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A study of Cloud Vertical Structure and its association with precipitation over Delhi.

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Water in the atmosphere (in vapour, liquid or ice form) act as a fuel for various atmospheric processes through addition/removal of latent heat. Formation of clouds involves all these processes and thus it greatly affects atmospheric dynamics and thermodynamics. It is important to know the vertical location of clouds in atmosphere in order to understand it's effect on other important atmospheric variables. The interaction of cloud vertical distribution with other meteorological variables is very significant in determining the hydrological cycle of any region. Therefore, in this study we have found out the cloud vertical structure over Delhi and associated it with the precipitation. The cloud top height, base height and cloud thickness along with their vertical location in the atmosphere is known as cloud vertical structure (CVS). The association of CVS with precipitation involving the amount of precipitation contributed by different layers of cloud could be very helpful in weather prediction models. We have used the balloon based measurements to calculate the CVS and for precipitation we have used CHIRPS (Climate Hazards Group InfraRed Precipitation with Station data) data. We have done multiple regressions to determine association between Cloud top height, cloud base height and cloud depth with precipitation. We have also related the monthly average of precipitation with monthly frequency of occurrence of single-layer, double-layer and triple-layer clouds. The frequency of occurrence of clouds classified based on their altitude and depth (i.e., low-level clouds, middle-level clouds, high-level clouds and deep convective clouds) are also correlated with the monthly average precipitation.