The thesis contains six chapters and consists of two parts. Part I - Chapters I to V deal with the propagation of low frequency radio waves (30 - 300 kHz) by reflection from the D-region of the ionosphere (60 - 95 km) at low latitudes. The study of the intensities of these radio waves reflected at oblique incidence provide an efficient method for exploring the D-region of the upper atmosphere.

The amplitudes of 164 kHz radio waves transmitted from Tashkent have been recorded at Ahmedabad since 1960. Similar receiving equipments were set up at Poona (period 1963 - 1964) and at Gulmarg (for a short period in 1971) in order to study the effect of changing the distance between the transmitter and receiver. The author modified the receiving equipment at Ahmedabad in 1969 by using a loop antenna and set up an identical unit at Gulmarg in 1971.

The thesis contains the results of a study of the above observations. (1) The radio data have first been analysed to obtain the variations during quiet day conditions. (2) The effect of solar X-ray flux enhancements during solar flares on the propagation of these radio waves has then been studied. (3) Night-time radio signal attenuations have been found to be
related to X-ray emissions from galactic X-ray sources. Theoretical estimates of this effect have been made and compared with the observations.

II. An associated D-region study has been made by the analysis of the lunar tidal variations of D-region absorption of medium frequency radio waves (1 - 3 MHz) at the equatorial and the mid-latitude stations.

The author expresses with deep gratitude his indebtedness to Professor K.R. Ramanathan for introducing him the subject and guiding him during the entire period of investigation.

The author with great pleasure wishes to express his heartiest gratitude to Professor R.G. Rastogi for his guidance and supervision throughout the course of work.

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