THE AMERICAN ASSOCIATION OF VARIABLE STAR OBSERVERS

Solar Division BULLETIN

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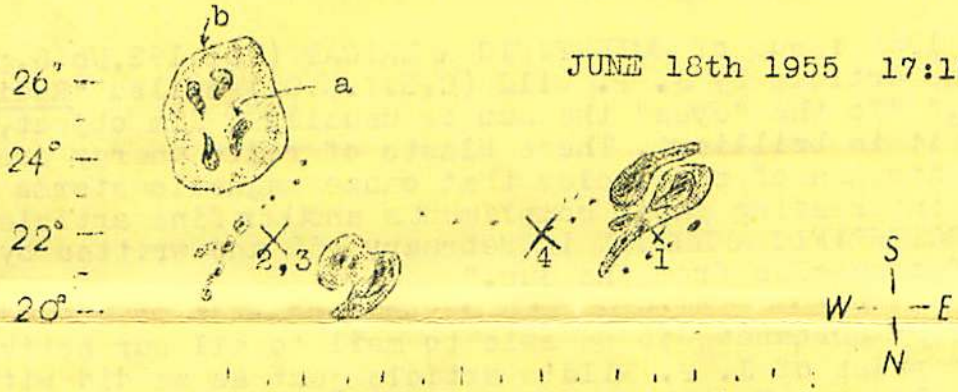
JUNE - JULY 1955 Nos: 106 - 107

The large JUNE 1955 sunspot group.

Solar activity was increasing rapidly in the past six months. This may suggest, perhaps, that the new solar cycle will be very active just like the two preceding ones. The most active solar region in the first half of 1955 occurred in June.

This active region /called 55-Qp by the High Altitude Observatory reports/ was crossing the central meridian with a very active sunspot group on June 16th some 25° South of the solar equator. We received several fine drawings of this group and one of the most interesting ones was from Dr. James C. Bartlett, Jr. showing where he observed a "bright red" region (a). (see also p.7)



a and b are regions where Dr. Bartlett, Jr. observed coloring (see page 7 for detail)

X indicates where flares were observed on June 18th-numbers 2 and 4 were major flares (3-; 3 imp.) associated with Sudden Ionospheric Disturbances (=SID); the latter (4) also in time association with outburts in Solar Radio Noise at 200Mc/s and particularly at 2800 Mc/s , one of the largest recorded by the National Research Council in Ottawa. While this region was visible there were at least 28 reported flares. Though most of them were minor, the June 18th flares, as stated, were large ones. Although spot, plage, flare and radio flux activity was very pronounced, coronal activity was, surprisingly, only moderate (coronal emission).

HLB

S O L A R D I V I S I O N - AAVSO N E W S :

From a report by your Chairman as presented to the "44th Spring Meeting" of the AAVSO" in Pittsburg on May 28, 1955: "At the last meeting (Oct.'54) I reported that the Solar Dvision BULLETIN had a circulation of 114 regular mailings. Now, I am glad to say, this number has risen to 135" (PS:this number is currently at 148!) "The following is a rough brakedown of our readers: 59 solar observers; 43 professional astronomers; 18 in exchange with publications or organizations; 11 "interested parties"; a gain of 21 since the fall." - - -

Thanks to Mr. Ralph N. Buckstaff the Solar Division is now able to sell printed copies of "Classification of Sun Spots" as originally published in the IAU Quarterly Bulletin on Solar Activity. In addition to the classification (illustrations and definition) there is a graphic illustration of "The paths of sunspots at different seasons" showing the varying positions of the solar axis and equator as seen from the Earth. The price of this folder is 20¢ for AAVSO members and 25¢ for non-members. Mail coins or stamps to this Chairman.

More thanks to Mr. Buckstaff for we are able to offer also sets of "THE STONYHURST SUN DISCS" approx. 4 13/16" in diameter. These are indispensable for any solar observer who wants to keep an accurate record of the positions of sunspots. A set consisting of 8 discs (from D=0 to D=±7°). The cost to AAVSO members is 40¢ per set; to non-members 50¢. Special prices for those wishing larger quatities upon request.

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O U T OF OTHER PUBLICATIONS:

The June 1955 issue of SCIENTIFIC AMERICAN (Vol.192,No.6,pp 40-44) carries a fine article by J. P. Wild (C.S.I.R.O.) called "Radio Waves from the Sun." "To the "eyes" the Sun is usually a dim object, but occasionally it is brilliant. These blasts of radio energy are associated with the streams of corpuscles that cause magnetic storms on the Earth." This interesting paper compliments another fine article published in the SCIENTIFIC AMERICAN in February '55 and written by Walter Orr Roberts "Corpuscles from the Sun."

We are very fortunate to be able to mail to all our active solar observers a reprint of J. P. Wild's article just as we did with W. O. Robert's in February. For this opportunity we are greatly indebted to the SCIENTIFIC AMERICAN. ---

"Can We Blame the Sun for Stormy Weather" is the title of a very informative article by Dr. Walter Orr Roberts and published in the June issue of POPULAR MECHANICS. Here Dr. Roberts describes how the corona is observed, its relation to other solar phenomena and finally how E. D. Farthing, a meteorologist with Trans World Airlines, found a "relationship between the coronal lines and the rainfall at Kansas City. "The greatest rainfall for the period 1951 through 1954 came when strong regions of green coronal emission covered areas of the sun facing the earth.."In conclusion Dr. Roberts cautions "In a new field of research it is easy to be fooled. The only answer will be more years of painstaking scientific study."

hlb

Ed. note: The American Relative Sunspot-Number- R_A'- is essentially the same relative sunspot-number devised by Rudolf Wolf in 1848 and based on his formula R=k(10g+f), where R is the daily sunspot-number, g is the total number of sunspot groups /whereby an isolated single spot is also counted as a group/, and f is the total number of spots (umbrae). k is a statistical factor which should account for instrumental and the individual's mode of observing and thus permit a comparison with a standard scale. While the more than one hundred years old Zürich statistic of sunspot-numbers is based primarily on a single telescope and observer at the Federal Observatory in Zürich (the telescope already used by R. Wolf; more about this in a future article), the American Relative Sunspot Number is based on observations secured by many members of the Solar Division. These members, socalled "standard" observers had several years of experience in sunspot-number observations so that their instrumental as well as personal habits could be statistically treated and evalued. The k or ki-factor is the "observatory coefficient" the wi-factor is the statistical weight for an observer. The wi-factor is highest when an observer's reports are most consistent, homogeneous or, in other words, when they fluctuate least from their own average as compared with the standard scale /Zürich's/. -- Since R_A' is based on many reports it is computed "by a method adapted from regression statistics for variables subject to error". This method was formulated by Mr. Alan H. Shapley of the National Bureau of Standards and first published in the "Publications of the Astronomical Society of the Pacific"- Vol.61 No.358; Feb. 1949. By definition the daily American Sunspot-Number is: the sum total of individual standard observers' sunspot-numbers (Ri) multiplied by the product of their wi-and ki-factors and this sum divided by the sum total of the individual participating standard observers wi-factors or ΣwikiRi divided by Σwi. (Detailed formulae may be found in the above named article.)

We are fortunate to be able to publish Mr. David W. Rosebrugh's paper which so aptly describes what has been so elaborately explained above.

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H O W R_A' I S C O M P U T E D .

The Editor of the Solar Division BULLETIN has asked me to submit a memorandum as to how R_A' is computed, so that our observers may know how this is done.

On looking over our recent records I have chosen January 10, 1955 as being a suitable day to describe. Once I received by Special Delivery the reports of the Standard Observers for January 1955 I arranged these immediately in order of decreasing weight factor wi; starting with Moore, whose wi-factor is 28, and going through Thrussell, Williams, Focas, Pierson, Pilsworth, DeKinder, Rosebrugh, Maher, Chase, Beetle, Venter, Trathen, Estremadoyro, Fernald, Macris, Buckstaff, Loebbick, Warren, Beardsley, Brennan, Koyama, Bollmeyer, Thomas, Cragg to Stryker whose weight-wi- is 8.

It should be borne in mind that this weighting factor wi is influenced among other things by an observer's climate. If an observer has good seeing part of the year and poor at another his weighting will be lowered in spite of himself.

The next step is to review everybody's daily observations and to mark the observations made under conditions of F6 (=fair seeing, 60% cloudy) or worse. These observations will not be used unless so few good observations are available on any day that it becomes necessary to include the F6 or worse observations. This F6 demarkation line is doubtless rather arbitrary but a line must be drawn somewhere and this was the point decided upon some years ago.

Actually reports were received from 21 Standard Observers for January 1955. On January 10, which is chosen as the day to describe only ten observers were able to observe. (Their list follows in Table I) They all observed under better conditions than F6, so all observations were usable. Merely to show how an observation made under F6 or worse conditions would be treated a fictitious report by "Observer X" is shown in Table I.His count of 13 is merely omitted. However if there had been seven or fewer of the good observations, this observations would have to be used, if it were a genuine one.

In a general sort of way what is desired is a minimum of eight good observations per day, but nor more than twelve are used for any one day. Where a choice exists the observations of the high weight observers are chosen first, then those made by low weight observers under fair to good or excellent seeing conditions.. If so few observations have been made on any one day that there are not eight available made under fair to good or excellent conditions, then observations made under fair to poor conditions are used. These are again chosen in order of weight until a total of eight observations are available.

This process completes the so-called "editting" of observations and from here forward it is merely a matter of arithmetic. The attached tabulation (Table I) for January 10, 1955 is practically self-explanatory. The Ri column shows the individual observations submitted as calculated by each observer using the formula: Ri=10g+f./g=groups of sunspots;f=spots/. Wi shows the observers weighting factor, while ki is the factor to bring everyone's observations to parity. (These factors may need recalculation in a couple of years). As the writer uses a 4" refractor and visual means, his observations (Ri) have to be multiplied or "cut down" by the factor ki=0.68. Some observers' Ri-s may be"raised", if their ki-factors exceed unity (see Venter in Table I.) The WiKi column shows the product of the two preceding columns to two significant figures, and this is the factor actually used so as to avoid decimals in the last column. The sum total of the ten entries in the last column /RiWiKi/ is 5419. When this is divided by the sum of the ten weights, Wi, namely 196, it gives the weighted average of 27.65 which is rounded to 28. This is R_A' for the day.

To get the monthly sunspot-numbers for R_A' the daily figures are added up and then divided by the number of days of a particular month. They totalled 721 for January 1955 and when divided by 31 this gave a monthly mean $\overline{R_A}$' for this month as 23.26; rounded to 23.3

In actual practice everybody's observations for the entire month are entered on two large sheets, the first for Ri and the second for RiWiKi. Each sheet is cross added. The sums of the Wi are also cross added. These cross checks serve to check the entire month.

(continued on page 5)

The results are mailed to Mr. Alan H. Shapley, for use by the National Buereau of Standards and publication in the Ionospheric Data -CRPL; the Solar Division BULLETIN and Sky and Telescope. The individual observations Ri-s are entered on a "summary sheet". All observations of Solar Division members are finally mailed to Mr. William A. Reid who enters them into "American Sunspot Number Reductions" forms. (These forms will be published in the Solar Division BULLETIN in the near future again.)

Table I. Computation of R_A for Jan.10th 1955

Observer:	Ri	Wi	Ki	WiKi	RiKiWi
Williams	29	26	.92	24	696
Pierson	18	24	.83	20	360
Rosebrugh	31	22	.68	15	465
Maher	36	22	.90	20	720
Chase	31	20	.95	19	589
Observer X *	(13)				
Venter	26	19	1.28	24	624
Estremadoyro	46	19	.80	15	690
Macris	35	18	.77	14	490
Buckstaff	27	17	1.11	19	513
Cragg	34	9	.92	8	272
Total:		196			5419

Weighted average R_A is 5419 divided by 196 which equals 28 (nearest integer). Thus 28 is the American Relative Sunspot-Number for January 10th 1955.

*) fictitious observation made under F6 seeing conditions or worse

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O L D Q U O T A T I O N :

Sir William Herschel - 1794:

"The Sun,...appears to be nothing else than a very eminent, large and lucid planet, evidently the first, or, in strictness of speaking, the only primary one of our system, all others being truly secondary to it. Its similarity to the other globes of the solar system with regards to its solidity, its atmosphere, and its diversified surface; the rotation upon its axis, and the fall of heavy bodies, lead us to suppose that it is most probably also inhabited, like the rest of the planets, by beings whose organs are adapted to the peculiar circumstances of that vast globe. Whatever fanciful poets might say ...., but now I think myself authorised, u p o n a s t r o n o m i c a l p r i n c i p l e s, to propose the Sun as an inhabitable world....

(from Richard A. Proctor; The Sun, London 1872)

American Relative Sunspot Numbers for May and June 1955 - R_A' -

Day	RA' May	RA' June	Day	RA' May	RA' June	Day	RA' May	RA' June
1	28	15	11	0	40	21	48	34
2	25	16	12	0	32	22	48	21
3	32	9	13	1	33	23	42	9
4	47	16	14	0	36	24	44	0
5	35	19	15	0	34	25	44	0
6	31	20	16	6	51	26	46	0
7	23	20	17	17	48	27	33	0
8	8	18	18	24	49	28	36	6
9	0	18	19	29	51	29	34	12
10	1	23	20	40	53	30	24	18
						31	20	

Mean for May: RA' = 24.7
Mean for June: RA' = 23.4

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Zürich Provisional Sunspot Numbers for May and June 1955 - RZ -

Dependent on observations made at Zurich Observatory and its stations in Locarno and Arosa.

Day	RZ May	RZ June	Day	RZ May	RZ June	Day	RZ May	RZ June
1	23	26	11	9	48	21	60	55
2	21	17	12	7	46	22	51	38
3	32	13	13	0	40	23	55	15
4	45	22	14	0	63	24	50	0
5	44	25	15	7	56	25	46	0
6	28	33	16	16	69	26	47	0
7	20	26	17	29	74	27	47	0
8	17	23	18	32	71	28	47	8
9	0	24	19	34	67	29	45	11
10	0	27	20	45	74	30	36	23
						31	24	

Mean for May RZ = 29.6
Mean for June RZ = 33.1

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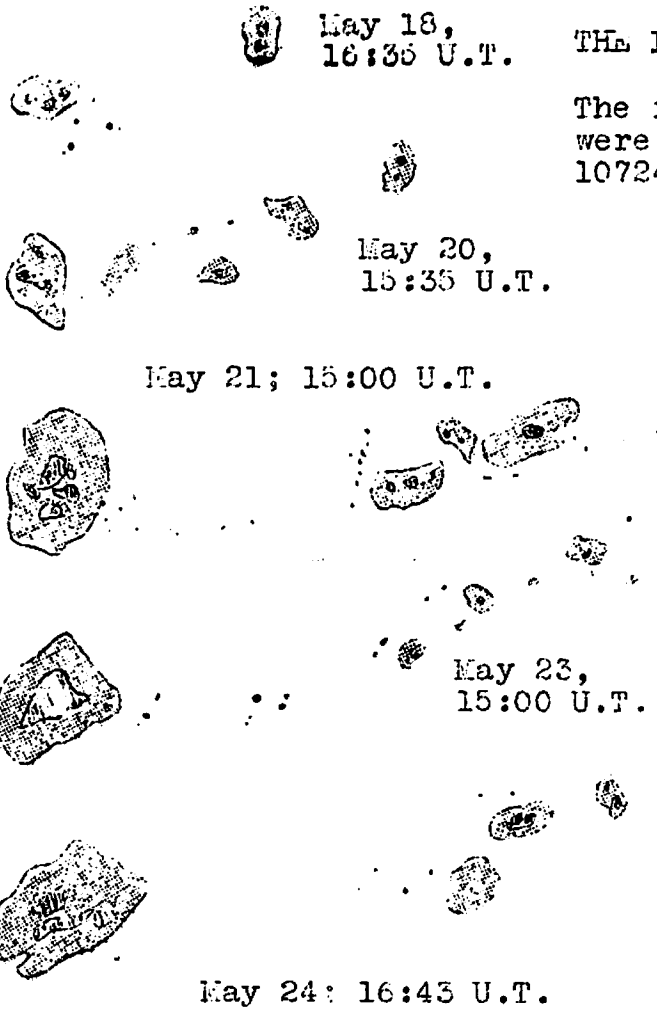
Monthly Values of SOLAR FLUX at 2800 Mc/s (10.7 cm) -Recorded at National Research Council, Ottawa, Canada

Flux in Watts/m^2/cycles/second bandwidth (x 10^{-22}) - 2 polarizations

	mean	highest flux-day		lowest flux-day		bursts*)
January	87.7	105.1	7	77.4	21	10
February	84.8	92.2	9	76.7	17	8
March	76.4	80.2	5	73.3	17	0
April	78.0	83.6	6	74.8	14-25	0
May	82.8	93.9	21	71.8	14	6
June	89.2	108.7	16	75.6	7	23

*) = "outstanding events" listed (number)

THE LARGE SUNSPOT GROUP OF MAY 1955



The preceding spot (P-spot) was centered on latitude 25°N; the following spots were about two degrees further North.

The fine sunspot drawings on the left were made by Mr. Frank J. DeKinder, 10724 Emile St., Montreal 12, Canada. These illustrate clearly the rapid evolution of a sunspot group. Note the changes from the D-type on May 18th (length about 8°), through the more complex stages of an E-type group (from 10° to 14°) to finally, before setting, to a G-type extending to 16° (on May 25th). Incidentally this group began as a B-type when first seen on May 16th.

Mr. DeKinder uses a 108mm refr. with 180x; and observes a projected solar image in his fine home-made observatory dome.

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With increasing sunspot activity we have been receiving some detailed drawings and photographs. We wish to extend our thanks to Messrs: Robert M. Adams; James C. Bartlett, Jr., Frank J. DeKinder, Dale P. Cruikshank and for some fine photographs to Charles Cuevas. Our active sunspot observers will soon be notified about a coordinated program called:"The Evolution of Sunspots". hlb

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"COLOR" IN SUNSPOT OBSERVATIONS.

We received reports of "color-in-sunspots" by two of our most experienced solar observers. Mr. John E. Thrussell, Pirton Hitchin, England, reported coloring in the P-spot of the large May group on May 21st (see group above) an suspected coloring in another group on May 29th. No other detailes were given.

Dr. James C. Bartlett, Jr. foundcoloring in the May group on the 24th when he saw "the entire penumbra /of the P-spot/ of a bright red-violet tint."

As is shown on our front cover, Dr. Bartlett, Jr. observed colors also in the large June group. "On June 13th; 1700 UT an unmistakable red-orange tint was observed in a localized area of the penumbra" (see b in sketch). "On June 17, 1715 UT the penumbra appea red distinctly reddish all around." "June 18, 1710 UT ...a bright red border was observed to the [illegible] component" (see a in sketch on front cover). A coordinated program of "color-in-sunspots" will soon be announced on these pages.

N O T E S FOR THE S U N S P O T O B S E R V E R
March; April; May 1955

MARCH: Sunspot activity reached minimum proportions again in March of this year. The U. S. Naval Observatory was able to photograph the sun on 26 days in March, of these 20 were without sunspots. All in all the Naval Observatory recorded 13 daily groups- four of type A; three of type B; one C and five J-type groups. Seven were in the Northern and six in the Southern hemisphere. Most occurred in latitudes from 20° to 35°.

A "typical day" in March (when spots were visible) was March 2nd. One J-group was at 19°W of Central Meridian and 23°South with an area of 145 millionths of the sol. hemisphere. Another C-group had its P-spot (preceding spot) at 49°W; 18°N-the F-spot (following) was at 39°W and 21°N. This latter group was at first erroneously classified as two groups-A and J, however Mt. Wilson Observatory magnetic polarity data classified it as a single bipolar group.

APRIL: Spot activity increased slightly. The Naval Observatory observed the sun on 30 days; five days were spotless. 18 daily groups were North four were South of the solar equator; total 22. Most of these groups were in latitudes 20° to 30°. These groups were divided into: 2 A; 6 B; 4 C; 6 D and 4 J-type groups.

"Typical day"-April 7th. The largest group of the month was the D-type group (total area 327 x 10⁻⁶ hem.) with its P-spot at 26°W and 23°N; its F-spot at 21°W;21°N. Another group on this day was a B group at 56°W;24°N and 49°W;26°N-the P- and F-spot respectively.

MAY: Sunspot activity increased further. On 28 days the U. S. Naval Observatory was able to photograph the sun; of these 7 were spotless. 40 of a total of 44 daily counted groups were in the Northern hemisphere;4 Souuth. "This condition has existed for several months now", writes Mr. Thomas A. Cragg and continues: "It is to be remembered that it was the southern hemisphere that started out much the stronger in 1945 and 1946; in fact when treated separately, the southern hemisphere came to a maximum in 1947 while the northern maximum wasn't reached until 1948."

30 photographed groups occurred in latitudes 26° to 35°. (We learfrom Mr. Cragg that an "old cycle" group- a minute bipolar group- was recorded by the Mt. Wilson Observatory on May 25th at S4°; E33° and was seen also on the 26th). The classification used by the Naval Observatory listed: 3 A; 5 B; 10 C; 11 D; 8 E; 1 F; 6 J type. Your Editor believes that 3 of the E-type groups should have been classified as D groups and in particular the F group seems misplaced. This latter group would have been more properly classified as an G-type. The lenght in longitude is not a sufficient criterion. (Mr. Demetrius Elias used the G classification in his detailed report "Positions of Sunspot Groups)

"Typical day"- May 25th. An A-type group was at 47°E, 29°N. The C group was at 11°W, 26°N (the P-spot) and 3°W; 27°N (F-spot). The extended "F" group (classified G by this writer) had its large P-spot at 61°W;26°N and follower at 47°W;26°N. The above mentioned minute "old cycle" group was at 4°S and 33°S as seen at Mt. Wilson Observatory.

HLB