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Comment

## ***Interactive comment on* “Technical Note: Reanalysis of upper troposphere humidity data from the MOZAIC programme for the period 1994 to 2009” by H. Smit et al.**

### **Anonymous Referee #2**

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The MOZAIC dataset for water vapor is a treasure trove of unique observations of one of the most important greenhouse gases in our atmosphere. The spatial and temporal characteristics of the observations allow evaluation and intercomparisons that are essential to further our understanding of dehydration and cloud processes. It is critical that the community has trust in the documented quality of the dataset. This manuscript retroactively improves the quality of a large fraction of the water vapor dataset and hence is an important contribution to the peer reviewed literature. The manuscript is publishable after the authors and editors consider the following points.

1) Abstract and elsewhere: The word ‘artefact’ is not appropriate to use in this study.

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The definition is ‘...something observed in a scientific investigation of experiment that is not naturally present but occurs as a result of the preparation or investigative procedure...’ A ‘artefact’ referred to here is a software coding error that widely and systematically propagated through an extensive dataset. The outgassing of water vapor in the Rosemount probe is an example of an artifact but a software error is not. I suggest removing this word and replacing it with ‘error’ as was already used in the title of section 3.2.

I suggest revising the Abstract starting on p11 as:

“An in-depth reanalysis of the data set identified a coding error in the calibration procedure from year 2000 on. The error did not affect earlier data from 1994 to 1999. The full data set for 2000–2009 was reanalysed applying the corrected calibration procedure.”

2) Figure 14 should really include the the pre-2000 data which is considered unaffected by the calibration error. Please add 2 more panels.

Further, something must be said about how the relative uncertainty between the sensors leads to scatter at the low probabilities for  $RHi > 100\%$ , ie if the data were shifted within its uncertainty band the PDF would move by an order of magnitude at a given  $RHi$ . Is the PDF spread at a given  $RHi$  between the sensors known to be statistical and not systematic?

3) The change in the apparent frequency of supersaturated air parcels changed significantly as a result of this correction. I suggest adding a brief discussion citing the published studies that used flawed water vapor data and conjecture how important the biased data may have been in influencing these previous conclusions. Ultimately, the authors of these previous studies will need to revisit their conclusions using the corrected data, but the current authors owe the reader an indication of the importance.

Smaller points

P18906 In 2 ‘respectively’ is not needed

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P18906 In 9 ‘the PDF...’

P18906 In 11 ‘not possible’ is not correct

P18907 In 10 replace ‘are’ with ‘were’

P18907 In 15 replace ‘data base is’ with ‘sampling regions are’

P18909 In 13 Suggest changing to Specifically, the investigation of seasonal variations of atmospheric chemical composition is meaningful only for those airports being visited continuously over the entire period (see e.g. Zbinden et al. (2013)).

P18907 In 22 This meaning is not clear in ‘..as the altitude band from pressure level at potential vorticity  $2.0\text{PVU} \pm 15\text{ hPa}$ ...’

P18910 In 4 What is the source of PV data?

P18910 In 6 ‘Few...’ and ‘A few...’ have different meanings in this sentence. I suggest ‘A few...’

P18911 In 1 ‘could not be explained by physical reasons’ What effort was made?

P18912 In 23 change to ‘LAH, respectively;’

P18913 In 9 change to ‘instrument was used.’

P18914 In 11 Change to ‘Consequently, this bias in the calibration function has had a quantitative impact of equal magnitude on the RH flight data and thus correcting the bias requires: (1) reprocessing...’

P18914 In 25 Change ‘will provide’ to ‘provides’

P18934 legend Change ‘new’ and ‘old’ to ‘after’ and ‘before’

P18935 This phrase is not understandable: ‘(for details see corresponding explanations for details);’

P18942 The Krämer line beyond 100% RHi is invalid for comparison to MOZAIC as

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stated in the text. Either remove it here or show as dashed line and define as upper limit.

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Interactive comment on Atmos. Chem. Phys. Discuss., 14, 18905, 2014.

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