Response to comments of Referee #1 on

Schäfler, A., Sprenger, M., Wernli, H., Fix, A., and Wirth, M.: Case study on the influence of synoptic-scale processes on the paired H2O-O3 distribution in the UTLS across a North Atlantic jet stream, Atmos. Chem. Phys. Discuss. [preprint], https://doi.org/10.5194/acp-2022-692, in review, 2022.

We are grateful for the valuable comments, which helped us to improve and complete our manuscript. The response to the individual comments and questions is presented in blue with the corresponding changes to the revised manuscript in *green*.

(…) The authors provide a very detailed description of the origin of the observed air masses and the influence of synoptic weather systems and mixing effecting it. The paper would probably benefit from a more concise description of the results.

We agree with the reviewer that the paper is detailed in the description of the results, which we found was inevitable to convey a clear picture of the complex transport and mixing processes. We would need to change the focus of the study to be more concise. With regard to the positive feedback from the second reviewer, we decided to keep the level of detail and the complete analysis of the observed cross section. To make the paper easily accessible, we provide the key messages in the introduction, discussion and conclusion sections.

Minor

Fig. 1: Why is the air mass TRO-3 separated into two parts for Fig. 1f but not for Fig. 1e (and Fig. 2, although for Fig. 2 it is obvious from the description, which main paths the two parts take, so I think mainly a separation in Fig. 1e would be interesting.)?

Thanks for this suggestion. In the original version of the figure (see Schäfler et al. 2021) we did not separate TRO-3 into two parts. The main motivation for a separate discussion of the transport and mixing behaviour was that the two air masses are spatially separated along the cross section. However, as stated in the caption of Fig. 1 (*"Please note that a separation of TRO-3a and TRO-3b is only possible in the cross section (f) and that both air masses overlap in (e)."*), it is not possible to distinguish them in Fig. 1e as they overlap in T-T space. The clearly different transport for both regions allowed us to summarize TRO-3a and TRO-3b trajectories and to avoid a seventh panel in Fig. 2. We think that in combination with Fig. 4, which distinguishes both regions, this should become clear.

Line 162: Maybe rather: "CAT can modify local gradients of wind (wind shear), temperature (stability) and trace gases (Kunkel et al., 2019)." instead of: "CAT can modify local gradients of winds (wind shear), temperature (stability) but also of trace gases (Kunkel et al., 2019)."

Changed.

Figure 8: It would be good to mention in the caption, that 8c and d do not have the same colour bar as 8 e and f (or use the same, if possible, or maybe the same for Fig. 8 e and f and Fig. 9.)

We added a note to the caption of Fig. 8.: *"Note the variable range for the colour bars for Ri in (c) and (e) as well as for TI in (d) and (f)."*

Technical

Line 34: Acronym LS not explained?

As we introduce *"upper troposphere and lower stratosphere (UTLS)"* in line 1, we assume that this is not needed. We leave the discussion to the technical editors and would explain the acronym if needed.

Line 147: Acronym NWP not explained?

Changed.

Line 160: "are an indicator for" or "are indicators for" instead of "are indicator for"?

Changed.

Fig. 2: The "Grey circles mark the Tropic of Cancer and the Arctic Circle." are difficult to see.

We changed the colour of the circles to black and thickened the lines.

Fig. 3: Subscripts of the color bar label are nor readable (zooming in does not help). Higher resolved graphic, vector graphic, and/or larger font size necessary.

This is partly related to the limited quality of the figures in the template version, which we unfortunately haven't noticed at the initial submission. We increased the font size, especially of the subscripts, and we will take care that all figure text are readable in the final typeset version.

Fig. 4 and 6: "pink contours" look rather violet or orchid to me? The white dots marking the hurricane positions are difficult to see.

Changed to *"violet"*.

Line 307: Remove double "that" in "All descending air that that was not"

Corrected.