

Interactive comment on “3-D tomographic observations of Rossby wave breaking over the Northern Atlantic during the WISE aircraft campaign in 2017” by Lukas Krasauskas et al.

Anonymous Referee #2

Received and published: 2 February 2021

Review of: 3-D tomographic observations of Rossby wave breaking over the Northern Atlantic during the WISE aircraft campaign in 2017.

By Krasauskas and colleagues

— General comments

This is a very nice paper that does a thorough job of capitalizing on information from a state-of-the art measurement system (instrument and retrieval algorithms) to provide insights into fine scale processes at work in the extratropical upper troposphere and lower stratosphere. The work is solid and well described, the data and models support the conclusions reached, the work is a welcome addition to the body of knowledge,

C1

and the standard of the writing and figures are both excellent.

I really have no "large scale" suggestions for improvements to make about the paper, and I'm very happy to recommend that it be ultimately accepted, pending some very minor clarifications and suggestions detailed below. I look forward to seeing this paper in press.

— Minor comments

As I say, all these are minor suggestions for improved wording, clarity, clarification, etc.

Line 17: "witch" -> "which"

Line 22: "The composition of +the+ UTLS", also, add "and" at the end of this line.

Line 24/25: Move "(RW)" from line 25 to right after "Rossby wave" on line 24.

Line 27: "from +the+ troposphere"

Line 85: I'm not sure "tomography images" is really the right word. Firstly, I'd suggest "tomographic" rather than "tomography". But regarding "images", those unfamiliar with retrievals might confuse them with the Level-1 radiance "images" (which really are "images", in the traditional 2-D sense of the word). "Fields" is an alternative, but I'm it's not quite right either, I recognize. Others might be "depictions", "representations", but I'm not sold on them either. Anyway, something to ponder.

Line 90: At face value, the discussion here seems to be talking about "high vertical resolution" for the radiances, but I think you mean it to apply also to the retrieved state, correct? It might be good to add a few words to clarify that "...not only for the measured radiances, but also, ultimately for the retrieved atmospheric states corresponding to those measured radiances".

Line 112: Is the temperature also "advected"? If so, how, as some kind of tracer? Is that valid meteorologically speaking?

C2

Figure 1: I found the yellow hard to spot, it's more of a lime green on my printer.

Line 162: "In the case of cloud presence..." -> "In cases where clouds are present, atmospheric properties can only be retrieved in the regions above the cloud tops".

Line 164 (and 162 before the above edit): "data" is plural (it's the plural of "datum"). So "is" -> "are". There may be other places where this needs to be fixed, I didn't check exhaustively.

Line 167: Put an "e.g." before the Schiller citation.

Line 168: If you're including a citation for ozone (line above) why not one for HNO₃ also, for symmetry.

Figure 2: It's a bit odd that panel (a) has a discrete color scale while (b)-(d) are continuous. I tend to favor the discrete ones myself, as that makes filaments more clear, but either way, it might be better to be consistent.

Line 171/172: "Retrievals of H₂O, O₃, and HNO₃ confirm this generally expected behavior, but also...?"

Figure 4: The captions should note what the dashed black lines signify. (e.g., "the 0.1 and 10 ppmv values for O₃ and H₂O, respectively, as discussed in the text" or something like that).

Lines 199/200: "The air found near...3 days at least". Are we supposed to be able to see that from examination of Figure 3? If so, it wasn't clear to me, so perhaps more hand-holding is required.

Line 201: Could/should the word "subsequently" be inserted right before "transported" (final word in this line). If that's not correct, then that means I haven't understood the discussion properly, and perhaps some clearer discussion is needed.

Figure 6: I'm afraid I found this figure hard to interpret/visualize. Perhaps, rather than multiple filled contours oriented vertically, might it be better to have just a few colored

C3

contour lines slicing horizontally. (e.g., Figure 6 doi:10.1002/2015JD023488).

Figure 7: I had to really search for the solid grey line. Could you make it thicker (and perhaps paler?)

Line 256: "This is because" is slightly weak wording. Firstly, it's not clear what the "This" refers too. Perhaps just saying "Specifically" would be better?

Lines 257, 260, 263: I don't think the use of the colons here is quite correct. In most cases, I think just starting a new sentence would be better. Also, for the double quotes here you should probably distinguish the open and close quotes.

Figure 9: Panel (a) is not discussed in the text so far as I could see. Also, panels (b) and (c) are discussed in reverse order. Consider discussing (a) and swapping the order of the panels so that they discussion and figure orders agree.

Line 273/274: "Panel c) shows the distribution of the potential temperatures at which the observed air parcels entered the stratosphere (maximum..."

Line 287/288: "Owing to the similarity of their source and sink regions, HNO₃ and O₃ typically display a very compact relationship within the stratosphere.

Line 304: Add "is" after "lifetime"

Line 401: "Large value+s+ of this term...". I think you should make it clear that (a) "this term" is J(x), correct, and also that (b) you mean large values after the iteration has converged, right?

That's it! Very nice job!

Interactive comment on Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2020-1053>, 2020.

C4