# Abstract Details

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**Corresponding Author :** Mr. S.V SUNIL KUMAR (sunilspl@yahoo.co.in)

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**Title:** Temperature dependencies of tropical cirrus properties

**Abstract:** Cirrus clouds are globally widespread and are well positioned in the upper troposphere to modulate the fluxes of incoming shortwave and out going longwave radiation. Hence they play a significant role in the radiative balance of Earth atmospheric system. Very low temperature and ubiquitous nature of cirrus at the upper troposphere indicates that they are composed of ice crystals. While the tropical cirrus forming at a higher altitude where the ambient temperature is low (cold cirrus) is composed of highly non-spherical ice crystals, the midlatitude warm cirrus forming at a lower altitude associated with higher temperatures is composed of supersaturated droplets and quasi-spherical ice crystals. The mid-cloud temperature and altitude at which the clouds are located play an important role in determining cloud radiative effects. The temperature dependencies of tropical cirrus properties have been studied using their mean properties derived from lidar observations at Gadanki (13.5°N, 79.2°E). The mid-cloud temperatures are obtained from the altitude profile of tropospheric temperature obtained from MST radar derived vertical winds. In this tropical station cirrus clouds are generally observed in the altitude region 10 to 18 km. The mid-cloud temperature lies in the range −85° to −40°C. In 90% of cases the mid-cloud temperature (Tc) is below -50°C. In most of the nights cirrus clouds are observed at an altitude where the ambient temperature is −60 ±10°C. The temperature dependence of cirrus properties such as cloud mean altitude, cloud width, Linear Depolarization Ratio (LDR), cloud depolarization, cloud extinction (or cloud optical depth) are studied. The cloud temperature decreases with increase in altitude as expected. The cloud width is a maximum (~1.7 km) in the temperature range −75° to −50°C. For higher and lower temperatures the cloud width decreases. The LDR within the cloud increases with decrease in Tc. This can be attributed to decrease in cloud particle size with decrease in temperature as revealed from direct insitu measurements. The cloud extinction and optical depth increases with increase in Tc. The temperature dependence of cirrus extinction / optical depth has been parameterized using different analytical forms such as exponential, linear and polynomial. The parameterisation results show that the polynomial function is well suited for cirrus extinction followed by linear function. From the measured cloud optical depth and particle size distribution model valid for tropical cirrus, the cloud ice water content (IWC) is estimated. The seasonal variation of IWC has been examined. This shows that the cloud IWC is high during the Southwest-monsoon months of June-September and low during winter.

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## Co-Authors

| No. | Title | First Name | Family Name | Organization |
|---|---|---|---|---|
| 1 | Dr. | Parameswaran | K | SPACE PHYSICS LABORATORY,VSSC |