Traveling ionospheric disturbances observed by GPS network in North America and Millstone Hill IS radar

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We report the daytime traveling ionospheric disturbances (TIDs) observed by the GPS receiver network in North America and the Millstone Hill incoherent scatter radar (MH-ISR) during Jan 20-23, 2007. Analysis of the high-resolution wide-coverage total electron content (TEC) maps from the GPS network revealed that the daytime TIDs have a wavelength of 300-1,000 km and a propagation velocity of 100-200 m/s. The daytime TIDs propagate southeastward prior to noon while the TIDs post-noon propagate southwestward. These TIDs are superimposed on each other around the post-noon period. The MH-ISR simultaneously observed periodic electron density fluctuations showing downward phase propagation in the ionospheric F-region. Perturbations with a period of ˜1 hour in the F-region electron density correspond to the perturbations observed in the GPS-TEC measured above the MH-ISR. The maximum phases of perturbations in both GPS and ISR datasets are seen during the transition of detrended wind direction from southward to northward. The wind direction was calculated using the MH-ISR ion drift data in the altitude range 230-400km. These observational results indicate that the daytime TIDs are caused by atmospheric gravity waves generated in the auroral latitudes.