Communications

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Forenoon Bite-out in f_0F2 at Low Latitudes

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Evidence is presented to show that the longitudinal extent of the forenoon bite-out in f_0F2 at low geomagnetic latitudes can sometimes be very narrow, and that marked differences in the extent of development of the forenoon bite-out can occasionally occur at locations separated in longitude by about 3 hr.

The diurnal variation of f_0F2 at low geomagnetic latitudes is known to exhibit sometimes a short-lived but striking decrease before local noon. The morphology of this phenomenon, referred to as the 'forenoon bite-out' (FNB), has been studied in detail for two stations, namely Ahmedabad (lat., 23.02°N; long., 72.60°E; mag. lat., 18.6°N) and Chung-Li (lat., 24.95°N; long., 121.23°E; mag. lat., 18.6°N) corresponding to the Indian and East Asian longitude zones, respectively[1,2]. The studies have shown that (a) the occurrence of FNB exhibits seasonal and sunspot cycle variations, and (b) the FNB occurs on magnetically quiet as well as disturbed days but with a marked tendency to occur on the first storm day. The causative mechanism(s) of FNB is (are) not yet well understood; the possible mechanism currently being considered is a modification of the thermospheric wind pattern or upward vertical drift velocity in the equatorial regions[2]. Another very well known phenomenon that occurs in the equatorial regions during daytime is the Appleton or equatorial anomaly, which manifests in the form of two crests around 16° dip latitude, one on either side of the dip equator, in the latitudinal distribution of f_0F2 (Ref. 3). It is well established that marked differences exist in the development patterns of the equatorial anomaly in the Asian, African and American longitude zones[4]. The recent work of Walker *et al.*[5] revealed quite remarkable differences in the development of the equatorial anomaly in the Indian and East Asian sectors, i.e. regions separated in longitude by 40°. It is, therefore, felt that it would be instructive to examine if such drastic changes exist between the Indian and East Asian sectors in the occurrence of FNB also. This point of view is further prompted by the facts that the recent work of Huang and Jeng[2] showed that unusual development of the equatorial anomaly occurred during the manifestation of FNB, and that FNB occurs at stations around the crest region of the equatorial anomaly. In this communication, we present the salient findings of a preliminary study made in this direction.

We have examined, for the presence of FNB, the published hourly f_0F2 data of Ahmedabad and Chung-Li for a 24-month period (Jan. 1966-Dec. 1967) on the ascending phase of the 20th solar cycle. Following

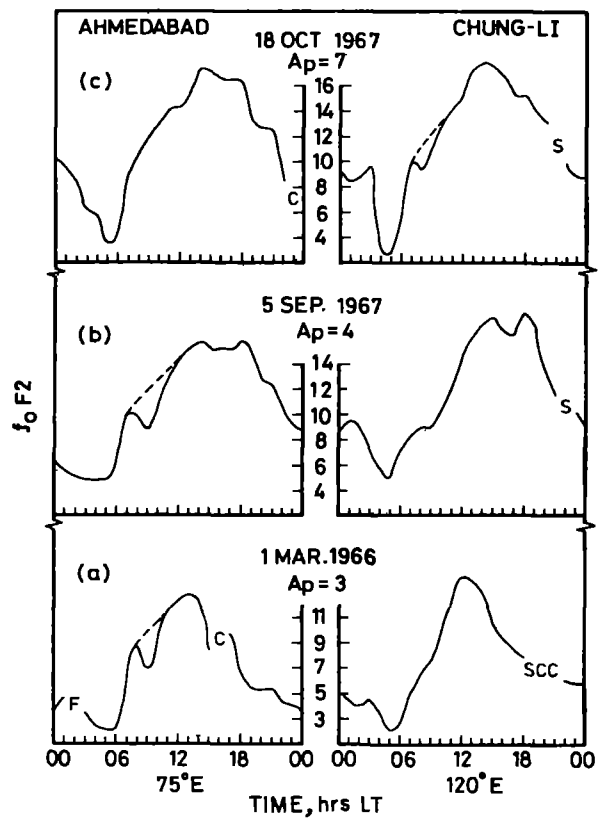

Fig. 1—Typical examples of the diurnal variation of f_0F2 at Ahmedabad and Chung-Li illustrating. (a) presence of forenoon bite-out at Ahmedabad and absence of it at Chung-Li, (b) presence of prominent forenoon bite-out at Ahmedabad and very poor development of it at Chung-Li; and (c) presence of forenoon bite-out at Chung-Li and absence of it at Ahmedabad (The dashed lines represent the assumed normal variation of f_0F2.)

Huang and Jeng[2], FNB is taken to be present when the depression in f_0F2 in the forenoon period is 0.5 MHz or more from the normal assumed trend. Careful scrutiny of the data showed the presence of FNB on 25 days at Ahmedabad and on 19 days at Chung-Li. But only on 14 days FNB is evident at both the stations. Out of the 11 days when FNB is inferred to be confined to the Indian sector, on 5 days there is no indication whatsoever of FNB at Chung-Li and on the remaining 6 days the forenoon decrease in f_0F2, although present, is too low in amplitude, i.e. there is very poor development of FNB. These features illustrated in Fig. 1 clearly indicate that FNB sometimes manifests fairly localized in spatial extent and exhibits occasionally remarkable differences in development in regions separated in longitude by about 3 hr LT. This interesting aspect of the morphology of FNB has not been reported earlier in the literature. A preference for the above mentioned behaviour of FNB to manifest in equinoctial and local winter months is evident, as out of the total of 16 days with dissimilar forms of FNB development at Ahmedabad and Chung-Li, 9 days correspond to equinoxes and 6 days to winter. It is further seen that although the dissimilar forms of FNB development in closeby longitude sectors occur both during geomagnetically quiet and disturbed conditions, there is a definite trend of a preference for quiet days with $A_p < 15$ (on 13 out of the total of 16 days). Further studies using data covering a sunspot cycle or more are required to throw light on the presence of any influence of sunspot cycle in the localized development of FNB, and also to confirm the trends noticed in the present study as regards its dependence on season and geomagnetic activity.

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