

Itemized response to Topical Editor

TE - 1. The statement about T impact and GNSSRO refractivity is unclear and clarification is required.

a. Line 409-410: “The vertical distribution of T impacts ... largely align with the impacts to GNSSRO refractivity.” Is this referred to the impact in southern hemisphere or all latitudes? It is not clear whether the degradation is related to the GNSSRO refractivity assimilation. If yes, this should be clearly addressed. I assume that the GNSSRO observations are available globally, not limited in the southern hemisphere.

b. Line 467-469: “Sensitivity tests conducted after this study was complete indicate that GNSSRO assimilation needs to be interrogated and improved”. This sentence is unclear to me. Have the authors conducted additional sensitivity experiments with the GNSSRO refractivity? Please provide clarification.

AC - 1a. L412 (new line numbers) "The vertical" —> "The vertical and latitudinal"

AC - 1b. Modified sentences starting on L470 (new line numbers). The new text says, "We have since conducted multiple sensitivity tests where we assimilate GNSSRO bending angle instead of refractivity, and carefully tune the bending angle observation errors. Those experiments reduce the stratospheric temperature bias significantly, and additional corrective measures are still under investigation."

TE - 2. I suggest that the authors should briefly comment about the neutral impact of the Qv field in dart100 and eda100, compared with gefs100. While there is clear difference between eda100 and gefs100 in other fields (U, V, T), why shouldn't we expect improvement in the Qv field? Is this related to the optimization of microwave radiance assimilation?

AC - Added two sentences starting on L391 (new line numbers): “The neutral Qv impact in this globally- and vertically-aggregated metric is likely due to the limited assimilation of moisture-sensitive observations (only sondes and aircraft). Assimilating radiances from water vapor channels in all-sky scenes (i.e., Liu et al., 2022) would better reveal the Qv impacts of these experimental ensembles.”