

Dear Reviewers:

We sincerely appreciate your valuable comments and suggestions, which have significantly improved the quality of our study. We have revised the manuscript accordingly and responded to all comments. Below are our point-by-point responses. The reviewers' comments are presented in black, our responses in blue, and the proposed changes to the manuscript in red.

Reply to Reviewer #1:

The latest version addressed most reviewers' comments. It is in a good shape for publication pending the following minor revisions:

1. Lines 511-512: "This discrepancy stems from... using surface station data".
Suggest removing this sentence.

Response:

Thank you for your comment. This sentence has been removed.

2. Lines 515-517: "On the one hand...on the other hand...": They talk about the same thing, i.e. background error covariance contribute to the negative impact which has been covered in Lines 514-515. Suggest removing them or revising them to read more smoothly.

Response:

Thank you for the suggestion. These sentences (Lines 515–517) are intended to further explain the statement made in the previous sentence (Lines 514–515). We have revised the phrasing to make the connection smoother and clearer.

“Regarding the degradation of wind fields above 500 m AGL, the background error covariance may contribute to this negative impact. Specifically, it propagates the RTTOV-gb increments concentrated in the ABL to higher levels and induces wind field adjustments in response to temperature and humidity updates.”

3. Lines 563-564: 1. "Be leveraging their complementary...across multiple layers of the atmosphere": either remove this sentence or move it to before "a more comprehensive evaluation of ..."; 2. if moving this sentence, change "this approach has the potential to" to "we may" as well.

Response:

Thank you for the suggestion. We have chosen to remove this sentence as suggested.