

Author's Response for amt-2023-237

The main issue with the original version, as pointed out by the reviewers, was the handling of the RAL May 16th 2013 discontinuity problem. In our initial version we show the validation with reference measurements and afterwards, when discussing long term trends this issue was brought up and elaborated upon. In part this scheme followed the workflow within this project where this issue was identified after comparisons with said data. Unfortunately this of course leaves us with validation parameters that were performed on uncorrected data .

In the reworked version of this paper we reordered matters significantly, which now yields comparison parameters on corrected data.

Therefore, prior to any comparisons, a section 3.7 was added to the Methodology section in which we outline the May 16th 2013 issue with the RAL data, quantify the discontinuity and discuss several correction options.

Chapter 4 in the original paper discussed internal consistency, direct comparisons and comparisons with reference measurements. Chapter 5 then discussed the long-term trend. Chapter 6 then discussed the partial column differences in RAL and the seasonal cycle issues in LMD.

In this update we first discuss subjects that are internal to each of the products. This section contains a subsection on Internal consistency (previously and now 4.1) and one on the RAL partial column differences (now 4.2), which takes many paragraphs from the original version's 6.1 section (Discussion on two partial columns).

Section 5 is now called 'Direct Comparisons' in which we compare LMD to RAL, either directly or using CAMS as an intermediate. It discussed absolute differences (5.1, previously 4.2) and Long-term trends (5.2 previously 5.1). This section also contains a new figure showing the RAL vs LMD monthly averaged global biases for several years (instead of the example 2012 year only) and a more elaborate version of figure 21 (now Figure 12) that shows and discusses the differences in trend and seasonal cycle for LMD, RAL and RAL_LMDavk with respect to CAMS for several latitude bands (and now also for several May 16th discontinuity correction methods). This way, the reader is not only aware of the issue but has a better understanding of the potential impact when applying corrections prior to the actual reference measurement comparisons.

Section 6 then goes on to discuss the actual comparisons with reference measurements (in situ and FTIR). In this section, as with the previous section on long-term trends, this time RAL discontinuity corrections have been applied to the dataset. It contains information from the original sections 4.3 to 4.7 although some sub-chapters have changed order. Information in 4.7 (short summary, but (rightly) deemed too elaborate and repetitive by the reviewer), has to a large degree been transferred to the respective subsections making place for a more compact summary.

Section 7 (Discussion) corresponds with previous version Section 6 (although several paragraphs on the partial column analysis transferred to new section 4 and Section 8 Conclusions also corresponds with its namesake in the previous version.

Due to the different structure, there is also a considerable rearrangement of figures. These changes have been listed in the Table below, showing the new numbering, the old numbering and mayor changes (other than improvements of the layout).

New nr	Original nr	Comment
1	1	
2	2	
3	18	Also showing partial columns
4	3	
5	19	
6	4	
7	New	As previous figure last row but for multiple years
8	10	
9	11	
10	12	Now with discontinuity correction
11	13	Now with discontinuity correction
12	21	Now with impact of correction methods
13	5	Now with discontinuity correction
14	7	
15	6	Now with discontinuity correction
16	8	
17	9	
18	14	Now with discontinuity correction
19	15	Now with discontinuity correction
20	16	
21	17	
22	20	

Also all suggested technical corrections and clarifications, to the best of our abilities, have been added to the article.

Finally, I want, again, to thank the reviewers for their helpful suggestions and I hope that these changes meet their expectations.