JSR Publications

Available Online

J. Sci. Res. **6** (1), 43-49 (2014)

JOURNAL OF SCIENTIFIC RESEARCH

www.banglajol.info/index.php/JSR

Response of High Latitude Ionospheric TEC to Enhanced Radiation Fluxes during the Major Solar Flare Events

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Received 14 July 2013, accepted in revised form 22 December 2013

Abstract

We have investigated the response of ionosphere to major solar flare events that occurred during 1998 to 2011. The effect of enhanced radiation fluxes in the X-ray and EUV band on the GPS derived Total Electron Content (TEC) is examined. The data of X-ray flux from Geostationary Operational Environment Satellite (GOES) and EUV flux from Solar EUV Monitor (SEM) onboard SOHO spacecraft were correlated with the Total Electron Content (TEC) data of a high latitude station, Davis (68.57^0S, 77.96^0E). We found that peak intensities of X-ray and EUV flux correlate very well with the peak values of TEC. We also studied the correlation of peak enhancement of these fluxes with the peak enhancement of TEC and found that peak enhancement of these fluxes correlate highly with the peak enhancement of TEC than with the peak values themselves. It is also found that correlation is extraordinarily improved when these fluxes are multiplied by Cos(CMD) where CMD is Central Meridian Distance on the solar disc, thereby showing that the location of flares on the solar disc plays an important role while investigating the ionospheric influences of solar flares.

Keywords: Ionosphere; TEC; CMD; Solar Flare.

doi: http://dx.doi.org/10.3329/jsr.v6i1.14100 J. Sci. Res. **6** (1), 43-49 (2014)

1. Introduction

The solar flares are accompanied by release of large amount of energy. The energy released during solar flares is in the form of radiations across entire electromagnetic spectrum. When the radiation impinges on the earth's ionosphere, several ionospheric disturbances are produced by increasing the ionization level. How much effect a flare can produce on the ionosphere depends on the strength of the flare as well as on the location of the flare on the solar disc. The solar flares occurring near the central meridian produce much stronger impact than those occurring at the solar limb [1]. The effect of flare

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