

Impact of Geomagnetic Variation over Sub-Auroral Ionospheric Region during High Solar Activity Year 2014

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Abstract : The present work is an attempt to evaluate the sub-auroral ionospheric behavior under changing space weather conditions especially during high solar activity year 2014. In view of this, the GPS TEC along with Ionosonde data over Indian permanent scientific base 'Maitri', Antarctica (70°46'00" S, 11°43'56" E) has been utilized. The results suggested that the nature of ionospheric responses to the geomagnetic disturbances mainly depended upon the status of high latitudinal electrodynamic processes along with the season of occurrence. Fortunately, in this study, both negative and positive ionospheric impact to the geomagnetic disturbances has been observed in a single year but in different seasons. The study reveals that the combination of equator-ward plasma transportation along with ionospheric compositional changes causes a negative ionospheric impact during summer and equinox seasons. However, the combination of pole-ward contraction of the oval region along with particle precipitation may lead to exhibiting positive ionospheric response during the winter season. Other than this, some Ionosonde based new experimental evidence also provided clear evidence of particle precipitation deep up to the low altitudinal ionospheric heights, i.e., up to E-layer by the sudden and strong appearance of E-layer at 100 km altitudes. The sudden appearance of E-layer along with a decrease in F-layer electron density suggested the dominance of NO⁺ over O⁺ at a considered region under geomagnetic disturbed condition. The strengthening of E-layer is responsible for modification of auroral electrojet and field-aligned current system. The present study provided a good scientific insight on sub-auroral ionospheric to the changing space weather condition.

Keywords : high latitude ionosphere, space weather, geomagnetic storms, sub-storm

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