

VHF radar observations of precipitation and drop-size-distribution associated with a typhoon

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High power VHF radar has a unique capability for observing back ground air motion making use of scattering of radio waves from irregularities in the atmospheric index of refraction due to turbulence with fine time and height resolution. VHF radar can detect precipitation and clear air echoes simultaneously. We can measure mean vertical air velocity (updraft or down draft) and fall speed spectrum of precipitation particles, which produce two distinct spectra, one corresponding to back scattered echoes corresponding to refractive index irregularities and other due to precipitation.

This paper describes research on the microphysical (i.e., drop size distributions) and kinematic (i.e., vertical air motion) properties of precipitating systems in typhoon Lekima using Chung-Li VHF radar. In order to understand this phenomenon and the vertical structure of the precipitation associated with typhoon at different time, analysis is carried out on data (26-28 September 2001) to obtain the back-scattered power, velocity and velocity width of the Doppler spectrum of clear air and hydrometeors. Vertical profiles of rain drop size distribution (DSD) parameters are estimated through model based regression analysis during the passage of typhoon to characterize the precipitating system and the different events associated with it.

During the passage of typhoon heavy precipitation was reported by the rain gauge and most of the precipitation, which are moderate and heavy could detect by the radar. It is observed that with in the mesoscale system there are convective and stratiform rains. There are two convective and one shallow convective event observed in three-day observation and remaining time precipitation shows the characteristics of stratiform type. The convective event reported has duration about 15 minutes. This may be a characteristic feature of the convective phenomena within the cells of the rain-bands that move with the typhoon. In the case of stratiform precipitation, most of the time rain gauge recorded value is lower than the values estimated and reverse is the case for convective events. The features of the bright band during convective and stratiform rain are in well agreement with the cases reported elsewhere. During the typhoon passage time the height of isotherm also reported at higher height than the normal day. Probably this is an important feature need to investigate further with more similar cases. DSD parameters were deduced for all the events and shows reasonably good agreement with the observations. The fitting algorithm and deducing the precipitation parameters fails when the clear air and precipitation echoes are closer or merge together. Due to this reason it is difficult to find DSD distribution around melting layer and to understand physical phenomena such as generation, aggregation and successive process associated with precipitation, even when the VHF radar is capable of correcting the background wind affecting the precipitation. However it helps to classify the events distinctly and derive the DSD below the melting layer.