



Climatological distributions of mid-latitude trough region irregularities based on Swarm in situ measurements

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A large number of studies have confirmed the frequent occurrence of plasma irregularities in the mid-latitude ionospheric trough (MIT), but their distribution characteristics have not been fully understood. Based on the Swarm in situ plasma density measurements from 2014 to 2020, the diurnal, seasonal, solar activity and geomagnetic activity variations of the occurrence rate of MIT region irregularities are analyzed. The results show that for the irregularities with scale size of 7.5-75 km: (1) the geomagnetic activity has an obvious inhibitory effect on the formation of irregularities inside the MIT region, regardless of dayside or nightside. (2) The occurrence rate of irregularities inside MIT region during the day is significantly higher than that at night, and the difference between day and night is greater than the difference between the two walls at the same local time sector. (3) On the dayside, the highest and lowest occurrence rate appears in winter and summer, respectively; but on the nightside, the highest and lowest occurrence rate appears in equinoxes and winter, respectively. (4) On the nightside, it shows lower occurrence rate under high solar activity conditions, but no obvious solar activity effect is shown on the dayside occurrence rate. The above results of the seasonal dependence, geomagnetic activity inhibitory effect, and solar activity influence are newly and important for understanding the behaviors of the plasma irregularities at MIT region.