

Investigation of the Mesopause Energetics and Its Possible Implications on the Mesosphere-lower Thermosphere –ionosphere (MLTI) Processes

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A significant contribution to the energy and momentum budget of the MLTI region comes from processes like the tides and the gravity waves. The measured temperature and wind fields around mesopause reflect the changes in the energetics and the dynamics of this region brought about by various competing insitu and non-local processes at any given time and location. The measurements on the night airglow emission intensities, OH band emissions in particular, had been traditionally used to get an indirect estimate of the temperature in the source region close to mesopause. Similar measurements during daytime have been proved to be technically challenging. The unique Multiwavelength dayglow photometer (MWDPM) operating from Thiruvananthapuram (8.5°N, 76.5°E, 0.5°dip), an equatorial station in India, has been providing these much needed continuous daytime measurements, in recent times. Measurements involving MWDPM, VHF radar and ionosonde from this station has brought out some interesting results on the mesopause (~87km) temperature, equatorial electrojet and thermospheric dayglow (O¹D 630.0nm) intensity vis-a-vis the ionospheric parameters measured by radar at altitudes slightly higher above. Few of these results are mentioned below.

- Significant day-to-day variations in the overall mesopause temperature are observed. The monthly mean temperatures exhibit distinct trends.
- The mean mid-day temperatures during winter months exhibit the presence of waves with an approximate period of ~16 days. While short-term periodic trends are quite frequent in the estimated temperatures, there are relatively fewer occasions when the thermospheric airglow intensity, alongwith the mesopause temperature, also shows wavelike periodicities.
- The initial comparison of the temporal variations in the mesospheric temperature with the radar measured irregularity drifts, Type I in particular, reveals significant correlation.
- The mesopause temperatures appear to be significantly low (~10K) during counter-electrojet events.

A detailed account of these results will be presented to highlight and discuss the daytime equatorial mesosphere, thermosphere and the ionosphere (MLTI) as a coupled system and the couplings involved therein.