IRS2012-571-1
International Radiation Symposium 2012
Dahlem Cube, Berlin, Germany, 06 – 10 August 2012

Application of a Method to Classify Precipitating Cloud Areas using Radar

W. Parichat and H. Tadahiro

Department of Geophysics, Graduate School of Science, Tohoku University, Japan

Accurate quantitative precipitation estimationis one of the most important elements in Weather forecast. For improvement the accuracy, it is necessary to distinguish between the convective and stratiform components of the cloud systems as the physics and dynamics of air motion and precipitation growth in the convective and stratiform regions differ fundamentally. The common method cannot differentiate the convective and stratiform regions of clouds, and gives the average instead of the componential actual rainfall.It has been long recognized, however, there are still lacks of accuratecloud classified application of precipitation forecastover Thailand. Therefore, we attempt to apply the cloud classification technique to radar reflectivity in order to improve the precipitation forecast.

The ground radar was located at Phimai, Thailand (15o10'90"N, 102o33'88"E)with 231 MSL. The S-band radar transmits the radiation with a wavelength of 10.7 cm, and produces a beam width of 1o and a maximum 240 km range. The Constant Altitude Plan Position Indicator (CAPPI) reflectivity product with 6-minute temporal resolution and 1 km2 for spatial resolution during July to September in 2009 were used.

Precipitation in general may be characterised by convective and stratiform regimes (Houze 1993). Convective systems are associated with strong vertical velocity fields, small areal coverage and high rainfall intensities whereas stratiform systems have relatively weak vertical velocity fields, greater horizontal homogeneity, and lower rainfall intensity.Regarding this point, the basic idea of this method is to search for peaks of reflectivity to the surrounding background reflectivity, then the peaks and a surrounding circular area are categorized as convective, and the remainder as stratiform. The reflectivity threshold for the peaks detection and the convective radius depend on the background reflectivity. This classification proposed by Steiner et al. (1995).

We use3-km altitude Cartesian-gridded data thatinterpolated reflectivity fields at 2km*2km*1.5km gridded resolution.The target convective-stratiform separation method has been iteratively adjusted to match the manual identification as closely as possible. Finally results as the best suitable criteria based on three-step algorithm. First, any grid point having a reflectivity value greater than 30 dBZ is classified as a convective center. This is attributed to the fact that rain of this intensity could practically never be stratiform. Secondly, for the points that are not classified as convective by the above criterion, a background reflectivity is defined, which is the linear average of non-zero reflectivity points within a radius of 21 km centered at the center of that grid point. If any point exceeds this background reflectivity by certain intensity the dependent value is classified as a convective center. This is controlled by a non-linear relationship between the difference in background and the reflectivity at the pixel and the mean background reflectivity. Lastly, for the points that are identified as convective centers by the above two criteria, all surrounding grid points within an intensity dependent radius are also classified as convective. All other non-zero remaining points are classified as stratiform.