

Ensemble-based Singular Value Decomposition Analysis to Clarify Relationship between the Atmospheric State and the Hydrometeors

Sho Yokota (syokota@mri-jma.go.jp)

Meteorological Research Institute, Japan Meteorological Agency,
Forecast Research Department

To improve the accuracy of numerical forecasts of local rainfalls through assimilation of dense observations, it is important to understand the relationship between the hydrometeors in the rainfall regions and the atmospheric state around the precipitating area. A statistical analysis based on ensemble forecasts with large members using a cloud-resolving model is one of the promising approaches to investigate such relationship. Therefore, we performed the singular value decomposition of the ensemble-based cross-covariance matrix between the hydrometeors and the atmospheric variables using 301-member ensemble forecasts of a local rainfall event occurred on the Kanto Plain in Japan on 4 August 2016. The initial states of the ensemble forecasts were created by assimilation of the C-band polarimetric radar, the water vapor Raman lidar, GNSS, and so on with the local ensemble transform Kalman filter (LETKF). The resulted singular vectors indicate that the hydrometeors in the rainfall were mainly correlated with the atmospheric state only below the 2-km height before the rainfall although they were correlated with the atmospheric state from the ground to over 10-km height after the rainfall. This result means that correcting the atmospheric state near the surface through the hydrometeor data assimilation is effective for rainfall forecasts.