The Use 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) have been widely studied for the use of short-range numerical weather prediction (NWP) and have been found to have positive impact to analyses and forecasts. However, these studies only assimilated observations from a single PAWR and the use of multiple PAWR observations for NWP has not yet been explored. Yet the recent development of PAWR located at sites in Osaka and Kobe, Japan mean that a common observation region now exists where we are able to obtain a set of dual PAWR observations in an area where convective storms can develop suddenly bringing intense rainfall and hazardous conditions.

In this study we present the first attempt of utilizing dual PAWR observations for the purpose of numerical weather prediction of a sudden convective rainfall event. Firstly, we present a new approach to removing three-body scatter spikes, a common radar artifact that appear as elongated echoes extending radially away from convective storms, utilizing the dual radar observations. Secondly, we employ the SCALE-LETKF system, which couples the Local Ensemble Transform Kalman Filter (LETKF) with the Scalable Computing for Advanced Library and Environment (SCALE)-RM model, to perform simulations with 30-second-cycling of PAWR observations within a high-resolution mesh. The results showed we can exploit the availability of two PAWR radars to observe a single convective rainfall event and improve analyses and short-range forecasts with dual-PAWR assimilation compared to assimilating observations from just a single PAWR.

Keywords: LETKF, Assimilation, Forecasts