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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Comparison of in-situ FISH measurements of water vapor in the UTLS with ECMWF (re)analysis data" *by* A. Kunz et al.

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We thank reviewer 2 for the careful reading and valuable feedback on our paper. After a short summary of the revision the general and specific comments of reviewer 2 are repeated first (in italic type) and we reply to the respective statements in detail. The new sections of the revised paper concerning the reviewers' comments are red colored.

Summary of the revision:

In response to the reviewers' comments and suggestions, we have made a revision of the manuscript. The main points of the revision addressed in the text are summarized here:

- Following largely the suggestions and comments by reviewer 1 many parts of the text are revised. In particular, the abstract, introduction and the summary and discussion sections. All important information on the model data, i.e., reanalysis and operational analyses, can be found in their respective sections (2.2 and 2.3) in the revised manuscript. The information is not distributed at several places in the manuscript anymore. A new chapter 2.4 is included with a discussion on the changes to the IFS over time from 2001 to 2011. Influenced by a special comment of reviewer 1 a further figure is included as a case study to show an area in the LS where an improvement of the operational analysis data is identified.

- According to a comment of reviewer 2 the ratio between simulated and observed water vapor mixing ratio is revised. The former ratio $\Delta(H_2O)$ is an asymmetric quantity, that is, underestimations are related to $\Delta(H_2O) \in (0, 1]$ and overestimations to $\Delta(H_2O) \in [1, \infty)$. The reviewer is right, that this asymmetry has implications on statistical quantities like means and standard deviations. Following the reviewers' suggestion we replaced the ratio through its logarithm (with base 2), i.e., $\Delta(H_2O^{log2})$. This is a symmetric quantity around 0 and there are no issues with statistical quantities anymore. Section 2.4 of the revised version gives a detailed introduction of this new quantity including an additional figure. All other figures and their discussion in the text are revised concerning this new ratio.

Specific comments of reviewer 2:

P. 14407, l. 17: The description of the temporal interpolation is hard to understand. Please rewrite.
Rewritten. *P. 14408, bottom line: check sentence "the ratio of the ECMWF water vapor is calculated". This sounds like a ratio of one item alone.*
The sentence is revised.
P. 14410, around line 20: you might consider to give the uncertainty bounds for a ratio = 1 as well, that is to give the range where ECMWF data are undiscriminable from the

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measured data.
This is good suggestion that is included in the text.
P. 14411, l. 16-17: Equality of mean and median indicate a symmetric distribution but not necessarily a good agreement. Perhaps you want to say that both median and mean are close to 1.
The reviewer is right, we revised this discussion.
P. 14411, l. 19: variances are hard to interpret, see above.
Right. The new ratio based on the logarithm allows an interpretation in the revised manuscript.
P. 14413, ll. 24-27: Perhaps there is a possibility to split this very long sentence in order to increase comprehensibility.
Done.
Section 3.3: The sheer amount of information in this section is hard to digest and also the figures don't actually help to condense the information. Please think about re-structuring the section to help the reader to gather the information. Perhaps you might introduce subheadings, e.g. tropics vs. extratropics, or stratosphere vs. troposphere, etc.
This section is restructured and partly rewritten in the revised version for a better comprehensibility.
Figures are too small and hard to read in print, Figures 6-10 didn't print at all on my printer. On my screen all Figures are nice and clear. Please take care that these problems are fixed in the final version to be published.
We hope that the size of the figures with the many panels is better in the final version of the paper when results are presented on DIN4 pages. Anyhow, the problems with printing may be due to the size of the Figures 9 and 10. We replaced those figures and hope that problems with printing do not exist anymore.

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