A comparative study of the Geomagnetic *S* and *L* Fields in the low latitude region

K. S. RAJA RAO

Meteorological Office, Poona

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In separate communications (1962 a, b) the author has discussed the characteristic features of the Solar and Lunar geomagnetic tides in the low latitude region, after determining the harmonic coefficients of S and L at Kodaikanal, Alibag, Honolulu, San Juan and Apia and making use of the harmonics for Huancayo and Ibadan determined by earlier investigators. In order to understand the mechanism of these transient geomagnetic variations, it is worthwhile comparing the S and L variations.

Earlier investigators (Onwumechilli and Alexander 1959) have taken the first component of S and the first component of L for comparison. As the principal component of the L variation is the second harmonic L_2 and the principal component of the S variation is the first S_1 the comparison of L and S may be confined to L_2 (H) and S_1 (H) in order to get a better physical picture of the phenomenon.

The major difference between S and L is the largeness of S in comparison with L. The ratios of the amplitudes $S_1(H)/L_2(H)$ for the various low latitude stations for the three seasons are given in Table 1.

It has been shown in the earlier communications that there is no appreciable seasonal variation in S while L shows considerable seasonal variation. The large seasonal variation in L is borne out by the variation in the ratio $S_1(H)/L_2(H)$. This ratio increases from December solstice to June solstice at Huancayo, Kodaikanal, Ibadan and Alibag. At these places the amplitude of the lunar variation is greater in the December solstice than in the June solstice. At San Juan and Honolulu the ratio decreases from winter to summer. Sitka, a high latitude station, also shows the same type of variation for similar reason.

Another interesting feature that has been noticed is the fact that the maximum of the ratio for the year occurs in the June solstice only at Kodaikanal and Huancayo which are very close to the geomagnetic equator. At all other places the maximum of the ratio occurs in the equinoctial season.

The difference between the December and the June values of the ratio $S_1(H)/L_2(H)$ decreases as the distance from the geomagnetic equator increases. This difference is plotted against geographic, geomagnetic and magnetic latitudes and shown in Fig. 1.

From the graphs it is clear that the geomagnetic variations do not have a geographic dependence and there is a geomagnetic control of the S and L variations.

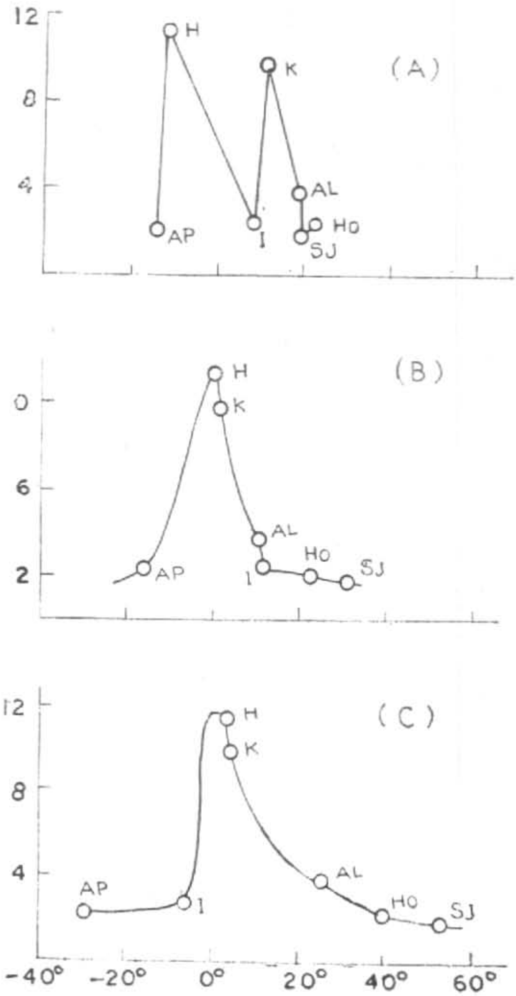

Fig. 1. Variation of the amplitude ratio $S_1(H)/L_2(H)$ with (A) Geographic latitude, (B) Geomagnetic latitude and (C) Dip

AP—Apia AL—Alibag I—Ibadan K—Kodaikanal

Ho—Honolulu SJ—San Juan

TABLE 1

Amplitude ratio $S_1(H)/L_2(H)$ for the low latitude stations

Station	Geomagnetic latitude	Amplitude ratio $S_1(H)/L_2(H)$			Difference	
		December Solstice (D)	Equinox	June Solstice (J)	D-J	Dip
Kodaikanal	0·6°N	6·0	10·7	15·8	9·8	3·5°N
Alibag	10·5°N	8·3	15·4	12·1	3·8	25°N
Honolulu	21·1°N	7·4	11·1	5·1	2·3	30°N
San Juan	29·9°N	5·6	9·9	3·9	1·7	52°N
Apia	16·0° S	15·1	16·0	12·9	2·2	30° S
Huancayo	0·6° S	5·1	8·8	16·5	11·4	2·5°N
Ibadan	9·5° S	8·3	12·1	10·8	2·5	6° S

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