

Authors thank three reviewers for taking time in reviewing this paper and providing positive comments and valuable suggestions. We addressed all comments in the revised manuscript and provide responses here in red text. In addition, we re-produced all figures with a color scheme accessible to readers with color-blindness.

Response to RC1:

1. A more detailed caption for Figure 1 is required for standalone comprehensibility.

The revised manuscript uses a more detailed caption for Figure 1.

2. Figure 2 has quality issues.

Fixed the figure quality issue in the revised manuscript.

3. Please refer to the GMD style guide

1. Avoid the use of hyphenate modifiers containing abbreviated units. This includes "6-h" (e.g., line 240, 275), "30-km" (e.g., line 237, 241,), etc
2. Numbers that begin a sentence should be spelled out or reformulated (e.g., line 243, 412, 416).
3. The units of physical quantities in the denominator should be formatted with negative exponents (e.g., m/s should be $m s^{-1}$)
4. Equations should be referred to by the abbreviation "Eq." and the respective number in parentheses (e.g., line 118, 161, 190,).

Corrected all of these in the revised manuscript.

Response to RC2:

Line 286: This line "Overall the mean and RMS give the same indication regarding the four experiments' relative performances." Is not clear. What is meant by "give the same indication"?

Revised it as "Overall the mean and RMS give the consistent performance indication for the four experiments."

Line 305: What is the relevance of this comment? "Note that the majority of radiosonde temperature observations in GSI's ncdiag files is expressed in terms of Tv." Also, "is" should be replaced with "are".

This sentence is to explain why Tv instead of T is used in the figure. Assimilating Tv is a practice of GSI. We clarified this with a revised sentence. Replaced 'is' by 'are' in the revised manuscript.

Lines 313 and 357: An experiment "clmhs" is mentioned in two locations in the text. Do you mean "clrmhs"?

Thank you for catching those typos. Yes, they should be 'clrmhs'. Corrected.

Line 437: Suggested wording changes: less-advanced and fewer observations.

Changed as suggested.

Figure 1: The caption for this figure is insufficient.

The revised manuscript uses a more detailed caption for Figure 1.

Response to RC3:

- 1) The abstract is too long, it needs to be a concise summary of the manuscript, not read like the introduction.

Shortened the abstract in the revised manuscript.

- 2) Please use standard notation from Ide et al 1997 where it should be $\mathbf{h}(\mathbf{x})$ for nonlinear observation operators and $H\mathbf{x}$ for linear.

Changed as suggested.

- 3) The caption for figure 1 is unacceptable and needs to concisely explain what is in the figure

The revised manuscript uses a more detailed caption for Figure 1.