

Atmos. Chem. Phys. Discuss., referee comment RC1
<https://doi.org/10.5194/acp-2022-692-RC1>, 2022
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Comment on acp-2022-692

Anonymous Referee #1

Referee comment on "Case study on the influence of synoptic-scale processes on the paired H₂O–O₃ distribution in the UTLS across a North Atlantic jet stream" by Andreas Schäfler et al., Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2022-692-RC1>, 2022

The paper analyses O₃ and H₂O from observations of the airborne, range-resolved Differential Absorption Lidar (DIAL) during a flight over the North Atlantic jet stream. The observed trace gas distributions are linked to the evolution of synoptic scale weather systems using the Lagrangian Analysis Tool (LAGRANTO), tracing meteorological parameters and derived turbulence diagnostics along 10-day backward trajectories. The results indicate a strong influence of turbulence on the formation of the Extratropical Transition Layer and the importance of non-local mixing for the observed trace gas distributions. 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.

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.)?

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)."

Figure 8: It would be good to mention in the caption, that 8c and d do not have the same color 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.)

Technical

Line 34: Acronym LS not explained?

Line 147: Acronym NWP not explained?

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

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

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.

Fig. 4 and 6: "pink contours" look rather violet or orchid to me? The white dots marking

the hurricane positions are difficult to see.

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