URSI AP-RASC 2019, New Delhi, India, 09 - 15 March 2019

Response of upper and lower ionosphere to enhanced radiation fluxes during major solar flare events

Parvaiz A. Khan*(1) , Malik A. Waheed(2) , P. K. Purohit (3) and A. K. Gwal(4)
(1) Government College for Women, Anantnag, 192101, e-mail:khan.parvaiz80@gmail.com
(2) Government Degree College Kokernag, 192221,e-mail:malikwaheed80@gmail.com
(3)National Institute of Technical Teachers' Training and Research, Bhopal-462002, India
(4) AISECT University, Bhopal, M.P.

Abstract

The studies conducted in the past concerning ionospheric influences of solar flares have used the Global Positioning Satellite System (GPS) derived Total Electron Content (TEC). In our present study we validate these studies by using ionospheric parameters derived from ground based Ionosonde measurements. We investigated the effect of enhanced X-ray and EUV fluxes on the upper and lower ionosphere during ten X-class solar flares that occurred during the peak phase (2000-2004) of solar cycle 23. The data of X-ray flux from Geostationary Operational Environmental Satellite (GOES) and EUV flux from Solar EUV Monitor (SEM) onboard Solar and Heliospheric Observatory (SOHO) were correlated with the ionospheric parameters fmin (frequency of minimum reflection of D layer) and NmF2 (maximum electron density of F2 layer) to establish the extent of impact and magnitude of correlation in the two layers. The Ionosonde data of Okinawa (lat.26.3^{0}N, long.158.7^{0}E) station, Japan were utilized for the present study. The correlation analysis was performed to bring the correspondence between ionospheric parameters and radiation fluxes. From our analysis we found that the peak values and peak enhancements of ionospheric parameters follow a good correlation with peak values and peak enhancements in radiation fluxes. It is also found that correlation is highly improved when these fluxes are multiplied by Cos(CMD) where CMD is Central Meridian Distance on the solar disc. At the same time it was found on account of their much higher energy and penetration power X-ray photons produce intense ionization in the lower ionosphere (D-layer) than the EUV flux. We also found that the impact of enhanced radiation flux is immediately felt in the ionospheric ionization level.

Key words: *Solar flare, X-ray, EUV, Ionosphere*