

Preferred days for the occurrence of sudden commencement of magnetic disturbance at Alibag

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ABSTRACT. Preference tendency in Sudden Commencement, SC, occurrence at Alibag during the 48-year period, 1921-1968, is examined with respect to calendar date and lunar phase. The results suggest that this tendency, if it exists, appears feeble.

1. Introduction

Lincoln (1967) mentions the claim by Glushkova that geomagnetic storms have a tendency to recur from year to year on the same days. However, studies by Shapiro and Ward (1960) using long series of Ci indices and, by Pohrte *et al.* (1960) using various indices of geomagnetic disturbance, have not been able to uncover such singular days in geomagnetic activity. Recently Yacob and Bhargava (1971), by an examination of extensive daily magnetic data of Alibag, find that depressions in the horizontal intensity tend to recur significantly on September, 4-5. The occurrence of Sudden Commencement, SC, of magnetic disturbance at Alibag (Geog. Lat. 18° 38' N and Geomagn. Lat. 9° 30' N) during the period 1921-1968 is examined here for evidence of any preference in SC occurrence. The data are taken from the Annual Volumes of the Observatory.

2. SC on calendar date

Frequency distribution of 970 SCs during the period 1921 to 1968 is formed over all the days of the year. The dates on which 6 or more SCs occurred in different months of the year are given in Table 1, with the number of occurrences on the date in brackets.

It is seen that the maximum number 7 occurs on dates 3, 13-14 and 22-25, with nearly ten days interval between them. The highest of occurrences for a day is on 29 November. It is noteworthy that 11 out of the 19 dates in Table 1 are between 22 and 30 and six out of nine dates on which seven or more SCs occurred are also between the dates 22 and 30. Also, SC occurrence in general is less frequent between the dates 15 & 20.

The mean and the standard deviation for the whole distribution are 2.66 and 1.55 respectively. Frequency of 6 is significantly different from the

mean at 95% level of confidence and frequency of 7 and 8 at 99 % level. Thus the number of occurrences on dates enumerated in Table 1 differ significantly from the mean.

3. SC in lunar phase

The lunar phase of the day on which SC occurred is entered against each one of the SCs. The frequency distribution of the 970 SCs over the 24 lunar phases in each of the 12 months of the year is formed. The mean and standard deviation of the whole distribution are 3.37 and 1.78 respectively. Therefore, the occurrence of 8 or more SCs at a particular lunar phase, in any month, is significantly different from the mean at 95% level of confidence. Such occurrence frequencies (figures in brackets) in different months are given in Table 1(b) against the lunar phase at which they occurred.

In the months of April and May, lesser number of SCs occurred in the first two quarters than in the last two quarters. 33 of the 86 SCs in the month of April occurred on the four lunar phases given in Table 1(b). However no such significant preference for any date in April is seen from Table 1(a), excepting for the 1st.

4. SC of severe storms

Bigg (1963) finds that very severe storms avoid dates around new moon. 11 very severe storms with range in H at Alibag $\geq 600\gamma$, listed in Table 1(b) in an earlier paper (Sastri and Jayakar 1969), similarly show in their SCs a preference for forenoon and noon and avoid occurrence on days around new moon.

5. SC recurrence at the same time

While examining the SC data, it is noticed that on some occasions an SC occurs at about the same time (within about 30 min) and on the same date as another SC in an earlier year. The dates, on which such recurrence is noted, are given in Table 1(c).

TABLE 1

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(a) Dates on which 6 or more SCs occurred											
27 (6)	3 (7) 11 (6) 16 (6) 23 (7)	1 (6) 27 (6)	1 (6)	—	13 (7) 25 (7)	23 (6)	4 (6) 22 (7) 29 (6)	30 (6)	14 (7) 22 (7) 24 (7)	29 (8)	—
(b) Lunar phases at which 8 or more SCs occurred											
—	—	—	13 (8) 15 (8) 20 (9) 23 (8)	19 (8)	17 (8)	1 (8)	9 (8)	—	—	—	—
(c) Dates on which SCs recurred											
1 (3) 11 26 (27)†	3 (11) 21 (23)†	3 10 (15) 23 27	(3) 4 5 11 21	12	9 (13) (23) 25 (30)	2 7 27	4 11 22 29	2 22 30	7 (22)† (24)†	29†	5 27

The dates on which the times of recurrence of SCs do not differ by more than 10 min are bracketted. The † mark indicates two or more SCs recurring on that day. On January 27 three SCs occurred at about 1130 hr LT in the year 1937 and 1956, and on October 22, three SCs, at the same time (in 1948, 1958 and 1962 around 0800 hr LT) and again another pair at a different time (around 1130 hr LT in 1927 and 1943).

The number of such recurrences of SC during the 48-year period, 1921-1968, is 47. As can be seen from Table 1(c), they avoid dates 16 to 20, when the SCs in general are less frequent. It is interesting to note that 35 of the 47 occur between 4 hr and 14 hr LT, with 11 of them occurring in the interval 12 hr to 14 hr LT. SCs in general tend to crowd in their occurrence in the interval 12 to 13 hr LT (Moos 1910 and Sastri 1966). 8 of these, 14 pair differ in their respective times of occurrence by less than 10 min. The chance of an SC occurring on any day of the year, during a period of 48 years, is 48/365, nearly 13 per cent. The chance of another SC occurring at about the same time on the same day in any other year is less than 2 per cent. Thus, the occurrence of more than two SCs at an almost

identical time on the same date in different years has a very low chance. Such dates, which are also found in Table 1(a), are: 27 January, 23 February, 22 and 24 October and 29 November. Bhargava and Yacob (1970), investigating the fine structure of the variation of H from 74-year mean daily values at Colaba-Alibag, processed in three independent sets, observed that the appearance of field depressions in more than one data series around certain days suggested the recurrence of geomagnetic disturbance around specific calendar days.

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