6.20 CALIBRATION OF RADAR REFLECTIVITY AND DIFFERENTIAL REFLECTIVITY FOR OPERATIONAL DUAL-POLARIZATION WEATHER RADAR NETWORK

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Stability of radar system leads to significant uncertainty in radar-based quantitative precipitation estimation (QPE). Particularly, mis-calibration of the system results in considerable discrepancies in radar measurements over nationwide radar network. Thus, the accurate estimation of biases in reflectivity (Z_H) and differential reflectivity (Z_{DR}) is the primary requisite to improve an accuracy of rainfall estimation and to mitigate the discrepancies in hydrometeor classification based on radar network. However, it remains as a challengeable issue to estimate the accurate biases using operational dual-polarization weather radar in real time. We aim to calculate the calibration biases of Z_H and Z_{DR} for operational S-band dual polarization radar network.

Z_H bias was calculated based on self-consistency principle between Z_H and specific differential phase shift (K_{DP}). The method is suitable for the large spatial extent and moderate precipitation, but not for convective systems. Therefore, we proposed the total span K_{DP} algorithm to exclude the ray contaminated by hail or convective cells. Total span K_{DP} was defined as total differential phase shift divided by total path length along the ray. This method provides more stable calibration bias in time.

Z_{DR} bias was determined by using vertical pointing method. To obtain stable Z_{DR} biases in real time, we developed automated quality control algorithm for vertical pointing measurements, which is composed of four steps following as: 1) Removal of Z_{DR} above the top of bright band using vertical reflectivity profile, 2) Filter out an invalid radar measurement using thresholds for Z_H (¡0 dBZ), Z_{DR} (¡-2.0 dB or ¿6 dB), and ρ_{HV} (¡0.95) below bright band, 3) Elimination of an invalid layer using the count threshold of valid measurements along azimuthal direction at a given radar range, and 4) Discarding of an invalid layer by the continuity check. Finally, Z_{DR} bias was estimated as averaged Z_{DR} value in linear space. The calibration bias of Z_{DR} was expected to be within 0.2 dB.

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