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Deep Ionospheric Hole Created by Sudden Stratospheric Warming in the Post-Midnight Ionosphere

Abstract:

Multiple observational studies have demonstrated large ionospheric variations associated with sudden stratospheric warming (SSW) events during the daytime, but only limited evidence of ionospheric disturbances during the night-time was reported up to now. We use observations by GPS TEC receivers and Arecibo and Millstone Hill incoherent scatter radars to investigate large-scale disturbances in the nighttime ionosphere for several SSW events. We report a deep decrease in TEC that reaches ~70% of the background level and is observed between the local midnight and local sunrise (6-12UT). This decrease is observed for several consecutive days in the range of latitudes from ~60oS to ~45oN. It is accompanied by a strong downward plasma motion and significant decrease in ion temperature, as observed by both Arecibo and Millstone Hill radars. We discuss variations in electric field and F-region dynamics as possible drivers of this behavior.