

Impact of reduced non-Gaussianity on analysis and forecast accuracy by assimilating every-30-second radar observation with ensemble Kalman filter: idealized experiments of deep convection

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Thank you for revising the manuscript properly based on my comments. Although many of my concerns are addressed, I suggest the authors to address the following minor comments additionally. The order of the following comments is not related to importance.

Comments:

1. L23-26: Could you add any references for 4D-EnKF?
2. L61: The unnecessary “re” should be removed.
3. L77-79 and L314-317: The spatial localization modifies the form of probability distribution function of the ensemble perturbations in EnKF analysis. It should be stated as one of the limitations of this study.
4. L128: “ \mathbf{y}^b ” \rightarrow “ $\bar{\mathbf{y}}^b$ ”
5. L146-148: The descriptions of the threshold and the upper limit are not necessary because they are obvious or redundant. (I don’t think the number of observations assimilated at a grid point exceeds 100.)
6. L162-163: This study states “we assume only convective-scale uncertainty (L73)”. Nevertheless, why are the perturbations necessary in the area outside the convective cell?
7. L164-165: It should be stated that the time when high reflectivity is first observed is 10 min after the initial Gaussian perturbations are added.
8. Table 1: The height of the center location also should be written here.
9. L191-194: To describe the definition of $p(x,y)$ may help readers understand.
10. Figure 3:
 - i. The time after 00:50:00 is confusing and not necessary to be plotted because it is not the data assimilation period.
 - ii. The assimilation window is not 5 min in 30SEC. Nevertheless, why the lines of 30SEC are plotted every 5 min? They should be plotted every 30 sec. The consistency to the explanation in L211-214 also should be confirmed.
11. L201: “The first The number of assimilated observation peaks ...” \rightarrow “The first peak of the number of assimilated observations is ...”
12. L212-213: “respectively 6.6 dBZ in the 5MIN-3D case and 3.2 dBZ in the 30SEC case” \rightarrow “respectively”
13. L235-237 and L304-307: Why was the impact on ensemble forecasts limited although analysis ensemble spreads were significantly different? To answer this question is important for this study.
14. Figure 7: Could you state the position ($X = 78$ km, $Y = 80$ km, $Z = 12.1$ km) also in the caption?
15. L245-246: Could you explain your interpretation that nonlinearity appears as non-Gaussianity also in the text?
16. L277-280, L290-292, and L349-354: Why the biased background profile causes these side effects should be explained briefly in the text.

17. L361: "Figure 10" -> "Figure 11"

18. L372: "Figure 6a" -> "Figure 7a"