

Solar Division

BULLETIN



HARRY L. BONDY, Editor

43-58 SMART ST., FLUSHING 55, N. Y.

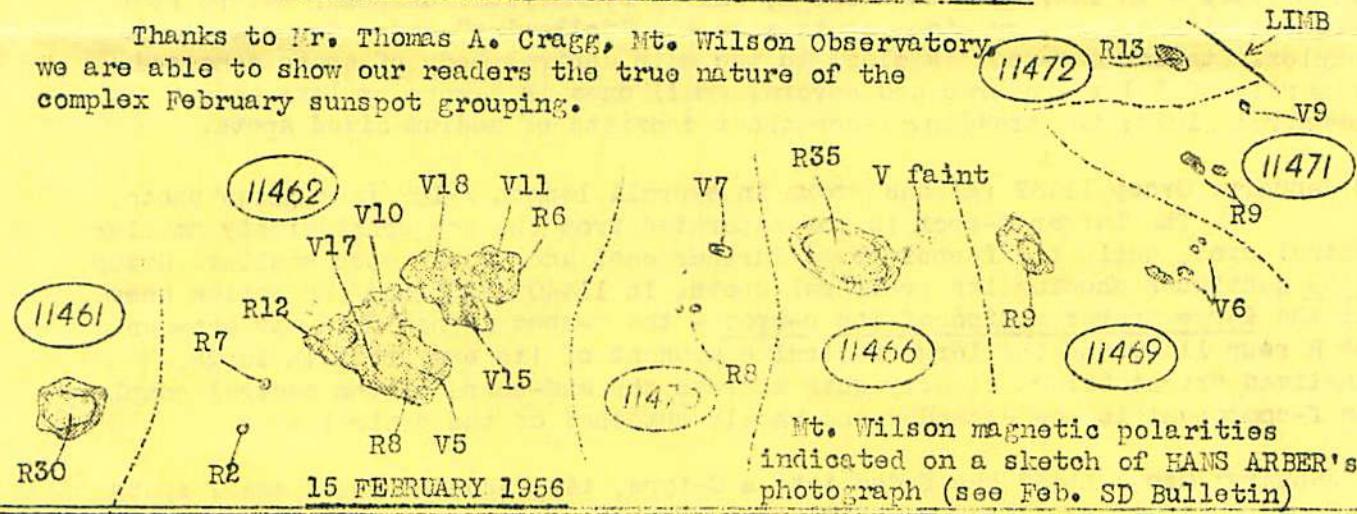
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MARCH - APRIL 1956

Numbers: 115 - 116

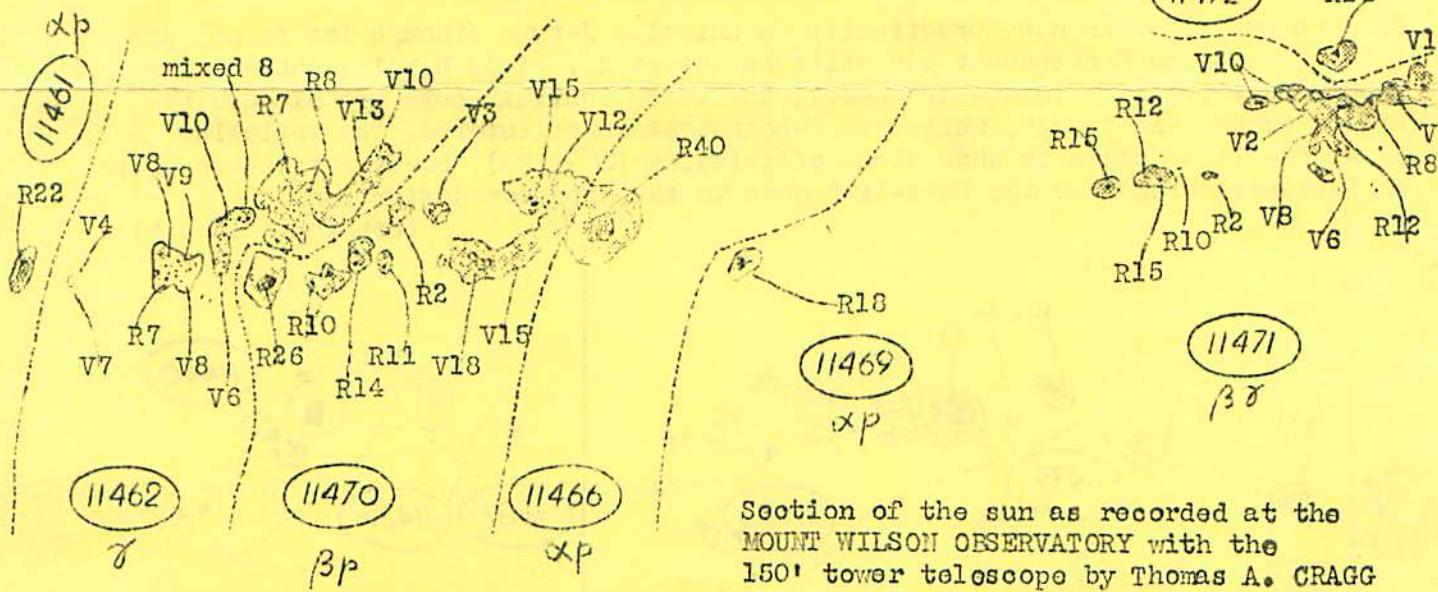
THE GREAT SUNSPOTS OF FEBRUARY 1956

Thanks to Mr. Thomas A. Cragg, Mt. Wilson Observatory, we are able to show our readers the true nature of the complex February sunspot grouping.



LIMB

20 FEBRUARY 1956 1700 UT seeing 4 (through cirrus)



(for additional notes see page 2)

MORE NOTES ON THE EVOLUTION OF SUNSPOTS.

As previously mentioned, the solar region which exhibited the large sunspots during January and February 1956 started and continued to be active since May 1955. Here I shall attempt to outline in rough terms some of the evolutionary changes starting with 13 January, 1956, when two groups were first seen rising over the Eastern limb. By 16 January three groups were clearly visible. The western-most was group No. 11437 - Mt. Wilson Observatory designation, roughly in latitude N 28° ; then came the impressive unipolar group No. 11439 and finally the complex group No. 11440 in latitude N 21° . Let us follow the evolution of these groups as they crossed the visible hemisphere.

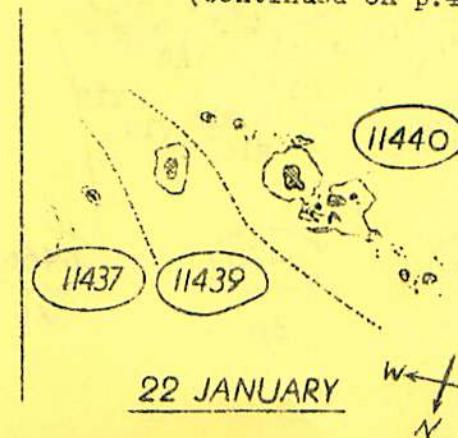
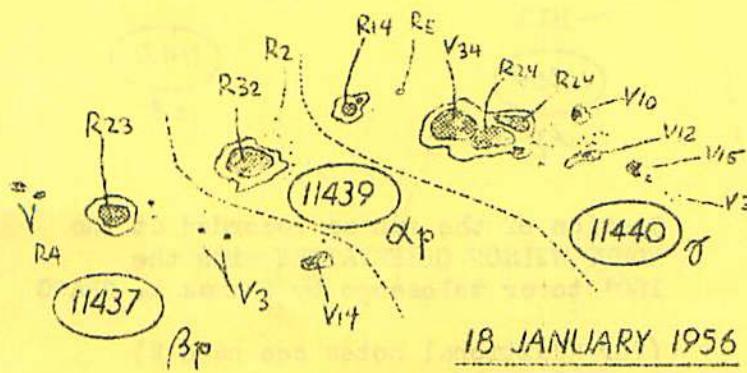
16 January: Group 11437 appears as an average bipolar E-type group. Its main p-component has an extended penumbral field and is somewhat larger than the f-spot (p for preceding; f for following); a few minor "precursor-spots" are ahead of the p-component (see Cuevas's picture in our February SD Bulletin). Group 11439 - in lat. N 24° - is a large, fairly symmetrical unipolar H-type spot attended with a few very minor spots near its "following" side. Group 11440 is complex. Its large p-spot is close to the main central body of spots composed primarily of 3 large umbrae and several small ones in a more or less common penumbral field; the trailing f-component consists of medium-sized spots.

18 January: Group 11437 (E) has grown in overall length $\sim 18^{\circ}$ (see Elias' photo) The larger p-spot is now separated from the now considerably smaller central spot, while the f-spot moved further east and is now much smaller. Group 11439 continues showing its preiferal spots. In 11440 $\sim 20^{\circ}$ long we notice above all the large proper motion of its p-spot - the p-spot is now half-way between the H group 11439 and the large central component of its own group. (A large, longlived bright bridge clearly cuts accross the end-umbra of the central complex) The f-component is now extended and wholly detached of the central mass.

20 January: Group 11437 has faded into a C-type, its f-component of small spots trailing. 11439 remains fairly stable. The p-spot of 11440 is now closer to 11439 than to the main body of its own group; a small spot keeps following the p-spot in a "piggy-back-ride" fashion! While the main component changed only slightly, the f-component continues streching away.

22 January: 11437 is now "practically" a unipolar J-type /though its faint, pore-like f-component can still be detected/. 11439 hardly changed. The p-component of 11440 is now drawn-out; the large central spots are divided by bright arches and "bays", while the f-component is splintered. The following day-23rd- 11440 seems to show signs of twisting (S-like), however the perspective foreshortening near the West-limb adds to the apparent distortion.

(continued on p.4)



Editor's note: The following Table I contains the predicted smoothed American Sunspot Numbers as computed by LEITH HOLLOWAY. Unfortunately, lack of space prevented us from carrying the hole text here. This will be done in our next issue.
hlb

PREDICTION FOR THE NEXT SUNSPOT MAXIMUM:

$$\bar{R}_A^1 = 196 \text{ at } 1957.25$$

See page 2* for details of how Leith Holloway made the above prediction. Also Table I below gives his month-by-month predictions of the smoothed American Relative sunspot numbers for the current cycle. These predictions are based partially on equations by Waldmeier.

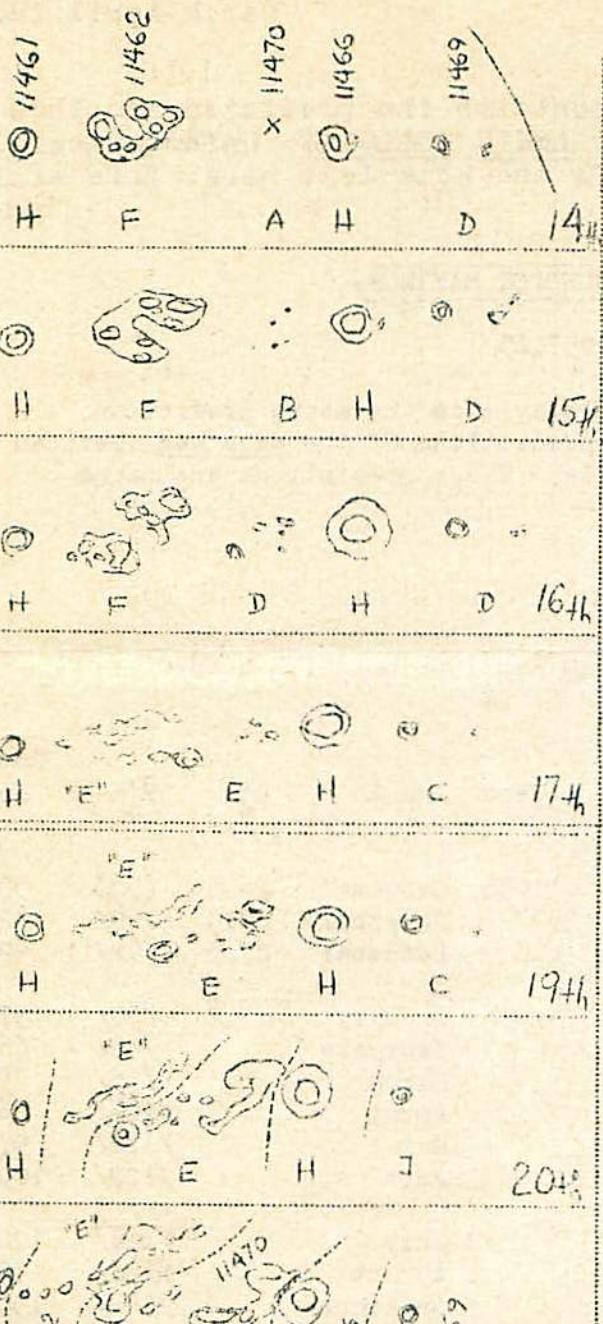
TABLE I

OBSERVED AND PREDICTED MONTHLY MEAN AMERICAN RELATIVE SUNSPOT NUMBERS FOR THE 19TH CYCLE

Year	Month	R_A^1	\bar{R}_A^1	Running Sum		Year	Month	R_A^1	\bar{R}_A^1	Running Sum	
				Year	Month					Year	Month
1954	April	0.6	2	1955	October	56.5	(56)	1956	January	359	
	May	0.2	3		November	82.0	/64/			423	
	June	0.2	3		December	67.5	/72/			495	
	July	2.1	4		12	67.2	/80/			575	
	August	8.1	6		18		/88/			663	
	September	0.3	7		25		/96/			759	
1955	October	4.7	7		32		/104/			863	
	November	8.0	9		41		/112/			975	
	December	7.7	11		52		/120/			1095	
	January	23.3	12		64	July	/128/	1957	January	1223	
	February	22.6	15		79	August	/136/			1359	
	March	4.7	17		96	September	/144/			1503	
1956	April	9.7	21		117	October	/152/			1655	
	May	24.7	26		143	November	/160/			1815	
	June	23.4	32		175	December	/168/			1983	
	July	23.2	36		211	July	/176/			2159	
	August	36.6	(42)		253	August	/184/			2343	
	Sept.	40.7	(50)		303	September	/192/			2535	
<u>1957.25 April MAX. /196/</u>											<u>2633</u>

*) full text in the May issue of the Solar Division BULLETIN

Leith Holloway
2800 Quebec Street
Washington 8, D.C.



(continued from page 2)

Perhaps the January evolution of sunspots seemed complicated; still it was quite normal. The February "events" were unusual, abnormal, due to the havoc a new-born group caused. On 12 Feb. the old H-type group /formerly 11437-now 11461/ and the complex F-type, formerly 11440, now 11462, returned. On the 14th we see 11461 and 11462, further east a large H-type 11466 and a D-group 11469 (see the schematic sketches on the left side). At 0500 UT Arber's photo shows no trace of a new group, nor is there any sign of this on a photo/print/made at the US Naval Observatory at 1311 UT. However, at 1700 UT Buckstaff records a small A-group (see x on upper sketch), observed and designated at Mt. Wilson Observatory as No. 11470. From here on you may follow the evolution schematically. Note the very rapid evolution of 11470, its effect on 11462 and 11466. 11470 seems to have merged in part with 11462 on the 21st and only the next day with 11466. The great disintegration of 11462 started on the 16th and was almost complete on the 17th when only shreds of penumbrae with minor umbræ remained.

I regret that lack of time and space prevents me from giving a more detailed account here. However, I wish to thank Mr. Cragg and the Mt. Wilson Observatory for their help, as well as to the many observers for reports and photographs, particularly to: Arber, von Brönsart, Bartlett, Buckstaff, Cuevas, Elias and the US Naval Observatory. (My own notes were also used).

H.L.Bondy...

On the left is a sketch from... an excellent photograph taken by Dr. von Brönsart and showing very clearly the group 11461 just setting on the West-limb.

from a photo-

graph taken

by Dr. Huberta von Brönsart
Stuttgart, Germany

* * * * *

Mt. Wilson symbols: α =unipolar group; β =bipolar group; γ =complex group mixed polarities; $\beta\delta$ =complex group with bipolar characteristics; p=preceding part stronger; V=violet; R=red shift due to magnetic field giving magnetic polarities and expressed in hundreds of Gauss units

AMERICAN RELATIVE SUNSPOT NUMBERS for FEBRUARY and MARCH 1956

day	Feb.	Mar.	day	Feb.	Mar.	day	Feb.	Mar.	day	Feb.	Mar.
1...	50	- 127	9...	40	- 83	17...	175	- 102	25...	140	- 110
2...	75	- 113	10...	29	- 80	18...	158	- 116	26...	116	- 123
3...	69	- 104	11...	47	- 77	19...	212	- 118	27...	113	- 103
4...	52	- 98	12...	75	- 77	20...	206	- 112	28...	132	- 105
5...	35	- 86	13...	96	- 85	21...	168	- 114	29...	128	- 104
6...	38	- 94	14...	124	- 103	22...	156	- 146	30.....	118
7...	37	- 102	15...	121	- 111	23...	152	- 123	31.....	88
8...	42	- 103	16...	153	- 123	24...	147	- 134			

Monthly mean: February R_A = 106.4 ; March R_A = 105.9

ZURICH PROVISIONAL SUNSPOT NUMBERS for FEBRUARY and MARCH 1956

day	Feb.	Mar.	day	Feb.	Mar.	day	Feb.	Mar.	day	Feb.	Mar.
1...	40	- 152	9...	31	- 102	17...	237	- 138	25...	149	- 138
2...	50	- 120	10...	29	- 97	18...	270	- 122	26...	140	- 140
3...	60	- 115	11...	56	- 84	19...	246	- 120	27...	122	- 106
4...	57	- 90	12...	80	- 80	20...	260	- 118	28...	132	- 115
5...	26	- 112	13...	90	- 97	21...	208	- 115	29...	132	- 122
6...	34	- 110	14...	142	- 132	22...	186	- 103	30.....	113
7...	29	- 107	15...	168	- 144	23...	177	- 120	31.....	118
8...	25	- 104	16...	224	- 120	24...	156	- 136			

Monthly mean: February R_Z = 122.6 ; March R_Z = 115.5

* * * * *

Monthly ZURICH Definitive Sunspot Numbers for 1955.

I....	23.1	IV....	11.3	VII....	26.7	X....	58.5				
II...	20.8	V....	28.9	VIII....	40.7	XI...	89.2	Yearly Mean:			
III...	4.9	VI....	31.7	IX....	42.7	XII..	76.9		38.0		

* * * * *

Monthly values of SOLAR FLUX AT 2800 Mc/s (10.7cm) in 1955 as recorded at NATIONAL RESEARCH COUNCIL, OTTAWA, CANADA

I....	83.1	IV....	77.2	VII....	87.3	X....	111.1				
II...	81.3	V....	82.7	VIII....	90.6	XI...	128.5				
III...	74.5	VI....	88.8	IX....	94.8	XII..	132.3				

Flux in watts/m²/ cycles/ second bandwidth(x 10⁻²²) -2 polariz.

* * * * *

BOOKSHELF NOTE: Dr. M. A. Ellison's excellent book "THE SUN AND ITS INFLUENCE" (see SD Bulletin review in Jan., p.3-4) is distributed here by The Macmillan Co., 60 Fifth Ave., New York 11, NY. Solar Division members may obtain this book from Herbert A. Luft, 42-10 82nd St., Elmhurst 73, N.Y. with a 10% discount (list price \$4.50). Don't miss this book, it's a gem. hb

AAVSO

AMERICAN SUNSPOT NUMBER OBSERVATIONS

MONTHLY MEAN R_A = 67.2

January

1956

SOLAR DIVISION

MONTHLY MEAN $R_z = 70.5$

OBSERVER	KL.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31							
Adams	070	3.18	2.19		3.14		5.14		3.14		6.33	5.31	6.57			4.65	3.60												4.20										
Asher		4.23	4.19	4.23	4.23	3.9		5.11	6.13	4.7	4.19	4.17	7.20		11.35	11.27	10.31	3.50	9.41	3.44	7.26	8.37							5.16		4.6								
Beardsley	074					5.13	5.12											3.72	3.86	8.75	3.64		3.31	6.58						3.19									
Belle	106	3.20	2.20	4.18	3.14	3.11	5.10	5.18		3.16	3.21	4.45			6.74		3.74	2.57	3.74	3.76								4.22	3.11	3.23									
Bundy	132	3.17	2.11				5.10										7.43		4.50		5.33									3.11									
vanBenschot	084			3.23				5.23		3.17							6.55	7.71	4.83																				
Buckstaff	111		3.13	4.14			5.11	6.13	3.7		4.18	7.15								5.42	5.52	5.33								5.13	4.7	4.4							
Chassapis	074		4.21	5.18	4.11			5.10			4.23	7.18	8.14	7.23				7.04	6.95	5.69	5.84		5.82	6.63	5.44							3.6							
Cragg	072	3.26	2.28	4.24	5.28	4.13	5.14	5.15	7.17	5.10	3.14	5.18	7.43			6.43	8.26	6.93		5.08	5.65	6.61						3.25	4.14	4.8									
DeKinder	080	3.13	3.4		4.6	3.5	4.7									3.7	4.25		8.56	3.62	2.50	2.45	2.40								2.11		4.6						
Elias	065	4.53		4.33	4.26		5.23		6.27	5.10		5.43	6.47	5.35	5.62	5.65		9.11		2.02	2.14	2.14	3.72					3.25	4.13	5.10	4.6								
Estremadaya	180	6.29	5.23	6.24	4.22	4.12		5.29		5.18	4.12	3.14	4.10	5.22	5.29	6.46		6.64	6.81	4.85	5.70	5.58	6.48	6.41	5.37	3.20	3.14	4.17	4.16	4.12									
Evans	3.11						5.9		3.5		3.11																		3.4	4.4									
Farnald	102	2.14	2.16		2.9		2.6	2.6													7.76	7.76								4.10	4.5								
Itabashi		3.22	4.19	2.18			4.9	5.12	6.10	3.6	3.16	3.21	6.18	8.37	7.28	7.54	7.68	7.70										5.80	7.60	4.42	3.21	2.21	4.18	4.10	4.8				
Koyama	070	4.11	4.12				4.11	6.21		4.12	3.22	4.30	7.55	7.34	7.57													4.18	6.84	4.13	4.93	4.32	2.16						
Loeffelholz	102	3.22	2.15														5.44	5.61	4.41												2.4		3.3						
Loeffelholz	3.20	2.19	2.3		4.9		3.4				3.14	3.25					5.47	5.85	3.111	2.59	2.98	2.123	2.105																
Luft	098	3.18	3.19		4.16												6.63	5.51					6.76	6.63							4.19	5.35	4.22	3.26	3.12	4.85			
Morris	4.37		3.25	4.24	4.13	5.16		5.9	5.15		3.21	4.14	4.13	7.45	6.60	6.73	6.79	6.92	4.37	4.106	4.95							4.69	7.43	4.23	3.22	2.11	2.19						
Maher	090															4.16	4.31		5.44	3.48									3.41		4.31		3.17	4.17	4.11	4.7			
Henderson	074	3.17	2.9	3.19		4.12			6.10	3.10		3.26	4.40				5.82	6.125	3.167	4.169	2.63	2.88	3.83	3.79	5.63		4.15		3.16	5.25	4.11	4.7							
Moore	076		4.22	4.17	3.12	5.20											7.18				4.63		4.61																
Pilsworth	084	4.33				5.12	3.5	4.4	3.5		3.15	5.23	6.35				7.58				5.44																		
Rosenblum	065	3.22						5.8	6.9								6.47		4.18	5.42		3.52	4.63								4.11	6.31	4.17	3.11	3.13	4.5			
Ruhe								2.6			3.12	4.12	4.22		4.29																4.8								
Thomas	084		3.11			5.13																							3.24	5.63	4.27	3.24		5.18	4.10	4.8			
Thrussell	147	2.9	2.8		4.18				3.7	3.13		4.16		5.27	6.34	4.24					3.38	3.29																	
Tieathen	128	3.9	2.3		3.6			4.4		3.7							6.21	3.13																					
Venter	128		3.12		4.14	3.8	3.9	6.17	6.8	3.8	3.16	3.14	4.15		5.49	4.44	4.45	3.56		2.46	3.58	3.88	4.37	4.22	3.13	3.9		4.16	3.6										
Warren	110				1.2	1.2	2.3	1.2					4.9	2.15							5.22	4.24																	
Wells																																							
Wunderkopp		3.15	3.8	2.4	2.5			2.2	2.3	2.2	3.7	3.5	4.8	2.17	6.21	6.28		6.37											4.31	4.15									
RA:	48	42	52	55	42	44	47	57	52	46	49	59	78	69	97	115	108	97	95	106	100	89	86	79	81	57	41	43	57	52	41								
Rz:	54	49	44	38	49	47	52	52	52	32	38	35	78	80	90	118	126	127	128	120	110	100	91	87	103	69	48	45	43	45	36								

AAVSO

AMERICAN SUNSPOT NUMBER OBSERVATIONS

MONTHLY MEAN $R_A = 106.4$

February

1956

SOLAR DIVISION

MONTHLY MEAN $R_7 = 122.6$

OBSERVER	KL	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31					
		5.18						3.11		4.27	5.32	5.46						4.96	4.95		6.62	5.59		6.45	7.54		6.28	6.35	6.41								
Adams	070																																				
Arber		5.11	6.19	7.15	4.8	4.11		3.9		5.19	4.6	5.25	4.20	6.25	5.36	5.61	5.66			10.53	10.45	11.46	11.33	11.30	11.29	9.40	8.25	10.37									
Beardsley	074	6.18								5.13																											
Beebe	086		5.25	6.20	4.14	2.8				3.17	3.9	3.9		4.28	4.39	6.62	5.136	5.102		6.170	6.104	7.113		10.70		8.36	11.57	15.48	11.47								
Bendy	028										2.6							6.42			8.35	10.06									10.37						
venBrensert	089																	6.43																			
Buckstaff	011		6.19	7.18	5.13	3.4			3.7		3.7	3.7						6.41	5.52		4.75	6.82	7.71	7.44	7.29	9.45		10.32	9.28	8.26	8.43						
Chassapis	074											5.17						3.81	10.62	11.13	10.83			8.173	10.101	10.107	10.64	12.88	10.70								
Clegg	092	5.13	5.30	6.22	3.13	2.15	2.9	2.16	3.6	3.4	4.14	4.11	4.35	6.32				11.02	11.93							14.99		14.79	11.60	12.89	12.58	10.56					
DeKinder	080	4.9		3.8	3.9	2.6							3.4	3.3	3.16				4.78	4.91						7.80	8.54	9.55		7.28	9.25	8.19	13.44				
Elias	069		6.23		5.14								2.8	4.28				6.38	6.47	6.67	7.16	6.24			7.219	8.164	8.155	12.17	11.15	10.81		10.54	12.12				
Estremadore	080	6.23			4.18	3.12	5.19	4.21	6.31	4.21			8.43	8.70	8.86			7.704	8.725	8.180	8.197	7.94	10.10	9.104	9.73	10.87	11.53	8.53	8.33		9.73						
Evans	3.6		4.9																7.37																		
Fernald	102	4.7		4.10	4.12	3.7	3.11		4.9	3.15	2.2						9.68		12.66	12.123		12.131	14.148								8.20	8.18		10.54			
Itayaai		6.16						3.7	3.8	3.13	5.22	4.11	5.20	5.28	6.44	7.66	9.87	9.146		8.170	11.150			11.148	11.78	11.91	11.83	10.67	11.87		9.38						
Keyama	070								4.26		3.24	2.16	4.22	5.37	4.42	6.62	8.126	9.113			7.350	9.325	8.288	10.260	12.171	13.132	13.98	11.85	14.91								
Loehde	5.20	5.14		4.11	4.14	4.16	3.21			4.17	4.20		5.46	4.22	7.76	8.190		9.200	12.277	6.285	6.98		7.12	10.94	10.107	10.72	11.57	7.34	11.62	11.62							
Lust	098	5.14			4.9				3.10		3.7		7.23	8.56	11.88			9.106		10.155		12.99	12.23								11.39		9.81				
Maeris	077	7.20									4.21			6.29	5.64	6.76	7.130	6.145			6.210	6.190	8.159	8.129										11.75	9.95		
Maher	090	4.11	5.20							3.9	2.7		5.27	5.89	6.56	5.62		5.115																			
Mandrusiak		5.21	6.29	6.38		3.16	4.15	3.30		3.18	4.27		5.101	2.5	6.90	6.207		6.344	7.302	6.233	7.215		8.161	8.108	10.78	10.59	11.61	15.79	13.77	12.76							
Moore	076										3.14								7.79		7.94		7.86	9.24	9.183	9.148	9.106	12.103		11.59			7.23	7.42			
Pilssworth	086			5.17	4.12	3.11					3.5									10.185		12.105	11.59	13.40	12.45		10.43	13.37		12.80	9.35						
Rosebrugh	048	5.18			2.3	3.4	4.11		4.8				7.29	7.43	8.65	11.98		10.185		12.105	11.59											10.56					
Ruhge		4.6	3.6	3.7							3.3			5.25	5.35				4.60		5.21	6.25		4.25	5.27										7.36		
Thomas	084	4.11	4.16		2.9		2.7				3.9	5.29	5.63	8.108	8.67		6.134	9.88															9.38				
Trathen	128	2.2	6.9	7.14	5.9	8.4	2.2	2.7	4.6	3.9	1.11	3.11	5.18	5.16	6.31	7.37	6.32	6.43	6.53																		
Venter	128	4.9	6.15	4.10														5.47			6.116	6.118	7.70	8.56	8.37											9.56	
Warren	119								3.8		1.3	1.3		3.14	3.23				5.34	5.43		6.45		5.27										2.10			
Wells											2.3	2.3	2.3						6.64				9.112		11.58	11.38		5.15	8.22	6.16	8.19	6.35					
Womelsdorff									2.4	3.6	3.10	2.4		3.13	4.18																						
RA	50	75	69	52	35	38	37	42	40	29	47	75	96	124	121	153	175	158	212	206	168	156	152	147	140	116	113	132	128								
Rz	40	50	60	57	26	34	29	25	31	29	56	80	90	142	168	224	237	270	246	260	208	184	177	186	149	140	122	132	132								

OBSERVATIONS MADE UNDER ADVERSE SEEING CONDITIONS

NUMBER BEFORE COMMA INDICATES TOTAL GROUPS.
NUMBER AFTER COMMA INDICATES TOTAL SPOTS.

RA' AMERICAN SUNSPOT NUMBERS

RZ ZÜRICH PROVISIONAL SUNSPOT NUMBERS