LETTERS TO THE EDITOR

DIURNAL VARIATION OF F_1 REGION DRIFTS AT WALTAIR

HORIZONTAL drifts in E and F_2 regions of the ionosphere at different latitudes have been studied by several investigators. Except for a few observations taken at Mayaguez by Donald Yerg[1] and at Cambridge, Mass., by Kurt Toman,[2] the F_1 region drift measurements have not been reported so far from any other station. In a recent communication[3] the authors reported results of F_1 drift measurements taken at Waltair at 0900, 1200 and 1500 hours. The present communication contains the results of F_1 region diurnal study carried out for all the four seasons of the year, during the period of 1956-58, at Waltair, using the spaced receiver method of Mitra.[4]

The operating frequency for each observation was decided taking into account the critical frequencies of E and F_1 regions. On some days during the early morning and late evening hours the f_0E and f_0F_1 values were so close that it was not possible to get reflections from F_1 region alone, without partial reflections from E region. For this reason F_1 drift measurement could not be taken for all the twelve hours during the interval 0600 to 1800 hours I.S.T. in all the four seasons. In summer the occurrence of E_s presented some difficulties reducing the volume of diurnal data. In view of these, the operating frequency had to be different on different days and generally lay between 4·0 Mc./sec. and 4·8 Mc./sec. The virtual height of F_1 reflection varies between 230 and 260 Km. In order to minimise the effect of lower region on the pulses reflected from the F_1 region, care was taken to see that the operating frequency for F_1 region was sufficiently higher than the critical frequency of E region.

Considering first the variation of drift speed, it is observed that there is no significant change in the magnitude of F_1 drift from hour to hour except that at noon time the drift speed may be said to be a little higher than at other hours.

The curve depicting the diurnal variation of F_1 drift direction for the four seasons is shown in Fig. 1. The drift direction in degrees East of North is plotted against the time at which the observation was taken. It is interesting to note that in winter the F_1 drift was directed towards SW throughout the duration of 0800 to 1600 hours when observations were possible. In all the other seasons the drift direction was towards NE in the morning and evening hours. It can also be seen that the times at which the drift direction changes from NE to SW in the morning and SW to NE in the evening as well

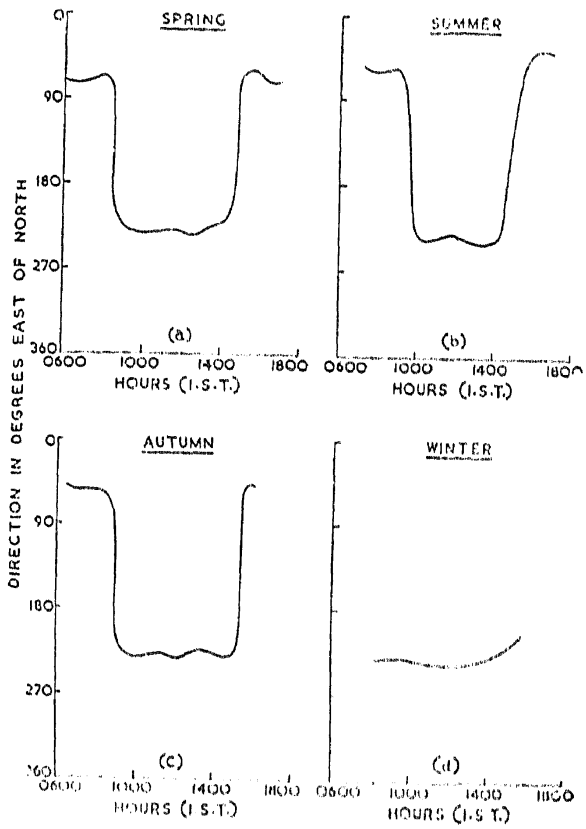

FIG. 1

as the duration for which the drift was directed towards SW shows definite seasonal variations. For instance in Summer the drift changes from NE to SW after 0930 hours and changes back to NE by about 1500 hours, the duration for which it was directed towards SW being about four hours which is the shortest compared to the duration of eight hours or more for Spring and Autumn. Even though the duration, for which F_1 drift was directed towards SW, was nearly the same for the Spring and Autumn seasons the transition time from NE to SW in the morning and SW to NE in the evening occurs about half an hour later in the Autumn compared to the Spring season. The drift directions observed at 0900, 1200 and 1500 hours from this diurnal study are in general agreement with the directions reported by the authors[3] from an analysis of records taken at 0900, 1200

and 1500 hours. Thus it may be seen that in all seasons except winter the F_1 drift direction shows a systematic variation.

For all the four seasons the EW and NS components are plotted separately with a view to see if there is any phase difference between the two components. It was found that the variation of the EW and NS components is similar both in magnitude and direction except in Summer when they showed a small phase difference. Thus it seems that at this low latitude station there is no systematic clockwise rotation of drift vector from hour to hour. On the other hand the drift vector shows a rapid reversal of direction twice in a period of 12 hours. From an analysis of about 26 observations Donald Yerg[1] found that at Mayaguez the mean drift for the F_1 region was towards NW in the morning and changes to NE by late afternoon, through North. Thus the F_1 drift direction at noon for Mayaguez is opposite to the direction obtained by the authors for Waltair, though the directions in the morning and late evening hours may be said to be in general agreement with the present results.

The authors are indebted to the Council of Scientific and Industrial Research (India) for financial support of these investigations.

Ionosphere Laboratories, E. BHAGIRATHA RAO.
Andhra University, B. RAMACHANDRA RAO.
Waltair (India),
November 20, 1960.

1. Yerg, D. G., *J. Geophys. Res.*, 1955, **60**, 173.
2. Toman, K., *Ibid.*, 1955, **60**, 57.
3. Rao, B. R. and Rao, E. B., *J. Atmosph. Terr. Phys.*, 1959, **14**, 94.
4. Mitra, S. N., *Proc. Instn. Elect. Engrs.*, 1949, **96**, Part III, 441.