Assessment of radar reflectivity factor and Doppler velocity measured by portable X-band and Ka-band Doppler weather radars

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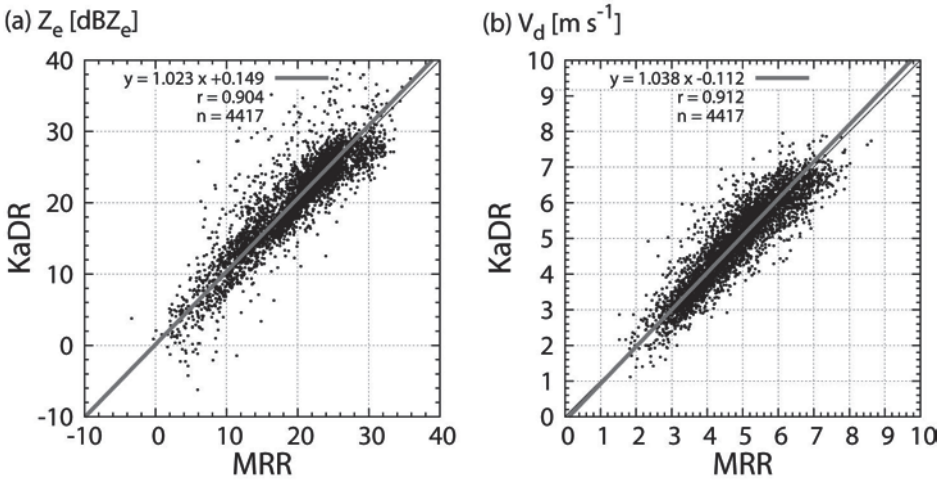
New X-band Doppler weather radar (XDR) has been developed to monitor localized torrential rains and tornadoes. XDR has the portability to be carried by a cart, and has high cost performance attained by using a low-cost magnetron. Owing to their high maintenance costs, most of existing millimeter-wave radars are not suitable for long-term (several months or longer) cloud and precipitation observations, which are necessary for monitoring earth environments. This resulted in the development of the new Ka-band frequency modulated continuous wave (FMCW) Doppler weather radar (KaDR), which achieves high cost performance by using a low-power traveling wave tube used in satellites. This study demonstrates the ability of XDR and KaDR measuring equivalent radar reflectivity factor (Z_e) and Doppler velocity (V_d) accurately.

To assess the accuracy of Z_e and V_d measured by XDR and KaDR, field experiment data collected during 25-26 October 2009 at the Shigaraki MU observatory (34°51'N, 136°06'E) were used. Data of Micro rain radar (MRR) and a 1.3575 GHz Doppler radar named LQ-7 were used to assess the Z_e and V_d measured by XDR and KaDR. Z_e and V_d measured by XDR, KaDR, and LQ-7 were computed from Doppler spectra using the moment method. Figure shows an example of the assessment results. Correlations greater than 0.9, regression slopes close to 1.0, and regression intercepts close to 0.0 indicate that XDR and KaDR measured Z_e and V_d accurately.



Scatter plot of Z_e (left) and V_d (right) measured by MRR and KaDR.

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