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Comment

Interactive comment on “The water vapour distribution in the Arctic lowermost stratosphere during LAUTLOS campaign and related transport processes including stratosphere-troposphere exchange” by A. Karpechko et al.

Anonymous Referee #3

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General Comments

The subject of the manuscript is the water vapour distribution in the Arctic UTLS which is used to derive STE processes in this part of the atmosphere. Thus it addresses questions relevant for ACPD. The paper consists of three parts, one presenting a novel data set of H₂O measurements and some discussion on the derived H₂O distribution in the UTLS, one with a case study of impact on the actual meteorology on specific events, i.e. a case study, and one model calculations in order to get some ideas about the general implications of the identified underlying processes. Each part for itself does

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not provide substantial new information: The new data set mainly support findings from previous studies (which are correctly cited), case studies of STE in the vicinity of the polar jet and its distortions have leading to specific trace gas distribution have also been published previously, and modelling of CTF becoming strongest in the vicinity of the tropopause are also not novel by itself. Thus the strength of the paper should be the combination of the three aspects, which however is not achieved in the current version of the manuscript. This value should in particular be worked out in the abstract and conclusions, but also in some details as suggested below. Currently the main findings are presented in a somewhat general way and seem to support some already well-known facts. Nevertheless, the new observations are of good quality and obtained at an “synoptical” sampling frequency and thus have the potential for a valuable scientific study.

Specific Comments

4729, 24-26: Delete the sentence “However, detailed studies” which is not correct, since from several of the cited campaigns, case studies up to more general interpretation papers exist.

Chapter 2 Data sets and tools: Here, a table with flight dates and some related information e.g. on meteorology would help to demonstrate that 11 flights in a period of 1 month are well suited to observe features as cut-off lows developing in the vicinity of the jet. Some details given already in the Introduction (time period, location) belong to this Chapter anyway.

Chapter 2: Start with the description of the FLASH instrument whose data are used in this study, followed by the NOAA hygrometer which is only used as a reference. Describe the calibration procedure for FLASH.

4731, 4-5: Both references Yushkov are not easily accessible (conference proceedings), can they be provided on a website?

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4731, 7: quantify “excellent” (in particular since Vomel et al 2006 is not yet published)

4731, 24-26: “This might be taken into account Ě” This should be done or at least discussed again later in the text and not let to the reader to be done by himself.

Chapter 3 Observations: It is not clearly worked out what the criterion is for an airmass to be free of tropospheric influence, several number between 4 and 7 are used or the variability (determined by eye?). Try Figure 1 in a logarithmic scale for H₂O, since these discriminations cannot be done in the critical area of 3-7 ppmv.

4732, 20: “3.9 ppmv at 365 K” not in the range of Figure 1, expand up to 370K!

4733, 8: “9 out of 11 profiles”: Are the 2 exceptions 17 and 24 February which are discussed as case studies below? If these are exceptions, I recommend to use the other 9 profiles in the following “climatology” only and to derive upper limits only for these 9 flights.

4734, 2: vertical (add:) direction

4734, 3 (also elsewhere in the text): Hoerling

4734, 6: than (add:) a value

4734, 14: “evident in Fig.2”: Why are mixing line(s) not plotted in this Figure?

Figure 3 and discussion in the text: The authors (correctly) derive from the O₃ and H₂O distribution that the observed airmasses have not yet been mixed and are still filaments. I think it is crucial for the upcoming model studies to demonstrate when and by which processes mixing will occur. Unfortunately, such a mixing probably cannot be traced by measurements.

4737, 1-2: I do not understand why this particular event can be useful “even from a climatological perspective”: There are similar observations as well as CAS (and also RDF) studies published previously, what is special of this particular event?

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4737, 10-13: This sentence should be moved to the next Chapter.

4740, 1: Can a brief explanation of the CAT index be given here, in order to avoid to check Traub and Lelieveld?

4740, 18: “An example”, has a similar CTF study been made also for 24 February?

Interactive comment on Atmos. Chem. Phys. Discuss., 6, 4727, 2006.

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