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ROALD AMUNDSEN'S ANTARCTIC EXPEDITION

SCIENTIFIC RESULTS

METEOROLOGY

BY
H. MOHN

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A. W. BRØGGERS BOKTRYKKERI A·S

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PART I.

Meteorological observations at Framheim.

Instruments and observations.

1. Barometers.

1. Barometer Wild-Fuess No. 361. The constant correction found at the Meteorological Institute in Christiania was + 0.095 ± 0.035 mm. The readings were taken with the same vernier at the upper and lower top of mercury, and the difference noted as the height of mercury. The bottom screw was not used.

2. Kew Station barometer Adie No. 839. In Christiania the constant correction was found to be — 0.65 ± 0.05 mm. Both barometers reached Framheim in good condition. Unhappily they were not brought home. When the »Fram« was lying at Colon the barometers were broken by accident. At Framheim they were in perfect order and were observed by Capt. AMUNDSEN when he was at home, and at other times by Mr. LINDSTRØM.

A comparison between the observations of Fuess and Adie for April 1911 (Amundsen) reduced to 0° C., normal barometer and normal gravity, gives Adie—Fuess = + 0.46 mm. A similar comparison for January 1912 gives Adie—Fuess = + 0.59 mm. The differences are partly caused by the circumstance that the readings of the Fuess thermometer are almost always higher than those of the Adie thermometer, up to 7°, as a mean 1°.8 higher. Apparently the Fuess was not so well sheltered from the heat of the kitchen range as the Adie. The average temperature was 18°. Considering that the Adie was better sheltered from radiant heat, that its mode of treatment was much better known by the observers than that of the Fuess, and that the observations of the Fuess with the double settings and readings of the vernier were liable to cause a greater error than those of the Adie, I have taken only the Adie observations as worthy of publication. In cases of doubt, the Fuess has been consulted. The reduced values have been compared with the barograms and corrected when necessary.

The barometers were suspended in the kitchen on the inner wall between the kitchen and the dwelling-room. The door between these rooms stood open, so that the barometers were behind it and sheltered by it from the radiant heat of the range. The door between the kitchen and the entry opened inwards and sheltered the instruments from the cold air of the latter.

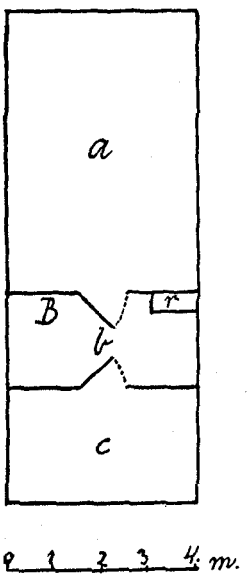

Fig. 1.
a Dwelling-Room, *b* Kitchen, *c* Entry, *B* Barometers, *r* Range.

The readings of the Adie have been reduced to 0° C., to the normal barometer (—0.65 mm.), to normal gravity (+ 1.85 mm. at 758.6 mm.) and to sea-level.

The height of the cistern of the barometer was found by Mr. B. J. BIRKELAND to be 11.1 m. above sea-level by means of synchronous observations at Framheim and onboard the »Fram«.

2. Thermometers.

Küchler No. 17. Toluol. Corr. 0°.0. Apr. 1. to June 29. 8. a.m. and Sept. 29. to Dec. 24.

Küchler No. 884. Toluol. Corr. — 0°.5. June 29. to Sept. 29.

Küchler No. 1308. Mercury. Corr. — 0°.2. Dec. 25. to Jan. 29.

The zero- points of the thermometers were observed in melting snow several times during the time they were in use. For observation they were slung like a sling-thermometer.

The observed temperatures have been checked, when possible, by comparison with the thermograms. The thermograph, standing in the screen, does not generally give values that accord well with those observed on the sling thermometers, and very often fails to register.

3. Hygrometers.

Psychrometrical observations were not practicable in the low temperature of Framheim. Happily the Expedition was provided with two hair hygrometers of Russeltvedt's construction, Nos. 12 and 14, with instructions for their use. This instrument is described in the »Meteorologische Zeitschrift«, 1908, p. 369. It has the advantage of having no axles or sockets to become rusty, or soiled, or filled with rime or drifting snow. Two horse-hairs act by torsion upon a pointer moving in a horizontal plane and read on a circular scale. Russeltvedts hygrometers have been employed in Norway for several years at inland stations where the winter is very cold,

and have answered exceedingly well. They have been tested at the Meteorological Institute in Christiania by means of observations with Assmann's aspiration psychrometer, and the Tables of correction constructed from the comparisons.

It is to be assumed that the corrected values give a fairly accurate representation of the Relative Humidity. On the 10th October, when the temperature changed from —46° to —52°, there is a sudden change in the reading of the hygrometer, but the corrected reading does not show any remarkable change of humidity. From the 1st April to the 13th October No. 14 was employed, and from that day to the 29th January No. 12.

The hygrometers were placed in a louvre-boarded screen together with a thermograph and a thermometer. The screen was a broad English hut standing on four posts, erected at a distance of 14 m. to the south-east of the dwelling-house. The height of the instruments from the surface of the snow was about two metres.

The tension of vapour has been computed from the relative humidity and the temperature of the air.

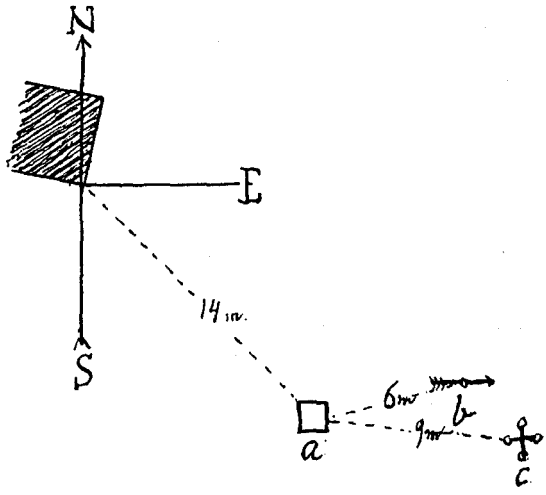

Fig. 2.
a Thermometer Hut, *b* Wind Vane, *c* Anemometer.

4. Wind.

The direction was observed with a vane at the top of a pole, 6 m. east of the thermometer-screen or 20 m. ESE of the house. The direction is true. The velocity was observed with Mohn's hand anemometer in metres per second. Description of this instrument is to be found in the »Norwegian North Atlantic Expedition« 1876—1878, Second Volume, Meteorology, pp. 6—10, and in the »Quarterly Journal of the Roy. Meteorological Society (London) for January, 1878, pp. 37—39. The place where the anemometer was whirled was 9 m. E by S from the thermometer-screen, and some 3 metres from the vane. The friction coefficient of the anemometer was 1 m. This has been added to the numbers noted by the observer. Direction noted without velocity signifies a wind of which the direction could be observed but which had a velocity of less than 1 m. per second.

Observations without Instruments.

The *Cloudiness* was noted in the usual scale: 0 clear, 10 overcast.

The observations were made every day from the 1st April to the 7th May. From that day to the 6th August they could not be made satisfactorily because of the darkness. From the 6th to the 21st August they were made only at 2 p. m., and from that day to the 3rd September at 8 a. m. and 2 p. m. After that, to the 29th January, they were again made at the 3 observation-hours.

The Sun is never above the horizon at Framheim between the 22nd April and the 20th August, and never below it between the 20th October and the 21st February. The period of darkness is 120 days and the period of midnight Sun 124 days. The twilight is of very long duration in the high latitude of Framheim.

The *Form* of the *Clouds* was noted at the same time as the amount of cloud.

Ci.	denotes	Cirrus.	A.–S.	denotes	Alto-stratus.
Ci.–S.	»	Cirro-stratus.	Cu.	»	Cumulus.
Ci.–Cu.	»	Cirro-cumulus.	S.	»	Stratus.
A.–Cu.	»	Alto-cumulus.			

Precipitation.

s	denotes	Snow.	d.s.	denotes	Drift Snow.
S	»	Heavy Snow.	f	»	Fog.
sl	»	Sleet.	F	»	Heavy Fog.

Aurora Polaris.

Direction in which it was seen.

Rings (Halos) round the Sun (S.) or Moon (M.).

The observations were taken at 8 a. m., 2 p. m. and 8 p. m., Framheim Mean Time. The date was not changed when the »Fram« passed the 180th meridian. The conventional dates are one day later.

The meteorological observations made at Framheim were provisionally worked out by Mr. B. J. BIRKELAND, now Director of the Meteorological Observatory in Bergen, and printed, together with some results, in ROALD AMUNDSEN'S »The South Pole«, Vol. II, Appendix II pp. 372—394.

The following Tables contain the complete revised observations in the usual international form.

Framheim. **April 1911.**

H_b = 11.1 m
C_g = 1.85 mm. at 760.5 mm.

	Pressure N. Gr. Sea-L. 700 mm. +			Temperature all negative C°.			Vapour-Tension m.m.			Relative. Humidity per Cent.			Wind Direction true. Velocity Metres per Second.					
D.	8	2	8	8	2	8	8	2	8	8	2	8	8		2		8	
1	32.9	34.4	35.7	31.8	28.5	32.0								0		0	ESE	2.8
2	37.4	39.1	39.3	25.6	23.0	22.0							SE	1.2	S	2.3	S	3.1
3	38.9	37.8	36.3	34.0	27.1	28.0								0	S	1.4	S	3.3
4	33.1	32.3	31.5	30.0	28.0	28.0							S	4.2	S	4.0	S	2.0
5	32.1	32.5	32.9	25.5	23.6	23.1							S	1.3	S	1.3		0
6	30.0	31.1	31.1	26.0	25.0	33.2							SSW	14.1	S	6.3	S	6.0
7	31.9	35.3	38.4	27.4	25.2	18.0								0		0	E	2.1
8	41.9	41.3	39.0	23.4	25.0	24.2	0.5	0.5	0.5	74	79	78	SSE	7.1	E	5.2	E	2.2
9	35.8	35.9	35.8	21.0	21.4	21.0	0.7	0.7	0.7	80	79	80	SE	1.4	E	4.3		0
10	33.1	32.0	31.0	11.0	11.0	16.2	1.8	1.7	1.2	88	86	88	E	8.2	E	6.2	NE	4.2
11	32.8	35.6	37.4	15.0	15.0	19.6	1.3	1.3	0.9	90	88	88	NW	9.2	N	7.2	NE	6.3
12	35.5	35.7	35.8	17.0	14.0	16.0	1.1	1.3	1.1	88	85	83	N	8.4	E	6.3	E	6.2
13	37.6	39.2	41.4	12.0	13.2	22.2	1.6	1.3	0.6	86	76	78	E	8.8	NE	5.9	NE	3.3
14	48.3	52.8	56.0	26.0	24.0	27.5	0.5	0.5	0.4	80	76	71	SW	7.1	SW	8.3	SW	8.3
15	57.5	58.2	57.0	27.0	26.2	25.0	0.4	0.4	0.5	83	78	80	SE	4.2	E	4.0	NE	6.2
16	55.1	54.1	49.4	26.0	23.5	20.0	0.4	0.7	0.8	80	81	84	NE	9.6	E	7.0	E	10.4
17	37.1	40.6	40.2	13.0	31.2	29.2	1.4	0.3	0.3	84	79	82	NW	2.3	SW	8.3	SW	5.3
18	39.8	40.8	41.2	31.8	36.4	38.0	0.3	0.2	0.1	81	79	81	SW	5.5		0		0
19	42.6	43.2	43.4	32.0	29.9	30.0	0.3	0.3	0.3	82	84	83	E	5.4	ENE	4.4	E	8.3
20	40.2	38.0	36.4	24.5	24.0	21.0	0.5	0.6	0.7	83	84	84	E	16.9	E	10.0	E	11.1
21	33.6	33.8	33.0	19.5	18.5	17.3	0.8	0.9	1.0	84	83	80	ESE	8.7	ESE	7.7	ESE	9.8
22	31.9	32.3	32.5	24.6	29.0	32.3	0.5	0.3	0.3	78	79	80	ENE	4.4	NE	3.8	NE	3.1
23	30.9	31.2	32.2	35.2	35.0	37.5	0.2	0.2	0.2	79	79	79		0		0		0
24	34.5	35.2	35.8	32.8	26.7	24.8	0.2	0.4	0.5	80	81	82		0	E	7.2	E	4.1
25	39.9	44.0	47.1	23.8	27.2	26.0	0.6	0.4	0.5	84	83	82	S.	0	SW	0	SW	0
26	49.3	48.7	48.3	33.4	35.6	37.7	0.2	0.2	0.2	76	79	80	S	0	SW	3.4	SW	2.0
27	50.6	51.6	51.5	47.0	48.0	47.6	0.1	0.1	0.1	76	77	76	SSW	2.8	SSW	2.4	SSW	0
28	48.5	46.2	44.9	47.0	43.8	43.0	0.1	0.1	0.1	77	77	78	ENE	3.4	E	3.2		0
29	42.9	43.0	43.6	38.4	37.6	37.0	0.1	0.1	0.2	79	78	79		0		0		0
30	43.7	42.1	41.9	41.3	39.0	39.3	0.1	0.1	0.1	79	79	79	SW	0	W	3.0	W	1.6
M.	39.3	40.0	40.0	27.4	27.2	27.9	0.6	0.5	0.5	81	80	81		4.5		4.1		3.7

Framheim. **April 1911.**

$\varphi = 78^\circ 38' S$
$\lambda = 163^\circ 37' W$

	Amount of Cloud 0—10			Form of Cloud.			Precipitation			Aurora Polaris.			Halos		
D.	8	2	8	8	2	8	8	2	8	8	2	8	8	2	8
1	9	10	1		S.		F.								
2	10	10	10				m.	s.	s.						
3	8	10	10	S.				f.	f.						
4	10	10	10		S.		f.								
5	10	10	10		S.		f.		s.						
6	7	6	7	A. Cu.	Ci. Ci-S. S.										
7	6	5	10		Ci. S.										
8	10	10	7		S. A-S.		m. ds.								
9	10	9	10		S.		s.		s.						
10	10	9	6		Ci-S. S.		s.								
11	10	10	9	S.	S.										
12	10	9	10		Ci.Ci-S.A-S.										
13	6	9	6	S.	S.										
14	10	2	0	S.	Ci.							NW			
15	10	10	8	S.	S.										
16	10	10	10	S.	S.				S.						
17	10	4	10	S.	S. A.-S.	S.									
18	10	6	10	S.	A.-S.	S.									
19	10	7	7	S.	A.-S.										
20	10	9	10	S.	S.				S.						
21	9	9	7	S.A.-S.	S. A.-S.										
22	3	5	0	S.A.-S.	S. A.-S.							NE-E.-SE			
23	2	1	0	Ci.-S.	S.							N			
24	10	10	10	S.	S.				s.						
25	10	10	10	S.	S.										
26	2	1	0	S.	S.							W-N-E			
27	1	1	0	S.	S.							NE			
28	1	10	0	A-Cu	S.							W-N-E			
29	10	7	0	S.	S.							N			
30	0	7	0		S.							W N-E			
M.	7.8	7.5	6.3												

Framheim. **May 1911.**

$H_b = 11.1$ m.
$C_g = 1.85$ mm. at 760.5 mm.

	Pressure N. Gr. Sea-L. 700 mm. +			Temperature all negative C°.			Vapour-Tension m.m.			Relative Humidity per Cent.			Wind Direction true. Velocity Metres per Second.					
D.	8	2	8	8	2	8	8	2	8	8	2	8	8		2		8	
1	41.4	42.2	42.7	40.7	42.4	43.0	0.1	0.1	0.1	78	78	77	SE	0		0		0
2	43.9	43.8	43.8	42.9	38.6	36.2	0.1	0.1	0.2	77	78	78		0		0	SSW	2.3
3	44.0	44.1	42.7	35.0	39.2	40.0	0.2	0.1	0.1	79	78	78		0	S	0	SW	0
4	39.2	38.9	37.5	36.6	37.3	38.8	0.2	0.2	0.1	78	78	78		0	S	0		0
5	36.4	39.0	41.8	25.0	27.4	28.0	0.5	0.4	0.4	83	82	82	SSW	3.7		0		0
6	51.2	53.4	54.4	20.0	20.0	20.1	0.8	0.8	0.8	87	87	88	E	3.0	E	2.7		0
7	54.7	54.8	53.2	28.2	31.2	31.0	0.4	0.3	0.3	83	82	79	S	0	S	0	S	3.6
8	51.2	51.0	51.0	34.8	30.2	30.8	0.2	0.3	0.3	80	79	80	SSE	2.8	SSW	2.5	S	2.5
9	51.6	52.3	52.4	33.0	35.0	37.3	0.2	0.2	0.2	79	80	79		0		0		0
10	49.6	48.1	47.0	34.5	35.3	36.0	0.2	0.2	0.2	80	80	79		0		0		0
11	47.4	48.6	49.1	40.0	36.1	37.2	0.1	0.2	0.2	78	79	80		0	E	3.4		0
12	46.7	44.4	42 5	24.0	23.1	21.0	0.5	0.6	0.7	80	82	76	SSE	3.3	E	7.0	ESE	5.3
13	36.2	34.4	32.0	37.5	42.0	39.6	0.1	0.1	0.1	74	73	76		0	SW	2.3		0
14	27.6	25.5	22.6	37.2	42.2	36.4	0.1	0.1	0.2	74	76	77	S	3.1	SW	2.2	SW	5.0
15	22.2	27.5	30.6	36.2	40.2	33.4	0.2	0.1	0.2	77	76	80	WSW	7.2	W	6.0		0
16	38.0	42.2	44.6	21.6	23.6	27.0	0.7	0.6	0.4	83	82	83	E	5.1	E	7.6	ESE	3.9
17	41.8	39.6	39.0	26.0	29.8	30.7	0.5	0.3	0.3	83	82	81	E	11.2		0	E	1.2
18	41.0	41.9	42.7	35.6	39.0	41.8	0.2	0.1	0.1	79	78	78		0	SSW	1.3	SSW	0
19	43.7	43.5	44.0	41.8	42.8	39.0	0.1	0.1	0.1	78	77	78		0	SSW	1.4	SW	7.0
20	42.9	40.1	37.5	37.5	41.6	39.9	0.1	0.1	0.1	79	76	77	WSW	6.4	SW	5.5	SW	4.0
21	35.3	35.0	34.4	48.2	47.0	45.3	0.0	0.1	0.1	73	75	75	S	5.3		0	SW	0
22	34.6	34.7	34.0	46.0	46.7	45.3	0.1	0.1	0.1	76	76	76	S	0	S	0		0
23	30.5	25.2	20.4	50.6	48.6	47.6	0.0	0.0	0.1	74	76	76		0		0	S	4.4
24	13.0	12.9	16.3	49.0	50.3	41.0	0.0	0.0	0.1	73	73	76	S	3.2	SE	6.3	E	5.4
25	23.8	29.7	32.7	27.2	23.6	28.3	0.4	0.6	0.4	79	84	82	SE	5.3	NE	6.2	E	3.5
26	34.6	37.6	41.6	32.5	34.8	40.3	0.2	0.2	0.1	80	80	77		0		0	E	4.8
27	47.8	48.4	47.0	29.8	29.5	31.0	0.3	0.3	0.3	82	82	83	E	3.9	E	4.8	E	3.3
28	39.6	36.3	34.5	38.2	38.0	38.6	0.1	0.1	0.1	82	82	79		0		0	SW	6.5
29	30.6	28.1	26.4	36.6	32.0	32.0	0.2	0.3	0.3	80	82	82	SSW	4.0		0	S	4.8
30	23 3	20.7	20.2	35.0	35.7	37.7	0.2	0.2	0.1	82	81	77	SW	0	W	4.4	SW	8.8
31	23.7	26.7	29.9	34.8	30.0	23.0	0.2	0.3	0.6	80	80	82	E	5.4	E	6.4	E	6.8
M.	38.3	38.4	38.3	35.4	35.9	35.4	0.2	0.2	0.2	79	79	79		2 4		2.3		2.8

Framheim. **May 1911.**

$\varphi = 78^\circ 38' S$
$\lambda = 163^\circ 37' W$

	Amount of Cloud 0—10			Form of Cloud			Precipitation			Aurora Polaris			Halos		
D.	8	2	8	8	2	8	8	2	8	8	2	8	8	2	8
1	10	3	0		S.							NE			
2	2	2	10		S.										
3	10	2	0		S.							NW-SE			
4	1	2	0		S. A-Cu.							NW-SE			
5	9	7	9		A.-Cu. S.										
6	10	9	10		A.-Cu. S.										
7	0	4	0									NW-SE			
8										WNW-ESE					
9															
10										Zenit					
11										Zenit					M
12												ENE			
13															
14															
15															
16															
17												N			
18												W-Z-E			M
19										S-E	SE				M
20										S	ESE	E-N-NW	M.		M
21												SW-Z.-NW		M	
22										S-Z.			M.		
23										S-Z.					
24										S					
25															
26															
27															
28										SW-W		SW-Z.-NE			
29							s.		s.						
30												E			
31															
M.															

Framheim.

June 1911.

Hb = 11.1 m.
Cg = 1.85 mm. at 760.5 mm.

	Pressure N. Gr. Sea-L. 700 mm. +			Temperature all negative C°.			Vapour-Tension m.m.			Relative Humidity per Cent.			Wind Direction true. Velocity Metres per Second.					
D.	8	2	8	8	2	8	8	2	8	8	2	8	8		2		8	
1	33.6	34.9	34.9	18.5	18.5	19.3	0.9	1.0	0.9	86	91	92	E	0	E	2.5		0
2	36.4	37.1	36.2	17.6	17.0	18.9	1.1	1.1	1.0	92	93	93	E	5.8	E	1.1	ESE	4.4
3	32.7	32.2	32.3	14.5	15.4	17.4	1.3	1.2	1.0	86	87	84	E	14.6	E	9.5		0
4	30.5	28.9	26.7	22.0	22.8	27.2	0.7	0.6	0.6	84	86	80	S	0		0	SSW	3.2
5	25.2	25.8	26.8	33.0	25.0	19.0	0.2	0.5	0.9	82	86	91	E	4.3	E	4.4	E	4.4
6	27.4	29.0	30.3	14.6	10.6	11.0	1.3	2.0	1.9	90	96	97	E	9.2	E	8.5	E	5.6
7	30.1	27.7	26.0	15.2	14.5	12.3	1.4	1.4	1.7	95	93	94	E	3.2		0		0
8	27.1	28.5	28.5	24.0	26.0	29.8	0.6	0.5	0.3	88	85	84	S	5.1	S	3.0		0
9	26.1	25.9	26.0	21.0	20.6	19.9	0.8	0.8	0.9	89	90	90	E	6.2	E	4.4	E	4.8
10	27.0	28.0	29.4	22.0	22.5	24.1	0.7	0.7	0.6	88	88	88	E	5.0	E	7.0	E	5.6
11	32.0	33.6	34.6	24.0	23.3	25.0	0.6	0.6	0.5	87	86	87	E	3.3	E	4.0	E	2.6
12	34.4	34.8	35.3	34.8	38.8	42.0	0.2	0.1	0.1	86	80	79		0	SSE	2.0		0
13	36.6	38.1	38.5	31.5	31.2	34.0	0.3	0.3	0.2	83	83	82	E	3.5	E	5.0	E	5.2
14	39.1	40.0	40.0	39.0	39.0	41.0	0.1	0.1	0.1	80	80	79	E	7.0	E	8.4	E	7.7
15	37.1	35.4	33.5	36.3	39.0	42.0	0.2	0.1	0.1	80	86	86	ESE	2.8		0		0
16	30.9	30.4	31.2	48.0	50.0	51.8	0.1	0.0	0.0	83	83	82	S	2.5		0		0
17	35.5	40.1	44.3	47.3	26.0	24.3	0.1	0.5	0.6	83	90	91	E	5.4	NNW	2.8	N	3.0
18	49.2	51.1	51.6	25.0	27.7	25.6	0.5	0.4	0.5	88	90	92	NW	4.2	E	6.3	E	6.3
19	49.9	46.4	43.0	34.8	33.0	40.0	0.2	0.3	0.1	87	88	86	ENE	2.4		0	SW	4.4
20	40.3	40.4	39.3	45.4	47.8	36.8	0.1	0.1	0.2	84	84	87	SSW	3.6		0		0
21	32.0	28.6	26.5	31.0	29.3	35.8	0.3	0.4	0.2	87	88	86	SSW	6.4	SSW	9.0	SSW	12.0
22	27.6	29.2	30.9	46.0	48.5	46.2	0.1	0.0	0.1	82	82	82	WSW	4.7		0		0
23	32.6	32.6	32.9	47.0	45.8	44.9	0.1	0.1	0.1	82	82	82	E	7.5	E	7.8	E	7.3
24	33.9	34.4	35.0	46.2	51.5	53.8	0.1	0.0	0.0	83	82	82		0		0		0
25	33.9	32.6	30.8	58.2	57.2	50.0	0.0	0.0	0.0	82	81	82		0	S	2.1	WSW	3.0
26	32.1	32.7	33.9	52.7	49.0	47.0	0.0	0.0	0.1	83	82	83		0	E	7.8	E	7.0
27	36.9	38.4	41.6	41.2	36.3	42.0	0.1	0.2	0.1	84	85	84	NE	5.8	E	10.0	E	5.2
28	47.1	47.7	47.3	51.0	54.0	53.3	0.0	0.0	0.0	82	82	82	E	6.5	ENE	5.0		0
29	45.0	42.4	40.8	56.0	53.5	47.5	0.0	0.0	0.1	81	82	79		0		0	S	2.2
30	36.5	34.1	31.9	45.5	41.5	39.2	0.1	0.1	0.1	82	82	80		0	SW	4.8	SSW	7.8
M.	34.6	34.7	34.7	34.8	33.8	34.0	0.4	0.4	0.4	85	86	86		4.0		3.8		3.4

Framheim. **June 1911.**

$\varphi = 78^\circ 38' S$
$\lambda = 163^\circ 37' W$

	Amount of Cloud 0—10			Form of Cloud			Precipitation			Aurora Polaris			Halos		
D.	8	2	8	8	2	8	8	2	8	8	2	8	8	2	8
1									S.						
2												S-E			
3															
4												E			
5									s.						
6								s.	s.	SE-Z-NW					
7								s.	S.						
8										S					
9															
10								s.							
11															
12													M		
13															
14												WSW			
15													M	M	
16										S	E-N-W				
17															
18															
19															
20															
21															
22										SE-Z-NW		E-N-W			
23										SE-Z-NW		E-N-NW			
24										SE-N-NW	SE-N-NW	SE-N-NW			
25												N			
26												NW			
27															
28										S		N			
29															
30															
M.															

Framheim. July 1911.

H_b = 11.1 m.
C_g = 1.85 mm. at 760.5 mm.

D.	Pressure N. Gr. Sea-L. 700 mm. + 8	2	8	Temperature all negative C°. 8	2	8	Vapour-Tension m.m. 8	2	8	Relative Humidity per Cent 8	2	8	Wind Direction true. Velocity Metres per Second. 8	2	8
1	33.3	37.5	38.7	48.0	54.1	48.0	0.1	0.0	0.1	81	79	80	SW 2.4	0	0
2	42.2	44.6	46.1	34.5	38.0	39.0	0.2	0.2	0.2	82	86	86	0	SW 6.4	SSW 9.6
3	50.1	50.9	49.5	45.9	47.5	48.5	0.1	0.1	0.1	82	84	84	SW 8.7	0	ESE 4.6
4	43.4	39.7	36.2	36.0	38.5	34.7	0.2	0.2	0.2	87	86	88	ESE 5.6	E 2.5	SE 5.3
5	28.7	24.2	22.6	30.4	33.3	37.9	0.3	0.3	0.2	87	88	86	E 4.3	SW 2.7	SSW 7.2
6	26.0	30.0	32.5	36.9	38.1	43.5	0.2	0.2	0.1	86	87	84	WSW 4.5	SW 3.5	S 4.1
7	37.6	41.4	43.8	43.3	42.3	42.5	0.1	0.1	0.1	87	87	87	SSW 4.0	0	S 2.9
8	42.9	37.6	34.8	34.5	24.9	25.9	0.2	0.6	0.6	90	91	92	E 7.3	ESE 16.0	E 10.4
9	30.9	29.3	28.4	16.7	17.8	17.8	1.4	1.2	1.2	97	99	98	E 12.2	E 8.5	E 8.4
10	27.4	24.1	22.2	20.5	12.5	17.9	0.9	1.8	1.2	97	98	98	E 3.5	ESE 6.5	E 13.0
11	20.7	19.1	18.6	27.0	31.5	34.0	0.5	0.3	0.3	98	93	94	0	S 5.6	E 3.0
12	19.9	22.0	22.6	20.5	17.5	17.5	0.9	1.2	1.2	98	97	98	E 6.2	E 8.4	ESE 3.0
13	22.8	21.5	20.8	21.5	31.7	37.0	0.8	0.3	0.2	97	94	93	0	SW 4.4	S 3.0
14	23.2	26.8	28.6	43.9	39.5	30.5	0.1	0.1	0.4	90	91	95	0	E 4.8	WNW 3.0
15	32.9	34.0	34.0	37.5	42.5	37.5	0.2	0.1	0.2	92	90	92	WSW 2.1	0	0
16	32.7	31.8	31.9	30.6	29.5	32.0	0.4	0.4	0.3	95	92	92	E 10.4	E 7.2	E 7.0
17	36.4	37.5	37.8	40.5	42.1	31.3	0.1	0.1	0.3	92	83	86	0	0	E 6.0
18	35.5	33.0	31.2	31.1	27.5	23.8	0.3	0.5	0.6	88	90	88	ESE 7.0	ESE 8.3	E 3.7
19	27.3	27.4	27.3	45.2	46.1	49.3	0.1	0.1	0.1	90	87	87	0	WSW 5.0	SW 10.3
20	27.5	26.4	23.1	46.7	48.7	49.5	0.1	0.1	0.0	87	87	87	WSW 6.5	SSW 6.6	SW 8.0
21	21.3	23.5	26.3	49.5	43.7	30.5	0.0	0.1	0.4	84	88	92	0	ENE 3.6	ENE 3.6
22	32.4	35.4	36.6	26.4	33.3	36.5	0.5	0.3	0.2	94	92	92	NE 5.6	E 7.8	E 5.6
23	35.6	36.3	38.4	28.5	29.3	34.8	0.4	0.4	0.2	88	89	89	E 9.2	E 8.0	E 5.3
24	42.4	42.8	42.4	32.3	30.6	31.5	0.3	0.3	0.3	90	90	90	ENE 6.8	E 4.5	ENE 6.1
25	40.6	39.9	39.8	28.2	27.6	28.2	0.4	0.5	0.4	91	92	92	E 4.0	E 4.6	ESE 9.6
26	41.9	43.7	44.2	33.5	40.7	45.5	0.3	0.1	0.1	91	92	91	E 4.6	E 2.8	E 6.0
27	45.4	45.3	45.1	51.5	51.3	54.5	0.0	0.0	0.0	91	89	88	ESE 3.4	S 2.2	0
28	43.7	42.9	42.0	52.5	48.5	40.2	0.0	0.1	0.1	88	89	91	0	ESE 2.2	S 3.2
29	41.2	40.3	38.2	40.2	42.7	45.5	0.1	0.1	0.1	91	91	89	SSE 3.2	SSE 1.8	0
30	34.7	34.9	36.9	40.5	44.3	48.5	0.1	0.1	0.1	87	90	88	S 6.1	SW 4.3	0
31	41.5	42.4	41.8	47.5	47.7	48.3	0.1	0.1	0.1	88	88	88	0	SSW 3.0	WSW 2.2
M.	34.5	34.4	34.3	36.2	36.9	36.8	0.3	0.3	0.3	90	90	90	4.1	4.5	5.0

Framheim. **July 1911.**

$\varphi = 78^\circ 38' S$
$\lambda = 163^\circ 37' W$

	Amont of Cloud 0—10			Form of Cloud			Precipitation			Aurora Polaris			Halos		
D.	8	2	8	8	2	8	8	2	8	8	2	8	8	2	8
1										WSW	E	S			
2												S-Z-N			
3										SE-Z-NW	N	E-N			
4										Z					
5								s.							
6															
7														M	
8															
9															
10															
11															M
12															M
13											N				M
14															
15															
16															
17											E-N				
18										N		E-N	M		
19										Z					
20										S	N	SE-Z-NW			
21									s.	S-SW-W	NE				
22							s.					E-Z-W			
23												E-N-W			
24															
25															
26										S-Z		N			
27										S-W		S-E-N			
28										SE-NW					
29															
30										Z		E-N-W			
31										SE-Z-NW		N. E-Z-W			
M.															

Framheim. August 1911.

$H_b = 111$ m.
$C_g = 1.85$ mm. at 760.5 mm.

	Pressure N. Gr. Sea-L. 700 mm. +			Temperature all negative C°.			Vapour-Tension m.m.			Relative Humidity per Cent.			Wind Direction true. Velocity Metres per Second.		
D.	8	2	8	8	2	8	8	2	8	8	2	8	8	2	8
1	39.5	36.9	34.6	52.8	53.5	50.7	0.0	0.0	0.0	86	84	84	SW 8.2	SW 10.0	SSW 3.0
2	26.2	27.5	30.2	25.5	25.5	38.0	0.5	0.6	0.2	84	92	92	WSW 12.5	WSW 16.2	WSW 9.6
3	31.9	30.7	27.5	34.5	36.5	33.5	0.2	0.2	0.3	90	90	92	WSW 3.4	E 5.5	ESE 5.8
4	28.0	30.7	32.8	48.8	51.5	50.7	0.1	0.0	0.0	88	88	87	SSW 4.3	SW 6.0	0
5	37.6	40.0	42.7	50.9	45.0	45.5	0.0	0.1	0.1	88	90	89	E 5.4	E 5.8	E 3.0
6	45.0	46.4	47.2	38 5	45.5	45.9	0.2	0.1	0.1	92	91	90	0	0	0
7	49.5	48.9	46.9	49.5	49.5	46.1	0.1	0.0	0.1	88	87	88	0	0	0
8	42.9	39.8	38.3	47.3	40.5	47.3	0.1	0.1	0.1	89	92	89	E 2.0	E 5.4	WSW 3.0
9	35.1	33.7	33.8	49.5	48.7	50.5	0.1	0.1	0.0	88	88	88	0	W 0	S 3.7
10	36.8	39.0	40.2	52.3	56.5	50.5	0.0	0.0	0.0	88	87	88	0	S 1.5	E 6.8
11	41.0	40.2	38.4	41.0	40.5	42.5	0.1	0.1	0.1	92	91	91	E 8.6	E 6.9	0
12	34.3	33.4	33.6	51.1	55.0	56.5	0.0	0.0	0.0	88	88	88	0	SW 5.2	SW 4.0
13	33.7	33.4	32.4	59.0	52.5	50.5	0.0	0.0	0.0	84	87	88	0	SSW 1.5	E 7.0
14	32.1	33.2	33.5	54.0	56.8	45.5	0.0	0.0	0.1	88	87	89	SE 2.8	SSE 2.8	E 6.0
15	35.6	39.7	43.1	35.5	47.5	54.2	0.2	0.1	0.0	93	91	88	ENE 4.0	W 3.2	0
16	40.2	36.2	33.0	55.5	54.5	52.5	0.0	0.0	0.0	88	88	88	0	0	0
17	32.6	34.8	38.4	58.0	55.5	53.5	0.0	0.0	0.0	86	86	88	SW 7.0	SW 2.7	NW 1.6
18	39.7	40.4	40.8	46.7	46.5	40.8	0.1	0.1	0.1	88	90	91	E 6.0	E 7.0	E 6.0
19	39.5	38.5	37.3	38.5	44.0	46.2	0.2	0.1	0.1	91	91	91	E 6.0	NE 3.0	S 2.0
20	34.0	33.4	32.1	57.7	56.2	58.1	0.0	0.0	0.0	91	88	88	SW 2.4	S 1.5	0
21	30.9	30.2	28.3	57.5	56.5	53.8	0.0	0.0	0.0	88	87	88	0	0	E 4.8
22	30.9	32.1	31.3	25.1	28.3	44.5	0.6	0.5	0.1	95	94	92	E 12.3	E 10.2	SSW 4.6
23	33.0	33.3	32.0	37.5	42.5	45.5	0.2	0.1	0.1	91	93	91	0	E 2.3	SSW 7.0
24	33.0	34.6	34.5	36.5	37.3	42.5	0.2	0.2	0.1	91	92	91	ENE 6.5	E 7.5	0
25	31.8	31.0	30.3	34.8	41.1	31.5	0.2	0.1	0.3	93	92	93	0	ENE 4.7	E 5.0
26	33.2	35.6	38.9	36.9	33.1	28.5	0.2	0.3	0.4	92	93	94	ENE 6.6	ENE 7.2	N 5.7
27	45.6	48.4	49.7	24.5	27.7	32.3	0.6	0.5	0.3	94	96	93	N 3.4	NE 3.3	NE 3.0
28	48.7	45.9	43.6	42.5	40.0	38.5	0.1	0.1	0.2	91	92	92	NE 5.6	NE 3.7	NE 5.2
29	37.9	33.4	30.7	53.0	53.0	50.5	0.0	0 0	0.0	88	88	88	SE 2.2	S 2.2	S 1.8
30	26.9	25.5	25.6	53.0	51.1	40.5	0.0	0.0	0.1	87	88	91	S 2.3	0	0
31	33.3	38.0	38.8	26.4	34.1	39.5	0.5	0.3	0.1	95	93	92	NW 13.3	N 4.8	E 8.0
M.	36.1	36.3	36.1	44.3	45.4	45.3	0.1	0.1	0.1	90	90	90	4.0	4.2	3.4

Framheim. **August 1911.**

$\varphi = 78^\circ 38'$ S
$\lambda = 163^\circ 37'$ W

	Amount of Cloud 0—10			Form of Cloud			Precipitation			Aurora Polaris			Halos		
D.	8	2	8	8	2	8	8	2	8	8	2	8	8	2	8
1										S-Z		N			
2															M
3															
4															
5															
6		3			S.										M
7		6			S. Ci.										
8		9			S										M
9		6			S.A.-S.								M		
10		2			S.										
11		10						S.							
12		5			S.								M		M
13		2			S.										
14		2			S.										
15		0										E-N-W			
16		1			S.							E			
17		5						f.				S-E-N			
18		2			S.										
19		5			S.			f.				SE-E-N-NW			
20		0										N			
21	1	1		S.	S.										
22	10	5			S. Ci.		S.								
23	8	2		S. A-Cu.	S.										
24	0	2			S.							E-N-W			
25	10	10					f.	F.							
26	8	10		S. A-Cu.	S.										
27	10	10		S.	S.										
28	1	8		S.	S.										
29	1	3		S.	S.										
30	4	8		S.	S.										
31	10	3			S.		S.								M
M.															

Framheim. **September 1911.**

$H_b = 111$ m.
$C_g = 1.85$ mm. at 760.5 mm.

	Pressure N. Gr. Sea-L. 700 mm. +			Temperature all negative C°.			Vapour-Tension m.m.			Relative Humidity per Cent.			Wind Direction true. Velocity Metres per Second.					
D.	8	2	8	8	2	8	8	2	8	8	2	8	8		2		8	
1	39.0	39.2	40.3	42.5	45.0	47.3	0.1	0.1	0.1	91	92	90	NE	5.0	NE	4.3		0
2	39.4	40.4	41.3	53.1	48.1	49.8	0.0	0.1	0.0	88	88	88		0		0	SW	1.6
3	42.4	44.1	44.6	52.5	49.1	49.2	0.0	0.1	0.1	88	88	88	E	6.2		0		0
4	42.4	40.7	37.4	44.5	42.7	44.5	0.1	0.1	0.1	88	90	91	E	5.3	NE	9.2	NE	8.5
5	32.3	31.8	32.3	43.5	39.5	36.5	0.1	0.2	0.2	92	93	92	NE	6.3	E	1.3	E	6.3
6	35.3	38.3	40.4	31.5	31.7	29.8	0.3	0.3	0.4	94	94	94	E	9.3	E	8.0	E	7.3
7	45.7	47.4	49.5	32.5	24.3	22.5	0.3	0.7	0.8	93	96	97	ENE	1.3	E	10.3	E	12.4
8	48.4	46.6	44.4	34.5	36.5	41.5	0.2	0.2	0.1	93	93	93	ENE	4.2	E	6.2	E	1.1
9	38.5	37.9	34.9	43.7	42.0	43.0	0.1	0.1	0.1	91	92	88	NE	.0	NE	1.2	E	0
10	33.9	34.5	35.4	42.5	41.5	46.5	0.1	0.1	0.0	91	91	38	NE	1.1	NE	1.2	SW	3.3
11	36.3	35.7	35.2	52.5	51.5	53.5	0.0	0.0	0.0	41	44	43	SW	4.2	SW	1.2	S	0
12	29.3	28.4	28.2	50.5	47.7	45.5	0.0	0.0	0.0	43	49	51	S	0	S	4.2	SW	1.1
13	30.2	29.5	28.0	48.5	49.5	51.5	0.0	0.0	0.0	56	54	55	S	4.3	S	2.4	S	4.0
14	26.8	28.4	30.2	49.5	45.5	45.5	0.0	0.1	0.1	59	60	62	S	0	SW	5.2	SW	7.0
15	32.5	34.5	34.6	42.5	38.5	39.7	0.1	0.1	0.1	62	68	72	W	4.2	W	4.4	SW	4.1
16	36.5	37.6	37.6	44.5	47.5	51.5	0.1	0.1	0.0	71	72	73	NE	0	SE	1.1	S	1.2
17	32.4	30.8	27.8	52.5	49.4	53.5	0.0	0.0	0.0	74	73	74	NE	0	SE	0	S	1.3
18	25.8	29.2	30.3	50.0	47.5	45.5	0.0	0.1	0.1	73	74	74		0	NE	3.3		0
19	35.3	39.9	41.2	44.0	43.1	47.5	0.1	0.1	0.1	79	78	77	SW	5.3	SW	3.7	E	2.0
20	42.8	45.0	46.7	32.7	30.5	31.7	0.3	0.3	0.3	83	84	86	NE	6.2	E	5.4	NE	6.8
21	48.2	48.8	49.2	25.1	26.6	29.7	0.6	0.5	0.4	88	90	88	E	11.5	E	7.6	E	9.1
22	49.4	48.7	48.0	35.5	36.5	42.5	0.2	0.2	0.1	88	87	87	S	2.5		0	S	2.3
23	45.5	42.6	39.7	42.3	34.4	42.1	0.1	0.2	0.1	87	90	87	S	3.7		0		0
24	33.4	29.0	28.7	33.5	31.0	38.5	0.3	0.3	0.2	91	90	91		0		0	SW	3.1
25	28.0	28.7	28.9	35.3	33.3	28.5	0.2	0.3	0.4	88	88	90	E	4.0	ENE	4.4	NE	6.0
26	30.9	30.8	31.7	27.9	18.5	18.7	0.5	1.1	1.1	92	98	98	E	3.3	N	7.0	NNE	7.6
27	27.7	25.9	26.4	20.0	19.2	19.5	1.0	1.0	1.0	96	96	95	E	9.7	E	11.7	E	9.0
28	26.2	23.5	17.7	14.5	12.1	9.5	1.5	1.9	2.4	97	97	100	E	8.0	SE	6.0	ESE	11.0
29	24.1	26.9	27.3	9.5	12.2	14.6	2.4	1.8	1.4	100	97	93	NE	20.0	NNE	15.0	E	6.0
30	20.0	16.9	13.4	12.6	11.5	16.0	1.7	1.8	1.3	98	95	96	E	2.0		0		0
M.	35.3	35.4	35.0	37.7	35.8	37.4	0.3	0.4	0.4	83	83	82		4.3		4.2		4.0

Framheim. **September 1911.**

$\varphi = 78^\circ 38'$ S
$\lambda = 163^\circ 37'$ W

	Amount of Cloud 0—10			Form of Cloud			Precipitation			Aurora Polaris			Halos		
D.	8	2	8	8	2	8	8	2	8	8	2	8	8	2	8
1	5	3		S.	S.							E-N			
2	3	1	1	S.	Ci.							N			
3	0	1			S. Ci.-S.										
4	10	10	10				F.	F.	F.						
5	8	10	10				F.	F.	F.						
6	10	7	10				F.	F.							
7	10	10	10					F.	F.						M
8	6	2	6	S.	S.	S.									
9	4	2	6	S.	S.	S.									
10	10	2	6						F.			NE			
11	2	0	0				F.					Aur.			
12	6	6	4			S.	F.	F.							
13	2	0	0	S.											
14	3	4	4	Ci.-S.	Ci.-S.				F.						
15	6	7	7	S.	S.	S.									
16	2	0	0	S.											
17	0	0	0												
18	1	0	2	Ci. S.		Ci. S.									
19	8	4	7	S.	A.-Cu.	S.									
20	10	10	8	S.	S.	S. A.-Cu.									
21	10	2	7	S.	S. Ci.	S.									
22	7	1	1	S. Ci.-S.	S. Ci.	S.									
23	7	7	5	S. Ci.-S.	S.	S.									
24	10	10	10				F.	F.	F.						
25	10	10	10				f.	f.	f.						
26	10	10	10	S.	S.	S.		s.							
27	10	10	10				S.	S.	S.						
28	10	5	10	S.	A.-Cu.-Cu. S.				s.						
29	10	8	9		Ci. S.	S.	S.								
30	9	10	10	S. Ci.-S.	S.	S.			s.						
M.	6.6	5.1	5.8												

Framheim. **October 1911.**

$H_b = 11.1$ m.
$C_g = 1.85$ mm. at 760.5 mm.

	Pressure N. Gr. Sea-L. 700 mm. +			Temperature all negative C°.			Vapour-Tension m.m.			Relative Humidity per Cent.			Wind Direction true. Velocity Metres per Second		
D.	8	2	8	8	2	8	8	2	8	8	2	8	8	2	8
1	16.2	21.3	26.4	13.0	14.8	12.7	1.7	1.4	1.7	97	94	95	N 11.4	NNE 9.8	NNE 7.7
2	29.8	27.2	25.3	18.1	13.9	13.7	1.1	1.5	1.5	94	96	97	ESE 13.4	E 12.0	ESE 8.0
3	21.3	20.7	20.7	11.7	11.9	14.3	1.8	1.8	1.5	98	97	96	ESE 10.2	ESE 13.0	E 6.5
4	23.5	23.8	23.6	18.8	20.8	19.2	1.0	0.8	0.9	92	90	91	NE 4.7	E 5.2	E 4.0
5	17.2	14.9	16.1	17.5	28.8	32.6	0.9	0.4	0.3	79	84	84	SSW 5.4	SSW 5.0	S 2.4
6	17.9	18.9	20.7	38.8	34.2	35.8	0.2	0.2	0.2	82	80	82	S 3.2	0	0
7	25.5	27.0	27.7	33.0	32.1	32.6	0.2	0.2	0.3	80	78	82	S 3.0	NE 3.5	SE 1.2
8	27.8	28.0	28.0	36.0	32.2	40.2	0.2	0.3	0.1	82	83	82	0	0	E 2.4
9	28.5	28.7	27.2	31.9	27.0	30.2	0.3	0.4	0.3	82	82	84	ENE 10.0	E 8.8	E 7.0
10	24.7	24.9	24.7	27.0	27.4	34.6	0.4	0.4	0.2	84	81	82	E 14.3	SE 0	0
11	25.5	26.5	26.9	39.2	37.0	40.1	0.1	0.2	0.1	78	79	80	0	SSW 3.0	SW 2.7
12	28.8	30.1	32.6	38.7	33.0	34.0	0.1	0.3	0.2	82	86	84	ENE 4.0	ENE 7.8	ENE 7.6
13	37.7	41.5	45.2	30.6	27.0	27.1	0 3	0.3	0.4	83	65	72	E 6.6	ENE 5.0	E 4.6
14	53.7	54.6	52.8	25.3	27.6	27.5	0.4	0.4	0.4	73	74	73	SW 1.7	ENE 5.0	E 7.2
15	46.9	41.1	34.4	32.0	28.7	25.0	0.2	0.3	0.5	77	72	74	E 6.0	E 6.0	ESE 5.5
16	26.0	24.3	22.0	24.9	27.0	30.0	0.5	0.4	0.3	75	75	74	SW 2.4	S 4.4	SSW 4.5
17	20.0	24.4	30.0	31.8	30.8	33.2	0.2	0.3	0.2	73	73	72	SW 7.2	SW 12.5	WSW 5.4
18	37.6	38.1	35.8	18.9	15.2	19.1	0.8	1.1	0 7	76	75	68	NE 5.0	NE 8.4	ESE 12.2
19	23.6	20.5	18.9	17.0	20.0	20.9	0.9	0.6	0.6	70	66	65	E 17.6	ENE 11.3	0
20	21.8	24.7	26.1	26.8	21.2	26.5	0.4	0.6	0.4	69	72	73	SE 3 3	E 4 0	NE 6.3
21	22.7	18.4	19.7	19.0	15.7	26.0	0.8	1.0	0.4	75	72	68	SE 9.2	SE 11.2	S 5.4
22	21.8	23.6	22.7	17.0	17.0	14.0	0.9	0.9	1.2	75	74	75	E 9.4	E 7.2	E 10.4
23	18.2	19.3	23.2	24.0	26.5	30.0	0.5	0.4	0.3	74	75	71	S 13.4	SW 14.1	SW 5.4
24	29.1	27.3	24.6	16.0	14.0	17.0	0.9	1.2	0.9	70	76	75	NE 4.3	NE 8.3	NE 6.1
25	22.1	22.8	27.8	17.0	17.0	22.0	0.9	0.9	0.6	70	76	75	SE 4.2	SW 7.3	SW 7.1
26	32.4	35.1	25.5	29.0	23.0	25.6	0.3	0.5	0.4	72	70	75	SW 3.3	0	S 4.1
27	35.6	36.1	30.7	29.5	26.4	12.0	0.3	0.4	1.3	66	71	72	0	S 2.3	E 13.2
28	20.0	16.3	14.8	12.2	9.0	12.0	1.3	1.9	1.5	70	83	83	SE 11.3	SE 6.4	0
29	19.8	23.3	29.2	25.0	16.0	12.0	0.5	1.0	1.6	73	75	84	SW 10.2	W 7.0	W 7.0
30	35.7	39.1	40.7	11.0	14.0	13.2	1.7	1.3	1.4	86	83	83	N 16.3	N 16.4	N 9.3
31	39.9	39.0	38.4	18.2	14.6	20.0	0.8	1.0	0.7	72	64	72	E 11.3	0	0
M.	27.5	27.8	28.1	24.1	22.7	24.3	0.7	0.7	0.7	78	78	79	7.1	6.6	5.3

Framheim. **October 1911.**

$\varphi = 78^\circ 38' \text{ S}$
$\lambda = 163^\circ 37' \text{ W}$

	Amount of Cloud 0—10			Form of Cloud			Precipitation			Aurora Polaris			Halos		
D.	8	2	8	8	2	8	8	2	8	8	2	8	8	2	8
1	10	10	10			S.	S.	S.							
2	10	10	10			S.	S.	s.							
3	10	10	10			S.	S.	S.							
4	10	7	10	S.	S. Ci.-S. Ci.	S.									
5	1	10	5	Ci.		A.-Cu. S.		f.							
6	2	3	7	A.-Cu.	Ci.-Cu. Ci.	A.-Cu. S									
7	2	2	3	A.-Cu. Ci.	Ci. S.	S.									
8	2	1	1	Ci. S.	Ci.	S.									
9	10	7	4	S.	S. A.-Cu. Cu.	S. Ci.									
10	7	8	4	S.	S. Ci.-S.	S. Ci.							S.		
11	1	1	10	Ci.	Ci.	S.									
12	10	10	8	S.	S.				f.						
13	10	10	10	S.	S.	S.									
14	8	10	10	S. Ci.	S.				f.						
15	6	10	10	S. Ci.	S.	S.									
16	10	6	9	S.	S.	S.		f.							
17	10	10	4	S.	S.	S. Ci.	f.	f.							
18	10	10	10	S.	S.	S.									
19	10	10	10	S.	S.	S.									
20	9	6	2	S.	S.	Ci. S.									
21	0	6	8		S.	S.									
22	10	6	4		A.-Cu. S.	Cu. S.	S.								
23	10	10	2			Cu. S.	S.	S.							
24	10	10	10				S.	S.	S.						
25	10	10	6			Cu. S.									
26	4	6	8	S.	A.-Cu. S.	S.									
27	0	4	10	S.	Cu.-S.				S.						
28	10	10	10				S.	S.	s.						
29	10	10	10				S.	S.	S.						
30	10	10	10				S.	S.	s.						
31	2	6	4	A.-Cu. S.	A.-Cu. S.	A.-Cu. S.									
M.	7.2	7.7	7.5												

Framheim. **November 1911.**

H_b = 11.1 m.
C_g = 1.85 mm. at 760.5 mm.

	Pressure N. Gr. Sea-L. 700 mm. +			Temperature all negative C°.			Vapour-Tension m.m.			Relative Humidity per Cent.			Wind Direction true. Velocity Metres per Second.					
D.	8	2	8	8	2	8	8	2	8	8	2	8	8		2		8	
1	40.6	43.5	44.1	28.0	22.0	20.5	0.3	0.6	0.7	72	75	72	E	1.4	S	6.0	SE	6.0
2	44.1	40.9	40.1	18.0	16.2	21.3	0.8	1.1	0.5	75	80	61	E	15.4	E	17.4	S	2.0
3	39.9	39.8	41.1	26.0	21.2	22.0	0.4	0.6	0.6	64	64	74	S	1.1	S	1.2	SW	6.4
4	46.2	49.3	50.8	21.0	17.0	21.0	0.6	0.9	0.6	72	74	72	S	1.2		0	SW	7.0
5	49.7	50.8	50.8	16.0	19.0	21.2	1.1	0.8	0.6	81	75	75	SW	5.4	S	7.0	SW	9.0
6	51.1	50.2	47.1	24.0	18.0	19.8	0.5	0.9	0.8	75	80	80	E	2.2	E	2.0		0
7	44.8	45.1	45.2	9.0	9.0	11.5	1.7	1.8	1.3	72	75	70	E	14.4	E	17.4	E	9.3
8	47.1	44.1	41.7	18.0	19.0	19.0	0.7	0.7	0.7	61	68	71		0	SW	7.2	SW	9.1
9	41.0	40.8	40.9	23.0	17.0	21.0	0.5	0.8	0.6	68	66	72	S	7.0	S	1.2		0
10	43.3	44.3	44.8	20.0	17.4	18.0	0.6	0.8	0.8	65	68	69	SW	1.2	SW	7.0	SW	3.2
11	45.3	46.3	47.0	20.5	16.0	16.6	0.7	1.0	0.9	72	72	70	SW	4.2	SW	6.1	SW	5.2
12	48.7	50.2	50.5	19.0	12.0	16.3	0.7	1.3	0.9	70	72	70	E	1.3	SE	1.2		0
13	51.4	51.9	50.9	16.0	16.0	16.5	1.0	1.0	1.0	72	73	75	SE	5.2	NE	1.4	E	8.0
14	49.9	51.7	50.3	17.0	14.2	17.2	0.8	1.0	0.9	68	66	70	E	15.4	E	5.2	E	14.3
15	50.5	51.9	51.6	15.0	13.2	16.4	0.8	1.3	0.9	58	75	71	SE	5.3	SE	8.0	SE	7.4
16	47.7	47.7	46.5	15.4	14.0	15.0	0.9	1.0	1.0	66	65	68	E	14.4	E	18.3	NE	19.3
17	45.0	44.0	43.9	13.4	12.0	12.0	1.0	1.2	1.1	62	64	60	SE	4.4	SE	5.2	SE	5.1
18	44.5	47.1	47.1	13.4	10.2	9.4	1.2	1.6	1.9	75	75	81	E	8.3	E	6.3	NE	1.2
19	48.3	48.7	48.9	9.2	8.0	14.0	1.9	1.9	1.1	81	75	68		0	SW	2.2	SW	4.3
20	49.3	49.5	51.7	14.4	13.2	17.1	1.0	1.1	0.9	64	64	73	S	1.2	SW	1.3	SW	2.4
21	53.2	54.9	55.3	22.6	17.6	18.6	0.6	0.8	0.8	75	71	72	SW	2.3	SW	2.3	SW	5.0
22	56.8	58.3	59.0	19.4	14.2	18.1	0.8	1.1	0.8	76	70	73	S	1.2	E	4.1	E	3.3
23	60.1	61.5	62.6	13.8	9.0	8.0	1.2	1.9	2.1	72	81	85	E	4.3	E	4.3	NE	1.2
24	63.3	63.4	61.7	8.0	7.8	9.2	2.1	2.1	1.6	83	81	70	E	1.2	E	2.3	E	0
25	58.2	56.1	53.8	7.2	7.2	9.6	1.7	2.0	1.6	63	72	70		0	SE	1.3		0
26	49.2	48.0	47.7	12.0	5.8	6.5	1.6	2.7	2.4	87	90	84	E	4.4	N	8.3	N	7.3
27	51.0	53.7	55.1	8.0	5.2	6.4	1.9	2.4	2.3	73	76	80	NW	4.2	NW	7.3	NW	13.3
28	58.0	60.2	59.8	7.2	8.2	13.0	2.1	1.8	1.4	77	72	81	W	1.1	SW	1.2	NE	4.1
29	58.0	58.0	57.5	9.4	7.6	11.1	1.8	2.1	1.6	79	77	82	E	2.1	E	3.3	E	2.3
30	56.8	57.2	57.7	8.8	6.4	10.2	1.7	1.8	1.6	73	64	75	SE	1.2		0		0
M.	49.8	50.3	50.2	15.8	13.1	15.2	1.1	1.3	1.1	72	73	73		4.4		5.2		5.2

Framheim. **November 1911.**

$\varphi = 78^\circ 38' S$
$\lambda = 163^\circ 37' W$

	Amount of Cloud 0—10			Form of Cloud			Precipitation			Aurora Polaris			Halos		
D.	8	2	8	8	2	8	8	2	8	8	2	8	8	2	8
1	5	0	2	S.		Ci. S.									
2	0	0	1			Ci. S.	S.	S.							
3	0	0	0												
4	0	0	0												
5	10	10	9	S.	S.	S.									
6	0	2	3		Cu. S.	Ci. Cu.			S.						
7	4	2	2	Ci. A.-S.	Ci. S.	Ci. S.	S.	S.	S.						
8	0	0	0												
9	0	0	0												
10	0	2	1		Ci. S.	Ci. S									
11	2	1	2	Ci.	S.	A.-Cu.									
12	1	1	2	Ci.	S.	A.-Cu.									
13	4	0	2	S.		Ci. S.									
14	0	1	0		S.		S		S.						
15	1	1	2	S.	S.	S.									
16	0	2	10		Ci. S.		S.		S.						
17	10	4	6	S.	S.	S.									
18	10	10	9	S.	S.	S.									
19	10	8	10	S.	S	S.									
20	10	7	6	S.	S.	Ci. S.									
21	0	0	0												
22	0	0	2			A.-Cu.									
23	10	10	10	S.	S.	S.									
24	10	10	10	S.	S.	S.									
25	8	8	10	A.-Cu.	S.				s.						
26	10	10	10				S.	S.	s.						
27	8	8	9	S.	S.	S.		S.	S.						
28	10	7	4	S.	S.	S.	s.								
29	8	8	9	S.	Ci. S.	S.									
30	6	4	4	Ci. S.	S.	A.-Cu.									
M.	4.6	3.9	4.5												

Framheim. **December 1911.**

H_b = 11.1 m.
C_g = 1.85 mm. at 760.5 mm.

	Pressure N. Gr. Sea-L. 700 mm. +			Temperature all negative C°.			Vapour-Tension m.m.			Relative Humidity per Cent			Wind Direction true. Velocity Metres per Second.					
D.	8	2	8	8	2	8	8	2	8	8	2	8	8		2		8	
1	57.5	58.1	57.6	10.6	10.0	14.2	1.6	1.7	1.2	75	77	77	E	4.4	S	3.1	S	5.4
2	58.2	57.9	56.3	12.2	12.4	15.2	1.2	1.3	1.1	68	72	75		0	SE	1.2	SE	1.3
3	53.1	56.0	57.6	16.8	12.2	15.0	1.0	1.4	1.2	81	75	81	SW	4.4	SW	1.3	SE	2.2
4	55.3	50.4	47.3	11.0	7.0	1.2	1.4	2.3	4.0	72	86	95	SE	12.3	E	14.1	NE	9.3
5	46.2	46.1	44.0	0.2	0.2	1.8	4.0	4.4	2.9	86	98	72	NE	11.3	NE	16.3	NE	19.4
6	44.9	45.3	45.2	2.0	2.2	2.2	2.8	3.0	3.7	72	77	93	NE	9.3	NE	10.1	E	10.1
7	51.7	56.3	58.5	2.6	1.0	4.0	2.9	2.4	2.8	76	57	81	SW	5.3		0		0
8	60.9	62.6	63.5	6.2	3.0	3.0	2.2	2.8	3.0	76	76	81		0		0	W	1.3
9	66.8	63.6	58.5	7.5	3.0	2.0	2.5	3.4	3.8	93	91	95		0	NW	2.4	W	6.1
10	51.4	50.4	49.2	4.0	4.5	7.1	2.6	2.7	2.2	76	81	80	S	9.1	SW	10.1	SW	11.1
11	46.9	46.3	45.2	8.8	6.6	6.5	2.0	2.1	2.1	81	74	74	SW	8.2	SW	7.3		0
12	42.7	43.8	44.2	7.0	8.6	8.0	2.1	2.1	1.9	76	85	75		0	E	3.4	E	8.0
13	44.3	44.6	44.1	8.0	6.2	7.2	2.1	2.3	1.9	80	79	70	E	7.0	E	8.0	SE	2.1
14	44.2	44.9	44.4	6.6	6.2	7.0	2.0	2.5	2.3	72	85	86		0	E	3.3		
15	46.7	49.6	52.1	8.8	7.2	7.2	2.1	2.3	2.4	85	85	88	E	5.2	E	6.4	E	7.4
16	56.1	58.0	58.6	5.0	2.2	3.2	2.8	3.6	3.4	87	90	92	E	4.1		0		0
17	57.1	56.1	54.9	4.2	2.0	6.4	2.8	2.8	2.5	85	70	86	E	4.1	E	2.3		0
18	53.7	53.1	53.5	5.2	4.2	4.6	2.7	2.8	2.7	85	85	83	E	4.3	E	5.2		0
19	55.8	57.5	58.5	7.6	5.8	5.0	2.2	2.5	2.7	85	85	85	SW	5.3	E	2.2		0
20	59.6	59.5	58.2	5.0	4.0	7.0	2.7	2.9	2.3	85	85	83	NE	5.3	NE	3.3	E	8.2
21	55.6	56.4	56.2	7.5	3.6	4.6	2.3	3.3	3.1	86	92	93	E	9.2	E	5.3	E	4.3
22	55.3	54.3	54.0	3.0	3.4	6.4	3.2	2.8	2.1	86	79	71	E	5.3	SE	6.1	E	5.2
23	54.9	56.6	57.5	7.0	4.0	3.3	2.6	2.5	3.2	93	71	87	E	6.2	E	6.1		0
24	58.0	58.2	57.9	3.6	2.6	6.6	2.9	3.1	2.4	82	82	83	E	4.2	E	5.1	E	5.1
25	56.5	56.3	56.2	1.2	6.8	9.7	2.7	2.3	2.8	63	79	82		0	S	3.3	S	6.2
26	57.3	57.7	58.6	11.4	4.2	7.4	1.4	2.6	2.1	70	75	75	S	3.1		0		0
27	60.4	60.8	60.6	9.8	5.4	6.4	1.5	2.3	2.5	68	73	85		0	S	3.4	SW	3.0
28	60.2	60.4	60.0	10.7	7.7	9.4	1.6	2.2	2.0	79	85	85	SE	3.3	E	4.0	E	3.1
29	59.0	59.0	58.8	10.4	6.2	6.6	1.8	2.4	2.5	86	81	86	E	6.2	E	6.3	E	6.2
30	58.1	57.6	56.7	7.2	5.4	5.7	2.3	2.6	2.6	86	82	84	E	5.2	ENE	4.4	E	2.3
31	54.6	53.6	53.8	6.8	3.4	7.5	2.4	3.2	2.1	86	88	79	E	4.4	ENE	3.1	SE	4.0
M.	54.3	54.6	54.3	7.0	5.2	6.5	2.3	2.6	2.5	80	81	83		4.5		4.5		4.2

Framheim. **December 1911.**

$\varphi = 78^\circ 38' S$
$\lambda = 163^\circ 37' W$

	Amont of Cloud 0—10			Form of Cloud			Precipitation			Aurora Polaris			Halos		
D.	8	2	8	8	2	8	8	2	8	8	2	8	8	2	8
1	8	6	3	S.	Ci.	Ci. Cu.									
2	0	0	0												
3	0	0	0												
4	10	10	10	S.	S.		S.	S.	s.						
5	10	10	10				S.	S.	S.						
6	10	10	10				S.	S.	S.						
7	10	10	9	S.	S.	S.									
8	8	10	4	S.	S.	S.									
9	10	10	10				F.	s.	sl.						
10	8	2	2	S.	Ci.	A.-Cu.	S.	S.							
11	9	2	10	S.	S.		S.		s.						
12	10	6	0	S.											
13	10	9	2	S.	A.-Cu. S.	A.-Cu.	S.								
14	0	5			A.-Cu.										
15	4	10	10	A.-Cu.	S.	S.			S.						
16	10	10	10	S.	S.	S.	S.								
17	10	3	4	S.	A.-Cu.	Ci. S.									
18	10	10	10	S.	S.	S.									
19	10	10	10	S.	S.	S.									
20	10	10	10	S.	S.				S.						
21	10	10	10	S.	S.		S.		s.						
22	10	10	10	S.	S.	Ci. S.									
23	8	4	8	A.-Cu. S.	A.-Cu.	S.									
24	10	10	8	S.	S.	A.-Cu.									
25	0	0	0												
26	0	0	1			Cu.									
27	2	2	2	Cu.	Cu.	Cu.									
28	8	2	1	S.	Ci. S.	Ci.									
29	10	10	8	S.	S.	A.-Cu. S.									
30	10	10	10	S.	S.	S.									
31	10	10	9	S.	S.	S.									
M.	7.6	6.8	6.3												

Framheim. **January 1912.**

H_b = 11.1 m.
C_g = 1.85 mm. at 760.5 mm.

	Pressure N. Gr. Sea-L. 700 mm. +			Temperature all negative C°.			Vapour-Tension m.m.			Relative Humidity per Cent.			Wind Direction true. Velocity Metres per Second.					
D.	8	2	8	8	2	8	8	2	8	8	2	8	8		2		8	
1	53.7	52.9	52.7	7.5	8.2	10.7	2.4	2.6	1.7	90	72	82	SW	4.0	SW	4.0	SW	2.4
2	51.6	50.9	50.1	9.7	3.8	9.2	1.9	2.4	1.8	83	68	75		0		0	SW	7.2
3	49.8	49.6	49.5	13.4	8.4	9.6	1.4	2.1	2.0	83	81	83	SW	5.1	SW	4.2	SW	5.1
4	51.4	52.1	52.3	10.4	10.0	10.2	1.7	1.9	1.8	81	86	84	SE	3.1	E	5.3	E	2.3
5	51.9	53.0	52.7	13.2	9.4	13.5	1.4	1.8	1.3	86	82	80	SE	2.2	N	2.2	NE	1.5
6	52.7	52.0	49.4	13.0	9.2	10.2	1.4	2.2	1.9	83	93	88		0	SW	4.3	E	3.2
7	45.0	43.0	41.3	9.6	7.2	8.2	2.0	2.5	2.1	88	92	83	E	7.0	SE	3.3	S	2.2
8	38.5	38.6	38.1	7.2	7.2	9.2	2.2	2.2	1.9	80	79	82	E	2.3		0		0
9	40.3	42.8	43.3	11.4	8.7	8.8	1.7	2.0	2.1	84	83	87	E	3.0	E	7.4	E	7.3
10	46.0	46.9	46.0	6.4	3.4	6.8	2.5	3.1	2.3	86	85	79	E	4.1	E	4.4	ESE	5.0
11	44.0	42.2	42.1	7.2	4.4	5.6	2.3	2.8	2.3	81	83	75	E	7.4	E	6.4	E	7.2
12	41.2	42.2	41.1	5.4	5.2	8.4	2.5	2.4	2.3	79	76	92		0		0	ENE	2.3
13	38.2	38.2	38.1	7.8	9.7	7.4	2.3	2.3	2.2	88	81	81	E	6.2	E	7.2	E	5.3
14	39.3	44.0	45.1	8.3	4.4	6.4	1.8	2.1	2.4	70	62	83		0		0	SW	2.2
15	48.5	49.7	51.0	9.0	8.0	8.4	2.2	2.2	2.0	92	84	81	SW	4.4	SW	4.1		0
16	50.7	49.6	48.0	10.6	6.7	6.4	1.7	2.4	2.4	81	83	81		0	E	1.3		0
17	45.8	46.2	47.1	5.7	2.7	8.2	2.5	3.1	2.0	83	79	77	W	2.3		0	SE	2.2
18	47.5	47.1	45.9	10.2	6.6	7.4	1.6	2.2	2.1	74	75	75		0	E	10.3		0
19	45.7	46.6	46.9	9.0	9.0	12.4	1.7	1.7	1.4	68	69	75		0	S	7.2	SSW	7.0
20	48.4	48.1	47.0	13.7	10.4	12.4	1.4	1.7	1.5	84	79	82	W	3.1	SW	4.1	SW	2.2
21	46.5	47.9	47.9	14.6	10.2	6.6	1.2	1.7	2.7	79	80	95	S	2.0	E	2.2	E	7.4
22	50.1	50.6	51.6	7.4	5.2	6.4	2.2	2.7	2.5	83	86	85	E	2.3	E	5.1		0
23	52.6	52.8	52.4	6.2	8.2	8.2	2.5	2.4	2.4	83	94	94		0	NE	4.4	ENE	6.3
24	52.7	52.9	53.0	11.7	12.8	15.2	1.6	1.3	1.1	81	76	77	S	4.1	S	5.3	S	3.3
25	48.6	46.7	43.2	17.2	17.2	13.4	1.0	1.0	1.5	81	79	88	SW	4.2	SSW	4.4	WSW	9.4
26	43.4	43.5	43.6	11.8	8.4	13.2	1.5	1.5	1.2	79	61	68	SE	6.2	E	3.3	SE	2.3
27	44.9	44.7	42.5	12.7	9.4	10.6	1.4	1.6	1.8	79	70	85	E	2.2	S	3.1	E	3.3
28	44.7	45.0	43.6	9.4	9.5	12.4	1.6	1.4	1.4	70	61	79	S	3.1	E	3.4		0
29	44.6	45.1	45.7	8.7	7.9	10.2	2.1	2.1	2.0	85	82	94	SE	2.0	S	5.0		0
M.	46.9	47.0	46.4	9.9	8.0	9.5	1.9	2.1	1.9	82	79	82		2.7		3.9		3.3

Framheim. **January 1912.**

$\varphi = 78^\circ 38' \text{ S}$
$\lambda = 163^\circ 37' \text{ W}$

	Amount of Cloud 0—10			Form of Cloud			Precipitation			Aurora Polaris			Halos		
D.	8	2	8	8	2	8	8	2	8	8	2	8	8	2	8
1	9	8	2	S.	S.	S.									
2	10	2	8		S.	A.-Cu. S.	s								
3	0	0	0												
4	1	2	6	Ci.	Ci.	Ci.									
5	2	0	1	Ci.		Ci.									
6	10	10	10			S.	F.	F.							
7	10	10	10	S.	S.	S									
8	10	4	5	S.	A.-Cu.	A.-Cu.									
9	6	8	10	A.-Cu	A.-Cu.	S.									
10	10	4	4	S.	Ci.	Ci.									
11	5	8	4	A.-Cu.	A.-Cu.	Ci.									
12	9	9	9	S.	S.	S.									
13	6	2	0	Ci. S.	Ci. S.										
14	2	8	10		S.	S.									
15	10	1	2	S.	Ci. S.	S.									
16	10	2	10	S.	S.	S.									
17	8	0	0	S.											S.
18	0	0	6			Ci.									
19	6	0	0	A.-Cu.											
20	0	0	0												
21	0	9	10		S.	S.			S.						
22	6	10	10	S.	S.	S.									
23	10	10	10	S.	S.	S.									
24	8	0	0	S.											
25	10	8	10	S.	A.-Cu.				S.						
26	2	0	0	S.											
27	2	0	0	Ci. S.											
28	0	0	10			S.									
29	10	10	10	S.	S.	S.									
M.	5.9	4.3	5.4												

Summary.

	Pressure mm.	Temp. ° C.	Vapour-Tension m.m.	Relative Humidity	Wind Direction	Wind Velocity	Storm	Cloud	Clear Days	Cloud Days	Fog Days	Snow Days	Auror. Days	Solar Halo Days	Lunar Halo Days
April	739.8	— 27.6	0.5	81	E	4.4	1	7.2	3	16	6	8	8	—	6
May	38.3	— 35.4	0.2	79	E	2.9	—				—	1	18	—	2
June	34.7	— 34.4	0.4	86	E	4.0	—				—	5	12	—	5
July	34.3	— 36.5	0.3	90	E	4.7	—				—	3	17	—	6
August	36.2	— 44.8	0.1	90	E	4.1	1	(4.5)			3	3	6	—	1
September	35.2	— 37.5	0.4	83	E	4.4	2	5.8	7	12	10	5	4	—	—
October	27.8	— 24.2	0.7	78	E	6.5	3	7.5	1	16	4	10	—	1	—
November	50.1	— 15.5	1.1	73	E	5.1	6	4.3	13	9	—	8	—	—	—
December	54.4	— 6.7	2.4	82	E	4.8	2	6.9	4	15	1	11	—	—	—
January	46.8	— 9.7	1.9	81	E	3.5		5.2	5	7	1	5	—	1	—
Maximum	766.8	— 0.2	4.4	100	E	20.0		10							
Minimum	13.4	— 59.0	0.0	38	NW	0.0		0							

Wind-Roses.

Smoothed.	N	NE	E	SE	S	SW	W	NW	C.	
Pressure	739.3	739.2	739.2	737.2	737.1	737.6	737.7	745.6	738.9	mm.
Temperature	−22.2	−23.3	−22.9	−23.4	−27.3	−29.3	−29.5	−21.9	−31.4	°C.
Tension of Vapour	1.1	1.1	1.0	0.9	0.6	0.6	0.6	1.0	0.7	mm.
Relative Humidity	86	85	85	82	78	78	79	84	82	%
Wind. Frequency	3	12	20	15	11	11	5	2	21	%
Wind. Velocity	6.5	6.0	5.9	5.0	4.1	4.5	5.0	6.1	—	m.p.s.
Wd.Vel.>15 m.p.s	3	4	7	—	—	—	1	—	—	cases
Cloudiness	7.6	7.0	6.6	5.8	4.5	4.6	5.3	7.8	5.8	0—10
Fog Probability	—	8	4	2	7	6	—	—	3	%
Snow	7.5	13.	37	6.5	6	4.5	3.5	3	13	cases
Snow Probability	46	18	13	10	5	3	15	30	67	%

Climate of Framheim.

Atmospheric Pressure.

Taking the means of the 3 daily observations as the means for the months, and extracting the highest and lowest observed values, we have

	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	
Mean	739.8	738.3	734.7	734.3	736.2	735.2	727.8	750.1	754.4	746.8	mm.
Max	758.2	754.8	751.6	750.9	749.7	749.5	754.6	763.4	766.8	753.7	»
Min.	730.0	712.9	725.2	718.6	725.5	713.4	714.9	739.8	742.7	738.1	»
Range	28.2	41.9	26.4	32.3	24.2	36.1	39.7	23.6	24.1	15.6	»

The pressure is very variable. The total range is 766.8—712.9 or 53.9 mm. It is highest in December, and lowest in October. Range 754.4—727.8 or 16.6 mm. The corresponding pressures at MacMurdo Sound are[1]

744.6 742.3 739.4 738.6 741.3 740.5 732.1 752.6 755.7 747.5 *mm.*,

and the differences between Mac Murdo Sound and Framheim

+ 4.8 + 4.0 + 4.7 + 4.3 + 5.1 + 5.3 + 4.3 + 2.5 + 1.3 + 0.7 mm.

Reducing the Framheim pressures to the 4-years' series of MacMurdo Sound[1], we get as preliminary normals

	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	
Mac Murdo S.	746.1	742.5	742.1	740.6	739.2	743.1	736.5	745.9	747.6	743.2	mm.
Framheim	741.3	738.5	737.4	736.3	734.1	737.8	732.2	743.4	746.3	742.5	»

The pressure at Framheim is always lower than at MacMurdo Sound.

[1] Met. Z. 1914, p. 551.

Baric Wind-Roses.

	N	NE	E	SE	S	SW	W	NW	C.
April	734.5	739.7	738.7	738.8	736.3	745.1	741.3	733.8	735.2
May	—	28.6	38.6	31.9	37.8	31.4	25.8	—	39.8
June	43.2	41.7	33.5	34.9	30.5	32.0	28.0	45.1	33.6
July	—	32.1	32.9	36.8	33.7	31.2	29.5	—	34.3
Aug.	39.7	35.2	34.7	32.2	31.8	32.0	32.3	34.6	36.0
Sept.	29.0	34.7	36.1	27.7	33.3	32.8	32.3	—	33.7
Oct.	30.0	28.9	29.7	22.3	22.2	24.9	26.0	—	26.2
Nov.	46.7	52.5	50.7	48.5	43.7	47.5	56.9	52.2	49.4
Dec.	—	48.8	52.7	53.9	55.7	51.2	60.0	62.5	55.2
Jan.	51.9	49.7	43.9	45.1	46.3	48.4	45.3	—	45.3
Mean.	734.5	737.6	738.7	736.3	735.8	737.0	733.9	743.2	738.9

The numbers in this Table and the following Wind-Roses are all weighted and smoothed means, computed from the formula

$$M = \frac{ap_a + 2bp_b + cp_c}{p_a + 2p + p_c}$$

M being the weighted and smoothed value for the respective wind-direction, *b* the mean value for that direction, *a* and *c* the values for the adjacent directions, p_a, p_b and p_c the respective weights or number of observations. The last row contains only weighted means of the numbers in the respective column (wind direction), and not smoothed.

The mean pressure found for a single wind is the mean of values differing often considerably from that mean. Any wind may accompany both high and low pressure.

The baric wind-rose shows maxima with E, SW and NW, and minima with N, S and W. There is no regular march round the compass.

The Temperature of the Air.

As the Thermograms were unsuitable for the computation of the daily and monthly mean temperatures, I have taken the means of the observations at 8 a. m and 8 p. m. as the mean temperature of the months.

	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.
Mean	— 27.6°	— 35.4°	— 34.4°	— 36.5°	— 44.8°	— 37.5°	— 24.2°	— 15.5°	— 6.7°	— 9.7°
Max.	— 11.0	— 20.0	— 10.6	— 12.5	— 24.5	— 9.5	— 9.0	— 5.2	— 0.2	— 2.7
Min.	— 48.0	— 50.6	— 58.2	— 54.5	— 59.0	— 53.5	— 40.2	— 28.0	— 16.8	— 17.2
Range	— 37.0	— 30.6	— 47.6	— 42.0	— 34.5	— 44.0	— 31.2	— 22.8	— 16.6	— 14.5

Prof. JULIUS v. HANN has reduced the Framheim temperatures to the 5-years' means of temperature from MacMurdo Sound[1].

[1] Met. Z. 1914, p. 553.

	Jan.	Feb.	March	April	May	June
MacMurdo Sound	− 4°.5	− 8°.9	− 15°.3	− 22°.7	− 23°.6	− 24°.4
Framheim	− 5.7	− 12.6	− 21.9	− 31.1	− 32.8	− 34.1
Diff.	1.2	3.7	6.6	8.4	9.2	9.7

	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
MacMurdo Sound	− 25°.9	− 25°.9	− 24°.3	− 19°.0	− 10°.0	− 3°.9	− 17°.4
Framheim	− 36.5	− 36.8	− 34.1	− 25.6	− 13.0	− 4.6	− 24.1
Diff.	10.6	10.9	9.8	6.6	3.0	0.7	6.7

The coldest month is August and the warmest December. The amplitude is 32°.0 at Framheim, 22°.2 at MacMurdo Sound. Framheim is much colder than MacMurdo Sound, particularly in the winter months.

As will be seen from the observations made by Capt. AMUNDSEN on his sledge-journey, there are very frequently inversions of temperature along the meridian of Framheim, even in the summer months. The force of the wind is much greater at MacMurdo Sound than at Framheim. The stronger wind mixes the lower, colder air with the warmer, higher air, and the result is a higher temperature at the surface of the earth.

The diurnal period of the temperature at Framheim is not at all pronounced, as will be seen from the following Table.

	Mean 8 a. m., 8 p. m.	Mean 2 p. m.	Diff.		Mean 8 a. m., 8 p. m.	Mean 2 p. m.	Diff.
April	− 27°.6	− 27°.2	+ 0°.4	Sept.	− 37°.5	− 35°.8	+ 1°.7
May	− 35.4	− 35.9	− 0.5	Oct.	− 24.2	− 22.7	+ 1.5
June	− 34.4	− 33.8	+ 0.6	Nov.	− 15.5	− 13.1	+ 2.4
July	− 36.5	− 36.9	− 0.4	Dec.	− 6.7	− 5.2	+ 1.5
Aug.	− 44.8	− 45.4	− 0.6	Jan.	− 9.7	− 8.0	+ 1.7
	Sun below the horizon				Sun above the horizon		

In the dark season there is no regular daily march of the temperature. Lower temperatures are more frequent at 2 p. m. than at 8 a. m. and 8 p. m.

In the sunny season the temperature rises at 2 p. m. only 1° to 2° above the daily mean.

No temperatures above zero have been observed. The absolute observed maximum is — 0°.2 in December. The absolute Minimum is — 59°.0 in August. Range 58°.8.

Number of Days with Temperature

		April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Total
below	− 40°	3	12	16	16	26	19	2	0	0	0	94
»	− 50	0	1	6	3	15	7	0	0	0	0	32

Thermal Wind-Roses.

	N	NE	E	SE	S	SW	W	NW	C.
	°	°	°	°	°	°	°	°	°
April	— 16.0	— 24.8	— 22.4	— 23.9	— 28.2	— 32.4	— 39.1	— 14.0	— 33.4
May	—	— 23.6	— 28.5	— 34.3	— 38.0	— 38.7	— 37.5	—	— 37.2
June	— 24.9	— 42.8	— 29.4	— 31.2	— 34.2	— 38.8	— 48.0	— 25.3	— 40.8
July	—	— 31.8	— 30.3	— 34.2	— 41.5	— 42.5	— 41.0	— 30.5	— 43.5
Aug.	— 29.0	— 37.1	— 41.7	— 50.7	— 51.5	— 49.9	— 42.4	— 39.9	— 44.8
Sept.	— 17.1	— 37.9	— 30.5	— 32.5	— 48.0	— 45.6	— 40.5	—	— 39.1
Oct.	— 13.0	— 22.3	— 23.4	— 19.0	— 28.9	— 27.8	— 14.0	—	— 27.8
Nov.	— 6.1	— 12.5	— 14.0	— 13.3	— 20.4	— 17.3	— 7.2	— 6.5	— 13.6
Dec.	—	— 2.3	— 6.1	— 10.3	— 8.0	— 8.0	— 2.5	— 3.0	— 5.3
Jan.	— 9.4	— 10.0	— 8.0	— 10.2	— 11.3	— 10.1	— 10.4	—	— 7.3
Mean	— 16.7	— 25.4	— 22.6	— 21.6	— 27.1	— 30.2	— 28.9	— 15.9	— 31.4

The warmest winds are NW and N, the coldest SW and W. Calms are cold.

The Inter-diurnal Variability of the Temperature.

	Temp. rising		Temp. falling		Weighted Mean	Norw. N.-Pol-Exp. 1893—96		
	Number of Days	Mean Amount	Number of Days	Mean Amount			Var.	S—N
		°		°	°		°	°
April	17	+ 4.5	13	— 6.6	± 5.4	October	± 3.6	1.8
May	16	5.8	15	5.0	5.3	November	3.9	1.4
June	14	6.1	16	7.1	6.6	December	3.5	3.1
July	14	7.8	17	6.6	7.1	January	3.3	3.8
August	17	6.9	14	7.9	7.3	February	4.7	2.6
September	18	5.2	12	5.1	5.2	March	4.0	1.2
October	16	4.6	15	6.5	5.5	April	2.6	2.9
November	18	2.1	12	3.0	2.5	May	2.0	0.5
December	11	2.3	20	1.2	1.6	June	1.0	0.6
January	15	1.1	13	1.9	1.7	July	0.6	1.1
Total	156	46.4	14.7	50.9	48.2		29.2	19.0
Mean	15.6	+ 4.6	14.7	— 5.1	± 4.8		± 2.9	1.9

The variability is greatest in the winter months, and smallest in Summer. Range $7^0.3 - 1^0.6$ or $5^0.7$. From the 18th to 19th July the variation was $- 19^0.8$. The wind changed from E to SSW. From the 1st to 2nd August the variation was $+ 20^0$, the wind changed from SW to WSW. From the 21st to the 22nd the variation was $+ 20^0.8$. The wind changed from S to Calm and E.

The interdiurnal variability of the temperature at Framheim is excessive. For comparison I have placed in the Table the corresponding values of the variability from Nansen's North Polar Expedition with the »Fram«. They are much smaller, and the difference between South and North ranges from $3^0.8$ to $0^0.5$.

The Tension of Aqueous Vapour.

Taking the means of the Tensions at 8 a. m. and 8 p. m. as the monthly means of the tensions of vapour, we get .

	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	
Mean	0.5	0.2	0.4	0.3	0.1	0.4	0.7	1.1	2.4	1.9	mm.
Max.	1.8	0.8	2.0	1.8	0.6	2.4	1.9	2.7	4.4	3.1	
Min.	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.3	1.0	1.0	
Diff.	1.7	0.8	2.0	1.8	0.6	2.4	1.8	2.4	3.4	2.1	

Maximum in December, Minimum in August. Range 2.4 — 0.1 or 2.3 mm. The highest observed is 4.4 mm. in December. The lowest tension observed does not reach 0.1 mm. A diurnal period is seen only in the warmest months with a slight excess of 0.2 mm. at 2 p. m. over the tension at 8 a. m. and 8 p. m.

Atmic Wind-Roses, mm.

	N	NE	E	SE	S	SW	W	NW	C.
April	1.2	0.7	0.8	0.7	0.3	0.3	0.1	0.1	0.2
May	—	0.6	0.4	0.3	0.2	0.1	0.2	—	0.2
June	0.6	0.1	0.6	0.5	0.3	0.2	0.1	0.5	0.3
July	—	0.4	0.5	0.4	0.1	0.2	0.2	0.4	0.2
August	0.4	0.2	0.2	0.1	0.1	0.1	0.2	0.3	0.1
September	1.3	0.3	0.6	0.9	0.0	0.6	0.1	—	0.3
October	1.5	0.7	0.7	0.9	0.4	0.4	1.1	—	0.5
November	2.6	1.5	1.3	1.2	0.7	0.9	2.1	2.2	1.3
December	—	3.3	2.5	1.8	2.0	2.1	3.4	1.4	2.4
January	1.8	2.0	2.1	1.8	1.6	1.8	1.9	—	2.1
Mean	1.3	0.9	1.0	1.0	0.5	0.6	0.8	1.2	0.7

The wettest winds are N and NW, the driest is South. Difference 0.8 mm. The predominating East wind is rather wet. The east winds seem to be chiefly incurved cyclonic winds coming from the sea.

The Relative Humidity.

Monthly. Means. Per Cent.

	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.
Mean	81	79	86	90	90	83	78	73	82	81
Max.	90	88	97	99	96	100	98	90	98	95
Min.	74	73	79	79	84	38	64	58	57	61
Diff.	16	15	18	20	12	42	34	32	21	34

Maximum in July and August. Minimum in November. Range 90 — 73 or 17 per cent. A very little diurnal period is visible.

Wind-Roses for Relative Humidity.

	N	NE	E	SE	S	SW	W	NW	C
April	88	81	83	81	78	80	79	87	79
May	—	84	82	78	78	77	78	—	79
June	91	84	87	84	83	84	82	89	84
July	—	91	92	90	89	87	89	95	88
August	94	93	91	88	89	88	90	91	89
September	98	96	92	83	64	61	65	—	87
October	89	79	80	79	77	75	78	--	75
November	87	78	74	68	68	71	77	76	71
December	—	84	84	76	76	80	88	91	78
January	82	89	82	81	76	83	84	—	78
Mean	90	85	85	78	78	78	82	86	82

The wettest Winds are those coming from the Sea, the driest come from the interior. Range 90 — 78 or 12 per cent.

Wind.

Frequency. Percentage.

	N	NE	E	SE	S	SW	W	NW	C
April	2	11	26	6	17	15	2	2	19
May	—	1	19	5	19	17	3	—	36
June	2	2	45	2	10	7	1	2	29
July	—	3	39	8	11	15	3	1	20
August	3	9	27	3	10	15	5	2	26
September	2	21	30	4	13	12	2	—	16
October	5	13	28	12	11	15	3	—	13
November	2	6	31	12	11	22	1	4	11
December	—	10	41	9	7	10	2	1	20
January	1	3	32	9	11	18	3	—	23
Mean	2	8	32	7	12	14	3	1	21

East is by far the most prevalent wind in every month. The rarest wind is NW. There is a good deal of SW and S. Calms are rather frequent. The most quiet month is May, while October and November have the fewest calms. Range 36 — 11 or 25 per cent.

The Velocity of the Wind. Metres per Second.

	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.
Mean	4.4	2.9	4.0	4.7	4.1	4.4	6.5	5.1	4.8	3.5

Maximum in October, Minimum in May.

Range 6.5 — 2.9 or 3.6 m. p. s.

Dynamic Wind-Roses, m. p. s.

	N	NE	E	SE	S	SW	W	NW
April	7.8	5.2	6.7	4.5	3.3	4.7	2.3	5.8
May	—	6.2	5.0	4.1	2.4	3.9	5.7	—
June	2.9	4.8	5.8	3.1	4.0	5.7	3.8	3.7
July	—	5.2	6.3	5.8	4.3	5.4	3.9	3.0
Aug.	4.6	4.5	5.7	3.1	2.7	5.8	5.9	7.4
Sept.	7.5	5.3	6.5	3.9	2.4	3.6	4.3	—
Oct.	12.4	6.5	8.3	7.6	4.7	6.3	6.7	—
Nov.	7.8	5.4	7.3	4.6	2.9	4.6	1.1	8.3
Dec.	—	9.8	5.4	4.1	4.8	6.2	3.7	2.4
Jan.	2.2	3.4	4.8	3.2	4.1	4.5	4.0	—
Mean	7.8	5.8	6.0	4.7	3.4	5.0	4.8	6.2

The strongest wind is N, the weakest S. Range 7.8 — 3.4 or 4.4 m. p. s.

Number of Strong Winds, Velocity equal to or > 10 m. p. s.

	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Total
N							3				3
NNE						1					1
NE						1		1	4		6
ENE							1				1
E	3	1	2	4	2	4	5	8	2	1	32
ESE				1		1	4				6
SE							2		1		3
SSE											0
S							1				1
SSW	1		1								2
SW				1	1		3		3		8
WSW					2						2
W											0
WNW											0
NW					1			1			2
NNW											0
	4	1	3	6	6	7	19	10	10	1	67

October, the month with the greatest mean velocity has also the greatest number of strong winds. The quarter with the greatest number of strong winds is East.

Maximum Velocity of Wind, metres per second.

	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.
N							16.3			
NNE						15.0				
NE						20.0		19.3	19.4	
ENE							11.3			
E	16.9	11.2	14.6	13.0	12.3	12.4	17.6	18.3	14.1	10.3
ESE				16.0		11.0	13.4			
SE							11.3		12.3	
SSE										
S							13.4			
SSW	14.1		12.0							
SW					10.0		14.1		11.2	
WSW					16.2					
W										
WNW										
NW					13.3			13.3		
NNW										

Number of winds with velocities = or > 15 m. per sec.

	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Total
N							2				2
NNE						1					1
NE						1		1	2		4
E	1						1	5			7
ESE				1							1
WSW					1						1
Total	1	—	—	1	1	2	3	6	2	—	16

Gales are most frequent from the East, and in November. The highest observed wind-velocity was 20 m. per sec. on the 29th September, Wind NE. May, June and January have no gales.

The strong east winds are relatively mild winds with an average temperature of 6° above the normal, and they are accompanied with snow in 18 cases out of 32, or 56 per cent. The pressure is between 750 mm. and 722 mm., average 742 mm. This proves that the east winds come mainly from the sea as incurved cyclonic winds, having their minimum pressure towards the North or North-west in Ross Sea.

The Cloudiness.

	April	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.
Mean	7.2	(4.5)	5.8	7.5	4.3	6.9	5.2

The distribution of cloudiness is rather irregular.

Means for the 6 months

8 a.m.	2 p.m.	8 p.m.	*Mean*	*Range*
6.6	5.9	6.0	6.2	0.7

Nephic Wind-Roses.

	N	NE	E	SE	S	SW	W	NW	C
April	10.	6.1	8.3	8.7	8.0	4.6	3.5	10.	6.1
Aug.	6.5	6.3	4.9	1.0	2.2	4.0	3.0	—	4.8
Sept.	9.5	5.6	8.2	3.0	2.7	4.5	6.5	—	6.0
Oct.	10.	8.6	6.0	7.6	5.0	7.3	9.0	—	4.5
Nov.	10.	6.6	4.5	4.1	2.1	3.2	10.	8.3	4.1
Dec.	—	10.	8.0	5.0	2.7	4.1	7.0	10.	6.4
Jan.	0	8.2	5.5	3.0	2.8	5.0	5.2	—	6.6
Mean	8.6	7.1	6.7	5.3	4.1	4.7	6.0	9.2	5.8

The weather is most cloudy with northerly wind, and clearest with southerly.

Number of Clear and Cloudy Days.

	April	Sept.	Oct.	Nov.	Dec.	Jan.
Clear (0 — 2)	3	7	1	13	4	5
Cloudy (8 — 10)	16	12	16	9	15	7

November is remarkably clear. April and October cloudy.

Form of Clouds.

Number of cases in which the different forms of clouds have been noted.

	Ci.	Ci.-S.	Ci.-Cu.	A.-Cu.	A.-S.	Cu.	S.
April	4	2	1	3	7	—	45
August	2	—	—	2	—	—	27
September	6	5	—	3	7	1	41
October	16	2	1	6	—	3	58
November	15	—	—	5	1	2	50
December	6	—	—	10	—	5	43
January	13	—	—	9	—	—	41
Sum	62	9	2	38	15	11	300

Stratus is most frequent, then Cirrus and Alto-Cumulus.

Precipitation.

Number of Days with Fog and Snow.

	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Total
Fog	6	—	—	—	3	10	4	—	1	1	25
Snow	8	1	5	3	3	5	10	8	11	5	59

On an average, on every 5th day there is snow. Rain was never observed.

Fog Wind-Roses. Number of cases.

	N	NE	E	SE	S	SW	W	NW	C	Total
April				1.5	4.5				1	7
August		0.5	2.5			1				4
September		4.5	8.5		2	4			2	21
October		0.5	1.5		1.5	1.5				5
December									1	1
January						1			1	2
Total		5.5	12.5	1.5	8.0	7.5			5	40
Probability		8	4	2	7	6			3	per Cent.

No Fog in the NW quadrant. Maximum with east wind. Dividing the numbers of frequency with the number of cases in which each wind has been observed, we get the Probability of Fog for each wind. This is greatest with NE and none with wind from the NW quadrant.

Snow Wind-Roses. Number of cases.

	N	NE	E	SE	S	SW	W	NW	C	Total
April			4	1	3				2	10
May					1				1	2
June			4						3	7
July		1.5	1.5							3
August			2					1		3
Sept.	1	1	3.5	0.5					1	7
Oct.	4.5	3.5	4	4	1	2	2		1	22
Nov.	2	1	9					2	2	16
Dec.		6	8	1	1	2	1		2	21
Jan.			1			0.5	0.5		1	3
Total	7.5	13	37	6.5	6	4.5	3.5	3	13	94
Probabil.	46	18	13	10	5	3	15	30	67	p. cent

Snow is most frequent with E, least frequent with NW wind.

The period of probability is very regular. Maximum with N, Minimum with SW. Calms show the greatest probability for snow. Next come the winds from N and NW.

Aurora Australis.

Number of Days.

April	May	June	July	Aug.	Sept.	Total
8	18	12	17	6	4	65

Number of Auroras observed in the different Octants.

	N	NE	E	SE	S	SW	W	NW	Zenith	Total
April	5	2	4	1	—	—	3	1	—	16
May	2	3	5	4	6	3	2	5	7	37
June	8	—	5	6	4	—	4	8	3	38
July	13	4	9	4	7	2	7	4	7	57
August	5	—	4	1	2	—	1	1	1	15
September	1	2	1	—	—	—	—	—	—	4
Total	34	11	28	16	19	5	17	19	18	167

Auroras seen in the Zenith.

NW to SE	6 times
S	2 „
S—N	1 „
SW—NE	1 „
SW—NW	1 „
N and E—W	1 „
E—W	2 „
Zenith alone	4 „
Total	18 times

The Auroras lie chiefly in an arc stretching from NW—N—NE—E on the NE side of Framheim. The majority of the auroras seen in the zenith extend from NW—SE. This indicates that Framheim is lying well within an auroral zone converging towards the SW.

The magnetic declination at Framheim is 104° N—E. The south end of the magnetic needle points towards the magnetic pole in S. Victoria Land, or towards WNW. The auroral zone has not the magnetic pole as its centre, but the so-called magnetic axis, the position of which is SW from Framheim in lat. 79° S. I am indebted to Prof. C. STØRMER for this remark.

Numbers of Auroras at various Hours.

	8 a. m.	2 p. m.	8 p. m.	Total
April	0	0	8	8
May	9	2	11	22
June	7	2	9	18
July	12	6	11	29
August	1	0	6	7
September	0	0	4	4
Total	29	10	49	88

The auroras were most frequently seen at 8 p. m.

Halos

are most frequently seen round the Moon, 20 times, and only twice round the Sun.

Wind and change of pressure.

From the wind-tables and the barograms I have taken out the change of pressure during 4 hours for each wind-direction, and computed the weighted means for the ten months.

Number of cases.

Pressure	N	NE	E	SE	S	SW	W	NW	C.	Total
rising	15	39	142	21	47.5	66.5	11.5	9.5	79	431
falling	2	28	115.	38.5	54.5	50.5	8.5	10	76	383
no change	0	6.5	31.5	4	11	10	1	0	24	88
Total	17	73.5	288.5	63.5	113	127	21	19.5	179	902

Amount of change in 4 hours, mm.

Pressure	N	NE	E	SE	S	SW	W	NW	C
Rising	1.4	0.9	0.8	0.6	0.7	0.9	1.5	1.7	0.9
Falling	0.2	0.8	1.0	1.0	0.8	0.9	1.3	1.4	0.9

Probability of change. Per cent.

Pressure	N	NE	E	SE	S	SW	W	NW	C
rising	88	53	49	33	42	52	55	49	44
falling	12	38	40	61	48	40	40	51	43
no change	0	9	11	6	10	8	5	0	13

The single months show the same character as the means for 10 months.

The probability of rising pressure is greatest for N and least for SE; and the probability for falling pressure is greatest for SE and least for N. The amount of change is greatest for NW. The pressure may rise and fall with any direction of wind. The gradients may point in any direction or »Highs« and »Lows« may be found all round Framheim. The rising and falling of the pressure indicate that high and low pressures are approaching, or retreating from, or passing Framheim in every direction.

SE wind with its maximum of probability of falling pressure, indicates »Lows« in the NE quadrant approaching Framheim, and North wind

with its maximum of rising indicates »Lows« leaving Framheim on the western to south-western side, or these »Lows« are passing from East to West. The preponderance of easterly winds shows that the majority of »Lows« are lying North of Framheim. I have tried to investigate the possible tracks of »Lows« round Framheim by studying the change of the direction of the wind, but have totally failed in finding any rule. It seems that minima and maxima of pressure originate and wander in every direction on all sides of Whales Bay.

The Climate of Framheim,

the southernmost meteorological station of the world, may be characterised thus.

Atmospheric pressure rather low.

Temperature very low. The yearly mean is — 24° C. The mean yearly temperature of the latitude of Framheim on the northern hemisphere is — 17°.4.

Tension of vapour, small.

Relative Humidity, moderate.

Wind-direction, East prevailing.

Wind velocity moderate. Maximum 20 m. p. s.

Gales not frequent.

Cloudiness moderate.

Precipitation. No Rain. Snow only every 5th day.

Many Auroræ Australes.

The characteristics of the winds are —

	Frequency	Velocity	Temperature	Humidity	Cloudiness	Precipitation Frequency	Precipitation Probability
N	small	fresh	mild	wet	cloudy	mod.	mod.
NE	small	mod.	cold	mod.	cloudy	mod.	slight
E	great.	mod.	mod	mod.	mod.	great	slight
SE	small	small	mod	mod.	mod.	small	slight
S	mod.	small	cold	dry	slight	small	slight
SW	mod.	mod.	cold	dry	slight	small	slight
W	v. small	small	cold	mod.	mod.	small	slight
NW	insignificant	fresh	mild	wet	great.	small	mod.
Calm.	r. great.		cold	mod.	mod.	mod.	strong

PART II.

Observations on the Sledge-Journey.

In September, 1913, Capt. ROALD AMUNDSEN handed over to me a small 8vo volume which contained, in manuscript,

1. Tables of the Sun's Declination, the Equation of time and their variation in one hour at Greenwich apparent noon, from the 1st September, 1911, to the 1st January, 1912.
2. Courses steered by compass from the 8th to the 15th September, 1911, and from the 20th October, 1911, to the 26th January, 1912, and registered distances.
3. Meridian double altitudes of the Sun's lower limb observed with artificial horizon at various stations from the 31st October to the 15th December, 1911, and computed latitudes.
4. Meteorological Observations made during the sledge-journeys from the 8th to the the 15th September, 1911, and from the 20st October, 1911, to the 26th January, 1912.
5. Comparisons of watches.
6. Observations of the Sun's altitude and chronometer to find the Azimuth of the Sun, simultaneous bearings of the Sun by compass, and computed variation of the compass, from the 31st October to the 12th December, 1911.
7. Sketches and bearings of mountains seen.
8. Sextant observations of the Sun's altitude on the 16th December, 1911, from 7 a. m. to 7 p. m. and compass-bearings of the Sun.
9. Sextant observations of the Sun's altitude and compass-bearings of the Sun from the 17th December, 1911, 11^h 30^m a. m. to the 18th December, noon.
10. List of beacons, with courses and distances, on the Barrier.

Besides this book, I had at my disposal the regular daily meteorological observations made at Framheim, and a list, showing the hours of starting and of camping every march-day, kindly sent to me by Mr. SVERRE HASSEL, one of the members of the Expedition to the South Pole, as also R. Amundsen's book, »The South Pole«.

I. The Route. Courses and Distances. Latitudes and Longitudes.

1. Courses.

The steering was regulated by the compass. Some distance ahead of the leading sledge, which carried the compass, there went a »forerunner« on ski, moving in the direction given by the man at the sledge, and continually checked by him[1].

During the journey to the Pole the variation of the compass was determined by means of the altitude and compass-bearing of the Sun. From the altitude and declination of the Sun, and the latitude, was computed the azimuth of the Sun; and this, compared with the compass-bearing, gave the error or variation of the compass.

2. Distances.

The distances accomplished every day were measured by 3 sledgemeters fixed aft on the sledges. They consisted of a running vertical wheel, with which was connected a counting mechanism indicating in nautical miles or minutes of arc the distance made. The totals of the distances measured were checked by the latitudes found from astronomical observations.

The following Table shows, for every day, the hours of starting and camping, the variation of the compass, the courses by compass, except a few true directions, and the latitudes determined from astronomical observations. There is only one determination of longitude, on the 17th November, 0° 49′ E of Framheim. The Table is a copy of the data in Mr. Sverre Hassel's list and Capt. Amundsen's note-book. The dates are Framheim time. The date was not changed when the »Fram« passed 180° of longitude on the way from Europe.

[1] The South Pole, I. p.p. 211—213.

Year	Month	Day	Start.	Camp.	Var. of Compass	Course	Distance	Latitude.
			h m	h m			′	
1911	Sept.	8	10.30 a. m.	3.30 p. m.		Eb N	7.5	
		9	8.30 a. m.	3.30 p. m.		Eb N	13.5	
		10	9. a. m.	4 p. m.		Eb N	16.3	
		11	7.50 a. m.	3 p. m.		Eb N	15.2	
		12	8 a. m.	10.30 a. m.		S true	4.0	
		13	8 a. m.	4 p. m.		S true	16.0	
		14	8 a. m.	10.30 a. m.		S true	6.8	80°00′
		"	Noon	5.30 p. m.		N true	14.6	
		15	7 a. m.	4 p. m.		N true	31.5	
		16	7 a. m.	4 p. m.		N true		78 38
	Oct.	20	11 a. m.	5 p. m.		Eb N	20.2	
		21	10 a. m.	3.30 p. m.		Eb N	20.2	
		22	8 a. m.	11 a. m.		NEb E		
			5 p. m.	8.15 p. m.		Eb N	21.1	
		23	8 a. m.	2 p. m.		Eb N	22.8	80 00
		24						
		25						
		26	9 a. m.	1.15 p. m.		Eb N ½ N	15.6	
		27	8.20 a. m.			Eb N ¾ N	10.0	
		"		1 p. m.		ENE	4.5	
		28						
		29	8.30 a. m.	1.30 p. m.		ENE	15.0	
		30	8.30 a. m.	2 p. m.	119° NE	ENE	16.2	
		31						81 00
	Nov.	1	8.30 a. m.	2.45 p. m.		ENE	15.0	
		2	8.15 a. m.	2 p. m.		ENE	15.0	
		3	8.15 a. m.			ENE	2.5	
		"		3 p. m.		ENE ¼ N	12.5	
		4	8.15 a. m.			ENE ¼ N	9.5	
		"		2.45 p. m.		ENE ½ N	6.5	
		5			129° NE	N	2.5	
		6						82 00
		7	8 a. m.	4 p. m.		NE ½ E	20.0	
		8	7.45 a. m.	2.40 p. m.		NE ½ E	20.0	
		9	7.45 a. m.	3 p. m.	133° NE	NE ½ E	20.0	
		10						83 00
		11	8 a. m.	3 p. m.		NE ¼ E	20.2	
		12	7.45 a. m.	2.15 p. m.		NE ¼ E	20.1	
		13	8 a. m.	2.30 p. m.	140° NE	NE ¼ E	20.1	
		14	7.40 a. m.	1.30 p. m.		NE ½ N	20.2	
		15	7.45 a. m.			NE ½ N	9.0	
		"		2.40 p. m.	140° NE	NEb N	11.0	84 30
		16	7.15 a. m.	3 p. m.		NEb N	23.2	
		17	7.30 a. m.	10 a. m.		NEb N	9.0	85 05
		18	7.20 a. m.	5 p. m.		NE bE ¼ E	10.0	
		19	7.30 a. m.	6.30 p. m.		SW true	12.9	
		20	7.30 a. m.	4 p. m.		SW true	4.4	
		21	8 a. m.	8 p. m.		SW true	16.9	
		22						85 36
		23						
		24						
		25						
		26	9 a. m.	2.30 p. m.		NE ½ N	9.9	
		27	8 a. m.	4.30 p. m.	145° NE	NE ½ N	15.1	
		28	7.45 a. m.	4 p. m.		NEb N	16.0	
		29	7.40 a. m.	2.30 p. m.		NEb N	9.0	86 21
		30	7.45 a. m.	3.30 p. m.		NEb N	5.0	

Year	Month	Day	Start.	Camp.	Var. of Compass.	Course	Distance	Latitude.
			h m	h m			′	
1911	Dec.	1	10 a. m.	4.30 a. m.		NEb N	9.9	
		2	7.45 a. m.	3 p. m.		NEb N	13.1	
		3	12.30 p. m.	2 p. m.		NEb N	1.9	86°47′
		4	7.45 a. m.		143° NE	NEb N	11.0	
		"		7 p. m.		NEb N	9.0	
		5	8 a. m.	6 p. m.		NE ½ N	20.0	
		6	8 a m.	5.30 p. m.		NE ½ N	20.0	
		7	8.15 a. m.			NE ½ N	11.0	
				6 p. m.		NE ½ N	9.1	
		8	7.30 a. m.			NE ½ N	7.0	88 16
		"		5 p. m.	147° NE	NEb N	9.0	
		9						
		10	8.15 a. m.			NEb N	6.0	
		"				NEb N	10.0	88 30
		"		5.30 p. m.	146° NE	NEb N	8.0	
		11	7.15 a m.	5.30 p. m.		NEb N	9.0	88 47
		12	7.30 a. m.			NEb N	8.0	89 06
		"		4.30 p. m.		NEb N	9.1	
		13	7 a. m.			NEb N	9.0	89 25
		"		3.30 p. m.		NEb N	6.0	
		14	7.15 a. m.			NEb N	8.0	89 37
		»		4.30 p. m.		NEb N	8.0	
		15	6.50 a. m.	4 p. m.		NEb N	15.0	89 54
		16			118° NW			89 54
		17	8.30 a. m.	11.30 a. m.	58° NW	NW ¼ W	5.5	89 58
		18	7.30 p.					
		19				SE ¼ E	5.5	
		"		2 a. m.		SWb S	10.0	
		"	7.30 p. m.					
		20		2.30 a. m.				
		"	7.30 p. m.			SWb S	15.0	
		21		2.45 a. m.				
		"	7.30 p. m.			SWb S	15.0	
		22		2.30 a. m.				
		"	7.10 p. m.			SWb S	15.0	
		23		2 a. m.				
		"	7.20 p. m.			SWb S	15.0	
		24		1.50 a. m.				
		"	7.30 p. m.			SWb S	15.0	
		25		12.15 a. m.				
		"	7 p. m.			SWb S	11.3	
		26		12.55 a. m.				
		"	7.15 p. m.					
		27		12.55 a. m.		SW ½ S	15.0	
		"	7.15 p. m.					
		28		1 a. m.		SW ½ S	15.0	
		"	7 p. m.					
		29		12.30 a. m.		SW ½ S	15.0	
		"	7.30 p. m.					
		30		12.30 a. m.		SW ½ S	15.0	
		»	7 p. m.	M. N.		SW ½ S	15.5	
		31	7.30 p. m.	M. N.		SWb S	15.0	
1912	Jan.	1	7 p. m.			SWb S	15.0	
		2		12.30 p. m.				
			7 p. m.	10.15 p. m.		SWb S	16.3	
			11.30 p. m.			SWb S	3.4	
		3		5 a. m.		Sb E ¾ E	2.8	
						SWb W	9.0	

Year	Month	Day	Start.	Camp.	Var. of Compass.	Course	Distance	Latitude.
			h m	h m				
1912	Jan.	4	7 a. m.	3.30 p. m.		SW ¾ W	10.0	
						SWb S	10.0	
		5	1.30 a. m.	11.30 a. m.		SW ½ S	23.5	
		6	1.15 a m.	7.30 a. m.		NE true	11.5	
			10.15 p. m.					
		7		6 a. m.				
		"	6 p. m.	10.45 p. m.		NE true	12.5	
						N true	3.0	
						N true	11.8	
		8	4.30 p. m.	8.15 p. m.		SWb S	8.7	
		9	7.45 a. m.	2.30 p. m.		SWb S	16.0	
		10	2 a m	9.30 a. m.		SWb S	16.0	
			10.30 p. m.			SW ½ S	2.0	
		11		4 a. m.		SW ½ S	13.0	
		"	3.30 p. m.	9.15 p. m.		SW ½ S	15.0	
		12	8 30 a. m.	2.15 p. m.		SW ¼ W	15.0	
		13	2 a. m.	7.40 a. m.		SW ¼ W	15.0	
		"	6.30 p. m.	11.30 p. m.		SW ¼ W	15.0	
		14	10 a. m.	3.30 p. m.		SW ¼ W	15.0	
		15	3 a. m.	8.45 a. m.		SW ½ W	15.0	
		"	7.45 p. m.			SW ½ W	15.0	
		16		1.30 a. m.				
		"	12.10 p. m.	6.10 p. m.		SW ½ W	15.0	
		17	5 a. m.	10.30 a. m.		SW ½ W	15.0	
		"	10.15 p m.			SWb W ½ W	6.5	
		18		4 a. m.				
		"	2.10 p m.	8.15 p. m.		SWb W ¾ W	22.0	
		"				WSW	1.5	
		19	6.10 a. m.	11.45 a m.		WSW	15.0	
			10 p. m.					
		20		3.50 a. m.		WSW	16.0	
		"	2.15 p. m.	8 p m.		WSW	16.2	
		21	6.10 a. m.	11.10 a. m.		WSW	15.0	
		"	8 p. m.			WSW	4.5	
		22		2 a. m.		WSW ¼ W	10.0	
		"	Noon	5.30 p m.		WSW ½ W	15.5	
		23	4 a. m.	9.45 a. m.		W ¾ S	15.0	
		"	8 p. m.			Wb S	20.0	
		24		1.15 a. m.				
		"	11.15 a. m.	5.15 p. m.		Wb S ¼ S	10.0	
		25	3.45 a. m.	9.45 a. m.		Wb S ½ S	21.0	
		"	10.10 p m.			Wb S	14.3	
		26		3.30 a. m.				

In the manner shown by the Table the Expedition travelled over the Barrier from the 20th October to the 14th November. The course was South every day, following the meridian of Framheim, and the southern latitude steadily increased. On the 14th the course was shaped a little to East of South, so that the longitude on the 17th was 0° 49′ East of Framheim, and the observed latitude was 85° 5′. Then on the 18th began the ascent of the glacier. That day the Expedition travelled 10 miles towards S by E, and reached latitude 85° 15′, longitude 162° 50′ W. On the 19th, 20th and 21st, the Expedition worked its way up the Glacier and reached the »Butcher's Shop«. Here the latitude was observed, 85° 36′. The course

was SW true, and the distances registered 12'.9, 4'.4 and 16'.9, total 34.2 minutes of arc. The spherical triangle with sides the colatitude on the morning of the 19th 4° 45', the colatitude of the »Butcher's« 4° 24', and the corrected distance 31'.2, gives difference of longitude 4° 49'.9 and course 45° 27'. The difference between the assumed and computed course is only 27'. The position of the camps on the 19th and 20th have been computed from the colatitude of the camp on the morning of the 19th, the distance made from this camp, and the computed course.

From the »Butcher's« the course was shaped as nearly as possible due South along the new meridian. On the 10th December the last observations for the determination of the variation of the compass were taken. The change of the altitude of the Sun became too small to give any reliable value of time and azimuth. During the succeeding days the course was shaped NE by N, the variation found on the 10th being applied. With the really increasing variation, the western longitude of the Expedition was increased and the longitude of 180° passed on the 14th December in latitude 89° 38'. On the 15th the observation of the Sun at noon gave the latitude 89° 54'.6. At 3 p. m. the Expedition stopped, the distance from the station at 88° 30' registered being 1° 30' or equal to the distance from the Pole.

A midnight observation of the Sun gave a latitude of 89° 56', somewhat uncertain.

In order to fix the latitude and the direction of the meridian, 18 altitudes and compass-bearings of the Sun were taken on the 16th December between 7 a. m. and 7 p. m. The computation made by Mr. ALEXANDER[1] gave the latitude 89° 54' ± 2'.

The distance from lat. 88° 30' to lat. 89° 54', registered by the sledgemeters, was 90 miles or 1° 30'. The spherical triangle between the Pole and these points gives the general course 3° 49' S—W, and the difference of longitude 88° 5'.4

We can now compute the longitude of the camp at 88° 54'.

Longitude of Framheim		163° 37'	W	Greenwich.
— » Station lat. 85° 15'		162 50	»	—
— » the »Butcher's« (add 4° 50)		167 40	»	—
— » Station lat. 89° 54' (add 88° 5')		255 45	»	—
	or	104 15	E	—

Mr. Alexander calculated the longitude of the last station to be about 7 hours or 105° E.

[1] The South Pole, II, p. 400.

The longitudes of the stations between lat. $88^0 30'$ and $89^0 54'$ have been computed from the general course $3^0 49'$ and the colatitudes $1^0 30'$ and those of the stations. The true course may be convex towards E and give rather smaller longitudes, but the error is of no real significance. Having found his latitude and the bearings of the Pole from his observations on the 16th December, Capt. Amundsen, on the 17th, shaped his course as nearly as possible towards the Pole, NW $\frac{1}{4}$ W b. C., and stopped when the sledge-meter showed a distance of 5.5 miles. During a period of 24 hours, from December 17th 11^h 30^m a. m. to December 18th noon, sextant observations of the altitude of the Sun were taken every hour at the Pole station. The result of the computation made by Mr. Alexander[1] was Latitude $89^0 58'.5$ and Longitude between 30^0 and 75^0 E.

The sextant-observations made by Capt. AMUNDSEN and his men on the 16th and the 17th December are given in full in the Appendix.

In order to find the most probable values of the latitudes and longitudes on these days, I have made the following computations.

At latitude $89^0 54'$ the altitude of the Sun increases $1'$ in 38^m in the first vertical, and in latitude $89^0 58'.4$ it increases $1'$ in 2^h 22^m. The accuracy of the observed altitudes being scarcely less than $\pm 1'$ they are not capable of affording an exact value of the hour.

The facts regarding the value of the altitudes themselves are better.

On the 17th, from $11^h 30^m$ a. m. to noon on the 18th Framheim Time, 4 observers took 26 double altitudes of the lower limb of the Sun with Sextant No. 1. These observations include the upper culmination (some hours before midnight) and the lower culmination (at about 9^h a. m on the 18th. Fr. T.)

With the index error $-1'$, Refraction $1' 52''$ the Sun's semidiameter $16' 17''$ (N. A.), Sun's parallax $8''$, we have

	Upper Culm.	Lower Culm.
Double alt. obs.	$46^0 10.'0$	$46^0 6'.3$
Altitude obs.	23 4.5	23 2.7
Corr.	+ 14.5	+ 14.5
Altitude	23 19.0	23 17.2
Zenith-Dist.	66 41.0	90 + h 113 17.2
Sun's Declin.	23 19.7	23 21.2
Latitude	$89^0 60'.7$	$89^0 56'.0$

The Mean is $89^0 58'.4$, and the altitudes require a correction of $+ 2'.3$.

[1] The South Pole, II. p. 402.

This error of the altitudes may be due to the combined effect of different errors, such as error in the determination of the index error, made by the visible snow-horizon, error in the levelling of the artificial horizon, repeated before each observation, curvature of the horizon, prismatic form of the coloured glasses belonging to the sextant, effect of irradiation rendering the observed semi-diameter of the Sun greater than that taken from the Nautical Almanac, eccentricity of the sextant, and abnormal refraction.

The direct observations show that noon at the Station should be about 10 p.m. Fr. T. on the 17th. The longitude of Framheim is about 13^h E. Gr. Hence the approximate longitude of the Station should be about 3^h E. Gr.

The observations taken on the 16th December were made by Capt. AMUNDSEN with sextant No. 1, and by Mr. HELMER HANSSEN with sextant No. 2.

Index error — 1′, Refraction, Sun's Semidiameter, and Parallax together + 14′.5, correction for Sextant No. 1 + 2′.3

	Sextant No. 1	Sextant No. 2.
Dobble alt. — 1′	46° 13′.0	46° 14′.0
Single »	23 6.5	23 7.0
Red.	+ 16.8	+ 14.5
Red. Alt.	23 23.3	23 21.5
Zenith Dist.	66 36.7	66 38.5
Sun's Declin.	23 16.4	23 16.4
Latitude	89° 53′.1	89° 54′.9 E
Mean	89° 54′.0	

The 16 observations give the mean difference Sextant No. 2 minus Sextant No. 1 = + 1′. mean deviation ± 1′.3. Applying the correction + 2′.3 to No. 1 we get No. 1 minus No. 2 = + 1′.3.

From watch No. 3, and his observed altitudes, Capt. Amundsen judged that noon occurred between 5^h and $5^h 30^m$ Framheim Time. The compass-bearing of the Sun was SE to SE ½ S. Mean SE ¼ S. Compass-course to the Pole NW ¼ N.

This course was strictly followed on the 17th, and the measured distance by sledge-meter was 5′.5.

As the observations made on the 17th and 18th show, the Pole-point was not quite reached. The course steered fell to the right of the meridian. The noon on the 16th had been taken one hour too early. The azimuth and the hour-angle are almost identical.

The most reliable data that we now have for finding the longitudes are the sides in the triangle between the Pole and the two stations: cola-

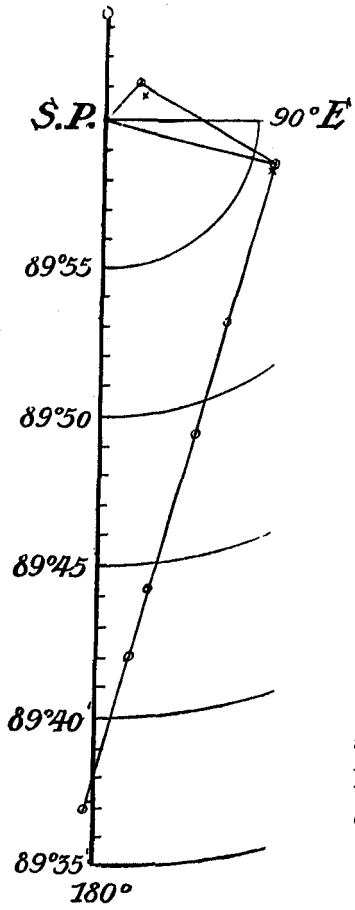

Fig. 3.

titud 1.'6, colatitude 6'.0, and distance between the stations 5'.5. The angles are:

at station in	89° 54',	15° 2 '	or	1h0 m
» » »	89 58,	103 16	»	6 53
» the Pole	90 00,	61 42	»	4 07

The compass course towards the Pole NW¼N was referred to Dec. 16th 5h 15m p. m. Framheim apparent time. The Sun's hour-angle or azimuth was then 15° 02' East, or 1h 0m.1. Noon followed at 6h 15m.1 apparent Time Framheim. The longitude of Framheim is 196° 23' E. Gr. or 13h 5m.6. Hence the longitude of Station in 89° 54 equals 6h 50m.5 or 102° 37'.5 E. Gr. The angle at the Pole is 61° 41'7. This subtracted from 102° 37'.5 gives 40° 55'.8 as the longitude of the station in lat. 89° 58'.4 or 2h 43m.7 E. Gr.

The diagram shows the position of the stations marked by small rings, the polar triangle, and the route from and to lat. 89° 37'. Mr. Alexander's positions are marked with crosses. The distances between our positions are only 0'.4 or 0.75 kilometres.

The compass-bearings of the Sun give the magnetic declination

at Station	89° 54'	118° N—W.
» »	89 58	58° N—W.

The south end of the magnetic needle always points, from Framheim to the South Pole, towards the South Magnetic Pole.

On the return journey to Framheim, the Expedition followed, with very few deviations, the route to the Pole, marked by the beacons erected on the way. No astronomical observations were taken.

The positions of the stations from lat. 89° 54' to lat. 88° 30' were computed from the general course 3° 49' N—E, the colatitude 1° 30', and the distance from the station in lat. 88° 30'.

The first remarkable deviation occurred on the 2nd January, 1912, when thick weather caused the Expedition to pass depot IX in lat. 86° 22', and brought it half a degree of longitude or 2 miles farther westwards than on the track southwards. The former track was speedily found again.

The second deviation occurred on the 6th—7th January, when the Expedition was descending from the »Butchers« to the Barrier taking a more direct way than when ascending. The positions have been computed by means of the notes in the Table of courses and distances, and controlled by Capt. Amundsen's description of the voyage[1].

The latitude and longitude of the stations where meteorological observations were made I have worked out by means of Capt. Amundsen's sextant observations, his courses and registered distances, and Mr. Sverre Hassel's Table of the hours of starting and camping. The position of the intermediate stations between the camps has been found by interpolation and calculated from the number of hours of travel from one camp to the Station, and from the latter to the next camp. The distances read by the sledge-meters were always checked, during the journey to the Pole, by the latitudes observed with the sextant. From the Pole to the »Butchers« on the Plateau northwards, the distances read had to be reduced in the proportion of 100 to 90 in order to agree with the distances between the camps found by observed latitudes.

The mean error of latitudes may be $\pm 2'$. To judge from the observations in latitude $89^0\,58'$ the latitudes may be $2'$ too high. The mean error of the longitudes may be of the same order, measured on an arc of a great circle. As one degre of longitude in the latitude of Framheim ($78^0\,38'$) corresponds with $0^0.25$ or $15'$ of a great circle, and to less in higher latitudes, it is quite sufficient to give the longitudes in tenths of a degree.

II. Meteorological Observations.

1. Temperature of the Air.

On the excursion in September, 1911, to the depot in lat. 80^0, the temperature was observed with the toluol sling-thermometer Küchler No. 895, centigrade. The corrections were found at the Meteorological Institute in Christiania to be $-0^0.7$ at 0^0 and $+0^0.2$ at -20^0. The zero point was verified in August at Framheim.

On the journey to the Pole and back, the temperature was observed with the same thermometer No. 895 from the 20th October to the 17th November. Afterwards the toluol sling-thermometer Küchler No. 889, centigrade, was observed from the 17th November 1911, 9 p. m., to the 25th January 10 p. m. The corrections found in Christiania were $0^0.0$ at

[1] The South Pole, II. pp. 155—157.

0^0 and $+ 0^0.4$ at $- 20^0$. The zero point was verified when it commenced to be read for the daily observations. The corrections for both thermometers have been inter- and extra-polated from the corrections at 0^0 and $- 20^0$.

2. Pressure of the Air.

On the excursion in September the pressure was observed with the aneroid No. 3, reading inches. Comparisons with the mercury barometer at Framheim made before and after the excursion, gave a mean correction of + 6.3 m.m. ± 0.3 m.m.

On the journey to the Pole and back, the pressure was observed with the aneroid No. 4, reading inches. The comparisons with the mercury barometer at Framheim gave, in October,

At	720	730	740	750 m.m.
Corr.	— 1.3	— 1.5	— 1.7	— 2.0 m.m. slightly smoothed.

On the journey to the Pole, Capt. AMUNDSEN carried with him two *Hypsometers*, No. 25249 and No. 25250, made by CARY, London, and divided into degrees Fahrenheit. They were a gift from Sir ERNEST SHACKLETON and proved extremely useful for the success of the scientific work of the Expedition. The Certificates of examination from the National Physical Laboratory, Teddington, dated April, 1910, give the following corrections.

	At	190^0	195^0	200^0	205^0	212^0 F.
No. 49	Corr.	$+ 0^0.4$	$+ 0^0.3$	$+ 0^0.3$	$+ 0^0.4$	$+ 0^0.3$ F.
No. 50	»	$+ 0^0.5$	$+ 0^0.5$	$+ 0^0.4$	$+ 0^0.5$	$+ 0^0.5$ F.

The two hypsometers and the aneroid were read simultaneously by Capt. AMUNDSEN from the 6th November to the 17th December, 28 times. Applying the corrections to the readings of the hypsometers, I found that the corrected values of their boiling-points agreed perfectly in 14 instances, within $0^0.1$. F. in 6 instances, and within $0^0.2$ F. in 8 instances. In the last cases the mean has been taken. The following Table shows the boiling-point T in C^0, the corresponding pressure of the air B in millimetres[1], the readings of the aneroid A converted into millimetres, and the resulting correction of the aneroid in millimetres.

[1] WIEBE, Tafeln über die Spannkraft des Wasserdampfes.

1911	T	B	A	Corr.	1911	T	B	A	Corr.
	°	m.m.	m.m.	m.m.		°	m.m.	m.m.	m.m.
Nov. 6	99.39	743.6	744.2	— 0.6	Dec. 2	90.53	536.6	533.4	+ 3.2
10	99.17	737.7	737.9	— 0.2	3	90.33	532.6	530.9	+ 1.7
13	99.28	740.7	741.7	— 1.0	4	90.03	526.6	424.5	+ 2.1
16	99.11	736.1	737.9	— 1.8	5	89.64	518.8	515.6	+ 3.2
17	98.67	724.6	723.9	+ 0.7	6	89.06	507.5	505.5	+ 2.0
18	95.86	654.3	652.7	+ 1.6	7	89.06	507.5	502.9	+ 4.6
20	95.67	603.6	602.0	+ 1.6	8	89.06	507.5	502.9	+ 4.6
21	89.06	507.5	506.7	+ 0.8	10	88.94	505.2	500.4	+ 4.8
26	89.78	521.6	519.4	+ 2.2	11	89.33	512.7	506.7	+ 6.0
27	90.50	536.0	532.1	+ 3.9	12	89.61	518.2	513.1	+ 5.1
28	91.56	557.9	553.7	+ 4.2	13	89.78	521.6	516.9	+ 4.7
29	91.39	554.3	551.2	+ 3.1	14	89.75	521.0	515.6	+ 5.4
30	91.28	552.0	548.6	+ 3.4	15	89.91	524.2	518.2	+ 6.0
Dec. 1	91.06	547.5	542.3	+ 5.2	17	89.61	518.2	513.1	+ 5.1

Separating the readings of the aneroid and the corrections into groups of different pressures, and taking the means for each group, we have

At	740.4	723.9	652.7	602.0	549.0	530.2	516.0	504.2	m.m.
Corr.	— 0.9	+ 0.7	+ 1.6	+ 1.6	+ 2.7	+ 2.7	+ 4.5	+ 3.8	»
d	± 0.5	—	—	—	± 1.3	± 0.8	± 1.1	± 1.6	»
n	4	1	1	1	4	4	7	6	

d is the mean of deviations of the observed corrections from the mean of the group. *n* is the number of observations in each group.

The corrections evidently increase with decreasing pressure, with the exception of the last group. The accuracy of the determination of the corrections is characterised by the value of *d*, and it increases with decreasing pressure. On the Barrier, 1st group, the mean deviation is half a millimetre, but on the Plateau it reaches one millimetre and upwards. These numbers may be taken as the probable error of the corrections of the aneroid.

The corrections for each group were plotted as ordinates against the corresponding readings of the aneroid as abscissæ, and a broken line drawn through the upper end of the ordinates. From this line could be read the corrections for every reading of the aneroid, from the 7th November to the 17th December 1911.

The observed pressure on the 6th November, on the Barrier, was 744.2 mm., and the correction found from the hypsometers — 0.6 mm. The comparisons made at Framheim in October gave for this reading the correction — 1.8 mm. Between the start on the 20th October and the 6th November the correction has thus changed from — 1.8 mm. to — 0.6 mm. or + 1.2 in 17 days or + 0.071 mm. per day. By adding 0.071 mm. per

day from the 20th October to the 6th November to the correction — 1.8 mm. found in October at Framheim, I have calculated the corrections for those days.

On the return journey no observations of the hypsometers were taken. After the return to Framheim 12 comparisons were made between the station barometer and aneroid No. 4, on January 26th to 29th, 1912, and gave a correction of + 0.6 mm. at 742.5 mm. Mean error of one comparison ± 0.8 mm. When the Expedition started on the 20th October, 1911, the correction at 742 mm. was — 1.8 mm. The change from — 1.8 to + 0.6 mm. or + 2 4 mm. in 99 days averages a change of + 0.024 mm. per day. By adding 0.024 mm. multiplied by the number of days that had elapsed from the 18th December, 1911, when the Pole was left, to the corrections found for the upward journey, I have tried to find the most probable corrections for the aneroid readings on the return journey.

From the 24th midnight to the 28th December 6 p. m. the reading of the aneroid was constantly 19.20 inches or 487.7 mm. This striking absence of oscillation in the barometer did not escape the attention of Capt. Amundsen, but he was not able to give any reasonable commentary on it. I have taken the extrapolated correction of + 3.0 mm. as the most probable.

3. Wind.

The observed *Direction* is true.

The *Velocity* was judged and noted in metres per second. From the daily observations with the hand-anemometer at Framheim, the observers had acquired a consummate skill in judging the velocity of the wind.

4. Cloudiness, Form of Clouds, Precipitation and Halos were observed in the same manner as at Framheim.

III. The Height of the Stations.

The most rational method for computing the height of a station from barometrical observations is to find the pressure at the lower level in the vertical of the station and then calculate the difference of height from the pressure and the temperature at the lower and the higher points.

As Framheim was the only station with continual observations, the corresponding pressure of the base point could not be found by means of a number of observations of pressure from stations surrounding the upper station in question or by isobars drawn from such observations at a known level.

Meanwhile I have tried to construct such isobars in an indirect manner. At the various stations Capt. Amundsen observed the direction

and velocity of the wind. The same was done at Framheim. From the direction we can find the direction of the gradients and from the velocity the magnitude of the gradients in both places. The directions locate the minimum or maximum of pressure, and the magnitudes give the distribution of pressure at the level of the stations. We have thus the necessary means for constructing a chart with isobars at the lower level, and can take out the pressure at that level in the vertical of the station of which the height is to be computed.

The formulæ I have taken to compute the directions and magnitudes of the gradients are,

when G is the magnitude of the gradient in mm. per degree of meridian,

$$\mu = 13.569 \frac{90}{10^6} = 0\ 0001224,$$

$$\varrho = \text{the mass of a cubic metre of air,}$$

$$= \frac{\text{the weight of 1 cub. m. of air}}{\text{the normal gravity}}$$

$$= \frac{1.293}{9\ 806} \cdot \frac{273}{273+t} \cdot \frac{b}{760} = 0.04736 \frac{b}{273+t},$$

where b = the pressure in mm.,

t = the temperature of the air, C⁰.

α = the angle of the wind's deviation from the gradient,

$\omega = \frac{2\pi}{86464} = 0.00007292$ the angular velocity of the rotation of the Earth,

v = the velocity of the wind in metres per second,

φ = the latitude,

k = the coefficient of friction,

we have

$$\frac{\mu}{\varrho} G \sin\alpha = 2\omega v \sin\varphi$$

$$\frac{\mu}{\varrho} G \cos\alpha = k.\ v$$

$$\tan\alpha = \frac{2\omega \sin\varphi}{k}$$

$$G = \frac{2\omega \sin\varphi.\ \varrho}{\sin\alpha.\ \mu} \cdot v = \frac{k}{\cos\alpha} \cdot \frac{\varrho}{\mu} \cdot v$$

Putting $k = 0.00008$ (inland) and $t = -17^0$, we have

latitude	78^0	79^0	80^0
$\alpha =$	$60^0 45'$	$60^0 48'$	$60^0 53'$

$\frac{G}{v} = 0.18$ for latitudes 78^0—80^0 and 740—710 mm.

I have tried this method for the stations from Framheim to 80° of latitude. Farther South the distance from Framheim was too great to allow of the construction of isobaric charts, the distribution of pressure being too irregular.

The next rational method for finding the heights above sea-level of the stations of observation is to proceed from Framheim, the only station of which the height is known, and run a barometrical levelling from station to station. The levelling-staff of the ordinary spirit levelling is replaced by the barometrical scale. The difference of pressure between two consecutive stations allows of the computation of their difference of height. By adding the results for the consecutive steps, we can find the height of the stations proceeding from Framheim to the Pole.

The observations employed for computing the differences of height are always those made immediately before the starting from one station, and immediately after the stop at the following station. This is the nearest approximation to simultaneous observations.

Observations of pressure and temperature were made on the journey both to and from the Pole. But it was not generally at the same places that the observations were made on the two journeys. I was therefore obliged to proceed in the following manner. Starting from Framheim, I took the sum of the heights computed from observations forwards and the sum of the heights computed from observations backwards till I arrived at a station visited on both journeys. Of these sums I took the mean. Starting from this mean I went in the same manner to the next double station, and so on to the Pole.

The height of the stations where only one set of observations had been made, have been found by interpolation. If the height of such a station at the latitude l_2 has been found to be h_2 and the height at the preceeding and following latitudes on the opposite track l_1 and l_3 has been found to be h_1 and h_3 the corresponding resulting h_2' for lat. l_2 has been computed by interpolation. Then $\frac{1}{2}(h_2 + h_2')$ has been taken as the most probable height of the Station.

The heights of the stations from Framheim to 80° lat. have been computed by both methods, and the mean taken as definitive.

The formula which I have employed for the calculation of the differences of height is:

The height dh of a column of air corresponding to a pressure of db is:

$$dh \text{ metre} = \frac{q}{d} \cdot \frac{273 \pm t}{273} \cdot \frac{760}{b} \cdot \frac{g_{45}}{g} \cdot db \text{ mm.}$$

q being the specific gravity of mercury,
d » the weight of one cubic metre of air at 0°C and 760 mm.
b » the pressure of the air in mm. mercury,
g_{45} » the normal gravity,
g » the local gravity.
At Framheim, lat. 78°38′, $g = 9.830$ m/sec.^{2}.

Towards the Pole the gravity at sea-level increases to 9.832. But with rising ground it diminishes, so that at the Pole, at an altitude of 2454 m., it is reduced to 9.825. Practically we may take g constant equal to 9.8275 in our calculation. We have then, with $g_{45} = 9.8062$, $\frac{g_{45}}{g} = 0.9978$, $q = 13.5956$ and $d = 1.29305$,

$$dh = -29.206\ (273 + t)\frac{1}{b} \cdot db \qquad (1)$$

The integral of this equation is

$$\triangle h = 29.206\ (273 + t) \log \text{nat} \left(\frac{b_I}{b_{II}}\right) = 67.25\ (273 + t) \log \text{br.} \left(\frac{b_I}{b_{II}}\right). \qquad (2)$$

t is the mean of the temperatures at the higher and lower stations C°,
b_{II} the pressure at the higher station, b_I at the lower, in mm.

The computation of the steps between two consecutive stations has been made from the formula

$$\triangle h_m = 29.206\ (273 + t)\frac{1}{b}\triangle b_{mm} \qquad (3)$$

$\triangle h$ Difference of height in metres
t Mean of temperature of air at the two stations
b Mean of pressure of air » » »
$\triangle b$ Difference of presure of air » » »

The highest step $b_I - b_{II}$ is 98.7 mm.

Computed from formula (2) Difference of height = 1343 m.
» » » (3) » » » 1340 m.

The difference of 3 metres is a negligible quantity.

The humidity of the air has not been observed. It is, to judge from the observations at Framheim, too small to be of any importance in the computation of the heights.

The accuracy which I have obtained for the height of the stations may be seen from the following Table which shows, for the stations where observations have been made both on the journey to and the journey from

the Pole, the mean error e of a single determination of the height or half the difference between the two determinations and the mean error m of their mean. $m = e/\sqrt{2}$.

Lat.	e	m	Lat.	e	m.	Lat.	e	m.
80° 00′	± 8 m.	± 6 m.	83° 32′	± 5 m.	± 4 m.	88° 00′	± 12 m.	± 9 m.
15	12	11	84 00	0.4	0.3	16	0.6	0.4
22	6	4	85 00	4	3	24	9	6
29	20	14	23	14	11	30	0	0
44	26	18	36	9	6	47	17	12
81 00	65	46	59	58	49	57	19	13
15	30	22	86 13	86	68	89 15	79	56
30	5	4	26	77	54	25	0.7	0 5
82 00	23	16	87 09	28	20	30	18	13
83 00	5	4	37	195	137	37	54	38
12	6	4	49	24	17	89 58	15	11

The general mean of m is ± 20 m. The mean for the Barrier is ± 11 m., and for the Ptateau ± 28 m.

The values of m are thus distributed:

From	0 to 10 m.	13 cases	From	61 to 70 m.	1 case
-	11 — 20 -	8 -	-	71 — 80 -	2 -
-	21 — 30 -	5 -	-	81 — 90 -	0 -
-	31 — 40 -	0 -	-	91 — 100 -	1 -
-	41 — 50 -	0 -	-	101 — 140 -	1 -
-	51 — 60 -	2 -			

The mean errors found for the computed heights are composed of different errors arising from the circumstances under which the observations were made.

The aneroid is read to 0.05 inches or 1.25 m.m. The mean error may be taken to be ± 0.625 m.m.

The corrections for the readings of the aneroid have been found, p. 51, to be

for the Barrier	for the Plateau
± 0.5 m.m.	± 1.2 m.m.

Hence the mean error of a single determination of the pressure:

$$\pm \sqrt{0.625^2 + 0.5^2} = \pm 0.8 \text{ mm.} \quad \pm \sqrt{0.625^2 + 1.2^2} = \pm 1.35 \text{ mm.}$$

and of a set of two determinations of which the mean has been taken,

$$\pm 0.8\sqrt{2} = \pm 1.13 \text{ mm.} \qquad \pm 1.35\sqrt{2} = \pm 1.91 \text{ mm.}$$

The resulting error of the height, from formula (3)

$$t = -16^0,\ b = 740 \text{ mm.} \qquad t = -15^0,\ b = 520 \text{ mm.}$$

$$m = \pm 11 \text{ m.} \qquad m = \pm 23 \text{ m.}$$

The observations gave

	± 11 m.	± 28 m.
Diff.	0 m.	5 m.

The differences between the judged and computed values of *m* are presumably caused by the following circumstances.

The pairs of observations from which the differences of height are computed are not synchronous. During the march from one station to the next the pressure varies at both stations.

The observations are made at two different places not in the same vertical.

These causes seem to eliminate each other perfectly on the Barrier, but not on the Plateau where the road was steeper and more rugged.

The probable error attaching to a computed height increases with the distances from the original station, the initial errors being multiplied in the process of calculation. Each step carries with it the error of the foregoing step, and adds to this its own error. Taking in this way the square root of the sum of the squares of the two we have, when dh is the error of one step, dH the error for the station and H the height.

Barrier

Lat.	*dh.*	*dH.*	H
	m.	m.	m
80° 00′	± 6	± 6	98
15	11	13	86
22	4	19	80
29	14	26	106
44	18	53	99
81 00	46	57	75
15	22	60	43
30	4	60	40
82 00	16	60	35
83 00	4	60	40
12	4	60	46
32	4	60	37
84 00	0	60	40
85 00	3	60	128

Plateau

Lat.	*dh.*	*dH.*	H
	m	m.	m.
85° 23′	± 11	± 61	910
36	6	62	2864
59	49	78	2500
86 13	68	104	2130
26	54	117	2097
87 09	20	119	2452
37	137	181	2717
49	17	182	2807
88 00	9	182	2795
16	0	182	2796
24	6	182	2786
30	0	182	2786
47	12	183	2766
57	13	184	2700
89 15	56	192	2500
25	1	192	2590
30	13	192	2523
37	38	196	2487
89 58	11	196	2454

The preliminary heights which Capt. AMUNDSEN gives in his book »The South Pole« are greater than mine. They were computed from uncorrected observations of pressure and a higher pressure at sea-level than that generally existing in the Antarctic.

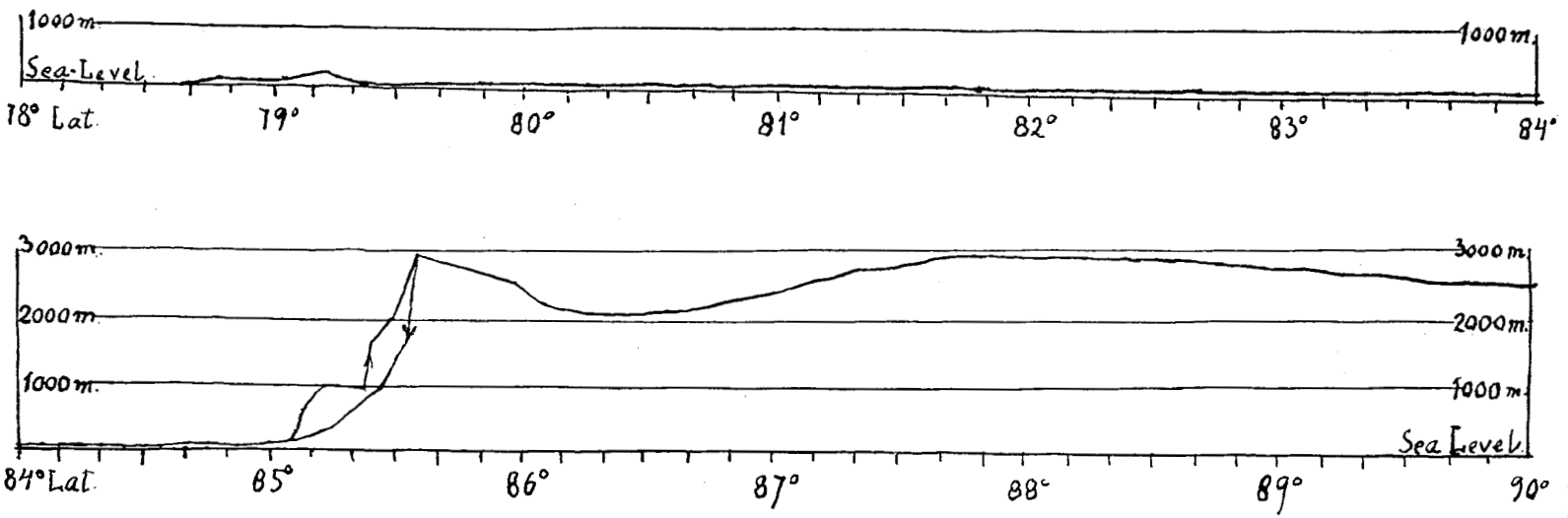
1000 m
Sea-Level
1000 m
78° Lat.
79°
80°
81°
82°
83°
84°
3000 m
2000 m
1000 m
3000 m
2000 m
1000 m
Sea Level
84° Lat.
85°
86°
87°
88°
89°
90°

Fig. 4.

The Barrier, from Framheim to lat. 85°, has an extent of 709 kilometres, and a mean height of 60 metres. From Framheim it rises to 258 metres 65 kilometres farther south, and thence seems to keep a lower level up to the glacier in lat. 85°. If the ice of the Barrier is floating and has a thickness of 8 times the height above the sea, the depth of the sea must be at least 480 metres. In Whales Bay the soundings found are from 265 to 610 m. The high ridge south of Framheim seems to indicate an obstruction to the seaward movement of the Barrier ice, perhaps caused by underlying rocks. The sounding of 265 m. near Framheim points in the same direction.

From lat. 85° to lat. 85° 36′ the glaciated ground rises to the highest point reached by the Expedition, »The Butcher's Shop«, 2864 meters. The steepest slope experienced by the Expedition was on the 5th January, 1912, when they had to descend 1348 meters in a stretch of 3 miles or 5.6 kilometers. The mean incline was 13°.6 or 24 per cent.

From »The Butcher's« the ground descends to 2070 m. in lat. 86° 30′, 794 m. lower than »The Butcher's«. It then rises 738 m. to 2808 m. in lat. 87° 49′ 56 m. lower than »The Butcher's«. From this point it descends slowly to lat. 88° 45′ and then more rapidly towards the Pole, to 2454 m. or 410 m. below »The Butcher's. The mean height of the Plateau is 2530 m.

The diagram Fig. 4, shows the height of the observing stations. The vertical scale is 30 times greater than the horizontal.

The following Table contains the observations made during the sledge-journey to the Pole and back, the position and height of the stations and the temperature and pressure reduced to sea level. The designations are the same as in the Framheim Tables of observation p 4. p is the conventional date, up to lat. 89° 38′, or Pacific. a is the Atlantic date, as noted by Capt. AMUNDSEN.

Year	Month	Day p.	Day a.	Hour.	Lat. S.	Long. W.	Height m	Temperature Station °C	Temperature Sea Level °C	Pressure Station mm.	Pressure Sea Level mm	Wind Dir. true	Wind Veloc. m.p.s.	Cloud am. 0-10	Cloud Form.	Precipitation	Remarks
1911	Sept.	7	8	5 p.m.	78° 45′	163°.6	70	−37.0		763.5		S	3	8	S. S.-Cu.		
		8	9	7 a.m.	- -	-	-	40.9				S	2	3	S.		
				11 a.m.	78 49	-	80	38.1		730.2				2	Ci. S.		
				4 p.m.	78 58	-	130	33.4		717.5		SE	7	8	S. A.-Cu.		
		9	10	6 a.m.	- -	-		38.1		715.0		NE	7	10	S.		
				Noon	79 04	-	170	28.4		704.8		S	3	8	S.		
				4 p.m.	79 13	-	249	38.9		698.4		S	4	5	S.		
		10	11	6 a.m.	- -	-	-	53.7		722.6			0	0			
				11 a.m.	79 22	-	100	52.7		727.7			0	0			
				4 p.m.	79 27	-	70	54.6		725.1			0	0			
		11	12	6 a.m.	- -	-	-	50.4		726.4		S	3	6	S.		
				Noon	79 31	-	61	46.0		727.7		S	5	6	S.		
		12	13	6 a.m.	- -	-	-	50.7		626.4			0	0			
				11 a.m.	79 37	-	-	50.5					0	0			
				4 p.m.	79 46	-	-	54.4		720.0			0	0			
		13	14	6 a.m.	- -	-	90	54.2					0	0			
				Noon	80 00	-	98	49.8					0	0			
				6 p.m.	79 54	-	100	54.3					0	0			
		14	15	6 a.m.	- -	-	-	46.5				NW	3	4	S.		
				1 p.m.	79 34	-	60	39.9					0	2	A.-Cu.		
				5 p.m.	79 24	-	80	−34.2		723.8		E	2	10	S.		
	Oct.	19	20	5 p.m.	78° 58′	163°.6	130	−17.2	−16.5	725.1	712.6	E	4	5	Ci. S.		
		20	21	8 a.m.	- -	-	-	17.9	17.2	10.3	22.8	E	6	1	Ci.		Squalls night.
				5 p.m.	79 17	-	140	23.8	23.1	07.7	21.4	E	10	0			
		21	22	7 a.m.	- -	-	-	18.5	17.8	09.0	22.5	SE	3	10	S.	s.	
				1 p m.	79 26	-	66	14.1	13.7	17.6	23.9	SE	3	10		S.	
				8 p.m.	79 38	-	60	21.2	20.8	17.7	23.6	SSE	6	4	S. Ci.-Cu.		

	22	23	7 a.m.	-	-	-	-	−27.9	−27.5	712.8	718.8	S	2	10	S.	
			11 a.m.	79	49	-	103	26.8	26.3	09.1	19.3	SSW	10	5	Ci.	Mist.
			4 p.m.	80	00	-	98	29.3	28.8	07.9	17.7	SW	10	5	Ci.	-
	23	24	7.30 a.m.	-	-	-	-	22.2	21.7	17.9	27.6	N	6	10	S.	S.
			1 p.m.	-	-	-	-	17.9	17.4	21.6	31.2	N	2	10	S.	s.
			5 p.m.	-	-	-	-	23.4	22i9	20.3	30.0	N	2	10	S.	
	24	25	9 a.m.	-	-	-	-	20.3	19.8	16.7	26.2	SE	6	10	S.	
			1 p.m.	-	-	-	-	20.8	20.3	17.9	27.5	SE	6	10	S.	
			6 p.m.	-	-	-	-	22.7	22.2	17.9	27.6	SW	4	10	S.	
	25	26	7 a.m	-	-	-	-	29.8	29.3	20.5	30.3	W	2	4	Ci.	
			2 p.m.	80	15	-	86	25.9	25.4	23.0	33.3	NW	4	1	Ci.	
			9 p.m.	-		-	-	34.6	34.1	25.5	34.5	NW	1	1	Ci.	
	26	27	7 a.m.	-	-	-	-	33.2	32.7	26.8	35.8		0	1	Ci.	
			10 30 a.m.	80	22	-	80	29.7	29.2	26.8	35.0	W	0.5	0	S.	
			9 p.m.	80	29	-	106	34.2	33.7	25.5	36.6	SE	1 5	7	Ci.	
	27	28	7.30 a.m.	-	-	-	-	21.7	21.2	15.7	26.1	SE	10	10	S.	S. drift
			noon	-	-	-	-	19.6	19.1	12.0	22.3	SE	10	10	S.	- -
			7 p.m.	-	-	-	-	16.0	15.5	10.7	20.8	SE	6	10	S.	s.
	28	29	7 a.m.	-	-	-	-	19.6	19.2	09.5	19.7	NW	1.5	9	Ci. S.	
			2 p.m.	80	44	-	99	18.4	17.9	10.8	20.3	NW	2.5	1	Ci.	
			9.30 p.m.	-	-	-	-	20.3	19.8	18.1	27.7	NW	4	10	S.	
	29	30	7 a.m.	-	-	-	-	13.9	13.4	27.0	36.6	NW	6	10	S.	
			2.30 p.m.	81	00	-	75	13.0	12.6	32.0	39.2	NE	2	3	Ci. S.	
			8.30 p.m.	-	-	-	-	16.0	15.6	35.7	43.1	NE	2	8	A.-Cu. S.	
	30	31	9 a.m.	-	-	-	-	19.3	18.9	34.6	42.1		0	1	Ci.	
			Noon	-	-	-	-	17.9	17.5	33.3	40.7		0	9	S.	
			7 p.m.	-	-	-	-	23.6	23.2	33.3	40.9		0	9	S.	
Nov.		1	7 a.m.	-	-	-	75	18.9	18.5	33.3	40.7		0	10	S.	Fog.
			3 p.m.	81	15	-	43	18.9	18.7	39.5	43.8	ESE	2	10		-
			8.30 p.m.	-	-	-	-	24.2	24.0	44.5	48.6	SE	2	10	S.	Mist.
	1	2	7 a.m.	-	-	-	-	33.1	32.9	43.3	47.8	SSE	2	4	S.	
			2.30 p.m.	81	30	-	40	24.1	23.9	40.9	45.0	SSE	3	1	Ci.	
			9 p.m.	-	-	-	-	26 5	26.3	38.3	42.4	S	5	0		
	2	3	7 a.m.	-	-	-	-	18.2	18.0	34.8	38.8	S	8	0		S. drift
			3 p.m.	81	42	-	67	10.3	10.0	32.3	38.7	S	10	0		-
			8.30 p.m.	-	-	-	-	16.9	16.6	31.7	38.3	S	4	9	A.-Cu. S.	
	3	4	7 a.m.	-	-	-	-	22.7	22.4	36.0	42.8	N	2	10	S.	Mist.
			2.30 p.m.	82	00	-	35	20.8	20.6	38.5	42.0	E	6	10	S.	-
			9.30 p.m.	-	-	-	-	18.3	18.1	39.8	43.3	NE	3	10	S.	-

Year	Month	Day p.	Day a.	Hour.	Lat. S.	Long. W.	Height m	Temperature Station °C	Temperature Sea Level °C	Pressure Station mm.	Pressure Sea Level mm.	Wind Dir. true	Wind Veloc m.p.s.	Cloud am. 0-10	Cloud Form	Precipitation	Remarks
1911	Nov.	4	5	9 a.m.	82° 00′	163°.6	35	−18.8	−18.6	743.6	747.0	SW	2	10	S.	Mist.	
				2 p.m.			-	11.9	11.7	43.6	47 0	S	2	9	A.-Cu. S.		
				9 p.m.	- -	-	-	13.1	12.9	43.6	47.0	SW	2	10	S.		
		5	6	9 a.m.	-	-	-	16.9	16.7	43.6	47.1	SW	2	3	Ci.		
				1.30 p.m.	- -	-	-	14.8	14.6	43.6	47.1	SW	2	0			
				7 30 p.m.	- -	-	-	19.0	18.8	46.3	49.8	SW	2	0			
		6	7	7 a.m.	- -	-	-	19.9	19.7	41.0	44.5	SSW	3	1	Ci.		
				4 p.m.	82 20	-	25	18.9	18.8	43.2	45.8	SSE	2	1	S.		
		7	8	7 a.m.	- -	-	-	22.7	22.6	42.0	44.5	S	4	0			
				Noon	82 33	-	29	17.2	17.1	42.0	44.9	S	4	0			
				3.30 p.m.	82 40	-	22	15.1	15.0	40.8	43.0	S	3	0			
		8	9	7 a.m.	- -	-	-	18.7	18.6	37.2	39.4	SSE	5	0			
				4 p.m.	83 00	-	40	13.2	13.0	36.0	39.9	S	10	0			Storm fr. S. night.
		9	10	8 30 a.m.	-	-	-	11.8	11.6	37.3	41.2	S	4	1	Ci.		
				12.30 p.m.	- -		-	10.3	10.1	36.0	39.8	S	8	8	S		
				8 p.m.	- -	-	-	13.3	13.1	37.3	41.2	S	3	8	A.-Cu. S.-Cu.		
		10	11	7 a.m.	- -	-	-	21.8	21.6	37.3	41.3	E	0.5	9	Ci.-Cu. S.		
				Noon	83 12	-	46	19.9	19.6	37.3	41.9	E	0.5	8	Ci.-Cu. S.-Cu.		
				4 p.m.	83 20	-	39	19.2	19.0	38.4	42.3	S	2	3	S.-Cu.		
		11	12	7 a.m.	- -	-	-	23.7	23.5	39.6	43.6	SE	1	9	Ci.-S.		
				11.30 a.m.	83 32	-	37	19.3	19.1	39.6	43.3	NW	1	9	A.-S.		
				3 p.m.	83 40	-	35	18.8	18.6	39.6	43.1	NW	4	10	A.-S. S.		
		12	13	7 a.m.	- -	-	-	18.8	18.6	44.2	47.7	NE	2	7	A.-Cu. Ci.		
				noon	83 52	-	44	18.9	18.7	42.0	46.4	NNE	3	1	Cu.		
				3 p.m.	84 00	-	40	18.9	18.7	43.3	47.3	NNE	4	1	Ci		
				6.30 p.m.	- -	-	-	20.3	20.1	40.6	44.6	N	3	10	S.		
		13	14	6 30 a.m	- -	163.6	-	21.0	20.8	43.3	47.3	SSE	2	10	S.		
				11 a.m.	84 12	163.5	40	19.8	19.6	40.8	44.8		0	10		S. drift	
				2.30 p.m.	84 20	163.4	24	20.1	20.0	43.3	45.7		0	10		- -	
				8 p.m.	- -	-	-	21.6	21.5	42.0	44.4	SE	2	10		- -	

14	15	6.30 a.m.	84°	20′	163.4	24	−23.7	−23.6	743.3	745.7	SE	3	10			
		11.30 a.m.	84	30	163.3	17	22.7	22.5	44.6	46.3	SE	3	1	S.		
		3 p.m.	84	40	-	18	22.0	21.9	45.8	47.6	SE	1	0			
		8 p.m.	-	-	163.1	-	22.6	22.5	48.4	50.2	NW	1	0			
15	16	6 a.m.				-	24.2	24.1	48.4	50.3	SSE	1	0			
		Noon	84	52	163.0	53	21.7	21.4	47.1	52.4	SE	5	0			
		3.30 p.m.	85	00	162.9	128	20.8	20.1	37.4	50.3	SE	4	0			
		7 p.m.	-	-	162.8	128	19.4	18.7	37.4	50.2	SE	4	0			
16	17	6.30 a.m.	-	-	-	-	15.8	15.1	36.1	48.7	SE	3	0			
		Noon	85	05		190	11.1	10.1	23.7	41.9		0	0			
		9 p.m.	-	-	-	-	11.8	10.8	23.7	41.9	S	4	0			
17	18	6.30 a.m.	-	-	-	-	13.7	12.7	725.9	44.3	SSE	1	0			
		11 a.m.	85	09	-	634	11.8	8.4	685.7	44.7	N	0.5	1	Ci.		
		4 p.m.	85	14	-	958	16.6	11.5	56.9	45.6		0	0			
		7 p.m.	85	15	-	987	18.7	13.5	54.4	46.4	S	0.5	0			
18	19	6.30 a.m.	-	-	-	-	15.7	10.5	55.6	46.6		0	1	Ci.		
		7.30 p.m.	85	23	164.5	910	16.2	11.4	59.4	43.6	W	3	0			
19	20	6.30 a.m.	-	-	-	-	11.8	7.0	62.0	45.1		0	0			
		2.30 a.m.	85	25	165.0	1609	15.9	7.3	03.6	45.2		0	0			
		9 p.m.	85	26	165.2	-	20,4	11.8	03.6	48.0		0	0			
20	21	7 a.m.	-	-	-	-	18.9	10.3	03.6	47.0	S	2	0			
		1 p.m.	85	30	166.5	2026	17.7	7.0	566.3	39.0		0	1	Ci.		
		8 p.m.	85	36	167.7	2864	26.0	10.8	10.7	50.7	SE	3	2	Ci.		
21	22	9 a.m.	-	-	-	-	25.5	10.3	09.3	48.0		0	10		S. drift.	Heavy squalls night.
		2.30 p.m.	-	-	-	-	25.7	10.5	09.3	48.2	ESE	12	9	Ci.	- -	
		8 p.m	-	-	-	-	—	—	10.7	—	ESE	10	10		- -	
22	23	9 a.m.	-	-	-	-	27.6	12.4	12.0	52.1	E	12	10		S^2	Storm fr. E night.
		7 p.m.	-	-	-	-	25.6	10.4	12.0	53.1	E	8	5	Ci.	S. drift.	
23	24	6.30 a.m.	-	-		-	26.5	11.3	13.4	54.0	ENE	4	10		- -	
		Noon	-	-	-	-	25.5	10.3	12.0	52.2	NE	10	10		- -	
		8 p.m.	-	-	-	-	25.7	10.5	12.0	49.9	NE	10	10		- -	
24	25	8 a.m.	-	-	-	-	23.6	8.4	09.3	44.7	NE	11	9	Ci.	- -	
		Noon	-	-	-	-	22.5	7.3	09.3	44.7	NE	10	7	Ci.	- -	
		8 p.m.	-	-	-	-	23.5	8.3	06.8	42.6	ENE	7	10	S.		
25	26	7.30 a.m.	-	-	-	-	26.2	11.0	03.9	40.9	NE	12	7	Ci.	S. drift.	
		3 p.m.	85	45	-	2673	22.0	7.7	22.5	44.9	NE	12	10		- -	
		8 p.m.	-	-	-	-	23.0	8.7	23.5	47.2	E	6	10		- -	
26	27	7 a.m.	-	-	-	-	23.6	9.3	23.5	48.0	E	6	8	Ci.	S. mist.	
		5.30 p.m.	85	59	-	2500	19.8	6.5	34.8	43.2	NNE	4	8	Ci.-S.		

Year	Month	Day p.	Day a.	Hour.	Lat. S.	Long. W.	Height m.	Temperature Station °C	Temperature Sea Level °C	Pressure Station mm.	Pressure Sea Level mm.	Wind Dir. true	Wind Veloc. m.p.s.	Cloud am. 0-10	Cloud Form.	Precipitation	Remarks.
	Nov.	27	28	6.30 a.m.	85° 59′	167°.7	2500	−20.9	− 7.0	536.1	746.3	NNE	3	8	Ci.-S.		Squalls fr. N night
				Noon	86 06	-	2285	20.6	8.3	49.8	44.1	E	10	8	Ci.-S.	S. drift.	Solar halo.
				5 p.m	86 13	-	2130	18.2	6.9	56.3	36.1		0	10	Ci.-S.	s.	- -
		28	29	6 30 a.m.	- -	-	-	22.6	11.3	56.3	39.6		0	7	Ci.-S.	mist	
				1 p.m.	86 21	-	2080	22 4	11.7	56.3	34 8	W	0.5	9	Ci.-S.	-	
				7 p.m.	- -	-	-	21.9	11.2	53.8	31.1		0	10		s.	
		29	30	7 a.m.	- -	-	-	24.9	14.2	53.8	33.4		0	3	Ci.	mist	
				Noon	86 23	-	2078	22.5	11.1	53.9	31.5		0	4	Ci.	-	Solar halo.
				7.30 p.m.	86 26	-	2097	25.8	15.1	51.3	32.6	SE	6	0		s drift.	
						-											
						-											
	Dec.		1	8.30 a.m.	- -	-	-	23.0	11.9	51.3	30.2	SE	7	4	Ci.	dry s. drift.	
				1 p.m.	86 30	-	2070	22.1	11.1	51.3	26.9	SE	12	7	Ci.-S.	- - -	
				5.30 p.m.	86 35	-	2123	23.2	11.9	45.0	24.4	SE	12	7	Ci.-S.	- - -	
		1	2	6.30 a.m.	- -	-	-	22.5	11.2	45.0	23.8	SE	14	7	Ci.-S.	S. drift.	
				Noon	86 47	-	2200	23.6	11.9	41.2	27.0	SE	18	9	S.	- -	Solar halo.
				5 p.m.	- -	-	-	23.2	11.5	36.1	19.8	SE	16	9	S.	- -	
		2	3	8 a.m.	- -	-	-	21.6	9.9	37.4	20.2	ESE	10	9	Ci.-S.	-	
				Noon	- -		-	19.3	7.6	37.4	18.4	SE	15	9	S.	- -	
				2.30 p.m.	86 49	-	2248	20.6	8.6	32.6	17.4	SE	18	10		- -	
				8 p.m.	- -	-	-	19.4	7.4	31.3	14.7	SE	16	10		S^2 -	
		3	4	6 a.m.	- -	-	-	21.9	9.9	37.4	25.0	N	5	7	Ci.-S.		Solar halo.
				1.30 p m.	87 00	-	2360	21.7	9.1	31.3	27.1	E	4	2	Ci.-S.		- -
				8 p.m.	87 09	-	2452	21.5	8.4	28.0	31.0	SE	3	4	Ci.		- -
		4	5	6.30 a.m.	-	-	-	17.6	4.5	26.8	25.8	E	6	10		mist. s dr.	
				Noon	87 17	-	2553	15.3	1.7	22.5	27.1	N	4	10		S^2	
				6.30 p.m	87 29	-	2665	15.1	1.4	20.1	34.1	N	4	10		S^2	
		5	6	6.30 a m	- -	-	-	14.9	1.2	19.5	39.8	SSE	3	10	S.	Rime ^{2} S.	
				Noon	87 37		2717	14.7	0.2	21.3	40.1	ESE	5	10	S.	S.	
				6 p.m.	87 49	-	2807	16 8	1.9	13 4	39.2	SE	5	10	S.	S.	

6	7	6.30 a.m.	87 49	-	-	−17.7	− 2.8	510.0	735.2	E	6	10	S.	Low S. drift.	
		Noon	88 00	-	2795	18.2	3.3	11.2	36.3	NE	6	10	S.	S^2	
		7 p.m.	88 09	-	2800	18.8	3.9	10.0	35.6	NE	6	10	S.	S^2	
7	8	6 a.m.	- -	-	-	17.4	2.5	06.6	29.4	NE	3	10	S.		
		Noon	88 16	-	2796	16.9	2.0	06.6	28.5		0	10	S.		
		6.30 p.m.	88 24	-	2786	17.6	2.8	05.3	26.4	S	2	10	S.	S^2 passim	
8	9	8 a.m.	- -	-	-	20.2	5.4	06.6	30.9		0	8	S.		
		2 p.m.	- -	-	-	21.7	6.9	02.6	26.7	SE	6	10	S.	Low S. drift.	
		8 p.m.	- -	-	-	23.6	8.8	02.6	28.7	SE	5	10	Ci.-S.		
9	10	6.30 a.m.	- -	-	-	27.6	12.8	02.6	33.0	S	4	1	S.		
		Noon	88 30	167.7	2786	27.6	12.8	02.6	33.0	SSW	6	0			Solar Halo.
		7 p.m.	88 39	168.2	2780	28.5	13.7	03.8	35.1	SW	3	0			- -
10	11	6 a.m.	- -	-	-	27.7	12.9	03.8	34.2	SSE	5	0			
		Noon	88 47	168.6	2766	27.4	12.7	05.2	34.6	SE	5	3	Ci.-S.		
		5.30 p.m.	88 57	169.4	2700	24.5	10.1	10.7	33.1	SSE	4	9	Ci.-S.		
11	12	6.30 a.m.	- -	-	-	24.1	9.7	15.0	38.9	SSE	5	10	S.	mist	
		Noon	89 06	170.2	2662	24.0	9.8	15.0	35.1	SE	0.5	7	Ci.-S.		
		5.30 p.m.	89 15	171.5	2590	25.8	12.0	17.9	34.2	S	3	9	Ci.-S.		
12	13	6.30 a.m.	- -	-	-	23.1	9.3	17.9	31.5	S	3	3	Ci.-S.		
		Noon	89 25	173.7	2590	25.1	11.3	17.9	33.5		0	3	Ci.-S.	S. SE passim	
		4 p.m.	89 30	175.4	2523	22.8	9.4	21.3	29.7	SSW	2	1	Ci.-S.		
13	14	6.30 a.m.	- -	-	-	22.6	9.2	20.1	27.8	SSW	0.5	7	Ci.-S.		
		Noon	89 37	179.0 W	2487	22.5	9.2	18.8	22.4	SE	3	9	S.	S. passim	
14		5.30 p.m.	89 44	176.6 E	2453	22.6	9.5	20.1	21.1	SE	3	8	S.		
15	15	5.30 a.m.	89 44	-	-	20.4	7.3	22.5	22.5	SSE	4	8	Ci.-S.	s.	
		Noon	89 54	172.6	2448	22.5	9.4	22.5	24.0	SSE	4	9	Ci. A.-Cu. S.	s.	
		3.30 p.m.	- -	-	-	22.5	9.4	22.5	24.0	SEE	4	8	Ci.-S.		Solar Halo.
		m. n.	- -	-	-	22.6	9.5	24.6	26.9	E	3	8	Ci.-S.		
16	16	6 a.m.	- -	-	-	21 6	8.5	25.3	27.0	SE	0.5	7	Ci.-S.		
		Noon	- -	-	-	20.8	7.7	22.5	22.4	SW	2	6	Ci.-S.	s.	
		8 p.m.	- -	-	-	23.7	10.6	20.1	21.8	SW	2	3	Ci.-S.	s.	Solar Halo.
17	17	7 a.m.	- -	-	-	22.5	9.4	17.4	16.9	W	3	1	Ci.-S.		
		Noon	89 58	40.9	2454	20.7	7.6	17.4	15.9	W	3	8	Ci.-S.		
		m. n.	- -	-	-	24.3	11.2	18.9	22.1		0	8	A.-Cu. S.		
18	18	6 a.m.	- -	-	-	21.7	8.6	18.8	18.8		4	8	Ci.-S.		
		8 a.m.	- -	-	-	22.2	9.1	18.8	19.1		1	3	Ci.-S.		
		10 a.m.	- -	-	-	20.1	7.0	20.1	19.0		2	6	Ci.-S.		Solar Halo.
		Noon	- -	-	-	20.6	7.5	20.1	19.4		1	4	A.-Cu.		
		6 p.m.	- -	-	-	19.1	6.0	20.1	18.2		3	7	S.-Cu.	s.	
		m. n.	89 52	146.5	2454	21.7	8.7	20.1	20.5	SE	2	7	Ci.-S.		

Year	Month	Day p.	Day a.	Hour	Lat. S.	Long. W.	Height m	Temperature Station °C	Temperature Sea Level °C	Pressure Station mm.	Pressure Sea Level mm.	Wind Dir. true	Wind Veloc. m p.s.	Cloud am. 0-10	Cloud Form.	Precipitation	Remarks
1911	Dec.	19	19	3 a. m.	89° 49′	161°.9 E	2443	−21.8	− 8.8	521.3	721.2	SE	3	5	Ci.-S.		
				6.30 p. m.	- -	-	-	21.7	8.7	22.4	22.6	SSE	8	8	Ci.-S.		
				m. n.	89 42	176.5 E	2484	23.8	10.6	20.1	25.2		0	5	Ci.-S.		
		19	20	3 a. m.	89 37	179.0 W	2487	20.8	7.7	17.5	19.1	SSE	1	7	Ci.-S.		
				6.30 p. m.	- -	-	-	23.7	10.7	17.2	21.5	SSE	5	10	S.		
				m. n.	89 30	174.7	2523	23.5	10.0	12.1	17.3		0	7	Ci.-S.		
		20	21	4 a. m.	89 20	173.4	2590	23.7	9.9	06.7	16.3		0	3	Ci.-S.		
				6.30 p. m.	- -	-	-	23.6	9.8	09.4	20.0		0	1	Ci.-S.		
				m. n.	89 15	171.5	2590	24.8	11.0	09.5	21.3		0	9	Ci.-S.	s.	Solar Halo.
		21	22	3 a. m.	89 08	170.8	2610	25.1	11.2	08.1	20.9	SSE	1	9	Ci.-S.		
				6 p. m.	- -	-	-	24.3	10.4	509.5	22.5	SSE	6	9	Ci.-S.		
				m. n.	89 01	169.3	2690	26.5	10.2	498.6	15.9	ESE	3	9	Ci.-S.	s.	
		22	23	3 a. m.	88 57	169.3	2710	26.3	11.9	97.2	16.5	SE	2	4	Ci.-S.		
				6.30 p. m.	- -	-	-	22.5	8.1	97.2	12.7		0	2	Ci.-S.		
				m. n.	88 47	168.6	2766	25.2	10.5	94.6	16.8	S	3	4	Ci.-S.		
		23	24	3 a. m.	88 43	168.3	2774	24.5	9.8	91.8	12.8	S	4	9	Ci.-S.		
				6.30 p. m.	- -	-	-	25.1	10.4	91.8	13.6	S	4	9	Ci.-S.		
				m. n.	88 31	167.7	2786	26.5	11.7	91.8	16.1	SE	3	1	Ci.-S.		
		24	25	5 a. m.	88 24	-	-	26.8	12.0	91.8	16.4	SSE	3	3	Ci.-S.		
				6 p. m.	- -	-	-	25.6	10.8	91.8	15.1	SSE	3	3	Ci.-S.		
		25	26	2 a. m.	88 16	-	2796	25.5	10.6	91.8	15.9	SSE	5	8	Ci.-S.		
				6.30 p. m.	- -	-	-	24.8	9.9	91.8	15.2	SE	4	2	Ci.-S.		
		26	27	2 a. m.	88 00	-	2795	26.7	11.8	91.8	17.0	S	5	1	Ci.-S.		
				6 p. m.	- -	-	-	21.6	6.7	91.8	11.7	S	3	2	Ci.-S.		
		27	28	2 a. m.	87 49	-	2808	22.7	7.8	91.8	14.1	S	4	3	Ci.-S.A.-Cu.S.		
				6 p. m.	- -	-	-	21.8	6.9	91.8	13.3	SSE	5	0			
		28	29	1.30 a. m.	87 37	-	2717	24.7	10.2	96.3	14.3	SSE	7	1	A.-Cu.		
				6 p. m.	- -	.	-	19.7	5.2	498.8	12.9	SSE	8	3	A.-Cu.	Low. s. drift.	
		29	30	1 a. m.	87 21	-	2596	20.8	7.0	516.3	27.6	SSE	7	1	Cu. Ci.		
				6.30 p. m.	- -	-	-	19.1	5.3	11.0	18.5	SSE	6	0			

1911	Dec.	30	31	1	a.m.	87	09	-	2453	−20 8	− 8.7	526.0	728.1	SSE	6	0		
				6	p.m.	-	-	-	-	18.8	6.7	24.9	24.8	SSE	7	1	A.-Cu.	
1912	Jan.	31	1	1	a.m.	86	54	-	2290	19.8	7.6	41.6	32.8	SSE	4	1	Cu.	
				6	p.m.	-	-	-	-	18.6	6.4	42.9	33.6	SSE	7	4	Cu.	
		1	2	1.30	a.m.	86	41	-	2150	20.6	9.2	54.3	37.2	SSE	5	1	Cu.	
				6	p.m.	-	-	-	-	18.4	7.0	66.7	51.9	SE	4	9	S	
				10.30	p.m.	86	26	167.7	2097	19.7	8.6	66.5	47.5	SE	5	9	S.	
		2	3	6	a.m.	86	13	168.2	2132	18.7	7.4	58.0	37.3	SE	3	1	Cu.	
				1	p.m.	-	-	-	-	16.7	5.4	58.0	30.5	SE	6	1	S.	
				7	p.m.	-	-	-	-	18.1	6.8	58.0	38.9	SW	4	3	A.-Cu.	
		3	4	6	a.m.	-	-	-	-	18.6	7.3	56.8	35.5		0	1	Cu.	
				3	p.m.	85	59	167.7	2500	17.4	4.1	23.0	27.8		0	9	S.-Cu.	
		4	5	1	a.m.	-	-	-	-	20.7	7.4	21.8	27.1	SW	2	1	Cu.	
				8.30	a.m.	85	36	-	2864	22.6	7.3	00.4	31.8	SE	2	2	Cu. Ci.	
				Noon		85	33	167.1	1516	12.7	4.6	99.1	28.9	W	2	1	S.	
		5	6	1	a.m.	-	-	-	-	21.6	3.5	597.9	29.7	W	4	1	Cu.	
				8.30	a.m.	85	27	165.8	926	11.8	6.9	647.5	30.2		0	1	Cu.	
				10	p.m.	85	23	164.5	910	9.3	4.5	48.8	29.4		0	7	A.-Cu.	
		6	7	7	a.m.	85	15	162.8	328	11.9	10.2	98.7	29.3		0	9	A.-Cu.	
				5	p.m.	-	-	-	-	8.8	7.1	696.3	26.4		0	1	Cu.	
				11	p.m.	85	05	-	190	10.9	9.9	708.8	26.6		0	1	Cu.	
		7	8	3 30	p.m.	-	-	-	-	10.3	9.3	17.7	35.6	S	6	10		S^2
				9	p.m.	85	00	162.9	128	10.8	10.1	17.7	29.8	S	4	5	Ci. S.	
		8	9	7	a.m.	-	-	-	-	6.4	5.7	17.7	29.6	E	1	10	S.	S^2 night
				3.30	p.m.	84	44	163.1	23	9.4	9.3	27.5	29.7	NW	3	8	S.-Cu.	
		9	10	1	a.m.	-	-	-	-	9.8	9 7	32.1	34.2	SE	3	10	S.	S^2 night
				10	a.m.	84	26	163.3	17	8.0	7.9	34.4	36.0	ESE	1	10	S.	s
				9.30	p.m.	-	-	-	-	8.9	8.8	35.5	37.1		0	10	S.	s.
		10	11	5	a.m.	84	15	163.4	27	7.9	7.8	34.4	36.0	W	1	9	S.	
				3	p.m.		-	-	-	8.1	8.0	33.2	34.8	W	1	10	S.	
				9.30	*p.m.*	*84*	*00*	*163.6*	*40*	*11.7*	*11.5*	30.7	34.5		0	10	S.	
		11	12	8	a m.	-	-	-	-	10.4	10.2	30.7	34.5	N	2	10	S.	
				2.30	p.m.	83	45	-	35	6.9	6.7	30.7	34.0	N	2	10	S.	
		12	13	1.30	a.m.	-	-	-	-	6.7	6.5	30.7	34.0	N	1	10	S.	
				8.30	a.m.	83	30	-	35	7.6	7.4	30.7	34.0		0	9	S.	
				6	p.m.	-	-	-	-	4.8	4.6	32.2	35.5		0	9	S.	
				11.30	p.m.	83	15	-	35	11.0	10.8	31.0	34.4	SE	1	9	S.	
		13	14	9.30	a.m.	-	-	-	-	7.6	7.4	34.5	37.8		0	10	S.	
				4.30	p.m.	83	00	-	40	10.3	10.1	35.6	39.4	N	1	10	S.	
		14	15	2.30	a.m.	-	-	-	-	10.0	9.8	38.0	41.9	SW	2	10	S.	S^2 Fog.
				9.30	a.m.	82	45	-	30	11.4	11.2	39.1	42 0	WNW	2	10	S.	s.
				7	p.m.	-	-	-	-	9.1	8.9	40.3	43.2	NW	3	9	S.	

Year	Month	Day p.	Day a.	Hour.	Lat. S.	Long. W.	Height m	Temperature Station °C	Temperature Sea Level °C	Pressure Station mm.	Pressure Sea Level mm.	Wind Dir. true	Wind Veloc. m.p.s.	Cloud am. 0-10	Cloud Form	Precipitation	Remarks
1911	Jan.	15	16	2 a.m.	82° 30′	163°.6	29	−10.6	−10.4	739.1	741.9	WNW	3	9	S.		
				Noon	- -	-	-	8.0	7.8	40.3	43.1	NW	2	10	S.		
				7 p.m.	82 15	-	26	7.3	7.2	39.1	41.6		0	9	S. A.-Cu. Cu.		
		16	17	4.30 a.m.	- -	-	-	9.8	9.7	38.1	40.6	WSW	0.5	10	S.	s.	
				11.30 a.m.	82 00	-	35	9.3	9.1	38.1	41.5	SW	2	3	A.-Cu. Ci. S.		
				9.30 p.m.	- -	-	-	12.2	12.0	39.5	42.9	WNW	4	10	S.	s.	
		17	18	4.30 a.m.	81 54	-	37	9.8	9.6	39.5	43.1	SW	2	9	A.-Cu. S.		
				1.30 p.m.	- -	-	-	8.0	7.8	42.3	45.9	SSW	4	10	S.		
				8.30 p.m.	81 30	-	40	9.8	9.6	41.0	44.8	S	4	8	S.	s.	
		18	19	5.30 a.m.	- -	-	-	15.7	15.5	41.0	44.9	SSW	2	2	S.		
				Noon	81 15	-	43	10.1	9.9	37.4	41.5	SSW	3	2	Ci. Cu.		
				9.30 p.m.	- -	-	-	18.7	18.5	37.4	41.7	SW	2	2	S.		
		19	20	4.30 a.m.	81 00	-	75	15.3	14.9	37.2	44.6	SW	5	7	S. Ci. A.-Cu.		
				1.30 p.m.	- -	-	-	10.8	10.4	38.5	45.8	WSW	4	8	S. A.-Cu.		
				8.30 p.m.	80 44	-	100	14.9	14.5	37.1	46.9	WSW	2	1	S.		
		20	21	5.30 a.m.	- -	-	-	17.1	16.6	37.1	47.0	W	2	1	S. Cu.		
				11.30 a.m.	80 29	-	106	12.9	12.4	37.1	47.5	W	4	0			
				9 p.m.	80 22	-	80	16.8	16.3	41.0	49.0	NNW	1	1	S. Cu.		
		21	22	3 a.m.	80 15	-	86	12.7	12.2	39.8	48.2	S	2	8	S. A.-Cu.		
				10 a.m.	- -	-	-	7.1	6.6	41.3	49.6	SE	4	10	S.		
				6 p.m.	80 00	-	98	5.1	4.6	41.3	50.6	SE	3	10	S.		
		22	23	3 a.m	- -	-	-	10.8	10.3	43.5	53.1	SSE	3	10	S.	mist	
				10.30 a.m.	79 43	-	77	9.8	9.4	44.7	52.2	SE	2	10	S.		
				8 p.m.	- -	-	-	12.0	11.6	46.0	53.5	SE	4	10	S.	S.	
		23	24	2 a.m.	79 23	-	100	6.8	6.4	44.7	54.3	S	1	7	S. A.-Cu.		
				10 a.m.	- -	-	-	12.4	12.0	47.3	57.2	S	1	1	Cu.		
				6 p.m.	79 13	-	250	13.7	12.4	20.5	44.6	NE	0.5	0			
		24	25	3 a.m.	- -	-	-	21.6	20.3	18.7	43.0	E	2	1	S.		
				10.30 a.m.	78 52	-	100	14.2	13.7	37.3	47.1	SW	6	9	S.		
				10 p.m.	- -	-	-	13.1	12.6	33.6	43.3	SSW	2	10	S.		
			26	3.30 a.m.	78 38	163 6	11										

V. The Temperature of the Air.

1. The vertical distribution of Temperature.

Taking the same steps as those from which the height of the stations has been computed, I find.

For the *Barrier*

Temp. increasing with height			Temp. decreasing with height		
Number of cases	Sum of heights	Sum of temp.s	Number of cases	Sum of heights	Sum of temp.s
24	475 m.	84.°3	33	970 m.	103.°4

No variation 2 cases.

Total. Number of cases	Sum of heights	Sum of temp.s
59	1447 m.	19°.1 decrease

Mean decrease of Temperature 1°.30 per 100 metres.

For the *Glacier* and the *Plateau*.

Temp. increasing with height.			Temp. decreasing with height.		
Number of Cases	Sum of Heights	Sum of Temp.s	Number of Cases	Sum of Heights	Sum of Temp.s
35	4003 m.	41°.9	34	5968 m.	83°.0

Total. Number of cases	Sum of heights	Sum of Temp.s
69	9971 m.	41°.1 decrease

Mean decrease of Temperature 0°.411 per 100 metres.

Barrier and *Mountain*.

Number of cases	Sum of heights	Sum of Temp's
128	11418 m.	60°.2

Temperature decreases with height 0°.53 per 100 metres.

The total number of cases with increasing temperature is 59
» » » » » » decreasing » » 67

The great proportion of increasing temperatures, 47 per cent, shows that *inversions* of temperature are almost as frequent as decrease of temperature with height. It is the higher rate of decrease[1] that renders the average fall of temperature with height as great as 0°.53 per 100 metres, a value of the same magnitude as that which has been found in other mountainous regions of the Earth.

2. The horizontal distribution of Temperature.

By reducing the observed temperatures to sea-level with 0°.53 per 100 m., taking the differences between the synchronous observations of Framheim (from the corrected thermograms) and the temperatures reduced

[1] In the few cases of a wind-velocity of 10 m. p. s. and upwards, the rate of decrease averages 2° per 100 m.

to sea-level, and grouping the differences Δt round each of the latitudes 79^0 to 90^0, we arrive at the numbers in the following Table.

Temperature Framheim minus Latitude Sea-level.

Date			Latitude			Δt		
Mean up.	Mean down	Mean	Mean up.	Mean down	Mean	Mean up.	Mean down	Weighted Mean
			°	°	°	°	°	°
Oct. 21	Jan. 25	Dec. 8	79.2	79.2	79.2	− 1.1	− 1.4	− 1.3
25	22	9	80.1	80.0	80.1	+ 4.5	+ 2.7	+ 4.0
31	20	11	80.9	81.1	81.0	+ 2.0	+ 2.3	+ 2.2
Nov. 5	17	16	82.0	82.0	82.0	− 1.2	+ 1.5	− 0.3
10	14	13	83.1	83.0	83.0	− 1.4	+ 1.5	− 0.1
14	11	13	84.1	84.0	84.1	+ 4.6	+ 2.1	+ 3.4
17	8	12	85.1	85.1	85.1	− 0.4	− 1.3	− 0.7
27	5	16	85.9	86.0	85.9	+ 1.4	− 4.9	− 0.3
Dec. 4	1	18	86.9	87.0	86.9	− 1.9	− 0.3	− 1.3
7	Dec. 27	17	88.1	88.0	88.1	+ 1.5	+ 1.0	+ 1.3
12	22	17	89.0	89.0	89.0	+ 3.7	+ 4.6	+ 4.2
17	18	17	89.8	89.8	89.8	+ 3.3	+ 2.9	+ 3.1

The weighted means show that the differences Framheim — Latitude run in an irregular manner, on an average increasing. The mean for the Barrier is $+ 1^0.32$ and for the Plateau $+ 1^0.05$. There is an average increase of $+ 0^0.20$ per degree of latitude. The mean date is December 15th. Taking, with Julius v. Hann[1], the mean temperature for December at Framheim to be $- 4^0.6$, we get from Capt. AMUNDSEN's observations for December the mean temperature at sea-level.

Lat.	79°	80°	81°	82°	83°	84°	85°	86°	87°	88°	89°	90°
Temp.	− 4°.7	− 4°.9	− 5°.1	− 5°.3	− 5°.5	− 5°.7	− 5°.9	− 6°.1	− 6°.3	− 6°.5	− 6°.7	− 6°.9

In December, 1911, the mean temperature of Framheim was $- 6^0.7$ and the computed temperature at sea-level at the Pole $- 9^0.8$.

The mean temperature of the air over the Arctic Polar Sea I have found to be[2]

	Lat. 80°	Lat. 85°	Lat. 90°
Lat. North June	− 1°.1	− 1°.7	− 2.0
Lat. South. Dec.	− 4.9	− 5.9	− 6.9
Diff. N—S	+ 3.8	+ 4.2	+ 4.9

3. The interdiurnal Variability of Temperature.

	Oct.	Nov.	Dec.	Jan.	Barrier	Plateau
Journey	± 5°.7	± 3°.1	± 1°.7	± 1°.9	± 4°.4	± 1°.6
Framheim	5.5	2.5	1.6	1.7		

[1] Met. Zeitch. 1914, p. 553.

[2] The Norwegian North Polar Expedition 1893—96. Scientific Results edited by FRIDTJOF NANSEN, Vol VI, Meteorology by H. MOHN, p. 575.

The corresponding numbers for the region round the North Pole are[1].

	April	May	June	July
	± 2°.6	± 2.°0	± 1°.0	± 0°.6
N—S	— 3.1	— 1.1	— 0.7	— 1.3

4. The highest temperatures observed between Framheim and the South Pole were.

	Sept.	Oct.	Nov.	Dec.	Jan.
obs.	— 28°.4	— 13°.0	— 10°.3	— 14.7	— 4.8
sea-level	— 27.5	— 12.6	— 6.5	— 0.2	— 3.5

The lowest temperatures observed.

obs.	— 54°.6	— 34°.6	— 33°.1	— 28°.5	— 22°.6
sea-level	— 54.2	— 34.1	— 32.9	— 13.7	— 20.3

VI. The Pressure of the Air.

To show the distribution of pressure along the track of the Expedition, I have reduced the pressures observed at each station to sea-level from the formula

$$\log b_1 = \log b_{11} + \frac{h}{67.25\,(273 + t)}, \qquad (2) \text{ p. } 55$$

where h is the height of the station in metres,

t the temperature of the air at the station reduced to half the height above sea-level by adding 0°.53 per 100 m.

b_{11} the pressure at the station, b_1 the pressure at sea-level.

The pressure at sea-level will be found in the Table on pp. 60 — 68.

Grouping the pressures at sea-level round each of the latitudes 79° to 90° in the same manner as the temperatures, we get the numbers in the following Table.

Pressure at Sea-level.

Date		Latitude			Pressure			*db*
Mean up.	Mean down	Mean up.	Mean down	Mean	Mean up.	Mean down	Weighted Mean	
		°	°	°	mm.	mm.	mm.	mm
Oct. 21	Jan. 25	79.2	79.2	79.2	723.1	748.2	736.8	± 0.5
25	22	80.1	80.0	80.1	28.0	50.5	34.9	1.3
31	20	80.9	81.1	80.9	37.1	44.6	39.5	5.6
Nov. 5	17	82.0	82.0	82.0	44.2	42.9	43.8	5.8
10	14	83.1	83.0	83.0	41.5	39.5	40.7	5.8
14	11	84.4	84.0	84.1	45.7	35.0	40.9	5.9
17	8	85.1	85.1	85.1	47.5	30.1	39.2	5.8
27	5	85.9	86.0	85.9	42.6	34.3	40.4	7.7
Dec. 4	1	86.9	87.0	86.9	24.0	31.8	26.8	11.4
7	Dec. 27	88.1	88.0	88.1	33.1	14.6	25.4	17.4
12	22	89.0	89.0	89.0	34.0	17.4	24.4	18.0
17	18	89.8	89.8	89.8	722.2	720.5	721.6	18.7

[1] L. c. p. 488.

The effect of the errors attaching to the computed heights upon the values of the pressure reduced to sea-level, has been computed from the formula

$$db = \frac{b}{29.206\,(273 + t)} \cdot dh$$

and the values of *db* are inserted in the last column of the Table.

On the Barrier, lat. 79^0—83^0 the pressure increases with latitude; it is constant to 86^0, but then decreases rather rapidly, and at last more slowly to the Pole. The Barrier has an anticyclonic distribution of pressure, but the *Plateau has a distinct, remarkably low pressure.*

VII. The Winds.

The Wind-Roses have been computed specially for

The Barrier: Framheim to lat. $84^0\,53'$
The Glacier: lat. $84^0\,53'$ to lat. $85^0\,36'$
The Plateau: lat. $85^0\,36'$ to lat. $89^0\,58'$

The numbers are weighted means referred to 8 points.

Wind-Frequency, per Mille

	N	NE	E	SE	S	SW	W	NW	Calm.
Barrier	89	46	61	200	215	112	69	108	100
Glacier	25	150	112	175	138	0	75	0	325
Plateau	33	91	95	351	202	54	25	0	149
Total	57	79	82	260	200	72	51	48	151

The direction of the maximum of frequency at Framheim is E, on the Barrier S by E, on the Glacier SE by S, and on the Plateau SE. From the interior to the coast the prevailing wind turns to the left from SE to E.

Dynamic Wind-Roses m. p. s.

	N	NE	E	SE	S	SW	W	NW
Barrier	2.4	2.2	3.5	3.6	3.5	3.3	2.0	2.7
Glacier	0.5	7.3	9.1	5.4	5.4	3.0	3.0	—
Plateau	4.1	6.1	6.0	6.6	3.7	2.5	1.7	—
Total	2.7	6.0	5.5	5.4	3.7	3.1	2.4	2.7

The strongest winds are E to SW on the Barrier, E on the Glacier, and SE on the Plateau. At Framheim the strongest winds are NE^{ly} in the summer months.

Thermal Wind-Roses, C° Sea-level.

	N	NE	E	SE	S	SW	W	NW	Calm.
	°	°	°	°	°	°	°	°	°
Barrier	−15.0	−15.9	−19.0	−18.0	−15.7	−16.1	−15.2	−17.2	−15.1
Glacier	− 8.4	−10.4	−11.9	−12.9	−11.0	—	− 6.5	—	− 9.1
Plateau	− 5.7	− 6.9	− 8.7	− 9.1	− 8.9	− 9.5	− 9.6	—	− 9.2
Total	−12.7	−10.2	−12.8	−12.6	−12.4	−13.2	−14.5	−17.2	−10.9

	Warmest	Coldest
Framheim	NE to NW	S to SE
Barrier	N	E to SE
Glacier	N and W	SE
Plateau	N	SW and W

The warmest winds come from the sea, the coldest from the interior.

Nephic Wind-Roses.

	N	NE	E	SE	S	SW	W	NW	C
Barrier	8.7	4.5	6.1	6.8	4.1	5.8	5.3	6.6	7.6
Glacier	1.0	7.2	8.6	3.4	0.6	—	1.0	—	5.0
Plateau	7.0	9.6	9.0	7.0	5.6	2.5	8.5	—	6.0
Total	7.8	7.3	7.5	6.3	3.8	4.8	5.0	6.6	6.0

North to East winds have the greatest cloudiness.

South to West are clearer.

Precipitation of Snow. Number of cases.

	N	NE	E	SE	S	SW	W	NW	C	Total
Barrier	2	—	1.5	7.5	3	1.5	1.5	1	4	22
Plateau	2	7.5	8.5	15.5	2.5	2	0	0	3	41

The frequency of falling snow is greatest with South-easterly winds and least with North West.

Probability of Precipitation.

	N	NE	E	SE	S	SW	W	NW	C	
Barrier	17	0	2	29	11	11	17	7	31	per cent.
Plateau	50	65	74	35	10	31	0	0	17	" "

On the Barrier SE and Calm have the greatest probability of precipitation, NE and E the least. On the Plateau East has the greatest probability, and then, successively diminishing, NE, N, SE, SW and W.

Frequency of stronger winds, velocity $\geqq$ 10 m. p. s.

Number of cases.

	N	NE	E	SE	S	SW	W	NW	Total
Barrier	0	0	1	2	2.5	1.5	0	0	7
Plateau	0	6	3.5	9.5	0	0	0	0	19

On the Barrier, stong winds from the South are most frequent. On the Plateau, SE has the maximum. The strong winds are to be found in the eastern quadrant. The north western quadrant has no strong winds.

The highest velocity observed is 18 m. p. s. with a SE wind on December 2nd and 3rd.

Precipitation with strong Winds

	N	NE	E	SE	S	SW	W	NW	
Barrier	0	0	0	2	1	0	0	0	cases
Plateau	0	6	2.5	7.5	0	0	0	0	«

Strong SE is the most likely to be accompanied with snow.

VIII. Cloudiness.

The frequency of the different *degrees of cloudiness* is registered in the following Table. *c* cloudiness, *n* number of cases.

C.	Barrier		Plateau		Total	
	n obs.	*n* per cent.	*n* obs.	*n* per cent.	*n* obs.	*n* per cent.
0	24	18	20	13	44	15
1	18	13	24	15	42	14
2	3	2	6	4	9	3
3	4	3	12	8	16	6
4	3	2	7	4	10	3
5	3	2	4	3	7	2
6	0	0	2	1	2	1
7	4	3	15	10	19	7
8	8	6	14	9	22	8
9	17	13	21	14	38	13
10	51	38	30	19	81	28
Total	135	100	155	100	290	100

The average cloudiness on the Barrier is 5.9
» » Plateau 5.4

The frequency of the different *forms of cloud* is shown in the following Table

Form of cloud	Barrier		Plateau		Total	
	obs.	per cent.	obs.	per cent.	obs.	per cent.
Cirrus	18	15	17	14	35	14
Cirro-Stratus	4	3	58	46	62	25
Cirro-Cumulus	4	3	0	0	4	2
Alto-Cumulus	12	10	9	7	21	8
Alto-Stratus	2	2	0	0	2	1
Strato-Cumulus	6	5	2	2	8	3
Cumulus	3	2	13	10	16	6
Stratus	75	60	27	21	102	41
Total	124	100	126	100	250	100

The most frequent Clouds are Stratus, Cirro-Stratus and Cirrus. Cumulus is rarely seen.

IX. Halos

round the Sun were observed on the Plateau

on Nov.	28th	Cirro-Stratus.	Low snow drift.
Dec.	2nd	Stratus	Snow drift
»	4th	Cirro-Stratus	
»	»	—» —	
»	»	Cirrus	
»	15	Cirro-Stratus	
»	16	Cirro-Stratus	A little snow
»	18	Cirro-Stratus	
»	21	Cirro-Stratus	A little snow

9 times 7 Days.

X. Pressure and Air-Currents.

The Table p. 71 shows the mean distribution of the pressure of the air along Capt. AMUNDSEN's route referred to the middle of December, 1911. Taking out the prevailing winds corresponding with the pressure at different latitudes, we get the following Table.

Mean Date	Mean Latitude	Mean Pressure	Prevailing Wind
		mm.	
Dec. 8	79°	736.8	E and S
9	80	34.9	SE
11	81	39.5	NW
16	82	43.8	SSW
13	83	40.7	S
13	84	40.9	SE
12	85	39.2	SSE
16	86	40.4	SE
18	87	26.8	SEb S
17	88	25.4	SSE
17	89	24.4	SSE
17	90	721.6	SEb S

From Framheim the pressure rises on the Barrier to latitude 85° and 86°, indicating an anticyclonic state with low pressure in lower latitudes. The winds are mainly SE-ly and rather cold.

But over The Plateau the pressure is rather low. The winds are SSE-ly and have a relatively high temperature. There is a gradient towards the North-East, indicating the existence of centres of low pressure in this direction.

It seems that in the higher regions, above 2000 m. and up to 2800 m., there were, in December 1911, cyclonic movements of the air with centres in the North-East quadrant, higher temperature and a great deal of precipitation.

This agrees in a remarkable way with the view set forth by Prof. W. MEINARDUS in his paper »Aufgaben und Probleme der meteorologischen Forschung in der Antarktis«[1]: He says:

»Die antarktische Anticyklone ist eine Luftdrucklage, die nur den unteren Schichten der Atmosphäre eigen ist. Sie tritt nur in der Luftdruckvertheilung im *Meeresniveau* deutlich hervor. Dagegen muss wegen der niedrigen Temperatur des Südpolargebiets die vertikale Abnahme des Luftdrucks dort so rasch sein, dass oberhalb eines gewissen Niveaus der Luftdruck über dem Südpolargebiet nicht höher sondern niedriger ist als in seiner Umgebung. Ueber der unteren Anticyklone liegt also eine Zyklone.«

That the distribution of pressure and winds in many cases is very irregular and of a character similar to those round Framheim, becomes apparent on scrutinizing the tables of observation. An illustration may be taken from the observations at »The Butcher's Shop« on the 24th to the 26th November. During the morning of the 24th the barometer begins to fall from 513.4 mm., and reaches 503.9 mm. on the morning of the 26th. The wind turns from ENE to NE, and its velocity rises from 4 to 12 m.p.s. The direction of the gradient turns from NW to WNW. A centre of low pressure seems to pass North of the station, being nearest on the morning of the 26th, from NE to SW. The temperature rises, and is highest at noon on the 25th, after which it falls. Snow drifts during the whole time.

[1] Geographische Zeitschrift. Herausgegeben von Dr. Alfred Hettner. 20. Jahrg. I. Heft. 1914.

Appendix I.

1911. December 16th.

Watch No. 3. 1911 October 16. $0^h\ 0^m\ 56^s$ past Framheim Mean Time
Daily Retardation 3^s.

Approximate Longitude 104° 15′ E. Gr.

Index error — 1′ both Sextants.

Artificial Horizon. Double Altitudes. Suns lower Limb.

Compass-Bearings of the Sun's Centre.

Watch	Sextant 1	Sextant 2	Compass	
7 a. m.	45° 44′ 00″	45° 46′ 00″	WNW ½ W	6 a. m. Temp. — 21°.6
8 - -	45 49 30	45 52 30	W ¼ N	- - - Bar. 525.3 mm.
9 - -	45 53 30	45 54 00	Wb S ¼ S	
10 - -	45 57 00	45 56 00	SWb S	
11 - -	45 59 00	46 01 00	SW	
Noon	46 03 00	46 06 00	SWb S ½ S	Noon Temp. — 20°.8
1 p. m.	46 03 20	46 05 30	Sb W	- Bar. 522.5 mm.
2 - -	46 07 30	46 09 00	S	
3 - -	46 11 30	46 13 30	Sb E	
4 - -	46 12 20	46 15 00	SSE ½ E	
4.30 - -	46 13 30	46 15 00		
5 - -	46 14 00	46 14 00	SE	
5.30 - -	46 14 00	46 13 30	SE ½ E	
6 - -	46 13 00	46 13 00	SEb E ¼ E	
6.30 - -	46 13 00	46 12 40	SEb E ¾ E	8 p. m. Temp. — 23°.7
7 - -	46 09 30	46 07 00		- - - Bar. 520.1 mm.

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Appendix II.

1911. December 17—18. Watch No. 3. Sextant 1. Index error — 1′ Approx. Long. 47° E. Gr.

Dec.	Watch	Sextant 1	Compass	Dec.	Hour	Sextant 1	Compass
	h m				h m		
17	11.30 a. m.	46° 04′ 00″		18	1 a. m.	46° 09′ 00″	NNE
	Noon	46 04 00			2 - -	46 09 00	N ¾ E
	1 p. m.	46 04 10			3 - -	46 09 00	N ½ W
	2 - -	46 06 50	S ½ W		4 - -	46 09 00	NbW ¾ W
	3 - -	46 06 50	S ¾ E		5 - -	46 09 00	NW ¾ W
	4 - -	46 06 50	SSE		6 - -	46 08 00	NW ½ W
	5 - -	46 09 30	SEbS		7 - -	46 08 00	Wb N ½ N
	6 - -	46 9 30	SEbE		8 - -	46 06 20	W ¼ N
	7 - -	46 9 30	ESE ¼ E		9 - -	46 06 20	WbS
	8 - -	46 9 30	E ½ S		10 - -	46 06 20	WSW
	9.15 - -	46 10 00	EbN ½ N		11 - -	46 08 30	SW ½ W
	10 - -	46 10 00	NEbE ½ E		Noon	46 10 00	SWbS
	11 - -	46 09 00	NE ½ E		-	46 09 00	Sextant 2
	M. N.	46 09 00	NE ¾ N				

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Dec.	17	Noon	Temp.	— 20°.7;	Bar.	517.4 mm.
-	-	M.N.	-	— 24 .3	-	518.9 -
-	18	6 a. m.	-	— 21 .7	-	518.8 -
-	-	8 a. m.	-	— 22 .2	-	518.8 -
-	-	10 a. m.	-	— 20 .1	-	520.1 -
-	-	Noon	-	— 20 .6	-	520.1 -

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