Observed Thermal Structure Differences from Coordinated Lidar Observations over Tropical and Sub-tropical Stations in India: Gadanki and Mount Abu

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Nd: YAG laser based Rayleigh lidars are in operation at, Gadanki (13.5^o N, 79.2^o E) a tropical site, and Mount Abu, (24.5^o N, 76.2^o E) a sub-tropical site in India. Lidars were operated simultaneously during the months of March, April and May 2004 for about 40 nights. Significant differences are found in the temperature profiles of March 2004 as compared with CIRA-86 and MSISE-90 model temperature and it is more pronounced above the stratopause over both the stations. The maximum temperature of about 250 K is observed at 50 km altitude, which is about 10 K higher than the CIRA-86 model temperature. At Mount Abu higher temperature (compared to CIRA-86 and MSISE-90 model temperature) is observed in the upper stratosphere, which is not found in the temperature observed over Gadanki during March 2004. However, during April 2004, on few occasions higher temperatures (~5 K) have been found in the height range of 55-65 km over both the locations. Temperatures above the stratopause do not show any signature of warming during May 2004. Lower temperatures have been recorded below the stratopause as compared to CIRA-86 model temperature during May 2004 at Gadanki, while no such feature has been observed over Mount Abu. Lidar observed temperatures over both the locations are compared with the temperatures from satellites (HALOE onboard UARS and SABER onboard TIMED). Although, qualitative agreement is found between lidar and satellite observed temperatures over both the locations; quantitatively there are significant difference (~ 10-12 K) in the mesosphere. Planetary wave type structure with a period of 2-3 days has been found in the observed temperatures at fixed altitudes over both the locations.