

Medium- to large-scale traveling ionospheric disturbances detected with detrended TEC maps over North America

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New characteristics of medium- to large-scale traveling ionospheric disturbances (TIDs) are detected with detrended GPS TEC maps over North America.

The detrended TEC data are obtained by subtracting a 60-minute running average from the original TEC data at each ionospheric penetration point (IPP). TEC data are collected from multiple GPS networks in North America. Currently detrended TEC data from 1,400 GPS receivers (as of December 2006) and at all IPPs are mapped onto the thin shell ionosphere at 300 km altitude, where the data is binned and averaged.

The detrended TEC maps cover a wide area of 70-130 deg W and 28-48 deg N, and have a spatial resolution of 1x1 deg in latitude and longitude, and a temporal resolution of 30 seconds.

A preliminary examination of these TEC maps from January through December 2006 reveals several new characteristics of medium- to large-scale TIDs, including:

1. Nighttime MSTIDs propagating southwestward with 200-500 km wavelengths are frequently observed over North America in summer and winter similarly to those observed over Japan.

It is revealed that the wavefront of nighttime MSTIDs can be extended from 30 to 50 degrees N.

2. Daytime equatorward TIDs with 300-1000 km wavelengths are frequently observed in winter. Their characteristics are similar to daytime MSTIDs observed previously over Japan and Southern California.

3. In rare cases, clear northward LSTIDs can be observed even at geomagnetically quiet conditions.

Although coordinated observations with other observation techniques, such as incoherent scatter (ISRs) radars and all-sky airglow imagers, are needed to clarify the generation and propagation mechanism of these TIDs, the detrended TEC maps over North America are a powerful tool to investigate the ionospheric disturbances.