

Generation mechanism and ISS-IMAP observation of medium-scale traveling ionospheric disturbances (MSTIDs)

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Plasma density structures and associated irregularities in the nighttime midlatitude ionosphere are frequently observed as frontal structures elongated from northwest to southeast (NW-SE) in the northern hemisphere, also known as medium-scale traveling ionospheric disturbances (MSTIDs). MSTIDs were often observed simultaneously at magnetic conjugate locations in the Northern and Southern Hemispheres. It has been believed from observational and theoretical studies that MSTIDs are not simple manifestation of atmospheric gravity waves, but generated by electrodynamic processes: Perkins instability in the F region and sporadic-E (Es)-layer instability in the E region. Through the E-F coupling process, the seeding by an Es layer accelerates the growth of MSTIDs, and the neutral wind in the E region controls the propagation of MSTIDs. The most important aspect of MSTIDs which is still unknown from ground-based observations is their boundary at high and low latitudes. There are several reports of MSTID observations at sub-auroral and equatorial ionization anomaly regions, but a systematic study on latitudinal boundary of MSTIDs has yet to be done. Imaging of MSTIDs from ISS-IMAP is expected to reveal the latitudinal boundary and contributes to further understanding of the MSTID generation mechanism.

Keywords: ionosphere, MSTID, Perkins instability, E-F coupling, ISS-IMAP