



On the vertical structure of longitudinal differences in electron densities in the mid-latitudes: COSMIC radio occultation observations and GITM simulations

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By using COSMIC (Constellation Observing System for Meteorology, Ionosphere, and Climate) satellite observations, and GITM (Global Ionosphere and Thermosphere Model) simulations, the altitudinal dependences of the longitudinal differences in electron densities N_e were studied at mid-latitudes for the first time. Distinct altitudinal dependences were revealed: (1) in the northern (southern) hemisphere, there were wave-1 variations mainly in the daytime in the altitudes below 180 km, but wave-2 (wave-1) variations over a whole day above 220 km; (2) a transition (or separation) layer occurred mainly in the daytime within 180 km and 220 km, showing reversed longitudinal variation from that at lower altitudes. Solar illumination was one of the plausible mechanisms for the zonal difference of N_e at lower altitudes. At higher altitudes both neutral winds and solar illumination played important roles. The neutral winds effects accounted for the longitudinal differences in N_e in the European-Asian sector. Neutral composition changes and neutral wind effects both contributed to the formation of the transition layer.