Response to Reviewers

February 28, 2026

We thank the referee for the comments. Reviewer comments are in **bold**, while our responses are in normal text.

Response to Reviewer 1

2. Result discussion on radiative impact

We plan to conduct a follow-up study including the role of water vapour and its feedback, including also the feedback of the other greenhouse gases on the dynamics, i.e. the transition from a quasi chemistry transport model (QCTM) to a fully coupled chemistry cliamte model (CCM). This study will elucidate much more the role of water vapour mixing and will potentially be more comparable to the results of Riese et al.. However, the chemical feedback on the dynamics has also not been addressed in the Riese study, as the CLAMS model is driven by ERA5, and does not allow for wind, temperature or pressure field modifications by radiation.

3. Outlook on future work (Sect. 4) I also encourage the authors to extend the outlook section a bit further. Given that the cooling effect found in this study is different from the warming effect concluded from the previous study, would the authors suggest possible ways to verify the simulation results? Related to Comment 1, maybe "the pros and cons" (line 334) can be a bit more specific.

We modified in the manuscript from considering the pros and cons of each diagnostic. to considering the pros and cons of each diagnostic on representing turbulence formed by different mechanisms.

Technical corrections
Tropopause definition for Fig. 2 and other figures: After the restructuring of the original Sect. 3.1, seemingly there is no description of the definition of tropopause. I assume it should still be the lapse rate tropopause? Consider inserting this information at a suitable place.

It is the PV tropopause at the extratropics and lapse rate tropopause at the tropics. The information has now been inserted into the figure caption.

Unit of t_{norm} in Table 2: Compared to the reply document, it is stated that t_{norm} is dimensionless. I am a bit confused by the unit here.

The t_{norm} is calculated by a time scaling factor divided by the second of a day, both of them are

with the unit of second, so mathematically it is indeed dimensionless. And since it is divided by the second of a day, we intended to provide a physical interpretation of it as a time scale in the table. To avoid confusion, it has now removed from the table.

Typo of "QCTM-MIX-ERI": e.g. line 177 and in Table 3.

Corrected.

Line 156: I think it is the mapping function being piece-wise linear - "while the mapping functions between the strength ..."

Corrected.

Line 163: "In order to ... CAT submodel, a comparison ..."

Corrected.

Line 185: "potential impact of tracers by the mixing algorithm of CAT"

Corrected.

Line 317: "while in the extra-tropics"

Corrected.

Line 333: "The CAT submodel also has the option ..."

Corrected.