Development of precipitation attenuation correction technique in a dual-pol radar network

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Dense radar network systems with low power transmitters at X-band has been proposed which can fill in observation gaps in low altitudes and have good accuracy and resolution. An X-band dual polarization radar network is the main stream of weather observation to make rapid scanning at low altitude. The dual polarization products such as differential reflectivity (Z_{DR}), specific differential phase (K_{DP}) and correlation coefficient (ρ_{hv}) provide us with detailed information about drop size distribution (DSD) and rainfall rate estimation. K_{DP} can be calculated from differential phase Φ_{DP}.

On the other hand, a weather radar, especially with transmitting short-wavelength pulses, is affected by precipitation attenuation. Various attenuation correction techniques for horizontal reflectivity (ZH) and Z_{DR} using Φ_{DP} and K_{DP} were proposed. However, measured differential phase Ψ_{DP} consists of Φ_{DP} and backscattered phase shift δ_{co}.

Especially at C-, or X-band, contamination due to delta cannot be ignored. Some δ_{co} removing techniques were proposed. Scarchilli et al. (1993) suggested recursive algorithm to remove delta from Ψ_{DP} in an individual radar using δ_{co} - Z_{DR} relationship. They assumed coefficients in the power-law relationship. However, the relationship actually depends on DSD. In this paper, probabilistic attenuation correction technique based on the Bayesian theory in multiple dual polatimetric radar network, is proposed. The proposed technique considering δ_{co} effects also derive coefficients of relationships.

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