LATITUDINAL GEOMAGNETIC VARIATION IN H ON QUIET DAYS AT EQUATORIAL STATIONS

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Abstract. The latitudinal geomagnetic variation of the element *H*, *D*. and *Z* at eight Indian Observatories from about 0° to 22° dip latitude have been studied. It is observed that the day-day variability of Sq (H), Sq (D) and Sq (Z) exhibit latitudinal variation. The latitudinal variation is found to be dependent on the position of the station from the equator. The latitudinal variation peaking around the dip equator suggests that one of the possible causative factors is the electrojet strength at the station near the dip equator. The latitudinal variation is independent of local time.

1. INTRODUCTION

The day-day variability of Sq at different latitudes has been given only little attention by few authors. Schlapp [1] discussed the day-day variability of the latitudes of the foci to move poleward or equatorward together. Aravindan and Lyer [2] found that the day-day variability at a number of low latitude stations in India. America and the Pacific sectors is a function of time.

Matsushita [3] found that Sq exhibits latitudinal variation which peak around the dip equator. Brown [4] also found that the phase of Sq at certain stations could exhibit considerable day-day variability Soicher and Gorman [5] concluded from their work that for middle and high latitude stations. the day-day variability of ionospheric electron content during the day is less than 25% irrespective of location. season and solar activity while at night it was significantly higher. especially in the equatorial stations. It is necessary therefore. to study the latitudinal variations at the equatorial zone spanning the geographical region within 20° North and 20° South of geographical equator. and their possible caustic sources examined.

2. DATA ANALYSIS

Published hourly values of H. D. Z of eight Indian observatories are used. The months of October. June and December hourly values are used in representing the Equinox. June solstice and December solstice respectively. The coordinates of the observatories are as indicated in Table 1.

The day-day variability of Sq for the months mentioned are calculated using sequential variability (SV). The SV is defined as:

$$SV_H = \frac{1}{n}\sum\left|h_{t(i+1)} - h_{ti}\right| \qquad (1)$$

$$SV_H = \frac{1}{n}\sum\left|d_{t(i+1)} - d_{ti}\right| \qquad (2)$$

$$SV_H = \frac{1}{n}\sum\left|z_{t(i+1)} - z_{ti}\right| \qquad (3)$$

where i = 1. 2. 3. …. n where n is the number of values in the batch and t = 1. 2. 3. … n. The mean values of SV at different latitudes for hours. 08 hr LT. 11 hr LT and 14 hr LT are plotted against the latitudes in Figs. 1-3.

3. RESULTS AND DISCUSSIONS

From Figs. 1-3 there is clear evidence that Sq exhibits latitudinal variations. It is seen that the peak is very close to the dip equator. The latitudinal variations of Sq (H) near the dip equator are more pronounced. and are particularly more enhanced at stations near the dip equator than those outside the dip equator. It is also noticed that at stations near latitude 30°. the variation changes rapidly assuming a positive increase. On the other hand. the type of vertical (Z) and (D) variation is almost the same as has been observed. It is also observed that the latitudinal variation of SV (H) at 08. 11 and 14 hr LT assume the same shape for all the seasons.

The latitudinal variation of SV (D) at 08. 11 and 14 hr LT for each season is almost identical. It is also noticed that the latitudinal variation of SV (Z) at 08. 11 and 14 hr LT is also similar for the three seasons. It is generally observed that the latitudinal variation of SV (H). SV (D) and SV (Z) is dependent on the relative position from the equator.

4. CONCLUSIONS

Day-day variability of Sq exhibits latitudinal variation. Latitudinal variation occurs at almost all the hours of the days as has been indicated at 08 hr. 11 hr and 14 hr LT. The latitudinal variation is independent of local time. The latitudinal variation of SV (H). SV (D) and SV (Z) is dependent on the position of the stations from the equator.

The latitudinal variation peaking near the dip equator suggests that one of the possible causative

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Table 1: Magnetic observatories and their coordinates

Station	Geographic Lat. °N	Geographic Long °E	Lat. From °N Equator	D °E	Geomagnetic Lat. °N	Geomagnetic Long °E
Dip Equator	8.09	76.82±2.1	0.00	-	-	-
Trivandrum	8.29	76.57	0.98	2.70	1.25	146.4
Kodaikanal	10.23	77.47	2.14	2.34	0.60	147.1
Ann	11.37	79.68	3.28	2.54	1.40	149.4
Hyderabab	17.42	78.55	9.33	1.45	7.60	148.9
Alibag	18.63	72.87	10.58	0.60	9.50	143.6
Ujjain	23.18	75.78	15.09	0.32	13.50	147.0
Jaipur	26.92	75.80	18.83	0.63	17.30	147.4
Sabhawala	30.37	77.80	22.28	0.52	28.80	149.8

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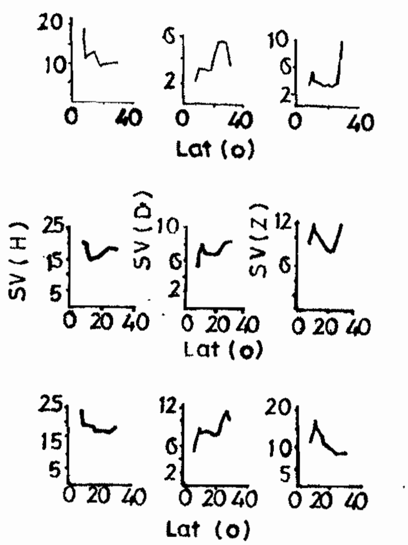

Fig.1: Latitudinal variation of SV in June at all stations (a) 8hr LT (b) 11 hr LT (c) 14 hr LT

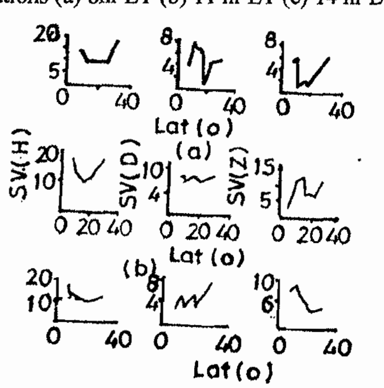

Fig.2: Latitudinal variation of SV in Oct at all stations (a) 8hr LT (b) 11 hr LT (c) 14 hr LT

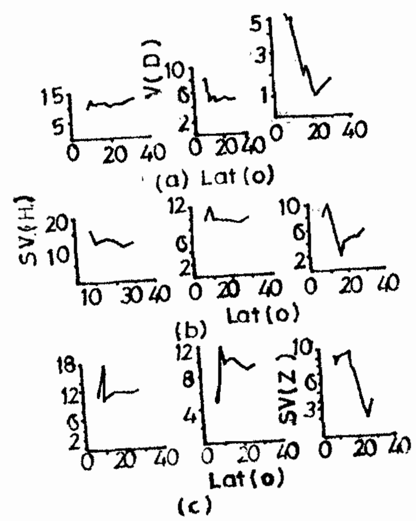

Fig.3: Latitudinal variation of SV in Dec at all stations (a) 8hr LT (b) 11 hr LT (c) 14 hr LT