The Assimilation of Dual Phased Array Weather Radar Observations to Short-range Convective Forecasts

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The assimilation of Doppler velocity and reflectivity observations from phased array weather radar (PAWR) has been widely studied for the use of short-range numerical weather prediction (NWP) and have been found to have positive impact on analyses and forecasts of convective scale weather systems (Maejima et al 2017). However, these studies only assimilated observations from a single PAWR and the use of multiple PAWR observations for NWP has not yet been explored. With the recent development of PAWR located at sites in Osaka University and Kobe a common observation region has been established providing dual radar observations over a large area of the Kobe region, where sudden convective storms can develop and bring intense rain, causing hazardous conditions.

In this study we investigate the impact of utilizing dual PAWR observations for the prediction of a localized convective weather system. We employ the use of the SCALE-LETKF system (Lien et al, 2017), which couples the Local Ensemble Transform Kalman Filter (LETKF) with the Scalable Computing for Advanced Library and Environment (SCALE)-Regional Model (RM), to perform data assimilation experiments with 30-second-update of PAWR observations within a high-1km resolution mesh in order to capture the rapid development of convective activity. The dual reflectivity observations are initially used to identify and remove remaining false echoes from observations, including range sidelobes which are a common radar artifact, thereby improving upon existing quality control measures. Next, we introduce a process of combining reflectivity observations from both radars to reduce the loss of information from rain attenuation, which is a major problem for X-band radars. The results show that implementing these new data assimilation methods lead to improvements in both rainfall intensity and distribution in short range forecasts.

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