The Longitudinal Structure of the Vertical E×B drift and its effect on the Plasma Density in the low-latitude F-region.

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The recent discovery of the longitudinally periodic plasma density structure could not be explained by any currently known mechanism. We have investigated the correlations between the longitudinal density structure and the equatorial vertical E×B drift pattern with the in-situ measurement data of the ROCSAT-1 at 600 km and DMSP at 840 km. The occurrence of the wave number-four structure was identified in all seasons on the ROCSAT-1 data. The periodic density structure was identified at 0930 LT and 1800 LT by the DMSP satellites but the wave number-four structure was clearly distinguishable only during the fall equinox months. The observations of the vertical ion velocity from the ROCSAT-1 demonstrated that the locations of the density peaks coincided with the peak locations of the upward ion velocity during daytime. The SAMI2 model simulations conducted using the observed ROCSAT-1 E×B drift velocity as input to the model showed that the observed longitudinal density difference could be produced by the effect of the E×B drift. Our observaions and model simulations provided strong supporting evidence that the daytime electric fields could be the main driver of the periodic density structure.