



Sensing the upper and lower levels of the atmosphere during the 2009 equinoxes using GPS measurements

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Abstract

This short-term work characterized the upper and lower levels of the atmosphere through Global Positioning System (GPS) measurements. The observations were conducted during the 2009 equinoxes from two pairs of conjugate polar observing stations: Husafell, Iceland (HUSA) and Resolute in Nunavut, Canada (RESO) and their conjugate pairs at Scott Base (SBA) and Syowa (SYOG) in Antarctica, respectively. The total electron content (TEC), an indicator of the upper atmosphere, and the precipitable water vapor (PWV), which served as the lower atmospheric response, were retrieved and analyzed. The results reveal a good relationship between TEC and PWV at each station during the onset day of the equinoxes, whereas an asymmetrical response was observed in the beginning of and after the equinoxes. In addition, the conjugate pairs were only consistent during the autumnal equinox. Thus, the high correlation was observed following the seasonal pattern for the onset day, while strong and moderate correlations were found only for the vernal equinox in Antarctica and the Arctic, respectively. This relationship reflects the fact that the intensity of solar activity during the solar minimum incident on the lower atmosphere through the conjugate points is associated with the variation of the Sun's seasonal cycle, whereas the TEC and PWV showed an opposite relationship.

Keywords

GPS TEC; PWV; Equinoxes; Conjugate points; Associations

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References

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