Solar Bulletin

THE AMERICAN ASSOCIATION OF VARIABLE STAR OBSERVERS— SOLAR DIVISION

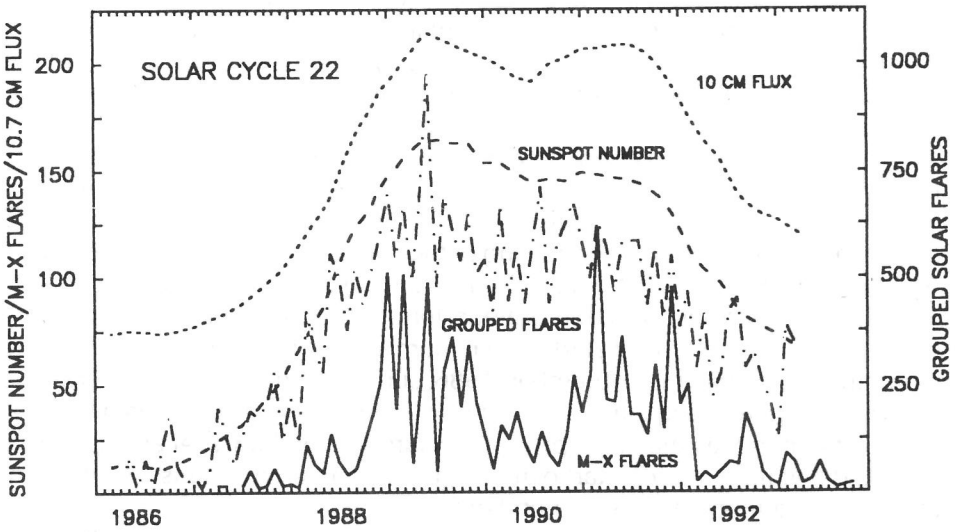
Peter O. Taylor, editor
4523 Thurston Lane, #5
Madison, WI 53711-4738 USA

Volume 49 Number 10 October 1993

American Relative Sunspot Numbers for October

	R_a Final				
1)	70	11)	61	21)	64
2)	85	12)	45	22)	60
3)	86	13)	29	23)	56
4)	88	14)	30	24)	47
5)	80	15)	50	25)	42
6)	70	16)	45	26)	43
7)	52	17)	38	27)	30
8)	65	18)	35	28)	28
9)	60	19)	47	29)	25
10)	46	20)	59	30)	26
				31)	26

Mean: 51.2
Number of reports: 98



October Summary: Despite the presence of two large sunspot groups on the Sun's visible hemisphere - NOAA/USAF Regions 7590 (N13, L224, FKI) and 7592 (S14, L180, EKI) - solar activity was mostly low during the first week of October. The single excursion into the moderate range occurred on the 2nd after Region 7590 produced its third class M flare (M1.4/SN) this rotation. A few small filaments dissolved during the period. The geomagnetic field began the week with a brief period of major to severe storming at high latitudes related to coronal hole activity, but was mainly quiet to unsettled thereafter.

Region 7590 produced two additional class M solar flares (M1.1/SF and M3.5/3B) as it exited the visible hemisphere on the 9th. Otherwise, activity was low during the second week of October. High latitude stations reported minor to severe geomagnetic storm disturbances during most of the week, linked to coronal hole effects. Reports of aurorae associated with these phenomena peaked from the 8th through 10th. Conditions gradually returned to normal towards the end of the period.

Solar activity was low and very low during the third week of October; just a few flares reached the class C intensity level. Filaments disappeared from the Sun on the 18th, 19th and 21st, but otherwise little of note occurred. The geomagnetic field was mostly quiet.

Although several mid to high-range class C flares occurred between the 25th and 28th, solar activity was mainly at a low level for the remainder of October. The largest event was a C9.4/SN in Region 7608 (N09, L234, BXO), accompanied by a Type II shock which spread outward with a velocity of 1000 kilometers per second. Other interesting events included a major filament in the Sun's NW hemisphere which erupted on the 24th. The EPL eventually extended out to 0.33 solar radii.

The geomagnetic field began week four in the unsettled range, then became increasingly disturbed on the 25th. Major to severe storm conditions were recorded at mid and high-latitudes, and the GOES-6 spacecraft experienced magnetopause crossings shortly after midday. The probable source of these events was the filament disappearance on the 21st. A lesser magnetic disturbance took place during the several following days, probably a result of coronal hole activity. Although a worldwide impulse was noted on the 31st, conditions were near normal at month's end. The smoothed mean American Relative Sunspot Number for April, 1993, declined to 63.7.

The mean estimated American Relative Sunspot Number for 1-14 November is 24. Solar activity was low and very low until the 12th, when the month's first class M flare (M2.0) erupted in Region 7618 (N09, L337, EAI). Region 7618 spawned two additional class M flares (M1.1, M2.1) on the 13th. The geomagnetic field was mainly in the active to unsettled range, with some periods of coronal hole related storm conditions especially at higher latitudes.

A Prediction for the Minimum of Solar Cycle 22

Everyone is talking about the extremely low level of sunspot activity in recent weeks. Sunspot minimum should not occur until 1997 if the canonical 11-year cycle is accepted, yet it sure looks like the Sun is heading for the cellar! Extrapolation of the present trend suggests a minimum sometime in 1995. The previous sunspot minimum was September, 1986.

The trend in daily values of solar 10.7 centimeter radio flux in September continues a rapid downward trend that has been present since March. This trend, and the values of the flux, resemble the daily 10.7 cm flux values observed in 1984, suggesting that the present cycle is at the same point in the cycle. That was only 9 years ago, reinforcing tentative predictions that the present cycle will end after only 9 years, becoming the shortest cycle in over 200 years! The last cycle recorded at near 9 years in length was cycle 3 which peaked in 1778!

A tentative prediction of a 9-year cycle was presented to the International Astronomical Union Colloquium #143 in June after updating comparisons among the 5 solar cycles for which there are 10.7 cm flux data. The cycles were plotted one under the other on a single graph, placing the cycles in alignment by use of the times of the abrupt drop in flux that has occurred at the end of the maximum phase of each cycle. This drop was most dramatic in the present cycle, occurring early in 1992.

When the cycles are so aligned, other critical points in the cycles align better than when the cycles are aligned with their times of sunspot minima. These points include the highest peak flux of each cycle and a post-maximum activity peak that occurred in all but Cycle 19. The times of minima at the end of the cycles, except for the anomalous Cycle 20, align more closely than the minima at the beginning of the cycles. This suggests a possibility that there is a constant interval of about 3.5 years between the abrupt drop in flux and the time of sunspot minimum. Using this supposition, the date of the coming sunspot minimum would be in the last quarter of 1995, resulting in a 9-year length to the cycle.

The most anomalous time of starting minimum is that of the present cycle, suggesting that the cycle had a true 'R*start*S' 8-9 months earlier than the September, 1986, sunspot minimum. In a separate comparison between the present cycle and the previous cycle, using smoothed sunspot numbers, the best fit is also achieved with a shift of the 1986 minimum 8 months later than the time of the previous minimum. Hathaway et al. (submitted to *Astrophysical Journal*, 1993) also concluded that the 'R*real*S' start of the cycle was earlier than sunspot minimum would define, using a fresh approach to a statistical treatment of sunspot numbers.

-- *Patrick S. McIntosh* --

NOAA Space Environment Lab
Boulder, Colorado

Sudden Ionospheric Disturbances (SES) Recorded During September, 1993

Records were received from A9,40,50,59,61,62,63,65,66,67,68,69,70,71,72,73,74,75,76,77,78,79,80,81

Day	Max	Imp	Def	Day	Max	Imp	Def	Day	Max	Imp	Def	Day	Max	Imp	Def
4	0543	1+	5	18	1405	1-	5	26	1027	1	5	27	1736	1-	5
4	1430	1	5	20	1226	1-	5	26	1728	2	5	27	1832	1	5
4	1625	1-	5	23	1314	1-	5	26	1831	1+	5	27	2106	1	5
4	1846	1	5	23	1333	1-	5	26	2002	1	5	27	2130	1-	5
5	1055	1-	5	23	1526	1	5	26	2159	3	5	27	2246	2	5
5	1145	1-	5	23	1640	1-	5	26	2339	1-	5	28	1106	1	5
5	1459	1-	5	23	2232	1	5	27	0016	1+	5	28	1816	1-	5
6	1633	1-	5	24	0515	1	5	27	0738	1-	5	28	2314	1-	5
6	1702	1+	4	24	1014	1	5	27	1051	1+	5	30	0636	1-	5
8	1345	1-	5	24	1151	1-	5	27	1210	1	5	30	1037	1-	5
13	1806	1-	5	25	1052	2	5	27	1223	2	5	30	1525	1	5
16	1745	2+	5	25	2044	2+	5	27	1341	2	5	30	1737	1	5
17	0000	1-	5	25	2200	1	5	27	1357	1	5	30	1936	1	5
17	0631	1-	5	26	0220	3+	5	27	1445	2	5	30	2100	1-	5
18	0915	1-	5	26	0551	1-	5	27	1607	1-	5	30	2124	1-	5

Analysts: J. Ellerbe; K. Garrison; S. Hansen; M. Hayden; J. Knight; A. Landry; R. Papp; C. Ranft; A. Stokes; M. Taylor; P. Taylor; L. Witkows

Frequencies recorded (kHz): 16.8; 18.3; 19.6; 21.4; 23.4; 24.0; 24.8; 28.5; 30.6; 48.5; 51.6; 73.6; 77.15

DECnet: 34367::ptaylor **INTERNET:** ptaylor@selvax.sel.bldrdoc.gov **FAX:** [USA] 608-231-2385
TELEX: [3762848] TO: EASYPLEX:74270,1516; **COMPUSERVE:** 74270,1516
Note: Network contributors are urged to submit their reports via these media whenever possible.