DEN NORSKE NORDHAVS-EXPEDITION

1876—1878.

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1. ASTRONOMISKE OBSERVATIONER.

H. MOHN.

2. MAGNETISKE OBSERVATIONER.

C. WILLE.

3. GEOGRAFI OG NATURHISTORIE.

MED 6 FARVETRYKTE BILLEDER, 13 TRÆSNIT OG 2 KARTER.

H. MOHN.

CHRISTIANIA.
GRØNDAHL & SØNS BOGTRYKKERI.
1882.

THE NORWEGIAN NORTH-ATLANTIC EXPEDITION

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WITH 6 CHROMO-LITHOGRAPHS, 13 WOOD ENGRAVINGS AND 2 MAPS.

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C. Wille. Magnetiske Observationer.

Efter den for Nordhavs-Expeditionen lagte Plan skulde der søges udført Observationer til Bestemmelse af Jordmagnetismens Elementer saavel i Land som i Søen. Til dette Øjemed anskaffedes og medbragtes følgende Instrumenter:

Et Unifilar-Magnetometer, No. 38, af Elliott Brothers i London. Instrumentet blev verificeret og dets Konstanter bestemte ved Observatoriet i Kew.

En liden Theodolit af Olsen i Kristiania, laant af den geografiske Opmaaling.

Et Inklinatorium af John Dover, Charlton, Kent, undersøgt i Kew.

Et Admiralitets-Standard-Kompas, verificeret ved Kompas-Observatoriet i Deptford.

Flere Azimuth-Kompasser.

En Fox-Cirkel No. 30 af John Dover, med Hjælpeapparater og Slingrebord.

Flere Kronometre og Sextanter.

Et Observationstelt fra Bergens Arsenal, velvillig udlaant af Armé-Intendanten.

Jeg skal nu særskilt behandle Observationerne paa Landstationer og Observationerne i Søen.

A. Observationer paa Land-Stationer og deres Resultater.

a. Deklination.

Begge til Magnetometret hørende Magneter var Kollimations-Magneter, med Skalaer i Objectivglassets Brændplan. Da Instrumentet ikke var forsynet med Plan-Spejl til Deklinationsbestemmelse, men kun havde et Hulspejl til at

C. Wille. Magnetical Observations.

The Scheme of Work approved for the Norwegian North-Atlantic Expedition, was, if possible, to comprise observations for determining the elements of terrestrial magnetism, alike on shore and at sea. With this object in view, the following instruments were provided.

A Unifilar Magnetometer, No. 38, made by Elliott Brothers, of London. This instrument was verified, and had its constants determined, at the Kew Observatory.

A small Theodolite, by Olsen of Christiania, obtained on loan from the Geographical Survey.

A Dip-Circle, by John Dover, of Charlton, Kent, examined at Kew.

An Admiralty Standard-Compass, verified at the Compass Observatory, Deptford.

Several Azimuth-Compasses.

A Fox-Circle, No. 30, by John Dover, with auxiliary apparatus and gimbal-table.

Several Chronometers and Sextants.

A Tent, kindly lent from the Bergen Arsenal.

I will now pass on to the observations, describing separately those taken at the land-stations and those made at sea.

A. Observations at Land-Stations, and their Results.

a. Declination.

Both of the magnets belonging to the magnetometer were collimator-magnets, with the scale in the focal plane of the object-glass. The instrument not being provided with a plane mirror for observing the declination, but belyse Magnetens Skala, maatte en særskilt Theodolit anvendes til Bestemmelse af Azimut. Theodoliten opstilledes i 1876 paa sit eget Stativ med sin Kikkert i samme Højde som Magneten og saa nær denne som muligt. Da dette voldte meget Bryderi, lod jeg forfærdige paa Hortens mekaniske Verksted et Underlag af Messing, der kunde lægges paa Magnetometret og fæstes til dette ved Hjælp af de samme Indretninger, som anvendtes ved Deflektionsstangens Befæstigelse. Paa den ene Side af dette Underlag anbragtes Theodoliten, med Fodskruerne i smaa dertil afpassede Huller, og paa den anden Side en Modvægt af Bly. Det var med denne Indretning altid let at faa se og kunne indstille Magnetskalaens Midtstreg paa Theodolitens Vertikalfilament. Observationerne udførtes i Regelen paa følgende Maade:

Ophængningstraadens Torsion ophævedes. Theodoliten nivelleredes, og indstilledes med Filamentet paa Skalaens Midtstreg i Magneten, hvorefter Theodolitens Nonier aflæstes (Magn. I).

Theodoliten drejedes, saaledes at dens Kikkert pegede lidt vestenfor Solen, i Solcentrets Højde, og fastklemtes. Tidspunkterne for Overgangen af forangaaende og efterfølgende Rand af Solen over Vertikalfilamentet noteredes efter Kronometer. Denne Iagttagelse gjordes enten med Blændglas foran Okularet eller ved at projicere Solens og Filamentets Billede paa en hvid Skjærm. I mange Tilfælde var der to Iagttagere, af hvilke den ene observerede Solrandenes Passage og raabte "Nu" i det Øjeblik, de tangerede Filamentet, medens den anden observerede og noterede tilsvarende Øjeblikke efter Kronometret. Nonierne aflæstes.

Kikkerten lagdes om gjennem Zenit (Nadir), drejedes 180° om Vertikalaxen og begge Solrandes Passage observeredes i denne Stilling efter Kronometret, ligesom Nonierne aflæstes.

Magneten omlagdes, idet den drejedes 180° om sin Længdeaxe, og Filamentet i Theodolitkikkerten indstilledes atter paa Magnetskalaens Midtstreg, og Nonierne aflæstes. (Magn. II).

Naar Omstændighederne tillod det, observeredes atter Magneten i Stillingen I. Stundom blev den omlagt flere Gange.

Ligesaa flyttedes, ved saadanne Lejligheder, Theodoliten ved den følgende Sats saaledes, at Fodskruerne kom hver i andre Huller, hvorved dens Cirkels Nulpunkt forandredes 120°. Det viste sig imidlertid, at dens Delingsfejl ikke var saa betydelige, at denne Vexling af Stilling var nødvendig for at opnaa den forlangte Nøjagtighed af c. 1 Minut.

I flere Tilfælde bestemtes Azimut af en Mire, til hvilken Observationen af Magneten i begge Stillinger blev knyttet.

Kronometrets Stand blev i de fleste Tilfælde bestemt ved Solhøjder tagne med Sextant paa Observations-

having only a concave mirror by which to illuminate the scale of the magnet, the azimuth had to be determined with a separate theodolite. In 1876, the theodolite was mounted on its own stand, with the telescope facing the magnet, and as near it as possible. This, however, proving excessively troublesome, I procured from the Horten Mechanical Works a brass support, which, when placed upon the magnetometer, could be attached in the manner adopted for fixing the deflection-rod. On one side of this brass support was mounted the theodolite, with the foot-screws fitting into holes made for the purpose, the other side being given a counterpoise of lead. With this arrangement, the scale of the magnet could be easily sighted, and the middle division bisected by the vertical wire of the theodolite. The observations were generally taken as follows: —

The torsion of the suspension thread having been first removed, the theodolite was levelled, and the wire made to bisect the middle division of the scale of the magnet, after which the verniers of the theodolite were read off (Magn. I). The theodolite was then moved in azimuth and altitude till its telescope pointed a little to the west of the sun, at the altitude of the sun's centre, and clamped in that position. The times for the transit of the preceding and following limbs of the sun across the vertical wire, were noted by a chronometer. This observation was taken either with a coloured glass before the eye-piece or by projecting the image of the sun and the wire on a white screen. Frequently, there were two observers, in which case one observed the transit of the solar limbs, calling out at the moment they were tangent to the wire, while the other observed and noted the corresponding readings of the chronometer. Then, after reading off the verniers, the telescope was turned through the zenith (nadir), moved 180° on its vertical axis, and the transits of both solar limbs observed in that position by the chronometer, the verniers being also read off.

The magnet was now inverted, being turned 180° about its longitudinal axis, and the wire of the telescope of the theodolite again made to bisect the middle division of the scale of the magnet, after which the verniers were read off (Magn. II).

Circumstances permitting, the magnet was again observed in position I. Occasionally, it was inverted several times.

Moreover, on such occasions the theodolite was so moved previous to the following set of observations, that the foot-screws should correspond with different holes, and change the zero of its circle by 120°. Its errors of division, however, did not prove so considerable as to render imperative such change in position for attaining the desired accuracy of about one minute.

In several cases, the azimuth of a mark was determined from the observations of the sun, and the observations of the magnet, in both positions, connected with the direct observations of the mark.

As a rule, the error of the chronometer was found from solar altitudes, taken with the sextant at the place stedet. Herom kan jeg henvise til den foranstaaende Afhandling af Professor Mohn. Kronometrenes Gang bestemtes efter Sammenligning med det ombord værende Normalkronometer, hvis Stand og Gang var bestemt væsentlig efter telegrafiske Tidssignaler fra Christiania Observatorium[1]. Paa et Par Steder toges Kronometrets Stand efter dets Stand for Greenwich Tid og Længden af Observationsstedet efter Kystkartet.

Observationerne af alle Elementer gjordes i Teltet. Ved Observation af Solen aabnedes Teltet netop saavidt i Rum og Tid, som var nødvendigt.

of observation. For details on this head, I can refer to the foregoing Memoir, by Professor Mohn. The rate of the chronometer was determined by comparison with the standard chronometer on board, the error and rate of which were found chiefly by means of the time-signals telegraphed from the Christiania Observatory[1]. At one or two points, the error of the chronometer was taken from its error on Greenwich time and the longitude of the place of observation on the coastal chart.

The observations of all the elements were made in the tent. For observations of the sun, the tent was opened to just the necessary extent in space and time.

b. Horizontal Intensitet.

Observationerne og Beregningerne udførtes efter Instruktionerne i "A Manual of Scientific Enquiry"; Fourth Edition, 1871 Side 96 til 101.. Unifilar-Magnetometrets Konstanter var ved Kew-Observatoriet bestemte saaledes:

Correction for Delingsfejl ved Afbøjningsstangen
ved 1 Foot. = + 0.00002 Foot. } ved 62° F.
„ 1.5 — = + 0.00004 — }

Svinge-Magnet, Værdi af 1 Skaladel = 1.'9.

Afbøjningsmagnetens Correction til 35° F = $0.000130\ (t_0 - 35) + 0.00000056\ (t_0 - 35)^2$.

Induktionskoefficient $\mu = 0.000195$.

Log π^2 K ved 60° F = 1.69708.

Der er desuden givet forskjellige Hjælpetabeller, blandt hvilke en for Værdierne af Log. π^2 K og Log $^1/_2$ r^3 for forskjellige Temperaturer:

b. Horizontal Intensity.

The observations and computations were made in accordance with the instructions contained in "A Manual of Scientific Enquiry;" Fourth Edition, 1871, pp. 96—101. The constants of the Unifilar Magnetometer had been determined at the Kew Observatory, as follows: —

Correction for errors of division of Deflecting Rod
at 1 Foot = + 0.00002 foot } at 62° F.
„ 1.5 — = + 0.00004 „ }

Vibration Magnet, value of 1 division of Scale = 1.'9.

Deflecting Magnet, correction to 35° F. = $0.000130\ (t_0 - 35) + 0.00000056\ (t_0 - 35)^2$.

Coefficient of Induction $\mu = 0.000195$.

Log π^2 K at 60° F = 1.69708.

Moreover, divers auxiliary Tables are annexed, one of which gives the values of Log. π^2 K and of Log. $^1/_2$ r^3 at different temperatures.

Temp. F	Log. π^2 K	Log. $\frac{1}{2}$ r^3	
		$r_0 = 1.0$	$r_0' = 1.3$
30	$\bar{1}$.69690	9.69859	0.04041
40	696	872	054
50	702	885	067
60	708	898	080
70	714	911	093
80	720	924	106
90	1.69726	9.69937	0.04119

Som Exempel paa Observationernes Udførelse og Beregning hidsættes følgende, efter de fra Kew erholdte trykte Blanketter udfyldte, Skemata.

To show the mode of taking and computing the observations, copies of the printed forms in use at Kew Observatory have been filled out, and here subjoined.

[1] Se den citerede Afh. Side 2.

[1] See Professor Mohn's Memoir, p. 2.

Observations of Deflection, 2nd of October 1876.

Station Christiania; Lat. 59° 54′ 43″, Long. 10° 43′ 37″.
Mean Time at Station; commencing $0^h\ 36^m$ p. m., ending $1^h\ 20^m$ p. m.
Magnet (A) deflecting; (B) suspended.

Deflecting Magnet			Readings of Verniers	Mean of Verniers	Corrected Circle Reading	Means and Differences	
Distance	N. End.	Temp.					
East							
1 Foot	E.	53.°4	143° 17′ 40″	143° 17′ 30″	143° 17′ 30″	143° 13′ 40″	
			17 20		143 9 50	90 23 40	
1 "	W.	53. 4	90 21 0	90 21 10		52 50 0	Diff.
			21 20		90 21 10		
1.3 "	E.	53. 3	128 13 20	128 13 20	26 10	26 25 0	u_o
			13 20				
1.3 "	W.	53. 2	105 7 40	105 7 50			
			8 0				
West							
1 Foot	W.	53.°4	90° 26′ 0″	90° 26′ 10″	128° 13′ 20″	128° 17′ 45″	
			26 20		22 10	105 10 25	
1 "	E.	53. 4	143 9 40	143 9 50		23 7 20	Diff.
			10 0		105 7 50		
1.3 "	W.	53. 0	105 13 0	105 13 0	13 0	11 33 40	u'_o
			13 0				
1.3 "	E.	53. 0	128 22 0	128 22 10			
			22 20				

Mean $t_o =$ 53° 26 − 8 = 52.°5

Observed Angles of Deflection $(u_{,o})$ $r_o = 1.0 = 26° 25' 0''$; $r'_o = 1.3 = 11\ 33\ 40$

$$\frac{m_o}{X_o} = \tfrac{1}{2} r^3 \sin u_o; \qquad \frac{m'}{X'} = \frac{m_o}{X_o}\left\{1 + \frac{2\mu}{r_o^3} + q\,(t_o - t)\right\}; \qquad \frac{m}{X} = \frac{m'}{X'}\left(1 - \frac{P}{r_o^2}\right).$$

$r = 1.0 \quad r' = 1.3 \qquad\qquad r' = 1.3$

	$r = 1.0$	$r' = 1.3$		$r = 1.0$	$r' = 1.3$
			$\frac{1}{2} r^3$ Log. =	9.69888	0.04070
$1 + \frac{2\mu}{r_o^3} =$	1.00039	1.00086	Sin. u_o Log. =	9.64826	9.30193
$+ (t_o - t)\, q =$	0.00244	0.00244	$\frac{m_o}{X_o}$ Log. =	9.34714	9.34263
$1 + \frac{2\mu}{r_o^3}(t_o - t)\, q =$	1.00283	1.00330	Log. =	0.00123	0.00143
			$\frac{m'}{X'}$ Log. =	9.34837	9.34406
$1 - \frac{P}{r_o^2} = 0.97618$			Log. =	9.98953	9.99384
			$\frac{m}{X}$ Log. =	9.33790	9.33790
			mX Log. =	0.41767	
			$mX - \frac{m}{X} = X^2$ Log. =	1.07977	
$3.4664 = X =$			Log. =	0.53988	
$0.7547 = m =$			Log. =	9.87779	
Red. to Metr. Un.			Log. =	9.66378	
$1.5983 = X =$			Log. =	0.20366	

Observer *Carl Wille.*

Observations of Vibration, 2nd of October 1876.

Station Christiania; Lat. 59° 54′ 43″, Long. 10° 43′ 37″.
Chronometer. Error at Station = $0^h\ 42^m\ 38^s$ Daily Rate (s) = 4.′5 Accl.
Magnet (A) suspended.
Effect of 90° of Torsion = 2.26 Div. = 4.′29. One Div. of Scale = 1.′9.

At Commencement	Mean Time	$1^h\ 50^m$ p. m.	Semiarc	76′	Temp. of	55.°0	$t_o' = 55.°0$
At End	at Station	2 2	of Vib.	22.8	Magnet		$t_o = 55.0$

Scale moving apparently to the Right					Scale moving apparently to the Left				
No. of Vib.	Time of Centre passing wire	No. of Vib.	Time of Centre passing wire	Time of 100 Vib.	No. of Vib.	Time of Centre passing wire	No. of Vib.	Time of Centre passing wire	Time of 100 Vib.
0	$2^h\ 33^m\ 21.'7$	100	$40^m\ 38.'1$	$7^m\ 16.'4$	5	$2^h\ 33^m\ 43.'5$	105	$41^m\ 00.'0$	$7^m\ 16.'5$
10	34 5.3	110	41 21.7	16.4	15	36 27.1	115	41 43.5	16.4
20	34 49.0	120	42 5.5	16.5	25	35 10.7	125	42 27.1	16.4
30	35 32.7	130	42 49.2	16.5	35	35 54.5	135	43 11.0	16.5
40	36 16.3	140	43. 33.0	16.7	45	36 38.0	145	43 54.5	16.5
50	37 0.0	150	44 16.5	16.5	55	37 21.7	155	44 38.3	16.6
Diff.	3 38.3			30	Diff.	3 38.2			29
100 at	2 40 38.3		Mean (1) =	7 16.5	105 at	40 59.9		Mean (2) =	7 16.48

$$T_{,} = T_o \left\{ 1 - \frac{s}{86400} - \frac{\alpha\alpha'}{16} \right\}. \quad T^2 = T_{,}^2 \left\{ 1 + \frac{H}{F} - q(t_o - t) + \mu \frac{X_o}{m_o} \right\}. \quad mX = \frac{\pi^2 K}{T^2}.$$

$1 - \frac{s}{86400} = 0.99995$ | Mean (1) = 7^m 16.50

$- \frac{\alpha\alpha'}{16} = 0.00001$ | " (2) = 7 16.48

$T_o = 4.'3649$ Log. = 0.63997

$1 - \frac{s}{86400} - \frac{\alpha\alpha'}{16} = 0.99994$ . . . . Log. = 9.99997

$T_{,}$ Log. = 0.63994

2

$T_{,}^2$ Log. = 1.27988

$1 + \frac{H}{F} = 1.00079$

$- q(t_o - t) = 0.00282$

$+ \mu \div \frac{m_o}{X_o}$ 0.99997
= 0.00088

$1 + \frac{H}{F} - q(t_o - t) + \mu \div \frac{m_o}{X_o} = 0.99885$ . . . . Log. = 9.99950

T^2 Log. = 1.27938

$\pi^2 K$ Log. = 1.69705

μ Log. = 6.29003

$mX = \frac{\pi^2 K}{T^2}$ Log. = 0.41767

$\frac{m_o}{X_o}$ Log. = 9.34714

$\frac{m'}{X'}$ Log. = 9.34837

$\mu \div \frac{m_o}{X_o} = 0.00088$ Log. = 6.94289

$mX - \frac{m'}{X'} = X'^2$ Log. = 1.06930

$X' = 3.4249$ Log. = 0.53465

m'^2. Log. = 9.76604

$m' = 0.76387$ Log. = 9.88302

Observation of Torsion.

Circle turned		Scale	Mean	Diff.
0°	=	40		
+ 180°	=	44.3	39.75	4.55
0°	=	39.5		
− 180°	=	35.5	40. 0	4.5
0°	=	40.5		4.5
			90° =	2.26 = 4.′29

Observer *Carl Wille.*

c. Inklination.

Det Doverske Inklinatorium havde tre Naale. Aflæsningen af Naalespidsene sker ved Mikroskoper. Nonierne angiver Minutter. Observationerne udførtes og beregnedes efter Instruktionerne i Manual of Scientific Enquiry Side 103—105. Følgende Skema benyttedes:

c. Inclination.

Dover's Dip-Circle had three needles. The ends of the needles are observed with microscopes. The verniers read minutes. The observations were taken and computed in accordance with the instructions in "A Manual of Scientific Enquiry," pp. 103—105. The printed form was as follows:

Magnetic Dip.

Station Christiania. Date 2nd of October 1876.
Needle No. 1.
Setting of Azimuth Circle 64° 49′ + 64° 28′ = 64° 38′.
Remarks . . . . . Magnetical Pillar in the Park of the Observatory.
Time 10^h 55^m a. m. to 0^h 5^m p. m.

		Poles direct B dipping				Poles reversed A dipping		
	Face of Instr.	Readings of Needle				Readings of Needle		
		Lower end	Upper end	Mean		Lower end	Upper end	Mean
Face of Needle to face of Instrument	EAST	71° 5.′5	71° 6.′0	71° 5.′7		71° 10′	71° 12′	71° 11.′0
		4.5	5.5	5.0		9	12	10.5
		4.0	4.0	5.0		9	11	10.0
		Mean = a		71 5.2		Mean = b		71 10.5
	WEST	71 0	70 58	70 59		71 1	70 58	59.5
		0	59	59.5		1	58	
		0	71 0	60				
		Mean = a'		70 59.5		Mean = b'		70 59.5
Face of Needle reversed	WEST	71 17	71 14	71 15.5		71 21.5	71 20	71 20.7
		16	14	15		21	19	20.0
		15	13	14		20	19	19.5
		Mean = a''		71 14.8		Mean = b''		71 20.1
	EAST	71 7	71 10	71 8.5		70 41	70 43	70 42.0
		3	6	4.5		41	43	42.0
		5	8	6.5		40	43	41.5
			Mean = a'''	71 6.5			Mean = b'''	70 41.8
			a''	71 14.8			b''	71 20.1
			a'	70 59.5			b'	70 59.5
			a	71 5.2			b	71 10.5
				4 26.0				4 11.9
			Mean of Means =	71° 6.′5			Mean of Means = β	71° 2.′97
							Do. Do. = α	71 6.5
							$\frac{\alpha + \beta}{2}$ Dip	9.47
								71 4.74

Observer *Carl Wille.*

I. Bergen.

Ved Observatoriet paa Nordnes. Bredde $\varphi = 60^\circ\ 23'\ 54''$, Længde $\lambda = 5^\circ\ 24'\ 0''$ E. Greenwich.

Horizontal-Intensitet.

1876, Mai 22.

Afbøjnings-Observation Kl. 12 til 1,30 Min. Eft.

Temperatur $t_0 = 62.^\circ 5$ F. Afbøjningsvinkel, for Afstanden $r_0 = 1$ Fod, $u_0 = 28^\circ\ 58'\ 55''$. Iagttager C. Wille.

Svingnings-Observation Kl. 2,6 Min. til 2,18 Min. Eft.

Temperatur $t_0 = 65.^\circ 5$ F. Observeret Svingetid $T_0 = 4.'4919$. Kronometret vinder daglig 3'. Halve Svingebue ved Begyndelsen $\alpha = 77.'9$, ved Enden $\alpha' = 24.'7$. Torsion for en Dreining af 90°, $u = 11.'78$. Iagttager C. Wille.

Resultat. Med $P = 0.02300$ faaes $m = 0.76660$ og Horizontalintensitet $X = 3.2238$.

Inklination.

Kl. 3,0 til 4,30 Min. Eft. Naal No. 1. C. Wille.

Resultat. $\theta = 72^\circ\ 24.'3$.

I. Bergen.

Observatory at Nordnes; latitude $\varphi = 60^\circ\ 23'\ 54''$, longitude $\lambda = 5^\circ\ 24'\ 0''$ E. Greenwich.

Horizontal Intensity.

1876, May 22.

Observation of Deflection: 12 a. m. to 1,30 p. m.

Temperature $t_0 = 62.^\circ 5$ F.; angle of deflection for the distance $r_0 = 1$ foot, $u_0 = 28^\circ\ 58'\ 55''$. Observer C. Wille.

Observation of Vibration: 2,6 p. m. to 2,18 p. m.

Temperature $t_0 = 65.^\circ 5$ F.; observed time of one vibration $T_0 = 4.'4919$; chronometer gaining daily 3'. Semiarc of vibration at commencement $\alpha = 77.'9$, at end $\alpha' = 24.'7$. Torsion for a twist of 90°, $u = 11.'78$. Observer C. Wille.

Result. — With $P = 0.02300$, m will be $= 0.76660$ and the horizontal intensity $X = 3.2238$.

Inclination.

3,0 p. m. to 4,30 p. m. Needle No. 1. Observer C. Wille.

Result. — $\theta = 72^\circ\ 24.'3$.

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2. Husø.

$\varphi = 60^\circ\ 59.'6$; $\lambda = 4^\circ\ 37'$ E. Greenwich.

a. Teltplads paa Øen, hvor Hr. Lexaus Hus staar.

Deklination. 1876, Juni 10, fandtes ved korresponderende Højder af Prof. Mohn[1] Kronometret Mewes 575 at være $0^h\ 28^m\ 30^s$ foran Stedets Middeltid og dets daglige Acceleration $5.^s93$.

Samme Dags Eftermiddag bestemtes fra Teltpladsen Azimut af "Poldetind", en Fjeldtop med Varde paa Indre Sulen, der ligger i en Afstand af 18.57 Kilometer fra Husø. Der observeredes i 3 Satser (I, II og III) med Cirkelens Nulpunkt i 3 forskjellige Stillinger, og i hver Sats Omlægning af Kikkerten gjennem Zenit (1 og 2). O = Object = Poldetinds Varde. ⊙ = Cirkelaflæsning for Solens Centrum. Ch. = Kronometertid. ⊙ = Forangaaende Solrand. |⊙ = Efterfølgende Solrand. U = Uhrkorrektion. M. T. = Middeltid. E = Tidsjevning. t = Sand Soltid. δ = Solens Deklination. φ = Bredden. a = Solens Azimut. N. P. = Cirkelens Nordpunkt. A = Azimut af Objektet.

[1] H. Mohn. Astr. Obs., Side 5.

2. Husø.

$\varphi = 60^\circ\ 59.'6$; $\lambda = 4^\circ\ 37'$ E. Greenwich.

a. Tent on the main island, where Mr. Lexau's house stands.

Declination. — On the 10th of June, 1876, Professor Mohn[1] found the error of the chronometer, Mewes, No. 575, from equal altitudes, to be $0^h\ 28^m\ 30^s$ fast on local mean time, and its daily acceleration $5.^s93$.

In the afternoon of the same day, the azimuth of "Poldetind," a mountain-top with a trigonometrical signal, on the island of Indre Sulen, distant from Husø 18.57 kilometres, was determined from the tent. We observed in three sets (I, II, and III), with the zero-point of the horizontal circle in three different positions, and for each set reversing the telescope through the zenith (1 and 2). O = object = Poldetind signal; ⊙ = reading of limb corresponding to the sun's centre; Ch = time by chronometer; ⊙ = preceding solar limb; ⊙ = following solar limb; U = error of chronometer; M. T. = mean time; E = equation of time; t = apparent solar time; δ = declination of sun; φ = latitude; a = azimuth of sun; N. P. = circle reading corresponding to the astronomical meridian (North Point); A = azimuth of object.

[1] H. Mohn. Astronomical Observations, p. 5.

	I			II			III		
	1	2	M.	1	2	M.	1	2	M.
O.	165° 7.'1	7.'5	165° 7.'3	44° 55.'5	55.'0	44° 55.'25	284° 32.'0	31.'25	284° 31.'6
⊙	46 16.5	67.5	46 42.0	289 52.5	104.5	290 18.5	173 15.0	71.25	173 43.1
Ch. ⊙|	7^h 3^m 0.'5	7^m 3.'5	7^h 5^m 2.'0	7^h 21^m 26.'0	25^m 32.'5	7^h 23^m 29.'2	7^h 39^m 31.'5	44^m 9.'0	7^h 41^m 50.'3
„ |⊙	5 38.3	9 41.5	7 39.9	24 4.2	28 9.4	26 6.8	42 7.0	46 43.7	44 25.3
Ch.			7^h 6^m 20.'95			7 24 48.0			7 43 7.8
U.			—0 28 31.53			—0 28 31.6			—0 28 31.7
M. T.			6 37 49.4			6 56 16.4			7 14 36.1
E.			+ 44.0			+ 43.9			+ 43.9
t			6 38 33.4			6 57 0.3			7 15 20.0
δ			23° 4′ 20″			23° 4′ 20″			23° 4′ 20″
φ			60 59 36			60 59 36			60 59 36
a			N 70 18.'0 W			N 66 28.'7 W			N 62 41.'0 W
⊙			46 42 0			290 18.5			173 43.1
N. P.			117 0.0			356 47.2			236 24.1
O.			165 7.3			44 55.2			284 31.6
A.			N 48° 7.3 E			N 48° 8.'0 E			N 48° 7.'5 E

Azimuth of Poldetind = N 48° 7.'6 E.

Samtidig maaltes Horizontalvinkelen mellem Poldetind og Gavlen af et Hus med Theodoliten og fandtes = 130° 50.'1. Altsaa bliver Azimut af Gavlen = N 178° 57.'7 E eller S 1° 2.'3 E.

The horizontal angle between Poldetind and the gable of a house, was measured at the same time with the theodolite, and found to be 130° 50.'1. Hence, the azimuth of the gable = N 178° 57.'7 E, or S 1° 2.'3 E.

Klokkeslet. (Hour.)	Magnet I.	Gavl. (Gable.)	Diff.	Magnet II.	Gavl. (Gable.)	Diff.	M.	Decl.
3^h 20^m p. m.	278° 39′	295° 44′	17° 5′	278° 27′	295° 46.'5	17° 20′	17° 12.'5	18° 14.'8
7 30 „ „	218 13	235 22	17 9	217 49	235 22	17 33	17 21.0	18 23.3
5^h 25^m p. m.								18° 19.'

Den 13de Juni tog Prof. Mohn følgende Observationer til Bestemmelse af Deklinationen, paa samme Tid som jeg svang Skibet for at bestemme Compassernes Deviation. Stativet med Theodoliten rykkedes 0.75 Meter mod Sydsydost fra den forrige Plads. Herved bliver Azimut af Poldetind fra den nye Plads 0.'1 mindre, eller N 48° 7.'5 E.

Magnetometret opstilledes paa sin Plads og der gjordes følgende Observationer, med Instrumentets egen Kikkert, for at bestemme Magnet-Axens Collimation.

On the 13th of June, Professor Mohn took the following observations to determine the declination, whilst I swung the ship for deviation of compass. The theodolite and stand was now moved 0.75 metre south-south-east from its former position. Taken from this point, the azimuth of Poldetind will be 0.'1 less, or N 48° 7.'5 E.

After mounting the magnetometer, he took the following observations, with the telescope of the instrument, to determine the collimation of the axis of the magnet: —

Magnet I.	Magnet II.
79° 27′ 20″	79° 6′ 35″
28 35	7 30
27 35	
M. 79° 27′ 50″	79° 7′ 2.″5

½ Diff. = 10′ 24″ = 10.′4

Med Theodoliten toges følgende Observationer.

With the theodolite he took the following observations: —

Klokkeslet. (Hour.)	Magnet II.	Poldetind.	Declination.
22h 34m	266° 33′	153° 19′	18° 28′ W.
54	43	19	18
23 11	41	—	20
53	40	19.5	20
0 28	48	17.5	12
31	44.5	—	16
53	51	18	9
1 5	48	17	11
32	44	—	15
51	42	—	17
3 55	44	17	15
4 17	46	17	13
27	47	17	12
54	48	17.5	12
5 5	49	—	10
22	50	—	9
37	49.5	17	9
59	50	—	9
6 16	51	17.5	9
49	53	—	6

Ved grafisk Udjevning findes følgende Værdier for Deklinationen.

Computed from diagramatic interpolation, the following values were found for the declination: —

22h 30m	18° 25	1h 30m	18° 15′	4h 30m	18° 12′
23 0	22	2 0	17	5 0	11
23 30	19	2 30	19	5 30	10
0 0	17	3 0	18	6 0	9
0 30	13	3 30	16	6 30	8
1 0	12	4 0	15	7 0	7

og saaledes i Middel for Kl. 2.45m Deklination = 18° 14.′7 W.

and thus, as a mean for 2.45 p. m. the declination is 18° 14.′7 W.

Horizontal-Intensitet.

1876, Juni 10.

Afbøjnings-Observation. Kl. 5.5 Min. Eft. til 6.0 Min. E. $t_0 = 50.^{\circ}5$; $r_0 = 1$, $u_0 = 29^{\circ}\ 30'\ 47''$; $r_0' = 1.3$, $u_0' = 12^{\circ}\ 49'\ 35''$. C. Wille.

Svingnings-Observation. Kl. 4.3 Min. Eft. til 4.15 Min. Eft.

$t_0 = 52.^{\circ}1$, $T_0 = 4.'52585$; $s = 4.'88$; $\alpha = 76'$; $\alpha' = 19'$; $u = 12.'82$. C. Wille.

Resultat. $P = 0.022999$; $m = 0.76534$; $X = 3.1732$.

1876, Juni 15.

Svingnings-Observation. Kl. 12.15 Min. til 12.27 Min. Eft.

$t_0 = 56.^{\circ}8$; $T_0 = 4.'53062$; $s = 4.'9$; $\alpha = 50'$ $\alpha' = 31'$, $u = 12.'51$. H. Mohn.

Afbøjnings-Observation. Kl. 1.20 Min. til 1.45 Min. Eft.

$t_0 = 56.'2$; $u_0 = 29^{\circ}\ 29'\ 40''$; $u_0' = 12^{\circ}\ 48'\ 35''$. H. Mohn.

Resultat. $P = 0.02462$; $m = 0.76500$; $X = 3.1751$.

Svingnings-Observation. Kl. 2.4 Min. til 2.16 Min. Efterm.

$t_0 = 57.^{\circ}2$, $T_0 = 4.'52815$; $s = 4.'9$; $\alpha = 72'$; $\alpha' = 22'$, $u = 10.'87$. H. Mohn.

Efter den foregaaende Afbøjnings-Observation beregnes $X = 3.1750$.

Svingnings-Observation. Kl. 6.6 Min. til 6.17 Min. Efterm.

$t_0 = 54.^{\circ}8$, $T_0 = 4.'52880$; $s = 4.'9$; $\alpha = 57'$; $\alpha' = 19'$; $u = 9.'03$. H. Mohn.

Efter den foregaaende Afbøjnings-Observation beregnes $X = 3.1746$.

1877, Juni 4.

Afbøjnings-Observation. Kl. 4.0 Min. til 4.55 Min. Efterm.

$t_0 = 52.^{\circ}9$; $u_0 = 28^{\circ}\ 37'\ 12.''5$; $u_0' = 12^{\circ}\ 27'\ 27.''5$. C. Wille.

Svingnings-Observation. Kl. 6.57 Min. til 7.8 Min. Efterm.

$t_0 = 48.^{\circ}8$; $T_0 = 4.'5902$; $s = 2.'8$; $\alpha = 74'$; $\alpha' = 26'$; $u = 3.'99$. C. Wille.

Resultat. $P = 0.02433$; $m = 0.74415$; $X = 3.1761$.

Inklination.

1876, Juni 12. Kl. 10.30 Min. til 11.45 Min. Form. Naal No. 1. C. Wille.

$\theta = 72^{\circ}\ 43.'35$.

Samme Dag. Kl. 1.30 Min. til 2.5 Min. Eft. Naal No. 2. C. Wille.

$\theta = 72^{\circ}\ 40.'96$.

Horizontal Intensity.

1876, June 10.

Observation of Deflection: — 5.5 p. m. to 6.0 p m. $t_0 = 50.^{\circ}5$; $r_0 = 1$; $u_0 = 29^{\circ}\ 30'\ 47''$; $r_0' = 1.3$; $u_0' = 12^{\circ}\ 49'\ 35''$. C. Wille.

Observation of Vibration: — 4.3 p. m. to 4.15 p. m.

$t_0 = 52.^{\circ}1$, $T_0 = 4.'52585$; $s = 4.'88$; $\alpha = 76'$; $\alpha' = 19'$; $u = 12.'82$. C. Wille.

Result. — $P = 0.022999$; $m = 0.76534$; $X = 3.1732$.

1876, June 15.

Observation of Vibration: — 12.15 p. m. to 12.27 p. m.

$t_0 = 56.^{\circ}8$; $T_0 = 4.'53062$; $s = 4.'9$; $\alpha = 50'$, $\alpha' = 31$, $u = 12.'51$. H. Mohn.

Observation of Deflection: — 1.20 p. m. to 1.45 p. m.

$t_0 = 56.^{\circ}2$; $u_0 = 29^{\circ}\ 29'\ 40''$, $u_0' = 12^{\circ}\ 48'\ 35''$. H. Mohn.

Result. — $P = 0.02462$; $m = 0.76500$; $X = 3.1751$.

Observation of Vibration: — 2.4 p. m. to 2.16 p. m.

$t_0 = 57.^{\circ}2$; $T_0 = 4.'52815$; $s = 4.'9$; $\alpha = 72'$; $\alpha' = 22'$, $u = 10.'87$. H. Mohn.

Computed from the preceding observation of deflection $X = 3.1750$.

Observation of Vibration: — 6.6 p. m. to 6.17 p. m.

$t_0 = 54.^{\circ}8$; $T_0 = 4.'52880$; $s = 4.'9$; $\alpha = 57'$; $\alpha' = 19'$; $u = 9.'03$. H. Mohn.

Computed from the preceding observation of deflection $X = 3.1746$.

1877, June 4.

Observation of Deflection: — 4.0 p. m. to 4.55 p. m.

$t_0 = 52.^{\circ}9$; $u_0 = 28^{\circ}\ 37'\ 12.''5$; $u_0 = 12^{\circ}\ 27'\ 27.''5$. C. Wille.

Observation of Vibration: — 6.57 p. m. to 7.8 p m.

$t_0 = 48.^{\circ}8$; $T_0 = 4.'5902$; $s = 2.'8$; $\alpha = 74'$; $\alpha' = 26'$; $u = 3.'99$. C. Wille.

Result. — $P = 0.02433$; $m = 0.74415$; $X = 3.1761$.

Inclination.

1876, June 12: — 10.30 a. m. to 11.45 a. m. Needle No. 1. C. Wille.

$\theta = 72^{\circ}\ 43.'35$.

Same Day: — 1.30 p. m. to 2.5 p. m. Needle No. 2. C. Wille.

$\theta = 72^{\circ}\ 40.'96$.

Samme Dag. Kl. 6.15 Min. til 7.5 Min. Eft. Naal No. 1. C. Wille.

$\theta = 72^\circ\ 43.'9.$

1876, Juni 15. Kl. 10.55 Min. til 11.53 Min. Form. Naal No. 1. H. Mohn.

$\theta = 72^\circ\ 46.'02.$

Samme Dag. Kl. 7.7 Min. til 7.32 Min. Eft. Naal No. 2. H. Mohn.

$\theta = 72^\circ\ 45.'05.$

1877, Maj 23. Kl. 5.0 Min. til 6.45 Min. Eft. Naal No. 1. C. Wille.

$\theta = 72^\circ\ 43.'35.$

Same Day: — 6.15 p. m. to 7.5 p. m. Needle No. 1. C. Wille.

$\theta = 72^\circ\ 43.'9.$

1876, June 15: — 10.55 a. m. to 11.53 a. m. Needle No. 1. H. Mohn.

$\theta = 72^\circ\ 46.'02.$

Same Day: — 7.7 p. m. to 7.32 p. m. Needle No. 2. H. Mohn.

$\theta = 72^\circ\ 45.'05.$

1877, May 23: — 5.0 p. m. to 6.45 p. m. Needle No. 1. C. Wille.

$\theta = 72^\circ\ 43.'35.$

β. Et Skjær paa Østsiden af Havnen.

Deklination. Juni 16. Iagttager: Professor Mohn.

Fra det Punkt, hvor Theodoliten var opstillet foran Magnetometret, kunde Poldetind ikke sees paa Grund af, at et nærmere liggende Fjeld kom i Vejen. Men fra et nærliggende Punkt paa Skjæret, i SSE for det første, var Poldetind synlig. Paa Øen, hvor Teltet stod, saaes Poldetind i samme Vertikal som Observationspunktet paa Skjæret, naar Theodoliten flyttedes, lodret paa Synslinien til Poldetind, 41.4 Meter mod SE fra Observationspunktet i Teltet. Heraf beregnes, at Azimut af Poldetind, seet fra Theodolitens Plads paa Skjæret, var

$$48^\circ\ 7.'6 - 7.'7 = 47^\circ\ 59.'9\ E.$$

Fra den søndre Ende af Skjæret saaes en anden fjern Fjeldtop 10° 25′ nordenfor Poldetind. Fra Observationspunktet paa Skjæret saaes Varden paa Husø 182° 27′ til venstre for den nævnte Fjeldtop. Vinkelen mellem Husø Varde (i SW) og Poldetind (i NE) regnet over Nord var følgelig 192° 52′. Da Poldetinds Azimut var N 48° 0′ E, bliver Azimut af Husø Varde:

β. An Islet at the east side of the Harbour.

Declination. June 16. Observer Professor Mohn.

From the point at which the theodolite was mounted in front of the magnetometer, Poldetind could not be sighted, a mountain in the vicinity intercepting the view in that direction. Poldetind was visible however from an adjacent point south-south-east of the former. From the island on which was pitched the tent, Poldetind could be sighted in the same vertical as the point of observation on the islet, after moving the theodolite, perpendicular to the line of vision, 41.4 metres south-east of the point of observation in the tent. Hence, the azimuth of Poldetind as observed from the position of the theodolite on the islet, was —

$$48^\circ\ 7.'6 - 7.'7 = N\ 47^\circ\ 59.'9\ E$$

From the southern extremity of the islet could be seen another distant mountain-top, 10° 25′ north of Poldetind. Sighted from the point of observation on the islet, Husø signal was 182° 27′ to the left of that summit. The angle between Husø signal (bearing SW.) and Poldetind (bearing NE.) reckoned through the north, was accordingly 192° 52′. The azimuth of Poldetind being N 48° 0′ E, that of Husø signal is —

$$192^\circ\ 52' - 48^\circ\ 0' = N.\ 144^\circ\ 52'\ W = S\ 35^\circ\ 8'\ W.$$

Kl. 11,15 Min. Form. gjordes følgende Observationer:

At 11.15 a. m. the following observations were made: —

	I	II	I	II
Magnet	159° 31′	339° 3′	159° 4′	158° 50′
Husø Varde (*Husø Signal*)	213 30	393 30	213 30	213 30
Vinkel (*Angle*)	53 59	54 27	54 26	54 40
Middel (*Mean*)			S 54° 8′ W	
Azimut af Husø Varde (*Azimuth of Signal*)			S 35 8 W	
Declination			19° 0′ W	

Om Eftermiddagen opstilledes Instrumenterne paa Skjæret paa en anden Plads, i Nærheden af den forrige. Da Solen var synlig, benyttedes den til Azimutbestemmelse.

In the afternoon the instruments were set up at a point on the islet near to that previously selected. The sun being visible, the azimuth was found from solar observations.

Ch. ⊙|	7^h 41^m 50.^s 46^m 17.^s5	7^h 44^m 3.^s75	Magnet I	7° 23.'75
„ |⊙	44 23.5 48 52.7	46 38.1	— II	57.0
		7 45 20.9	— I	37.0
U.		— 0 29 6.1	Magnet	7° 43.'7
M. T.		7 16 14.8	Magnét	187° 43.'7 — 180°
E.		— 31.3	N. P.	205 45.3
t		7 15 43.5	Decl.	18° 1.'6 W.
a		N 62° 26.'8 W.		
⊙		143 18.5		
N. P.		205 45.3		

Horizontal-Intensitet.

1876. Juni 16.

Afbøjnings-Observation. Kl. 12.5 Mm. til 12.37 Min. Eft.

$t_0 = 53.^08$; $u_0 = 29^0\ 30'\ 52.''5$; $u_0' = 12^0\ 50'\ 25.''6$. H. Mohn.

Svingnings-Observation. Kl. 1.0 Min. til 1.10 Min. Eft.

$t_0 = 60.^05$; $T_0 = 4.5331$; $s = 4.'9$; $\alpha = 33'$; $\alpha' = 7'$; $u = 5.'21$. H. Mohn.

Resultat: $P = 0.02075$; $m = 0.76655$; $X = 3.1686$.

Afbøjnings-Observation. Kl. 2.0 Mm. til 2.20 Mm. Eft.

$t_0 = 53.^08$; $u_0 = 29^0\ 25'\ 1''$. H. Mohn.

Beregnet efter foregaaende Svingnings-Observation faaes $m = 0.7654$ og $X = 3.1734$.

Horizontal Intensity.

1876. June 16.

Observation of Deflection: — 12.5 p. m. to 12.37 p. m.

$t_0 = 53.^08$; $u_0 = 29^0\ 30'\ 52.''5$; $u_0' = 12^0\ 50'\ 25.''6$. H. Mohn.

Observation of Vibration: — 1.0 p. m. to 1.10 p. m.

$t_0 = 60.^05$; T_0 4.5331; $s = 4.'9$; $\alpha = 33'$; $\alpha' = 7'$; $u = 5.'21$. H. Mohn.

Result: — $P = 0.02075$; $m = 0.76655$; $X = 3.1686$.

Observation of Deflection: — 2.0 p. m. to 2.20 p. m.

$t_0 = 53.^08$; $u_0 = 29^0\ 25'\ 1''$. H. Mohn.

Computed from the preceding observation of vibration $m = 0.7654$ and $X = 3.1734$.

Inklination.

1876. Juni 16.

Kl. 6.10 Min. til 6.49 Min. Eft. Naal No. 1. H. Mohn.

$\theta = 72^0\ 44.'8$.

Inclination.

1876. June 16.

6.10 p. m. to 6.49 p. m. Needle No 1. H. Mohn.

$\theta = 72^0\ 44.'8$.

3. Reykjavik.

$\varphi = 64^0\ 8'\ 30''$; $\lambda = 21^0\ 54'\ 8''$ V- Greenwich.

Den grønne Plæne ved Konsul Simons Hus.

Deklination. 1876. Aug. 1ste fandt jeg ved corresponderende Højder af Solen, at Kronometret Kullberg viste $2^h\ 6^m\ 55.^s6$ foran Stedets Middeltid ved Middag[1]. Kronometret vandt daglig 0.'60.

Den 29de Juli om Eftermiddagen bestemte jeg Azimut af en Mire.

[1] Se H. Mohn. Astr. Obs. Side 6.

3. Reykjavik.

$\varphi = 64^0\ 8'\ 30''$; $\lambda = 21^0\ 54'\ 8''$ W. Greenwich.

The grass-plot adjoining Mr. Simson's house.

Declination. 1876. Aug. 1st I found the Kullberg chronometer, from equal solar altitudes[1], to be at noon $2^h\ 6^m\ 55.^s6$ fast on mean local time; chronometer gaining daily 0.'60.

On the 29th of July, after noon, I determined the azimuth of a mark.

[1] See H. Mohn. Astronomical Observations, p. 6.

	1	2	M.
O.	95^0 10.'0	9.'5	95^0 9.'75
⊙	149 54.0	150 42.5	150 18.25
Ch. ⊙|	7^h 32^m 5.'5	35^m 46.'0	7^h 33^m 55.75
„ |⊙	34 41.5	38 19.5	36 30.50
			7^h 35^m 13.'1
U.			— 2 6 54.2
M. T.			5 28 18.9
E.			— 6 10.7
t			5 22 8.2
a			N 90^0 5.'4 W.
⊙			150 18.25
N. P.			240 23.65
O.			95 9.75
A.			N 145 13.9 W.

5^h 30^m p. m.	Magnet.	Mire. (*Mark.*)
I	21^0 34.'0	95^0 9.'5
II	22 34.5	95 10.0
I	21 37.5	95 10.0
	22^0 5.'1	95^0 9.'8

A = N 145^0 13.'9 W
Mire = 95 9.8

N P = 240 23.7
Magnet = 202 5.1 — 180^0

Decl. = 38^0 18.'6 W.

Horizontal-Intensitet.

1876. Juli 31,

Afbøjnings-Observation. Kl. 10 til 11 Form.
$t_0 = 55.^0 0$; $u_0 = 36^0\ 26'\ 45''$; $u_0' = 15^0\ 31'\ 55''$. C. Wille.

Svingnings-Observation. Kl. 12.6 Min. til 12. 18 Min. Eft.
$t_0 = 57.^05$; $T_0 = 5.'0050$; $s = 0.'60$; $a = 76'$; $a' = 23'$; $u = 10.'4$. C. Wille.

Resultat: P = 0.02231; m = 0.76147; X = 2.6141.

Svingnings-Observation. Kl. 3.57 Min. til 4.10 Min. Eft.
$t_0 = 57.^08$; $T_0 = 4.'9810$; $s = 0.'60$; $a = 76'$; $a' = 23'$; $u = 8.'5$. C. Wille.

Afbøjnings-Observation. Kl. 5.10 Min. til 6.10 Min. Eft.
$t_0 = 57.^00$; $u_0 - 35^0\ 59'\ 22''$. C. Wille.

Resultat: Med P = 0.02231; m = 0.7612; X = 2.6407.

Inklination.

1876. Juli 28. Kl. 5.0 til 6,35 Eft. Naal No. 1. C. Wille.

$\theta = 76^0\ 28.'5$.

1876. August 1. Kl. 1.20 Min. til 2.20 Min. Eft. Naal No, 2. C. Wille.

$\theta = 76^0\ 26.'3$.

Horizontal Intensity.

1876. July 31.

Observation of Deflection: — 10 a. m. to 11 a. m.
$t_0 = 55.^00$; $u_0 = 36^0\ 26'\ 45''$; $u'_0 = 15^0\ 31'\ 55''$. C. Wille.

Observation of Vibration: — 12.6 p. m. to 12.18 p. m.
$t_0 = 57.^05$; $T_0 = 5.'0050$; $s = 0.'60$; $a = 76'$; $a' = 23'$; $u = 10.'4$. C. Wille.

Result: — P = 0.02231; m = 0.76147; X = 2.6141.

Observation of Vibration: — 3.57 p. m. to 4.10 p. m.
$t_0 = 57.^08$; $T_0 = 4.'9810$; $s = 0.'60$; $a = 76'$; $a' = 23'$; $u = 8.'5$. C. Wille.

Observation of Deflection: — 5.10 p. m. to 6.10 p. m.
$t_0 = 57.^00$; $u_0 = 35^0\ 59'\ 22''$. C. Wille.

Result: — With P = 0.02231; m = 0.7612; X = 2.6407.

Inclination.

1876. July 28: — 5.0 p. m. to 6.35 p. m. Needle No. 1. C. Wille.

$\theta = 76^0\ 28.'5$.

1876. Aug. 1: — 1.20 p. m. to 2.20 p. m. Needle No. 2. C. Wille.

$\theta = 76^0\ 26.'3$.

4. Namsos.

$\varphi = 64° 28' 12''$ $\lambda = 11° 31' 33''$ E. Greenwich.

Ved Bunden af Bugten nordenfor Byen, c. 7 Meter fra Stranden, strax søndenfor Stien, der fører videre til en Grind.

Declination. 1876. August 19 fandt Prof. Mohn ved corresponderende Højder af Solen[1] Kronometret Frodshams Korrektion til Stedets Middeltid lig $+ 0^h\ 31^m\ 47.^s85$. Kronometret vandt daglig $5.^s12$.

Den 18de August om Eftermiddagen gjorde vi begge i Forening Observationer til Bestemmelse af Azimut og Deklination.

4. Namsos.

$\varphi = 54° 28' 12''$ $\lambda = 11° 31' 33''$ E. Greenwich.

At the head of the bay, north of the town, about 7 metres from the shore, and directly south of the pathway leading to a gate.

Declination. 1876. Aug. 19 Professor Mohn found, from equal solar altitudes,[1] the error of the Frodsham chronometer on mean local time $= 0^h\ 31^m\ 47.^s85$; chronometer gaining daily $5.^s12$.

On the 18th of August, in the afternoon, Professor Mohn and myself took observations to determine the azimuth and declination.

Ch. ⊙|	$5^h\ 47^m\ 54^s$	$51^m\ 53^s$	$5^h\ 49^m\ 53.^s5$	Magnet I	98° 26'
„ |⊙	50 18	54 17	52 17.5	— II	99 0
			5 51 5.5	— I	98 26
U.			+ 31 51.7		98° 43'
M. T.			6 22 57.2	Magnet	278° 43.'0 — 180°
E.			— 0 3 29.2	N. P.	292 25.9
t			6 19 28.0	Decl.	13° 42.'9 W.
a			N 80° 2.'9 W.		
⊙			212 23.0		
N. P.			292° 25.9		

Horizontal-Intensitet.

1879. Aug. 18.

Afbøjnings-Observation. Kl. 11.30 Min. Form. til 12.50 Min. Eft.

$t_o = 67.°3$; $u_o = 31° 29' 42''$; $u_o' = 13° 35' 40''$. C. Wille.

Svingnings-Observation. Kl. 1.51 Min. til 2.3 Min. Eft.

$t_o = 70.°7$; $T_o = 4.^s7183$; $s = 5.^s12$; $\alpha = 76'$; $\alpha' = 24'$; $u = 4.'1$. C. Wille.

Resultat: P = 0.02671; m = 0.75760; X = 2.9639.

Inklination.

1876. August 19. Kl. 10.30 Min. til 11.30 Form. Naal No. 1. C. Wille.

$\theta = 74° 2.'3$.

Samme Dag. Kl. 5.0 Min. til 6.0 Min. Eft. Naal No. 2. H. Mohn.

$\theta = 74° 2.'3$.

[1] H. Mohn. Astr. Obs. Side 7.

Horizontal Intensity.

1876. Aug. 18.

Observation of Deflection: — 11.30 a. m. to 12.50 p. m.

$t_o = 67.°3$; $u_o = 31° 29' 42''$; $u_o' = 13° 35' 40''$. C. Wille.

Observation of Vibration: — 1.51 p. m. to 2.3 p. m.

$t_o = 70.°7$; $T_o = 4.^s7183$; $s = 5.^s12$; $\alpha = 76'$; $\alpha' = 24'$; $u = 4.'1$. C. Wille.

Result: — P = 0.02671; m = 0.75760; X = 2.9639.

Inclination.

1876. Aug. 19: — 10.30 a. m. to 11.30 a. m. Needle No. 1. C. Wille.

$\theta = 74° 2.'3$.

Same Day: — 5.0 p. m. to 6.0 p. m. Needle No. 2. H. Mohn.

$\theta = 74° 2.'3$.

[1] H. Mohn. Astronomical Observations, p. 7.

5. Bodø.

$\varphi = 67° 17' 14''$ $\lambda = 14° 24' 51''$ E. Greenwich.

I Nærheden af Stranden, noget østenfor den østligste Landgangsbrygge.

1877. August 13 observerede Prof. Mohn Solhøjder samtidig med at jeg tog de magnetiske Observationer[1]. Ved de første fandtes umiddelbart Standen af Kronometret Frodsham for Stedets sande Tid (U').

5. Bodø.

$\varphi = 67° 17' 14''$ $\lambda = 14° 24' 51''$ E. Greenwich.

Near the shore, a little to the east of the most easterly landing-pier.

1877. Aug. 13 Professor Mohn observed altitudes of the sun, whilst I took magnetic observations[1]. By direct computation from the altitudes, he determined the error of the Frodsham chronometer on apparent local time (U').

Deklination. *Declination.*

1877. August 13.

Ch. ⊙|	5^h 59^m 5.'5	6^h 4^m 22.'0	6^h 1^m 43.'75	Magnet I	80° 41.'5
„ |⊙	6 1 27.0	6 46.0	4 6.50	— II	80 13.6
			6 2 55.1		80 27.55
U'			— 0 1 57.8	Magnet	260 27.55 — 180°
t			6 0 57.3	N. P.	272 8.7
a			N 84° 4.'5 W.	Decl.	11° 41.'2 W.
⊙			188 34.2		
N. P.			272 8.7		

Horizontal-Intensitet.

1877. Aug. 13.

Svingnings-Observation. Kl. 12.10 Min. til 12.23 Min. Eft.

$t_o = 77.°6$; $T_o = 4.''9275$; $s = 3.'4$; $\alpha = 76'$; $\alpha' = 25'$; $u = 3.'4$. C. Wille.

Afbøjnings-Observation. Kl. 4.30 Min. til 5.30 Min. Eft.

$t_o = 72.°7$; $u_o = 32° 46' 20''$; $u_o' = 14° 6' 35''$. C. Wille.

Resultat: P = 0.02445; m = 0.74020; X = 2.7854.

Inklination.

1877. August 13. Kl. 9.45 Min. til 11.10 Min. Form. Naal No. 1. C. Wille.

$\theta = 75° 21.'4$

Horizontal Intensity.

1877. Aug. 13.

Observation of Vibration: — 12.10 p. m. to 12.23 p. m.

$t_o = 77.°6$; $T_o = 4.''9275$; $s = 3.'4$; α 76'; $\alpha' = 25'$; $u = 3.'4$. C. Wille.

Observation of Deflection: — 4.30 p. m. to 5.30 p. m.

$t_o = 72.°7$; $u = 32° 46' 20''$; $u_o' = 14° 6' 35''$. C. Wille.

Result: — P = 0.02445; m = 0.74020; X = 2.7854.

Inclination.

1877. August 13: 9.45 a. m. to 11.10 a. m. Needle No. 1 C. Wille.

$\theta = 75° 21.'4$.

6. Tromsø.

$\varphi = 69° 39.'1$ $\lambda = 18° 59.'3$ E. Greenwich.

Ved Stranden, nogle hundrede Skridt nordenfor Bryggen ved Storstennes, paa Østsiden af Tromsø-Sundet.

Bredde og Længde efter de norske Kystkarter. Kronometrets, Frodshams, Stand for Stedets Tid er beregnet efter dets Stand for Greenwich Tid og Kartets Længde.

[1] H. Mohn. Astr. Obs. Side 8.

6. Tromsø.

$\varphi = 69° 39.'1$ $\lambda = 18° 59.'3$ E. Greenwich.

On the beach, a few hundred paces north of the landing-pier at Storstennes, on the east side of Tromsø Sound.

Latitude and longitude from the coastal charts. Error of chronometer (Frodsham) on local time computed from error on Greenwich time and the longitude of the chart.

[1] H. Mohn. Astronomical Observations, p. 8.

Deklination. Declination.

1877. Juli *(July)* 11.

Ch. ⊙|	6^h 24^m 4.'0	29^m 56.'5	6^h 27^m 0.'25	Magnet I 80° 10.'25
„ |⊙	26 36.0	32 28.0	29 32.0	— II 80 20.5
			6 28 16.1	80 15.4
U.			+ 22 56.0	Magnet 260° 15.'4 — 180°
M. T.			6 51 12.1	N. P. 270 33.1
E.			— 0 5 14.5	Decl. 10 17.7 W.
t			6 45 57.6	
a			N 71° 30.'9 W	
⊙			199 2.2	
N. P.			270 33.1	

Horizontal-Intensitet.

1877. Juli 11.

Svingnings-Observation. Kl. 4.2 Min. til 4.16 Min. Eft. $t_0 = 56.°4$; $T_0 = 5.'0459$; $s = 3.'4$; $\alpha = 74'$; $\alpha' = 21'$; $u = 5.'7$. C. Wille.

Afbøjnings-Observation. Kl. 5.35 Min. til 6.13 Min. Eftm.

$t_0 = 56.°6$; $u_0 = 35° \ 0' \ 35''$; $u_0' = 14° \ 59' \ 37.''5$. C. Wille.

Resultat: P = 0.02142; m = 0.74260; X = 2.6365.

Inklination.

1877. Juli 11. Kl. 11.40 Min. Form. til 12.45 Min. Eft. Naal No. 1. C. Wille.

$\theta = 76° \ 21.'85$.

Horizontal Intensity.

1877. July 11.

Observation of Vibration: — 4.2 p. m. to 4.16 p. m. $t_0 = 56.°4$; T_0 5.'0459; $s = 3.'4$; $\alpha = 74'$; $\alpha' = 21'$; $u = 5.'7$. C. Wille.

Observation of Deflection: — 5.35 p. m. 6.13 p. m.

$t_0 = 56.°6$; $u_0 = 35° \ 0' \ 35''$; $u_0' = 14° \ 59' \ 37.''5$. C. Wille.

Result: — P = 0.02142; m = 0.74260; X = 2.6365

Inclination.

1877. July 11: — 11.40 a. m. to 12.45 p. m. Needle No. 1. C. Wille.

$\theta = 76° \ 21.'85$.

7. Hammerfest.

$\varphi = 70° \ 40' \ 11''$ $\lambda = 23° \ 40' \ 26''$ E. Greenwich.

Paa Fuglenes, i Nærheden af Meridianstøtten. Tidsbestemmelse ved Solhøjder af Prof. Mohn den 9de og 10de Juli 1878.[1]

Deklination.

1878. Juli 9 om Eftermiddagen bestemte vi Azimut af Kirkespiret. Observationsuhr Lommekronometer, hvis Korrektion til Stedets sande Tid var funden = + 51^m 20.'4.

Den 10de Juli Kl. 12.35 Min. Eft., bestemte jeg Deklinationen.

[1] H. Mohn. Astr. Obs. Side 12—14.

7. Hammerfest.

$\varphi = 70° \ 40' \ 11''$ $\lambda = 23° \ 40' \ 26''$ E. Greenwich.

At Fuglenes, near by the arc of meridian terminus column. Error of chronometer found from altitudes of the sun, taken by Professor Mohn on the 9th and 10th of July, 1878.[1]

Declination.

1878. July 9, in the afternoon, we determined the azimuth of the church spire, observing with the pocket-chronometer, for which the error on local apparent time was found to be + 51^m 20.'4.

On the 10th of July, 12 35 p. m., I determined the declination.

[1] H. Mohn. Astronomical Observations, p. 12—14.

O.	229° 9′ 10.′0	229° 9.′5
⊙	18 41.5 19° 27.0	19 4.25
Ch. ⊙|	6^h 14^m 26.′4 17^m 46.′0	6^h 16^m 6.′2
|⊙	16 50.0 20 15.0	18 32.5
		6 17 19.35
U′		+ 51 20.4
t		7^h 8^m 39.75
a		N 66° 32.′5 W
⊙		19 4.25
N. P.		85° 36.′75
O.		229 9.5
A.		N 143° 32.′75 E.

	Magnet.	Mire. (*Mark.*)
I	80° 4.′0	48° 51.′5
II	79 36.7	48 52.0
	79 50.35	48 51.75
A =	N 143° 32.′75 E.	
Mire	48 51.75	
N. P.	265 19.0	
Magnet	259 50.35 — 180°	
Decl.	5° 28.′6 W.	

Horizontal-Intensitet.

Svingnings-Observation. 1878. Juli 9. Kl. 5.40 Min. til 5.52 Min. Eft.

$t_o = 55.°7$; $T_o = 5.'0660$; $s = 7.'0$; $\alpha = 76'$; $\alpha' = 19'$; $u = 2.'49$. C. Wille.

Afbøjnings-Observation. 1878. Juli 10. Kl. 12.45 Min. til 1.30 Min. Eft.

$t_o = 64.°9$; $u_o = 37° 22' 9''$; $u_o' = 15° 54' 10''$. C. Wille.

Resultat: $P = 0.01896$; $m = 0.7627$;[1] $X = 2.5484$.

Inklination.

1878. Juli 10. Kl. 10.45 Min. til 11.55 Min. Form. Naal No. 1. C. Wille.

$\theta = 76° 54.'25$.

Horizontal Intensity.

Observation of Vibration. 1878. July 9: — 5.40 p. m. to 5.52 p. m.

$t_o = 55.°7$; $T_o = 5.'0660$; $s = 7.'0$; $\alpha = 76'$; $\alpha' = 19'$; $u = 2.'49$. C. Wille.

Observation of Deflection. 1878. July 10: — 12.45 p. m. to 1.30 p. m.

$t_o = 64.°9$; $u_o = 37° 22' 9''$; $u_o' = 15° 54' 10''$. C. Wille.

Result: — $P = 0.01866$; $m = 0.7627$;[1] $X = 2.5484$.

Inclination.

1878. July 10: — 10.45 a. m. to 11.55 a. m. Needle No. 1. C. Wille.

$\theta = 76° 54.'25$.

8. Vardø.

$\varphi = 70° 22' 24''$ $\lambda = 31° 7' 51''$ E. Greenwich.

Paa Fæstningen Vardøhus's Glacis, 170 Meter Nord for Fæstningens Midtpunkt.

Horizontal-Intensitet.

Svingnings-Observation. 1878. Juni 26. Kl. 1.4 Min. til 1.13 Min. Eft.

$t_o = 50.°4$; $T_o = 5.'0418$; $s = 8.'0$; $\alpha = 72'$; $\alpha' = 28'$; $u = 4.'08$. C. Wille.

Afbøjnings-Observation. 1878. Juni 26. Kl. 5.10 Min til 6.5 Min. Eft.

$t_o = 47.°8$; $u_o = 37° 11' 12''$; $u_o' = 15° 48' 30''$. C. Wille.

Resultat: $P = 0.02259$; $m = 0.7616$ $X = 2.5737$.

Inklination.

1878. Juni 26. Kl. 10.40 Min. til 11.37 Min. Form. Naal No. 1. C. Wille.

$\theta = 76° 52.'4$.

[1] Magneten var i 1878 opmagnetiseret.

8. Vardø.

$\varphi = 70° 22' 24''$ $\lambda = 31° 7' 51''$ E. Greenwich.

The glacis of Vardøhus, 170 metres north of the centre of the fortress.

Horizontal Intensity.

Observation of Vibration. 1878. June 26: — 1.4 p. m. to 1.13 p. m.

$t_o = 50.°4$; $T_o = 5.'0418$; $s = 8.'0$; $\alpha = 72'$; $\alpha' = 28'$; $u = 4.'08$. C. Wille.

Observation of Deflection. 1878. June 26: — 5.10 p. m. to 6.5 p. m.

$t_o = 47.°8$; $u_o = 37° 11' 12''$; $u_o' = 15° 48' 30''$. C. Wille.

Result: — $P = 0.02259$; $m = 0.7616$; $X = 2.5737$.

Inclination.

1878. June 26. 10.40 a. m. to 11.37 a. m. Needle No. 1. C. Wille.

$\theta = 76° 52.'4$.

[1] The Magnet had been re-magnetised in 1878.

B. Observationer i Søen og deres Resultater.

Ved Expeditionens Udrustning var det paatænkt, at der skulde gjøres fuldstændige magnetiske Observationer ombord, naar man var i Søen. Hertil havdes fuldstændigt Apparat i Admiralitets Standard-Kompasset og Fox-Cirkelen. Med denne sidste foretog jeg i 1876, under Skibets Udrustning, paa Bergens Observatorium de nødvendige Afvejninger. Under Expeditionens Ophold i Husø fra den 10de til 19de Juni samme Aar gjordes alle de fornødne Basis-Observationer. De magnetiske Elementers Størrelse bestemtes, som ovenfor vist, i Land ved absolute Maalinger. Deviationen bestemtes saavel for Styre-Kompasset som for Fox-Cirkelens Plads og med Fox-Cirkelen maaltes Inklination og Intensitet under forskjellige anlagte Kurser, idet Skibet blev svunget ved Hjælp af Trosser. Der toges Svingnings-Observationer til Bestemmelse af Coefficienterne μ og λ.

Ved Beregningen af de med Fox-Cirkelen ombord maalte Inklinationer og Intensiteter, fandt Prof. Mohn, at disse ikke kunde bringes til indbyrdes Harmoni, med mindre Indexfejlen for Fox-Cirkelens Naal sattes hele 19 Minuter større, end den fandtes af de Observationer, der var gjorte i Land paa samme Sted og til samme Tid med Fox-Cirkelen og med Inklinatoriet.

Da vi den 22de Juni 1876 i meget roligt Vejr og rolig Sø forsøgte Observationer med Fox-Cirkelen, viste det sig, at Skibet, vel nærmest paa Grund af det langsomt virkende Styreapparat,[1] ikke kunde holdes paa Kurs med den Stohed, som udfordredes til at Observationerne kunde gjøres med nogenlunde Nøjagtighed, ligesom Skibets vertikale Bevægelser uagtet den rolige Sø viste sig yderst hindrende i samme Retning. Beregningen af Observationerne gav ogsaa et utilfredsstillende Resultat. Kun en Gang senere forsøgtes, nemlig under Sejladsen ind til Thorshavn, Observationer med Fox-Cirkelen. Det yderst urolige Vejr, som Expeditionen havde i 1876, forbød alle videre Forsøg i dette Aar.

I 1877 hindrede saavel Vejret, som den Omstændighed, at jeg maatte gaa fra Husø til Bergen for at faa indsat ny Mellemaxel i Maskinen, mig i at foretage Basis-Observationer. I 1878 var Expeditionen under Rejserne saa ganske optagen af andre mere nødvendige Gjøremaal, at der ikke levnedes Tid til at tage andre magnetiske Observationer ombord end til Bestemmelse af Misvisningen.

Saaledes forenede sig Skibets magnetiske Konstitution, om jeg saa maa kalde det, dets langsomtvirkende Styreapparat, dets Letbevægelighed og ringe Bredde, uroligt Vejr, Reparation af Maskinen og Hensynet til Expeditionens Hovedarbejder, Lodninger, Temperaturmaalinger og Skrabninger, til absolute Hindringer mod Fox-Cirkelens

[1] C. Wille. Apparaterne og deres Brug. Side 4.

B. Observations at Sea, and their Results.

The Scheme of Work approved for the Expedition included complete series of magnetic observations at sea, for which we had the Admiralty standard compass and the Fox circle. With the latter instrument, I undertook in 1876, at the Bergen Observatory, whilst the ship was fitting out, the necessary weighings. During the stay of the Expedition at Husø, from the 10th to the 19th of June, same year, were taken all necessary base-observations. The deviation was determined alike for the steering-compass and the position of the Fox circle, and inclination and intensity were observed with the Fox circle on different courses, the ship being swung the while by means of hawsers. Observations of vibration were taken to determine the coefficients μ and λ.

In his computations of inclination and intensity observed on board with the Fox circle, Professor Mohn could not, he found, attain satisfactory agreement for the respective results unless the index-error for the needle of the Fox circle were put as much as 19 minutes greater than the error found from the observations taken on shore in the same place and at the same time with the Fox circle and with the dip circle.

On taking a few preliminary observations with the Fox circle, June 22nd 1876, in very fine weather and a calm sea, it was found impossible, chiefly no doubt owing to the tardy action of the steering-apparatus,[1] to keep the ship sufficiently steady on her course for observing with comparative accuracy; moreover, the vertical motion of the vessel, calm as was the sea, proved a serious obstacle to the attainment of anything like trustworthy determinations. The computed results, too, were not to be relied upon. Only once afterwards, viz. when nearing Thorshavn, did we try to observe with the Fox circle; indeed the boisterous weather encountered by the Expedition throughout the summer of 1876, precluded any further attempt on the first cruise.

In 1877 I had no opportunity of taking base-observations, both by reason of the weather and the discovery, on arriving at Husø, of a defect in the engine-shaft, necessitating our immediate return to Bergen to get a new one put in. In 1878 the prosecution of other and more important exploratory work left no time for magnetic observations save those required to determine declination.

Thus, the ship's magnetic properties, so to speak, the slow action of her steering-apparatus, her great mobility and trifling breadth of beam, rough weather, time lost in repairing the engine, and regard to the main objects of the Expedition, viz. sounding, determining temperature, and dredging the bottom, — proved one with the other in-

[1] C. Wille. The Apparatus, and How Used, p. 4.

Anvendelse i Søen. Betingelser for dens heldige Anvendelse er et bredt Fartøj, en let Styring, roligt Vejr og tilstrækkelig Tid, samt fremfor alt en saadan Plads for Instrumentet, at de med samme tagne Bestemmelser af Inklination og Intensitet harmonerer.

Det er saaledes kun Misvisnings-Observationerne, der have ledet til brugbare Resultater.

Førend jeg gaar over til at beskrive den i Søen anvendte Fremgangsmaade og give de beregnede Resultater, maa jeg først omtale Resultaterne af de Observationer, som gjordes i Husø til Bestemmelse af Kompassets Deviation.

Den 13de Juni 1876 svang jeg Skibet paa Husø Havn for at bestemme Kompassets Deviation. Svingningen udførtes ved Trosser, fastgjorte i Land. For hver anlagt Kurs (16 forskjellige Streger), paa hvilke der observeredes, pejledes med Kompasset Varden paa Poldetind. Samtidig observerede paa Teltpladsen i Land Prof. Mohn, paa givet Signal, Magnetometret til Bestemmelse af den absolute Deklination. Fra Teltpladsen var, som ovenfor Side 8 anført, Azimut af Varden paa Poldetind N 48° 7.'5 E. Da Fartøjet (Standard Kompasset ombord) under Svingningen laa meget nær i Vertikalplanet mellem Teltpladsen og Poldetind, bliver Azimut af Poldetind for Standard-Kompasset ombord N 48.°1 E. Poldetinds Afstand fra Husø er 10 Kvartmil, saa at en Forrykning lodret paa Sigtelinen mellem begge Steder af 0.°1 svarer til 32.4 Meter, en Afstand, der er meget større end Forrykningen af Kompassets Plads under Svingningen.

Trækkes Azimut af Poldetind — 48.°1 — fra Pejlingen af Poldetind, faar man det sande Azimut af Kompasnaalens Nordende eller den devierende Misvisning. Den følgende Tabel indeholder Observationerne og de deraf beregnede Værdier for devierende Misvisning.

superable obstacles to the use of the Fox circle at sea. The conditions for successful observation with the instrument are a vessel broad in the beam and easy to steer, calm weather and sufficient time, and above all such a position for the instrument as will admit of satisfactory agreement in its determinations of inclination and intensity.

Hence, the only observations attended with trustworthy results, were those taken to find the declination.

Before proceeding to describe the method adopted at sea and give the computed results, I must first set forth the results of the observations taken at Husø for determining the deviation of the compass.

On the 13th of June, 1876, I swung the ship in Husø harbour, by means of hawsers, to obtain the deviation of the compass. For every course by compass (16 different points) on which I observed, the bearing of the Poldetind signal was taken with the compass. Professor Mohn, at a given signal, simultaneously observing the magnetometer in the tent on shore, to determine the absolute declination. As previously stated, page 8, the azimuth of the Poldetind signal from the tent was N. 48° 7.'5 E. Now, as the ship (standard compass on board) lay when swinging very nearly in the vertical plane between the tent and Poldetind, the azimuth of Poldetind for the standard compass on board will be N. 48.°1 E. The distance of Poldetind from Husø is 10 miles; and hence a change in position of 0.°1 perpendicular to the line of vision between both places, corresponds to 32.4 metres, a distance much greater than is that corresponding to the change in the position of the compass during the swinging of the ship.

If the azimuth of Poldetind — 48.°1 — be subtracted from the bearing of Poldetind, we get the true azimuth of the north end of the compass-needle, or the deviating variation. In the following Table are given the observations, and the values computed from them, for deviating variation.

Klokkeslet. (*Hour.*)	Anlagt Kurs paa St. Kompas. (*Ship's Head by Stad. Compass.*)	Pejling af Poldetind. (*Bearing of Poldetind.*)	Devierende Misvisning. (*Deviating Variation.*)
10h 34m a. m.	S 0.°2 E	N 66.°0 E	N 17.°9 W
10 55	S 21.6 E	75.1	27.0
11 58	S 45.0 E	82.3	34.2
0 28 p. m.	S 67.4 E	85.4	37.3
0 49	E	85.0	36.9
1 5	N 67.5 E	82.7	34.6
1 29	N 44.9 E	77.7	29.6
1 32	N 22.5 E	72.5	24.4
1 51	N 0.2 E	67.0	18.9
4 15	N 22.7 W	61.5	13.4
4 32	N 45.3 W	56.3	8.2
4 52	N 67.5 W	51.9	3.8
5 21	N 89.7 W	48.6	0.5
5 40	S 67.2 W	48.3	0.2
5 58	S 45.3 W	50.5	2.4
6 15	S 22.8 W	57.1	9.0
6 45	S 0.7 E	66.0	17.9

Tallene i den sidste Rubrik, den devierende Misvisning, afsattes som Ordinater paa Rudepapir, med Tallene i den anden Rubrik, anlagt Kurs paa Standard-Kompas, som Argument. Paa grafisk Vej droges mellem de afsatte Punkter den sandsynligste Kurve, og af denne Kurve udtoges følgende Værdier: C = Anlagt Kurs efter St. Kompasset. D = Devierende Misvisning.

The figures in the last column, the deviating variation, were set down as ordinates on ruled paper, with the figures in the second column as abscissæ. A free hand curve was then drawn as nearly as possible through all the marked points, and from this curve were deduced the following values (C signifies "course by compass;" D, "deviating variation"): —

C	D	C	D	C	D	C	D
N	18.°8 W	E	37.°0 W	S	17.°8 W	W	0.°4 W
N 10° E	21.3	S 80° E	37.4	S 10° W	13.8	N 80° W	1.6
20	23.8	70	37.3	20	10.0	70	3.3
30	26.1	60	36.6	30	6.6	60	5.2
40	28.4	50	35.2	40	3.8	50	7.2
50	30.8	40	33.0	50	1.6	40	9.4
60	33.1	30	30.0	60	0.6	30	11.8
70	35.0	20	26.5	70	0.1	20	14.0
80	36.4	10	22.1	80	0.0	10	16.5

Medium af de devierende Misvisninger i denne Tabel er

18.°68 West.

Ifølge Side 7 var Middel-Misvisningen paa Teltpladsen paa samme Tid 18° 14.'7 = 18°.24.

Paa Skjæret østenfor Havnen fandt Prof. Mohn (Side 11) den 16de Juni Misvisningen om Formiddagen = 19° 0', om Eftermiddagen 18° 2', i Middel 18° 31' = 18°.52. Da Fartøjet under Svingningen laa mellem Teltpladsen og Skjæret, turde det være rigtigst at sætte Misvisningen paa Skibets Plads lig

18.°38 West.

Dette Tal er kun 0.°30 mindre end *Middeltallet af de devierende Misvisninger ombord. Det sidste giver saaledes den sande Misvisning med en Nøjagtighed af mindst en halv Grad.* Efter dette Princip udførtes Misvisningsbestemmelserne i Søen. Til Bedømmelse af Skibets magnetiske Forhold hidsættes de beregnede Værdier for Konstanterne i Deviations-Formelen.

The mean of deviating variation in this Table is

18.°68 W.

As previously shown, page 11, the mean declination simultaneously found at the tent was 18° 14.'7 = 18.°24.

On the islet east of the harbour, Professor Mohn found the declination in the forenoon of the 16th of June = 19° 0', in the afternoon 18° 2', giving a mean of 18° 31' = 18.°52. Now, as the vessel lay when swinging between the tent and the islet, the declination for the ship's position may be put at

18.°38 W.

This value is only 0.°30 less than *the mean of the deviating variations observed on board. Hence, this mean gives the true variation within half a degree.* On this principle was determined the variation at sea. To show the magnetic influence of the vessel, the computed values of the constants in the deviation formula are here given. —

$$A = 0.°0;\ B = -18.°47;\ C = -0.°45;\ D = +2.°47;\ E = +0.°23.$$

Deviationen er 0 for anlagt Kurs Nord og Syd, Maximum, 18.°5, for Ost og West.

Misvisnings-Bestemmelserne i Søen udførtes paa følgende Maade. Skibet blev, i roligt Vejr og under Solskin, ved Maskine og Ror bragt til at ligge an forskjellige, i Regelen 16, Kurser, saa jevnt som muligt fordelte over hele Horizonten. For hver af disse anlagte Kurser bestemtes Vinkelen mellem Diametralplanet og Solens Vertikal-

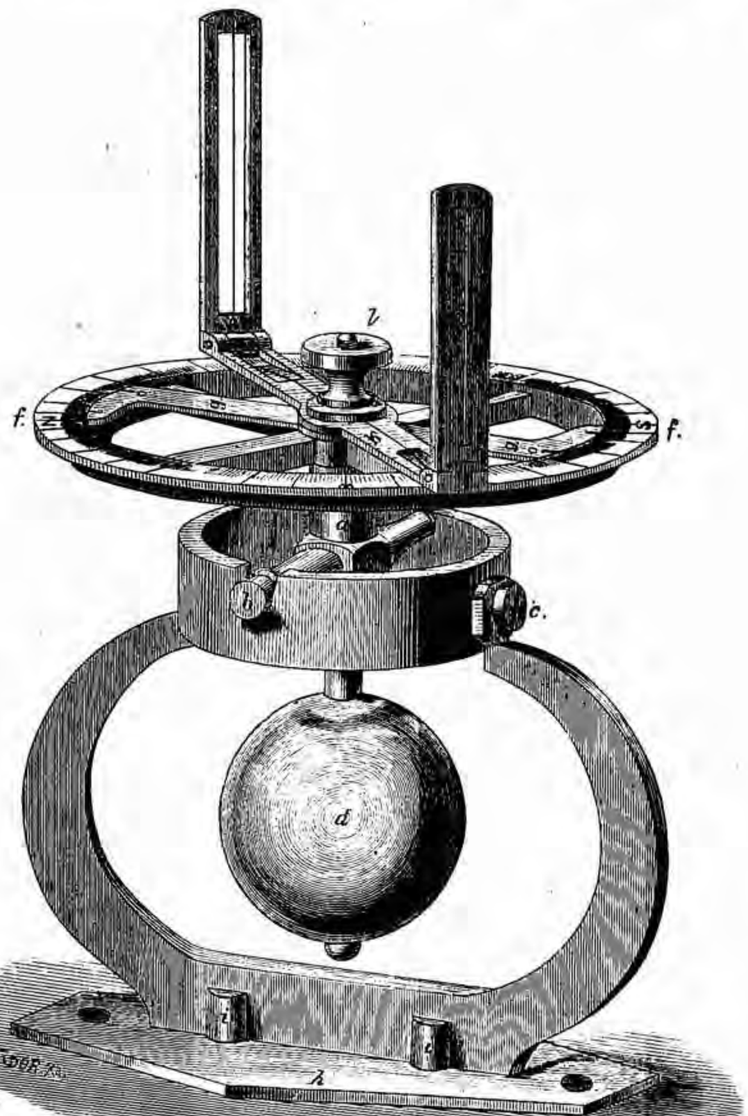
The deviation is 0 with the ship's head due north or south, its maximum with the ship's head due east or west being 18.°5.

The determinations of declination at sea were performed as follows: — In calm, bright weather the ship's head was brought upon different points of the compass, as a rule 16, as regularly distributed round the circumference as possible. For each of these points was determined the angle between the midship line and the vertical circle of cirkel. Dette gjordes en enkelt Gang (i 1877) ved Hjælp af Kompassets Pejlapparat, men i Regelen (i 1878) paa nedenfor beskrevne Maade.

Da enhver Pejlings Nøjagtighed væsentligst beror paa, at Kompasnaalen er i Ro og rigtig indstillet i den devierende magnetiske Meridian, og da Naalen let kan bringes i Svingninger ved Manipulationen af Pejlapparatet, naar dette er anbragt direkte paa Kompasdaasen, anvendtes til Pejlinger Wille's Azimuth Pejlskive, et Instrument, som jeg konstruerede i 1869 og som siden har været reglementeret i den norske Marine. Instrumentet er fremstillet i hosstaaende Figur, og vil lettelig forstaaes af Tegningen.

the sun. On one occasion (1877) this was done by means of the sight vanes on the standard compass, but subsequently without exception in the manner described below.

As the accuracy of every bearing is mainly dependent upon the compass-needle being steady, and parallel to the deviating magnetic meridian, and as the needle will be easily caused to vibrate when manipulating the bearing apparatus, if the latter be fixed direct to the compass-box, — all bearings were taken with Wille's Azimuth Dumb-card, an instrument devised by the author in 1869, and which has since been officially adopted for the Norwegian Navy. The instrument is represented in the Figure.



Paa Grund af Bevægeligheden om Tapperne *b* og *c* vil Kuglen *d*, der er af Bly, altid holde Tappen *a* vertikal, og Ringen *f*, der med sit Centerstykke kan drejes om den øvre Del af Tappen *a*, vil saaledes indtage en horizontal Stilling og bibeholde denne under Skibets Bevægelser. Ringen er inddelt i 360° og er tillige mærket med de 8 Hovedstreger N, NO, O, SO o. s. v. Til Overkant af Tappen *a* er fastskruet Tverstykket *g*, paa hvilket er an-

The ball *d*, which is of lead, moving readily on the pivots *b* and *c*, will always keep the pivot *a* perpendicular; and the ring *f*, which along with its centre-piece can be made to revolve about the upper part of the pivot *a*, will accordingly take a horizontal position and keep it during the motion of the vessel. The ring is divided into 360 degrees, with separate marks for the 8 cardinal points, N., NE., E., SE., &c. To the upper edge of the pivot *a* is mærket to diametralt staaende Nulpunkter (Indexer), og Beslaget h skal være saaledes placeret, at naar Pejlskiven nedsættes i dette med sine to Tapper $i\,i$, saa skal Linjen mellem de to Nulstreger paa det faste Tverstykke g være parallel med Skibets Diametralplan. Om en tyndere Fortsættelse af Tappen a bevæger sig Diopterlinealen k med sine Dioptere, og kan fæstes i en hvilkensomhelst Vinkel med g ved Hjælp af Skruen l.

Pejlingen foregik altsaa saaledes: En Observatør passede Styringen og aflæste nøjagtig anlagt Kurs i Observationsøjeblikket, en anden havde Kronometret og Noticebogen, og en tredie stod ved Pejlskiven. Naar Skibet gik støt, uden Giringer, og Kompasnaalen var i Ro, pejltes Solen enten direkte eller, naar den var højere paa Himlen, ved Hjælp af Skyggen af den vertikale Traad og Diameterstregen paa Linealen k. Naar disse var nøjagtig overet, raabtes "Nu!" og Kronometrets Visende noteredes; derefter opgaves anlagt Kurs, der ligeledes noteredes, og Ringen f drejedes saaledes, at den samme Kursstreg kom overet med Nulpunktet paa g. Inddelingen paa Ringen havde da nøjagtig samme Stilling til Diametralplanet som Inddelingen paa Kompasrosen havde i det Øjeblik, da der blev raabt "Nu", hvorpaa Pejlingen aflæstes paa Ringen i Aabningen og ligeud for Diameterstregen paa Linealen k, som om den var aflæst direkte paa Kompasrosen. Dersom Linealen k under en forlig eller agterlig Pejling dækker Nulstregen, benyttes de to Hjælpestreger, der er anbragte et vist Antal Grader til Siden af den egentlige Nulstreg.

screwed a cross-piece, g, marked with two diametrically opposite zero-points (indices), and the frame h must be so placed that, on inserting into it the dumb-card with its two pivots $i\,i$, the line between the two zero-points on the fixed cross-piece g will be parallel to the middle fore and aft line of the ship. On a thinner continuation of the pivot a moves a cross-piece, k, with sight-vanes, which admits of being fixed at any required angle with g by means of the screw l.

The bearings were taken accordingly as follows: — One observer looked to the steering, and read off the exact compass course at the moment of observation, another had charge of the chronometer and noted the time, and a third observed the azimuth dumb-card. Now, when the ship kept steady on her course without yawing, and with the compass-needle at rest, the bearing of the sun was taken either direct or, for greater altitudes, by the shadow of the vertical wire and the diameter-line on the cross-piece k. The moment the shadow of the thread and the line were exactly coincident, observer No. 3 called out to his colleague with the chronometer, who noted and entered the time, after which the direction of the ship's head by the compass was given, and entered in the note-book, the ring f being then moved in such manner that the division corresponding to the direction of the ship's head by compass was made coincident with the zero-point on the cross-piece g. Hence, the division-lines on the ring had precisely the same position relative to the midship line as the division-lines on the compass-card at the moment observer No. 3 called out, and the bearing was then read off through the open space in the centrepiece k, the extremities of the diameter-line being the index, exactly as though it had been read off direct from the compass-card. Should the piece k when taking a bearing in or near the direction of the fore and aft midship line cover the zero-point, recourse is in that case had to the two lines drawn a certain number of degrees from the true zero-point, one on either side.

Kronometrets Stand for sand Tid ombord bestemtes enten efter dets Stand for Greenwich Tid og Skibets beregnede Længde eller, naar Dagstiden var gunstig, det er Solen ikke for nær Meridianen, ved at tage nogle Solhøjder og deraf beregne Solens Timevinkel.

The error of the chronometer on apparent time on board was found either from its error on Greenwich time and the ship's computed longitude, or, at a favourable hour of the day, i. e. with the sun not too near the meridian, by taking a few solar altitudes and computing the hour-angle of the sun.

Af den saaledes fundne Uhrkorrektion, den efter Kronometret noterede Tid, Bredden og Solens Deklination beregnedes Solens Azimut. Forskjellen mellem Solens sande Azimut og Pejlingen af Solen gav de til de forskjellige anlagte Kurser svarende Værdier for den devierende Misvisning. Efter den ovenbeskrevne grafiske Methode bestemtes derpaa Middeltallet af de ækvidstante Værdier for denne, hvilket antoges som den sande Misvisning.

From the error of the chronometer thus determined, the observed chronometer-time, the latitude, and the sun's declination, was computed the azimuth of the sun. The difference between the true azimuth and the bearing of the sun gave the values for deviating variation corresponding to the different compass courses. By the diagramatic method described above was found the mean of the equidistant values for the deviating variation, which we assumed to be the true declination.

De følgende Tabeller indeholder Observationerne og de deraf udledede Resultater. t = Klokkeslettet efter sand Soltid, S Pejling af Solen, a Solens Azimut.

In the following Tables are set forth the observations and their computed results: t signifies apparent time; S, bearing of sun; a, azimuth of sun.

I. Vestfjorden. *(The West Fjord).* 1877. August 10.

$\varphi = 68° 5'$ N. $\lambda = 14° 30'$ E. Greenwich.

No.	C	t	a	S	D
1	SE	4h 48m 50s	N 100° 42′ W	N 71° 40′ W	29.°0 W
2	SE	49 53	100 27	71 20	29. 1
3	SSE	57 28	98.6	77 30	21. 1
	S	5 2 3	97.5	86 30	11. 0
4	S 0° 20′ E	2 47	97.3	86 10	11. 1
	S 1° W	4 11	97.1	87 0	10. 1
5	SSW	9 44	95.8	S 84 40 W	0. 5
	SSW	10 36	95.6	84 30	0. 1 W
6	SW	15 29	94.4	79 0	6 9 E
	SW			78 30	
7	WSW	20 34	93.2	76 0	10. 6
	WSW			76 20	
8	S 88° W	23 4	92.6	76 40	10. 6
	W			77 5	
9	N 69.°5 W	27 19	91.6	81 20	7. 1
	N 67 W	27 56	91.4	81 40	6. 9
10	NW	31 25	90.7	87 0	2. 0 E
	NW			87 30	
11	N 24° W	33 50	90.1	N 85 30 W	4. 6 W
	N 21 W	36 33	89.5	84 20	5. 2
12	N 1.°5 E	42 51	88.0	76 20	11. 8
	N 1. 5 E			76 0	
13	NNE	47 45	87.0	68 40	18. 2
	NNE			69 0	
14	NE	51 30	86.0	61 30	24. 4
	NE			61 40	
15	ENE	55 46	85.0	55 30	29. 6
	ENE			55 20	
16	E	58 59	84.3	51 10	33. 0 W
	E			51 20	

$A = 0.°0$; $B = -21.°92$; $C = -0.°25$; $D = +2.°50$; $E = +0.°62$.

Ved denne og alle de følgende Bestemmelser var den forreste Jollebom om Bagbord svunget ud; i Husø var den svunget indover.

For this and all subsequent determinations, the foremost port davit was swung *out,* excepting at Husø, where it was swung *in.*

C	D	C	D	C	D	C	D
N	11.°6 W	E	33.°1 W	S	10.°5 W	W	10.°5 E
N 10° E	14. 7	S 80° E	33. 6	S 10° W	5. 8	N 80° W	9. 3
20	17. 6	70	33. 4	20	1. 3 W	70	7. 6
30	20. 5	60	32. 4	30	2. 6 E	60	5. 4
40	23. 1	50	30. 3	40	5. 7	50	2. 9
50	25. 7	40	27. 5	50	8. 3	40	0. 2 E
60	28. 2	30	24. 0	60	10. 0	30	2. 5 W
70	30. 3	20	20. 0	70	11. 0	20	5. 4
80	32. 0	10	15. 4	80	11 1	10	8. 3

Middel af D = Misvisning = 11.°2 W.

Mean of D = variation = 11.°2 W.

2. Bergen. **Byfjorden.** *(Bergen. The Byfjord.)* **1878. Juni 14.**

$\varphi = 60° 23.'9$ N. $\lambda = 5° 54.'0$ E. Greenwich.

No.	C	t	a	S	D
1	N 29.°5 E	5^h 25^m 47^s	N 85.°2 W	N 61.°0 W	24.°2 W
2	S 79. W	37 49	82.7	82.0	0.7
3	S 58. W	41 10	82.0	80.5	2.5
4	S 37. W	44 0	81.4	75.5	5.9
5	S 17.5 W	47 11	80.7	69.0	11.7
6	S 1.2 W	49 13	80.3	62.7	17.6
7	S 8. E	51 20	79.8	53.7	26.1
8	S 68.5 E	54 52	79.1	42.5	36.6
9	N 88. E	57 20	78.6	43.0	35.6
10	N 58. E	6 0 17	77.9	47.3	30.6
11	N 35.7 E	2 16	77.5	52.0	25.5
12	N 9.7 E	4 29	77.1	56.7	20.4
13	N 3. W	6 18	76.7	59.8	16.9
14	N 36.5 W	9 53	75.9	67.0	8.9
15	N 68.7 W	13 42	75.2	74.0	1.2
16	N 89.5 W	17 8	74.5	72.8	1.7
17	N 69.5 W	19 52	73.9	70.5	3.4
18	N 55.2 W	22 19	73.4	67.2	6.2
19	N 48. W	25 26	72.8	64.8	8.0
20	N 20.5 W	28 14	72.2	59.0	13.2
21	N 11. W	30 21	71.7	57.0	14.7

$A = +0.°0$; $B = -17.°48$; $C = +0.°50$; $D = +2.°33$; $E = +0.°24$.

C	D	C	D	C	D	C	D
N	17.°6 W	E	36.°0 W	S	18.°2 W	W	1.°0 W
N 10° E	20.1	S 80° E	36.7	S 10 W	14.5	N 80° W	2.0
20	22.5	70	36.7	20	10.9	70	3.3
30	24.7	60	36.0	30	7.7	60	4.8
40	26.9	50	34.7	40	5.0	50	6.6
50	29.0	40	32.4	50	3.0	40	8.6
60	31.1	30	29.4	60	1.7	30	10.7
70	33.0	20	25.8	70	0.8	20	13.0
80	34.6	10	22.0	80	0.6	10	15.2

Middel af D = Misvisning = 18.°2 W. Mean of D = Variation = 18.°2 W.

3. Øst-Finmarken. *(East Finmark.)* 1878. Juni *(June)* 25.

$\varphi = 70° 45'.8$ N. $\lambda = 30° 6'.6$ E. Greenwich.

No.	*C*	*t*	*a*	*S*	*D*
1	S 45.°5 E	6h 20m 41s	N 77.°0 W	N 58.°6 W	18.°4 W
2	S 63.75 E	23 12	76.5	54.8	21.7
3	S 78.5 E	24 37	76.2	54.2	22.0
4	N 88.5 E	27 7	75.6	54.0	21.6
5	N 74.5 E	28 54	75.2	55.2	20.0
6	N 59. E	30 42	74.8	57.9	16.9
7	N 43.25 E	32 47	74.4	62.0	12.4
8	N 25.6 E	34 23	74.0	66.8	7.2
9	N 9.3 E	37 47	73.2	71.3	1.9 W
10	N 2.3 E	39 45	72.8	73.6	0.8 E
11	N 11. W	41 13	72.4	78.2	5.8
12	N 23.6 W	42 58	72.0	80.0	8.0
13	N 40.3 W	44 19	71.7	84.8	13.1
14	N 54.6 W	46 19	71.2	N 87.2 W	16.0
15	N 69. W	48 18	70.8	S 89.2 W	20.0
16	N 83.3 W	49 44	70.5	87.9	21.6
17	S 80. W	52 21	69.9	87.9	22.2
18	S 65.3 W	53 58	69.5	S 89.2 W	21.3
19	S 52.6 W	56 15	69.0	N 89.1 W	20.1
20	S 40.3 W	58 6	68.6	86.1	17.5
21	S 30.3 W	7 0 20	68.1	82.2	14.1
22	S 16.6 W	2 37	67.6	75.2	7.6
23	S 1.5 W	4 30	67.2	67.2	0.0
24	S 10.3 E	6 6	66.8	62.3	4.5 W
25	S 19. E	8 9	66.3	57.3	9.0
26	S 26.5 E	11 18	65.6	54.0	11.6
27	S 34.5 E	13 0	65.2	49.5	15.7 W

$A = +\ 0.°05;\ B = -\ 22.°22;\ C = +\ 0.°43;\ D = +\ 2.°30;\ E = +\ 0.°22.$

C	*D*	*C*	*D*	*C*	*D*	*C*	*D*
N	1.°2 E	E	21.°9 W	S	0.°1 W	W	22.°1 E
N 10 E	2.2 W	S 80 E	22.4	S 10 W	4.5 E	N 80 W	21.2
20	5.4	70	22.2	20	9.3	70	19.7
30	8.6	60	21.3	30	13.6	60	17.7
40	11.6	50	19.5	40	16.8	50	15.3
50	14.5	40	16.8	50	19.4	40	12.6
60	17.1	30	13.5	60	21.0	30	9.9
70	19.3	20	9.5	70	22.0	20	7.1
80	21.0	10	5.0	80	22.3	10	4.3

Middel af *D* = Misvisning = 0.°2 E. Mean of *D* = Variation = 0.°2 E.

4. Vest-Finmarken (*West Finmark*). 1878, Juli (*July*) 13.

$\varphi = 71^\circ\ 7'$ N. $\lambda = 21^\circ\ 11'$ E. Greenwich.

No.	*C*	*t*	*a*	*S*	*D*
1	N 89.° W	$5^h\ 2^m\ 26^s$	N 96.°2 W	N 112.°2 W	16.°0 E
2	N 71 W	4 49	95.6	108.8	13.2
3	N 43 W	7 52	94.9	100.8	5.9
4	N 24 W	9 21	94.6	96.5	1.9 E
5	N 2 E	11 56	93.9	90.1	3.8 W
6	N 22.5 E	14 39	93.3	82.4	10.0
7	N 45.5 E	16 35	92.8	74.0	18.8
8	N 65 E	20 5	92.0	67.4	24.6
9	E	22 8	91.5	64.0	27.5
10	S 67.5 E	25 51	90.6	63.5	27.1
11	S 45 E	28 9	90.1	66.1	24.0
12	S 23 E	31 34	89.2	72.4	16.8
13	S	33 55	88.7	82.0	6.7
14	S 0.5 W	35 15	88.3	82.0	6.3 W
15	S 22.5 W	37 44	87.7	93.0	5.3 E
16	S 43.5 W	39 20	87.4	101.0	13.6
17	S 67 W	41 46	86.9	103.0	16.1
18	N 89 W	45 55	85.9	102.0	16.1 E

$A = 0.^\circ 0$; $B = -22.^\circ 17$; $C = +0.^\circ 22$; $D = +2.^\circ 78$; $E = +0.^\circ 05$.

C	*D*	*C*	*D*	*C*	*D*	*C*	*D*
N	5.°0 W	E	27.°6 W	S	6.°5 W	W	16.°3 E
N 10 E	8.0	S 80 E	28.0	S 10 W	1.3 W	N 80 W	14.9
20	11.0	70	27.8	20	3.6 E	70	13.0
30	14.1	60	26.7	30	8.2	60	11.2
40	17.2	50	25.0	40	11.8	50	8.5
50	20.2	40	22.5	50	14.4	40	6.0
60	22.9	30	19.4	60	16.3	30	3.5
70	25.1	20	15.6	70	17.0	20	0.7 E
80	26.7	10	11.3	80	16.9	10	2.1 W

Middel af D = Misvisning = 5.°6 W. Mean of D = Variation = 5.°6 W.

5. Det norske Hav. *(The Norwegian Sea.)* **1878. Juli** *(July)* **20.**

$\varphi = 75° 3' N.$ $\lambda = 5° 13'$ E. Greenwich.

No.	*C*	*t*	*a*	*S*	*D*
1	S 45.°5 E	4^h 19^m 19^s	N 109.°1 W	N 66.°7 W	42.°4 W
2	S 69.3 E	21 31	108.6	61.0	47.6
3	S 89 E	23 55	108.0	61.5	46.5
4	N 68.3 E	26 13	107.3	64.2	43.1
5	N 42.6 E	29 47	106.4	69.7	36.7
6	N 18 E	32 15	105.8	80.2	25.6
7	N	34 2	105.4	85.2	20.2
8	N 27 W	40 5	104.0	94.8	9.2
9	N 46.3 W	41 47	103.6	99.7	3.8 W
10	N 65 W	43 22	103.1	103.2	0.1 E
11	N 89.3 W	44 55	102.7	107.3	4.6
12	S 68 W	46 50	102.2	107.2	5.0 E

$A = +0.°02$; $B = -26.°42$; $C = 0.°0$; $D = +2.87$; $E = +0.°48$.

C	*D*	*C*	*D*	*C*	*D*	*C*	*D*
N	20.°2 W	E	46.9 W	S	20.°0 W	W	4.°8 E
N 10° E	24.1	S 80° E	47.3	S 10 W	13.8	N 80° W	3.8
20	28.0	70	47.0	20	8.2	70	0.2 E
30	31.5	60	45.9	30	3.6	60	2.0 W
40	35.0	50	43.9	40	0.0	50	2.9
50	38.2	40	40.8	50	2.6 E	40	5.6
60	41.0	30	36.9	60	4.4	30	8.9
70	43.5	20	32 0	70	5.3	20	12.5
80	45.5	10	26.3	80	5.3	10	16.1

Middel af *D* = Misvisning = 20.°5 W. Mean of *D* = Variation = 20.°5 W.

6. Sydkap, Spidsbergen. *(South Cape, Spitzbergen.)* 1878. August *(August)* 5.

$\varphi = 76° 27'$ N. $\lambda = 17° 0'$ til $17° 10'$ E. Greenwich.

No.	C	t	a	S	D
1	N 89.°3 E	7ʰ 48ᵐ 47ˢ	N 59.°9 W	N 20.°0 W	39.°9 W
2	N 68.3 E	51 47	59.2	23.1	36.1
3	N 45.6 E	58 23	57.6	29.7	27.9
4	N 18.3 E	8 0 52	57.1	39.9	17.2
5	N 23 E	2 58	56.6	37.3	19.3
6	N 2.3 W	6 7	55.8	49.2	6.6
7	N 2 E	9 41 45	33.1	23.8	9.3
8	N 24.3 W	44 8	32.5	31.5	1.0 W
9	N 50.3 W	46 19	32.0	40.5	8.5 E
10	N 70 W	48 25	31.5	44.2	12.7
11	N 88.6 W	51 22	30.8	45.1	14.3
12	S 88.3 W	56 21	29.6	45.3	15.7
13	S 65 W	10 0 13	28.7	43.8	15.1
14	S 43.6 W	3 32	27.9	37.2	9.3
15	S 24.3 W	7 8	27.0	28.2	1.2 E
16	S 0.3 W	9 57	26.4	15.2	11.2 W
17	S 22.6 E	13 11	25.6	N 1.9 W	23.7
18	S 47.3 E	15 48	24.9	N 9.7 E	34.6
19	S 71.6 E	20 38	23.8	15.1	38.9
20	N 85.3 E	25 34	22.6	N 16.2 E	38.8

$A = + 0.°02;\ B = - 27.°67;\ C = + 0.°62;\ D = + 2.°47;\ E = + 0.°49.$

C	D	C	D	C	D	C	D
N	10.°5 W	E	39.°7 W	S	11.°5 W	W	16.°0 E
N 10 E	14.4	S 80 E	40.2	S 10 W	5.8	N 80 W	14.8
20	18.3	70	39.7	20	0.7 W	70	13.1
30	22.0	60	38.1	30	4.0 E	60	10.5
40	25.7	50	35.5	40	8.0	50	7.6
50	29.5	40	31.9	50	11.4	40	4.4
60	33.1	30	27.5	60	14.0	30	1.0 E
70	36.2	20	22.5	70	15.7	20	2.5 W
80	38.3	10	17.0	80	16.3	10	6.3 W

Middel af D = Misvisning = 11.°4 W. Mean of D = Variation = 11.°4 W.

7. Grønlandshavet. *(The Greenland Sea.)* **1878. August 9.**

$\varphi = 76° \ 27'$ N. $\lambda = 0° \ 56'$ W. Greenwich.

No.	*C*	*t* (a. m.)	*a*	*S*	*D*
1	S 56.°3 E	10ʰ 41ᵐ 53ˢ	S 21.°5 E	S 32.°0 W	53.°5 W
2	S 35 E	45 30	20.5	24.9	45.4
3	S 17.3 E	48 40	19.6	15.8	35.4
4	S 2 W	51 6	19.0	S 6.3 W	25.3
5	S 23.3 W	53 14	18.4	S 3.2 E	15.2
6	S 50 W	55 46	17.7	14.4	3.3 W
7	S 64.3 W	57 16	17.3	18.5	1.2 E
8	N 89 W	59 11	16.8	20.6	3.8 E
9	N 71 W	11 2 14	15.9	15.4	0.5 W
10	N 51.3 W	8 40	14.2	S 7.7 E	6.5
11	N 17.6 W	10 39	13.6	S 6.2 W	19.8
12	N 2 E	13 13	12.9	14.9	27.8
13	N 15 E	19 16	11.2	21.0	32.2
14	N 51.3 E	22 6	10 5	35.0	45.5
15	N 64.6 E	26 0	9.4	39.0	48.4
16	N 87 E	28 6	8.8	44.5	53.3
17	S 72.3 E	30 1	8.3	45.8	54.1
18	S 48.6 E	32 16	7.6	41.4	49.0
19	S 68.6 E	37 26	6.2	S 46.8 W	53.0 W

$A = -0.°32$; $B = -28.°17$; $C = -0.°33$; $D = +2.°39$; $E = -0.°80$.

C	*D*	*C*	*D*	*C*	*D*	*C*	*D*
N	26.°7 W	E	53.°7 W	S	26.°7 W	W	3.°6 E
N 10° E	30.5	S 80.° E	54.3	S 10° W	21.5	N 80° W	2.0 E
20	34.3	70	54.0	20	16.5	70	0.5 W
30	38.0	60	52.7	30	11.7	60	3.5
40	41.5	50	50.2	40	7.3	50	6.8
50	44.8	40	46.6	50	3.3 W	40	10.6
60	47.8	30	42.3	60	0.2 E	30	14.7
70	50.4	20	37.3	70	2.6	20	18.7
80	52.4	10	32.0	80	3.8 E	10	22.7 W

Middel af *D* = Misvisning = 25.°9 W. Mean of *D* = Variation = 25.°9 W.

Oversigts-Tabel. *(Synoptic Table.)*

Station.	Nordl. Bredde *(North Latitude)*	Længde fra Gr. *(Longitude)*	Datum *(Date)*	Klokkeslet *(Hour)*	Declination	Horizontal-Intensitet *(Horizontal Intensity)* Brit. Un.	Metr. Un.	*m*	Inclin. θ
Bergen	60° 23.′9	5° 24.′0 E	1876 Mai 22	1—2 p. m.		3.2238	1.4864	0.7666	
—				3—4½ p. m.					72° 24.′3
Husø	60 59.6	4 37.0 E	1876 Juni 10	4—6 p. m.	18° 19′ W	3.1732	1.4631	0.7653	
—			— „ 12	10½—12 a. m.					72 43.4
—			— „ „	1½—2 p. m.					72 41.0
—			— „ „	6—7½ p. m.					72 43.9
—			— „ 13	10½ a.m.—7 p.m.	18 15 W				
—			— „ „	11—12 a. m.					72 46.0
—			— „ 15	12¼—1¾ p. m.		3.1751	1.4640	0.7650	
—			— „ „	2¼ p. m.		3.1750	1.4640		
—			— „ „	6¼ p. m.		3.1746	1.4637		
—			— „ „	7¼ p. m.					72 45.5
Do. Skjær *(Islet)*			— „ 16	11¼ a. m.	19 0 W				
— —			— „ „	12—1 p. m.		3.1686		0.7666	
— —			— „ „	2¼ p. m.		3.1734	1.4632		
— —			— „ „	6½ p. m.					72 44.8
— —			— „ „	7½ p. m.	18 2 W				
Husø			1877 Mai 23	5½ p. m.					72 43.4
—			— Juni 4	4—5 p. m.		3.1761	1.4644	0.7442	
Reykjavik	64 8.5	21 54.1 W	1876 Juli 28	5—6½ p. m.					76 28.5
—			— „ 29	5½ p. m.	38 19 W				
—			— „ 31	10—12¼ p. m.		2.6141	1.2053	0.7615	
—			— „ „	4—6 p. m.		2.6407	1.2176	0.7612	
—			— Aug. 1	1¼—2¼ p. m.					76 26.3
Namsos	64 28.2	11 31.5 E	1876 Aug. 18	11½—2 p. m.		2.9639	1.3666	0.7576	
—			— „ „	6 p. m.	13 43 W				
—			— „ 19	10½—11½ a. m.					74 2.3
—			— „ „	5—6 p. m.					74 2.3
Kristiania	59 54.7	10 43.6 E	1876 Oct. 2	11 a. —2 p. m.		3.4664	1.5983	0.7547	71 4.7
Bodø	67 17.2	14 24.9 E	1877 Aug. 13	9¾—11¼ a. m.					75 21.4
—			— „ „	12¼—5½ p. m.		2.7854	1.2842	0.7402	
—			— „ „	6 p. m.	11 41 W				
Tromsø	69 39.1	18 59.3 E	1877 Juli 11	11¾—12¾					76 21.9
—			— „ „	4—6¼ p. m.		2.6365	1.2155	0.7426	
—			— „ „	7 p. m.	10 18 W				
Hammerfest	70 40.2	23 40.4 E	1877 Juli 9	5¾—24 p. m.		2.5484	1.1750	0.7627	
—			— „ 10	10¾—12 a. m.					76 54.3
—			— „ „	12½ p. m.	5 29 W				
Vardø	70 22.4	31 7.8	1878 Juni 26	10¾—11½ a. m.					76 52.4
—			— „ „	1—6 p. m.		2.5737	1.1867	0.7616	
Bergen *(Bergen)*	60 23.8	5 17.1 E	1878 Juni 14	6 p. m.	18.°2 W				
Vestfjorden *(West Fjord)*	68 5	14 30 E	1877 Aug. 10	5½ p. m.	11.2 W				
Vest-Finmarken *(West Finmark)*	71 7	21 11 E	1878 Juli 13	5½ p. m.	5.6 W				
Øst-Finmarken *(East Finmark)*	70 45.8	30 6.6 E	— Juni 25	7 p. m.	0.2 E				
Norske Hav *(Norwegian Sea)*	75 3	5 13 E	— Juli 20	4½ p. m.	20.5 W				
Sydkap Spidsbergen *(South Cape Spitzbergen)*	76 27	17 5 E	— Aug. 5	10 p. m.	11.4 W				
Grøndlandshavet *(Greenland Sea)*	76 27	0 56 W	— „ 9	11 a. m.	25.9 W				