EFFECT OF ACTIVE THUNDERSTORM ON IONOSPHERIC ELECTRON AND ION TEMPERATURES AS MEASURED BY THE SROSS-C2 SATELLITE

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It has been realized that the ionospheric temperatures and ion densities are influenced by the lightning/ Sprite activity. The ionospheric temperatures (electron and ion temperatures) were measured by the RPA payload aboard the Indian SROSS-C2. To see the effect of active thunderstorm the ionospheric electron and ion temperatures have been compared to the values on normal days. The data collected by SROSS-C2 satellite using RPA payload during the period from 1995-1998 has been analyzed for anomalous variations due to thunderstorm activity in the altitude range from 425 to 625 km. The data on thunderstorm activity for the same period was obtained from India Meteorological Department (IMD), Pune. The measurements corresponding to three different locations viz. Bhopal (23.16° N, 77.36° E), Panji (15.30° N, 73.55° E) and Trivandrum (08.29° N, 76.59° E) have been analyzed. It is a difficult task to study the ionospheric temperature using the satellite data in respect of thunderstorm activity because very rarely passes of satellite match the thunderstorm activity at a meteorological data station. The first task is to match the satellite data corresponding to the thunderstorms activities. During the period from 1995 to 1998, it has been found that seven events of thunderstorms correspond to the satellite data. The recorded average electron and ion temperature during active thunderstorms have been compared with the average normal days electron and ion temperature for the same time interval. Care has been taken to select the satellite data, which is free from diurnal, seasonal, latitudinal, longitudinal and altitude effects. The average of normal time electron and ion temperatures have been made for a month, starting almost 15 days before the thunderstorm day and continuing to 15 days more after that. Thus the possibility of seasonal effect has completely been ruled out because all data points correspond to the same season. A window of 5° in latitude and longitude for the satellite observation at the meteorological data center has enabled the latitudinal and longitudinal effect to be ineffective. The averaging of electron and ion temperatures at nearly the same hours of the day as that of the active thunderstorm has made it free from the diurnal effect. The analysis has been made for the altitude range 425-625 km only, thus making it independent of the altitude. To remove the effect of solar flare activity, the data on solar flares were obtained from National Geophysical Data Center (NGDC), Boulder, Colorado (USA). Only those thunderstorm days have been considered in this study, which are free from the solar flares. Care has also been taken to choose the data only from those days, which are free from earthquakes. It has been found that there is a consistent enhancement of ionospheric electron and ion temperatures recorded during active thunderstorms period. This enhancement was for the average electron temperature ranging from 1.2 to 1.7 times compared to the average normal day's temperature. However, for ion temperature this enhancement was from 1.1 to 1.5 times. It is worth mentioning here that in the present analysis the data were selected in such way that the effect of diurnal, seasonal, latitudinal, longitudinal and altitude effects are minimized. Thus the temperature anomalies are directly related to the thunderstorm events.

Thunderstorm, ionospheric temperatures, SROSS-C2 satellite

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