12.7 CHARACTERISTICS OF CLOUD VERTICAL STRUCTURE DURING DIFFERENT PHASES OF INDIAN SUMMER MONSOON: CLOUD RADAR PERSPECTIVE

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The intra seasonal oscillation (ISO) of time scales of 1020 and 3060 days comprises of the active and break phases of Indian summer monsoon (ISM). Active (break) phases of ISM correspond to the high (deficient or no) rainfall over tropical Indian regions .Here, Cloud Vertical Structure (CVS) consists of mainly three types of convective clouds. It is proposed CVS is the potent parameter to reveal the contrasting features of ISM phases in terms of cloud macro-physical as well as microphysical properties. High resolution and vertical looking cloud radar measurements of IITM over the Western Ghats serves the purpose, with the added benefit of being quality controlled. Vertical Profile of Radar Reflectivity (VPRR) can be used to infer cloud macro physical properties (e.g. cloud depth, cloud occurrence frequency, cloud particle sizes and shape information) as well as microphysical properties (e.g. liquid and ice water contents). From the present study it was observed that the CVS during active monsoon phase was favorable for clouds to transform into rain. Strikingly, owing to mid-tropospheric dryness during break, the reflectivity structure in vertical is broken between a low level shallow cloud and a thin cirrus cloud. During this period, cloud top heights in the warm regions were limited below 2-3 km (maximum 6km) signifying the fact that their generation was limited to local convection. Thus, compared to active spells, break period lacks the ingredients (updraft intensity, humidity) required for the growth and sustenance of deep clouds. Whereas, during active days, intensity of frequent convergence (besides the local boundary layer convection) is highly evident which helps cloud tops reach even up to 10-14km AMSL. The effect of diurnal heating on convection and consequent initiation of precipitation have resulted in a late afternoon and early morning maxima in the diurnal evolution of radar retrieved liquid water content. Cirrus clouds were found to dominate the occurrence frequency during both monsoon phases compared to mixed phase cloud. This study also showed the variations in the ice water content, thickness, etc of cirrus clouds are the key factors to depict the contrast between the two phases of monsoon. Despite being a point observation, the uniqueness of this study is that it captured the associated large scale monsoon features over the site in terms of radar observed variables. Further analysis is carried out on the macro and microphysical aspects of monsoon clouds using radar measurements and they are attempted to be related to the large scale state of the atmosphere. Analysis of such type and more shall be further elucidated in the conference.