

CONTENTS

	Page	Page
Part I. Introduction.		
1. Introductory Remarks	5	
2. Stations in action and list of aurora nights when photographs of aurora were taken or observations made	5	
3. List of aurora photographs which might be used for determining height and position.....	7	
4. The baselines used to determine height and position of the aurora.....	7	
5. Brief summary of the methods of measuring and calculating the negatives.....	8	
6. List of height and situation of all the measured aurora points	9	
Part II. Observations and measurements in chronological order.		
7. Plan for the following sections.....	9	
8. Auroræ in August 1932	9	
9. Auroræ in September 1932	10	
10. Auroræ in October 1932	11	
11. Auroræ in November 1932	12	
12. Auroræ in January 1933	12	
13. Auroræ in February 1933	13	
14. Preparations for an expedition to Trondheim	15	
15. The Aurora of March 18—19, 1933	15	
16. The Aurora of March 19—20, 1933	17	
17. The Aurora of March 20—21 and 21—22, 1933	19	
18. The Aurora of March 23—24, 1933	20	
19. The Aurora of March 24—25, 1933	22	
20. Auroræ in April, 1933.....	24	
21. Other Auroræ in April, 1933	25	
22. The big Aurora on May 1—2, 1933	27	
23. Hassel's list of nights when no aurora was seen...	29	
24. Hassel's visual observations of the occurrence and intensity of the aurora lines seen in a pocket-spectroscope	32	
Part III. Statistics of Aurora heights.		
25. Statistics for all measured aurora points.....	32	
26. Statistics of heights of the lowest points of the aurora	37	
27. The heighest points of the aurora.....	42	
Part IV. Geographical positions of the measured Auroræ.		
28. Geographical distribution of the aurora from 23—25 March and from 1—2 May 1933. Comparison with the three-hour-range magnetic indices K	45	
Part V. The sunlit Aurora rays.		
29. Position relativ to the Earths shadow.....	48	
Appendix: Auroræ observations from ships in the polar year 1932—33.		
30. Instructions	49	
31. The results obtained	50	
32. Possible application of the material in table 12 and 13	58	
Table 1. List of aurora photographs which might be used.....	59	
Table 2. Height and situation of measured Aurora points	70	
Tables.		
Table 1 and 2 at the end of the paper, the others in the text		
Table 1. Liste of aurora photographs which might be used	59	
» 2. Height and situation of meassured aurora points	70	
» 3. Hours of observation when no aurora was seen. Station Darbu, Observer Hassel.....	29	
» 4. Frequences of heights at all the measured aurora points	32	
» 5. Frequency of heights of the measured aurora points until H = 150 km	36	
» 6. Frequency of heights of the lowest points of the different aurora forms	38	
» 7. Frequency of heights of lowest points of aurora taken 3 by 3 and 5 by 5.....	40	
» 8. Frequency of heights of the lower border of the aurora form RB, taken 5 by 5.....	41	
» 9. Frequency of highest points of the different aurora forms	42	
» 10. Comparison between the magnetic indices K and the distance θ from the geomagnetic axis point to some of the measured aurora during the polar year 1932—33	48	
» 11. Observations of aurora from ships, from August 1, 1932 to August 31, 1933.....	51	
» 12. More detailed observations supplementing the observations in Table 11. The time is GMT and the azimuth of the extension is measured by the ships magnetic compass along the horizon N = 0°, E = 90°, S = 180° and W = 270°...	55	

RESULTS OF THE OBSERVATIONS AND PHOTOGRAPHIC MEASUREMENTS OF AURORA IN SOUTHERN NORWAY AND FROM SHIPS IN THE ATLANTIC DURING THE POLAR YEAR 1932–1933

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PART I.

INTRODUCTION.

1. Introductory Remarks.

The photographic work and observations of the Aurora from Southern Norway during the Polar Year 1932–1933 form a part of my systematic work on the same subject which has continued without interruption from 1911 up to now.¹⁾

The material coming from ships on route from Norway to America and back is added as an appendix.

The year 1932–1933 was a year of minimum activity of the sun with correspondingly few aurorae near Oslo. Therefore in March 1933 I undertook an expedition to Trondheim to get more material from this district which is nearer to the auroral zone and where the aurorae are much more frequent than in Oslo.

A preliminary report from that expedition was published in 1934.²⁾

¹⁾ *Carl Størmer*: Resultats des mesures photogrammétriques des aurores boréales dans la Norvège méridionale de 1911–1922, Geof. Publ. Vol. IV, No. 7, and Remarkable Aurora Forms from Southern Norway I–IX, *ibid.* Vol. XI, No. 5 and 12, Vol XIII, No. 7. See also Geof. Publ. Vol. XI, No. 3 and Vol. XII, No. 7.

²⁾ *Carl Størmer*: Über eine Nordlichtexpedition nach Trondheim im März 1933, Gerlandes Beiträge zur Geophysik, B. 41, p. 382–386, 1934.

In the present paper a detailed report of our work is given, with all measurements of height and situation of the aurora. To my numerous assistants I express my heartiest thanks. First to Mr. *Olav Egeberg* and Mr. *Nicolai Herlofson*, who have helped me in measuring and calculating the aurora negatives, and to all my assistants during the nights when aurorae were photographed and observed. Their names will be given later.

Captain *A. Herstad*, my assistant at the station Lökken Verk, deserves special mention. In spite of his age he worked with neverfailing enthusiasm during cold aurora nights. Due to his splendid cooperation the collected material of simultaneous aurora photographs from Trondheim and Lökken Verk was of great value. I am sorry to record his death some years later.

2. Stations in action and list of aurora nights when photographs of aurora were taken or observations made.

During the polar year the following stations in southern Norway were in action:

- C.* *Oslo Observatory*, Latitude $59^{\circ}54'44''$, Longitude E of Greenwich $10^{\circ}43'24''$. Height 33 m.
- Da.* *Darbu*, Lat. 59.41.56, Long. 9.48.17 E, Height 55 m.
- K₄.* *Kongsberg*, Lat. 59.40.18, Long. 9.39.28 E, Height 170 m.

- Li.* Lillehammer, Lat. 61.05.47, Long. 10.30.11, Height 350 m.
Lö. Lökken Verk, Lat. 63.07.45, Long. 9.41.24, Height 284 m.
N. The Physical Institute, Norges tekniske Högskole, Trondheim, Lat. 63.25.01, Long. 10.24.32, Height 70 m.
O. Oscarsborg, Lat. 59.40.22, Long. 10.36.49, Height 25 m.
T. Tömte, Lat. 60.17.39, Long. 11.04.07, Height 290 m.

- On station *C.* Tvetter, Anda, Sandøy.
 " *Da.* Olaf Hassel.
 " *K₄.* Odleiv Busengdal.
 " *Lö.* Herstad.
 " *N.* Westin, Koren.
 " *O.* Baköy.
 " *T.* Albert and Egil Tömte.

Aurorae were photographed from one or several of these stations during the following nights:

1932

August	29-30	Stations C, Li, O, T
September	23-24	" C, Li, O
October	23-24	" C, Li, T

1933

February	18-19	" Lö
"	22-23	" Lö
March	18-19	" C, Da, Li, Lö, N, O
"	19-20	" Lö, N
"	21-22	" C, K ₄ , Li, O, T
"	23-24	" Li, Lö, N
"	24-25	" Lö, N
April	15-16	" C, Da, K ₄ , Li, Lö
"	18-19	" Lö
"	21-22	" C, K ₄ , T
May	1-2	" C, Da, K ₄ , Li, Lö, O

As to *visual observations* of interest in connection with the photographs, notes concerning the photographs were made at the stations on the abovementioned nights, and moreover, visual observations were received on the following nights:

1932

August	27-28	From Bærum near Oslo
"	29-30	" Da
"	30-31	" Da
September	4-5	" Da
"	7-8	" C, Da
"	18-19	" Da
"	19-20	" Da
"	23-24	" C, Li, O
"	25-26	" C, K ₄ , T, Da
"	29-30	" Da

October	4-5	" Da
"	23-24	" C, Li, Da
"	24-25	" C, Da
"	25-26	" C, Da
November	16-17	" C, Da
"	28-29	" Da

1933

January	27-28	" Da
"	28-29	" Da

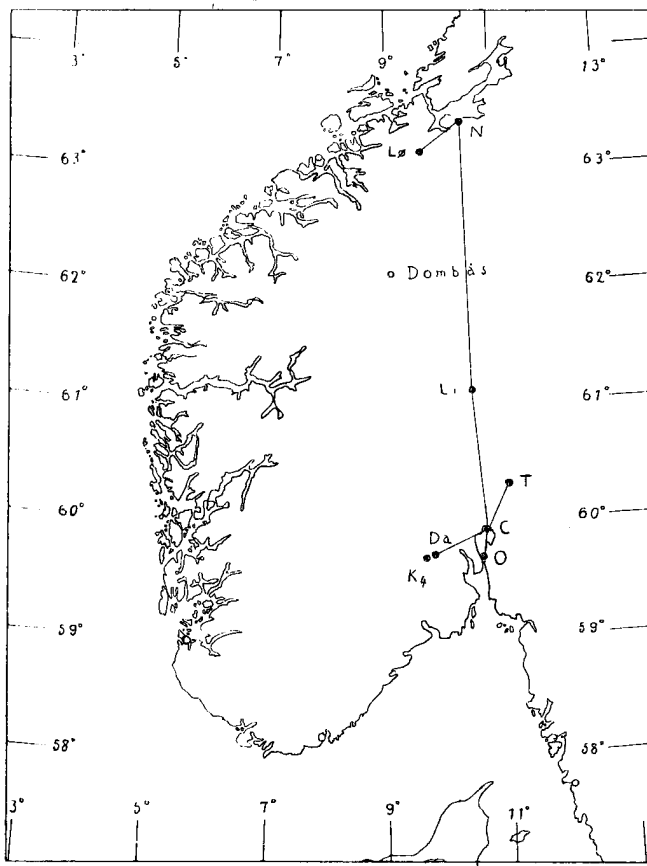


Fig. 1. Geographical positions of the photographing aurora stations.

On fig. 1 the geographical situations of these stations are seen.

Each station was provided with an aurora camera and with plates Sonja EW from Heme-lingen Bremen, sensitive to blue, violet and ultra-violet. All except Da had field telephones and could be connected by state telephone lines when simultaneous photographs should be taken.

Assistants were:

January	29-30	From	Da
February	14-15	"	Da
"	19-20	"	Da, Koppang
March	3-4	"	Lö
"	20-21	"	Da
April	6-7	"	C
"	16-17	"	Da
"	17-18	"	Da, Ustaoset
"	18-19	"	Da
"	19-20	"	Da
"	20-21	"	C
"	21-22	"	Da
"	22-23	"	Da
"	23-24	"	Da

From this list it can be seen that a great many observations were taken from Darbu (Da). At that station I had a most enthusiastic and zealous observer, Mr. *Olaf Hassel*. In spite of the fact that he is deaf and dumb, he has since 1919 sent me an enormous amount of observations and photographs of aurora of great scientific value.

3. List of aurora photographs which might be used for determining height and position.

From a detailed study of all the aurora photographs I have worked out a list of all which could probably be used to determine height and position of the aurora in space. This list is given in Table 1 at the end of the paper. Most of the pictures have been measured out.

The headings have the following meanings:

For each date the stations in action are given by the letters C, O, etc., as explained in section 2. The names of the assistants are added.

PN means the current number of the sets of simultaneous photographs or of the single photograph of the aurora.

St means the stations from which the photographs were taken. The letters of the stations are combined by dashes if the simultaneous photographs could be used for height measuring, if not the letters are separated by commas.

MET means the mean European time (12^h Greenwich = 1^h MET) for the middle of the exposure, in hours, minutes and seconds (22.08.30 means 22^h,08^m,30^s for instance).

Ex means the time of exposure, in seconds.

F means the auroral form according to the international *Photographic Atlas of Auroral Forms*, Oslo 1930. Printed by A. W. Brögger, that is

HA Homogeneous quiet arcs

HB Homogeneous bands

PA Pulsating arcs

DS Diffuse luminous surfaces

PS Pulsating surfaces

G Feeble glow

RA Arcs with ray structure

RB Bands with ray structure

D Draperies

R Rays

C Corona

F Flaming aurora

Ref.Con. means the constellation towards which the cameras were pointed, with the abbreviations universally adopted.

Remarks. Here additional remarks on the aurora or on questions regarding it are given.

4. The baselines used to determine height and position of the aurora.

When the stations were connected by state telephone lines, simultaneous photographs could be taken from two stations. The corresponding base lines have been calculated from the latitude and longitude of the two stations, with the following results:

List of base lines.

St.	g	a ₀	h ₀	δ ₀	t ₀	Calculated by
C-Li	132,65			29,49	174,096	Herlofson 1936
C-K ₄	65,50	66,34	-0,18			Anda 1933
C-O	27,36	13,02	0			Geogr. Survey 1921
Li-C	132,65			-29,49	-6,125	Herlofson 1936
Li-K ₄	165,35	15,97				Leif Rosseland
Li-O	158,66	357,61	-0,82			"
Lö-Li	230,58			-27,36	-12,35	Herlofson 1937
N-Li	258,77			-27,68	-1,27	"
N-Lö	48,26			-17,16	51,78	"
O-K ₄	53,82	89,46	-0,39			Anda
T-C	46,71			-27,33	27,71	Herlofson 1936
T-K ₄	104,98	49,20	-0,54			"
T-O	73,78	20,32	-0,54			"

Here the headings have the following meaning:
 St means the stations at the two ends of the base line. The first one is the head station, the second the substation.

g is the length of the base line, in kilometers.

a_0 is the azimuth of the point in the sky where the line from the head station to the substation hits the celestial sphere as seen from the head station. a_0 is reckoned from south westwards from 0 to 360° and is given in degrees with decimals.

h_0 is the height of the same point seen from the head station. h_0 is positive over and negative under the horizon.

δ_0 is the declination of the same point positive over and negative under the celestial equator.

t_0 is the hour angle of the same point, reckoned from south positive westwards from 0° to 180° and negative eastwards from 0° to -180° .

All angles are reckoned in hundredths of a degree. a_0 and h_0 were used in earlier calculations, δ_0 and t_0 in more recent ones. See next section.

5. Brief summary of the methods of measuring and calculating the negatives.

The measuring and calculations of the plates to find height and situation of the aurora were made by my assistants, Olaf Egeberg and Nicolai Herlofson, and later revised to some extent by Johs. Östvold and myself.

The measuring was done by optical and graphical methods, thus avoiding the very tedious numerical calculations. Only the rapid calculation of sidereal time is done numerically.

It may be useful to give a short account of the methods:¹⁾

The two negatives with aurora and stars are placed in two identical projection lanterns giving each an enlarged copy on a wall, where sheets of art paper (to enhance the contrasts) are fastened by drawing pins. The enlargements are adjusted so that 1 cm on the paper approximately corresponds to 1° on the sky. The exact adjustment is done later.

The first thing to do is to identify the stars and choose three of them as reference stars. For

that purpose good star maps on a scale of $1 \text{ cm} = 1^\circ$ are essential. We have found such star maps, made by *M. Beyer*, in 24 sheets containing all stars to the 9th magnitude.¹⁾

With the help of these maps the stars are rapidly identified. Moreover, on these star maps we have added the Greek letters of all the stars of the first three magnitudes, to facilitate orientation.

Then the optical center and three stars are marked on the sheets as reference stars.

Now, as proposed by Mr. *Egeberg*, the sheets are taken off and the necessary angles for these three stars are found by graphical methods,²⁾ and the calculated positions are marked anew on the sheets by means of underlying nets.

The sheets are then again placed on the wall and the distance of the lanterns adjusted until the images of the three stars coincide with their marked positions; then the sheets are again fixed on the wall by drawing pins.

The procedure now continues as explained in the references given: The outlines of the aurora are drawn and if necessary more stars, on the two sheets. As the two images are projected side by side this is easily done. Corresponding points of the aurora are easily found either by direct comparison or by the direction of the displacement given by the nets.

On the sketch from the head station a series of points of the aurora is now selected, and by means of the nets placed under the sketches and illuminated from below, the values of necessary angles, in particular the parallax, are found. Another set of nets give height and azimuth of the selected points.

From the parallax p , the distance r from the head station to the aurora point is found by slide rule and from r and h the height H and the geodetic distance D are taken out graphically. Finally the geographical situation of the aurora is found by another graphical procedure.

For details see the above mentioned paper in Geof. Publ. Vol. XII.

¹⁾ See: Some Results regarding Height and Spectra of Auroræ etc., Geof. Publ. Vol. XII, No. 7, p. 5.

¹⁾ Sternatlas enthaltend alle Sterne bis zur 9ten Grösse sowie die helleren Sternhaufen und Nebel zwischen dem Nordpol und 23° südlicher Declination für 1955, von Max Beyer, ausgeg. von Dr. K. Graf, Hamburg 1925.

²⁾ See the explanation given by Mr. Herlofson in the paper just mentioned, Geof. Publ. Vol. XII, No. 7, p. 6-9.

6. List of height and situation of all the measured aurora points.

In Table 2 at the end of this paper the height and situation of all the measured aurora points are given, 1427 in all. Many of the heights of the lowest and highest points are extrapolated. Moreover, situation is given for many aurora forms, arcs in particular, assuming a reasonable value for the height.

The headings in Table 2 have the following meaning:

- No. means the current number of the photograph or of the two simultaneous photographs.
- Pt means the selected point of the aurora.
- MET means the time of the middle of the exposure in Central European Time (12^h Greenwich time = 1^h MET).
- St. means the station or stations from which the aurora was photographed. First letter headstation, second letter substation.
- F means the auroral form according to the International Photographic Atlas of Auroral Forms (See explanation to table 1).
- S indicate the situation of the selected point on the aurora:
 - l means that the point is *at* the lower border or at the base of a ray,
 - l' that it is near this border or base,
 - m that it is between lowest and highest part of the aurora,
 - h that it is *at* the upper border or at the summit of a ray,
 - h' that it is near the upper border or summit.
- ϵ_2 means the angle between the direction from the substation to the aurora point and the plane perpendicular to the base line at the substation.
- p is the parallaxe.
- h is the altitude of the aurora point over the horizon at the head station.
- a is the azimuth of the aurora point seen from the head station. a is reckoned positive from S over W to N and negative from S over E to N.
- D is the distance along the surface of the Earth from the head station to the vertical projection of the aurora point.
- H is the height of the aurora point over sea level.

θ is the angular distance from the magnetic axis point in northern Greenland (latitude 78°30', longitude W of Greenwich 68° 38'.)

PART II.

OBSERVATIONS AND MEASUREMENTS IN CHRONOLOGICAL ORDER.

7. Plan for the following sections.

In the following sections an account of the aurora and its height and situation will be given for each night in chronological order, based both on visual observations and on the measurements of the plates.

As to the visual observations, long series were made at the stations in connection with the photographic work. From the station Darbu (Da) my excellent observer Olaf Hassel, who at that time had only a Ernostar camera at his disposal (one picture on each plate 9 × 12 cm), supplied his visual observations with drawings of the outlines of the aurora on star maps; an extract of his very extensive observational work will be given on each date.

For the rest of the visual observations the latitude and longitude of the places of observation are given below:

- Da, Darbu, Latitude 59.41.56, Longitude 9.48.17.
E. Gr. Height 55 meters.
- D, Dombås, Lat. 62.05.30, Long. 9.05.54, Height 550 m.
- U, Ustaoset, Lat. 60.30., Long. 8.02.42, Height 990 m.

In the following photographs and observations follow in chronological order.

8. Auroræ in August 1932.

On August 27-28 I received a report from the telegraph department that earth currents were observed. Being in Bærum, some kilometers west of Oslo, I watched the sky in the evening. In spite of cloudy weather I saw through breaks in the clouds a glow in the north. No photographs were taken from my stations, as the weather was too cloudy.

On August 29-30 earth currents were reported again, 15 milliamperes at 17^h30^m. When it became dark an arc was visible in the north, and the

aurora stations were notified. The first pictures were taken at 22^h, see Table I.

From Darbu Olaf Hassel made a series of visual observations, from which I quote the following:

- 21.50 the aurora line 5577 Å visible.
- 22.05 feeble narrow arc in the north.
- 22.15 stronger. The position of the arc marked on a star map.
- 22.35–23.00 as before. Position marked on a star map.
- 23.05 the arc more feeble.
- 23.07.30 the first ray.

In Oslo photographs of the arc were taken simultaneously with photographs from other stations. From the best ones the geographical situation of the arc was found assuming for the lower border a height of 100 km.

After 23.07.30 only feeble rays were seen; a series of photographs were taken to determine height. The measurements showed that they all were situated in sunlight. The rays were, like the arc, lying between the small-circles $\theta = 24^\circ$ and $\theta = 26^\circ$, but farther west towards the Feröe islands.

The situations of the arcs are seen on fig. 2.

9. Auroræ in September 1932.

September 4–5.

From Darbu Hassel observed feeble aurora glow from about 20 to midnight. Here are his further observations:

- 0.0–0.6 narrow homogeneous arc from 12 CVn to α, β Gem. Position drawn on a star map.
- 0.20–0.28 isolated pulsating arc. Periods of pulsation observed and position drawn on a star map.
- 0.28–0.40 isolated bit of an arc. Position drawn on star maps.
- About 1^h the aurora had almost gone.
- 1.30–2.30 homogeneous arc again. Successive positions noted on star maps.
- 2.32 aurora gone.
- 3.20 observations ended.

September 7–8.

The stations C, T, K₄ and Li in action, but no pictures succeeded. Some visual observations made from C:

- 22.20 auroral line 5577 Å, glow.
- 22.25 arc in the north.
- 23.00 the arc lower. Aurora line visible up to 12 CVn.

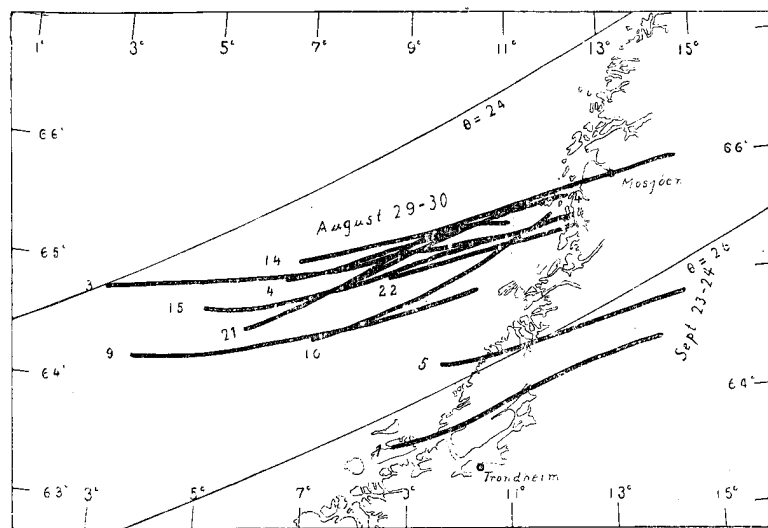


Fig. 2. Geographical positions of auroral arcs on August 29–30 and September 23–24, No 1 at 21, 27, 36 and No 5 at 21, 32, 25.

On August 30–31 Hassel, observed weak aurora again, in N as diffuse surfaces, from 21.15 to 0.30.

- 23.15 as before, the line stronger, no arc.
- 23.25 arc again, but feeble.
- 23.35 arc disappeared, but 5577 well seen.

- 23.45 5577 visible up to half the height of 12 CVn.
- 0.00 5577 visible till a little higher than 12 CVn.
- 0.15 the same.
- 0.30 5577 very feeble.
- 0.45 the same.
- 1.00 part of an arc visible in NW.

Later feeble aurora until 3^h when observations ceased.

Of much more interest were the observations made by Hassel at Darbu. He observed the periods of pulsating bits of arc and found between two consecutive maxima of intensity a mean of about one minute. Hassel's observations are published in my paper *Remarkable Aurora Forms from Southern Norway*,¹⁾ III-IX, p. 22-23.

September 18-19 and 19-20.

Both nights weak aurora in N. were observed from Da by Hassel. Nothing of particular interest. *September 23-24.*

At 20.15 strong aurora line 5577 seen in N. The aurora stations in action but only single photographs could be used. (Table 2). The positions of an arc are seen on Fig. 2. Later rays were observed but no simultaneous photographs succeeded.

From Da Olaf Hassel made a series of observations, in particular of pulsating arcs between 23^h and 24^h. Some of his observations are given in "Remarkable Aurora Forms," p. 23. Hassel's observations from 20^h to 3^h are very carefully made, with drawings on star maps of the aurora's position.

September 25-26.

When it cleared up in Oslo at 22^h, an auroral arc was visible in N. The stations C, T and K₄ were soon in action and about 10 simultaneously pictures were taken, but none of them could be used.

At Da, however, Hassel made a great many observations from 20.20-3.25 supplied by drawings on star maps and observations of periods of pulsation.

Here is an extract of his notes²⁾:

- 20.20 situation of the arc drawn on a star map.
- 20.29.20 the arc dissolved in short rays. Figures on star maps.
- 20.42 rays gone. Arc again.
- 21.00 the arc narrow. Drawn on a star map.

¹⁾ Geof. Publ. Vol. XIII, No. 7.

²⁾ Later Hassel has written to me that 25 seconds must be subtracted from all times noted.

- 21.25 the arc double. Drawn on a star map.
 - 21.27 the lower arc turns round in east to the left of Gem. and continues back again towards west, lower down. Sketches at 21.28, 21.33, 21.35 and 21.40.
 - 21.50 The arc more regular again. Sketch.
 - 21.55 Some long feeble rays from the arc between α UMa and α Gem.
 - 22.12 the arc broader.
 - 22.18.30 double arc which dissolved in diffuse broad rays and irregular cloudlike aurora (DS); continued till 22.40.
 - 22.50-23.17 some single rays moving westwards.
 - 23.25 New arc close under ψ , μ , λ UMa. Continued till about midnight. Some short rays.
 - 0.06 the arc pulsating. The periods of pulsation were observed.
 - 0.18 pulsating and flaming. Periods of pulsation observed.
 - 0.40 the pulsations and the flaming aurora gone.
 - 0.43-1.06 pulsations and flaming aurora again, but more feeble.
- Till 3.25, when observations ended, some feeble remnants of aurora from time to time. Several notes.

September 29-30.

From Hassel I received a series of observations made at Da. Here is an extract:

- 20.45 feeble glow with aurora line in N.
- 20.52 summits of some rays over the horizon in N.
- 21.19 some feeble rays up to ζ and ψ UMa lasted about 30 seconds. Sketches.
- 21.39 and 21.40 other feeble rays up to 12 CVn and a little higher. Sketches.
- 21.45 Ray up to γ Boo. Lasted about 2 minutes. Later, till 2^h only glow in the north.

10. Auroræ in October 1932.

October 4-5 at 20^h40^m Hassel observed feeble glow in N, with a weak aurora line 5577.

October 23-24.

At 21.10 Høstmølingen telephoned from Li and said that a fine arc was seen in N, close over 12 CVn. I notified my other aurora stations, but the aurora soon faded away and no photographs succeeded because of clouds and too feeble aurora.

From his station Da Hassel made the following observations:

- 20.40 Feeble aurora line 5577.

- 20.49 Feeble diffuse ray, visible 1 minute from the horizon up to γ Boo.
 20.54 New feeble diffuse ray near the place where the former had appeared.
 20.55–21.05 No rays.
 21.05 Diffuse ray of short duration from the horizon to μ UMa. Later the aurora was diminishing and had completely gone at midnight.

October 24–25.

The aurora was seen again from Oslo, low in the north, but the stations were not warned. From Da the following observations were made by Hassel:

- 18.55 The aurora line seen, but very feeble and one quarter of an hour later it had disappeared.
 20.45 no trace of aurora.
 21.02 the aurora had reappeared; broad diffuse rays were moving westwards from ψ UMa to 12 CVn, till 21.04.
 21.15–21.20 new feeble rays in thrift westwards under μ UMa to Boo. Strong ray at ε Boo. at 20.20.
 All the rays from 21.02–21.20 reached from the horizon up to the same height as ψ UMa and 12 CVn.
 21.28–21.29 narrow ray from the horizon up to ψ UMa moving slowly westwards.
 21.48.30 two rays from the horizon up to 12 CVn and to the middle between ψ and μ UMa.

From 23.30–0.30 no more aurora and no aurora line.

October 25–26.

From 18.00 to 21.00 I observed feeble pulsating aurora at different places between CrB and Gem. No photographs were taken. From his station Da Hassel gave the following more complete report:

- 19.10 an isolated pulsating arc was discovered in W.
 19.15–19.20 Drawn on a star map. From CVn. to ψ UMa.
 19.20–19.25 Drawn on a star map. Narrower, same position. Periods of pulsation were 25, 46, 27, 35, 103 and 14 seconds. Later the periods were much longer, about 60 seconds.
 19.35 Drawn on a star map. Same position.
 19.40 " " " " " further N, towards Gem.

- 19.43–44 Drawn on a star map, the same.
 19.45 " " " " " " "
 19.48 " " " " " , thicker under \varkappa UMa
 19.50 " " " " " " "
 19.52 the pulsating arc more feeble and then it vanished till 20.10.
 20.10–20.15 only a feeble bit of it from the horizon up to ρ Boo. Vanished again till 21.45.
 21.45–21.50 from CrB up to γ Boo. Later nothing seen till 1^h when the observations ended.

11. Auroræ in November 1932.

November 16–17.

In spite of strong moonlight Hassel discovered at 18^h13^m from Da an auroral arc from CVn. to Gem; lower border 6° under μ UMa. 3 successive positions of the arc, at 18.15, 18.20 and 19.00 were drawn on star maps. After 19^h 04 no more aurora were seen.

November 28–29.

From the same station Hassel reported a feeble arc, about 20°–25° long, lower border some degrees over the northern horizon. The aurora line was very feeble. It lasted only from 18.10 to 18.15. No more aurora observed till 19.30 when the sky became overcast.

In December no auroræ were observed.

12. Auroræ in January 1933.

January 27–28.

Olaf Hassel sent the following report from his station Darbu:

- 20.20 In a break of the clouds I discovered an arc, about 3° broad. Very feeble and difficult to draw on account of foggy weather. To the right of Vega.
 20.35 almost gone.
 20.37 only a feeble glow. Auroral line.
 21.07 pulsating but very feeble. Fog to about 22^h. Glow over clouds in N.
 22.30 clear sky. Feeble glow in breaks of clouds. Fog and clouds till 1^h when observations ended.

January 28–29.

From his station Da Hassel sent the following report:

Till 21^h no aurora seen.

- 21.27 I observed a feeble diffuse ray 2° broad, quiet, from the horizon up to γ Cygni. Lasted for about 2 minutes. Along the northern horizon the aurora line was seen, but very feeble until past 22^h.
- 22.18 no aurora line in N, NNW and NW.
- 22.35 the aurora line again visible in N and NNW, but very feeble.
- 22.45 feeble auroral surface (DS) in Lyr. and Cyg.
- 23.05 view hindered by fog.
- 23.20 The same DS, drawn on a star map.
- 23.26–23.27 more feeble. Fog from 23.27 till 0.25, but then no more aurora. Later fog again. Observations ended at 1.30.

January 29–30.

Very feeble aurora observed from Da by Hassel:

- 19.40 Feeble summit of diffuse ray in Her.
- 19.42 Another on the same place.
- 19.47 Summit of a ray to the right of Lyr.
- These rays moved slowly west, and their bases were under the northern horizon. Drawn on star maps. Later some similar rays and some DS, until midnight. The aurora was so feeble all the time that it was very difficult to see the aurora line 5577 Å.

13. Auroræ in February 1933.

The first dates with aurora were:

- February 12–13:* 19.10–19.15 very weak aurora line. Later nothing.
- February 13–14:* 19.05–19.25 very weak aurora line. Later nothing.

February 14–15.

At about 19^h the sky began to be clear and at 19.50 the aurora line was visible in breaks of the clouds in N.

- 20.10 the line stronger.
- 20.15 the lines strong, between Lyr. and Her. rays.
- 20.20 rays gone.
- 20.25 new diffuse rays, for about 1 minute.
- 20.27–20.29 broad ray about 5° to the left of Vega. Down to the horizon. Summit hidden behind clouds.
- 20.30–20.45 Feeble rays from time to time low in NW.
- 20.55 An arc appeared in N. The western part drawn on a star map. The eastern hidden

behind clouds. Some minutes later it had gone.

- 21.00 only faint glow.
- 21.04 feeble ray during 30 to 60 seconds.
- 21.10–21.13 Glow.
- 21.14–21.15 Only glow in the part under γ Cyg.
- 21.17–21.18 The aurora fainter and then disappeared.

No more aurora till midnight, when observations ceased. At 3^h40^m no aurora.

February 18–19.

From my station Lökken Verk (Lö) southwest of Trondheim, my assistant, Captain Herstad sent me four fine photographs of a strong arc in the north, taken at 0.21.30, 0.31.30, 0.46.30 and 0.51.30.

Supposing that the lower border was lying 100 km. over the earth, we have mapped the geographical situation of the arc. It was lying between 66° and 68° northern latitude and about 250 km. to the north of the arcs from August 29–30, 1932. The distance from the magnetic axis was between 22° and 24° , thus the situation in the aurora belt.

February 19–20.

That night Hassel made in Da a long series of observations with drawings on not less than 34 star maps of arcs from 20^h05^m to 20^h50^m. Here is an extract of his observations:

- 19.05 a very feeble arc near the northern horizon.
- 19.30 drawn on a star map. Now still more feeble, and a short time afterwards it had disappeared. ι Her. at the lower border.
- 20.00 the arc came again.
- 20.05.30 rays along the arc. Drawn on a star map. Vega and π Her at the upper border. Rays up to ι Her.
- 20.08 New arc (HA) appeared. α Peg., Deneb, γ Dra. at lower border, γ Boo. at the upper border. Drawn on star maps.
- 20.15 The same, drawn on a star map together with the lower one. Same situation. At Deneb about 8° broad.
- 20.20 The western part of A as before. The eastern from γ Dra. divided in two arcs on each side of γ Boo. Drawn on star maps.
- 20.30 The same. Western part going through the middle of the square of Pegasus, of the

eastern from Deneb only the lower part left.

Drawn on star maps.

- 20.35.40 Sketch on star map. Eastern part more narrow, from γ Bootes over ξ Dra. to Cep. From Cep. to γ Peg. broader and divided into two to three arcs.

This sketch, combined with observations from Koppang and Sunswall, can be used to find the height and situation of the arc. We come back to this later.

- 20.40 Sketch on star map. Western part has γ Peg. in the upper border.
- 20.45 Sketch on star map. Eastern part gone. *The lower arc in North grew stronger when the upper arc disappeared.*
- 20.50 The whole upper arc gone. The lower one under Vega and π Her. Sketch on star map.
- 20.55 The western part of the upper arc came again as two prominences, one towards α , β Cas, another towards λ And. Sketch on star map.
- 21.00 Sketch on star map. Lower arc under Vega.
- 21.01–21.02 The western part of the upper arc vanishes and has two prominences up to α and δ And. Sketch on star map.
- 21.05 Lower arc again, under Vega. Sketch on star map.
- 21.08 Last trace of the upper arc from the horizon up to δ And. Sketch on star map.
- 21.10 Lower arc rising. Vega in the middle of the arc. Sketch on star map.
- 21.20 Sketch of the lower arc on star map. Stretches to the square of Pegasus.
- 21.30 Sketch on star map. The same.
- 21.32.30–21.33 The eastern part more feeble.
- 21.35 Under the arc another close to the horizon. Sketch on star map.
- 21.40 The same. The lowest arc gone. Sketch on star map.
- 21.55 The same. Sketch on star map.
- 21.57–21.58 The arc fainter. Strongest under γ Cyg.
- 22.00 The arc still fainter.
- 22.01 The arc changes to a glow.
- 22.05 Glow.
Observations postponed until
- 22.55–23.05 Only glow in N.
- 23.10 A new very feeble arc very low in N.
- 23.15 Sketch on star map. The new arc from Peg. to Lyr. Lower border 5° under γ Cyg.
- 23.30 Sketch on star map. The same.

- 23.35 The arc broader and stronger.
- 23.40 The western part of greenish colour. Sketch on star map.
- 23.45 The arc still stronger with dark segment under it. Sketch on star map.
- 23.50 The western part pale-green. The breadth in the western part 3° , in the middle $2\frac{1}{2}^\circ$ and in the eastern part $1\frac{1}{2}^\circ$. Sketch on star map.
- 23.56 The dark segment still darker.
- 23.56.30 The arc dissolved in short broad rays.

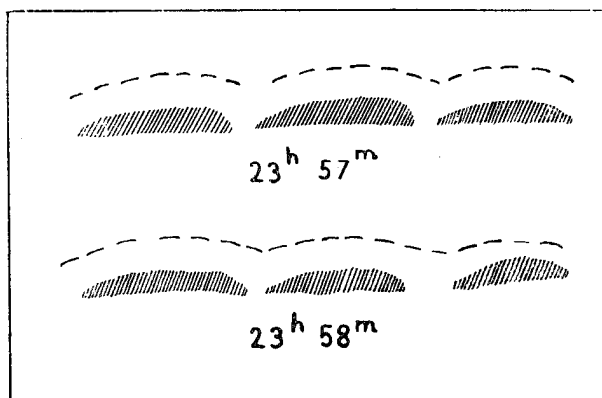


Fig. 3. Sketch by Olaf Hassel of an arc with 3 successive segments, on February 19–20, at 23, 57 to 23, 58.

- 23.57–23.58 The aurora has now the form shown in fig. 3.
- 24.00 The same. Sketch on star map.
- 0.02–0.04 The same, now like an HA beginning to divide in two.
- 0.06 The two arcs fine. Sketch.
- 0.10–0.11 Western part of the arcs changed into flaming aurora. Later diffuse rays, flaming and pulsating aurora. Lasted to about 1^h. At that time long feeble diffuse rays in NW (And. and Tri.).

The rest of the observations till 4.40 concern only diffuse feeble surfaces and flaming and pulsating aurora with glow (DS, F, PS and G). Observations ended at 4.40.

Observations of the aurora this night was also received from Adolf Lindvik, Koppang (latitude $61^\circ 57'$, longitude $10^\circ 97'$ east of Grnw.) and from Mr. Wilhelm Österberg in the Swedish town of Sundswall. The letter from Mr. Lindvik is supplied with a sketch of the auroral arc at 20.45 which, together with Hassel's drawing, makes possible a calculation of height and situation. The base line

Darbu-Koppang had a length of 218.5 km. The height of the arc was found to be 117 km, and its geographical situation was from Sundswall over Sognefjord to the Shetland islands. Comparing this situation with the observations from Sundswall, the agreement was fairly good.

February 21-22, 1933.

From 17^h to 18^h earth currents of 25 milliampères were reported from the telegraph department. The sky was overcast with snow, and no aurora could be seen.

February 22-23.

Same remarks. At Lökken Verk, however, Mr. Herstad took some pictures, but they were not good enough to be measured.

Mr. Koren, and at Lökken Verk Captain Herstad did excellent work.

A preliminary report of the obtained results is published in 1934.¹⁾ From the strong auroral and magnetic activity in the second half of February it was probable that the second part of March would be favourable. Moreover I wrote to the director of the Auroral Observatory in Tromsø, Dr. Leif Harang, to get a curve of the magnetic activity in January and February, which might be used to give a forecast of the activity in March according to the 27 days period. On Fig. 4 the activity is seen, and the continuation of the curve in March and April corresponds to the great activity which came again during these two months.

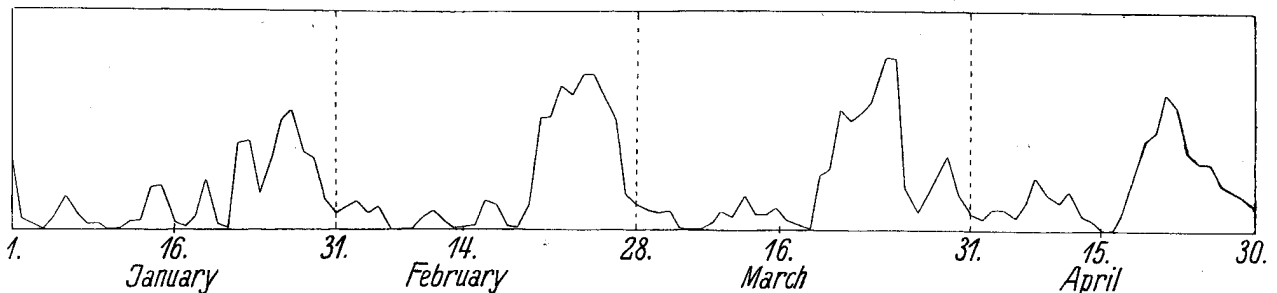


Fig. 4. Magnetic activity from January 1 to April 30 as observed at the Tromsø auroral observatory.

February 23-24.

Same remarks.

After this the period February 21-24 would probably have given fine results if the sky had been clear.

14. Preparations for an expedition to Trondheim.

As the results of the photogrammetric work in the Polar Year in southern Norway until March 1933 had been very poor, I decided to start an expedition to Trondheim nearer the aurora zone to get more material. As head station I was allowed to use the platform on the roof of the Physical Institute of the technical highschool in Trondheim (Norges tekniske Högskole) (N), and as substation Lökken Verk (Lö). The latitude and longitude of these two stations are given in section 2 and the constants of the base line N-Lö in section 4.

At the station in Trondheim I received most valuable help from two students, Mr. Westin and

The results obtained were also quite successful. From 18-24 March a long series of fine aurora-photographs were secured. Moreover the southern stations round Oslo were in action, and Olaf Hassel made a long series of visual observations which gave a most valuable supplement to the photographic work. For details we refer to the following sections.

15. The Aurora of March 18-19, 1933.

In the following the results of the photographic work and visual observations are given in chronological order (See Table 1 and 2).

My two stations Trondheim (N) and Lökken Verk (Lö) were ready for work at 21^h45^m, and the first photographs were taken at 22.35. Hassel began his observations at 22.55. The first 19 sets taken simultaneously from N and Lö could not be used for height determinations on account of clouds and too small parallaxes, but a series of

¹⁾ Ueber eine Nordlichtexpedition nach Trondheim in März 1933, Gerlands Beiträge zur Geophysik, Bd. 41, p. 382-386.

photographs from N gave the geographical situation assuming that the height of the lower border of the arc to be 100 km. From this it was seen that the arc was moving southwards from south of Tromsø to Mosjøen, a distance of about 140 km, in a direction normal to the arc. This gives a velocity of about 225 km. per hour.

At 22.55 this arc came over the horizon in Darbu according to Hassel, who says: At 22.55 I saw a feeble arc appearing in the north. The arc was at that time over Bodö.

At 23.15 Hassel says that the arc changed into RA. From the Photographs in N this change to RA was already seen at 23.13.

Simultaneous photographs from 23.16 gave for the lower border (RA) heights from 110 to 130 km.

Later RA changed to curtains RB, which descended to about 100 km (pictures no 33 and 35) at the same time as the intensity increased.

In this period Hassel's observations were:

- 23.15 Fine very low HA drawn on a star map. Lower border 3° under β And. 11° under γ Cyg. Rays begin.
- 23.30 Rays gone. Changing to G (The RB Nos. 33 and 35 were under the horizon in Darbu).
- 23.39 Isolated aurora in NW round Algol. Sketch on a star map.
- 23.45 The isolated aurora gone. Another in Tau.
- 23.55 The G still fainter.
- 0.00–0.05 The G as before.

Set No. 47 gives a short pulsatory ray going down to about 87 km. The vertical thickness is about 26 km., much shorter than in the set No. 20, whose lower border was at about 120 km. and vertical thickness about 50 km.

At 0.12.32 a very distant curtain was photographed low in NW (No. 53).

0.13–0.15 Hassel observes a stronger glow in NW.

0.17–0.18 Hassel observes greenish colour in the diffuse arc in NW. At the same time a set, No. 57, was taken from N–Lö with lower border at about 100 km. The curtain was lying between 68° and 69° latitude and 3° and 5° longitude E of Greenwich.

0.20.30 Hassel observed three arcs of the flaming aurora, going successively upwards from the arc with great rapidity.

The following sets from N–Lö, no 62, 63, 64 and 65 are interesting in so far as they show a distant curtain and a band to the right of it.

They were lying respectively 400 and 200 km. west of the Lofoten islands, 21 to 24 degrees from the geomagnetic axis. They were below the horizon for observers in Oslo. See Plate 1.

An arc began now to appear from the southern stations C, Da and Li. At N and Lö it was much higher in the sky, but the direction of displacements was not favourable to the pictures taken. At about 0.27.34 pictures were taken from C and Li, and the Li pictures could be used together with the picture at 0.26.54 from N, correction made for the motion of the arc as seen from N. The results seem to be good. The arc was lying over Namsos. Lower border from 101 to 105 km. The intensity of the arc increased successively and at 0^h36^m it was so strong that an exposure of 2^s almost overexposed the plate. The height was found to be down to 94 km. and the arc was lying over Kristiansund and north of zenith in Lökken. In the meantime the eastern end had bent around and formed a very fine horse-shoe in NE from 0.39 to 0.41.

Fine photographs of this band are published in the above mentioned report: Ueber eine Nordlichtexpedition nach Trondheim in März 1933, plate X. Mean of the 10 heights along the lower border (sets No. 85, 86, 87 and 88) was 94 km. in round numbers.

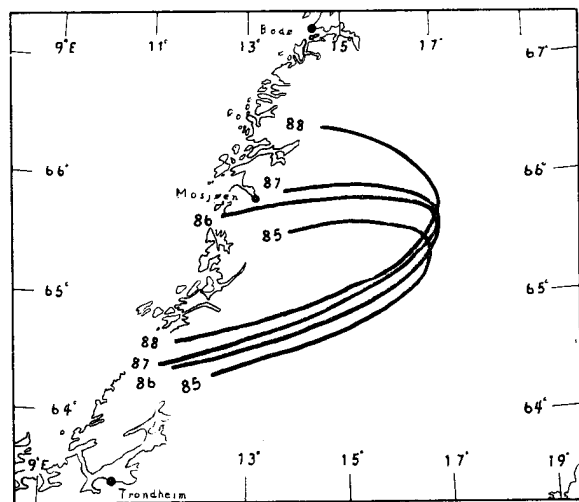


Fig. 5. Geographical positions of the band of March 18–19 from the photographs no 85, 86, 87 and 88.

In fig. 5 are seen 4 successive geographical situations of the band, supposing the height of lower border to be 94 km.

Corresponding observations from Darbu by Hassel¹⁾ run as follows:

- 0.45 Two arcs HA in N. Drawn on a star map.
- 0.50 The upper one gone except a bit from the western horizon up to β Per. Sketch on star map.
- 0.55 As before. Sketch on star map.
- 1.00 The upper arc has come again. Sketch on a star map.
- 1.15 The same. Sketch on star map.
- 1.18 Pulsating aurora observed at N and Lö.
- 1.25 Low HA again. β And. at lower border. Sketch on a star map.
- 1.40-1.48 HA photographed at Li. Clouds.
- 1.50 Two arcs again at Da. Sketch on a star map.

Now comes a series of fine photographs of a *strong arc* in N, No. 98-106, between 1^h59^m and 2^h07^m, which could not be used for height measuring, except No. 103, on account of too small a parallax, but which might give the geographical situation of the arc, supposing the height given.

On account of the intensity of the arc and the results for No. 103, we have supposed $H = 95$ km, which gave the situations seen on Fig. 6. It is remarkable how the arc follows the direction of

$\Theta = \text{constant}$, lying between $\Theta = 24^\circ$ and $\Theta = 26^\circ$. The same arc was observed by Hassel from Darbu and drawn on star maps at 2^h and 2^h05^m. With the supposed height the position from Hassel's drawings coincide with the position on Fig. 6. At 2^h 08^m the arc changed in R.B.

2.15 From Darbu Hassel observed flaming aurora with diffuse rays moving eastwards and situated under Perseus. Later clouds.

At 2.27 came a very interesting form. Short rays assembled to irregular curtains. See Plate 1. In spite of the fact that the Lö picture was a little out of focus, the measurements gave good results, because the parallax is from 9 to 11 degrees, See Plate 1.

The lower part went down to under 80 km (see Table 2).

Later the aurora did not present anything of particular interest except some pulsating forms (see Table 1 and 2).

16. The Aurora of March 19—20 1933.

The aurora this night as seen from N and Lö was of special interest. In fact we recorded on the

¹⁾ He has no observations of the horse-shoe formed curtain.

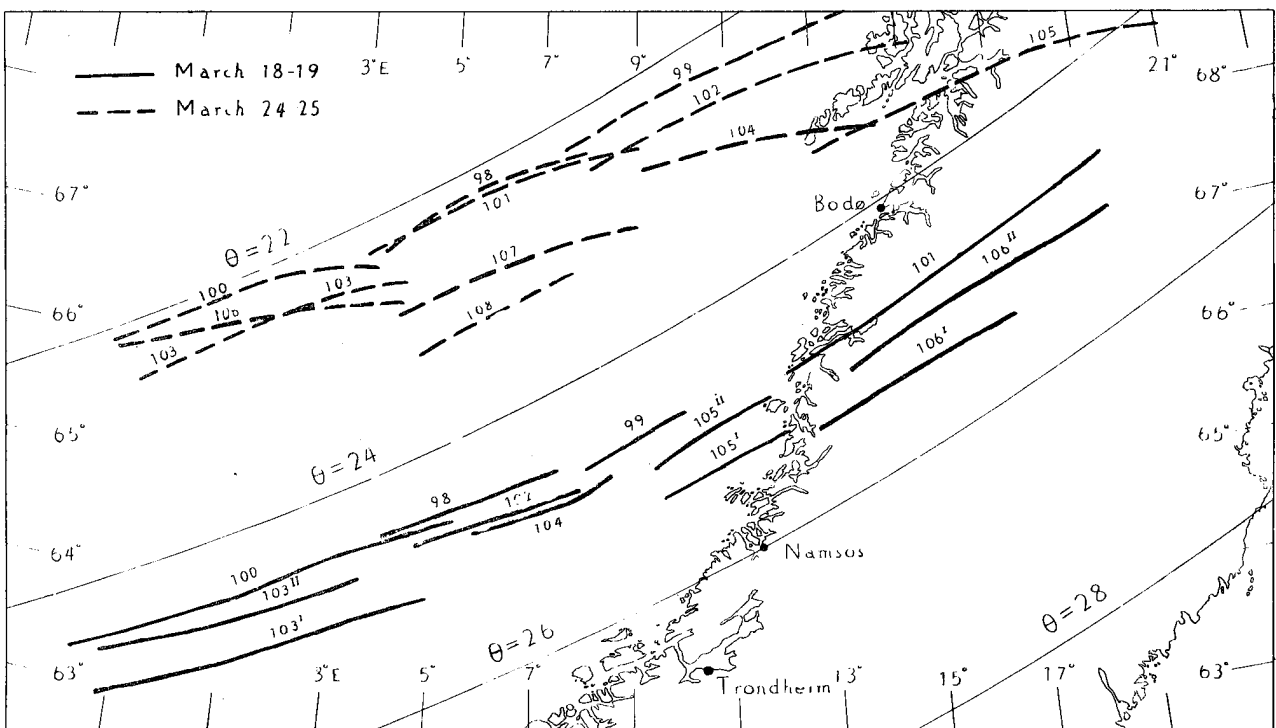


Fig. 6. Positions of arcs on March 18—19 and 24—25.

plates sunlit rays which we did not see, and whose light was probably ultraviolet. This phenomenon has only appeared at one other occasion during our aurora work 1911–1953, namely on February 28, 1929, and is described in my paper *Remarkable Aurora Forms From Southern Norway*,¹⁾ III–IX, p. 4, 8 and 50.

My two stations N and Lö were ready for work at 20.20. The first simultaneous pictures were taken at 21^h6^m towards west, where a diffuse arc was visible. On the pictures the arc is seen, but also some faint rays that we had not seen and which were lying in sunshine. On pictures 3 and 4 some minutes later, when a fainter arc was seen south of the main one, the invisible sunlit rays are beautifully developed, in particular on picture 4, which has been reproduced as plate XI in the above mentioned report in Gerlands Beiträge. See Plate 1.

The plates used, Sonja EW from Herzog Bremen, were sensitive to blue, violet and ultraviolet. The rays reached from about 200 to about 400 km, in full sunshine, and were situated from NW of Kristiansund towards the Ferøe islands, between

24° and 26° from the geomagnetic axis' north point in NW Greenland.

Later rays were visible at the same place, No. 10, 15, 17, 18, but now they were much lower, down to 90–100 km, and in shadow. At the same time they had moved southwards and were now lying between Trondheim and Dombås. They were also associated with pulsating and flaming aurora.

At 22^h pulsating surfaces and pulsating arcs were dominating. An arc with pulsating patches (No. 27) went down to about 82 km. It was lying in the south, over Dombås.

Soon increasing cloudiness at Lö made further simultaneous work impossible. However, at Trondheim some pictures of an arc were taken at 23.30. Supposing the height equal to 100 km., it stretched from Lofoten westwards to a point 66° north, 1° west of Greenwich. See Fig. 7.

These were the last pictures taken. At 1^h20^m the work ended on account of cloudiness, unfortunately too early. In fact the next day my assistant Koren gave me the following observations (from the night 19–20 March):

2.20 Clear sky. Strong arc.

2.22 The arc through zenith, two smaller arcs in north.

¹⁾ Geofysiske Publikasjoner Vol. XIII, No. 7, Oslo 1942.

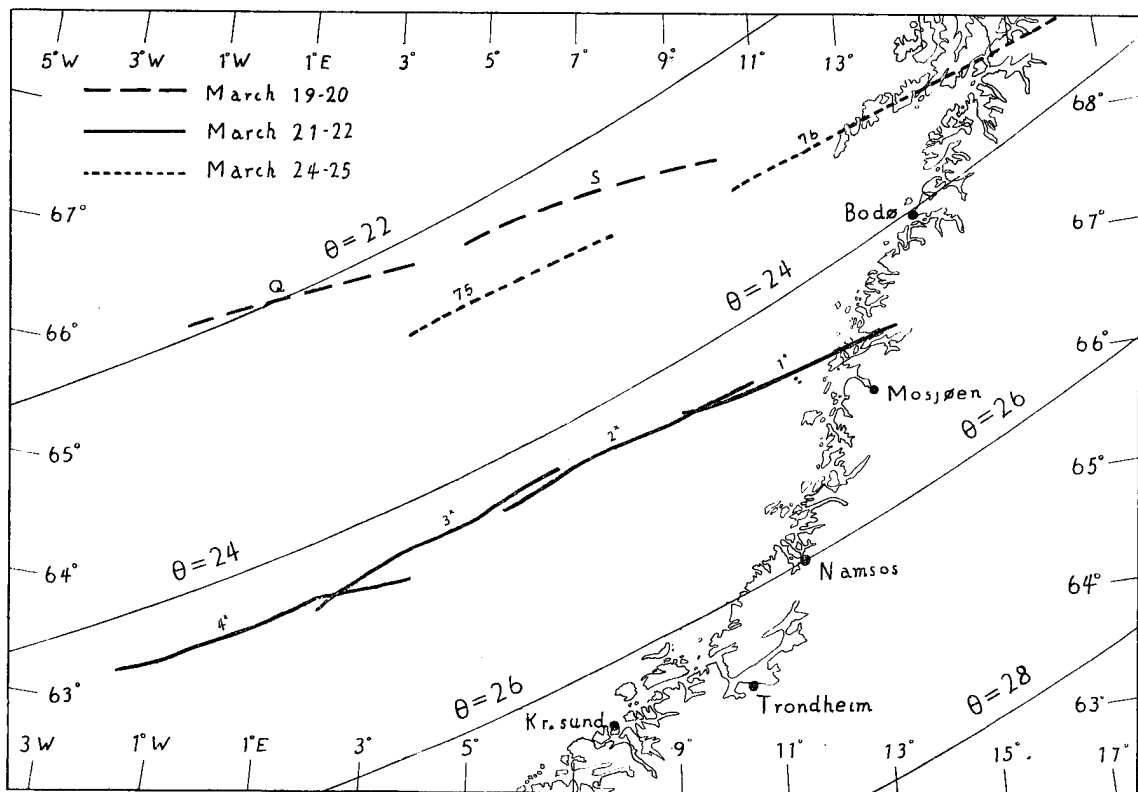


Fig. 7. Positions of arcs on March 19–20, 21–22 and 24–25.

2.25 Band in zigzag, red lower border. Rays along the band. Arcs and rays in other places too.

2.30 Rays.

2.50 Pulsating aurora.

The band with *red lower border* probably was very low. I am very sorry that we missed it.

On my more southern stations the weather was bad. Only Hassel made some observations. Here they are:

21-21.05 Feeble aurora line 5577 in break on stratus clouds in NW.

21.57.45 Through the thinnest clouds I could see the aurora increasing in brilliancy.

22-22.03 The aurora weaker.

22.05 Aurora line visible from N to zenith.

22.20-22.30 The aurora probably gone. Overcast.

23-23.05 No aurora line. Overcast.

23.55-0.05 Perhaps the aurora line visible, but very weak. Overcast.

0.55-1.06 No aurora line.

17. The Aurora of March 20—21 and 21—22.

March 20-21.

On the night of March 20-21 no aurora was observed in Trondheim on account of bad weather.

Among the southern stations only Darbu with Hassel as observer was in action. He says:

At 20.02 during the twilight I discovered in N.N.E. a band RB.

20.19-20.20 Long sunlit rays from the horizon in NW to δ and ζ Cep.

Till 20.46 some rays.

Nothing to see till 23^h, when an aurora arc was seen near the horizon in N. Some sketches on star maps were made at 23.10, 23.20 and 23.40.

23.12.14 the arc dissolved in short rays.

23.15 the arc was again visible as double arc.

23.22 Again short rays along the arc.

23.25 Arc again.

23.55 Aurora almost gone.

23.57 Bit of an arc from the horizon up to the Andromeda nebula. Sketch.

23.58-0.05 Short ray under Cas. in motion westwards. Sketches on star maps.

0.25 Patch at β And.

0.55-1.05 No aurora.

Later only feeble remains at the horizon.

2.40 Narrow arc at the horizon. Sketch on star map. Later only glow with feeble aurora line.

March 21-22.

That night the weather was bad at the stations N and Lö, but the southern stations were in action.

The aurora was first seen by Hassel at Darbu. After midnight the stations C, K₄, T, O and Li began their work and took a series of photographs.

From Hassel's observations we may quote: 20.01-21.00 and at 21.05, 21.15, 21.32, 22.00, 22.05 no aurora line visible.

22.25 An aurora arc appeared in N, passing over ϵ Cyg. Between 22.25 and 22.30 it dissolved into short rays.

22.40 The aurora changed into a glow and disappeared at 22.44.

22.45-23.05 Only a glow in N.

23.52.30 Feeble arc again visible. Sketch on star maps at 23.55, 0.00, 0.05, 0.10, 0.15, 0.20, 0.25, 0.30, 0.35.

As seen from Table 1, the other aurora stations now took a series of photographs of the arc. The situation has been found from the pictures No.:

Li 1*, 2*, 3*, 4*,

supposing the lower border to have a height of 100 km., it stretched from Mosjöen towards the Feröe islands, parallel to the line $\theta = 24^\circ$.

On fig. 7 the result is seen.

One set of pictures, No. 13, taken simultaneously from K₄ and T could be used for height measuring. It was a pulsating patch at 1^h04^m. Height from 99 to 114 km.

As to the rest of the visual observations by Olaf Hassel, we quote:

0.44.30 The arc now double.

0.52.50 Flaming aurora began in NW.

1.13 The flaming aurora gone.

1.15 Diffuse surface (DS).

1.25-1.28 Diffuse ray going westwards. Sketch on a star map.

1.40-1.55 DS.

The rest of the observations till 3.45 are not of particular interest: Some arcs, glow, pulsations and flames, at all events only feeble remains.

18. The Aurora of March 23—24 1933.

That night a very fine aurora was observed and photographed from the northern stations Trondheim (N) and Lökken Verk (Lö). Lillehammer was also in action and a few pictures were taken simultaneously with the northern stations.

Moreover, Hassel at Darbu made a series of visual observations with sketches on star maps.

At 20.36 the aurora line could already be seen in N and NW at station N, and the first aurora, a curtain, was seen at 21.09. The first photographs from N and Lö were taken at 21.29.

Hassel gave the following report from Darbu (Da):

- 20.30 Glow along the northern horizon.
- 21.10 Sunlit rays up to Cas.
- 21.13–21.14 Sunlit ray up to β Tri.
- 21.37 Ray from the horizon with α , β Ari in the middle up to ϱ Per. Sketch on a star map.
- 21.38 The ray as before but has moved southwards. Has now ϵ Ari in the middle. Sketch on a star map.
- 21.47 In breaks in clouds W–NW–N only a glow is seen.
- 21.55 Glow.
- 21.57.45 Diffuse ray from the horizon up towards Cas.
- 22.00 A feeble ray was visible some seconds from the horizon with β And. in the middle. Sketch on a star map.
- 22.05 Only glow.
Observations stopped till 22.54.
- 22.54 A bit of a narrow arc (ray?) seen in W from the horizon up to λ Ori. Length 10 degrees. Sketches on star maps at 22^h 54–56, 23.00, 23.05, 23.10, 23.15, 23.25.
- 23.05 The arc passing between α and γ Ori.
- 23.10 The arc now with α Ori at the left border, broader at the upper end like an arc and not like a ray.
- 23.15 As before, a little curved towards S.
- 23.25 Very weak, α Ori. on the right border.
- 23.26 The arc gone. Only glow in N. Clouds in N up to 10° over the horizon.
- 23.53 The glow stronger.
- 23.56 Weaker again.
- 0.00 Only glow in N.
- 0.21–0.24 Glow stronger to the right of β And.
- 0.29–0.30 Diffuse ray from the horizon in N up to Cas. Later more rays.
- 0.30–0.36 Pulsating aurora with the Andromeda nebula in the middle. Periods of pulsations 14, 16 and 18 seconds.
- 0.36–0.41 Aurora gone.
- 0.46 Pulsation again about 20^s.
- 0.55–0.57 Period of pulsation about 10^s.
- 0.57–1.00 Period about 20^s.
- 1.00–1.04 Bit of an arc under Per. prolonged itself to the Andromeda nebula and then vanished. Sketch on star map.
- 1.07–1.10 Strong light from the horizon to the Andromeda nebula.
- 1.15–1.16 Strong greenish light in N.
- 1.18.30 Flaming aurora.
- 1.20 No more flaming aurora, only glow.
- 1.23–1.40 The glow strong, greenish.
- 1.49–1.50 The glow stronger under Per.
- 1.55–1.57 Pulsating aurora (PS). Period about 10^s.
- 2.00–2.02 The same; period 20^s and later 30^s. Sketches on star maps.
- 2.05–2.07 The same. Period 20^s–25^s. Sketch on star map.
- 2.10–2.13 The same. Period 20^s. Sketch on star map.
- 2.15–2.17 The pulsations almost ceased. Glow persisted.
- 2.20–2.25 The same.
- 2.31–2.32 The glow weaker.
- 3.15–3.30 Diffuse surface under Per. Later some pulsating bits of arcs.
- 3.52–3.57 Bit of an arc from ι Aur. to β And. Sketch on a star map.
- 4.00 The same, quiet.
- 4.00–4.05 Greenish light along the NW horizon from Gem. to Aur. The quiet bit of an arc still visible.
- 4.05–4.07 The glow lighter in Gem. and Aur. Later only in Aur. Sketch on a star map.
- 4.15–4.20 The glow vanishing.
Dawn. Observations ceased.

It is interesting to compare this series with the long series of observations and photographs from Li, N and Lö. We shall do this at the same time as we give the result of the photographic determination of height and position of the aurora.

The work on the stations Li, N and Lö began already at 20.30, when the aurora line was visible in NW and N about 10° over the horizon. The

first 24 sets of pictures more or less failed on account of clouds. The aurora forms were feeble rays and arcs whose outlines were difficult to see on account of the clouds.

Hassel's interesting observation of an arc in W from 22.54 to 23.25 did not have corresponding observations from the northern stations.

The first usable set of pictures from N and Lö was No. 25, at 0.21.20 of diffuse rays in north. The following sets No. 26, 27, 28 and 30 were taken of the same rays. Ordinary heights for rays in the earth's shadow. They were lying far north between 68° and 69° N and 7° east of Greenwich in the aurora belt.

The pulsations observed by Hassel from 0.30 to 0.36 were also seen from the northern stations, sets 33 and 34. The measured heights were 119, 105, 108, 102 and 103 km. and the pulsating surface was situated about 330 km. west of Bodö.

On the sets 37, 38, 39 is seen a diffuse curtain, whose left border, which is seen tangentially, has the form of a fine ray. This ray can be followed up to 250 km., and the situation was at 66° N and 2° W of Grw. about 500 km. west of Mosjöen. The curtain had its lower border at a height of 90–100 km. and was developing westwards with a velocity about 200 m/s.

The set No. 40, at 0.40.24, is taken of a cloud-like aurora, height 97–124 km.

Pulsations were again recorded both from Darbu $0^h46^m-1^h$ and from N and Lö, sets 43 and 44. Under the pulsating parts a new fine arc with ray structure was now in formation. Of this arc a series of determinations of height was made, giving $H = 95, 81, 96, 93$ and 89 km. (sets No. 43, 44 and 45). Assuming a height $H = 90$ km., the geographical situation was found from No. 44, 45, 47 and 49. If we assume $H = 95$ km., the corresponding situation is very similar, corresponding to a parallel displacement to the north of 15 km. perpendicular to the direction of the arc. The situation was westwards from Bodø near the line $\theta = 24^\circ$.

The next sets and single pictures, No. 50 to 59, gave similar results.

At 1^h35^m the arc was very fine, with a sharp lower border. The two sets No. 61 and 62 did not give sufficient parallax, but $H = 90$ km. seems to be very probable. The arc stretched from Lofoten westwards. See Plate 1.

From Darbu Hassel saw only a glow which was strong and greenish and which must have been *the upper border of the arc, the lower border being under the horizon.*

The Lö picture No. 61 is seen on plate 1.

The following sets No. 63, 64, 65, 66 were taken of the same arc but do not give any new results.

No. 69, at $1^h46^m06^s$ was taken of a pulsating patch and gave ordinary heights from 96 to 114 km. It was situated over a region 200 km. due west of Namsos.

The pictures No. 72, 75 and 79 gave again the situation of the arc.

The sets 82, 85, 86 and 87 show in the western part of the arc a saw tooth depression corresponding to a fold or to a part with ray structure. This was good for height determinations and gave for the lower border the heights:

No. 82: 88, 90, 94 km. No. 86: 104, 98 km.
 „ 85: 97, 92 km. „ 87: 102, 95 km.
 mean 96 km.

Now the aurora became more cloudlike. The next two pictures, No. 88 and 89, gave heights for DS over the arc at about 100 km.

No. 90, at 2.31: the arc again had a fold, and was stronger. Height about 95 km.

New cases of cloudlike forms over the arc, No. 91 and 92 was measured about 2^h36^m .

During this time only a weak glow at the northern horizon was seen in Darbu.

At 2.48 pulsating aurora began and persisted to 3.20 (pictures 93, 95, 96). It was lying lower than the aurora before, down to about 80 km.

New cloudlike patches were measured on pictures 103 and 104, about 3.46. Down to 86 and 91 km.

On pictures 105, at 3.49, a sunlit ray appeared over the cloudlike patches. It was also photographed from Lillehammer. It stretched from 165 to 350 km. approximately.

New feeble cloudlike short rays were photographed from 3.52 to 3.54. Down to 85 and 91 km. A sunlit ray on the last picture was lying from 187 to 287 km. over the earth.

At 4^h an interesting development began. The lower border of the aurora in the north became stronger and sharper, and developed successively to a very fine horse-shoe curtain with maximum brilliance from 4^h4^m to 4^h10^m , and a long series

of sets were taken of this curtain. The best ones were No. 117, 118, 119, 120 and 121, which give heights of the lower border about 95 km. See Plate 2. The vertical thickness of the most luminous part of picture No. 117 was

point 5 to point 6: 14 km.

„ 7 „ „ 8: 14 km.

On the picture No. 122 the upper part of the curtain with rays is seen to go much higher, up to 250 to 300 km. in the sunlit atmosphere. See Plate 2. The height of the earth's shadow was in fact:

Near point 1 150 km.

„ „ 4 141 „

„ „ 7 128 „

The geographical positions of the lower border of three of the best pictures. No. 119, 121 and 122, are seen on Fig. 8. The displacement towards NE of the curtain was from No. 119 to 122 about 125 km. in 128 seconds, that is with a velocity near 1 km. pr. second.

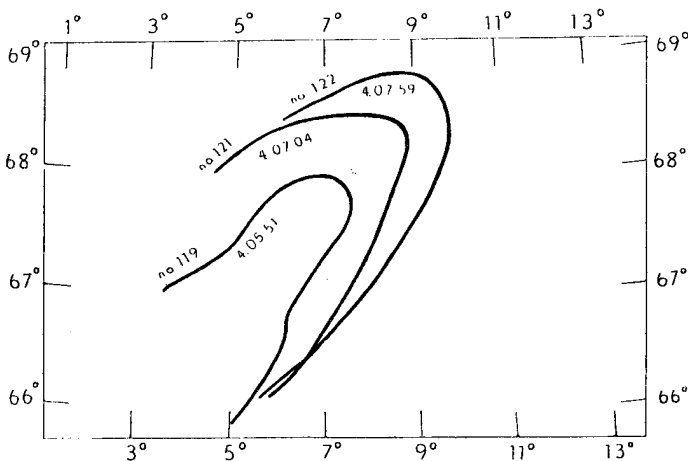


Fig. 8. Successive positions of the curtain no 119, 121 and 122 on March 23—24.

After the fading away of this fine curtain only a few feeble sunlit rays were photographed, lying between 200 and 300 km. above the earth.

19. The Aurora of March 24—25 1933.

The aurora continued from sunset to sunrise. Among my southern stations only Darbu was in action, where Olaf Hassel made the following notes:

21.25 Having worked till 4.30 last night I awoke at 21.25 and saw an aurora arc low in the north. Two sketches on star maps were made.

21.40 The arc fainter. Sketch on star map of the arc and of another close to the horizon.

21.50 Sketch on star map of the same arcs.

21.55 More and more diffuse.

22.00—22.05 The same, 5 to 6 degrees broad.

22.12—22.14 Transformed to a glow.

22.15 Stronger in NW.

22.30 A diffuse arc appeared in the glow. Small clouds along the lower border.

22.33.40 Several thin rays moved with great velocity towards east, under Lacerta. Half a minute later summits of small shortlasting rays along the horizon.

22.40 Short ray in Lacerta. Lasted 30 seconds. Sketched on a star map.

22.46.30 Long diffuse ray from the horizon up to 61 Cyg. Later some diffuse rays.

22.55 Only glow.

22.55.30 A very feeble diffuse ray under 0 And.

23—23.05 Cloudlike aurora.

23.06 Feeble diffuse ray, from the horizon up to ι And., about 10° long.

23.20 Diffuse ray in Cyg. towards NNE.

23.55—24.05 Glow.

Lasted till 1.35, with variable intensity.

1.40—1.44 Feeble arc. β And. at the lower border. Sketch on a star map.

Later only feeble glow.

Observations ended at 2.05.

At our stations Trondheim and Lökken Verk, however, the aurora was much finer and the work continued from sunset to sunrise.

Already at 20^h the stations were ready for work, and the first set, No. 4, was taken of a strong yellow-green curtain at 20.27.40. The curtain was lying in sunshine. In fact, the shadow of the earth at the vertical of the curtain was only 100 km. over the earth. Measurements of the lower border gave heights of 109, 103, 111, 103, 113, 106 (see Table 2). The curtain was lying over Mosjöen.

From 20.29.31 to 20.29.52 the intensity of the curtain had increased, and the lower border had penetrated deeper into the atmosphere and was now in the earth's shadow. (See Table 2.)

A series of sunlit rays were now photographed, but the heights were little different from usual. At 20.49.37 an arc (No. 19) was seen and its situation was calculated under the hypothesis that the lower border was either 90 km or 110 km. See Table 2.

The next set, No. 22, showing a fine drapery, is of special interest. It has been reproduced in preliminary report as Plate XII. What is interesting is the weakening of the intensity near the shadow of the earth. See Plate 2. The upper part is lying in sunlight and can be followed up to 266 km., but continues outside the photographic field. The lower border is lying in the earth's shadow, from 95 to 98 km. over the earth. The height of the earth shadow over the points 5, 6, 7 and 8 is 159, 166, 171 and 175 km. See Fig. 9 and Plate 2.

On the set No. 42 at 21^h17^m41^s can be seen some rays and a fine rayed arc nearer to the horizon. The most luminous part of this arc had a vertical extension of 13 km. The arc was lying near the aurora belt about 600 km to the west of Mosjøen. The Lökken picture is seen on Plate 3.

A series of sunlit and partly sunlit rays, No. 47 to 50, 53 and 55 do not present any particular interest. They were situated much lower than the sunlit rays generally seen in Oslo.

A homogeneous yellow-green arc, No. 56,

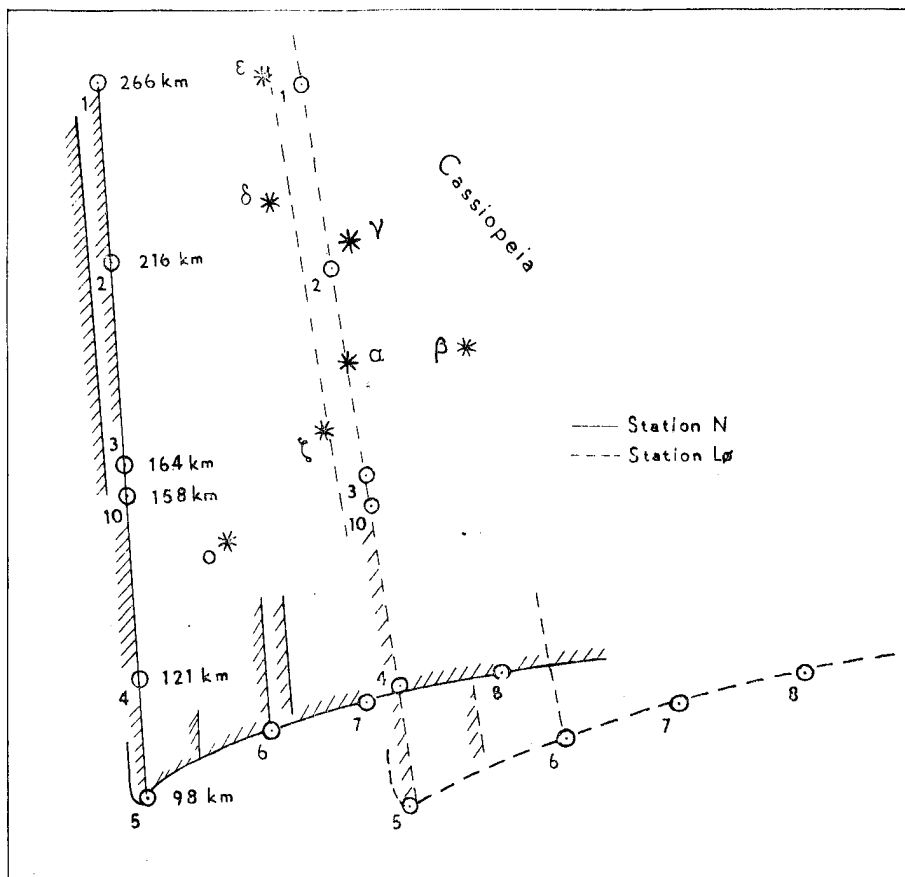


Fig. 9. Sketch of the two simultaneous pictures of the partly sunlit curtain no. 22. at 20.55.24 on March 24—25.

No. 26, at 20.57.52, was also very interesting. It showed a very luminous curtain with an exposure of only 2 seconds. The parallax, 7,5° gave a good determination of height. The lower border went down to 86 km. over the earth.

A series of sunlit rays now follows. What is remarkable is that the summits of these rays do not reach any astonishing height like those observed in Oslo during maxima of solar activity.

appeared again at 21^h30^m. Over it was a much broader one, more diffuse, and with a grey violet colour; it was not possible to get reliable parallax measurement of this grey violet arc. The lower one gave from the picture No. 57 a height of 98 km. The geographical position is given on Table 2. Compare Hassel's observations at 21.40.

At 22^h6^m to 22^h32^m a new arc with fine lower border was measured. From the pictures

No. 75 and 76 its geographical position was found on the assumption that the height of this border equal to 100 km. See fig. 7.

On the following pictures, No. 84 to 92, a diffuse arc is again seen, from 0.39 to 0.44, more to the north than the former one; positions are calculated corresponding to $H = '90$ and $H = 110$ km.

From 1^h7^m to 1.37 a long series of pictures (No. 98 to 108) was taken of an arc in the north and geographical positions calculated for $H = 90$ and $H = 110$. We have drawn the positions for the intermediary value $H = 100$, corresponding to the pictures 98 to 108. See Fig. 6.

At 2^h52^m began a series of most interesting pictures of pulsating and later cloudlike aurora reaching far down to 80 km. and lower. The first one, No. 116, of a pulsating patch at 2.56.16, went down to 82 km., and at 3.11.47 a cloudlike aurora (No. 126) even down to 80 km.

But the most interesting series are No. 136 to 156, between 3.35 and 4.01, reaching down even to 70 km. This series has been described in my paper "Remarkable Aurora Forms From Southern Norway" III-IX, section 37, Geof. Publ. Vol. XIII, No. 7, and for details I must refer to this paper. All the single measurements are, however, seen in Table 2, in the present paper.

The last forms before sunrise were some pulsating violet sunlit rays. See table 2.

20. Auroræ in April 1933.

After the night of March 24-25 no more auroræ were seen in Trondheim before our departure on March 28. Having returned to Oslo, we watched the sky every night, but no usable aurora were seen before April 15-16. Only faint aurora line on *April 6-7*, from 21.55 to 22.10 and on *April 7-8* from 20.45 to 21.30.

April 15-16.

I was then on a holiday at Ustaoset on the Oslo-Bergen railway, and I observed a fine aurora in the evening. I took a series of pictures with another camera, Ernostar, but they did not succeed very well, and since I was alone the times were not observed with sufficient care. They are therefore omitted here.

The aurora stations, however, took a series of

observations and photographs. Mr. Olaf Hassel made the following visual observations from *Darbu*:

At 21.15 no trace of aurora was seen. A quarter of an hour later the aurora had developed as arcs in south and north. Clouds made observations difficult, but a series of sketches of the aurora were made on star maps.

21.40 Part of an arc seen among clouds in N with lower border at ϵ Cyg. Another pulsating one under Vega.

20.05 A broad feeble pulsating arc on the southern sky from β Aur. towards Boo. δ Aur. and ϱ Boo. in the middle of the arc, δ UMa at the lower border and β and γ UMa at the upper border.

(I saw the same arc from Ustaoset stretching from Bootes to Leo and Jupiter in S to Procyon in SW. Authors remark).

22.10 Now only the part from β , γ UMa to Boo. visible.

22.15 The arc in N now forming a narrow horse-shoe with the opening towards W.

22.40 Now two remnants of pulsating arcs in south. One from CVn. to Ser. with 12 CVn and ϵ Boo. at the lower border and another from Vir. towards Oph., with ϵ , δ Vir on each side and μ Ser. at the eastern end.

22.45 The two remains are smaller. The upper one from 12 CVn to χ Ser and the lower from 109 Vir. to μ Ser.

22.55 Broad diffuse arc in N. β And. at the lower border and β Per. at the upper.

23.12 The same remain near 109 Vir. and another in Vir. γ Vir. at the upper and α Lib. at the lower border.

23.15 Fine arc in N from Cyg. to Aur. Lower border 5-6 degrees under ϵ Cyg., 5 degrees under α And., 2½ degrees over β And. and 4-5 degrees under ϱ Per.

23.40 The same arc. Lower border now 1 degree over β And.

23.50 The same arc. Lower border at ζ Per and 2 degrees over β And.

23.52 From the eastern end of the arc a ray going up to Lac.

23.55 The arc fainter, with diffuse borders.

0.00 The arc narrower.

0.05 β And. 2½ degrees under the lower border, γ And. and β Per. at the upper border.

The breadth of the arc near γ And. is $3\frac{1}{2}$ degrees.

- 0.15 Same arc. β Peg. at the lower border, β And. 2 degrees under it and β Per. 3 to 4 degrees over it. Same breadth near γ And. and β Per. These stars at the upper border.
- 0.30 The arc a little lower.
- 0.40 A dark segment under the arc. β And. now at the lower border, and β Per. 4 degrees over it.

The situation of the arc was also sketched on star maps at 0.55, 1.05, 1.15, 1.40 and 2.00.

2.05.20 Some rays visible along the arc.

- 2.12 A ray from the arc 10 degrees upwards near β And.
- 2.17 The ray has gone westwards, with summit at ν And.
- 2.20 Regular homogeneous arc again. Lower border at ξ Per.
- 2.22 to 2.25 The arc changes to a glow, which becomes fainter and fainter towards dawn.

Here Hassel's observations ended.

We now come to the photographs from my aurora stations C, O, K_4 and Li and L \ddot{o} . Clouds very often made photographic work unreliable. The first usable pictures, No. 13, 14 and 15, from 22.58 to 23.25 were taken of an arc in the North simultaneously from the stations C and Li, but were not very good on account of clouds interfering. The arc was situated between Trondheim and Namsos. On picture No. 20, at 23.15 feeble rays are seen along the arc, down to 95, 99, 96 and 97 km.

The following pictures up to No. 35, at 23.33 gave the geographical situation of the arc under different assumptions relative to the height of the lower border. See Table 2. Picture No. 27* at 23.27.19. base line C- K_4 represents two feeble sunlit rays in the height interval from about 230 to about 400 km. The next set of pictures, at 23.56.15, show an arc with sharp lower border from 87 to 90 km.

The last series of pictures, from 2.08 to 2.17 shows a series of rays belonging to a distant curtain, and lying in sunshine. The height was rather low for this aurora form, compared with the heights during years of great solar activity. See Table 2.

We return to the sunlit rays of the polar year in a later section.

21. Other Auroræ in April 1933.

April 16-17.

On that night my assistant Olaf Hassel observed aurora from Darbu, but no photographs were taken.

Here are his observations:

- 21.33 The aurora line 5577 Å, very feeble, could be seen, but disappeared at 21.40 and came back at 21.55.
- 23.55 Along a diffuse arc at the northern horizon rays were observed.
- 23.57 The arc almost gone, but reappeared some minutes later.
- 0.00 The situation of the arc sketched on a star map. ζ Per., β And. and β Peg. along upper border. The breadth of the arc near β And. was equal to 2 degrees.
- 0.05 The arc very diffuse.
- 0.55 The arc very feeble. Sketched on a star map. Disappeared about 0.58. From 1.00 to 1.15 some feeble remains as bits of arc. Sketched on a star map.
- 1.15 A short ray from the horizon up to ϵ Per., length 6 degrees. Lasted half a minute.
- 1.15.45 Pulsating bits of arc and flames. Lasted till 1.25.
- 1.25-1.35 A short ray, 7 degrees long, from the horizon up to π Per. moved westwards to 1° west of β Per.
- 1.40 Feeble glow with irregular distribution of intensity lasted till 2.05.
- 1.42 Another short ray from the horizon up to a point 2-3 degrees west of β And. Length 6° .

A feeble glow with irregular distribution of intensity lasted till dawn, at about 2.05, when observations ceased.

April 17-18.

The next night Olaf Hassel saw aurora again.

Here are his observations:

- 21.30 to 22 No aurora and no aurora line.
- 22.10 to 22.11 A feeble ray, 9 degrees long from the horizon up to a point 1 degree west of \circ Lac.
- From 22.12 to 2.00 only a feeble glow along the northern horizon.
- At 2.01 flames began and lasted to 2.09.
- From 2.07-2.08 a feeble long ray up to δ Aur. Glow up to α Per.

- 2.17.30 A very long ray from α Aur. up to 22 H Cam. Moved slowly east and disappeared at 2.20.
- 2.25 Another long ray to the west of the former one. Both rays sketched on a star map. A series of similar feeble and high rays were sketched on star maps 2.30–2.35, 2.37, 2.40.
- 2.43–2.45 Similar, very feeble ray from α Aur. up to 22H Cam.
- 2.47 The last one, from ξ Aur. to β Cam., during dawn. Observations ended.

All these feeble rays were undoubtedly sunlit.

The same night I was at Ustaoset, and I observed the same aurora, tried to get photographs of it, but did not succeed. Here is an extract of my observations:

It started with a glow in the north, over the mountain Hallingskarvet, at about 23^h. From 0.15 to about 1.45 feeble pulsations were seen from time to time. At 1.54 flames going upwards began.

2.16 to 2.17 Very feeble rays (probably sunlit) were seen and photographed. But the picture, taken with an Ernostar camera, showed only stars and very feeble traces of aurora which were not measurable. I only remember that the rays reached from Aur. up to the Pole star. The same rays were observed by Olaf Hassel.

April 18–19.

In the night 18 to 19 April my assistant Herstad at the station Lökken Verk succeeded in taking a series of pictures of fine arcs and bands in the north.

Among these we have chosen No. b, c, o and p and measured their geographical position, supposing the height of the lower border equal to 100 km. They were lying almost parallel to the circles $\theta = 22^\circ, 23^\circ$ and 24° in the aurora zone, from Lofoten islands westward to about Greenwich meridian. As to the times of the photographs, see Table 1.

From his station Darbu, Olaf Hassel made the following observations:

- 22.15 A feeble aurora line 5577 in the north. Later stronger.
- 22.38 Some short diffuse rays were seen for a short time in NNE.
- 22.54–22.55 A broad feeble ray from the horizon and up in Lac.

- 23.24 The glow much fainter.
- 0.56 Some strong rays in breaks of clouds, 3 to 4 degrees over the horizon in NNE. Lasted some seconds.
- 1.05 Observations ended. Overcast and strong wind.

April 19–20.

From Darbu my assistant Olaf Hassel made the following observations:

- From 22.35 the aurora line 5577 was visible.
- 23.32 The first aurora ray, from the horizon and up to 3 Lac. Sketch on a star map.
- 23.35 The same ray. Lasted to 23.45. Sketches.
- 0.02 New feeble ray from the horizon up to ω Aur. Sketch on star map.
- 0.04.30 Now from the horizon up to β Aur. Sketch.
- 0.07 Now from the horizon up to χ Aur. Disappeared immediately afterwards. Sketch.
- 0.18–0.22 Another ray from δ to ψ And. Sketch.
- 0.23.25 No aurora visible.
- 0.26–0.27 Very feeble ray from β And. upwards. Sketch.
- 0.29–0.34 One stronger ray and some weaker ones going westwards from β And. The weaker ones reached only to the height of γ And. Sketches.
- 0.42 The summit of a short and relatively broad ray a little higher than γ And. Sketch.
- 0.45 A longer, very feeble ray from the horizon up to α Per. Later, till dawn, no more aurora visible.

April 21–22.

The aurora stations C, K₄ and T were in action and a series of observations were taken by Hassel at Darbu. The aurora was feeble, only rays and arcs near the northern horizon. First we quote Hassel's observations:

- 22.05 The aurora line 5577 visible for the first time this night.
- 22.22–22.23 The first diffuse rays visible in N.
- 22.25 A diffuse arc, 4–5 degrees broad near the northern horizon from Per. to Peg. sketched on a star map. From β And. the summit of a ray about 10° long.
- 22.30 Long and diffuse rays from the lower border of the arc up to Cas. The arc vanishing. Another ray up to Algol. Sketch.

- 22.55 The arc appeared again but only 2 degrees broad. Sketch.
- 22.59.50 The arc dissolved in rays from the western end and progressed eastwards.
- 23.10 The arc with ray structure (RA). Sketch.
- 23.13 Between β and γ And. the arc had vanished.
- 23.14-15 The aurora changed to a cloudlike glow.
- 23.16 Feeble diffuse rays in W-NW.
- 23.18 Only feeble DS.
- 23.35 3 rays in Perseus. Sketched on a star map.
- 23.37 The rays disappeared.
- 23.40 to 23.45 Feeble diffuse rays from time to time.
- 23.45 Only glow.
- 23.52.30 Glow. A feeble ray near ν And. Sketch.
- 0.32 to 0.35 A very feeble arc for some minutes.
- 0.45 A very feeble diffuse ray between Algol and γ And.
- 0.55 Feeble glow.
- 0.58 Feeble arc, probably pulsating, under Perseus. Sketch.
- 1.00 Only glow.
- 1.03-1.04 A bit of an arc near β And. Sketch.
- 1.05-1.08 Pulsating bits of an arc in the glow at the northern horizon.
- 1.24-1.26 Pulsating arc between ϵ and β Per. The aurora vanished successively.
- 2.05 Observations ended.

As to the photographs for determining the height and situation, only 4 sets could be used. The rays photographed were all sunlit and stretched from about 175 to 200 km. up to 400 to 450 km. over the earth. See Tables 1 and 2.

Probably all the rays observed by Hassel were sunlit.

April 22-23.

From Darbu my assistant Hassel saw only the aurora line 5577, but very feeble and no visible aurora.

April 23-24.

The observations by Olaf Hassel from Darbu ran as follows:

- 22.55 The aurora line 5577 first visible.
- 23.45 Feeble pulsating bits of arc near northern horizon. The periods of pulsation very irregular from 8 to 90 seconds.
- 23.55 to 0.00 A pulsating bit of an arc stretching from ω Per. to μ And. Sketch.

- 0.04 The pulsations ended.
- 0.07-0.07.30 A feeble diffuse ray from the horizon up to 2° west of γ And. moved 3 degrees towards west in 30 seconds.
- 0.15 Glow in N, increasing in intensity.
- 0.30 Pulsations started again, but very feeble and difficult to see.
- 0.45 New pulsating aurora with periods of 40 seconds to about 10 seconds later on.
- 0.53-54 Periods of pulsation from 10 to 11 seconds.
- 1.00-1.02 Period 23 to 25 seconds.
- 1.03-1.04 Period about 10 seconds.
- 1.04-1.05 „ „ 15 „
- 1.07 Pulsations ended.
- 1.10 Feeble glow.
- 1.16 Mixture of pulsating and flaming aurora.
- 1.30 Ended about this time.
- 1.32 Feeble ray in Aur., from the horizon and up towards η Aur, 7 to 8 degrees long. Sketch on star map.
- Observations ended at dawn.

April 27-28.

Faint aurora line visible till 2.00.

22. The big Aurora on May 1-2, 1933.

The greatest aurora observed during the polar year occurred on the night of May 1-2. It was of special interest, and we got a long series of observations and photographs of it from the aurora stations (see Tables 1 and 2).

Olaf Hassel made a series of notes from his station at Darbu. He did not see the beginning, but started his observations at 22.55. Here they are:

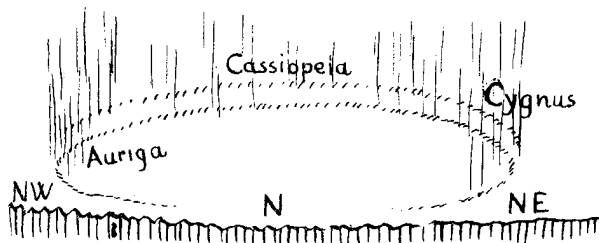


Fig. 10. Almost closed curtain observed by Olaf Hassel at 22, 55 on May 1-2.

- 22.55 The aurora had a very fine form of an almost closed curtain from NW to NE, see Fig. 10.

- From the curtain long rays were stretching upwards towards zenith, forming part of a corona.
- 23.06 The point of radiation of the corona was situated midway between ζ UMa and 12 CVn.
From 23 to 23.30 the corona had a form very similar to the photograph No. 31 in the Photographic Atlas of Auroral Forms¹. For the same period the situations of the broad aurora band are sketched on star maps No. 1 to No. 6 (not published here).
- 23.00 The band stretched from Cyg., through Cas. to Aur.; Deneb and Capella at the upper border.
- 23.10 The band is a little lower.
- 23.20 From Aur. an appendix is going down to γ And. The main band from Aur. to Lac. and Cyg.
- 23.30 The bands and the appendix have melted together. The situation and transformations of the broad band from 23.35 till 0.05 is sketched on star maps No. 7 to 14 (not published here).
- The lower border is going down towards And. where the appendix was seen earlier. This lowering is moving eastwards.
- 0.00–0.05 The western end meets the horizon between Pollux and Procyon.
The aurora is now spread over the whole northern part of the sky.
- 0.04.30 The summit of a ray, up to 4° over the horizon visible between the moon and δ Can. Sketched on a star map.
- 0.12 Again a series of rays along the band. From 0.21 to. 0.27, four pictures were taken of the aurora.
- 0.27 to 0.29 The aurora band disappeared. Sketches were made on star maps of the last appearance.
- 0.30 to 0.35 Pulsating and flaming aurorae, in Leo minor and Ursa major. Sketch of a bit of an arc over Vega.
- 0.35 to 0.40 Pulsating patches and short rays near zenith.
- 0.40 The arc appeared again, from Gemini to Pegasus. Capella and β Peg. in the middle of the arc. Sketch on a star map.
- 0.45 The arc more narrow. β Gem, δ Per. and β Peg. at the upper border. Sketches on star maps.
- 0.55 A long sunlit ray from 6 to 7 degrees east of Capella to 6 degrees west of the Pole star and another in Gem. Sketch on a star map.
- 1.00 Flames and a band (breadth 3° – 4°) from Gem. to And. Capella at the lower border and two more feeble bands parallel to the main one. The upper one reaching Cas.
- 1.05 Flames going upwards from the band, sometimes *as arcs thrown upwards*, and long pulsating rays from W towards the zenith.
- 1.10 Arc from Peg. to Aur. Some rays along the arc, one from α Peg. to 7 Lac. Sunlit. Sketch on a star map.
- 1.15 Flaming aurorae continues. The intensity of the arc different in different places. Sketch on a star map.
- 1.15 to 1.20 The point of radiation of rays was situated at χ Her. The arc dissolving in pulsating and flaming rays.
- 1.26 The arc again very narrow. Capella, β and α And. at the lower border. Sketch on star maps. The western end down about 10° north of Regulus.
- 1.30 The point of radiation under φ Her. The arc higher, from β and α And. to 12° under Regulus.
- 1.35 Very fine arc with ray structure (RA) with more than 30 short rays of almost constant interval between consecutive rays.
- 1.45 The flaming seems to have ended. The moon has gone down and it is easier to see the faint aurora. Glow and cloudlike aurora now.
- 1.47 An arc again visible from Aur. to β And. Over it flaming arcs. Soon the aurora vanished with the beginning of dawn.
- 1.55–2.00 Still flaming aurora could be seen.
- 2.02 No aurora seen in the dawn. But in the pocket spectroscope directed towards NW the aurora line could be seen, fainter and fainter till 2.20, when I could not see it any more. Observations ended.
- We shall now see what was derived from the photographic work of this remarkable aurora. I am sorry that the base line C-Li gave only a few measurements, because the camera used by Mr. Anda in Oslo had its iris almost closed without

his knowledge. This was not discovered before the work was ended. A series of single pictures taken at Li could, however, be used for other purposes.

When I first came to the aurora station C on the roof of the old observatory in Oslo, long aurora rays were seen on the western sky towards zenith. The first usable pictures, No. 7 and 8 about 21.22, with base line C-K₄, gave heights from about 240 to 460 km. on rays lying in the sunlit part of the atmosphere over Skagerak, south of Mandal.

The next pictures, 9, 10 and 11 (see Tables 1 and 2), were pointed towards the center of the corona, and the situation of the point of radiation was measured.

The next picture, No. 12, at 22.25.49, was taken of a drapery in WNW. It was lying in sunshine.

No. 13 and 14 show rays with their upper parts in sunshine and their lower parts in shadow. No. 15 and 16 are again pictures of the corona. As to the coordinates of the point of radiation, see Table 2. The following numbers from 17 to 43 are all of aurora forms in the sunlit atmosphere, except No. 17 point 1 and No. 42, points 3 and 4. Among these, No. 35 shows a ray whose summit was more than 400 km. above the earth.

Now comes a very fine series of photographs (no. 42-51) of the remarkable curtain or drapery, which Olaf Hassel observed at 22.55 (Fig. 14). Of the western part numbers 42-51 were taken, of the eastern part only No. 52.

The curtain was very characteristic: the rays beginning at the lower border stretch upwards as long sunlit rays, as seen on Plate 3. The lower border was near the border between the atmosphere in sunshine and in shadow, sometimes over and sometimes under this border.

As to the geographical situation, No. 45, for instance, was situated over Norway in the region of Aalesund, Kristiansund and Dombaas, and the others up to No. 51, not far from this region. The eastern part of the curtain, No. 52, was situated in sunshine over the middle of the southern part of the Gulf of Bothnia. No. 55, 56 and 59 are

rays, the first two sunlit and the last one in shadow.

No. 61, at 23.05 is a sunlit drapery over the region of Trondheim, Lökken Verk.

No. 62, 63 and 64 are rays partly in sunshine and partly in shadow. The same is the case with No. 65 and 66. Fine sunlit rays are seen on picture No. 67, at 23.08.12, one ray perhaps going down in the shadow (see Table 2). No. 68, 69 and 70 is a diffuse drapery mingled with rays, lying partly in sunlight, partly in shadow. The lower border of the drapery is lying in shadow, heights between 89 and 113 km., mean 101 km.

On the sets No. 72, 73 and 74 the lower border of the drapery is rather sharp. By combining the simultaneous pictures C 73 and Li 41 we got the height of the lower border equal to 106, 107, 102 and 101 km. (parallaxes from 17.7 to 21.6 degrees).

The ray photographed on No. 76 and 77 is sunlit and the measurements seem very reliable.

The following sets of pictures are taken of rays and draperies in the sunlit part of the atmosphere (see Tables 1 and 2). One of them, a ray at 1.12.11 had its summit higher than 500 km. over the earth. As a contrast to this, we have No. 102, at 0.14.15, of a curtain descending to 83 and 88 km. and lying in the earth's shadow, over Sognefjorden.

In the chapter on the general results of the measures taken, we come back to the situation of the sunlit aurora rays to the borderline between sunlit and dark atmosphere.

23. Hassel's list of nights when no aurora was seen.

In my instructions to Olav Hassel I asked him not only to observe aurora but also to note when aurora was not seen, which he did with great care. As I said before, his observing station was *Darbu* (Da). Lat. 59°41'56", long. E. of Gr. 9°48'17", if no other station is mentioned.

In Table 3 a translation in English of his observations is given. The time is always Middle European Time (MET).

Table 3.

Hours of observation when no aurora was seen. Station Darbu. Observer Hassel.

1932.

August	18-19	Observed till 23.30	Clear sky.
	21-22	—, —	Moonlit cirrostratus.
	22-23	22.35-0.00	Moonlit cirrocumulus.
	23-24	Observed till 23.00.	Hazy and moonlight.
	24-25	23.15-1.10	Clear sky.
	25-26	22-0.05	Clear sky except cumulonimbus in N.
	28-29	Observed till 23.00	Mostly cloudy sky.
September	2- 3	3.40-4.10.	
	3- 4	21.45-23.05	Clear sky.
	8- 9	22.40-0.05	—, —, , later clouds.
	11-12	Till 0.00	(Observed from Oslo).
	12-13		Clouds.
	13-14	At 2.50	clear sky.
	14-15	Till 22	clear sky, later clouds.
	15-16	Observed till 22.30.	Clouds.
	16-17	—, —	22.30. Cirrostratus.
	17-18	Observed 20-21.	Almost overcast.
	20-21	Observed till 0.00.	Clear sky.
	21-22	—, —	23.20. —, —
	26-27	Observed 21.40-22.40	Overcast but breaks in clouds.
	27-28	Observed till 22.30.	Clear sky.
October	2- 3	Till 0.30	Clear sky.
	3- 4	” 23.00	—, —
	4- 5		Overcast.
	5- 6	”	”
	6- 7	”	”
	7- 8	Observed till 22.45.	Haze.
	8- 9		Overcast with rain.
	9-10	—, —	—, —
	10-11	—, —	—, —
	11-12	At 20.00 and 20.15-22.30	clear sky.
	12-13	Observed till 22.45.	Overcast.
	13-14	—, —	22.25. ” , rain.
	14-15	—, —	22.00. Cloudy.
	15-16	—, —	22.10. ”
	16-17	—, —	23.30. ”
	17-18	—, —	22.00. Moonlit cirrocumulus.
	18-19	—, —	22.00. Almost clear.
	19-20	—, —	21.10 and from 3.40. Clear.
	20-21	—, —	20.00. Overcast in Oslo.
	21-22	—, —	0.00. —, —
	22-23	—, —	0.00. —, —
November	1- 2	Snow. No aurora line 5577.	
	2- 3	”	—, —
	3- 4	Rain.	—, —
	4- 5	”	—, —
	5- 6	Observed till 22.10.	Clear.
	6- 7	—, —	22.20. Clear.
	7- 8	—, —	22.10. Dense fog.
	8- 9	—, —	21.00. Overcast and fog.
	9-10	—, —	21.45 Rain and snow.
	10-11	—, —	0.00. Clear.
	11-12	—, —	22.30. Some clouds, fog.
	12-13	Observed 20.30-21.00.	Clear, later fog.
	13-14	Till 21.	Clear, later fog.

	14-15	After 22	clear sky.
	15-16	Till 21.35.	Clear sky.
	18-19	Observed till 22.45.	Overcast.
	19-20	—, —	21.30. ”
	20-21	—, —	22.00. ”
	21-22	—, —	22-23. Clear sky.
	22-23	—, —	22.30. Overcast.
	23-24	—, —	22.00. Overcast, hazy.
	24-25	—, —	21.15. Clear sky, later overcast.
	25-26	—, —	21.45. Partly clear.
	26-27	—, —	20.10. Overcast, snow.
	27-28	—, —	21.45. ” ”
	29-30	—, —	21.00. ”
	30-31	—, —	22.30. ”
December	1- 2	—, —	22.00. ”
	2- 3	—, —	22.15. ” , rain.
	3- 4	Before 18.30	clear sky, later overcast.
	4- 5	Observed till 21.15.	Overcast.
	5- 6	—, —	21.30. ”
	6- 7	—, —	22.00. Partly clear sky.
	7- 8	—, —	22.00. Clear sky.
	8- 9	—, —	22.00. ”
	9-10	—, —	23.00. ” , 4.45 clear sky.
	10-11	Before 22	overcast, later partly clear. Till 22.00.
	11-12	Observed till 0.15.	Clear sky. 4.00 clear.
	12-13	—, —	23.15. ”
	13-14	—, —	21.00. Rain and fog.
	14-15	—, —	21.30. Overcast.
	15-16	—, —	22.30. ” 2.45 overcast.
	17-18	—, —	22.00. ” 3.30 overcast.
	18-19	—, —	22.00. Clear 17-20. Later overcast.
	19-20	—, —	23.00. Partly clear. 2.25 the same.
	20-21	—, —	22.00. Fog.
	21-22	—, —	22.00. Rain and fog.
	22-23	—, —	21.30. —, —
	23-24	—, —	23.15. Mostly overcast.
	24-25	—, —	22.15. After 19.00 clear sky. At 4.25 ” ”
	25-26	—, —	22.00. Fog.
	26-27	—, —	22.00. ”
	27-28	—, —	19.25. ” , 1.15 fog.
	28-29	—, —	21.15. Overcast.
	29-30	—, —	22.00. ”
	30-31	—, —	22.00. ”
	31-1 Jan.	—, —	0.45. ”

1933.

January	1- 2	Observed till 22.30.	Overcast.
	2- 3	—, —	22.00. ”
	3- 4	—, —	22.30. Almost clear.
	4- 5	—, —	22.00. Overcast. 2.24 also overcast.
	5- 6	—, —	22.30. Overcast.
	6- 7	—, —	22.10. Almost clear.
	7- 8	—, —	21.00. Overcast.
	8- 9	—, —	22.25. ”
	9-10	—, —	21.00. Clear sky. 1.00 clear.

	10-11	Observed till 22.15.	Clear sky.		5- 6	Observed till 22.00.	Overcast.
	11-12	"	0.00. Overcast.		6- 7	"	22.10. "
	12-13	"	23.05. Overcast.		7- 8	"	22.15. "
	13-14	"	22.30. At 20.00 overcast, later cloudy.		8- 9	"	23.05. " or some clouds.
	14-15	"	23.30. Overcast.		9-10	"	1.00. "
	15-16	"	22.00. "		10-11	"	0.30. "
	16-17	"	22.00. "		11-12	"	1.05. "
	17-18	"	22.00. "		12-13	"	22.00. " or some clouds.
	18-19	"	22.20. "		14-15	"	23.15. Cloudy.
	19-20	"	22.00. "		15-16	"	0.00. Clear sky.
	20-21	From 20.45 to 21	clouds, 22.00 overcast.		16-17	"	23.25. From 19.45 to 22.30 clear sky, later overcast.
	21-22	Observed till 22.15.	Overcast.		17-18	"	22.05. Overcast.
	22-23	"	22.15. "		18-19	"	22.05. Clouds and overcast sky, but the aurora line sometimes visible in breaks of clouds. Later aurora.
	23-24	"	22.15. "		22-23	"	0.30. Overcast.
	24-25	"	22.30. "		25-26	"	23.00. " and clouds.
	25-26	18.00 to 21.00	clear, 21.00-22.00 overcast, from 22.00 sometimes clear, sometimes fog.		26-27	"	23.10. Clear sky.
	26-27	Observed till 22.00.	Some clouds.		27-28	"	1.00. Overcast.
	27-28	"	19.15. 20.25 aurora.		28-29	"	1.35. "
	28-29	"	21.00. Later feeble aurora.				
	30-31	"	21.00. Overcast.				
	31-1 Feb.	"	22.30. Before 20. cloudy, later overcast.				
February	1- 2	Observed till 22.15.	Cloudy.				
	2- 3	"	23.30. Almost overcast.				
	3- 4	"	22.30. Cloudy.				
	4- 5	"	22.00. Overcast. 2.50 cloudy.				
	5- 6	"	22.15. "				
	6- 7	"	22.30. Cloudy.				
	7- 8	"	22.00. Overcast.				
	8- 9	"	22.00. "				
	9-10	"	0.30. "				
	10-11	"	0.05. Clear sky.				
	11-12	"	0.05. Overcast.				
	12-13	"	21.30. 19.20, 19.30-19.40, 20.00-20.05 clear sky. From 21.00 overcast. From 21.40-22.30 clear. ¹⁾				
	13-14	From 19.25 to 23.00	clear sky.				
	16-17	Observed till 21.40.	Overcast.				
	17-18	"	22.00. "				
	18-19	"	22.05. "				
	20-21	"	22.40. "				
	21-22	"	22.40. "				
	22-23	"	22.30. "				
	23-24	"	22.00. "				
	24-25	"	22.05. "				
	25-26	"	22.15. "				
	26-27	"	21.05. "				
	27-28	"	22.10. "				
	28-1 March	"	23.30. Clear sky.				
March	1- 2	"	22.05. Overcast.				
	2- 3	"	22.05. "				
	3- 4	"	22.00. "				
	4- 5	"	22.05. "				

No further observations until April 3rd because Mr. Has-
sel was in hospital.

April	3- 4	Observed till 22.30.	Cloudy or overcast.
	4- 5	"	23.30. "
	5- 6	"	20.45. Overcast.
	6- 7	From 22.20-0.00.	Clear sky.
	7- 8	"	21.35-22.30. Clear, later overcast.
	8- 9	Observed till 23.30.	Overcast.
	9-10	"	0.00. Clear sky and some- times overcast.
	10-11	"	2.00. Mostly overcast.
	11-12	Overcast till 23.05.	Later clear sky in N. Ended 1.00.
	12-13	Observed till 0.45.	Clear sky.
	13-14	"	0.15. " "
	14-15	"	0.05. Overcast.
	15-16	"	21.15. Overcast. Later aurora.
	18-19	"	21.05. Later aurora line, clear sky.
	19-20	"	22.30. Later aurora, clear sky.
	20-21	"	22.30. Later aurora line, clear sky.
	26-27	"	1.00. Clear sky.
	27-28	From 0.00-0.20,	later faint aurora line.
	28-29	Observed till 23.05.	Overcast.
	29-30	"	1.00. Clear sky.
	30-1 May	"	0.00. Overcast.

The observations continued till May 15-16
with changing weather, but no traces of aurora
were discovered. May 3-4 and 6-7 and all the
following nights overcast, with clear sky on the
other nights.

¹⁾ In the following the hours when observations were made
are all given. We have only given the last observation.

24. Hassel's visual observations of the occurrence and intensity of the aurora lines seen in a pocket-spectroscope.

According to the program given by La Cour in Photographic Atlas of Auroral Forms, Supplement I, p. 15, Hassel also made very careful statistics of the occurrence and intensity of the aurora lines, in particular the line 5577 Å. We do not find it necessary to publish these extensive tables and have therefore omitted them here.

PART III.

25. Statistics for all measured aurora points.

In spite of the relatively few heights, 1429 in number, compared with more than 12 000 heights from the period 1911-1944,¹⁾ we find again some of the same general results which were drawn from this much more extensive material. We therefore give short statistics for these 1429 heights.

In table 4 the number of measured heights for each km. is given, first for each particular aurora form and than for all forms. This gives a picture of the vertical distribution of the aurora in the atmosphere.

Table 4.

Frequencies of heights of all the measured aurora points.

H	HA	HB	PA	DS	PS	RA	RB	D	R	R'	Total
70	1	..	..	..	..	..	..	1
1
2	1	..	..	..	..	..	..	1
3	1	..	..	..	..	..	..	1
4
5	3	..	..	..	..	..	..	3
6	2	..	..	..	..	..	..	2
7	1	..	..	1	..	..	..	2
8	6	..	..	1	..	..	..	7
9	1	1	..	..	..	..	..	2
80	3	1	..	3	..	..	..	7
1	1	1	1	1	..	..	4
2	1	..	2	..	..	..	..	..	3
3	4	..	..	2	..	..	..	6

¹⁾ Carl Störmer: Statistics of Heights of various auroral Forms from southern Norway, second communication Ferr. Magn. and Atmosph. Electricity, Vol. 53 September 1948.

Table 4 (continued.)

H	HA	HB	PA	DS	PS	RA	RB	D	R	R'	Total
4	..	..	1	2	1	..	..	..	..	..	4
5	1	..	..	4	..	..	..	2	..	..	7
6	..	..	..	4	1	..	2	1	1	..	9
7	2	..	..	4	1	..	1	..	..	..	8
8	2	..	..	3	..	1	4	..	..	..	10
9	1	1	..	2	3	1	1	1	1	..	11
90	3	1	..	5	1	..	5	2	..	..	17
1	1	..	..	3	..	..	2	..	..	..	6
2	..	2	1	2	1	..	5	3	1	..	15
3	..	1	1	7	1	3	1	..	1	..	15
4	4	..	..	1	..	1	5	4	3	..	18
5	..	..	..	3	..	2	8	3	..	..	16
6	5	3	..	..	2	2	6	1	..	..	19
7	1	2	..	4	2	2	7	3	1	..	22
8	3	1	..	4	2	3	15	..	3	..	31
9	1	..	..	6	2	2	4	3	1	1	20
100	2	..	..	7	2	..	8	4	1	..	24
1	2	..	..	2	..	1	8	6	1	..	20
2	..	..	..	5	2	5	11	2	3	..	28
3	2	..	..	2	5	1	7	5	2	..	24
4	..	1	..	3	1	3	9	3	..	..	20
5	3	..	..	9	2	1	9	1	2	..	27
6	2	..	..	5	1	1	9	5	1	..	24
7	2	..	..	4	2	2	6	3	3	..	22
8	..	..	..	6	1	..	9	4	4	..	24
9	..	..	..	2	..	..	6	1	1	1	11
110	..	..	..	7	1	2	5	3	2	..	20
1	..	..	..	5	..	2	6	1	2	..	16
2	1	..	..	1	..	1	..	3	2	1	9
3	..	..	..	2	2	1	8	2	3	1	19
4	..	..	..	3	2	1	6	1	2	1	16
5	..	..	..	6	..	..	7	2	6	1	22
6	..	..	..	3	..	..	3	1	1	..	8
7	..	..	..	1	..	..	2	1	6	..	10
8	..	..	..	3	..	..	5	1	..	..	9
9	1	..	..	..	1	..	7	2	3	..	14
120	..	..	..	3	1	..	2	3	3	..	12
1	..	..	..	..	..	..	1	1	3	..	5
2	..	..	..	..	..	..	4	1	2	..	7
3	..	..	..	1	..	1	3	2	4	1	12
4	..	..	..	1	..	..	1	1	5	1	9
5	..	..	..	..	..	1	2	..	2	1	6
6	2	..	..	..	..	..	2	3	..	..	7
7	..	..	..	..	..	..	2	1	2	2	7
8	..	..	..	1	..	..	1	..	1	1	4
9	..	..	..	1	1	..	..	1	1	..	4
130	..	..	..	..	..	1	3	1	1	..	6
1	1	..	..	..	..	..	2	..	1	1	5
2	..	..	..	1	1	..	2	1	1	3	9
3	1	..	..	1	..	..	..	..	..	..	2
4	1	..	..	..	..	..	3	1	..	..	5
5	1	..	..	..	..	..	2	1	2	..	6
6	..	..	..	..	..	..	3	..	3	..	6
7	..	..	..	..	..	..	2	..	1	2	5
8	1	..	..	..	..	..	..	1	1	..	3

Table 4 (continued.)

H	HA	HB	PA	DS	PS	RA	RB	D	R	R'	To- tal
9	1	..	..	..	1	..	1	..	..	3	6
140	1	1	..	..	2
1	1	..	1
2	1	..	2	1	4
3	2	..	2	2	6
4	1	..	1	1	3
5	1	..	3	4
6	1	..	1
7	2	2
8	2	..	..	3	5
9	2	2	2	6
150	1	..	6	..	7
1	2	..	..	1	3
2	1	1	1	3	6
3	1	..	1	2	4
4	2	..	2	1	5
5	1	..	1	1	3
6	1	..	..	1	..	2
7	1	..	1	1	3
8	1	..	3	..	4
9	3	2	5
160	1	..	1	2
1	1	..	2	1	4
2	1	1	2
3	2	..	1	5	8
4	2	3	5
5	1	2	2	1	6
6	1	1	2	4
7	1	..	..	3	4
8	1	1	..	..	2
9	1	..	..	3	4
170	1	2	3	6
1	2	1	1	2	6
2	1	2	3
3	1	..	1	3	5
4	2	2
5	1	4	5
6	1	..	1
7	3	4
8	1	..	..	..	2
9	2	..	1	4
180	1	..	..	2	3
1	1	..	1	2
2	2	2
3	1	2	3
4	1	2	2	5
5	1	..	..	4	5
6	1	2	3
7	2	6	8
8	1	..	..	1	2
9	4	2	6
190	2	..	2
1	1	..	2	..	3
2	1	..	1
3	1	..	1

Table 4 (continued.)

H	HA	HB	PA	DS	PS	RA	RB	D	R	R'	To- tal
4	2	2	..	4
5	2	1	3
6	1	1	2
7	1	..	..	..	1
8	1	1
9	1	..	..	2	3
200	1	1	1	3	6
1	2	..	2	4
2	4	4
3	1	1	4	6
4	1	1	..	2
5	1	..	2	3
6	1	..	1
7	1	1
8	1	..	4	5
9	5	5
210	1	..	1	2
1	3	..	1	4
2	1	..	3	5
3	1	1
4	1	..	3	4
5	1	1	..	3
6	1	2
7	1	1	2	6
8	1	..	2	3
9	1	..	2
220	1	..	2	3
1	1	..	..	1
2	1	..	2
3	3	5
4	1	..	2
5	1	1	..	3
6	1	2
7	1	..	2
8	3	4
9	2
230	1	1
1	1	2
2	3
3	3	4
4	1	2
5	1	4
6	1	1
7	1	2
8	5
9	1	4
240	2
1	7
2	2
3	2
4	5
5	2
6	7
7	2
8	2
9	5
190	2
1	1	..	2	..	3
2	1	..	1
3	1	..	2

Table 4 (continued.)

H	HA	HB	PA	DS	PS	RA	RB	D	R	R'	Total
9	1	..	..	1
360	1	1
1	1	1
2	1	1
3	2	2
4	1	1
5	1	1
6	2	2
7
8
9	1	1
370	1	1
1	1	1
3	1	1
4	1	1
6	1	1
8	2	2
9	1	1
380	1	1
4	1	1
5	2	2
8	1	1
9	1	1
390	1	1
1	1	1
2	1	1
5	1	..	..	1
400	1	1
2	1	1
6	2	2
410	2	2
6	2	2
8	1	1
9	1	1
422	1	1
8	1	1
432	1	1
4	1	1
6	1	1
453	2	2
4	1	1
9	1	..	..	1
466	1	1
484	2	2
492	1	1
6	1	1
516	1	1
517	1	1

Number of aurora heights measured.
In all

HA	HB	PA	DS	PS	RA	RB	D	R	R'	Total
47	12	4	162	48	43	292	156	184	481	1429

The headings in Table 4 have the following meanings: H is the height in kilometers, HA and HB homogeneous arcs and bands, PA pulsating arcs, DS cloudlike aurora, PS pulsating patches,

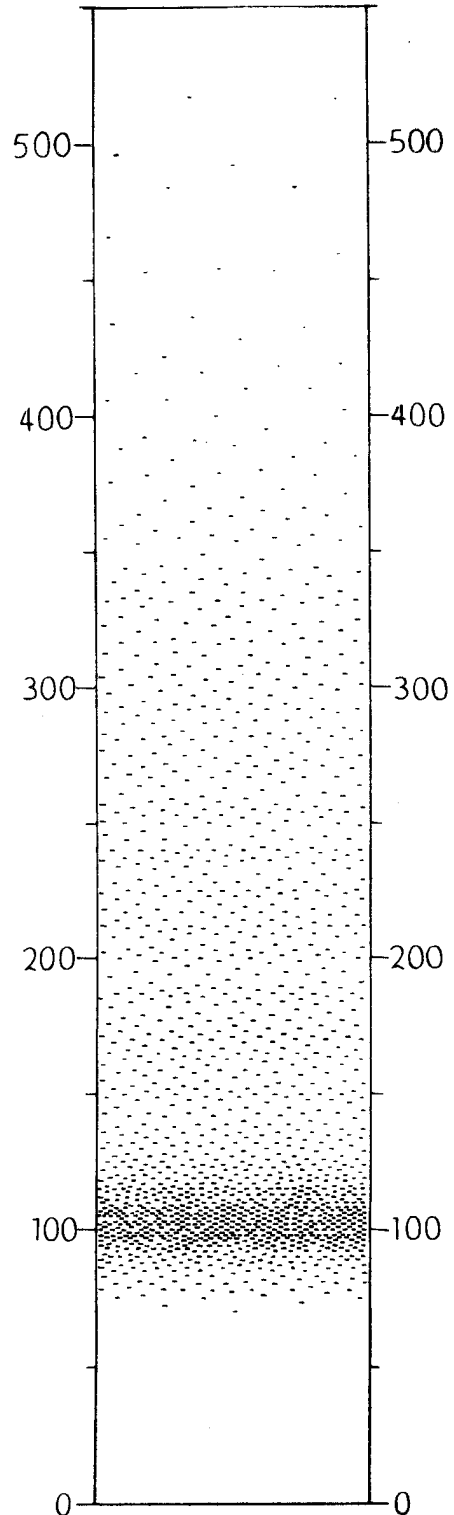


Fig. 11. Vertical distribution of all measured aurora points.

RA and RB arcs and bands with ray structure, D draperies, R and R' rays. Under R points in the earth's shadow are enumerated, and under R' those in the sunlit part of the atmosphere. Under the heading "Total" all points of the given height are enumerated.

Among these aurorae, certain forms such as red DS, high arcs (200 km), and red arcs, observed in the more extensive material from 1911-1950, were not seen in southern Norway during the polar year.

A still better picture of the vertical distribution of all forms is seen on Fig. 11, (page 35), where all points corresponding to a given height are distributed regularly along the line having this height, as small dots.

Still another method has been used to show the vertical frequency in the interval 70 to 150 km. We have made the following summation in order to eliminate accidental errors as far as possible:

1° The sum of cases for 69, 70 and 71 km.

2° The sum of cases for 70, 71 and 72 km.

3° The sum of cases for 71, 72 and 73 km.

and so on.

The result is seen in table 5 where the sum is written in the same line as the second of the 3 heights.

Table 5 (continued.)

H	Number of heights	3 by 3	5 by 5
7	8	27	45
8	10	29	55
9	11	38	52
90	17	34	59
1	6	38	64
2	15	36	71
3	15	48	70
4	18	49	83
5	16	53	90
6	19	57	106
7	22	72	108
8	31	73	116
9	20	75	117
100	24	64	123
1	20	72	116
2	28	72	116
3	24	72	119
4	20	71	123
5	27	71	117
6	24	73	117
7	22	70	108
8	24	57	101
9	11	55	93
110	20	47	80
1	16	45	75
2	9	44	80
3	19	44	82
4	16	57	74
5	22	46	75
6	8	40	65
7	10	27	63
8	9	33	53
9	14	35	50
120	12	31	47
1	5	24	50
2	7	24	45
3	12	28	39
4	9	27	41
5	6	22	41
6	7	20	33
7	7	18	28
8	4	15	28
9	4	14	26
130	6	15	28
1	5	20	26
2	9	16	27
3	2	16	27
4	5	13	28
5	6	17	24
6	6	17	25
7	5	14	26
8	3	14	22
9	6	11	17
140	2	9	16
1	1	7	19

Table 5.

Frequency of heights of the measured aurora points until $H = 150$ km.

H	Number of heights	3 by 3	5 by 5
70	1	1	2
1	..	2	3
2	1	2	3
3	1	2	5
4	..	4	7
5	3	5	8
6	2	7	14
7	2	11	16
8	7	11	20
9	2	16	22
80	7	13	23
1	4	14	22
2	3	13	24
3	6	13	24
4	4	17	29
5	7	20	34
6	9	24	38

Table 5 (continued.)

H	Number of heights	3 by 3	5 by 5
2	4	11	16
3	6	13	18
4	3	13	18
5	4	8	16
6	1	7	15
7	2	8	18
8	5	13	21
9	6	18	..
150	7	..	..

In Fig. 12 the curves for 3 and 3 heights are superimposed, giving a fairly good impression of the relative aurora frequency for the different heights.

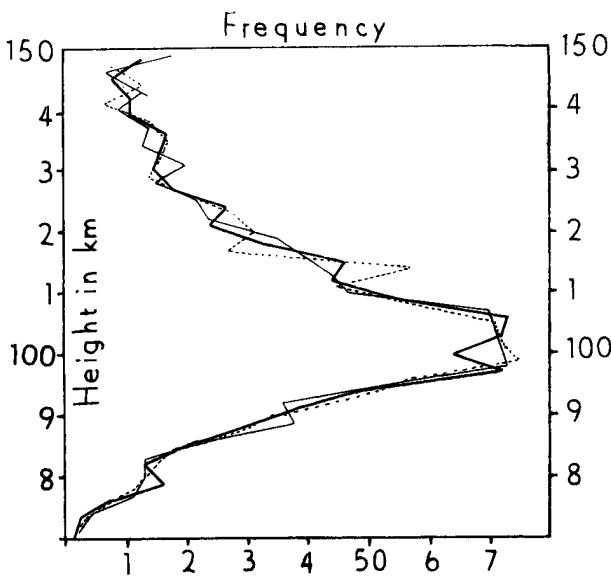


Fig. 12. Curves of frequency of all heights taking 3 and 3 (See the text).

For comparison we have made the same additions for groups of five heights associating each sum with the third of the heights (the height in the middle). See Table 5 and Fig. 13.

The corresponding five frequency curves give a still better impression of the distribution of the aurora heights than Fig. 12.

From these enumerations certain characteristic features are found again when we compare the

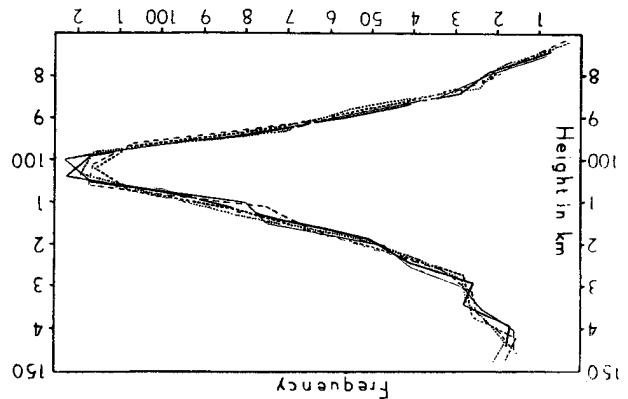


Fig. 13. The same, taking 5 and 5 heights.

results with those found from the statistics of the heights from 1911-1944:

The concentration of heights in the interval from 90 to 120 km.

The greater heights of the sunlit aurora rays.

The low heights reached by certain aurora forms, in particular by cloudlike forms DS and bands with ray structure RB (curtains). These low heights occurred in general some hours after midnight.

26. Statistics of heights of the lowest points of the aurora.

How far down in the atmosphere the aurora reaches has great importance in theoretical respects. In fact, if we assume, corresponding to the ideas of *Kr. Birkeland*, that the aurora is caused by streams of electric corpuscles coming from the sun, the penetrability of these corpuscles can be found by observing how low down in the atmosphere they penetrate. We must also take into account certain phenomena of more secondary nature following the penetrating rays in curtains, namely the diffuse cloudlike aurorae which often penetrate even lower down than the curtains.

In spite of the relatively small material from the polar year we have made up a table like Table 4, for the lowest points of each aurora form. This table, No. 6, has the same headings as Table 4:

Table 6 (continued.)

H	HA	HB	PA	DS	PS	RA	RB	D	R	R'	Total
7	1	1
8	1	..	1
9	1	1
180
1
2	1	1	2
3
4
5
6
7	1	2	3
8
9	1	1
190
1
2
3	1	..	1
4
5
6
7
8	1	1
9	1	1
200	1	..	1
1	1	1
2	1	1
3	1	1
4
5
6
7	1	1
8	1	1
9	2	2
210	1	1
1	1	1
2	1	1
3
4
5
6
7
8	1	1
9
220
1
2
3
4
5
6
7
8	1	1
9	1	1
230
1

Table 6 (continued.)

H	HA	HB	PA	DS	PS	RA	RB	D	R	R'	Total
2
3
4
5	1	1
6	1	1
7
8
9
240
1
2	1	1
3
4	1	1
5
6
7	1	1
8
9
250
2	1	1
6	1	1
260	1	1
1	1	1
267	1	1

Number of heights.

HA	HB	PA	DS	PS	RA	RB	D	R	R'	Total
41	10	4	46	19	32	126	64	52	72	466

Mean height of the lowest points.

104	94	88	88	93	101	103	104	127	180	115
-----	----	----	----	----	-----	-----	-----	-----	-----	-----

We see as before that the cloudlike aurora reaches lowest down, and next come the curtains. As can be found from Table 2, these low aurora forms occurred in particular in the morning hours on March 24 and 25, 1953.

The lowest points of the rays are very dispersed, but those of rays in sunshine are situated decidedly higher than those of rays in shadow. See also section 29.

We have added the mean height for the lowest borders of each aurora form and the mean height 115 km. of all these.

On Fig. 14 is seen a diagram analogous to Fig. 11 for the lowest points of all aurora forms.

To illustrate the frequency of the lowest points in the interval from 70 to 150 km. we have also

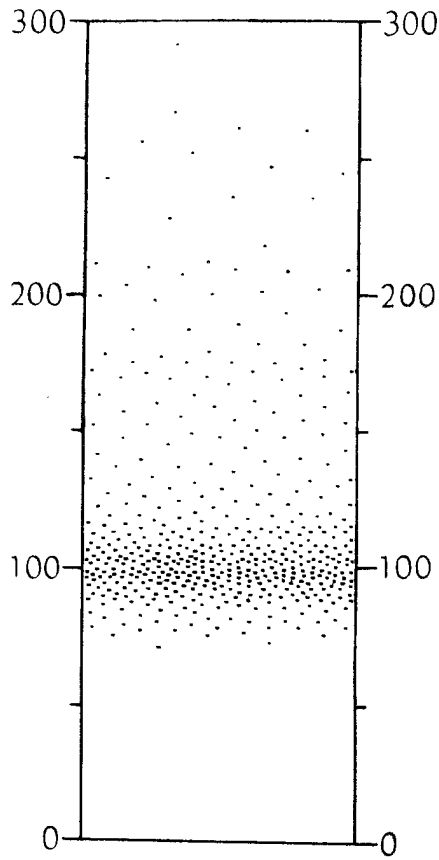


Fig. 14. Distribution of heights of lower borders of all aurora forms.

made enumerations 3 by 3 and 5 by 5 as in table 5. The results are seen for all auroraforms together, in table 7. *H* is the height, *N* the frequency for each *H*.

Table 7.

Frequency of heights of the lowest points of aurora taken 3 by 3 and 5 by 5.

H	N	3 by 3	H	N	5 by 5
70	1	1	70	1	2
1	..	2	1	..	2
2	1	1	2	1	2
3	..	1	3	..	4
4	..	3	4	..	5
5	3	4	5	3	6
6	1	6	6	1	11
7	2	8	7	2	13
8	5	9	8	5	14
9	2	11	9	2	17
80	4	10	80	4	18
1	4	11	1	4	16
2	3	10	2	3	17

Table 8 (continued.)

H	N	3 by 3	H	N	5 by 5
3	3	9	3	3	18
4	3	11	4	3	19
5	5	13	5	5	21
6	5	15	6	5	21
7	5	18	7	5	34
8	8	24	8	8	40
9	11	30	9	11	40
90	11	27	90	11	47
1	5	28	1	5	48
2	12	26	2	12	51
3	9	35	3	9	52
4	14	35	4	14	63
5	12	42	5	12	65
6	16	42	6	16	75
7	14	49	7	14	73
8	19	45	8	19	69
9	12	39	9	12	67
100	8	34	100	8	72
1	14	41	1	14	66
2	19	46	2	19	62
3	13	40	3	13	64
4	8	31	4	8	61
5	10	29	5	10	51
6	11	30	6	11	51
7	9	33	7	9	46
8	13	25	8	13	42
9	3	22	9	3	38
110	6	16	110	6	34
1	7	18	1	7	30
2	5	21	2	5	32
3	9	19	3	9	33
4	5	21	4	5	28
5	7	14	5	7	26
6	2	12	6	2	20
7	3	8	7	3	20
8	3	11	8	3	16
9	5	11	9	5	14
120	3	8	120	3	14
1	..	6	1	..	15
2	3	7	2	3	12
3	4	9	3	4	9
4	2	6	4	2	12
5	..	5	5	..	11
6	3	5	6	3	8
7	2	6	7	2	8
8	1	5	8	1	11
9	2	6	9	2	9
130	3	6	130	3	10
1	1	7	1	1	10
2	3	5	2	3	9
3	1	5	3	1	7
4	1	3	4	1	6
5	1	2	5	1	5
6	..	3	6	..	6

Table 7 (continued.)

H	N	3 by 3	H	N	5 by 5
7	2	4	7	2	7
8	2	6	8	2	7
9	2	5	9	2	8
140	1	4	140	1	6
1	1	2	1	1	5
2	..	2	2	..	4
3	1	2	3	1	4
4	1	3	4	1	3
5	1	2	5	1	4
6	..	2	6	..	5
7	1	3	7	1	6
8	2	5	8	2	6
9	2	5	9	2	6
150	1	3	150	1	5

On Fig. 15 the curves from the enumerations 3 by 3 and on Fig. 16 the same from 5 by 5 are shown superimposed.

Fig. 15 og 16

To make similar tables and figures for every special auroral form is not worth while because of the small number of measurements. As to the form

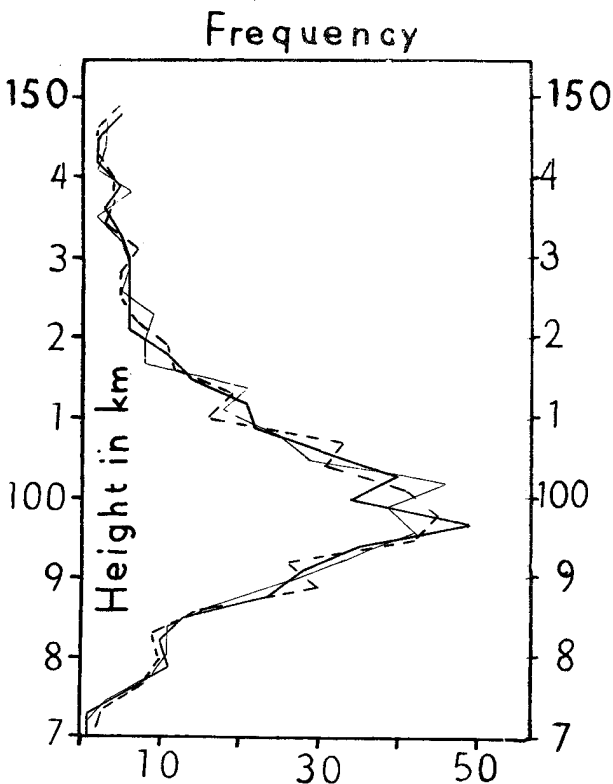


Fig. 15. Curves of frequency of heights of lower border, all forms, taken 3 and 3.

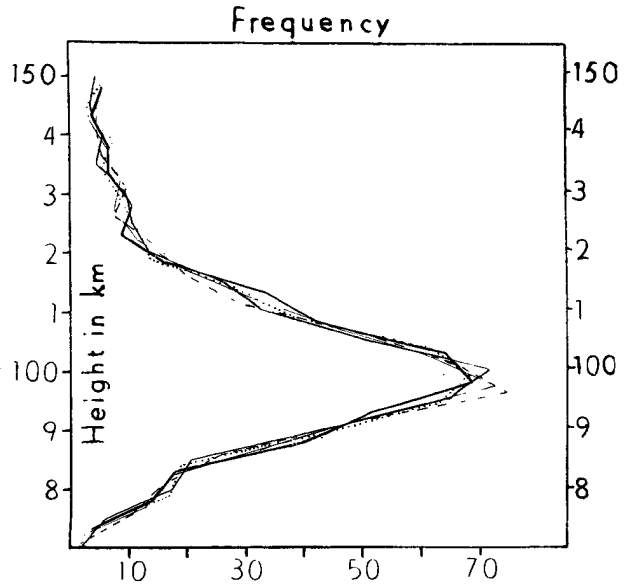


Fig. 16. Curves of frequency of heights of lower border, all forms, taken 5 and 5.

RB, that means bands with ray structure or curtains, we have in table 8 made the same enumeration 5 by 5. The superposed curves are seen in Fig. 17.

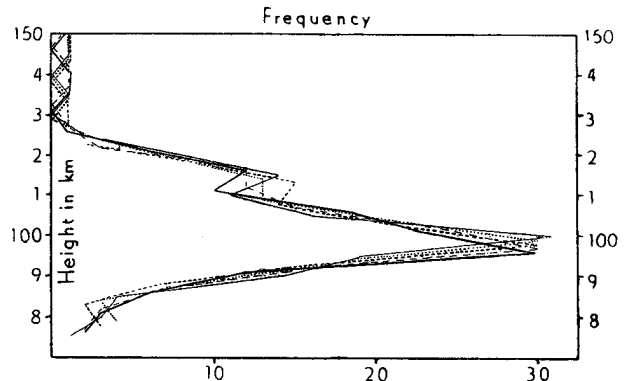


Fig. 17. Curves of frequency of heights of lower border of curtains RB, taken 5 by 5.

Table 8.
Frequency of heights of the lower border of the aurora form RB, taken 5 by 5.

H	N	5 by 5	H	N	5 by 5
75	..	1	105	4	14
6	..	2	6	1	12
7	1	2	7	1	12
8	1	3	8	3	9
9	..	4	9	3	8
80	1	3	120	1	8

Table 8 (continued.)

H	N	5 by 5	H	N	5 by 5
1	1	3	1	..	6
2	..	3	2	1	3
3	1	2	3	1	2
4	..	3	4	..	3
5	..	4	5	..	2
6	2	6	6	1	1
7	1	7	7	..	1
8	3	10	8	..	1
9	1	10	9	..	0
90	3	14	130	..	0
1	2	12	1	..	0
2	5	14	2	..	0
3	1	16	3	..	1
4	3	18	4	..	1
5	5	19	5	1	1
6	4	30	6	..	1
7	6	30	7	..	1
8	12	30	8	..	0
9	3	30	9	..	0
100	5	31	140	..	0
1	4	23	1	..	1
2	7	24	2	..	1
3	4	21	3	1	1
4	4	21	4	..	1
5	2	16	5	..	1
6	4	18	6	..	0
7	2	15	7	..	0
8	6	14	8	..	1
9	1	13	9	..	1
110	1	11	150	1	1
1	3	10			
2	..	12			
3	5	15			
4	3	13			

27. The highest points of the aurora.

A similar research has been done for the highest points of the different forms. Here the material is still more scanty.

In *table 9* the result is seen. We may further remark that the great heights for certain RB and D are due to the summits of some rays of the curtains reaching much higher than most of the other rays of the same curtains.

A point-diagram is seen on Fig. 18 page 45.

The greater heights of the sunlit aurora rays are a striking feature, but the immense heights of these rays during years of maximum activity of the sun were not observed during the polar year, which belonged to years of minimum activity. See also section 29.

Table 9.

Frequency of highest points of the different aurora forms.

H	HA	HB	PA	DS	PS	RA	RB	D	R	R'	Total
90	1	..	..	..	..	..	1	..	..	..	2
1
2
4	1	..	..	..	1
5
6	1	..	1	..	..	..	2
7	1	..	..	..	1	..	..	..	..	..	2
8	2	..	..	1	1	..	..	..	..	..	4
9	1	..	..	..	..	..	..	1
100	1	..	..	4	1	..	..	..	1	..	7
1	1	..	..	1	..	..	..	2
2	1	..	..	1	..	..	..	2
3	1	3	1	..	..	..	..	5
4	1	..	..	2	..	..	..	3
5	3	1	..	3	..	..	..	7
6	1	1	..	1	..	..	..	3
7	1	2	..	..	..	..	..	3
8	2	..	..	2	..	..	..	4
9	1	..	..	3	..	..	..	4
110	5	1	..	1	..	..	..	7
1	1	..	..	1	..	..	..	2
2	1	..	..	..	..	..	..	1
3	1	..	..	..	1	..	2
4	1	1	1	2	..	..	..	5
5	2	..	..	2	..	..	..	4
6	3	..	..	1	..	..	..	4
7	1	..	..	..	..	..	..	1
8	2	..	..	..	..	..	..	2
9	1	..	1	..	1	..	3
120	3	..	..	..	..	..	..	3
1
2	2	..	..	..	2
3	1	..	..	..	..	..	..	1
4	1	..	..	1	..	..	..	2
5	1	..	..	..	1
6
7
8	1	..	..	..	..	..	..	1
9	1	..	..	..	..	..	..	1
130
1	1	..	..	1
2	1	..	..	..	..	..	1
3
4	1	..	..	..	1
5	1	..	..	..	1
6	1	..	..	..	1
7	1	..	..	..	1
8
9	1	..	..	..	..	..	1
140	1	..	..	..	..	..	..	1

Table 9 (continued.)

H	HA	HB	PA	DS	PS	RA	RB	D	R	R'	Total
1
2	1	..	..	..	1
3	1	..	..	..	1
4
5
6
7
8	1	..	..	..	1
9	1	..	1
150	1	..	1
1
2	1	..	1	..	2
3
4	1	..	..	..	1
5	1	..	..	..	1
6
7
8
9
160
1
2
3
4	2	..	2
5
6
7
8
9
170
1	1	..	..	..	1
2
3
4
5
6
7
8	1	..	1
9
180
1
2
3
4
5
6
7
8	1	..	..	..	1
9	1	..	1
190	2	..	2
1	1	..	1
2	1	..	1
3
4
5	1	..	1

Table 9 (continued.)

H	HA	HB	PA	DS	PS	RA	RB	D	R	R'	Total
6	1	..	1
7
8
9
200	1	..	..	..	1
1
2
3	1	..	1
4
5
6
7
8	1	1
9
210
1
2
3
4
5
6
7	1	..	1
8
9
220
1	1	..	..	..	1
2
3
4
5	1	..	..	..	1
6
7	1	..	1
8
9
230
1
2
3	1	1
4
5
6
7
8
9
240	2	1	3
1
2
3
4
5
6
7	1	1
8
9	1	1	2
250	1	1	1

Table 9 (continued.)

H	HA	HB	PA	DS	PS	RA	RB	D	R	R'	Total
1
2	1	1
3	2	2
4	1	1
5	1	1
6	1	1
7
8
9	1	1
373	1	1
378	2	2
379	1	1
385	2	2
390	1	1
391	1	1
400	1	1
406	2	2
410	1	1
416	1	1
419	1	1
422	1	1
428	1	1
434	1	1
453	1	1
454	1	1
466	1	1
484	1	1
516	1	1
517	1	1
Number of heights											
	5	..	..	42	17	2	53	1	30	81	231

PART IV.

GEOGRAPHICAL POSITION OF THE MEASURED AURORA.

28. Geographical distribution of the aurora from 23—25 March and from 1—2 May 1933.

Comparison with the three hour range magnetic indices K.

It is of special interest to consider the geographical positions of the measured points of aurora on the two nights 23—24 and 24—25 March photographed from Trondheim and Lökken Verk and to compare them with the positions of the points from the big aurora 1—2 May, photographed from Oslo and other southern stations.

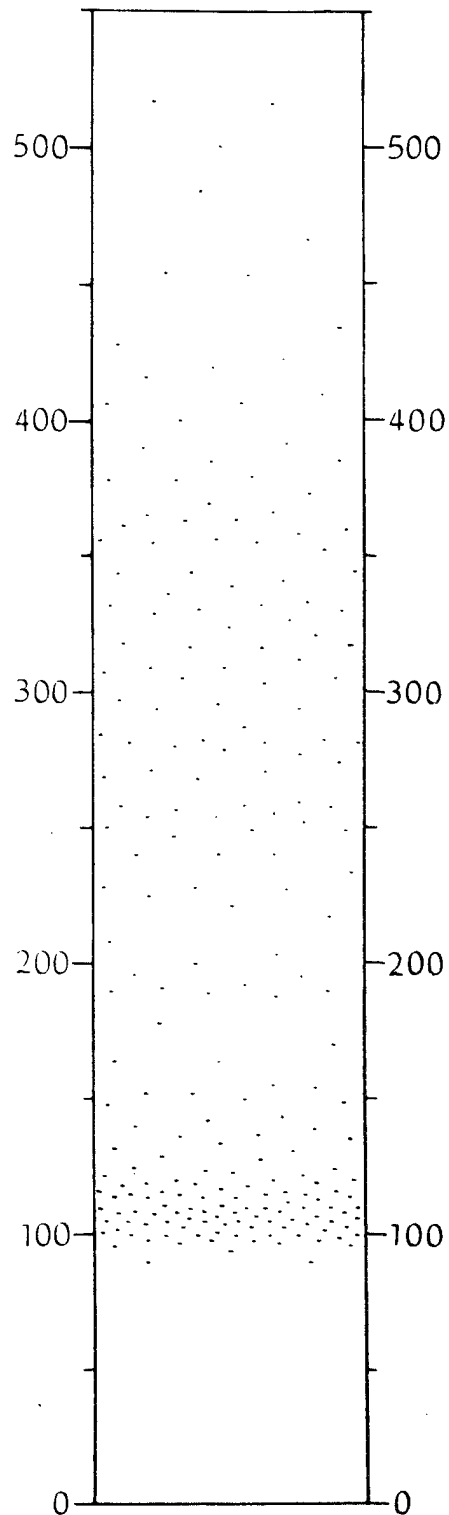


Fig. 18. Distribution of heights for the highest points of all aurorae.

The geographical positions of the points corresponding to the two first nights are seen in Fig. 19 and from the last night 1—2 May in Fig. 20.

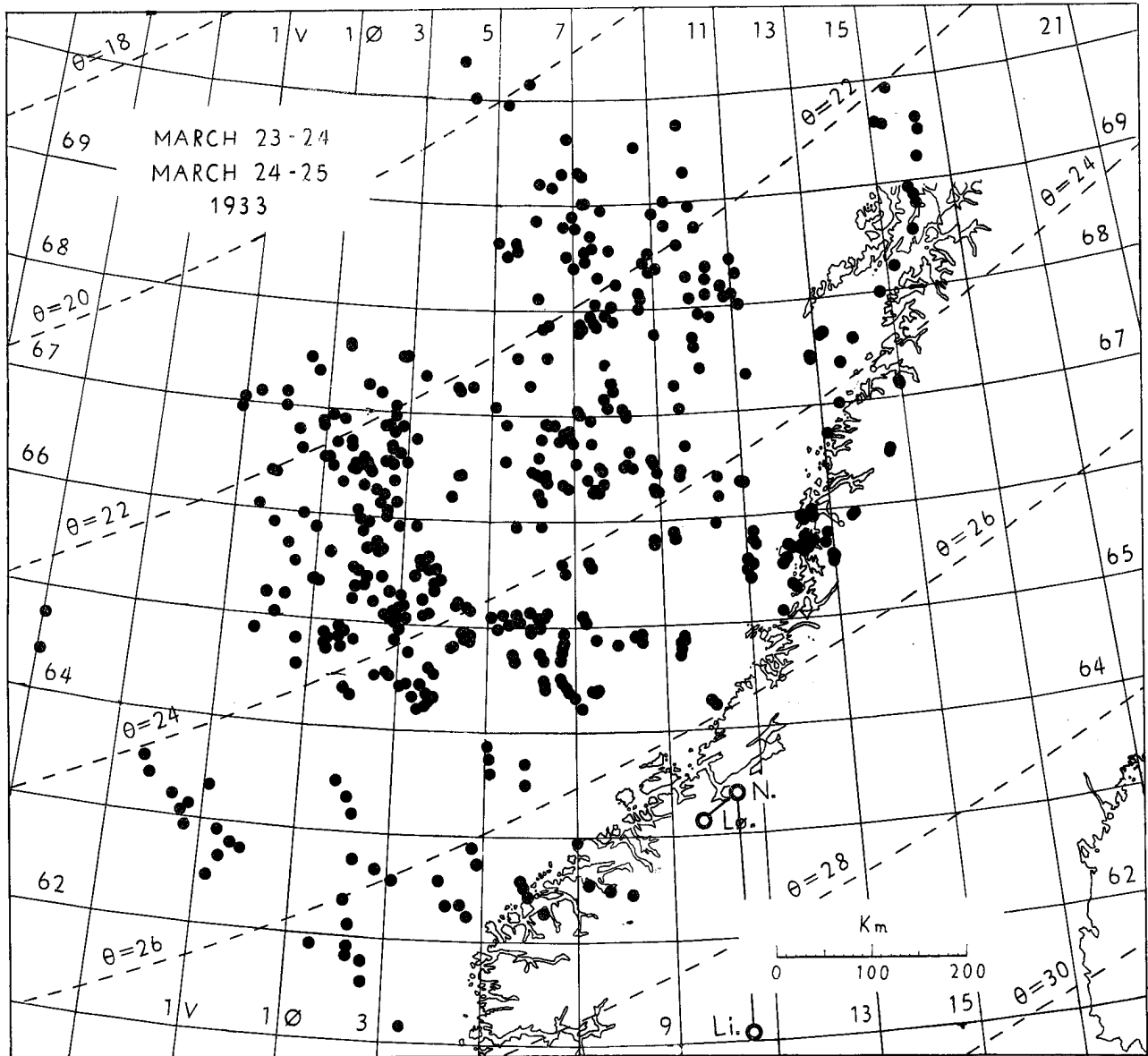


Fig. 19. Geographical positions of all the measured aurora points on March 23—24 and 24—25.

Drawn in the same figures are the lines $\theta =$ constant, marking the angular distance from the point where the geomagnetic axes through the centre of the earth cuts its northern hemisphere. The aurora on May 1—2 was by far the greatest of all the aurorae observed from southern Norway during the polar year and reached furthest south. On account of the bright night (Sunset $20^{\text{h}}11^{\text{m}}$) we did not see it earlier than about $22^{\text{h}}20^{\text{m}}$; it is probable that it reached even further to the south before 20^{h} , judging from the big magnetic storm that evening.

It is a well known fact that aurora far away

from the auroral belts, for instance northern lights over central Europe or southern lights over Australia and south Africa, are always accompanied by severe magnetic storms. In 1911¹⁾ I tried to explain this fact as an action of a corpuscular ring drawing the aurora from the aurora belts towards the geomagnetic equator and that the component of the magnetic perturbation parallel

¹⁾ Sur les trajectoires des corpuscules électriques dans l'espace sous l'action du magnétisme terrestre avec application aux boréales etc. Second memoire § 20, Archives des sciences physiques et naturelles, 4. période, t. XXXII, 1911.

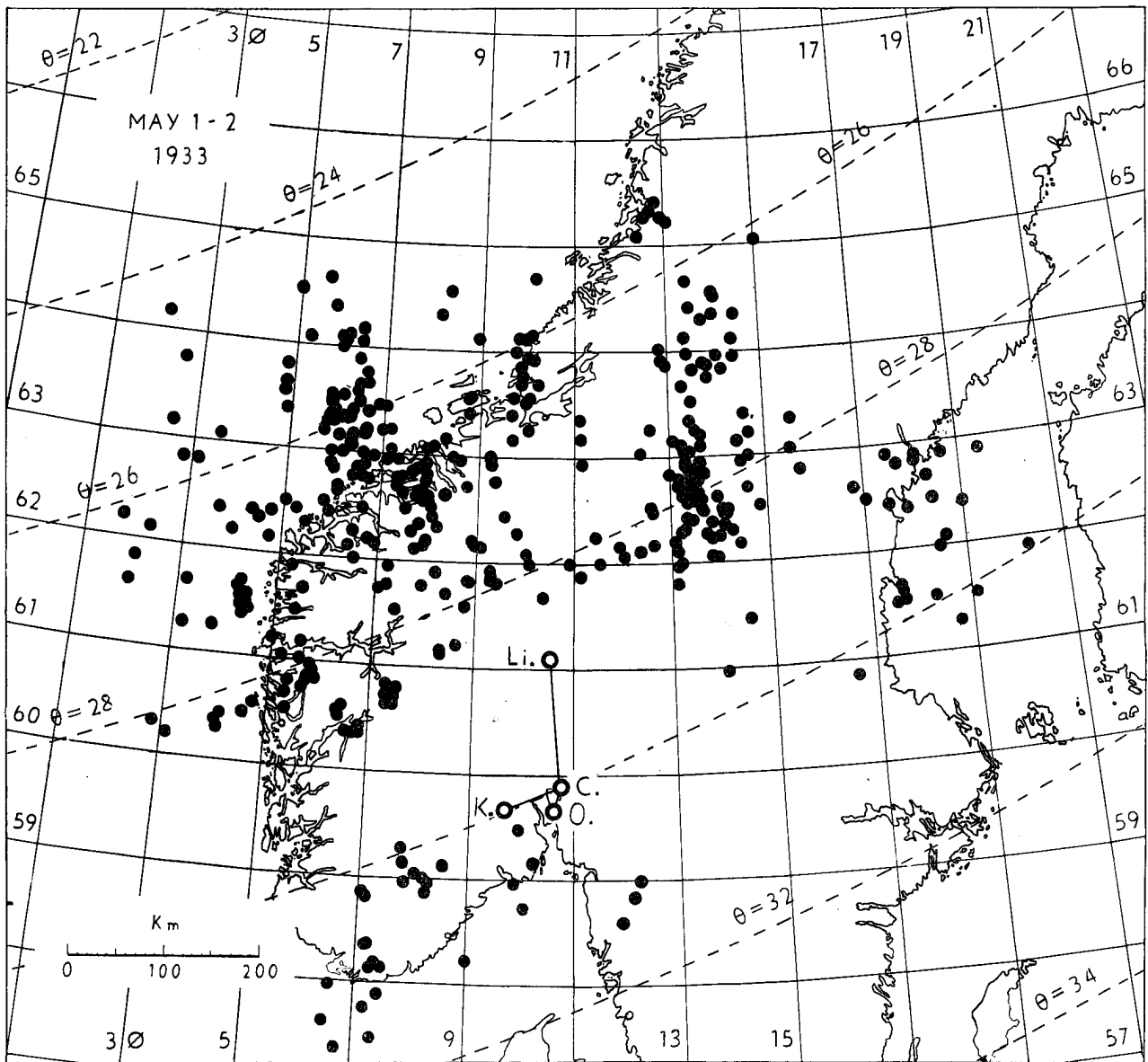


Fig. 20. Geographical positions of all the measured aurora points on May 1—2.

to the earth's geomagnetic axis was a measure of how far the aurora went towards the geomagnetic equator.

In my paper on the results of the measurements of height and position of aurora in southern Norway 1911-1922,¹⁾ I came back to this theory in connection with the 6 greatest aurorae in this period, but I did not compare the aurorae with the component of the perturbation parallel to the geomagnetic axes.

Similarly for the polar year I have had no opportunity of doing this comparison. However,

¹⁾ Geofysiske Publikationer Vol. 4, § 24, p. 70.

for the aurora on May 1-2, it has been done by *Tagesi Nagata*, in his paper: *Development of a Magnetic Storm. The southward Shifting of the Auroral Zone.*¹⁾

He has found good agreement between theory and observation.

As an illustration we give in Table 10 page 48 the Three-Hour-Range indices K, which are a good measure of the intensity of the magnetic storm occurring simultaneously with the measured aurorae. We have used the K indices for Dombaas

¹⁾ Journal of Geophysical Research, June 1950, No. 2, Washington.

Table 10.

Comparison between the magnetic indices K and the distance θ from the geomagnetic axispoint to some of the measured aurorae during the polar year 1932-33.

Year	Date	Time MET	K indices Dombaas				Kp indices				θ
			16-19	19-22	22-1	1-4	16-19	19-21	22-1	1-4	
1932	Aug. 29-30	22.46-23.12	5	6	5	6	4	5	5	4	23-26
1933	March 18-19	23.16- 3.03	3	3	7	5	4	3	6	5	19-27
	" 19-20	21.05-22.01	4	8	7	6	4	5	6	6	24-28
	" 23-24	0.21- 4.25	5	6	4	5	5	5	4	4	19-24
	" 24-25	20.27- 4.12	5	4	4	4	5	4	4	4	21-29
	April 15-16	22.39- 2.19	3	6	7	3	3	5	4	3	22-28
	" 21-22	0.41- 1.16	3	4	5	3	3	4	5	3	19-23
May 1-2	22.21- 1.14	8	9	8	7	8	8	7	6	24-32	

and the planetary K_p indices for the whole earth in accordance with Bartels.¹⁾

In the same table, the lines $\theta = \text{constant}$ between which the aurora was situated are also given.

From this table it is evident how much farther south the aurora May 1-2 went, corresponding to the much greater K indices for this night.

A comparison between the intensity of the magnetic storms and the southern limit of aurorae was also the subject of some papers by A. Røstad in 1927.²⁾

PART V.

THE SUNLIT AURORA-RAYS.

29. Position relative to the Earth's shadow.

As stated earlier the sunlit aurora-rays did not reach the great heights 600 to 1000 km. observed for such rays during years of maximum activity of aurorae and sunspots. It had been observed earlier that the feet of aurora-rays have a tendency

to follow the earth's shadow, and it is of interest to see if this is the case here again.

For that purpose the position of the earth's shadow relative to the measured points of the ray has been calculated for each of the sunlit rays and further the position of the ray taken from the point where the shadow line touches the earth. The result for all the sunlit rays is seen in Fig. 21, representing a vertical section of the

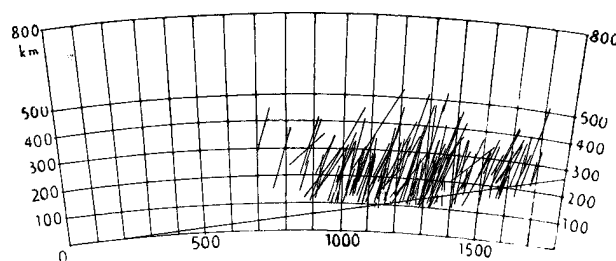


Fig. 21. The positions of sunlit aurora rays to the earth's shadow line (without refraction).

atmosphere with the border line between sunlit and dark atmosphere. Refraction is neglected.

From this figure, the above mentioned tendency is clear but not so marked as on other diagrams for March 22-23, 1920. September 18-19, 1928 and October 16-17, 1936.¹⁾

Among the sunlit rays there are two special cases already mentioned in sections 16 and 19.

¹⁾ International Union of Geodesy and Geophysics. Association of Terrestrial Magnetism and Electricity, Bulletin No. 12 d. Washington 1950. Before I got this paper, Mr. Wasserfall in Bergen had sent me the K indices for Dombaas.

²⁾ A. Røstad: Ueber die Einwirkung der magnetischen Perturbationen auf die geographische Verbreitung des Nordlichts, Geofysiske Publikationer, Oslo, Vol. V, No. 5. and: Ueber Nordlichterscheinungen in niedriger Breiten, Gerlands Beiträge zur Geophysik, Vol. XVI, 1927.

¹⁾ Carl Störmer: Sonnenbelichtete Nordlichtstrahlen, Zeits. f. Geophysik, Jahrg. 5, 1929. and *ibid*: Some results etc. Geofysiske Publikasjoner, Vol. XII, No. 7, Oslo, 1938.

The first one, on March 19–20 between 21^h6^m and 21,9 showed some most interesting *invisible rays*, whose light was probably *ultraviolet*.

The second one, of a fine drapery, at 22,55 on March 24–25, shows a distinct weakening of the rays round the earth's shadow. This is a transition from undivided to divided¹⁾ rays.

Fine figures of both cases are seen in the preliminary report²⁾ on the expedition, published in 1934. They are reproduced here on plate 1, middle figures and on plate 2, lower figures.

APPENDIX.

AURORA OBSERVATIONS FROM SHIPS DURING THE POLAR YEAR 1932—33.

30. Instructions.

In July 1932 circulars regarding aurora-observations were sent to the captains of a series of ships by Th. Hesselberg, Director of Det Norske Meteorologiske Institut. The circular was as follows after translation:

In the attached letter from Professor Störmer a request is sent to you asking you to order observations to be made during the winter 1932–33.

The necessary instructions are sent in a separate cover containing:

1. Photographic Atlas of Auroral Forms with a norwegian translation attached.
2. Observations of aurora from ships.

Further a logbook for aurora observations is enclosed and this should be returned to Professor Störmer when the polar year is ended. To this letter was attached the following letter:

"In the polar year from August 1, 1932 to August 31, 1933 simultaneous photographs and visual observations of aurora will be made from a series of land stations from Alaska, northern Canada, Scandinavia, Finland, Russia and Siberia.

The aim of these observations is to get informations about important features of the aurora, features which can not be obtained from a single station alone but only through the cooperation of a series of stations round the northern zone i.e.

one extending from end of the magnetic axis at Smits sund in northern Greenland to about 40° south-wards from that point.

Examples of such a feature are the length of a stationary homogeneous arc, the times when certain characteristic aurora variations occur, for instance when a homogeneous arc changes to an arc with ray structure. Further we may observe if this occurs simultaneously or not over the region where the aurora is seen.

In between the series of land stations there are however important gaps, namely the Atlantic ocean, the North Sea and the northern part of the Pacific. Here observations according to the adjoined instructions will be extremely important.

Very important also are observations from other regions of the sea where aurora can be seen, both in the northern and in the southern hemisphere. Therefore I must ask you emphatically in the interest of Science to make these observations which will not only be of importance to Science but will also be an important contribution from Norway to the international cooperation during the polar year."

To this letter I attached a circular concerning observations of aurora from ships during the polar year as follows:

"It is desirable that observations of aurora be made from ships north of a line from Valencia to Boston from August 1, 1932 to August 31, 1933. It is also desirable that corresponding observations be made from ships in the most northern part of the Pacific and in the Antarctic sea, in particular south of Australia and New Zealand when aurora occur."

Regular observations.

The times of observations are 01, 04, 07, 10, 13, 16, 18, (19) and 22 GMT.

The observations are to be written up schematically as follows:

The first four columns shall contain the date, time, geographic longitude in whole and tenths of a degree, geographic latitude in whole and tenths of a degree.

In the fifth column is to be indicated the degree of cloudiness by numbers from 0 to 10, 0 meaning completely clear and 10 completely overcast.

In the sixth column is to be written the

¹⁾ See the above referred paper. Sonnenbelichtete Nordlichtstrahlen, from 1929.

²⁾ Ueber eine Nordlichtexpedition nach Trondheim im März 1933, plate XI and XII, Gerlands Beiträge zur Geophysik, Bd. 41, 1934.

Aurorae form according to the descriptions in the Photographic Atlas where

- HA = Homogeneous quiet arc (Atlas p. 4-6)
 HB = Homogeneous band (Atlas p. 8)
 PA = Pulsating arc (Atlas p. 8)
 DS = Diffuse luminous surface (Atlas p. 10)
 PS = Pulsating surface (Atlas p. 10)
 G = Feeble glow (Atlas p. 10)
 RA, Arc with ray structure (Atlas p. 12)
 RB, Band with ray structure (Atlas p. 12)
 D Drapery (Atlas p. 14)
 R = Ray (Atlas p. 16)
 C = Corona (Atlas p. 18)
 F = Flaming Aurora (Atlas p. 18)

If quiet homogeneous arcs are seen, the number of such arcs is to be given. If only one such arc is seen at the stated hour, measurements of the position of this arc, as mentioned below, will be of great importance.

In the seventh column is to be entered the southern limitation in the sky of the aurora for the northern hemisphere, and the northern limitation for the southern hemisphere. The limitation must be given in degrees, measured along the great circle from magnetic north to the lower border of the most southern arc drapery or band. If for instance the lower border of an arc is 20° south of Zenith, 110° shall be noted as the southern limitation.

In the eighth column the colour of the aurora shall be denoted by one of the letters r, g or v, where

- R means red
 G „ yellowgreen or grey
 V „ blue or violet

If no aurora can be seen at the fixed hour on account of clouds haze or fog, ships having a pocket spectroscope are asked to write in the ninth column if the yellow green line is visible in the spectroscope or not. These observations are to be denoted by one of the numbers 0 to 4, where

- 0 means that the aurora line can not be seen
 1 „ „ „ „ „ is very weak
 2 „ „ „ „ „ is easely seen, but not strong
 3 „ „ „ „ „ is strong
 4 „ „ „ „ „ is very strong

Observations at times other than the fixed hours of observation.

If a stationary homogeneous arc is seen, it is very desirable to fix its position by measuring height and azimuth of 3 points along its lower border, one at its heighest point and the two others where it cuts the horizon. Azimuth can be measured by the ship's compass and the only height which needs to be measured is the heighest point of the lower border. This height must be measured (not extimated) and with an accuracy of half a degree. Such measurements are desirable each time such a homogeneous quiet arc is visible. As the arc probably can be seen over very big regions, a series of such observations over these regions is highly desirable and the measurements ought to be made every half hour, quarter hour or even each 5 or single minute if this is possible. The exact hour and minute and the position of the ship, must be noted as exactly as possible, for each observation.

Further it is of great importance to note times as GMT, when the aurora changes its aspect completely, for instance when a homogeneous arc (without rays) changes into an arc or band with ray structure."

31. The results obtained.

From the following ships I got aurora observations:

- T/S Drottningholm
 S/S Frederik VIII
 M/S Gripsholm
 M/S Kungsholm
 D/S Mexicano
 M/S Toledo
 M/S Tønsbergfjord
 S/S United States

In Table 11 are given the aurorae observations under the headings: Date, Time, Latitude, Longitude, Cloudiness, Aurora Form, Southern limitation, Colour and Spectrographic observations.

More detailed observations during the same period are seen in Table 12.

In both tables we have omitted the names of the observers because it was too difficult to read several of the names with certainty; observations with no visual aurora omitted.

Table 11.

Observations of Aurora from ships, from Aug. 1, 1932 to Aug. 31, 1933. (More detailed descriptions, see Table 12.)

T/S Drottningholm.

Date	Time GMT	Lat.	Long.	Cl.	F.	Sl.	Col.	Sp.	
Aug. 13	1.00	N. 57°26'	W.20°22'	3	HA	29°	G		
	28	1.00	45°54'	54°24'	3	G	24°	G	
	1.43	45°58'	54°18'	3	RA	81°	G		
	2.25	46°07'	53°57'	4	G	34°	G		
	4.00	46°22'	53°25'	4	G	16°	G		
Sept. 26	23.00	50°40'	45°08'	4	PS	22°	G	3	
	27	1.15	51°00'	44°17'	8	PS	30°	G	1
Nov. 16	21.40	52°55'	39°05'	10			G		
	22.58	52°40'	39°40'	6	HA	12°	G	3	
	23.17			3	RA	26°			
	23.33			2	R	50°	G		
Jan. 23	21.42	53°30'	37°52'	4	HA	23°	G		
	22.13	53°34'	37°42'	3	HA	39°	G	3	
	22.41	53°37'	37°34'	3	HA	34°	G	3	
	22.50	53°38'	37°30'	3	HA	52°	G	3	
	23.05	53°40'	37°25'	3	HA, RB	49°	G	3	
	24	0.25	53°43'	36°31'	6	RB	34°	G, V	4
		0.37	53°45'	36°23'	6	HA	80°	G	3
		0.51	53°56'	36°15'	4	RB	32°	G, V	4
		0.56	53°55'	36°11'	4	HA	78°	G	4
		1.46	54°00'	35°48'	5	HA	17°	G	3
		4.00	54°12'	35°00'	4	G	15°	G	3
		6.30	54°29'	34°03'	4	G	12°	G	1
		21.40	56°20'	27°08'	4	HA	31°	G	2
		22.21	56°22'	27°03'	5	RA	38°	G	2
		22.27	56°22'	27°02'	5	HA	32°	G	2
25	23.55	56°36'	25°50'	6	HA	35°	G	3	
	1.14	56°42'	25°20'	4	D		G	4	
	1.31	56°43'	25°14'	3	R	71°	G	4	
	1.44	56°43'	25°13'	3	R	44°	G	2	
	1.52	56°44'	25°12'	3	HA	33°	G	1	
	4.00	56°21'	24°03'	10				2	
	26	22.00	58°37'	11°38'	4				1
	Febr. 20	19.00	57°46'	E. 9°25'	2	HA	30°	G	
		0.00	42°35'	W.65°37'	2	HA	13°	G	2
		1.00	42°49'	65°23'	2	HA	18°	G	2
4.00		43°25'	64°42'	2	HA	10°	G	1	
7.50		44°12'	63°58'	2	HA		G	2	
23	22.17	53°09'	34°00'	8	HA	49°	G	4	
	23.46	53°20'	33°30'	8	HA	41.30,5	G	3	
24	1.00	53°30'	32°48'	8	HA	17°	G	2	
	4.00	53°55'	31°30'	10				1	
	7.00	54°18'	30°20'	8	HA	9°	G	2	
	21.16	56°11'	23°50'	6	HA	17°	G	2	
	21.23			6	RA	17°	G	3	
	21.26			6	HA	21°	G	3	
	21.29	56°11'	23°48'	8	HA	16°	G	2	
	22.20	56°14'	23°23'	5	HA	23°	G	2	
	23.30	56°14'	23°20'	7	HA	180°	G	3	
	25	1.00	56°30'	22°10'	7	HA	15°	G	2
4.00		56°44'	21°00'	9				1	

Table 11 (continued).

Date	Time GMT	Lat.	Long.	Cl.	F.	Sl.	Col.	Sp.
March	5	22.00	N 59°20'	W 6°28'	10			1
	6	1.00	59°10'	7°47'	10			1
		21.00	57°41'	17°00'	2	R	180°	2
	8	22.00	52°55'	35°02'	10			1
	9	1.00	52°09'	37°18'	10			1
	11	1.00	45°12'	42°33'	10			1
	22	1.00	45°29'	50°45'	10			1
		4.00	45°48'	49°20'	10			1
	24	1.00	52°51'	34°38'	10			3
		1.10	52°53'	34°35'	9	G		3
		2.40	53°05'	34°00'	7	G	17°	2
		4.00	53°18'	33°20'	10	G		2
		5.05	53°26'	32°55'	3	HA	13	4
		21.36	55°40'	26°00'	3	G	18°	2
		21.46			3	HA	21°	2
		21.51			3	RA	23°	
		21.58			3	RA	35°	3
	25	1.00	55°58'	24°40'	4	HA	17°	2
		3.10	56°14'	23°38'	4	PS	54°	3
		3.37	56°16'	23°31'	6	HA	59°	2
		3.46	56°17'	23°28'	7	G	21°	1
		4.00	56°18'	23°24'	9			1
		22.00	57°50'	14°25'	9			2
	26	4.00	58°10'	11°02'	4	HA		1
May	23	2.32	44°47'	56°58'	0	HA	13°	3
Aug.	18	0.20	51°00'	44°00'	1	RA	16°	2
		1.15	51°00'	44°00'	1	HA	15°	1—2
	19	1.43	46°47'		9	G	5°	1
	29	2.15	50°41'	45°00'	8	G		1
		5.15	51°10'	44°00'	8	G	20°	3
<i>Fredrik VIII.</i>								
Aug.	3	1.00	56°.3	28°.9	3	RA		G
	5	5.08	48°.9	48°.8	3	DS		G
Sept.	4	22.00	59°.4	2°.1	7	DS		G
	7	23.15	54°.6	36°.0	6	DS		G
	8	3.00	54°.1	37°.5	8	R		G
	9	4.00	50°.1	46°.8	8	DS		G
	20	23.15	48°.9	48°.7	0	RA		V
	21	0.05	49°.0	48°.5	0	HA		V
		22.50	52°.6	40°.3	1	DS		V
	24	4.00	57°.9	16°.2	8	DS		
<i>Gripsholm.</i>								
Sept.	24	22.00	56°.5	28°.3	3	DS	35°	V
		22.13	56°.5	28°.4	2	RA		V
		22.15	56°.5	28°.4	2	DS		V
		22.23	56°.5	28°.5	1	F	88°	V
		22.26	56°.4	28°.5	1	F	105°	V
		22.29	56°.4	28°.5	1	DS		V
		22.40	56°.4	28°.6	2	R	76°	V
		22.51	56°.4	28°.6	2	F	98°	V
		22.55	56°.4	28°.6	3	R	40°	V
		23.06	56°.4	28°.7	3	DS	16°	V
		23.16	56°.4	28°.7	2	F	24°	V
		23.18	56°.4	28°.7	2	R		V

Table 11 (continued).

Date	Time GMT	Lat.	Long.	Cl.	F.	Sl.	Col.	Sp.
25	4.00	N 55°.9	W 30°.9	7			G	2
	4.55	55°.8	31°.2	5	HA	27°	G	2
27	7.00	55°.5	32°.1	4	DS	20°	V	1
	0.13	49°.6	47°.5	2	R	48°	V	4
	0.22	49°.6	47°.5	2	DS	26°	V	3
	0.31	49°.6	47°.6	1	R		V	3
	0.38	49°.6	47°.6	1	F	75°	V	4
	0.44	49°.6	47°.7	1	RA	48°	V	3
	1.00	49°.5	47°.8	1	DS	15°	V	2
Oct. 23	19.55	59°.5	3°.8	3	HA	26°	V	2
	22.00	59°.5	4°.5	2	DS	40°	V	2
27	22.00	51°.9	42°.8	4	RA	23°	V	3
28	1.00	51°.5	43°.7	0	DS	20°	V	1
Dec. 16	18.0	59°.5	2°.8	0	DS	27°	V	2
	20.5	59° 3	1°.3	0	HA	8°	G	3
May 30	1.21	44°.5	59°.1	0	HA	10°	G.V	1
	1.35	44°.5	59°.1	0	R	8°	G.V	1
	1.40	44°.5	59°.1	0	HA	12°	G.V	1
	1.55	44°.5	58°.9	0	HA	15°	G.V	1—2
	2.05	44°.5	58°.9	0	RB	10°	G.V	2
	2.16	44°.5	58°.8	0	RA	10°	G.V	2—3
	2.25	44°.5	58°.7	0	RA	14°	G.V	2
	2.30	44°.5	58°.7	0	RB	12°	G.V	2
	2.49	44°.5	58°.6	0	RA	15°	G.V	2—3
	2.57	44°.5	58°.5	0	HA	13°	V	1—2
	3.02	44°.5	58°.5	0	RA	20°	V	2
	4.00	44°.5	58°.1	0	HA	15°	G	2
	5.00	44°.5	57°.7	0	HA	15°	G	1
<i>Kungsholm.</i>								
Oct. 4	22.00	56°.3	26°.5	4	HA	170°	G	
	1.00	56°.1	28°.0	2	HA	175°	G	
21	1.00	58°.6	6°.6	3	HA	26°		
	2.43	58°.7	5°.6	5	HA	19°		
	4.00	58°.7	4°.9	5	HA	12°	G	1
<i>Mexicano.</i>								
Dec. 1	22.00	59°.4	12°.5	3	HA	8°	G	
	4.00	58°.8	17°.2	5	R	10°	G	
Jan. 24	1.00	41°.5	65°.0	0	HB	8°	G	
	1.00	46°.2	48°.7	0	HA	5°	G	
March 4	1.25	56°.9	25°.4	5	RA	7°	G	
<i>Toledo.</i>								
March 23	22.00	62°.9	5°.6	2	HA	8°	G	
<i>Tonsbergfjord.</i>								
Sept. 4	1.00	53°.8	51°.8	0	HA		G	
	2.04	54°.0	51°.5	0	PA		G	
	4.00	54°.4	50°.7	2	HA		G	
6	1.05	59°.8	35°.1	0	PS,G,R	115°	V.G	
	4.00	60°.0	34°.0	7	R	120°	G	
7	1.00	61°.5	25°.7	3	DS		G	
	4.00	61°.6	24°.4	4	G	40°	G	
	22.00	62°.5	15°.7	4	PA		R.V	
Oct. 30	1.00	59°.2	12°.6	3	G	30°	G	
	4.00	52°.9	40°.4	4	G	15°	G	

Table II (continued).

Date	Time GMT	Lat.	Long.	Cl	F	Sl	Col.	Sp.
	4	4.00	N 49° 7	W 47° 7	2	G	20°	G
	27	22.00	59° 5	19° 4	6	DS		G
	28	1.00	59° 6	18° 2	4	RA		G
		4.00	59° 7	17° 0	6	DS		G
Dec.	8	22.00	52° 8	42° 6	4	G		
	26	1.00	52° 6	42° 4	5	G		
	27	4.00	55° 7	34° 9	7	PS		G
Mai	6	1.00	49° 1	64° 3	0	RA	36°	V
	12	1.00	57° 4	24° 8	3	G		
	13	1.00	59° 7	16° 0	2	G		
<i>United States.</i>								
Aug.	28	1.00	43° 04'	65° 00'	1	RA, 26 ¹	20°	G
		4.00	42° 27'	65° 45'	2	HA, 9	22°	G
Sept.	6	4.00	45° 43'	55° 12'	1	HA, 9	16°	V
		7.00	46° 07'	54° 10'	1	RA, 25	51°	V
	8	7.00	52° 28'	40° 00'	9			V
	24	1.00	58° 03'	E. 6° 10'	1	HA, 2	12°	G
	25	22.00	59° 00'	W. 14° 10'	5	R, 41	60°	G
		24.00	58° 55'	15° 00'	4	G, 19	20°	G
	26	1.00	58° 50'	15° 30'	3	HA, 2	28°	G
	28	4.00	54° 40'	36° 20'	6	G, 19	8°	G
	29	1.00	52° 05'	43° 01'	9	G, 19		G
	30	4.00	47° 53'	50° 42'	8	G, 19	30°	G
Oct.	30	22.00	59° 5	13° 0	6	G, 19		2
	31	1.00	59° 1	14° 0	4	HA, 2		V
		4.00	58° 8	15° 5	8			1
		21.00	57° 8	22° 7	4	HA, 2		G
Nov.	1	1.00	57° 6	24° 2	9			1
		7.00	57° 3	25° 5	4	PS, 21	102°	G
		22.00	56° 2	30° 5	8			1
		24.00	56° 0	31° 4	5	G, R		G
	2	1.00	56° 0	31° 8	7	G		G
		4.00	55° 7	32° 8	3	HA, 2		V
		4.36	55° 8	33° 0	2	RA, 25		V
		7.00	55° 2	33° 9	2	G, 19	12°	G
		24.00	53° 5	39° 3	6	G, 19		G
	4	7.00	49° 8	46° 6	9			G
	16	3.00	47° 5	51° 4	0	HA	9°	G
		4.00	47° 7	51° 3	0			1
		4.45	47° 8	51° 0	0	R, 39		G
		7.00	48° 1	50° 4	1	HA, 2		G
	19	19.00	57° 4	19° 7	5	G, 19		G
		22.00	57° 5	18° 4	4	G, 19		G
	20	23.00	58° 6	6° 7	3	DS, 19		G
Febr.	13	22.00	59° 0	8° 0	2			1
	14	20.15	58° 0	18° 0	3	HA		V
		22.00	57° 5	19° 0	1	G		G
	16	4.00	54° 0	30° 2	10			1
	17	4.00	50° 5	38° 0	10			1
	19	22.00	44° 1	57° 8	0	DS		G
	20	0.00	44° 0	58° 0	0	G		G
		1.00	43° 9	58° 3	0	HA	10°	G
March	3	4.00	50° 0	39° 5	3	G		G
	4	1.00	53° 0	33° 0	2	G		G
	5	1.00	56° 0	23° 5	4	G		G

¹ The number after the form refers to the photographic atlas.

Table 12.

More detailed observations supplementing the observations in Table 11. The time is GMT and the azimuth of the extension is measured by the ship's magnetic compass, along the horizon, N = 0°, E = 90°, S = 180° and W = 270°.

Drottningholm.

Aug. 13	0.10	Extension of arc 30° to 295°. The aurora lasted from 23.30 to 3.17.
Aug. 28	1.00	Extension 37° to 341°. Beginning 0.20.
	1.43	The aurora changed from G to RA. Extension 17° to 346°.
	1.52	The aurora changed again to G. Southern limitation 31°, extension 47° to 320°.
	2.15	Grand RB. Southern limitation 91°, extension 5° to 360°.
	2.25	Again changing to G extension 43° to 310°.
	4.00	Extension 65° to 315°.
Aug. 29		Between 0.20 and 2.35 strong illumination behind clouds. Position 0.20: N. 49° 15', W. 46° 45' and 0.35 N. 50° 19', W. 45° 51'.
Sept. 26	23.00	Extension 40° to 320°.
Sept. 27	1.00	Extension 40° to 340°.
	0.15	to 0.20, rays at mag. azimuth 30° up to about 40° over the horizon.
	0.30	to 0.40, the same.
	0.50	Strong. Extension 3° to 340°, up to 60°.
Nov. 16		Between 21.40 and 22.25 the southern limitation was about 150°. The aurora was visible along great parts of the horizon, but exact extension could not be seen on account of clouds.
	22.58	Extension 25° to 345°. Lasted 6 ^m .
	23.17	to 23.20 the rays reached from 14° to 26° and RA had the extension 30° to 335°.
	23.33	The Rays were observed from the horizon up to about 50° over the horizon, Lasted 2 ^m .
Jan. 23	21.42	Extension 78° to 315°, southern limitation between 23° and 31°.
	22.13	Extension 89° to 280°.
	22.41	Same extension 89° to 280°.
	22.50	Extension 100° to 286°.
	23.05	RB towards azimuth 340°. A narrow ray from 10° to 26° over the horizon during 30 ^s . The arc HA had an extension of 85° to 315° and reached 49° over the horizon.
Jan. 24	0.25	The HA changed into RB (RA?). Extension 87° to 284°.
	0.37	RB changed to HA. Height 80°.
	0.39	The same HA up to 86°. Extension 100°-290°.
	0.51	Changed again in RB (RA?) up to 32°, extension 70° to 290°.
	0.56	Again RB changed into HA which during 4 minutes raised to a height of 83° with extension 97° to 264°.
	1.46	The arc descending to 17° with extension 60° to 298°.
	1.54	No more observations possible on account of clouds.
	2.00	to 4.00 extension 70° to 305°.
	4.00	to 6.00 " 57° to 320°.
	21.40	" 64° to 320°.
Jan. 24	22.21	same extension.
	22.27	Again an arc.
	23.55	Extension 66° to 295°.
Jan. 25	1.14	Towards azimuth 5° rapid moving flames upwards, upper limitation obscured by clouds. Lasted 10 to 15 seconds. Sometimes like draperies D, but the cloudiness made it difficult to decide.
	1.31	Suddenly the aurora changed to rays.
	1.34	The rays reached the greatest height 71°. Extension from 65° to 325°. The strongest rays in azimuth 3°.
	1.36	Again HA.
	1.44-1.52	Again rays between azimuth 0° and 58° southern limitation 44°.
	1.52	Again HA.
Jan. 27	19.00	Extension 0°-30°. Height 15°.
Febr. 20	0.00	————— 45°-335°.
	1.00	————— 40°-340°.
		Between 0.50 and 1.00 some D.
	1.25	The arc HA changed to RA.
	1.25-1.43	extension of RA 60° to 350°, the height between 20° and 45°.
	1.43	RA changed to D.
	1.43-1.50	extension 30 to 330 and height 35°.

- 1.50 changed from D to RA. The rays reached 45° .
 1.50-2.10 extension 25° - 330° .
 2.10 changed to HA, extension 55° - 335° , height 15° . Lasted to 3.15.
 3.15-4.00 extension 10° to 55° , height 10° .
 4.00 hidden by clouds.
 4.30 feeble auroræ, extension very changing. Height constant.
 7.50 The same.
- Febr. 21 Between 4.00 and 6.00 feeble glow, extension 25° - 50° .
- Febr. 23 22.17 The arc reached the height of 48° towards azimuth 17° . Extension impossible to measure on account of clouds.
 23.45 Extension impossible to measure.
- Febr. 24 1.00 Between clouds the height was measured to 17° in azimuth 23° .
 7.00 A feeble glow, southern border not exceeding 8° .
 21.16 Strong aurora extension 92° - 330° .
 21.23 Stronger, more luminous parts appearing in azimuth 2° .
 21.26 2 concentric arcs, height of the most southern 21° of the lowest one 12° .
 21.29 Luminosity decreasing height 16° and extension 80° - 315° .
 21.44 Hidden by clouds.
 22.20 Again visible, extension of the arc 90° - 310° .
 22.30 Suddenly a ray appeared in azimuth 97° stretching from horizon to horizon.¹
 22.42 The original arc had moved, extension 35° - 330° .
 22.55 Disappeared.
 22.30 Observed again.
 23.16 Southern limitation 28° . Soon lower. Extension variable but difficult to measure on account of clouds.
- March 6 From 21.00 to 21.16 strong aurora over the entire sky.
- 24 1.10 Aurora seen in breaks of clouds in the direction azimuth 38° . Lasted to 1.27 then overcast sky.
 2.40- 2.48 feeble glow. Extension 10° - 40° .
 2.48- 2.55 " " " 350° - 40° .
 2.55- 3.06 " " " 335° - 40° .
 3.06- 3.15 Overcast.
 3.15- 3.21 Strong aurora, height 17° , extension 17° - 28° .
 3.21- 4.00 Almost overcast but auroraglow could be seen in breaks of clouds from azimuth 350° - 35° .
 5.05- 5.35 Arc fine, extension 320° - 45° .
 5.35 Hidden by clouds.
 5.35- 5.48 Some feeble rays up to 35° in azimuth 20° .
 5.48- 6.00 Rays and strong flames up to 50° in azimuth 10° - 40° .
 6.00- 6.06 The same up to 65° in Azimuth 350° - 40° .
 6.06 Hidden by clouds.
 6.06- 6.22 Overcast.
 6.25 Glow along northern horizon from 345° - 45° .
 6.27 Feeble rays in Azimuth 20° , up to 30° .
 6.27- 6.40 Rays up to 65° to 70° extension along the horizon 355° - 25° .
 6.40 Aurora gone.
 21.36 In azimuth 350° rather strong aurora in a break of clouds. Southern limitation about 18° .
 21.44 Decreasing in intensity.
 21.46 Very feeble, extension 310° - 70° . Up to about 21° .
 21.51 Rays begin to develop in particular between 350° and 10° .
 21.58 The intensity of the rays a maximum. Up to 35° .
- March 25 3.10 Since 21.58 aurora continuing between 330° and 55° . Pulsating waves going upwards, reaching to about 54° above the horizon.
 3.37 Feeble arc, extension 280° - 76° .
 3.46 The aurora lower and more feeble. Extension 295° - 67° .
 4.10 Northern sky overcast.
 22.00 Feeble aurora near northern horizon ca. 0° - 40° , difficult to observe on account of clouds.
 23.55-24.00 A single ray in azimuth 50° , from 15° to 60° height.
- March 26 4.00 A glow near magnetic north.
- May 23 2.32 A glow (arc?). Lower border 11° and upper 13° over the horizon, extension 45° - 62° . Visible until 3.45 when it disappeared.
- July 18 2.35 (Position $53^\circ 23'$ N, $37^\circ 50'$ W).
 2.20- 2.35 Strong ray in azimuth 295° from the horizon to 55° over it.

¹ Doubtful, Carl Størmer.

- Aug. 18 0.30 RA of extension 300° - 10° . Under this one another whose southern limitation was about 7° . Long rays upwards to 19° .
 1.10 Extension 330° - 20° . Towards azimuth 350° two more intense patches. They disappeared after 4 minutes.
 1.15 The arc was an HA. Southern limitation about 15° and extension 310° - 45° . Intensity much less than before, about 1 to 2.
 1.45 Only a feeble glow left, intensity 1.
- Aug. 19 1.43 From 1.43 to 1.46 feeble glow, extension 333° - 360° .
 1.50 Feeble rays near azimuth 340° .
 1.55 The same near 360° .
 1.55 to 2.10 A feeble patch at azimuth 10° .
 2.10 Nothing to observe on account of clouds.
- Aug. 29 2.15 to 2.46 Glow toward N. Too much cloud.
 5.15 Extension 260° - 0° Feeble glow. Later hidden by clouds.

S/S Frederik VIII.

- 1932
- Aug. 3 1.00 Quiet arc. Extension 270° - 20° . Height 25° .
 Aug. 5 5.08 The aurora lasted till dawn.
 Sept. 8 3.00 The rays from azimuth 285° - 360° .
 Sept. 20 23.15 Extension 355° - 15° . Highest at 355° . Lasted to 23.21.
 Sept. 21 0.05 Extension 320° - 355° . Highest at 340° . Lasted to 0.08.
 22.50 The aurora lasted to about 23.00.
 Sept. 24 0.40 The aurora was seen as a strong glow from 340° to 10° .

M/S Gripsholm.

- Sept. 24 22.23 Strong flames over the whole sky between 95° and 250° .
 22.26 Narrow sharp flames in 313° azimuth.
 22.51 Narrow feeble flames in 320° azimuth.
- Sept. 25 4.00 Feeble partly obscured by clouds.
 4.55 Feeble arc. Western end 280° , height 8° in azimuth 330° .
- Sept. 27 0.13 Long narrow rays with broad intervals, from 302° to 66° .
 0.38 Flaming rays rapidly changing relative to position, height and intensity. Greatest height 75° and greatest intensity in azimuth 350° . The rays narrow.
- Dec. 16 20.35 Disappeared at 20.44.
- May 30 1.35 Some short rays toward azimuth 25° . 5 minutes later again HA.
 1.55 Aurora increasing in height and luminosity. Extension 255° - 0° .
 2.05 Transformed to an arc or band, 3° broad, same extension.
 2.16 Short sharp rays, beginning at 275° azimuth. In north down to $6,5^{\circ}$.
 2.25 Decreasing in intensity and extension, rays becoming shorter.
 2.49 Strong rays along the whole arc.
 3.02 The same.
 4.00 Extension 300° - 20° . Greatest height equal to 3° in azimuth 340° .
 5.00 The same. Now maximum height $3,5^{\circ}$.

S/S Mexicano.

- Dec. 1 22.00 Visible between Vega and UMa, the rest obscured by clouds.
 3 4.00 About 10° over the horizon, azimuth 10° - 12° narrow and broad rays are seen in break of clouds.
 4 4.00 ($58,0^{\circ}$ N, 23° W) a glow is seen through clouds between 10° and 15° over northern horizon. More details hindered by clouds.
- Jan. 24 1.00 The same form as fig. 15 and 16 p. 8 in the Photographic Atlas of auroral forms. Lasted 20 minutes.
 Jan. 27 1.00 The same form as fig. 2, page 21, in the Atlas. Lasted from 0.40 to 1.00.
 March 4 1.25 Form as fig. 26, p. 16 in the Atlas. Azimuth about 45° . Lasted 2 minutes.

M/S Tønsbergfjord.

- Sept. 4 1.00 Extension 305° - 47° , from Bootes to Auriga. Regular arc highest point $9,5^{\circ}$ in azimuth 340° .
 2.04 Appeared and disappeared with intervals of 8-12 seconds.
 4.00 The highest and lowest points of the arc were: Height 30° in Azimuth 302 . Height 40° in Azimuth 0, height 15° in A. 45° .

Sept. 6	1.05	PS in Azimuth 60° , R in Azimuth 204° . Always in motion.
Sept. 7	1.00	Observed from 0.30 to 1.00. Aurora did not change. Extension 52° - 274° .
	4.00	Feeble quiet luminosity. Extension could not be observed on account of clouds.
	22.00	Azimuth 342 . Period 8 secs.
	8	1.45 to 3.15 There was a pulsating arc. Extension 45° - 270° . Southern limitation 85° . At last the arc changed to draperies and rays.
Sept. 9	1.00	Feeble glow in N. Clouds prevented any measuring.
Sept. 30	1.00	The same.
Oct. 27	22.00	Extension 330° to 20° . Highest point $24,5^\circ$ in Azimuth 350° .
Oct. 28	1.00	Glow over clouds, who extend upwards to 31° .
	4.00	Highest point 31° in Azimuth 5° .
May 5	1.00	Extension 350° to 32° . Highest point 29° in Azimuth 9° . Lasted 8 minutes.
May 13	1.00	Strong red nearest the horizon. Higher up yellow green and still higher violet. Extension 351° - 33° .

S/S United States.

Aug. 28	1.00	Extension of arc 330° - 20° .
	4.00	Homogeneous arc. Extension 325° - 25° .
Sept. 6	4.00	" " " 320° - 30° .
	5.35	Rays begin.
	7.00	Irregular arc, extension 270° - 60° .
Sept. 8	7.00	Clouds prevented measuring, but flames and rays to the south of zenith.
Sept. 24	1.00	Regular arc from 300° - 20° .
Sept. 25	22.00	Some rays from 290° to 360° .
	24.00	Feeble yellowwhite glow from 270° - 30° .
Sept. 26	1.00	Strong yellowgreen arc from 255° - 30° .
Sept. 28	4.00	Feeble yellowwhite glow from 250° - 340° .
Sept. 29	1.00	Through breaks in clouds in NW and N, DS (Atlas no. 19) seen.
	30	4.00 Through breaks in clouds feeble yellow glow between 270° and 340° .
Oct. 31	1.00	Could not be measured on account of clouds.
Nov. 2	1.00	Feeble aurora in breaks of clouds.
	4.00	Extension could not be measured on account of clouds. Strong aurora.
	24.00	The aurora line also visible in the southern sky.
Nov. 4	7.00	Aurora visible in some breaks of the clouds.
Nov. 16	3.00	The extension from 315° - 20° .
	4.00	Aurora only seen in spectroscope.
	4.45	Rays over northern horizon.
	7.00	Diffuse over northern horizon.
Nov. 19	19.00	Aurora seen through breaks in clouds.
Nov. 20	23.00	Also some single rays with short duration.
Febr. 20	0.00	Feeble yellow glow over the northern horizon.
	1.00	Extension 300° - 40° .

32. Possible application of the material in Table 12 and 13.

If the height of the lower border of auroral arcs (according to extensive measurements in southern Norway from 1911-1941) is taken as 107 km., it may be possible to map the geographical position of aurora-arcs over the Atlantic in the polar year and from other of the observations in the same table to draw similar

conclusions. In spite of the fact that these would only be approximate they might have a certain importance for those who try to coordinate all aurora observations from all countries in the polar year.

In this report we have refrained from doing this research and have only given the observation as we have found them in the aurora logs from the ships.

Table I.
List of aurora photographs which might be used.

PN	St	MET	Ex	Fm	Ref. Con.	Remarks
<i>August 29-30, 1932.</i>						
Worked from 20.30-0.30. C (Tveter, Anda, myself), Li Høstmølingen), O (Bakøy), T (Albert and Egil Tømte).						
3	T	22.08.30	60	HA	LMi, Lyn	
4	T, Li	11.30	60	HA	LMi, UMa, Lyn	The Li-camera out of focus
9	O, T, Li	25.00	60	HA	LMi, UMa	
10	"	27.00		HA	LMi, UMa	
14	"	38.00	60	HA	LMi, UMa, Lyn	
15	"	40.00	60	HA	LMi, Lyn	
20	O-T	46.57	31	HA, R	LMi, UMa, CVn	Partly sunlit
21	T	47.59	33	HA	UMa, Lyn	
22	"	49.02	31	HA	UMa, Lyn	
26	C-O-T-Li	54.50	20	R	Boo	Sunlit rays
27	C-O-T	55.56	21	R	Boo	" "
29	C-O-T-Li	58.04	32	R	Boo	" "
30	"	59.04	32	R	Boo	" "
31	"	23.02.13	35	R	CVn, Boo	" "
32	"	03.17	33	R	Boo	" "
33	C-O-T	04.32	33	R	CVn, Boo	" "
34	"	05.40	33	R	Boo	" "
35	C-O-T-Li	06.43	32	R	Boo	" "
36	"	07.42	29	R	CrB, Boo	" "
38	"	11.17	37	R	Boo	" "
<i>September 23-24, 1932.</i>						
Worked from 10.30-2.00. C (Tveter, Anda, Sandøy), O (Bakøy), Li Høstmølingen).						
1	O	21.27.36	45	HA	UMa	Arc near the horizon
5	"	32.00	29	HA	UMa	—, —
<i>October 23-24, 1932.</i>						
Worked from 21.00-0.30. C (Tveter, Sandøy, myself), T (Albert and Egil Tømte), Li (Ole Høstmølingen).						
2	Li	21.52.15	60	HA	UMa	Arc near the horizon
11	"	22.09.42	90	HA	UMa	—"
14	"	18.01	120	HA	CVn, UMa	—"
15	"	21.01	120	HA	CVn, UMa	—"
<i>February 18-19, 1933.</i>						
Lø (Herstad).						
1	Lø	21.30	180	HA	And.	Sharp lower border.
2	"	31.50	180	Ha	And. Peg.	—"
3	"	46.30	180	HA	And. Ari.	—"
4	"	51.30	180	HA	And. Peg.	—"
<i>February 22-23, 1933.</i>						
Lø (Herstad).						
8	Lø	21.36.30	180	HA	Lyr. Cyg.	Diffuse arc
11	"	22.00.00	120	HA	Cyg.	—"
13	"	0.11.30	180	HB	And. Cas.	—"
14	"	21.30	180	HB	And. Peg. Cas.	—"

Table I (continued).

PN	St	MET	Ex	Fm	Ref. Con.	Remarks
<i>March 18-19, 1933.</i>						
Worked from 22.30-5.30. C (Tvetter, Anda, Sandøy), Da (Hassel), K ₄ (Odleiv Busengdal), Li (Höstmælingen) O (Bakøy), Lø (Herstad), N (Westin, myself).						
1	N	22.35.55	120	HA	Cyg.	Clouds hindering.
2	"	39.00	120	HA	Cas. And.	—, —
3	"	42.00	120	HA	Cyg.	—, —
5	"	49.00	120	HA	Cas. And.	Very diffuse.
7	"	55.30	60	HA	Cyg.	
10	"	23.03.30	60	HA	Cyg.	
11	"	06.00	60	HA	Cas. And.	
15	N, Lø	13.05	24	RA	Cyg.	Lower border sharp.
17	N	14.31	14	RA	Cyg.	
18	"	15.04	13	RA	Cyg.	
20	N-Lø	16.41	6	RA	Cyg.	Fine rays, but clouds at the station Lø.
22	"	17.59	10	R	Tau	
25	"	20.05	5	R	Cas. And.	
26	N	20.58	2	R	Cyg.	Tangential view of curtain.
28	Lø	22.02	7	RA	Tau	—, —
30	N-Lø	23.31	6	RB	Ori, Tau	
33	"	25.27	5	RB	Tri, Ari	
35	"	27.06	6	RB	Tri, Ari	Fine small curtain.
4**	Da	30.05	10	HA	Cas. And	Arc near the horizon.
5**	"	32.03	15	RA	Per.	Rays along the arc.
41	N	0.03.09		HA	Tau	Western end of low arc.
42	"	04.09	20	HA	Tri	The same. Pulsation above the arc.
43	"	05.42	14	HA	Tri, And.	—, —
47	N-Lø	07.52	9	RA	Tri, And.	—, —
48	N	08.19	10	RA	Tri, And.	—, —
49	N, Lø	09.44	8	RA	Per, And.	—, —
53	N-Lø	12.32	13	RB	Tri, And.	Distant curtain lower down.
56	"				Tri, And	The same.
57	"	17.17	8	RB	Tri, And	Two horsehoeformed curtains.
62	"	22.36	5	R	Per, Tri, And	Not sunlit.
63	"	23.08	9	RB	Tri, And	Fine distant curtain.
2*	C-Li	23.25	32	HA	Per	Very feeble.
64	N-Lø	23.47	9	RB	Tri, And	The same as No. 63
65	"	24.30	8	RB	And	—, —
3*	C-Li	24.41	33	HA	And, Cas	Fine arc, clouds.
67	N-Lø	26.13	3	R, HA	Cyg.	Double arc. The same as 3* and 4*
4*	C-Li	26.18	33	HA	Cas, Lac. Cyg.	Can be used with 67 for height measuring.
68	N-Lø	26.36	3	R, HA	Cyg.	The arc is double.
69	N, Lø	26.54	2	HA	Cyg.	Can be used with 5*.
5*	C-Li	27.34	34	HA	Cyg., Landscape.	
72	N-Lø	29.36	3	HA, R	Cyg.	Double arc, eastern part.
7*	Li	30.04	20	HA	Tau, Aur	
73	N-Lø	30.46	2	RA, R	Her, Cyg, Lyr	Multiple arc, eastern part.
8*	C-Li	31.08	37	HA, R	Tau	
74	N-Lø	31.19	4	RA, R	Her, Lyr, Cyg	
75	"	31.47	5	HA, R	Cyg.	4 arcs, eastern end.
9*	C-Li	32.17	30	HA	Tau	
76	N-Lø	32.34	7	RB	And	3 curtains.
10*	C	33.25	31	HA	Tau	
77	N-Lø	33.35	8	RB	Cyg	

Table 1 (continued).

PN	St	MET	Ex	Fm	Ref. Con.	Remarks
78	N-Lø	0.34.03	5	RA	Lyr, Her	Multiple arc
79	"	35.16	3	RB	Gem	Very luminous band.
81	"	36.01	2	RB	Gem	—"
82	N-Lø	36.16	2	RB	Gem	—"
83	Lø	37.05	1	RB	Gem	—"
13*	C-Li	37.22	20	RB	Landscape	Horseshoe-formed band.
85	N-Lø	38.41	4	HB	Cyg	The same. Very fine.
86	"	39.13	3	HB	Cyg	—"
87	"	39.24	12	HB	Cyg	—"
88	"	40.28	4	HB	Cyg	—"
89	"	42.36	3	HB	Cyg	—"
90	"	43.15	6	RB	Per	—"
91	N, Lø	44.59	7	RB	Cyg	
96	N-Lø	1.20.08	4	PS	CMi	Pulsations since 1 ^h 18 ^m
20*	Li	40.29	24	HA	And	
24*	"	44.49	31	HA	And	
25*	"	46.27	31	HA	And	
26*	"	47.22	27	HA	And	
97	N	59.03	9	HA	Aur	
98	N-Lø	59.52	11	HA	Aur	Fine lower border.
99	N	2.00.47	10	HA	Per	
100	N-Lø	01.27	12	HA	Gem	
101	Lø	02.33	9	HA	Landscape	Eastern end.
102	N-Lø	03.20	10	HA	Aur	
103	"	04.46	11	HA	Gem	
104	"	05.29	11	HA	Aur	
105	N	06.06	14	HA	Cas	Double arc
106	"	07.14	6	HA	And	" , eastern end.
107	N-Lø	08.03	10	RB	Gem	
108	"	12.30	9	HA, RB	Aur, Tau	
111	"	27.16	12	RB	Cnc	Irregular short rays.
112	"	28.21	15	RB	Leo, Cnc	—"
113	"	29.18	10	R	Leo, Cnc	
114	N	30.02	12	HA	Aur, Tau	
116	N-Lø	3.01.23	3	PS	Aur	Fine pulsating patches.
117	"	01.48	5	PS	Aur	—"
118	"	02.23	9	PS	Aur	—"
119	"	02.59	10	PS	Aur	—"
120	"	03.25	8	PS	Aur	—"
a	Lø	44.46	30	HA	Gem	From this time clouds at station N
b	"	45.48	30	HB	Aur	Irregular.
c	"	46.42	30	RA, R	And	Probably sunlit rays.
d	"	47.41	30	HB	Aur	
e	"	49.34	20	HA	Gem	
f	"	50.18	20	HA	Gem, Aur	
g	"	51.25	20	HA	Aur	
h	"	52.35	20	HA	Per	
i	"	53.18	20	R	And	Probably sunlit rays.
k	"	55.42	20	HA	Gem	
l	"	57.52	20	HA	Aur	
m	"	58.44	20	R	And	Probably sunlit rays.
124	N-Lø	4.00.51	20	HA	Gem	
125	N, Lø	11.05	20	HA	Gem	
x	N	26.01	30	HA	Aur	

Table 1 (continued).

PN	St	MET	Ex	Fm	Ref. Con.	Remarks
<i>March 19-20, 1933.</i>						
Worked from 20 ^h -1 ^h 30 ^m . Station N (Koren, myself), Lö (Herstad).						
1	N-Lö	21.05.59	25	HA, R	Ari	Sunlit rays over broad HA, invisible to the eye.
2	N	06.45	21	HA	Cas	Lower border of the arc.
3	N-Lö	07.56	25	R	Per	Sunlit, invisible to the eye.
4	"	08.55	29	R	Tau, Ari	The same, very fine
9	"	27.20	27	R	Tau	Sunlit.
10	"	21.28.21	25	DS	Tau	
15	"	37.09	30	R	Boo, CVn, UMA	Very feeble.
17	"	47.55	4	R	Tau, Ori	Fine R in shadow.
18	"	48.11	4	R	Tau, Ori	—"
23	"	51.47	13	RB	Ori	Diffuse raymasses.
24	"	52.15	7	DS	Ori	Cloudlike
27	"	59.21	11	PA, RA	CMi, Mon	" , pulsating
28	"	22.00.16	5	DS, PA	Ori	—"
Q	N	23.30.03	22	HA	Ari, Tri	
R	"	30.51	28	HA	Tri, And	
S	"	31.40	24	HA	And, L ac, Per	
<i>March 21-22, 1933.</i>						
Worked from 20.00-4.30. Stations C (Tvetter, Anda, Sandøy), Li (Höstmælingen), K ₄ (Odleiv Busengdal), T (Albert and Egil Tömte), O (Bakøy), Da (Hassel).						
13**	Da	23.47.12	25	HA	And, Cas	All near northern horizon.
1*	O-Li	0.29.30	24	HA	And, Lac	—"
2*	"	31.28	22	HA	And, Tri	—"
3*	"	32.32	21	HA	Per, Tri	—"
4*	Li	33.45	25	HA	Per	—"
2	T, K ₄	34.08	32	HA	And, Cas	—"
3	"	35.18	26	HA	Per	—"
4	K ₄	36.28	32	HA	Per	—"
5	T, K ₄	37.54	32	HA	Per, And	—"
7*	Li	57.02	14	HA	Cas, And	—"
8*	"	58.01	9	HA	Per, And	—"
13	K ₄ -T	1.04.03	14	PS	Tri, And	—"
11*	O-Li	05.03	9	PS	Cas, And	—"
<i>March 23-24, 1933.</i>						
Worked from 18 ^h -4 ^h 30 ^m . Station N (Westin, myself), Lö (Herstad), Li (Höstmælingen).						
3	Li-Lö	21.35.29	11	R	Per, And, Tau	
12	N-Lö	23.01.44	25	R	And	
14	Lö	52.54	40	HA	Tau	
15	"	53.55	20	HA	Tau	
17	N	55.24	25	HA	And, Cas	
20	N-Lö	0.15.39	11	PS	Cas	Feeble.
25	"	21.20	25	R, RB	And, Tri	
26	"	22.36	23	R	Cas, And	
27	"	23.10	22	R	And	
28	"	24.52	19	RB	"	
29	"	26.53	19	PS	Per	
30	"	27.50	24	RB	And	The same as No. 28.
33	"	32.00	12	R, PS	Per, And, Tri	Diffuse forms
34	"	32.47	19	R, PS	And, Tri	—"
37	"	36.24	18	R, RB	Per	

Table I (continued).

PN	St	MET	Ex	Fm	Ref. Con.	Remarks
38	N-Lö	0.38.37	16	R, RB	Aur, Per	Fine ray.
39	"	39.34	23	R	"	The same.
40	"	40.24	24	RB, DS	Per	Cloudlike diffuse curtain.
41	"	44.00	21	RB, DS	"	—"
43	"	56.17	18	RA, PS	"	Broad arc with dentated lower border.
44	"	57.03	21	RA, PS	And, Per, Tau	Western end of the same.
45	"	58.12	25	RA	Per, And, Tri	The same arc
47	N	1.00.56	20	RA	And	—,"— western end.
49	N-Lö	03.46	20	RA	Cas, And	—,"— eastern end.
50	"	04.42	20	RA, RB	And	—,"— —" and band.
51	N	06.34		HA		
52	"	07.55		HA		
53	N-Lö	08.43	18	HA	Per	Now two arcs.
54	N	09.47	22	HA	Aur, Tau	The same, western end.
55	N-Lö	14.43	23	RB	"	The same
56	N	16.08	27	RB	Cas, And	—,"— eastern end.
59	N-Lö	20.35	30	RB	Per	
60	"	23.11	30	RB	Per	—,"— fine picture.
61	N, Lö	35.38	20	HA	Cas, And	—,"— very fine.
62	N, Lö	36.29	20	HA	Tau, Pec	Triple, Western end.
63	"	39.07	8	HA	Aur, Tau	Western end.
64	"	39.45	10	HA	And, Per	The same arc.
65	"	40.24	20	HA	Cas, And	—,"— eastern end.
66	"	41.26	18	HA	And	—,"— —"
69	N-Lö	46.06	12	PS	Aur, Per	
72	N, Lö	49.56	20	HA	Tau	The same arc, western end.
73	N-Lö	51.56	10	PS	Gem	
75	N, Lö	54.49	23	HA	Per	Arc, very fine.
76	"	2.05.59	15	"	Tau	The same, W. end.
77	"	06.50	19	"	Per	—,"— in N.
78	"	07.37	18	"	And	—,"— eastern end.
79	"	12.47	21	"	"	—,"— —"
80	"	13.33	23	"	Per	—,"— in N.
81	N-Lö	14.28	20	"	Aur	—,"— western end.
82	"	20.52	16	HA, RB	Aur, Tau	Band, at the lower border.
83	N	21.41		HA		
85	N-Lö	24.15	18	HA, DS	Aur, Tau	The same as No. 82, cloudlike at the upper border.
86	"	26.40	10	HB, DS	Per	The same as No. 82, moving eastwards.
87	"	27.54	13	HB	Per	The same arc.
88	"	29.12	20	DS	Gem	Over the arc.
89	"	30.18	25	DS	Aur	The same.
90	"	31.15	20	HA	Per, And, Tri	The same arc as No. 82.
91	"	35.17	20	DS	And, Per, Cas	The same as No. 88.
92	"	36.20	23	DS	Gem	The same.
93	"	48.03	12	PS, HA, RA	Aur, Tau	The same, now pulsating.
95	"	3.01.25	12	PS	Aur, Per	—,"—
96	"	20.37	14	PS	Aur, Gem	—,"—
103	"	45.07	21	DS	Aur, Per	Cloudlike arc.
104	"	46.13	27	DS	Per, And	Cloudlike patches.
105	N-Lö-Li	49.00	31	R, D	Per, And, Tri	Sunlit rays over cloudlike patches.
107	N-Lö	52.49	20	DS	Aur, Cam	The same.

Table I (continued).

PN	St	MET	Ex	Fm	Ref. Con.	Remarks
108	N-Lö	3.54.05	20	R, DS	Aur, Cam	Upper part in sunshine, red violet, lower yellow green.
110	"	4.00.02	6	RB, DS	Gem	Horeshoe-formed curtain begins to be formed.
111	"	00.27	5	RB	Gem	The same. Not sunlit.
112	"	01.20	8	RB	Gem, Aur	—, —
113	N	01.53	6	RB	Gem	—, —
114	"	02.23	6	RB	"	—, —
115	"	03.34	8	RB	"	—, —
116	"	04.11	8	RB	Leo	—, — W. end.
117	N-Lö	04.48	2	RB	Gem	The same. Short rays along the curtain. Very luminous.
118	"	05.09	6	RB	"	The same
119	"	05.51	5	RB	Aur	—, — very fine.
120	"	06.23	3	RB	"	—, — —, —
121	"	07.04	5	RB	"	—, — —, —
122	"	07.59	10	RB, R	Aur, Per	—, — —, —, rays upwards to sunlit atmosphere.
123	"	09.08	13	RB	"	The same.
124	Lö	12.36	6	RB	"	W. end of the same.
125	N-Lö	14.41	14	RB, R	Aur	The same with rays farther north.
126	"	15.37	12	RB, R	"	The same with sunlit ray.
127	N	16.59		RA	"	
128	"	19.30	7	RB	"	The same curtain.
130	N-Lö-Li	23.40	12	R	Gem	Sunlit
131	"	24.26	17	R	"	—, —
132	N-Lö	25.51	28	R	UMa	Feeble red violet sunlit ray.

*March 24-25, 1933.*Worked from 20^h-5^h. Stations: N (Westin, myself), Lö (Herstad).

4	N-Lö	20.27.40	2	RB	Lyr	Yellow green curtain.
7	"	29.31	2	RB	Lyr, Cyg, Dra	The same, very luminous.
8	"	29.52	2	RB	Lyr, Cyg	—, —
9	"	31.57	10	R	Tau, Ori	Sunlit rays.
10	"	32.27	15	R	"	—, —
11	"	33.33	12	R	"	—, —
13	N	39.25	9	RB	Cyg	
15	N-Lö	44.28	8	R	UMi	Diffuse sunlit ray.
16	"	45.15	18	R	Aur	Sunlit.
19	N	49.37	19	HA	Cyg	
22	N-Lö	55.24	9	RB	Cas	Very fine, partly sunlit.
23	"	55.56	7	RB	"	The same.
26	"	57.52	2	RB	Cyg	Very luminous curtain.
28	"	59.31	8	R	Aur	Summits of rays.
29	"	21.00.16	10	R	Aur, Tau	—, —
30	"	01.19	9	R	Aur	Sunlit rays.
38	"	14.09	5	R	Per, Cas	Partly sunlit rays.
39	"	15.17	10	HA, R	And	—, —
41	"	17.22	7	RB	Ari	RB with rays.
42	"	17.46	8	RB, R	Tri, Ari	The same. Very fine.
43	"	18.28	4	RB	Landscape	Very luminous.
47	"	20.57	9	R	Tau, Per	Sunlit.
48	"	21.25	12	R	"	—, —
49	"	22.18	15	R	"	Partly sunlit.

Table 1 (continued).

PX	St	MET	Ex	Fm	Ref. Con.	Remarks
50	N-Lö	21.22.53	16	R	Tau, Per	Partly sunlit
53	"	25.08	13	R	Aur, Tau	Sunlit.
55	"	28.47	24	R, HA	Ari, Tri	R sunlit.
56	N, Lö	32.58	20	HA	And, Tri	
57	N-Lö	33.47	21	HA	Ari, Tri	Western end.
58	N, Lö	38.50	21	HA	Cyg	Eastern end, yellowgreen. Over it another violet diffuse arc.
59	N-Lö	39.51	20	HA	Tri, And	Lower HA with very sharp lower border.
60	"	40.46	30	HA	Ari, Tri	Western ends of both arcs.
61	Lö	41.57	26	HA	Cas	Upper violet arc.
62	"	42.51	27	HA	Cas	The same, eastern end.
63	N-Lö	43.51	19	HA	Tri, And	Lower yellow green arc.
64	"	44.41	5	HA, RB	"	RB under lower arc.
65	"	45.13	3	HA, RB	"	The same.
66	"	45.47	9	RB	"	---
68	"	48.56	21	HA	Lyr	Upper violet arc.
69	"	51.31	10	RB	Tri, And	Lower arc has gone at 21.50.
70	"	56.32	23	R	"	Violet rays, partly sunlit.
71	"	57.16	27	R	"	---
72	N	22.05.29	22	HA	Cyg	
73	"	27.45	20	HA	Tri, And	Two arcs, the lower narrow.
74	"	28.42	22	HA	Cyg	The same, eastern end.
75	"	29.35	19	HA	Tri, And	The same, western end of upper arc.
76	"	30.55	20	HA	Cyg	The same, eastern end of upper arc.
77	N-Lö	31.47	21	HA, R	Tri, And	The same with a short ray.
78	"	32.43	5	RB	"	The arc transformed in RB.
79	N	33.22	3	RB	"	The same.
80	N-Lö	33.47	2	RB	"	---
81	"	34.10	3	RB	"	---
83	"	39.22	5	R	Cyg	
84	"	47.04	9	R	"	In shadow.
89	N	0.39.14	37	HA	Per, Tau	Broad diffuse arc.
90	"	40.44	33	HA	Tri, And	The same.
91	"	42.25	35	HA	Peg, And	---
92	"	43.46	34	HA	Tri, And	---
96	N-Lö	58.02	30	HB	And, Per	HB under the arc.
98	"	1.07.33	16	HA, R	"	
99	N	09.23	19	HA	And	The same No. 89.
100	"	12.25	19	HA	Aur, Tau	Western end.
101	"	13.10	19	HA	And, Per	Fine lower border.
102	"	13.57	24	HA	And	---
103	"	26.37	20	HA	Aur, Tau	The same arc.
104	"	29.44	24	HA	And	The same.
105	"	31.05	20	HA	Peg, And	Eastern end.
106	"	31.59	20	HA	Aur, Tau	Western end.
107	Lö	32.45	20	HA	And, Per	
108	"	36.36	15	HA	"	Since 1 ^h 34 ^m feeble pulsations over the arc.
109	"	39.56	10	HB	Aur, Tau	HB bends in left end.
110	N	40.32	10	HA	Per, And	
111	"	41.01	6	RA	And	Intensity increasing.

Table I (continued).

PN	St	MET	Ex	Fm	Ref. Con.	Remarks
116	N-Lö	2.52.16	20	PS	Aur	Pulsating patch.
120	"	58.13	20	PS	Per	---
125	N	3.10.38		HA		
126	N-Lö	11.47	24	DS	Per, And	
127	N	13.51	20	HA	Tau, Aur	Pulsations over the arc.
128	"	15.08	33	HA	Gem	
129	"	21.30	32	HA	Tau, Aur	3.16-3.18 flames upwards.
130	"	25.24	32	HA	Gem	Western end.
131	"	29.00	33	HA	Tau, Aur	The same arc.
135	N-Lö	34.16	30	DS	Gem	Cloudlike.
136	"	35.18	45	DS	Cnc, Leo	---
137	"	36.26	45	DS	Gem, Cnc	---
138	"	37.39		DS		
141	"	41.28	30	DS	"	---
142	"	42.19	30	DS	Gem	---
143	"	43.14	30	DS	"	---
145	"	46.10	30	DS, PS	"	Upper part pulsating.
147	N	52.22		HA		
148	"	53.04		HA		
149	"	57.13		HA		
151	N-Lö	4.04.04	34	PS, DS	Cnc, Leo	Now begins a fine series.
152	"	04.53	30	PS, DS	Gem	Fine
153	"	05.50	34	DS	Cnc, Leo	"
154	"	06.46	35	DS	Cnc Gem	"
155	"	07.53	34	DS	Cnc, Gem	"
156	"	08.51	35	DS	Cnc, Gem, Lyn	"
157	"	10.43	24	R	UMa	Pulsating, sunlit ray.
158	"	12.00	21	R	"	The same, colour violet.

April 15-16, 1933.

Worked from 21^h to 3^h 30^m. Stations: C (Tvetter, Anda, Sandøy, Johnsen), O (Bakøy, K₄ (Odleiv Busengdal), Li (Høstmælingen), Lö (Herstad), Da (Hassel).

2	Li-C	22.37.22	15	R	Stars not yet identified	
4	"	39.10	18	RB	Per	
13	"	58.45	22	HA	Ari, Tau, Per	
14	"	59.53	20	HA	Per	
15	C	23.01.19	21	HA	Cyg, Lac	
16	Li	02.48	30	HA	Cyg	Eastern end of arc.
17	C	04.51	21	HA	Per, And	In N.
12*	C-O-K	08.56	30	HA, R	Cyg	
19	Li-C	14.16	22	RA	"	Eastern end.
13*	C	14.49	31	RA	"	---
20	Li-C	15.08	20	RA	And, Lac	---
21	C	15.48	20	RA	Cas, And	In N.
14*	C	16.00	30	RA	Cyg, Lac	
15*	C	16.49	30	HA	Cas, And	In N.
23	Li-C	17.11	28	HA	Aur, Per	
25	"	20.05	26	HA	Cyg, Lac	Triple arc.
26	"	20.50	20	HA	Lac, And	Now double.
22*	C	26.31	30	HA	Cas, And	Near the horizon.
	Da	26.45	180	HA	Cas, And	---
32	Li	29.18	23	HA	Aur, Per	Western end.
33	Li	30.02	27	HA	Per	In N.

Table I (continued).

PN	St	MET	Ex	Fm	Ref. Con.	Remarks
34	Li	23.32.14	32	HA	And, Per	Eastern part.
35	Li-C	33.15	31	HA	Lac, And	--- end.
27*	C-K	37.19	30	R	Per	Sunlit.
37-34*	Li-O	56.15	31	HA	Per	
38	Li-C	57.23	33	HA	Per, And	
40	"	0.00.59	31	RA	And	Eastern part
41	"	02.24	37	RA	Lac, And	--- end.
42	Li	03.34	34	RA	Aur, Tau	Western part.
43	"	2.03.55	57	RA	Gem	--- end.
45	Li-C	07.42	32	RA	Gem	Ray in RB.
46	"	08.42	15	RB	Per	Sunlit RB with limiting ray to the right.
37*	C-O-K ₄	11.52	15	RB	Per	---
48	Li-C	13.07	34	RB	Per, And, Tri	---
38*	C-O-K ₄	13.18	12	RB	Per, And	---
49	Li-C-Lö	14.42	32	RB	Per, And, Tri	---
50	"	15.43	32	RB	"	---
51	"	16.50	37	RB	And, Tri	---
39*	C-O-K ₄	18.03	17	RB	Per, And, Tri	The time not quite exact.
52	Li-C-Lö	18.07	33	RB	And, Tri	---

April 18-19, 1933.

Worked from 23^h to 2^h. Station Lö (Herstad).

a	Lö	23.35.15	30	HA	And, Lac	Eastern end.
b	"	38.15	30	HA	Tri, And	--- part.
c	"	40.15	30	HA	Per, Tri	In N.
d	"	42.15	30	HA	Tau, Aur	Western end.
e	"	50.15	30	RB	Tau, Aur	The western end bends northwards again.
g	"	59.13	25	RB	Per	
h	"	0.01.13	25	RB	Tri, And.	
m	"	25.15	30	RB	Tri, And	Double arc.
n	"	38.10	20	RB	And, Peg	---
o	"	40.10	20	HA	Per, And	Fine arc again.
p	"	42.10	20	HA	Tau, Aur	---, W. end.
s	"	55.10	20	HA	Tau, Aur, Per	W. part begins to bend.
t	"	57.08	15	HA	Per, And	Eastern Part.
v	"	1.00.05	10	RB	Per, And, Tri	About 0 ^h 59 ^m dissolved in rays.
w	"	03.08	15	RB	Per	
y	"	24.15	30	HA	Gem	Western end.
z	"	25.15	30	HA	Tau, Aur	The arc sinking towards the horizon.

April 21-22, 1933.

Worked from 23^h to 3^h. Stations C (Tveter, Anda), K₄ (Busengdal), T (Albert and Egil Tönte), Da (Hassel).

1	C-K ₄ -T	0.41.55	35	R	Per	Sunlit rays.
2	"	44.47	49	R	"	---
3	"	1.03.57	32	R	"	---
4	"	15.25	59	R	"	---

May 1-2, 1933.

Worked from 22^h to 2^h. Stations: C (Tveter, Anda, Sandøy, myself), O (Bakøy), K₄ (Odleiv Busengdal), Li (Höstmælingen), Da (Hassel), Lö (Herstad).

4	C-K ₄	22.13.15	10	R	Gem, Cnc, MMi	
7	C-O-K ₄	21.40	8	R	Leo	Sunlit rays.

Table 1 (continued).

PN	St	MET	Ex	Fm	Ref. Con.	Remarks
8	C-O-K ₄	22.22.48	9	R	Leo, UMa	Sunlit rays
9	C, K ₁	23.57	8	C	CVn, Com	
10	C, K ₁	24.27	8	C	"	
11	"	24.57	10	C	"	
12	O-K ₄	25.49	9	RB, R	Per, Aur	Sunlit.
13	C-O	27.44	10	R	Leo	"
14	"	28.32	9	R	"	Partly sunlit.
15	C, O, K ₁	29.49	8	C	CVn, UMa	
16	"	30.30	7	C	"	
17	C-O-K ₄	31.42	4	RB	Cyg	Sunlit.
18	"	32.09	5	RB	Per, And	"
23	O-K ₁	37.42	9	RB	"	"
29	C-O-K ₁	43.28	14	R	Aur	"
32	C-O	45.48	20	R	"	"
33	"	46.20	20	C	UMa, CVn	"
35	C-O-K ₁	48.31	18	R	Aur	"
37	C-O, K ₁	50.58	9	C	UMa, CVn	"
41	C-K ₁	54.40	9	RB	Per	"
42	C-O	55.03	12	RB	Cyg	"
43	C-O-K ₄	55.48	5	D	Per	Sunlit western end, From here to No. 52 a very fine series of the same D.
44	"	56.04	5	D	Per, Aur	Sunlit W. end.
23*	Li	56.05	4	D	Aur	—
45	C-O-K ₁	56.18	5	D	Per, Aur	—
46	"	56.34	5	D	Per, Aur	—
47	"	56.58	19	D	Per	—
48	"	57.31	9	D	Per, Cam	—
26*	Li	58.10	5	D	Aur	—
49	C-O-K ₄	58.13	14	D	Per	—
50	"	58.38	11	D	Aur, Cam, Per	—
51	"	59.00	6	D	Per, Cam	—
52	"	59.33	11	D	Cyg	Eastern part of the same.
55	C-O	23.01.16	14	R	Aur	Sunlit.
56	"	01.52	16	R	Aur, Cam	The same.
57	C-O-K ₁	02.29	8	R	Gem	Sunlit.
58	"	02.54	10	R	"	"
59	"	03.29	11	R	Gem	"
61	"	05.06	10	D	Cas	"
62	"	05.38	6	R	Cep, Lac, Cyg	" , very fine bundle.
63	"	05.56	7	R	"	The same, very fine.
32*	Li	06.10	5	D, R	Cyg, Lac	—
64	C-O-K ₁	06.15	9	D, R	Cep, Lac, Cyg	—
33*	Li	06.36	6	D, R	And, Cyg, Lac	—
65	C-O-K ₁	06.39	13	D, R	Cep, Cyg, Lac	—
66	"	07.03	12	R	Cep, Lac, Cyg	Sunlit.
67	"	08.12	9	R	Cas, Cyg, Lac	" , very fine.
68	"	08.36	8	D, R	"	Partly sunlit.
37*	Li	08.50	5	D, R	?	The same D
69	C-O-K ₄	08.58	12	D, R	Cas, And, Per	—
38*	Li	09.16	6	D, R	Cyg	—
70	C-O-K ₄	09.21	9	D, R	Cas, Lac, Per	—
72	"	10.13	8	D	Aur	Western part of the same.
40*	Li	10.19	6	DC	Cyg	Eastern

Table 1 (continued).

PN	St	MET	Ex	Fm	Ref. Con.	Remarks
73	C-O-K ₄	23.11.41	11	D, R	Cyg, Lac, And	Eastern part of the same
41*	Li	11.43	6	D	Cyg	" ---"
42*	"	12.03	6	D	"	" ---"
74	C-O-K ₄	12.11	12	D	Cyg, Lac, And	" ---"
44*	Li	19.15	28	D	Cyg	" ---"
76	O-K ₄	20.42	13	R	Gem, Aur	Sunlit
77	C-O-K ₄	21.24	11	R	"	"
45*	Li	21.31	18	D	Cyg	Eastern part.
78	C-K ₄	22.06	13	D	Aur, Cam	Feeble.
46*	Li	22.11	14	D	Cyg	Eastern part.
47*	"	23.29	15	D	"	---"
80	C, O, K ₄	24.00	13	HA	Cas	
48*	Li	24.11	15	HA	Cyg	---"
81	C-O-K ₄	24.56	14	D	Per	Feeble.
82	"	25.27	18	D	"	"
86	C-K ₄	28.20	17	R	Cas	"
87	"	28.51	14	R	"	Sunlit.
88	O-K ₄	29.43	12	R	Cas, Per, And	"
91	C-O-K ₄	38.59	21	R	Per, Cas	"
92	"	40.39	26	R	"	"
93	"	41.55	20	R	"	"
98	"	49.20	24	R	Per, Cas, And	"
102	O-K ₄	0.14.15	9	RB	Gem	More luminous.
13**	Lö	17.35	10	RB	Jupiter	Fine bands.
107	O	17.49	12	RB	Aur	
109	K ₄	19.43	16	HB	Aur	
14**	Lö	20.10	20	RB	And	Eastern part.
111	C-O-K ₄	21.35	11	R	UMa, Lyn	
1***	Da	21.40	20	HA, HB	Gem, Aur	
2***	"	23.35	20	"	Aur, Per	The same as 1***.
114	C-K ₄	24.55	14	R	Gem	
3***	Da	25.20	30	HA, HB	Aur, Per, Cas	
16**	Lö	27.08	15	RB	And	
119	O-K ₄	40.30	9	R	UMa	
74*	Li	42.08	15	HA	Cas	
25**	Lö	54.10	20	HB	UMa	
26**	"	55.10	20	HB	"	
121	C-O	55.31	21	R	UMa, Cas, Lyn	Sunlit.
122	C	56.15	20	R	"	The same.
75*	Li	56.47	26	R	UMa	Perhaps the same?
129	C-K ₄	1.06.54	16	R	UMi	Feeble ray.
132	"	11.01	14	R	Aur, Cam	Sunlit.
32**	Lö	12.10	20	R	Jupiter	
133	C-K ₄	12.11	28	R	And, Lac, Cyg	"
134	"	13.01	20	R	Cyg, Cep	"
135	"	13.47	7	R	Aur, Cam	"
37**	Lö	25.08	15	RB	Jupiter	
5***	Da	25.20	10	RB	Gem, Aur	
38**	Lö	26.05	10	RB	Jupiter, Vir	Fine curtain.
39**	"	27.05	10	RB	Boo	---"
6***	Da	32.20	10	D	Cas	---"
43**	Lö	37.05	10	RB	Boo	
45**	"	44.05	10	RB	Leo	

Table 2.
Height and situation of measured Aurora points.

No	Pt	MET	St	F	S	ϵ_2	p	h	a	D	H	Remarks	θ
August 29-30, 1932.													
3	1	22.08.30	T	HA	l			5.8	144.0	664		H supposed = 100 km	24-26
	2	-	-	-	-			6.3	148.0	617		-	-
	3	-	-	-	-			7.0	154.0	585		-	-
	4	-	-	-	-			7.6	162.0	558		-	-
	5	-	-	-	-			7.7	173.0	553		-	-
	6	-	-	-	-			7.5	-178.7	563		-	-
4	1	22.11.30	T	-	-			7.5	158.0	564		-	-
	2	-	-	-	-			7.6	166.0	558		-	-
	3	-	-	-	-			7.5	174.0	564		-	-
	4	-	-	-	-			7.1	180.0	581		-	-
	5	-	-	-	-			6.7	-174.9	599		-	-
9	1	22.25.00	T	-	-			7.1	142.0	581		-	-
	2	-	-	-	-			7.9	147.0	544		-	-
	3	-	-	-	-			8.5	154.0	519		-	-
	4	-	-	-	-			9.0	162.0	500		-	-
	5	-	-	-	-			9.0	169.0	500		-	-
	6	-	-	-	-			8.7	176.6	512		-	-
10	1	22.27.00	T	-	-			8.9	158.0	503		-	-
	2	-	-	-	-			8.9	164.0	503		-	-
	3	-	-	-	-			8.4	174.0	523		-	-
	4	-	-	-	-			7.1	-176.3	581		-	-
14	1	22.38.00	O	-	-			7.2	160.0	570		-	-
	2	-	-	-	-			7.4	166.0	560		-	-
	3	-	-	-	-			7.3	174.0	573		-	-
	4	-	-	-	-			6.8	-178.0	594		-	-
	5	-	-	-	-			6.1	-170.0	629		-	-
	6	-	-	-	-			5.7	-166.0	651		-	-
15	1	22.40.00	T	-	-			7.3	150.0	578		-	-
	2	-	-	-	-			7.8	156.0	549		-	-
	3	-	-	-	-			8.1	164.0	536		-	-
	4	-	-	-	-			7.8	174.0	550		-	-
	5	-	-	-	-			7.4	-178.0	567		-	-
	6	-	-	-	-			7.1	-174.0	581		λ	-
21	1	22.47.59	T	-	-			8.05	156.0	538		-	-
	2	-	-	-	-			8.0	162.0	540		-	-
	3	-	-	-	-			7.7	170.0	553		-	-
	4	-	-	-	-			7.2	178.0	576		-	-
	5	-	-	-	-			6.7	-176.0	600		-	-
20	1	22.46.57	T-O	R	m	-44.7	4.7	18.0	152.7	589	226	The O-picture diffuse	-
	2	-	-	-	m	-46.3	4.6	10.2	152.8	613	143	-	-
	3	-	-	-	h			20.8	152.6	581	257	1-4 belong to one ray	-
	4	-	-	-	l			8.3	152.8	619	123	-	-
22	1	22.49.02	T	HA	-			8.1	168.0	536		H supposed = 100 km	-
	2	-	-	-	-			8.0	174.0	540		-	-
	3	-	-	-	-			7.7	180.0	553		-	-
	4	-	-	-	-			7.3	-174.0	572		-	-
26	1	22.54.50	T-O	R	h'	-10.9	4.8	17.1	116.7	790	308	Good set of pictures	24-25
	2	-	-	-	m	-12.3	4.9	11.4	117.9	802	220	-	-
	3	-	-	-	h'	-7.8	4.4	16.4	113.8	869	334	1, 2, 6, 7 belong to one ray	-
	4	-	-	-	m	-8.6	4.4	12.7	114.6	891	275	3, 4, 5, 8, 9 to another ray	-
	5	-	-	-	l'	-9.7	4.45	7.1	115.7	906	184	-	-
	6	-	-	-	h			18.7	116.4	787	332	-	-

Table 2 (continued).

No	Pt	MET	St	F	S	ϵ_2	p	h	a	D	H	Remarks	θ
27	7	22.54.50	T-O	R	l			6.7	118.8	811	152		24-25
	8	-	-	-	h			17.9	113.5	874	364		-
	9	-	-	-	l			6.2	115.9	908	172		-
	1	22.55.56	T-C	R	m	- 0.3	3.15	16.7	111.2	779	295	Very diffuse set. Small base line	24-26
	2	-	-	-	m	- 1.2	3.15	12.7	112.2	799	240		-
29	3	-	-	-	l'	- 2.2	3.15	8.5	113.2	817	180	1-5 belong to the same ray	-
	4	-	-	-	l			7.3	113.6	823	163		-
	5	-	-	-	h			20.8	110.3	762	355		-
	1	22.58.04	T-O	R	h'	- 2.3	5.05	17.6	107.3	760	300	The ray (1, 2) gives the best result	25-26
	2	-	-	-	m	- 4.0	5.2	10.7	109.1	775	200		-
30	3	-	-	-	h'	- 2.0	5.0	16.5	107.0	777	292	1, 2, 5, 6 belong to one ray	-
	4	-	-	-	l'	- 3.3	5.2	10.8	108.4	775	202	3, 4, 7, 8 to another	-
	5	-	-	-	h			18.7	107.0	758	318		-
	6	-	-	-	l			6.9	110.1	784	147		-
	7	-	-	-	h			17.3	106.8	775	303		-
	8	-	-	-	l			8.7	108.9	790	175		-
	1	22.59.04	T-O	R	m	- 2.2	4.5	16.7	107.9	857	333	The O-picture diffuse and measurements not so good	24-26
	2	-	-	-	l'	- 3.4	4.3	10.8	109.4	926	255		-
31	3	-	-	-	m	0.9	4.7	15.6	104.5	829	300		-
	4	-	-	-	l'	0.1	4.5	10.7	105.7	894	241		-
	5	-	-	-	h			20.7	106.8		385	1, 2, 5, 6 belong to one ray	-
	6	-	-	-	l			9.9	109.6		244	3, 4, 7, 8 to another	-
	7	-	-	-	h			19.3	103.7		344		-
	8	-	-	-	l			9.5	106.0		229		-
	1	23.02.13	T-O	R	m	-12.9	4.7	16.7	118.7	802	307	The O-picture not so good.	23-26
	2	-	-	-	m	-13.9	4.6	11.8	119.7	842	241		-
32	3	-	-	-	l	-15.2	4.4	6.7	121.2	899	175	1, 2, 3, 7 belong to one ray	-
	4	-	-	-	m	- 9.3	5.4	21.5	114.3	685	323	4, 6, 8 to another	-
	5	-	-	-	m	- 9.9	5.35	18.8	114.9	706	293		-
	6	-	-	-	l	-10.8	5.3	15.4	115.8	727	252		-
	7	-	-	-	h			21.6	117.9	782	379		-
	8	-	-	-	h			24.0	114.0	692	365		-
	1	-	Li-O	-	m	-34.1	9.5	18.8	99.7	701	301	The Li picture out of focus	25-26
	2	-	-	-	m	-35.5	9.2	13.5	100.6	760	236	Points 1, 2, 3 the same as before	-
33	3	-	-	-	l	-37.0	9.1	8.1	101.9	777	163		-
	1	23.03.17	T-O	R	h'	-11.9	5.3	21.7	117.3	691	329	The right border gave the best results	24-26
	2	-	-	-	m	-13.4	5.4	16.6	118.6	703	260		-
	3	-	-	-	l	-14.5	5.4	12.7	119.6	718	209	1, 2, 3, 7 belong to one ray	-
	4	-	-	-	h'	-11.5	5.0	16.7	117.0	761	287	4, 6, 8, 9 to another	-
	5	-	-	-	m	-12.3	4.9	12.7	117.9	795	238		-
	6	-	-	-	l'	-13.3	4.6	8.1	119.1	863	188		-
	8	-	-	-	h						305		-
	9	-	-	-	l						177		-
34	4	-	Li-O	R	m	-32.4	9.9	18.4	111.4	710	289	Points 4, 5, 6 the same as before	24-25
	5	-	-	-	m	-33.7	9.7	14.1	112.4	735	236		-
	6	-	-	-	l'	-35.0	9.4	9.3	113.7	768	177		-
	1	23.04.32	T-O	R	h	- 9.1	5.1	24.3	114.5	703	378	Good set	25-26
	2	-	-	-	m	-10.9	5.3	18.5	116.1	713	291		-
	3	-	-	-	m	-12.7	5.6	12.7	117.5	700	202	1-4 belong to one ray	-
34	4	-	-	-	l			9.9	118.2	727	171		-
	1	23.05.40	T-O	R	h	-4.75	4.55	23.8	110.4	795	428	Diffuse ray, difficult to measure	24-26
	2	-	-	-	m	- 6.0	4.7	18.7	111.5	806	342		-

Table 2 (continued).

No	Pt	MET	St	F	S	ϵ_2	p	h	a	D	H	Remarks	θ
34	3	23.05.40	T-O	R	m	- 7.5	4.7	12.6	112.9	838	253		24-26
	4	-	-	-	l	- 8.7	4.6	7.8	114.2	875	187	1-4 belong to one ray	-
35	1	23.06.43	T-O	R	m	- 3.6	4.8	19.1	108.9	788	340	Very diffuse ray	24-26
	2	-	-	-	m	- 4.5	4.6	14.6	110.2	851	292	1-5 belong to one ray	-
	3	-	-	-	m	- 5.5	4.5	10.7	111.4	888	240		-
	4	-	-	-	l	- 6.3	4.3	8.1	112.3	937	211		-
	5	-	-	-	h						390		-
36	1	23.07.42	T-O	R	h'	- 1.8	4.8	18.7	107.0	792	335	Diffuse ray	24-26
	2	-	-	-	m	- 2.3	4.8	15.7	107.6	809	293	1-5 belong to one ray	-
	3	-	-	-	m	- 2.8	4.7	12.7	108.3	844	257		-
	4	-	-	-	l	- 3.9	4.6	9.2	109.6	878	210		-
	5	-	-	-	h			19.5	106.9	805	356		-
38	1	23.11.17	-	-	h			25.3	116.0	605	332	Diffuse ray	25-26
	2	-	-	-	m	- 11.5	6.0	20.6	116.9	621	275	1-5 belong to one ray	-
38	3	-	T-O	R	m	- 12.4	5.9	16.7	117.7	648	236		25-26
	4	-	-	-	m	- 13.3	6.0	12.6	118.7	654	185		-
	5	-	-	-	l			10.3	119.9	666	160		-
38	2	-	Li-O	-	m	- 32.0	11.0	23.3	110.2	619	312		24-26
	3	-	-	-	m	- 33.4	10.9	19.2	111.1	637	264		-
	4	-	-	-	l'	- 34.7	10.8	14.2	112.1	654	212		-

September 23-24, 1932.

1	1	21.27.36	O	HA	l			10.6	168.0	445		H supposed -- 100 km	
	2	-	-	-	-			10.3	176.0	455		-	
	3	-	-	-	-			9.4	-176.0	486		-	
	4	-	-	-	-			8.3	-169.0	527		-	
	5	-	-	-	-			7.5	-163.0	563		-	
5	2	21.32.25	O	HA	-			8.6	175.0	515		-	
	3	-	-	-	-			8.4	-178.0	523		-	
	4	-	-	-	-			7.6	-170.0	558		-	
	5	-	-	-	-			6.5	-162.0	608		-	

March 18-19, 1933.

1	1	22.35.55	N	HA	l			4.0	-153.0	755		H supposed -- 100 km	
	2	-	-	-	-			6.6	-168.0	605		-	
	3	-	-	-	-			8.5	176.0	520		-	
2	1	22.39.00	N	HA	-			9.3	170.0	490		-	
	2	-	-	-	-			8.7	158.0	513		-	
	3	-	-	-	-			8.2	148.0	532		-	
3	1	22.42.00	N	HA	-			5.3	-153.0	673		-	
	2	-	-	-	-			7.5	-166.0	562		-	
	3	-	-	-	-			9.6	-178.0	479		-	
5	1	22.49.00	N	HA	-			10.2	174.0	458		-	
	2	-	-	-	-			10.4	162.0	453		-	
	3	-	-	-	-			10.3	148.0	455		-	
7	1	22.55.30	N	HA	-			8.0	-152.0	540		-	
	2	-	-	-	-			10.0	-162.0	465		-	
	3	-	-	-	-			11.7	-172.0	414		-	
10	1	23.03.30	N	HA	-			7.9	-146.0	544		-	
	2	-	-	-	-			10.4	-156.0	453		-	
	3	-	-	-	-			12.6	-168.0	390		-	
11	1	23.06.41	N	HA	-			13.6	168.0	365		-	
	2	-	-	-	-			14.1	158.0	355		-	
	3	-	-	-	-			14.1	146.0	355		-	
15	1	23.13.05	N	RA	-			10.6	-144.0	446		-	

Table 2 (continued).

No	Pt	MET	St	F	S	ϵ_2	p	h	a	D	H	Remarks	θ
17	2	23.13.05	N	RA	l			14.3	-156.0	350		H supposed 100 km	
	3	-	-	-	-			16.7	-170.0	305		-	
	1	23.14.31	N	RA	-			13.6	-148.0	365		-	
18	2	-	-	-	-			15.4	-158.0	327		-	
	3	-	-	-	-			17.0	-170.0	300		-	
	1	23.15.04	N	RA	-			14.8	-151.0	340		-	
	2	-	-	-	-			15.8	-155.0	320		-	
	3	-	-	-	-			16.2	-160.0	312		-	
20	4	-	-	-	-			16.3	-164.0	310		-	
	5	-	-	-	-			16.8	-169.0	303		-	
	1	23.16.41	N-Lo	RA	-	-57.6	3.6	16.6	-163.8	388	130	1-2 along one ray	24-25
	2	-	-	-	m	-56.5	3.7	20.5	-163.3	377	156	3-4 along another	24-25
	3	-	-	-	-	-70.0	2.1	12.2	-149.8	434	110	-	-
22	4	-	-	-	l'	-69.3	2.1	13.7	-149.7	441	125	-	-
	1	23.17.59	N-Lo	R	l	22.9	4.9	11.3	110.3	502	122	-	23-24
	2	-	-	-	m	23.9	4.9	18.6	108.1	477	184	1-3 belong to one ray	-
	3	-	-	-	h			23.6	106.6		228	-	-
25	1	23.20.05	N-Lo	R	l'	-32.5	6.5	17.3	163.8	337	115	Not so good; the ray far	23-24
	2	-	-	-	m	-31.0	6.6	24.8	163.7	320	159	from optical center	-
	3	-	-	-	h'	-29.3	6.5	30.5	163.5	311	196	1-3 belong to the same ray	-
30	1	23.23.31	N-Lo	RB	l'	54.3	2.5	9.4	80.4	624	137	Very feeble ray along western edge	25-26
	2	-	-	-	m	54.3	2.7	13.7	78.8	567	169	-	-
	3	-	-	-	h'	54.1	2.6	17.2	77.6	578	212	1-3 belong to this edge	-
33	1	23.25.27	N-Lo	RB	l	-4.5	3.7	4.4	139.4	734	101	-	20-21
	2	-	-	-	h'	-4.2	3.6	7.4	139.2	745	144	-	-
	3	-	-	-	l	0.2	5.5	10.3	132.8	488	108	-	22-24
	4	-	-	-	l	2.3	5.5	11.3	130.6	485	114	-	-
	5	-	-	-	h	2.6	5.4	13.0	130.5	488	134	-	-
	6	-	-	-	l	5.0	5.8	11.7	127.6	458	113	-	-
	7	-	-	-	h	5.4	5.6	14.7	127.3	466	142	-	-
35	1	23.27.06	N-Lo	RB	l	2.2	4.8	7.4	131.4	563	99	Good set, sharp lower border	21-23
	2	-	-	-	l	0.6	4.1	5.5	133.8	665	100	-	-
	3	-	-	-	l	-0.2	3.8	4.3	134.9	717	97	-	-
41	1	0.03.09	N	HA	l			3.8	120.4	780		H supposed = 100 km	
	2	-	-	-	l			4.3	128.7	742		-	
	3	-	-	-	l			4.8	138.9	710		-	
42	1	0.04.09	N	HA	l			4.5	127.3	728		-	
	2	-	-	-	-			4.6	134.0	721		-	
	3	-	-	-	-			4.8	141.0	710		-	
	4	-	-	-	-			4.9	148.0	702		-	
	5	-	-	-	-			4.9	155.3	702		-	
43	1	0.05.42	N	HA	-			5.5	166.0	663		-	
	2	-	-	-	-			6.0	155.0	635		-	
	3	-	-	-	-			6.0	142.0	604		-	
47	1	0.07.52	N-Lo	PS	h	-15.9	5.5	11.1	149.3	477	113	Short pulsating ray	22-23
	2	-	-	-	l	-15.9	5.4	7.9	149.2	483	87	along RA	-
48	1	0.08.19	N	HA	-			7.2	170.0	577		H supposed = 100 km	
	2	-	-	-	-			7.6	162.0	560		-	
	3	-	-	-	-			7.6	154.0	560		-	
	4	-	-	-	-			8.1	146.0	536		-	
53	1	0.12.32	N-Lo	RB	l'	-18.5	3.1	4.3	154.0	831	119	-	19-21
	3	-	-	-	m	-17.3	3.3	4.3	152.6	785	110	-	-
	4	-	-	-	l'	-9.7	3.9	6.0	144.4	684	110	-	-
	a	-	N	-	l			5.7	146.5	653		a-i along lower border of	20-22
	b	-	-	-	-			5.5	148.5	662		the distant RB	-

Table 2 (continued).

No	Pt	MET	St	F	S	ϵ_2	p	h	a	D	H	Remarks	θ	
57	c	0.12.32	N	RB	l			5.3	150.4	673		H supposed = 100 km	-	
	d	-	-	-	-			4.9	152.0	695			-	
	e	-	-	-	-			3.5	152.3	790			18-20	
	f	-	-	-	-			3.2	151.2	814			-	
	g	-	-	-	-			3.4	150.0	802			-	
	h	-	-	-	-			3.6	148.8	782			-	
	i	-	-	-	-			3.8	148.2	770			-	
	1	0.17.17	N-Lø	RB	l'	-17.5	5.8	10.8	150.6	439	100			20-22
	2	-	-	-	h'	-19.5	3.8	12.2	154.7	655	180			-
	3	-	-	-	l	-19.8	4.0	7.5	154.8	635	118			-
62	4	-	-	-	m	-20.8	3.6	6.9	156.3	702	126		-	
	5	-	-	-	l	-21.0	3.8	5.2	156.3	670	98		-	
	6	-	-	-	h'	-22.7	4.1	12.2	157.7	596	161		-	
	7	-	-	-	l'	-23.0	3.8	6.9	158.2	656	115		-	
	1	0.22.36	N-Lø	R	l'	-17.8	4.1	7.4	152.5	627	114	1-2 the same ray	21-23	
	2	-	-	-	m	-16.9	4.3	15.0	151.7	579	187	3-4 another ray	-	
	3	-	-	-	l'	-19.2	4.6	9.0	153.4	553	113	5-6	-	
63	4	-	-	-	m	-18.1	4.5	15.8	152.7	548	183		-	
	5	-	-	-	l	-21.4	4.8	10.3	155.7	518	117	Pt. 5 and 6 not so good as	-	
	6	-	-	-	h'	-20.2	4.5	16.7	155.1	537	189	the earlier ones	-	
	1	0.23.08	N-Lø	RB	h'	-22.9	5.2	22.0	157.8	442	199		21-23	
	2	-	-	-	m	-24.6	4.9	12.6	158.8	491	131		-	
	3	-	-	-	l	-23.6	4.8	9.5	157.8	514	108		-	
	4	-	-	-	l	-21.2	4.3	8.0	155.6	583	110		-	
64	5	-	-	-	l	-19.8	3.8	6.6	154.7	672	115		-	
	6	-	-	-	l	-18.9	3.7	6.2	153.8	690	115		-	
	7	-	-	-	m	-18.7	3.9	9.1	153.5	653	140		-	
	8	-	-	-	l'	-30.3	3.4	5.3	165.8	690	103	Belong to another RB	-	
	1	0.23.47	N-Lø	RB	m	-15.8	7.6	18.1	147.2	328	118	Interesting isolated cur-	22-24	
	2	-	-	-	l'	-16.0	7.4	15.6	147.5	342	106	tains	-	
	3	-	-	-	h	-18.9	6.3	17.4	151.8	389	137	Very good	-	
	4	-	-	-	l	-19.4	6.1	13.7	152.2	410	115		-	
	5	-	-	-	h'	-19.8	5.8	12.7	152.8	432	113		-	
	6	-	-	-	l'	-20.1	5.9	10.6	153.0	429	96		-	
	7	-	-	-	h	-24.1	4.4	19.9	159.6	523	217		20-22	
65	8	-	-	-	l	-25.7	4.3	8.8	160.2	565	114		-	
	9	-	-	-	l	-23.4	3.7	7.0	158.3	670	120		-	
	10	-	-	-	l'	-22.0	3.8	7.1	156.9	660	118		-	
	11	-	-	-	l'	-35.4	3.1	6.5	170.8	711	123		-	
	2	0.24.30	N-Lø	RB	l	-28.3	4.0	7.6	163.1	594	108	Pt. 2, 3, 4, 5 along RB to	21-23	
	3	-	-	-	l	-26.6	4.6	9.0	160.9	523	107	the left	-	
	4	-	-	-	m	-24.1	4.4	10.4	158.9	553	127		-	
	5	-	-	-	h'	-23.4	4.4	14.2	158.1	546	165		-	
	6	-	-	-	m	-39.6	3.6	9.2	175.4	576	121		-	
	7	-	-	-	l'	-40.1	3.4	6.0	175.8	610	95		-	
	8	-	-	-	l'	-40.9	3.3	6.0	176.7	620	97		-	
67	9	-	-	-	l	-43.3	3.3	8.3	179.3	594	116	Along lower border	-	
	10	-	-	-	l	-47.4	3.8	9.7	-176.9	480	102		-	
	11	-	N	-	l			5.5	176.2		92	Left edge of RB	-	
	1	0.26.13	N-Lø	R	l'	-62.0	4.4	19.0	-157.9	275	102	Rays under HA	25-26	
	2	-	-	-	h'	-58.6	4.6	26.3	-156.8	275	144	1-2 one ray	-	
	3	-	-	-	l'	-73.3	2.3	14.4	-143.5	330	94	3-4 another ray	-	
	4	-	-	-	h'	-71.3	2.5	17.7	-143.2	333	117		-	
68	1	0.26.30	N-Lø	R	h'	-59.2	3.9	25.6	-155.5	321	165	All measurements	24-26	
	2	-	-	-	l	-63.6	3.1	15.5	-156.8	376	117	doubtful on account of	-	
	3	-	-	-	h'	-67.0	2.3	19.3	-147.8	432	170	small parallaxes.	-	

Table 2 (continued).

No	Pt	MET	St	F	S	ϵ_2	p	h	a	D	H	Remarks	θ	
N69, Li5*	4	0.26.30	N-L \emptyset	R	l'	-70.0	2.1	13.7	-148.8	430	121	1-2, 3-4, 5-6, 7-8 and 9-10 each belong to separate rays	-	
	5	-	-	-	h'	-68.3	2.2	19.1	-145.6	427	161		-	
	6	-	-	-	l'	-71.2	2.2	14.3	-146.7	386	112		-	
	7	-	-	-	h'	-72.5	2.4	16.3	-142.3	328	106		-	
	8	-	-	-	l'	-74.1	2.0	13.5	-142.7	364	99		-	
	9	-	-	-	h	-73.0	2.6	17.5	-139.6	293	100		-	
	10	-	-	-	l'	-75.7	2.0	13.1	-140.5	329	86		-	
	1	0.27.14	N-Li	HA	l	-67.5	23.2	22.8	-139.6	229	101		Correction made for motion of the arc at N.	25-27
	2	-	-	-	l	-68.9	25.6	27.1	-140.7	190	101		Time mean of the two times for N and Li	-
	3	-	-	-	l	-69.9	27.2	31.2	-143.6	165	103			-
4	-	-	-	l	-70.7	28.6	35.1	-145.1	144	105		-		
5	-	-	-	l	-71.5	29.8	38.8	-148.4	128	105		-		
72	1	0.29.36	N-L \emptyset	HA	l	-71.1	2.1	16.0	-144.7	403	131	Very feeble remains of arc under the main one.	24-26	
2	-	-	-	m	-69.9	2.5	19.3	-143.3	351	135			-	
3	-	-	-	l	-73.1	1.5	12.6	-144.4	513	138	Doubful		-	
73	7	0.30.46	N-L \emptyset	RA	l	-74.0	2.6	18.5	-127.0	273	98	Lower border	26-27	
8	-	-	-	l	-67.6	5.8	28.2	-129.2	159	98	The points 1-6 dropped on account of unfavourable direction of parallaxe	-		
9	-	-	-	l	-62.9	8.4	35.5	-132.6	128	94		-		
74	3	0.31.19	N-L \emptyset	RB	l'	-72.5	2.5	16.9	-120.4	313	104	Points 3-7 tangential view of curtains to the right of the main arc 8-9	26-27	
4	-	-	-	m	-66.6	3.3	23.6	-118.3	298	139			-	
5	-	-	-	h'	-60.0	4.2	30.6	-115.7	276	173			-	
6	-	-	-	m	-70.0	2.3	20.0	-121.1	278	151			-	
7	-	-	-	h'	-64.3	3.0	26.0	-119.2	350	185			-	
8	-	-	RA	l	-73.8	2.7	19.0	-130.0	267	99			-	
9	-	-	-	l	-69.6	4.2	24.4	-133.3	207	98			-	
75	4	0.31.47	N-L \emptyset	RA	l	-72.5	2.7	18.8	-138.8	288	105			25-26
5	-	-	-	l	-69.1	4.0	22.1	-143.3	225	97			-	
6	-	-	-	l	-64.0	5.3	25.6	-150.0	203	102		-		
77	2	0.33.35	N-L \emptyset	RB	l	-75.7	1.7	15.6	-134.8	380	119		-	
3	-	-	-	l	-72.3	2.8	18.3	-140.4	280	100		-		
4	-	-	-	l	-62.8	5.1	27.8	-148.5	216	119		-		
5	-	-	-	l	-57.6	6.5	31.9	-155.5	190	123		-		
78	1	0.34.03	N-L \emptyset	RA	m	-61.5	7.5	35.5	-122.3	141	104		26-27	
2	-	-	-	m	-64.9	5.3	29.2	-121.4	189	110		-		
3	-	-	-	m	-68.4	3.8	23.4	-120.9	262	111		-		
79	1	0.35.16	N-L \emptyset	RB	l	35.0	13.2	33.3	75.8	144	97		26-27	
81	1	0.36.01	N-L \emptyset	RB	-	39.3	11.7	31.7	72.7	155	98		26-27	
2	-	-	-	-	36.9	13.1	32.6	73.1	142	94		-		
3	-	-	-	-	33.3	14.1	35.4	73.7	134	98		-		
4	-	-	-	-	30.0	14.9	38.4	74.2	127	101		-		
85	1	0.38.41	N-L \emptyset	HB	-	-59.3	9.9	38.1	-147.3	112	90	No 85-89 a most interesting horseshoformed band Mean of all H for $p > 5^\circ$ equal to 94 km. This H used for finding geographical situation	26-27	
2	-	-	-	-	-62.3	8.0	34.4	-141.8	132	92			-	
3	-	-	-	-	-65.3	6.3	30.6	-136.9	157	96			-	
1	-	-	-	-	-	-	38.1	-147.3	117				-	
2	-	-	-	-	-	-	34.4	-141.8	134				-	
3	-	-	-	-	-	-	30.6	-136.9	154				-	
4	-	-	-	-	-	-	23.3	-129.9	207				-	
5	-	-	-	-	-	-	20.6	-127.0	236				-	
6	-	-	-	-	-	-	12.2	-131.5	379				-	
7	-	-	-	-	-	-	13.6	-139.4	344				-	
8	-	-	-	-	-	-	15.7	-145.4	304				-	
9	-	-	-	-	-	-	20.5	-150.7	237			-		
10	-	-	-	-	-	-	21.0	-155.9	231			-		
11	-	-	-	-	-	-	21.4	-160.8	228			-		

Table 2 (continued).

No	Pt	MET	St	F	S	ϵ_2	p	h	a	D	H	Remarks	θ
86	1	0.39.13	N-L σ	HB	1	-57.3	9.8	36.6	-154.5	123	93	Same remarks	26-27
	2	-	-	-	-	-63.2	7.3	31.7	-144.5	144	92		-
	3	-	-	-	-	-67.1	5.2	27.4	-137.7	182	97		-
	1	-	N	-	-	-	-	36.6	-154.5	123	-		-
	2	-	-	-	-	-	-	31.7	-144.5	148	-		-
	3	-	-	-	-	-	-	27.4	-137.7	173	-		-
	4	-	-	-	-	-	-	20.8	-131.3	234	-		-
	5	-	-	-	-	-	-	17.3	-128.2	279	-		-
87	6	-	-	-	-	-	-	11.3	-132.0	399	-	25-26	
	7	-	-	-	-	-	-	13.1	-142.0	356	-	-	
	8	-	-	-	-	-	-	16.7	-156.0	287	-	-	
	1	0.39.24	N-L σ	HB	-	-60.6	7.9	33.4	-150.0	142	96	Same remarks	26-27
	2	-	-	-	-	-64.6	6.8	30.0	-144.0	150	89		-
	1	-	N	-	-	-	-	33.4	-150.0	139	-		-
	2	-	-	-	-	-	-	30.0	-144.0	158	-		-
	3	-	-	-	-	-	-	24.9	-137.4	194	-		-
4	-	-	-	-	-	-	19.6	-132.5	248	-	-		
5	-	-	-	-	-	-	17.8	-130.6	271	-	-		
6	-	-	-	-	-	-	11.4	-131.6	401	-	25-26		
88	7	-	-	-	-	-	-	12.3	-141.3	376	-	-	
	8	-	-	-	-	-	-	14.1	-149.1	335	-	-	
	1	0.40.28	N-L σ	HB	-	-56.6	8.6	32.4	-159.6	149	97	Same remarks	-
	2	-	-	-	-	-62.5	6.5	28.6	-150.0	171	96		-
	1	-	N	-	-	-	-	32.4	-159.6	144	-		-
	2	-	-	-	-	-	-	28.6	-150.0	167	-		-
	3	-	-	-	-	-	-	23.9	-140.0	204	-		26-27
	4	-	-	-	-	-	-	18.0	-133.6	269	-		-
5	-	-	-	-	-	-	14.0	-130.0	337	-	-		
6	-	-	-	-	-	-	10.8	-136.0	417	-	25-26		
89	7	-	-	-	-	-	-	11.0	-144.0	412	-	-	
	8	-	-	-	-	-	-	11.6	-150.0	395	-	-	
	1	-	N	HB	-	-	-	25.8	-152.0	186	-	Same remarks. H supposed = 94 km	-
97	2	-	-	-	-	-	-	21.3	-146.0	228	-	-	
	3	-	-	-	-	-	-	16.0	-141.3	300	-	-	
	1	1.59.03	N	HA	-	-	-	16.3	122.0	294	-	H supposed = 95 km	24-25
98	2	-	-	-	-	-	-	18.2	132.0	267	-	-	
	3	-	-	-	-	-	-	19.4	142.0	251	-	-	
	4	-	-	-	-	-	-	20.4	154.0	239	-	-	
	1	1.59.52	N-L σ	HA	-	-1.6	9.6	17.8	130.3	272	94	Unfavourable direction of parallax	24-25
2	-	-	-	-	5.2	9.8	16.3	123.0	268	85	-		
1*	-	N	-	-	-	-	13.9	114.0	338	-	H supposed = 95 km		-
2*	-	-	-	-	-	-	16.0	122.0	299	-	-		
3*	-	-	-	-	-	-	18.2	132.0	265	-	-		
99	4*	-	-	-	-	-	-	20.0	144.0	243	-	-	
	1	2.00.47	N	HA	-	-	-	21.3	152.0	228	-	-	
	2	-	-	-	-	-	-	20.8	164.0	234	-	-	
100	3	-	-	-	-	-	-	19.8	174.0	245	-	-	
	1	2.01.27	N	HA	1	-	-	6.0	94.0	613	-	-	
	2	-	-	-	-	-	-	9.1	100.0	472	-	-	
	3	-	-	-	-	-	-	11.3	106.0	404	-	-	
	4	-	-	-	-	-	-	14.1	114.0	335	-	-	
101	5	-	-	-	-	-	-	16.6	122.0	290	-	-	
	1	2.02.33	N	HA	-	-	-	15.4	-161.9	310	-	-	
	2	-	-	-	-	-	-	12.0	-153.0	384	-	-	

Table 2 (continued).

No	Pt	MET	St	F	S	ϵ_2	p	h	a	D	H	Remarks	θ
102	3	2.02.33	N	HA	l			9.0	-147.0	474		Same remarks.	
	4	-	-	-	-			6.0	-142.0	613		-	
	1	2.03.20	N	HA	-			15.7	116.0	304		-	
	2	-	-	-	-			18.2	124.0	266		-	
	3	-	-	-	-			20.7	134.0	235		-	
103	4	-	-	-	-			22.5	146.0	216		-	
	1	2.04.46	N-L \emptyset	HA	-	33.3	5.2	10.5	99.4	433	96	Unfavourable direction of	24-25
	2	-	-	-	-	25.8	6.8	13.0	104.8	354	94	parallaxe	-
	1*	-	N	-	-			6.5	90.0	587		H supposed = 95 km	
	2*	-	-	-	-			9.9	94.0	447		1, 2, 3, 4 upper arc	
	3*	-	-	-	-			13.3	100.0	352		5, 6, 7, 8 lower arc	
	4*	-	-	-	-			16.8	106.0	286		H supposed = 95 km	
	5*	-	-	-	-			6.5	94.0	582		-	
	6*	-	-	-	-			9.4	98.0	462		-	
	7*	-	-	-	-			11.4	102.0	401		-	
8*	-	-	-	-			13.4	106.8	349		-		
104	1	2.05.29	N	HA	-			18.7	123.2	260		-	
	2	-	-	-	-			20.7	130.0	235		-	
	3	-	-	-	-			22.3	138.0	218		-	
	4	-	-	-	-			23.2	146.0	209		-	
	5	-	-	-	-			22.9	154.0	213		-	
105	1	2.06.06	N	HA	-			27.4	168.0	174		-	
	2	-	-	-	-			25.5	180.0	188		- 1-4 upper arc	
	3	-	-	-	-			23.0	-170.0	211		- 5-8 lower arc	
	4	-	-	-	-			20.7	-162.0	235		-	
	5	-	-	-	-			23.6	168.0	206		-	
	6	-	-	-	-			21.8	178.0	223		-	
	7	-	-	-	-			20.0	-174.0	243		-	
	8	-	-	-	-			17.9	-166.0	269		-	
106	1	2.07.14	N	HA	-			18.4	-154.0	263		-	
	2	-	-	-	-			15.4	-148.0	309		- 1-4 upper arc	
	3	-	-	-	-			12.2	-142.0	380		- 5-8 lower arc	
	4	-	-	-	-			9.9	-138.0	447		-	
	5	-	-	-	-			14.8	-154.0	320		-	
	6	-	-	-	-			11.4	-147.0	401		-	
	7	-	-	-	-			8.8	-142.0	484		-	
	8	-	-	-	-			6.6	-138.0	582		-	
107	2	2.08.03	N-L \emptyset	RB	m	21.4	5.9	13.7	110.5	418	117		24-25
	3	-	-	-	l'	24.6	6.0	11.6	107.4	406	98		-
	4	-	-	-	m	26.0	5.8	16.4	105.3	404	134		-
	5	-	-	R	l	19.4	6.3	14.3	112.1	397	115		-
	6	-	-	-	h	20.0	6.0	18.4	111.2	402	149		-
	108	1	2.12.30	N-L \emptyset	R	h'	8.0	5.9	15.0	124.4	441	136	Rest of RB
2		-	-	-	-	7.7	5.8	11.1	124.8	457	108		-
3		-	-	RB	l	6.6	6.0	9.2	126.6	447	89		-
4		-	-	R	h'	11.3	5.8	14.7	121.2	444	135		-
5		-	-	-	l'	11.4	5.6	12.7	121.4	466	124		-
111	1	2.27.16	N-L \emptyset	RB	l'	35.0	11.0	21.8	87.8	190	80	The L \emptyset picture out of focus	26-27
	2	-	-	-	l'	34.4	11.0	22.0	88.5	190	80	and not so good	-
	3	-	-	-	h'	33.8	10.9	28.6	85.4	183	104	1,3 one ray of RB	-
	4	-	-	-	h'	33.3	10.9	28.8	86.0	183	105	2,4 another ray of RB	-
	5	-	-	-	h	37.9	9.6	26.3	83.3	203	104		-
	6	-	-	-	l'	39.1	9.4	20.3	85.6	213	87		-
	1*	-	-	-	l						77	Close to point 1	
	2*	-	-	-	l						78	--- 2	
6*	-	-	-	l						81	--- 6		

Table 2 (continued).

No	Pt	MET	St	F	S	ϵ_2	p	h	a	D	H	Remarks	θ
112	1	2.28.21	N-L \emptyset	RB	l'	41.6	8.0	20.4	84.0	240	95		26-27
	2	-	-	-	h	41.1	8.2	23.4	82.7	231	105		-
	3	-	-	-	l	42.4	9.1	22.6	80.5	206	90		-
	4	-	-	-	m	41.5	9.4	25.6	78.9	198	99		-
	5	-	-	-	l	-	-	-	-	-	94	Close to point 1	-
116	1	3.01.23	N-L \emptyset	PS	h	-16.3	6.8	19.0	148.7	362	139	Very diffuse	23-24
	2	-	-	-	l	-16.0	6.7	17.1	149.0	375	129		-
117	1	3.01.48	N-L \emptyset	PS	h	-23.7	8.1	18.6	155.3	294	107		23-25
	2	-	-	-	l	-23.9	7.7	16.6	155.7	311	102		-
118	1	3.02.23	N-L \emptyset	PS	l'	-13.0	8.4	16.6	161.2	305	99	Diffuse outline	24
	2	-	-	-	l'	-17.6	8.2	16.2	165.8	306	98		-
119	1	3.02.59	N-L \emptyset	PS	l	-22.4	7.9	17.0	153.8	307	103	Diffuse outline	23-25
	2	-	-	-	m	-21.4	7.9	19.0	152.9	304	113		-
	3	-	-	-	m	-21.3	8.1	21.0	152.8	293	120		-
	4	-	-	-	h	-21.2	8.0	22.9	153.0	292	132		-
<i>March 19-20, 1933.</i>													
1	1	21.05.59	N-L \emptyset	R	h'	34.0	3.6	26.0	96.0	547	304	Sunlit rays	24-25
	2	-	-	-	m	34.0	3.65	24.6	96.6	548	285	1-4 belong to one ray,	-
	3	-	-	-	m	34.1	3.6	21.5	97.6	570	259	5-8 to another	-
	4	-	-	-	l	34.1	3.7	19.8	98.2	562	235		-
	5	-	-	-	h'	37.5	2.8	23.6	93.8	685	353		-
	6	-	-	-	m	37.5	2.9	22.1	94.3	678	321		-
	7	-	-	-	m	37.6	3.0	19.1	95.2	664	276		-
	8	-	-	-	l	37.8	2.9	17.1	95.7	692	261		-
	9	-	-	-	h	-	-	27.6	95.3	545	324		-
	10	-	-	-	h	-	-	24.7	93.5	681	369		-
3	1	21.07.56	N-L \emptyset	R	h	-	-	53.0	93.9	256	362	Sunlit rays	24-26
	2	-	-	-	m	19.7	6.0	50.2	96.1	265	339	1-5 belong to one ray	-
	3	-	-	-	m	20.2	6.1	46.0	98.9	283	313	6-9 to another	-
	4	-	-	-	m	20.7	6.2	39.5	102.6	310	274		-
	5	-	-	-	l	20.9	6.3	34.7	104.8	325	242		-
	6	-	-	-	h	23.7	5.9	46.3	93.1	284	317		-
	7	-	-	-	m	24.5	6.1	41.0	96.2	300	278		-
	8	-	-	-	m	25.3	6.2	34.6	99.1	322	238		-
	9	-	-	-	l	-	-	31.5	100.4	332	218		-
4	1	21.08.55	N-L \emptyset	R	m	36.8	3.85	33.2	87.2	458	332	Sunlit rays	24-26
	2	-	-	-	m	37.6	3.95	29.7	88.8	462	292	1-4 belong to one ray	-
	3	-	-	-	m	38.0	4.05	27.0	90.0	461	261		-
	4	-	-	-	m	38.4	4.2	24.1	91.1	455	227		-
	5	-	-	-	l	-	-	22.3	91.7	463	212		-
	6	-	-	-	h	47.1	2.0	20.2	84.8	835	385		-
	7	-	-	-	m	47.3	2.25	17.5	85.7	761	299		-
	8	-	-	-	m	47.4	2.45	13.7	86.9	720	224		-
	9	-	-	-	l	47.3	2.55	11.7	87.5	701	189		-
	10	-	-	-	h	-	-	36.3	85.8	458	373		-
10	1	-	-	DS	h	48.9	4.9	19.0	80.0	344	129	Difficult to decide aurora form	25-26
	2	-	-	-	m	49.3	4.9	16.7	80.6	347	115		-
	3	-	-	-	m	49.5	4.8	14.5	81.5	357	104		-
	4	-	-	-	l	49.1	4.7	13.1	82.7	370	98		-
15	1	21.37.09	N-L \emptyset	R	h	-40.9	13.3	48.3	- 86.0	103	119	Not sunlit	27-28
	2	-	-	-	m	-43.8	13.35	45.1	- 88.2	105	107	1-4 belong to one ray	-
	3	-	-	-	m	-46.0	13.35	42.5	- 89.8	106	98		-
	4	-	-	-	l	-	-	39.3	- 91.4	107	89		-

Table 2 (continued).

No	Pt	MET	St	F	S	ϵ_2	p	h	a	D	H	Remarks	θ
17	1	21.47.55	N-Lø	R	h			31.9	68.2	295	195		25-27
	2	-	-	-	m	51.0	5.4	26.5	70.2	282	149	2-4 belong to one ray	-
	3	-	-	-	m	52.8	5.1	23.2	71.5	291	135	5-7 to another	-
	4	-	-	-	l	54.1	4.8	20.1	72.6	311	123		-
	5	-	-	-	h'	46.9	4.7	21.1	81.3	367	155		-
	6	-	-	-	m	47.2	5.0	17.7	82.4	352	124		-
	7	-	-	-	l	47.3	5.0	15.0	83.3	377	107		-
	8	-	-	-	h			22.1	80.9	367	164		-
18	1	21.48.11	N-Lø	R	h			37.3	65.9	287	233	1-5 belong to one ray	25-27
	2	-	-	-	m	48.0	5.2	30.6	69.2	295	186	6-8 to another	-
	3	-	-	-	m	50.4	5.5	26.9	70.8	280	150	9-11 to another	-
	4	-	-	-	m	52.2	5.5	22.5	72.6	280	123		-
	5	-	-	-	l	53.7	5.4	16.8	75.1	286	94		-
	6	-	-	-	h	50.6	3.7	20.1	78.9	435	178		-
	7	-	-	-	m	51.0	3.9	17.8	79.7	415	150		-
	8	-	-	-	l	50.7	4.1	15.6	80.8	406	128		-
	9	-	-	-	h			20.6	79.9	450	190		-
	10	-	-	-	m	50.1	3.85	16.0	81.5	435	142		-
	11	-	-	-	l	50.25	3.65	13.5	82.5	462	130		-
23	1	21.51.47	N-Lø	RB	h	58.3	4.95	21.9	64.3	268	115		26-27
	2	-	-	-	m	59.6	4.85	19.5	65.1	269	101		-
	3	-	-	-	l	60.9	4.8	17.2	66.0	265	88		-
24	1	21.52.15	N-Lø	DS	h	68.0	3.0	17.9	55.6	323	114	The lower border difficult to measure	26-28
	2	-	-	-	m	69.7	2.7	16.1	56.2	337	108		-
	3	-	-	-	m	70.5	2.5	15.1	56.7	351	105		-
	4	-	-	-	h	67.8	2.35	16.4	60.1	419	140		-
	5	-	-	-	m	68.7	2.15	14.7	61.4	442	133		-
	6	-	-	-	m	67.6	2.15	13.6	64.1	466	132		-
	7	-	-	-	m	64.6	3.45	17.7	62.7	323	110		-
	8	-	-	-	m	66.0	3.7	14.9	63.6	336	99		-
27	1	21.59.21	N-Lø	PA	l	65.9	4.25	19.2	42.5	248	92	Feeble dots along the arc	27-28
	2	-	-	-	l	62.6	5.0	20.4	38.7	236	93		-
	3	-	-	-	l	58.6	6.55	21.1	35.1	203	82		-
	5	-	-	-	l	52.1	8.1	22.7	28.5	193	84		-
28	1	22.00.11	N-Lø	DS	l	69.9	2.85	16.9	49.7	315	105		27-28
	2	-	-	-	l	71.0	2.45	16.0	52.2	349	111		-
	3	-	-	-	l	71.5	2.4	14.7	54.4	348	102		-
	4	-	-	-	l	71.9	2.45	13.3	56.3	338	90		-
	5	-	-	-	l	71.9	2.15	12.1	59.1	384	95		-
Q	1	23.30.03	N	HA	l			6.0	124.9	637		H supposed = 100 km	
	2	-	-	-	l			7.4	133.2	567		-	
	3	-	-	-	l			9.3	140.0	490		-	
	4	-	-	-	l			9.1	147.1	497		-	
R	1	23.30.51	N	HA	l			7.9	136.0	545		-	
	2	-	-	-	l			9.0	146.0	500		-	
	3	-	-	-	l			9.2	154.0	494		-	
	4	-	-	-	l			9.4	162.0	487		-	
	5	-	-	-	l			9.4	170.0	487		-	
S	1	23.31.40	N	HA	l			9.3	158.0	490		-	
	2	-	-	-	l			9.3	166.0	490		-	
	3	-	-	-	l			9.1	174.0	498		-	
	4	-	-	-	l			9.2	176.0	493		-	

Table 2 (continued).

No	Pt	MET	St	F	S	ϵ_2	p	h	a	D	H	Remarks	θ
<i>March 21-22, 1933.</i>													
1*	1	0.29.39	Li	HA	1			6.6	-166.0	605		H supposed = 100 km	
	2	-	-	-	1			7.7	-174.0	553		-	
	3	-	-	-	1			8.5	178.0	520		-	
	4	-	-	-	1			8.6	174.0	516		-	
2*	1	0.31.28	Li	HA	1			9.4	152.0	486		-	
	2	-	-	-	1			9.1	162.0	496		-	
	3	-	-	-	1			8.8	172.0	508		-	
	4	-	-	-	1			8.1	-179.0	536		-	
3*	1	0.32.32	Li	HA	1			8.0	130.0	538		-	
	2	-	-	-	1			8.6	140.0	516		-	
	3	-	-	-	1			9.2	150.0	493		-	
	4	-	-	-	1			9.0	160.0	500		-	
3*	1	0.32.32	O	HA	1			5.9	148.6	643		-	
	2	-	-	-	1			6.1	152.0	630		-	
	3	-	-	-	1			6.2	156.0	624		-	
	4	-	-	-	1			6.1	160.0	630		-	
	5	-	-	-	1			6.0	162.6	635		-	
4*	1	0.33.45	Li	HA	1			5.3	116.0	673		-	
	2	-	-	-	1			6.9	124.0	588		-	
	3	-	-	-	1			8.1	132.0	536		-	
	4	-	-	-	1			9.3	140.0	489		-	
2	1	0.34.08	T	HA	1			6.9	164.0	588		-	
	2	-	-	-	1			7.0	170.0	585		-	
	3	-	-	-	1			6.9	176.0	588		-	
	4	-	-	-	1			6.6	-179.6	605		-	
	5	-	-	-	1			6.3	-176.0	623		-	
2	1	0.34.08	K ₁	HA	1			6.0	160.0	635		-	
	2	-	-	-	1			6.1	166.0	630		-	
	3	-	-	-	1			5.9	171.0	643		-	
	4	-	-	-	1			5.7	176.0	654		-	
3	1	0.35.18	T	HA	1			6.3	144.9	620		-	
	2	-	-	-	1			6.7	150.0	600		-	
	3	-	-	-	1			7.2	156.0	576		-	
	4	-	-	-	1			7.4	162.0	567		-	
3	1	0.35.18	K ₁	HA	1			5.3	144.0	673		-	
	2	-	-	-	1			5.6	149.0	658		-	
	3	-	-	-	1			5.8	153.0	647		-	
	4	-	-	-	1			6.0	156.5	635		-	
	5	-	-	-	1			6.2	162.0	624		-	
4	1	0.36.28	K ₁	HA	1			5.5	140.0	665		-	
	2	-	-	-	1			5.7	144.0	654		-	
	3	-	-	-	1			5.8	148.0	647		-	
	4	-	-	-	1			5.9	152.0	643		-	
5	1	0.37.54	T	HA	1			7.1	164.0	581		-	
	2	-	-	-	1			7.1	170.0	581		-	
	3	-	-	-	1			6.8	176.0	594		-	
	4	-	-	-	1			6.4	-178.0	615		-	
	5	-	-	-	1			6.0	-174.5	635		-	
5	1	0.37.54	K ₁	HA	1			5.6	146.0	638		-	
	2	-	-	-	1			6.0	152.0	635		-	
	3	-	-	-	1			6.1	158.0	630		-	
	4	-	-	-	1			6.2	164.0	624		-	
	5	-	-	-	1			6.2	170.0	624		-	
	6	-	-	-	1			6.1	174.6	630		-	

Table 2 (continued).

No	Pt	MET	St	F	S	ϵ_2	p	h	a	D	H	Remarks	θ
13	1	1.04.03	K-T	PS	l	-37.3	10.2	10.1	166.5	458	99	Pulsating dot	25-26
	2	-	-	-	h'	-37.3	10.3	12.2	166.6	449	114		-
<i>March 23-24, 1933.</i>													
25	1	0.21.20	N-L θ	R,RB	l	-30.2	4.5	8.3	164.7	520	98	Ray behind the RB	22-23
	2	-	-	-	m	-29.6	4.5	12.0	164.5	515	132	-	-
	3	-	-	-	h	-25.5	4.4	17.5	164.1	512	188	-	-
26	1	0.22.36	N-L θ	R	h	-28.6	3.7	21.4	165.5	589	268	Ray far away	20-22
	2	-	-	-	m	-30.0	3.9	15.5	165.9	575	191	-	-
	3	-	-	-	m	-30.8	3.7	10.1	166.2	619	143	-	-
	4	-	-	-	l'	-30.9	3.5	7.3	166.3	662	121	-	-
	5	-	-	-	l	-30.1	3.5	5.6	165.4	670	103	-	-
27	1	0.23.10	N-L θ	R	m	-30.6	3.6	16.3	166.8	616	217	The same ray	19-22
	2	-	-	-	m	-31.3	3.6	11.8	166.9	629	166	1-4 belong to one ray	-
	3	-	-	-	m	-31.7	3.4	7.2	167.1	676	124	5-6 to another	-
	4	-	-	-	l	-31.0	3.0	5.7	166.7	774	127	-	-
	5	-	-	-	m	-26.3	3.0	12.7	162.5	780	231	-	-
	6	-	-	-	l	-26.7	2.9	9.3	162.7	820	193	-	-
	7	-	-	-	h	-	-	21.0	166.8	-	269	-	-
28	1	0.24.52	N-L θ	RB	h	-30.8	3.8	21.6	167.9	560	255	1-4 belong to the same R	20-22
	2	-	-	-	m	-31.7	3.7	16.9	168.0	591	214	of RB	-
	3	-	-	-	m	-32.4	3.5	11.6	168.3	639	167	5-6 belong to the another	-
	4	-	-	-	l'	-32.7	3.2	7.5	168.4	709	136	R of RB	-
	5	-	-	-	h'	-25.3	4.3	19.7	161.0	530	218	-	-
	6	-	-	-	l'	-26.0	4.2	14.3	161.1	560	171	-	-
	7	-	-	-	l	-28.2	3.7	10.3	163.7	637	150	-	-
	8	-	-	-	l	-29.1	3.1	6.5	164.8	760	135	-	-
30	1	0.27.50	N-L θ	RB	h	-40.05	2.75	18.3	178.2	701	282	-	21-22
	2	-	-	-	m	-41.1	3.0	15.1	178.3	651	215	-	-
	3	-	-	-	m	-42.0	3.2	11.9	178.5	615	163	-	-
	4	-	-	-	l	-42.7	3.3	10.8	178.9	593	143	-	-
	5	-	-	-	h	-39.1	3.2	16.3	176.2	623	221	-	-
	6	-	-	-	m	-39.7	3.4	12.4	175.9	598	163	-	-
	7	-	-	-	m	-39.1	3.4	9.3	174.9	611	131	-	-
	8	-	-	-	l	-38.3	3.1	6.9	174.2	684	122	-	-
33	1	0.32.00	N-L θ	R	m	-22.5	6.0	28.3	157.5	364	212	1, 2, 3, 6 belong to the	22-24
	2	-	-	-	m	-23.5	6.4	25.2	157.8	350	179	same ray	-
	3	-	-	-	l	-24.6	6.6	22.3	158.7	346	154	-	-
	4	-	-	PS	h	-23.7	5.8	14.0	157.1	418	119	-	-
	5	-	-	-	l	-24.5	5.8	12.2	157.7	418	105	-	-
	6	-	-	R	h	-	-	32.0	157.2	338	227	-	-
34	1	0.32.47	N-L θ	R	h	-25.4	5.95	25.5	160.1	369	192	1-2 belong to the same ray	22-24
	2	-	-	-	l'	-26.3	6.25	20.7	160.2	364	150	-	-
	3	-	-	PS	m	-22.4	5.75	12.1	156.7	429	108	-	-
	4	-	-	-	l	-27.1	6.0	12.7	160.4	395	102	-	-
	5	-	-	-	l	-27.9	5.05	12.0	161.5	418	103	-	-
37	1	0.36.24	N-L θ	R	h'	1.6	5.1	25.3	131.1	472	249	1-3 the same ray	22-23
	2	-	-	-	m	1.2	5.1	22.3	131.7	486	225	-	-
	3	-	-	-	l	0.5	5.1	19.4	132.7	498	200	-	-
	4	-	-	RB	m	-1.1	4.9	9.7	134.8	548	119	-	-
	5	-	-	-	l'	-1.4	4.9	8.4	135.2	551	107	-	-
	6	-	-	-	l'	-5.3	5.0	8.8	139.0	537	107	-	-
	7	-	-	-	l	-	-	-	-	98	-	-	-
38	1	0.38.57	N-L θ	R	h	2.0	5.25	25.4	131.1	455	240	1-3 on the same ray	22-23

Table 2 (continued).

No	Pt	MET	St	F	S	ϵ_2	p	h	a	D	H	Remarks	0
39	2	0.38.57	N-Lo	R	m	0.9	4.95	19.3	132.4	512	206		22-23
	3	-	-	-	l	0.4	4.9	15.1	133.2	532	170		-
	4	-	-	RB	h	-4.6	5.45	10.1	138.0	492	108		-
	5	-	-	-	l	-4.7	5.35	7.9	138.2	505	91		-
	1	0.39.34	N-Lo	R	h	4.7	5.0	24.7	128.0	483	249		-
40	2	-	-	-	m	4.1	5.05	21.3	128.9	493	217		-
	3	-	-	-	l	3.3	5.15	17.1	129.9	500	178		-
	1	0.40.24	N-Lo	DS	h	-4.6	5.2	11.2	138.0	513	124		-
	2	-	-	-	l'	-4.7	5.2	9.8	138.2	516	111		-
43	3	-	-	-	h'	-6.0	5.1	10.0	139.5	524	115		-
	4	-	-	-	l	-6.0	5.05	8.9	139.6	534	97		-
	1	0.56.17	N-Lo	RA	l'	-11.6	7.2	14.1	143.1	362	102		23-24
	2	-	-	-	l'	-15.1	7.4	14.7	146.5	346	101		-
44	3	-	-	-	l'	-24.7	6.9	15.5	157.3	347	107		-
	4	-	N	-	l			13.1	143.0		95	Near point 1	-
	1	0.57.03	N-Lo	RA	l	17.8	5.9	8.6	115.0	438	81		23-24
	2	-	-	-	l	12.9	5.75	9.8	120.0	457	96		-
	3	-	-	-	l	3.9	6.85	11.6	128.0	390	93		-
	4	-	N	-	l			12.7	134.0	368		4-8 with supposed H equal to 95 km	23-25
	5	-	-	-	l			13.9	140.0	340			-
	6	-	-	-	l			12.0	116.0	386			-
	7	-	-	-	l			13.5	122.0	350			-
45	8	-	-	-	l			14.9	128.0	321			-
	1	-	-	-	l			8.6	115.0	473		H supposed = 90 km	22-24
	2	-	-	-	l			9.8	120.0	429		-	-
	3	-	-	-	l			11.6	128.0	376		-	-
	4	-	-	-	l			12.7	134.0	348		-	-
	1	-	-	-	l			8.6	115.0	555		H supposed = 110 km	-
	2	-	-	-	l			9.8	120.0	508		-	-
	3	-	-	-	l			11.6	128.0	443		-	-
	4	-	-	-	l			12.7	134.0	418		-	-
	1	0.58.12	N-Lo	RA	h	-34.5	6.7	16.1	168.1	323	103	One short ray of the arc	23-24
	2	-	-	-	m	-34.7	6.75	14.7	168.0	323	93		-
	3	-	-	-	l	-34.4	6.75	13.9	167.5	326	89		-
47	4	-	N	-	l			15.1	152.0	302		H supposed = 90 km	23-24
	5	-	-	-	l			14.9	158.0	307		-	-
	6	-	-	-	l			14.5	164.0	313		-	-
	7	-	-	-	l			13.2	176.0	340		-	-
	8	-	-	-	l			11.8	-176.0	373		-	-
	4	-	-	-	l			15.1	152.0	363		H supposed = 110 km	-
	5	-	-	-	l			14.9	158.0	367		-	-
	6	-	-	-	l			14.5	164.0	374		-	-
	7	-	-	-	l			13.2	176.0	406		-	-
	8	-	-	-	l			11.8	-176.0	445		-	-
	1	1.00.54	N	RA	l			14.3	176.0	316		H supposed = 90 km	23-25
	2	-	-	-	l			13.0	-178.0	342		-	-
49	3	-	-	-	l			12.0	-172.0	366		-	-
	4	-	-	-	l			10.3	-166.0	414		-	-
	5	-	-	-	l			8.4	-161.3	478		-	-
	1	-	-	-	l			14.3	176.0	378		H supposed = 110 km	-
	2	-	-	-	l			13.0	-178.0	410		-	-
	3	-	-	-	l			12.0	-172.0	438		-	-
	4	-	-	-	l			10.3	-166.0	492		-	-
	5	-	-	-	l			8.4	-161.0	564		-	-
	1	1.03.46	N-Lo	R	h	-42.7	3.5	22.1	-178.7	520	240	1-2 on the same ray	22-24

Table 2 (continued).

No	Pt	MET	St	F	S	ϵ_2	p	h	a	D	H	Remarks	θ
50	2	1.03.46	N-Lo	R	l	-44.7	3.5	14.5	-178.5	531	163		22-24
	3	-	-	-	h	-56.3	3.2	11.5	-166.7	462	113	3-4 on another	-
	4	-	-	-	l	-56.7	3.2	9.2	-166.9	464	93		-
	5	-	N	RA	l			15.1	174	302		H supposed = 90 km	23-25
	6	-	-	-	l			13.7	-176	327		-	-
	7	-	-	-	l			12.7	-168	350		-	-
	8	-	-	-	l			10.3	-162	414		-	-
	9	-	-	-	l			8.3	-159	482		-	-
	5	-	-	-	l			15.1	174	363		H supposed = 110 km	-
	6	-	-	-	l			13.7	-176	392		-	-
	7	-	-	-	l			12.7	-168	419		-	-
	8	-	-	-	l			10.3	-162	492		-	-
	9	-	-	-	l			8.3	-159	569		-	-
	1	1.04.42	N-Lo	R	h	-45.9	3.35	14.1	-177.0	546	164	1-2 on the same ray	22-23
	2	-	-	-	l	-47.5	3.55	8.4	-176.7	514	97		-
3	-	-	-	RB	-44.2	3.5	7.1	179.8	555	95		-	
5	-	-	-	l	-38.0	4.35	8.2	172.9	490	90		-	
6	-	-	-	l	-36.8	4.2	7.8	171.8	518	92		-	
7	-	N	-	l			15.2	164.0	299		H supposed = 90 km	23-25	
8	-	-	-	l			14.5	170.0	313		-	-	
9	-	-	-	l			14.0	178.0	322		-	-	
10	-	-	-	l			12.6	-170.0	352		-	-	
11	-	-	-	l			10.8	-164.0	400		-	-	
7	-	-	-	l			15.2	164	358		H supposed = 110 km	-	
8	-	-	-	l			14.5	170	374		-	-	
9	-	-	-	l			14.0	178	384		-	-	
10	-	-	-	l			12.6	-170	420		-	-	
11	-	-	-	l			10.8	-164	476		-	-	
51	1	1.06.34	N	HA	l			9.1	116.0	453		H supposed = 90 km	23-25
	2	-	-	-	l			11.6	122.0	377		-	-
	3	-	-	-	l			13.6	128.0	330		-	-
	4	-	-	-	l			15.3	134.0	298		-	-
	5	-	-	-	l			16.5	140.0	278		-	-
	1	-	-	-	l			9.1	116.0	535		H supposed = 110 km	-
	2	-	-	-	l			11.6	122.0	450		-	-
	3	-	-	-	l			13.6	128.0	393		-	-
	4	-	-	-	l			15.3	134.0	357		-	-
	5	-	-	-	l			16.5	140.0	334		-	-
	1	1.07.55	N	HA	l			17.3	144.0	266		H supposed = 90 km	23-25
2	-	-	-	l			17.7	150.0	260		-	-	
3	-	-	-	l			17.8	156.0	258		-	-	
4	-	-	-	l			17.4	162.0	264		-	-	
5	-	-	-	l			16.7	168.0	275		-	-	
1	-	-	-	l			17.3	144.0	320		H supposed = 110 km	-	
2	-	-	-	l			17.7	150.0	313		-	-	
3	-	-	-	l			17.8	156.0	311		-	-	
4	-	-	-	l			17.4	162.0	318		-	-	
5	-	-	-	l			16.7	168.0	331		-	-	
53	3	1.08.43	N	HA	l			17.2	140.0	267		H supposed = 90 km	23-25
	4	-	-	-	l			18.4	152.0	251		3, 4, 5, 6 upper.	-
	5	-	-	-	l			18.3	164.0	252		7, 8, 9 lower arc	-
	6	-	-	-	l			17.1	174.0	269		-	-
	7	-	-	-	l			12.7	148.0	374		-	22-24
	8	-	-	-	l			12.9	158.0	368		-	-
9	-	-	-	l			12.7	168.0	374		-	-	

Table 2 (continued).

No	Pt	MET	St	F	S	ϵ_2	p	h	a	D	H	Remarks	θ
54	1	1.09.47	N	HA	l			11.4	118.0	383		H supposed = 90 km	23-25
	2	-	-	-	l			13.4	124.0	333		Upper arc -	-
	3	-	-	-	l			15.4	130.0	296		-	-
	4	-	-	-	l			17.9	138.0	257		-	-
	1	-	-	-	l			11.4	118.0	456		H supposed = 110 km	-
	2	-	-	-	l			13.4	124.0	398		-	-
	3	-	-	-	l			15.4	130.0	353		-	-
	4	-	-	-	l			17.9	138.0	310		-	-
55	1	1.14.43	N-Lo	RB	l	8.8	6.9	12.2	122.5	383	95		23-24
	2	-	-	-	l	8.2	7.0	11.7	123.1	379	90		-
	3	-	-	-	l	11.6	6.0	11.5	120.5	437	105		-
	4	-	-	-	l	12.8	5.2	10.1	120.3	503	111		-
59	1	1.20.35	N-Lo	RB	m	-17.8	5.6	11.0	150.9	456	106		22-23
	2	-	-	-	l	-16.6	5.1	7.9	150.0	509	92		-
60	1	1.23.11	N-Lo	RB	l	-22.8	5.7	11.2	156.1	434	101		22-24
	2	-	-	-	l	-23.1	5.95	12.3	156.3	413	104		-
	3	-	-	-	l	-24.2	6.3	13.0	157.1	385	101		-
	4	-	-	-	l	-27.1	6.7	13.7	159.9	353	97		-
	5	-	N	-	l			10.6		445		H supposed = 100 km	
	6	-	-	-	l			10.2		458		-	
	7	-	-	-	l			10.6		445		-	
	8	-	-	-	l			10.9		437		-	
	9	-	-	-	l			13.9		358		-	
	10	-	-	-	l			13.5		367		-	
61	1	1.35.38	N	HA	l			9.9	166.0	427		H supposed = 90 km	22-24
	3	-	-	-	l			9.8	176.0	428		-	-
	4	-	-	-	l			9.1	-174.0	453		-	-
	5	-	-	-	l			7.5	-164.0	515		-	-
	7	-	-	-	l			5.1	-154.0	638		-	-
	1	-	-	-	l			9.9	166.0	506		H supposed = 110 km	-
	3	-	-	-	l			9.8	176.0	508		-	-
	4	-	-	-	l			9.1	-174.0	535		-	-
	5	-	-	-	l			7.5	-164.0	605		-	-
	7	-	-	-	l			5.1	-154.0	727		-	-
62	1	1.36.29	N	HA	l			6.8	126.0	549		H supposed = 90 km	21-23
	3	-	-	-	l			8.5	140.0	474		1, 3, 4, 6 upper.	-
	4	-	-	-	l			9.3	150.0	446		7, 9, 11, 12 lower arc	-
	6	-	-	-	l			9.7	162.0	432		-	-
	7	-	-	-	l			8.8	124.0	463		-	22-24
	9	-	-	-	l			11.1	138.0	390		-	-
	10	-	-	-	l			11.9	148.0	368		-	-
	12	-	-	-	l			12.6	162.0	352		-	-
	1	-	-	-	l			6.8	126.0	642		H supposed = 110 km	21-23
	3	-	-	-	l			8.5	140.0	560		-	-
	4	-	-	-	l			9.3	150.0	527		-	-
	6	-	-	-	l			9.7	162.0	513		-	-
7	-	-	-	l			8.8	124.0	548		-	22-24	
9	-	-	-	l			11.1	138.0	464		-	-	
10	-	-	-	l			11.9	148.0	440		-	-	
12	-	-	-	l			12.6	162.0	420		-	-	
63	1	1.39.07	N	HA	l			6.8	124.0	549		H supposed = 90 km	21-23
	2	-	-	-	l			8.1	130.0	490		1, 2, 3, 4 lower arc	-
	3	-	-	-	l			9.0	136.0	456		5, 6 upper arc	-
	4	-	-	-	l			10.1	144.0	519		-	-
	5	-	-	-	l			13.0	128.0	342		-	23-25

Table 2 (continued).

No	Pt	MET	St	F	S	ϵ_2	p	h	a	D	H	Remarks	θ	
64	6	1.39.07	N	HA	l			14.1	134.0	320			23-25	
	1	-	-	-	l			6.8	124.0	642		H supposed = 110 km	21-23	
	2	-	-	-	l			8.1	130.0	577		-	-	
	3	-	-	-	l			9.0	136.0	538		-	-	
	4	-	-	-	l			10.1	144.0	498		-	-	
	5	-	-	-	l			13.0	128.0	410		-	23-25	
	6	-	-	-	l			14.1	134.0	383		-	-	
	3	1.39.45	N	HA	l			9.8	156.0	429			H supposed = 90 km	22-24
	4	-	-	-	l			10.7	166.0	402			-	-
	5	-	-	-	l			10.9	174.0	396			-	-
	6	-	-	-	l			10.9	178.0	396			-	-
	65	3	-	-	-	l			9.8	156.0	508		H supposed = 110 km	-
4		-	-	-	l			10.7	166.0	478		-	-	
5		-	-	-	l			10.9	174.0	472		-	-	
6		-	-	-	l			10.9	178.0	472		-	-	
1		1.40.24	N	HA	l			10.6	176.0	408			H supposed = 90 km	22-24
2		-	-	-	l			9.7	-176.0	432			-	-
3		-	-	-	l			8.4	-168.0	478			-	-
4		-	-	-	l			7.1	-162.0	535			-	-
5		-	-	-	l			5.7	-156.0	606			-	-
1		-	-	-	l			10.6	176.0	483			H supposed = 110 km	-
2		-	-	-	l			9.7	-176.0	513			-	-
69		3	-	-	-	l			8.4	-168.0	564		-	-
	4	-	-	-	l			7.1	-162.0	623		-	-	
	5	-	-	-	l			5.7	-156.0	700		-	-	
	1	1.46.06	N-Lø	PS	h	- 2.8	12.8	30.8	127.6	185	114		25-26	
	2	-	-	-	m	- 3.3	13.2	28.8	127.8	182	104		-	
	3	-	-	-	l	- 4.0	13.5	26.8	128.4	181	96		-	
	4	-	N	HA	l			7.3	131.0	525			H supposed = 90 km	22-24
	2	-	-	-	l			9.4	142.0	444			-	-
	5	-	-	-	l			11.3	156.0	385			-	-
	4	-	-	-	l			7.3	131.0	616			H supposed = 110 km	21-23
	2	-	-	-	l			9.4	142.0	523			-	-
	72	5	-	-	-	l			11.3	156.0	460		-	-
1		1.49.56	N	HA	l			5.3	122.0	626			H supposed = 90 km	21-23
2		-	-	-	l			6.9	126.0	543			-	-
3		-	-	-	l			7.9	132.0	498			-	-
4		-	-	-	l			8.9	140.0	460			-	-
5		-	-	-	l			9.8	150.0	429			-	-
1		-	-	-	l			5.3	122.0	726			H supposed = 110 km	-
2		-	-	-	l			6.9	126.0	634			-	-
3		-	-	-	l			7.9	132.0	585			-	-
4		-	-	-	l			8.9	140.0	543			-	-
75		5	-	-	-	l			9.8	150.0	508		-	-
		1	1.54.49	N	HA	l			9.6	152.0	436			H supposed = 90 km	22-24
	2	-	-	-	l			9.6	159.0	436			-	-
	3	-	-	-	l			9.6	166.0	436			-	-
	4	-	-	-	l			9.6	173.0	436			-	-
	5	-	-	-	l			9.3	180.0	446			-	-
	1	-	-	-	l			9.6	152.0	515			H supposed = 110 km	-
	2	-	-	-	l			9.6	159.0	515			-	-
	3	-	-	-	l			9.6	166.0	515			-	-
	4	-	-	-	l			9.6	173.0	515			-	-
	76	5	-	-	-	l			9.3	180.0	527		-	-
		1	2.05.59	N	HA	l			9.4	138.0	442			H supposed = 90 km	22-24

Table 2 (continued).

No	Pt	MET	St	F	S	ϵ_2	p	h	a	D	H	Remarks	θ	
77	2	2.05.59	N	HA	l			10.4	142.0	411		H supposed = 90 km	22-24	
	3	-	-	-	l			11.5	148.0	379		-	-	
	1	-	-	-	l			9.4	138.0	523		H supposed = 110 km	-	
	2	-	-	-	l			10.4	142.0	489		-	-	
	3	-	-	-	l			11.5	148.0	452		-	-	
	1	2.06.50	N	HA	l			11.4	154.0	383		H supposed = 90 km	22-24	
	2	-	-	-	l			11.5	161.0	379		-	-	
	3	-	-	-	l			11.2	168.0	387		-	-	
	4	-	-	-	l			11.0	175.0	393		-	-	
	5	-	-	-	l			10.5	-178.0	408		-	-	
78	1	-	-	-	l			11.4	154.0	456		H supposed = 110 km	-	
	2	-	-	-	l			11.5	161.0	452		-	-	
	3	-	-	-	l			11.2	168.0	462		-	-	
	4	-	-	-	l			11.0	175.0	468		-	-	
	5	-	-	-	l			10.5	-178.0	485		-	-	
	1	2.07.37	N	HA	l			7.8	-164.0	502		H supposed = 90 km	22-24	
	2	-	-	-	l			6.0	-158.0	588		-	-	
	3	-	-	-	l			4.5	-154.0	677		-	-	
	1	-	-	-	l			7.8	-164.0	589		H supposed = 110 km	-	
	2	-	-	-	l			6.0	-158.0	683		-	-	
79	3	-	-	-	l			4.5	-154.0	780		-	-	
	2	2.12.47	N	HA	l			9.6	-176.0	436		H supposed = 90 km	22-24	
	3	-	-	-	l			8.7	-168.0	467		2, 3, 4, 5 upper arc	-	
	4	-	-	-	l			7.7	-162.0	507		-	-	
	5	-	-	-	l			6.8	-158.0	549		-	-	
	6	-	-	-	l			8.5	-176.0	474		6, 7, 8, 9 lower arc	-	
	7	-	-	-	l			7.3	-170.0	525		-	-	
	8	-	-	-	l			6.0	-164.6	588		-	-	
	9	-	-	-	l			4.5	-160.0	677		-	-	
	2	-	-	-	l			9.6	-176.0	515		H supposed = 110 km	22-24	
80	3	-	-	-	l			8.7	-168.0	542		-	-	
	4	-	-	-	l			7.7	-162.0	595		-	-	
	5	-	-	-	l			6.8	-158.0	642		-	-	
	6	-	-	-	l			8.5	-176.0	560		-	-	
	7	-	-	-	l			7.3	-170.0	616		-	-	
	8	-	-	-	l			6.0	-164.6	683		-	-	
	9	-	-	-	l			4.5	-160.0	780		-	-	
	1	2.13.33	N	HA	l			11.0	152.0	393		H supposed = 90 km	22-24	
	2	-	-	-	l			11.4	159.0	383		-	-	
	3	-	-	-	l			11.1	166.0	390		-	-	
81	4	-	-	-	l			10.7	173.0	402		-	-	
	5	-	-	-	l			10.0	180.0	423		-	-	
	1	-	-	-	l			11.0	152.0	468		H supposed = 110 km	-	
	2	-	-	-	l			11.4	159.0	456		-	-	
	3	-	-	-	l			11.1	166.0	464		-	-	
	4	-	-	-	l			10.7	173.0	478		-	-	
	5	-	-	-	l			10.0	180.0	502		-	-	
	2	2.14.28	N-Lø	HA	l		- 9.1	6.0	9.4	142.0	444	90	Very disfavoured direction of parallax	22-23
	82	1	2.20.52	N-Lø	RB	l	- 7.2	5.05	6.9	140.9	534	88		22-23
		2	-	-	-	m	- 7.0	5.15	7.4	140.7	522	90		-
3		-	-	-	h	- 7.5	5.35	8.3	140.9	502	94		-	
83	1	2.21.41	N	HA	l			9.8	-178.0	429		H supposed = 90 km	22-24	
	2	-	-	-	l			8.9	-170.0	460		-	-	
	3	-	-	-	l			7.8	-162.0	502		-	-	
	4	-	-	-	l			6.8	-156.0	549		-	-	

Table 2 (continued).

No	Pt	MET	St	F	S	ϵ_2	p	h	a	D	H	Remarks	θ
85	1	2.21.41	N	HA	l			9.8	-178.0	508		H supposed = 110 km	22-24
	2	-	-	-	l			8.9	-170.0	543		-	-
	3	-	-	-	l			7.8	-162.0	489		-	-
	4	-	-	-	l			6.8	-156.0	642		-	-
	1	2.24.15	N-L ϕ	RB	m	-11.8	4.6	7.9	146.0	575	107		21-23
	2	-	-	-	l	-11.8	4.65	6.9	145.9	576	97		-
	3	-	-	-	m	-14.9	5.05	8.8	148.8	516	102		-
	4	-	-	-	l	-15.0	5.1	7.8	148.7	512	92		-
	5	-	-	DS	h	-6.9	9.35	19.7	136.5	274	106		24-25
	6	-	-	-	l	-7.1	9.5	17.6	136.4	273	93		-
	7	-	-	HA	l	-17.3	5.3	9.2	151.1	476	96		21-23
	8	-	-	-	l	-22.0	5.2	10.1	156.1	479	105		-
9	-	-	N	-				11.5	164.0	419		Height supposed equal to	-
10	-	-	-	-	l			6.0	144.0	634		100 km	-
11	-	-	-	-	l			6.5	140.0	608		-	-
12	-	-	-	-	l			6.9	135.0	588		-	-
86	1	2.26.40	N-L ϕ	HB	m	-25.4	4.9	9.5	159.5	497	104	Along a fold in the band	22-23
2	-	-	-	-	m	-26.1	4.6	8.1	160.3	528	98	-	-
87	1	2.27.54	N-L ϕ	RB	m	-32.0	4.3	8.3	166.7	533	102	The same	22-24
2	-	-	-	-	m	-31.6	4.9	9.3	165.7	469	95	No. 2 the best one	-
3	-	-	-	HA	l	-36.6	5.4	10.2	166.2	420	91	-	-
4	-	-	N	-	l			10.7	169.6	423		Height supposed equal to	-
5	-	-	-	-	l			11.0	174.0	414		100 km	-
6	-	-	-	-	l			11.1	-178.0	411		-	-
7	-	-	-	-	l			10.9	-172.0	417		-	-
8	-	-	-	-	l			7.8	166.0	527		-	-
9	-	-	-	-	l			7.0	160.0	561		-	21-22
88	1	2.29.12	N-L ϕ	DS	h	4.6	10.7	25.7	121.6	230	116		24-26
2	-	-	-	-	m	4.0	10.8	23.5	122.5	233	106		-
3	-	-	-	-	l	3.3	10.8	21.6	123.4	236	99		-
89	1	2.30.18	N-L ϕ	DS	h	1.0	11.5	27.7	124.7	211	116		24-26
2	-	-	-	-	m	0.7	11.4	25.7	125.2	218	109		-
3	-	-	-	-	l	0.0	11.4	23.8	126.3	221	102		-
4	-	-	-	-	h	-2.1	9.2	21.9	131.0	275	118		-
5	-	-	-	-	l'	-2.7	9.3	19.4	131.6	277	105		-
90	1	2.31.15	N-L ϕ	HA	l	-44.4	3.7	7.7	179.7	525	94		22-23
2	-	-	-	-	l	-45.1	3.8	8.5	-179.6	500	96		-
3	-	-	N	-	l			9.7	-177.3	454		Height supposed equal to	22-24
4	-	-	-	-	l			10.3	-172.6	436		95 km	-
5	-	-	-	-	l			10.1	-166.0	441		-	-
6	-	-	-	-	l			9.8	-162.0	451		-	-
7	-	-	-	-	l			7.1	178.0	559		-	-
8	-	-	-	-	l			6.0	172.0	612		-	21-22
91	1	2.35.17	N-L ϕ	DS	h	-56.7	5.1	24.3	-161.8	267	128	Diffuse DS over arc	24-26
2	-	-	-	-	m	-58.3	4.9	22.3	-161.2	270	118		-
3	-	-	-	-	m	-59.4	4.7	19.7	-161.3	278	107		-
4	-	-	-	-	l	-59.0	4.5	17.3	-162.8	299	101		-
5	-	-	-	-	m	-43.6	6.5	20.7	179.2	284	115		-
6	-	-	-	-	m	-44.6	5.9	18.9	-179.8	311	115		-
7	-	-	-	-	l	-44.5	5.6	17.5	-179.9	331	114		-
92	1	2.36.20	N-L ϕ	DS	h'	-51.0	6.2	21.6	-172.0	262	111	The same	24-25
2	-	-	-	-	m	-51.2	6.2	19.7	-172.7	266	102		-
3	-	-	-	-	l	-51.5	5.9	17.8	-172.7	275	95		-
93	1	2.48.03	N-L ϕ	RA	h	-7.9	4.3	7.5	142.3	622	114		21-22
2	-	-	-	-	l	-7.9	4.3	5.1	142.4	623	88		-

Table 2 (continued).

No	Pt	MET	St	F	S	ϵ_2	p	h	a	D	H	Remarks	θ	
95	3	2.48.03	N-L \emptyset	PS	h	-14.1	8.6	19.2	144.9	291	110		24-25	
	4	-	-	-	l	-14.7	8.5	15.6	144.5	301	92		-	
	1	3.01.25	N-L \emptyset	PS	h	-17.5	6.9	14.4	149.3	366	105		23-24	
	2	-	-	-	l	-17.8	6.8	11.7	149.5	375	90		-	
	3	-	-	-	h	-18.7	6.4	13.2	150.9	394	106		-	
	4	-	-	-	m	-19.0	6.5	11.6	151.1	390	93		-	
	5	-	-	-	l'	-19.6	6.7	10.2	151.5	380	80		-	
	6	-	-	-	h	-21.5	6.7	13.1	153.6	370	98		-	
	7	-	-	-	l	-22.0	6.8	12.2	154.0	363	89		-	
	8	-	-	-	h	-31.3	6.3	13.3	164.6	361	97		-	
	9	-	-	-	l	-31.3	6.4	10.7	164.3	360	79		-	
96	10	-	-	-	h	-32.1	6.3	13.4	165.5	357	96		-	
	11	-	-	-	l	-32.3	6.1	10.7	165.6	374	82		-	
	1	3.20.37	N-L \emptyset	PS	h	19.8	6.4	13.4	111.3	391	107		24-26	
	2	-	-	-	l	19.6	6.4	10.9	111.7	296	89		-	
	3	-	-	-	h	10.7	7.6	15.9	119.5	341	103		-	
	4	-	-	-	l	10.7	7.5	12.4	119.8	339	84		-	
	5	-	-	-	h	2.6	13.1	28.1	120.9	185	103		-	
	6	-	-	-	m	2.2	12.6	25.3	122.6	198	97		-	
	7	-	-	-	l	2.0	12.3	22.5	123.2	207	89		-	
	103	1	3.46.07	N-L \emptyset	DS	h	-33.3	6.2	14.7	166.8	357	105		24-25
	2	-	-	-	l	-33.6	6.3	12.1	166.7	354	86		-	
3	-	-	-	h	-37.1	5.1	11.7	171.6	418	101		-		
4	-	-	-	l	-37.3	5.1	10.3	171.5	420	91		-		
104	1	3.46.13	N-L \emptyset	DS	h	-63.9	4.2	21.4	-153.3	265	111		25-26	
2	-	-	-	m	-65.2	4.0	18.9	-153.6	270	100		-		
3	-	-	-	l	-66.3	3.9	16.3	-154.0	271	86		-		
105	1	3.49.00	N-L \emptyset	R	h	-56.3	2.0	23.5	-159.3	668	344	Sunlit rays	21-23	
2	-	-	-	m	-58.9	2.0	16.5	-160.3	661	239		-		
3	-	-	-	l	-60.4	1.8	9.1	-161.3	732	164		-		
4	-	-	-	h'	-55.3	2.0	17.7	-164.0	719	283		-		
5	-	-	-	m	-56.2	1.9	14.5	-164.3	754	250		-		
6	-	-	-	l	-57.3	2.0	9.8	-164.6	718	169		-		
7	-	-	DS	h	-63.1	4.2	18.4	-156.9	279	100		25-26		
8	-	-	-	l'	-63.8	4.0	16.2	-157.2	290	92		-		
9	-	-	-	m	-49.2	4.0	9.7	-175.1	440	91		23-24		
107	1	-	N-Li	R	m	-73.0	5.7	12.5	-161.3	723	209	Sunlit rays	22-23	
	2	-	-	-	m	-70.3	6.6	18.0	-160.7	695	275		-	
	3	-	-	-	h'	-67.1	7.7	23.7	-160.1	655	338		-	
	1	3.52.49	N-L \emptyset	DS	h	-22.7	12.0	29.7	151.0	183	108		25-26	
	2	-	-	-	m	-23.3	12.0	26.7	151.3	188	98		-	
	3	-	-	-	l	-24.4	12.1	22.9	152.1	191	85		-	
	4	-	-	-	h	-31.9	12.6	34.7	162.1	153	109		-	
	5	-	-	-	m	-32.8	12.4	31.1	162.5	159	99		-	
	6	-	-	-	l	-33.5	12.2	28.7	162.8	165	93		-	
	108	1	3.54.05	N-L \emptyset	DS	h	-33.7	11.5	31.9	164.8	168	108		25-26
	2	-	-	-	m	-34.3	11.4	29.7	164.8	172	102		-	
3	-	-	-	l	-35.1	11.6	26.8	165.1	173	91		-		
4	-	-	R	h	-30.6	3.5	22.1	168.2	604	287	Very feeble, sunlit	21-22		
5	-	-	-	m	-31.7	3.4	17.1	168.6	639	237		-		
6	-	-	-	l'	-32.6	3.3	12.9	168.9	669	194		-		
7	-	-	-	l	-32.5	3.3	12.3	168.7	672	187		-		
110	1	4.00.02	N-L \emptyset	RB	h	6.1	4.5	8.8	128.0	594	122	1, 2 along the right border, not sunlit, 3-9 along the lower border with H	23-24	
2	-	-	-	l	6.2	4.5	7.2	128.0	598	105		-		
3	-	-	N	-	l			6.6	112.0	626		22-24		

Table 2 (continued).

No	Pt	MET	St	F	S	ϵ_2	p	h	a	D	H	Remarks	θ
111	4	4.00.02	N	RB	l			7.0	118.0	606		supposed equal to 105 km	22-24
	5	-	-	-	l			7.2	122.0	597			-
	6	-	-	-	l			7.2	126.0	597			-
	7	-	-	-	l			6.7	127.3	621			21-22
	8	-	-	-	l			6.0	124.7	658		-	
	9	-	-	-	l			5.2	121.4	701		-	
	1	4.00.27	N-L σ	RB	h	2.1	4.9	15.2	131.3	530	171	1, 2 along the right edge.	23-24
	2	-	-	-	m	1.5	4.85	11.3	132.1	549	136	Not sunlit	-
	3	-	-	-	l'	1.0	4.85	7.6	132.7	558	100	-	-
	4	-	-	-	l	1.4	4.85	7.0	132.4	559	95	-	-
	5	-	N	-	l			7.5	117.1	540		5-11 along the lower border	22-24
6	-	-	-	l			8.0	122.0	516		-	-	
7	-	-	-	l			8.0	126.0	516		H supposed = 95 km	-	
8	-	-	-	l			7.9	131.5	521		-	-	
9	-	-	-	l			7.1	131.8	560		-	-	
10	-	-	-	l			6.7	128.0	579		-	-	
11	-	-	-	l			6.4	124.8	591		-	-	
112	1	4.01.20	N-L σ	RB	h	-12.3	4.8	9.4	146.4	546	115	1,2 belong to the main RB	22-24
	2	-	-	-	l'	-12.0	4.6	8.3	146.1	574	111	-	-
	3	-	-	-	h	3.5	7.5	15.0	127.4	340	101	3,4 belong to another	25-26
	4	-	-	-	l	3.5	7.5	12.5	127.5	344	86	short one over the main RB	-
	5	-	N	-	l			8.8	124.8	508		5-12 along the lower border of the main RB	22-24
	6	-	-	-	l			8.7	132.0	512		-	-
	7	-	-	-	l			8.6	138.0	515		Along the lower border of	-
	8	-	-	-	l			8.2	144.6	532		the main RB, with H =	-
	9	-	-	-	l			7.9	145.0	544		100 km	21-22
	10	-	-	-	l			7.6	142.0	558		The vertical thickness of	-
	11	-	-	-	l			7.0	136.0	584		the most luminous part	-
	12	-	-	-	l			6.5	131.1	609		only 9 km	-
113	1	4.01.53	N	RB	l			7.2	112.0	575		For all points is H taken	22-24
	2	-	-	-	l			7.9	118.0	544		equal to 100 km	-
	3	-	-	-	l			8.6	126.0	515		-	-
	4	-	-	-	l			8.8	132.0	508		-	-
	5	-	-	-	l			8.5	138.0	520		-	-
	6	-	-	-	l			6.6	138.0	603		-	21-22
	7	-	-	-	l			6.0	134.0	633		-	-
	8	-	-	-	l			6.5	130.0	609		-	-
	9	-	-	-	?			8.5	140.0	520		-	22-23
	10	-	-	-	?			8.1	144.0	535		-	-
	11	-	-	-	l			7.0	140.0	584		-	21-22
	12	-	-	-	l			7.4	144.0	567		-	-
114	1	4.02.23	N	RB	l			7.7	116.0	546		For all points is H supposed = 98 km	22-24
	2	-	-	-	l			8.3	124.0	520		-	-
	3	-	-	-	l			8.5	132.0	512		-	-
	4	-	-	-	l			8.1	138.0	528		-	-
	5	-	-	-	l			6.7	142.0	591		-	21-22
	6	-	-	-	l			7.9	146.0	535		-	-
115	1	4.03.34	N	RB	l			8.2	114.0	524		Same supposition H = 98 km	22-24
	2	-	-	-	l			8.4	120.0	516		-	-
	3	-	-	-	l			8.7	126.0	505		-	-
	4	-	-	-	l			9.0	132.0	493		-	-
	5	-	-	-	l			8.0	135.3	530		-	-
	6	-	-	-	l			7.2	132.0	568		-	-

Table 2 (continued).

No	Pt	MET	St	F	S	ϵ_2	p	h	a	D	H	Remarks	θ
116	7	4.03.34	N	RB	l			7.7	138.0	546		H = 98 km	21-22
	8	-	-	-	l			7.7	144.0	546		-	-
	9	-	-	-	l			7.7	148.0	546		-	-
	1	-	-	-	l			4.3	100.0	708		H supposed = 95 km	22-24
	2	-	-	-	l			5.9	106.0	617		-	-
	3	-	-	-	l			7.3	112.0	550		-	-
117	4	-	-	-	l			8.2	118.0	509		-	-
	5	-	-	-	l			8.6	122.0	495		-	-
	1	4.04.48	N-Lø	RB	m	15.2	5.65	10.0	117.9	459	98		24-26
	2	-	-	-	h'	11.2	5.8	11.3	121.5	453	107	Short ray in RB	-
	3	-	-	-	l'	11.1	5.75	10.4	121.7	458	101	Same as no 2	-
	4	-	-	-	l'	6.5	5.8	10.2	126.2	460	100	Short ray in RB	-
	5	-	-	-	h	3.0	5.6	11.5	129.9	476	116	Another ray in RB	-
	6	-	-	-	l	2.7	5.6	9.8	130.1	480	102	The same as no 5	-
	7	-	-	-	h	- 1.3	6.2	11.7	133.8	432	105	Another short ray in RB	-
	8	-	-	-	l	- 1.7	6.25	9.9	134.1	431	91	The same as no 7	-
	a	4.04.48	N	RB	l			9.0	116.0	480		H supposed = 95 km	22-24
	b	-	-	-	l			10.0	121.6	446		-	-
	c	-	-	-	l			9.9	126.2	449		-	-
	d	-	-	-	l			9.7	130.0	455		-	-
118	e	-	-	-	l			9.8	134.0	450		-	-
	f	-	-	-	l			9.8	140.0	450		-	-
	g	-	-	-	l			9.5	146.0	460		-	-
	h	-	-	-	l			7.1	134.0	556		-	-
	i	-	-	-	l			7.4	142.0	543		-	-
	j	-	-	-	l			7.9	150.0	520		-	-
	1	4.05.09	N-Lø	RB	l	- 2.6	4.75	6.6	136.6	570	93		23-24
	2	-	-	-	l	- 2.2	4.65	6.7	136.2	582	96		-
	3	-	-	-	l	- 0.6	4.65	6.7	134.6	583	96		-
	4	-	N	-	l			6.7	138.0	578		H supposed = 95 km	21-23
	5	-	-	-	l			7.1	142.0	559		-	-
	6	-	-	-	l			7.6	145.0	534		-	-
	7	-	-	-	l			7.9	148.0	521		-	-
	8	-	-	-	l			9.1	116.0	475		-	23-24
9	-	-	-	l			9.7	122.0	455		-	-	
10	-	-	-	l			10.3	130.0	436		-	-	
11	-	-	-	l			11.1	140.0	412		-	-	
12	-	-	-	l			10.7	148.0	423		-	22-23	
13	-	-	-	l			10.3	152.0	436		-	-	
14	-	-	-	l			7.9	153.0	512		-	-	
119	1	5.05.51	N-Lø	RB	l	-17.7	6.4	11.4	150.3	399	96		22-24
	2	-	-	-	l	-19.5	6.2	11.3	152.4	408	95		-
	3	-	-	-	l	-22.3	5.7	10.4	155.7	436	96		-
	4	-	-	-	l	-31.7	4.5	8.5	166.3	510	98		-
	5	-	-	-	l	-22.5	4.9	7.8	156.3	510	92		-
	6	-	-	R	m	-31.4	4.45	10.1	166.2	514	114	No. 6 and 7 along the ray	-
	7	-	-	-	h	-30.7	4.35	13.7	166.0	520	152	forming edge of curtain to	-
	8	-	N	RB	l			12.2	146.0	382		the right	-
	9	-	-	-	l			9.7	160.0	455		For points 8-14	-
	10	-	-	-	l			9.1	164.0	475		H supposed = 95 km	-
	11	-	-	-	l			7.6	164.0	534		-	-
	12	-	-	-	l			7.5	160.0	540		Vertical thickness of cur-	21-22
	13	-	-	-	l			8.2	150.0	509		tain 11 km	22-24
	14	-	-	-	l			8.1	146.0	513		-	-
120	1	4.06.23	N-Lø	RB	h	-19.6	6.4	13.7	152.4	391	109	1-2 same short ray of RB	-

Table 2 (continued).

No	Pt	MET	St	F	S	ϵ_2	p	h	a	D	H	Remarks	θ	
121	2	4.06.23	N-L ϕ	RB	l	-20.2	6.35	12.2	152.9	395	98		22-24	
	3	-	-	-	h	-27.3	5.4	11.9	161.1	439	109	3-4 same short ray of RB	-	
	4	-	-	-	l	-27.4	5.4	10.5	161.1	441	98		-	
	5	-	-	-	h	-33.6	4.3	.95	168.6	520	110		-	
	6	-	-	-	m	-33.7	4.2	8.3	168.8	535	102		-	
	7	-	-	-	l	-33.0	4.3	8.3	167.9	527	100		-	
	8	-	N	-	l			7.1	162.0	572			For points 8-16	21-23
	9	-	-	-	l			7.2	156.0	567			H is supposed equal to	-
	10	-	-	-	l			7.7	152.7	544			98 km	-
	11	-	-	-	l			8.1	150.0	526				-
	12	-	-	-	l			8.9	158.0	495				-
	13	-	-	-	l			7.4	168.0	557				-
	14	-	-	-	l			8.4	154.0	516				-
	15	-	-	-	l			9.4	165.0	476				-
	16	-	-	-	l			13.1	149.0	370				23-24
	1	4.07.04	N-L ϕ	R	m	l'	-31.0	5.2	22.7	166.6	410	189	1, 2 and 21 belong to a	21-24
2	-	-	-	l'	h'	-31.7	5.3	19.1	166.7	411	158	diffuse ray over RB	-	
3	-	-	RB	h'	m	-37.2	3.8	13.2	173.3	552	157	6-7, 8-9 and 10-11 short	-	
4	-	-	-	m	l'	-37.9	3.7	9.9	173.7	571	127	rays of RB.	-	
5	-	-	-	l'	h	-38.6	3.8	8.1	174.3	556	105	3-4-5 edge of RB	-	
6	-	-	-	h	l	-31.5	5.2	11.5	165.8	439	105		-	
7	-	-	-	l	h	-31.6	5.1	10.3	165.9	448	98		-	
8	-	-	-	h	l	-30.3	5.4	12.3	164.5	425	108		-	
9	-	-	-	l	h	-30.4	5.3	10.7	164.5	436	98		-	
10	-	-	-	h	l	-24.4	5.9	13.6	157.7	409	114		-	
11	-	-	-	l	l	-24.7	6.0	12.3	157.8	404	102		-	
12	-	-	-	l	l	-37.4	3.8	8.2	173.0	563	108		-	
13	-	N	-	l	l			7.5	174.0	553		For the points 12-20 H is	21-23	
14	-	-	-	l	l			6.9	168.0	580		supposed equal to 98 km	-	
15	-	-	-	l	l			6.7	160.0	589			-	
16	-	-	-	l	l			7.0	154.0	575			-	
17	-	-	-	l	l			9.3	168.7	481			-	
18	-	-	-	l	l			11.6	160.0	409			23-24	
19	-	-	-	l	l			12.7	152.0	381			-	
20	-	-	-	l	l			12.9	146.0	374			-	
21	-	-	R	h	h			26.4	166.5	401			-	
122	1	4.07.59	N-L ϕ	R	h'	-30.8	5.7	31.6	169.0	357	222	1-2-3 on the same sunlit	22-24	
	2	-	-	-	m	-32.3	5.75	25.9	168.8	356	187	ray	-	
	3	-	-	-	l	-33.1	5.8	22.3	168.6	360	161	4-5-6 on another ray,	-	
	4	-	-	-	m	-33.4	5.0	33.9	174.4	368	269	upper part sunlit	-	
	5	-	-	-	m	-37.0	4.85	22.8	174.5	408	189		-	
	6	-	-	-	l	-39.2	4.74	12.7	174.3	433	113		-	
	7	-	N-L ϕ	RB	h	h	-37.2	4.15	29.0	177.9	446	274	7, 8, 9, 10, 11 edge of	-
	8	-	-	-	m	l	-40.2	4.15	18.5	177.6	470	178	curtain, upper part sunlit	1
	9	-	-	-	l'	h	41.6	4.15	12.1	177.4	479	122		-
	10	-	-	-	m	l	-42.0	3.85	8.7	177.4	521	103		-
	11	-	-	-	m	h	-42.1	3.8	7.3	177.3	544	94		-
	12	-	-	-	h	l	-24.4	3.85	10.8	159.6	629	154		21 22
	13	-	-	-	l	l	-25.0	4.0	6.7	159.9	614	103	The vertical thickness of	-
	14	-	-	-	l	l	-37.8	3.7	7.7	176.6	578	106	most luminous part of RB	-
	15	-	-	-	l	l			12.8	150.0	378		equal to 15 km	22-24
	16	-	-	-	l	l			12.4	156.0	390		For points 15-22 H is	-
	17	-	-	-	l	l			11.7	162.0	406		supposed = 98 km	-
	18	-	-	-	l	l			10.1	170.0	453			-
	19	-	-	-	l	l			8.5	176.0	512			-

Table 2 (continued).

No	Pt	MET	St	F	S	ϵ_2	p	h	a	D	H	Remarks	θ
123	20	4.07.59	N-L \emptyset	RB	l			6.5	176.0	598			21-22
	21	-	-	-	l			6.3	170.0	609			-
	22	-	-	-	l			6.6	162.0	595			22-24
	23	-	-	R	h			37.4	174.3	358	297	H found by sxtpolation	-
	1	4.09.08	N-L \emptyset	RB	h	-36.6	4.0	11.7	172.0	533	125	1-2 a ray of the RB. No 1	22-23
	2	-	-	-	l	-37.0	4.1	8.5	171.9	526	102	in sunlight .	-
	3	-	-	-	l	-42.7	3.9	10.5	178.3	504	115		-
	4	-	-	-	l	-43.8	3.6	9.3	179.5	540	113		-
	5	-	N	-	l			13.3	150.0	372		For the points 5-11 H is	22-24
	6	-	-	-	l			13.2	158.0	374		supposed equal to 100 km	-
	7	-	-	-	l			12.7	166.0	388			-
8	-	-	-	l			11.8	174.0	410			-	
9	-	-	-	l			10.6	178.0	446			-	
10	-	-	-	l			6.8	178.0	594			21-22	
11	-	-	-	l			6.7	170.0	599			-	
125	1	4.14.41	N-L \emptyset	R	m	-31.6	3.85	11.5	167.2	588	150	1-2 one ray	21-22
	2	-	-	-	l	-31.8	3.95	9.4	167.1	578	124		-
	3	-	-	-	m	-25.7	3.9	11.4	161.1	612	156	3-4 another ray in sunlight	-
	4	-	-	-	l	-26.1	3.9	8.0	161.3	621	120		-
	5	-	N	RB	l			10.5	150.0	448		For the points 5-9 H sup-	22-24
	6	-	-	-	l			11.4	156.0	421		posed = 100 km	-
	7	-	-	-	l			11.7	168.0	414			-
	8	-	-	-	l			11.5	176.0	419			-
	9	-	-	-	l			10.9	-176.0	437			-
126	1	4.15.37	N-L \emptyset	R	h	-30.7	3.65	27.8	169.7	548	329	1-4 belong to a sunlit R	21-23
	2	-	-	-	m	-32.5	3.6	20.4	169.9	585	255		-
	3	-	-	-	m	-33.7	3.5	11.8	169.9	628	166		-
	4	-	N	-	l			8.5	169.9	646	132		-
	5	-	-	RB	l			10.4	156.0	451		For 5-9 H is supposed	-
	6	-	-	-	l			11.3	162.0	425		= 100 km	-
	7	-	-	-	l			11.6	170.0	416			23-24
	8	-	-	-	l			10.9	180.0	437			-
	9	-	-	-	l			9.3	-172.0	490			-
127	1	4.16.59	N	RA	l			9.4	156.0	484		The height is supposed to	-
	2	-	-	-	l			10.3	164.0	454		be 100 km	-
	3	-	-	-	l			10.7	170.0	442			-
	4	-	-	-	l			10.4	176.0	450			-
	5	-	-	-	l			9.6	-176.0	477			-
128	1	4.19.30	N	RA				6.9	150.0	589		H supposed = 100 km	-
	2	-	-	-				8.4	160.0	522			-
	3	-	-	-				8.9	170.0	503			-
	4	-	-	-				8.0	180.0	540			-
130	1	4.23.40	N-L \emptyset	R	h'	0.3	4.7	22.1	133.3	527	244	Sunlit	22-23
	2	-	-	-	l'	-0.2	4.8	18.5	133.8	530	205		-
	3	-	-	-	h			22.6	133.2		247		-
	4	-	-	-	l			17.6	133.9		198		-
131	1	4.24.26	N-L \emptyset	R	h'	-0.6	4.8	22.6	134.4	513	242	1-2-5 one ray	22-23
	2	-	-	-	l	-0.8	4.9	19.2	134.6	517	207		-
	3	-	-	-	h'	-1.0	4.7	22.6	134.9	524	249	3-4-6 another bot sunlit	-
	4	-	-	-	l	-1.3	4.8	18.9	135.1	529	209		-
	5	-	-	-	h			23.3	134.3		250		-
	6	-	-	-	h			23.3	134.9		257		-

Table 2 (continued).

No	Pt	MET	St	F	S	ϵ_2	p	h	a	D	H	Remarks	θ
<i>March 24-25, 1933.</i>													
4	1	20.27.40	N-L σ	RB	l	-50.0	6.8	23.5	-173.5	237	109	1-2, 3-4, 5-6, 7-8 and 9-10 along 5 rays of RB. All sunlit	24-26
	2	-	-	-	h'	-48.7	6.5	26.6	-173.5	247	130		-
	3	-	-	-	l	-51.1	6.9	23.2	-172.6	229	103		-
	4	-	-	-	h	-49.2	6.5	27.9	-172.4	243	135		-
	5	-	-	-	l	-56.4	5.6	23.1	-165.0	248	111		-
	6	-	-	-	h'	-53.9	5.2	28.8	-164.4	269	151		-
	7	-	-	-	l	-56.9	5.4	22.9	-164.4	254	113		-
	8	-	-	-	h'	-54.4	5.2	28.5	-163.8	267	153		-
	9	-	-	-	l	-61.0	4.6	20.0	-160.2	271	106		-
	10	-	-	-	h	-57.8	4.6	27.5	-159.3	279	155		-
7	1	20.29.31	N-L σ	RB	h	-46.0	3.7	11.2	-177.2	555	136	Sunlit	23-25
	2	-	-	-	m	-46.1	3.6	9.7	-177.0	518	111	-	-
	3	-	-	-	h	-60.9	3.4	11.2	-161.8	385	90	Not sunlit	-
	4	-	-	-	l	-60.7	3.1	13.3	-161.1	419	114	-	-
8	1	20.29.52	N-L σ	RB	l'	-39.3	5.6	11.3	173.2	372	87	Not sunlit, 1-2 one R	23-25
	2	-	-	-	h	-38.9	5.7	14.3	173.0	361	104	-	-
	3	-	-	-	l	-61.2	4.0	12.3	-161.8	322	80	Not sunlit, 3-4 another R	-
	4	-	-	-	h	-60.2	4.0	15.7	-161.4	327	102	-	-
9	10	20.31.57	N-L σ	R	l	42.6	6.1	26.9	81.4	291	157	Sunlit	26-27
	11	-	-	-	m	39.9	5.8	35.1	77.9	290	217	-	-
	12	-	-	-	h	-	-	43.9	73.0	286	294	-	-
10	2	20.32.27	N-L σ	R	m	41.4	4.3	34.0	79.2	383	281	Sunlit ray	25-27
	3	-	-	-	m	43.4	4.3	28.6	81.5	397	236	2, 3, 4 one ray	-
	4	-	-	-	l'	44.7	4.2	23.3	83.5	418	199	-	-
	6	-	-	-	h	45.2	3.0	23.0	84.6	574	281	6, 7, 8 another	-
	7	-	-	-	m	45.7	3.2	17.8	83.3	558	209	-	-
	8	-	-	-	l	45.5	3.4	13.0	87.7	544	152	-	-
	9	-	-	-	h	52.8	3.1	29.4	67.1	451	281	9, 10, 11 another again	-
	10	-	-	-	m	56.5	3.1	22.6	69.7	441	205	-	-
11	1	20.33.33	N-L σ	R	h	50.5	3.1	35.7	58.6	440	344	Diffuse sunlit ray	28-29
	13	20.39.25	N	RB	l	-	-	11.8	162.0	445	-	H supposed = 110 km	22-23
13	2	-	-	-	l	-	-	11.5	174.0	453	-	-	-
	3	-	-	-	l	-	-	10.4	-176.0	490	-	-	-
	4	-	-	-	l	-	-	9.0	-169.0	540	-	-	-
	1	20.29.25	N	RB	l	-	-	11.8	162.0	374	-	H supposed = 90 km	23-24
15	2	-	-	-	l	-	-	11.5	174.0	387	-	-	-
	3	-	-	-	l	-	-	10.4	-176.0	413	-	-	-
	4	-	-	-	l	-	-	9.0	-169.0	460	-	-	-
	1	20.44.28	N-L σ	R	h	20.5	9.6	68.9	167.6	95	254	Very diffuse sunlit ray	25-26
16	2	-	-	-	m	26.0	12.5	62.3	168.9	89	174	-	-
	1	20.45.15	N-L σ	R	h	19.7	7.4	63.0	49.2	153	316	1, 2, 3 one ray	26-28
	2	-	-	-	m	23.8	7.5	58.5	56.2	169	290	4, 5, 6 another	-
	3	-	-	-	l	27.8	7.6	53.5	61.7	184	260	Both sunlit	-
	4	-	-	-	h	29.6	5.6	54.0	61.6	241	252	-	-
	5	-	-	-	m	34.3	6.0	47.0	67.4	250	283	-	-
	6	-	-	-	m	38.4	6.5	40.0	72.0	298	219	-	-
	7	-	N	-	l	-	-	-	-	-	187	-	-
19	1	20.49.37	N	HA	l	-	-	11.4	162.0	457	-	H supposed = 110 km	22-24
	2	-	-	-	l	-	-	11.4	172.0	457	-	-	-
	3	-	-	-	l	-	-	10.5	-176.0	486	-	-	-
	4	-	-	-	l	-	-	9.4	-163.0	524	-	-	-
	1	-	-	-	l	-	-	11.4	162.0	384	-	H supposed = 90 km	23-24
	2	-	-	-	l	-	-	11.4	172.0	384	-	-	-

Table 2 (continued).

No	Pt	MET	St	F	S	ϵ_2	p	h	a	D	H	Remarks	θ
22	3	20.49.37	N	HA	l			10.5	-176.0	410			23-24
	4	-	-	-	l			9.4	-166.0	444			-
	1	20.55.24	N-L \emptyset	R	h'	-1.5	7.8	47.6	129.2	231	266	9, 1, 2, 3, 10, 4, 5 belong to	24-25
	2	-	-	-	m	-3.0	8.6	41.1	131.1	236	216	the ray forming the left	-
	3	-	-	-	m	-4.9	9.5	33.3	132.9	238	164	border of the curtain.	-
	4	-	-	-	m	-6.4	10.1	25.3	134.4	243	121	Over point 10, sunlit. The	-
	5	-	-	-	l	-7.2	10.4	20.8	135.1	245	98	ray goes out of the photo-	-
	6	-	-	RB	l	-12.8	11.3	23.3	140.2	218	98	graphic field	-
	7	-	-	-	l	-17.1	12.0	24.7	144.3	199	95		-
	8	-	-	-	l	-22.0	11.8	25.7	150.2	195	98		-
23	10	-	-	R	m	-5.1	9.6	32.2	133.2	238	158		-
	1	20.55.56	N-L \emptyset	RB	h	-12.2	10.1	26.0	141.0	239	122	The most luminous part	24-25
26	2	-	-	-	l	-12.6	10.1	21.6	141.5	246	103	of the same curtain	-
	1	20.57.52	N-L \emptyset	RB	l'	-37.1	7.5	16.1	169.9	280	88		24-25
28	2	-	-	-	h	-37.9	7.5	18.1	169.8	274	96		-
	6	-	-	-	l						86	Lowest under pt. 1	-
	1	20.59.31	N-L \emptyset	R	h	33.2	7.7	52.0	75.6	179	240	Sunlit summits of rays	26-27
29	2	-	-	-	h	36.0	5.1	47.8	771	333	277		-
	1	21.00.16	N-L \emptyset	R	h	36.7	6.3	42.8	71.0	250	245	Summits of rays, sunlit	27-28
30	2	-	-	-	h	41.4	4.9	37.5	73.0	319	271		-
	3	-	-	-	h	46.4	3.2	31.8	75.1	482	333		-
	4	21.01.19	N-L \emptyset	R	h	41.4	4.8	39.7	68.9	319	284	Upper part of sunlit ray	26-27
38	5	-	-	-	m	45.0	4.7	33.6	72.2	335	240		-
	1	21.14.09	N-L \emptyset	R	l'	2.9	6.7	17.3	128.6	387	136	Diffuse ray	23-24
	2	-	-	-	m	4.4	6.2	26.9	126.9	386	215	Points 2, 5, 3, 6 in sun-	-
	3	-	-	-	h'	5.7	5.4	36.6	124.8	392	318	light, 1, 4 in shadow	-
	4	-	-	-	l'	1.4	6.3	17.4	130.6	411	146		-
	5	-	-	-	m	2.9	5.8	27.1	129.0	411	231		-
39	6	-	-	-	h'	4.3	5.1	36.9	127.1	412	340		-
	3	21.15.17	N-L \emptyset	R	h	12.0	4.7	24.3	120.3	526	258	In sunlight	22-23
	4	-	-	-	m	11.4	4.7	18.6	121.7	541	208		-
41	5	-	-	-	m	10.7	4.6	13.0	122.9	564	159		-
	6	-	-	-	l	10.2	4.5	9.1	123.8	588	124		-
	1	21.17.22	N-L \emptyset	R	l'	21.3	4.6	9.8	112.3	543	119		23-24
	2	-	-	-	h	22.2	4.8	19.3	109.8	490	196		-
	3	-	-	-	l	10.0	5.8	11.2	122.4	455	108		-
	4	-	-	-	h	11.3	5.9	22.2	119.9	415	189		-
	5	-	-	-	l	8.8	5.8	11.5	123.6	457	111		-
	6	-	-	-	h	10.2	5.9	22.3	121.1	416	190		-
	7	-	-	-	l	7.6	6.0	11.7	124.6	442	109		-
	8	-	-	-	h	8.5	6.0	17.2	123.3	428	150		-
	10	-	-	RB	h	12.9	5.2	9.8	120.2	505	109		-
42	11	-	-	-	l	5.9	5.7	9.4	126.8	471	97		-
	12	-	-	-	l	5.5	5.8	10.3	127.1	461	102		-
	13	-	-	-	l	2.0	6.7	11.9	129.7	399	98		-
	1	21.17.46	N-L \emptyset	R	h	18.9	4.6	24.9	112.4	497	259	1, 2, 3, 4 ray, 1, 2 in	22-24
	2	-	-	-	m	18.4	4.6	17.7	114.4	528	196	sunshine	-
	3	-	-	-	m	17.4	4.7	10.6	116.3	543	127		-
	4	-	-	-	l'	16.8	4.9	9.2	116.8	525	108		-
	6	-	-	-	h	10.7	5.1	26.3	121.4	460	254	6, 7, 8 another ray, 6, 7	-
	7	-	-	-	m	9.2	5.1	16.7	123.7	500	174	in sunshine	-
	8	-	-	-	l	7.8	5.1	7.5	125.6	526	92		-
	9	-	-	RB	h	-0.4	5.5	10.6	133.4	487	111		-
10	-	-	-	l	-0.8	5.7	9.1	133.6	473	94		-	
11	-	-	-	l	13.2	5.3	9.0	120.0	495	99		-	

Table 2 (continued).

No	Pt	MET	St	F	S	ϵ_2	p	h	a	D	H	Remarks	θ	
47	12	21.17.46	N	RB	l			5.3	121.5	639		12, 13, 14 same border as no 10	--	
	13	--	--	--	l			8.7	129.4	483			--	
	14	--	--	--	l			9.7	137.3	447			--	
	15	--	--	--	l			8.0	117.8	535			Near point 11	--
	1	21.20.57	N-L \emptyset	R	h	38.0	3.2	22.8	93.2	601	294	294	Sunlit rays	23-25
	2	--	--	--	m	38.1	3.2	17.7	95.2	625	239	239	1-2-3-4 one ray	--
	3	--	--	--	m	37.7	3.3	12.7	96.8	632	178	178		--
	4	--	--	--	l	36.0	3.8	8.7	98.2	637	132	132		--
6	--	--	--	h	36.0	4.1	22.7	94.9	523	249	249	6-7-8 another	--	
7	--	--	--	l				16.1	97.2	511	172		--	
8	--	--	L \emptyset	--	h						296		--	
48	1	21.21.25	N-L \emptyset	R	h'	38.9	3.1	26.8	90.2	590	342	Sunlit	24-25	
	2	--	--	--	m	39.8	3.3	19.8	92.4	584	246		--	
	3	--	--	--	m	39.8	3.6	13.3	94.2	562	161		--	
	4	--	N	--	l				95.3	578	114		--	
	5	--	--	--	h						360		--	
49	1	21.22.18	N-L \emptyset	R	m	41.5	3.4	24.7	86.3	531	277	Partly sunlit	24-26	
	2	--	--	--	m	42.7	3.4	18.0	88.6	552	209	(Not so good)	--	
	3	--	--	--	m	43.1	3.3	9.9	91.0	590	132		--	
	6	--	N	--	h						321		--	
7	--	--	--	l						102		--		
50	1	21.22.53	N-L \emptyset	R	h	34.9	4.5	31.9	90.1	411	279	Partly sunlit	24-26	
	2	--	--	--	m	35.8	4.7	26.3	92.5	416	225		--	
	3	--	--	--	l	36.2	4.8	19.8	95.0	427	172		--	
53	1	21.25.08	N-L \emptyset	R	h'	38.0	3.2	44.2	71.0	454	492	Sunlit	26-27	
	2	--	--	--	m	40.9	3.5	38.6	74.8	440	388		--	
	3	--	--	--	m	44.0	3.7	31.8	78.3	437	299		--	
	4	--	--	--	h				45.8	69.7	449	516		--
55	1	21.28.47	N-L \emptyset	R	h	28.2	2.8	23.2	104.8	753	391	Sunlit	22-23	
	2	--	--	--	m	27.2	3.1	11.7	107.8	755	208		--	
	3	--	--	--	l				109.1	757	137		--	
56	1	21.32.58	N	HA	l			9.7	127.0	434		H supposed = 90 km	--	
	2	--	--	--	l			11.2	136.0	390			--	
	3	--	--	--	l			12.4	145.0	360			--	
	4	--	--	--	l			13.3	153.0	338			--	
	1	--	--	--	l			9.7	127.0	473		H supposed = 100 km	--	
	2	--	--	--	l			11.2	136.0	425			--	
	3	--	--	--	l			12.4	145.0	392			--	
	4	--	--	--	l			13.3	153.0	368			--	
	1	--	--	--	l			9.7	127.0	513		H supposed = 110 km	--	
	2	--	--	--	l			11.2	136.0	463			--	
	3	--	--	--	l			12.4	145.0	427			--	
	4	--	--	--	l			13.3	153.0	403			--	
57	1	21.33.47	N-L \emptyset	HA	l	0.0	6.1	10.6	132.8	440	98	For 1, 2 and 3 H is here supposed to be 100 km	23-24	
	1	--	N	--	l			10.6	132.8	445			--	
	2	--	--	--	l			8.9	123.2	504			--	
3	--	--	--	l			7.2	114.0	576			--		
58	1	21.38.50	N	HA	l			14.0	172.0	353		H supposed = 100 km	--	
	2	--	--	--	l			12.9	180.0	379			--	
	3	--	--	--	l			11.1	172.0	427			--	
	4	--	--	--	l			9.1	167.0	494			--	
59	1	21.39.51	N	HA	l			10.0	124.0	465		H supposed = 100 km	--	
	2	--	--	--	l			11.9	134.0	408			--	
	3	--	--	--	l			13.0	142.0	379			--	
	4	--	--	--	l			14.2	154.0	351			--	

Table 2 (continued).

No	Pt	MET	St	F	S	ϵ_2	p	h	a	D	H	Remarks	θ
60	1	21.39.51	N	HA	l			11.1	126.4	430		H supposed = 100 km	22-24
	2	-	-	-	l			8.9	118.9	504			-
	3	-	-	-	l			8.0	114.9	540			-
	4	-	-	-	l			13.9	138.0	359			-
63	1	21.43.51	N	HA	l			9.4	129.1	444		H supposed = 90 km	22-24
	2	-	-	-	l			11.5	139.7	381			-
	3	-	-	-	l			12.3	146.0	362			-
	4	-	-	-	l			12.6	152.0	355			-
64	1	21.44.41	N	HA	l			9.4	129.1	524		H supposed = 110 km	-
	2	-	-	-	l			11.5	139.7	453			-
	3	-	-	-	l			12.3	146.0	430			-
	4	-	-	-	l			12.6	152.0	423			-
64	1	21.44.41	N	HA	l			9.2	129.0	450		H supposed = 90 km	23-24
	2	-	-	-	l			10.9	136.0	400			-
	3	-	-	-	l			12.0	144.0	368			-
	4	-	-	-	l			12.5	151.0	356			-
64	1	-	-	-	l			9.2	129.0	530		H supposed = 110 km	22-23
	2	-	-	-	l			10.9	136.0	473			-
	3	-	-	-	l			12.0	144.0	440			-
	4	-	-	-	l			12.5	151.0	424			-
65	1	21.45.13	N-Lø	RB	l	- 2.2	5.5	9.5	135.5	490	102		22-23
	2	-	-	-	l	- 0.8	5.1	8.7	134.3	528	104		-
	3	-	-	-	l	- 0.5	4.8	7.5	134.5	563	100		-
	4	-	N	HA	l			8.0	126.0	547		H supposed = 102 km	22-24
	5	-	-	-	l			9.9	132.0	476			-
	6	-	-	-	l			11.2	138.9	435			-
	7	-	-	-	l			10.9	142.0	445			-
	8	-	-	-	l			11.5	148.0	425			-
	9	-	-	-	l			11.5	154.0	425			-
	10	-	-	-	l			7.1	135.2	589			21-22
66	1	21.45.47	N-Lø	RB	l	- 1.0	5.2	9.0	134.4	518	104		21-23
	2	-	-	-	l'	2.5	4.6	7.5	131.6	587	106		-
	3	-	N	-	-			10.0	138.9	480		H supposed = 104 km	22-24
	4	-	-	-	-			10.7	144.0	458			-
	5	-	-	-	-			10.9	150.0	450			-
	6	-	-	-	-			11.4	154.0	436			-
69	1	21.51.31	N-Lø	RB	h	- 7.8	4.8	13.0	141.9	545	152		21-22
	2	-	-	-	m	- 7.2	4.7	9.6	141.4	566	123		-
	3	-	-	-	l	- 6.7	4.6	8.9	141.0	581	119		-
70	1	21.56.32	N-Lø	R	h'	1.3	4.1	21.2	132.9	604	273	Points 1 and 4 in sunlight	21-22
	2	-	-	-	m	0.3	4.1	15.4	134.0	631	212		-
	3	-	-	-	l'	- 0.5	4.2	9.5	135.0	638	142		-
	4	-	N	-	h			22.6	132.6	596	288		-
	5	-	-	-	l			21.9			141		-
71	1	21.57.16	N-Lø	R	h	3.3	3.7	21.1	131.3	666	305	Point 1 in sunlight	21-22
	2	-	-	-	m	2.2	3.9	14.3	132.3	668	212		-
	3	-	-	-	l'	1.3	4.1	7.5	133.5	659	123		-
72	1	22.05.29	N	HA	l			9.4	180.0	444		H supposed = 90 km	23-24
	2	-	-	-	l			8.3	-172.0	484			-
	3	-	-	-	l			7.3	-165.0	525			-
	1	-	-	-	l			9.4	180.0	524		H supposed = 110 km	22-23
	2	-	-	-	l			8.3	-172.0	569			-
73	1	22.27.45	N	HA	l			7.3	-165.0	613			-
	1	22.27.45	N	HA	l			8.9	136.0	492		H supposed = 90 km	22-24
	2	-	-	-	l			9.7	146.0	435			-

Table 2 (continued).

No	Pt	MET	St	F	S	ϵ_2	p	h	a	D	H	Remarks	θ	
74	3	22.27.45	N	HA	l			10.1	156.0	421			22-24	
	4	-	-	-	l			10.3	166.0	416			-	
	1	-	-	-	l			8.9	136.0	577		H supposed = 110 km	21-23	
	2	-	-	-	l			9.7	146.0	513			-	
	3	-	-	-	l			10.1	156.0	499			-	
	4	-	-	-	l			10.3	166.0	493			-	
	1	22.28.42	N	HA	l			9.8	178.0	430			H supposed = 90 km	23-24
	2	-	-	-	l			8.5	-174.0	476			-	
	3	-	-	-	l			7.0	-166.0	540			-	
	4	-	-	-	l			5.4	-159.0	620			-	
75	1	-	-	-	l			9.8	178.0	508		H supposed = 110 km	22-23	
	2	-	-	-	l			8.5	-174.0	560			-	
	3	-	-	-	l			7.0	-166.0	628			-	
	4	-	-	-	l			5.4	-159.0	712			-	
	1	22.29.35	N	HA	l			10.1	138.0	431			H supposed = 90 km	22-24
	2	-	-	-	l			10.6	148.0	408			1-4 upper arc, 5-7 lower	-
	3	-	-	-	l			10.7	158.0	404			-	
	4	-	-	-	l			10.7	166.0	404			-	
	5	-	-	-	l			7.3	136.0	525			-	
	6	-	-	-	l			7.8	148.0	502			-	
76	7	-	-	-	l			8.2	159.0	487			-	
	1	-	-	-	l			10.1	138.0	499			H supposed = 110 km	-
	2	-	-	-	l			10.6	148.0	483			1-4 upper arc, 5-7 lower	-
	3	-	-	-	l			10.7	158.0	480			-	
	4	-	-	-	l			10.7	166.0	480			-	
	5	-	-	-	l			7.3	136.0	613			-	
	6	-	-	-	l			7.8	148.0	589			-	
	7	-	-	-	l			8.2	159.0	573			-	
	1	22.30.55	N	HA	l			10.0	180.0	425			H supposed = 90 km	-
	2	-	-	-	l			8.6	-170.0	473			-	
77	3	-	-	-	l			6.7	-160.0	554			-	
	4	-	-	-	l			4.8	-152.0	652			-	
	1	-	-	-	l			10.0	180.0	503			H supposed = 110 km	-
	2	-	-	-	l			8.6	-170.0	556			-	
	3	-	-	-	l			6.7	-160.0	644			-	
	4	-	-	-	l			4.8	-152.0	744			-	
	1	22.31.47	N	HA	l			9.0	130.0	459			H supposed = 90 km	22-24
	2	-	-	-	l			10.0	138.0	425			1-4 upper arc, 5-8 lower	-
	3	-	-	-	l			10.9	150.0	399			-	
	4	-	-	-	l			11.6	162.0	379			-	
78	5	-	-	-	l			7.0	133.0	537			-	
	6	-	-	-	l			7.8	142.0	503			-	
	7	-	-	-	l			8.6	152.0	474			-	
	8	-	-	-	l			9.3	160.0	447			-	
	1	-	-	-	l			9.0	130.0	538			H supposed = 110 km	-
	2	-	-	-	l			10.0	138.0	503			1-4 upper arc, 5-8 lower	-
	3	-	-	-	l			10.9	150.0	472			-	
	4	-	-	-	l			11.6	162.0	450			-	
	5	-	-	-	l			7.0	133.0	625			21-22	
	6	-	-	-	l			7.8	142.0	589			-	
78	7	-	-	-	l			8.6	152.0	550			-	
	8	-	-	-	l			9.3	160.0	527			-	
	1	22.32.43	N-L \emptyset	RB	h	- 3.4	5.3	11.6	136.8	503	124	Upper arc transformed	22-23	
2	-	-	-	m	- 3.4	5.3	9.7	136.8	507	108	to RB	-		
3	-	-	-	l	- 3.2	5.3	8.8	136.5	509	100		-		

Table 2 (continued).

No	Pt	MET	St	F	S	ϵ_2	p	h	a	D	H	Remarks	θ
81	4	22.32.43	N	RB	l			7.2	136.0			H supposed = 100 km	
	5	-	-	-	l			7.7	144.0			(Lower arc)	
	6	-	-	-	l			8.2	152.0				
	7	-	-	-	l			7.6	160.0				
	1	22.34.10	N-L \emptyset	RB	h	- 4.3	4.3	7.8	138.5	628	119		21-22
	2	-	-	-	l	- 4.6	4.2	6.2	138.9	644	104		-
	3	-	N	-	l			5.5	136.0			H supposed = 90 km	20-22
	4	-	-	-	l			6.4	144.0				-
	5	-	-	-	l			7.1	152.0				-
	6	-	-	-	l			7.4	160.0				-
83	3	-	-	-	l			5.5	136.0			H supposed = 110 km	-
	4	-	-	-	l			6.4	144.0				-
	5	-	-	-	l			7.1	152.0				-
	6	-	-	-	l			7.4	160.0				-
	1	22.39.30	N-L \emptyset	R	l	-59.5	2.9	11.7	-162.9	466	115	1-2 one ray	23-24
	2	-	-	-	h	-57.2	2.8	18.7	-162.1	494	191		-
	3	-	-	-	l	-56.7	3.0	10.4	-166.2	491	110	3-4 another	-
	4	-	-	-	h	-56.3	3.0	12.7	-166.0	490	131		-
	1	22.47.04	N-L \emptyset	R	h	-58.9	2.1	19.4	-158.7	619	258		23-24
	2	-	-	-	m	-61.1	2.2	13.8	-159.5	576	171		-
89	3	-	-	-	l'	-62.2	2.3	9.4	-160.2	545	115		-
	1	0.39.14	N	HA	l			3.7	135.0	724		H supposed = 90 km	20-22
	2	-	-	-	l			4.3	142.0	683			-
	3	-	-	-	l			4.8	150.0	652			-
	4	-	-	-	l			5.5	158.0	614			-
	1	-	-	-	l			3.7	135.0	823		H supposed = 110 km	-
	2	-	-	-	l			4.3	142.0	781			-
	3	-	-	-	l			4.8	150.0	749			-
	4	-	-	-	l			5.5	158.0	708			-
	1	0.40.44	N	HA	l			5.3	158.0	626		H supposed = 90 km	20-22
90	2	-	-	-	l			5.7	166.0	603			-
	3	-	-	-	l			6.0	176.0	587			-
	4	-	-	-	l			6.0	-176.0	587			-
	1	-	-	-	l			5.3	158.0	720		H supposed = 110 km	-
	2	-	-	-	l			5.7	166.0	696			-
	3	-	-	-	l			6.0	176.0	679			-
	4	-	-	-	l			6.0	-176.0	679			-
	1	0.42.25	N	HA	l			7.3	178.0	526		H supposed = 90 km	21-23
	2	-	-	-	l			5.8	-174.0	599			-
	3	-	-	-	l			4.0	-164.3	705			-
91	1	-	-	-	l			7.3	178.0	613		H supposed = 110 km	-
	2	-	-	-	l			5.8	-174.0	691			-
	3	-	-	-	l			4.0	-164.3	803			-
	1	0.43.46	N	HA	l			5.7	155.0	603		H supposed = 90 km	21-23
	2	-	-	-	l			6.4	164.0	568			-
	3	-	-	-	l			6.8	174.0	548			-
	4	-	-	-	l			6.4	-175.0	567			-
	1	-	-	-	l			5.7	155.0	697		H supposed = 110 km	20-22
	2	-	-	-	l			6.4	164.0	658			-
	3	-	-	-	l			6.8	174.0	639			-
98	4	-	-	-	l			6.4	-175.0	658			-
	1	1.07.33	N	HA	l			8.9	144.0	463		H supposed = 90 km	22-23
	2	-	-	-	l			8.9	156.0	463			-
	3	-	-	-	l			8.9	168.0	463			-
	1	-	-	-	l			8.9	154.0	544		H supposed = 110 km	21-22

Table 2 (continued).

No	Pt	MET	St	F	S	ϵ_2	p	h	a	D	H	Remarks	θ	
99	2	1.07.33	N	HA	1			8.9	156.0	544			21-22	
	3	-	-	-	1			8.9	168.0	544			-	
	4	-	N-L ϕ	R	1									
	5	-	-	-	1									
	1	1.12.25	N	HA	1			8.7	166.0	470			H supposed = 90 km	22-23
100	2	-	-	-	1			7.8	176.0	505			-	
	3	-	-	-	1			6.8	-174.0	549			-	
	4	-	-	-	1			5.7	-166.0	603			-	
	1	-	-	-	1			8.7	166.0	551			H supposed = 110 km	21-23
	2	-	-	-	1			7.8	176.0	591			-	
	3	-	-	-	1			6.8	-174.0	639			-	
	4	-	-	-	1			5.7	-166.0	696			-	
	1	1.13.10	N	HA	1			5.8	120.0	598			H supposed = 90 km	21-23
	2	-	-	-	1			7.5	132.0	510			-	
	3	-	-	-	1			9.2	142.0	451			-	
101	1	-	-	-	1			5.8	120.0	690			H supposed = 110 km	-
	2	-	-	-	1			7.5	1.320	602			-	
	3	-	-	-	1			9.2	142.0	530			-	
	1	1.13.10	N	HA	1			8.8	142.0	466			H supposed = 90 km	21-23
	2	-	-	-	1			9.0	150.0	460			-	
	3	-	-	-	1			9.1	162.0	455			-	
	4	-	-	-	1			9.0	174.0	460			-	
	1	-	-	-	1			8.8	142.0	547			H supposed = 110 km	-
	2	-	-	-	1			9.0	150.0	540			-	
	3	-	-	-	1			9.1	162.0	535			-	
102	4	-	-	-	1			9.0	174.0	540			-	
	1	1.13.57	N	HA	1			9.3	168.0	447			H supposed = 90 km	22-24
	2	-	-	-	1			8.2	180.0	487			-	
	3	-	-	-	1			7.2	-170.0	530			-	
	4	-	-	-	1			6.2	-161.0	578			-	
	1	-	-	-	1			9.3	168.0	527			H supposed = 110 km	22-23
	2	-	-	-	1			8.2	180.0	572			-	
	3	-	-	-	1			7.2	-170.0	618			-	
	4	-	-	-	1			6.2	-161.0	668			-	
	1	1.28.57	N	HA	1			6.5	118.0	563			H supposed = 90 km	22-23
103	2	-	-	-	1			7.7	126.0	508			-	
	3	-	-	-	1			8.9	136.0	461			-	
	4	-	-	-	1			10.0	144.0	426			-	
	1	-	-	-	1			6.5	118.0	653			H supposed = 110 km	22-23
	2	-	-	-	1			7.7	126.0	593			-	
	3	-	-	-	1			8.9	136.0	542			-	
	4	-	-	-	1			10.0	144.0	502			-	
	1	1.29.44	N	HA	1			9.6	174.0	439			H supposed = 90 km	23-24
	2	-	-	-	1			9.0	-176.0	460			-	
	3	-	-	-	1			8.5	-168.0	478			-	
104	4	-	-	-	1			8.0	-162.0	495			-	
	1	-	-	-	1			9.6	174.0	517			H supposed = 110 km	22-24
	2	-	-	-	1			9.0	-176.0	540			-	
	3	-	-	-	1			8.5	-168.0	560			-	
	4	-	-	-	1			8.0	-162.0	580			-	
	1	1.31.05	N	HA	1			9.1	-168.0	455			H supposed = 90 km	23-25
	2	-	-	-	1			7.1	-158.0	535			1	
	3	-	-	-	1			5.2	-150.0	628			-	
	4	-	-	-	1			4.2	-144.0	688			-	
	106	1	1.31.59	N	HA	1			6.0	120.0	588			H supposed = 90 km	22-24

Table 2 (continued).

No	Pt	MET	St	F	S	ϵ_2	p	h	a	D	H	Remarks	θ	
107	2	1.39.59	N	HA	l			7.3	126.0	527			22-24	
	3	-	-	-	l			8.8	134.0	466			-	
	4	-	-	-	l			10.4	142.0	415			-	
	1	-	-	-	l			6.0	120.0	679		H supposed = 110 km	21-23	
	2	-	-	-	l			7.3	126.0	614			-	
	3	-	-	-	l			8.8	134.0	547			-	
	4	-	-	-	l			10.4	142.0	491			-	
	1	1.32.45	Lø	HA	l			16.5	146.0	410			H supposed = 90 km	23-24
	2	-	-	-	l			10.7	155.0	406			-	
	3	-	-	-	l			10.4	168.0	415			-	
108	4	-	-	-	l			10.3	177.0	418			-	
	5	-	-	-	l			16.5	146.0	487		H supposed = 110 km	22-23	
	6	-	-	-	l			10.7	155.0	480			-	
	7	-	-	-	l			10.4	168.0	491			-	
	8	-	-	-	l			10.3	177.0	494			-	
	1	1.36.36	Lø	HA	l			11.8	145.0	375			H supposed = 90 km	23-24
	2	-	-	-	l			11.9	156.0	372			-	
	3	-	-	-	l			11.5	168.0	383			-	
	1	-	-	-	l			11.8	145.0	445			H supposed = 110 km	22-23
	2	-	-	-	l			11.9	156.0	442			-	
109	3	-	-	-	l			11.5	168.0	453			-	
	1	1.39.56	Lø	HA	l			7.2	126.6	530			H supposed = 90 km	22-24
	2	-	-	-	l			8.1	128.0	491			A small ray appears in the western end	
	3	-	-	-	l			8.8	130.0	464			-	
	4	-	-	-	l			9.8	136.0	431			-	
	5	-	-	-	l			11.1	146.0	394			-	
	1	-	-	-	l			7.2	126.6	619			H supposed = 110 km	
	2	-	-	-	l			8.1	128.0	570			-	
	3	-	-	-	l			8.8	130.0	546			-	
	4	-	-	-	l			9.8	136.0	509			-	
110	5	-	-	-	l			11.1	146.0	466			-	
	1	1.40.32	N	HA	l			12.3	148.0	362			H supposed = 90 km	23-24
	2	-	-	(trans-	l			12.5	156.0	357			-	
	3	-	-	formed	l			12.7	166.0	352			-	
	4	-	-	in	l			12.2	177.0	365			-	
	1	-	-	RA)	l			12.3	148.0	431			H supposed = 110 km	22-24
	2	-	-	-	l			12.5	156.0	424			-	
	3	-	-	-	l			12.7	166.0	420			-	
	4	-	-	-	l			12.2	177.0	433			-	
	1	1.41.01	N	RA	l			12.6	170.0	354			H supposed = 90 km	23-24
111	2	-	-	-	l			11.5	180.0	382			-	
	3	-	-	-	l			10.4	-172.0	412			-	
	4	-	-	-	l			9.2	-165.0	451			-	
	1	-	-	-	l			12.6	170.0	423			H supposed = 110 km	23-24
	2	-	-	-	l			11.5	180.0	453			-	
	3	-	-	-	l			10.4	-172.0	488			-	
	4	-	-	-	l			9.2	-165.0	531			-	
	1	1.52.16	N-Lø	PS	h'	19.6	8.7	18.2	150.4	282	100			24-25
	2	-	-	-	l'	19.9	8.8	15.5	150.5	284	86			-
	3	-	-	-	h						103			-
4	-	-	-	l						82			-	
120	1	2.58.13	N-Lø	PS	h	-32.7	8.0	19.1	165.1	273	100			24-25
	2	-	-	-	l	-33.5	8.0	15.2	165.5	277	81			-
125	1	3.10.38	N	HA	l			5.2	132.0	634		H supposed = 90 km		

Table 2 (continued).

No	Pt	MET	St	F	S	ϵ_2	p	h	a	D	H	Remarks	0
	2	3.10.38	N	HA	l			5.5	140.0	617		H supposed = 90 km	
	3		-	-	l			5.6	148.0	611		-	
	4		-	-	l			5.8	156.0	600		-	
	1		-	-	l			5.2	132.0	732		H supposed = 110 km	
	2		-	-	l			5.5	140.0	713		-	
	3		-	-	l			5.6	148.0	706		-	
	4		-	-	l			5.8	156.0	694		-	
126	1	3.11.47	N-Lø	DS	h	-49.2	5.3	15.6	-175.0	325	100		24-25
	2		-	-	l'	-49.8	5.3	12.9	-175.1	325	84		-
	3		-	-	l						80		
127	1	3.13.51	N	HA	l			6.3	139.0	573		H supposed = 90 km	
	2		-	-	l			6.4	146.0	568		-	
	3		-	-	l			6.5	152.0	563		-	
	4		-	-	l			6.6	159.0	558		-	
	1		-	-	l			6.3	139.0	668		H supposed = 110 km	
	2		-	-	l			6.4	146.0	662		-	
	3		-	-	l			6.5	152.0	656		-	
	4		-	-	l			6.6	159.0	650		-	
128	1	3.15.08	N	HA	l			5.8	124.0	600		H supposed = 90 km	
	2		-	-	l			6.3	129.0	563		-	
	3		-	-	l			7.0	134.0	539		-	
	4		-	-	l			7.6	139.0	511		-	
	1		-	-	l			5.8	124.0	694		H supposed = 110 km	
	2		-	-	l			6.3	129.0	668		-	
	3		-	-	l			7.0	134.0	630		-	
	4		-	-	l			7.6	139.0	599		-	
129	1	3.21.30	N	HA	l			7.9	138.0	499		H supposed = 90 km	
	2		-	-	l			8.0	146.0	495		-	
	3		-	-	l			8.0	154.0	495		-	
	4		-	-	l			7.8	164.0	503		-	
	1		-	-	l			7.9	138.0	585		H supposed = 110 km	
	2		-	-	l			8.0	146.0	581		-	
	3		-	-	l			8.0	154.0	581		-	
	4		-	-	l			7.8	164.0	590		-	
130	1	3.25.24	N	HA	l			6.4	122.0	568		H supposed = 90 km	21-23
	2	-	-	-	l			7.1	128.0	534		-	-
	3	-	-	-	l			7.7	134.0	507		-	-
	4	-	-	-	l			8.4	140.0	478		-	-
	1		-	-	l			6.4	122.0	662		H supposed = 110 km	-
	2		-	-	l			7.1	128.0	624		-	-
	3		-	-	l			7.7	134.0	594		-	-
	4		-	-	l			8.4	140.0	565		-	-
131	1	3.29.00	N	HA	l			7.4	144.0	520		H supposed = 90 km	22-23
	2		-	-	l			7.7	152.0	507		-	-
	3		-	-	l			7.5	160.0	515		-	-
	4		-	-	l			7.5	168.0	515		-	-
	1		-	-	l			7.4	144.0	610		H supposed = 110 km	21-22
	2		-	-	l			7.7	152.0	594		-	-
	3		-	-	l			7.5	160.0	604		-	-
	4		-	-	l			7.5	168.0	604		-	-
135	1	3.34.16	N-Lø	DS	h'	1.1	10.3	20.0	126.9	250	97	Points 1, 2, 5, 6 belong	24-25
	2		-	-	l'	0.5	10.2	17.7	127.7	257	87	to one patch and 3, 4, 7,	-
	3		-	-	h'	5.3	9.4	18.5	123.2	275	99	8 to another	-
	4		-	-	l'	4.5	9.4	15.2	124.3	281	83		-
	5		N	-	h						100		

Table 2 (continued).

No	Pt	MET	St	F	S	ε_2	p	h	a	D	H	Remarks	0	
136	6		N	DS	l						84			
	7		-	-	h						104			
	8		-	-	l						80			
	1	3.35.18	N-L \emptyset	DS	h'	24.8	5.5	13.0	107.6	428	114	Points 1, 2, 11 belong to one patch; 3, 4, 7, 8 to another and 5, 6, 9, 10 to a third one	23-25	
	2		-	-	l'	24.4	5.6	10.8	108.3	437	99		-	
	3		-	-	h'	19.1	5.4	10.5	114.0	469	105		-	
	4		-	-	l'	18.8	5.4	9.0	114.5	473	93		-	
	5		-	-	h'	20.4	5.4	10.4	112.7	466	104		-	
	6		-	-	l'	20.0	5.4	9.1	113.1	469	93		-	
	7		N	-	h						110			
	8		-	-	l						88			
9		-	-	h						110				
10		-	-	l						88				
11		-	-	h						123				
137	1	3.36.26	N-L \emptyset	DS	h'	17.5	5.6	11.6	115.2	455	111	Points 1, 2, 5, 6 belong to one patch, 3, 4, 7 to another	23-24	
	2		-	-	l'	17.2	5.6	9.2	115.7	461	93		-	
	3		-	-	h	19.5	5.6	11.0	113.2	452	105		-	
	4		-	-	l'	18.4	5.6	9.0	114.5	458	90		-	
	5		N	-	h						116			
	6		-	-	l						89			
	7		-	-	h						87			
138	1	3.37.39	N-L \emptyset	DS	h	21.5	6.1	13.1	110.4	405	110		24-25	
	2		-	-	l	20.6	6.8	11.6	110.7	370	89		-	
141	1	3.41.28	N-L \emptyset	DS	l'	12.3	6.3	10.5	120.0	417	92	1, 2, 5, 6 belong to one patch, 3, 4 to another	23-25	
	2		-	-	h'	12.5	6.5	14.0	119.0	396	113		-	
	3		-	-	m	14.8	6.5	11.6	117.0	396	95		-	
	4		-	-	h'	14.9	6.8	13.7	116.3	378	105		-	
	5		N	-	l						83			
142	1	3.42.19	N-L \emptyset	DS	l						120			
	2		-	-	h'	10.0	6.5	9.8	122.0	410	85	1, 2 and 3 belong to the same patch	23-24	
	3		-	-	h	10.7	6.6	13.4	120.8	395	108		-	
143	1	3.43.14	N-L \emptyset	DS	l	8.8	6.5	8.8	123.3	413	78		1, 2 and 5 belong to one patch, 3 and 4 to another	23-24
2		-	-	h'	9.3	6.5	12.8	122.4	404	106	-			
3		-	-	l	11.9	6.5	11.0	119.9	405	93	-			
4		-	-	m	12.2	6.4	12.8	119.6	405	106	-			
5		N	-	l						70	Perhaps doubtful?			
145	1	3.45.56	N-L \emptyset	DS	h'	2.7	6.6	13.5	129.0	401	110		23-24	
	2		-	-	l'	2.4	6.5	11.0	129.5	413	94		-	
147	1	3.52.22	N	HA	l			7.7	148.0	553		H supposed = 100 km		
	2		-	-	l			8.0	154.0	539				
	3		-	-	l			8.1	160.0	535				
	4		-	-	l			8.2	168.0	531				
148	1	3.53.04	N	HA	l			9.1	169.0	496		H supposed = 100 km		
	2		-	-	l			8.0	178.0	539				
	3		-	-	l			7.2	174.0	576				
	4		-	-	l			6.1	167.0	631				
149	1	3.57.13	N	HA	l			7.9	158.0	543		H supposed = 100 km		
	2		-	-	l			7.9	166.0	543				
	3		-	-	l			7.7	172.0	553				
	4		-	-	l			7.6	178.0	558				
151	1	4.04.04	N-L \emptyset	DS	h'	- 3.9	9.5	18.2	132.8	273	97	1, 2, 7, 8 patch I 3, 4, 9, 10 patch II 5, 6, 11, 12 patch III	24-25	
	2		-	-	l'	- 5.1	9.5	13.3	134.2	281	73		-	
	3		-	-	h'	2.3	8.5	16.0	127.4	308	97		-	

Table 2 (continued).

No	Pt	MET	St	F	S	ϵ_2	p	h	a	D	H	Remarks	θ	
	4	4.04.04	N-L \emptyset	DS	l'	1.5	8.3	12.3	128.6	322	78		24-25	
	5		-	-	h'	7.8	7.8	15.2	122.5	334	100		-	
	6		-	-	l'	7.2	7.9	12.9	123.1	335	86		-	
	7		N	-	h						100	Along 1-2		
	8		-	-	l						72	-		
	9		-	-	h						110	Along 3-4		
	10		-	-	l						75	-		
	11		-	-	h						110	Along 5-6		
	12		-	-	l						80	-		
		1	4.04.04	N-L \emptyset	DS	h'	- 3.9	9.5	18.4	132.9	273	98	New measurements of the	24-25
		2		-	-	l'	- 4.6	9.2	13.6	134.0	289	76	same set	-
		3		-	-	l'	- 0.6	8.6	12.8	130.3	311	78	Not the same points but	-
4			-	-	h'	0.0	8.8	17.6	129.4	298	103	the same distribution	-	
5			-	-	h'	7.7	8.0	15.6	122.4	325	100	among the patches I, II	-	
6			-	-	l'	7.4	7.8	13.4	123.0	337	90	and III	-	
7			N	-	h						108	Along 1-2		
8			-	-	l						75	-		
9			-	-	h						113	Along 3-4		
10			-	-	l						76	-		
11			-	-	h						105	Along 5-6		
12			-	-	l						87	-		
152	1	4.04.53	N-L \emptyset	DS	l	9.3	5.7	7.9	123.6	470	83	1-2, 3-4, 5-6 and 7-8 four	23-25	
	2		-	-	h	9.3	5.7	10.2	123.5	465	102	edges of the patches.	-	
	3		-	-	l'	4.7	5.8	8.6	128.0	464	87		-	
	4		-	-	h	5.0	5.9	10.6	127.6	455	103		-	
	5		-	-	l	6.4	8.1	13.1	123.7	328	85		-	
	6		-	-	h	6.9	8.0	15.1	123.4	328	99		-	
	7		-	-	l	- 2.4	8.9	13.0	132.1	300	77		-	
	8		-	-	h	- 1.7	9.0	17.3	131.2	292	98		-	
153	1	4.05.50	N-L \emptyset	DS	h	20.9	6.9	14.9	109.6	358	107	1-2 along an edge	24-25	
	2		-	-	l'	20.5	6.7	11.9	110.8	375	90	-	-	
	3		N	-	l						78	lowest part	-	
154	1	4.06.46	N-L \emptyset	DS	h	19.6	7.2	15.4	110.6	343	105	1-2 along one	24-25	
	2		-	-	l'	19.1	7.0	12.0	112.0	361	88	edge	-	
	3		N	-	l						75	lowest point	-	
155	1	4.07.53	N-L \emptyset	DS	h	4.2	7.3	15.7	126.5	358	112	1-2 along one	23-24	
	2		-	-	l	3.7	7.4	12.8	127.1	359	93	edge	-	
	3		N	-	h						120	Along 1-2	-	
	4		-	-	l						90	-	-	
156	1	4.08.51	N-L \emptyset	DS	h'	16.5	7.4	15.6	113.9	342	106	1-2, 3-4, 5-6	24-25	
	2		-	-	l'	16.0	7.4	12.1	114.7	350	85	three edges of the aurora	-	
	3		-	-	h'	21.2	7.2	15.9	109.1	339	108		-	
	4		-	-	l'	20.5	7.3	11.9	110.2	344	83		-	
	5		-	-	m	23.3	6.9	15.3	107.3	350	107		-	
	6		-	-	l'	22.7	7.2	12.6	107.9	341	86		-	
	7		N	-	h						117	Along 1-2	-	
	8		-	-	l						78	-	-	
	9		-	-	h						118	Along 2-3	-	
	10		-	-	l						79	-	-	
	11		-	-	h						115	Along 4-5	-	
	12		-	-	l						78	All these DS from 136-156 not sunlit	-	
157	1	4.10.43	N-L \emptyset	R	m	19.3	7.0	50.7	94.9	227	292	Sunlit	25-26	
	2		-	-	l'	19.7	8.3	41.5	100.3	228	212	-	-	
	3		-	-	h			53.9	92.6	227	330	-	-	

Table 2 (continued).

No	Pt	MET	St	F	S	ϵ_2	p	h	a	D	H	Remarks	θ		
158	1	4.12.00	N-Lø		h'	17.6	5.55	53.9	97.3	265	389	Sunlit	25-26		
	2		-		m	18.1	6.2	48.8	100.6	267	324	-	-		
	3		-		l'	18.4	6.8	43.4	103.3	271	271	-	-		
	4		Lø		l							256	-	-	
	5		N		h			55.4	96.0	263	410	-	-		
<i>April 15-16, 1933.</i>															
13	1	22.58.45	Li	HA	l			14.3	135.1	338		H supposed = 96 km	26-27		
	2		-	-	l			13.8	131.4	349		See next picture	-		
	3		-	-	l			13.2	127.1	362			-		
	4		-	-	l			12.5	121.9	379			-		
	5		-	-	l			11.5	116.3	406			-		
	6		-	-	l			15.3	142.4	320			-		
14	1	22.59.53	Li-C	HA	h	-63.1	11.7	18.1	139.6	278	98	1, 2, 3, 4, 7 along	25-27		
	2		-	-	h	-65.9	11.6	18.6	144.3	251	90	upper border	-		
	3		-	-	h	-68.4	9.8	18.9	148.5	268	98	5, 6 along lower	-		
	4		-	-	h	-70.2	8.9	19.0	152.2	271	100	Diffuse pictures	-		
	7		-	-	h	-66.4	12.4	17.4	135.5	288	97	No 2 doubtful	-		
	5		-	-	l	-57.5	11.0	13.3	132.7	360	96		-		
15	1	23.01.19	C	HA	h			11.1	-171.2	424		Upper border	26-27		
	2		-	-	h			10.5	-166.0	442		H supposed = 98 km	-		
	3		-	-	h			9.8	-162.0	465			-		
	4		-	-	h			8.2	-156.0	524			-		
	12*		1	23.08.56	C-K ₄	R	h	-55.3	2.9	19.6	-146.6	666	282	Feeble ray	26-28
	2		-		-	m	-56.5	2.8	15.3	-147.1	690	234		-	
3	-	-	l		-57.3	2.7	10.3	-147.7	721	176		-			
19	1	23.14.16	Li-C		RA	l	-66.3	6.8	12.6	-156.9	433	112		26-27	
2	-		-		l	-62.1	7.7	11.7	-151.2	448	111		-		
3	-		-		l	-57.3	8.0	10.4	-145.6	500	113		-		
4	-		-	l	-51.8	7.5	8.6	-140.2	610	123		-			
13*	1	23.14.49	C*	RA	l			7.4	-154.0	520		H supposed = 90 km	26-28		
2	-		-	l			6.7	-150.0	553			-			
3	-		-	l			6.1	-148.0	583			-			
4	-		-	l			5.3	-146.0	628			-			
1	-		-	l			7.4	-154.0	610			H supposed = 110 km	-		
2	-		-	l			6.7	-150.0	645			-			
3	-		-	l			6.1	-148.0	678			-			
4	-		-	l			5.3	-146.0	726			-			
20	1	23.15.08	Li-C	RA	l	-71.0	7.6	15.5	-162.9	312	95		26-27		
	2		-	-	l	-67.8	8.15	14.7	-158.2	338	99		-		
	3		-	-	l	-64.0	9.1	13.5	-152.4	354	96		-		
	6		-	-	l	-65.8	8.7	14.0	-155.0	345	97		-		
	4		-	-	l			16.9	-173.0	295		H supposed = 97 km	-		
21	1	23.15.48	C	RA	l			9.2	166.2	482		H supposed = 97 km	25-27		
	2		-	-	l			9.9	174.2	458		-	-		
	3		-	-	l			9.9	-177.8	458		-	-		
	4		-	-	l			9.4	-167.9	477		-	-		
14*	1	23.16.00	C*	RA	l			9.3	-170.0	446		H supposed = 90 km	26-28		
	2		-	-	l			8.5	-162.0	474		-	-		
	3		-	-	l			7.3	-154.0	525		-	-		
	4		-	-	l			6.1	-148.0	583		-	-		
	1		-	-	l			9.3	-170.0	527		H supposed = 110 km	-		
	2		-	-	l			8.5	-162.0	560		-	-		

Table 2 (continued).

No	Pt	MET	St	F	S	ϵ_2	p	h	a	D	H	Remarks	θ
15*	3	23.16.00	C*	RA	1			7.3	-154.0	615		H supposed = 110 km	26-28
	4		-	-	1			6.1	-148.0	678		-	-
	1	23.16.49	C	HA	1			9.3	174.0	446		H supposed = 90 km	26-28
	2		-	-	1			9.5	-178.0	439		-	-
	3		-	-	1			9.4	-170.0	443		-	-
	4		-	-	1			8.9	-162.0	460		-	-
	5		-	-	1			8.2	-156.0	486		-	-
	1		-	-	1			9.3	174.0	527		H supposed = 110 km	25-27
	2		-	-	1			9.5	-178.0	519		-	-
	3		-	-	1			9.4	-170.0	523		-	-
25	4		-	-	1			8.9	-162.0	542		-	-
	5		-	-	1			8.2	-156.0	573		-	-
	1	23.20.05	Li-C	HA	1	-66.9	4.9	9.3	-158.8	592	126	Difficult to measure	25-27
	2		-	-	1	-65.0	5.45	9.1	-156.1	574	119	-	-
	3		-	-	1	-63.1	5.95	8.7	-153.4	565	112	-	-
26	4		-	-	1	-61.7	6.3	8.3	-151.5	549	107	-	-
	1	23.20.50	Li-C	HA	1	-77.6	5.0	15.4	-176.2	293	88	Upper arc	26-27
	2		-	-	1	-76.3	5.2	15.3	-173.1	330	100	-	-
	3		-	-	1	-74.7	5.7	14.9	-169.6	336	99	-	-
	4		-	-	1	-72.4	3.8	10.2	-166.0	584	134	Lower arc	24-26
	5		-	-	1	-68.7	4.3	9.7	-160.8	622	139	-	-
	6		-	-	1	-65.0	5.0	9.1	-156.3	625	133	-	-
22*	7		-	-	1	-60.4	5.7	8.1	-150.6	643	126	-	-
	1	23.26.31	C*	HA	1			8.1	172.0	490		H supposed = 90 km	25-27
	2		-	-	1			7.9	180.0	499		-	-
	3		-	-	1			7.2	-174.0	530		-	-
	4		-	-	1			6.6	-168.0	558		-	-
	5		-	-	1			6.1	-162.0	583		-	-
	1		-	-	1			8.1	172.0	577		H supposed = 110 km	-
	2		-	-	1			7.9	180.0	585		-	-
	3		-	-	1			7.2	-174.0	620		-	-
	4		-	-	1			6.6	-168.0	650		-	-
32	5		-	-	1			6.1	-162.0	678		-	-
	1	23.29.18	Li	HA	1			9.0	126.0	456		H supposed = 90 km	24-26
	2		-	-	1			9.9	130.0	426		-	-
	3		-	-	1			10.5	136.0	409		-	-
	4		-	-	1			10.7	144.0	403		-	-
33	1		-	-	1			9.0	126.0	538		H supposed = 110 km	-
	2		-	-	1			9.9	130.0	505		-	-
	3		-	-	1			10.5	136.0	484		-	-
	4		-	-	1			10.7	144.0	477		-	-
	1	23.30.02	Li	HA	1			10.8	140.0	400		H supposed = 90 km	24-26
34	2		-	-	1			11.4	148.0	382		-	-
	3		-	-	1			12.1	156.0	363		-	-
	1		-	-	1			10.8	140.0	474		H supposed = 110 km	-
	2		-	-	1			11.4	148.0	456		-	-
	3		-	-	1			12.1	156.0	435		-	-
	1	23.32.14	Li	HA	1			11.3	162.0	385		H supposed = 90 km	24-26
	2		-	-	1			11.1	170.0	391		-	-
3		-	-	1			10.8	178.0	400		-	-	
34	4		-	-	1			10.2	-174.0	417		-	-
	5		-	-	1			9.8	-168.0	429		-	-
	1		-	-	1			11.3	162.0	459		H supposed = 110 km	-
	2		-	-	1			11.1	170.0	464		-	-
	3		-	-	1			10.8	178.0	474		-	-

Table 2 (continued).

No	Pt	MET	St	F	S	ϵ_2	p	h	a	D	H	Remarks	θ	
35	4	23.32.14	Li	HA	l			10.2	-174.0	496		H supposed = 110 km	24-26	
	5		-	-	l			9.8	-168.0	509		-	-	
	1	23.33.15	Li	HA	l			7.9	-156.3	567		H supposed = 105 km	25-26	
	2		Li-C	-	l	-68.7	5.2	8.9	-160.0	519	103		-	
	3		-	-	l	-72.0	4.6	10.0	-164.6	496	107		-	
	4		-	-	l	-75.3	4.0	10.7	-168.5	469	106		-	
27*	5		Li	-	l			11.2	-176.0	447		H supposed = 105 km	-	
	6		-	-	l			11.4	178.0	441		-	-	
	1	23.37.19	C-K ₄	R	h	0.1	4.2	20.3	151.6	795	363	1, 2, 7, 3 one ray	24-26	
	2		-	-	m	0.0	4.2	16.0	151.8	822	303	4, 5, 6 another	-	
	3		-	-	l			10.8	152.0	856	228	Both sunlit	-	
	7		-	-	m	-0.1	4.2	13.3	151.9	839	364		-	
37-	4		-	-	h	-4.8	4.4	24.7	155.8	730	400		-	
	5		-	-	m	-5.1	4.8	20.1	155.9	699	308		-	
	6		-	-	l	-5.3	5.1	16.6	156.0	668	247		-	
	34*	1	23.56.15	Li-O	HA	l	-64.5	11.3	12.9	142.9	337	87	Li 37 and O 34*	25-26
	2		-	-	l	-66.5	10.4	13.2	146.1	337	89		-	
	3		-	-	l	-69.8	9.4	13.7	151.0	323	88		-	
38	4		-	-	l	-72.1	8.2	13.9	155.1	328	90		-	
	5		O	-	l			8.5	170.0	477		H supposed = 89 km	25-27	
	6		-	-	l			8.2	176.3	480		-	-	
	7		-	-	l			8.1	148.0	491		-	-	
	8		-	-	l			7.5	142.0	516		-	-	
	9		-	-	l			7.1	138.0	532		-	-	
40	2	23.57.23	Li-C	HA	l	-79.9	3.2	13.1	-179.6	450	106		26-27	
	3		-	-	l	-80.5	3.5	13.7	174.5	343	94		-	
	4		-	-	l	-79.8	4.1	14.0	169.5	316	87		-	
	5		Li	-	l			14.3	164.0	334		H supposed = 95 km	25-26	
	6		-	-	l			14.3	158.1	334		-	-	
	7		-	-	l			13.9	152.8	342		-	-	
41	1	0.00.59	Li-C	RA	l	-70.3	5.9	10.5	-162.0	423	93	Point 1 doubtful	25-27	
	2		-	-	l	-73.9	4.7	11.2	-167.4	435	102		-	
	3		-	-	l	-76.3	4.15	11.8	-171.5	419	102		-	
	4		-	-	l	-78.0	3.7	12.6	-175.1	412	106		-	
	5		-	-	l	-79.3	3.6	13.7	-179.5	376	104		-	
	6		-	-	l	-80.0	3.6	14.6	175.1	351	102		-	
42	7		Li	-	l			15.3	168.6	336		H supposed = 102 km	-	
	1	0.02.24	Li-C	RA	l	-65.0	5.45	7.9	-155.5	576	107		25-26	
	2		-	-	l	-68.3	5.2	8.7	-159.6	528	104		-	
	1	0.03.34	Li	RA	l			8.7	126.0	467		H supposed = 90 km	24-26	
	2		-	-	l			10.0	132.0	423			-	
	3		-	-	l			11.0	138.0	394			-	
45	4		-	-	l			11.9	146.0	368			-	
	1		-	-	l			8.7	126.0	551		H supposed = 110 km	-	
	2		-	-	l			10.0	132.0	502			-	
	3		-	-	l			11.0	138.0	468			-	
	4		-	-	l			11.9	146.0	440			-	
	1	2.07.45	Li-C	R	h	-50.4	7.3	14.9	129.3	624	203		23-24	
37*	2		-	-	m	-51.8	7.2	11.1	130.1	630	158		-	
	3		-	-	l	-52.8	7.1	8.0	130.7	632	122		-	
	1	2.11.52	O-K ₄	R	h	3.9	3.3	16.4	172.6	852	325	Sunlit	22-23	
	2		-	-	m	4.0	3.3	13.6	172.5	869	282		-	

Table 2 (continued).

No	Pt	MET	St	F	S	ϵ_2	p	h	a	D	H	Remarks	θ
38*	3	2.11.52	O-K ₄	R	m	4.1	3.4	10.7	172.4	862	228		22-23
	4		-	-	l	4.2	3.2	7.7	172.4	977	199		-
	5		-	-	h	-8.0	3.7	16.3	-175.3	760	280		23-25
	6		-	-	m	-7.7	3.75	11.7	-175.7	772	214		-
	7		-	-	l	-7.3	3.6	7.8	-176.1	822	170		-
	1	2.13.18	O-K ₄	R	h	-15.4	3.2	15.5	-166.9	857	309	Sunlit	23-25
	2		-	-	m	-15.4	3.3	11.4	-167.3	852	237	1-2-3 one ray	-
3		-	-	l'	-15.5	3.5	7.6	-167.7	822	167		-	
5		-	-	h	-4.3	3.2	16.7	-178.5	877	341	5-6-7 another	-	
6		-	-	m	-4.2	3.3	13.7	-178.8	869	284		-	
7		-	-	l'	-4.1	3.5	9.8	-179.1	841	208		-	
49	2	2.14.42	L σ -Li	R	h'	-56.1	11.2	18.4	-148.4	621	245	Sunlit	24-25
	3		-	-	m	-57.7	11.2	14.7	-149.2	612	195		-
	4		-	-	m	-58.9	10.9	10.9	-149.9	620	153		-
	5		L σ	-	l			7.1	-150.6	631	112		23-24
50	1	2.15.43	Li-C	R	h	-61.5	4.3	17.8	-156.9	767	307	Sunlit	24-25
	2		-	-	m	-63.2	4.1	14.2	-157.2	783	256		-
	3		-	-	m	-64.6	3.8	10.5	-157.5	820	212		-
	4		-	-	l'	-65.2	3.7	8.7	-157.7	831	187		-
50	3	2.15.43	L σ -Li	R	h'	-55.5	12.0	16.5	-146.4	599	212	Sunlit	24-25
	4		-	-	m	-56.2	11.7	14.1	-146.9	612	189		-
	5		-	-	m	-56.7	11.4	11.9	-147.3	627	167		-
51	6		L σ	-	l'			7.3	-148.2	632	114		-
	1	2.16.50	Li-C	R	h			18.6	-154.7	836	355	Sunlit	24-25
	2		-	-	m	-61.0	4.0	15.2	-155.2	852	302		-
	3		-	-	m	-62.2	3.9	12.4	-155.6	857	256		-
	4		-	-	m	-63.1	3.7	9.9	-155.9	889	225		-
51	5		-	-	l'	-63.9	3.6	7.3	-156.3	900	184		-
	2	2.16.50	L σ -Li	R	m	-51.7	11.7	20.4	-143.5	649	287	Sunlit	24-25
	3		-	-	m	-53.1	11.7	17.1	-144.1	646	240		-
	4		-	-	m	-54.1	11.5	14.0	-144.7	655	203		-
	5		-	-	m	-55.0	11.3	10.9	-145.2	663	166		-
	6		L σ	-	l'			8.6	-145.6	668	139		-
39*	1	2.18.03	O-K ₄	R	h	-23.1	2.9	16.9	-158.6	889	352	Sunlit	23-25
	2		-	-	m	-23.0	2.8	12.8	-158.9	949	299	1-2-3-4 one ray	-
	3		-	-	m	-22.9	2.7	8.2	-159.2	1010	233	5-6-7-8 another	-
	5		-	-	h	-17.0	3.1	16.0	-165.4	873	326		-
	6		-	-	m	-16.9	3.1	11.3	-165.7	900	254		-
	7		-	-	m	-16.8	3.0	7.5	-165.9	950	202		-
	8		O	-	l			5.4	-166.0	959	167		-
	52	1	2.18.07	Li-C	R	h	-58.0	4.6	18.9	-152.8	789	336	Sunlit
2		-	-	m	-60.05	4.35	14.4	-153.4	814	272		-	
3		-	-	m	-61.2	4.3	11.6	-153.8	808	225		-	
4		-	-	l	-62.5	4.0	7.6	-154.5	850	175		-	

April 18-19, 1933.

a	1	23.35.15	L σ	HA	l			12.5	-172.0	391	For all pictures H is supposed = 100 km 1, 2, 3 upper, 4, 5, 6 lower arc	22-24
	2				l		11.4	-167.0	421	-		
	3				l		9.4	-162.0	485	-		
	4				l		8.7	-172.0	512	-		
	5				l		8.2	-169.4	531	-		
	6				l		7.3	-167.0	572	-		
b	1	23.38.15	L σ	HA	l			10.9	163.0	437	22-24	
	2				l		10.3	169.0	456	-		
	3				l		9.7	176.0	475	-		

Table 2 (continued).

No	Pt	MET	St	F	S	ϵ_2	p	h	a	D	H	Remarks	θ
c	4	23.38.15	L \emptyset	HA	l			8.8	-174.0	508		H supposed = 100 km	22-24
	5				l			7.7	-165.0	553			-
	1	23.40.15	L \emptyset	HA	l			10.5	140.0	449			-
	2				l			10.7	148.0	443			-
	3				l			10.6	156.0	445			-
d	4				l			10.5	164.0	449		-	
	5				l			10.2	172.0	458		-	
	1	23.42.15	L \emptyset	HA	l			8.6	127.1	515		-	
	2				l			10.0	132.3	465		-	
	3				l			11.0	138.0	434		-	
o	4				l			11.4	142.0	422		-	
	1	0.40.10	L \emptyset	HA	l			14.7	162.0	340		23-24	
	2				l			14.3	170.0	350		-	
	3				l			13.3	180.0	373		-	
	4				l			11.6	-170.0	417		-	
p	5				l			10.2	-162.1	457		-	
	6	0.42.10	L \emptyset	HA	l			9.2	124.0	493		23-24	
	7				l			10.7	131.0	443		-	
	8				l			12.0	140.0	406		-	
	9				l			12.8	148.0	385		-	
z	10				l			12.9	154.8	382		-	
	1	2.25.15	L \emptyset	HA	l			6.0	130.0	634		21-22	
	2				l			6.9	138.0	589		-	
	3				l			7.2	146.0	577		-	
	4				l			7.3	156.0	572		-	
	5				l			7.0	164.0	584		-	
	6				l			6.7	170.0	600		-	

April 21-22, 1933.

1	1	0.41.55	C-K ₄	R	h	-17.6	2.7	14.5	171.7	1206	454	All sunlit	19-20
	2				m	-17.7	2.8	11.7	171.6	1187	376		-
	3				m	-17.7	2.75	8.8	171.5	1231	323		-
	4				l	-17.7	2.7	6.3	171.5	1271	276		-
2	1	0.44.47	C-K ₄	R	h	-17.9	3.35	16.3	171.5	970	378	21-22	
	2				m	-17.9	3.35	13.8	171.3	989	332		-
	3				m	-17.8	3.4	10.5	171.1	995	272		-
2	1	0.44.47	T-K ₄	R	h	-34.5	4.55	17.4	170.7	982	406	The points 1, 2, 3 are the same as for baseline C-K ₄	21-22
	2				m	-34.7	4.6	14.7	170.3	909	354		-
	3				m	-35.0	4.75	11.2	170.0	979	280		-
	4				l	-36.2	4.8	9.3	169.9	957	236		-
3	1	1.03.57	C-K ₄	R	h	-20.4	3.8	17.4	173.8	842	339	1-2-3-4 one ray 5-6-7 another	21-23
	2				m	-20.6	3.6	12.6	173.7	916	285		-
	3				m	-20.7	3.5	8.5	173.6	966	224		-
	4				l	-20.8	3.5	6.0	173.5	962	179		-
	5				h	-19.0	3.4	13.3	172.4	971	317		-
	6				m	-19.2	3.4	9.5	172.3	993	252		-
	7				l	-19.3	3.4	6.6	172.2	1008	201		-
3	1	1.03.57	T-K ₄	R	h	-37.0	4.8	17.1	172.8	906	366	The same. Points 2, 3 and 6 common	21-22
	2				m	-37.5	4.8	13.4	172.7	929	301		-
	3				m	-38.0	4.8	9.1	172.7	943	228		-
	4				l	-38.3	4.9	5.7	172.6	938	169		-
	5				h	-35.9	4.8	14.7	171.2	938	330		-
	6				m	-36.4	4.8	10.2	171.2	960	354		-
	7				l	-36.7	4.9	6.3	171.2	957	182		-
4	1	1.15.25	T-K ₄	R	h	-32.3	4.3	15.1	167.9	1077	419	19-21	

Table 2 (continued).

No	Pt	MET	St	F	S	ϵ_2	p	h	a	D	H	Remarks	θ
	2	1.15.25	T-K ₄	R	m	-32.8	4.4	11.0	167.8	1083	316		19-21
	3				l	-33.4	4.5	5.6	167.8	1083	203		-
	4				h	-20.1	6.1	18.6	153.8	833	356		-
	5				m	-20.6	6.1	15.2	154.0	853	305		-
	6				m	-21.1	6.2	12.3	154.2	855	254		-
	7				l	-21.6	6.3	9.5	154.4	851	208		-
<i>May 1-2, 1933.</i>													
7	1	22.21.40	O-K ₄	R	m	31.0	6.6	40.2	53.7	295	265	Sunlit	30-32
	2			-	m	25.2	5.6	46.6	49.0	324	370		-
	3				h	20.0	5.0	52.0	44.0	334	466		-
8	1	22.22.48	O-K ₄		l'	29.7	7.9	42.4	56.7	243	234	1-2-3 one ray	30-32
	2				m	23.4	7.3	48.8	51.8	245	297	4-5-6 another	-
	3				m	18.7	5.6	54.5	45.6	285	432	7 a third one	-
	4				l'	25.3	8.1	43.0	49.6	244	239		-
	5				m	21.3	7.0	47.5	45.6	265	308		-
	6				h	17.6	5.6	52.1	40.5	304	422		-
	7				m	7.1	7.9	61.0	32.8	179	342		-
9	1	22.23.57	C	C				70.5	-10.0			Point 1 is the point of radiation	
	1		K ₄	-				70.5	-11.5				
10	1	22.24.27	C	C				70.5	-14.0			The same	
	1		K ₄	-				69.0	-9.0				
11	1	22.24.57	C	C				70.0	-14.0			good	
	1		K ₄	-				69.5	-12.0				
12	1	22.25.49	K ₄ -O	RB	h'	-55.5	7.8	34.7	115.7	181	130	The points 1, 2, 3, 4, 5	27-29
	2			D	m	-56.9	7.7	32.0	116.7	175	113	6, 7, 8, 9, 10, 11, 12, 16,	-
	3				l	-57.6	7.4	28.5	118.8	177	109	17 and 18 belong to RB,	-
	4				h	-53.2	7.3	35.1	118.4	204	148	the points 13, 14, 15 to a	-
	5				m	-55.1	7.2	31.0	120.0	208	130	ray to the right of it. All	-
	6				m	-49.7	6.3	35.9	121.7	250	191	sunlit	-
	7				m	-51.1	6.4	33.0	122.8	246	168		-
	8				m	-52.3	6.6	30.2	133.7	213	148		-
	9				m	-53.6	6.5	26.0	125.0	250	128		-
	10				l'	-54.7	6.4	22.0	125.8	255	109		-
	11				l	-55.7	6.0	19.6	125.3	269	103		-
	12				l	-57.1	5.5	17.7	124.0	286	99		-
	13			R	m	-41.0	7.0	27.9	140.6	288	162	13, 14, 15 doubtful	26-28
	14			-	m	-41.5	6.3	24.2	140.8	327	159		-
	15			-	m	-41.8	5.7	20.7	140.9	370	153		-
	16			RB	h	-47.1	6.2	40.6	119.9	250	225		28-29
	17			-	l	-56.8	7.3	26.5	121.5	206	106		-
	18			-	h	-54.5	7.5	36.0	115.2	189	143		-
13	1	22.27.44	C-O	R	h'	26.6	2.8	54.3	46.7	275	410	Sunlit	30-31
	2				m	27.4	3.3	49.8	51.3	259	326		-
	3				m	28.0	4.6	36.1	60.9	232	181		-
	4				l'	27.9	4.8	33.7	62.2	234	164		-
14	1	22.28.32	C-O	R	m	20.5	4.3	56.8	52.3	180	288	1-2 one ray	29-31
	2				l	20.0	5.7	52.8	56.7	148	202	3-4-5 another	-
	3				m	19.3	4.3	54.1	59.5	193	282	6-7-8 a third one	-
	4				m	18.7	5.1	49.5	64.2	183	224	1, 2, 3, 4, 5 sunlit	-
	5				l	17.8	5.9	43.3	69.3	179	175	6, 7, 8 in shadow	-
	6				l'	30.5	6.0	36.9	54.6	177	137		-
	7				l	30.6	6.4	34.0	56.4	173	120		-
	8				l	29.5	6.5	30.1	60.0	179	108		-

Table 2 (continued).

No	Pt	MET	St	F	S	ϵ_2	p	h	a	D	H	Remarks	θ
15	1	22.29.49	C	C				70.0	— 12.5			h and a for the point of radiation of the corona	
	1		O	C			69.5	— 13.0					
	1		K ₄	C			69.5	— 13.0					
15	1	22.29.49	C	C				70.5	— 11.0			New measurements	
	1		O	C			70.0	— 15.0					
	1		K ₄	C			69.5	— 13.0					
16	1	22.30.30	C	C				70.5	— 7.0			Point of radiation a from C doubtful	
	1		O	C			70.5	— 14.0					
17	1	22.31.42	O-K ₄	RB	l'	—41.6	9.9	25.8	144.2	209	105	In shadow	28-29
	2				l'	—41.0	9.8	29.2	143.7	205	120	Sunlit	—
	3				l'	—37.3	10.5	28.8	149.0	203	116	—	—
	4			O	—	l						103	—
18	1	22.32.09	O-K ₄	RB	l'	38.4	5.2	11.7	135.1	449	110	Sunlit	26-28
	2			m	38.2	5.5	15.6	134.0	417	132	—	—	
	3			m	36.6	6.0	20.8	133.4	378	158	—	—	
	4			O	h	27.6		27.6	132.4	420	241	—	—
	5			O-K ₄	l'	29.2	6.4	12.6	143.5	407	105	—	—
	6			m	28.9	6.5	14.9	143.2	395	119	—	—	
	7			m	28.2	7.1	18.9	142.3	355	134	—	—	
	8			O	h	25.3		25.3	142.1	386	200	—	—
	9			O-K ₄	l'	34.0	5.7	11.8	139.2	433	106	—	—
	10			O	l	10.9		10.9				104	Near point 1
23	1	22.37.42	O-K ₄	R	l	5.3	6.6	10.3	168.2	442	99	Sunlit point 1	—
	2			m	5.1	6.5	18.1	167.9	440	163	—	—	
	3			h	4.9	6.3	25.9	167.6	425	228	—	—	
	4			RB	l	9.5	5.9	10.4	170.6	500	113	—	—
	5			l	11.6	5.3	9.5	168.4	554	118	—	—	
	6			l	13.3	5.5	8.4	166.8	532	102	—	—	
29	2	22.43.28	O-K ₄	R	m	37.0	4.6	28.5	131.3	451	271	2, 3, 4, 5 one ray	25-27
	3			m	39.7	4.3	12.7	134.8	528	143	6, 7, 8 another	—	
	4			l'	34.6	4.0	9.8	135.7	575	127	9, 10, 11 a third one	—	
	5			m	41.1	4.1	12.5	133.7	541	145	—	—	
	6			h	41.6	4.4	34.7	118.9	412	312	12, 13, 14 a fourth one.	26-28	
	7			m	46.7	4.1	23.7	122.4	458	223	Sunlit	—	
	8			l	49.1	3.7	13.1	125.3	521	145	—	—	
	9			m	28.8	9.8	41.0	124.1	205	185	—	28-29	
	10			m	31.5	10.2	34.5	126.2	209	149	—	—	
	11			m	34.0	10.8	26.2	128.6	212	109	—	—	
	12			m	30.4	9.4	40.1	123.0	212	187	—	—	
	13			m	33.1	9.7	33.8	125.2	218	152	—	—	
	14			m	35.7	10.0	26.1	127.5	223	115	—	—	
	32		1	22.45.48	C-O	R	l'	—27.5	3.8	18.4	128.0	341	124	Sunlit	27-28
2			m		—20.0	3.4	36.7	124.0	334	267	—	—	
3			h'		—13.7	3.0	49.4	119.4	312	392	—	—	
33	1	22.46.49	C-O	R	h'	13.9	3.5	67.2	— 26.6	160	402	Sunlit	31-32
	2			m	11.5	4.2	65.8	— 35.5	143	335	—	—	
	3			m	9.5	4.8	64.4	— 42.1	134	291	—	—	
	4			C	C			71.5	— 11.0			Point of radiation	—
35	1	22.48.31	O-K ₄	R	l	50.6	3.4	12.4	124.4	551	148	Sunlit	26-27
	2			m	47.8	3.5	24.6	121.3	518	268	—	—	
	3			h	42.3	3.4	36.0	118.5	511	416	—	—	
37	1	22.50.58	C-O	R	h'	10.2	4.5	75.1	18.5	85	331	1-2 one ray	30-31
	2			m	6.5	6.4	74.9	42.3	62	236	3-4 another	—	
	3			m	19.1	5.5	64.5	24.4	112	244	—	—	

Table 2 (continued.)

No	Pt	MET	St	F	S	ϵ_2	p	h	a	D	H	Remarks	θ		
41	4	22.20.58	C-O	R	h'	18.9	4.2	66.7	16.2	133	325	Point of radiation	30-31		
	5		C	C				71.0	— 9.5						
	6		O	C				71.0	— 10.0						
	7		K ₄	C				71.0	— 16.0						
	1	22.54.40	O-K ₄	RB	l	21.4	4.6	7.7	154.0	609	113			Sunlit	24-26
	2				m	20.9	4.7	19.4	152.7	560	229			—	—
	3				h'	19.5	4.9	30.1	151.4	491	317			—	—
42	4				l'	18.4	4.7	7.8	157.0	607	114	—	—		
	5				m	17.8	4.7	18.0	156.4	577	220	—	—		
	6				h'	16.9	4.6	27.2	155.7	545	317	—	—		
	7		O		h			31.0	155.4	528	358	—	—		
	8		O-K ₄		l	16.7	5.3	8.5	158.2	544	106	—	—		
	1	22.55.03	C-O	RB	h	-45.5	1.9	26.9	-127.5	495	281	Points 1 and 2 sunlit,	28-30		
	2				m	-50.9	1.8	18.8	-130.0	504	197	3 and 5 in shadow	—		
43	3				l'	-55.7	1.7	10.3	-132.3	504	113	(doubtful)	—		
	5				l'	-57.1	1.7	9.4	-133.5	488	101	—	—		
	1	22.55.48	O-K ₄	D	m	25.0	4.7	27.2	146.3	507	292	The whole D sunlit. 1, 2,	25-26		
	2				m	25.7	4.8	20.3	147.3	525	222	3, 4 one ray of the drapery	—		
	3				m	26.2	5.0	11.8	148.0	532	135	5, 6, 7 another 8, 11 a third ray	—		
	4				l	25.5	5.0	7.4	149.1	546	95	—	—		
	5				m	21.3	5.6	27.9	149.4	437	225	—	26-28		
	6				m	22.0	6.2	13.9	150.8	441	121	—	—		
	7				l	21.7	6.2	10.9	151.5	448	103	—	—		
	8				l	18.5	6.1	12.3	154.8	462	119	—	—		
	9				l	14.6	7.4	14.5	157.1	386	112	—	—		
44	10				l	10.2	8.2	16.6	160.7	350	116	—	—		
	11				m	18.0	5.6	28.6	153.0	443	267	—	—		
	1	22.56.04	C-K ₄	D	h'	3.1	7.0	40.3	143.1	388	359	Sunlit	25-27		
	2				m	2.7	7.6	29.5	144.6	416	256	—	—		
44	3				l'	1.2	8.1	12.1	146.6	448	112	—	—		
	4				l	0.0	8.0	9.9	148.1	458	96	—	—		
	1		O-K ₄	D	m	22.8	5.6	29.0	147.0	428	260	1, 2, 3 left edge, sunlit	25-28		
	2				m	23.8	5.7	22.0	148.0	446	201	—	—		
	3				m	24.4	5.7	12.4	149.1	474	123	4 sunlit, 5, 6 in shadow	—		
	4				l	23.7	5.8	9.1	150.2	476	94	—	—		
	5				l	17.0	9.1	13.9	153.2	312	85	5 and 6 not so reliable	—		
45	6				l	11.3	8.8	16.2	159.1	258	81	—	—		
	1	22.56.18	C-K ₄	D	h'	1.6	8.4	41.4	142.8	321	304	1, 2, 3 left edge	26-28		
	2				m	1.0	8.9	29.5	144.9	357	219	1, 2, 3, 4 in sunlight; 5, 6 in shadow	—		
	3				m	0.0	9.1	16.0	146.7	391	126	—	—		
	4				l	- 1.1	9.2	12.6	147.9	395	101	—	—		
	5				l	- 6.3	10.2	16.0	152.1	349	101	—	—		
	6				l	-10.3	11.6	18.0	154.8	300	106	—	—		
46	2	22.56.34	O-K ₄	D	m	17.6	8.2	19.3	153.0	333	129	—	27-28		
	3				m	17.3	7.9	24.5	152.5	334	166	—	—		
	4				l	16.0	4.3	4.8	160.0	650	94	—	24-25		
	5				l	17.4	4.6	5.6	158.3	630	94	—	—		
	6				m	17.7	4.5	7.7	158.0	639	120	—	—		
	8				l'	15.5	4.9	6.0	159.9	598	92	—	—		
	9				l'	14.9	4.7	6.6	160.7	623	103	2, 3 one ray	—		
	11				l	10.5	7.5	11.7	162.1	394	95	4-9 lower part	26-27		
	12				l	5.7	11.1	19.7	162.5	259	100	10-11 another	27-28		
	13				l'	6.5	11.1	20.4	161.6	257	103	lower part,	—		
	14				m	6.2	11.1	24.2	161.4	250	120	12-16 another ray	—		
	15				l'	4.7	11.2	20.6	163.5	255	103	—	—		
	16				m	4.4	11.2	24.3	163.3	248	119	—	—		

Table 2 (continued.)

No	Pt	MET	St	F	S	ε_2	p	h	a	D	H	Remarks	θ
47	1	22.56.34	C-K ₄	D	l	- 5.5	10.6	16.0	150.3	336	108		26-28
	2				m	- 4.6	10.6	26.0	149.7	312	165		-
	3				m	- 3.7	10.3	33.8	148.5	295	211		-
	1	22.56.58	O-K ₄	D	m	21.8	5.5	25.1	150.0	456	237	Sunlit	25-27
	2				m	22.4	5.6	18.3	150.5	472	177	1, 2, 3, 4 along the left	-
	3				m	22.7	5.6	11.9	151.3	490	123	edge	-
	4				l'	22.4	5.6	9.1	151.8	497	100		-
	6				l	21.2	5.7	9.5	152.9	491	102		-
48	7				m	6.6	8.2	16.9	164.9	352	118		-
	8				l	7.4	7.7	14.0	164.9	381	107		-
	1		C-K ₄	D	l	- 2.4	8.2	9.7	150.5	448	94	Left edge of D	25-26
	2				m	- 1.0	7.9	12.1	149.4	460	117	-	-
	3				m	- 0.3	7.6	17.9	148.7	460	170	-	-
	4				m	0.1	7.4	21.9	148.2	461	208	-	-
	5				m	- 2.1	8.1	12.1	150.2	449	114	-	-
	6				m	- 1.3	7.7	17.9	149.7	455	168	-	-
	7				m	- 0.9	7.5	21.9	149.1	453	204	-	-
	1	22.57.31	O-K ₄	D	l	21.0	6.5	14.2	151.9	424	124	1, 2, 3 one ray	26-28
	2				m	20.8	6.5	19.1	151.3	412	160	4, 5, 6 another	-
	3				m	20.5	6.6	22.5	150.8	396	181		-
	49	4				m	6.2	10.0	16.9	163.4	290	97	
5					m	6.1	9.8	18.8	163.5	287	106		-
6					l			15.3	163.4	292	90		-
2		22.58.13	O-K ₄	D	m	17.3	5.2	29.7	153.2	471	298	All points except	25-26
3					m	18.3	5.5	19.8	154.7	488	200	No. 14 in sunlight	-
4					l	18.5	5.8	9.1	155.8	492	99	5 rays:	-
6					m	13.3	7.0	31.1	156.1	361	225	2-3-4	26-28
7					m	13.9	7.6	23.1	156.8	355	165	6-7-8	-
8					l	14.2	7.8	15.2	157.5	366	111		-
9					m	12.5	7.2	29.5	157.2	353	215	9-10	-
10					l'	13.3	7.6	17.0	158.3	372	126		-
12					m	3.7	10.5	29.5	164.1	251	149	12-13-14	27-28
13					m	3.8	10.8	25.2	164.3	255	126		-
14					l	3.9	11.0	20.0	164.5	260	101		-
15					m	17.6	5.7	10.7	156.7	499	115	15-16	25-26
49		16				l'	17.3	5.4	8.6	157.6	532	104	
	1	22.58.13	C-K ₄	D	m	- 4.5	7.8	13.8	152.8	459	132	1, 2, 3, 9 one ray	25-27
	2				m	- 3.7	7.8	23.7	151.7	429	210		-
	3				h	- 3.0	7.7	31.6	150.8	401	270		-
	4				m	- 9.6	10.2	19.8	155.7	338	134	4, 5, 6 another	26-28
	5				m	- 9.1	10.1	25.8	155.2	325	171		-
50	6				m	- 8.7	10.0	29.7	154.9	316	194		-
	9				l						95		25-27
	1	22.58.38	C-K ₄	D	m	- 4.5	7.6	35.2	152.3	386	296	All points except	25-28
	2				m	- 5.7	8.0	24.1	153.7	416	205	No. 7 and 8 sunlit	-
	3				m	- 6.6	8.1	14.1	154.8	441	127	1-2-3-4 one ray at the	-
	4				l	- 6.1	7.7	10.8	154.8	466	108	left border	-
	5				l'	-10.7	9.6	16.8	157.5	364	122		-
	6				l	-11.6	9.3	15.2	158.7	378	115		-
50	7				l	-20.5	14.3	26.1	163.1	220	112		-
	8				l	-18.0	12.5	22.0	162.1	263	113		-
	1	22.58.38	O-K ₄	D	l	17.6	5.6	9.3	156.6	513	106	1-8 left edge	25-27
	2				m	17.8	5.7	12.4	156.5	541	145		-
	3				m	17.6	5.0	19.8	156.0	537	223		-
4				m	17.1	4.7	27.4	155.4	533	312		-	

Table 2 (continued.)

No	Pt	MET	St	F	S	ϵ_2	p	h	a	D	H	Remarks	0			
51	5	22.58.38	O-K ₅	D	m	16.8	7.4	14.1	155.2	383	110		25-27			
	6				m	16.7	7.1	19.6	154.7	385	152	-				
	7				m	16.2	6.8	27.1	154.1	377	211	-				
	8				m	17.0	6.9	12.4	155.7	414	107	-				
	9				l	14.0	7.5	13.0	158.1	385	103	9-12 lower border	-			
	10				l	12.3	7.5	13.9	159.7	386	110	-				
	11				l	10.7	7.3	13.3	161.6	401	110	-				
	12				l	8.7	7.3	12.5	163.8	404	104	-				
	1				22.59.00	C-K ₄	D	h'	-5.8	7.7	35.1	153.9	381	291	1-2-3 left border	26-27
	2							m	-7.0	8.2	22.1	154.9	412	184	All sunlit except per-	-
	3							l	-7.7	8.3	11.1	155.6	436	101	haps point 3	-
	4							l	-10.9	10.0	14.2	157.1	354	100	-	
5	l	-15.6	9.6	15.0				162.3	360	108	-					
52	1	22.59.33	C-O	D	m	34.9	2.3	33.5	-117.0	444	324	Sunlit	29-31			
	2				m	39.8	2.5	27.2	-119.7	415	234	-				
	4				m	33.7	2.4	28.3	-112.8	458	273	-				
	5				m	37.5	2.3	22.3	-115.2	485	223	-				
	6				m	40.5	2.0	16.5	-117.4	556	194	-				
	7					C	h'			36.0	-109.3	436	349	-		
	8					O	l			10.7	-121.3	584	138	-		
	55				1	23.01.16	C-O	R	m			54.0	133.5	219	317	Sunlit
2		m	26.6	3.8	45.5				136.6	249	267	-				
3		m	33.1	3.8	34.6				139.4	276	201	-				
4		l	39.4	3.4	21.3				141.9	325	137	-				
56	1	23.01.52	C	R	h'			54.0	133.9	282	418	Sunlit	26-28			
	2					C-O	m	-27.9	3.0	43.0	137.9	323	384	-		
	3				m	-35.4	3.1	30.4	141.1	345	218	-				
	4				l	-41.2	2.8	17.6	143.5	393	139	-				
59	1	23.03.29	O-K ₄	R	m	62.3	3.55	20.2	103.9	371	150	In shadow	28-29			
	2				m	64.7	3.3	16.6	105.1	375	125	1-2-3 one ray	-			
	3				l	66.5	3.2	13.1	106.2	370	98	4-5 another	-			
	4				m	70.9	2.3	12.8	101.5	421	111	-				
	5				l	72.1	2.1	10.2	102.6	438	94	-				
61	1	23.05.07	O-K ₄	D	h'			39.2	-186.7		321	Sunlit	26-28			
	2				m	-0.8	6.7	29.1	-186.6	389	236	3 rays:	-			
	3				m	-0.5	6.8	21.2	-186.4	414	177	1-2-3-4,	-			
	4				l	-0.2	6.9	11.7	-186.0	432	105	-				
	5				h'	-2.9	6.7	27.3	-184.1	396	223	5-6 and	-			
	6				l	-2.7	6.8	14.8	-183.7	431	130	-				
	7				h'			41.8	-175.0		333	7-8-9-10	-			
	8				m	-10.5	6.6	35.4	-175.3	361	277	-				
	9				m	-10.6	6.9	25.5	-175.8	387	201	-				
	10				l	-10.6	7.1	14.6	-176.0	407	120	-				
62	1	23.05.38	C	R	h'			54.0	-144.0	222	323	1, 2 in sunlight	28-29			
	2					C-K ₄	m	-46.4	7.7	40.5	-148.6	249	223	4, 5 in shadow	-	
	3					-	m	-50.3	7.5	32.0	-150.5	265	175	-		
	4				m	-53.4	7.3	23.0	-152.2	278	125	-				
	5				l	-53.6	7.3	18.3	-154.0	286	102	-				
63	1	23.05.56	C	R	h'			54.0	-146.3	235	343	1, 2 sunlit	27-29			
	2					C-K ₄	m	-44.1	7.2	41.7	-150.5	270	255	4, 5, 6 in shadow	-	
	3				m	-48.9	6.9	30.0	-153.3	302	186	-				
	4				m	-51.9	6.6	18.0	-155.3	329	117	-				
	5				l'	-51.9	6.4	16.5	-155.6	342	112	-				
	6				l	-51.6	6.6	15.1	-156.6	338	101	-				
64	1	23.06.15	C	R	h'			54.1	-145.2	294	436	1-2-3-4 one ray	27-29			

Table 2 (continued.)

No	Pt	MET	St	F	S	ϵ_2	p	h	a	D	H	Remarks	θ	
65	2	23.06.15	C-K ₄		m	-42.7	6.2	43.2	-149.5	311	313	5-6 another	27-29	
	3				m	-46.8	6.2	34.5	-151.9	330	244	The summits in sunlight	--	
	4				l	-50.4	6.4	23.8	-154.2	334	159		--	
	5				m	-49.6	6.2	22.8	-155.4	355	162		--	
	6				l'	-50.7	6.4	17.2	-156.5	350	120		--	
	1	23.06.39	C	R	h'				50.0	-150.7	290	371	3 rays:	27-29
	2		C-K ₄		m	-43.1	6.6	39.5	-153.8	309	272	1-2-3-4	--	
	3				m	-47.4	6.7	27.9	-156.2	327	186		--	
	4				l'	-49.5	6.8	19.0	-157.8	334	125		--	
	5		C		h'				56.1	-141.2	299	484	5-6-7-8 and	--
	6		C-K ₄		m	-43.5	5.8	43.5	-146.7	324	332		--	
	7				m	-47.2	5.9	36.5	-148.8	336	267		--	
	8				l'	-50.5	5.9	28.6	-150.7	345	203		--	
10		C		h'				50.7	-140.8	266	347	10-11-12-13	--	
11		C-K ₄		m	-47.9	6.5	39.4	-145.1	290	253	All in sunlight	--		
12		--		m	-51.5	6.3	31.9	-147.2	306	203		--		
13		--		l	-54.7	6.1	23.4	-149.0	320	149		--		
65	2	23.06.39	O-K ₄	R	m	-26.3	6.7	36.7	-156.2	320	255	2, 3, 4, 5 the same ray	26-29	
	3				m	-27.1	6.8	25.7	-157.3	355	185		--	
	4				m	-27.0	6.8	14.9	-159.1	386	116	11, 12, 13 another ray	--	
	5				l	-26.0	6.3	12.3	-159.9	424	107		--	
	6			RB	l	-24.8	6.3	12.0	-161.1	430	107	2, 3 in sunlight	--	
	7				l	-22.4	5.7	11.5	-162.8	482	118	4, 5, 6 in shadow	--	
	8				l	-21.1	5.2	10.8	-163.7	535	126		--	
	11			R	m	-32.3	6.4	36.7	-147.0	317	250		--	
	12				m	-33.3	6.5	29.4	-148.7	336	204		--	
	13				l	-33.9	6.5	21.4	-150.3	360	154		--	
	33*-65	1	23.06.39	Li-K ₄	RB	l	-76.1	7.0	17.9	-150.8	306	108	In shadow	26-28
	2				l	-77.5	6.1	17.2	-153.9	316	108		--	
	3				l	-78.6	4.9	16.1	-157.3	363	117		--	
33*-65	1	23.06.39	Li-O	R	m	-54.0	18.0	39.0	-140.3	229	194		27-28	
	2				m	-62.3	15.6	23.8	-144.4	247	115		--	
66	1	23.07.03	C-K ₄	R	m	-43.5	6.1	38.5	-153.2	336	288	1-2-3 one ray	27-29	
	2				m	-47.8	6.3	27.7	-155.2	344	195		--	
	3				l	-50.6	6.4	14.5	-157.2	357	103	1 in sunlight	--	
67	1	23.08.12	C	R	h			53.9	-149.8	304	453	1-2-3-4-5 one ray	27-29	
	2		C-K ₄		m	-41.5	6.0	40.1	-154.5	342	311		--	
	3				m	-44.8	6.1	31.7	-156.5	360	240	6-7-8-9 another	--	
	4				m	-47.4	6.1	22.4	-158.3	377	170	10-11-12 a third	--	
	5		C		h			52.2	-142.4	342	484	All sunlit	--	
	6		C-K ₄		m	-45.2	5.2	39.5	-147.2	374	335		--	
	7				m	-50.3	5.2	28.4	-150.3	393	231		--	
	8				m	-52.7	5.1	19.9	-152.2	410	165		--	
	9			K ₄	h			48.0	-140.3	304	363		--	
	10			C-K ₄		m	-46.0	5.7	42.4	-142.5	322	317		--
	11				m	-50.9	5.8	34.0	-145.3	327	237		--	
	67	12			l	-55.3	5.6	23.1	-147.9	344	159		--	
2		23.08.12	O-K ₄	R	m	-24.8	5.8	37.5	-155.8	367	305	1, 2, 3, 4, 5, 6 one ray	27-28	
3					m	-25.5	5.9	29.4	-157.3	396	244		--	
4					m	-25.7	6.0	20.7	-158.7	423	177	7, 8, 9 another	--	
5					m	-24.7	5.3	16.9	-159.5	494	173	All except point	--	
6					l	-24.0	5.6	13.1	-160.7	481	132	9 in sunlight	--	
7					m	-30.7	5.4	26.5	-151.3	424	233		--	
8					m	-30.9	5.5	18.8	-152.8	446	170		--	
9					l	-30.3	5.6	11.3	-154.5	461	110		--	

Table 2 (continued.)

No	Pt	MET	St	F	S	ϵ_2	p	h	a	D	H	Remarks	θ
68	1	23.08.36	C-K ₄	R	h'			41.6	-153.7	351	338	1, 2, 3, 4, 5, 6 one ay	27-29
	2				m	-43.5	5.8	36.5	-154.8	362	290		-
	3				m	-46.0	5.95	29.8	-156.0	370	229	8, 9, 10 another	-
	4				m	-48.0	5.9	22.0	-157.2	386	171	7 lowest point of D	-
	5				m	-48.7	6.4	17.7	-158.4	364	128		-
	6				l'	-48.4	6.3	16.3	-159.1	374	123	All, except no 7 in	-
	7					-46.8	6.5	13.9	-161.5	380	106	sunlight	-
	8					-45.3	6.2	36.9	-152.1	328	264		-
	9					-48.5	6.3	28.9	-153.7	336	200		-
	10					-50.6	6.4	21.3	-155.1	341	144		-
68	1	23.08.36	O-K ₄	R	m	-18.7	6.7	16.6	-166.2	412	138	1, 2 one ray	27-28
	2				l'	-18.8	7.3	13.5	-166.7	385	105	3, 4, 6 another	-
	3				m	-26.3	6.4	28.4	-157.2	369	216	7 the same point as on	-
	4				m	-26.4	6.5	21.1	-158.0	388	165	C-K ₄ 68	-
	6				l'	-25.6	7.1	15.7	-159.5	372	117		-
	7					-23.6	6.7	12.5	-161.1	407	104		-
	69				1	23.08.58	O-K ₄	D	l	-14.1	10.8	20.2	-176.0
2	l	-17.5	9.5	19.4	-171.0				289	109	1, 2, 3, 4, 5 in shadow	-	
3	l	-22.6	9.5	17.6	-165.7				284	97		-	
4	m	-25.3	8.0	17.4	-161.4				329	113	4, 5 right edge	-	
5	l'	-25.2	8.1	15.4	-161.7				329	100		-	
6		-10.1	6.0	17.9	-175.2				470	173	6, 7 ray in sunlight	26-27	
7		-9.8	5.9	14.9	-175.3				488	151		-	
70	1	23.09.21	O-K ₄	D	l	-17.2	11.1	21.7	-173.0	245	103	1, 2, 3, 4 in shadow	28-29
	2				l	-20.5	10.4	19.7	-169.0	260	99		-
	3				l	-24.6	9.7	17.3	-164.1	274	92		-
	4				l	-27.2	9.2	16.1	-161.1	285	89		-
	5					-18.7	5.7	17.5	-166.0	478	173	5, 6, 7 in sunlight	26-27
	6					-18.5	5.8	13.5	-166.6	482	136		-
	7					-18.0	5.7	12.3	-167.2	494	129		-
	72				1	23.10.13	C-O	R	m	-34.6	3.1	19.1	136.5	386	148	1, 2 in sunlight the rest	26-27
2	l	-35.6	3.0	15.6	137.1				403	127	in shadow	-	
3		-37.7	4.2	15.5	137.9				282	85		27-29	
4		-44.2	4.1	18.6	145.9				257	92		-	
5		-49.6	4.4	21.2	152.6				213	86		-	
6		-40.9	3.8	17.1	142.1				293	97		-	
7		-47.1	4.4	20.0	149.2				234	90		-	
8		-52.0	4.6	22.1	155.7				232	99		-	
73	1	23.11.41	O-K ₄	D	h'	-41.5	3.6	35.8	-130.5	491	395	1, 2, 3, 4 edge of D	28-30
	2				m	-43.5	3.9	29.5	-132.5	478	301		-
	3				m	-45.0	4.2	22.0	-134.8	466	211		-
	4				l	-45.5	4.4	14.6	-136.8	465	140		-
	5					-31.9	4.6	37.7	-144.1	445	380	5, 6, 7 ray	27-29
	6					-33.7	4.8	27.4	-146.8	457	263	All sunlit	-
	7					-34.2	4.9	18.3	-148.7	482	182		-
41*	1	23.11.42	Li-C	D	l	-56.8	21.6	31.4	-137.4	165	106	Lower border	28-29
	2				l	-53.9	19.1	25.4	-134.2	213	107		-
	3				l	-50.3	18.7	21.5	-129.2	242	102		-
	4				l	-47.3	17.7	18.5	-126.3	276	101		-
74	1	23.12.11	O-K ₄	D	h'	-42.1	3.0	34.3	-130.6	588	459	1, 2, 3, 4 edge of D.	28-29
	2				m	-44.2	3.4	26.7	-132.8	555	318	Point 1 in sunlight	-
	3				m	-45.4	3.7	19.4	-134.7	534	217		-
76	1	23.20.42	O-K ₄	R	h'	40.7	4.75	33.7	122.3	393	285	Point 4 in shadow	-
	2				m	42.3	4.75	29.9	123.5	400	251	Sunlit	27-28

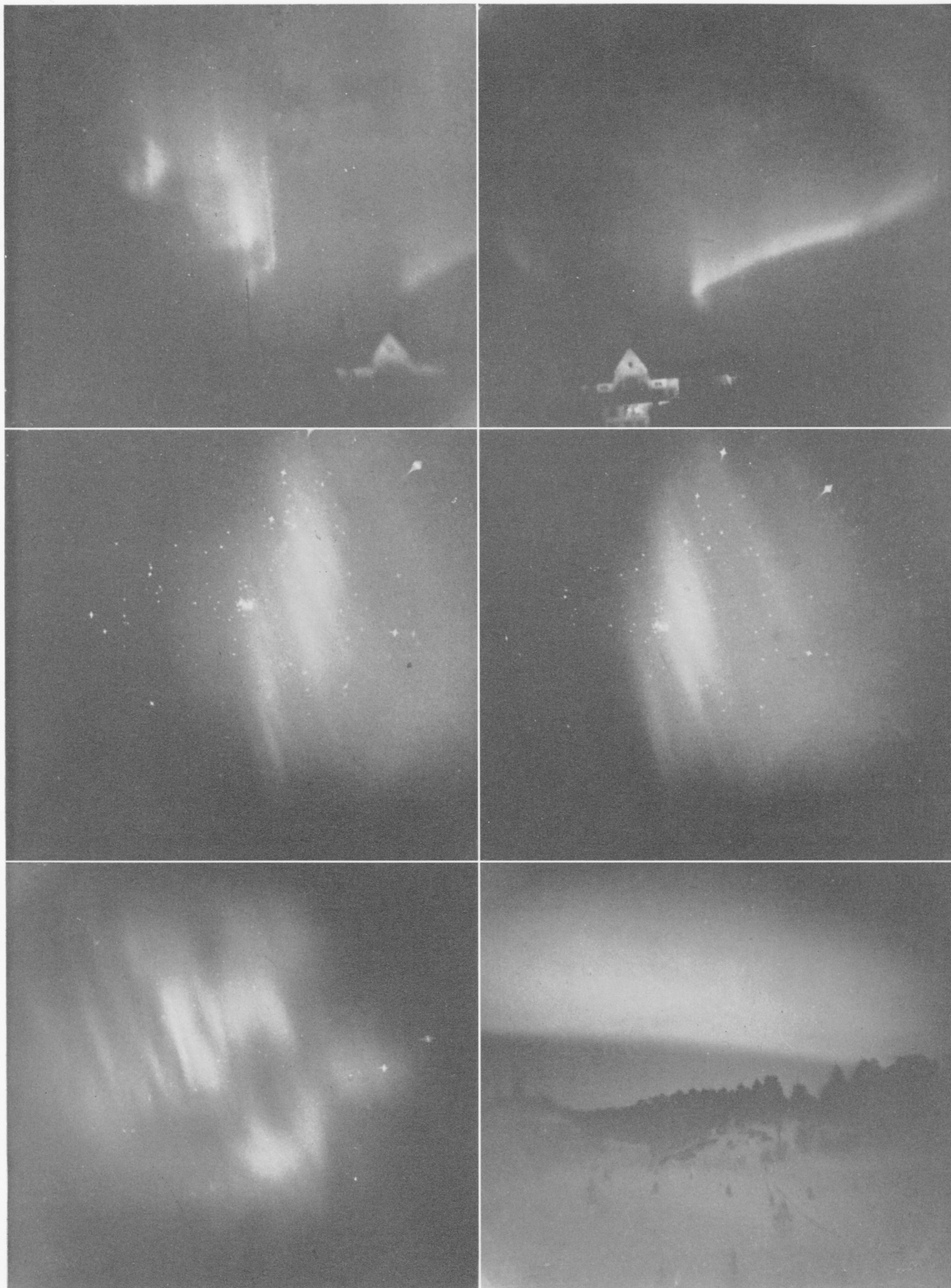
Table 2 (continued.)

No	Pt	MET	St	F	S	ϵ_2	p	h	a	D	H	Remarks	θ
77	3	23.20.42	O-K ₄	R	m	43.4	4.8	26.4	124.5	405	220		27-28
	4				m	44.5	4.8	22.3	125.4	412	187		--
	5				l	45.3	4.9	18.4	126.4	413	163		--
	2	23.21.24	C-K ₄	R	m	20.7	5.05	38.2	136.1	513	453	Feeble, sunlit	24-26
	3				m	20.9	5.0	26.7	138.3	597	345		--
81	4				l'	20.6	5.1	15.4	140.0	645	217		--
	1	23.24.56	O-K ₄	D	h'	19.9	6.0	29.5	149.9	407	251	1, 2, 3 left edge, sunlit	25-27
	2				m	21.3	5.85	22.5	150.6	441	203		--
91	3				l	22.7	5.5	14.5	151.5	491	149		--
	1	23.38.59	O-K ₄	R	h'	-17.3	4.65	34.0	-164.0	497	374	1-2-3-4 one ray	25-27
	2				m	-17.6	4.7	24.9	-165.3	545	287		--
	3				l'	-17.7	4.8	16.5	-166.3	570	200		--
	4				l			13.5	-166.7	578	169		--
	5				h	3.1	5.6	32.2	177.4	445	309	5-6-7-8 another	--
	6				m	3.0	5.7	25.5	177.2	471	250	Both sunlit	--
	7				m	2.8	5.75	17.8	177.0	497	183		--
92	8				l	2.9	5.3	13.0	177.7	555	155		--
	1	23.40.39	O-K ₄	R	h'	-20.4	4.6	32.1	-161.0	506	355	1-2-3 one ray	26-27
	2				m	-20.9	5.0	27.2	-161.8	493	283		--
	3				l'	-21.2	5.2	23.9	-162.1	494	235		--
	4				h'	-20.1	4.7	22.7	-162.9	547	262	4-5-6 another	--
	5				m	-20.1	4.7	18.9	-163.3	564	225	Both sunlit	--
93	6				l'	-20.1	4.8	15.1	-163.6	567	183		--
	1	23.41.55	O-K ₄	R	h'			31.1	-157.7	493	330	Sunlit	26-28
	2				m	-23.55	4.8	25.2	-158.8	512	271		--
	3				m	-23.5	4.9	20.5	-159.6	524	224		--
	4				m	-23.2	4.8	15.8	-160.4	554	185		--
98	5				l	-22.4	4.5	12.3	-161.1	633	173		--
	1	23.49.20	O-K ₄	R	h'			23.5	-169.2	618	312	1-2-3-4-5 right edge	25-26
	2				m	-13.8	4.3	20.4	-169.5	627	275	of the ray	--
	3				m	-13.6	4.45	15.5	-170.2	631	213	6, 7 middle of it	--
	4				m	-13.1	4.5	9.6	-171.0	645	145	Sunlit	--
	5				l	-12.4	4.8	7.6	-172.1	608	113		--
	6				m	-12.5	4.45	15.5	-171.3	634	214		--
102	7				m	-12.4	4.6	11.6	-171.7	627	163		--
	1	0.14.17	O-K ₄	RB	h	48.3	4.9	19.8	120.6	385	154	1, 3 right; 2, 4 left edge	27-28
	2				h	51.9	5.2	18.3	117.8	342	125	of first short ray	--
	3				l	51.2	4.6	13.6	122.0	403	111		--
	4				l	53.7	4.7	10.7	120.0	387	83	6, 7 right; 5, 8 left edge	--
	5				l	39.9	8.4	17.1	129.0	266	88	of second short ray	--
	6				l	38.2	8.1	17.8	130.9	282	97		--
	7				h	37.2	8.4	21.8	129.7	268	114	Both in shadow	--
8				h	38.9	8.7	21.3	127.6	255	106		--	
111	1	0.21.35	C-K ₄	R	h'	27.3	8.0	41.2	106.3	302	282	1, 2, 3 left edge	28-29
	2				m	29.0	8.7	33.1	109.2	306	214	4, 5, 6 right edge	--
	3				l	29.9	9.4	25.5	111.5	308	157	Partly sunlit	--
	4				m	32.6	7.6	33.1	105.6	337	237		--
	5				h'	31.0	6.9	39.6	103.4	345	309		--
	6				l			21.7	108.8	352	153		--
121	2	0.55.31	C-O	R	m	-39.5	2.9	38.4	152.3	315	267	Sunlit	27-28
	3				m	-36.5	3.0	42.8	151.7	295	292		--
	4				m	-30.7	3.1	51.1	150.4	260	344		--
132	1	1.11.02	C-K ₄	R	m	-14.9	7.1	14.0	164.4	486	142	1, 2, 3 along right edge	25-27
	2				m	-13.5	6.8	26.0	163.7	466	253		--
	3				h	-10.6	5.8	40.9	162.4	451	434	4, 5 along left	--

Table 2 (continued.)

No	Pt	MET	St	F	S	ϵ_2	p	h	a	D	H	Remarks	θ
133	4	1.11.02	C-K ₄	R	m	-13.3	7.3	14.0	162.5	477	139	6, 7, 7, 9 along middle line Sunlit	25-27
	5				m	-12.1	7.2	26.0	161.7	443	240		--
	6				m	-14.0	7.1	14.0	163.5	489	143		--
	7				m	-12.7	6.9	26.0	162.5	461	250		--
	8				h	-10.2	6.2	41.0	161.5	423	406		--
	9				l			9.6	170.3	499	105	--	
	1	1.12.12	C-K ₄	R	m	-50.9	4.0	42.8	-118.4	408	416	1, 2, 3, 6, 7 one ray 4, 5 another Sunlit	29-30
	2				m	-57.6	3.3	34.8	-122.1	475	366		--
	3				m	-64.1	2.7	26.4	-125.3	521	292		--
4	m				-39.2	6.9	57.0	-123.7	218	358	--		
5	l				-50.6	6.2	42.9	-130.8	270	267	--		
6							h			45.4	-115.3		456	517	30-31
134	7		K ₄		l'			14.9	-126.7	495	154		29-30
	1	1.13.01	C-K ₄	R	h'	-55.4	3.8	38.2	-118.3	418	361	1, 2, 3 one ray 4 another 5, 6 a third one All sunlit	29-31
	2				m	-59.5	3.6	33.7	-120.4	421	308		--
	3				m	-65.0	2.8	26.3	-123.0	488	270		--
	4				h'	-41.7	4.6	53.0	-110.6	340	496		--
	5				m	-43.1	9.7	53.6	-136.2	163	230		--
6	m				-37.5	8.9	60.2	-130.9	161	294	--		
135	1	1.13.47	C-K ₄	R	m	-20.0	9.5	27.5	168.1	323	180	Partly sunlit	26-28
	2				m	-20.7	9.4	21.5	168.3	343	147		--
	3				m	-20.9	9.4	18.8	168.4	348	131		--
	4				l'	-21.1	9.5	16.8	168.4	349	117		--
	5							h'			32.6		168.0	325	222	--

Plate 1.



Upper left: Photograph 18—19 March 1933, N 64, 0^h 23^m 47^s showing distant curtains in the north.

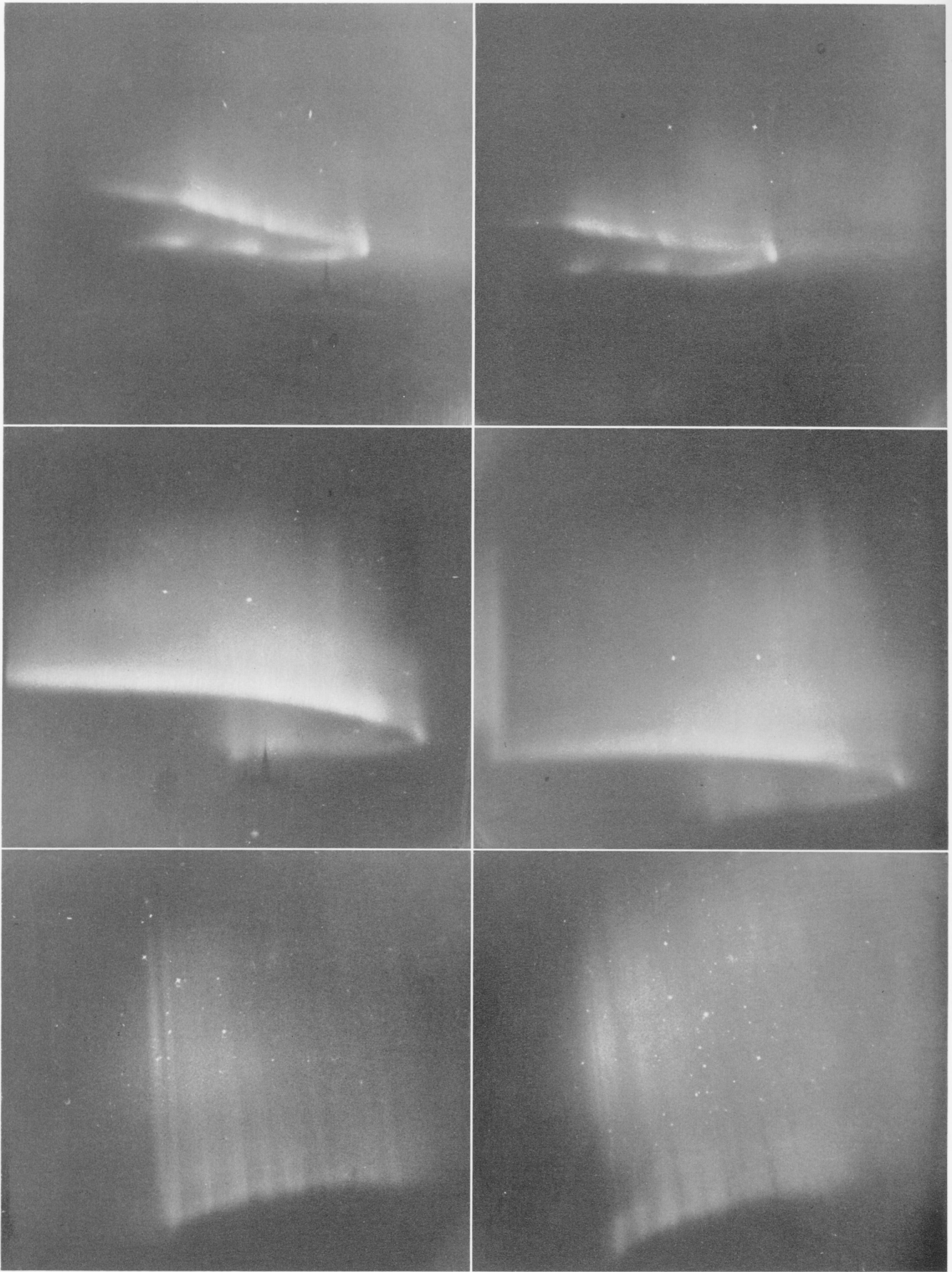
Upper right: Photograph the same date, N 65, 0^h 24^m 30^s showing band to the right of picture N 64.

Middle left: Photograph 19—20 March 1933, Lö 4, 21^h 08^m 55^s showing sunlit invisible rays.

Middle right: Photograph 19—20 March 1933, N 4, 21^h 08^m 55^s showing the same rays from the other station.

Lower left: Photograph 18—19 March 1933, N 111, 2^h 27^m 16^s, showing aurora going down under 80 km altitude.

Lower right: Photograph 23—24 March 1933, Lö 61, 1^h 35^m 38^s, showing eastern part of a fine arc.



Upper left: Photograph 23—24 March 1933, Lö 119, 4^h 05^m 51^s, showing horseshoeformed curtain.

Upper right: Photograph 23—24 March 1933, N 119, 4^h 05^m 51^s, showing the same curtain from the other station.

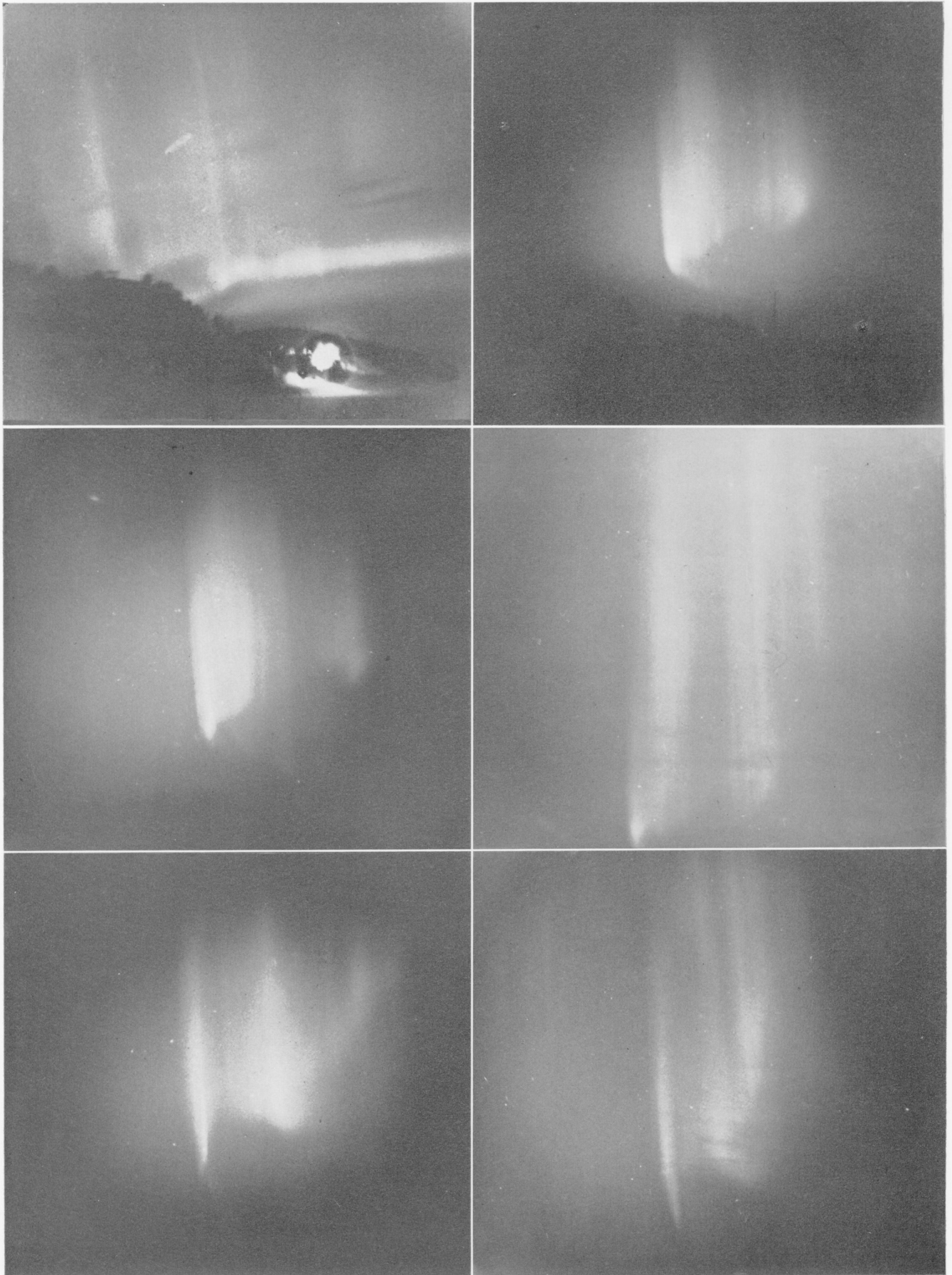
Middle left: Photograph 23—24 March 1933, Lö 122, 4^h 07^m 59^s, showing bent arc.

Middle right: Photograph 23—24 March 1933, N 122, 4^h 07^m 59^s, showing the same arc from the other station.

Lower left: Photograph 24—25 March 1933, Lö 22, 20^h 55^m 24^s, showing drapery. Lower part in darkness, upper in sunshine, weakened intensity between.

Lower right: Photograph 24—25 March 1933, N 22, 20^h 55^m 24^s, showing the same drapery from the other station.

Plate 3.



Upper left: Photograph 24—25 March 1933, L6 42, 21^h 17^m 46^s, showing arcs and rays.

Upper right: Photograph 1—2 May 1933, O 47, 22^h 56^m 58^s, showing lower part of sunlit drapery.

Middle left: Photograph 1—2 May 1933, K 47, 22^h 56^m 58^s, showing lower part of the same drapery from the second station.

Middle right: Photograph 1—2 May 1933, C 47, 22^h 56^m 58^s, showing upper part of the same drapery from the third station.

Lower left: Photograph 1—2 May 1933, K 50, 22^h 58^m 38^s showing the same drapery.

Lower right: Photograph 1—2 May 1933, C 50, 22^h 58^m 38^s, showing the same drapery from the other station.