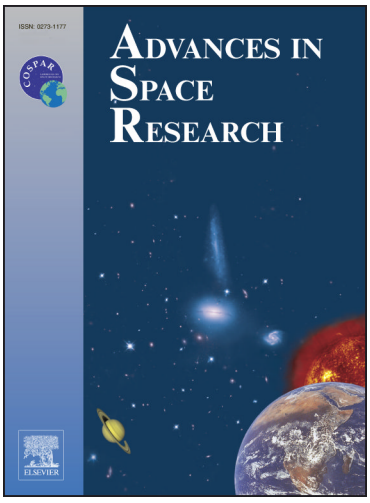

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Characteristics of nighttime *E*-region over Arecibo: Dependence on Solar flux and Geomagnetic Variations

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Abstract

Electron concentration (*Ne*) inferred from Incoherent Scatter Radar (*ISR*) measurements has been used to determine the influence of solar flux and geomagnetic activity in the ionospheric *E*-region over Arecibo Observatory (AO). The approach is based on the determination of column integrated *Ne*, referred to as E-region total electron content (*ErTEC*) between 80 - 150 km altitude regions. The results discussed in this work are for the AO nighttime period. The study reveals higher *ErTEC* values during the low solar flux periods for all the seasons except for summer period. It is found that the *E*-region column abundance is higher in equinox periods than in the winter for low solar activity conditions. The column integrated *Ne* during the post-sunset/pre-sunrise periods always exceeds the midnight minima, independent of season or solar activity. This behavior has been attributed to the variations in the coupling processes from the *F*-region. The response of *ErTEC* to the geomagnetic variability is also examined for different solar flux conditions and seasons. During high solar flux periods, changes in *Kp* cause an *ErTEC* increase in summer and equinox, while producing a negative storm-like effect during the winter. Variations in *ErTEC* due to geomagnetic activity during low solar flux periods produce maximum variability in the *E*-region during equinox periods, while resulting in an increase/decrease in *ErTEC* before local midnight during the winter/summer periods, respectively.

Keywords: Ionosphere; E-region; ISR; low latitude.

1. Introduction:

The *E* region of the Earth's ionosphere often reveals thin layers of ionization referred to as '*Sporadic E or Es*' in literature (*Whitehead, 1989; Mathews 1998*). These have been attributed to vertical wind shears in the horizontal neutral winds that cause convergence zones in the vertical component of the **V**×**B** drift resulting in accumulation of long-lived (metal) ions within the shear