Perianez, A., T. H. Reich, and R. W. E. Potthast, 2014: Optimal localization for ensemble Kalman filter systems. *J. Meteor. Soc. Japan*, **92**, 585-597.
Special Edition on AICS International Workshop on Data Assimilation
http://dx.doi.org/10.2151/jmsj.2014-605

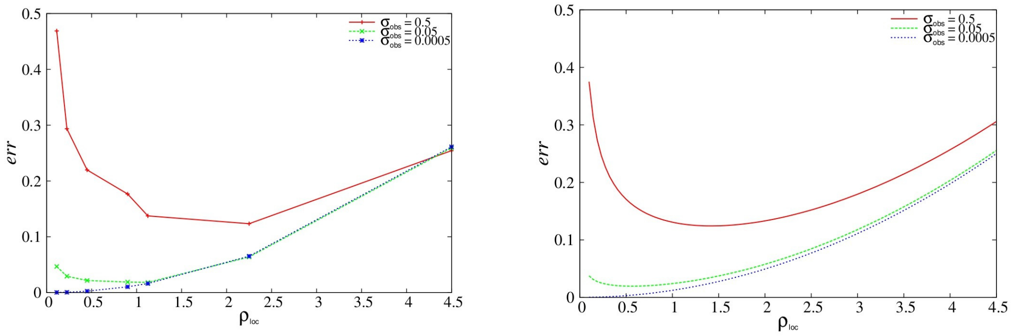

Figure 1. We show the numerical and theoretical error curves for the assimilation error with different localization radii.

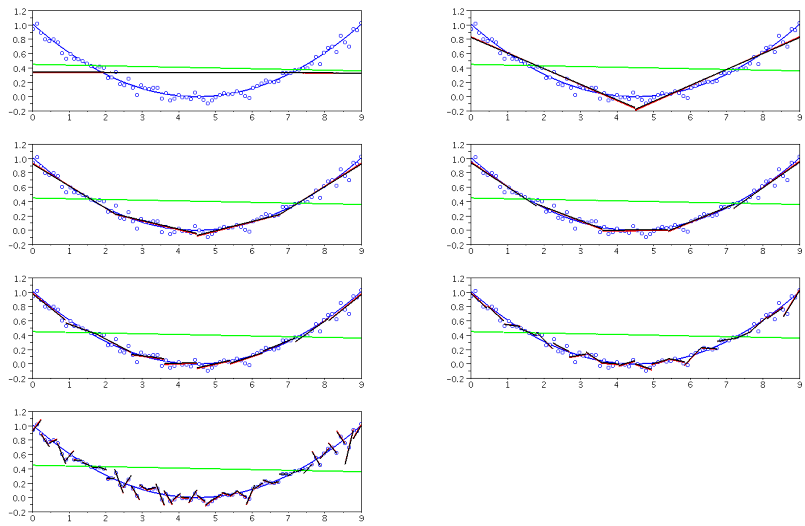

Figure 2. Depending on the localization radius the reconstruction of the quadratic function from noisy measurements moves from high approximation error (no localization) to high noise error (strong localization).

- In ensemble Kalman filter methods, localization is applied for both avoiding the spurious correlations of distant observations and increasing the effective size of the ensemble space. The procedure is essential in order to provide quality assimilation in large systems; e.g., severe localization can cause imbalances that impact negatively on the accuracy of the analysis.
- We want to understand the fundamental properties of localized ensemble methods and to investigate an optimal localization formula that minimizes the analysis error. The theoretical expression of the optimal localization radius that we derive in this work depends on the observation error, the density of measurements, and the approximation error, i.e., the error that comes from working in the ensemble space.
- The mathematical results are tested with two numerical simulations using a toy model. We demonstrate that observations with different observation error or density need different localization length scales. The numerical results demonstrate the validity of the analytical results derived in our first parts.