THE AMERICAN ASSOCIATION OF VARIABLE STAR OBSERVERS

Solar Bulletin

HARRY L. BONDY, EDITOR — 61-30 157 ST., FLUSHING 67, N. Y.

SOLAR DIVISION COMMITTEE: RICHARD W. HAMILTON, AAVSO PRESIDENT; H. L. BONDY, CHAIRMAN
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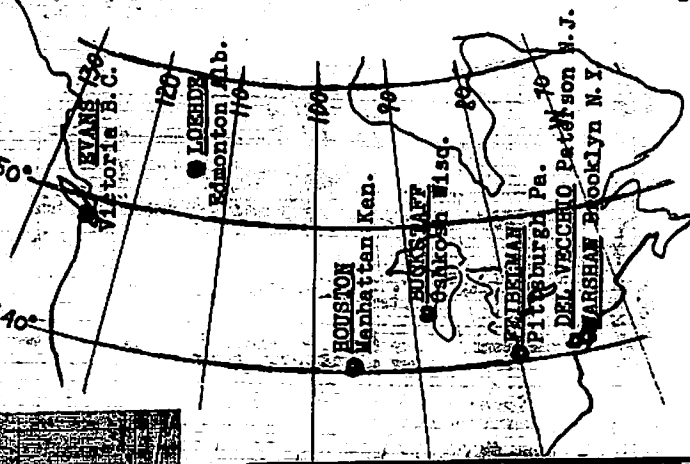
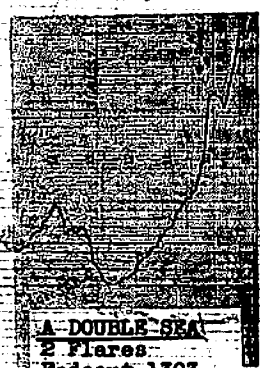
SEPTEMBER - OCTOBER 1957 — Numbers: 133 - 134

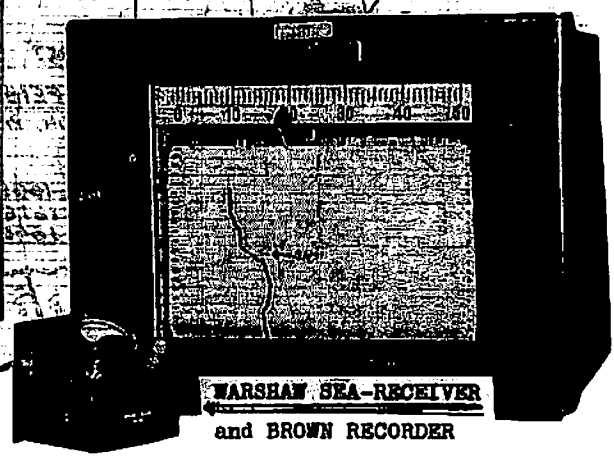
SOLAR DIVISION—AAVSO STATIONS RECORDING SEA's on 27 kc/s - (Sudden Enhancements of Atmospherics) for the I. G. Y. Program.





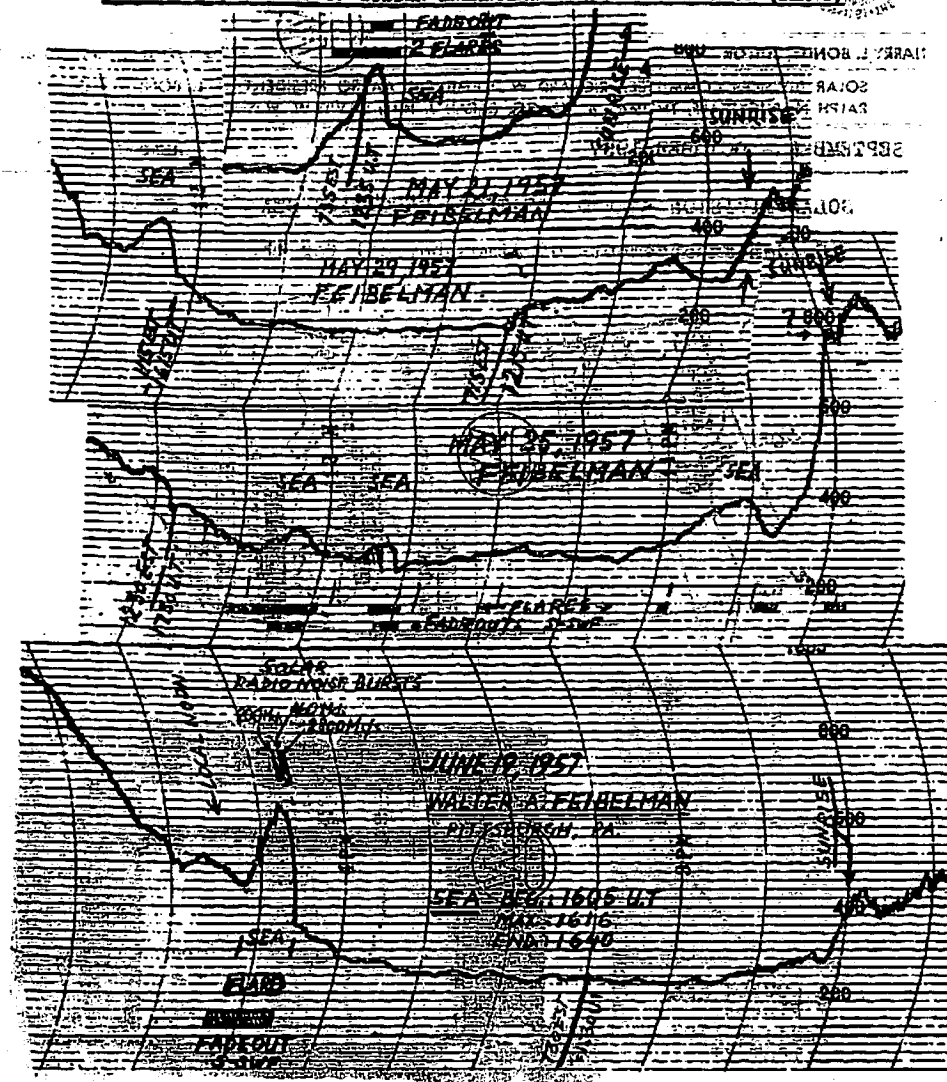
A DOUBLE SEA
2 Flares
Fadeout 1303 - 1607 UT

Warshaw's record



WARSHAW SEA-RECEIVER and BROWN RECORDER

SOME GOOD EXAMPLES OF SUDDEN ENHANCEMENTS OF ATMOSPHERICS (SEA's)



SOLAR DIVISION - AAVSO Program of Recording SEA's for the IGY.

The Solar Division's Radio-Astronomy Program of recording Sudden Enhancements of Atmospherics (SEA's) for the US-IGY Program is now fully under way. The SEA's, due to increased ionization of the D-layer caused by solar flare radiation, are recorded on 27 kc/s with transistorized radio receivers specially designed and developed by Mr. DAVID WARSHAW.

At least eight of the Warshaw-type SEA-receivers are now in operation. The results obtained in three cities, Brooklyn, Pittsburgh and Paterson, are presented onthe following pages, together with illustrations and tabulations.

Following Warshaw's work, Mr. WALTER A. FEIBELMAN, Pittsburgh, Pa., who built his own SEA-receiver according to Warshaw's design, started to record SEA's in May of this year. Some of Mr. Feibelman's fine recordings are illustrated on the opposite page, and the results are tabulated on pages 6,7 and 8. Due to local interference and some instrumental effects there are only several parallel SEA's recorded during May and June between Warshaw and Feibelman who live some 400 miles apart. About one tenth that distance from Warshaw lives Mr. Del Vecchio, Paterson, N.J.

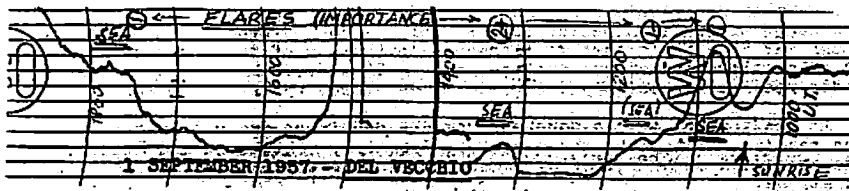
Mr. PHILIP J. DEL VECCHIO also built his own Warshaw-type SEA-receiver and he records his own SEA's since July. Currently he is engaged to limit his local interference effects to a bare minimum, and we shall report on this later on. Some of Del Vecchio's fine recordings are shown on p. 4 and the first part of his September SEA's are tabulated on p.6. Del Vecchio's records are usually best in the morning hours and for this reason the more or less typical sunrise pattern is shown on the next page. Note the following:

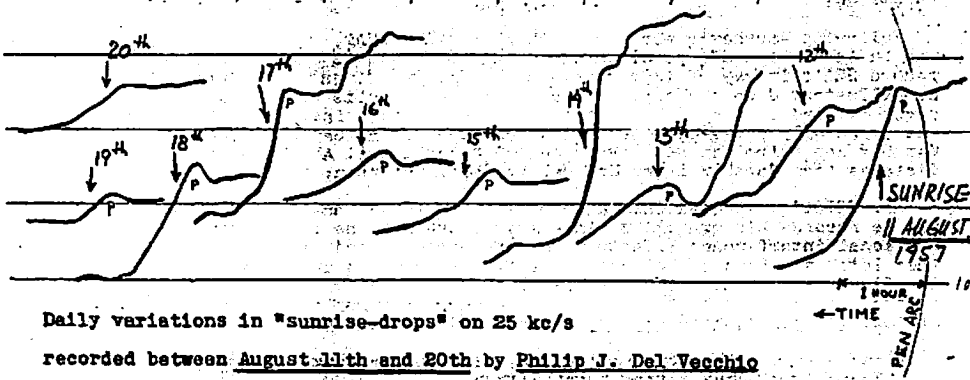
a) there is a slight but noticeable "dip" in the tracings occurring some 35 to 45 minutes before sunrise; then
b) a distinct "rise" (sort of hump), marked P on the graphs, appears. This "Precursor" appears some 20 minutes before sunrise;
c) sunrise itself occurs during a rather clear "sunrise drop". This pattern seems most characteristic for days when good SEA-records are made. In fact the lack of this pattern for an extended period should be an indicator of some malfunction. There seems no such evident "sunset pattern".

Furthermore it should be stressed that the AMPLITUDE of SEA's is NOT RELATED to the associated FLARE's IMPORTANCE. A fine illustration of this can be seen on Del Vecchio's record, top of page 4. The first SEA starting at 1035 UT was associated with a Class 1 flare; the SEA at 1259, much smaller than the first one, was caused by a 2+ flare. The same lack of reciprocity can be seen from the tables on pp. 6,7,8. In fact some identical SEA's differ greatly in amplitude when recorded at two or more stations.

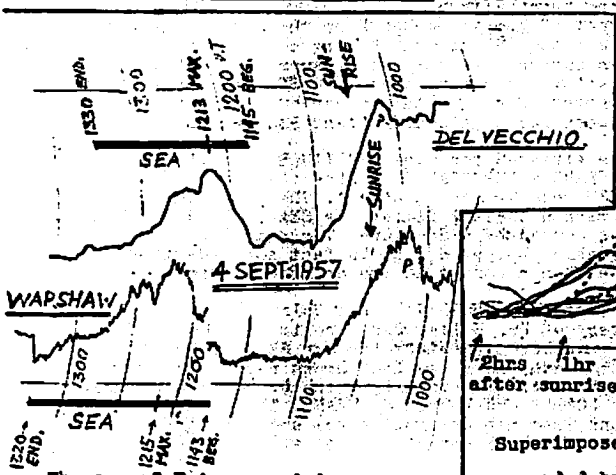
As reported in our May-June SOLAR BULLETIN, the Solar Division-AAVSO obtained through the courtesy of Dr. Walter Orr Roberts and the National Bureau of Standards four Brown Potentiometers for our SEA-IGY Project (see front picture). DAVID WARSHAW adopted these four Brown recorders for four of his SEA-receivers which he built for Messrs. Ralph N. BUCKSTAFF, Walter Scott HOUSTON, Franklin C. LOEHDE and Robert S. EVANS. These units are now in operation in all stations (see map on front page) and the first records of SEA's were obtained here. We shall report on this work in our bulletin.

RLB



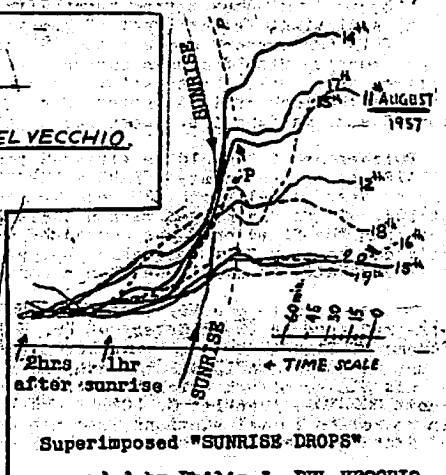


Daily variations in "sunrise-drops" on 25 kc/s recorded between August 11th and 20th by Philip J. Del Vecchio



The same S.E.A. recorded in PATERSON, NEW JERSEY and BROOKLYN, NEW YORK

(note that there is a difference in the rate of the two recorders)

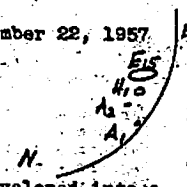


Superimposed "SUNRISE-DROPS" recorded by Philip J. DEL VECCHIO AUGUST 11th to 20th 1957

LETTERS AND NOTES:

Mr. Thomas A. Cragg writes: "Two areas of questioned grouping were resolved here (Mt. Wilson Observatory) as follows:

1) September 22, 1957



A_1 developed into a good C_7 type group by CMP

2) "The other was a smallish single spot which came over the SE limb on September 22nd. On 9/24 another small spot developed nearby. During the remainder of their disk passage a number of spots formed all around the first one. This area was a return of a complex group last rotation so all of that stuff was called one group."

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SUN DIMMED 0.9%.

During a recent IGY symposium in New York City, Dr. Walter Orr Roberts reported on a very interesting finding by Dr. E. C. Slipher, Lowell Observatory, Flagstaff, Arizona, namely that the sun's radiation dropped 0.9% from normal during the winter months 1956-57 and returned to normal within a few weeks. The observations were made through a 21-in telescope equipped with a photometer taking light readings of Uranus or Neptune and comparing these with near by stars, thus eliminating the uncertainties induced by variable atmospheric transparency. The full significance of these findings cannot be ascertained.

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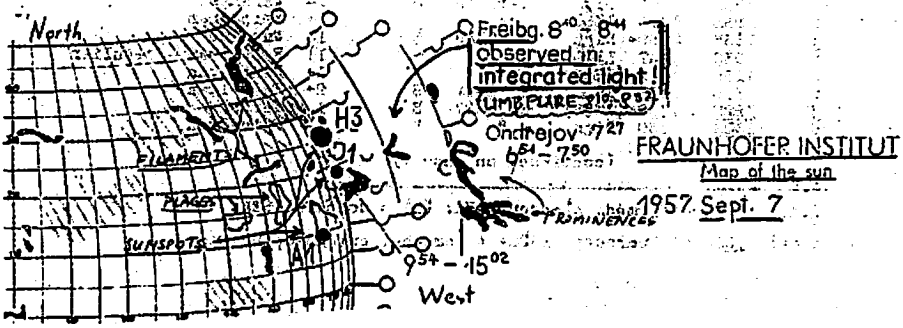
PROMINENCE OBSERVED IN INTEGRATED LIGHT on September 7th, 1957.

The FRAUNHOFER INSTITUT's MAP OF THE SUN for 1957 Sept. 7, carries a note that a PROMINENCE was seen in integrated light at 0810 to 0811 UT in Freiburg. At that time several observatories recorded a class 2 flare at 17°N and 86° W from 0810 to 0837. This time and position are the same as that of the prominence seen in integrated light. It thus appears that this is another instance of a WHITE FLARE.



SUDDEN ENHANCEMENTS OF ATMOSPHERICS - S. E. A.'s

recorded on 27 kc/s by

DAVID WARSHAW, Brooklyn, N. Y.

WALTER A. FEIBELMAN, Pittsburgh, Pa.

1957 MAY	U. T. beg.	max.	end.	flare class beg.	SWF	SEA class	observer notes
(1)	1415	1425	1448			(1)	Warshaw - doubtful
(3)	1522	1530	intf.	1- 1515		(2)	Warshaw - doubtful
(3)	1602	1610	intf.			(2)	Warshaw - doubtful
(3)	(1858)	1928+	irr.	1 1920	G	(3)	Warshaw - pec.; doubt.
5	1630	1648	1730	1-b1657		1	Feibelman
7	1338	1345	1430	1- 1334		1+	Warshaw
7	1430	1440+	1455	1-b1440		1	Warshaw
8	2328	2340	2400	1- 2335	S1	1	Warshaw
(9	2320	2335	2345	1- 2325		2+	Feibelman
9	2328	2332+	high	"		1	Warshaw
11	1508	1520+	intf.	1 b1516		2	Warshaw
13	1242	1250	1315			1+	Feibelman
13	1315	1335	1430	1- 1315	S1	1+	Feibelman (double SEA)
13	1522	1530	1600	1 1516	S	2-	Feibelman
16	1215	1240	into SEA			2+	Feibelman
16	1247	1252	(1315)	1+ 1242	S	3	Feibelman
19	1430	1440	1510	1- 1415		1	Feibelman
20	1350	1355	high		S	1	Feibelman
21	1210	1218	(1305	1 b1208	S1	2	Feibelman
(21	1215	1222	1300	"	"	1-	Warshaw
22	1752	1808+	1835			2	Feibelman (burst 2800Mc/s)
24	1607	1610+	1630	1+b1617	S	1	Warshaw
(25)	1025	1040	1130			(2)	Feibelman - doubtful
(25	1447	1456	1513	1 1450	S	1	Feibelman
25	1437	1445	high	"	"	1-	Warshaw
25	1545	1600	1630	1 1540	S	1-	Feibelman
25	1732	1737	high	(1- 1745?)		1-	Feibelman
26	2215	2230	high	1- 2215		2	Warshaw
27	1745	1805	1815			3	Feibelman-peculiar
29	1620	1632	1655			2	Feibelman
31	1605	1620	1635	1+ 1557		1+	Feibelman
JUNE							
1	1252	1255	high	1-b1315	S	1-	Warshaw
(1	1255	1300	1350	"	"	1+	Feibelman
1	2335	2350+	high	1 2329	S	1-	Warshaw
(2)	1030	1047	1120			(1)	Feibelman - peculiar
2	1130	1140	(1245)			1+	Feibelman
2	1515	1530	1600	2- 1512	S	2+	Feibelman
(5	1325	1330+	(1358)	2- 1327	S	1	Warshaw
5	1325	1330	high	"	"	1-	Feibelman

(continued on page 7)

date: 7 = confirmed, clearcut SEA; (1) = doubtful SEA

time: 1338 = clearcut; 1928+ = somewhat extended; broad;

(continued) S.E.A.'s recorded by WARSHAW and FEIBELMAN -

1957 JUNE	beg.	max.	end.	flare class	beg.	SWF	SEA class	observer notes
(6	0745	0752	0810	1	0744	S	1	Feibelman NIGHT SEA??*
6	0753	-756	0805	"		"	1-	Warshaw " "
6	1630	1645	high	1	b1634	S	2	Feibelman
6	1658	1710	high	1	b1700	S	1+	Feibelman
7	0628	0637	0705	1	b0637		3	Feibelman NIGHT SEA?**
9	1635	1650+	high				1	Warshaw
10	1433	1442	(1455)				1	Warshaw (HAO -1430)
(10)	1758	1803+	high	1-	1757		1	Warshaw
11	-1315	1320	high				1+	Warshaw
12	1725	1730	high				2	Feibelman
13	1534	1538+	1615	1-	1530		1+	Warshaw
18	1430	1445	1510	1-	1430		2	Feibelman
19	1605	1615	1640	2	b1610	S	3-	Feibelman
20	1625	1630	high			S	1	Feibelman
21	1138	1145	1203	1	b1155	G	1	Warshaw
23	1215	1230+	high	1+	b1225	S	1-	Warshaw
(23	1215	1230	1330	"		"	3-	Feibelman
23	1340	1400	high	1	1340	S	1-	Warshaw
23	1515	1520	high				1-	Warshaw
24	1730	1755	1820	1-	1752		3	Feibelman
(30)	1035	1055	1130				(3)	Feibelman - doubtful
30	1420	1430	(1450)				1+	Feibelman

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Notes: time: (1450) = uncertain; intf. = into interference

"high" = no decline following maximum /no return/

flare beginning: b1657 = flare started before this time

SWF = short wave fadeout; S = sudden; Sl = slow; G = gradual

SEA class = estimates according to amplitude, where 3+ is highest

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UNPRECEDENTED SOLAR ACTIVITY.

Since solar activity was recorded, and monthly Sunspot Numbers were extended to 1749, astronomers have never witnessed the magnitude of solar activity like that of OCTOBER 1957. The monthly Zürich Sunspot Number reached an unprecedented value of 262.9, while the monthly average value of the 2800 Mc/s flux recorded by the National Research Council in Ottawa was 281. The corresponding high values during 1947 were: R_Z = 201,3 and 2800 Mc/s flux 261, both occurring in May 1947.

The very high values during September and October 1957 shift the period of Maximum from January-February 1957 to March-April and perhaps later. At this moment it may not be known until late spring of 1958 when Maximum of the current cycle occurred.

Sudden Enhacements of Atmospherics (SEA's) - 27 kc/s

recorded by Warshaw (Brooklyn); Feibelman (Pittsburgh); Del Vecchio (Paterson) during the first two weeks of September 1957. (Partial listing)

1957 Sept.	U.T. beg.	max.	end.	flare class	beg.	SWF	SEA	class	observer	notes
1	1035	1047	1112	1	1024	G	2+		Del Vecchio	
1	1130	1138	(1146)	1-	1131		1-		Del Vecchio	
1	1259	1315	1332	2+	1255	S	1+		Del Vecchio	) identical
(1)	1300	1315	1332	"	"	"	1+		Feibelman	
1	1722	1730	high	1	1723	Slow	1+		Del Vecchio	
(1)	1722	1735	high	"	"	"	1+		Feibelman	
(1)	1722	1730	high	"	"	"	1-		Warshaw	
1	1952	2010	high	2	1945	S	3		Warshaw	
(1)	1950	2015	(2100)	"	"	"	3		Del Vecchio	
(1)	1950	2015	off sc.	"	"	"	3		Feibelman	- off scale
2	1205	1212	1245				2		Del Vecchio	
2	1305	1308	1314	2	1259		1-		Warshaw	
2	1345	1352	1400	3	b1338	S	1		Del Vecchio	
2	1415	1438	(1502)	1	1415	G	3-		Del Vecchio	
2	1608	1612	1630	(1	1554)		1		Warshaw	- uncertain
2	2215	2308	2338	1	2212		3+		Del Vecchio	- uncertain
(3)	1603	1606	1625	(1-	1610)?		(1)		Del Vecchio	- doubtful
(3)	2020	2028	intf.				(3+)		Warshaw	- doubtful
3	2110	(rec.	interupt.)	2	2110	Slow	3+		Warshaw	- interrupted
4	1145	1213	1330	2	b1156	S	2+		Del Vecchio	
(4)	1143	1215	1320	"	"	"	2+		Warshaw	
(4)	1829	1840	high				(1+)		Feibelman	- doubtful
4	1935	1950	high	1-	1937		1+		Feibelman	
5	1212	(1225)	high	2	1206		2-		Del Vecchio	
5	1614	1622	high	1-	1605		1+		Del Vecchio	
(6)	1145	1152	1155				(1)		Warshaw	- doubtful
6	1210	1218	(1240)				1+		Warshaw	
6	1320	1332	high	1-	1320		1+		Warshaw	
7	1315	1325	1347	?		1312-S	3-		Del Vecchio	
7	2045	2048	high				3-		Del Vecchio	- peculiar
7	2133	2140	high	2	2134	G	1		Warshaw	
(8)	1038	1048	1130				1+		Del Vecchio	- doubtful
9	1055	1102	1130				1		Del Vecchio	
(9)	1310	1313	high				(1)		Warshaw	- doubtful
12	1520	1525	(1600)	2+	1510	S	2-		Warshaw	
12	1925	1930	(2005)	1	1924		1+		Warshaw	- erratic
12	2005	2016	2038	1-	2000		2		Warshaw	- erratic
(13)	1843	1850	1925				(2-)		Feibelman	- doubtful

OUT OF OTHER PUBLICATIONS.

ASTRON. MITTEILUNGEN der EIDG. STERNWARTE ZÜRICH, NR. 207:

"The Rotation of Sunspots in High Latitudes" by M. Waldmeier:

Abstract: "The sun's rotation has been computed from the observations of a unipolar sunspot crossing the sun's disk from August 15 to 31, 1956 at latitude of 48.3°. At this latitude the daily sideriel motion amounts to 12.35° ± 0.15°, far less than was expected from the Greenwich formulafor the latitude dependence of solar rotation. The rotation derived from the spot is even slower than that derivedfrom the filaments at the same latitude, showing the angular velocity to increase with height."

The Greenwich formula would give a daily angular motion at lat.=48.3° equal to 12.93°. Dr. Waldmeier comments also that said high lat. spot was visible for 17 consecutive days, though on the morning of August 31st it was visible only visually at the eye-piece but not in projection or on photographs. (see also Mr. De Kinder's comments in the Solar Division BULLETIN, Sept.-Oct. 1956)

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Mr. Thomas A. Cragg, Mt. Wilson Observatory, writes: "Our plates of the high latitude group of June 1957 indicate it had a mean latitude of about +51°. We have compiled a list of all groups whose mean latitude is farther from the equator than 40° and which lasted for two or more days. This group is the highest latitude groun in the entire list! This list includes everything published in the Greenwich Photoheliographic Results and brought up to date with our own material. Also, it should be noted that up to the beginning of this cycle there were twelve such groups observed, eight of them in the last cycle (1944-1954). We have had thirteen so far in this cycle."

This high latitude group was Mt. Wilson No. 12428, CMP on June 16.1; latitude +51°; first seen on June 20, last seen going over the limb on June 23rd; class. dsl. Close to the western limb, this D-type group may have reached an area of over 200 millionths of the sol. hemisphere.

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The New York Times, September 26th and 28th, 1957.

BALLOON CAMERA PHOTOGRAPHS SUN--8,000 PICTURES TAKEN FROM 81,000 FEET.

Donald Janson describes the Navy research project called STRATOSCOPE of Prof. MARTIN SCHWARZSCHILD, Princeton University, conducted on September 25th. A special 12" reflector telescope was raised to 81,000 feet by a giant Skyhook balloon in order to photograph solar granulation. Mr. Janson writes: "(the photographs) showed that the face of the sun was made up of gaseous eddies 200 to 500 miles in diameter. Only the largest eddies (i.e. granules)...had been visible in pictures taken (previously). Prof. Schwarzschild said he had expected to find the great eddies were batches of smaller ones. The pictures show this is not true, he told a news conference....(Schwarzschild) estimated their (the smallest, brightest granules) temperature at 12,000°Fahrenheit (about 6700° C), that of the big, "cool" storms at 9,000° F (about 5,000 C).

OUT OF OTHER PUBLICATIONS - continued.

THE OBSERVATORY , 1957 February issue p.20:
PHOTOGRAPHY OF SOLAR GRANULATION FROM A MANNED BALLOON
by D.E. Blackwell, D.W. Dewhirst, and A. Dollfus.

"The best photographs of solar granulation so far obtained show a resolution of no more than about 0".7, corresponding to the Rayleigh limit of an 8-inch visual telescope.... (using an 11-in f/10 visual-doublet by Schaer and an eye-piece giving a solar image of 18-in in diameter the balloon made its "first ascent from the terrace of the Meudon Observatory on 1956 November 22, when 390 photographs were taken during three hours at heights between 18,000 and 20,000 ft." (due to shutter speed failures "because of low temperature" the results were not as satisfactory as possible, still)... "The best photographs, however, show the fine structure of granulation with a resolution of about 0".9, and seem little inferior to the photographs of Lyot and others..; it is encouraging to see that they are free from the defect of reseau photospherique."

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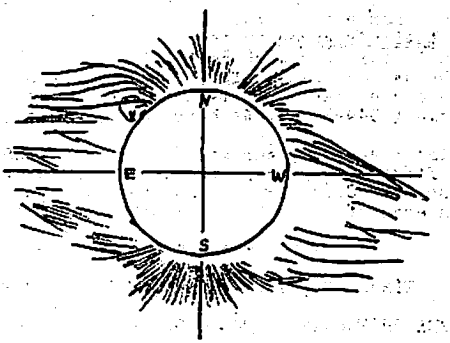
Mr. HANS ARBER's photographs of the 20 June 1955 solar eclipse, taken in Manila, Philippines, form the basis of scientific data on the white corona described in ASTON. MITTEILUNGEN der EIDG. STERNWARTE ZURICH , Nr. 208 by M. Waldmeier, H. Arber and H. Bachmann.

The following is a composite picture showing the coronal structure as based on Mr. Arber's photographs.



(from the abstract) "The corona observed at the eclipse of June 20, 1955, is of the minimum type characterised by two long streamers in opposite directions, the one in the NE-, the other in the SW-Quadrant, which are in connection with disturbed photospheric regions near the sun's limb. In the new sunspot-cycle the S-hemisphere is less developed than N-hemisphere; therefore the S-polar region shows the polar plumes still undisturbed, while the N-polar region is occupied by bright cloudswith only few polar plumes visible..."

AAVSO – SOLAR DIVISION

AMERICAN SUNSPOT NUMBER OBSERVATIONS

MONTHLY MEAN $R_A' = 160.4$ JULY 1987 MONTHLY MEAN $R_Z = 194.3$

OBSERVER	K1	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	.85		19,37	4,39	13,51	6,37	19,65			19,97	19,38			5,32							13,42	13,96			15,89	14,91	13,87	6,63				
Arbor		16,95	6,81		9,64	6,47	6,86			16,96	16,87	5,33	6,20					8,53	6,41	15,72					6,63	6,65	14,32	16,59		16,52	13,98	5,97
Bandy	.89		[illegible]	[illegible]	[illegible]	6,40	[illegible]	[illegible]	[illegible]	[illegible]	5,32	5,24	4,71			16,83	11,25	12,76	15,47	[illegible]	16,83	16,96	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
von Brandis	[illegible]		[illegible]	10,32	[illegible]	4,97	12,86	[illegible]	6,51	[illegible]		5,33	5,11			5,95		9,90	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	5,98
Dickstaff	.81		16,93	15,21		13,70	13,40		13,38	16,32	5,17		[illegible]	5,17	5,18	5,31		15,88	16,43	15,91	15,53		16,76	16,97	9,50			8,95		5,21	6,38	7,38
Colel		16,96	6,85	15,85	16,90	6,41	16,96	6,86	6,86	6,38	8,98	9,39	5,25	5,95	6,18	7,36	16,85	12,96	16,99	6,40	16,96	16,96	16,72	16,86	16,90	5,86	5,86	6,43	16,91	6,68	5,81	6,86
Chocopis	.82			6,41		15,16		5,68		16,50		16,35	5,20			16,52	6,31	16,68	16,20	15,32	6,96		16,76			16,86	16,96		5,91		5,99	5,20
Crapp	.82	16,85	15,39	16,86	16,98	16,95	6,31	5,83	5,80	5,91	5,32	5,38	5,10		5,39		16,79	16,90	15,20	16,28	6,16	5,36	16,86	15,97	16,95	16,97	16,77	5,93	16,95	16,85	5,99	6,51
Gulinder	.80		16,17		16,38	6,53	16,85	5,80	16,97	5,31			5,20	5,38	5,37	5,33	5,85	6,35	16,97	6,38	15,65				16,53	5,65	5,77	5,63	5,46	5,38	6,31	5,87
Del Vecchio		5,49	5,53	5,73	6,92	5,82	5,91	5,77	5,39	5,35	5,35	5,31	5,31		6,39	5,93	5,55	5,32	5,63	15,31	16,39	16,45	5,42		8,09	5,83	16,16					
Elias	.75	16,90	16,86	16,97	16,95	16,97	6,42	16,91	6,97	16,96	16,87	16,97	6,73	5,36	16,85	15,85	15,84	16,92	16,45	15,95	16,92	16,75	16,87	16,12	16,95	16,96	5,95	5,96	16,96	6,86	6,86	6,87
Entremdayoro, V.	.80	16,85	16,65	[illegible]	[illegible]	16,81	16,92	[illegible]	6,95	[illegible]	16,85	[illegible]	[illegible]			[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	16,80	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Evans	6.8	16,36	16,95	[illegible]	16,90		16,96	16,86	[illegible]	[illegible]	5,32	[illegible]			5,98	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	6,86	15,48	6,96
Fornald	6.02		[illegible]	15,21	15,86	15,97	16,73	15,88	16,96		16,80	16,96	16,16	5,23	5,39	16,92	16,59	[illegible]	16,95	6,71	16,86				16,31	6,46	16,95	16,96	16,86			16,58	5,91
Fisher		5,33	5,35	5,35	6,91	16,97	5,94	5,29		5,46	5,16	5,9	5,94	5,20	6,74		5,35	16,35	16,97	6,33			5,96	5,91	5,91	5,35	5,33			5,31	6,16	5,29
Hicks		5,76	5,89	16,65		6,71	6,58	5,85								5,42	16,73			16,86	15,99	16,86			16,98	16,91	16,35		5,89	5,98	5,59	6,36	5,97
Itabashi				15,89		16,83	16,97	16,86							5,38	5,10	5,96	15,94		16,31						16,97				5,65	16,65		5,57
Lastbich	6.02	16,48		16,94			16,87	16,97	5,59	5,93	6,31	5,86		5,31	5,38	5,50	5,93		16,35	16,35	16,95		16,48	16,86		16,97		16,88			5,93	
Lunde			16,37		15,91	16,96		16,90	6,53			6,33			5,30	15,64			15,96	15,36	15,95	16,68	15,47	16,31	16,96		16,87	3,64	3,57			
Luft	.88	15,80		16,16	15,93		6,97	16,97	6,67		5,39	5,38	5,35			15,98	15,35	15,91	6,41	16,98	16,21	15,79	15,86		16,70	16,41		5,111			5,98	5,89
Baker	.80	15,36	15,46	15,65	15,86	15,58		16,41	15,37	16,32	15,36	5,18	5,71	16,36	15,38	16,91	16,42	15,63	15,50	15,37	15,55	15,64	16,86	15,68	16,36	16,79	5,57	5,68	16,46	5,36	5,94	5,33
Pendrelton				16,99		5,79			16,30		5,37		6,18			3,99					15,83	16,98	15,33	15,16	16,49	16,97		5,65	5,78			6,46
Rowe	.78									16,35	16,36	6,37	16,91				15,57	15,50	16,94	15,73	15,35	16,91	16,85		15,112	15,85			5,52		5,81	5,94
Sicolini							5,94	16,71	16,48	16,63	5,36	6,37	5,28	6,34								6,91	16,96	16,88	16,46	5,36	5,94	5,79	5,57	5,95	6,35	5,97
Ellsworth	.86		15,41	15,85	16,46	16,95	15,94	15,37		15,32	16,37	5,38	6,96		15,40	15,60	15,77	16,74	15,72	15,86	16,96	16,42		15,15	16,46	16,86		16,90	16,87	16,95	16,86	5,51
Boonbrugh	.68	16,72	16,68	16,96	15,86	16,97	16,95	16,58	16,97	5,94	5,37	5,35	5,23		5,96		15,58	15,71	15,76	15,28	15,86	6,79	6,97		15,45	15,87	16,95	5,55	5,95	5,96	5,56	5,36
Thomas	.89		15,63	16,95	16,95	15,95	6,95		5,97	5,57	16,59		5,33	5,29	16,15		16,63	16,79	15,57	16,69		16,96	16,17	16,96		16,97	16,95		5,63	16,78	5,86		5,20
Trowsell	1.07	15,33	15,37			15,51	16,97	16,31			7,41		5,43	5,76				15,35	5,37			15,36	15,33	15,76			5,97	5,99	5,96		5,35	6,31
Trochon	1.28		15,37	15,37	15,33	15,37	15,39	16,35	5,98	16,98	6,15	5,34	5,11											15,39	15,34	16,41	16,41	16,35	5,38	5,38	6,17	5,16
Wolfbillick		15,62	16,85		15,90	5,58					5,36	6,15	6,18		5,37	5,30	16,34	16,93		16,35	15,59	15,71			5,99	16,58	5,56					6,90
Wells		15,30	15,36	15,97		15,73	15,31	15,33	5,36	5,93	5,95		6,49		5,16			15,84							5,59	5,96						5,11
Wendlydorff			16,48	16,95		15,63	15,98	16,99			5,97		5,84	16,36	15,16	16,38	16,53				16,58		17,62				16,86	15,80	16,95	16,35		

NOTE: R_A' = AMERICAN RELATIVE SUNSPOT NUMBER AND IS COMPUTED FROM OBSERVATIONS MADE BY MEMBERS OF THE SOLAR DIVISION OF THE AMERICAN ASSOCIATION OF VARIABLE STAR OBSERVERS. R_A' IS COMPUTED FOR THE NATIONAL BUREAU OF STANDARDS.

R_Z = ZURICH PROVISIONAL SUNSPOT NUMBER AND IS DEPENDENT ON OBSERVATIONS MADE AT THE FEDERAL OBSERVATORY IN ZURICH AND ITS STATIONS IN LOCARNO AND ASCONA.

THE WOLF RELATIVE SUNSPOT NUMBER R IS BASED ON THE FORMULA: $R = k(10g + f)$ WHERE k = OBSERVATORY COEFFICIENT, g = TOTAL NUMBER OF GROUPS, AND f = TOTAL NUMBER OF SPOTS (SINGLE).

	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
R_A'	181	166	192	149	206	197	153	144	129	119	98	96	106	113	141	158	175	186	189	211	220	252	227	189	171	166	155	138	110	112	97
R_Z	187	204	208	261	216	259	194	197	167	135	110	96	96	140	169	200	210	218	235	244	250	290	285	232	232	206	173	158	192	171	152

☐ ADVERSE SEEING

✱ RECEIVED LATE

NUMBER BEFORE COMMA = TOTAL GROUPS

NUMBER AFTER COMMA = TOTAL SPOTS

AMERICAN RELATIVE SUNSPOT NUMBERS for AUGUST and SEPTEMBER 1957

day	August	September	day	August	September
1	102	224	16	173	219
2	126	198	17	175	214
3	132	163	18	175	220
4	126	169	19	173	223
5	116	165	20	125	223
6	142	113	21	112	232
7	125	112	22	95	279
8	126	165	23	86	220
9	114	186	24	99	225
10	90	197	25	145	219
11	97	234	26	144	181
12	95	232	27	167	191
13	109	226	28	191	222
14	133	250	29	210	211
15	163	256	30	236	246
			31	228	

Monthly mean R_A: for August: 139.7

for September: 207.2

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ZURICH PROVISIONAL SUNSPOT NUMBERS for AUGUST and SEPTEMBER 1957 dependent on observations made at Zürich Observatory and its stations in Locarno and Arosa.

day	August	September	day	August	September
1	150	257	16	198	283
2	148	230	17	189	258
3	178	201	18	197	295
4	166	166	19	185	317
5	147	184	20	170	294
6	162	160	21	144	334
7	167	137	22	147	302
8	141	175	23	114	268
9	121	250	24	104	239
10	88	265	25	138	234
11	95	255	26	164	220
12	118	264	27	182	227
13	120	260	28	222	249
14	135	263	29	244	249
15	170	265	30	255	229
			31	282	

Monthly mean R_Z for August: 162.6

for September: 244.3