

Mechanism of night-time enhancements in NmF2 close to the geomagnetic equator during 17-22 March 1990 and 22-26 April 1990

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We present a comparison between the modeled NmF2 and hmF2, and NmF2 and hmF2, which were observed in the low latitude ionosphere simultaneously by the Kokubunji, Yamagawa, Okinawa, Manila, Vanimu, and Darwin ionospheric sounders, and by the middle and upper atmosphere (MU) radar during the quiet and geomagnetic storm periods of 17-22 March 1990 and 22-26 April 1990. A comparison between the electron and ion temperatures measured by the MU radar and those produced by the model of the ionosphere and plasmasphere is presented. The empirical zonal electric field, the meridional neutral wind taken from the HWM90 wind model, and the NRLMSISE-00 neutral densities are corrected so that the model results agree reasonably with the ionospheric sounder observations and the MU radar data. We found that changes in a flux of plasma into the night-time equatorial F2-region from higher L-shells to lower L-shells caused by the meridional component of the ExB drift can lead to an enhancements in NmF2 close to the geomagnetic equator. The equatorward wind-induced plasma drift along magnetic field lines, which cross the Earth equatorward of about 200 geomagnetic latitude in the northern hemisphere and about -190 geomagnetic latitude in the southern hemisphere, contributes to the maintenance of the F2-layer close to the geomagnetic equator. It is proved that the night-time weakening of the equatorial zonal electric field (in comparison with that produced by the empirical model of Fejer and Scherliess (1997) or Scherliess and Fejer (1999)) in combination with corrected equatorward night-time wind-induced plasma drift along magnetic field lines in the both geomagnetic hemispheres are found to be the physical mechanism of the night-time NmF2 enhancement during the studied time periods close to the geomagnetic equator over Manila.