

General statement

We would like to thank the editor for coordinating the review of our work and the peer-reviewers for their valuable comments on our study. In the following, we will address the referees' comments and present our plans and ideas for revising the manuscript. For clarity, our responses are highlighted in blue.

Referee #2

1. L 12-13: Change "This error not only reflects the spatial characteristics of the difference between first guess and observation but also dominates the primary uncertainty in analysis errors" with "This error reflects the spatial characteristics of the difference between the first guess and observations and dominates the primary sources of analysis uncertainty."

Reply 1:

Thanks for the comments. We have revised the sentence in Line 12-13 as suggested.

2. L 53-55: Change: "The observations provide an estimate of the true atmospheric values, while the three-dimensional first guess provides a complete spatial structure within the region of interest." with "Observations estimate true atmospheric values, while the three-dimensional first guess offers a comprehensive spatial structure for the region of interest."

Reply 2:

Thanks for the comments. We have revised the sentence in Line 53-55 as suggested.

3. L 214-215: Change: "The primary objective of this work is not to show dramatic improvements in verification scores, but to focus on the quantification of uncertainty in analysis" with "This work primarily focuses on quantifying analysis uncertainty rather than achieving dramatic improvements in verification scores."

Reply 3:

Thanks for the comments. We have revised the sentence in Line 214-215 as suggested.