The Solar Cycle Dependence Variability of the Morning-Time Plasma Density Irregularities Occurrence Pattern in Mid-to-Low Latitude

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Plasma density irregularities are significant feature that can be responsible for the interference to radio communication and navigation systems. The plasma density irregularities in mid-to-low latitude during the morning time show different characteristics compared with the previous studies on those during the night. The most recent observations have revealed that the plasma density irregularities exist at the morning sector with the low level of background ionospheric density especially during the solar minimum period. However, the onset conditions, the mechanism to explain those irregularity occurrences and their solar cycle dependence are still questionable. We investigate the solar cycle variation of the morning-time plasma irregularities activity using the in-situ measurement observations by DMSP. We also investigate the FAI echoes observed by the ionospheric coherent scatter radar to study the connection of the post-mid night irregularities to those during the morning-time. The association of the post-midnight plasma density irregularities with those in morning time will be discussed combining the multiple observational results.