# Localization on convective scales: What can we learn from a 1000-member ensemble?

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**Abstract**

Finding a proper localization is crucial for the success of ensemble data assimilation systems. Localization mitigates sampling errors and damps spurious correlations, which arise when modeling ensemble-based background error covariances using small ensembles. However, choosing an optimal localization is very challenging, especially for non-local satellite observations. Our goal is to improve localization techniques on convective scales by applying a novel convective-scale 1000-member ensemble simulation. The data set covers several forecasts in a high-impact weather period in summer 2016 (Necker et al. 2020a & 2020b). Our latest study analyzes correlations and optimal localization in the vertical. We focus on 40-member subsamples and assume the 1000-member ensemble as truth. We present estimated optimal localization length scales based on the often-applied Gaspari-Cohn tapering function. Besides, we discuss optimal localization functions for different variables and observations in model and observation space. That includes the open question on how to optimally localize visible and infrared satellite observations. A distance-based localization can be suboptimal for non-local satellite observations considering domain localization. A possible solution offer statistical sampling error correction approaches.

**Keywords:** ensemble data assimilation, convective, scale, localization, satellite, sampling error, covariance

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