



## ***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***

### **Anonymous Referee #1**

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Referee 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

\*\*\*\* General Comments \*\*\*\*

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.

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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).

(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) !!!

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)

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

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).

\*\*\*\* 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.

8243.9 (Introduction): double "the"

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

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

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

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

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 subsections describing MIPAS and ACE-FTS (similar to subsection 3.3)

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

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

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

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

8253.11 and 16 (section 3.3.2): Why emphasizing "positive"  $k \geq 0$  by definition?

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

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

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

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

8255.24 (section 4): double "and"

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

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

\*\*\*\* REFERENCES \*\*\*\*

\* If possible provide doi's for all references.

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

\*\*\*\* 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")

\* 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".

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