

Identification and Filtering of Non-Precipitation Echoes in Dual-Polarization Radar Data Using Selective Frequency Domain Filter

Bo-Young Ye

Dept. of Astronomy and Atmospheric Sciences, Research and Training Team for Future Creative Astrophysicists and Cosmologists, Kyungpook National University, Korea

Lee, Gyuwon (Dept. of Astronomy and Atmospheric Sciences, Kyungpook National University, Korea)

Kwon Soohyun (Dept. of Astronomy and Atmospheric Sciences, Research and Training Team for Future Creative Astrophysicists and Cosmologists, Kyungpook National University, Korea)

E-mail: boyoungye@gmail.com

Removal of radar data contaminated by non-precipitation echoes improves the accuracy in quantitative precipitation estimation. In Korea, S-band dual-polarization radar has been operated since 2009 but recently acquire the capability to collect time series data. In this study, thus, a quality control algorithm is explored by combining two methods (moment-based fuzzy classifier and frequency domain filter) similar to CMD (Clutter Mitigation Decision) algorithm. The fuzzy logic algorithm is used for identification of non-precipitation echoes using the optimized membership functions and weights for Mt. Sobaek radar. The selective frequency filter suppresses the non-precipitation echoes and restores precipitation echoes in the frequency domain.

For selected precipitation and non-precipitation cases, the probability density functions of five fuzzy parameters are derived to define the characteristics of the precipitation and non-precipitation echo. These density functions are used for determination of the membership functions and weights. Finally, the non-precipitation echoes are identified and eliminated by the pre-determined membership functions and weights. The validation of fuzzy classifier are performed using rainfall accumulation, probability of detection, and fraction of echoes as functions of clutter-signal ratio.

To remain precipitation echo untouched and to remove contamination by non-precipitation echoes near zero Doppler velocity, the time series data are processed at pixels that are identified as non-precipitation echoes by the fuzzy classifier and are filtered. Ground clutter signals are removed by the Gaussian function of three points near zero velocity in Doppler power spectrum. Precipitation signals are then recovered by the symmetry of precipitation signal with respect to the peak of remaining power spectrum.