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*Supplement of*

## **Long-term trend analysis and climatology of tropical cirrus clouds using 16 years of lidar data set over Southern India**

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**Table S1.** Number of profiles being used to compute percentage of occurrence shown in Fig. 2

Seasons	NARL Lidar		CALIOP	
	Total no. of profiles	Total no. of cloudy profiles	Total no. of profiles	Total no. of cloudy profiles
Winter (DJF)	41205	13515	720 (673)*	298 (218)
Pre-monsoon (MAM)	28695	13140	741 (674)	385 (334)
Monsoon (JJA)	9090	6900	781 (780)	698 (680)
Post-monsoon (SON)	14700	7725	780 (779)	495 (588)
Total	93690	41280	3022 (2906)	1876 (1820)

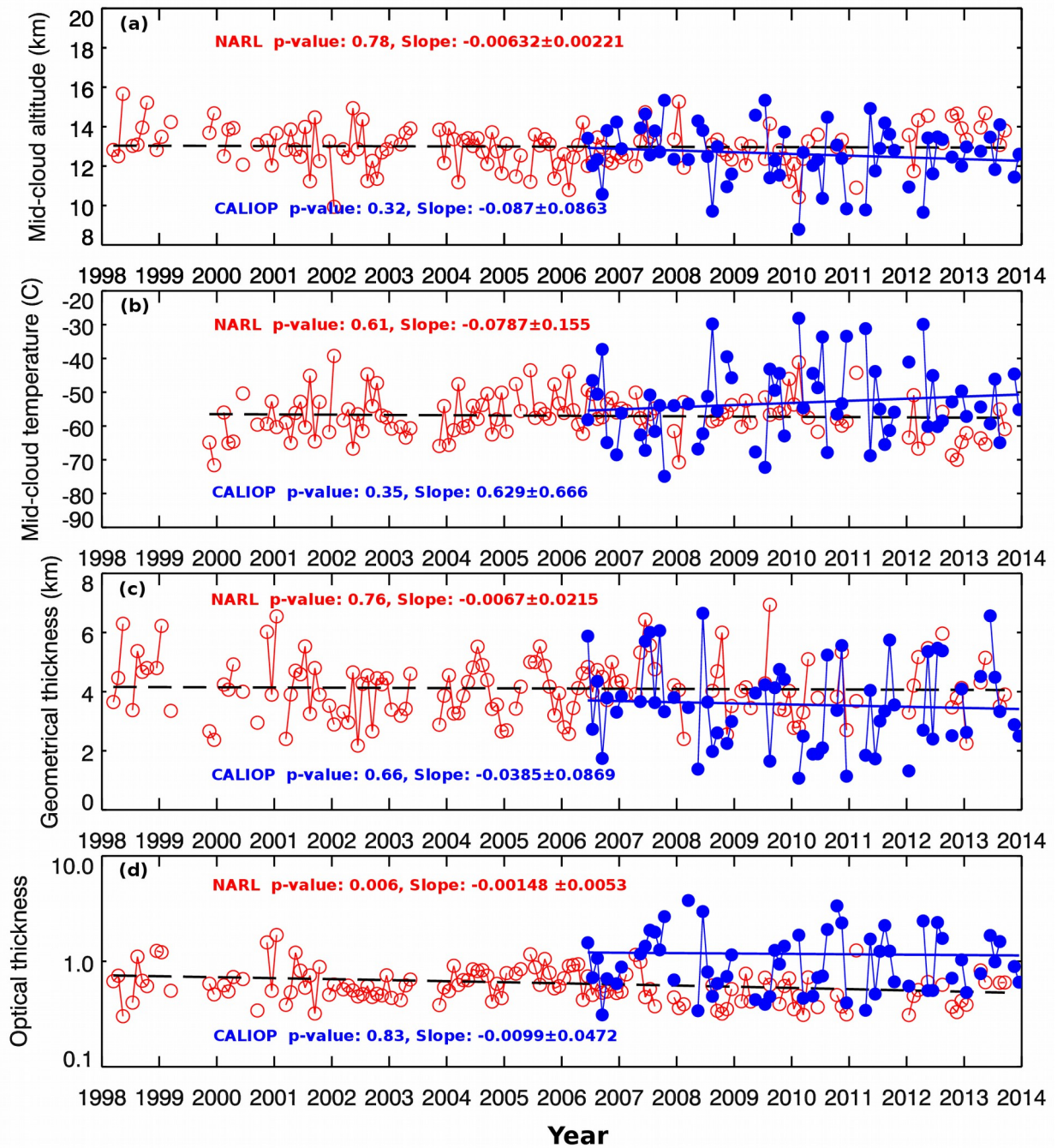
(\* Value in the parentheses corresponds to CALIOP day-time observations.)

**Table S2.** Details of trend analysis for cirrus cloud properties for each type of cirrus cloud.

Parameter	Sub-visible cirrus		Thin cirrus		Thick cirrus	
	Trend per year	p-value	Trend per year	p-value	Trend per year	p-value
Mid-cloud altitude (km)	<b>0.0414</b> (0.0604)*	<b>0.05</b> (0.56)	0.00959 (-0.00264)	0.64 (0.98)	-0.00632 (-0.08724)	0.78 (0.32)
Mid-cloud temperature (°C)	-0.1229 (-0.5745)	0.35 (0.44)	-0.00262 (-0.12121)	0.98 (0.88)	-0.0787 (0.62862)	0.61 (0.35)
Geometrical thickness (km)	0.00473 (-0.0249)	0.27 (0.24)	0.01544 (-0.00917)	0.15 (0.82)	-0.00671 (-0.03852)	0.76 (0.66)
Optical thickness	<b>-9.4 x 10<sup>-5</sup></b> (-2. x 10 <sup>-4</sup> )	<b>0.09</b> (0.6)	3. x 10 <sup>-4</sup> (-1.94x10 <sup>-3</sup> )	0.58 (0.5)	<b>-0.0148</b> (-9.92 x 10 <sup>-3</sup> )	<b>0.01</b> (0.83)
Cloud fraction (%)	<b>0.59</b>	<b>0.1</b>	<b>-0.48</b>	<b>0.09</b>	-0.11	0.6

\*Value in parentheses corresponds to CALIOP night-time data-set. Statistically significant trends are shown in bold fonts.

### Thick cirrus clouds



**Figure S1.** Time series of monthly mean **(a)** mid-cloud altitude, **(b)** mid-cloud temperature, **(c)** geometrical thickness and **(d)** optical thickness of thick cirrus clouds obtained using NARL Lidar (shown by open red circles) and CALIOP night time data (shown by blue filled circle). The dashed black line shows the linear fit to the NARL Lidar data points while the solid blue line shows the same for CALIOP data points. Slopes are expressed in unit per year.