BEACON SATELLITE STUDIES OF THE IONOSPHERE OVER AHMEDABAD AND NEIGHBOURING LOW LATITUDES

presented

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PREFACE

Since the discovery of the layers reflecting electromagnetic waves in the earth's high atmosphere, their physical characteristics such as virtual heights and critical frequencies have been extensively investigated by means of ground based equipments. Artificial earth satellites made it possible to study the topside of the ionosphere and the radiations reaching the earth's atmosphere from outside sources.

Space Research started in India in 1962 under the auspices of the INCOSPAR, whose Chairman is Professor Vikram Sarabhai, with the establishment of a Microlock satellite tracking station at Ahmedabad and the organisation of an equatorial Rocket launching station at Thumba. When NASA and NRL decided to orbit satellites with real time transmissions and telemetry, the Physical Research Laboratory, Ahmedabad made immediate arrangements for the reception of satellite signals so as to obtain as much information about the upper atmosphere as possible.

The thesis embodies the results of the author's work on the tracking and recording of polarised radio waves transmitted by NASA beacon satellites and on the Faraday rotation analysis of the satellite signals received at the Physical Research Laboratory. The receiving system was set up by the author in the

Microlock station. The data collected have been analysed and studied so as to determine the total electron content variations. The bottomside ionograms taken at the times of satellite transits have been subjected to true height analysis and the variations of topside and bottomside electron contents have been compared. The present study has thrown some light on the diurnal and seasonal variations of total electron content, topside electron content, bottomside electron content and maximum electron density over Ahmedabad, which is situated at a ~~the~~ latitude, where maximum F_2 peak ionisation occurs.

The role of sporadic E ionisation in producing satellite signal scintillations has not been very clear. In the present investigation, an empirical relationship between scintillation depth and f_xE_s has been found. The relationship between the ratio of 20 MHz depth to 40 MHz depth and f_xE_s has also been determined. Good correlation has been found between scintillation rate and f_xE_s.

The variations of total electron content and the equivalent slab thickness of the ionosphere upto 1000 km with 10.7 cm solar flux and with magnetic activity have also been studied. It has been found that the total electron content and the equivalent slab thickness increase linearly with solar flux.

Besides maintaining the beacon satellite tracking system, the scaling, computation and analysis of the Faraday

rotation and satellite signal scintillation data were done by the author throughout the period of investigation.

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References to other workers and authors have been made in the appropriate places.

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