

# Solar Bulletin

THE AMERICAN ASSOCIATION OF VARIABLE STAR OBSERVERS— SOLAR DIVISION

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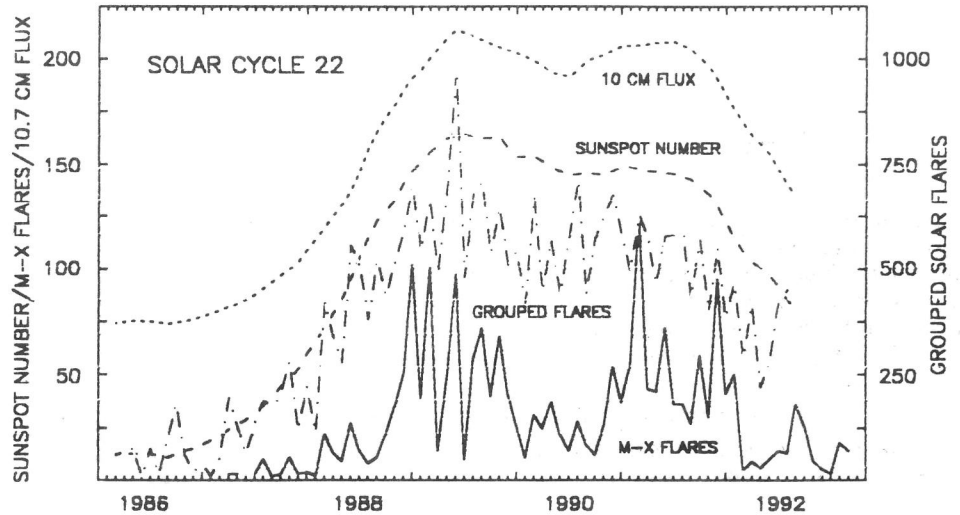
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## American Relative Sunspot Numbers for March

R <sub>a</sub> Final	
1) 80	11) 79
2) 81	12) 76
3) 84	13) 66
4) 102	14) 54
5) 114	15) 58
6) 101	16) 58
7) 98	17) 57
8) 102	18) 65
9) 95	19) 73
10) 82	20) 70
	21) 86
	22) 70
	23) 61
	24) 48
	25) 44
	26) 54
	27) 58
	28) 54
	29) 52
	30) 60
	31) 67

Mean: 72.5  
 Number of reports: 97



**March Summary:** Solar activity began the month in the high range after old NOAA/USAF Region 7420 returned as Region 7440 (S07, L102, DKC) and spawned a major flare (a long-duration M5.1/SF) on the 2nd. A 32-degree long filament also disappeared from the Sun on the 2nd. Region 7435 (N10, L183, EAI) contributed an M1.0/1N flare early on the 4th. Surprisingly, Region 7434 (S11, L219, HAX), a small decaying spot-group, produced a long-duration C8/2N flare on the 4th followed by a 10 MeV proton event later that day. The geomagnetic field experienced storm conditions at the beginning of March, possibly due to continuing effects from the filament disappearances which occurred at the end of February.

Region 7440 yielded its second major flare - a M7.7/3B Tenflare - on the 6th, again raising the activity level into the high range. The Type IV radio burst associated with this event lasted nearly fourteen hours. (A Type IV burst appears as a smooth continuum of broad-band radio emission primarily in the meter range.) Proton fluxes were enhanced to near-event level following this eruption. Region 7440 is the suspected source of an optically uncorrelated class M flare which occurred several hours before the major event, and is also credited with a M1 on the 11th.

A 30-degree long filament disappeared from the Sun sometime between 2300UT on the 10th and early on the 11th. The third major flare to occur during March (M7.3/2B) was spawned by Region 7448 (N15, L358, FSO) later on the 11th. The geomagnetic field was relatively quiet until late on the 8th when the shock from this event arrived (50 nT at Boulder). The shock was followed by severe magnetic storm conditions on the 9th. By the 10th the disturbance had subsided, and conditions returned to their previous level. Major to severe conditions resumed on the 11th; primarily at higher latitudes.

Activity varied between high and low during the third week of March. Region 7440 produced March's fourth major flare at the beginning of the period, a long duration M7.0/3B event on the 12th. A satellite level proton event related to this eruption began shortly thereafter, reached maximum early on the 13th, and ended near midday. Region 7440 also spawned the week's second class M flare, a M2.9 late on the 15th when the spot-group was just behind the Sun's west limb. The geomagnetic field was quiet to active until the 15th, when a sudden storm commencement - related to the M7 flare - raised storm levels to major or severe at mid and high-latitudes. The storm continued on the 16th, bolstered by the effects of a coronal hole.

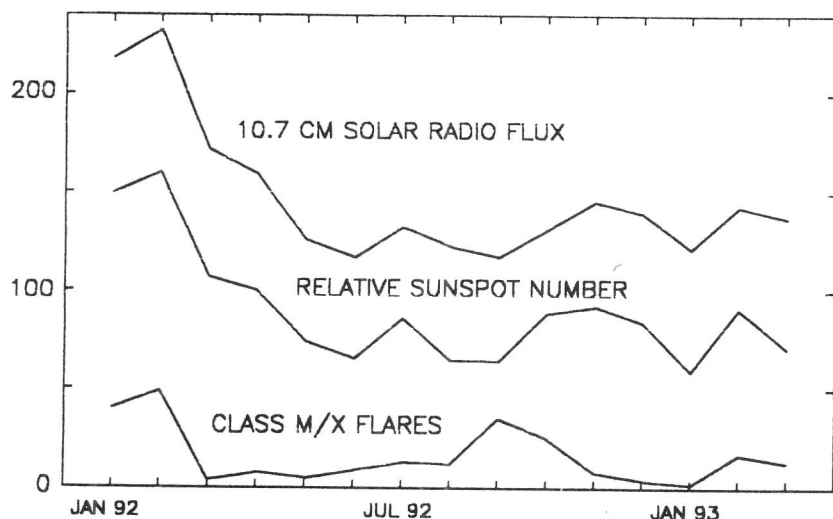
Solar activity was low and moderate during the remainder of March. Region 7448 produced three additional class M flares before rotating off the visible hemisphere on the 23rd/24th. These events occurred on the 20th, 21st and 23rd. Other active phenomena included an eruptive prominence on the SW limb on the 19th, and another on the NW limb reaching out to 0.44 solar radii on the 21st. A large filament also disappeared from the Sun later that day. Region 7461 (N05, L157, EKO) spawned March's final two class M flares, a M1.0/SF on the 29th and M2.6/1B Tenflare on the 30th. The geomagnetic field returned to quiet or active levels until a sudden impulse (27 nT at Boulder) was recorded on the 23rd, followed by sporadic intervals of storm conditions, both immediately thereafter, and during the final days of the month. The smoothed mean American Relative Sunspot Number for September 1992 is 80.1.

The estimated mean American Relative Sunspot Number for 1-14 April is 70. Just one class M flare has been recorded during this interval. A major geomagnetic storm - possibly coronal hole related - occurred on the 5th.

[A portion of this information was taken from the SELDADS data base.]

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 NOTE: Network contributors are urged to submit their reports via these services whenever possible.

## The Decrease in the Solar UV Output in 1992



Measurements of the radiative loss in the chromosphere in the K line at the National Solar Observatory, Lyman Alpha from the UARS instruments, and the 10.7 centimeter radio flux from Penticton all show a rapid decline in the Sun's output starting in February 1992. The decrease stopped in June 1992 with the Sun at a lower level of activity that continues to date.

The cause of this change arises principally from the level of activity in the Southern Hemisphere of the Sun; the distribution of activity complexes changed dramatically at Carrington rotation 1855. The apparent magnetic field in the photosphere also shows a sharp drop by about 2X in both the MWO and NSO mean field indices at this time.

This change in solar output resulted in substantial decreases in both temperature and density at 600 kilometers in the thermosphere where both UARS and the Hubble telescope are flying. Gary Rottman and Dick White of the SOLSTICE science team are working with Jack Harvey, Steve Keil and Bill Livingston of the NSO and with Karen Harvey of the Solar Physics Research

Corporation on this change in the Sun during the last months of cycle twenty-two. We point out that such a decline in the 10.7 centimeter radio flux preceded the burst of activity in 1972 that produced the August 1972 flares.

(Editorial Note: The original version of this article included - among other indices - a graph of Lyman- $\alpha$ , 10.7 centimeter radio flux and 1-8Å X-ray flux for the interval described in the text. We prepared the above figure which shows similar decreases in relative sunspot number and production of class M and X solar flares.)

Reference: AAS Solar Physics Division Newsletter, 1993, Number 1. (Submitted 15 February 1993 by Dick White).

### Sudden Ionospheric Disturbances (SES) Recorded During February 1993

Records were received from A3,9,40,50,59,61,62,63,65,66,67,68,69,70,71,72,73,74,75,76,77,78,79

Day	Max	Imp	Def	Day	Max	Imp	Def	Day	Max	Imp	Def	Day	Max	Imp	De
1	0914	1-	5	7	1059	1+	5	12	2259	2	5	17	1307	1+	5
1	1003	1-	5	7	1401	1-	5	13	0006	1	5	17	2301	1+	5
1	1100	1-	5	7	1852	2+	5	13	0059	2+	5	18	0759	1-	5
1	1316	1-	5	8	0001	1+	5	13	0346	1	5	18	0946	2+	5
1	1759	2	5	8	0239	1+	5	13	0735	1-	5	18	1100	1-	5
1	1952	2	5	8	0814	2	5	13	1229	1-	5	18	1129	1-	5
1	2219	1	5	8	1712	2	5	13	1324	2+	5	18	1257	2+	5
3	1501	2+	5	8	2316	1	5	13	1451	1-	5	18	1340	1+	5
3	2039	1-	5	9	0154	2+	5	13	1535	1-	5	18	1410	1+	5
4	1430	2	5	9	0718	2	5	13	1716	1	5	18	1750	1-	5
4	1500	1-	5	9	0959	1	5	13	1802	2	5	18	2020	1-	5
4	1521	1-	5	9	1133	1-	5	13	1922	1-	5	19	1415	1	5
4	2003	2	5	9	1415	1-	5	13	2125	1	5	19	1724	1+	5
5	0753	1-	5	9	1906	1+	5	13	2253	1-	5	20	1557	2	5
5	0902	1-	5	9	2230	2	5	14	0010	1-	5	20	1650	1+	5
5	1122	1-	5	10	0718	1	5	14	1253	1+	5	20	1743	2	5
5	1442	1	5	10	0740	1+	5	14	1826	1-	5	20	1930	2+	5
5	1832	1-	5	10	0840	1	5	14	2308	2	5	20	2300	1	5
5	2033	1-	5	10	1805	1	5	15	0239	1	5	21	0034	2	5
5	2126	1-	5	10	1855	1-	5	15	1331	1-	5	21	0712	1-	5
5	2200	1	5	10	1925	2+	5	15	1346	1-	5	21	1359	1-	5
6	0808	1	5	10	2005	2	5	15	1400	1-	5	21	1659	1-	5
6	1346	1	5	10	2046	1-	5	15	1911	1-	5	21	1907	1-	5
6	1648	2	5	11	0738	2	5	15	1920	1-	5	21	1947	1-	5
6	1740	2	5	11	1446	1-	5	15	1942	2	5	22	0737	1+	5
6	1819	3	5	11	1552	2	5	15	2300	2+	5	22	1709	1+	5
6	2004	1	5	11	1615	1-	5	16	0728	1-	5	22	1946	2	5
6	2026	1-	5	11	1718	2	5	16	1426	2	5	22	2111	2+	5
6	2038	1-	5	11	1807	1	5	16	1700	1	5	22	2330	1-	5
6	2047	2	5	11	1833	2	5	16	1726	1+	5	23	0054	2	5
6	2138	1+	5	12	0044	1	5	16	1750	1	5	23	1513	1-	5
6	2206	1	5	12	0758	1-	5	16	1915	1	5	23	2106	1-	5
7	0110	1-	5	12	0806	1	5	16	2027	2	5	23	2200	1-	5
7	0256	1-	5	12	1045	1	5	16	2130	1	5	24	0130	1-	5
7	0417	1	5	12	1235	1	5	17	0316	2+	5	24	1651	1+	5
7	0600	1+	5	12	1300	1	5	17	1038	2+	5	24	1731	1-	5
7	1016	1-	5	12	2230	1-	5								

No events: 25-28 February

**SID Analysts:** J. Ellerbe; S. Hansen; J. Knight; A. Okorogu; A. Stokes; M. Taylor; P. Taylor; B. Wingate

Frequencies recorded (kHz): 19.6; 21.4; 22.3; 23.4; 24.0; 24.8; 28.5; 30.6; 48.5; 51.6; 73.6; 77.15