

Seasonal Variation in Mesospheric Neutral Turbulence Investigated using Rocket and Radar Observations

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Three rockets carrying Langmuir probes were flown from Sriharikota (14°N, 80°E) and Thumba (8.3°N, 76.9°E), India, during 2004-2005 to study the mesospheric neutral turbulence from electron density measurements, two of which were part of the Mesospheric Turbulence and Stratification campaign conducted in coordination with the MST radar at Gadanki (13.5°N, 79.2°E). The first and second flights were during summer (23 July 2004) and equinox (08 April 2005), respectively, from Sriharikota and the third was during winter (27 November 2005) from Thumba. These observations were used to investigate the seasonal variation in neutral turbulence over low and equatorial latitudes. The Langmuir probes detected electron density irregularities with scale sizes in the range of one meter to a few km in the upper mesosphere and the mesopause region. Neutral turbulence parameters estimated by fitting the Heisenberg model to wavelet spectra of these electron density fluctuations showed significant seasonal variation. Strong turbulence was seen during summer and equinox flights and the winter flight showed very weak turbulence. The energy dissipation rate was maximum during summer, followed by equinox and was minimum during winter. These results from rocket observations along with those from radar observations will be discussed with emphasis on the probable causes of production of turbulence and also that of the seasonal variation.