THE RELATIONSHIP BETWEEN SUNSPOT AND SOLAR FLARE ACTIVITIES FOR THE PERIOD 1974.6 - 1987.6

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Abstract

A statistical comparison between American Relative Sunspot Numbers and monthly totals of solar flares for 1974.6 - 1987.6 is presented.

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For many years it has been recognized that sunspot and solar flare activities are closely related (e.g., Bray and Loughead 1965). Normally, as the relative sunspot number increases or decreases, the number of recorded flares changes accordingly. For data obtained during July 1974 to July 1987, statistical examination of this relationship using the method of linear regression yields the following equation:

$$SGF = INT\ (-6.97 + 5.58\ SSN). \qquad (1)$$

That is, the smoothed monthly total number of flares (SGF) will be approximated by equation (1), where SSN is the smoothed monthly American Relative Sunspot Number. The time period chosen for analysis extends from two years before to ten months after sunspot cycle 21. The statistical relationship is a strong one: the correlation coefficient associated with (1) equals 0.998.

The values provided in Table I were derived from monthly counts of un-smoothed grouped flares given in **Solar Geophysical Data.** (When flares are grouped, the same event, monitored by separate stations, is counted as one.) The data were smoothed according to equation (2) (Taylor 1985):

$$GC_{sm} = [GC_{i-6} + GC_{i+6} + 2(\sum_{-5}^{+5} GC_i)]/24. \qquad (2)$$

In (2), "GC" is set equal to the group count for the month to be smoothed, and other values are taken appropriately. Each result is listed in Table I.

Smoothed sunspot numbers for the identical period, also computed according to the method dictated by (2), were selected from the archival table of these data (Taylor 1988). These values, and those listed in Table I, were paired in the least-squares analysis that produced (1).

Figure 1 compares the monthly values of these data series. For simplicity, smoothed flare counts are shown after division by ten.

REFERENCES

Bray, R. J. and Loughhead, R. E. 1965, **Sunspots**, John Wiley & Sons Inc., New York.
Coffey, H. E. and McKinnon, J. A., ed., **Solar Geophysical Data**, 522, Part II, 17.
Taylor, P. O. 1985, **Journ. Amer. Assoc. Var. Star Obs. 14**, 28.
_____ 1988, **Journ. Amer. Assoc. Var. Star Obs.**, this issue.

TABLE I

Smoothed Monthly Counts of Grouped Solar Flares
July 1974 - July 1987

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1974	--	--	--	--	--	--	214	209	205	191	167	154
1975	142	142	140	118	103	99	97	95	97	103	104	103
1976	93	73	60	59	53	48	47	49	45	39	40	48
1977	61	70	82	100	113	130	153	183	218	250	280	301
1978	328	353	374	397	421	447	487	522	546	571	604	641
1979	663	692	726	762	803	829	825	812	804	814	825	829
1980	837	833	830	830	834	842	839	838	854	859	845	823
1981	814	830	831	814	797	778	770	772	767	744	722	725
1982	724	707	694	680	659	656	649	613	571	546	542	536
1983	516	490	461	437	407	362	338	349	360	366	365	344
1984	317	296	278	259	249	245	231	203	171	144	116	98
1985	96	93	86	86	86	82	79	82	88	86	81	74
1986	64	58	56	58	62	62	60	53	47	52	63	71
1987	76	85	98	102	109	120	128	--	--	--	--	--

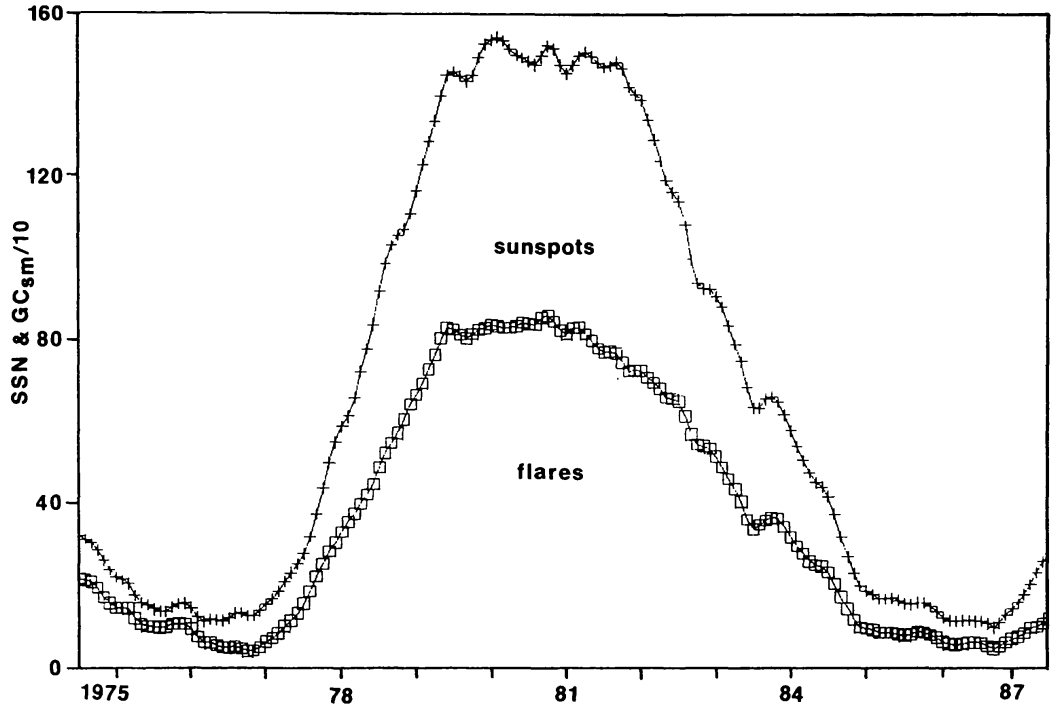

Figure 1. Smoothed monthly values of American Relative Sunspot Numbers (+) and grouped solar flare counts/10 (□) for 1974.6 - 1987.6. Note: Flare counts after 1982 are preliminary.