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Prediction of the Intensity of the Present Sunspot Cycle

KING-HELE[1] predicted that the intensity of the present sunspot cycle (beginning about late 1964) may resemble the relatively high activity cycles with maxima in 1870 and 1949 and that the solar activity of the forthcoming maximum would reach the level which prevailed in late 1959. This prediction of a fairly high level of sunspot activity for the present cycle can be supported by circumstantial evidence from three periods A.D. 1100–1203, 1724–98 and 1914–64, which have remarkable similarities in various aspects of solar activity, and in terrestrial climate, glacial activity and tree growth.

The 1100–1203 period apparently had a mean sunspot cycle length of about 10·2 years, an interval less than the average cycle length and one which probably indicated a high level of sunspot activity[2]. The mean sunspot number (Wolf number of '*R*' *sensu* Waldmeier[3]) for the maximum years of the ten cycles from the period 1100–1203 was about 113 (including the maximum year of 1098, presumably the same maximum as the year 1100 in Bray[2]) as calculated from the estimates in Schove[4]. This high mean sunspot maximum number again suggests a fairly high cycle strength during the period.

The 1724–98 period had a cycle length of 10·7 years and a mean yearly sunspot number of 54. The lengthy interval following the sunspot maximum of the last cycle of this period somewhat increased its mean cycle length[2]. The mean sunspot number for the maximum years of the seven cycles from the period 1724–98 was about 117 calculated from the estimates in Schove[4] and 113 from the measurements in Waldmeier[3].

The mean cycle length for the 1914–64 period was 10·2 years and the mean yearly sunspot number was 62. The mean sunspot number for the maximum years of the five cycles from the period 1914–64 was about 116 calculated from the estimates in Schove[4] and 127 from the measurements in Waldmeier[3].

The foregoing results show that the three outlined periods had a relatively high mean yearly sunspot activity and a moderately high to high activity for the cycle maximum. A comparison of these periods with other sequences of high sunspot activity in Schove indicates that the years 1100–1203, 1724–98 and 1914–64 were among the most active of the past millennium. Further evidence of high solar activity in the first two periods (no reliable data for 1914–64) is their below-normal level of carbon-14 activity (1100–1203 = −0·5 per cent; 1724–98 = −0·1 per cent) (ref. 5). Such lower carbon-14 activity may be an indication of higher than average sunspot activity[6,7].

All three of the outlined periods were intervals of warm and apparently comparable terrestrial temperature[8–13] and represent maximum temperature intervals during the past millennium[7,10,14]. These periods were also intervals of agricultural expansion into cooler areas[10,14] and recession or stagnation in volume of glacial and sea ice[2,10,13–19]. During the last two periods, tree growth over the past four centuries was at a maximum in the Canadian Rocky Mountains[2] and in the polar Ural Mountains[20]. If there tend to be warmer terrestrial temperatures and glacial recession during periods of high solar activity[2], then these observations are additional evidence for a relatively high solar activity during the three indicated periods.

If the length of the present high sunspot activity period, which began in 1914, is analogous to the length of the high activity periods of 1100–1203 and 1724–98 (that is, 7–10 cycles), it is conceivable that the present interval of high activity may extend for seven or more cycles. If this occurs and if the present high-activity period can be dated as beginning with the 1914 cycle, then the present cycle which began in 1964 should be of moderately high to high activity. The similarity in solar activity and in terrestrial climate, glacial activity, and tree growth between the 1724–98 and 1914–64 periods suggests that future sunspot cycles of the present period may be similar in pattern to the latter part of the eighteenth century. Mean yearly sunspot number per cycle for 1914–64 has shown the same general tendency to increase with each succeeding cycle as occurred in 1724–98 (Table 1, calculated from Waldmeier[3]). If this tendency continues, the present cycle may be of similar magnitude to the record cycle 1954–64 and may conceivably exceed it in mean yearly sunspot number.

Table 1. ASPECTS OF SUNSPOT ACTIVITY FOR THE PERIODS 1700–1798 AND 1890–1964

Sunspot cycle	Mean yearly sunspot No.	Sunspot cycle	Mean yearly sunspot No.
1700–1711	18	1890–1901	38
1712–1723	28	1902–1913	31
1724–1733	54	1914–1923	45
1734–1744	52	1924–1933	41
1745–1755	40	1934–1944	55
1756–1766	43	1945–1954	75
1767–1775	59	1955–1964	96
1776–1784	69		
1785–1798	60		

The high sunspot activity from the period 1914–64 has been identical in sunspot cycle length (10·2 y) to that estimated for the ten cycles of the twelfth century[2]. The climate and glacial activity for these two periods also correspond. This again suggests that the present period of high sunspot activity may continue for several more cycles. Bray and Struik[17] noted the possibility of the present level of relatively high sunspot activity extending to near the close of the twentieth century.

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Slow-speed Tape Recordings of Seismic Signals

SEISMIC interpretation at the University of Tasmania has been enhanced by using very-low-speed magnetic tape recordings in conjunction with the normal pen recordings. When played back with a time compression of 250, the outputs from the short period 'Willmore' seismometers become audible. By comparing the tape and

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