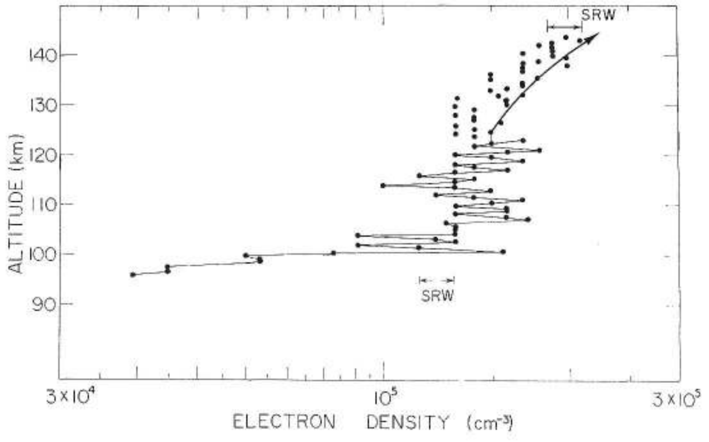

Fig. 2 Measured irregularity of electron density in the ionospheric E region ; SRW, scattering range due to the wake effect of vehicle motion.

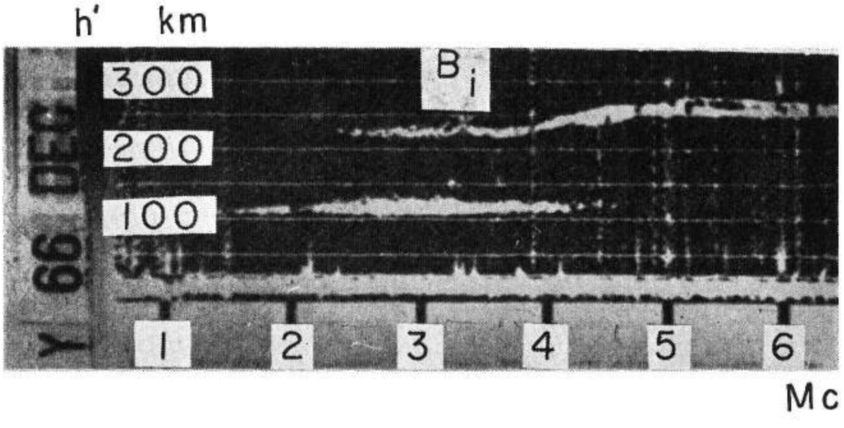

Fig. 3 Ionogram trace of the diffuse type sporadic E layer observed at 1100 JST, 5 Dec. 1966, at Yamagawa ionosonde station (130.6°E, 31.2°N).

quency of 3.8 Mc. The sporadic-E trace on the ionogram is, however, extended to 4.5 Mc without the separation of o-and x-modes; while electron density around the bottom region of the F_1 layer (see Fig. 2), gives the critical frequency of 3.42 Mc which agrees well, with the observed trace indicated by symbol B_i (see Fig. 3). This diffuse type sporadic E trace is, then, attributed to the irregularity of electron density which was disclosed by rocket observation in an altitude range of 100 km $\sim$ 103 km. The maximum value was inferred around an altitude of 121 km (see Fig. 2) and the accompanying irregularity in an altitude range from 115 km to 120 km was further enhanced during 10 minutes of rocket observation. That is, the ionosonde record at 1115 JST (see Fig. 4) also indicates a sporadic E; especially, the vertically expanded echo of the sporadic-E trace can be attributed to the irregularity of the electron density distributed in a comparatively wide altitude range as has been disclosed by this rocket experiment.

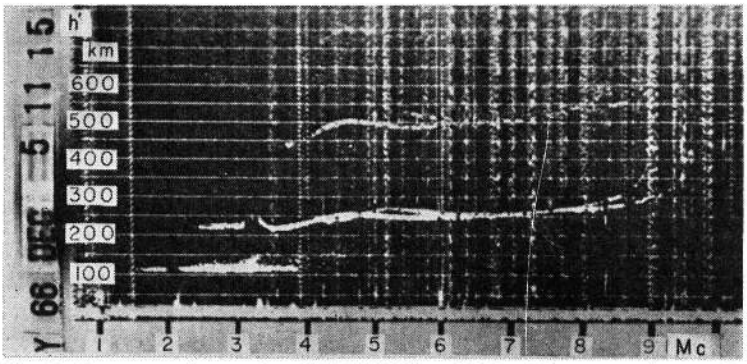

Fig. 4 Ionogram observed at 1115 JST, 5 Dec. 1966, at Yamagawa ionosonde station (130.6°E, 31.2°N).

4. Discussion

The size of the irregularity is much smaller than the measuring interval of the gyro-plasma probe, hence no precise spatial correlation of the irregularity is observed. The characteristic size can, however, be estimated from the sporadic-E trace of the ionogram by using the scattering coefficient, given in the BookerGordon scattering formula, for the criterion used by Bowhill [1966] (see Appendix), which yeilds the characteristic length of 35 m.

The irregular type sporadic-E layer has, then, been confirmed; the results agreeing with those pointed out by Bowhill [1966], and Smith [1965, 1966]. Their results were obtained, however, mainly by the D.C. Probe technique. While their D.C. probe is very much more sensitive to fine structure of the ionization profile, it cannot measure absolute values of electron density and the constant of proportionality varies with altitude. In this context, the gyro-plasma probe is excellent for measuring the absolute of electron density. The results of direct measurement can, then, be compared in detail with the radio echo trace.

5. Conclusion

The structure of the diffuse type of sporadic-E layer, which is called m_2E_s, has been investigated and the irregurality distribution of electron density was revealed at an altitude range of 100 km $\sim$ 103 km and 115 km $\sim$ 120 km. Two small maxima of electron density distribution have also been observed, at altitudes of 108 km and 121 km, respectively, being separated by a minimum value.

A detailed correspondence between the radio scattering source and the ionogram trace was investigated, and has confirmed that the diffuse type of sporadic E in temperate latitudes detected by the ionosonde is caused by an irregular state of electron distribution. It is inferred that the correlation distance of the irregular type sporadic-E observed in this experiment is 35 m. Thus, further confirmation of the previous works on the existence of irregular type sporadic-E in temperate zones has been carried out.

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