ALTITUDE VARIATION OF DROP SIZE DISTRIBUTION AND LATENT HEAT PROFILES

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Knowledge of raindrop size distribution (DSD) is very crucial to understand the microphysics of cloud systems as well as for retrieving the integral rain parameters. Vertically pointing wind profilers are excellent tools for retrieving rain drop size distribution. Indian MST radar operating at 53 MHz (VHF) is sensitive to Bragg scattering from the radio refractive index fluctuations, while Lower Atmospheric Wind Profiler (LAWP) operating at 1357.5 MHz (UHF) is sensitive to Rayleigh scattering from hydrometeors. At UHF, it is possible to resolve echoes from clear air and precipitation during light rain, however, the precipitation echo masks the clear air echo during moderate to heavy rain. This problem is solved by using a dual frequency algorithm. i.e., the information of the ambient air motion and turbulence is retrieved from a VHF profiler and used in UHF spectra to delineate the precipitation part of the spectra. A Gamma model is then, fitted to the observed precipitation spectra to derive the model parameters. From the retrieved DSD integral rain parameters (Rain rate, reflectivity factor, liquid water content, etc) are derived and compared with Disdrometer derived parameters. A reasonably good agreement is found between these measurements, although radar measurements are volume integrated and Disdrometer is only a point measurement. Further, variations of DSD as a function of altitude in different rain regimes are studied to understand the microphysics of cloud system. During convection, the shape parameters (ì) changed significantly with altitude. During stratiform events at 3.6 km, significant breakup of large raindrops are observed. At the same time an increase in number concentration of lower diameter raindrops are seen in lower altitudes just below where breakup process is seen. At altitude 3.3 km there is combination of drops is seen and there is an increase in the size of drops till size attains 4.0 mm and after reaching 4.0 mm there is again breakup of drops is seen. In Convective event process of Breakup of Rain drops is seen whenever Diameter of raindrop greater than or equal to 5.5 mm and in case of stratiform event Breakup occurred when diameter is greater than or equal to 4 mm. Whenever the concentration of raindrops is high we observed that the vertical velocity and spectral width gradient.

The latent heating associated with deep cloud systems plays an important role in not only global circulation but also meso-and–cloud-scale circulation. Since latent heat heating is the result of the phase change of water, it is possible to retrieve the latent heating profile if both microphysical and dynamical information of cloud systems are available. Using humidity information from

radiometers (launched during rain in a campaign mode) and the vertical wind information from MST radars, Latent heat profiles are derived.