Review of Spang et al, 2023, round 2

I thank the authors for incorporating many of the suggestions, both clarifications and some major additions or changes (e.g., moving the winter radiation effects to the discussion part of the manuscript). I have two additional major points and several minor points that should be addressed before the study can be published

1. **UTC and climate models**

In the Abstract:
"These clouds have a small vertical extent and optical depth, and are frequently neither observed even by sensitive sensors nor considered in climate model simulations"

Such clouds are simulated by at least some models, and are certainly not actively excluded from simulations. Saying "not considered" implies that models just don't simulate them for some reason. This is not true, and should be removed from the sentence.

"The properties of ultrathin cirrus clouds in the lowermost stratosphere and tropopause region need to be better observed and ultra thin cirrus clouds need to be considered in climate model simulations."

Instead of considered I suggest "evaluated" or similar.

In conclusions:

So far UTCs are an unnoticed cirrus cloud type in many fields from cloud microphysical modelling to the parameterisation of the formation processes for various types in global models. …
Finally, such work should allow a more accurate quantification of the cooling or warming potential of UTCs ~~which is so far not included in climate models.~~

I would like to point out again that UTCs have not gone unnoticed in climate modeling. They are also not a separate cloud type, just the thinnest of the clouds that form. I believe that such clouds are relatively well sampled in some of the in-situ datasets (indeed, with rather poor coverage over high latitude areas).
Beyond the references mentioned earlier (Gasparini et al., 2018, Nugent et al., 2022, Turbeville et al, 2022, Gasparini et al., 2022), see also Sullivan et al., 2022, Atlas et al., 2023 or Lamraoui et al., 2023, and probably some more that I didn't list.

2. **Other impacts of UTC**

Related to two of the comments in the first round of review:
(1)
…However, even such thin clouds may be important in modulating the radiative budget within the atmosphere and thus modifying the mean tropopause temperature. In this way, they may indirectly control the amount of water vapor entering the stratosphere (at least in the tropics) and influence circulation patterns. This may be their most important climatic role and should not be neglected in this analysis.
And (2)
I would instead appreciate it if the authors showed the heating rates (units K day-1) in the result section. I am mentioning that particularly as it is very straightforward to transform radiative flux vertical profiles in W m-2 to heating rates. High cloud heating rate was shown

to strongly modulate circulation patterns (e.g. Voigt et al., 2021, Gasparini et al., 2023 and references therein).

I suggest adding some information on this issue in the Discussion/Conclusion section as possible follow-up work that could have a larger climate impact.

While the manuscript is very valuable because it is the first to evaluate the CRE of UTC, its main results (for a climate modeler) imply that we shouldn't worry too much about UTC. Their CRE is small, but comparable to the CRE of cirrus contrails. However, in contrast to UTC, contrail cirrus coverage is increasing and contributes significantly to anthropogenic climate forcing.

Minor points

1. Line 12:
   I suggest mentioning that you extrapolated the results to winter months from your summer results (instead of “in a more limited way”)

2. Introduction: Sherwood et al., 2020 may be an additional good recent reference for cloud feedbacks

3. Line 37-39: The text flow is broken at the sentence starting with “*Luo et al. (2003)…”* and could be fixed.

4. Introduction part related to measurements of thin cirrus: the authors could mention a just published ACPD manuscript that also focuses on cirrus, too thin to be detected by CALIPSO (Lesigne et al., 2023).

5. Line 106: Avery et al., 2012 is a more appropriate reference for CALIOP

6. Figure 4: What exactly are the “ALL” lines representing? I don’t see that mentioned in text/caption.

7. The newly written sentence is unclear:

Where along the limb path (line of sight) the cloud is located, for example in front of or behind the tangent point, and how long the cloud is extended along the line sight is unknown in limb measurements and cannot be retrieved.

A (shortened, but simplified) suggestion you could consider:

The exact position of the cloud along the limb path (line of sight) remains unknown in limb measurements and is not retrievable.

References

Atlas et al., 2023, https://essopenarchive.org/doi/full/10.1002/essoar.10511104.1
Avery et al., 2012, https://doi.org/10.1029/2011GL050545
Lamraoui et al., 2023, https://doi.org/10.5194/acp-23-2393-2023
Lesigne et al., 2023, https://doi.org/10.5194/egusphere-2023-2763
Sherwood et al., 2020, https://doi.org/10.1029/2019RG000678
Sullivan et al., 2022, https://doi.org/10.1029/2022MS003226