Study of relationship between medium-scale traveling ionospheric disturbances and sporadic E layer over Japan

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We have investigated relationship between nighttime medium-scale traveling ionospheric disturbances and sporadic E layer by analyzing total electron content (TEC) data obtained from the Global Positioning System (GPS) network in Japan and and ionosonde data obtained at Kokubunji. Perturbation component of TEC is obtained from subtracting 1-hour running average from the original TEC data for each satellite-receiver pair. Standard deviations of the TEC perturbation within an area of 4x4 degrees in latitude and longitude and within an hour are calculated. MSTID activity is defined as a ratio of the standard deviation to the background TEC. To investigate electrodynamical coupling between the E and F regions, we have compared day-to-day variations of the MSTID activity and foEs (foEs - fbEs). The results show that the MSTID activity correlate with the electron density (and perturbations) in the Es layer. These electron density perturbations in the E and F regions could be caused by electric fields transmitted along the geomagnetic fields between both the regions.