

# 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 47 Number 3

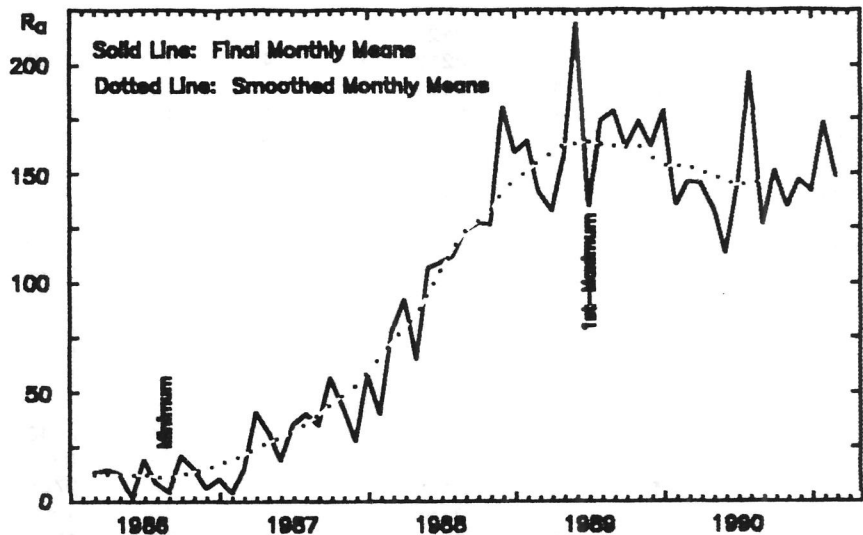
March 1991

## American Relative Sunspot Numbers for March

$R_a$ Final		
1) 114	11) 153	21) 171
2) 97	12) 162	22) 176
3) 84	13) 158	23) 183
4) 80	14) 174	24) 179
5) 92	15) 190	25) 171
6) 90	16) 202	26) 164
7) 130	17) 188	27) 142
8) 139	18) 168	28) 129
9) 168	19) 150	29) 130
10) 163	20) 173	30) 142
		31) 118

Mean: 147.7

Number of contributors: 102



Relative sunspot numbers declined during the first week of March, but activity was high. Six X-level, and twenty-nine M-class solar flares were recorded. In addition to the X-level flares, four M-class events were major flares. Two very strong events occurred during the period. The first was an optically un-correlated X7.1 accompanied by a strong Type II sweep and 5500 s.f.u. Tenflare from behind the southeast limb on the 4th. This event took place near the location of old SESC Region 6511 (S23, L346), an area which was eventually numbered 6538 (S25, L342, Fki on 7 March). The second, a X5.5/3B with Type II and IV sweeps and 3000 s.f.u. Tenflare on the 7th, also took place in this spot-group. Region 6538 also produced at least five of the remaining major flares: X1.5/3N, X2.0/3B and M6.2/2B events on the 5th, and a X2.5/2B and M5.0/SF on the 7th. Another major flare (X1.4/2B) occurred on the 5th in Region 6537 (S08, L001, Dao on 7 March). Two other major events were un-correlated.

Activity was moderate and high during the second week of March. Five X-class, and eleven M-level solar flares were recorded. The X-class events took place in Region 6538 which produced a X1.7/2B on the 8th, and Region 6545 (S08, L286, Fki on 16 March). Region 6545 spawned a X1.7/2B Tenflare on the 12th; X1.3/2B and X3.9/2N Tenflares on the 13th; a X1.8/1B Tenflare on the 14th, and a M9.7/2B on the 13th. Brief periods of major geomagnetic storm conditions occurred at mid and high-latitudes early on the 13th.

Solar activity was predominately high between 15 and 21 March. Three X-class, and thirty-eight M-level solar flares were recorded. Major flares included a X1.8/2B and M6.0/2B on the 16th; a X1.0/2B on the 17th; a M5.3/1B on the 18th; and a M6.7/2B on the 19th, all in Region 6545. A M7.0/1N on the 20th, and X1.0/1N and M5.4/2B events on the 21st in Region 6555 (S24, L191, Fki on 20 March) completed the picture. Region 6555 is the probable return of old Region 6509 (S22, L191).

Activity was high during most of the fourth week of March. Four X-class, and twenty M-level solar flares were recorded. Major flares included a M6.3/1B and X9.4/3B Tenflare on the 22nd; M6.8/2B, M6.8/1B and M5.6/2B events on the 23rd; a X1.1/3B and X5.3/3B on the 25th, and a X4.7/3B on the 26th. All occurred in Region 6555. Region 6555 reached a maximum area of 2530 millionths solar hemisphere (~7680 million km<sup>2</sup>) on the 25th, making it one of the largest groups to appear during this cycle.

The major flare activity which took place on the 22nd resulted in a long period of intense geomagnetic storming which lasted throughout the week. A SSC (Storm Sudden Commencement) arrived early on the 24th, followed by severe conditions at many reporting stations (K-indices of 8-9); a consequence of the X9 flare in Region 6555. A second shock was detected later in the day, possibly caused by the long-duration M6 flare which occurred earlier on the 22nd. A > 10 MeV proton event began on the 23rd, reached a peak flux of 43,000 p.f.u. as the SSC arrived, and continued for much of the week. An intense PCA (Polar Cap Absorption) began shortly after the onset of the proton event and disrupted transpolar radio communications for most of the period. In the Northern Hemisphere, aurorae were observed at least as far south as the Gulf of Mexico. Reports of aurorae were also received from Coonabarabran, NSW, and Johannesburg, RSA, in the Southern Hemisphere. The magnetic field was returning to normal as the week ended.

Region 6555 produced five M-level, and two X-class flares during the final three days of March, bringing the total for the month to twenty X-class, and 103 M-level events; the largest number of these flares for any month of solar cycle twenty-two. Major events included a X2.4/3B Tenflare on the 29th, and a X1.0/SF and M6.3 (without optical correlation) on the 31st. The PCA which began on the 23rd ended on the 28th, and the proton event dropped below event threshold on the 29th. A second (weaker) proton event began later on the 29th, then reached maximum and ended on the 30th.

The final smoothed monthly-mean for September 1990 climbed to 145.0. Sunspot and solar flare activity continued to be strongly centered in the Sun's Southern Hemisphere during March. This activity resulted in a new peak in smoothed spot-number for either hemisphere for September 1990. The current flurry of solar activity is expected to subside within the next few months, and then resume the slow decline which began over a year ago.

(continued)

The estimated American sunspot number for 1-14 April is 170. Activity has been in the low and moderate range during the majority of the first half of April, although the number of recorded M-level flares was on the increase at mid-month. No X-class events were detected during this interval.

[A portion of this information was obtained from the SESC data base.]

**Sudden Ionospheric Disturbances Recorded During February 1991**  
 Records were received from A1,3,9,19,40,50,52,59,61,62,63,64,65,66,67,68,69,70,71.

Day	Max	Imp	Def	Day	Max	Imp	Def	Day	Max	Imp	Def	Day	Max	Imp	De
1	0606	2+	5	4	1507	1-	4	10	1533	1-	5	19	0847	2+	5
1	0723	2	5	4	1601	1	5	10	1737	2	5	19	1006	1-	5
1	0830	1-	5	4	1611	2	5	10	1949	1+	5	19	1018	1-	5
1	1128	2+	4	4	1649	1-	5	10	2059	2	5	19	1051	1-	4
1	1230	1	5	4	1728	2	5	11	0556	2	5	19	1230	2+	5
1	1303	2	5	4	1843	2+	5	11	0925	2	3	19	1341	1-	5
1	1448	2	5	4	2121	1	5	11	2121	2	5	19	1520	1+	5
1	1621	2+	5	4	2218	1-	4	11	2329	1+	5	19	1715	1-	5
1	1646	1+	5	4	2321	1+	5	12	0756	1-	4	19	1815	1+	5
1	1739	2+	5	5	1448	1-	5	12	1554	1-	4	19	2211	2	5
1	1916	1	5	5	1744	1-	5	12	1800	1	4	20	1328	2	5
1	1945	1	5	5	1959	1	5	12	2119	1+	5	20	1939	1	5
1	2011	2	5	5	2101	2	5	13	0414	1	5	20	2051	1	5
2	0708	2	5	5	2220	2+	5	13	1506	1+	5	21	0813	2+	5
2	0758	1	5	6	0426	2+	5	13	1642	1	4	21	1010	1-	4
2	0824	1	5	6	0616	1+	5	13	1724	2+	5	21	1053	1-	5
2	1009	1+	5	6	0649	1	5	13	1901	1-	4	21	1245	1+	5
2	1114	3	5	6	0810	1-	5	13	2149	2+	5	21	1445	1	5
2	1317	2	5	6	1505	2	5	14	0428	1+	4	21	1555	1+	5
2	1352	2+	5	6	1542	1+	5	14	0620	1+	5	21	1830	1-	5
2	1553	1	5	6	1837	2+	5	14	1233	3+	5	22	0002	1	4
2	1815	1	5	6	1912	1-	4	14	2143	2	4	22	1422	1-	5
2	1854	2+	5	6	2020	1	5	15	0534	1+	4	22	1729	1-	4
2	1939	2	5	6	2122	1	5	15	0705	2	4	22	2017	1+	5
2	2146	2	5	6	2155	2+	5	15	1300	1-	4	23	1051	2+	4
2	2210	1-	5	7	0501	1+	5	15	1739	1	5	23	1651	2+	5
2	2224	1	5	7	0800	2+	5	15	2140	1	5	23	2307	1+	5
2	2309	1+	5	7	0851	1	5	16	0520	3+	5	24	0334	2+	4
2	2340	1+	5	7	0935	2	5	16	1001	1-	5	24	1610	1	5
3	0016	1+	5	7	1415	1-	5	16	1410	2	5	24	1651	1	5
3	0812	1-	4	7	1503	2+	5	16	1444	1	5	24	1839	1+	5
3	0836	2	5	7	1631	1	4	16	1551	1	5	24	2043	1+	5
3	0919	2	5	7	1709	2+	5	16	1905	1	5	24	2133	2+	5
3	1024	1-	4	7	1845	1-	4	16	2351	1-	4	25	0801	1-	3
3	1057	2+	5	7	1943	2+	5	17	0621	2	5	25	0815	2+	5
3	1153	1-	4	7	2000	1-	5	17	1232	1	5	25	1602	2+	5
3	1321	1+	5	7	2027	1	5	17	1316	1-	5	25	1658	2+	5
3	1345	1-	5	7	2120	2	5	17	1414	1-	5	25	1715	2+	5
3	1444	1+	5	7	2351	1+	5	17	1515	1+	5	25	1757	2	5
3	1508	2	4	8	0015	1-	5	17	1655	1+	5	25	1836	1	5
3	1629	2	5	8	0250	2+	4	17	1800	1-	4	26	1229	1	5
3	1722	1-	5	8	0452	1	4	17	1838	2	5	26	1514	1-	4
3	1815	1	5	8	0515	1+	4	17	2030	1	5	26	1540	1-	4
3	1828	1-	4	8	0600	2	3	18	0726	2+	5	27	1917	1-	5
3	1851	1+	5	8	0655	3+	5	18	0923	1	5	28	0422	1-	4
3	1945	1-	4	8	0809	1-	4	18	1430	1-	5	28	1418	1-	5
3	2103	1-	5	8	1449	2	5	18	1652	2	5	28	1553	1-	5
4	0808	1-	5	8	1530	1	4	18	1725	3	5	28	1609	1-	5
4	0829	2	5	8	1601	2	5	18	1759	1	5	28	1712	1	5
4	0944	1	5	8	1611	1	5	18	2058	2	5	28	1825	1-	5
4	1051	2+	5	10	1402	1-	5	18	2208	1+	5	28	1831	1+	4
4	1346	1+	5	10	1410	1-	5	19	0033	1-	5	28	2329	2	5

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

SPAN: SELVAX::ptaylor TELEX: [3762848] TO: EASYPLEX:74270,1516 FAX: [USA] 404-353-2336  
 INTERNET: ptaylor%SELVAX.span@ames.arc.nasa.gov COMPUSERVE: 74270,1516

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