# DAY-TO-DAY VARIABILITY OF TOTAL ELECTRON CONTENT AT LOW LATITUDES

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FROM the vertical incidence ionosonde measurements, it has been observed[1] that the latitudinal distribution of the critical frequency of the *F*-layer, $f_0F_2$ ($f_0F_2$ is proportional to the square root of the maximum electron density of the *F*-layer, $N_m$) showed a noon time bite-out at the equator and two peaks, one on either side of the dip equator at $\pm 30°$ magnetic dip locations. This latitudinal characteristics of $f_0F_2$ during the day time is known as the Appleton anomaly or equatorial anomaly. Both the features of equatorial noon bite-out and latitudinal anomaly are consequent of the upward movement of the plasma at the equator and the subsequent diffusion along the magnetic field lines[2]. Rastogi and Rajaram[3] studied the day-to-day variation of $f_0F_2$ at Indian stations and found that while $f_0F_2$ at Kodaikanal (an equatorial electrojet station) showed a decrease in $f_0F_2$ at Ahmedabad (equatorial anomaly crest station) it showed an increase steadily, with the increase of the strength of equatorial electrojet, estimated by the difference of daily range of *H* between Trivandrum and Alibag.

With the stationing of the geostationary satellite ATS-6 at 35°E longitude, ionospheric columnar electron content ($N_f$), by the Faraday rotation of the signal at ground was measured along a chain of six Indian stations in the latitudinal belt from the magnetic equator to about 45° magnetic dip location in India. It was found that at any of the latitudes, there was only one single maximum at 1400–1500 LT and latitudinally there was a definite maximum at 10–15° dip latitude[4]. Later, Sethia *et al*[5] found that the electron content over Ahmedabad was sensitive to the changes of the equatorial electrojet and always had a good positive correlation and much stronger than at Ootacamund, where electron content did not change with electrojet strength during solsticial months and decreased slightly with the increase of electrojet strength. As the $F_2$ region of the ionosphere at low latitudes is primarily controlled by equatorial electrojet[6], it was felt necessary to check the day-to-day variability of ionospheric electron content, at stations in the trough and crest of the Appleton anomaly. In this paper we have studied the standard deviation of each 15 min observations of Faraday electron content, $N_f$ at Ootacamund (dip 2°N) and Ahmedabad (dip 32°N) for December 1975.

Mean diurnal variation of the standard deviation (SD) and per cent standard deviation (PSTD) of $N_f$ computed for every 15 min, using ionospheric electron content values, derived from Faraday rotation measurements from ATS-6 satellite at Ootacamund and Ahmedabad, during December 1975 are shown in figure 1. The curves of the mean diurnal variation of maximum electron density ($N_m$) for the stations Kodaikanal (dip 3°N) and Ahmedabad (dip 32°N) are shown for comparison with the variations of $N_f$ at Ootacamund and Ahmedabad.

Referring to the variations of $N_m$ and $N_f$ it is observed that both the parameters had the minimum values around sunrise. Thereafter, a sharp increase is seen. The equatorial $N_m$ showed a flattened pattern of variation in the noon time but $N_m$ at Ahmedabad clearly showed a peak around 1400 LT. The noon time dip in $N_m$ at Kodaikanal is found to be less significant, the period being the December (winter) month of the low solar activity period. The $N_f$ at Ahmedabad had low values as compared to the equatorial station Ootacamund. One salient feature observed is the close resemblance between the curves of $N_m$ and $N_f$ at Ahmedabad especially during day time. Examining the curves of SD at both the stations, minimum standard deviation was around sunrise. This indicates that the variability of $N_f$ remained less prominent, where absolute values of $N_f$ are low. A sharp increase in SD is noticed at both equatorial and crest stations after 06 LT. However, SD at Ootacamund seems to remain flattened, whereas the values at Ahmedabad continued to increase with the maximum value of $8 \times 10^{16}$ el $m^{-2}$ at 1400 LT, SD ($N_f$) at Ootacamund remained about $3 \times 10^{16}$ el $m^{-2}$ from 1000 LT to 1600 LT. After 1400 LT, Ahmedabad values started dropping and attained the same level as the equatorial station by sunset.

The curves of PSTD represent the variations of SD normalized with respect to the mean. Here again the outstanding feature is the enhanced noon time PSTD at Ahmedabad occurring between 1100 and 1800 LT, while the Ootacamund values are rather low. However, there is no significant difference in the behaviour at both the stations during night time.

From the foregoing results, it is evident that the TEC at the anomaly crest location Ahmedabad has a larger response to the day-to-day variability in the

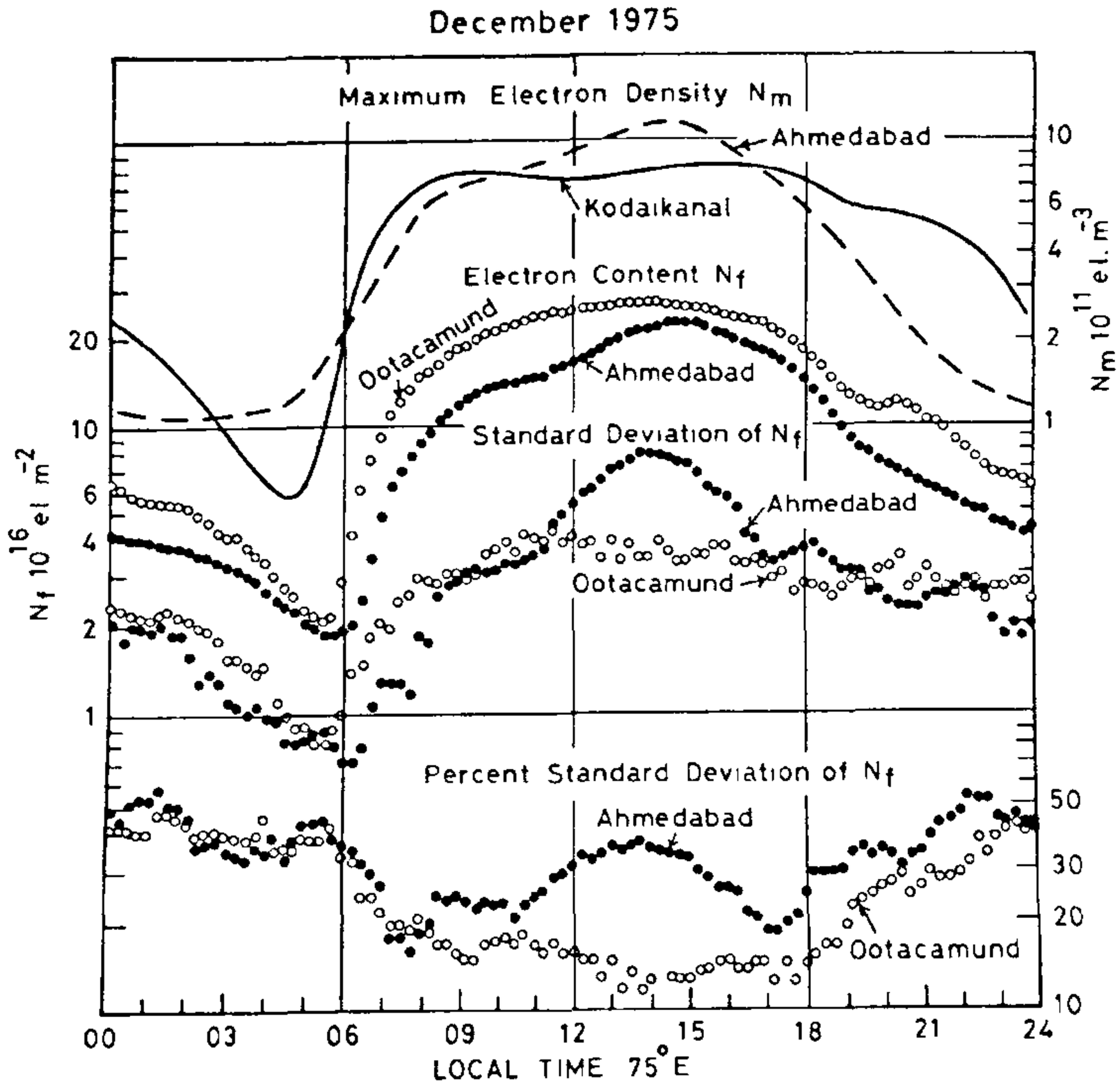


**Figure 1.** Mean diurnal curves of $N_m$, $N_f$ standard deviation of $N_f$ and per cent standard deviation of $N_f$ for December 1975.

equatorial dynamics, though the same effect is not reflected in the equatorial TEC to a greater extent. It is therefore, suggested that the simultaneous consideration of the equatorial and crest TEC would bring out the influence of equatorial dynamics of TEC.

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