

Relationship Between Medium-Scale Traveling Ionospheric Disturbances and Sporadic E Layer Over Japan

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We investigated relationship between nighttime medium-scale traveling ionospheric disturbances (MSTIDs) and sporadic E layer (Es) by analyzing total electron content (TEC) data obtained from a Global Positioning System (GPS) network in Japan and ionosonde data obtained at Kokubunji during May-August in 2001-2005. Perturbation component of TEC, which would be caused by MSTIDs, was obtained from subtracting 1-hour running average from the original TEC time series for each satellite-receiver pair. Standard deviations of the TEC perturbations over Kokubunji within an area of 4x4 degrees in latitude and longitude and within an hour were calculated every hour. MSTID activity was defined as a ratio of the standard deviation to the background TEC. On the other hand, foEs - fbEs could be a measure of strength of the electron density perturbations that exist within Es. To investigate relationship between the MSTID activity and Es parameters on the basis of their day-to-day variations, we averaged hourly values of MSTID activity, foEs, and foEs - fbEs over 20-02 LT and obtained their daily values. We found that the MSTID activity was closely correlated with foEs and foEs - fbEs. When the MSTID activity was high (low), foEs and foEs - fbEs were high (low). Cross-correlation coefficients between MSTID and foEs (foEs - fbEs) were 0.38-0.6 (0.36-0.56) for 2001-2004. This result suggests that the electron density perturbations in the E and F regions could be caused by polarization electric fields transmitted along the geomagnetic fields between both the regions.