

MERIDIAN ZENITH DISTANCES OF γ DRACONIS

FROM OBSERVATIONS MADE AT
THE ROYAL OBSERVATORY, GREENWICH,
WITH THE
REFLEX ZENITH TUBE

DURING THE YEARS
1886 TO 1899:

UNDER THE DIRECTION OF
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ASTRONOMER-ROYAL.

(FORMING AN APPENDIX TO THE VOLUME OF GREENWICH OBSERVATIONS FOR THE YEAR 1904.)



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INTRODUCTION.

THE reflex zenith tube was erected at the Royal Observatory, Greenwich, in 1854, and a full description of it is given in Appendix I. to the *Greenwich Observations* for that year. The instrument was designed by Sir George Airy for the observation of zenith distances of stars which pass very near the zenith, especially of γ Draconis, with the object of determining the constant of aberration, and also the parallax of the star. Discussions of the observations by Mr. Main (*Memoirs, R.A.S.* Vol. XXIX.) and by Dr. Downing (*Monthly Notices, R.A.S.* Vol. XLII.) gave in both cases a negative parallax and a value of the constant of aberration which was inconsistent with other determinations. These anomalous results were regarded as evidence of undiscovered instrumental error, and it was suspected that the annual variation of temperature might affect the observations by alteration of the scale value. An investigation of the scale value at different temperatures was accordingly made in the years 1883 to 1885, by transits of γ Draconis, with the result that no explanation of the anomalous results could be found. The regular observations of γ Draconis were resumed in 1886 and continued to 1899, when observations were discontinued. In 1902 Dr. Chandler showed (*Astronomical Journal*, No. 511) that the anomalous results were entirely accounted for by variation of latitude. The observations from 1886 to 1889 are accordingly printed in this Appendix, with a very brief account of the investigations of scale value at different temperatures made in 1883–1885.

An examination of the possible effect of temperature was prompted by the following considerations. The temperature at the time of observation reaches its maximum and minimum respectively at nearly the same time as the parallax. The zenith distance (north) of the star would, due to parallax alone, be greatest in June and least in December. This zenith distance is measured by the interval between two wires, mounted in a gun-metal frame, and if the angular value of this interval varies with the temperature through the difference of expansion of gun metal and the object-glass, a spurious parallactic effect will be produced.

For more accurate determination of the focus a prismatic focussing rod with scale reading (by vernier) to $\frac{1}{200}$ th of an inch (representing $\frac{1}{100}$ th of an inch in the focal

length) and ivory point for contact with the mercury, was applied to the instrument in 1882, April, in place of the former light brass rod and wooden float. The focussing rod and the micrometer frame are both of gun metal. A system of thirty wires was inserted in the micrometer frame, and values of the scale corresponding to different temperatures and to different readings of the focal length were determined by means of transits of γ Draconis across the wires, the wire frame being rotated through 90° for this purpose. The reading for focus was noted at each transit, and a thermometer, placed close to the instrument, was read before and after the observations.

The intervals of the wires were also measured in terms of each of the micrometer screws A and B by means of cross-wires in a four-glass eye-piece, which was mounted so that it could be brought opposite to each wire in succession. The interval between this wire and an adjacent one was then accurately measured in terms of the micrometer screw. Thus the relative intervals of the wires were found and referred to the mean interval.

The following table gives the deduced value of the mean wire interval on each day of observation, along with the corresponding temperature and reading for focus. A few observations of 9 Aurigæ, made in 1885, February, are included. These are made comparable with those of γ Draconis by multiplying by the factor 1.0015.

As far as practicable, transits were observed over all the thirty wires, and in the case of incomplete transits corrections were applied to reduce to the mean interval for the complete set of wires.

In several cases the instrument was re-focussed in the middle of the transit, the second reading given in the table being that to which it was then set.

As the wires were renewed in 1883, October, these observations were discussed in two groups. The first group of 44 observations at temperatures extending from 54° to 72° gives a change of $+^s.0023$ for 1° of temperature in a mean wire interval of about 21^s , while the second group of 69 observations at temperatures from 45° to 71° gives a change of $-^s.0008$. The discordance in these two results shows that many more observations would be required to obtain a measure of the actual change of scale due to temperature.

The readings for focus were also compared with the temperatures, and the results obtained from the two groups are of opposite signs.

INTRODUCTION.

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Mean Intervals of Wires from Transits over thirty wires.

Date.	Observer.	Temperature.	Reading for Focus.	Mean Interval.	Date.	Observer.	Temperature.	Reading for Focus.	Mean Interval.
1883			in.	s	1883.			in.	s
May 15	L	59°0	...	20°947	Sept. 19	T	66°0	0°28	21°040
16	HC	63°0	0°42	21°062	26	H	63°1	0°32	21°045
17	H	59°0	0°41	21°032					
21	H	59°8	0°40	21°004	Oct. 1	H	54°0	0°34	21°038
22	AD	59°8	0°41	20°979	18	H	55°2	0°29	21°025
23	L	65°0	0°30	21°067		Mean.....	63°6	0°32	21°031
25	H	62°9	0°42	21°044					
31	L	57°2	0°34	21°023					
June 1	T	61°0	0°37	21°031	Nov. 26	H	49°1	0°30	21°064
4	H	60°0	0°39	21°031					
8	H	59°7	0°43	21°011	1884				
9	AD	62°0	0°27	21°019	May 22	L	57°3	0°24	21°076
11	L	58°1	0°28	21°056	26	B	59°6	0°30	21°031
14	T	65°0	0°25	21°040	27	L	58°1	0°28	21°119
29	AD	68°3	0°23	21°040					
30	T	68°0	0°23	21°057	June 10	H	56°0	0°39	21°032
July 4	T	67°0	0°23	21°052	11	JP	60°2	0°38	21°034
6	JP	66°1	0°30	21°011	12	L	62°4	0°38	21°033
9	HC	66°8	0°28	21°006	16	JP	59°0	0°39	21°029
11	SD	64°9	0°28	21°016	23	H	65°0	0°38 ⁵	21°024
17	H	59°8	0°29	21°047	30	L	68°2	0°38	21°036
26	HC	62°0	0°29	21°028	July 1	H	68°5	0°38	21°024
28	L	65°6	0°30	21°035	2	AD	69°9	{0°38 0°28	21°038
30	H	64°0	0°37	21°042	4	L	73°9	0°38	21°027
Aug. 3	H	65°1	0°38	21°061	7	H	68°0	0°38	21°019
9	T	61°0	0°38	21°028	9	T	72°3	0°38	21°023
11	BB	64°7	0°30	21°034	12	AD	67°2	{0°38 0°42	21°051
13	T	69°0	0°32	21°029	16	L	64°4	{0°37 0°27	21°028
14	HC	68°2	0°30	21°026	17	H	64°6	0°38	21°033
16	H	63°1	0°38	21°028	19	T	62°7	0°38	21°039
18	BB	67°3	0°30	21°042	25	AD	62°9	{0°38 0°27	21°006
21	T	72°5	0°31	21°045	31	L	72°7	{0°38 0°42	21°017
23	JP	69°8	0°29	21°027					
24	HC	69°9	0°27	21°023	Aug. 1	H	70°3	{0°38 0°35	21°026
25	SD	67°5	0°25	21°033	6	H	69°0	{0°54 0°51	21°036
28	H	69°1	0°39	21°039					
Sept. 8	AD	59°2	0°27	21°041					
12	L	61°2	0°29	21°024					
13	AD	62°8	0°28	21°027					
18	HC	66°0	0°29	21°050					
1883 June 9. Focussed at wires 1-4. 1884 July 9. Focus fairly good. July 31. Focus very little better after alteration. Aug. 2. A piece was cut off ivory point of scale, shortening it by '112 inches or '224 in scale-reading.									

MERIDIAN ZENITH DISTANCES OF γ DRACONIS.*Mean Intervals of Wires from Transits over thirty wires—continued.*

Date.	Observer.	Temperature.	Reading for Focus.	Mean Interval.	Date.	Observer.	Temperature.	Reading for Focus.	Mean Interval.
1884.			in.	s	1885.		°	in.	s
Sept. 1	AP	63°8	0.38	20.983	July 10	AD	67.9	{0.51 0.44	21.047
4	T	61.1	0.37	21.040	11	T	69.0	0.51	21.064
17	HT	74.6	{0.51 0.41	21.017	14	H	64.9	{0.51 0.54	21.032
18	AD	72.2	{0.51 0.42	21.028	17	L	63.9	0.52	21.033
25	JP	60.0	0.51	21.042	20	AD	67.3	{0.51 0.47	21.043
Nov. 3	HT	52.8	0.51	20.976	22	T	65.4	0.56	21.040
					25	JP	71.3	0.51	21.065
1885.					Aug. 8	H	65.0	0.51	21.043
Feb. 6	H	45.9	0.51	21.068	10	L	65.2	0.52	21.041
May 8	HT	46.2	0.51	21.038	14	L	61.2	0.54	21.029
23	H	51.7	0.51	21.042	15	T	63.6	0.51	21.056
27	H	60.4	0.51	21.049	20	H	60.0	0.51	21.066
29	L	59.7	0.52	21.034	22	L	61.4	0.48	21.061
June 4	RW	67.8	0.51	21.025	24	H	62.5	{0.51 0.64	21.039
10	L	59.1	{0.48 0.47	21.031	Sept. 3	AP	63.2	0.51	21.055
11	AD	57.8	{0.54 0.51	21.035	4	RW	62.3	0.51	21.061
12	AP	61.9	0.51	21.033	5	R	63.0	0.51	21.054
13	T	63.8	0.51	21.037	11	AD	57.4	{0.51 0.48	21.029
17	RW	58.5	0.51	21.026	21	L	61.0	0.51	21.022
18	H	60.9	{0.51 0.49	21.034	22	RW	60.8	0.48	21.041
20	AD	58.7	{0.51 0.50	21.048			62.8		21.037
26	H	57.5	{0.51 0.62	21.042			9 AURIGÆ.		
27	L	60.5	0.51	21.019	1885.				
30	H	60.5	{0.51 0.49	21.051	Feb. 7	H	48.7	0.51	21.059
July 6	AD	69.0	0.51	21.026	18	L	48.5	0.55	21.040
8	H	64.1	0.51	21.036	19	T	43.2	0.55	21.025
9	L	65.1	0.49	21.038	21	L	42.6	0.57	21.037
					25	L	56.5	0.54	21.024
					27	T	49.7	0.51	21.003
							48.2		21.031
1884 Sept. 18. Focus bad at '051. Sept. 25. Focus good. Nov. 3. Focus fair. 1885 June 10. Image bad; not improved by focussing. June 17, 20, Aug. 8, 14, Sept. 4. Focus good. June 27, July 17, Sept. 21. Focus fair. July 20. In good focus at '051. July 25. In good focus. Aug. 10. Fair image. Aug. 24. Focus not good at '051. Sept. 5. Very faint at times; cloudy.									

Taking the coefficient of expansion for brass as $\cdot 000018$, a variation of $+0^{\circ}00038$ per 1° Fahrenheit would be expected in an interval of 21° . With a range of 20° in the temperature between summer and winter, this variation would imply an effect on the parallax of $0''\cdot 036$, whereas the observations discussed by Mr. Main and Dr. Downing showed that the quantity in question was $0''\cdot 20$. It was concluded therefore that the spurious parallax was not attributable to temperature. As stated above, the anomalous results were accounted for by Dr. Chandler by the variation of latitude which had not been discovered when these discussions were undertaken.

The observations of zenith distance of γ Draconis 1886–1899 were made as in previous years, and the results are given in substantially the same form as in the *Greenwich Observations* up to 1881.

The correction due to the readings of the level-scale is determined from the following considerations:—When micrometer A is to the left—that is, south of the zenith—the micrometer readings increase as the wire moves to the left—that is, as the star's zenith distance north increases; and, in this position, the readings of the level-scale increase from left to right, and therefore the level-indications will increase when the right or northern edge of the object-glass is raised.

Supposing this northern edge to be raised, the central ray of light for a zenithal star, descending through the focal centre and reflected up through the focal centre, meets the wire-frame (which is above the focal centre) not at its zenithal point, but at a point which is north or to the right of the zenithal point.

Therefore the wire, when in that position it is laid upon the star, is more to the north or right than it ought to be; and therefore its micrometer-reading is smaller than it ought to be, and a positive correction is required: that is, for increasing readings of the level-scale the correction is positive.

The linear amount of the correction (omitting a constant depending on the zero of the level-scale) is $\{\text{dist. from focal centre to wire-frame}\} \times \{\frac{1}{2} \text{ sum of readings of level-scale}\} \times \{\text{value of one division of level-scale}\}$.

The angular amount of the correction is this quantity divided by the focal length of the object-glass.

From statements made by the late Mr. William Simms, it is assumed that the focal centre coincides sensibly with the upper surface of the object-glass, and therefore that the distance of the plane of the wires from the focal centre = $0^{\text{in}}.25$; and that the value of one division of the level-scale is $6''$ nearly. Also, the focal length of the object-glass, which is that of Troughton's transit instrument dismantled in the year 1851, is 116 inches.

With these data, the correction to zenith distance due to the readings of the level-scale is found to be $0''.00646 \times \text{sum of readings of the level-scale}$.

From these numbers, the numerical value of the sums of equivalents for micrometer-readings and for level-readings is computed by the formula given in the footnotes to the Observations; and thus is obtained the zenithal distance of the star, as measured towards micrometer B, increased by an instrumental constant, which it is necessary to determine from the observations. This constant is usually determined by forming for each day the half-sum of the two sums of equivalents in the two reversed positions of the instrument, and by taking the arithmetical mean of those half-sums determined on different days. By subtracting this constant from the sum of equivalents when A is to the left, or by subtracting the sum of equivalents from this constant when A is to the right, the star's observed zenith distance north is obtained; and by applying to the mean of the two results L and R, the correction for the reduction of apparent Z.D. to mean Z.D. north, the mean zenith distances north given in the last column of the tabular arrangement are found.

W. H. M. CHRISTIE.

ROYAL OBSERVATORY, GREENWICH,
1906 *February* 27.

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ROYAL OBSERVATORY, GREENWICH.

MERIDIAN ZENITH DISTANCES
OF γ DRACONIS

OBSERVED WITH

THE REFLEX ZENITH TUBE

DURING THE YEARS

1886 TO 1899.

OBSERVERS WITH THE REFLEX ZENITH TUBE
IN THE YEARS 1883-99.

Observer.	Initials.	Observer.	Initials.
Mr H. H. Turner	HT	Mr T. F. Fisher.	F
Mr A. M. W. Downing	AD	Mr H. A. Wise	AW
Mr W. G. Thackeray	T	Mr W. Russell	WR
Mr T. Lewis	L	Mr A. Cochrane.	AC*
Mr H. P. Hollis.	H	Mr A. P. Miskin	AM
Mr A. C. D. Crommelin	AC	Mr H. H. Furner	HF
Mr W. W. Bryant	B	Mr C. R. Davidson	CD
Mr T. C. Hudson	TH	Mr C. Martin	CM
Mr J. W. H. Pead	HP	Mr D. J. R. Edney	DE
Mr J. Power	JP	Mr W. Bowyer	WB
Mr J. A. J. Pead	AP	Mr R. W. Cheeseman.	RC
Mr B. Bennett	BB	Mr G. F. Johns	J
Mr W. H. Cox	HC	Mr E. H. Banks.	EB
Mr S. Dolman	SD	Mr P. G. Showell	S
Mr R. Woodgate	RW	Mr W. M. Witchell	W
Mr F. C. Robinson	R	Mr J. Storey	JS

The letters L and R in column 4 denote respectively that micrometer A was to the Left or to the Right.

MERIDIAN ZENITH DISTANCES of γ DRACONIS observed with the REFLEX ZENITH TUBE.														
No. for Reference.	Day and Hour of Observation, 1886.		Observer.	Position.	Wire used.	Micrometer Readings.		Level Readings.		Equivalent for Level.	Sum of Equivalents for wire, for Micrometer-Readings and for Level-Readings.	Star's observed Zenith Distance North.	Star Correction.	Concluded Mean Zenith Distance North 1886°.
						A.	B.	div.	div.					
						r.	r.							
1	June	d h 1. 13	L	L R	16 15	27°000 27°362	47°245 47°245	9.2 25.4	66.6 82.5	0.49 0.70	7. 16.63 4. 5.81	1. 35.15 1. 35.67	— 3.17	1. 32.24
2		4. 13	H	L R	16 15	27°000 27°253	47°390 47°390	11.0 23.0	68.8 81.0	0.52 0.67	7. 19.09 4. 6.38	1. 37.61 1. 35.10	— 4.16	1. 32.20
3		7. 12	AD	R L	15 16	27°536 27°536	47°000 46°799	27.4 9.5	84.9 67.0	0.72 0.49	4. 4.63 7. 18.13	1. 36.85 1. 36.65	— 5.15	1. 31.60
4		10. 12	T	R L	15 16	27°209 27°209	47°035 47°218	23.8 10.3	81.4 67.7	0.68 0.50	7. 16.81 4. 2.59	1. 35.33 1. 38.89	— 6.14	1. 30.97
5		12. 12	H	L R	16 15	28°000 28°031	46°342 46°342	8.8 26.6	66.0 84.0	0.49 0.71	7. 18.25 4. 1.89	1. 36.77 1. 39.59	— 6.78	1. 31.40
6		15. 12	AD	R L	15 16	28°073 28°073	46°350 46°353	26.3 8.0	84.0 67.0	0.71 0.49	4. 2.73 7. 19.67	1. 38.75 1. 38.19	— 7.74	1. 30.73
7		28. 12	AD	R L	16 17	22°028 22°028	40°200 41°253	27.7 9.0	83.5 65.0	0.72 0.48	3. 55.22 7. 26.36	1. 46.26 1. 44.88	— 11.90	1. 33.67
8		30. 11	T	L R	16 15	27°600 27°058	46°996 46°996	6.6 31.5	62.3 86.7	0.45 0.76	7. 22.48 3. 56.59	1. 41.00 1. 44.89	— 12.54	1. 30.41
9	July	1. 11	L	R L	15 16	26°947 26°947	47°000 47°791	86.6 6.5	30.8 62.4	0.76 0.45	3. 54.79 7. 24.86	1. 46.69 1. 43.38	— 12.84	1. 32.20
10		2. 11	AD	L R	16 15	27°000 26°229	47°833 47°833	7.0 29.5	63.0 85.3	0.45 0.74	7. 26.45 3. 56.70	1. 44.97 1. 44.78	— 13.14	1. 31.74
11		3. 11	H	R L	15 16	26°037 26°037	48°000 48°800	30.3 8.5	84.4 62.5	0.74 0.46	3. 56.28 7. 26.53	1. 45.20 1. 45.05	— 13.44	1. 31.69
12		5. 11	T	R L	15 16	25°139 25°139	48°829 49°725	35.8 3.3	89.4 57.2	0.81 0.41	3. 55.19 7. 26.96	1. 46.29 1. 45.48	— 14.04	1. 31.85
13		6. 11	AD	L R	16 15	25°000 24°072	49°871 49°871	6.0 32.9	59.5 86.2	0.42 0.77	7. 27.07 3. 54.73	1. 45.59 1. 46.75	— 14.34	1. 31.83
14		10. 11	T	R L	15 16	24°081 24°081	49°900 50°905	32.8 2.3	89.3 60.7	0.79 0.41	3. 55.39 7. 28.98	1. 46.09 1. 47.50	— 15.54	1. 31.26
15		12. 10	H	L R	16 15	24°000 22°895	51°020 51°020	5.5 29.7	62.8 86.4	0.44 0.75	7. 29.59 3. 54.24	1. 48.11 1. 47.24	— 16.10	1. 31.58
16		15. 10	L	R L	15 16	50°041 50°041	23°800 25°000	31.3 4.5	88.2 61.8	0.77 0.43	3. 53.02 7. 29.93	1. 48.46 1. 48.45	— 16.94	1. 31.52
17		16. 10	H	L R	16 15	50°000 48°588	25°167 25°167	8.0 29.7	63.6 85.0	0.46 0.74	7. 32.08 3. 51.55	1. 50.60 1. 49.93	— 17.22	1. 33.05
18	August	2. 9	H	L R	16 15	49°000 47°244	26°312 26°312	9.0 26.5	65.8 83.5	0.48 0.71	7. 34.52 3. 48.18	1. 53.04 1. 53.30	— 21.50	1. 31.67

The numerical value of the Sum of Equivalents in column 11 = Wire Interval + (sum of Micrometer-Readings - 60°) $\times$ 16".780 + sum of Level-Readings $\times$ 0".00646; where the Wire Interval for wire 15 is zero, for wire 16 = + 3'.17".11, and for wire 17 = + 6'.30".82. The numerical difference between this sum of Equivalents and the Instrumental Constant is the star's Z. D. North. During the year 1886 the adopted Instrumental Constant was 5'.41".48.

2. The reading of micrometer B has been increased 1 rev. 4. The reading of micrometer A has been diminished 1 rev. 5. Cloudy.
 6. The reading of micrometer B has been diminished 1 rev. 9. The reading of micrometer B, position R, has been diminished 1 rev.
 13. The reading of micrometer B was set down 50°129. It has been assumed, however, that the micrometer-head was read in the wrong direction.
 18. Diffused and tremulous.

MERIDIAN ZENITH DISTANCES OF γ DRACONIS WITH THE REFLEX ZENITH TUBE,MERIDIAN ZENITH DISTANCES of γ DRACONIS observed with the REFLEX ZENITH TUBE—*continued*.

No. for Reference.	Day and Hour of Observation, 1886.		Observer.	Position.	Wire used.	Micrometer Readings.		Level Readings.		Equivalent for Level.	Sum of Equivalents for wire, for Micrometer-Readings and for Level-Readings.	Star's observed Zenith Distance North.	Star Correction.	Concluded Mean Zenith Distance North 1886°.
						A.	B.							
						r.	r.	div.	div.					
1	August	d h 6. 9	H	L	16	47'100	28'258	8'2	64'0	0'47	7. 35'28	1. 53'80	-22'38	1. 31'17
				R	15	45'298	28'258	28'2	83'8	0'72	3. 48'19	1. 53'29		
2		10. 8	H	L	16	45'300	30'131	11'2	67'3	0'51	7. 36'55	1. 55'07	-23'22	1. 31'80
				R	15	43'328	30'131	24'9	81'0	0'68	3. 46'52	1. 54'96		
3		14. 8	H	L	16	43'200	32'240	11'6	68'8	0'52	7. 36'71	1. 55'23	-23'94	1. 31'10
				R	15	41'225	32'240	25'0	81'5	0'69	3. 46'63	1. 54'85		
4		30. 7	H	L	16	45'000	30'638	15'5	69'0	0'55	7. 40'06	1. 58'58	-26'22	1. 31'42
				R	15	42'720	30'638	23'2	77'0	0'65	3. 44'79	1. 56'69		
5		31. 7	T	R	15	42'650	30'640	21'5	74'3	0'62	3. 43'63	1. 57'85	-26'30	1. 31'52
				L	16	42'650	32'941	15'8	68'3	0'54	7. 39'27	1. 57'79		
6	September	1. 7	AD	L	16	42'650	32'974	15'9	69'0	0'55	7. 39'84	1. 58'36	-26'38	1. 31'30
				R	15	40'367	32'974	22'2	75'6	0'63	3. 44'49	1. 56'99		
7		3. 7	H	L	16	41'000	34'602	16'0	71'8	0'57	7. 39'48	1. 58'00	-26'54	1. 31'66
				R	15	38'656	34'602	20'1	75'7	0'62	3. 43'09	1. 58'39		
8		6. 7	L	R	15	38'732	34'600	20'2	76'2	0'62	3. 44'32	1. 57'16	-26'78	1. 31'72
				L	16	38'732	36'978	16'8	72'2	0'58	7. 41'31	1. 59'83		
9		7. 7	H	L	16	39'000	36'642	16'6	72'3	0'57	7. 40'15	1. 58'67	-26'86	1. 31'79
				R	15	36'602	36'642	20'6	76'0	0'62	3. 42'86	1. 58'62		
10		8. 7	R	R	15	36'327	37'000	20'8	76'6	0'63	3. 44'26	1. 57'22	-26'94	1. 30'97
				L	16	36'327	39'311	15'9	71'6	0'56	7. 40'07	1. 58'59		
11		13. 7	AD	R	15	33'619	39'650	19'6	75'3	0'61	3. 43'27	1. 58'21	-27'14	1. 31'66
				L	16	33'619	42'066	14'9	71'4	0'56	7. 40'86	1. 59'38		
12		14. 6	JP	L	16	33'620	42'152	16'1	72'3	0'57	7. 42'34	2. 0'86	-27'18	1. 32'61
				R	15	31'087	42'152	19'7	75'7	0'61	3. 42'76	1. 58'72		
13		16. 6	L	L	16	33'000	42'715	11'4	70'8	0'53	7. 41'34	1. 59'86	-27'26	1. 31'90
				R	15	30'536	42'715	23'3	80'4	0'67	3. 43'03	1. 58'45		
14		17. 6	AD	R	15	30'545	42'700	26'0	83'7	0'70	3. 42'95	1. 58'53	-27'30	1. 31'35
				L	16	30'545	45'097	8'8	66'2	0'49	7. 40'24	1. 58'76		
15		22. 6	JP	L	16	28'200	47'351	5'8	63'2	0'45	7. 38'51	1. 57'03	-27'26	1. 30'12
				R	15	25'938	47'351	29'8	87'5	0'76	3. 43'75	1. 57'73		

The numerical value of the Sum of Equivalents in column 11 = Wire Interval + (sum of Micrometer-Readings - 60°) × 16''780 + sum of Level-Readings × 0''00646; where the Wire Interval for wire 15 is zero, and for wire 16 = + 3'.17''.11. The numerical difference between this sum of Equivalents and the Instrumental Constant is the star's Z. D. North. During the year 1886 the adopted Instrumental Constant was 5'.41''.48.

5. Very diffused. The reading of micrometer B, position R, was set down 34'640.

6. Very tremulous.

8. Diffused and tremulous.

15. Very cloudy. The reading of micrometer A, position L, has been diminished 1 rev.

MERIDIAN ZENITH DISTANCES of γ DRACONIS observed with the REFLEX ZENITH TUBE—continued.

No. for Reference.	Day and Hour of Observation, 1887.		Observer.	Position.	Wire used.	Micrometer Readings.		Level Readings.		Equivalent for Level.	Sum of Equivalents for wire, for Micrometer-Readings and for Level-Readings.	Star's observed Zenith Distance North.	Star Correction.	Concluded Mean Zenith Distance North 1887.0.
						A.	B.							
						r.	r.	div.	div.					
1	June	d h 10. 12	JP	L	16	30'500	43'684	17'8	74'4	0'60	4. 27'92	1. 33'85	— 4'60	1. 29'70
				R	15	31'008	43'684	18'5	75'1	0'60	1. 19'33	1. 34'74		
2		11. 12	F	L	16	30'800	43'508	16'5	72'0	0'57	4. 29'96	1. 35'89	— 4'92	1. 31'52
				R	15	31'048	43'508	18'8	79'0	0'63	1. 17'08	1. 36'99		
3		13. 12	RW	L	16	31'000	43'479	16'6	71'8	0'57	4. 32'84	1. 38'77	— 5'56	1. 32'31
				R	15	31'080	43'479	74'5	20'0	0'61	1. 17'11	1. 36'96		
4		14. 12	F	L	16	31'000	43'391	17'3	72'0	0'58	4. 31'37	1. 37'30	— 5'88	1. 32'07
				R	15	31'070	43'391	19'0	75'0	0'61	1. 15'47	1. 38'60		
5		15. 12	AD	R	15	31'105	43'400	19'6	74'6	0'61	1. 16'20	1. 37'87	— 6'20	1. 31'47
				L	16	31'105	43'297	15'6	71'3	0'56	4. 31'53	1. 37'46		
6		16. 12	L	L	16	31'000	43'496	15'8	70'6	0'56	4. 33'11	1. 39'04	— 6'52	1. 31'23
				R	15	31'092	43'496	20'8	76'2	0'63	1. 17'61	1. 36'46		
7		17. 12	H	R	15	30'501	44'000	22'0	77'7	0'65	1. 16'18	1. 37'89	— 6'84	1. 30'48
				L	16	30'501	43'859	14'8	70'2	0'55	4. 30'82	1. 36'75		
8		20. 12	AD	R	15	30'106	44'400	23'0	79'6	0'66	1. 16'27	1. 37'80	— 7'80	1. 30'24
				L	16	30'106	44'347	11'6	68'6	0'52	4. 32'35	1. 38'28		
9		30. 11	H	R	15	29'261	45'000	25'2	81'8	0'69	1. 12'20	1. 41'87	— 10'90	1. 30'86
				L	16	29'261	45'393	20'0	66'8	0'50	4. 35'71	1. 41'64		
10	July	2. 11	AD	L	16	29'300	45'328	10'0	65'0	0'49	4. 35'26	1. 41'19	— 11'52	1. 29'93
				R	15	28'946	45'328	26'8	71'7	0'64	1. 12'37	1. 41'70		
11		3. 11	T	R	15	28'920	45'350	27'5	80'6	0'70	1. 12'39	1. 41'68	— 11'83	1. 30'54
				L	16	28'920	45'820	10'2	63'8	0'48	4. 37'13	1. 43'06		
12		11. 11	HT	R	15	31'326	42'700	30'5	84'2	0'74	1. 8'30	1. 45'77	— 14'28	1. 29'42
				L	16	31'326	42'330	8'2	62'8	0'46	4. 35'70	1. 41'63		
13		18. 10	L	L	16	29'000	46'046	7'9	64'2	0'47	4. 42'25	1. 48'18	— 16'24	1. 31'48
				R	15	27'892	46'046	28'6	85'0	0'74	1. 6'81	1. 47'26		
14		20. 10	AD	R	15	27'542	46'400	28'8	84'0	0'73	1. 6'87	1. 47'20	— 16'80	1. 29'48
				L	16	27'542	47'335	8'6	64'0	0'47	4. 39'42	1. 45'35		
15		27. 10	T	R	15	31'835	42'000	31'0	85'3	0'75	1. 5'09	1. 48'98	— 18'55	1. 31'23
				L	16	31'835	43'354	7'9	62'8	0'46	4. 44'64	1. 50'57		
16		28. 10	AD	L	16	31'800	43'427	8'3	63'7	0'47	4. 45'30	1. 51'23	— 18'80	1. 31'15
				R	15	30'427	43'427	29'1	84'6	0'73	1. 5'40	1. 48'67		
17		31. 9	T	R	15	30'878	43'000	29'2	84'6	0'74	1. 5'81	1. 48'26	— 19'51	1. 29'73
				L	16	30'878	44'289	7'8	63'1	0'46	4. 44'28	1. 50'21		
18	August	3. 9	L	R	15	29'650	44'000	29'7	85'8	0'75	1. 2'00	1. 52'07	— 20'14	1. 30'57
				L	16	29'650	45'466	6'6	62'4	0'45	4. 43'41	1. 49'34		

The numerical value of the Sum of Equivalents in column 11 = Wire Interval + (sum of Micrometer-Readings - 70°) × 16''·780 + sum of Level-Readings × 0''·00646; where the Wire Interval for wire 15 is zero, and for wire 16 = + 3'·17''·11. The numerical difference between this sum of Equivalents and the Instrumental Constant is the star's Z. D. North. During the year 1887 the adopted Instrumental Constant was 2'·54''·07.

1, 7, 13. Diffused.
2, 4, 17. Very diffused.
11. The reading of micrometer A was set down 31'·920.
15, 18. Very diffused and tremulous.

2. The reading of micrometer A, position L, has been diminished 1 rev.
5. The readings of micrometer B have been diminished each 1 rev.
12. The reading of micrometer B, position L, has been diminished 1 rev.
16. Faint; cloudy.

6, 14. Very tremulous.

MERIDIAN ZENITH DISTANCES OF γ DRACONIS WITH THE REFLEX ZENITH TUBE,MERIDIAN ZENITH DISTANCES of γ DRACONIS observed with the REFLEX ZENITH TUBE—*continued*.

No. for Reference.	Day and Hour of Observation, 1887.		Observer.	Position.	Wire used.	Micrometer Readings.		Level Readings.		Equivalent for Level.	Sum of Equivalents for wire, for Micrometer-Readings and for Level-Readings.	Star's observed Zenith Distance North.	Star Correction.	Concluded Mean Zenith Distance North 1887°.
						A.	B.							
						r.	r.	div.	div.					
1	August	d h	T	L	16	29.650	45.554	6.5	62.7	0.45	4. 44.89	1. 50.82	—20.35	1. 32.00
		4. 9		R	15	27.988	45.554	31.1	86.2	0.76	1. 0.19	1. 53.88		
2	5. 9	AP	R	15	28.482	45.556	45.556	30.7	85.6	0.75	1. 8.50	1. 45.57	—20.56	(1. 26.61)
				L	16	28.482	46.600	7.0	61.8	0.45	4. 42.83	1. 48.76		
3	22. 8	L	R	15	30.580	43.000	43.000	32.6	89.0	0.79	1. 0.86	1. 53.21	—23.49	1. 30.12
				L	16	30.580	44.816	3.8	60.6	0.42	4. 48.07	1. 54.00		

The numerical value of the Sum of Equivalents in column 11 = Wire Interval + (sum of Micrometer-Readings - 705) $\times$ 16''780 + sum of Level-Readings $\times$ 0''00646; where the Wire Interval for wire 15 is zero, and for wire 16 = + 3.17''11. The numerical difference between this sum of Equivalents and the Instrumental Constant is the star's Z. D. North. During the year 1887 the adopted Instrumental Constant was 2.54''07.

1. The reading of micrometer A was set down 31.988.

2. Very diffused.

MERIDIAN ZENITH DISTANCES of γ DRACONIS observed with the REFLEX ZENITH TUBE—*continued*.

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No. for Reference.	Day and Hour of Observation, 1888.		Observer.	Position.	Wire used.	Micrometer Readings.		Level Readings.		Equivalent for Level.	Sum of Equivalents for wire, for Micrometer-Readings and for Level-Readings.	Star's observed Zenith Distance North.	Star Correction.	Concluded Mean Zenith Distance North 1888 ^o .
						A.	B.	div.	div.					
						r.	r.							
1	May	d h 12. 14	T	L R	16 15	34'200 35'929	39'444 39'444	21'3 11'7	80'6 70'6	0'66 0'53	4. 18'92 1. 30'69	1. 22'81 1. 23'42	+ 6'35	1. 29'46
2		22. 14	H	R L	15 16	33'088 33'088	42'000 40'652	13'0 20'4	71'8 78'8	0'55 0'64	1. 25'92 4. 20'51	1. 28'19 1. 26'40	+ 3'41	1. 30'71
3		23. 14	L	L R	16 15	30'500 31'842	43'395 43'395	18'8 14'0	77'4 72'6	0'62 0'56	4. 23'08 1. 28'44	1. 28'97 1. 25'67	+ 3'10	1. 30'42
4		26. 14	H	R L	15 16	32'161 32'161	43'000 41'819	15'9 17'4	74'8 77'1	0'59 0'61	1. 27'20 4. 24'50	1. 26'91 1. 30'39	+ 2'17	1. 30'82
5	June	11. 13	T	R L	15 16	32'525 32'525	42'200 41'544	20'9 14'4	77'3 70'6	0'63 0'55	1. 19'92 4. 25'94	1. 34'19 1. 31'83	- 2'81	1. 30'20
6		14. 12	JP	L R	16 15	31'000 31'587	43'193 43'193	13'8 20'9	71'3 78'5	0'55 0'64	4. 28'02 1. 20'85	1. 33'91 1. 33'26	- 3'77	1. 29'82
7		25. 12	H	L R	16 15	32'000 32'028	42'402 42'402	18'6 17'0	73'2 71'8	0'59 0'57	4. 31'56 1. 14'90	1. 37'45 1. 39'21	- 7'29	1. 31'04
8	July	19. 10	T	L R	16 15	31'000 30'265	43'832 43'832	24'8 10'3	81'9 66'9	0'69 0'50	4. 38'87 1. 9'25	1. 44'76 1. 44'86	- 14'27	1. 30'54
9		23. 10	T	R L	15 16	30'295 30'295	43'831 44'535	9'4 26'1	65'6 82'8	0'49 0'70	1. 9'73 4. 38'85	1. 44'38 1. 44'74	- 15'27	1. 29'29
10	August	2. 9	AD	R L	15 16	29'361 29'361	44'600 45'641	8'3 25'8	66'2 84'0	0'48 0'71	1. 6'95 4. 41'75	1. 47'16 1. 47'64	- 17'61	1. 29'79
11		23. 7	H	L R	16 15	30'000 28'321	45'329 45'329	22'5 12'8	79'7 69'8	0'66 0'53	4. 47'19 1. 1'78	1. 53'08 1. 52'33	- 21'32	1. 31'39
12		31. 7	H	L R	16 15	30'000 28'306	45'309 45'309	22'1 10'5	80'2 68'3	0'66 0'51	4. 46'85 1. 1'17	1. 52'74 1. 52'94	- 22'21	1. 30'63
13	September	3. 7	AP	R L	15 16	28'302 28'302	45'354 46'978	10'7 24'5	67'5 81'4	0'51 0'68	1. 1'86 4. 46'39	1. 52'25 1. 52'28	- 22'45	1. 29'82
14		6. 7	AW	L R	16 15	28'000 26'421	47'242 47'242	26'5 9'0	83'2 66'1	0'71 0'49	4. 45'78 1. 1'96	1. 51'67 1. 52'15	- 22'69	1. 29'22
15		7. 7	F	R L	15 16	30'856 30'856	42'700 44'460	10'4 25'3	68'0 83'0	0'51 0'70	1. 0'18 4. 47'01	1. 53'93 1. 52'90	- 22'77	1. 30'65
16		11. 6	H	L R	16 15	30'000 28'252	45'330 45'330	24'6 10'9	83'0 69'2	0'70 0'52	4. 47'24 1. 0'62	1. 53'13 1. 53'49	- 22'89	1. 30'42
17	October	1. 5	AW	L R	16 15	30'000 28'225	45'338 45'338	24'5 8'7	83'3 67'9	0'70 0'49	4. 47'37 1. 0'28	1. 53'26 1. 53'83	- 22'69	1. 30'86
18		19. 4	F	R L	15 16	28'942 28'942	45'100 46'184	16'0 17'1	76'3 77'2	0'60 0'61	1. 8'42 4. 43'74	1. 45'69 1. 49'63	- 20'73	(1. 26'93)

The numerical value of the Sum of Equivalents in column 11 = Wire Interval + (sum of Micrometer-Readings - 70') $\times$ 16''780 + sum of Level-Readings $\times$ 0''00646; where the Wire Interval for wire 15 is zero, and for wire 16 = + 3'17''11. The numerical difference between this sum of Equivalents and the Instrumental Constant is the star's Z. D. North. During the year 1888 the adopted Instrumental Constant was 2'54''11.

4. Cloudy; 2nd bisection very uncertain, the star being only seen at intervals.
7. Wires scarcely visible.
16. The reading of micrometer A, position R, was set down 31'252.

5. Very diffused.
15. Very cloudy.
18. Scarcely visible.
17. Faint and diffused.

MERIDIAN ZENITH DISTANCES OF γ DRACONIS WITH THE REFLEX ZENITH TUBE,MERIDIAN ZENITH DISTANCES OF γ DRACONIS observed with the REFLEX ZENITH TUBE—continued.

No. for Reference.	Day and Hour of Observation, 1889.		Observer.	Position.	Wire used.	Micrometer Readings.		Level Readings.		Equivalent for Level.	Sum of Equivalents for wire, for Micrometer-Readings and for Level-Readings.	Star's observed Zenith Distance North.	Star Correction.	Concluded Mean Zenith Distance North 1889'o.
						A.	B.							
						r.	r.	div.	div.					
1	March	d h 22. 18	T	L	16	31'000	37'865	23'5	86'0	0'71	3. 32'33	1. 11'71	"	' "
				R	15	34'130	37'865	8'7	70'6	0'51	1. 7'54	1. 13'08	+ 17'47	1. 29'87
2	May	22. 14	HT	R	15	32'598	38'700	8'0	65'0	0'47	0. 55'81	1. 24'81	+ 6'36	(1. 33'12)
				L	16	32'598	37'280	25'3	82'7	0'70	3. 49'32	1. 28'70		
3		30. 13	L	L	16	31'000	38'587	24'8	82'9	0'70	3. 44'44	1. 23'82	+ 3'88	1. 28'46
				R	15	32'678	38'587	9'2	67'7	0'50	0. 55'29	1. 25'33		
4		31. 13	H	R	15	29'200	42'000	9'0	66'8	0'49	0. 54'19	1. 26'43	+ 3'57	1. 29'44
				L	16	29'200	40'475	25'9	83'7	0'71	3. 45'93	1. 25'31		
5	June	4. 13	H	R	15	31'200	40'000	30'2	66'0	0'62	0. 54'32	1. 26'30	+ 2'29	1. 29'49
				L	16	31'200	38'642	26'5	82'3	0'70	3. 48'71	1. 28'09		
6		12. 12	H	R	15	27'940	43'000	9'0	66'5	0'49	0. 49'82	1. 30'80	— 0'27	1. 29'91
				L	16	27'940	41'988	26'5	83'7	0'71	3. 50'17	1. 29'55		
7		18. 12	WR	R	15	30'545	40'266	9'4	66'4	0'49	0. 47'66	1. 32'96	— 2'19	1. 29'07
				L	16	29'661	40'266	27'2	84'0	0'72	3. 50'17	1. 29'55		
8		22. 12	H	R	15	29'613	41'000	10'7	66'0	0'50	0. 44'35	1. 36'27	— 3'45	1. 32'25
				L	16	29'613	40'648	24'6	80'2	0'68	3. 55'74	1. 35'12		
9		25. 12	AD	L	16	29'600	40'738	22'5	78'0	0'65	3. 56'98	1. 36'36	— 4'38	1. 29'59
				R	15	30'153	40'738	13'4	69'0	0'53	0. 49'04	1. 31'58		
10		27. 11	WR	R	15	30'545	40'158	14'8	69'6	0'55	0. 45'91	1. 34'71	— 5'00	1. 29'93
				L	16	30'107	40'158	22'6	77'8	0'65	3. 55'77	1. 35'15		
11		28. 11	L	R	15	30'716	40'000	15'4	70'2	0'55	0. 46'13	1. 34'49	— 5'31	1. 29'39
				L	16	30'716	39'535	21'5	76'3	0'63	3. 55'52	1. 34'90		
12	July	5. 11	H	R	15	28'579	42'000	17'5	72'3	0'58	0. 43'86	1. 36'76	— 7'38	1. 29'14
				L	16	28'579	41'757	18'8	73'4	0'60	3. 56'90	1. 36'28		
13		6. 11	L	L	16	28'600	41'743	16'9	72'1	0'58	3. 57'00	1. 36'38	— 7'67	1. 28'86
				R	15	28'840	41'743	19'4	74'3	0'61	0. 43'95	1. 36'67		
14		15. 10	T	R	15	29'175	41'300	16'5	72'8	0'58	0. 42'11	1. 38'51	— 10'23	1. 28'22
				L	16	29'175	41'286	17'8	74'3	0'59	3. 59'00	1. 38'38		
15		18. 10	JP	L	16	30'400	40'082	16'8	73'9	0'59	3. 59'34	1. 38'72	— 11'07	1. 27'69
				R	15	30'375	40'082	17'7	74'6	0'60	0. 41'83	1. 38'79		
16		19. 10	WR	R	15	30'545	39'818	19'8	76'6	0'62	0. 40'27	1. 40'35	— 11'35	1. 28'74
				L	16	30'730	39'818	16'6	73'2	0'58	4. 0'44	1. 39'82		
17	August	5. 9	WR	R	15	30'545	39'710	16'8	72'2	0'58	0. 38'42	1. 43'00	— 15'29	1. 28'09
				L	16	31'118	39'710	20'8	76'4	0'63	4. 5'19	1. 43'77		
18		6. 9	H	R	15	28'121	42'000	16'9	72'7	0'58	0. 36'18	1. 45'24	— 15'50	1. 30'11
				L	16	28'121	42'840	18'6	74'4	0'60	4. 7'40	1. 45'98		

The numerical value of the Sum of Equivalents in column 11 = Wire Interval + (sum of Micrometer-Readings - 68") $\times$ 16''780 + sum of Level-Readings $\times$ 0''00646; where the Wire Interval for wire 15 is zero, and for wire 16 = + 3'17''11. The numerical difference between this sum of Equivalents and the Instrumental Constant is the star's Z. D. North. During the year 1889 the adopted Instrumental Constant was 2'20''62 until July 19; from August 5, 2'21''42.

1. The reading of micrometer B was set down 41'865.

2. Definition very poor; 2nd bisection a mere estimation.

8. Very faint; cloudy.

11. Very faint; scarcely visible.

12. Unsteady.

13. Very faint and diffused. The reading of micrometer A, position L, has been diminished 1 rev.

14. Diffused.

MERIDIAN ZENITH DISTANCES OF γ DRACONIS observed with the REFLEX ZENITH TUBE—*continued*.

No. for Reference	Day and Hour of Observation, 1889.		Observer.	Position.	Wire used.	Micrometer Readings.		Level Readings.		Equivalent for level.	Sum of Equivalents for wire, for Micrometer-Readings and for Level-Readings.	Star's observed Zenith Distance North.	Star Correction.	Concluded Mean Zenith Distance North 1889.0.
						A.	B.							
						r.	r.	div.	div.					
1	August	d h 17. 8	WR	R L	15 16	30°545 31°396	39°571 39°571	15.8 20.2	71.6 75.8	0.56 0.62	0. 36.07 4. 7.52	1. 45.35 1. 46.10	—17.49	1. 28.24
2		31. 7	WR	R L	15 16	30°545 31°688	39°323 39°323	16.8 19.4	71.6 74.4	0.57 0.61	0. 31.91 4. 8.25	1. 49.51 1. 46.83	—19.27	1. 28.90
3	September	10. 7	WR	R L	15 16	30°545 31°760	39°340 39°340	15.7 22.7	71.2 78.3	0.56 0.65	0. 32.18 4. 9.78	1. 49.24 1. 48.36	—19.89	1. 28.91
4		12. 7	AD	R L	15 16	30°584 30°584	39°250 40°569	15.6 20.6	70.3 75.4	0.55 0.62	0. 31.32 4. 10.64	1. 50.10 1. 49.22	—19.95	1. 29.71
5		13. 6	AC*	L R	16 15	30°545 29°178	40°690 40°690	21.0 17.0	75.9 71.5	0.63 0.57	4. 12.02 0. 31.91	1. 50.60 1. 49.51	—19.98	1. 30.08
6		16. 6	AC*	R L	15 16	30°545 31°744	39°422 39°422	18.5 18.5	75.4 75.3	0.61 0.61	0. 33.62 4. 10.85	1. 47.80 1. 49.43	—20.07	1. 28.55
7		17. 6	RW	R L	15 16	31°012 31°012	39°000 40°118	19.5 16.2	77.3 73.4	0.63 0.58	0. 34.39 4. 10.21	1. 47.03 1. 48.79	—20.10	1. 27.81
8		18. 6	JP	L R	16 15	30°000 28°778	41°123 41°123	15.4 19.2	72.7 76.3	0.57 0.62	4. 10.09 0. 32.52	1. 48.67 1. 48.90	—20.13	1. 28.66
9		20. 6	AD	R L	15 16	28°739 28°739	41°100 42°408	17.6 14.8	76.7 74.3	0.61 0.58	0. 31.46 4. 10.50	1. 49.96 1. 49.08	—20.09	1. 29.43
10		25. 6	AC*	R L	15 16	30°545 31°737	39°382 39°382	21.5 13.5	78.2 73.4	0.64 0.56	0. 32.98 4. 10.01	1. 48.44 1. 48.59	—19.99	1. 28.53
11		26. 6	R	R L	15 16	30°545 31°779	39°333 39°333	19.9 12.4	79.2 71.7	0.64 0.54	0. 32.15 4. 9.87	1. 49.27 1. 48.45	—19.97	1. 28.89
12	October	10. 5	R	R L	15 16	30°545 31°632	39°372 39°372	21.0 12.5	79.9 71.3	0.65 0.54	0. 32.82 4. 8.06	1. 48.60 1. 46.64	—18.97	1. 28.65
13	November	13. 2	RW	L R	15 14	38°000 37°436	44°568 44°568	22.4 11.6	83.0 72.3	0.68 0.54	4. 5.13 0. 38.52	1. 43.71 1. 42.90	—12.47	1. 30.84
14	December	19. 0	H	R L	15 16	26°992 26°992	44°000 43°088	6.7 25.4	68.8 87.1	0.49 0.73	0. 50.69 3. 52.74	1. 30.73 1. 31.32	— 0.83	1. 30.20

The numerical value of the Sum of Equivalents in column 11 = Wire Interval + (sum of Micrometer-Readings - 68r) $\times$ 16''780 + sum of Level-Readings $\times$ 0''00646; where the Wire Interval for wire 15 is zero, and for wire 16 = + 3'17''11. The numerical difference between this sum of Equivalents and the Instrumental Constant is the star's Z. D. North. During the year 1889 the adopted Instrumental Constant was 2'.20''62 until July 19; from August 5, 2'.21''42.

MERIDIAN ZENITH DISTANCES OF γ DRACONIS WITH THE REFLEX ZENITH TUBE,MERIDIAN ZENITH DISTANCES of γ DRACONIS observed with the REFLEX ZENITH TUBE—*continued*.

No. for Reference.	Day and Hour of Observation, 1890.		Observer.	Position.	Wire used.	Micrometer Readings.		Level Readings.		Equivalent for level.	Sum of Equivalents for wire, for Micrometer-Readings and for Level-Readings.	Star's observed Zenith Distance North.	Star Correction.	Concluded Mean Zenith Distance North 1890.0.
						A.	B.							
						r.	r.	div.	div.					
1	May	d h 30. 13	AD	R L	15 16	25.890 25.890	44.650 42.591	17.0 14.0	77.2 74.8	0.61 0.57	0.43.23 3.25.75	1.21.60 1.20.92	+ 7.02	1.28.28
2	June	7. 13	WR	R L	14 15	39.440 39.440	42.700 40.977	20.2 14.4	78.2 72.4	0.64 0.56	0.40.90 3.28.92	1.23.93 1.24.09	+ 4.54	1.28.55
3		18. 12	AD	R L	15 16	27.273 27.273	42.800 41.630	17.8 15.8	74.6 73.0	0.60 0.57	0.35.39 3.32.83	1.29.44 1.28.00	+ 1.05	1.29.77
4		19. 12	HT	L R	16 15	28.000 29.277	40.888 40.888	15.3 19.0	72.9 76.3	0.57 0.62	3.32.57 0.36.95	1.27.74 1.27.88	+ 0.73	1.28.54
5		20. 12	H	R L	15 16	28.059 28.059	42.000 40.805	18.6 15.0	75.0 72.0	0.60 0.56	0.35.15 3.32.17	1.29.68 1.27.34	+ 0.41	1.28.92
6		24. 12	H	R L	15 16	29.038 29.038	41.000 39.930	18.3 16.8	74.1 72.9	0.60 0.58	0.34.79 3.33.93	1.30.04 1.29.10	- 0.83	1.28.74
7		26. 12	AD	R L	15 16	30.117 30.117	40.000 38.922	18.0 16.5	74.6 73.8	0.60 0.58	0.36.13 3.35.12	1.28.70 1.30.29	- 1.45	1.28.05
8	July	1. 11	L	L R	16 15	30.000 30.785	39.147 39.147	16.5 17.0	73.8 75.2	0.58 0.60	3.36.94 0.33.01	1.32.11 1.31.82	- 2.99	1.28.98
9		29. 9	H	R L	15 16	26.499 26.499	43.000 43.092	20.2 15.5	76.0 71.8	0.62 0.56	0.25.77 3.44.37	1.39.06 1.39.54	- 10.64	1.28.66
10	August	7. 9	SD	R L	15 16	26.947 26.947	42.700 42.856	18.5 15.4	74.5 71.0	0.60 0.56	0.28.24 3.47.92	1.36.59 1.43.09	- 12.57	1.27.27
11		20. 8	L	R L	15 16	26.566 26.566	42.700 43.134	15.0 20.0	72.2 77.0	0.56 0.63	0.21.81 3.46.27	1.43.02 1.41.44	- 14.81	1.27.42
12	September	8. 7	AD	R L	15 16	26.431 26.431	42.700 43.385	16.0 18.6	71.8 74.4	0.57 0.60	0.19.55 3.48.18	1.45.28 1.43.35	- 16.69	1.27.63
13		15. 6	H	L R	16 15	28.000 27.180	41.908 41.908	19.3 17.7	75.6 74.0	0.61 0.59	3.49.73 0.18.84	1.44.90 1.45.99	- 16.90	1.28.55
14		16. 6	WR	R L	15 16	26.438 26.438	42.700 43.556	17.7 17.7	73.2 73.6	0.59 0.59	0.19.68 3.51.16	1.45.15 1.46.33	- 16.93	1.28.81

The numerical value of the Sum of Equivalents in column 11 = Wire Interval + (sum of Micrometer-Readings - 68°) × 16".780 + sum of Level-Readings × 0".00646; where the Wire Interval for wire 15 is zero, and for wire 16 = + 3'.17".11. The numerical difference between this sum of Equivalents and the Instrumental Constant is the star's Z. D. North. During the year 1890 the adopted Instrumental Constant was 2'.4".83.

3. The reading of micrometer A was set down 32".273.

6. The reading of micrometer A has been diminished 2 revs.

6, 9. Very diffused.

MERIDIAN ZENITH DISTANCES of γ DRACONIS observed with the REFLEX ZENITH TUBE—*continued*.

No. for Reference.	Day and Hour of Observation, 1891.		Observer.	Position.	Wire used.	Micrometer Readings.		Level Readings.		Equivalent for Level.	Sum of Equivalents for wire, for Micrometer-Readings and for Level-Readings.	Star's observed Zenith Distance North.	Star Correction.	Concluded Mean Zenith Distance North 1891.0.
						A.	B.							
						r.	r.	div.	div.					
1	June	d h 16. 12	WR	R L	15 16	27.700 27.700	42.700 40.884	8.0 27.2	65.2 84.4	0.47 0.72	1. 31.08 4. 17.97	1. 23.58 1. 23.31	+ 4.76	1. 28.21
2		17. 12	AM	R L	15 16	27.693 27.693	42.700 40.923	8.7 26.9	65.0 82.8	0.48 0.71	1. 30.97 4. 18.50	1. 23.69 1. 23.84	+ 4.44	1. 28.21
3		19. 12	H	R L	15 16	28.302 28.302	42.000 40.285	8.8 24.8	63.7 79.7	0.47 0.68	1. 29.43 4. 17.98	1. 25.23 1. 23.32	+ 3.80	1. 28.08
4		25. 12	WR	R L	15 16	27.564 27.564	42.700 41.263	8.8 27.8	64.8 83.8	0.48 0.72	1. 28.82 4. 22.05	1. 25.84 1. 27.39	+ 1.94	1. 28.56
5		27. 12	AM	R L	15 16	27.518 27.518	42.700 41.323	8.6 27.8	65.3 83.1	0.48 0.72	1. 28.04 4. 22.28	1. 26.62 1. 27.62	+ 1.32	1. 28.44
6	July	1. 12	H	R L	15 16	28.241 28.241	42.000 40.657	9.7 26.0	66.0 81.5	0.49 0.69	1. 28.44 4. 23.20	1. 26.22 1. 28.54	+ 0.10	1. 27.48
7		3. 11	L	R L	15 16	27.414 27.414	42.700 41.435	12.2 23.7	68.6 80.5	0.52 0.67	1. 26.34 4. 22.36	1. 28.32 1. 27.70	- 0.50	1. 27.51
8		4. 11	AC*	L R	16 15	27.418 28.569	41.497 41.497	26.1 9.8	92.2 66.2	0.76 0.49	4. 23.56 1. 25.50	1. 28.90 1. 29.16	- 0.80	1. 28.23
9		6. 11	H	R L	15 16	28.088 28.088	42.000 40.828	9.2 26.4	66.0 82.9	0.49 0.71	1. 25.86 4. 23.53	1. 28.80 1. 28.87	- 1.40	1. 27.44
10		9. 11	AM	R L	15 16	27.282 27.282	42.700 41.790	8.7 25.9	66.2 83.2	0.48 0.70	1. 24.07 4. 26.14	1. 30.59 1. 31.48	- 2.30	1. 28.74
11		10. 11	H	R L	15 16	27.062 27.062	43.000 41.612	9.7 23.2	66.4 80.0	0.49 0.67	1. 25.43 4. 19.44	1. 29.23 1. 24.78	- 2.58	(1. 24.43)
12		11. 11	WR	R L	15 16	27.454 27.454	42.700 41.516	10.0 24.6	66.8 82.6	0.50 0.69	1. 26.99 4. 24.42	1. 27.67 1. 29.76	- 2.86	1. 25.86
13		13. 10	AC*	R L	15 16	28.371 28.371	41.517 40.611	12.1 23.1	68.3 79.6	0.52 0.66	1. 22.53 4. 24.58	1. 32.13 1. 29.92	- 3.42	1. 27.61
14		14. 10	H	R L	15 16	28.135 28.135	42.000 40.909	12.5 24.4	68.8 80.8	0.53 0.68	1. 26.69 4. 25.65	1. 27.97 1. 30.99	- 3.70	1. 25.78
15		17. 10	AC*	L R	16 15	28.120 28.616	41.033 41.033	23.7 12.6	78.4 67.5	0.66 0.52	4. 27.46 1. 18.53	1. 32.80 1. 36.13	- 4.54	1. 29.93
16		23. 10	WR	R L	15 16	27.163 27.163	42.700 42.004	10.8 24.4	68.4 81.8	0.51 0.69	1. 21.11 4. 27.73	1. 33.55 1. 33.07	- 6.10	1. 27.21
17		30. 9	AM	R L	15 16	27.080 27.080	42.700 42.213	10.5 22.6	69.0 80.8	0.51 0.67	1. 20.72 4. 29.82	1. 33.94 1. 35.16	- 7.82	1. 26.73
18	August	5. 9	HT	R L	15 16	26.732 26.732	43.000 42.604	10.0 23.8	68.3 81.1	0.51 0.68	1. 19.91 4. 30.54	1. 34.75 1. 35.88	- 9.14	1. 26.18

The numerical value of the Sum of Equivalents in column 11 = Wire Interval + (sum of Micrometer-Readings - 65') $\times$ 16''780 + sum of Level-Readings $\times$ 0''00646; where the Wire Interval for wire 15 is zero, and for wire 16 = + 3'17''.11. The numerical difference between this sum of Equivalents and the Instrumental Constant is the star's Z. D. North. During the year 1891 the adopted Instrumental Constant was 2'.54''66.

5. Very diffused and tremulous.
14. Very tremulous.

10, 14. Very faint and diffused.
15. Very diffused; 2nd bisection uncertain.

11. Image bad.
16. Invisible at times.

MERIDIAN ZENITH DISTANCES of γ DRACONIS observed with the REFLEX ZENITH TUBE—*continued.*

No. for Reference.	Day and Hour of Observation, 1892.		Observer.	Position.	Wire used.	Micrometer Readings.		Level Readings.		Equivalent for Level.	Sum of Equiva- lents for wire, for Micrometer- Readings and for Level- Readings.	Star's observed Zenith Distance North.	Star Correction.	Concluded Mean Zenith Distance North 1892'o.
						A.	B.							
						r.	r.	div.	div.					
1	July	d h 22. 10	L	R	15	7'723	13'300	23'6	80'6	0'67	0. 17'84	1. 31'06	— 3'70	1. 27'70
				L	16	7'723	12'457	10'8	67'7	0'51	3. 20'64	1. 31'74		
2		30. 9	L	L	16	6'720	13'468	13'2	69'0	0'53	3. 20'79	1. 31'89	— 5'64	1. 27'22
				R	15	7'391	13'468	24'2	80'6	0'67	0. 15'08	1. 33'82		
3	August	11. 9	AM	R	15	7'496	13'300	23'5	80'2	0'67	0. 14'03	1. 34'87	— 8'12	1. 26'14
				L	16	7'496	12'798	10'0	66'2	0'49	3. 22'54	1. 33'64		
4		15. 8	CD	R	15	7'322	13'300	24'3	79'6	0'67	0. 11'11	1. 37'79	— 8'84	1. 27'72
				L	16	7'322	13'071	12'9	67'9	0'52	3. 24'22	1. 35'32		
5	October	22. 4	TH	R	15	7'333	13'300	18'4	80'0	0'63	0. 11'25	1. 37'65	— 9'04	1. 28'02
				L	16	7'333	13'125	14'6	76'2	0'58	3. 25'37	1. 36'47		

The numerical value of the Sum of Equivalents in column 11 = Wire Interval + (sum of Micrometer-Readings - 20°) × 16''·780 + sum of Level-Readings × 0''·00646; where the Wire Interval for wire 15 is zero, and for wire 16 = + 3' 17''·11. The numerical difference between this sum of Equivalents and the Instrumental Constant is the star's Z. D. North. During the year 1892 the adopted Instrumental Constant was 1'.48''·90

2. The reading of micrometer A, position L, has been diminished 1 rev.

MERIDIAN ZENITH DISTANCES of γ DRACONIS observed with the REFLEX ZENITH TUBE—continued.

No. for Reference.	Day and Hour of Observation, 1893.		Observer.	Position.	Wire used.	Micrometer Readings.		Level Readings.		Equivalent for Level.	Sum of Equivalents for wire, for Micrometer-Readings and for Level-Readings.	Star's observed Zenith Distance North.	Star Correction.	Concluded Mean Zenith Distance North 1893 ^o .
						A.	B.							
						r.	r.	div.	div.					
1	May	d h 24. 14	H	L R	16 15	7.700 10.971	11.213 11.213	8.0 26.3	65.8 84.0	0.48 0.71	3.32.91 1.11.92	1.11.13 1.9.86	+16.16	1.26.66
2		25. 14	B	R L	15 16	8.932 8.932	13.300 9.816	27.9 8.2	84.8 64.4	0.73 0.47	1.11.74 3.30.13	1.10.04 1.8.35	+15.85	1.25.05
3		30. 13	B	R L	15 16	8.495 8.495	13.300 10.464	26.6 7.4	85.3 66.3	0.72 0.48	1.4.40 3.33.68	1.17.38 1.11.90	+14.30	1.28.94
4	June	5. 13	WB	R L	15 16	8.510 8.510	13.300 11.724	30.3 13.3	93.7 63.0	0.80 0.49	1.4.73 3.38.31	1.17.05 1.16.53	+12.38	1.29.17
5		13. 12	J	R L	15 16	8.408 8.408	13.300 10.893	32.0 5.2	87.1 61.0	0.77 0.43	1.2.99 3.39.37	1.18.79 1.17.59	+9.82	1.28.01
6		14. 12	TH	R L	15 16	8.425 8.425	13.300 10.994	32.8 4.5	87.5 59.5	0.78 0.41	1.3.29 3.41.33	1.18.49 1.19.55	+9.50	1.28.52
7		15. 12	AC	R L	15 16	10.652 10.652	10.994 8.964	33.7 4.1	88.2 58.9	0.79 0.41	1.1.97 3.44.64	1.19.81 1.22.86	+9.18	1.30.52
8		19. 12	AC	L R	16 15	7.999 10.115	11.503 11.503	3.1 35.1	57.2 88.9	0.39 0.80	3.42.70 1.1.51	1.20.92 1.20.27	+7.90	1.28.50
9		21. 12	H	R L	15 16	8.502 8.502	12.990 10.990	33.0 3.6	88.9 60.0	0.79 0.41	0.59.38 3.42.55	1.22.40 1.20.77	+7.26	1.28.85
10		27. 12	AC	L R	16 15	8.501 10.435	11.045 11.045	3.1 32.6	60.1 89.2	0.41 0.79	3.43.46 0.59.18	1.21.68 1.22.60	+5.34	1.27.48
11		29. 11	H	R L	15 16	8.390 8.390	13.000 11.388	33.7 4.0	90.0 60.6	0.80 0.42	0.57.68 3.47.37	1.24.10 1.25.59	+4.70	1.29.55
12	July	2. 11	CD	R L	15 16	8.044 8.044	13.300 11.537	33.5 5.0	88.0 58.6	0.79 0.41	0.56.90 3.44.05	1.24.88 1.22.27	+3.77	1.27.35
13		5. 11	WB	R L	15 16	8.125 8.125	13.300 11.579	37.3 14.5	87.6 60.4	0.80 0.48	0.58.27 3.46.19	1.23.51 1.24.41	+2.84	1.26.80
14		10. 10	CD	R L	15 16	7.961 7.961	13.300 11.865	33.6 2.7	88.7 57.8	0.79 0.39	0.55.52 3.48.14	1.26.26 1.26.36	+1.32	1.27.62
15		11. 10	H	R L	15 16	8.281 8.281	13.000 11.585	33.0 6.0	87.2 61.1	0.78 0.43	0.55.84 3.48.85	1.25.94 1.27.07	+1.04	1.27.55
16		12. 10	B	R L	15 16	8.034 8.034	13.300 11.694	29.9 6.4	85.7 62.6	0.75 0.45	0.56.69 3.46.05	1.25.09 1.24.27	+0.76	1.25.44
17		17. 10	AC	R L	15 16	7.875 7.875	13.300 12.036	29.9 6.0	86.8 63.2	0.76 0.45	0.54.04 3.49.63	1.27.74 1.27.85	-0.64	1.27.16
18		20. 10	B	R L	15 16	7.676 7.676	13.300 12.300	28.4 7.8	84.7 64.5	0.73 0.47	0.50.67 3.50.74	1.31.11 1.28.96	-1.45	1.28.59

The numerical value of the Sum of Equivalents in column 11 = Wire Interval + (sum of Micrometer-Readings - 18r) $\times$ 16''780 + sum of Level-Readings $\times$ 0''00646; where the Wire Interval for wire 15 is zero, and for wire 16 = + 3'17''11. The numerical difference between this sum of Equivalents and the Instrumental Constant is the star's Z. D. North. During the year 1893 the adopted Instrumental Constant was 2'.21''78.

2. Very faint; cloudy.

6, 7. Diffused.

14. Very diffused.

15. The integral number of revolutions of micrometer B, position L, has been supplied.

16. Scarcely visible. The reading of micrometer A has been increased 1 rev.

MERIDIAN ZENITH DISTANCES of γ DRACONIS observed with the REFLEX ZENITH TUBE—*continued*.

No. for Reference.	Day and Hour of Observation, 1893.		Observer.	Position.	Wire used.	Micrometer Readings.		Level Readings.		Equivalent for Level.	Sum of Equivalents for wire, for Micrometer-Readings and for Level-Readings.	Star's observed Zenith Distance North.	Star Correction.	Concluded Mean Zenith Distance North 1893'0.
						A.	B.							
						r.	r.	div.	div.					
1	July	d h 27. 9	J	R L	15	7'731	13'075	21'7	80'4	0'66	0. 47'74	1. 34'04	— 3'20	1. 30'05
					16	7'731	12'454	10'0	60'7	0'46	3. 54'23	1. 32'45		
2	August	4. 8	WB	R L	15	7'723	13'300	83'4	32'4	0'75	0. 51'48	1. 30'30	— 5'02	1. 27'20
					16	7'723	12'560	11'5	65'1	0'50	3. 55'92	1. 34'14		
3		9. 8	B	R L	15	7'429	13'300	29'7	83'4	0'73	0. 46'53	1. 35'25	— 6'08	1. 28'88
					16	7'429	12'887	9'3	63'0	0'47	3. 56'44	1. 34'66		
4		10. 8	WB	R L	15	7'718	13'300	30'7	84'3	0'74	0. 51'38	1. 30'40	— 6'26	1. 26'55
					16	7'718	12'631	12'0	61'6	0'48	3. 57'00	1. 35'22		
5	September	4. 7	HF	R L	15	7'200	13'300	30'7	83'1	0'73	0. 43'07	1. 38'85	— 9'63	1. 28'83
					16	7'200	13'317	9'9	65'2	0'49	3. 59'84	1. 38'06		
6		7. 6	CD	R L	15	7'410	13'300	26'8	81'8	0'70	0. 46'18	1. 35'60	— 9'90	1. 26'17
					16	7'410	13'016	10'0	65'0	0'49	3. 58'31	1. 36'53		
7	October	30. 4	CD	R L	15	7'506	13'300	27'2	88'0	0'74	0. 47'82	1. 33'96	— 6'17	1. 27'95
					16	7'506	12'788	4'5	65'0	0'45	3. 56'06	1. 34'28		

The numerical value of the Sum of Equivalents in column 11 = Wire Interval + (sum of Micrometer-Readings - 18^r) $\times$ 16''780 + sum of Level-Readings $\times$ 0''00646; where the Wire Interval for wire 15 is zero, and for wire 16 = + 3'17'11. The numerical difference between this sum of Equivalents and the Instrumental Constant is the star's Z. D. North. During the year 1893 the adopted Instrumental Constant was 2'.21''78.

1. Very diffused.

7. Very faint.

MERIDIAN ZENITH DISTANCES of γ DRACONIS observed with the REFLEX ZENITH TUBE—*continued*.

No. for Reference.	Day and Hour of Observations, 1894.		Observer.	Position.	Wire used.	Micrometer Readings.		Level Readings.		Equivalent for Level.	Sum of Equivalents for wire, for Micrometer-Readings and for Level-Readings.	Star's observed Zenith Distance North.	Star Correction.	Concluded Mean Zenith Distance North 1894 ^o .
						A.	B.							
						r.	r.	div.	div.					
1	January	18. 22	CD	R	15	8.989	13.300	4.6	66.1	0.46	1. 12.43	1. 9.35	+ 18.54	1. 28.98
				L	16	8.989	9.933	26.9	88.4	0.74	3. 33.32	1. 11.54		
2	July	11. 11	H	R	15	40.252	14.000	27.6	84.0	0.72	0. 38.51	1. 26.50	+ 2.02	1. 28.15
				L	16	40.252	12.432	10.0	66.7	0.50	3. 30.76	1. 25.75		
3		25. 9	WB	R	15	40.865	13.300	74.0	18.2	0.59	0. 36.92	1. 28.09	- 1.80	1. 28.26
				L	16	40.865	12.188	16.7	72.6	0.58	3. 37.03	1. 32.02		
4		27. 9	DE	R	15	40.870	13.300	19.1	73.9	0.60	0. 37.02	1. 27.99	- 2.30	1. 25.93
				L	16	40.870	11.971	17.7	72.4	0.58	3. 33.47	1. 28.46		
5		28. 9	H	R	15	42.193	12.000	20.8	75.0	0.62	0. 37.42	1. 27.59	- 2.55	1. 25.53
				L	16	42.193	10.655	17.0	71.8	0.58	3. 33.58	1. 28.57		
6	August	15. 8	B	R	15	40.602	13.300	21.3	77.5	0.64	0. 32.55	1. 32.46	- 6.33	1. 25.52
				L	16	40.602	12.407	14.0	70.4	0.54	3. 36.25	1. 31.24		
7	September	1. 7	B	R	15	40.411	13.300	18.3	74.2	0.60	0. 29.32	1. 35.69	- 8.66	1. 27.34
				L	16	40.411	12.898	16.0	71.9	0.57	3. 41.31	1. 36.30		
8		12. 7	AC	R	15	40.344	13.301	20.0	77.5	0.63	0. 28.23	1. 36.78	- 9.40	1. 26.18
				L	16	40.344	12.850	14.0	71.7	0.56	3. 39.38	1. 34.37		
9	October	1. 7	H	R	15	40.594	13.000	16.6	75.8	0.59	0. 27.34	1. 37.67	- 9.30	1. 27.55
				L	16	40.594	12.698	15.0	74.4	0.58	3. 41.04	1. 36.03		

The numerical value of the Sum of Equivalents in column 11 = Wire Interval + (sum of Micrometer-Readings - 52^r [but for Jan. 18, - 18^r]) $\times$ 16''⁷⁸⁰ + sum of Level-Readings $\times$ 0''⁰⁶⁴⁶; where the Wire Interval for wire 15 is zero, and for wire 16 = 3'.18''⁷⁸ [but for Jan. 18, 3'.17''¹¹]. The numerical difference between this sum of Equivalents and the Instrumental Constant is the star's Z. D. North. During the year 1894 the adopted Instrumental Constant was 2'.5''⁰¹ [but for Jan. 18, 2'.21''⁷⁸].

1. Very faint.

1, 4. The reading of micrometer B, position L, has been diminished 1 rev.

3. Very diffused.

July 10. The wires were found broken.

6. Very windy.

MERIDIAN ZENITH DISTANCES of γ DRACONIS observed with the REFLEX ZENITH TUBE—*continued*.

No. for Reference.	Day and Hour of Observations, 1895.		Observer.	Position.	Wire used.	Micrometer Readings.		Level Readings.		Equivalent for Level.	Sum of Equivalents for wire, for Micrometer-Readings and for Level-Readings.	Star's observed Zenith Distance North.	Star Correction.	Concluded Mean Zenith Distance North 1895°.
						A.	B.							
						r.	r.	div.	div.					
1	May	d h 30. 14	H	R	15	19°178	35°000	21.8	76.7	0.64	1. 10°75	1. 10°50	+ 15.30	1. 25°44
				L	16	19°178	31°518	16.1	71.0	0.56	3. 31°02	1. 9°77		
2		31. 14	AC	L	17	5°364	33°603	15.3	70°6	0.55	3. 30°37	1. 9°12	+ 14.98	1. 24°87
				R	16	8°721	33°603	20.9	76°3	0.63	1. 10°60	1. 10°65		
3	June	5. 13	B	R	15	14°750	39°145	20.8	77°5	0.64	1. 5°99	1. 15°26	+ 13.38	1. 27°31
				L	16	14°750	36°114	14.6	71°2	0.56	3. 33°84	1. 12°59		
4		6. 13	CM	R	15	19°069	35°000	22.0	79°2	0.65	1. 8°93	1. 12°32	+ 13.06	1. 25°50
				L	16	19°069	31°793	14.7	71°7	0.56	3. 33°80	1. 12°55		
5		7. 13	H	L	16	19°000	31°923	14.3	70°6	0.55	3. 34°82	1. 13°57	+ 12.74	1. 26°30
				R	15	22°075	31°923	21.0	76°8	0.63	1. 7°71	1. 13°54		
6		8. 13	AC	R	15	22°078	31°924	22.7	77°6	0.65	1. 7°80	1. 13°45	+ 12.42	1. 26°59
				L	16	22°078	28°924	14.8	70°0	0.55	3. 36°14	1. 14°89		
7		13. 12	HF	R	15	25°080	29°000	20.7	80°5	0.65	1. 9°11	1. 12°14	+ 10.78	1. 23°33
				L	16	25°080	25°810	10.0	67°0	0.50	3. 34°21	1. 12°96		
8		18. 12	B	R	15	21°820	32°000	31.1	87°7	0.77	1. 4°87	1. 16°38	+ 9.13	1. 24°75
				L	16	21°820	29°186	6.0	63°1	0.45	3. 36°11	1. 14°86		
9		19. 12	H	R	15	23°580	30°000	28.8	86°0	0.74	1. 0°81	1. 20°44	+ 8.80	1. 29°16
				L	16	23°580	27°747	8.0	65°1	0.47	3. 41°52	1. 20°27		
10		24. 12	H	R	15	23°541	30°000	29.7	85°6	0.74	1. 0°16	1. 21°09	+ 7.15	1. 28°71
				L	16	23°541	27°891	8.0	64°0	0.47	3. 43°27	1. 22°02		
11	July	1. 11	CD	R	15	24°379	29°000	30.6	86°3	0.76	0. 57°46	1. 23°79	+ 4.88	1. 28°69
				L	16	24°379	27°161	6.8	62°4	0.45	3. 45°07	1. 23°82		
12		2. 11	H	L	16	24°000	27°517	6.9	63°8	0.46	3. 44°70	1. 23°45	+ 4.57	1. 28°47
				R	15	25°829	27°517	31.2	87°0	0.76	0. 56°90	1. 24°35		
13		4. 11	AC	R	15	25°712	27°517	30.3	86°7	0.76	0. 54°95	1. 26°30	+ 3.95	1. 30°13
				L	16	25°712	25°961	6.6	63°1	0.45	3. 47°31	1. 26°06		
14		6. 11	H	L	16	26°000	25°472	6.1	62°0	0.44	3. 43°92	1. 22°67	+ 3.33	1. 26°84
				R	15	27°874	25°472	31.0	87°2	0.76	0. 56°90	1. 24°35		
15		8. 11	AC	R	15	27°940	25°460	34.9	88°7	0.80	0. 57°85	1. 23°40	+ 2.71	1. 26°63
				L	16	27°940	23°637	6.8	61°1	0.44	3. 45°69	1. 24°44		
16		9. 11	B	R	15	29°680	23°625	32.5	87°1	0.77	0. 56°22	1. 25°03	+ 2.40	1. 27°61
				L	16	29°680	21°955	6.1	60°6	0.43	3. 46°64	1. 25°39		
17	August	6. 9	AC	R	15	23°740	29°000	28.1	85°1	0.73	0. 46°71	1. 34°54	- 4.86	1. 29°50
				L	16	23°740	28°416	7.7	65°0	0.47	3. 55°43	1. 34°18		
18		7. 9	B	R	15	24°357	28°415	28.3	85°3	0.73	0. 47°25	1. 34°00	- 5.08	1. 28°75
				L	16	24°357	27°768	6.8	63°8	0.46	3. 54°90	1. 33°65		

The numerical value of the Sum of Equivalents in column 11 = Wire Interval + (sum of Micrometer-Readings - 50°) × 16''·780 + sum of Level-Readings × 0''·00646; where the Wire Interval for wire 15 is zero, for wire 16 = 3'.18''·78, and for wire 17 = 6'.34''·95. The numerical difference between this sum of Equivalents and the Instrumental Constant is the star's Z. D. North. During the year 1895 the adopted Instrumental Constant was 2'.21''·25.

1. The reading of micrometer A has been diminished 1 rev.
 7, 17. The reading of micrometer B, position L, has been diminished 1 rev.
 8. Observation hurried.

- 6, 15, 16. Very diffused and unsteady.
 13. Diffused and unsteady.

MERIDIAN ZENITH DISTANCES of γ DRACONIS observed with the REFLEX ZENITH TUBE—continued.

No. for Reference	Day and Hour of Observation, 1895.		Observer.	Position.	Wire used.	Micrometer Readings.		Level Readings.		Equivalent for Level.	Sum of Equivalents for wire, for Micrometer-Readings and for Level-Readings.	Star's observed Zenith Distance North.	Star Correction.	Concluded Mean Zenith Distance North 1895°.
						A.	B.							
						r.	r.	div.	div.					
1	August	d h	WB	R	15	24'811	28'000	29'0	85'4	0'74	0.47'91	1.33'34	— 6'02	1.27'58
		12. 8		L	16	24'811	27'327	7'9	63'8	0'46	3.55'11	1.33'86		
2		19. 8	AC	R	15	23'827	29'000	30'4	84'7	0'74	0.48'18	1.33'07	— 7'25	1.26'14
				L	16	23'827	28'300	9'0	63'2	0'47	3.54'95	1.33'70		
3		20. 8	H	L	16	24'000	28'102	9'5	63'9	0'47	3.54'52	1.33'27	— 7'40	1.25'78
				R	15	24'725	28'102	29'4	83'2	0'73	0.48'17	1.33'08		
4		21. 8	B	R	15	24'865	28'069	31'0	84'6	0'75	0.49'98	1.31'27	— 7'55	1.24'15
				L	16	24'865	27'169	8'9	62'7	0'46	3.53'37	1.32'12		
5		22. 8	WB	R	15	25'852	27'000	32'0	86'0	0'76	0.48'61	1.32'64	— 7'70	1.25'46
				L	16	25'852	26'274	9'0	62'0	0'46	3.54'92	1.33'67		
6		23. 8	S	R	15	25'811	27'000	31'0	83'0	0'74	0.47'91	1.33'34	— 7'85	1.25'63
				L	16	25'811	26'310	11'0	65'0	0'49	3.54'87	1.33'62		
7		24. 8	H	R	15	23'852	29'000	28'7	84'0	0'73	0.48'58	1.32'67	— 8'00	1.24'63
				L	16	23'852	28'209	8'7	64'0	0'47	3.53'84	1.32'59		
8		27. 7	AC	R	15	24'672	28'207	29'1	85'2	0'74	0.49'05	1.32'20	— 8'45	1.24'10
				L	16	24'672	27'409	6'3	62'5	0'45	3.54'15	1.32'90		
9		28. 7	CM	R	15	23'698	29'000	31'7	87'5	0'77	0.46'04	1.35'21	— 8'60	1.25'23
				L	16	23'698	28'357	6'2	62'0	0'44	3.53'70	1.32'45		
10		30. 7	H	R	15	23'692	29'000	30'0	84'7	0'74	0.45'91	1.35'34	— 8'80	1.26'77
				L	16	23'692	28'561	7'9	62'7	0'46	3.57'05	1.35'80		
11		31. 7	AC	R	15	24'132	28'572	29'3	84'9	0'74	0.46'12	1.35'13	— 8'90	1.25'88
				L	16	24'132	28'039	8'0	63'7	0'46	3.55'68	1.34'43		
12	September	2. 7	B	R	15	23'659	29'000	29'2	83'7	0'73	0.45'35	1.35'90	— 9'10	1.26'47
				L	16	23'659	28'560	8'8	63'5	0'47	3.56'49	1.35'24		
13		3. 7	RC	R	15	23'700	29'000	34'0	88'0	0'79	0.46'10	1.35'15	— 9'20	1.26'08
				L	16	23'700	28'532	5'1	60'0	0'42	3.56'65	1.35'40		
14		4. 7	AC	R	15	24'092	28'553	30'0	84'4	0'74	0.45'12	1.36'13	— 9'30	1.26'62
				L	16	24'092	28'155	8'2	62'4	0'46	3.56'95	1.35'70		
15		6. 7	B	R	15	24'466	28'275	29'5	84'6	0'74	0.46'80	1.34'45	— 9'50	1.24'89
				L	16	24'466	27'699	8'5	63'4	0'46	3.55'57	1.34'32		
16		7. 7	DE	R	15	24'760	28'000	31'1	85'4	0'75	0.47'07	1.34'18	— 9'60	1.24'80
				L	16	24'760	27'423	8'0	62'6	0'46	3.55'87	1.32'62		
17		13. 6	J	R	15	27'659	25'000	34'0	90'7	0'81	0.45'43	1.35'82	— 9'84	1.27'03
				L	16	27'659	24'721	7'0	63'9	0'46	3.59'17	1.37'92		
18		14. 6	B	R	15	28'013	24'581	29'9	86'5	0'75	0.44'28	1.36'97	— 9'88	1.26'81
				L	16	28'013	24'277	5'6	62'9	0'44	3.57'65	1.36'40		

The numerical value of the Sum of Equivalents in column 11 = Wire Interval + (sum of Micrometer-Readings - 50°) × 16''780 + sum of Level-Readings × 0''00646; where the Wire Interval for wire 15 is zero, for wire 16 = 3'.18''78, and for wire 17 = 6'.34''95. The numerical difference between this sum of Equivalents and the Instrumental Constant is the star's Z. D. North. During the year 1895 the adopted Instrumental Constant was 2'.21''25.

1, 6, 16. Very diffused.

5. Very faint; cloudy.

17. The reading of micrometer B, position R, has been diminished 2 revs.

MERIDIAN ZENITH DISTANCES of γ DRACONIS observed with the REFLEX ZENITH TUBE—*continued*.

No. for Reference.	Day and Hour of Observation, 1895.		Observer.	Position.	Wire used.	Micrometer Readings.		Level Readings.		Equivalent for Level.	Sum of Equivalents for wire, for Micrometer-Readings and for Level-Readings.	Star's observed Zenith Distance North.	Star Correction.	Concluded Mean Zenith Distance North 1895 ^o
						A.	B.							
						r.	r.	div.	div.					
1	September	d h 16 6	DE	R	15	24.612	28.000	31.8	89.0	0.78	0.44.61	1.36.64	— 9.96	1.27.14
				L	16	24.612	27.748	5.1	62.3	0.43	3.58.81	1.37.56		
2		20. 6	S	R	15	24.822	28.000	31.0	86.0	0.76	0.48.11	1.33.14	— 10.00	1.25.68
				L	16	24.822	27.573	12.0	66.0	0.50	3.59.46	1.38.21		
3		21. 6	AC	R	15	25.643	26.999	29.4	86.9	0.75	0.45.08	1.36.17	— 10.00	1.26.34
				L	16	25.643	26.653	6.2	63.6	0.45	3.57.76	1.36.51		
4		30. 5	J	R	15	22.000	30.595	32.0	86.4	0.77	0.44.31	1.36.94	— 9.85	1.26.77
				L	16	21.690	30.595	6.6	61.0	0.43	3.57.55	1.36.30		
5	October	3. 5	H	R	15	23.645	29.000	27.2	85.8	0.73	0.45.11	1.36.14	— 9.70	1.26.54
				L	16	23.645	28.639	7.7	66.1	0.48	3.57.59	1.36.34		
6	November	14. 2	B	R	15	23.999	29.000	22.8	82.1	0.68	0.51.00	1.30.25	— 2.90	1.27.06
				L	16	23.999	27.885	11.1	70.3	0.53	3.50.92	1.29.67		
7		18. 2	W	R	15	23.953	29.000	23.2	83.5	0.69	0.50.24	1.31.01	— 1.84	1.28.98
				L	16	23.953	27.989	9.4	69.5	0.51	3.51.87	1.30.62		

The numerical value of the Sum of Equivalents in column 11 = Wire Interval + (Sum of Micrometer-Readings - 50°) × 16".780 + sum of Level-Readings × 0".00646; where the Wire Interval for wire 15 is zero, for wire 16 = 3'.18".78, and for wire 17 = 6'.34".95. The numerical difference between this sum of Equivalents and the Instrumental Constant is the star's Z. D. North. During the year 1895 the adopted Instrumental Constant was 2'.21".25.

1, 2. Very diffused.

2. The reading of micrometer B, position R, has been increased 1 rev.

MERIDIAN ZENITH DISTANCES of γ DRACONIS observed with the REFLEX ZENITH TUBE—continued.

No. for Reference.	Day and Hour of Observation 1896.		Observer.	Position.	Wire used.	Micrometer Readings.		Level Readings.		Equivalent for Level	Sum of Equivalents for wire, for Micrometer-Readings and for Level-Readings.	Star's observed Zenith Distance North.	Star Correction.	Concluded Mean Zenith Distance North 1896.
						A.	B.							
						r.	r.	div.	div.					
1	June	d h 11. 13	B	R L	15 16	24'901 24'901	29'000 26'361	32'0 3'5	87'6 60'9	0'77 0'41	1. 6'23 3. 40'37	1. 15'35 1. 18'79	+ 10'10	1. 27'17
2		20. 12	WB	R L	15 16	21'402 21'402	32'000 29'760	31'6 7'6	87'3 63'0	0'77 0'46	0. 57'85 3. 38'74	1. 23'73 1. 17'16	+ 7'13	1. 27'58
3		26. 12	B	R L	15 16	23'410 23'410	30'000 28'020	30'0 4'5	86'2 61'0	0'75 0'42	0. 57'97 3. 43'19	1. 23'61 1. 21'61	+ 5'15	1. 27'76
4	July	20. 10	B	R L	15 16	24'268 24'268	29'000 27'703	38'4 1'9	92'0 55'7	0'84 0'36	0. 55'68 3. 52'22	1. 25'90 1. 30'64	- 2'10	1. 26'17
5		22. 10	W	L R	16 15	24'000 25'344	27'718 27'718	4'0 35'3	58'8 90'0	0'41 0'81	3. 48'02 0. 52'19	1. 26'44 1. 29'39	- 2'62	1. 25'30
6		24. 10	AC	R L	15 16	25'025 25'025	28'000 26'837	36'1 1'9	91'2 56'9	0'82 0'38	0. 51'58 3. 50'40	1. 30'00 1. 28'82	- 3'14	1. 26'27
7	August	1. 9	S	R L	15 16	25'054 25'054	28'000 26'930	42'0 1'0	93'0 56'0	0'87 0'37	0. 52'12 3. 52'44	1. 29'46 1. 30'86	- 5'10	1. 25'06
8		4. 9	CD	R L	15 16	25'972 25'972	27'000 26'031	36'0 0'9	92'0 57'1	0'83 0'38	0. 50'70 3. 52'77	1. 30'88 1. 31'19	- 5'76	1. 25'28
9		10. 8	EB	R L	15 16	25'950 25'950	27'000 26'232	34'2 1'8	91'0 58'7	0'81 0'39	0. 50'31 3. 55'78	1. 31'27 1. 34'20	- 7'02	1. 25'72
10		11. 8	W	R L	15 16	25'763 25'763	27'000 26'220	36'0 0'9	92'2 57'8	0'83 0'38	0. 47'20 3. 52'43	1. 34'38 1. 30'85	- 7'21	1. 25'41
11		12. 8	CD	R L	15 16	25'820 25'820	27'000 26'294	34'9 3'3	90'6 59'0	0'81 0'40	0. 48'13 3. 54'66	1. 33'45 1. 33'08	- 7'40	1. 25'87
12		25. 8	W	R L	15 16	25'707 25'707	27'000 26'592	27'4 8'9	83'8 65'2	0'72 0'48	0. 46'15 3. 57'84	1. 35'43 1. 36'26	- 9'52	1. 26'33
13		31. 7	W	R L	15 16	25'612 25'612	27'000 26'638	31'0 6'2	88'2 63'5	0'77 0'45	0. 44'60 3. 56'99	1. 36'98 1. 35'41	- 10'24	1. 25'96
14	September	3. 7	W	R L	15 16	25'632 25'632	27'000 26'651	26'0 8'9	83'8 66'0	0'71 0'48	0. 44'87 3. 57'57	1. 36'71 1. 35'99	- 10'54	1. 25'81
15		19. 6	H	R L	15 16	24'612 24'612	28'000 27'673	21'2 13'6	78'4 71'1	0'64 0'55	0. 44'47 3. 57'67	1. 37'11 1. 36'09	- 11'34	1. 25'26
16	October	5. 5	B	R L	15 16	24'433 24'433	28'000 27'900	18'3 13'7	78'0 73'0	0'62 0'56	0. 41'44 3. 58'48	1. 40'14 1. 36'90	- 10'86	1. 27'66
17		9. 5	B	R L	15 16	24'720 24'720	27'900 27'600	20'7 12'3	78'7 70'7	0'64 0'54	0. 44'61 3. 58'25	1. 36'97 1. 36'67	- 10'54	1. 26'28
18	November	5. 3	AC	R L	15 16	25'849 25'849	27'001 26'239	23'9 7'0	85'0 68'2	0'70 0'49	0. 48'52 3. 54'30	1. 33'06 1. 32'72	- 6'34	1. 26'55

The numerical value of the Sum of Equivalents in column 11 = Wire Interval + (sum of Micrometer-Readings - 50r) $\times$ 16''780 + sum of Level-Readings $\times$ 0''00646; where the Wire Interval for wire 15 is zero, and for wire 16 = 3'.18''78. The numerical difference between this sum of Equivalents and the Instrumental Constant is the star's Z. D. North. During the year 1896 the adopted Instrumental Constant was 2'.21''58.

1. Wires not vertical.
3. The reading of micrometer A has been increased 1 rev.
8, 10. Diffused.

2, 5, 7. Very diffused.
5. Very cloudy.
9, 12, 16. Cloudy.

MERIDIAN ZENITH DISTANCES of γ DRACONIS observed with the REFLEX ZENITH TUBE—*continued*.

No. for Reference.	Day and Hour of Observation, 1896.		Observer.	Position.	Wire used.	Micrometer Readings.		Level Readings.		Equivalent for Level.	Sum of Equivalents for wire, for Micrometer Readings and for Level-Readings.	Star's observed Zenith Distance North.	Star Correction.	Concluded Mean Zenith Distance North 1896.0.
						A.	B.							
						".	".	div.	div.					
1	November	d h 6. 3	B	R L	15	26.650	26.239	23.2	85.0	0.70	0.49.17	1.32.41	— 6.14	1.26.23
					16	26.650	25.413	8.4	70.2	0.51	3.53.91	1.32.33		
2		10. 2	B	R L	15	25.949	27.000	19.4	82.2	0.65	0.50.13	1.31.45	— 5.14	1.26.30
					16	25.949	26.060	9.0	71.8	0.52	3.53.01	1.31.43		

The numerical value of the Sum of Equivalents in column 11 = Wire Interval + (sum of Micrometer-Readings = 50r) $\times$ 16".780 + sum of Level-Readings $\times$ 0".00646; where the Wire Interval for wire 15 is zero, and for wire 16 = 3'.18".78. The numerical difference between this sum of Equivalents and the Instrumental Constant is the star's Z. D. North. During the year 1896 the adopted Instrumental Constant was 2'.21".58.

2. Very faint; hazy.

Nov. 30^d 2^h. All wires found broken.

MERIDIAN ZENITH DISTANCES of γ DRACONIS observed with the REFLEX ZENITH TUBE—*continued*.

No. for Reference.	Day and Hour of Observation, 1897.		Observer.	Position.	Wire used.	Micrometer Readings.		Level Readings.		Equivalent for Level.	Sum of Equivalents for wire, for Micrometer-Readings and for Level-Readings.	Star's observed Zenith Distance North.	Star Correction.	Concluded Mean Zenith Distance North 1897 '0.
						A.	B.							
						r.	r.	div.	div.					
1	July	d h 13. 10	B	R	15	24°040	27°000	29°7	85°3	0°74	0. 18°19	1. 28°92	— 2°04	1. 25°60
				L	16	24°040	25°673	8°3	63°9	0°47	3. 13°47	1. 26°36		
2		14. 10	CD	R	15	24°099	27°000	30°0	84°9	0°74	0. 19°18	1. 27°93	— 2°33	1. 25°82
				L	16	24°099	25°734	8°4	63°4	0°47	3. 15°48	1. 28°37		
3		15. 10	RC	R	15	24°085	27°000	32°0	86°0	0°76	0. 18°96	1. 28°15	— 2°62	1. 26°16
				L	16	24°085	25°810	8°0	63°0	0°46	3. 16°52	1. 29°41		
4		16. 10	H	R	15	24°089	27°000	31°2	85°0	0°75	0. 19°02	1. 28°09	— 2°91	1. 25°19
				L	16	24°089	25°728	8°3	62°4	0°46	3. 15°21	1. 28°10		
5		27. 9	AC	L	16	24°645	25°309	10°2	66°0	0°49	3. 17°54	1. 30°43	— 5°89	1. 24°72
				R	15	25°620	25°309	28°3	84°0	0°73	0. 16°32	1. 30°79		
6	August	4. 9	B	R	15	24°800	26°000	28°7	81°7	0°71	0. 14°13	1. 32°98	— 7°77	1. 25°94
				L	16	24°800	25°393	10°7	63°9	0°48	3. 21°54	1. 34°43		
7		27. 7	S	R	15	24°618	26°000	31°0	86°0	0°76	0. 11°13	1. 35°98	— 11°89	1. 24°62
				L	16	24°618	25°730	12°0	64°0	0°49	3. 24°14	1. 37°03		
8		10. 7	CD	R	15	23°456	27°000	25°6	84°0	0°71	0. 8°36	1. 38°75	— 13°25	1. 25°48
				L	16	23°456	26°992	8°3	66°8	0°49	3. 25°82	1. 38°71		
9		11. 6	AC	L	16	23°456	26°932	9°4	67°9	0°50	3. 24°82	1. 37°71	— 13°29	1. 24°64
				R	15	23°560	26°932	26°2	84°8	0°72	0. 8°97	1. 38°14		
10		21. 6	B	R	15	23°440	27°000	23°5	81°9	0°68	0. 8°06	1. 39°05	— 13°54	1. 25°28
				L	16	23°440	27°000	9°5	68°3	0°50	3. 25°70	1. 38°59		
11	October	16. 4	JS	R	15	24°490	26°000	23°7	81°2	0°68	0. 8°90	1. 38°21	— 12°07	1. 25°68
				L	16	24°490	25°865	17°0	79°1	0°62	3. 24°39	1. 37°28		
12		30. 3	H	R	15	23°679	27°000	21°5	80°2	0°66	0. 12°06	1. 35°05	— 9°87	1. 25°49
				L	16	23°679	26°584	12°0	70°8	0°54	3. 22°78	1. 35°67		

The numerical value of the Sum of Equivalents in column 11 = Wire Interval + (sum of Micrometer-Readings - 50°) × 16''·780 + sum of Level-Readings × 0''·00646; where the Wire Interval for wire 15 is zero, and for wire 16 = 3'. 17''·82. The numerical difference between this sum of Equivalents and the Instrumental Constant is the star's Z. D. North. During the year 1897 the adopted Instrumental Constant was 1'. 47''·11.

MERIDIAN ZENITH DISTANCES of γ DRACONIS observed with the REFLEX ZENITH TUBE—*continued.*

No. for Reference.	Day and Hour of Observation, 1898.		Observer.	Position.	Wire used.	Micrometer Readings.		Level Readings.		Equivalent for Level.	Sum of Equivalents for wire, for Micrometer-Readings and for Level-Readings.	Star's observed Zenith Distance North.	Star Correction.	Concluded Mean Zenith Distance North 1898 ^o .
						A.	B.							
						r.	r.	div.	div.					
1	May	d h 21. 14	B	R	15	27'861	24'000	24'4	83'8	0'70	1. 5'49	1. 13'85	+ 12'59	1. 26'44
				L	16	27'861	21'026	8'1	67'5	0'49	3. 33'19	1. 13'85		
2	June	2. 13	B	R	15	25'774	25'000	21'5	80'9	0'66	0. 47'22	1. 16'83	+ 8'71	1. 26'71
				L	16	25'774	22'513	14'7	74'0	0'58	3. 23'22	1. 19'17		
3		7. 13	S	R	15	24'710	26'000	24'0	83'0	0'69	0. 46'17	1. 17'88	+ 7'01	1. 24'97
				L	16	24'710	23'514	8'0	69'0	0'50	3. 22'09	1. 18'04		
4		10. 13	W	R	15	25'690	25'000	23'0	82'5	0'68	0. 45'82	1. 18'23	+ 5'99	1. 24'67
				L	16	25'690	22'598	12'0	70'2	0'53	3. 23'18	1. 19'13		
5		19. 12	W	R	15	24'504	26'000	24'0	80'0	0'67	0. 42'69	1. 21'36	+ 3'02	1. 24'44
				L	16	24'504	23'923	12'8	69'2	0'53	3. 25'52	1. 21'47		
6		20. 12	H	R	15	24'412	26'000	24'3	80'2	0'68	0. 41'15	1. 22'90	+ 2'69	1. 26'00
				L	16	24'412	24'149	12'9	68'9	0'53	3. 27'77	1. 23'72		
7		22. 12	B	R	15	26'006	24'358	23'4	79'9	0'67	0. 40'34	1. 23'71	+ 2'03	1. 25'75
				L	16	26'006	22'556	12'9	69'2	0'53	3. 27'78	1. 23'73		
8	July	7. 11	RC	R	15	24'148	26'000	27'0	83'0	0'71	0. 36'75	1. 27'30	- 2'85	1. 23'43
				L	16	24'148	24'507	10'0	66'0	0'49	3. 29'30	1. 25'25		
9		14. 10	H	R	15	25'002	25'000	29'2	85'0	0'74	0. 34'33	1. 29'72	- 4'97	1. 24'25
				L	16	25'002	23'861	8'2	64'1	0'47	3. 32'77	1. 28'72		
10		16. 10	RC	R	15	25'000	25'000	29'0	84'0	0'73	0. 34'29	1. 29'76	- 5'55	1. 24'28
				L	16	25'000	23'933	9'8	65'0	0'48	3. 33'95	1. 29'90		
11		22. 10	H	R	15	24'825	25'000	28'1	83'7	0'72	0. 31'34	1. 32'71	- 7'23	1. 25'17
				L	16	24'825	24'238	8'5	64'9	0'47	3. 36'13	1. 32'08		
12	August	10. 8	RC	R	15	24'585	25'000	27'0	84'0	0'72	0. 27'31	1. 36'74	- 11'80	1. 24'98
				L	16	24'585	24'760	8'2	65'7	0'48	3. 40'86	1. 36'81		
13		13. 8	B	R	15	24'631	25'000	30'2	83'7	0'74	0. 28'11	1. 35'94	- 12'37	1. 24'14
				L	16	24'631	24'730	10'0	63'0	0'47	3. 41'13	1. 37'08		
14		16. 8	CD	R	15	24'577	25'000	29'6	82'3	0'72	0. 27'19	1. 36'86	- 12'94	1. 24'45
				L	16	24'577	24'833	10'9	64'0	0'49	3. 41'97	1. 37'92		
15		17. 8	B	R	15	24'530	25'000	28'6	82'0	0'72	0. 26'39	1. 37'66	- 13'13	1. 24'60
				L	16	24'530	24'870	7'8	74'6	0'53	3. 41'84	1. 37'79		
16		24. 8	RC	R	15	24'360	25'000	33'0	87'2	0'78	0. 23'60	1. 40'45	- 14'21	1. 25'74
				L	16	24'360	25'145	6'2	61'0	0'43	3. 43'50	1. 39'45		
17	September	16. 6	H	R	15	24'280	25'000	35'6	89'1	0'81	0. 22'29	1. 41'76	- 16'23	1. 25'17
				L	16	24'280	25'322	3'9	57'3	0'39	3. 45'09	1. 41'04		
18		26. 6	B	R	15	24'329	25'000	33'3	91'0	0'80	0. 23'10	1. 40'95	- 16'31	1. 24'37
				L	16	24'329	25'234	2'2	60'0	0'40	3. 44'45	1. 40'40		

The numerical value of the Sum of Equivalents in column 11 = Wire Interval + (sum of Micrometer-Readings - 48r) $\times$ 16''780 + sum of Level-Readings $\times$ 0''00646; where the Wire Interval for wire 15 is zero, and for wire 16 = 3'.17''82. The numerical difference between this sum of Equivalents and the Instrumental Constant is the star's Z. D. North. During the year 1898 the adopted Instrumental Constant was 2'.4''05 (but for May 21, 2'.19''34).

2. Very diffused.

MERIDIAN ZENITH DISTANCES of γ DRACONIS observed with the REFLEX ZENITH TUBE—*continued*.

No. for Reference.	Day and Hour of Observation, 1898.		Observer.	Position.	Wire used.	Micrometer Readings.		Level Readings.		Equivalent for Level.	Sum of Equivalents for wire, for Micrometer-Readings and for Level-Readings.	Star's observed Zenith Distance North.	Star Correction.	Concluded Mean Zenith Distance North 1898 ^o .
						A.	B.							
						r.	r.	div.	div.					
1	October	d h	W	R	15	24 ^h 32 ^m 28 ^s	25 ^h 00 ^m 00 ^s	34 ^h 0 ^m	92 ^h 4 ^m	0 ^h 81 ^m	0. 23 ^h 09 ^m	1. 40 ^h 96 ^m	-16 ^h 01 ^m	1. 24 ^h 84 ^m
		3. 5		L	16	24 ^h 32 ^m 28 ^s	25 ^h 25 ^m 56 ^s	1 ^h 4 ^m	59 ^h 4 ^m	0 ^h 39 ^m	3. 44 ^h 79 ^m	1. 40 ^h 74 ^m		
2		20. 4	B	R	15	24 ^h 42 ^m 0 ^s	25 ^h 00 ^m 00 ^s	26 ^h 5 ^m	85 ^h 3 ^m	0 ^h 72 ^m	0. 24 ^h 55 ^m	1. 39 ^h 50 ^m	-14 ^h 39 ^m	1. 25 ^h 08 ^m
				L	16	24 ^h 42 ^m 0 ^s	25 ^h 08 ^m 1 ^s	7 ^h 1 ^m	66 ^h 2 ^m	0 ^h 47 ^m	3. 43 ^h 48 ^m	1. 39 ^h 43 ^m		
3		28. 4	B	R	15	24 ^h 52 ^m 0 ^s	25 ^h 00 ^m 00 ^s	25 ^h 0 ^m	83 ^h 5 ^m	0 ^h 70 ^m	0. 26 ^h 21 ^m	1. 37 ^h 84 ^m	-13 ^h 11 ^m	1. 24 ^h 52 ^m
				L	16	24 ^h 52 ^m 0 ^s	24 ^h 86 ^m 0 ^s	8 ^h 9 ^m	67 ^h 0 ^m	0 ^h 49 ^m	3. 41 ^h 46 ^m	1. 37 ^h 41 ^m		
4		31. 3	W	R	15	24 ^h 51 ^m 4 ^s	25 ^h 00 ^m 00 ^s	25 ^h 4 ^m	82 ^h 0 ^m	0 ^h 69 ^m	0. 26 ^h 10 ^m	1. 37 ^h 95 ^m	-12 ^h 51 ^m	1. 25 ^h 36 ^m
				L	16	24 ^h 51 ^m 4 ^s	24 ^h 88 ^m 8 ^s	9 ^h 4 ^m	66 ^h 2 ^m	0 ^h 49 ^m	3. 41 ^h 83 ^m	1. 37 ^h 78 ^m		
5	November	1. 3	B	R	15	24 ^h 56 ^m 0 ^s	25 ^h 00 ^m 00 ^s	23 ^h 4 ^m	83 ^h 6 ^m	0 ^h 69 ^m	0. 26 ^h 87 ^m	1. 37 ^h 18 ^m	-12 ^h 31 ^m	1. 24 ^h 54 ^m
				L	16	24 ^h 56 ^m 0 ^s	24 ^h 76 ^m 6 ^s	8 ^h 8 ^m	68 ^h 8 ^m	0 ^h 50 ^m	3. 40 ^h 57 ^m	1. 36 ^h 52 ^m		
6		8. 3	W	R	15	24 ^h 63 ^m 0 ^s	25 ^h 00 ^m 00 ^s	24 ^h 2 ^m	84 ^h 0 ^m	0 ^h 70 ^m	0. 28 ^h 05 ^m	1. 36 ^h 00 ^m	-10 ^h 87 ^m	1. 25 ^h 13 ^m
				L	16	24 ^h 63 ^m 0 ^s	24 ^h 66 ^m 4 ^s	9 ^h 0 ^m	69 ^h 0 ^m	0 ^h 50 ^m	3. 40 ^h 04 ^m	1. 35 ^h 99 ^m		
7		10. 3	W	R	15	24 ^h 69 ^m 4 ^s	25 ^h 00 ^m 00 ^s	23 ^h 0 ^m	83 ^h 0 ^m	0 ^h 69 ^m	0. 29 ^h 12 ^m	1. 34 ^h 93 ^m	-10 ^h 39 ^m	1. 24 ^h 96 ^m
				L	16	24 ^h 69 ^m 4 ^s	24 ^h 58 ^m 6 ^s	11 ^h 0 ^m	70 ^h 0 ^m	0 ^h 52 ^m	3. 39 ^h 82 ^m	1. 35 ^h 77 ^m		
8		22. 2	W	R	15	24 ^h 84 ^m 2 ^s	25 ^h 00 ^m 00 ^s	19 ^h 5 ^m	81 ^h 5 ^m	0 ^h 65 ^m	0. 31 ^h 55 ^m	1. 32 ^h 50 ^m	- 7 ^h 31 ^m	1. 24 ^h 69 ^m
				L	16	24 ^h 84 ^m 2 ^s	24 ^h 18 ^m 2 ^s	11 ^h 0 ^m	72 ^h 2 ^m	0 ^h 54 ^m	3. 35 ^h 55 ^m	1. 31 ^h 50 ^m		
9	December	22. 23	W	R	15	25 ^h 44 ^m 6 ^s	25 ^h 00 ^m 00 ^s	15 ^h 8 ^m	80 ^h 0 ^m	0 ^h 62 ^m	0. 41 ^h 66 ^m	1. 22 ^h 39 ^m	+ 2 ^h 66 ^m	1. 25 ^h 13 ^m
				L	16	25 ^h 44 ^m 6 ^s	23 ^h 04 ^m 3 ^s	13 ^h 4 ^m	76 ^h 2 ^m	0 ^h 58 ^m	3. 26 ^h 60 ^m	1. 22 ^h 55 ^m		
10		29. 23	W	R	15	26 ^h 60 ^m 4 ^s	24 ^h 00 ^m 00 ^s	17 ^h 0 ^m	75 ^h 0 ^m	0 ^h 59 ^m	0. 44 ^h 29 ^m	1. 19 ^h 76 ^m	+ 5 ^h 07 ^m	1. 25 ^h 04 ^m
				L	16	26 ^h 60 ^m 4 ^s	21 ^h 74 ^m 4 ^s	14 ^h 0 ^m	76 ^h 5 ^m	0 ^h 58 ^m	3. 24 ^h 23 ^m	1. 20 ^h 18 ^m		

The numerical value of the Sum of Equivalents in column 11 = Wire Interval + (sum of Micrometer-Readings - 48^h) × 16^h 78^m 0^s + sum of Level-Readings × 0^h 00^m 64^s 6; where the Wire Interval for wire 15 is zero, and for wire 16 = 3^h 17^m 82^s. The numerical difference between this sum of Equivalents and the Instrumental Constant is the star's Z. D. North. During the year 1898 the adopted Instrumental Constant was 2^h 4^m 05^s (but for May 21, 2^h 19^m 34^s).

2. Cloudy.

MERIDIAN ZENITH DISTANCES of γ DRACONIS observed with the REFLEX ZENITH TUBE—continued.

No. for Reference.	Day and Hour of Observation, 1899.		Observer.	Position.	Wire used.	Micrometer Readings.		Level Readings.		Equivalent for Level.	Sum of Equivalents for wire, for Micrometer-Readings and for Level-Readings.	Star's observed Zenith Distance North.	Star Correction.	Concluded Mean Zenith Distance North 1899 ^o .
						A.	B.							
						".	".	div.	div.					
1	January	d h 2. 23	W	R	15	25 ^o 652	25 ^o 000	16 ^o 0	79 ^o 2	0 ^o 61	0. 45 ^o 11	1. 18 ^o 81	+ 5 ^o 89	1. 24 ^o 44
				L	16	25 ^o 652	22 ^o 574	13 ^o 8	76 ^o 2	0 ^o 58	3. 22 ^o 20	1. 18 ^o 28		
2		10. 23	W	R	15	25 ^o 852	25 ^o 000	13 ^o 5	74 ^o 8	0 ^o 57	0. 48 ^o 42	1. 15 ^o 50	+ 8 ^o 53	1. 23 ^o 83
				L	16	25 ^o 852	22 ^o 181	18 ^o 7	80 ^o 2	0 ^o 64	3. 19 ^o 01	1. 15 ^o 09		
3		25. 22	W	R	15	26 ^o 109	25 ^o 000	12 ^o 0	75 ^o 7	0 ^o 57	0. 52 ^o 74	1. 11 ^o 18	+ 13 ^o 22	1. 25 ^o 32
				L	16	26 ^o 109	21 ^o 801	16 ^o 0	79 ^o 2	0 ^o 62	3. 16 ^o 93	1. 13 ^o 01		
4		26. 1	W	R	15	26 ^o 068	25 ^o 000	14 ^o 0	77 ^o 4	0 ^o 59	0. 52 ^o 07	1. 11 ^o 85	+ 13 ^o 51	1. 25 ^o 45
				L	16	26 ^o 068	21 ^o 784	15 ^o 4	79 ^o 0	0 ^o 61	3. 15 ^o 95	1. 12 ^o 03		
5		27. 21	W	R	15	26 ^o 111	25 ^o 000	14 ^o 0	78 ^o 2	0 ^o 59	0. 52 ^o 80	1. 11 ^o 12	+ 13 ^o 80	1. 24 ^o 94
				L	16	26 ^o 111	21 ^o 690	14 ^o 9	78 ^o 2	0 ^o 60	3. 15 ^o 07	1. 11 ^o 15		
6	February	20. 20	B	R	15	26 ^o 402	25 ^o 000	14 ^o 8	76 ^o 4	0 ^o 59	0. 57 ^o 67	1. 6 ^o 25	+ 19 ^o 26	1. 24 ^o 51
				L	16	26 ^o 402	20 ^o 987	16 ^o 5	78 ^o 1	0 ^o 61	3. 8 ^o 17	1. 4 ^o 25		
7	March	4. 19	B	R	15	26 ^o 554	25 ^o 000	15 ^o 9	79 ^o 0	0 ^o 61	1. 0 ^o 25	1. 3 ^o 67	+ 20 ^o 70	1. 24 ^o 97
				L	16	26 ^o 554	20 ^o 873	13 ^o 6	76 ^o 8	0 ^o 58	3. 8 ^o 78	1. 4 ^o 86		
8	May	6. 15	W	R	15	26 ^o 151	25 ^o 000	25 ^o 0	85 ^o 4	0 ^o 71	0. 53 ^o 59	1. 10 ^o 33	+ 14 ^o 01	1. 24 ^o 20
				L	16	26 ^o 151	21 ^o 590	7 ^o 8	68 ^o 2	0 ^o 49	3. 13 ^o 96	1. 10 ^o 04		

The numerical value of the Sum of Equivalents in column 11 = Wire Interval + (sum of Micrometer-Readings - 48^r) $\times$ 16^o780 + sum of Level-Readings $\times$ 0^o00646; where the Wire Interval for wire 15 is zero, and for wire 16 = 3^o.17^o.82. The numerical difference between this sum of Equivalents and the Instrumental Constant is the star's Z. D. North. During the year 1899 the adopted Instrumental Constant was 2^o.3^o.92.

3. Unsteady.