

Solar Bulletin

THE AMERICAN ASSOCIATION OF VARIABLE STAR OBSERVERS— SOLAR DIVISION

Peter O. Taylor, Editor
P.O. Box 5685
Athens, GA 30604-5685 USA

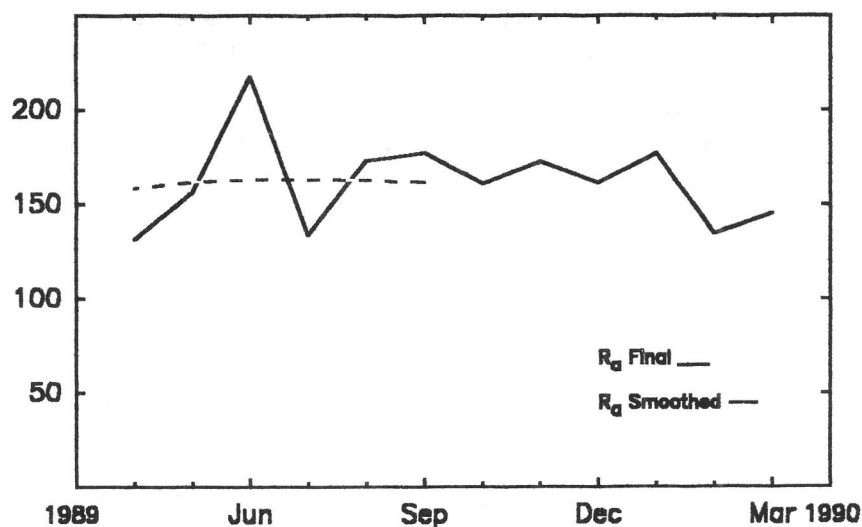


Volume 46 Number 3

March 1990

American Relative Sunspot Numbers for March

R _a Final		
1) 169	11) 87	21) 230
2) 169	12) 89	22) 210
3) 155	13) 90	23) 234
4) 113	14) 89	24) 234
5) 105	15) 108	25) 215
6) 98	16) 125	26) 193
7) 116	17) 136	27) 161
8) 91	18) 165	28) 135
9) 90	19) 203	29) 132
10) 85	20) 228	30) 130
		31) 109
Mean = 145.0		



The smoothed-mean American Relative Sunspot Number for September 1989 is 161.7. One-hundred five members of the international network of *American Sunspot Program* collaborators submitted reports for March. Solar activity increased considerably when compared with the low levels which were experienced during February. Activity was in the moderate and low range during the first two weeks of the month. Six solar flares attained M-level intensity but all were at the lower end of the scale. Accordingly, the solar background x-radiation dropped into the mid-B area, and sunspot numbers also declined, with as few as five spot groups visible on the disk on 5 March.

Activity began to increase as the Sun's more-active longitudes rotated into view, and on 18 March, SESC Region 5974 (S33, L017, FAI on 18 March) spawned a M3.2/1B flare. Then on the 19th, Region 5969 (N23, L074, DAI on 19 March) produced the first X-class flare since December 1989; a powerful X1.5/2B event. Regions 5987 (S14, L317, DAO on 19 March) and 5983 (S32, L327, EAI on 19 March) followed with M4.2/1N and M1.3/1N events, and Region 5969 also contributed an M1.3/2N flare prior to the X-level flare. The X-class event gave rise to satellite proton and Polar Cap Absorption (PCA) events which began on the 19th and reached maxima on 20 March. The 20th also saw the production of four more M-level flares: an M1.2/1N from Region 5983, an M1.3/1B from Region 5988 (S08, L307, DKO on 20 March), and M2.1/1B and M1.8/1F flares assigned to Region 5974.

Activity declined slightly on the 21st, and both proton and PCA events ended. However, planetary K-indices as high as 7 were experienced early in the day as a result of the X-class flare which erupted on the 19th. The geomagnetic field experienced minor to severe storm levels, with aurorae reported from the northern United States and portions of South Africa. Several additional M-class flares were recorded during the final days of March. The strongest of these were an M2.7/1B produced by Region 5984 on the 25th, and an M4.2/2N associated with Region 5988 on 28 March. The latter flare was a long-lived proton event which included a 10 centimeter radio burst and similar enhancements across the spectrum. The solar 10.7 centimeter radio flux and background x-radiation levels were at 172 and C1.0 as March ended.

The estimated mean American sunspot number for 1-17 April is 131. However, mean relative sunspot numbers are increasing as the month progresses. Thus far during April, fifteen M and three X-level solar flares have been recorded.

Reference: SESC PRE, Numbers 757-61 (1990).

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(Note: Network collaborators should utilize these reporting facilities whenever possible.)

The Status of Sunspot Cycle 22

There is some question as to whether the maximum of solar cycle 22 has been attained. During the past several months activity has leveled off, although flare activity did increase to some extent during March. The *Space Environment Services Center* (SESC) in Boulder, Colorado, continues to predict that sunspot maximum will occur in March 1990 (PRE, 1990). However the prediction of its intensity has currently fallen to 172 ± 12 . (Note that the smoothed-mean always lags six months behind the more recent monthly-mean.) The SESC value is in good agreement with our mid-1988 prediction for the maximum of cycle 22 of 173 ± 17 to occur 1990.0 ± 0.2 (Taylor, 1989), as well as with the prediction of Royal Observatory of Belgium using a modified classical technique (Koeckelenbergh, 1989).

The ascending branch of cycle 22 has roughly paralleled the rise of cycle 21, which also paused in its rise at a similar phase of its development before climbing to a maximum several months later. If relative sunspot numbers for April resume the levels which were experienced late in 1989, the smoothed-mean for October 1989 will rise from current levels. However, it is uncertain if the current series of monthly means will support a maximum which exceeds about 170.

References:

- Koeckelenbergh, A. 1989, *SIDC-News*, Number 6.
 SESC PRE, Number 762 (10 April 1990).
 Taylor, P.O. 1989, *J.A.A.V.S.O.*, 18, Number 1.

Sudden Ionospheric Disturbances Recorded During February 1990

Records were received from A1, 19, 46, 50, 52, 59, 61, 62, 63, 64, 65, 66, 67, 68.

Day	Max	Imp	Def	Day	Max	Imp	Def	Day	Max	Imp	Def	Day	Max	Imp	Def
1	0347	1	1	7	1820	1+	5	20	0410	2+	3	25	0745	1	2
1	0900	1	1	8	1834	3	5	20	0741	2	2	26	1627	2+	5
1	2037	1	5	8	2132	1	5	20	1745	2	5	27	0712	2+	4
2	1955	2+	5	11	1829	1-	5	21	1715	1-	3	27	0845	2	4
3	0645	2+	2	11	2032	1-	5	21	1841	1-	2	27	1055	2	2
3	1825	2	5	12	1600	1-	1	21	2100	1-	4	27	1535	2+	5
3	1915	2+	5	12	1723	1-	1	21	2131	1	1	27	1810	2+	4
4	1934	2	5	12	1745	2	5	22	0640	2	3	27	1937	1-	4
4	2158	1	5	13	1747	1-	4	22	0720	2	2	28	0455	1-	3
5	1437	1	4	14	1746	2	4	22	0840	2	3	28	0515	3+	5
5	1606	1+	5	15	1351	1	2	22	1025	2	2	28	0825	2	2
5	1645	1-	5	17	2230	1-	5	22	1448	2+	5	28	0900	2	2
5	1708	2+	5	18	0425	1	2	22	1635	1-	5	28	0942	1	2
5	2108	1+	5	18	0827	2	2	23	1257	2	5	28	1007	2	3
6	0625	2	3	18	1049	1+	3	23	1633	1+	5	28	1320	1+	4
6	0656	2	2	18	1420	1	3	23	1911	1-	4	28	1335	1-	4
6	0827	2+	2	19	1234	2	4	23	2048	1	5	28	1546	2+	5
6	1432	1-	3	19	1434	1-	5	23	2231	1+	4	28	1651	1+	5
6	1603	1-	2	19	1555	1-	2	24	0321	2+	2	28	1817	1+	5
7	1313	1-	4	19	1648	1	5	24	0510	2	3	28	2040	1-	3
7	1630	1-	3	19	1726	1	5	24	1600	1-	5				

SID Analysts: J. Knight; W. Morris; D. Overbeek; A. Stokes; P. Taylor; A. Voorvelt; B. Wingate

Reports of Aurorae

We receive a number of reports of aurorae. When the information is complete it is forwarded to *National Oceanic and Atmospheric Administration* who compile the material for use by researchers in several fields of study. Generally these data are especially interesting when the report contains information from low-latitude locations in either hemisphere, or the event is unusual in some way. We are happy to receive this material, which should include a detailed visual description of the phenomenon, the Universal Times of beginning, end, and variations when possible, and its sky location.