General comments

A new algorithm called "Local DA" is introduced. Compared to the last version, the current manuscript has been considerably improved. Overall, I feel that the paper is lengthy as authors attempts to tackle several problems. But some of them remain still unclear to the end and will be further investigated in the future as authors claims. In my opinion, the most remarkable difference compared to the LETKF is that the Local DA works in columns instead of in points. Therefore, I have one concern in this regard.

1. If I understand correctly (I may get it wrong), the Local DA works in columns. Therefore, I thought there is no need for vertical localization for integrated observations (e.g., PWV). But there is vertical localization applied to PWV. Intuitively, I would have thought that the Local DA should be able to better assimilate PWV data since it does not require the vertical localization, but there is no discussion about this.

Minor points:

1. Line 55: do not understand "The LETKF, however, performs the analysis in the ensemble space, which implies that a static ensemble is necessary".

2. Section 2.1: It is suggested that dimensions be given here as well.

3. Line 170: do not understand "Note that the variational DA methods seek the combination of the columns of the square root of the background error covariance matrix, while Local DA combines the columns of the error correlation matrix" since the 3DVAR is also formulated as an optimization problem of control variables.

4. Line 210: What is $\overline{\hat{\mathbf{X}}}_o$?

5. Line 244: do not change $--\!>$ are equal

6. Line 259 : Typo: Coo

7. Line 283: $\mathbf{x}^f$ is not initial condition

8. Line 407: Is the fixed multiplication inflation 1.5 employed in all experiments?

9. Line 464: "Let us have a quick look at the results", the language is too causal.

10. Line 511: speculation $--\!>$ assumption

11. Line 540-541: differences ... are ...

12. Line 542: overestimated negative increment

13: Line 615: correlation $--$ > ratio