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Is 30-second update fast enough for convection-resolving data assimilation?

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For local severe weather forecasting at 100-m resolution with 30-minute lead time, we have been working on the "Big Data Assimilation" (BDA) effort for super-rapid 30-second cycle of an ensemble Kalman filter. We have presented two papers with the concept and case studies (Miyoshi et al. 2016, BAMS; Proceedings of the IEEE). We focus on the non-Gaussian PDF in this study. We were hoping that we could assume the Gaussian error distribution in 30-second forecasts before strong nonlinear dynamics distort the error distribution for rapidly-changing convective storms. However, using 1000 ensemble members, the reduced-resolution version of the BDA system at 1-km grid spacing with 30-second updates showed ubiquity of highly non-Gaussian PDF. Although our results so far with multiple case studies were quite successful, this gives us a doubt about our Gaussian assumption even if the data assimilation interval is short enough compared with the system's chaotic time scale. We therefore pose a question if the 30-second update is fast enough for convection-resolving data assimilation under the Gaussian assumption. To answer this question, we aim to gain combined knowledge from BDA case studies, 1000-member experiments, 30-second breeding experiments, and toy-model experiments with dense and frequent observations. In this presentation, we will show the most up-to-date results of the BDA research, and will discuss about the question if the 30-second update is fast enough for convective-scale data assimilation.