ON THE LUNAR SEMIMONTHLY TIDES IN H AT THE INDIAN EQUATORIAL REGION

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ABSTRACT

Fine structure of the lunar semimonthly tides in H at different U.T. hours is studied at a station under the influence of equatorial electrojet as well as at a station just outside the influence of the electrojet in the Indian region. It is noticed that the amplitude of the tide varies with solar time at the electrojet station and is complex at the non-electrojet station. Known differential vertical upward drift motion of charged particles in and outside the equatorial electrojet belt appear to be responsible for this phenomena. The maximum deviation in the instantaneous range in H occurs about one day later at Trivandrum than at Alibag.

1. INTRODUCTION

TRIVEDI AND RASTOG: (1969) have shown that the lunar semimonthly waves at fixed solar hours vary with the solar time, for a station under the influence of equatorial electrojet, in the same way as the electrojet current. According to them the amplitude starts increasing with sunrise, reaches a maximum near noon and decreases to a low value by sunset. Association of the lunar tides at the equatorial stations and the electrojet currents has been reported by several investigators (Bartels, 1936; Rastogi and Trivedi, 1970). Matsuishiita (1962) has brought out the idea of lunar equatorial electrojet to explain the enhanced lunar variations in the vicinity of dip equator.

In this communication an attempt is made to study the fine structure of the lunar semimonthly tide in the horizontal intensity at Trivandrum (dip 0°/36' 3 S), a station under the influence of equatorial electrojet and Alibag (dip 24° 38' 5 N) which is outside the electrojet belt.
Lunar Semimonthly Tides in $H$ at Indian Equatorial Region

2. DATA AND ANALYSIS

Hourly values of horizontal intensity ‘$H$’ from January 1, 1958 to December 31, 1961, excluding the hourly values on 5 international disturbed days of each month, have been used for analysis. Days on which more than three hourly values were missing have been excluded from this analysis. The sequence of values are formed corresponding to 00 hr U.T. for the above four years period. This sequence of data have been divided according to Lloyd’s seasons ($d$-season: November, December, January and February; $e$-season: March, April, September and October; $j$-season: May, June, July and August). Following Bartels and Johnston (1940), the daily values corresponding to 00 hr U.T. are arranged into twelve groups according to lunar phase, $\mu$ or $\mu + 12$. The mean values arranged accordingly represent the lunar semimonthly variation and these are harmonically analysed. The amplitude and phase of the first harmonic represent the lunar semimonthly amplitude and the time of lunar hour at which the first maximum occurs. The lunar semimonthly tides are calculated for all the 24 solar hours (00, 01 ......22, 23 U.T.). The results of the harmonic analysis for the U.T. hour $i$ can be expressed as

$$C_i = (C_0)_i + (C_1)_i \sin [2\mu + (\phi)_i].$$

Values of $C_0$, $C_1$ and lunar phase for maximum deviation for Alibag and Trivandrum are given in Tables I and II respectively.

Lunar semimonthly tides in the instantaneous (maximum—minimum) ranges in $H$ for the two stations are computed for the same period, 1958–61 by the method outlined above. These results for each of the months and the seasons are given in Table III. In Table III, the result for the entire period, designated as Year, is also included.

3. DISCUSSION

3.1. Lunar semimonthly tides at different hours of U.T.—The U.T. hours from 01 to 12 can be considered as the day–time hours in the Indian region. From Table II, it is noticed that, at Trivandrum, the lunar semimonthly tide is maximum during the daylight hours in all seasons. In $d$- and $e$-seasons the maximum amplitude is noticed before the local noon whereas in $j$-season, it occurs after the local noon. The amplitude of the semimonthly tide at Trivandrum, however, can be considered to vary with the solar time. At Alibag, however, it is noticed that the amplitude of the semimonthly tide has maximum at more than one U.T. hour. In $d$-season it is maximum at