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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Arctic stratospheric dehydration – Part 1: Unprecedented observation of vertical redistribution of water" *by* S. M. Khaykin et al.

Anonymous Referee #2

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This paper is a systematic documentation of a unique set of water vapor observations in the Arctic in January/February 2010. The authors combine balloon-borne sensors with airborne measurements and add - to obtain an Arctic-wide view - different satellite sensors. The paper is well written, easy to read but a little bit too longish in some parts. An example are the extensive descriptions of the figures. Another example are the appendices which do not really add new information about the topic of the paper. On the other hand, the authors really give good overviews, e.g. about the sensors in Chap. 2, about the general topic in the Introduction. However, what I really miss in this paper is a clear statement of the scientific questions which will be tackled. It is certainly

worthwhile to document such a unique data set. But, what new knowledge about the processes do we gain from these observation, what are the implications? I believe, to focus on questions like those might sharpen the paper considerably.

The paper lacks information which is supposed to be in the second part. The second part shall relate the Eulerian observations presented in this paper with the parcel histories which are necessary to investigate the dehydration/rehydration of air masses. The essential, the critical points are the definitions of dehydration, rehydration, and redistribution: in the present paper, the authors refer to anomalies with respect to a climatological mean (balloon soundings) or to perturbations wrt a background field (airborne observations). However, all the discussion of air parcel trajectories and the associated water vapor history along these trajectories is promised to be considered in part 2 which I could not find on the ACPD server. Only such studies really allow to talk about dehydration, rehydration, and redistribution in a physical sense of a process study.

Summarizing: Well, the paper could be published after minor revisions (see above) but I would recommend to wait until the second part is submitted and clear links between both parts are established.

Minor Comments:

Some of the figures could be improved. The axes titles should be consistently written (requested by SI standards) as

Physical Quantitiy / Unit

or

Physical Quantity (Unit)

e.g. Potential Temperature / K or Potential Temperature (K)

The panels in Figure 4 and Figure 5 are too small.

Interactive comment on Atmos. Chem. Phys. Discuss., 13, 14249, 2013.