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Ground based and satellite simultaneous observations of Medium Scale Travelling Ionospheric Disturbances

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Medium-scale Traveling Ionospheric Disturbances (MSTIDs) are considered as an ionospheric manifestation of Atmospheric Gravity Waves (AGWs). Daytime MSTIDs are generated by the ion-neutral collisions in the F-region and it has been considered that plasma disturbances at the top-side ionosphere might be too small for satellite observations. In this presentation, we present simultaneous observations of daytime MSTIDs over North America, using data obtained from GPS-TEC and DEMETER satellite observation. On several selected MSTID events, detrended variations of ion velocity parallel to magnetic field lines and electron density data observed by the satellite instruments are compared to GPS-TEC value which is detrended both in time and space. GPS-TEC value used in the comparison is taken from the northern conjugate point of the satellite coordinate at the altitude of 300km, which is the assumed altitude in the construction of a GPS-TEC map. A novel result is the correspondence of the ion velocity along magnetic field lines at the satellite's altitude (660-710km) to the MSTID structures in the TEC map at 300km altitude. Electron density of the satellite observation shows a relatively less coherence to GPS-TEC. But in certain cases, the correspondence to a MSTID event is observed clearly, allowing the discussion of the phase differences among observed parameters at the satellite's altitude and 300km. We believe this is the first simultaneous observation of daytime MSTID by GPS-TEC and satellite measurements, which helps understand the generation/propagation mechanism of daytime MSTID/AGW and the ion propagation mechanism from the F-region to the top-side ionosphere.