Solar Bulletin

THE AMERICAN ASSOCIATION OF VARIABLE STAR OBSERVERS— SOLAR DIVISION

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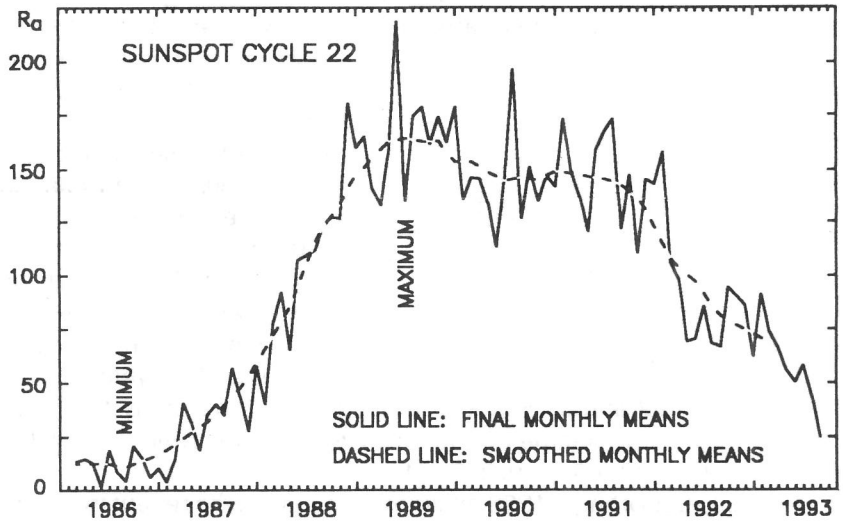
American Relative Sunspot Numbers for September

	R_a Final				
1)	32	11)	0	21)	14
2)	31	12)	0	22)	7
3)	23	13)	7	23)	21
4)	25	14)	10	24)	26
5)	20	15)	14	25)	45
6)	14	16)	25	26)	50
7)	11	17)	22	27)	47
8)	16	18)	25	28)	52
9)	15	19)	17	29)	53
10)	2	20)	15	30)	53

Mean: 23.1
Number of reports: 98



September Summary: Solar activity was very low during the first three days of September. The Sun's Southern Hemisphere was spotless through the 3rd, and all groups in the opposite hemisphere were magnetically-simple. The geomagnetic field was mainly quiet, although a northern polar coronal hole produced occasional storm conditions late in the period.

Activity continued to be very low between the 4th and 10th. Only one to three simple spot-groups were present on the disk during any one day of the week. The Sun's Southern Hemisphere was spotless from the 7th through 9th. Then, beginning early on the 10th - according to information provided by Space Environment Services Center and Solar Division observers - the entire visible hemisphere was spotless for the first time since mid-July 1987. Since sunspot activity was so sparse, background radio flux rates also appeared to be very low (less than A2.2) throughout the period. However, particle contamination of the X-ray sensors resulting from the low flux levels should be considered when evaluating such rates. Lingering effects from the disturbance which began on the 3rd caused sporadic storm conditions at the beginning of the week, but otherwise the geomagnetic field was mostly quiet.

The Sun's disk remained spotless until the 13th, when a small type A group was born in the Northern Hemisphere, heralding a slight increase in sunspot activity. A 23-degree filament disappeared from the NW quadrant on the 11th, but otherwise little of interest occurred between the 11th and 17th. The geomagnetic field was quiet to unsettled as the period began, but degenerated to storm levels later in mid-week due to effects from a returning coronal hole. These conditions resulted in a large increase in auroral activity between the 12th and 14th, which gradually subsided.

Solar activity was very low and low from the 18th to 24th; no groups appeared in the Northern Hemisphere between the 16th and 24th. The geomagnetic field continued to be quiet with occasional brief periods of minor storm conditions. Two small Sudden Impulses (8 and 11 nT) were recorded at Boulder on the 23rd.

Activity continued to be low until the 27th and the arrival of NOAA/USAF Region 7590 (N12, L223, FKI), which promptly produced two class M1.8 Tenflares. These events were the only class M flares to be recorded during September. Region 7590, a large (1140 millionths solar hemisphere, or ~3450 million square kilometers) and complex (beta-gamma-delta) sunspot group, had the potential to spawn even stronger flares. However, such an event did not occur until October.

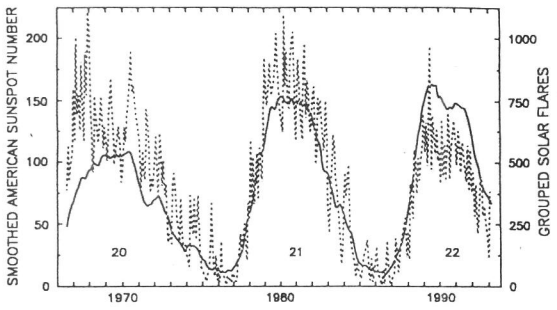
The geomagnetic field was quiet to unsettled during the final days of the month. However, a weak proton enhancement - probably related to events in Region 7585 (S07,L341, DAO) - occurred on the 25th. Isolated storm conditions were recorded at high latitudes at month's end, likely related to a coronal hole. The smoothed-mean American Relative Sunspot Number for March 1993 fell to 67.2.

The estimated mean American Relative Sunspot Number for 1-16 October is 58. Although daily sunspot numbers increased markedly, solar activity was mainly in the low range during the first part of October. Region 7590 (see page 1) spawned its third class M flare on the 2nd and two more while exiting the disk on the 9th. With the exception of the first day of the month when storm conditions occurred at high latitudes, the geomagnetic field was relatively quiet until the 8th when coronal hole effects caused a distinct increase in disturbance levels and reports of associated aurorae. Conditions returned to normal by the end of the period.

[A portion of this information has been obtained from the **SELDADS** data-base]

A Preliminary Prediction for the Minimum of Solar Cycle 22

In many ways, cycle 22 is an extraordinary cycle. Its ascending branch is the shortest on record; its maximum amplitude and number of exceptionally intense flares have exceeded predictions based on previous cycles. On the other hand, when compared with sunspot activity, the number of flares recorded during many months of cycle 22 is noticeably less than for several recent cycles (left).



In spite of these differences, a clue to the occurrence of cycle minimum may be found in an examination of the historical series of observed spot-cycles. Three such events are similar to the present cycle, at least in maximum amplitude and rate of ascent: cycle 3 which peaked in 1778, cycle 18 which reached maximum during 1947, and cycle 21 which crested late in 1979. All attained maxima that exceeded a smoothed monthly-mean sunspot number of 150, and all had ascending branches of less than 3.50 years duration. The descending phase for each cycle is also similar - 6.33, 6.92 and 6.75 years, respectively. If we apply this information to the present cycle, it follows that minimum should occur sometime during late 1995 or early 1996. According to this scenario, cycle 22 will be the third shortest on record; about 9.5 years in length.

Further evidence supporting a 1996 minimum appears in the recent trend of smoothed sunspot numbers, which indicate that the steep decline we have experienced during much of the post-maximum phase of cycle 22, has slowed. For the past six months or so, cycle 22 has pretty-well followed a path that describes the average descent for all observed cycles (6.73 years). Moreover, with the exception of cycle 20, all cycles since 1933 have had fall-rates in this range.

A final interesting point: the first consecutive spotless days of both cycle 18 and 21 occurred about 3 years before minimum. The Sun appears to have displayed the first post-maximum spotless days of cycle 22 during September, 1993.

-- *Peter O. Taylor* --

Sudden Ionospheric Disturbances (SES) Recorded During August 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	De
1	0641	1	5	6	1545	2+	5	11	2340	1+	5	16	1332	1-	5
1	1807	2+	5	8	1331	1-	5	12	0703	1-	4	17	1205	1-	5
2	0827	1-	5	9	1700	2	5	12	1146	1-	5	17	1549	1-	5
2	0916	1-	5	9	2155	1+	5	12	1723	2+	5	17	2030	1+	5
2	0946	2+	5	10	0617	1-	5	12	2230	2+	4	17	2347	1-	5
2	1929	1-	5	10	1328	1+	5	13	0829	1	5	18	2316	1-	5
3	1343	1+	5	10	1904	2	5	13	1244	1-	5	21	0015	1-	5
4	0225	1	5	11	1018	1	5	13	2026	1+	5	21	1543	1	5
5	0114	1	5	11	1442	1+	5	13	2316	1-	5	22	1033	1-	5
5	0600	1-	5	11	1601	1	4	14	0431	1-	5	23	1405	1-	5
5	1445	1	5	11	1631	2+	5	14	0553	1	5	23	2305	1-	5
6	0522	1-	5	11	1821	2+	5	14	1146	1-	5	25	1121	1	5
6	1110U	1-	5	11	2024	1	5	14	1245	1-	5	29	0243	1-	5
												31	1231	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

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