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East-west differences in F-region electron density at midlatitude: comparision between the US and the Far East regions

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The global configuration of the geomagnetic field shows that the maximum east-west difference in geomagnetic declination of northern middle latitude lies in the US region (about 32 degree), which produces the significant ionospheric east-west coast difference in terms of total electron content (TEC) first revealed by Zhang et al. [2011]. For verification, it is valuable to investigate this feature over the Far East area where also shows significant geomagnetic declination east-west gradient but smaller (about 15 degree) than that of US. The current study provides evidence of the longitudinal change supporting the thermospheric zonal wind mechanism by examining the climatology of peak electron density (NmF2), electron density (Ne) of different altitudes in the Far East regions with a longitude separation of up to 40-60 degree based on ground ionosonde and space-based measurements. Although the east-west difference (Rew) over the Far East area displays a clear diurnal variation similar to the US feature, that is negative Rew (West Ne > East Ne) in the noon and positive at evening-night, the observational results reveal more differences including: 1) The noontime negative Rew is most pronounced in April-June while in US during February-March. Thus for the late spring and summer period negative Rew over the Far East region is more significant than that of US. 2) The positive Rew at night is much less evident than in US, especially without winter enhancement. 3) The magnitude of negative Rew tends to enhance toward solar maximum while in US showing anti-correlation with the solar activity. The altitude distribution of pronounced negative difference (300˜400 km) moves upward as the solar flux increases and hence produces the different solar activity dependence at different altitude. The result in the paper is not simply a comparison corresponding to the US results but raises some new features that are worth further study and improve our current understanding of ionospheric longitude difference at midlatitude.

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