Applying data assimilation to precipitation nowcasting

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Data assimilation (DA) has been developed in numerical weather prediction (NWP) for decades. Various types of observations are combined with physically-based numerical simulations in a sophisticated way. In a similar manner, we applied DA to precipitation nowcasting with space-time extrapolation. Although the basic workflow is the same as NWP, there are two major differences. The model we use is a simple advection equation without complex physics, and the "observations" are motion vectors computed from consecutive two bitmap images by a cross-correlation method. These differences require additional developments of DA techniques for nowcasting such as covariance inflation in an ensemble Kalman filter. We have been running two nowcasting systems at different scales: 1) global precipitation nowcasting based on satellite observations for 12 hours, and 2) phased-array weather radar three-dimensional nowcasting for 10 minutes. The local ensemble transform Kalman filter (LETKF) is applied in the global precipitation nowcasting to achieve high accuracy, whereas a simple grid-by-grid time filtering is used in the phased-array radar nowcasting to achieve high stability and low computational cost. In this presentation, we will discuss differences in these DA methods for nowcasting at different scales.

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