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Atmospheric Measurement Techniques Discussions

Interactive comment on "Climatologies from satellite measurements: the impact of orbital sampling on the standard error of the mean" *by* M. Toohey and T. von Clarmann

M. Toohey and T. von Clarmann

mtoohey@geomar.de

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The authors thank the reviewer for his/her helpful comments. In the following, the original review is printed in black while our replies are printed in blue.

The manuscript tackles a common problem in the statistical analysis and interpretation of atmospheric remote sensing data that is rarely considered in the literature but clearly deserves more attention. Accordingly I appreciate these considerations and – except for several issues listed below – I would like to recommend its publication in AMT. Actually the problem discussed is not specific to atmospheric measurements and

would deserve a wider audience beyond AMT. Even in the ATM(D) domain the scope of the study – focusing on infrared limb sounders – is quite narrow, but the problems addressed here are clearly relevant also for data derived from nadir sounders and/or microwave and UV instruments. For example it would be nice to see at least a discussion of issues related to the spatial resolution of nadir sounders (e.g. a "low" resolution instrument like GOME vs a high resolution instrument like AIRS or IASI; Likewise the non-continuity of SCIAMACHY's nadir observation might be interesting).

We agree that such studies would be interesting but it is not feasible within one initial study to apply the analysis to all instrument types and sampling patterns. Further, the model data we have available are not well enough spatially resolved to assess the much better resolved footprints of a nadir sounder (c.f. Review 2). This point will be added to a discussion of the resolutions of the model and measurement data.

More generally, we offer that the purpose of this study is 3-fold: (a) to generate awareness of the problem (b) to suggest a strategy to estimate the impact of the problem (c) to demonstrate feasibility of this by application to some sample cases. We will as such more clearly defined the scope of the study in the Introduction.

(In the following a compact notation is used, e.g. Page 8242, line 11 is simply denoted as 8242.11) **** Major Remarks **** 8245.12 (Theory): Please define the $r_{i,j}$ introduced in equation (3) !!!

$r_{i,j}$ is the correlation coefficient between measurements x_i and x_j. This will be added to the description of equation 3.

8251.15 (section 3.2): "... Figure 5 shows ... the standard deviation (SD) of all data ..." What are these "all data" – the chemical fields from the last ten years mentioned at the top of the page, or ...? (see also figure caption)

This was poorly phrased on our part, the SD is a simple monthly zonal standard deviation. "All data" was referring to the fact that the the SD is applied to the model fields

for all timesteps and all longitudes for each latitude and height, rather than, e.g. a SD over time of zonal means (which would quantify temporal variability). This description of Figure 5 as well as the caption for the figure we be modified, with the quantity plotted described as a “monthly zonal standard deviation”.

Section 3.3: Resampling of the MIPAS/ACE sampling I would greatly appreciate to see a brief description how this is actually done.

A brief description of the resampling will be added as requested by both reviewers.

8254.11ff (section 3.4): Here a discussion of the 50-55N latitude bin is given, so it would be nice to see the corresponding sampling pattern in Fig. 2 (2f shows the 55-60N bin).

The sampling distribution for the 50-55N bin is shown in Figure 8. Since the 55-60 N and S bins are used consistently for Figures 1, 2 and 3, and there are specific comments in the text to these figures, we would prefer to leave them as they are.

**** Minor Remarks****

8242.11 (Abstract): Although it is clear when reading the entire paper, it might be useful to emphasize in the abstract (and possibly in the introduction, 8244.5) that the study is based on computations only, e.g. using "numerical experiment" etc.

Will be fixed.

8243.9 (Introduction): double "the"

Will be fixed.

8245.2 (Theory): "... since the measurement error can ..." or "... since measurement errors can ..."

Will be fixed.

8246.4 (Theory): "... but not less than ..."

Will be fixed.

8247.5ff (section 3.1): "... MIPAS is a mid infrared FT ..." Actually MIPAS (and ENVISAT) ceased operation in April 2012, accordingly it would be appropriate to reformulate this paragraph using past tense.

Will be fixed.

8248.3 (section 3.1): Please explain "scan pattern cycles"

We will remove this technical term, simply quoting the time periods which are used to define the MIPAS sampling patterns.

8247.5ff (section 3.1): This subsection is quite long. In order to help the reader it would be nice to split it in two subsubsections describing MIPAS and ACE-FTS (similar to subsection 3.3)

Will be done.

8247.23 (section 3.1): why the quotes for "high"?

Quotes to be removed.

8248.6 (section 3.1): comma: "... periods, respectively"

Will be fixed.

8248.28 (section 3.1) and 8254.8 (section 3.4): Please explain acronyms NH, SH for northern, southern hemisphere

Will be fixed.

8249.22 (section 3.1): delete "with" —> "... but almost 50% ..."

Will be fixed.

8253.11 and 16 (section 3.3.2): Why emphasizing "positive" k values, k>=0 by definition?

Right, we mixed up “positive” with “greater than one”. This will be fixed.

8253.18 (section 3.3.2): "... values found occur in ..."

Will be fixed.

8254.21 (section 3.4): "... phasing of THE sample distribution . . ."

Will be fixed.

8255.14ff (section 3.4): Missing verb in "Figure 9 shows that ... of this latitude."

Will be fixed.

8255.23 (section 4): "... the result of factors such as . . ."

Will be fixed.

8255.24 (section 4): double "and"

Will be fixed.

8256.19 (section 4): "... instances . . ."

Will be fixed.

8256.26 (section 4): "... an appropriate . . ."

Will be fixed.

**** REFERENCES ****

If possible provide doi’s for all references.

Will be done.

Hegglin&Shepherd: capitalize "Atmospheric Chemistry Experiment" in title

Will be fixed.

**** FIGURES ****

* Fig. 5 Only the left plot of this figure shows March ozone, whereas the right one shows "all data" (whatever "all" is, see remark above). ===> rephrase the caption (position of "left")

Will be fixed.

* Figs. 6 and 7 captions: Strictly speaking only panels (a), (b) and (c) in the top row are explained. Although its quite clear, one could completely remove the letters (a) ... (f) and explain the figure using "left", "middle", and " right".

Will be fixed.

Interactive comment on Atmos. Meas. Tech. Discuss., 5, 8241, 2012.