Mesospheric scattering layer structures using MST radar echoes over Gadanki

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The observation of mesospheric echoes over Gadanki (13.5˚N, 79.2˚E) using high power VHF radar has provided a means to investigate the low latitude mesosphere on a continuous basis. Using the existing 53 MHz MST Radar at Gadanki, the seasonal variations of the scattering characteristics of radio waves from tropical mesosphere have been studied for the 1998- 2002 period.

The radar backscattered signals show the presence of a primary scattering layer between 68-76 km and a secondary layer between 80-85 km height region with seasonal variation characterized as follows: (a) Significant height variation of the main scattering layer between 68-76 km has been observed. The layer occurs at lowest level in winter/ equinox months compared to that in summer months and (b) There is an increase in the rate of occurrence of detectable scattered signal and return echo power during summer compared to other seasons.

Variations in mesospheric layer thickness and embedded thin layer structures are derived using short pulse lengths of 1-4 μs (equivalent to 150-600 m vertical scale sizes) along with their velocities and spectral widths of turbulence. The seasonal trends in the scattering layer fine structure and dynamics are discussed in terms of possible sources of mesospheric turbulence.