

Weight Structure of the Local Ensemble Transform Kalman Filter: A Case with an Intermediate AGCM

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The Local Ensemble Transform Kalman Filter (LETKF) computes the analysis by a weighted average of the first-guess ensemble with surrounding observations within a localization cutoff radius. Since overlapped observations are assimilated at neighboring grid points, the LETKF results in spatially smooth weights. This study explores the spatial structure of the weights with the intermediate atmospheric model SPEEDY (Simplified Parameterizations, Primitive Equation Dynamics). Based on the characteristics of the weight structure, we aim at improving the weight interpolation (WI) method with which we compute the weights at coarser reference points and interpolate the weights into higher resolution model grid points. The results show that larger localization and sparser observations result in spatially smoother weights. WI is less detrimental for larger localization scales and sparser observations when weight patterns are spatially smoother. An advanced WI method with observation-density-dependent reference points results in better forecasts than those with uniformly distributed reference points. This improvement may be owing to the spatially inhomogeneous localization function realized by WI with observation-density-dependent reference points. The spatial distribution of the optimal localization scales shows that larger (smaller) localization is beneficial in sparsely (densely) observed regions. This presentation will include the most recent progress up to the time of the conference.

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