand and between Oddsskarð and Eskifjörður on the other. The difference in height between the thermometers at Ljósá and Sómastaðagerði is approx. 247 m and between Oddsskarð and Eskifjörður approx. 518 m. The many simultaneous occurrences of higher temperatures being observed at Ljósá and Oddsskarð than at Sómastaðagerði and Eskifjörður, prove the occurrence of thick stable air layers in Reyðarfjörður, often ground based, as stable air is also observed in the mast at Sómastaðagerði.

9. 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. Five years of observations are now available, and the observation programme is still ongoing during the summer 2003.

A most 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. Three years of observations are now available for these stations. Observations are also available from other automatic stations in the Reyðarfjörður area: Eskifjörður, Oddsskarð, Seley and Fagridalur. Important older observations are further

available from Kollaleira, Leirur and Eyri in Reyðarfjörður and from Mjóeyri in Eskifjörður.

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

As pointed out in earlier reports, 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 as well as the 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 also pointed out earlier the sea and land breeze circulation seems to take place inside Reyðarfjörður.

The prevalence of stable air and ground based inversions in Reyðarfjörður during winter as well as during nights in summer is proved by the observations in the mast at Sómastaðagerði. This is confirmed by simultaneous observations of frequently higher temperatures at Ljósá and Oddsskarð than at the low level stations Sómastaðagerði and Eskifjörður. Obviously ground based inversions often reach higher than Ljósá and even higher than Oddsskarð.

The great, semi-regular, diurnal variation of the stability of the air layer between 36.5 m and 3.0 m at Sómastaðagerði is once more demonstrated for the summer half of the year in Annexes 34, 35 and 39.

As previously emphasized [Ref.7] 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 inside Reyðarfjörður can possibly result in the same air blowing two or even three times over the smelter and the Búðareyri village during the same day. In spite of good mixing during each circulation this would increase the concentration of pollution occurring at Búðareyri.

A reentry over the smelter is also possible in summer when light westerly wind having blowed ower the smelter during late night suddenly changes to become easterly during the early morning. Fumigation can then follow when the air near the ground becomes unstable due to heating by the rising sun, and polluted air is partly brought down to the surface.

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 occasionally possible.

Dispersion calculations for Aluminum Plants at Sómastaðagerði have been carried out by the Norwegian Institute for Air Research (NILU) [Ref. 10] and Earth Tech [Ref. 11]. The former were based on meteorological observations during the two year period September 1998 - September 2000. The modeling period of the latter, made for the Alcoa Aluminum Plant, was July 1, 2000 through June 30, 2001.

The latter calculations are pertinent for the plant shortly to be built at Sómastaðagerði/Hraun. They show relatively low annual average SO_2 concentrations at Búðareyri. On the other hand predicted 1-hour values are occasionally quite high. The 350 $\mu g/m^3$ 1-hour guideline and the 50 $\mu g/m^3$ 24-hour guideline are predicted reached at Búðareyri, although only on very rare occations. However, this seems very high compared with the generally very low background values for SO_2 in Iceland.

All 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.

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

Vegna áforma um álver í Reyðarfirði hefur Veðurstofa Íslands frá 1. maí 1998, eða um rúmlega fimm 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), á 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 yfir um rúmlega þriggja ára skeið og gefið mikilvægar nýjar upplýsingar um vindafar í Reyðarfirði.

Greinargerð þessi nær aðallega yfir 12 mánaða tímabilið júní 2002 - maí 2003, en einnig er þó fjallað um vindmælingar að Sómastaðagerði á fimm ára tímabilinu júní 1998 - maí 2003. Niðurstöður eldri mælinga á ofangreindum og öðrum mælistöðum í Reyðarfirði er að finna í fyrri skýrslum Veðurstofunnar (Ref. 1-9). Er gerð grein fyrir þessu í fyrsta kafla greinargerðarinnar.

Í öðrum kafla er gerð grein fyrir athugunarstöðvum í Reyðarfirði og mælitækjum þeirra.

Í þriðja kafla og viðaukum 1-10 er fjallað ítarlega um vindáttar- og vindhraðamælingar í Sómastaðagerði á 12 mánaða tímabilinu júní 2002 - maí 2003 og einnig á fimm ára tímabilinu júní 1998 - maí 2003.

Í fjórða kafla og viðaukum 11-33 er fjallað um vindmælingar á mælistöðvunum Ljósá, Kollaleiru 2, Eskifirði, Vattarnesi og Seley.

Fimmti kafli fjallar í stuttu máli um hita- og stöðugleikamælingar lofts í mastrinu að Sómastaðagerði, en stöðugleikinn er sýndur dag fyrir dag í viðaukum 34-39 (sem hitamunur í 36.5 m og 3.0 m hæð og sem hitamunur í 36.5 m og 10.5 m hæð í mastrinu). Meðaldagssveifla stöðugleikans er svo sýnd fyrir mánuðina júní-ágúst 2002 og maí 2003 í viðaukum 40 og 41.

Í kafla 6 er sýndur meðallofthiti hvers mánaðar á tímabilinu júní 2002 - maí 2003 á 7 veðurstöðvum á Reyðarfjarðarsvæðinu.

Í framhaldi er í kafla 7 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 frá degi til dags í viðaukum 42-45. Hlýrra er að jafnaði á Vattarnesi en á Kollaleiru að vetrarlagi en kaldara að sumarlagi. Hin mikla dagssveifla hitamunarins að sumarlagi endurspeglar og skýrir dagssveiflu hafgolu og landgolu í firðinum.

Kafli 8 fjallar um samtímaathuganir á 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 46-51. Hér er um mikilsverðar upplýsingar að ræða um stöðugleika lofts í Reyðarfirði, til viðbótar við mælingarnar í mastrinu að Sómastaðagerði.

Í kafla 9 er fjallað í stuttu máli á ensku um aðstæður í Reyðarfirði og drepið á helstu niðurstöður mælinganna. Er þetta einnig gert á íslensku í kafla 10:

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 frá álverinu út til hafs, en þaðan berst það svo til hliðar meðfram ströndinni. Hægar austlægar áttir eru hins vegar varasamar þar sem þær flytja mengað loft frá álverinu í átt að þéttbýlinu 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 mengunarefnum á hinni löngu hringrás loftsins innan fjarðarins.

Einnig er bent á að hægir vestlægir vindar munu oft blása yfir álbræðsluna síðla nætur að sumarlagi, en snúast í austlæga innlögn snemma morguns. Getur mengað loft þá borist aftur yfir verksmiðjuna og síðar yfir Búðareyri. Með hækkandi sól hitnar loftið næst jörðu og verður óstöðugt. Getur þá stöku sinnum orðið svæling (fumigation) þegar hluti mengaðs lofts berst niður til jarðar.

Hættulegri varðandi skammtíma mengun eru þó sennilega miklir hægviðriskaflar með breytilegri vindátt. Sama loftið gæti þá stöku sinnum borist margsinnis yfir álverið og svo yfir Búðareyri.

Á grundvelli mælinga Veðurstofunnar hafa útreikningar á dreifingu mengunarefna fra álveri við Sómastaðagerði/Hraun verið gerðir af Norsk Institutt for Luftforskning (NILU) [Ref. 10] og Earth Tech [Ref. 11].

Sýna síðarnefndu útreikningarnir, sem eru gerðir fyrir það álver sem innan skamms verður byggt að Sómastaðagerði/Hrauni, m.a. að langtímamengun af SO_2 yfir ár eða misseri yrði vel viðunandi á Búðareyri. Skammtímamengun gæti hins vegar stöku sinnum orðið tiltölulega há. Því er þannig spáð að klukkustundargildi geti einstöku sinnum náð viðmiðunargildinu 350 $\mu g/m^3$ og 24-stunda gildi náð viðmiðunargildinu 50 $\mu g/m^3$. Verður það að teljast mjög hátt, miðað við hin lágu bakgrunnsgildi SO_2 almennt á Íslandi.

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

11. References

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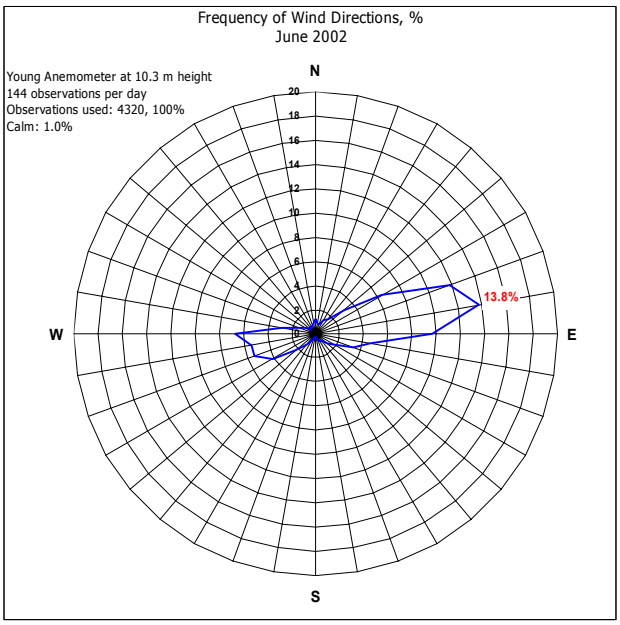
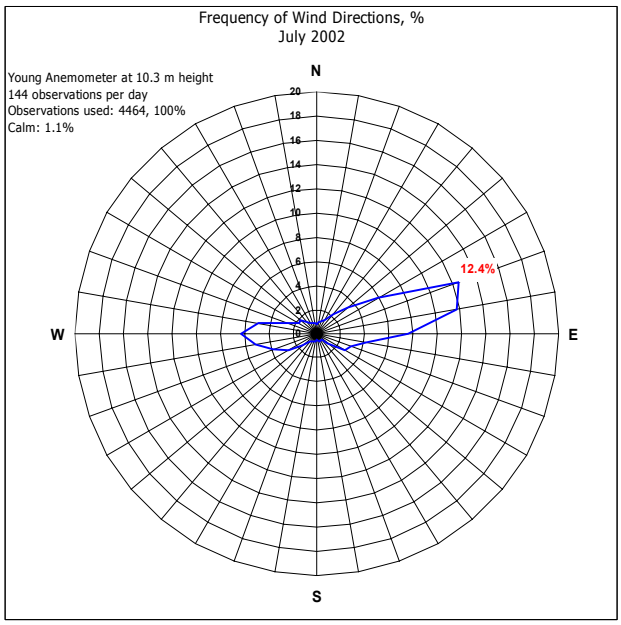
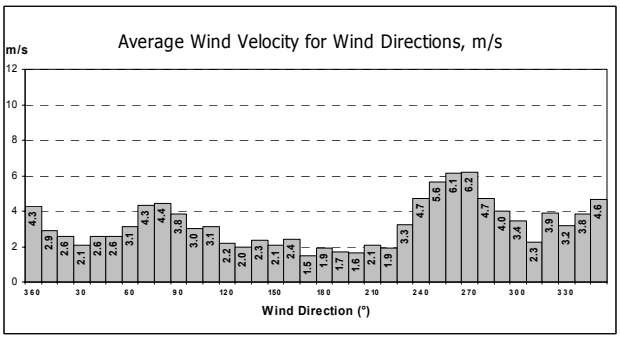
Annexes 1 - 51


Frequency of Wind Directions, %
June 2002
Young Anemometer at 10.3 m height
144 observations per day
Observations used: 4320, 100%
Calm: 1.0%
N
W
E
S
13.8%


Frequency of Wind Directions, %
July 2002
Young Anemometer at 10.3 m height
144 observations per day
Observations used: 4464, 100%
Calm: 1.1%
N
W
E
S
12.4%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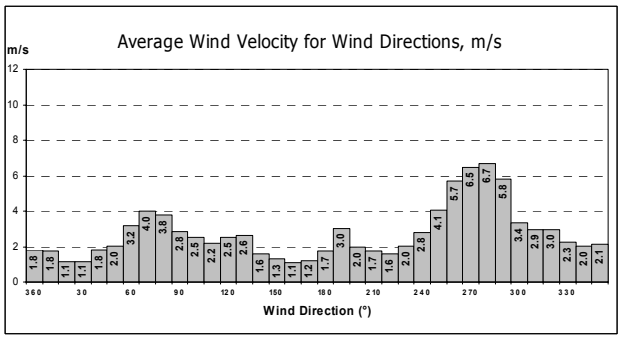
m/s
Wind Direction (°)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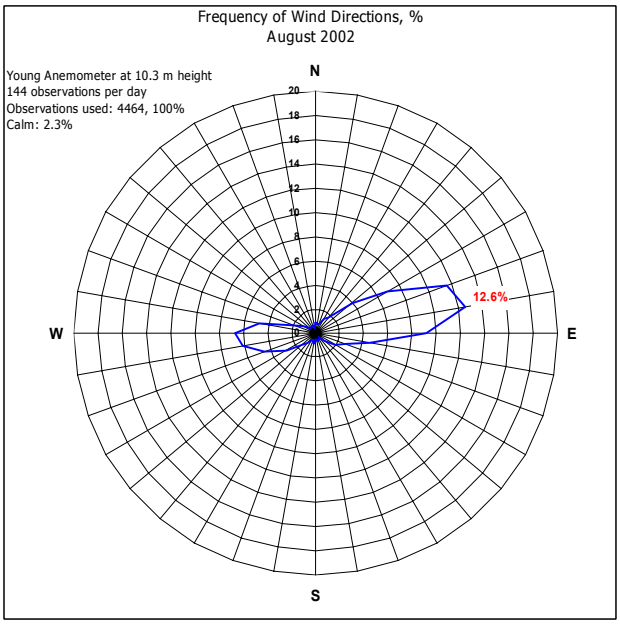
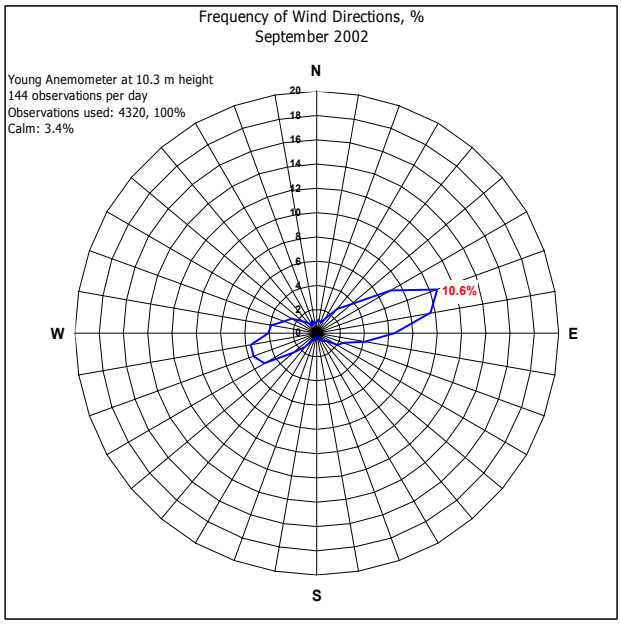
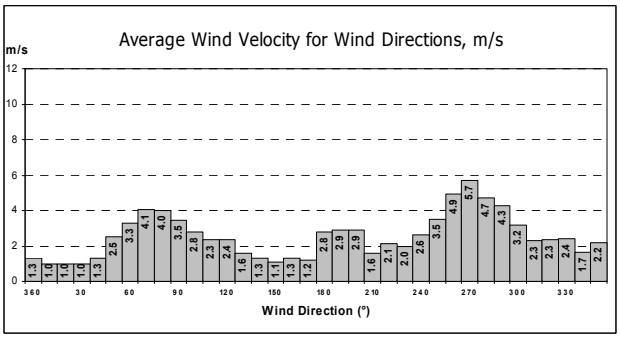
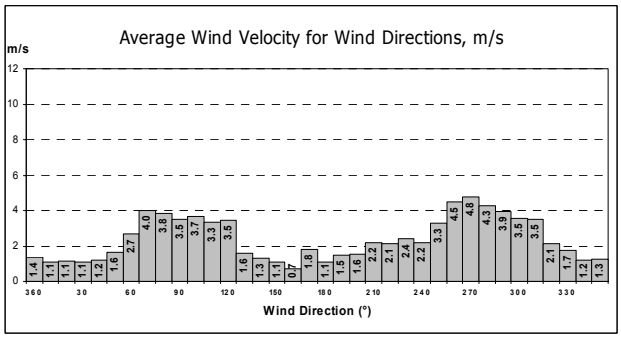
m/s
Wind Direction (°)


Frequency of Wind Directions, %
August 2002
Young Anemometer at 10.3 m height
144 observations per day
Observations used: 4464, 100%
Calm: 2.3%
N
W
E
S
12.6%


Frequency of Wind Directions, %
September 2002
Young Anemometer at 10.3 m height
144 observations per day
Observations used: 4320, 100%
Calm: 3.4%
N
W
E
S
10.6%


Average Wind Velocity for Wind Directions, m/s
m/s
Wind Direction (°)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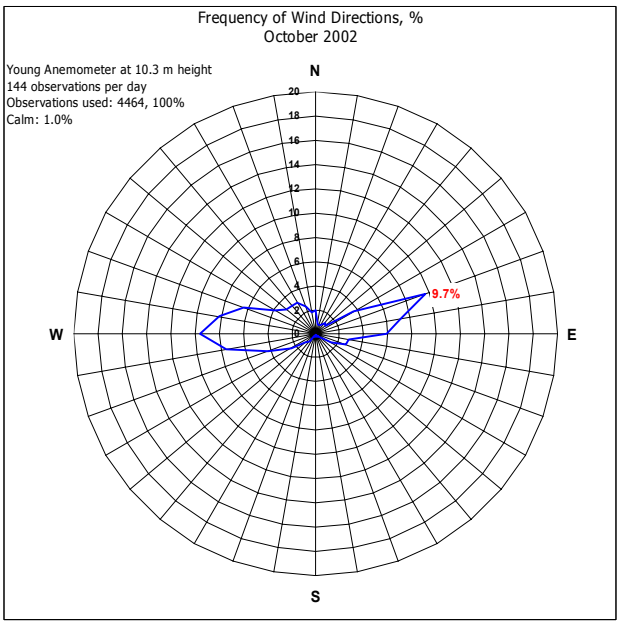
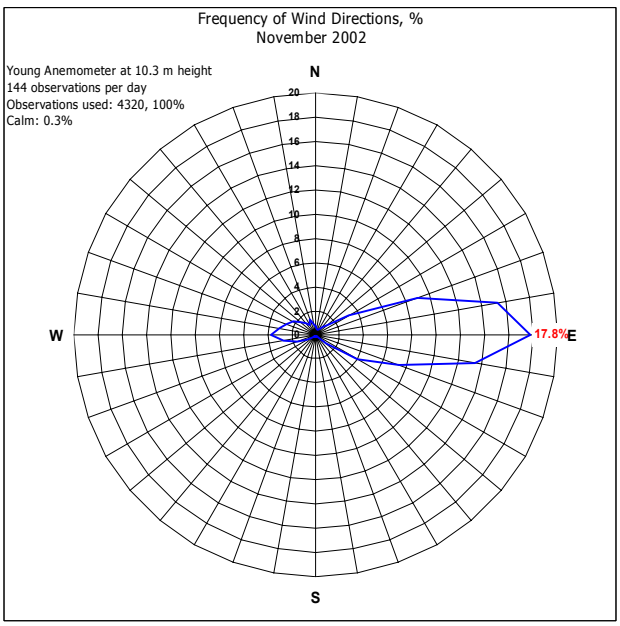
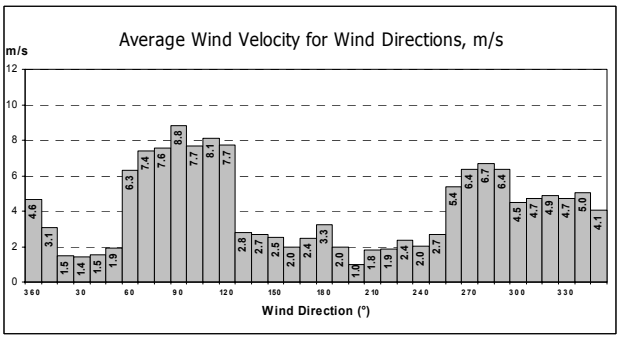
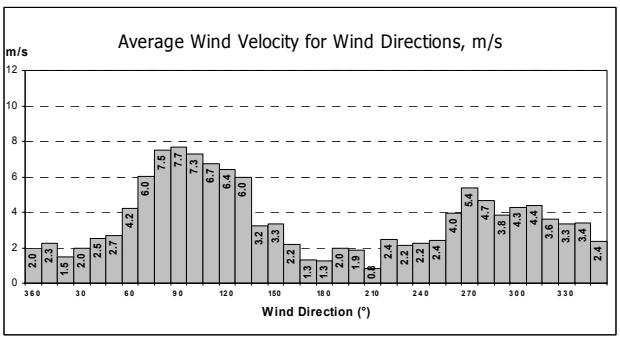
m/s
Wind Direction (°)

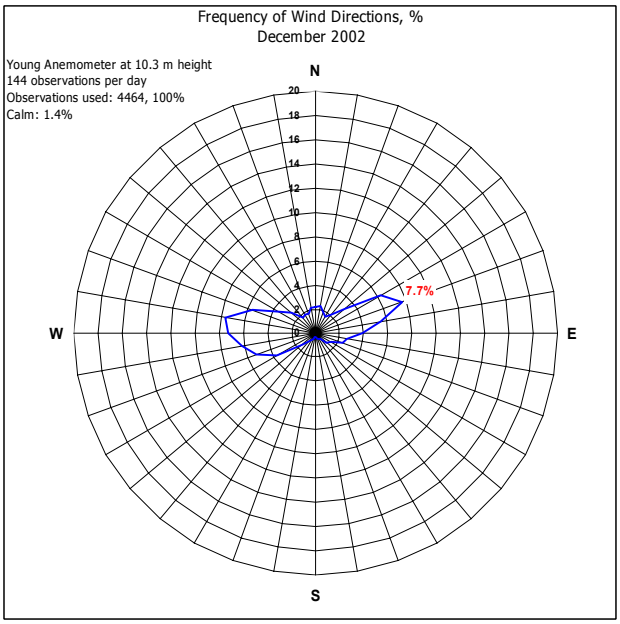
Sómastaðagerði

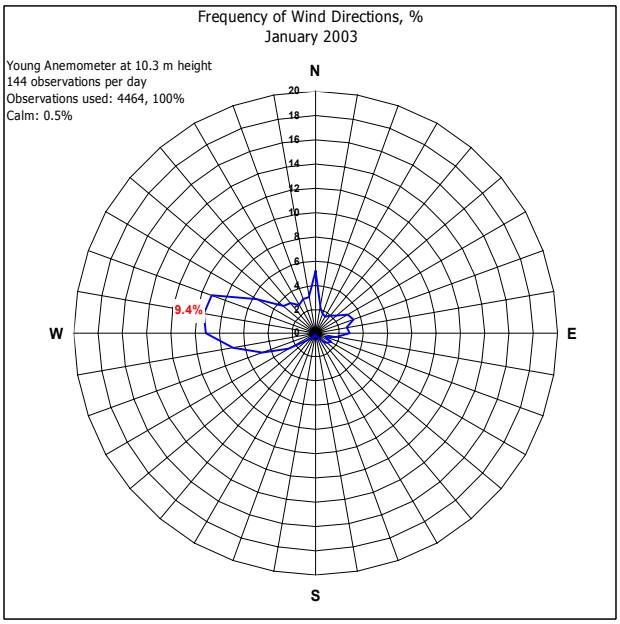


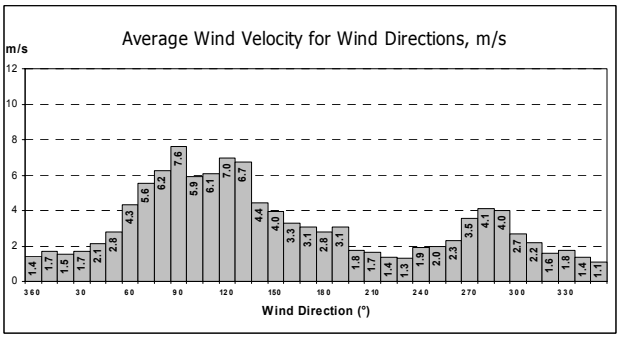


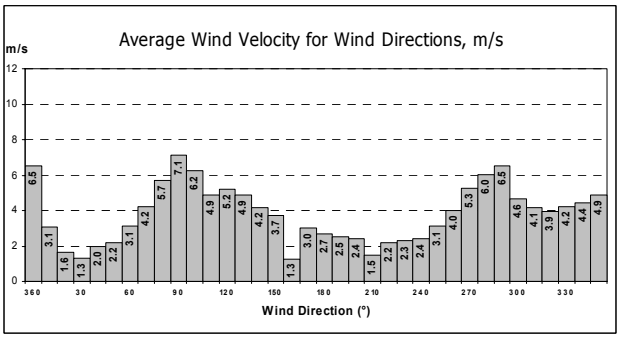




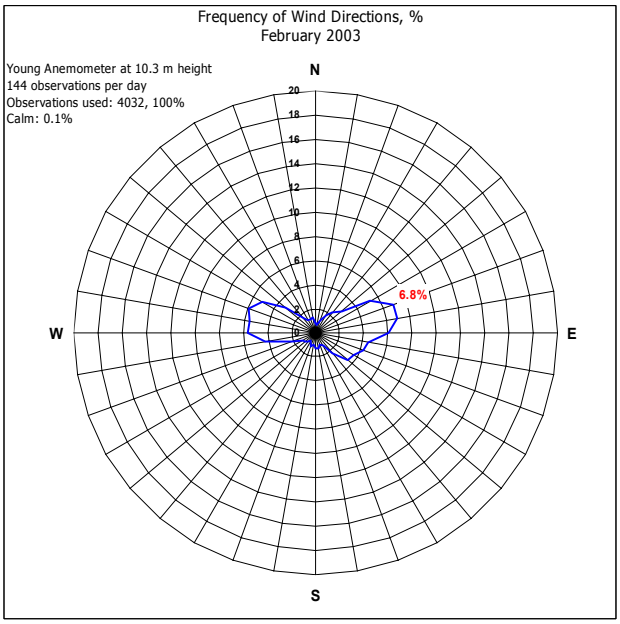


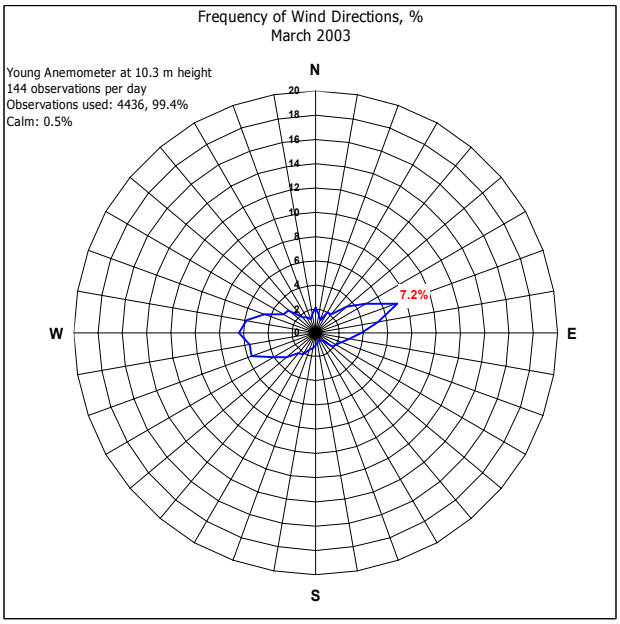


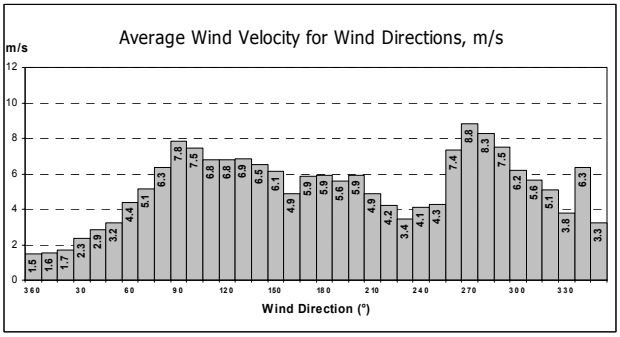


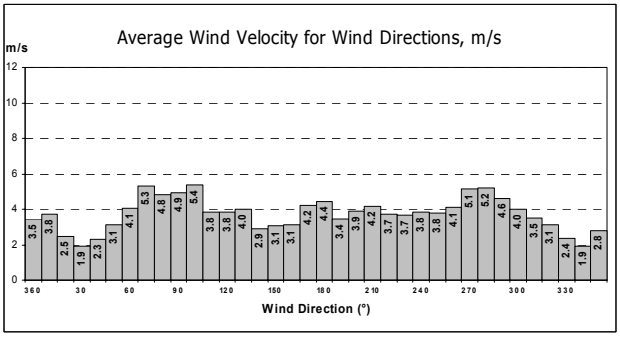


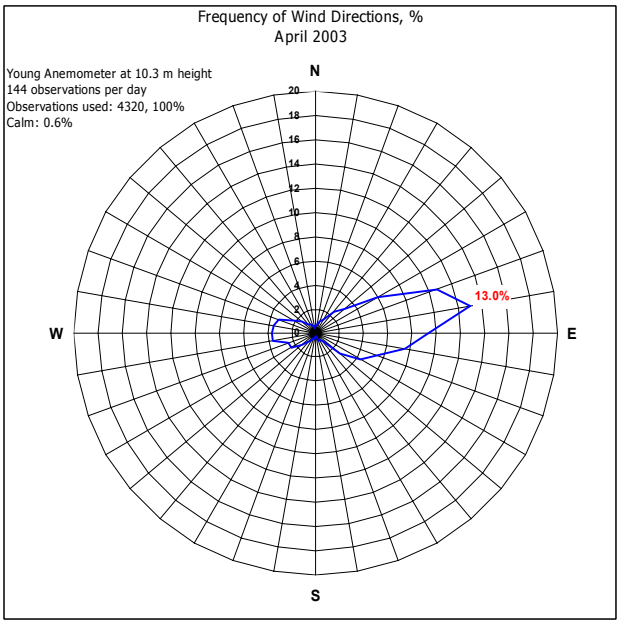
Annex 2

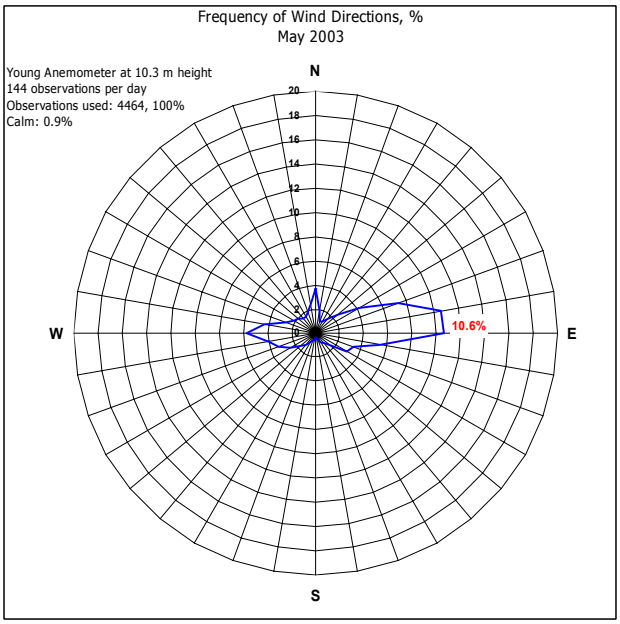

Frequency of Wind Directions, %
February 2003
Young Anemometer at 10.3 m height
144 observations per day
Observations used: 4032, 100%
Calm: 0.1%
N
E
S
W
6.8%

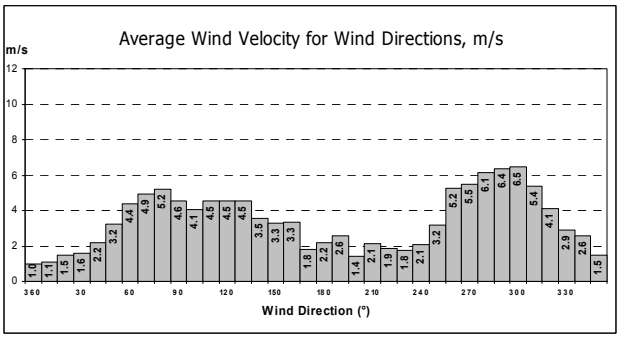

Frequency of Wind Directions, %
March 2003
Young Anemometer at 10.3 m height
144 observations per day
Observations used: 4436, 99.4%
Calm: 0.5%
N
E
S
W
7.2%

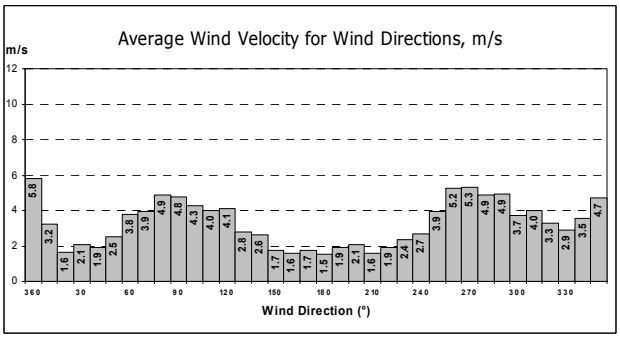

Average Wind Velocity for Wind Directions, m/s
m/s
Wind Direction (°)

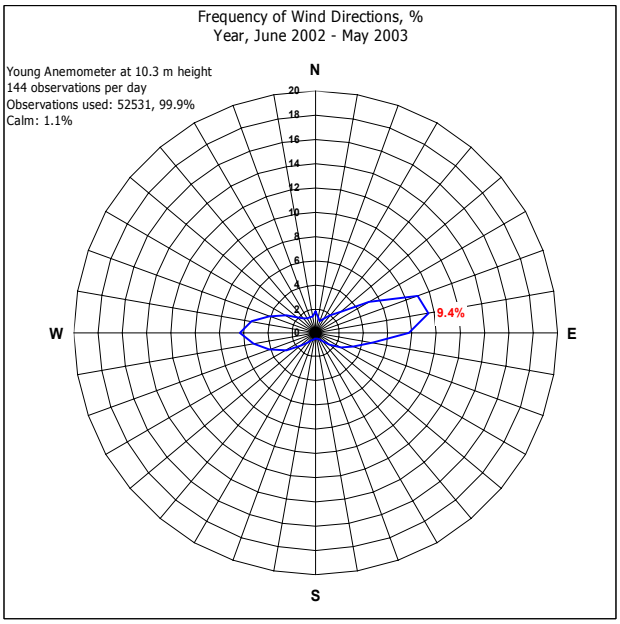

Average Wind Velocity for Wind Directions, m/s
m/s
Wind Direction (°)

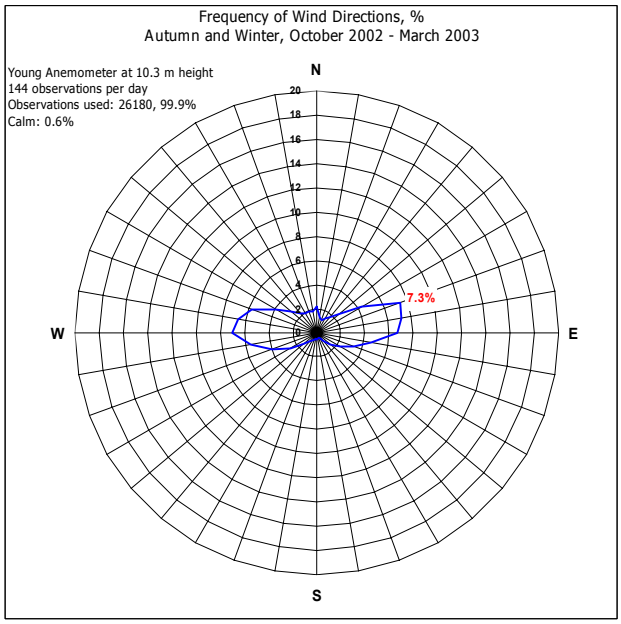

Frequency of Wind Directions, %
April 2003
Young Anemometer at 10.3 m height
144 observations per day
Observations used: 4320, 100%
Calm: 0.6%
N
E
S
W
13.0%

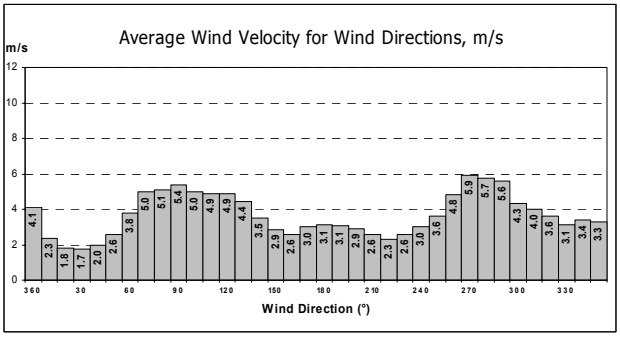

Frequency of Wind Directions, %
May 2003
Young Anemometer at 10.3 m height
144 observations per day
Observations used: 4464, 100%
Calm: 0.9%
N
E
S
W
10.6%

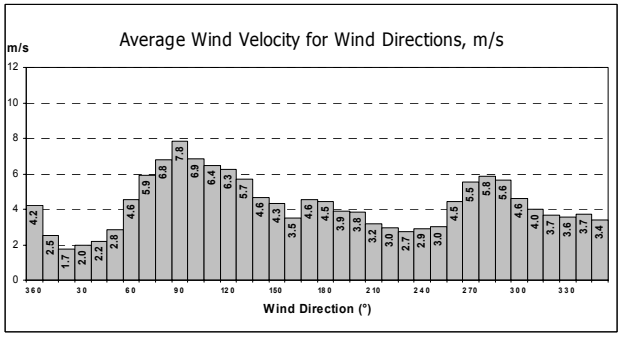

Average Wind Velocity for Wind Directions, m/s
m/s
Wind Direction (°)

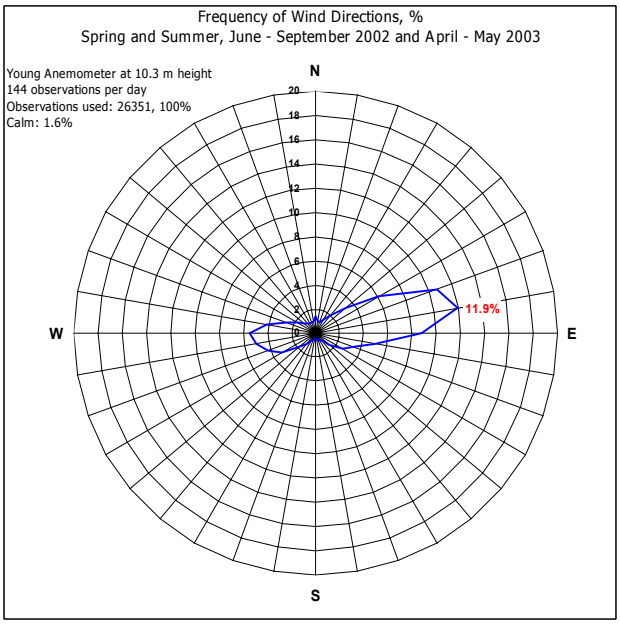

Average Wind Velocity for Wind Directions, m/s
m/s
Wind Direction (°)

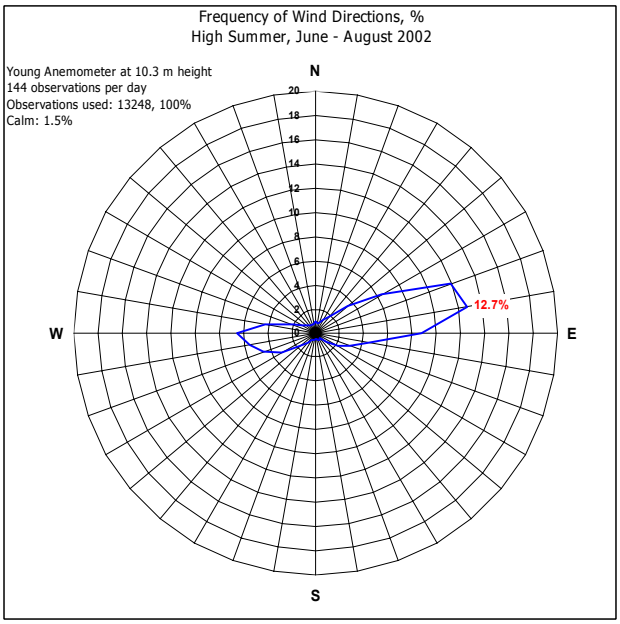

Frequency of Wind Directions, %
Year, June 2002 - May 2003
Young Anemometer at 10.3 m height
144 observations per day
Observations used: 52531, 99.9%
Calm: 1.1%
N
W
E
S
9.4%

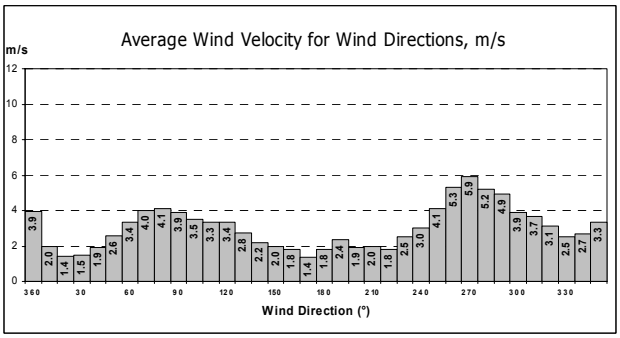

Frequency of Wind Directions, %
Autumn and Winter, October 2002 - March 2003
Young Anemometer at 10.3 m height
144 observations per day
Observations used: 26180, 99.9%
Calm: 0.6%
N
W
E
S
7.3%

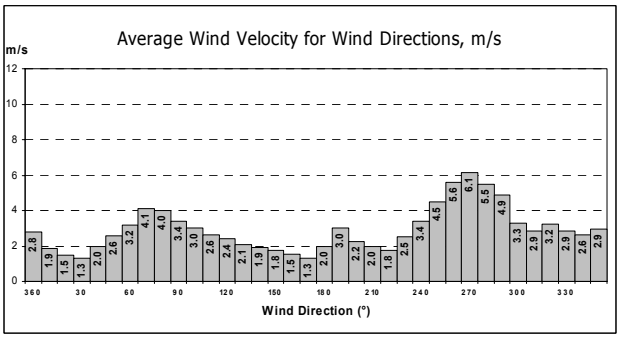

Average Wind Velocity for Wind Directions, m/s
m/s
Wind Direction (°)


Average Wind Velocity for Wind Directions, m/s
m/s
Wind Direction (°)


Frequency of Wind Directions, %
Spring and Summer, June - September 2002 and April - May 2003
Young Anemometer at 10.3 m height
144 observations per day
Observations used: 26351, 100%
Calm: 1.6%
N
W
E
S
11.9%

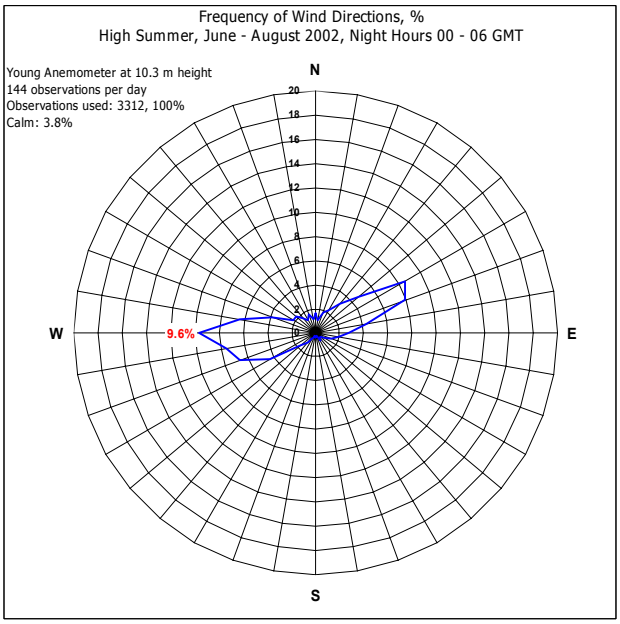

Frequency of Wind Directions, %
High Summer, June - August 2002
Young Anemometer at 10.3 m height
144 observations per day
Observations used: 13248, 100%
Calm: 1.5%
N
W
E
S
12.7%

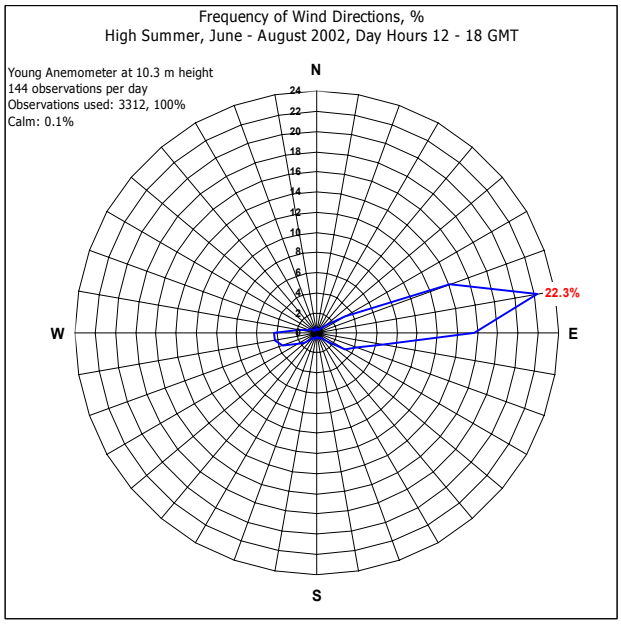

Average Wind Velocity for Wind Directions, m/s
m/s
Wind Direction (°)

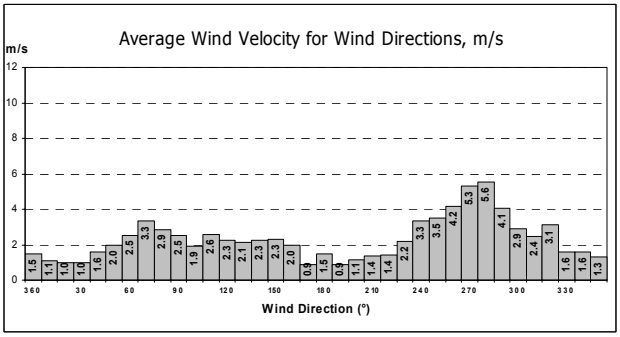

Average Wind Velocity for Wind Directions, m/s
m/s
Wind Direction (°)

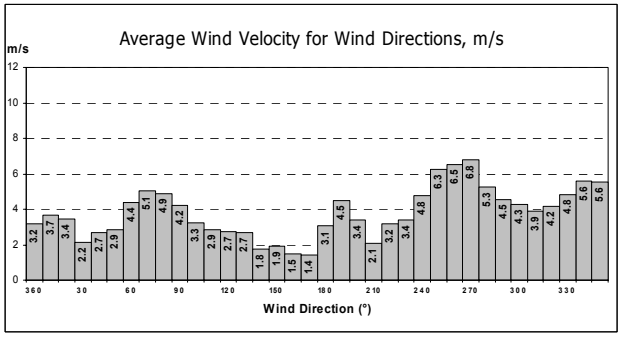
Annex 4

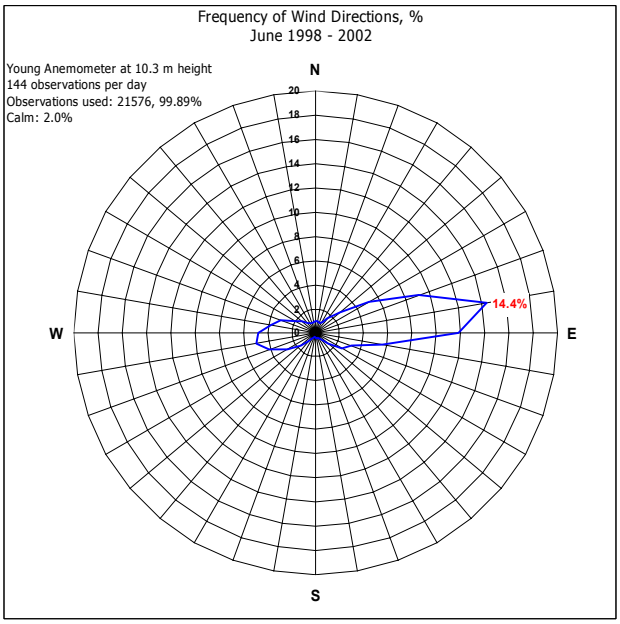
Sómastaðagerði

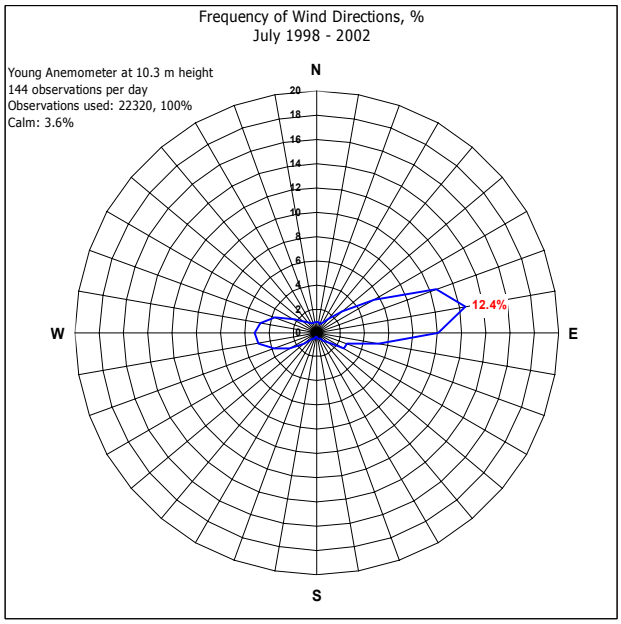


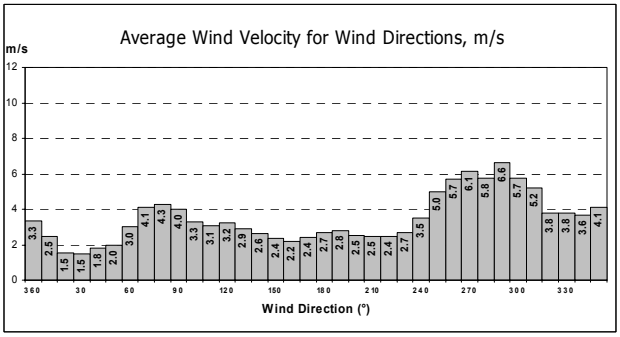


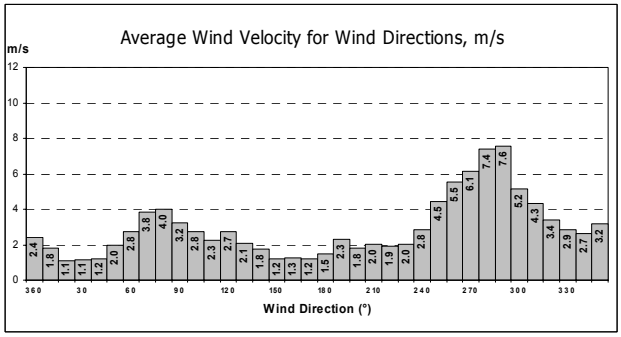


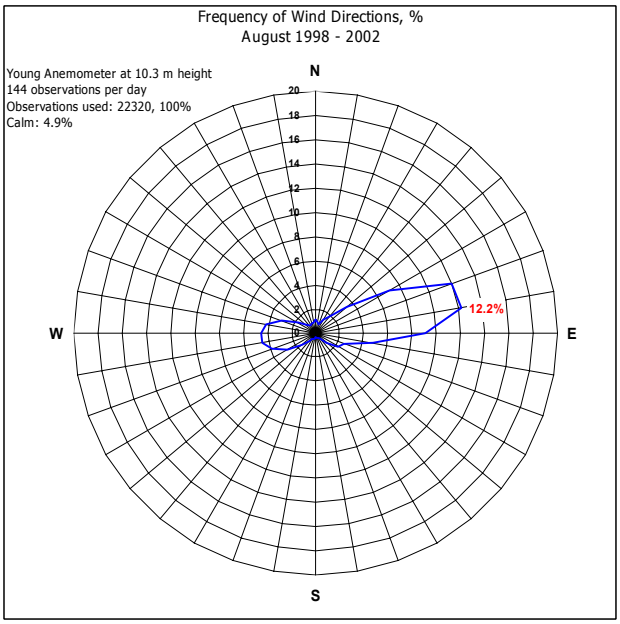


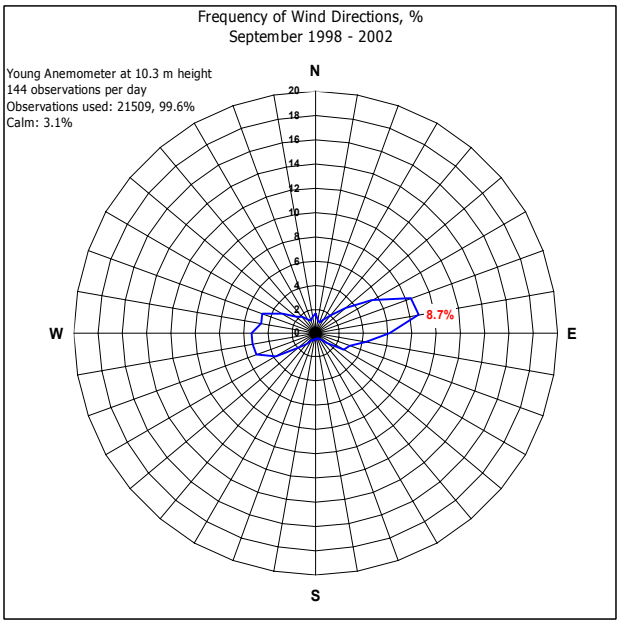

Frequency of Wind Directions, %
June 1998 - 2002
Young Anemometer at 10.3 m height
144 observations per day
Observations used: 21576, 99.89%
Calm: 2.0%
N
W
E
S
14.4%

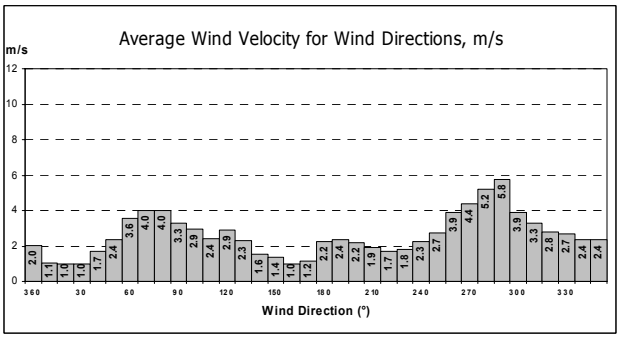

Frequency of Wind Directions, %
July 1998 - 2002
Young Anemometer at 10.3 m height
144 observations per day
Observations used: 22320, 100%
Calm: 3.6%
N
W
E
S
12.4%

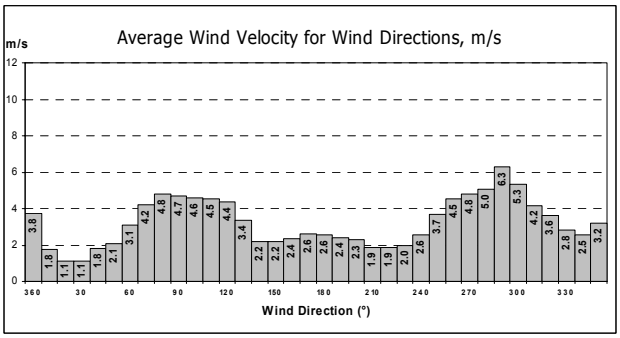

Average Wind Velocity for Wind Directions, m/s
m/s
Wind Direction (°)


Average Wind Velocity for Wind Directions, m/s
m/s
Wind Direction (°)


Frequency of Wind Directions, %
August 1998 - 2002
Young Anemometer at 10.3 m height
144 observations per day
Observations used: 22320, 100%
Calm: 4.9%
N
W
E
S
12.2%

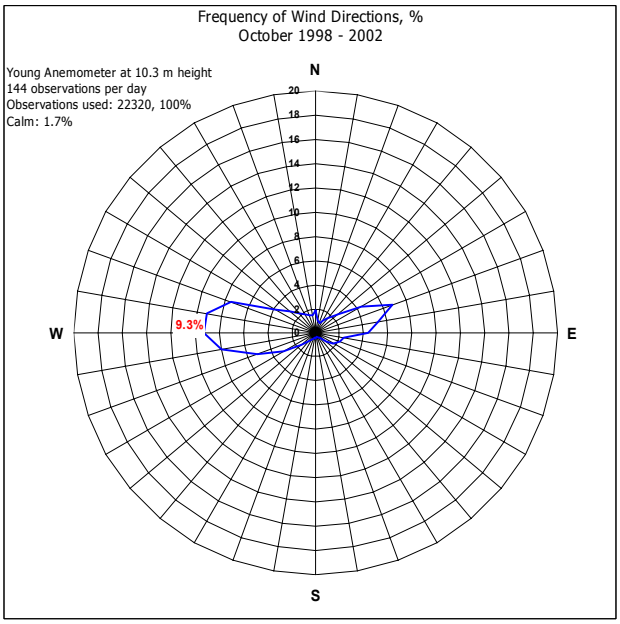

Frequency of Wind Directions, %
September 1998 - 2002
Young Anemometer at 10.3 m height
144 observations per day
Observations used: 21509, 99.6%
Calm: 3.1%
N
W
E
S
8.7%

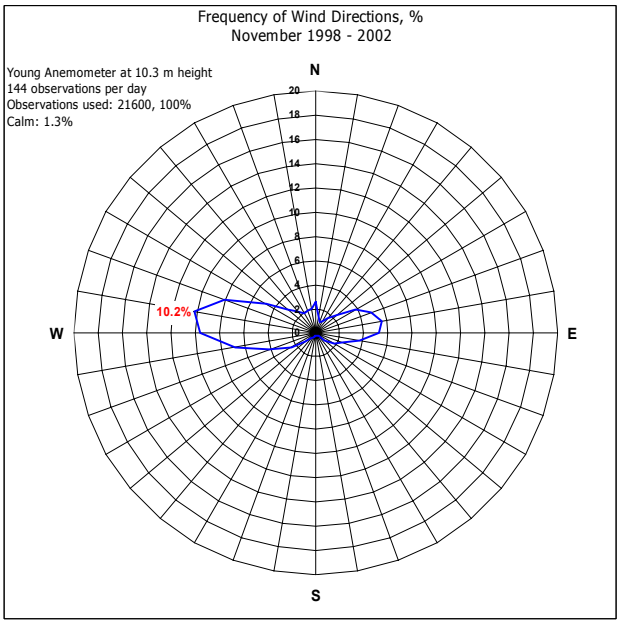

Average Wind Velocity for Wind Directions, m/s
m/s
Wind Direction (°)

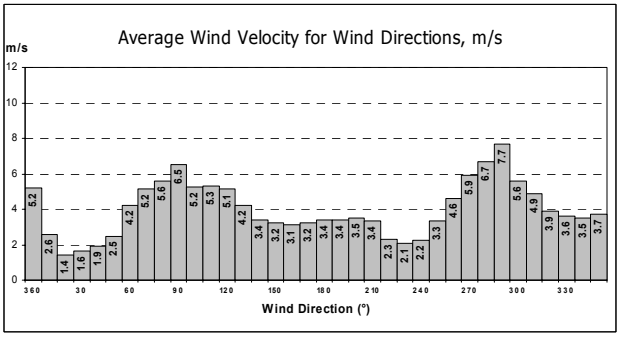

Average Wind Velocity for Wind Directions, m/s
m/s
Wind Direction (°)

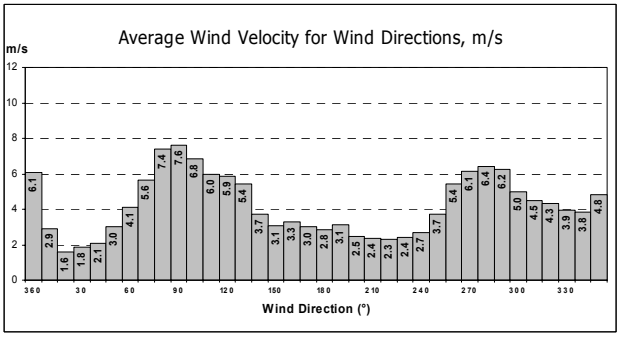
Annex 6

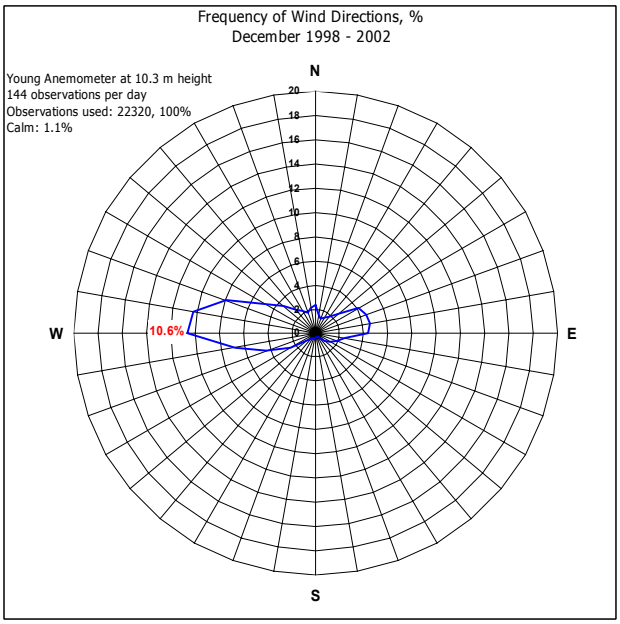
Sómastaðagerði

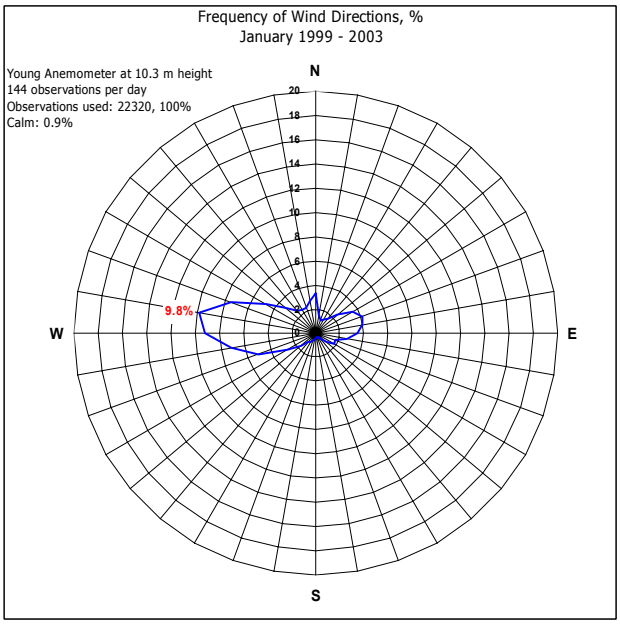


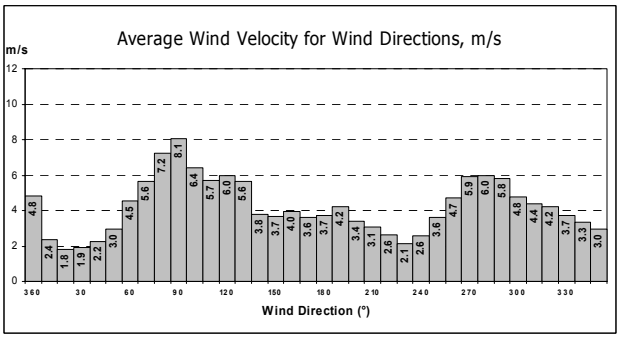


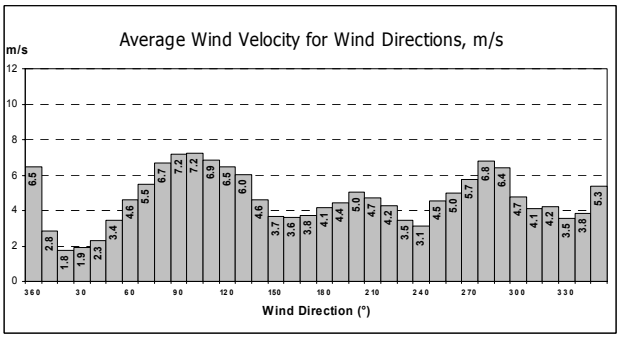




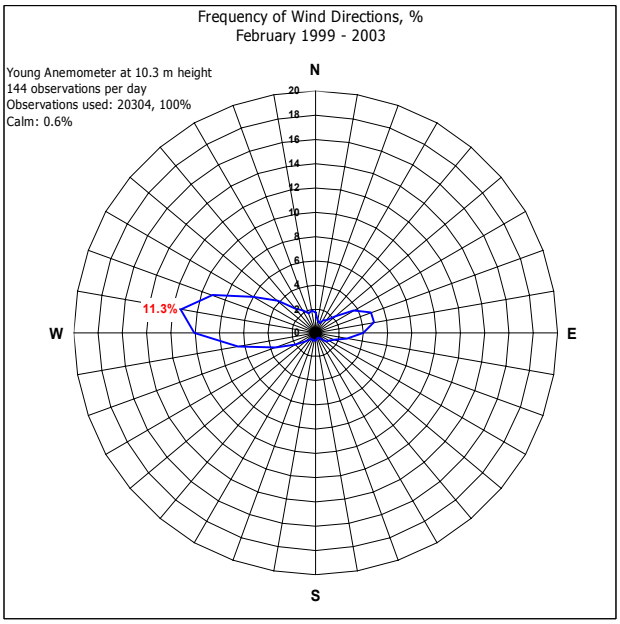


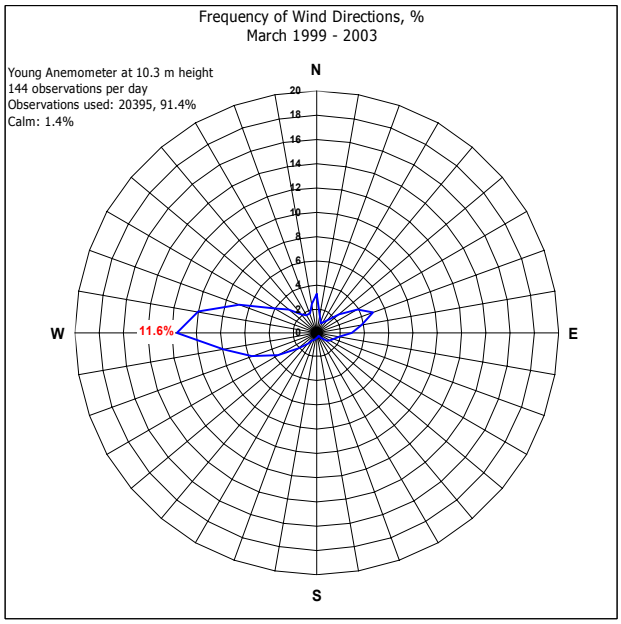


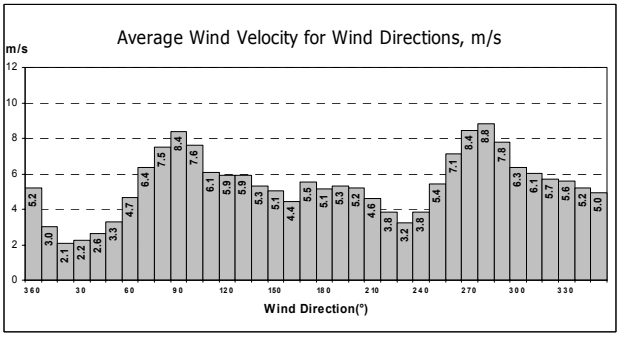


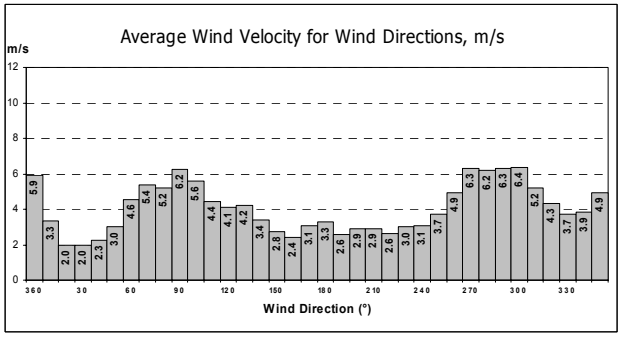


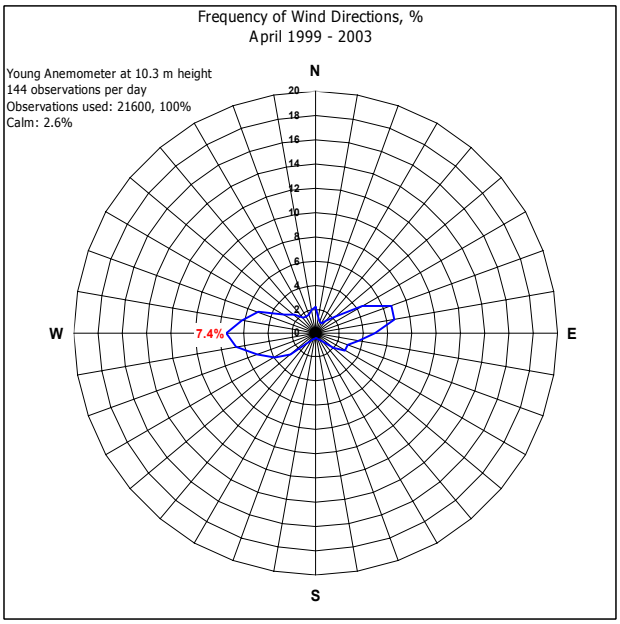
Annex 7

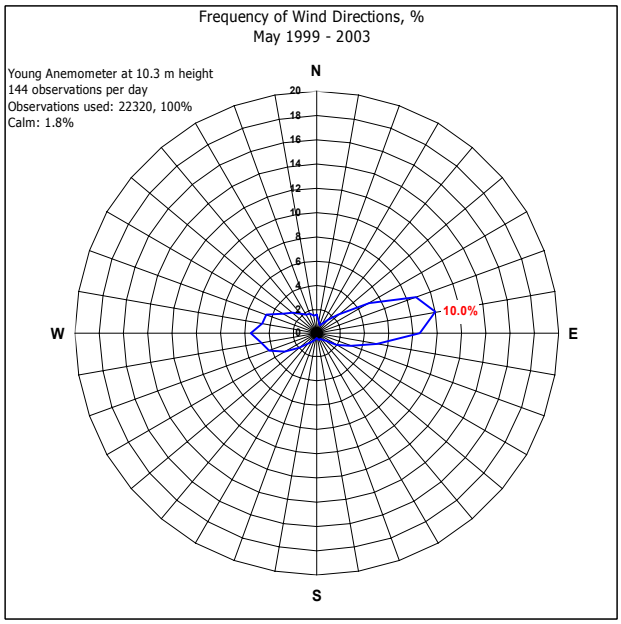

Frequency of Wind Directions, %
February 1999 - 2003
Young Anemometer at 10.3 m height
144 observations per day
Observations used: 20304, 100%
Calm: 0.6%
N
E
S
W
11.3%

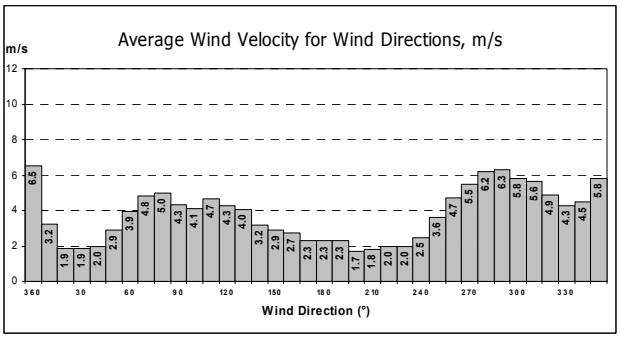

Frequency of Wind Directions, %
March 1999 - 2003
Young Anemometer at 10.3 m height
144 observations per day
Observations used: 20395, 91.4%
Calm: 1.4%
N
E
S
W
11.6%

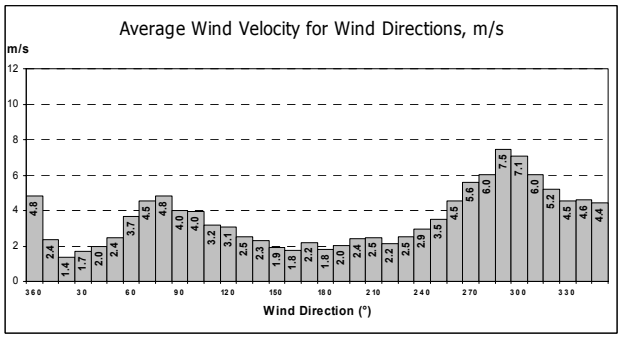

Average Wind Velocity for Wind Directions, m/s
m/s
Wind Direction(°)

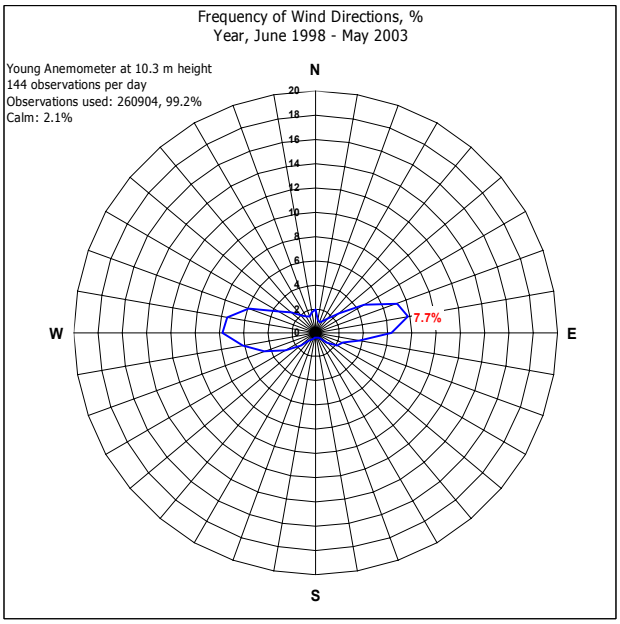

Average Wind Velocity for Wind Directions, m/s
m/s
Wind Direction (°)

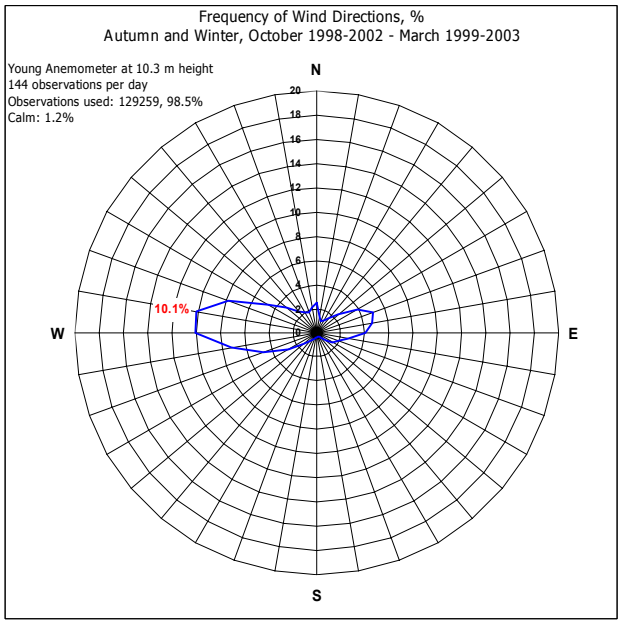

Frequency of Wind Directions, %
April 1999 - 2003
Young Anemometer at 10.3 m height
144 observations per day
Observations used: 21600, 100%
Calm: 2.6%
N
E
S
W
7.4%

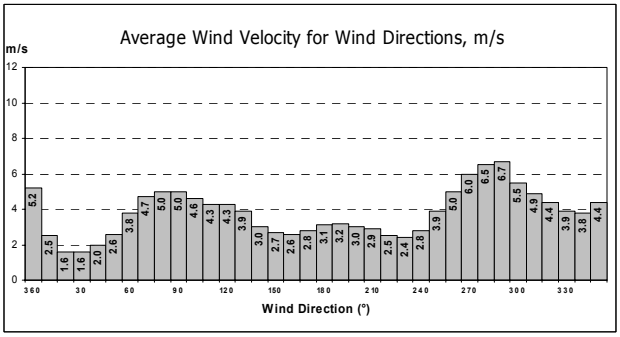

Frequency of Wind Directions, %
May 1999 - 2003
Young Anemometer at 10.3 m height
144 observations per day
Observations used: 22320, 100%
Calm: 1.8%
N
E
S
W
10.0%

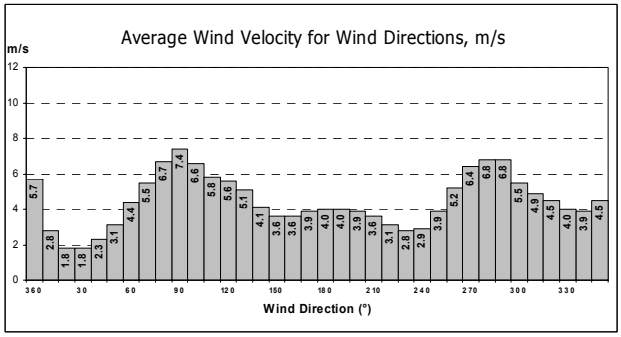

Average Wind Velocity for Wind Directions, m/s
m/s
Wind Direction (°)

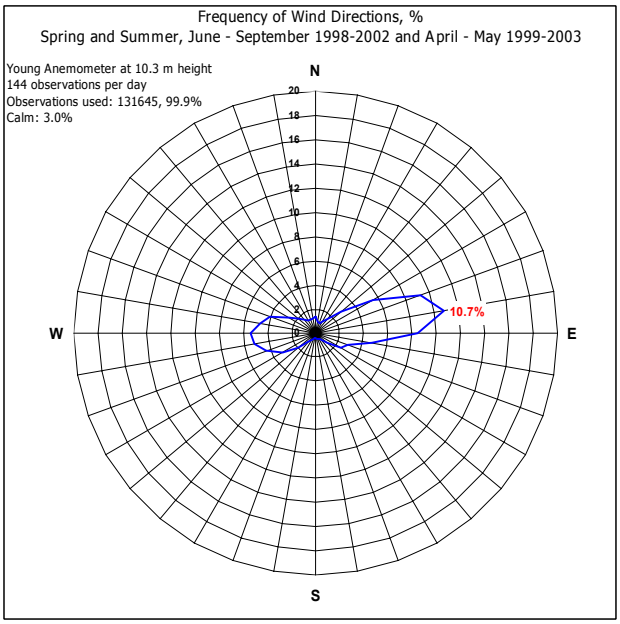

Average Wind Velocity for Wind Directions, m/s
m/s
Wind Direction (°)

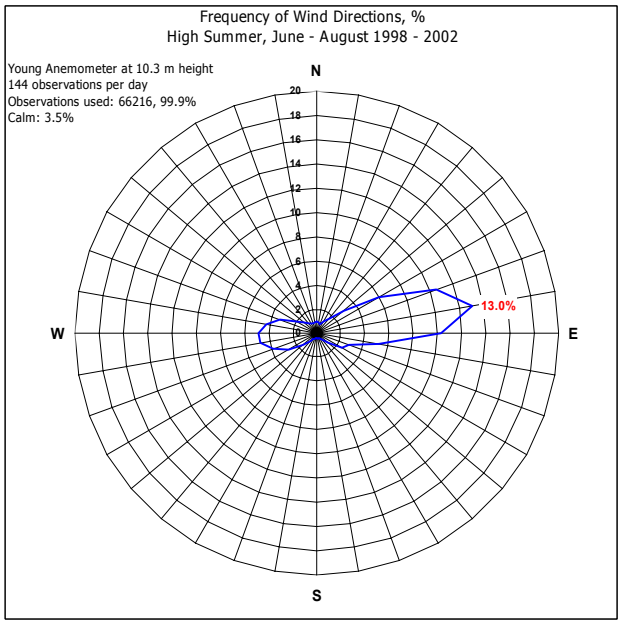

Frequency of Wind Directions, %
Year, June 1998 - May 2003
Young Anemometer at 10.3 m height
144 observations per day
Observations used: 260904, 99.2%
Calm: 2.1%
N
W
E
S
7.7%

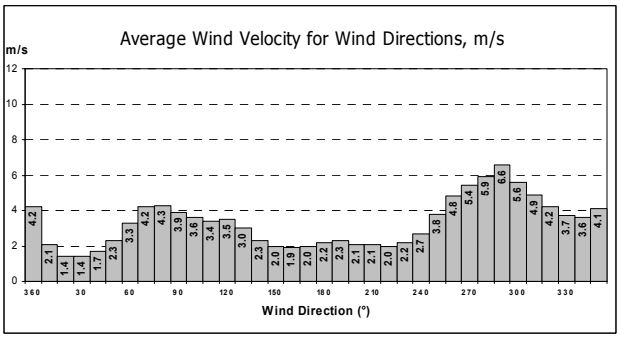

Frequency of Wind Directions, %
Autumn and Winter, October 1998-2002 - March 1999-2003
Young Anemometer at 10.3 m height
144 observations per day
Observations used: 129259, 98.5%
Calm: 1.2%
N
W
E
S
10.1%

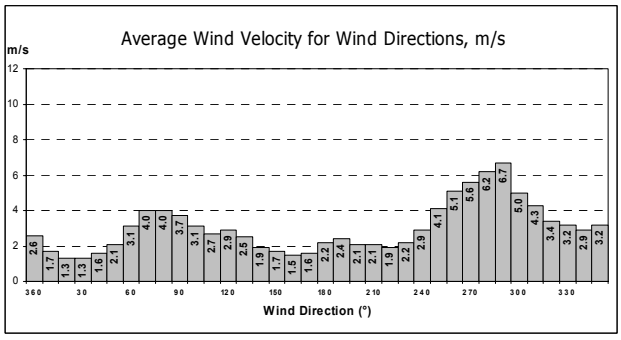

Average Wind Velocity for Wind Directions, m/s
m/s
Wind Direction (°)


Average Wind Velocity for Wind Directions, m/s
m/s
Wind Direction (°)

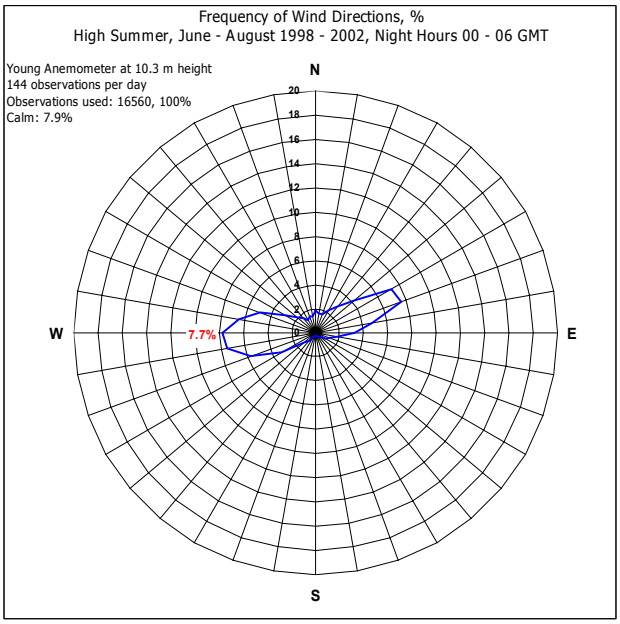

Frequency of Wind Directions, %
Spring and Summer, June - September 1998-2002 and April - May 1999-2003
Young Anemometer at 10.3 m height
144 observations per day
Observations used: 131645, 99.9%
Calm: 3.0%
N
W
E
S
10.7%

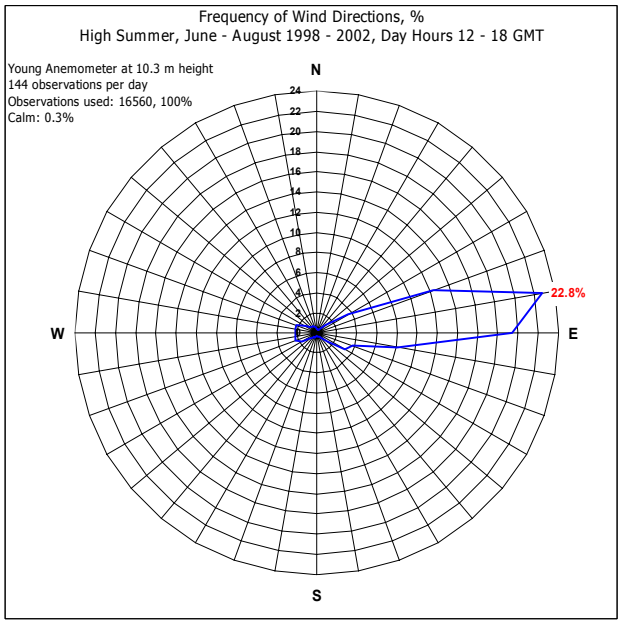

Frequency of Wind Directions, %
High Summer, June - August 1998 - 2002
Young Anemometer at 10.3 m height
144 observations per day
Observations used: 66216, 99.9%
Calm: 3.5%
N
W
E
S
13.0%

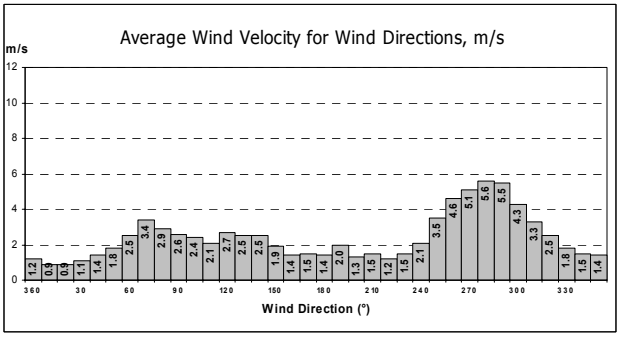

Average Wind Velocity for Wind Directions, m/s
m/s
Wind Direction (°)

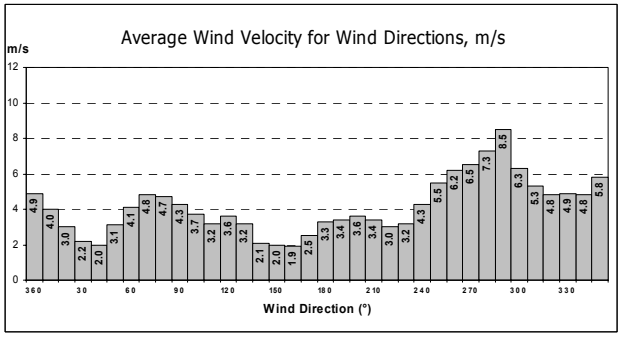

Average Wind Velocity for Wind Directions, m/s
m/s
Wind Direction (°)

Sómastaðagerði



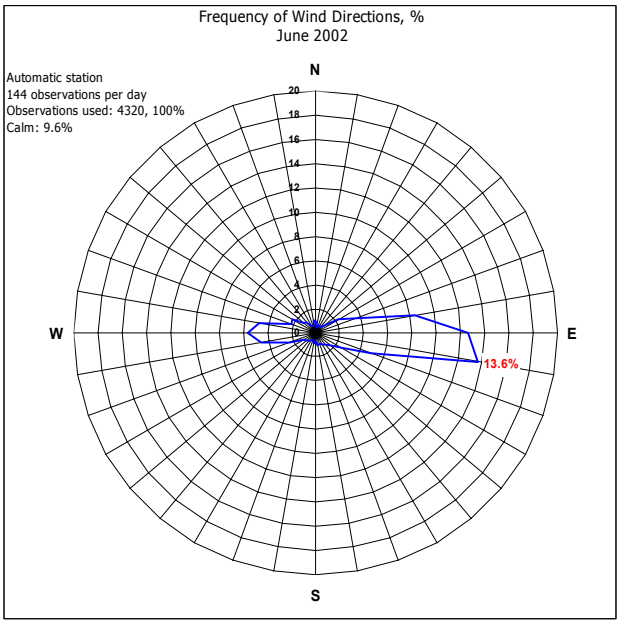


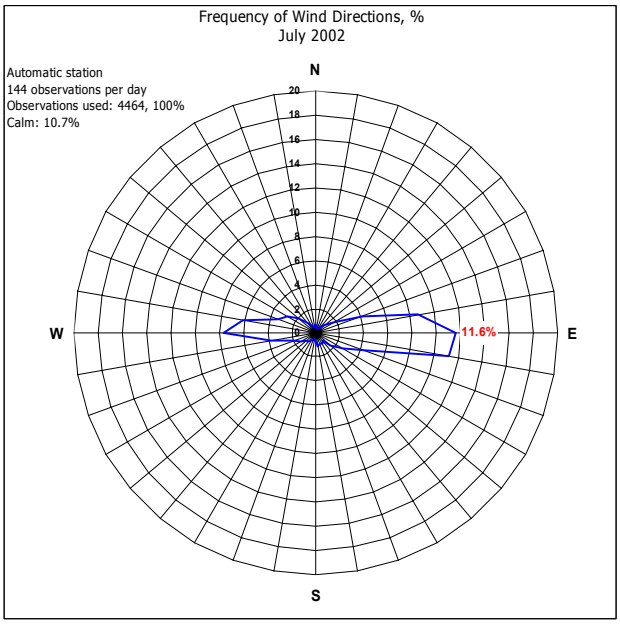


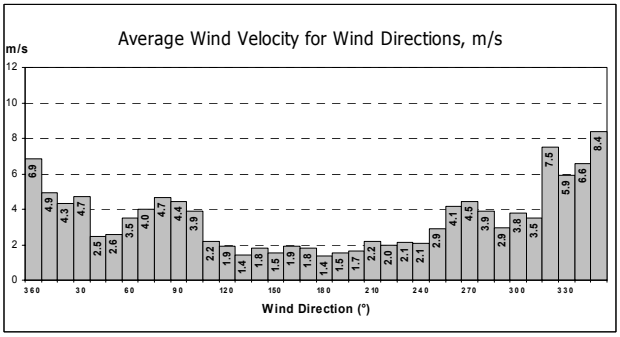


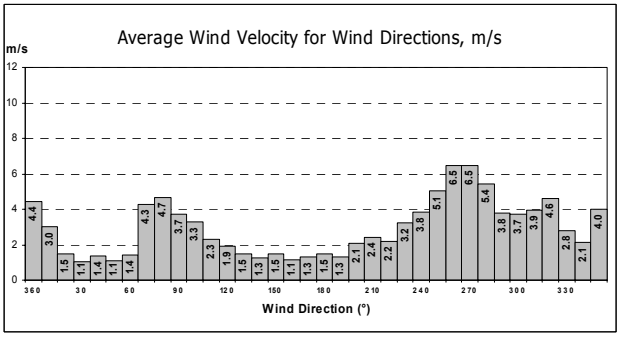
Annex 10

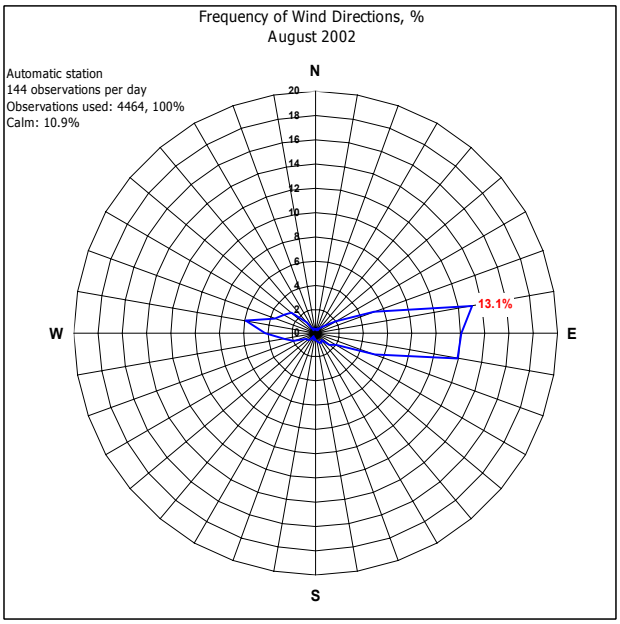
Ljósá

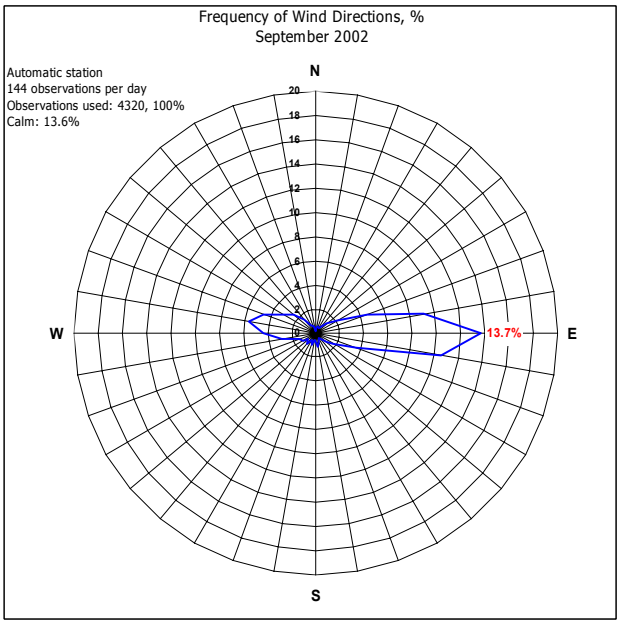

Frequency of Wind Directions, %
June 2002
Automatic station
144 observations per day
Observations used: 4320, 100%
Calm: 9.6%
N
W
E
S
13.6%

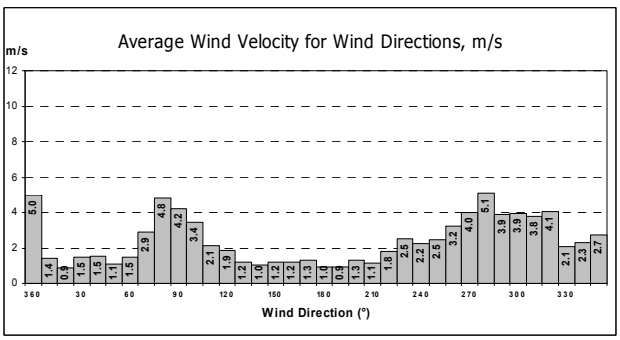

Frequency of Wind Directions, %
July 2002
Automatic station
144 observations per day
Observations used: 4464, 100%
Calm: 10.7%
N
W
E
S
11.6%

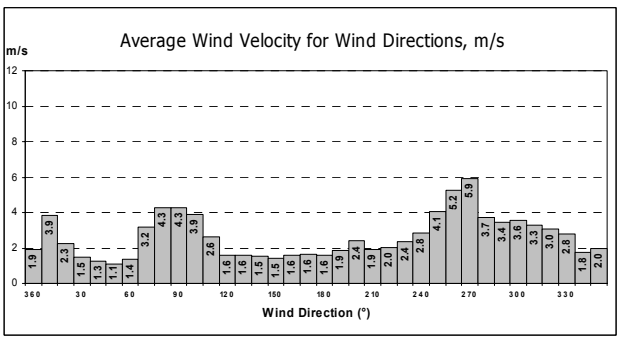

Average Wind Velocity for Wind Directions, m/s
m/s
Wind Direction (°)


Average Wind Velocity for Wind Directions, m/s
m/s
Wind Direction (°)

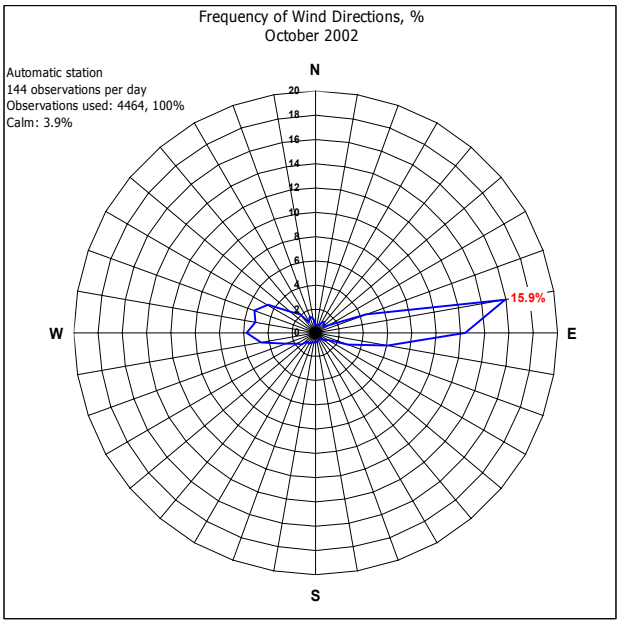

Frequency of Wind Directions, %
August 2002
Automatic station
144 observations per day
Observations used: 4464, 100%
Calm: 10.9%
N
W
E
S
13.1%

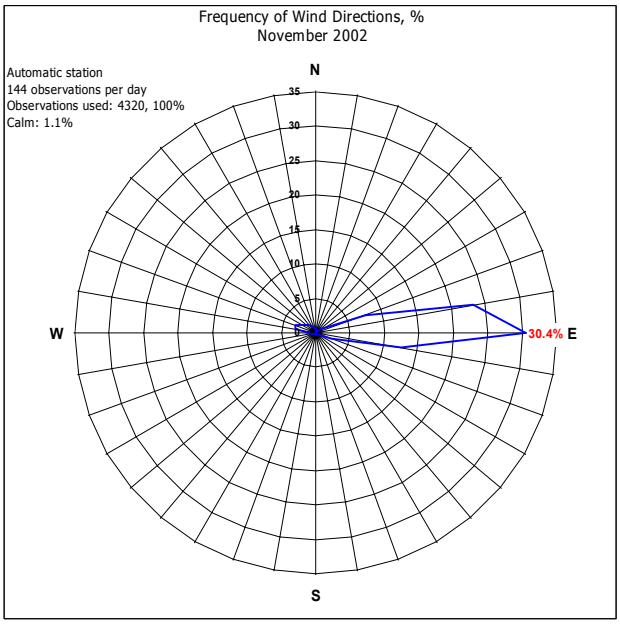

Frequency of Wind Directions, %
September 2002
Automatic station
144 observations per day
Observations used: 4320, 100%
Calm: 13.6%
N
W
E
S
13.7%

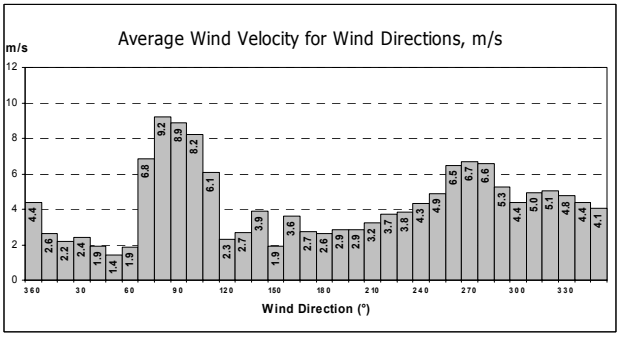

Average Wind Velocity for Wind Directions, m/s
m/s
Wind Direction (°)

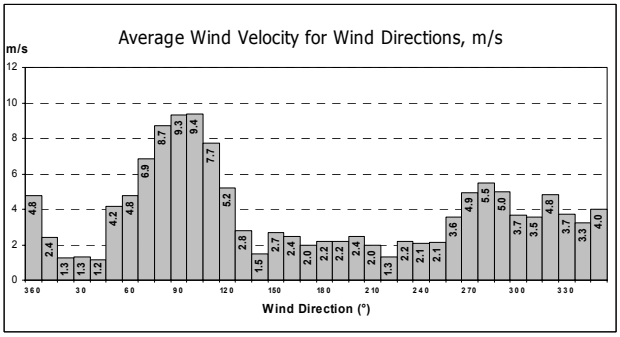

Average Wind Velocity for Wind Directions, m/s
m/s
Wind Direction (°)

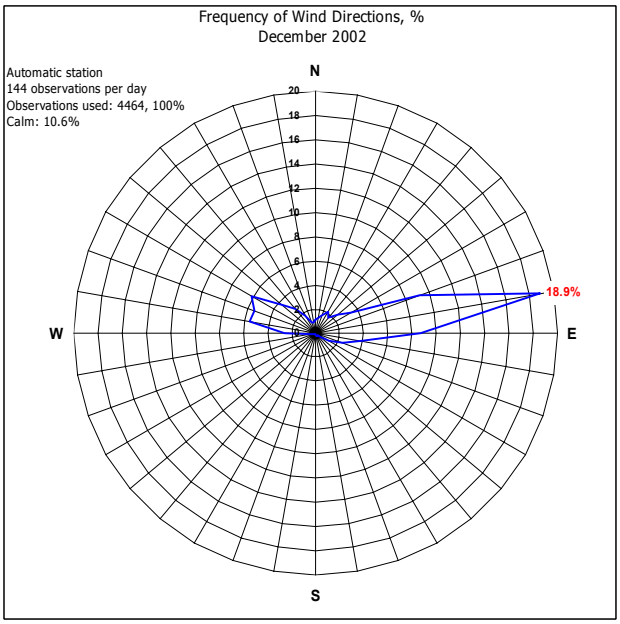
Ljósá

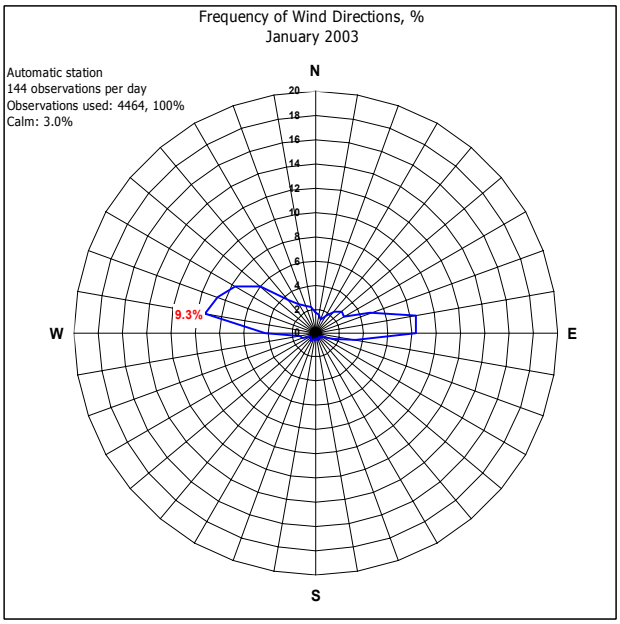


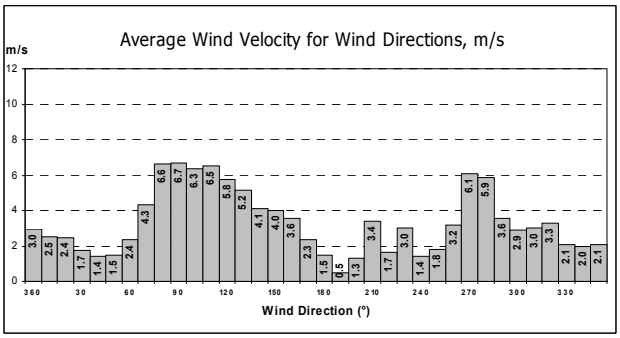


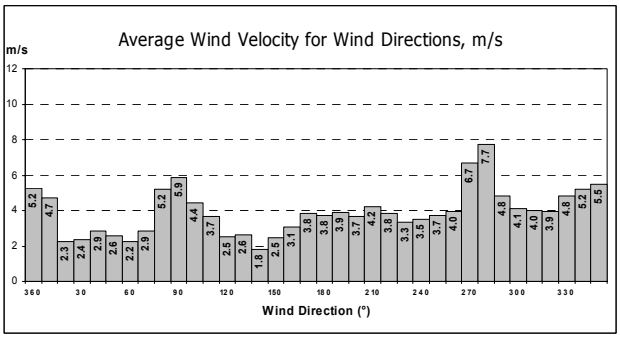






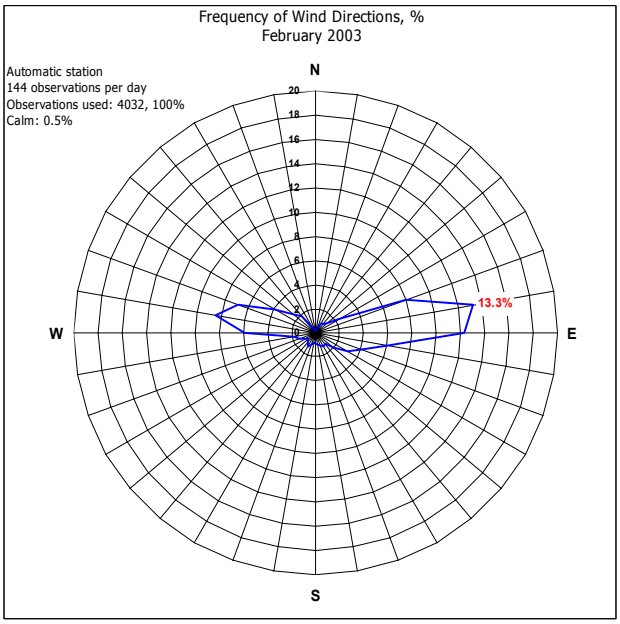


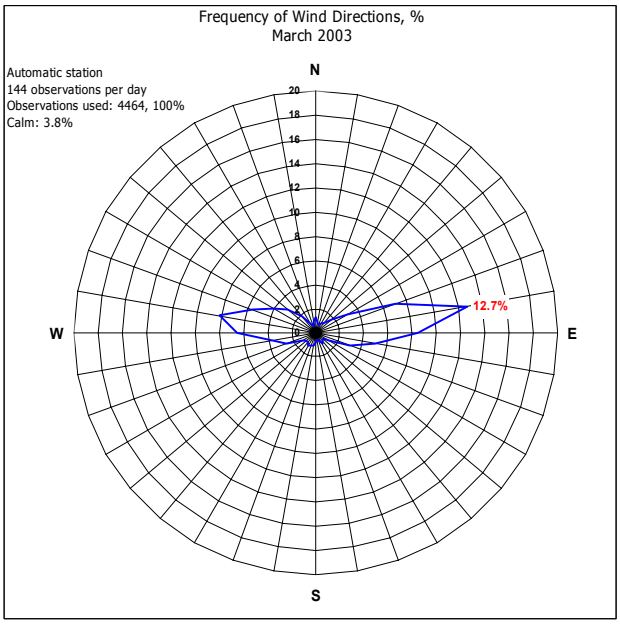


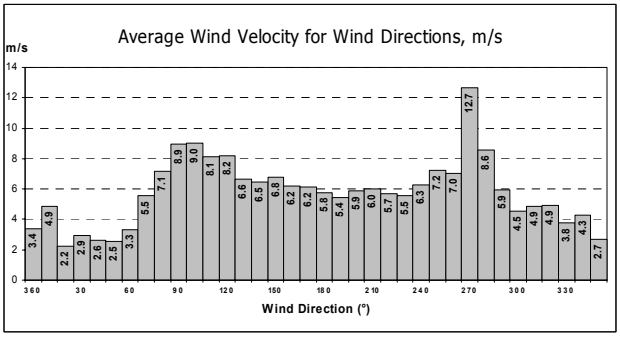


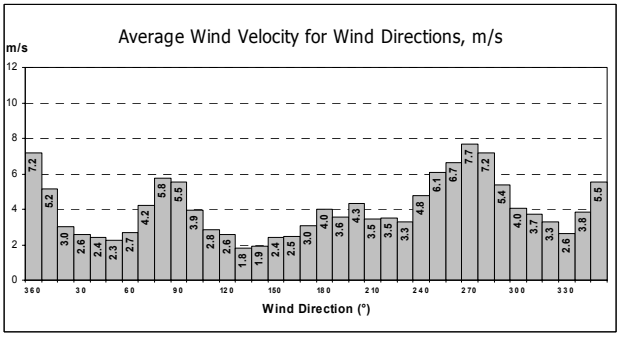
Annex 12

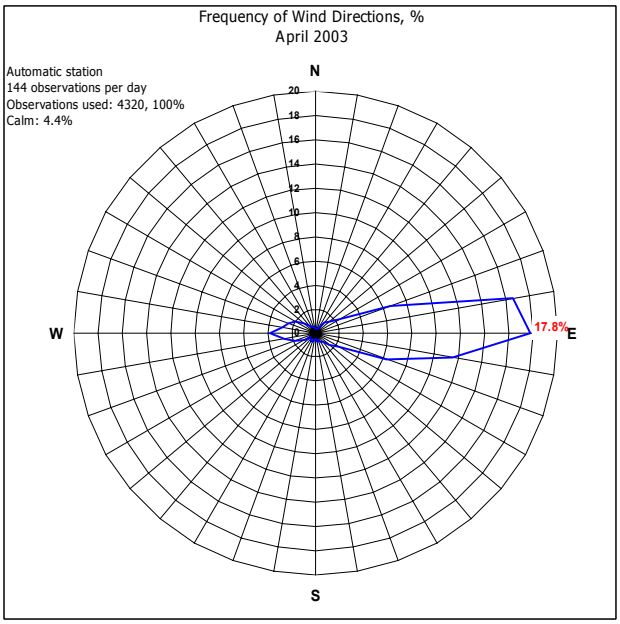
Ljósá

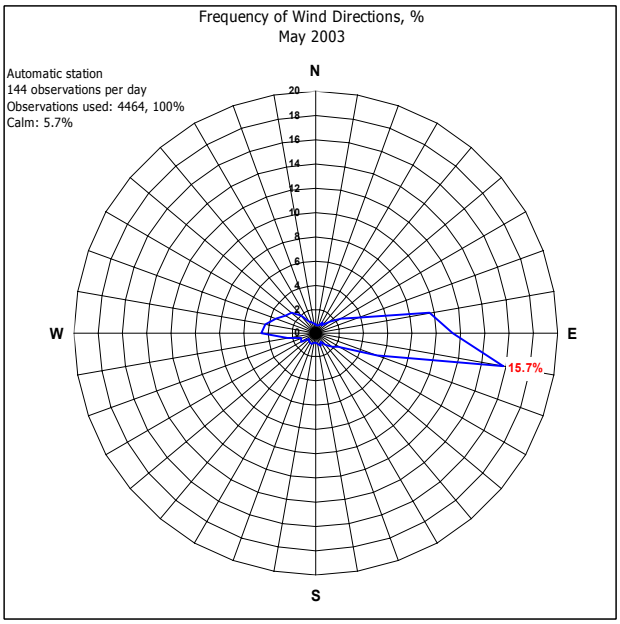

Frequency of Wind Directions, %
February 2003
Automatic station
144 observations per day
Observations used: 4032, 100%
Calm: 0.5%
N
W
E
S
13.3%

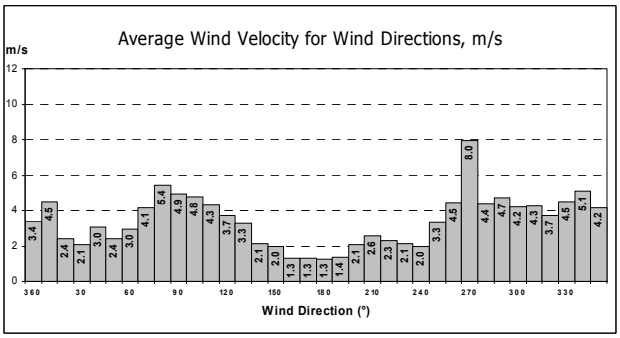

Frequency of Wind Directions, %
March 2003
Automatic station
144 observations per day
Observations used: 4464, 100%
Calm: 3.8%
N
W
E
S
12.7%

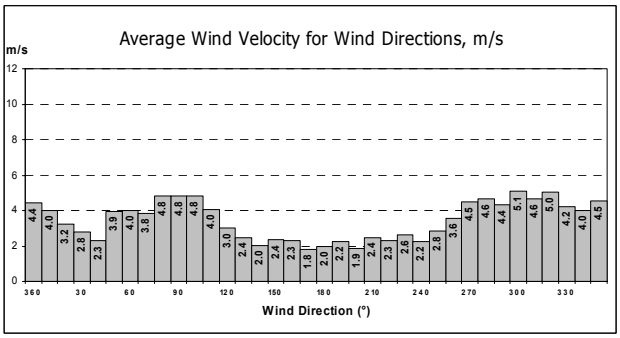

Average Wind Velocity for Wind Directions, m/s
m/s
Wind Direction (°)


Average Wind Velocity for Wind Directions, m/s
m/s
Wind Direction (°)

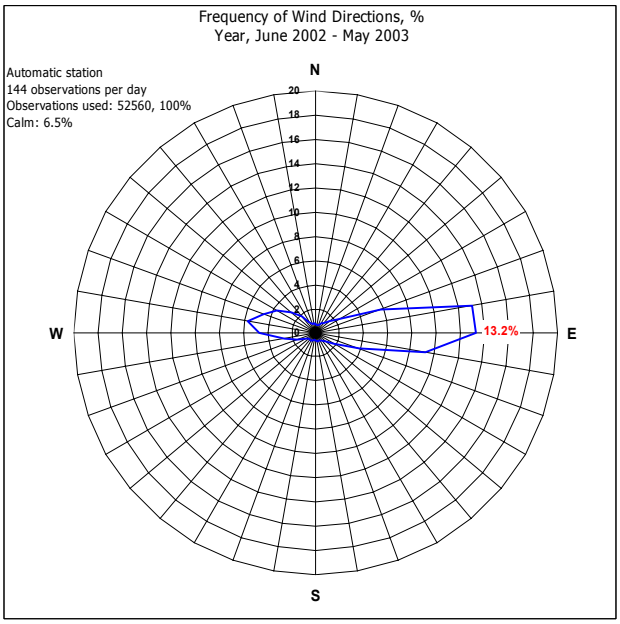

Frequency of Wind Directions, %
April 2003
Automatic station
144 observations per day
Observations used: 4320, 100%
Calm: 4.4%
N
W
E
S
17.8%

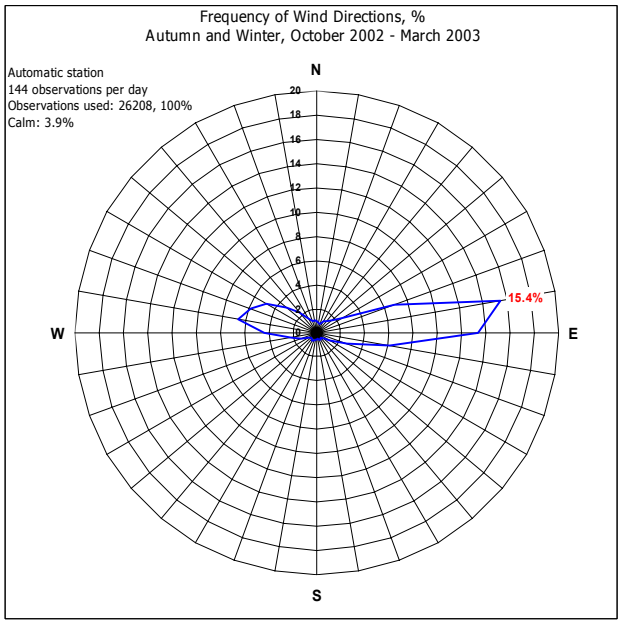

Frequency of Wind Directions, %
May 2003
Automatic station
144 observations per day
Observations used: 4464, 100%
Calm: 5.7%
N
W
E
S
15.7%

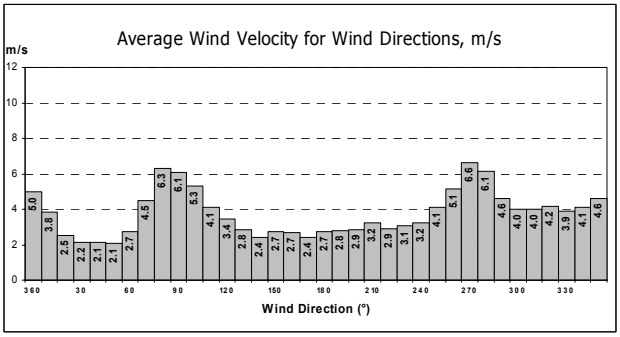

Average Wind Velocity for Wind Directions, m/s
m/s
Wind Direction (°)

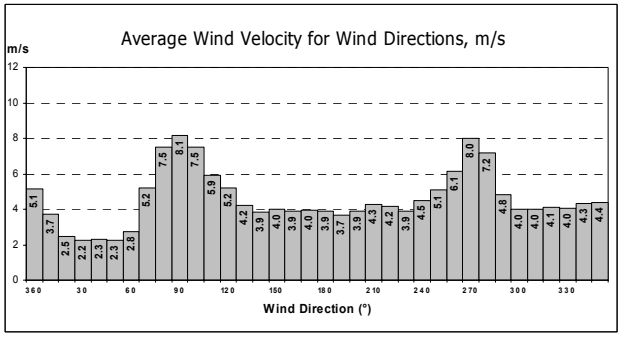

Average Wind Velocity for Wind Directions, m/s
m/s
Wind Direction (°)

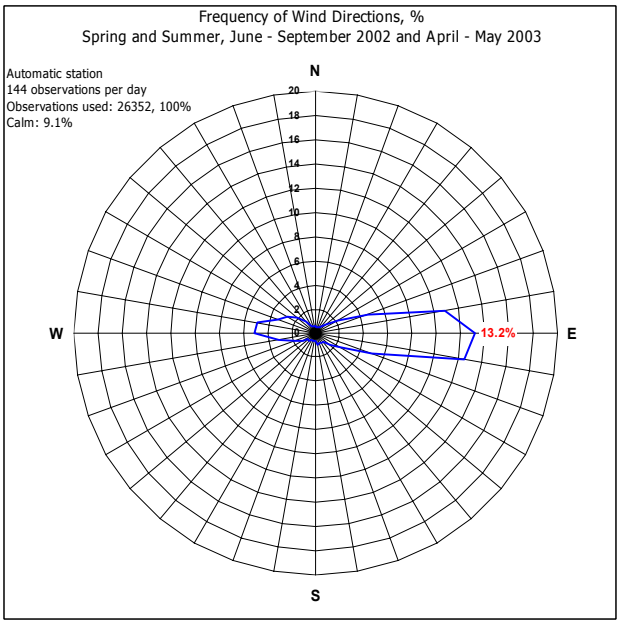
Ljósá

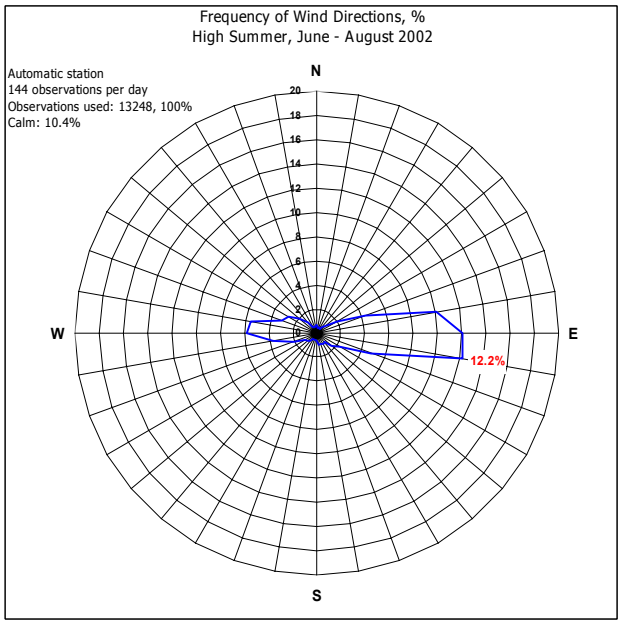


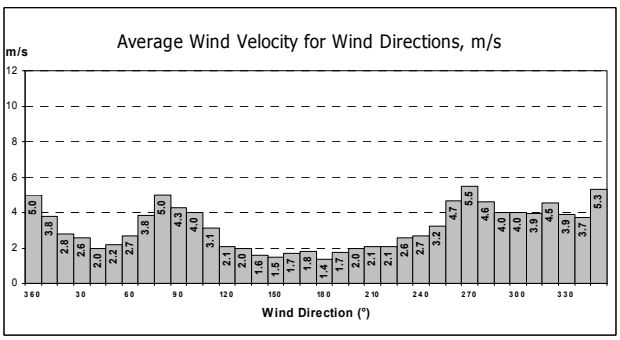


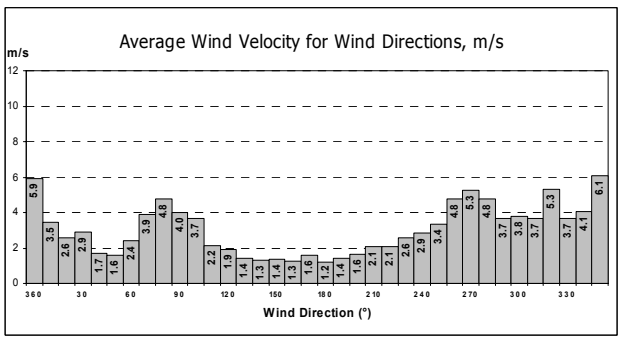






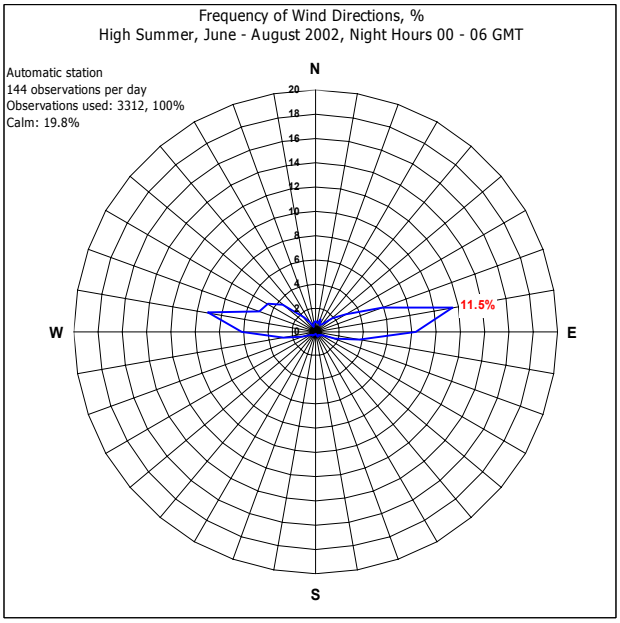


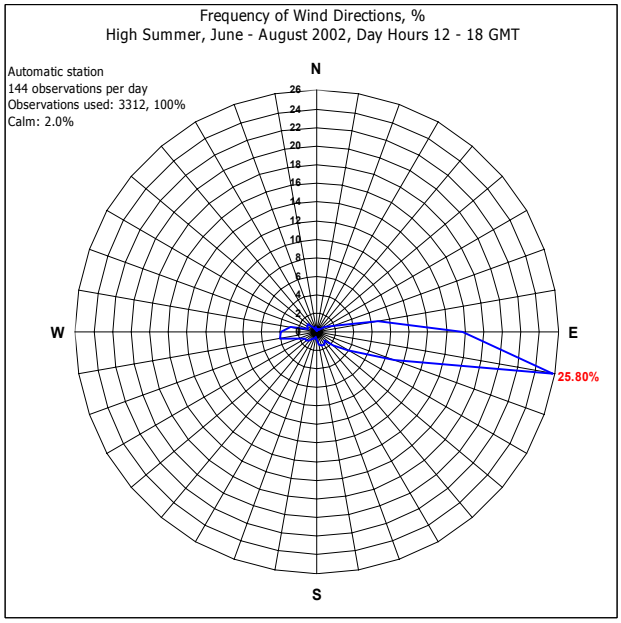


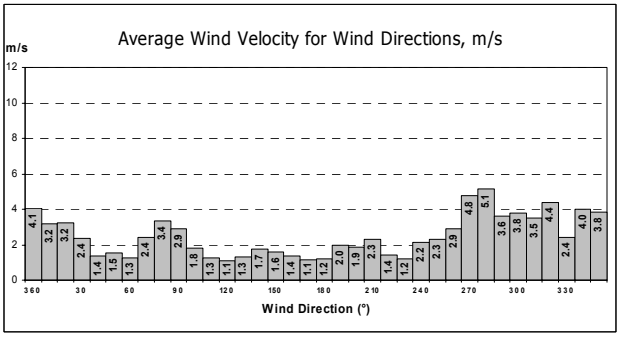


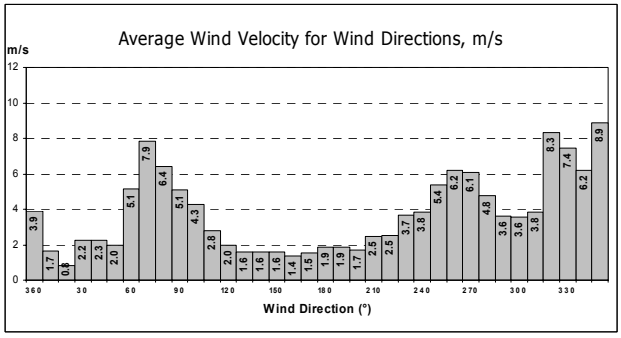
Annex 14

Ljósá

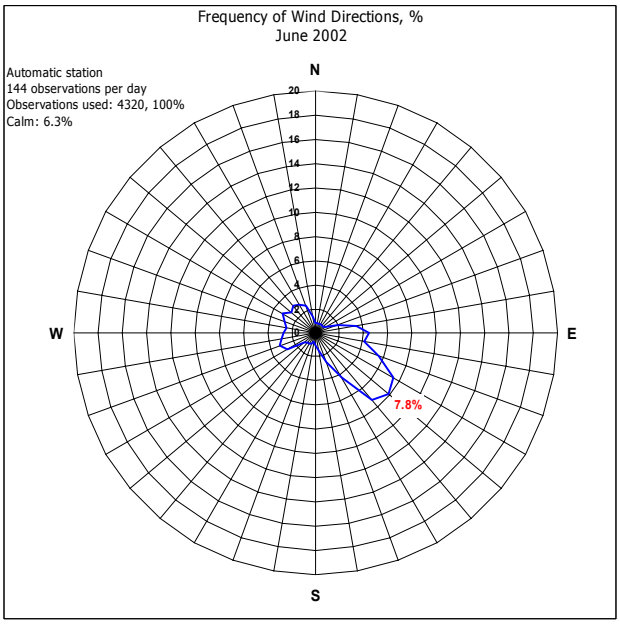

Frequency of Wind Directions, %
High Summer, June - August 2002, Night Hours 00 - 06 GMT
Automatic station
144 observations per day
Observations used: 3312, 100%
Calm: 19.8%
N
E
S
W
11.5%

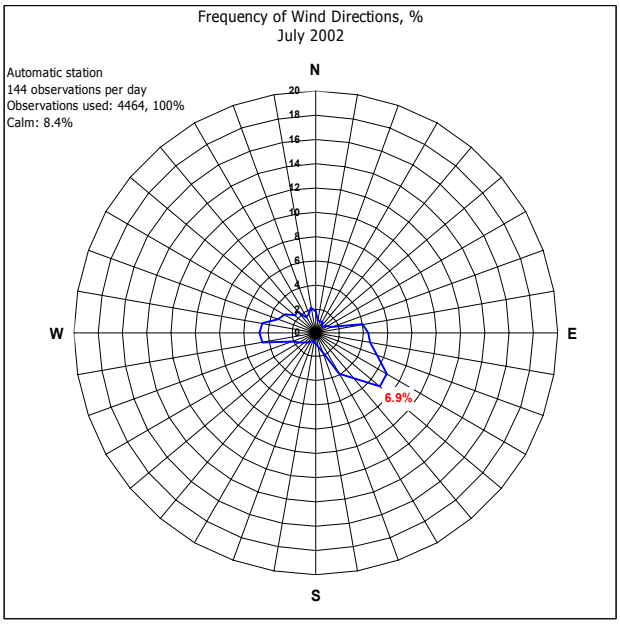

Frequency of Wind Directions, %
High Summer, June - August 2002, Day Hours 12 - 18 GMT
Automatic station
144 observations per day
Observations used: 3312, 100%
Calm: 2.0%
N
E
S
W
25.80%

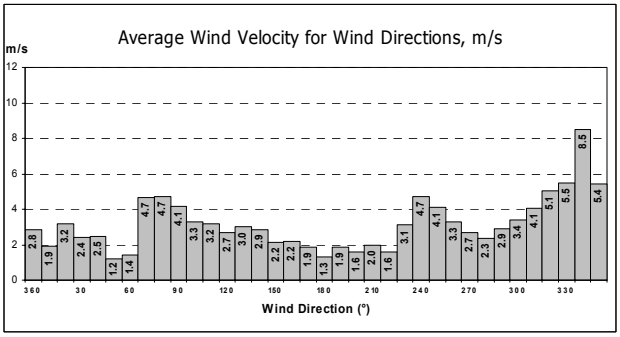

Average Wind Velocity for Wind Directions, m/s
m/s
Wind Direction (°)

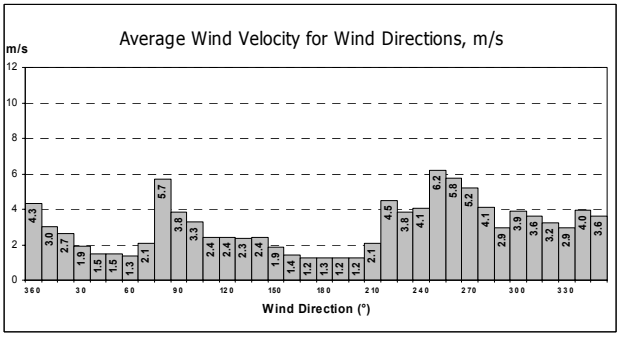

Average Wind Velocity for Wind Directions, m/s
m/s
Wind Direction (°)

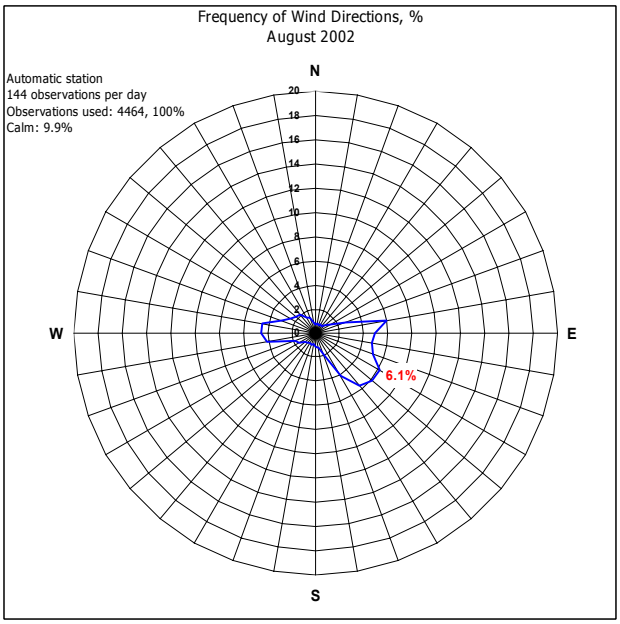
Kollaleira 2

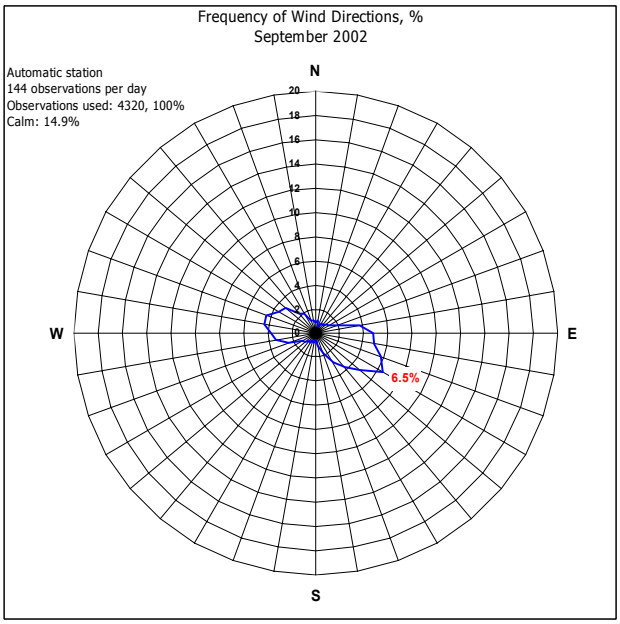


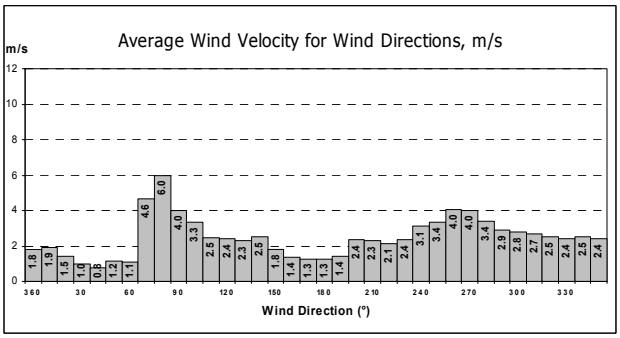


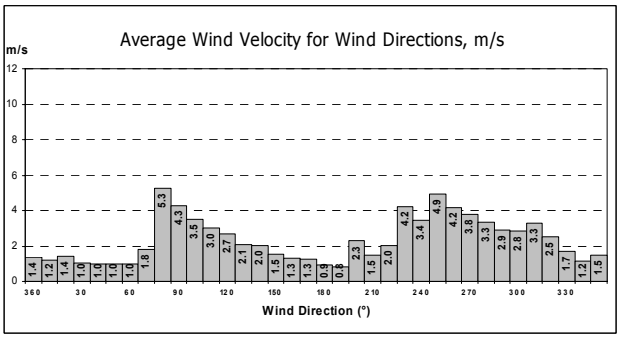






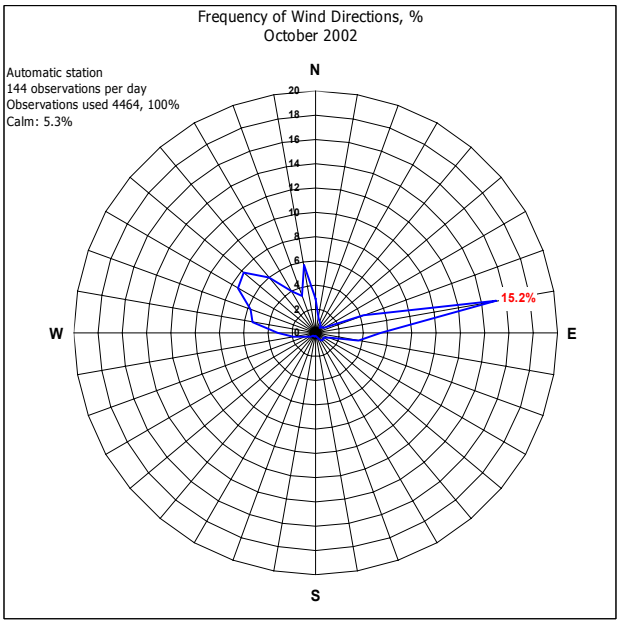


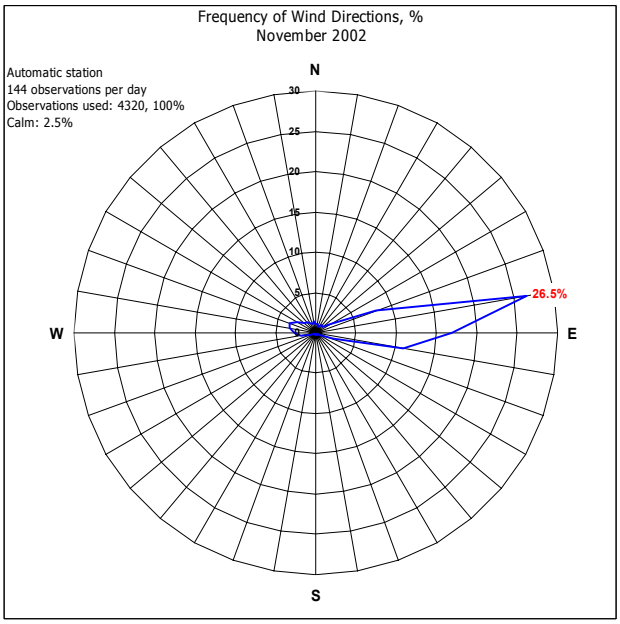


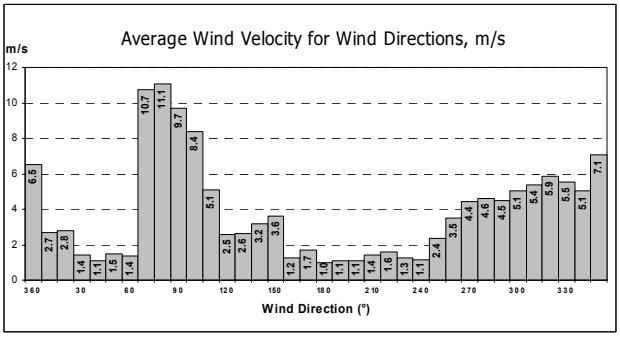


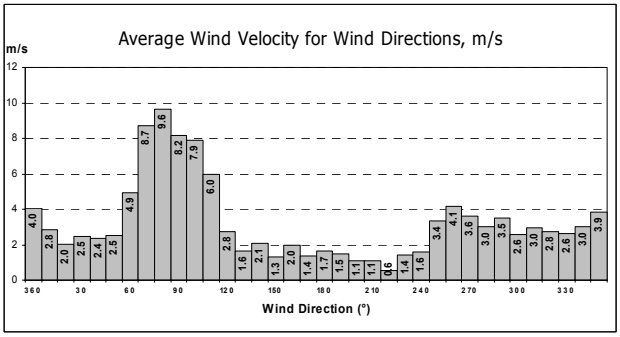
Annex 16

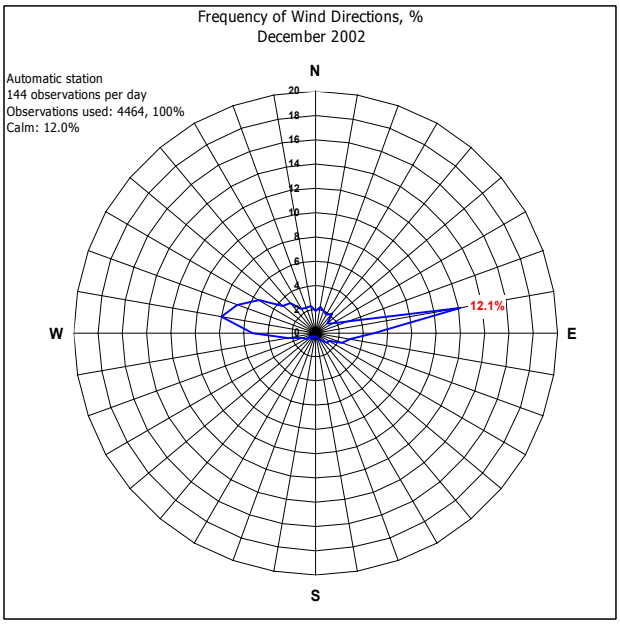
Kollaleira 2

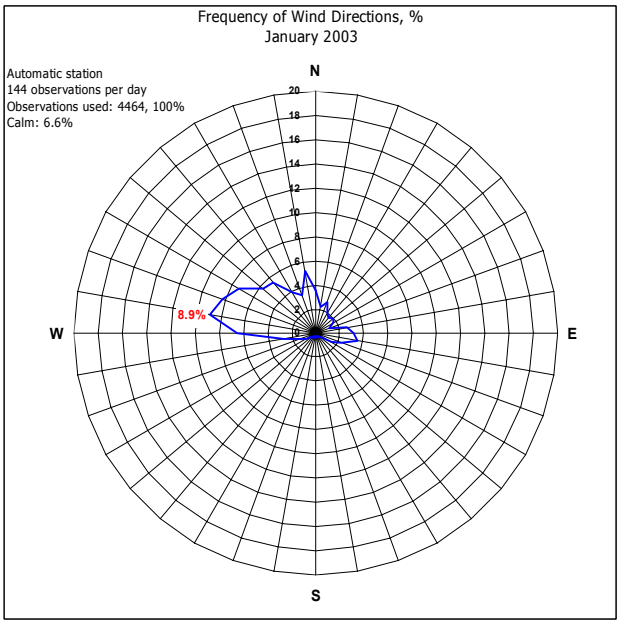


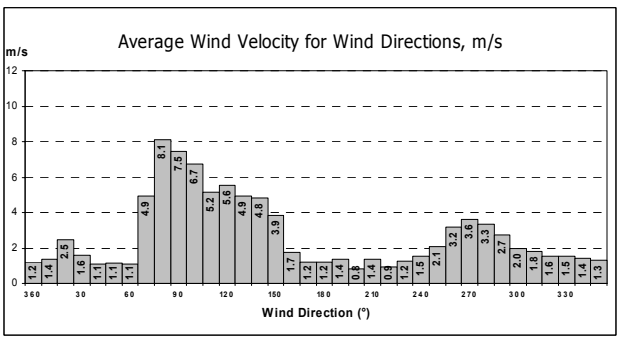


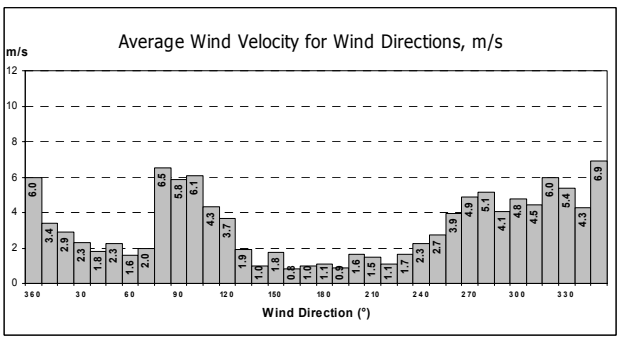




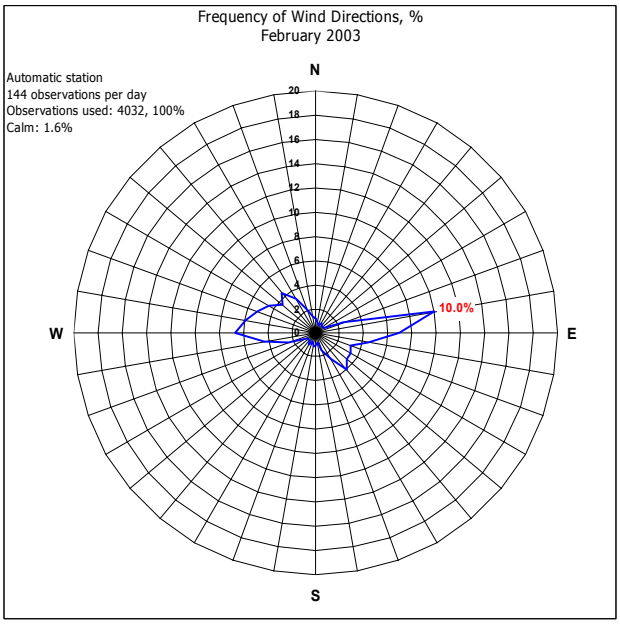


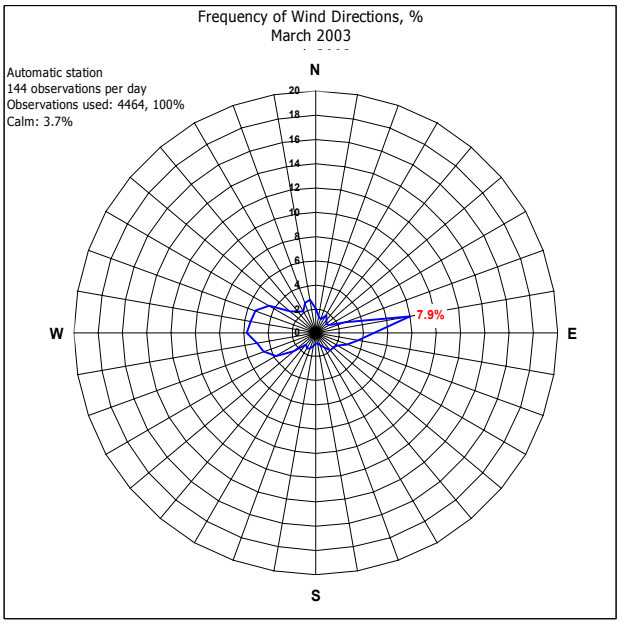


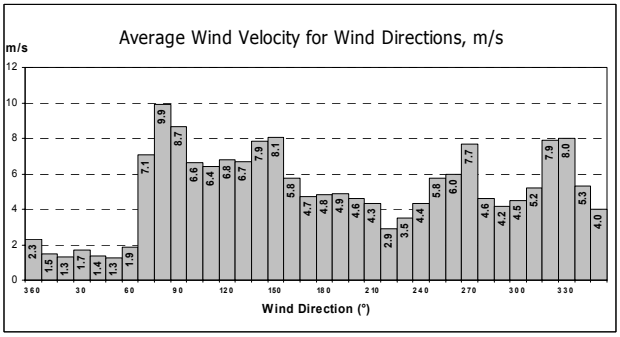


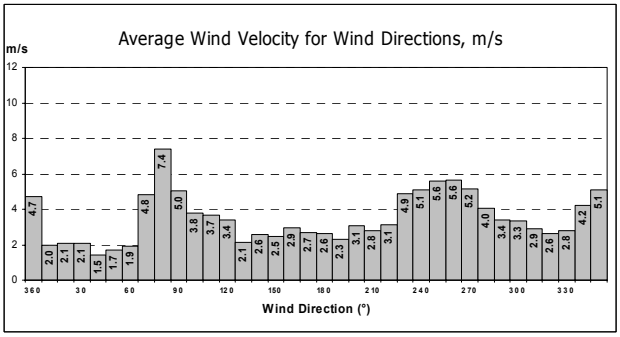


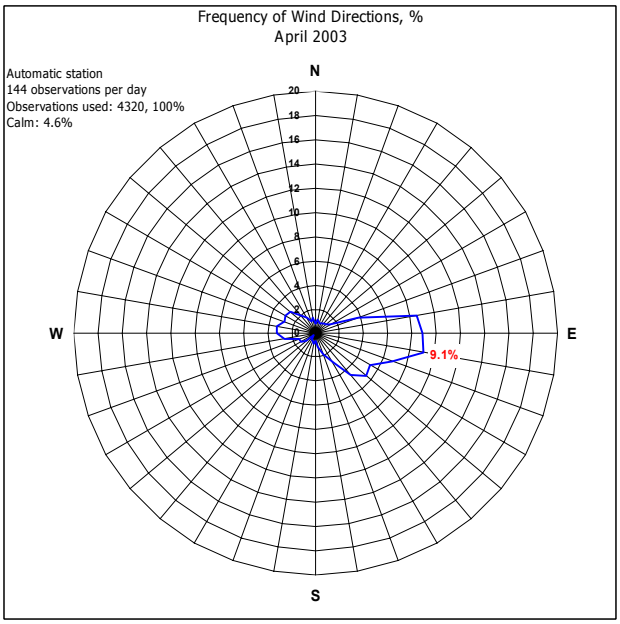
Kollaleira 2

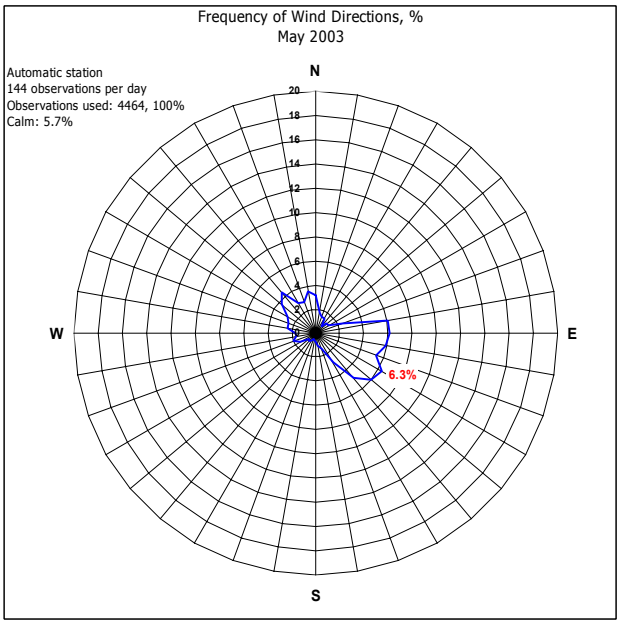


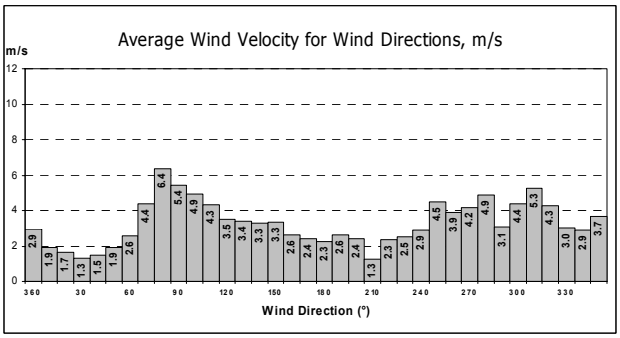


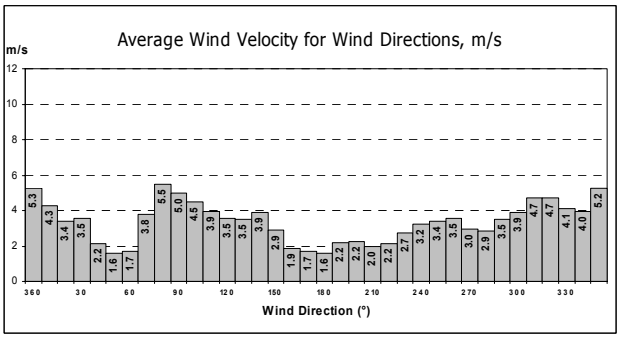






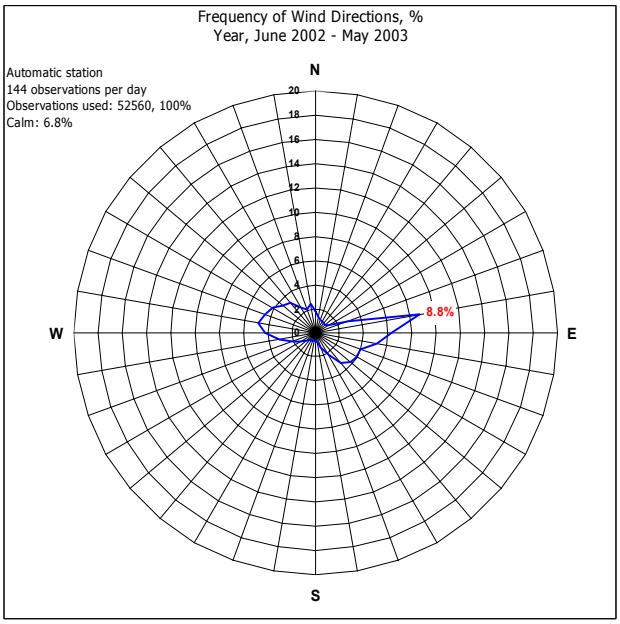


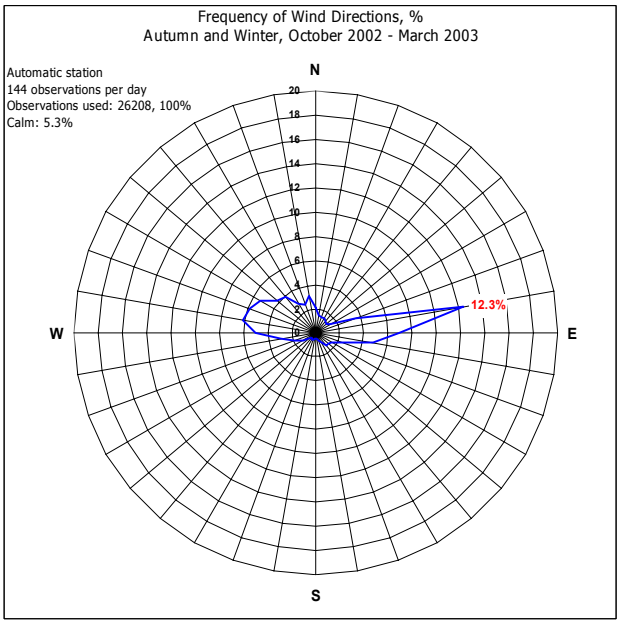


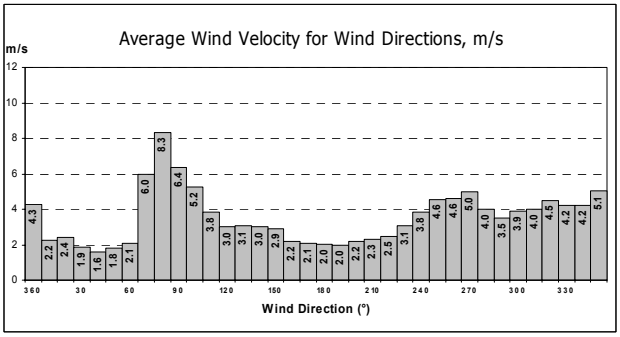


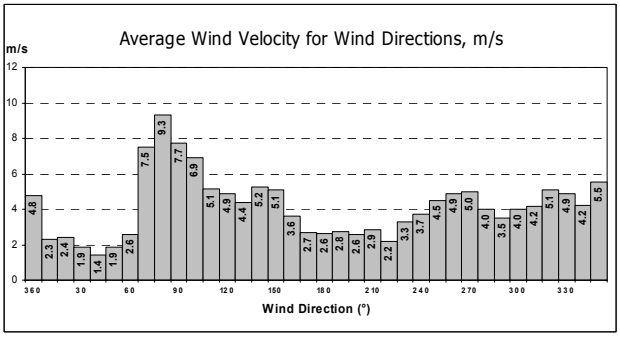
Annex 18

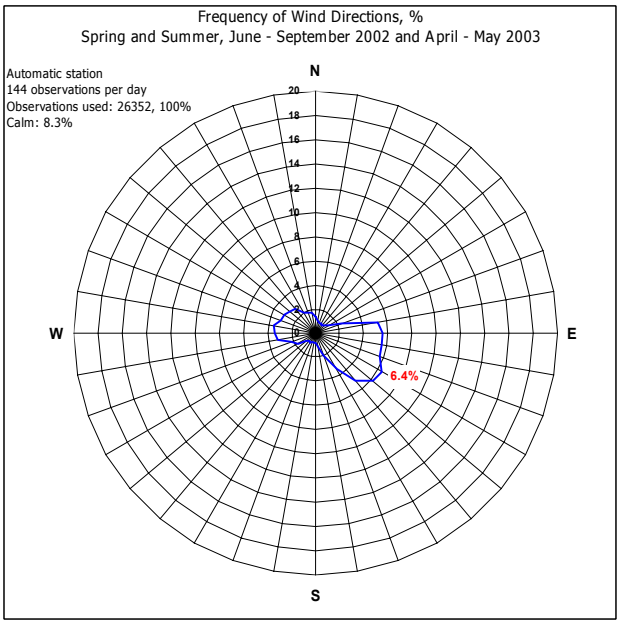
Kollaleira 2

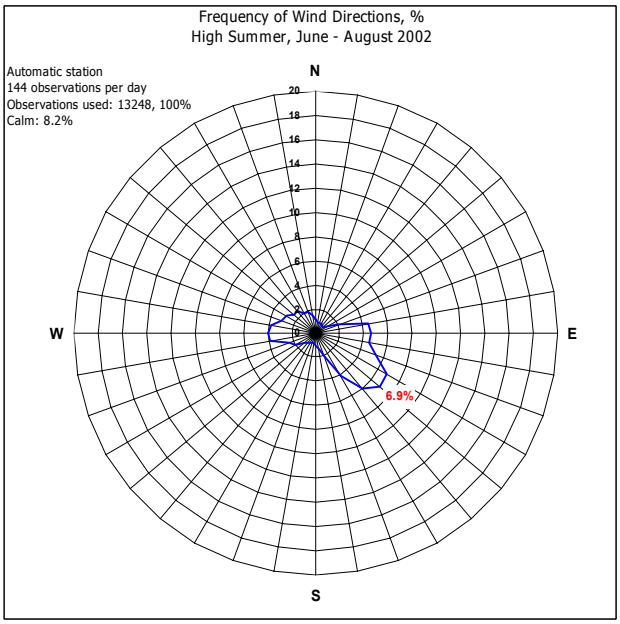


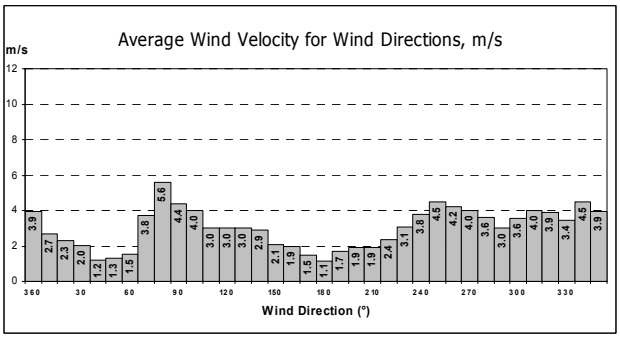


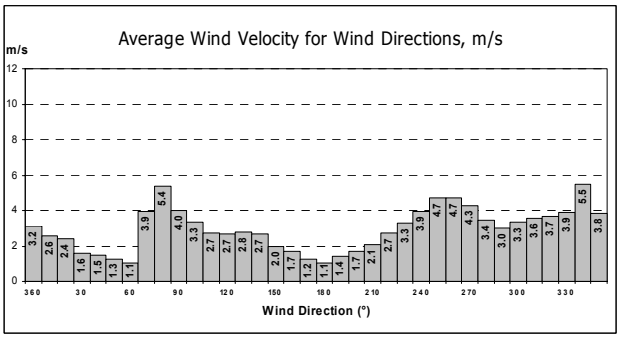




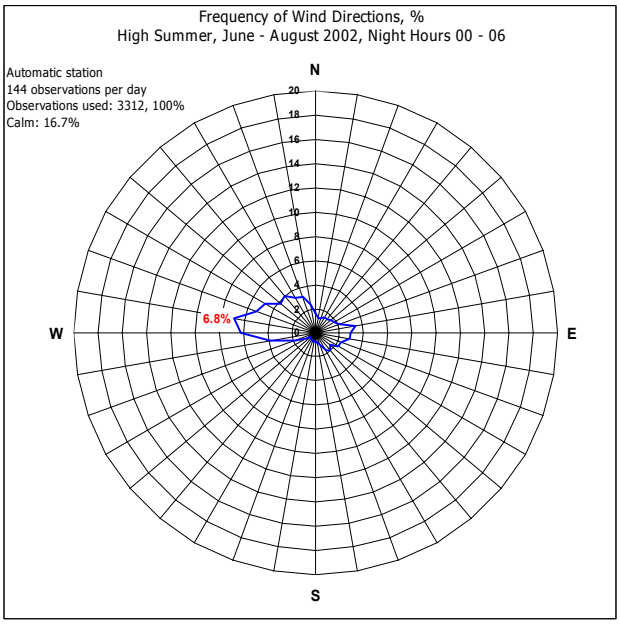


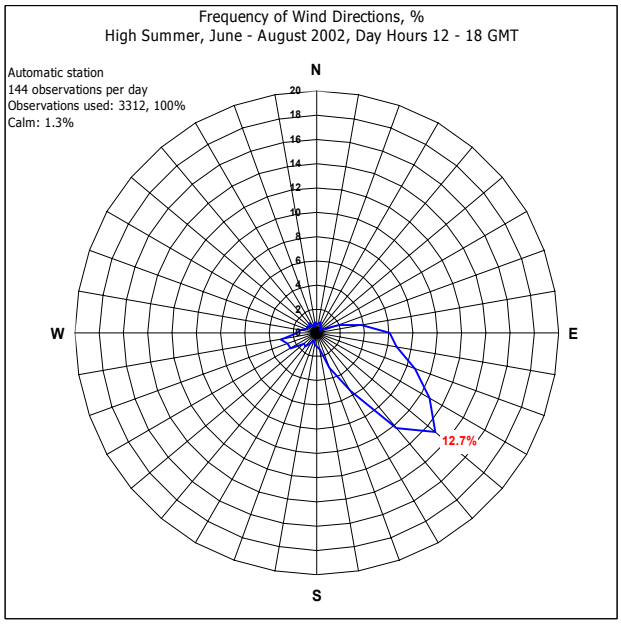


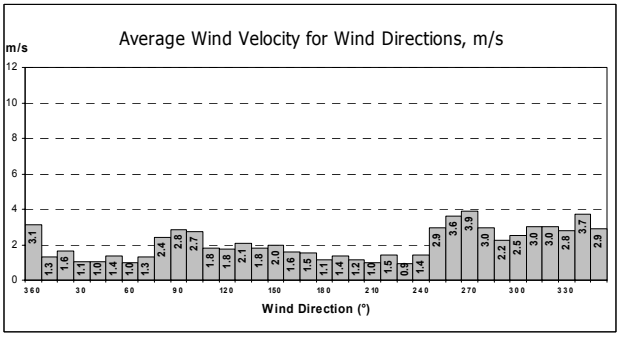


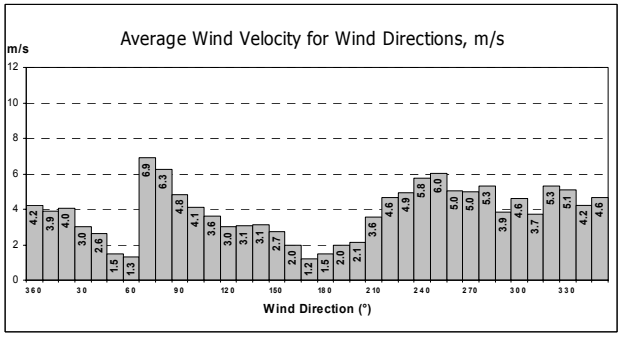


Kollaleira 2









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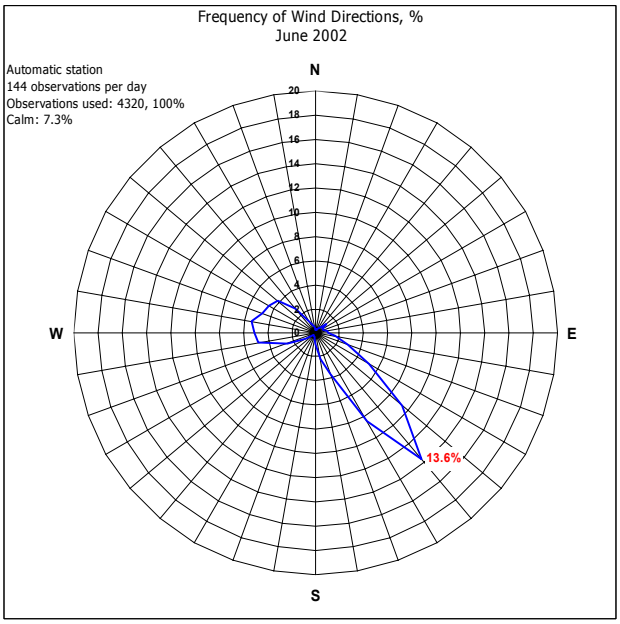
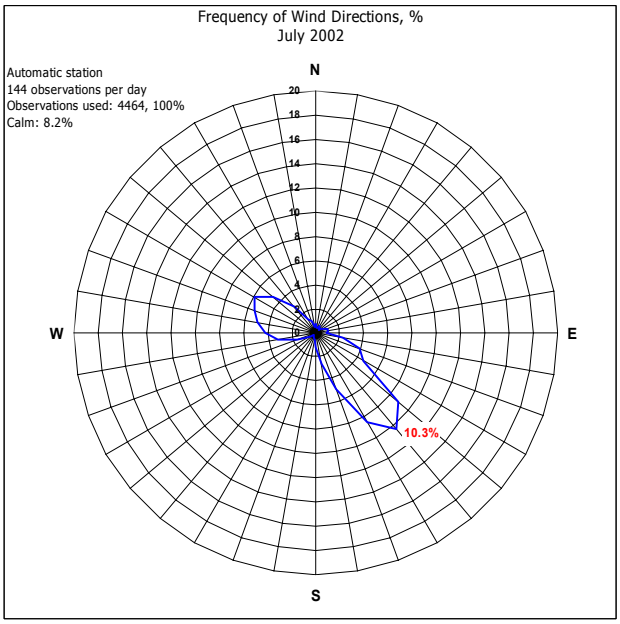
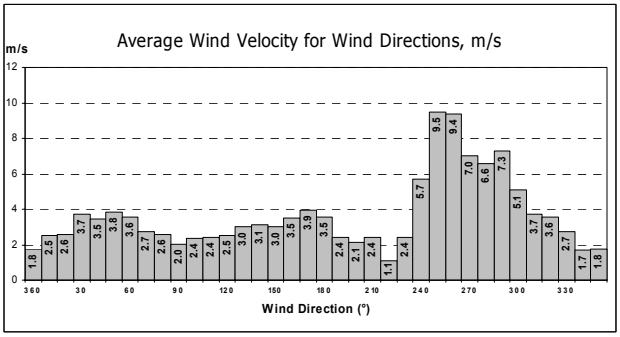
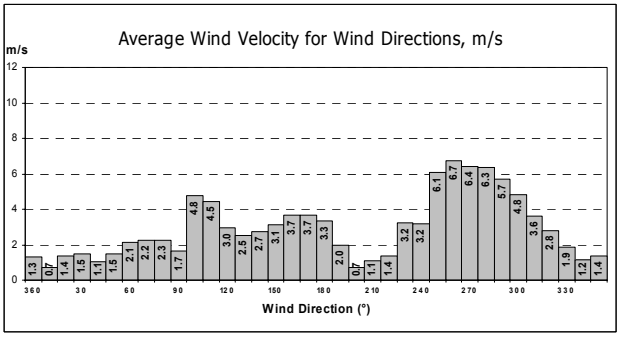
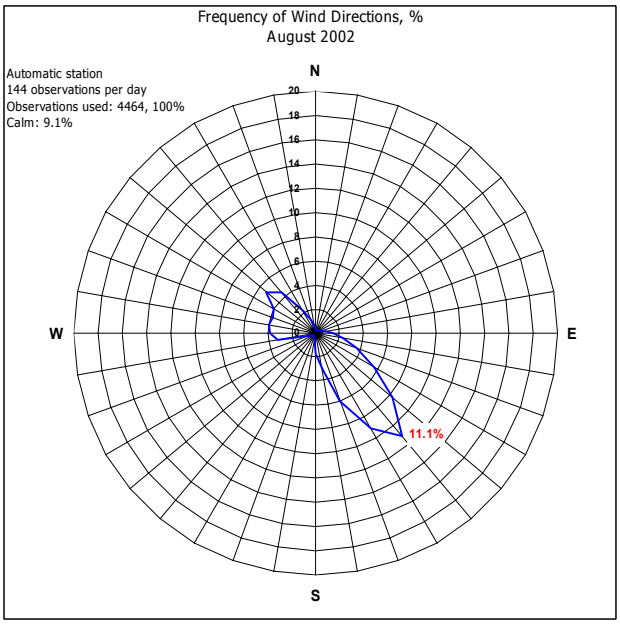
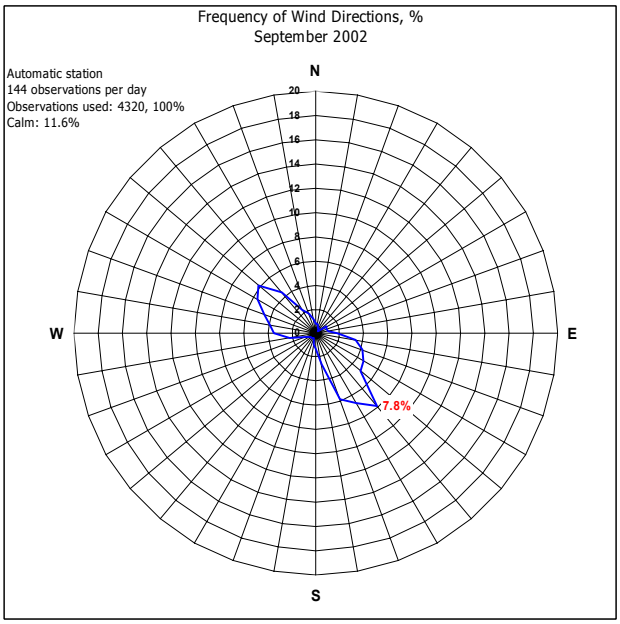


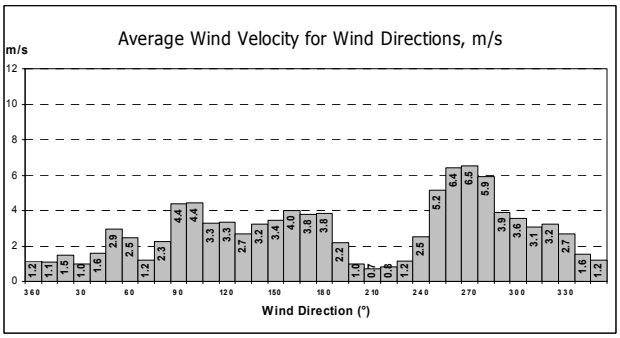


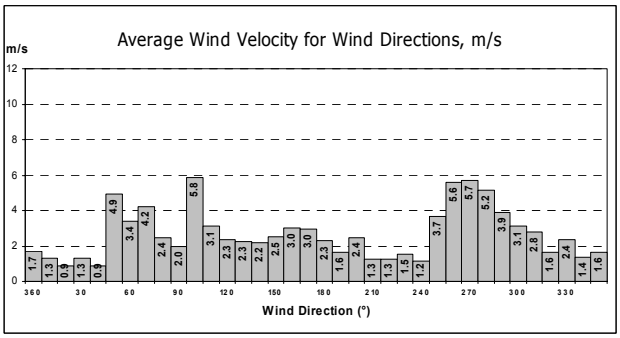






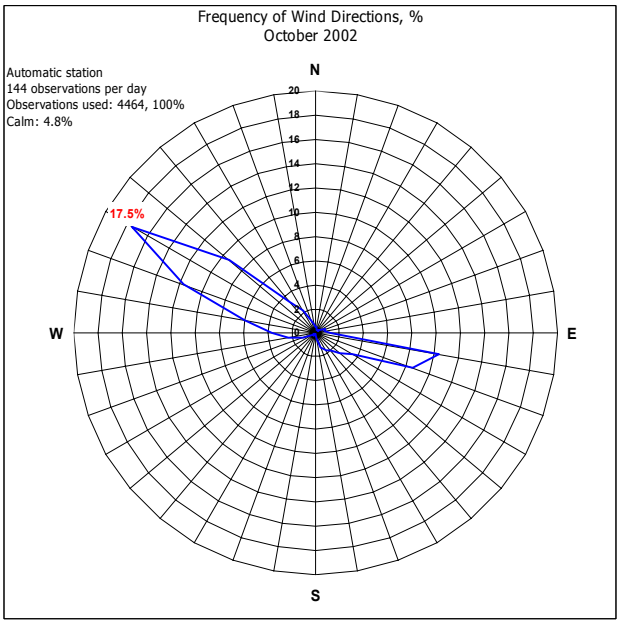


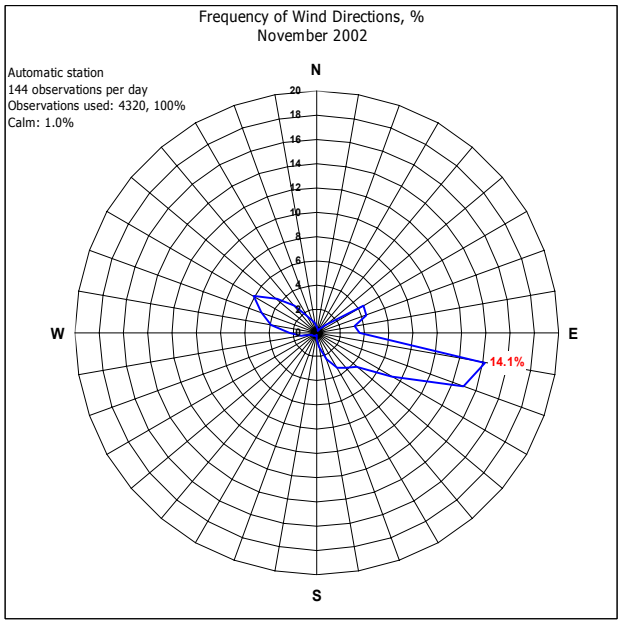


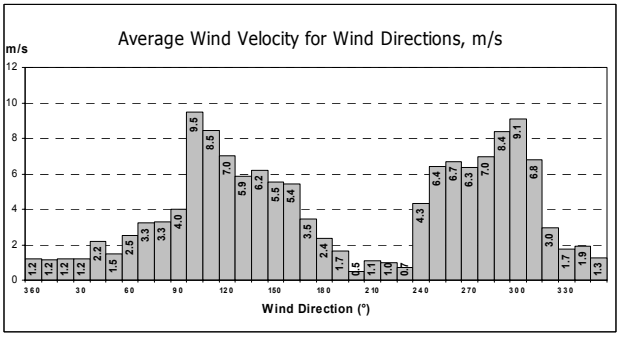


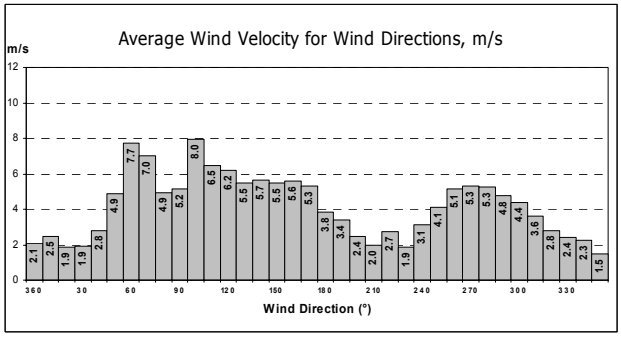
Annex 21

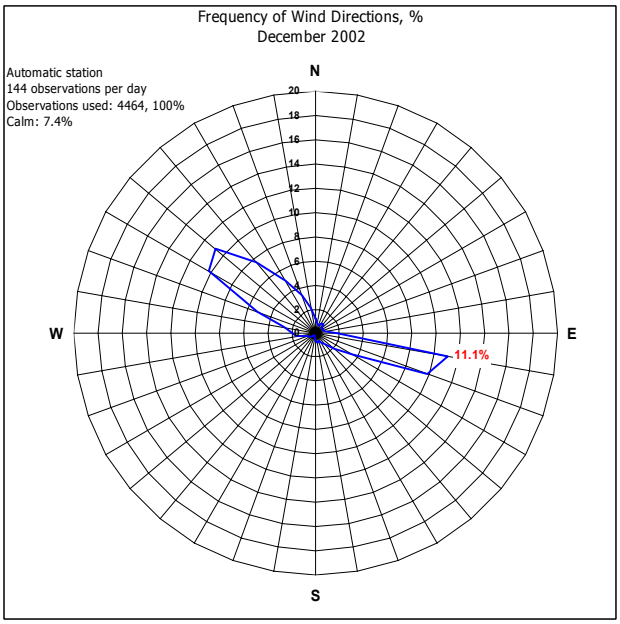
Eskifjörður

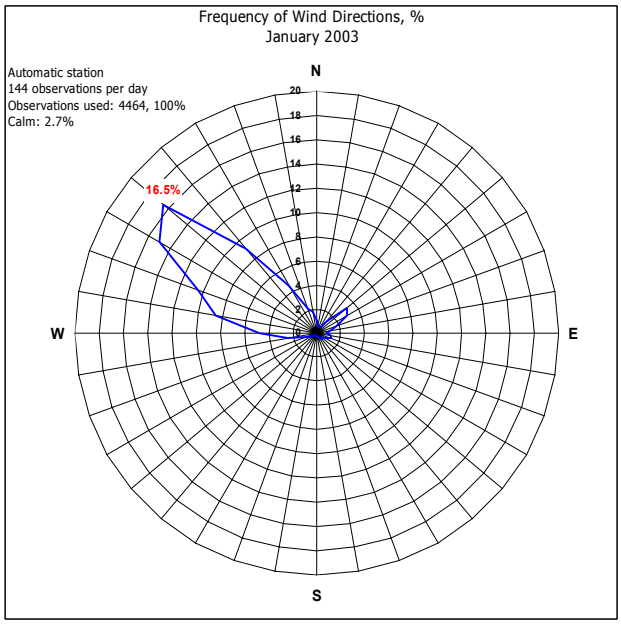


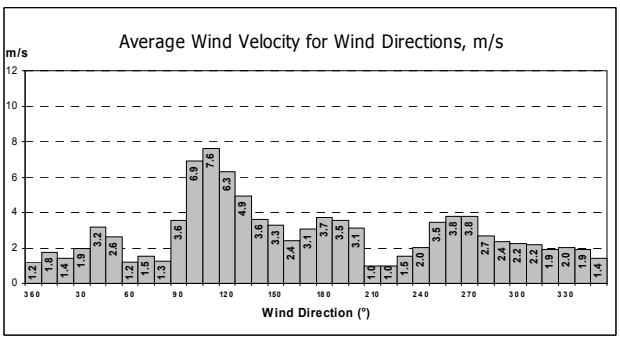


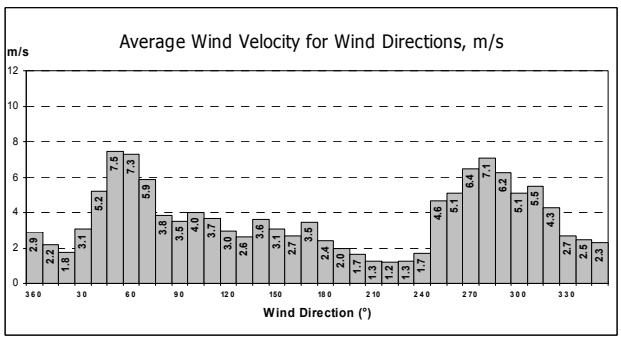






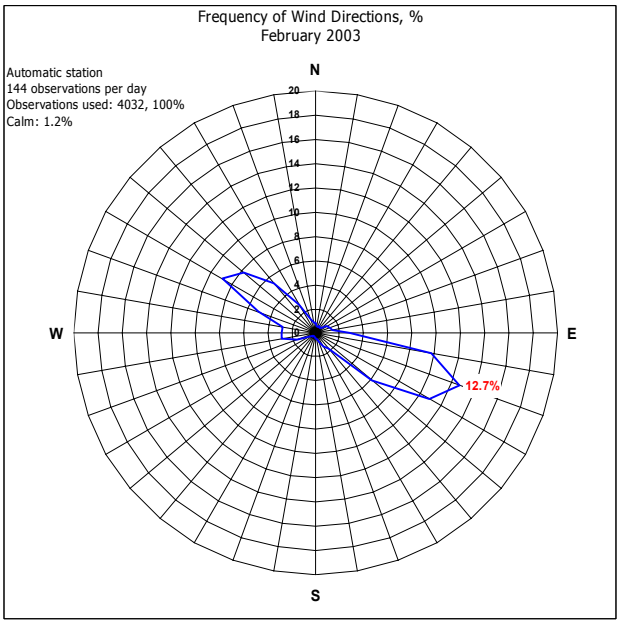


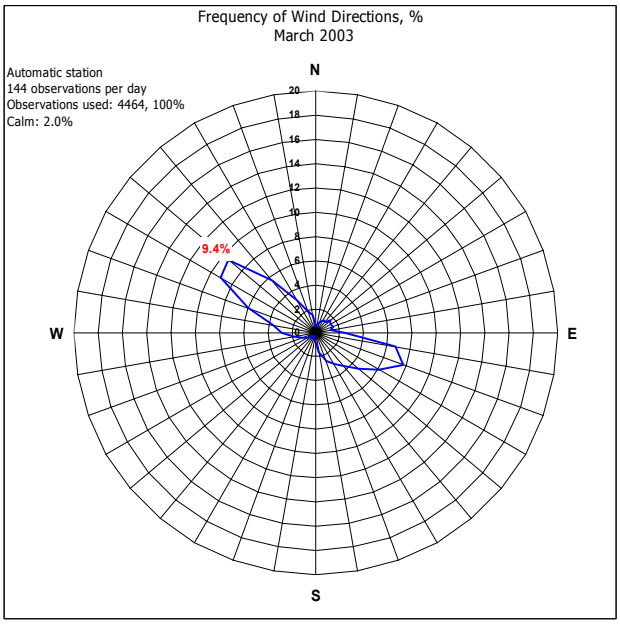


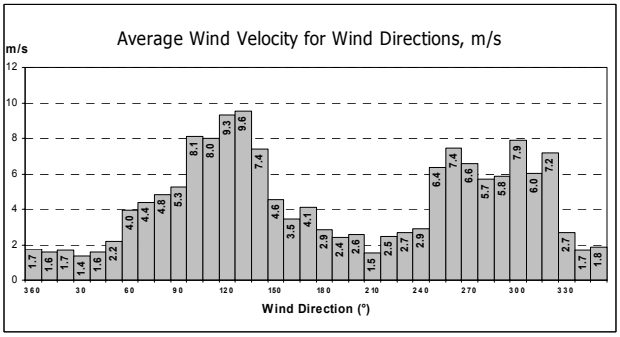


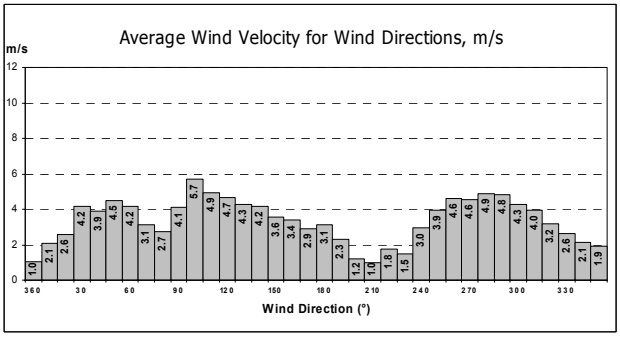
Annex 22

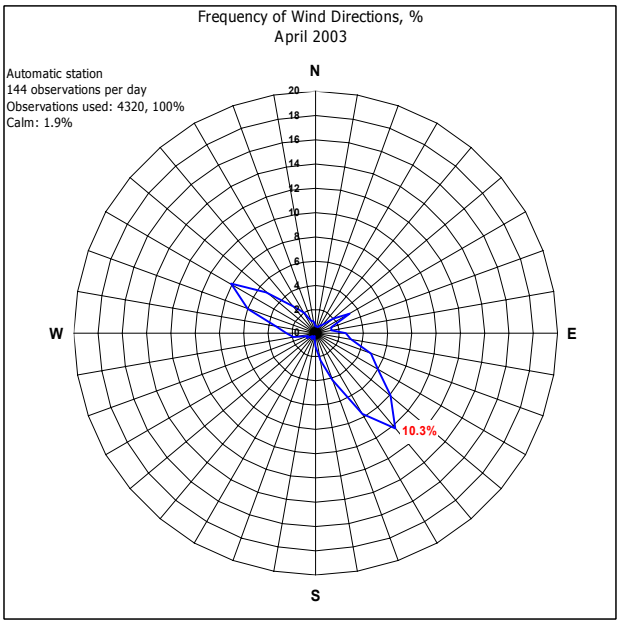
Eskifjörður

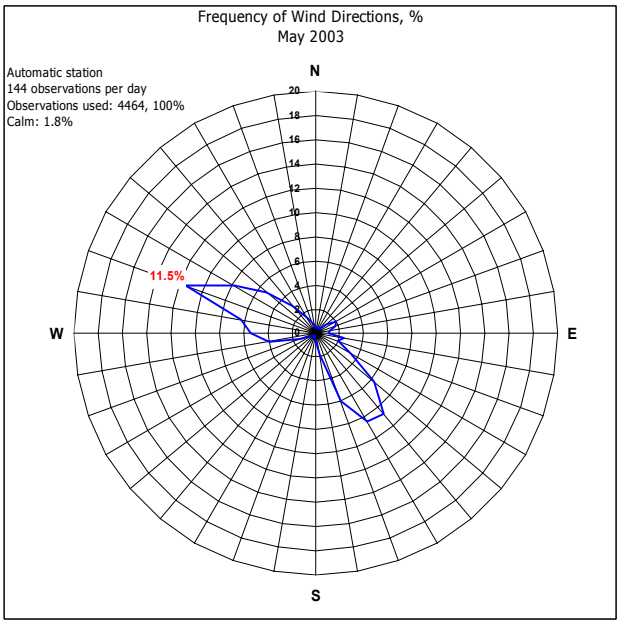


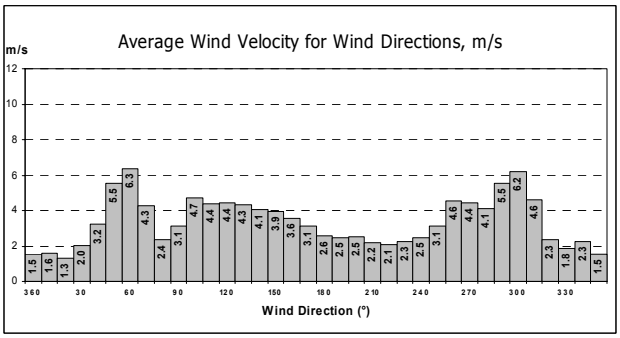


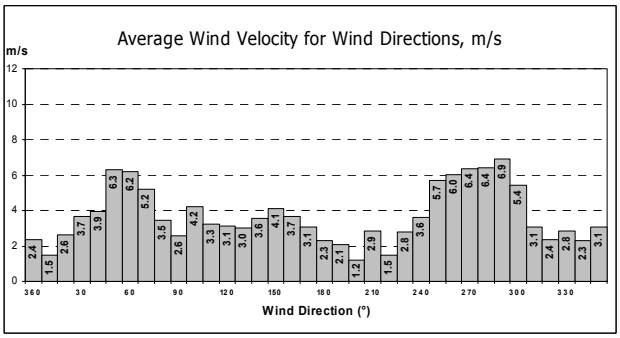




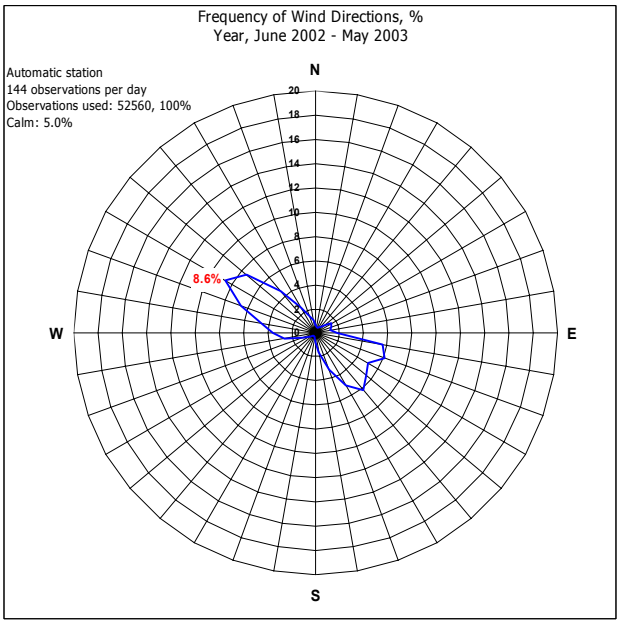


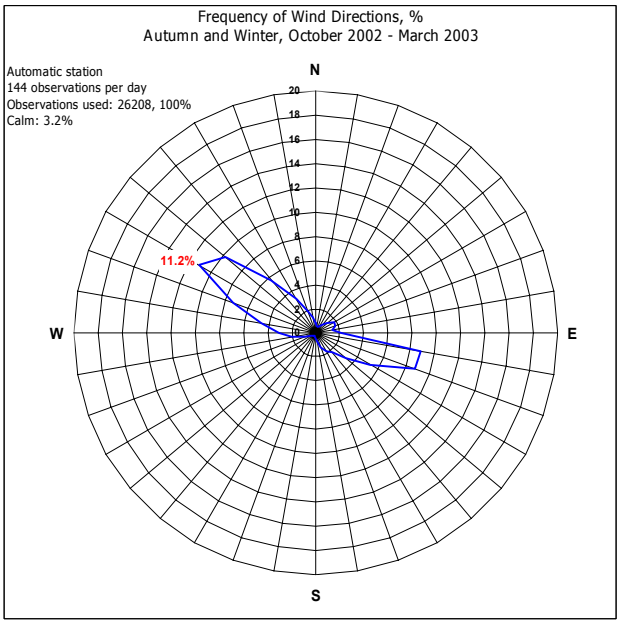


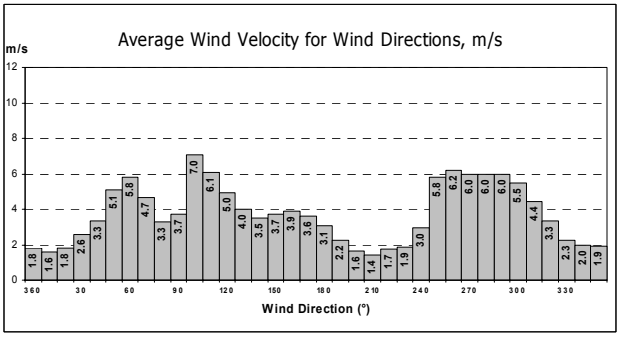


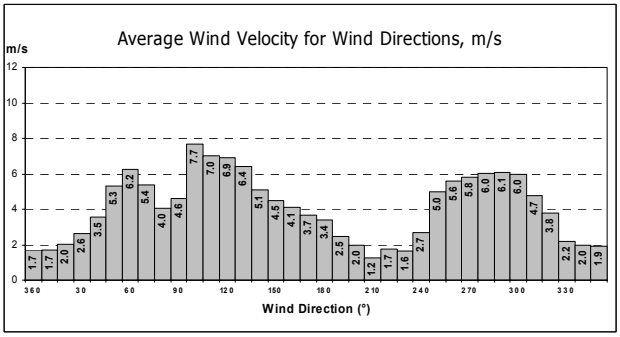


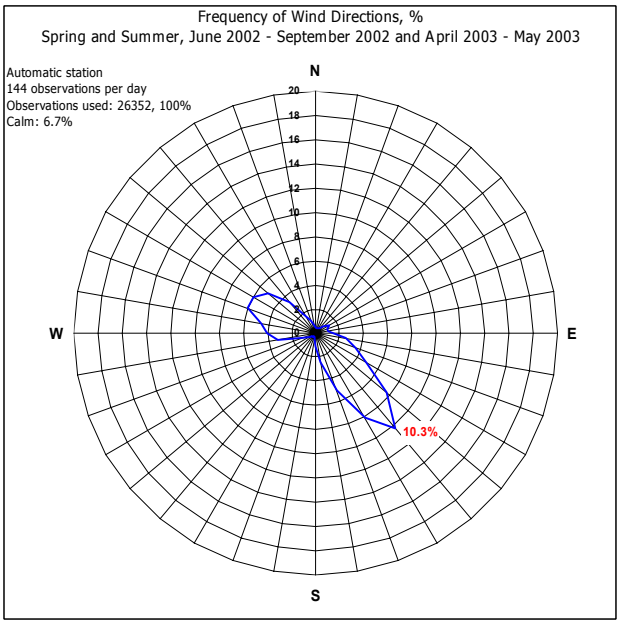
Eskifjörður

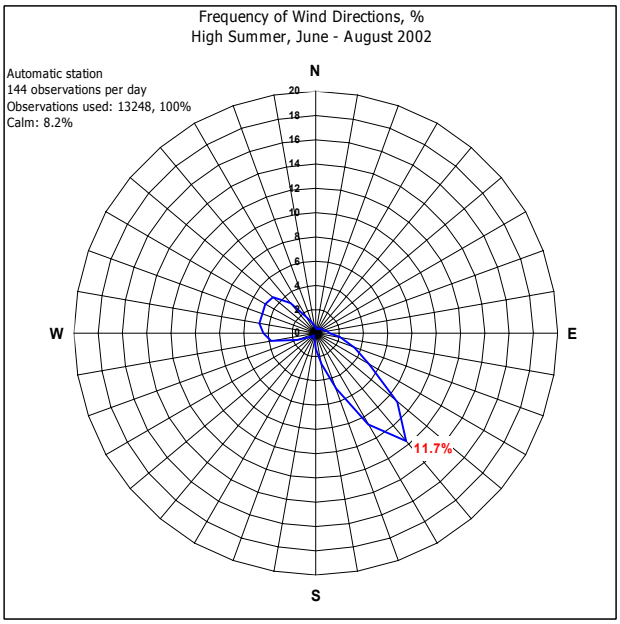


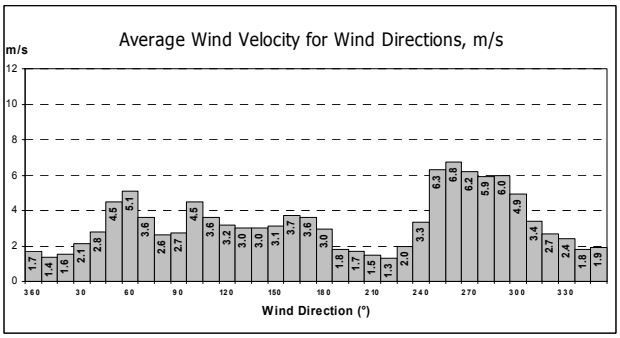


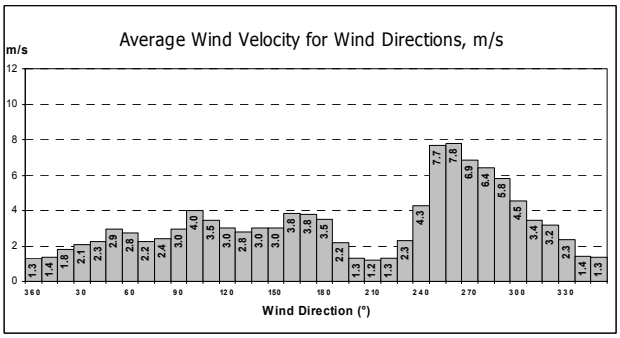






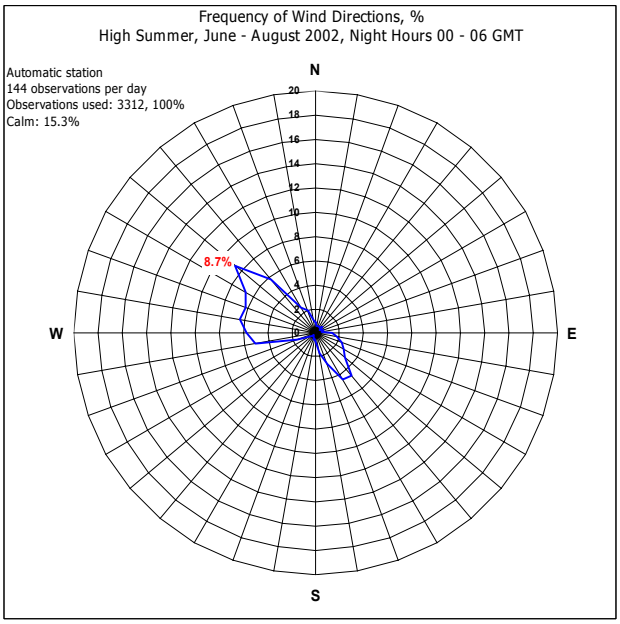


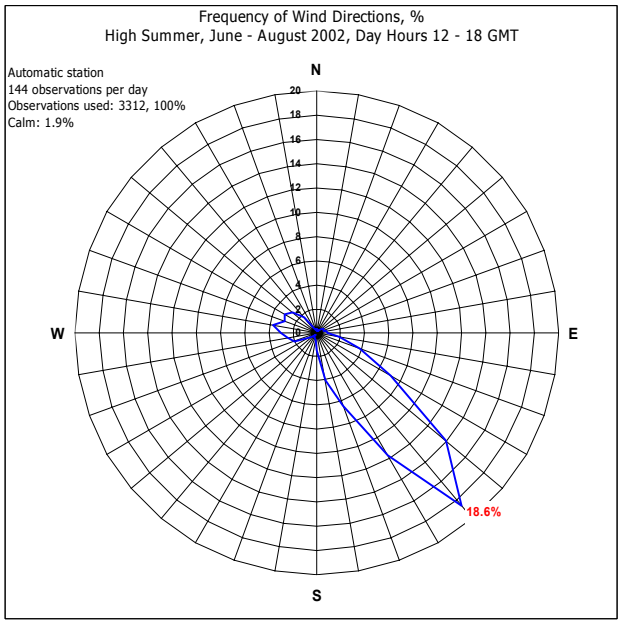


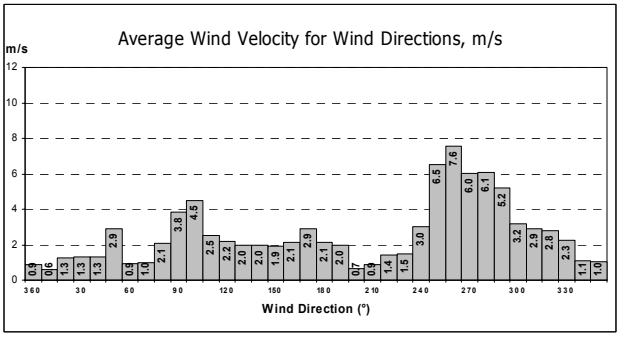


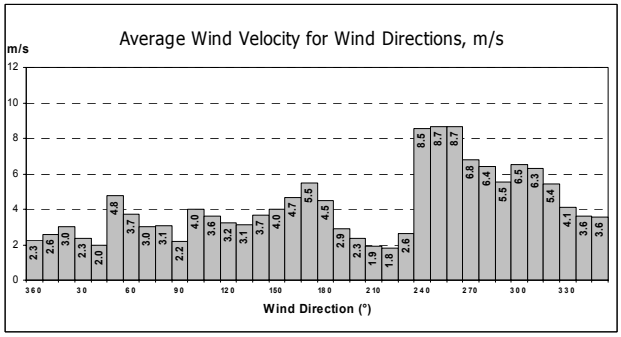
Annex 24

Eskifjörður

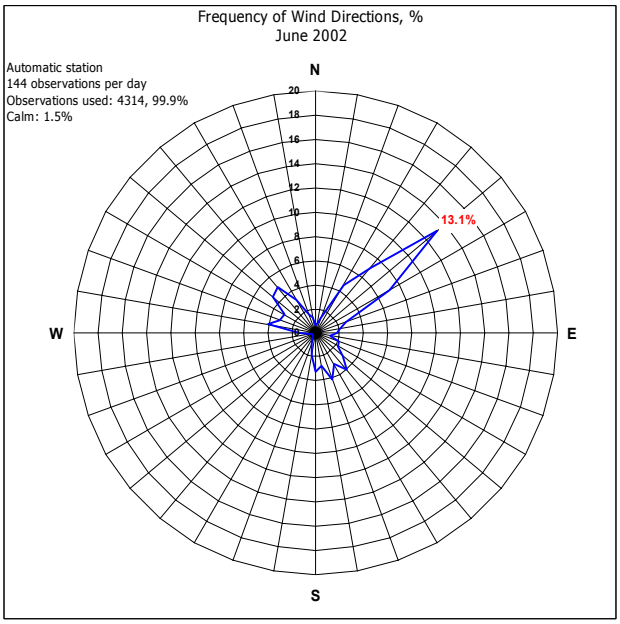


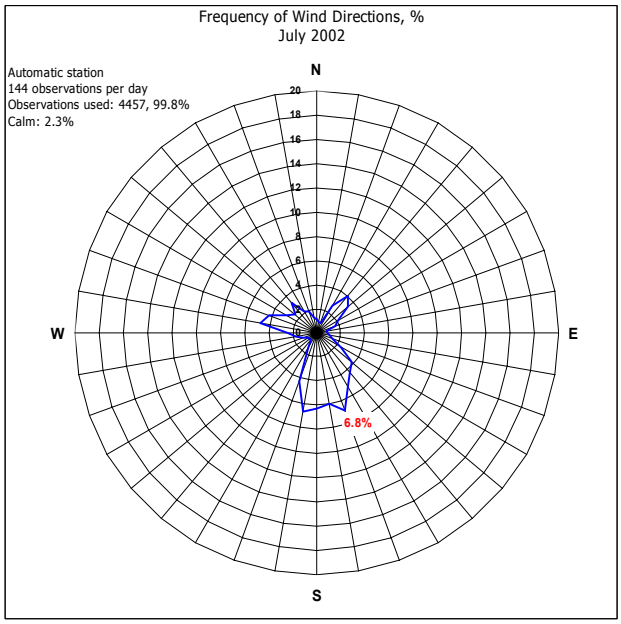


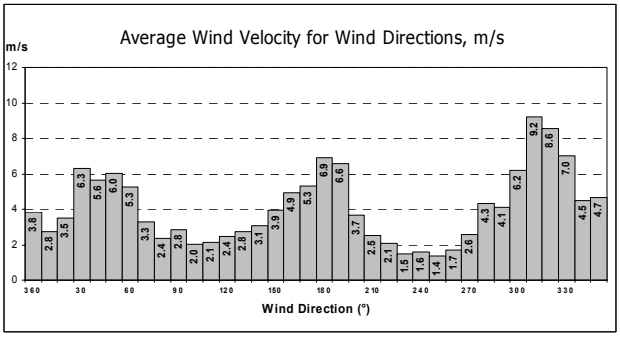


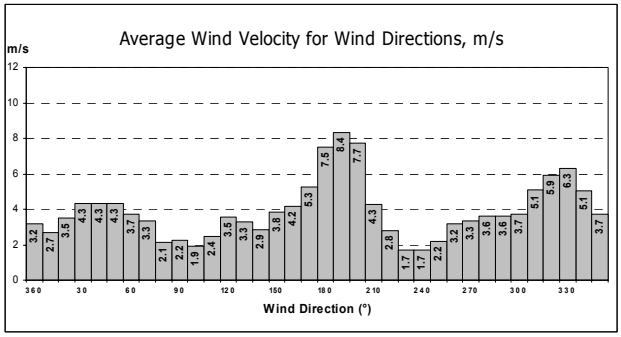


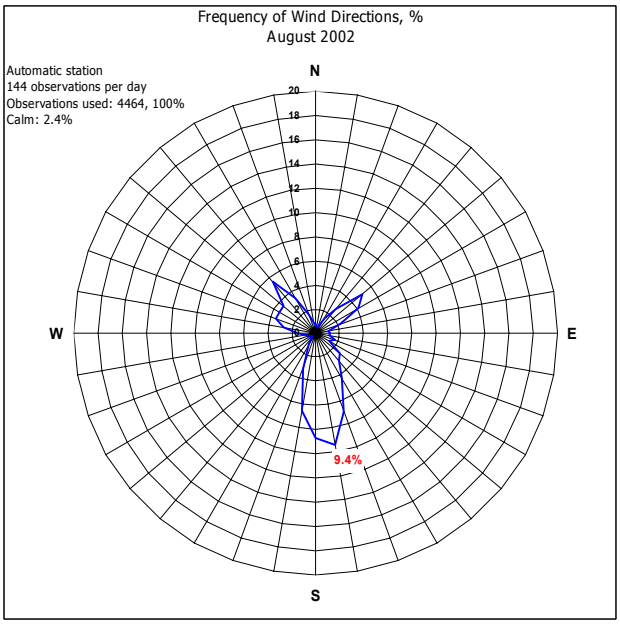
Vattarnes

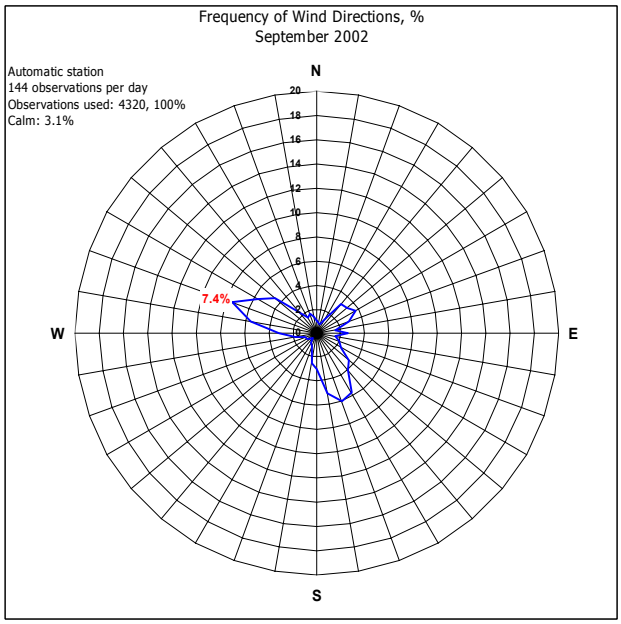

Frequency of Wind Directions, %
June 2002
Automatic station
144 observations per day
Observations used: 4314, 99.9%
Calm: 1.5%
N
W
E
S
13.1%

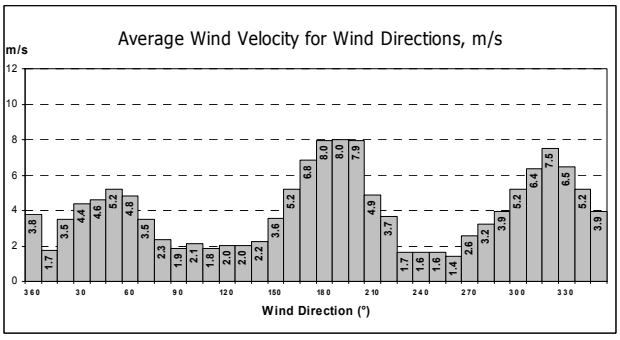

Frequency of Wind Directions, %
July 2002
Automatic station
144 observations per day
Observations used: 4457, 99.8%
Calm: 2.3%
N
W
E
S
6.8%

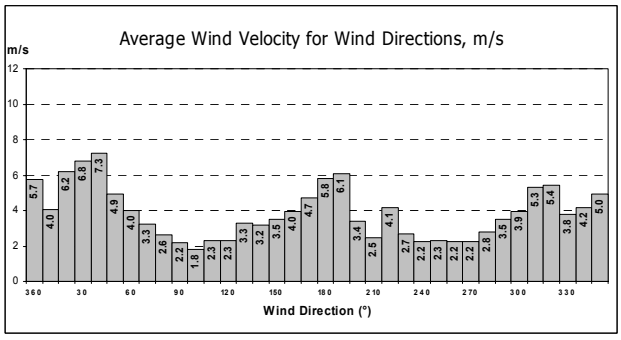

Average Wind Velocity for Wind Directions, m/s
m/s
Wind Direction (°)


Average Wind Velocity for Wind Directions, m/s
m/s
Wind Direction (°)

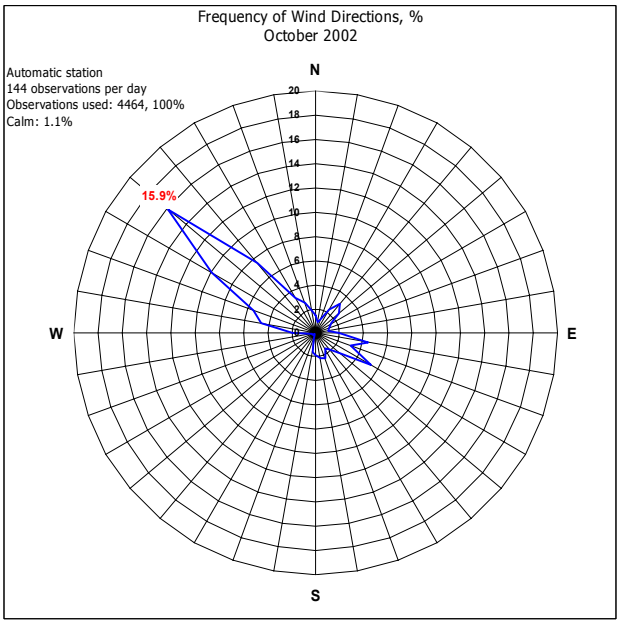

Frequency of Wind Directions, %
August 2002
Automatic station
144 observations per day
Observations used: 4464, 100%
Calm: 2.4%
N
W
E
S
9.4%

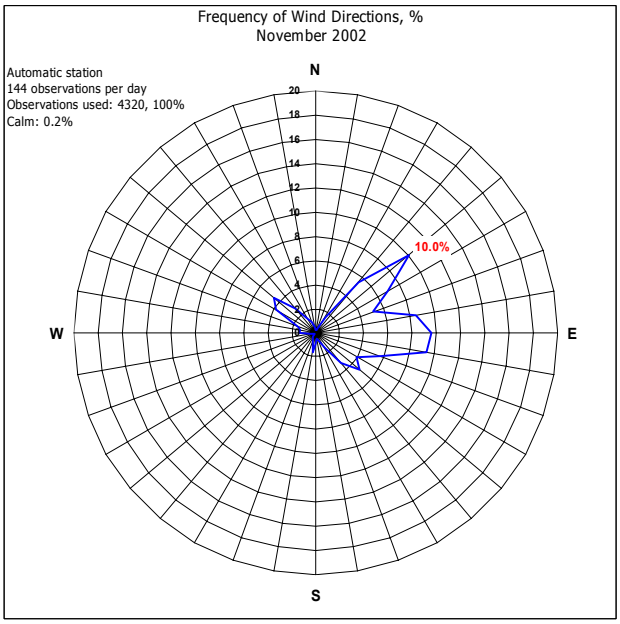

Frequency of Wind Directions, %
September 2002
Automatic station
144 observations per day
Observations used: 4320, 100%
Calm: 3.1%
N
W
E
S
7.4%

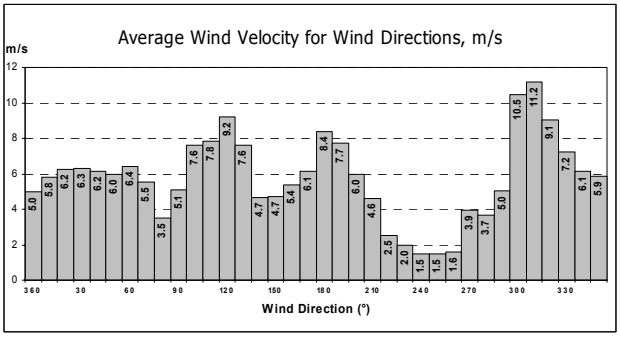

Average Wind Velocity for Wind Directions, m/s
m/s
Wind Direction (°)

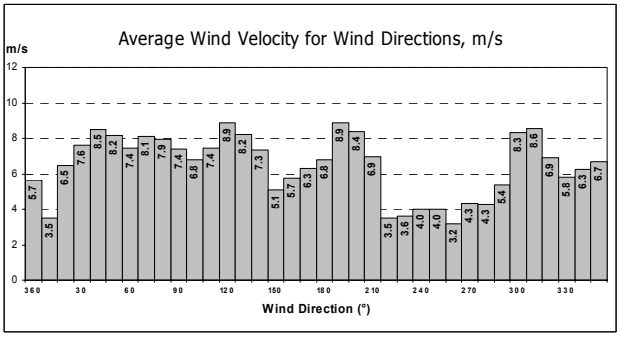

Average Wind Velocity for Wind Directions, m/s
m/s
Wind Direction (°)

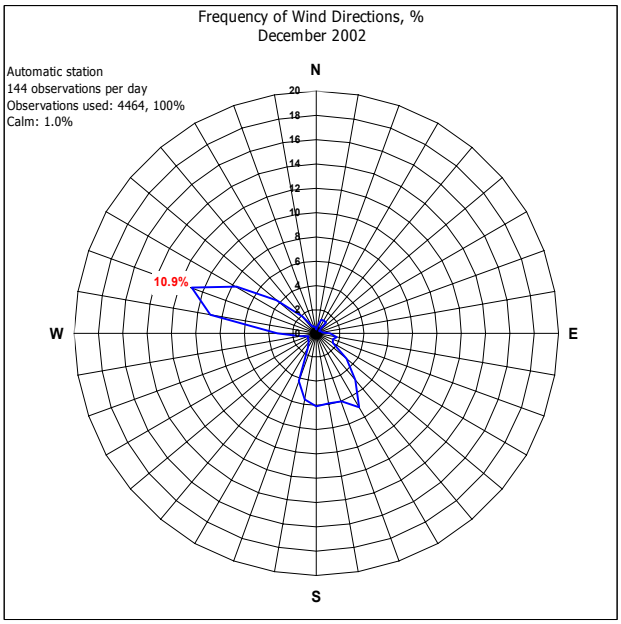
Vattarnes

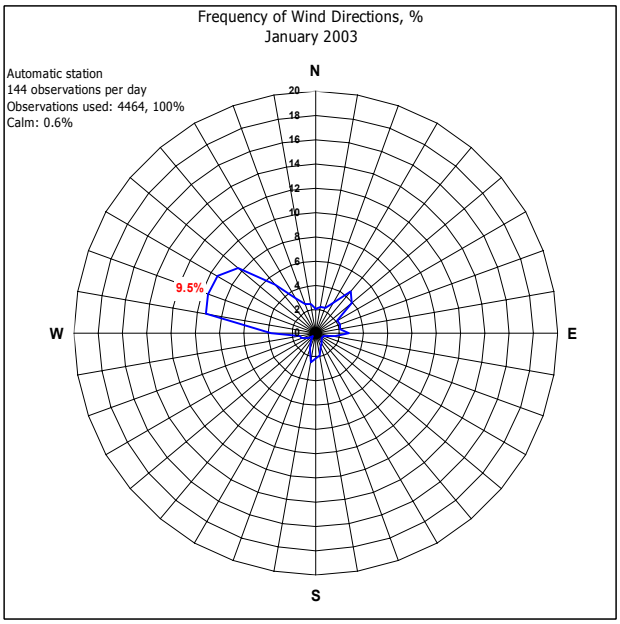

Frequency of Wind Directions, %
October 2002
Automatic station
144 observations per day
Observations used: 4464, 100%
Calm: 1.1%
N
E
S
W
15.9%

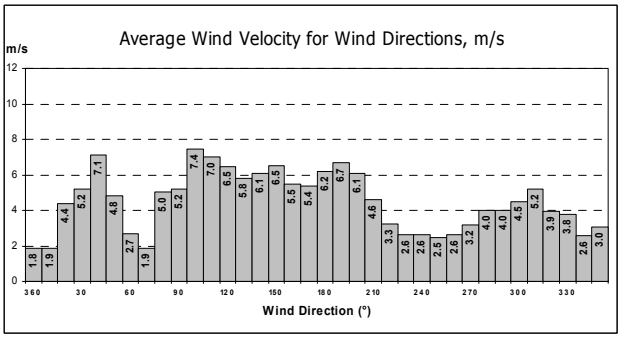

Frequency of Wind Directions, %
November 2002
Automatic station
144 observations per day
Observations used: 4320, 100%
Calm: 0.2%
N
E
S
W
10.0%

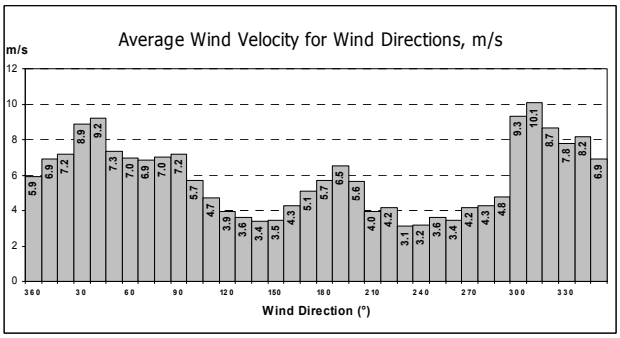

Average Wind Velocity for Wind Directions, m/s
m/s
Wind Direction (°)


Average Wind Velocity for Wind Directions, m/s
m/s
Wind Direction (°)

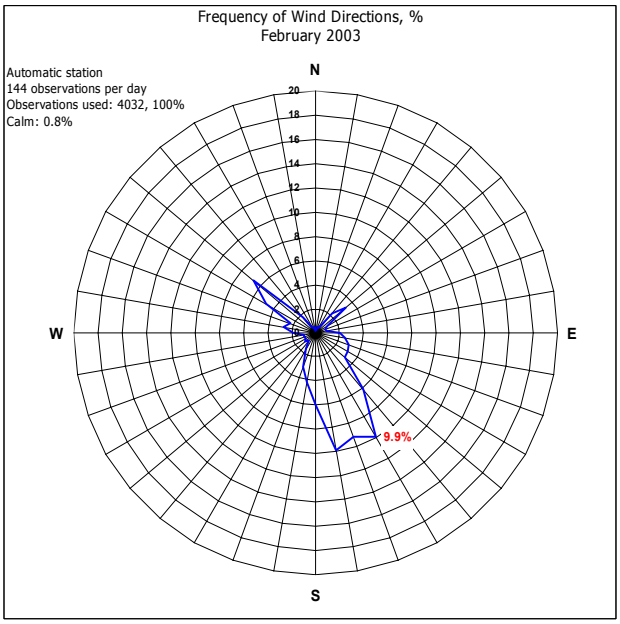

Frequency of Wind Directions, %
December 2002
Automatic station
144 observations per day
Observations used: 4464, 100%
Calm: 1.0%
N
E
S
W
10.9%

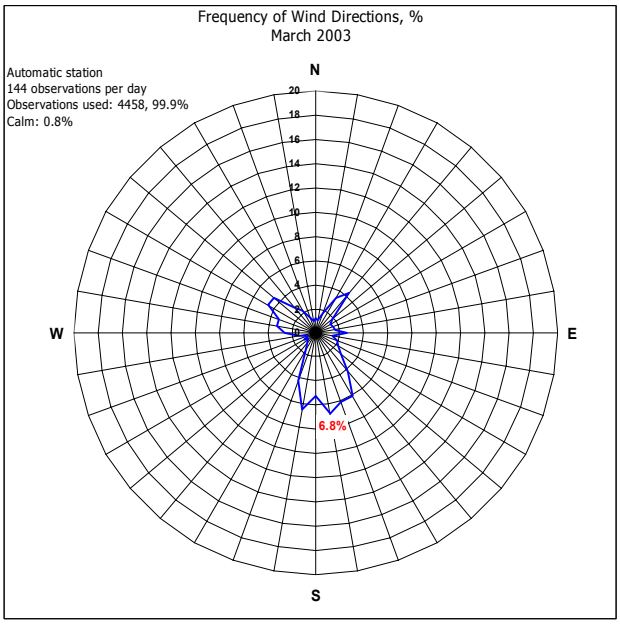

Frequency of Wind Directions, %
January 2003
Automatic station
144 observations per day
Observations used: 4464, 100%
Calm: 0.6%
N
E
S
W
9.5%

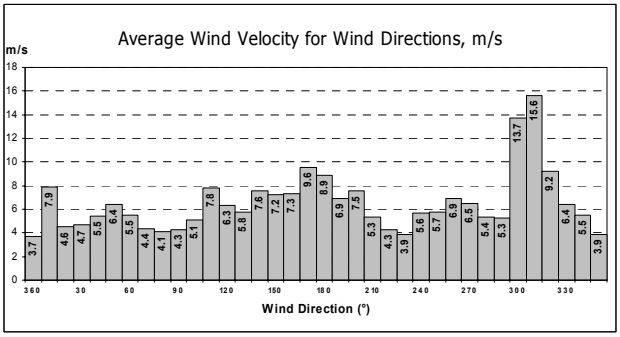

Average Wind Velocity for Wind Directions, m/s
m/s
Wind Direction (°)

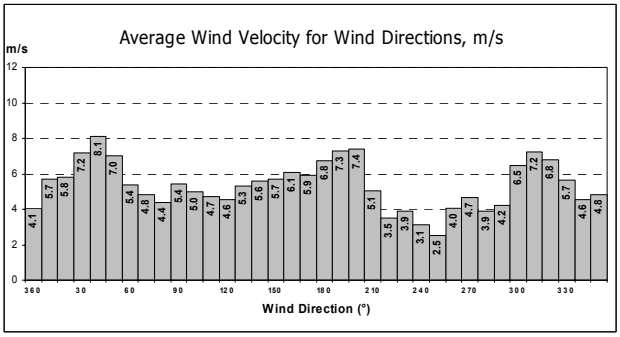

Average Wind Velocity for Wind Directions, m/s
m/s
Wind Direction (°)

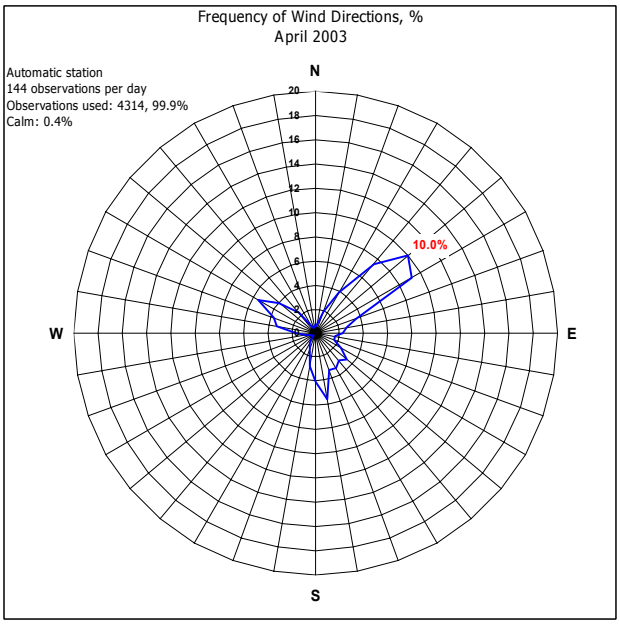
Vattarnes

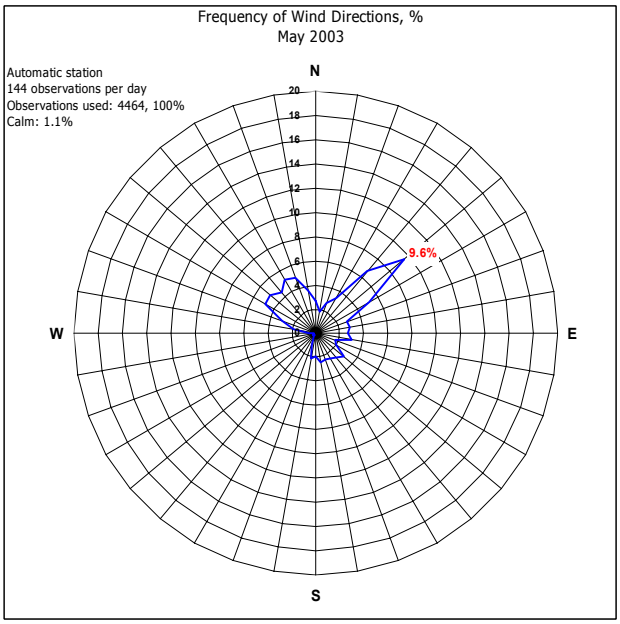

Frequency of Wind Directions, %
February 2003
Automatic station
144 observations per day
Observations used: 4032, 100%
Calm: 0.8%
N
W
E
S
9.9%

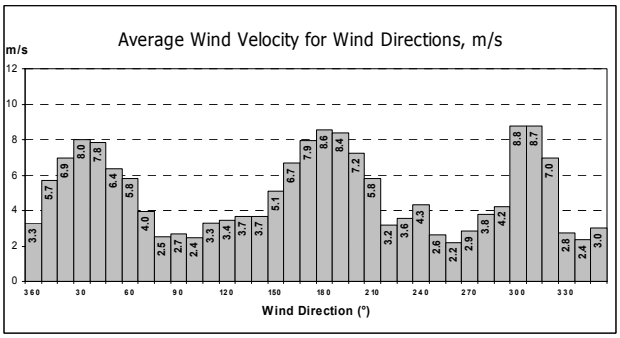

Frequency of Wind Directions, %
March 2003
Automatic station
144 observations per day
Observations used: 4458, 99.9%
Calm: 0.8%
N
W
E
S
6.8%

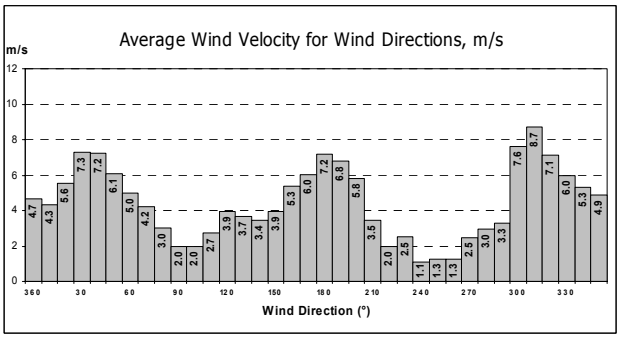

Average Wind Velocity for Wind Directions, m/s
m/s
Wind Direction (°)


Average Wind Velocity for Wind Directions, m/s
m/s
Wind Direction (°)

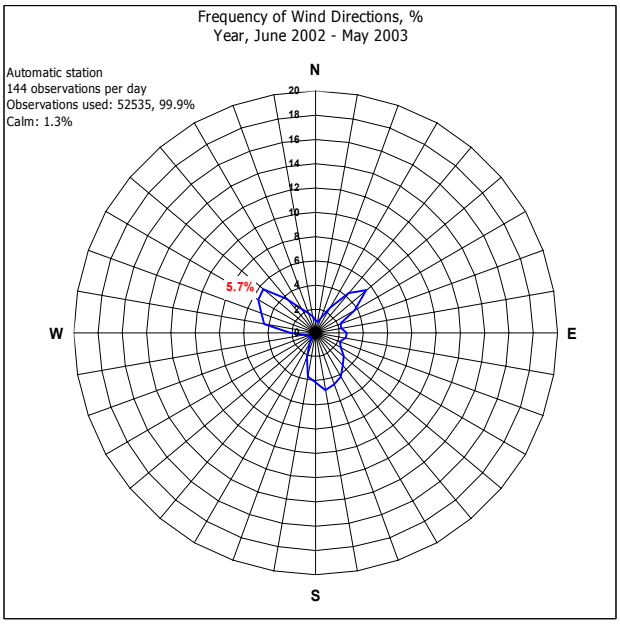

Frequency of Wind Directions, %
April 2003
Automatic station
144 observations per day
Observations used: 4314, 99.9%
Calm: 0.4%
N
W
E
S
10.0%

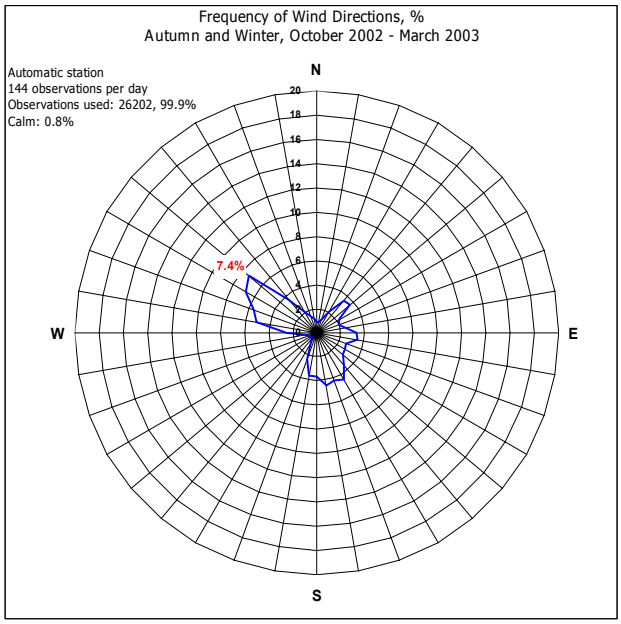

Frequency of Wind Directions, %
May 2003
Automatic station
144 observations per day
Observations used: 4464, 100%
Calm: 1.1%
N
W
E
S
9.6%

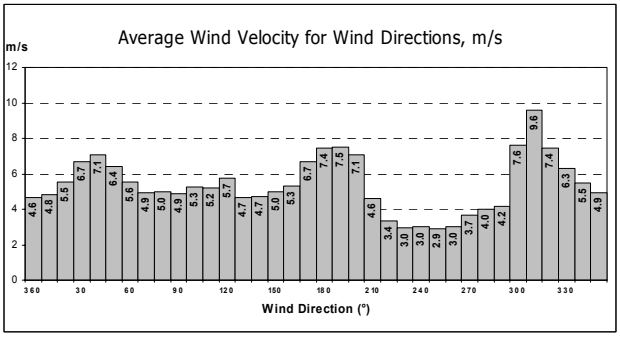

Average Wind Velocity for Wind Directions, m/s
m/s
Wind Direction (°)

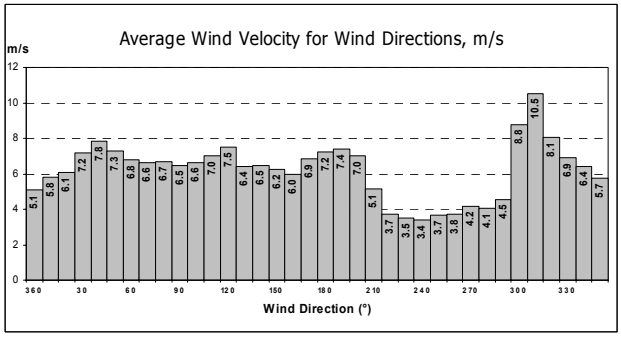

Average Wind Velocity for Wind Directions, m/s
m/s
Wind Direction (°)

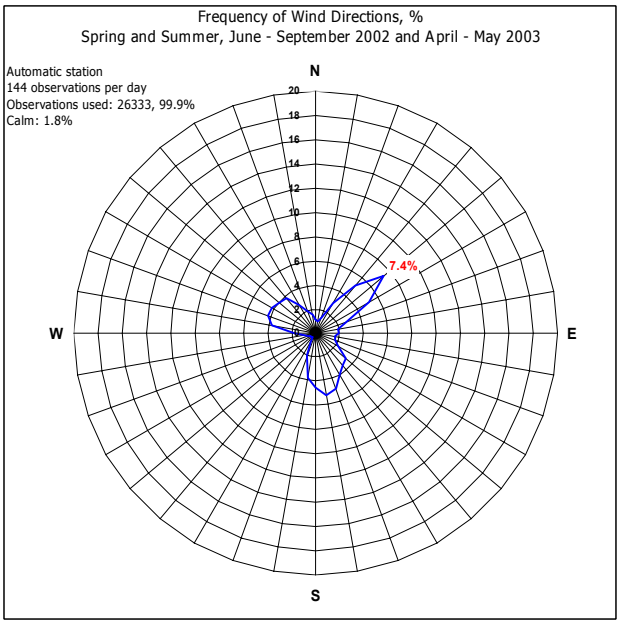
Vattarnes

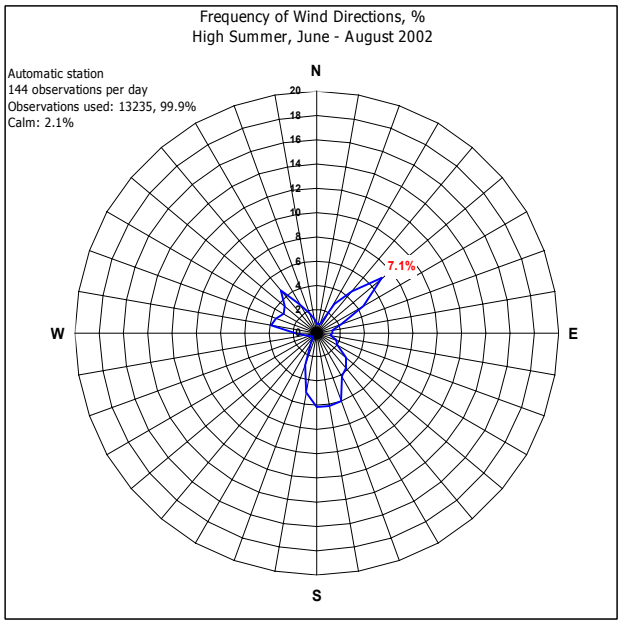

Frequency of Wind Directions, %
Year, June 2002 - May 2003
Automatic station
144 observations per day
Observations used: 52535, 99.9%
Calm: 1.3%
N
W
E
S
5.7%

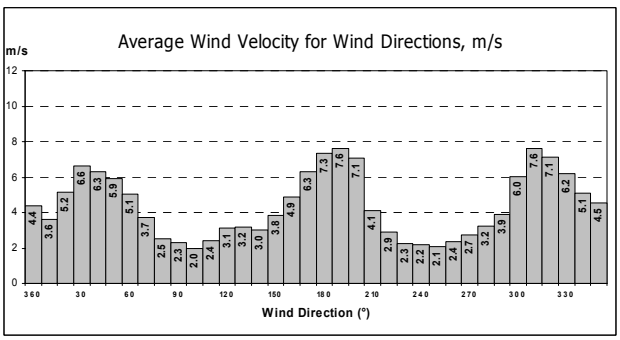

Frequency of Wind Directions, %
Autumn and Winter, October 2002 - March 2003
Automatic station
144 observations per day
Observations used: 26202, 99.9%
Calm: 0.8%
N
W
E
S
7.4%

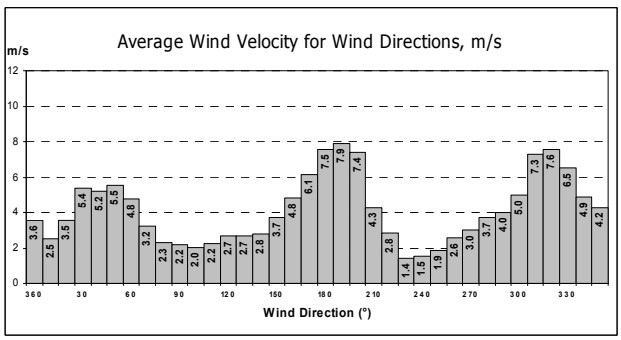

Average Wind Velocity for Wind Directions, m/s
m/s
Wind Direction (°)


Average Wind Velocity for Wind Directions, m/s
m/s
Wind Direction (°)

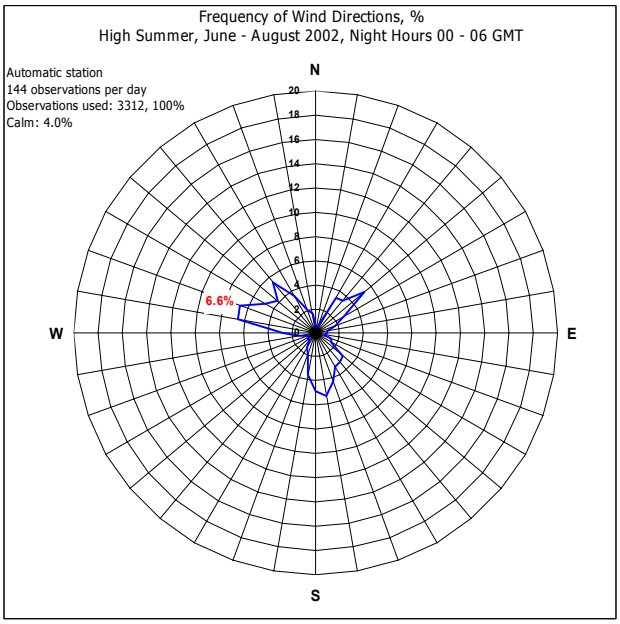

Frequency of Wind Directions, %
Spring and Summer, June - September 2002 and April - May 2003
Automatic station
144 observations per day
Observations used: 26333, 99.9%
Calm: 1.8%
N
W
E
S
7.4%

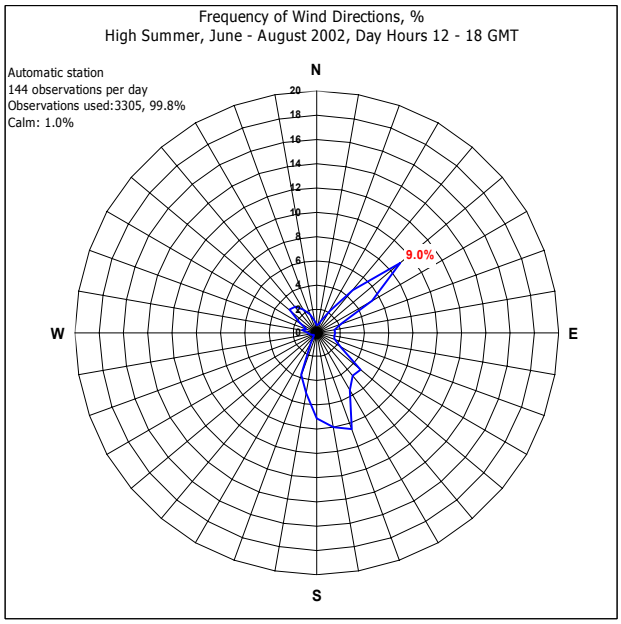

Frequency of Wind Directions, %
High Summer, June - August 2002
Automatic station
144 observations per day
Observations used: 13235, 99.9%
Calm: 2.1%
N
W
E
S
7.1%

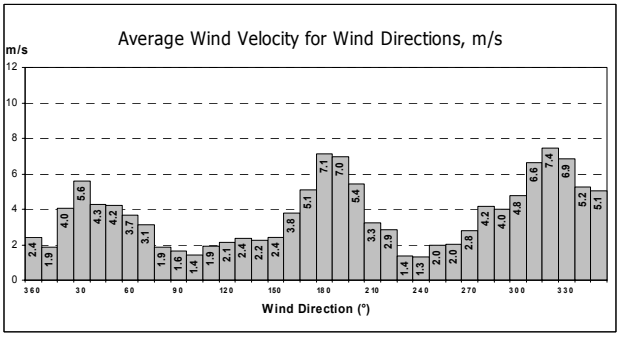

Average Wind Velocity for Wind Directions, m/s
m/s
Wind Direction (°)

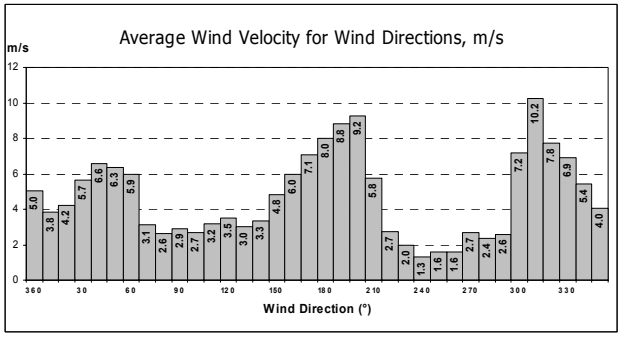

Average Wind Velocity for Wind Directions, m/s
m/s
Wind Direction (°)

Vattarnes

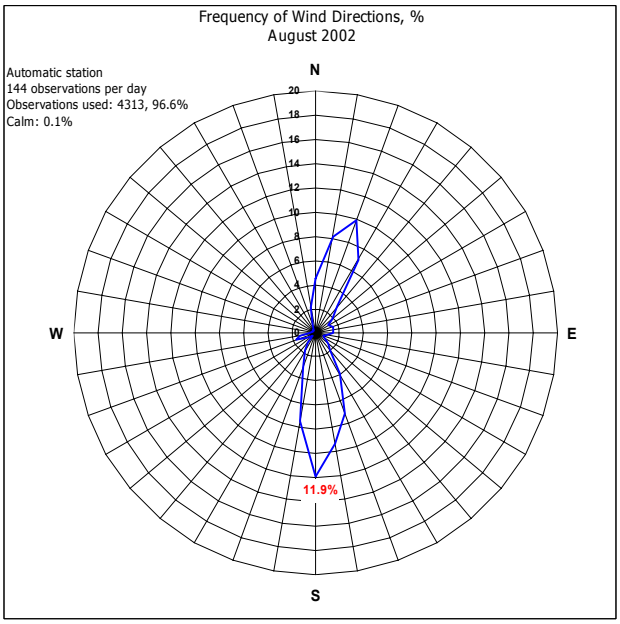

Frequency of Wind Directions, %
High Summer, June - August 2002, Night Hours 00 - 06 GMT
Automatic station
144 observations per day
Observations used: 3312, 100%
Calm: 4.0%
N
E
S
W
6.6%

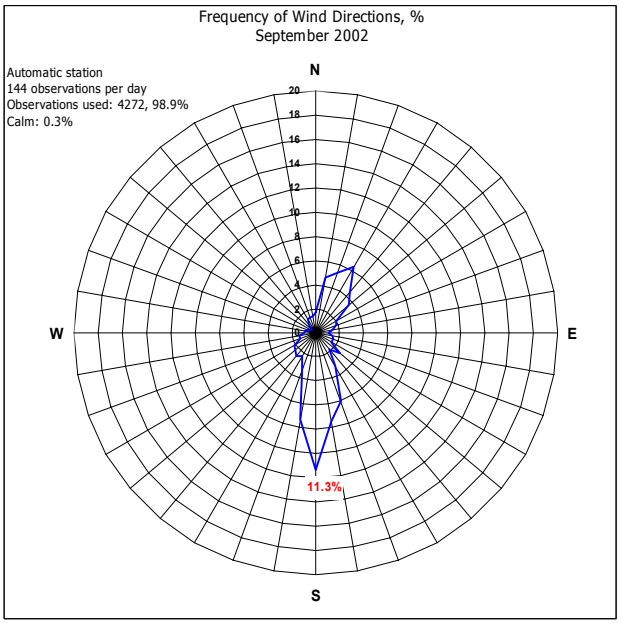

Frequency of Wind Directions, %
High Summer, June - August 2002, Day Hours 12 - 18 GMT
Automatic station
144 observations per day
Observations used:3305, 99.8%
Calm: 1.0%
N
E
S
W
9.0%

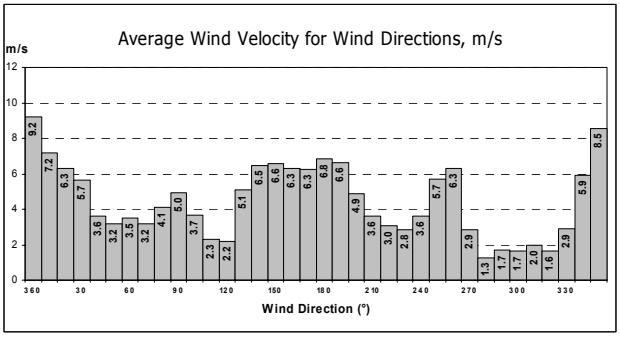

Average Wind Velocity for Wind Directions, m/s
m/s
Wind Direction (°)

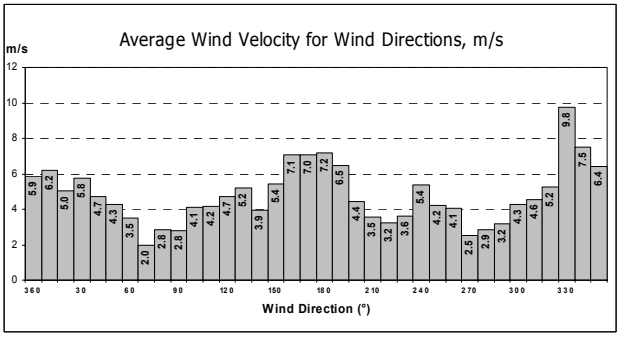

Average Wind Velocity for Wind Directions, m/s
m/s
Wind Direction (°)

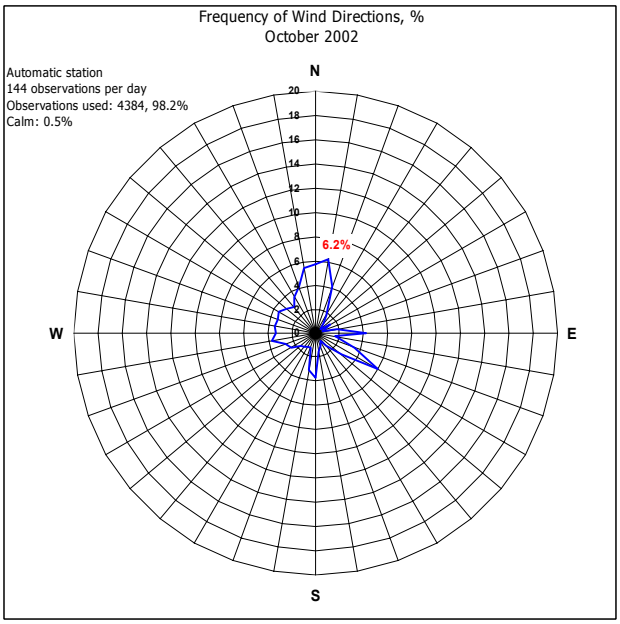
Seley

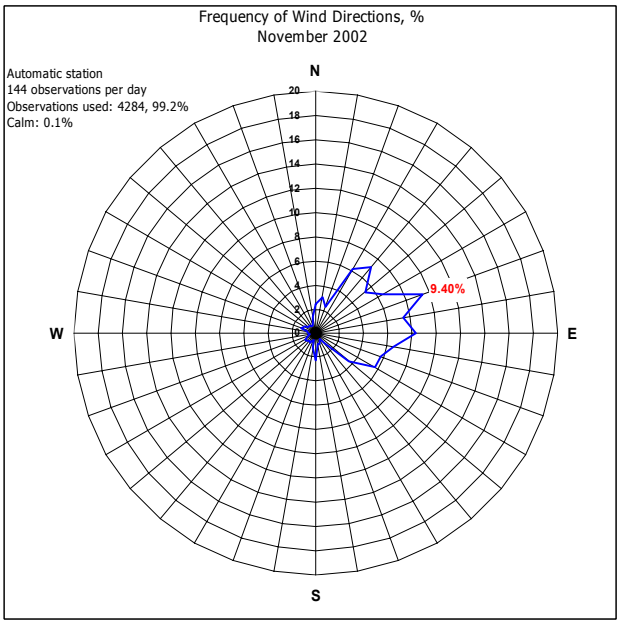

Frequency of Wind Directions, %
August 2002
Automatic station
144 observations per day
Observations used: 4313, 96.6%
Calm: 0.1%
N
W
E
S
11.9%

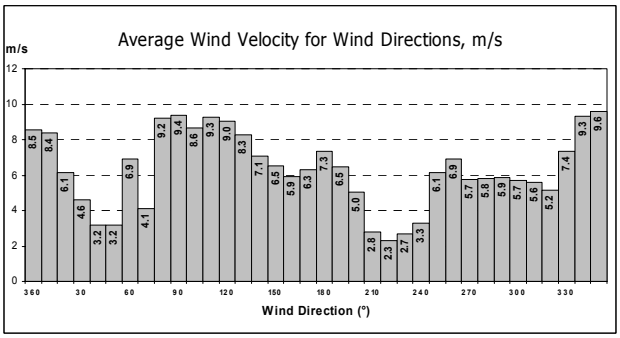

Frequency of Wind Directions, %
September 2002
Automatic station
144 observations per day
Observations used: 4272, 98.9%
Calm: 0.3%
N
W
E
S
11.3%

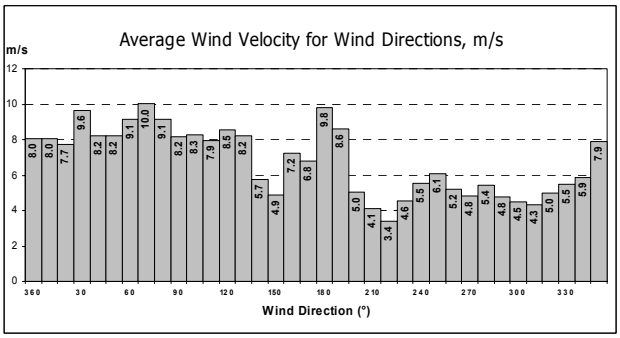

Average Wind Velocity for Wind Directions, m/s
m/s
Wind Direction (°)


Average Wind Velocity for Wind Directions, m/s
m/s
Wind Direction (°)

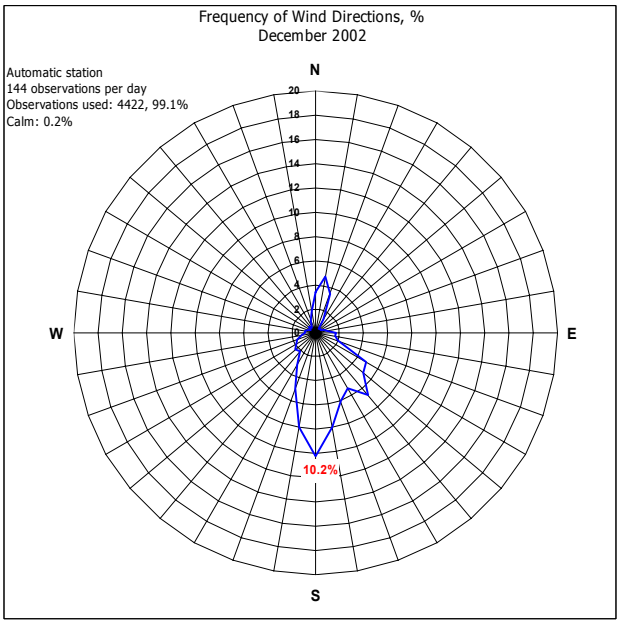

Frequency of Wind Directions, %
October 2002
Automatic station
144 observations per day
Observations used: 4384, 98.2%
Calm: 0.5%
N
W
E
S
6.2%

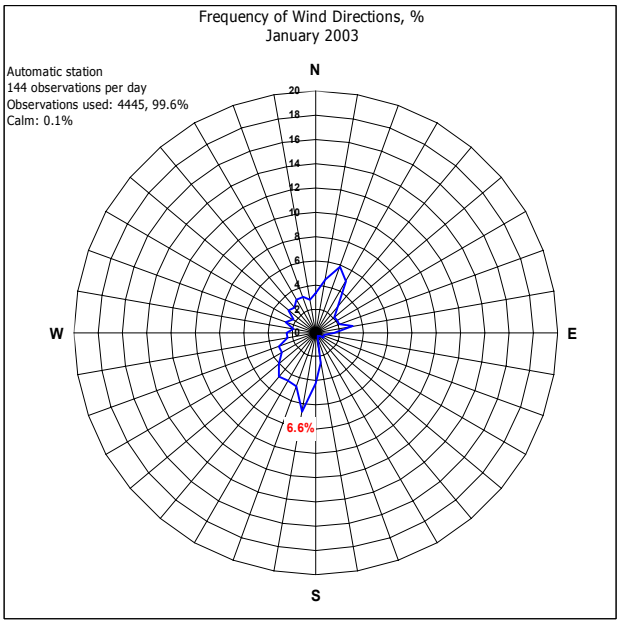

Frequency of Wind Directions, %
November 2002
Automatic station
144 observations per day
Observations used: 4284, 99.2%
Calm: 0.1%
N
W
E
S
9.40%

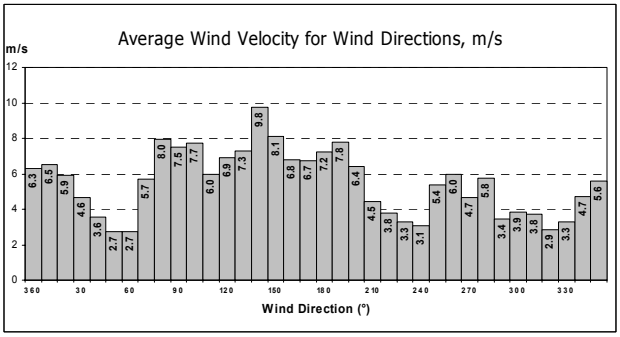

Average Wind Velocity for Wind Directions, m/s
m/s
Wind Direction (°)

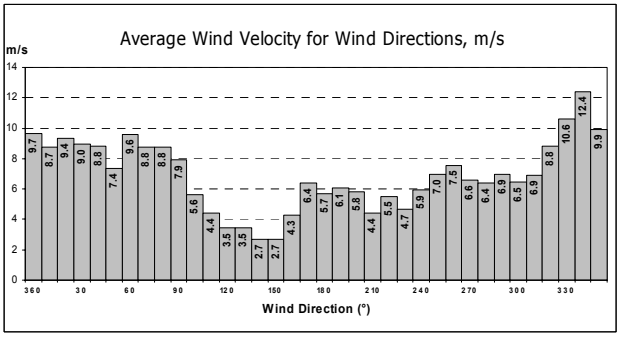

Average Wind Velocity for Wind Directions, m/s
m/s
Wind Direction (°)

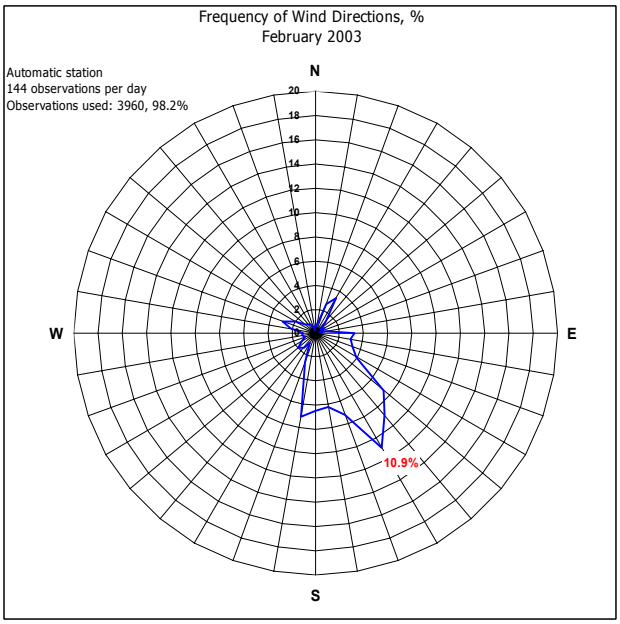
Seley

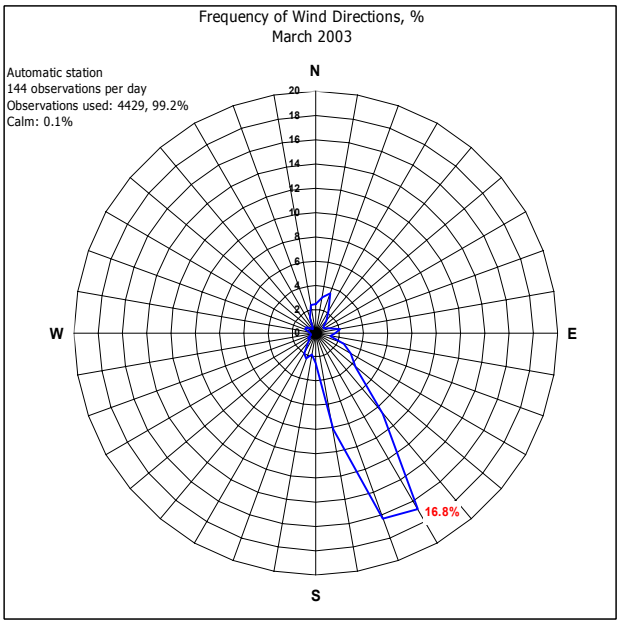


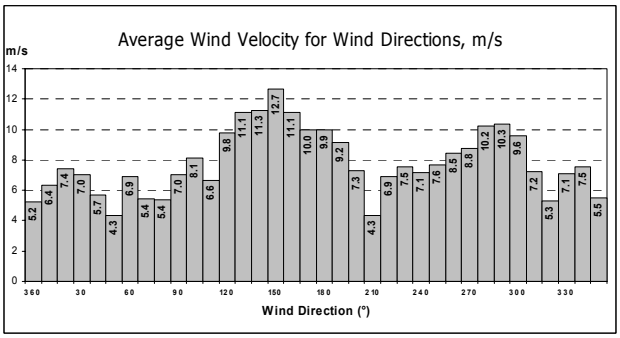


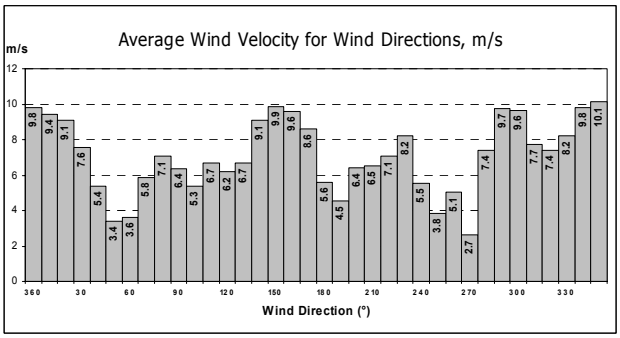






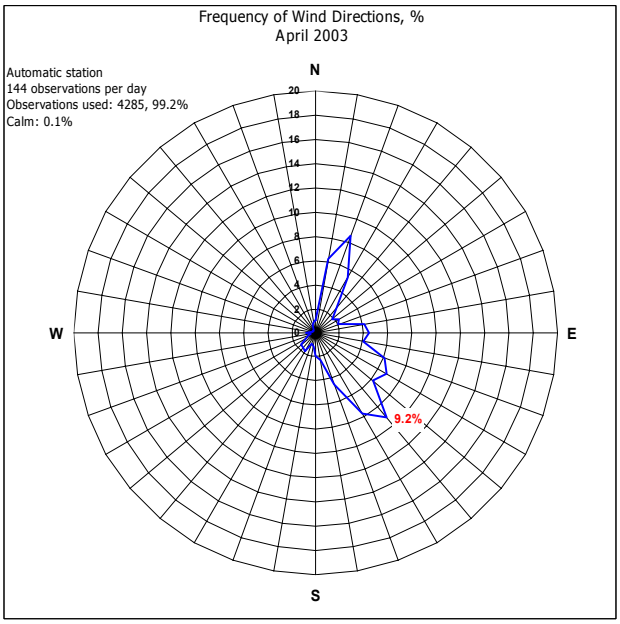


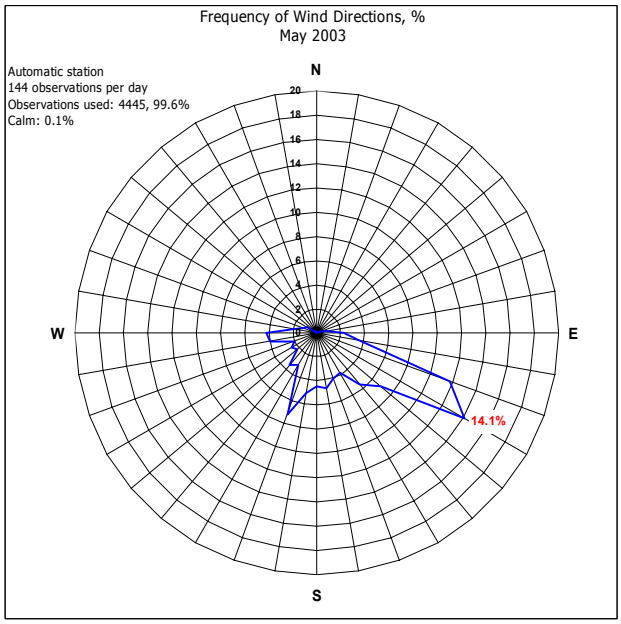


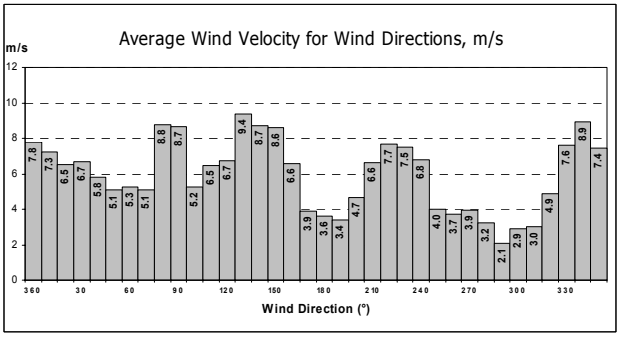


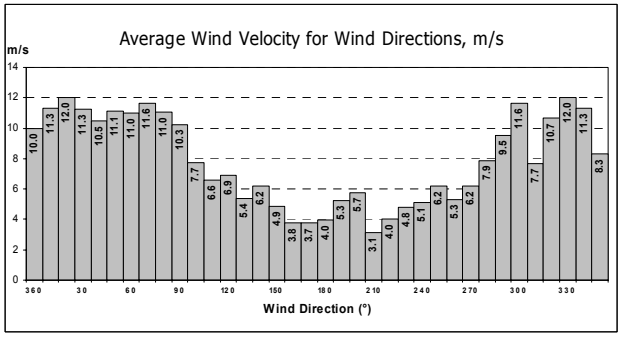
Annex 32

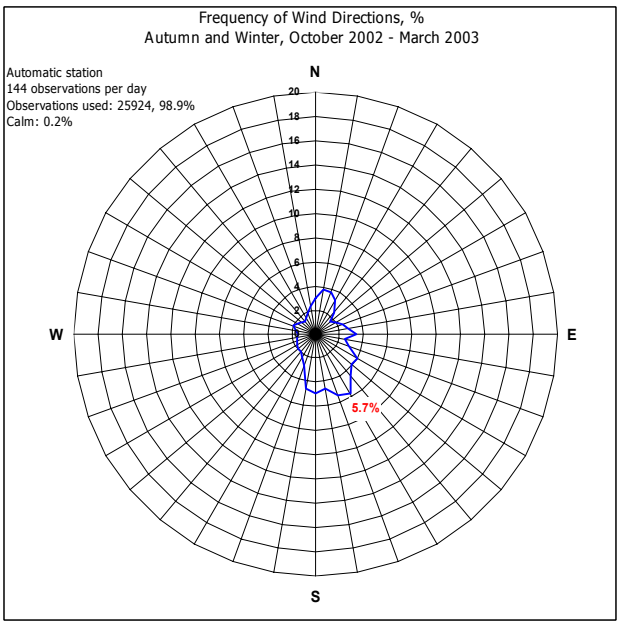
Seley

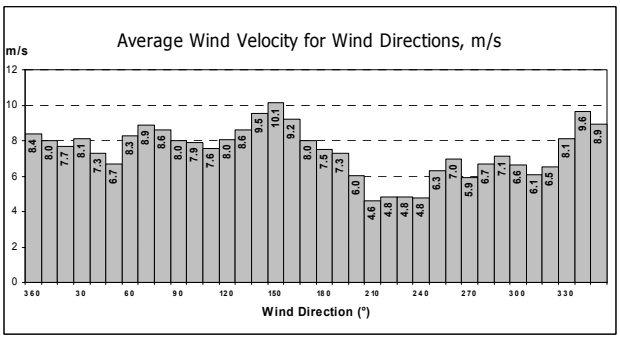






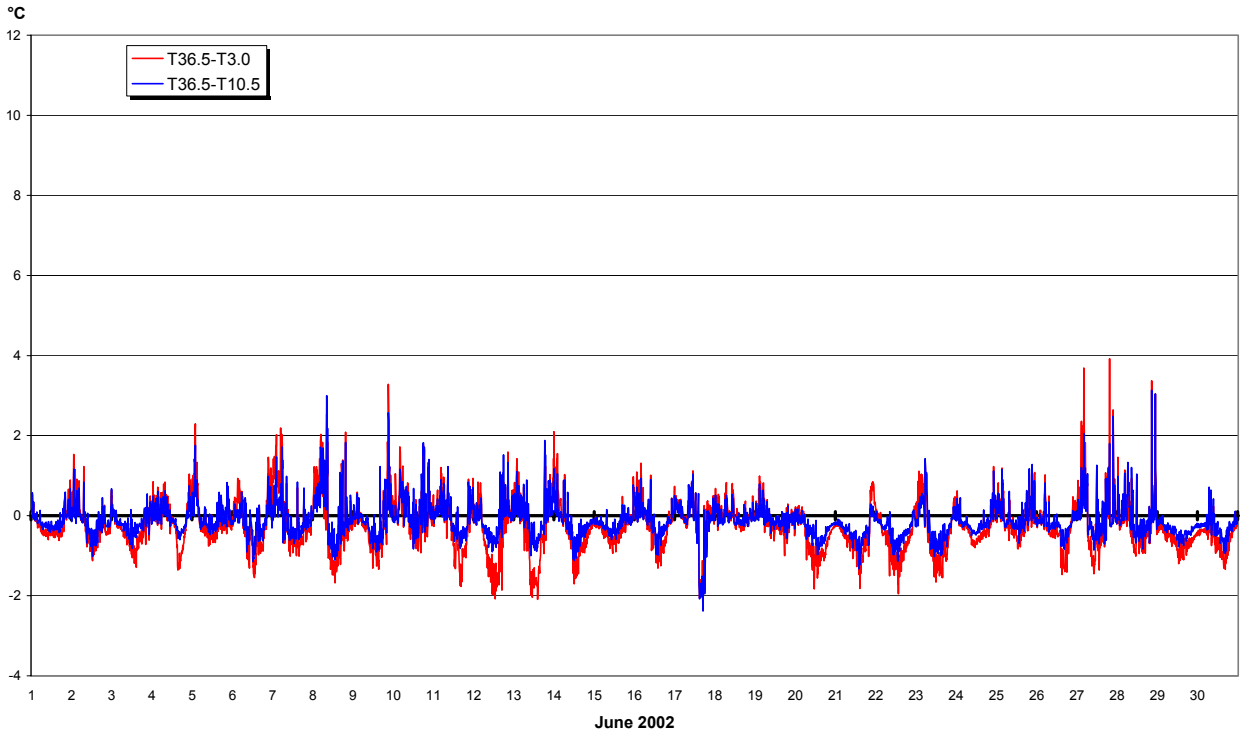


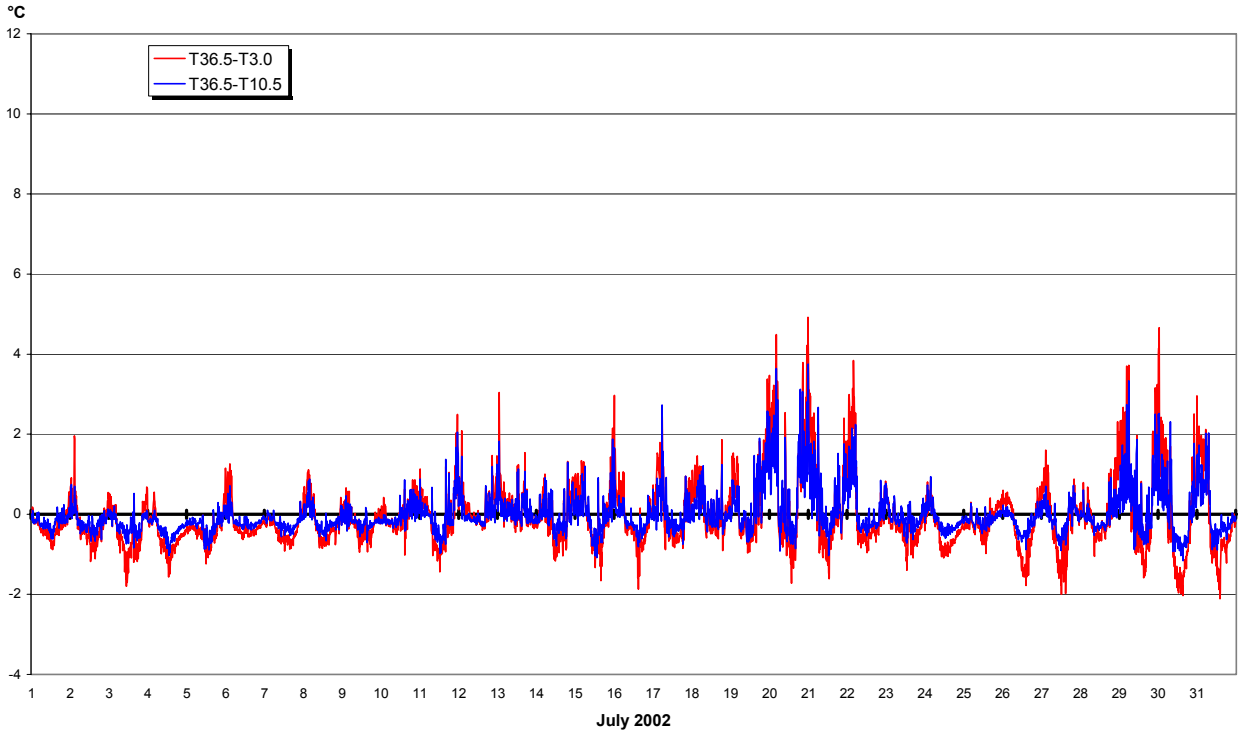




Annex 33

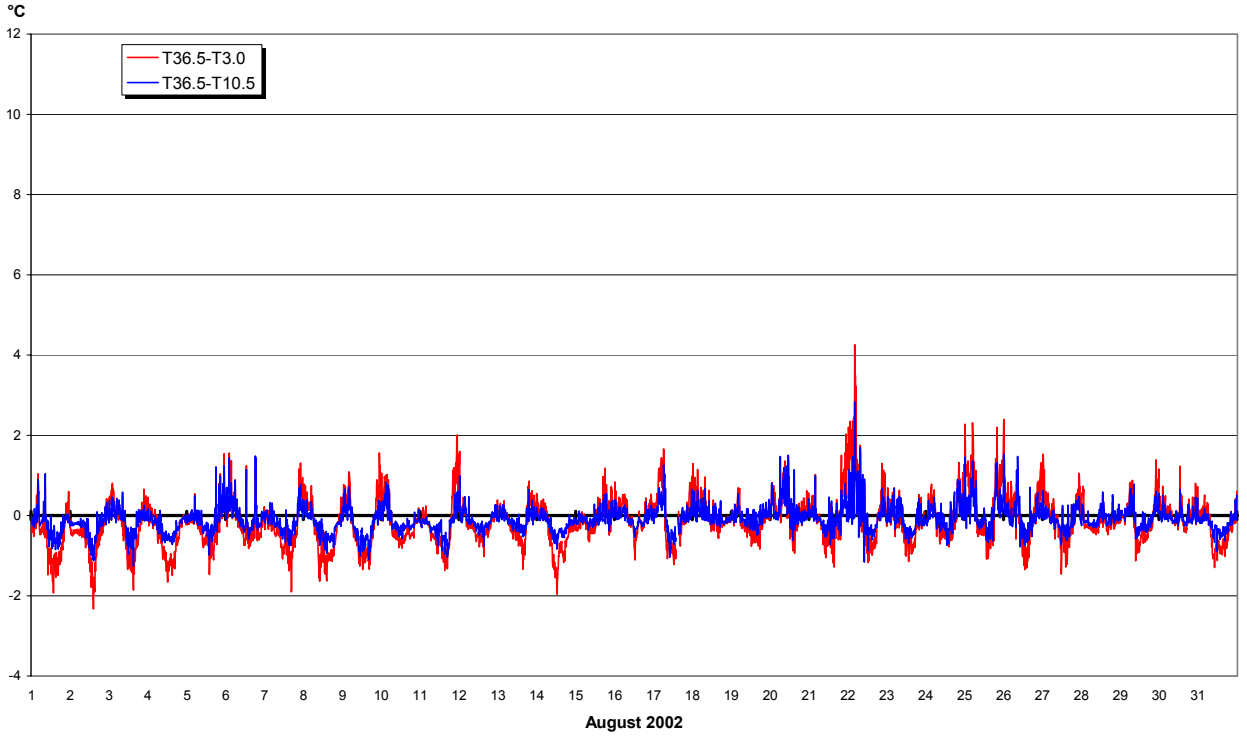
Sómastaðageröi, Vertical Temperature Gradient, °C

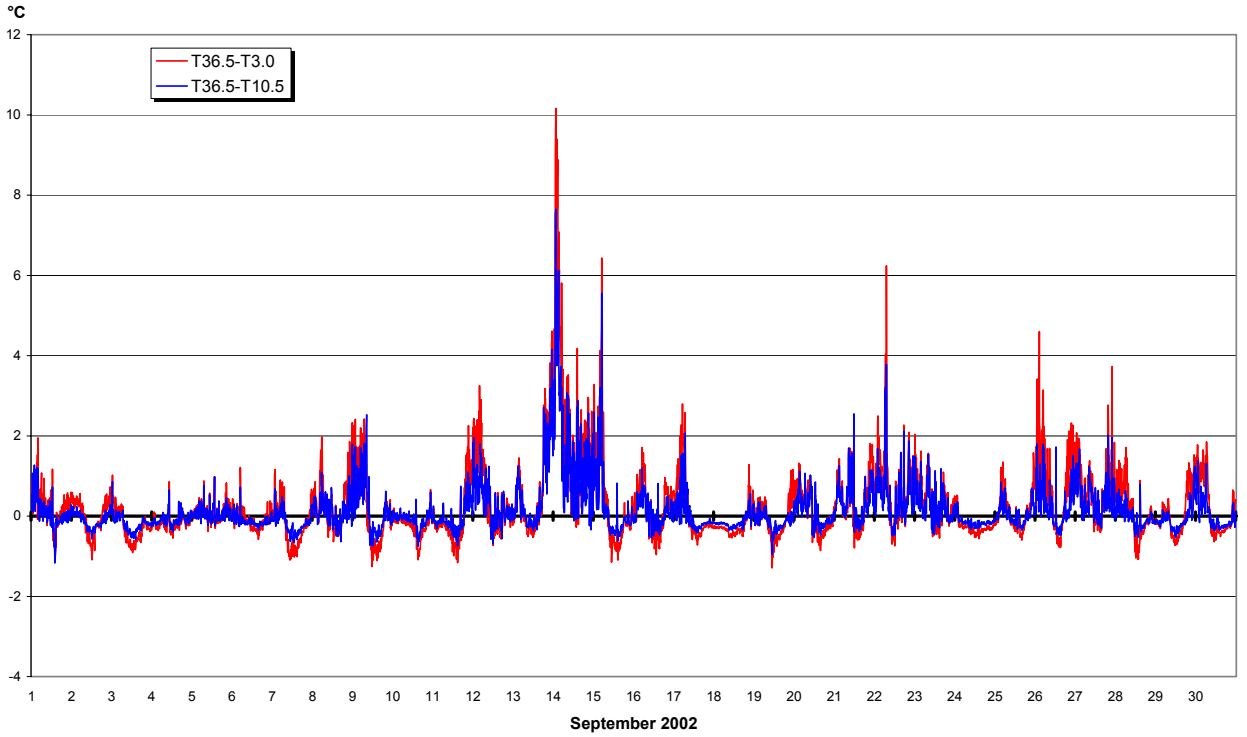




Annex 34

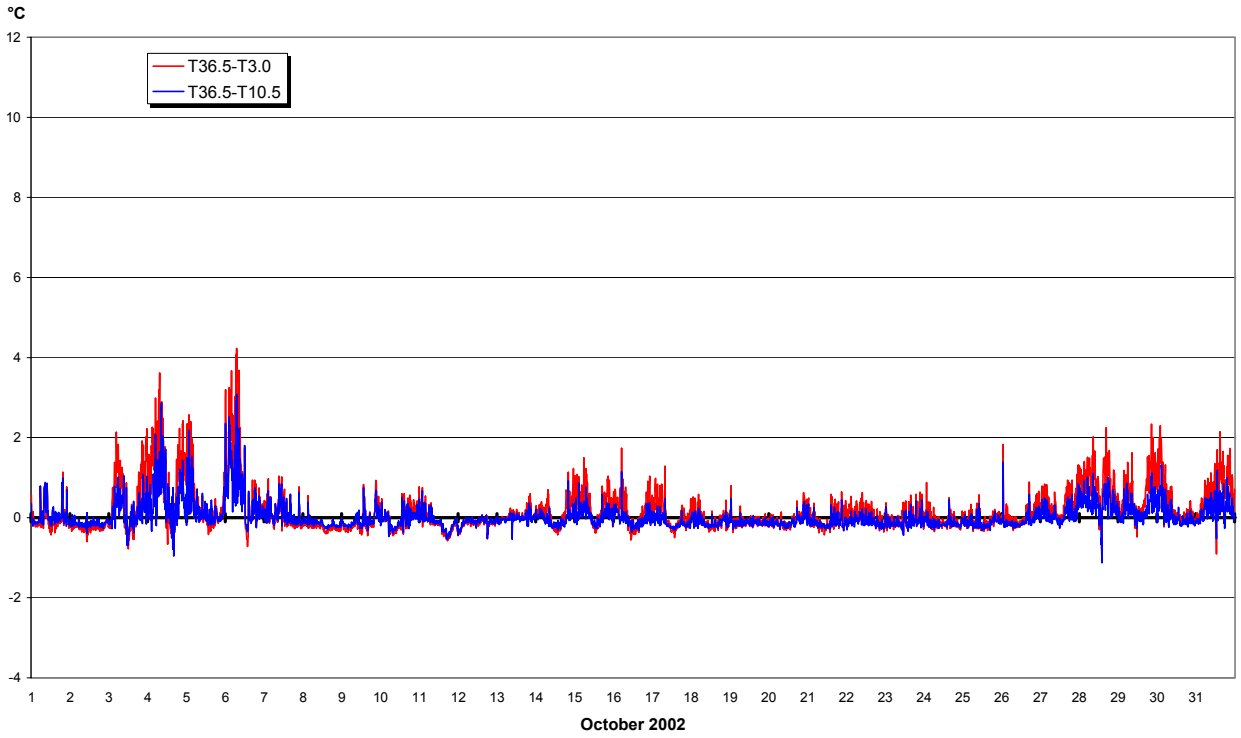
Sómastaðageröi, Vertical Temperature Gradient, °C

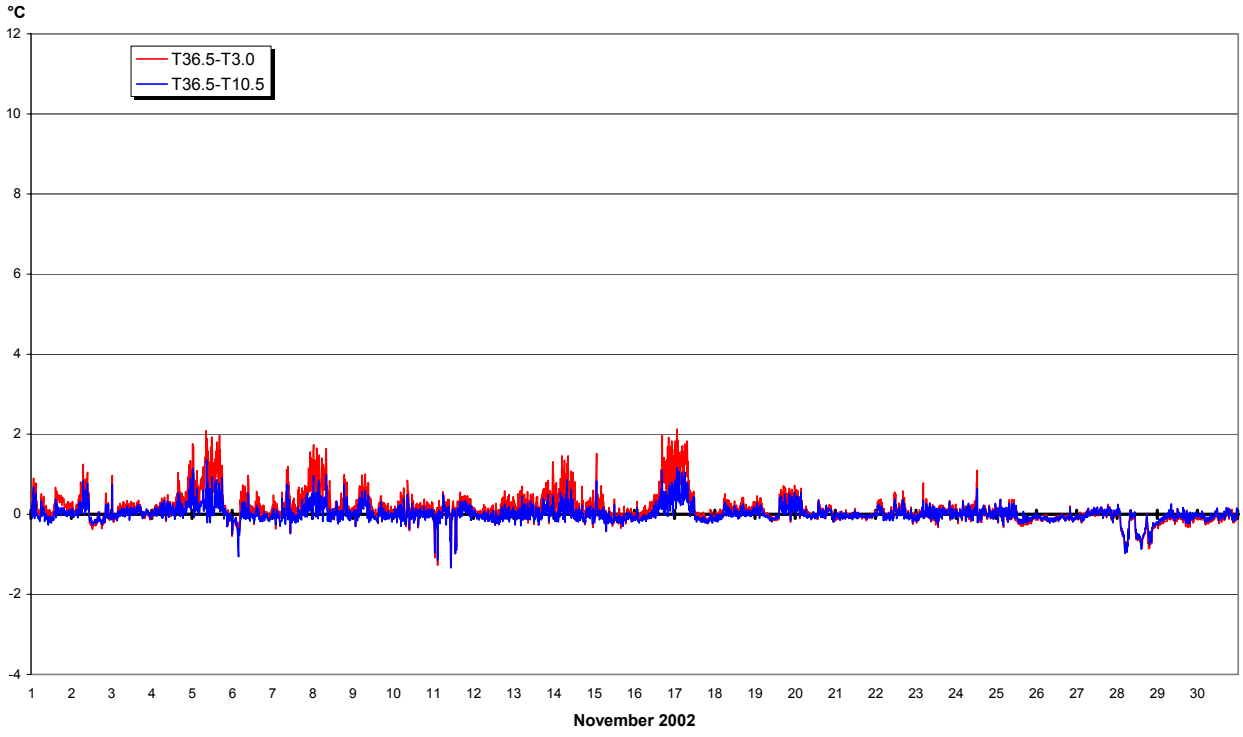




Annex 35

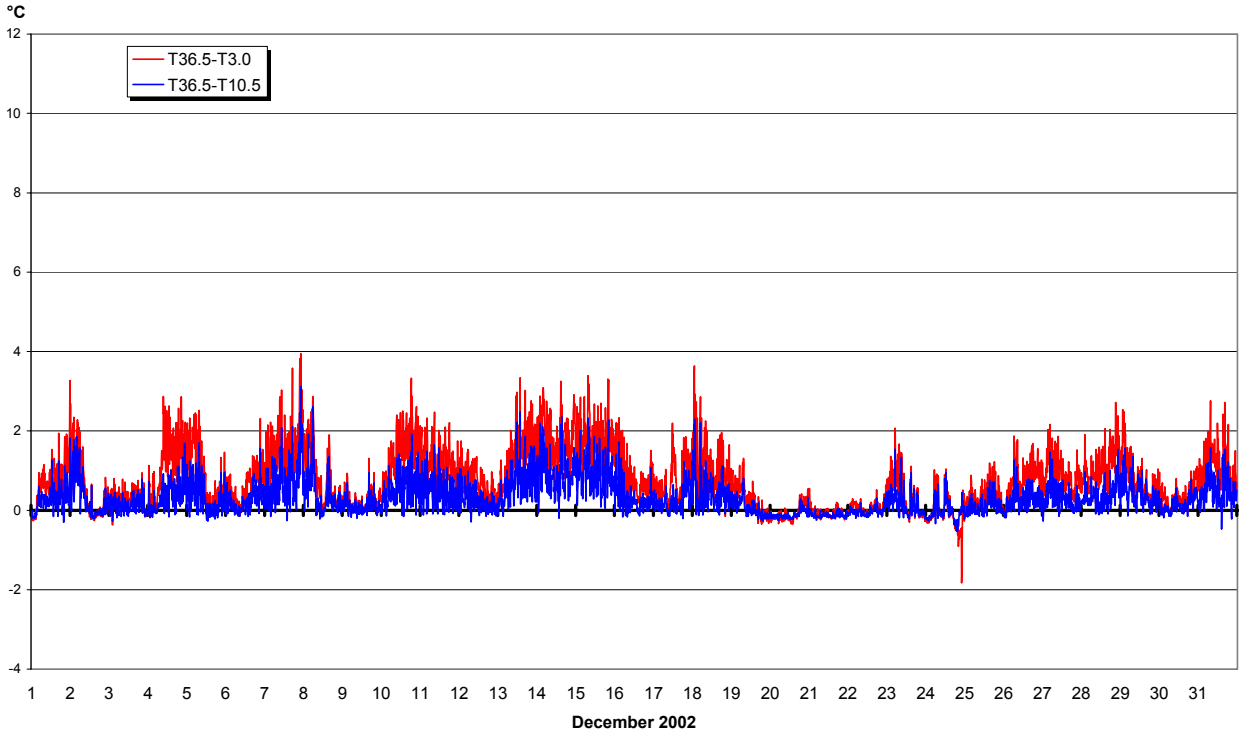
Sómastaðageröi, Vertical Temperature Gradient, °C

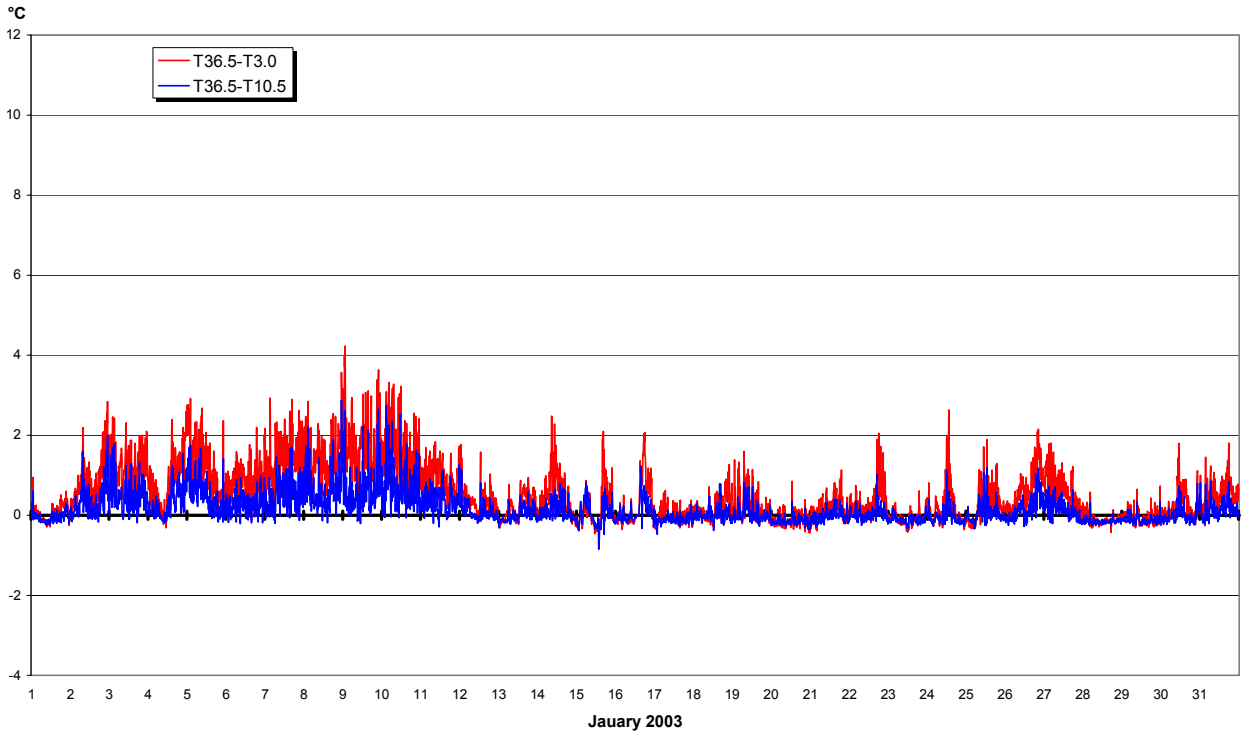




Annex 36

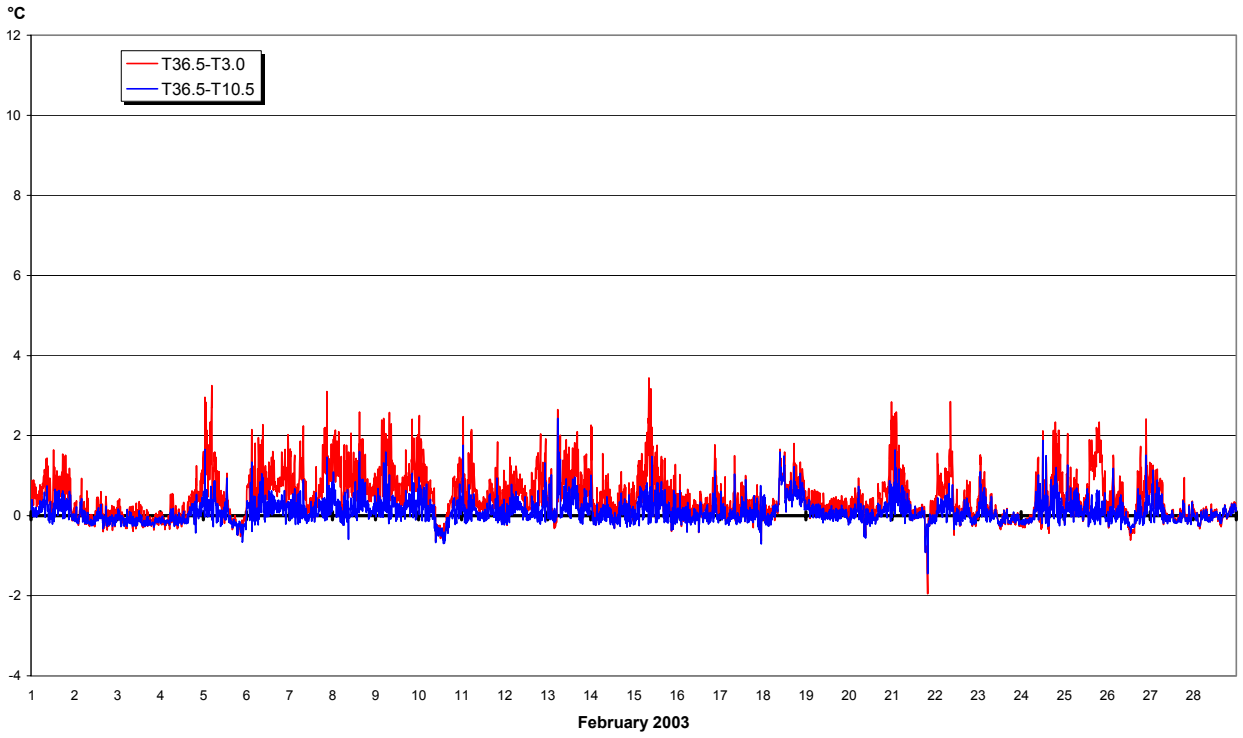
Sómastaðageröi, Vertical Temperature Gradient, °C

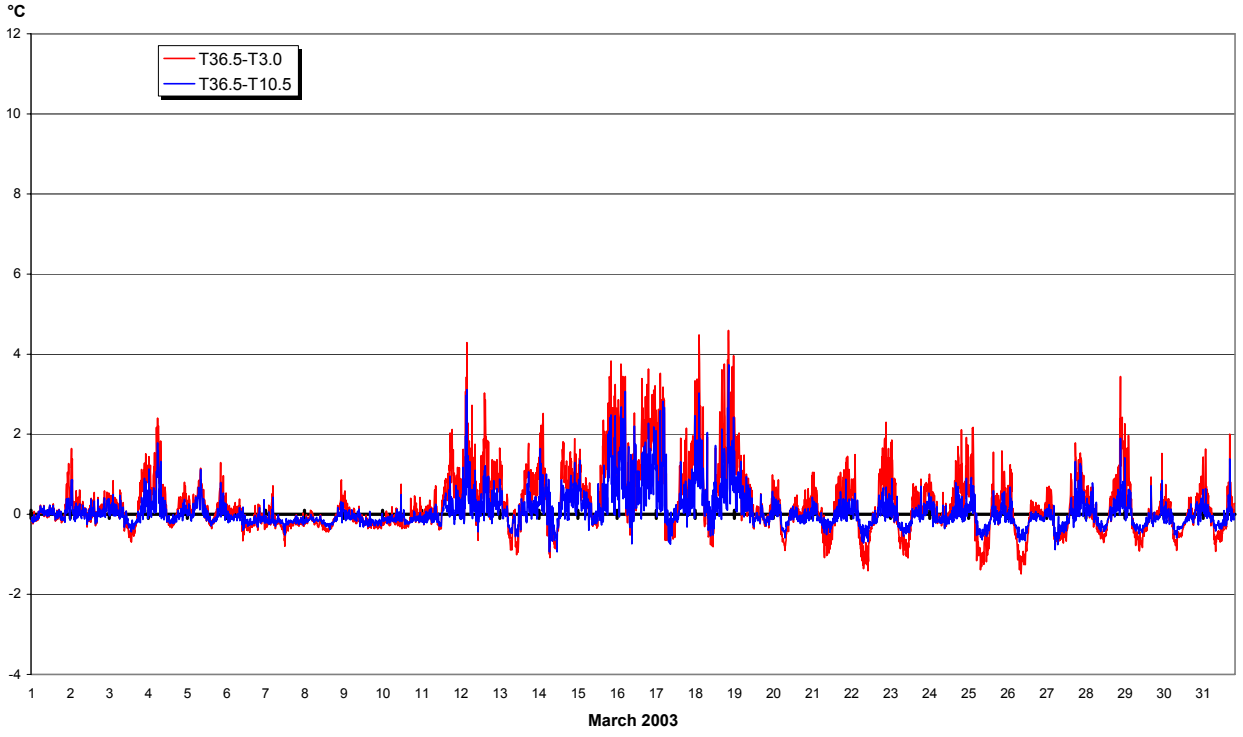




Annex 37

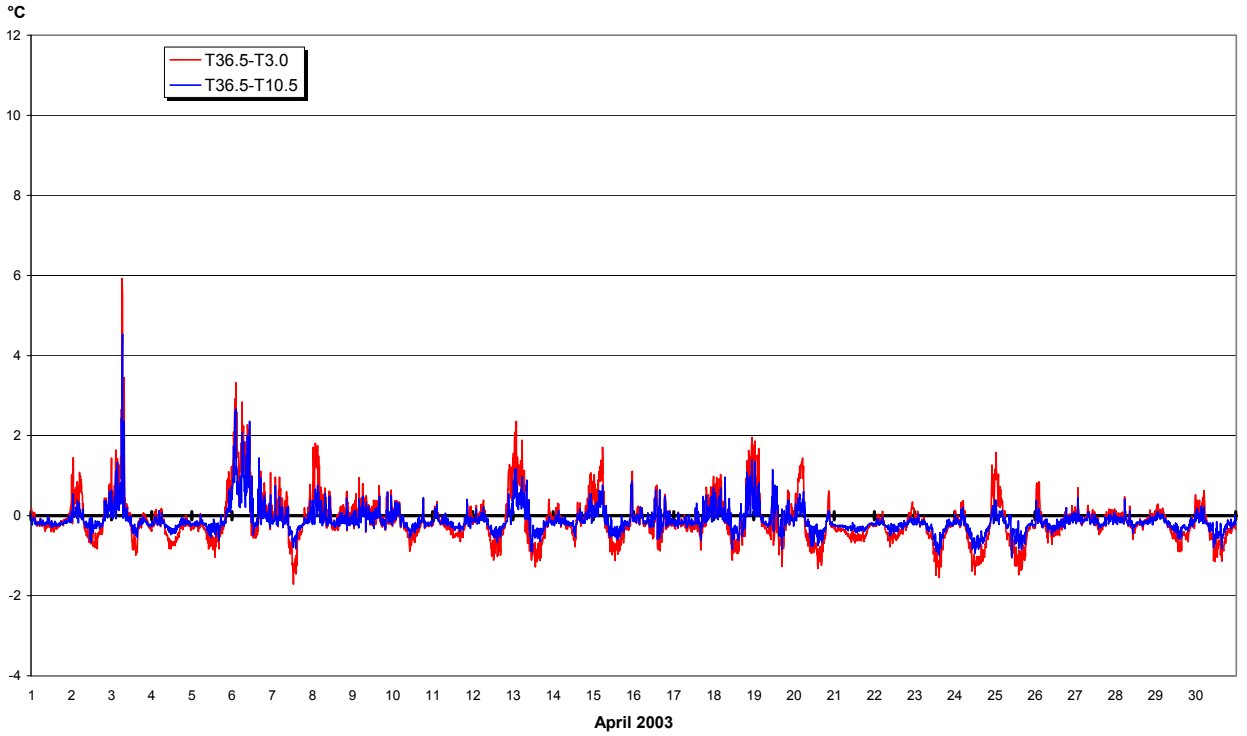
Sómastaðageröi, Vertical Temperature Gradient, °C

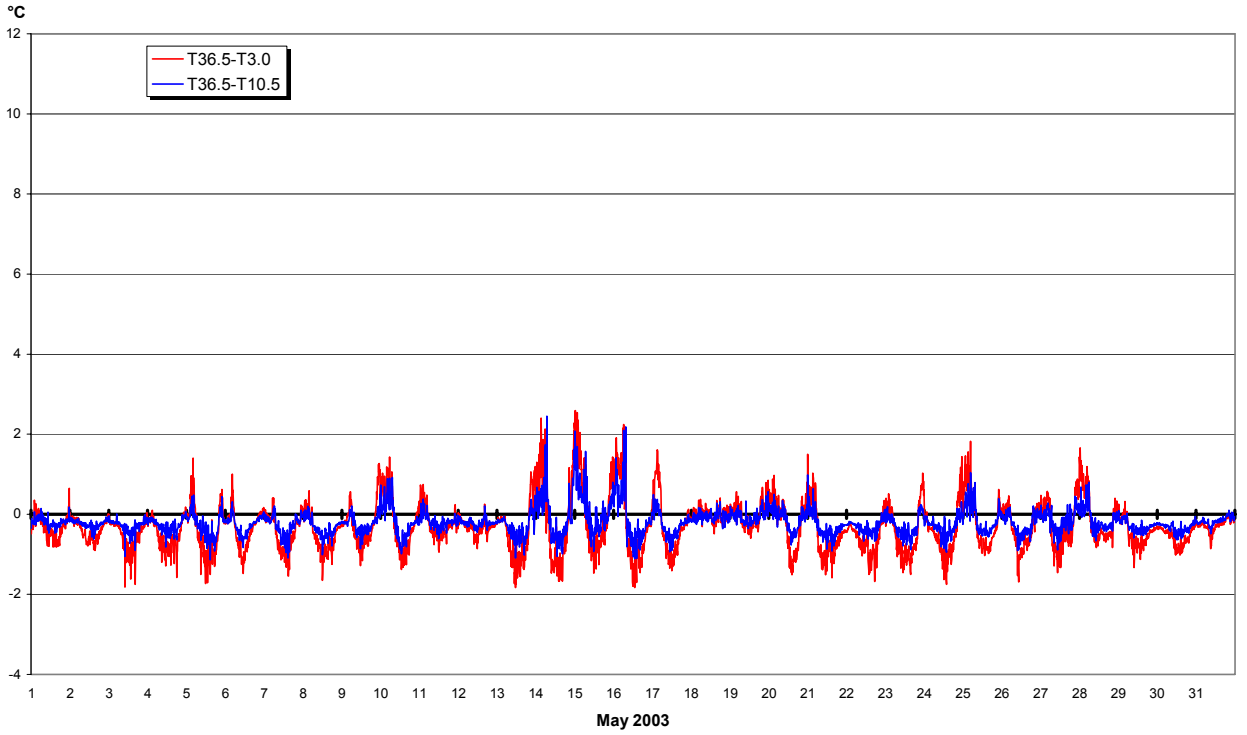




Annex 38

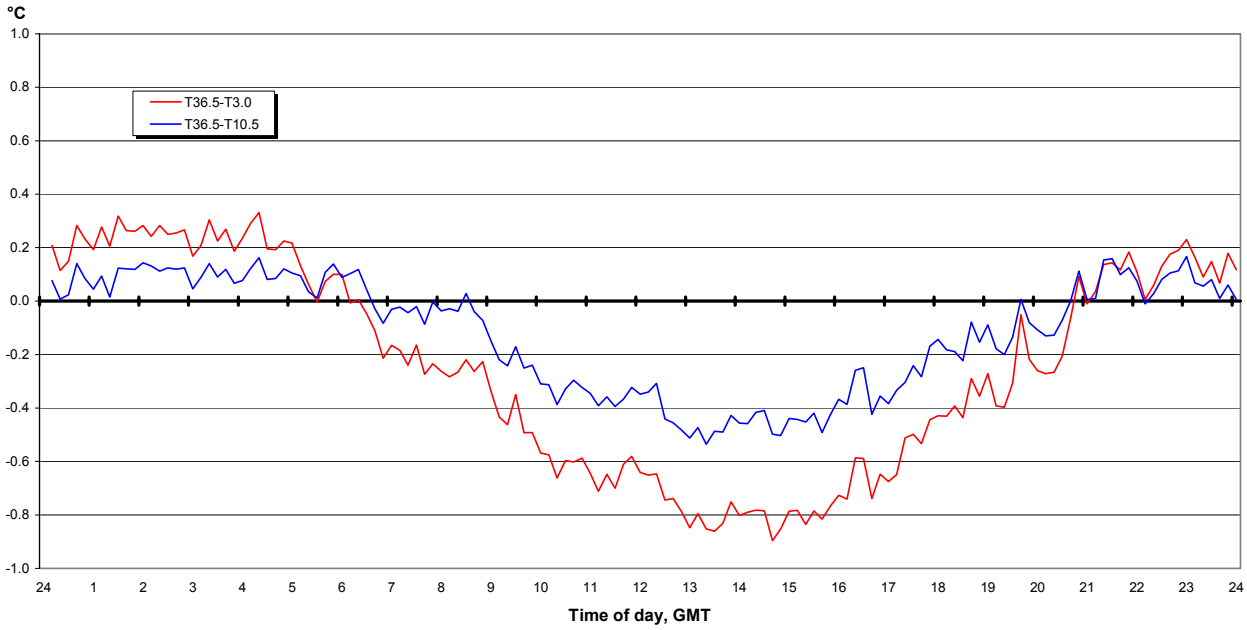
Sómastaðageröi, Vertical Temperature Gradient, °C



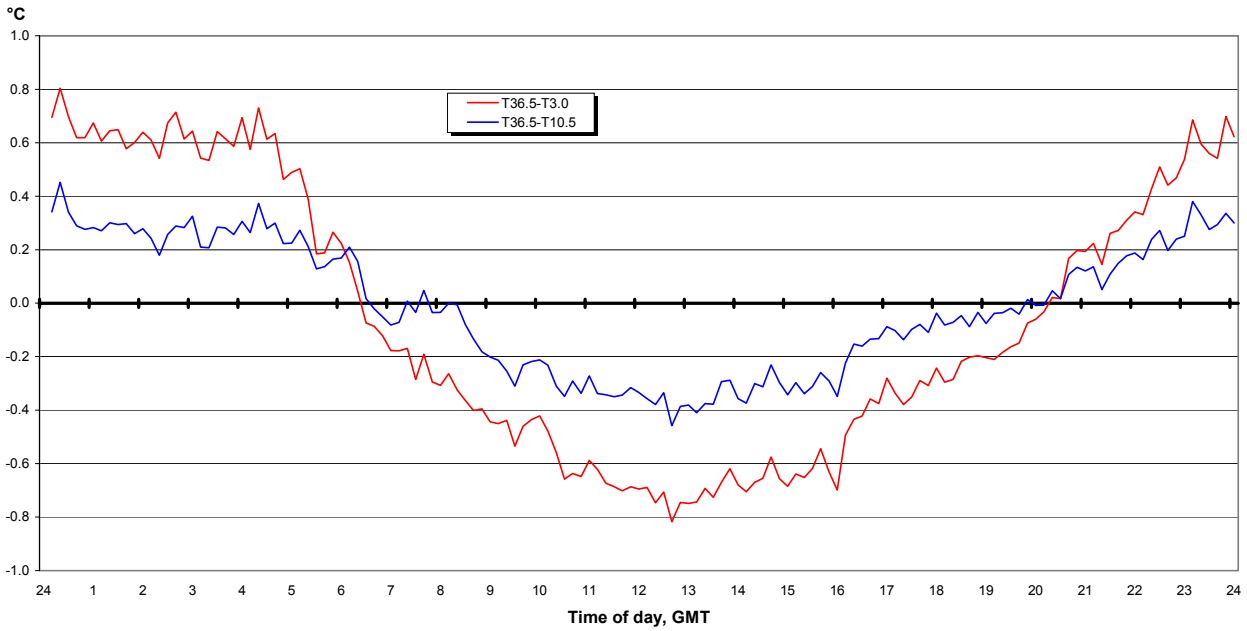


Annex 39

Sómastaðagerði
Average Vertical Temperature Gradient, °C
June 2002

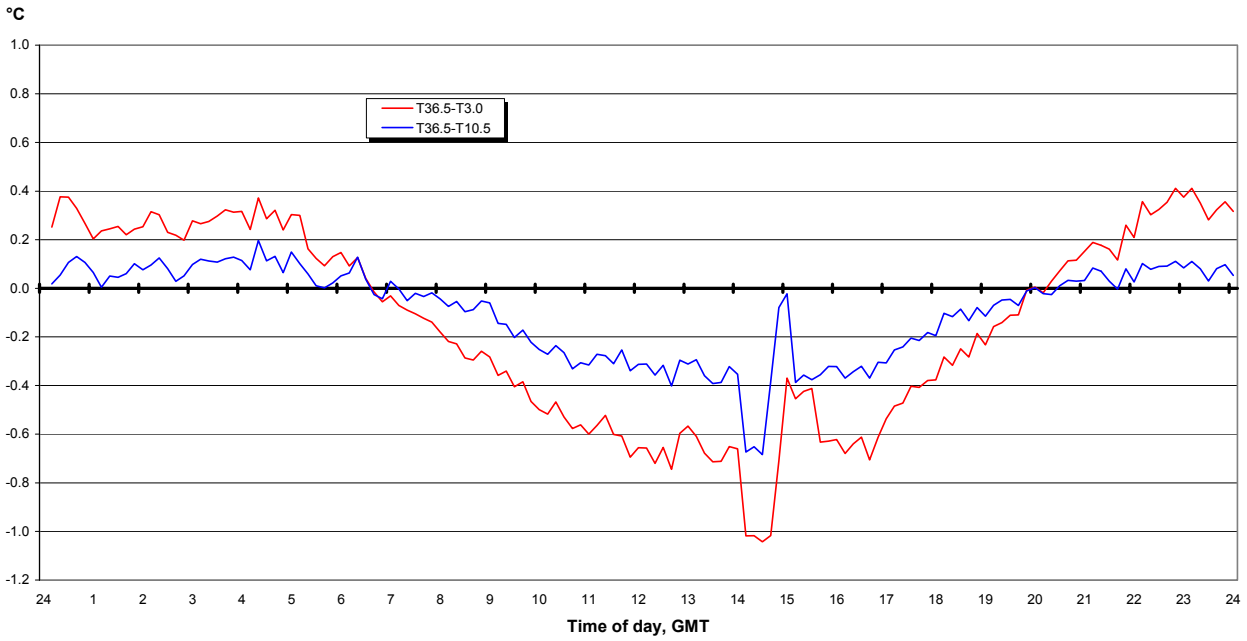


Sómastaðagerði
Average Vertical Temperature Gradient, °C
July 2002

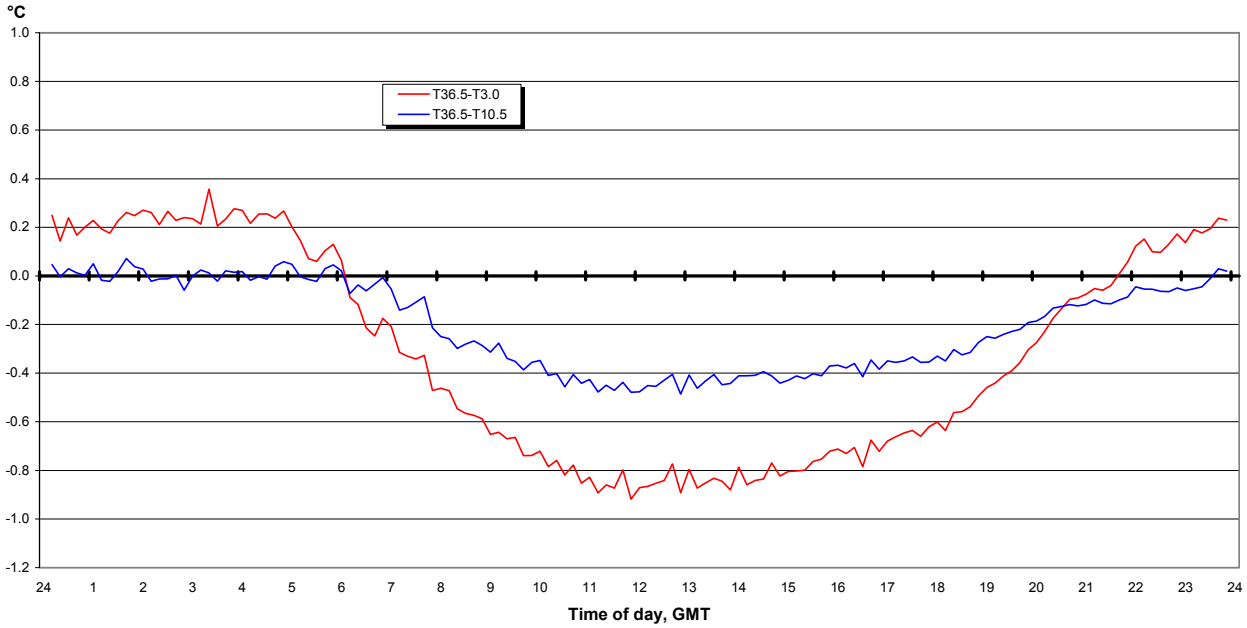


Annex 40

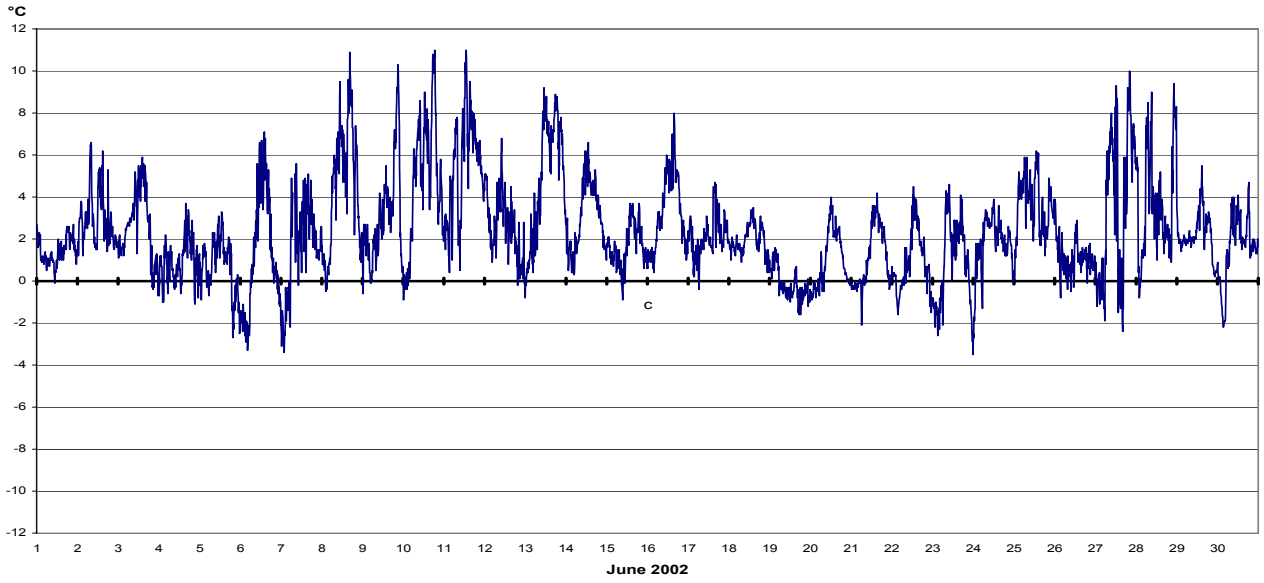
Sómastaðagerði
Average Vertical Temperature Gradient, °C
August 2002

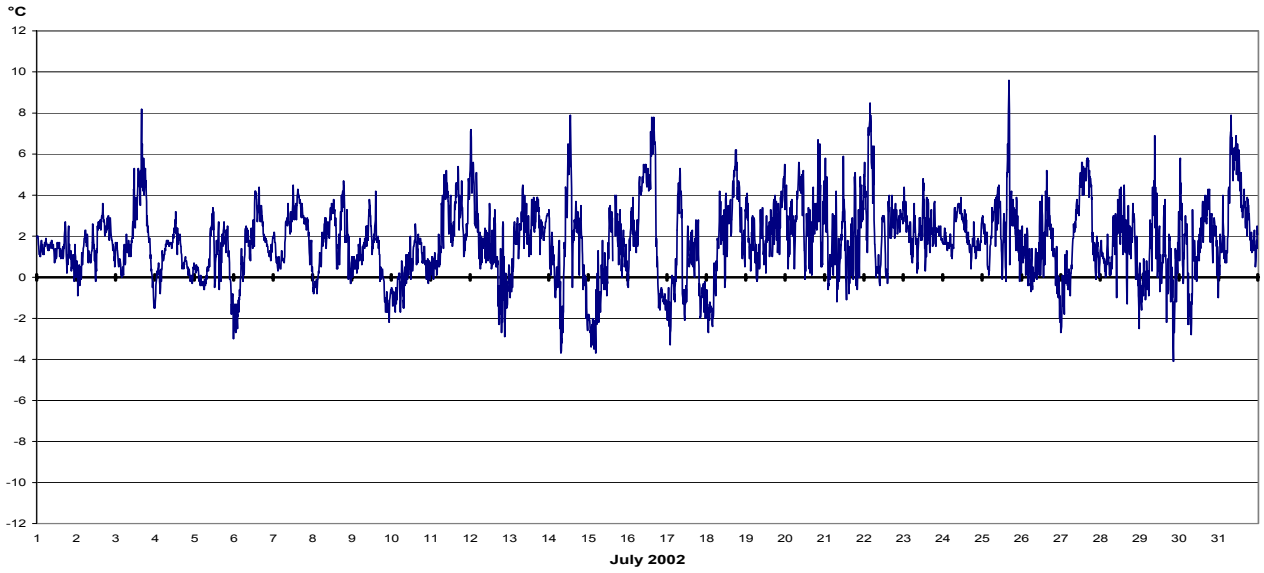


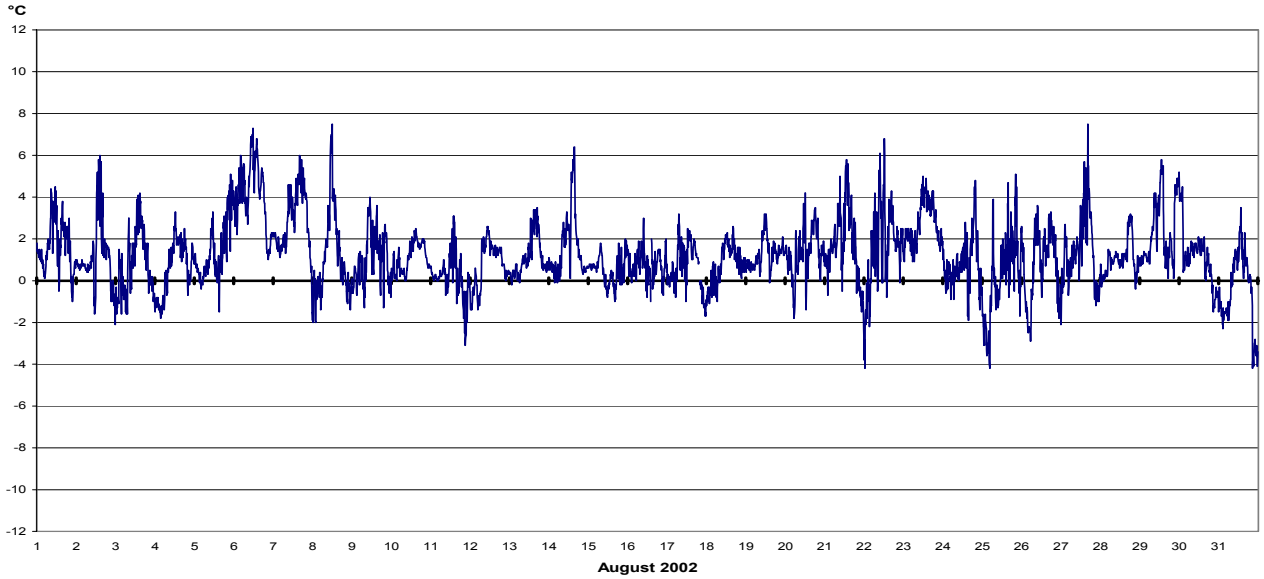
Sómastaðagerði
Average Vertical Temperature Gradient, °C
May 2003



Temperature Difference Kollaleira 2 – Vattarnes, °C

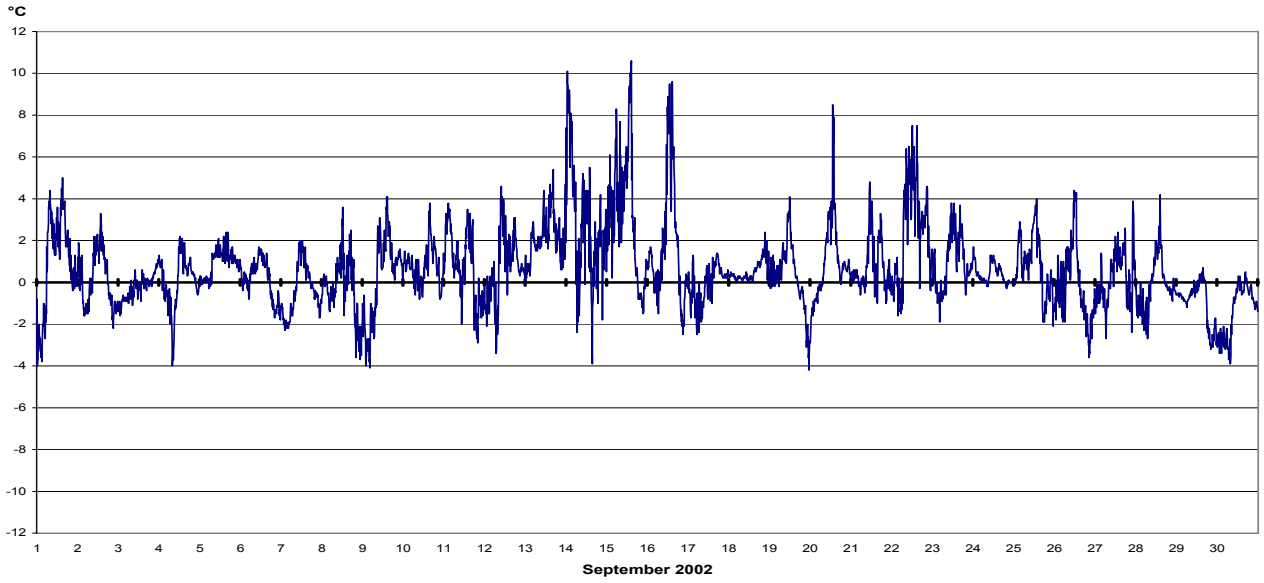


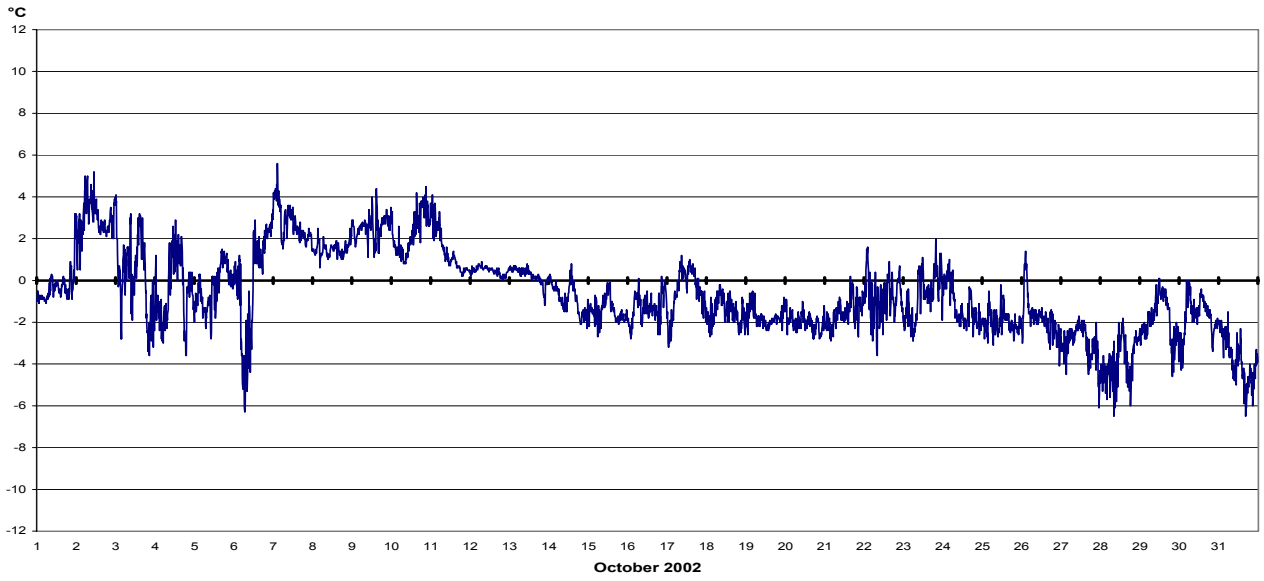


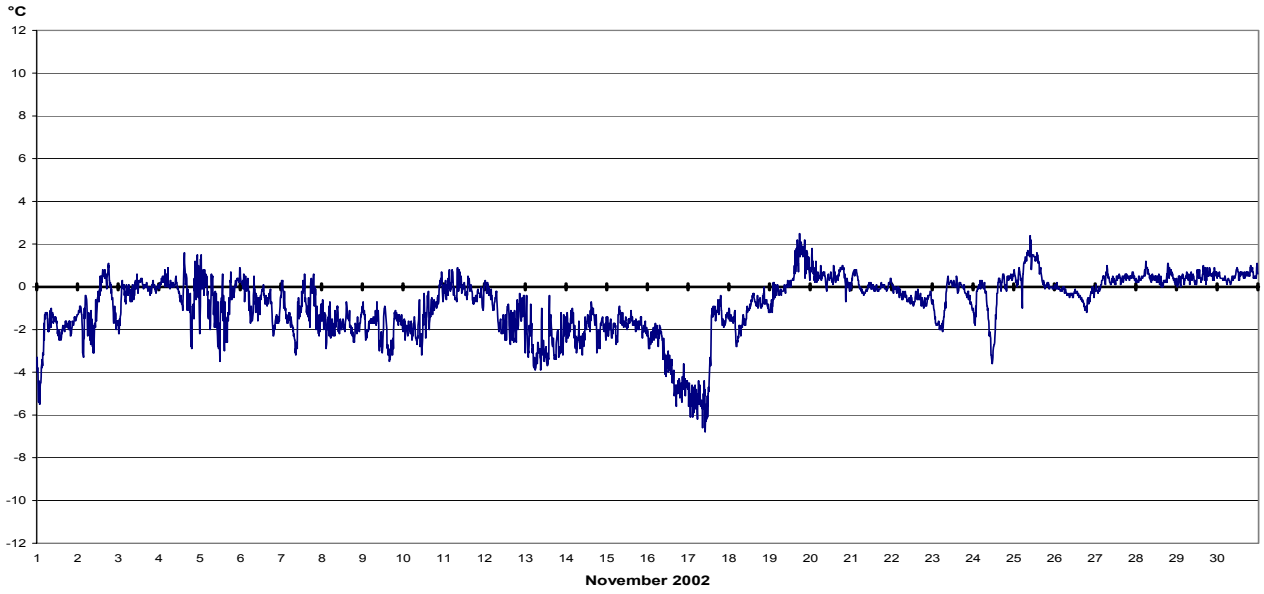


Annex 42

Temperature Difference Kollaleira 2 – Vattarnes, °C

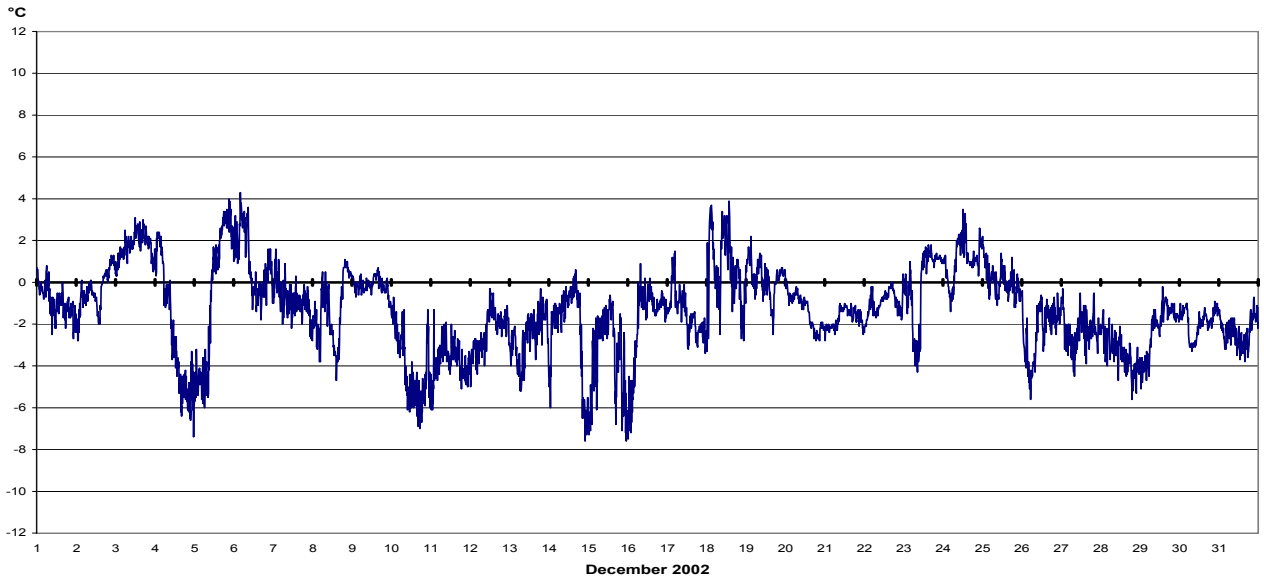


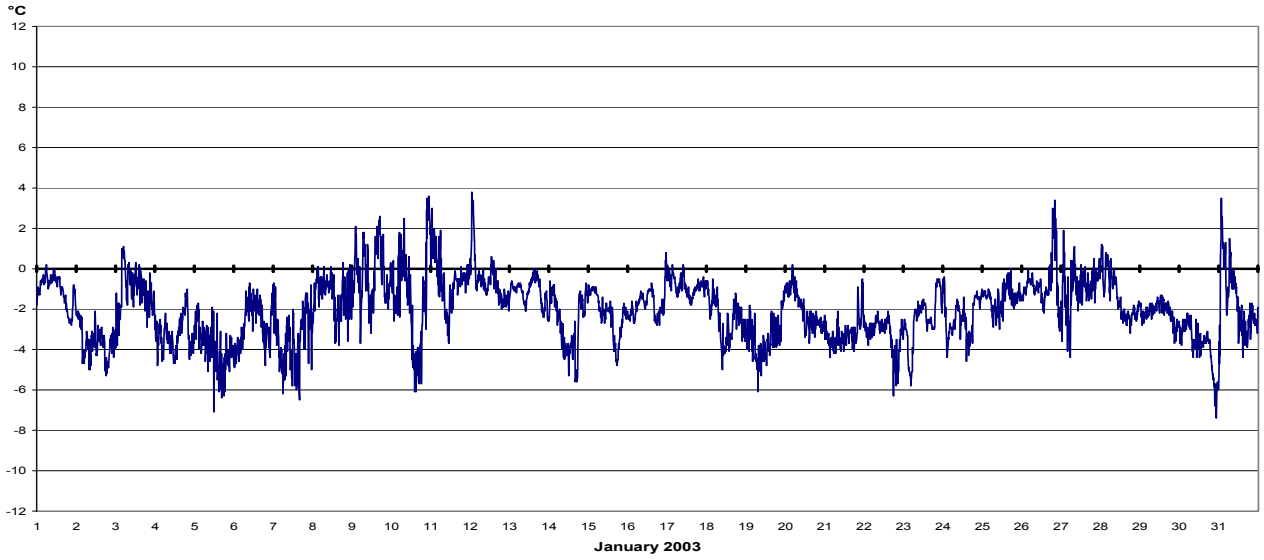


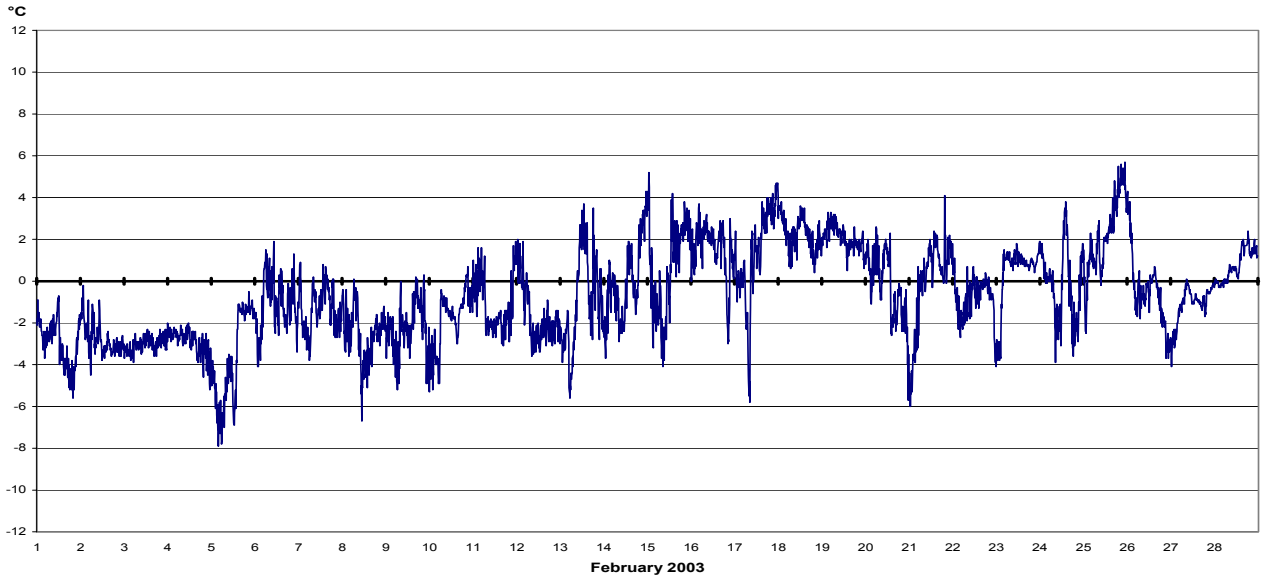


Annex 43

Temperature Difference Kollaleira 2 – Vattarnes, °C

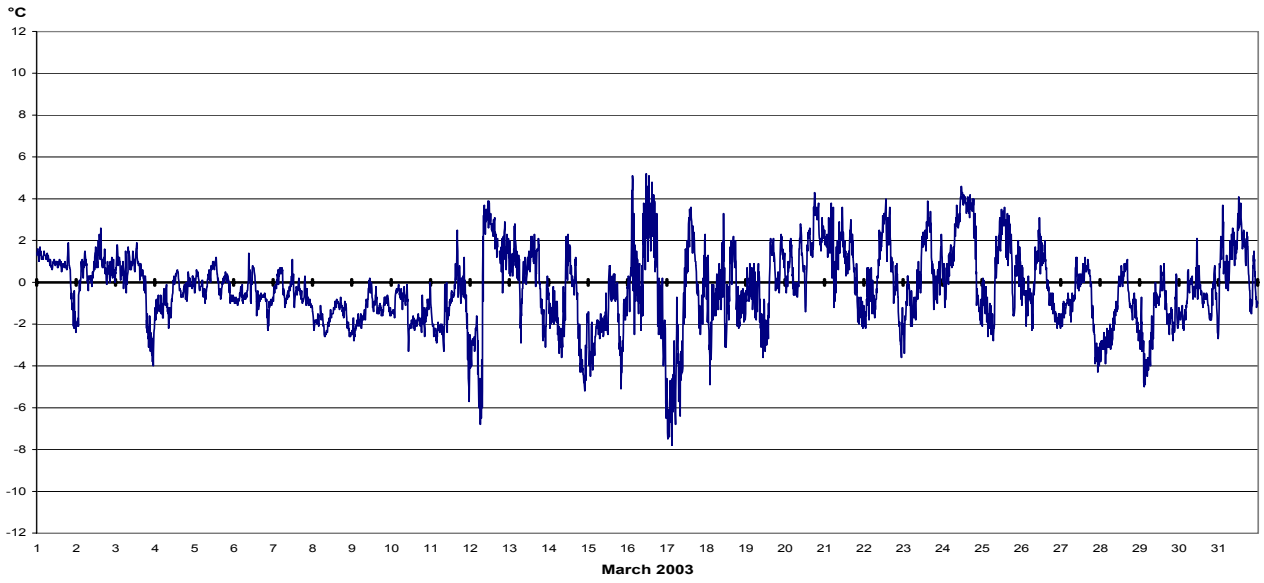


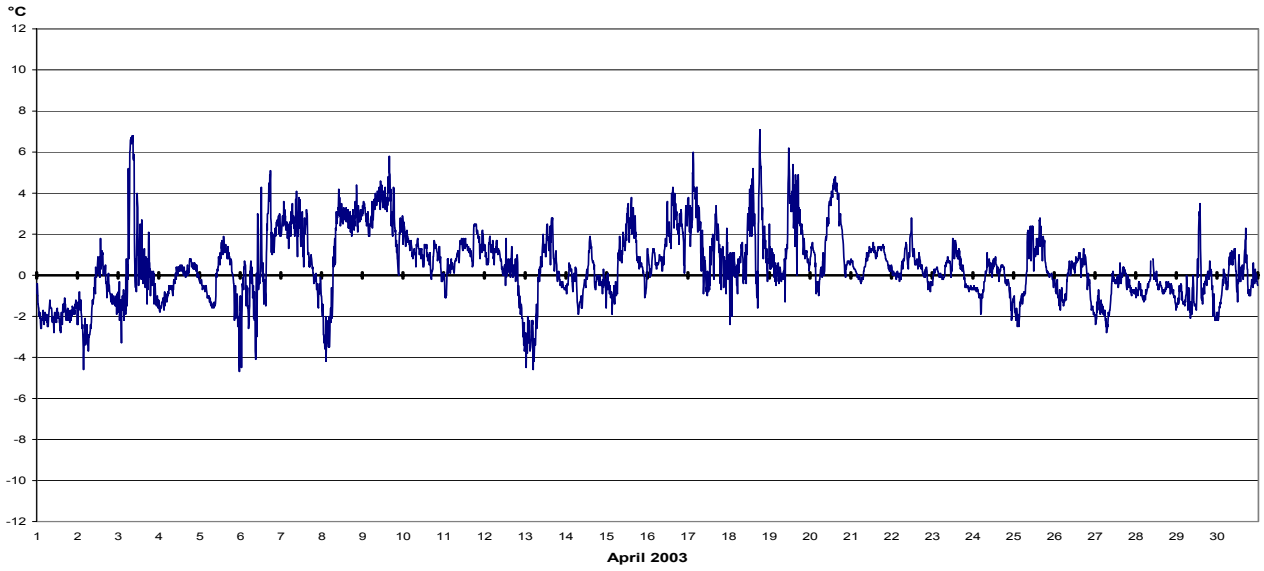


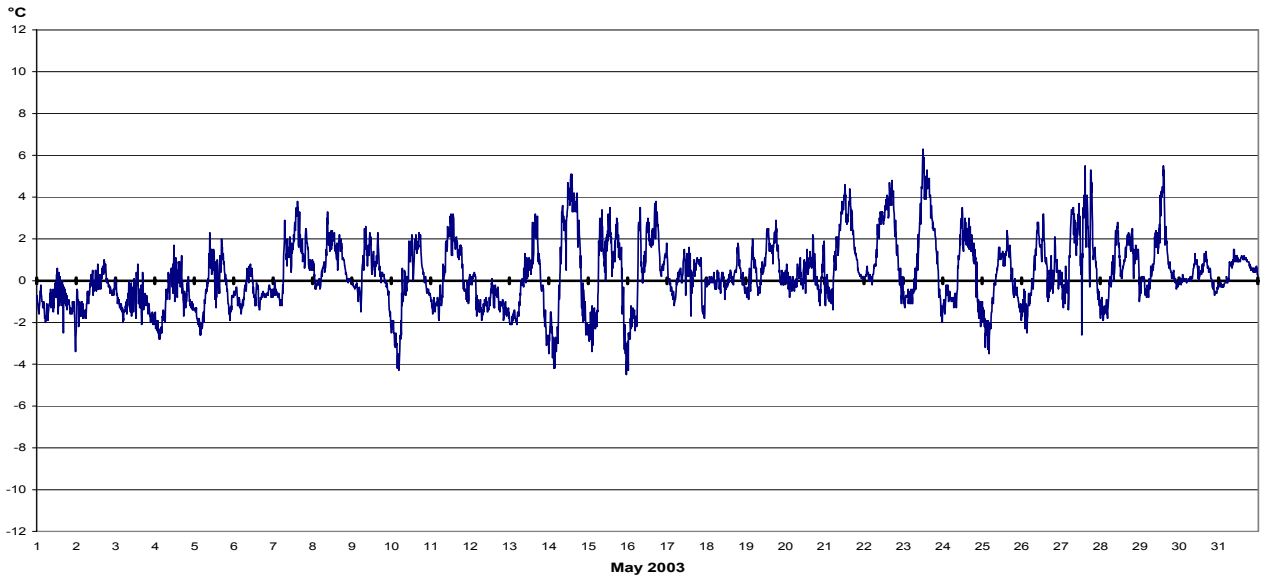


Annex 44

Temperature Difference Kollaleira 2 – Vattarnes, °C

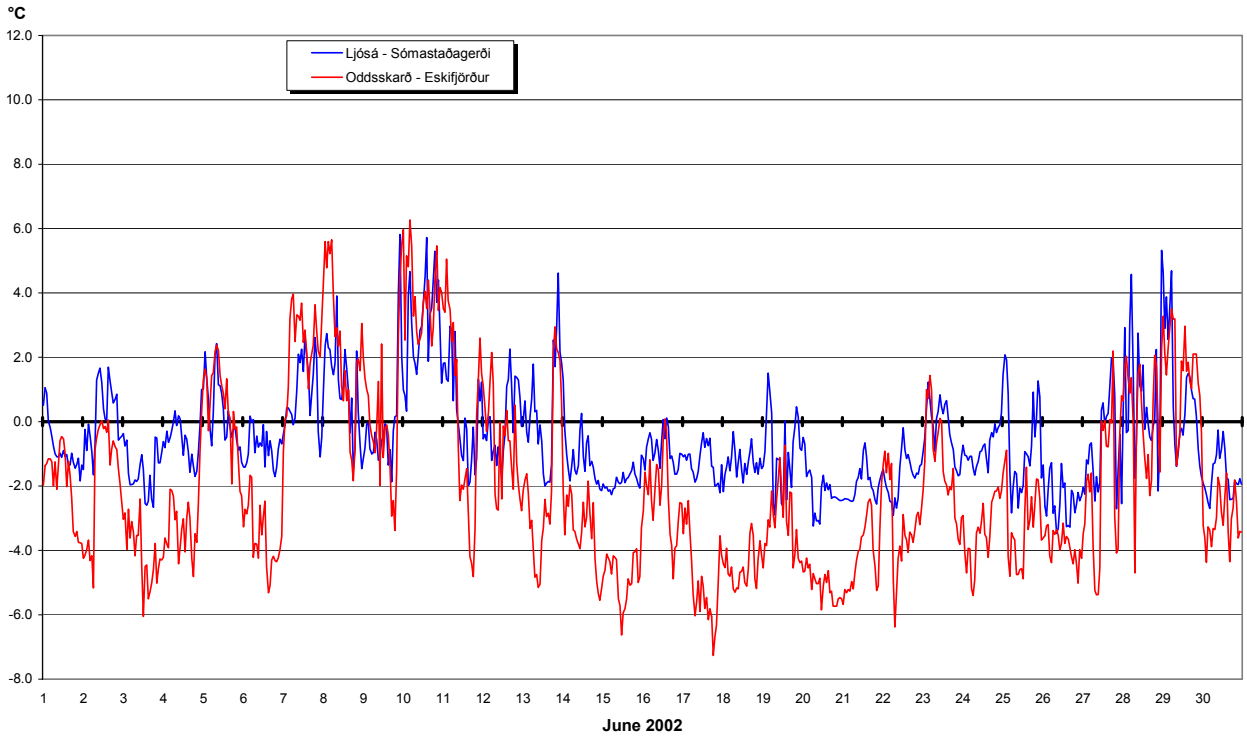


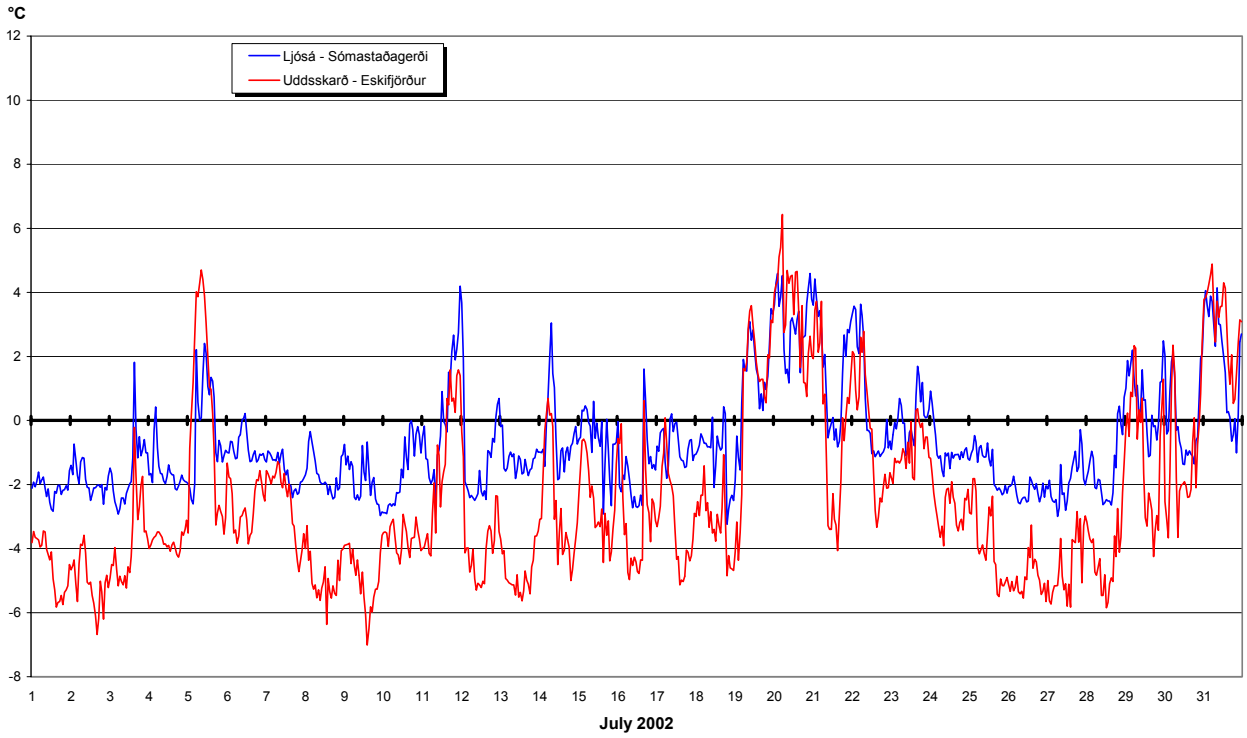




Annex 45

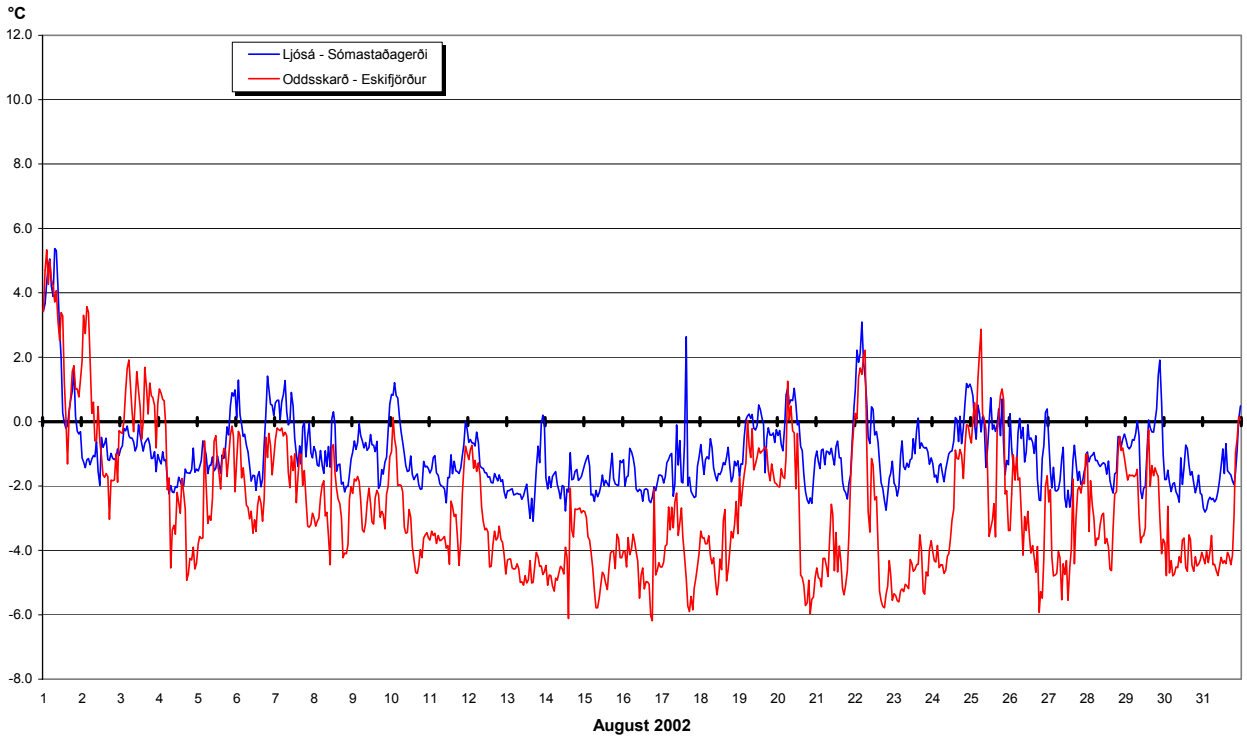
Temperature Difference, °C
Ljósá – Sómastaðagerði and Oddsskarð – Eskifjörður

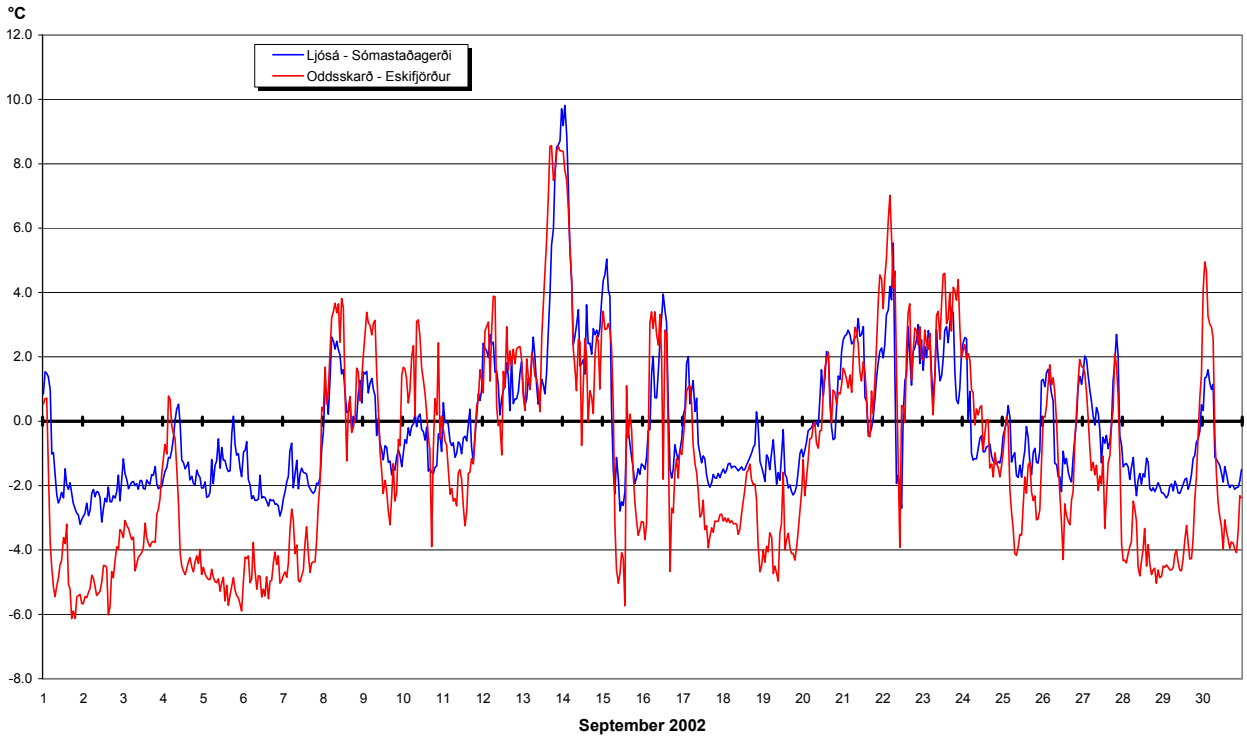




Annex 46

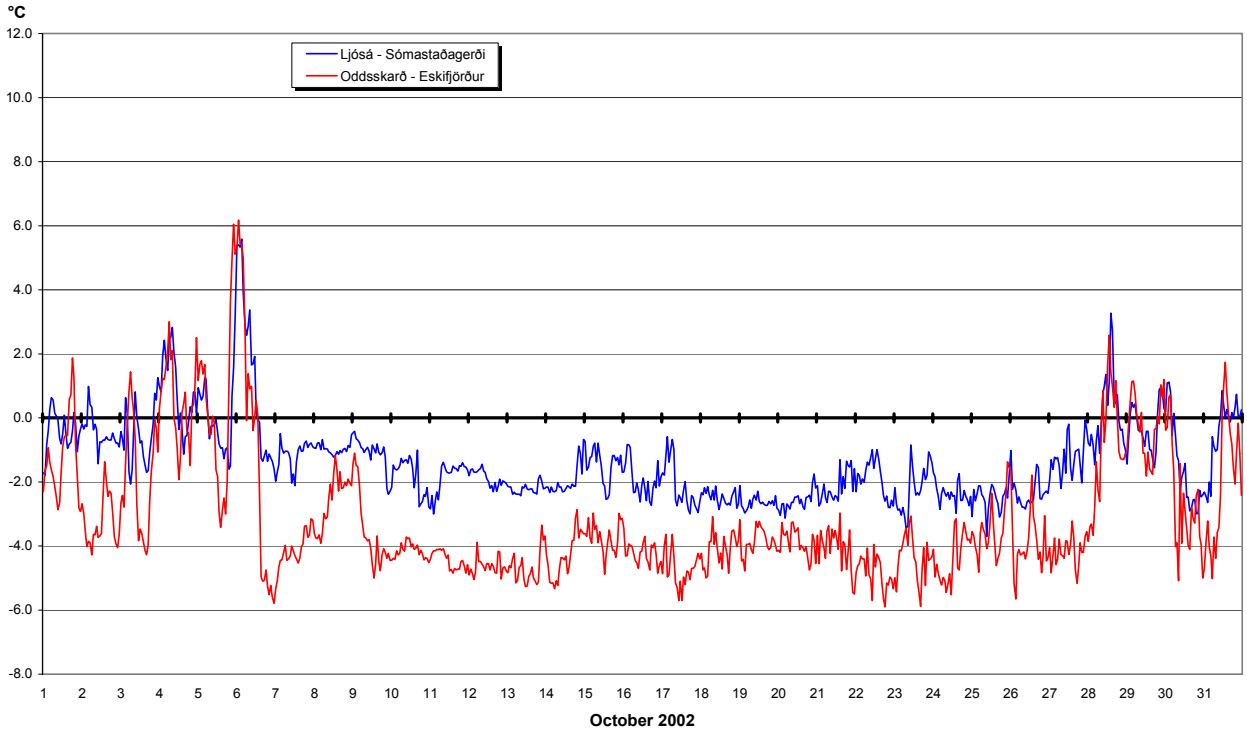
Temperature Difference, °C
Ljósá – Sómastaðagerði and Oddsskarð – Eskifjörður

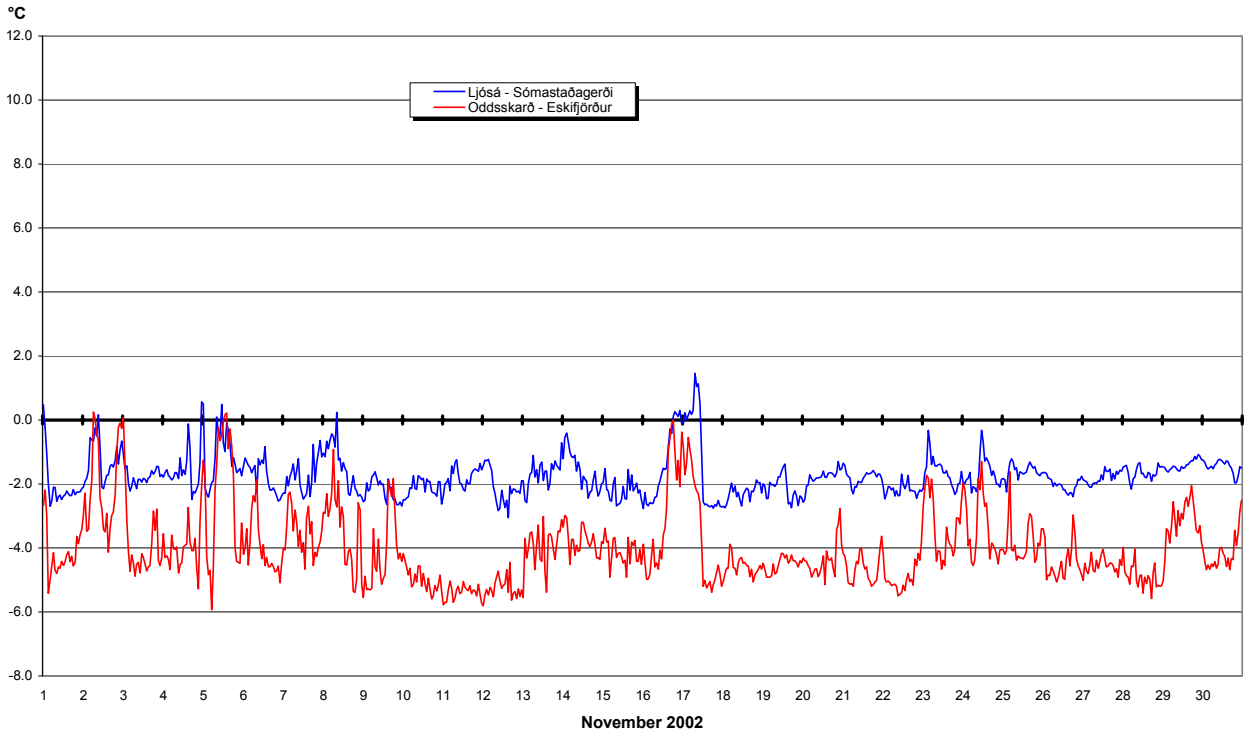




Annex 47

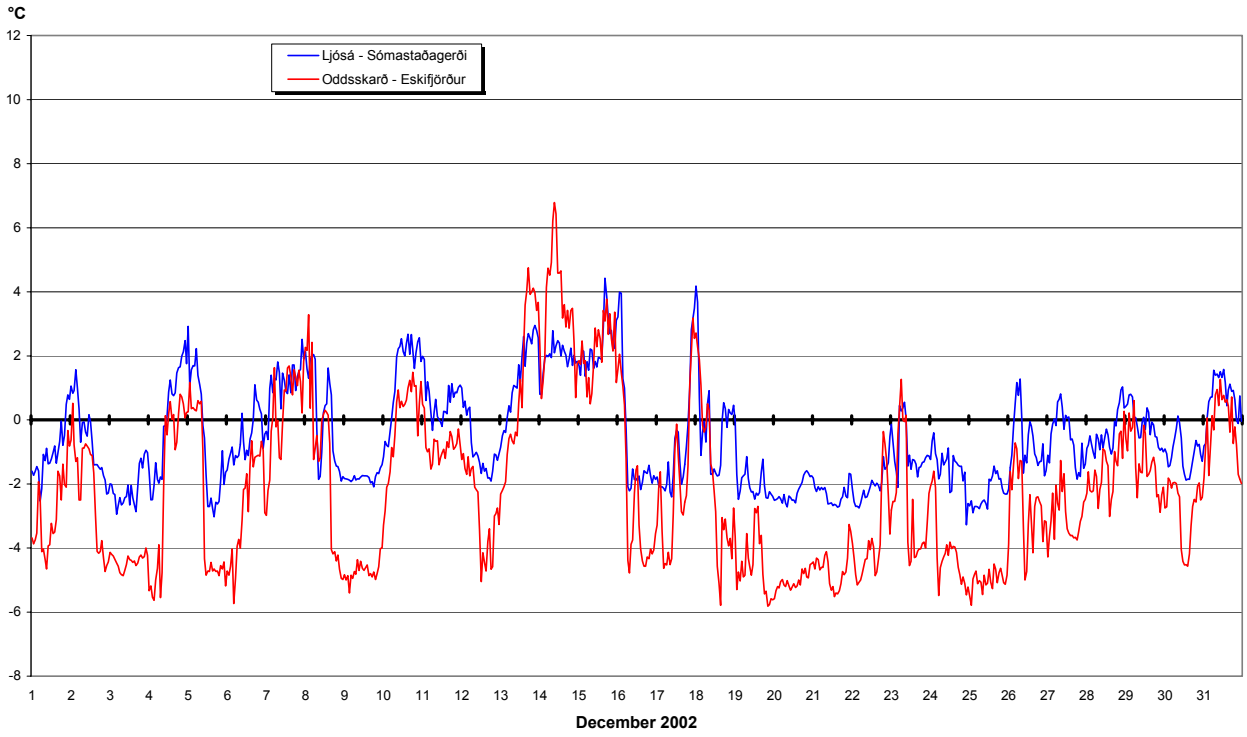
Temperature Difference, °C
Ljósá – Sómastaðagerði and Oddsskarð – Eskifjörður

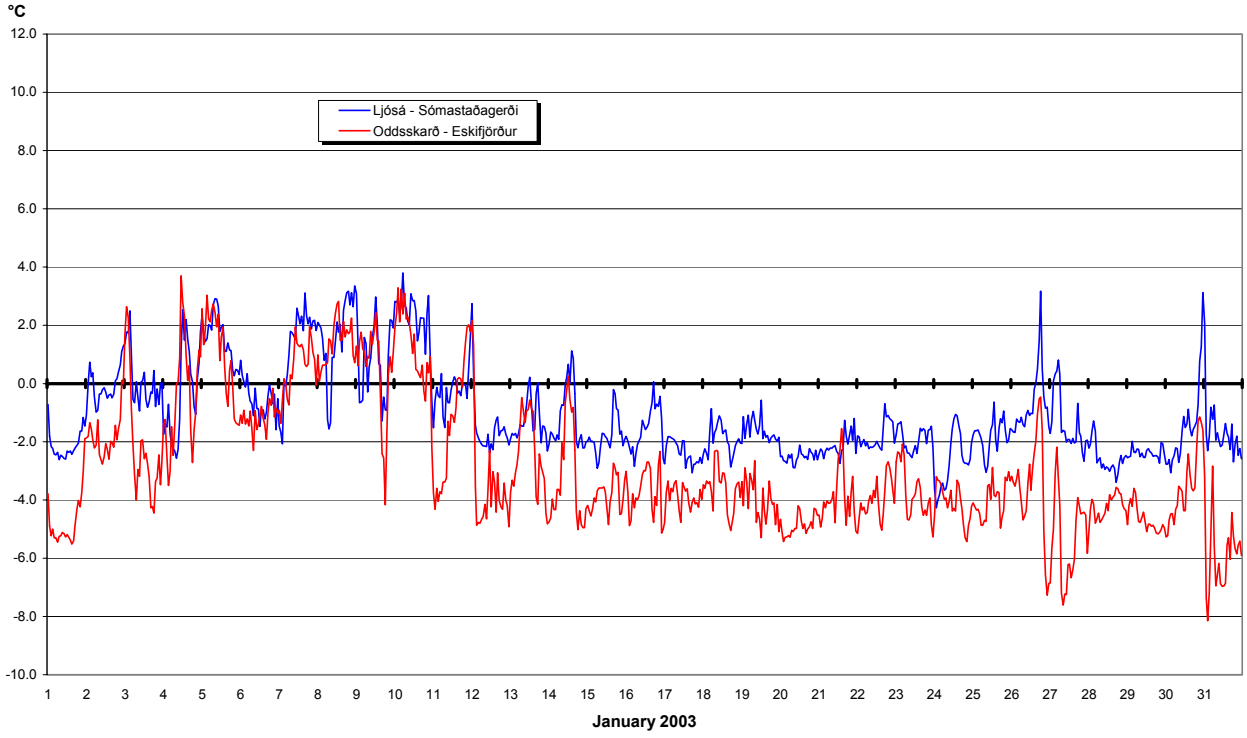




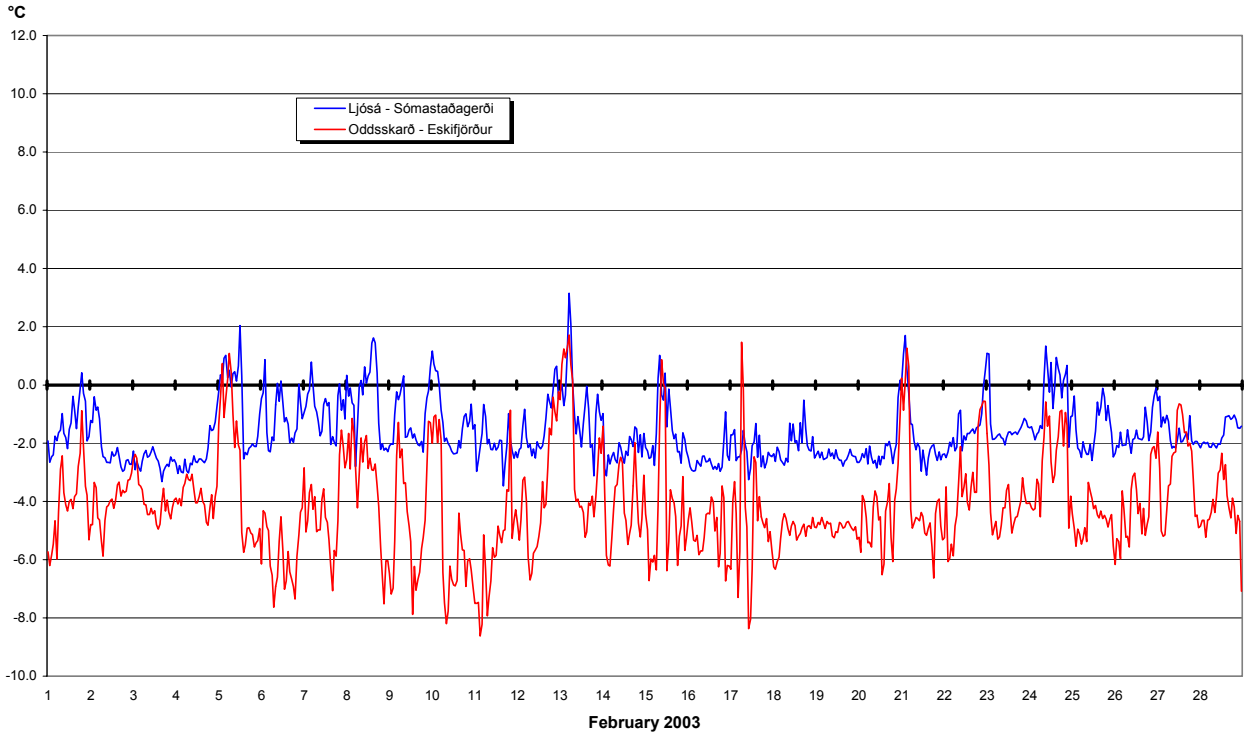
Annex 48

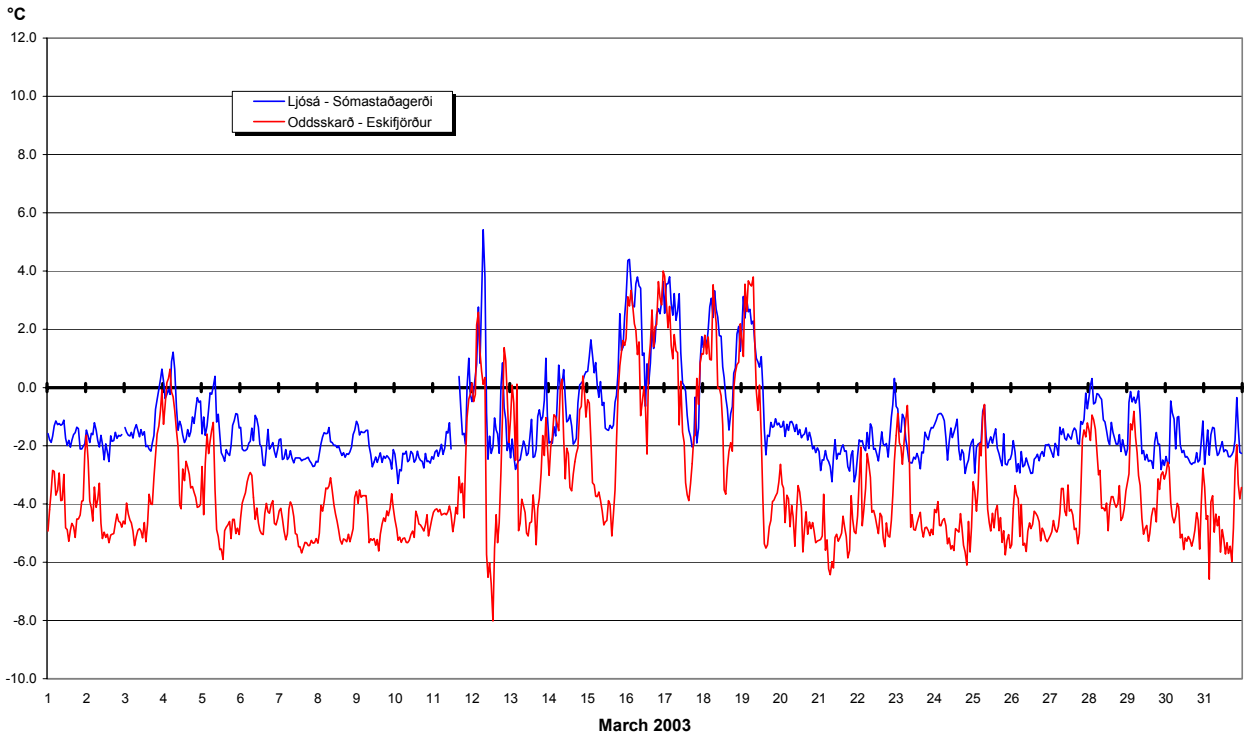
Temperature Difference, °C
Ljósá – Sómastaðageröi and Oddsskarð – Eskifjörður





Temperature Difference, °C
Ljósá – Sómastaðagerði and Oddsskarð – Eskifjörður





Annex 50

Temperature Difference, °C
Ljósá – Sómastaðagerði and Oddsskarð – Eskifjörður