

Interactive comment on “Metrology of ground-based satellite validation: co-location mismatch and smoothing issues of total ozone comparisons” by T. Verhoelst et al.

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The authors would like to thank anonymous referee 1 for his/her careful reading of the manuscript and for the suggestions for improvements listed in the report. In particular the general comment about terminology is pertinent. Answers to each individual point are provided below.

General Comment:

Referee: It would be good if further thought could be given to the issue of when and in which context the terms “error” and “uncertainty” are used. It is not clear to me.

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Are they fully interchangeable, and should you then rather just use one or the other? Please also add a short discussion on this issue for the reader. Especially for a paper like this on, it is important to clear this up thoroughly.

Authors: The manuscript has been checked thoroughly for consistency w.r.t. nomenclature, and the following paragraphs have been added in the Introduction to clarify the difference between “error” and “uncertainty”:

The VIM (Vocabulaire International de Métrologie, BIPM, 2012) defines an error as the (measured) quantity value minus a reference quantity value. Taking a ground-based measurement as the reference, the difference between a co-located satellite measurement and said reference measurement can thus be considered an error. This error contains several components such as for instance a measurement error and a co-location error, and it can be either positive or negative, expressed in absolute units or relative to the reference quantity value.

Uncertainty is defined as a non-negative parameter characterizing the dispersion of the quantity values attributed to a measurand. Hence, the uncertainty quantifies the statistical properties of an ensemble of errors. For instance, the random errors between measurement and truth often follow a normal probability distribution, the width of which can be considered the measurement uncertainty.

In the following, the term error is therefore used for the deviation between a single value and the corresponding reference, while the term uncertainty covers the statistical properties of these errors. For instance, in Sect. 3.5, a measurement error will be simulated by a random draw from a normal distribution with a width determined by the measurement uncertainty provided with the data product.

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References

Joint Committee for Guides in Metrology: International Vocabulary of Metrology - Basic and General Concepts and Associated Terms, 3, available at http://www.bipm.org/utils/common/documents/jcgm/JCGM_200_2012.pdf, 2012.

Specific comments:

- Abstract, page 8024, lines 13-15: delete “on the one hand” and “on the other hand” and add “ground-based” before “direct-sun”.

Authors: Changed

- Abstract, page 8024, line 27: add something like “due to strong TOC gradients” after “polar vortex.”

Authors: Added

- Abstract, page 8025, line 2: delete “now”

Authors: Deleted

- Abstract, page 8025, line 5: should read “system”

Authors: Changed

- Page 8028, lines 21-24: Would be of interest if you could add a sentence or two why there is a difference in the requirements for direct-sun and zenith-sky for TOC.

Authors: This seems to be a misunderstanding: the 2 values refer to the uncertainty and stability requirements respectively, so not to the different measurement techniques. There's a “%” missing after the first value, which probably lead to this confusion. This is corrected in the revised versions.

- Page 8036, lines 16, 19: Please explain what exactly a “barycentre” is.

Authors: These sentences have been rephrased, avoiding the use of “barycenter”.

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- Page 8053, line 4: Replace “On the other hand,” with “However,”
Authors: Changed
- Page 8053, line 6: How about replacing “too pessimistic” with “too conservative”?
Authors: Agreed and changed
- Page 8053, line 22: should read “or any other erratic”
Authors: Changed
- Page 8054, lines 12: replace “on the one hand” with “both,”
Authors: Changed
- Page 8055, lines 25 & 26: replace “on the other hand” with, “however,”
Authors: Changed
- Figure 1, caption: Use rather “satellite to ground”
Authors: Changed
- Figure 8, caption: would be good to add explicitly what the crosses are.
Authors: A sentence was added to clarify that crosses denote individual differences while solid lines represent a running median of these differences.
- Figure 9, caption: “Error budget of 5 years of . . .” should rather be 4 years, right??
Authors: Yes indeed, has been corrected.
- Figure 31, caption: “. . ., is based on the revised estimates of the random satellite measurement uncertainty.”
Authors: Assuming this required further explanation, a reference to the related section was included.

- *Several figures (such as Figures 5 & 6 and 13-16) are very small when printed out and it would be helpful, if they could take up the whole width of the page to make them a little more readable. Figures 2, 8 & 10 are also hard to read and would benefit from being a little bigger.*

Authors: These figures were in fact already optimized for the final 2-column format and didn't come out very well in the AMTD format. Extra attention will be paid to the readability of these graphs during the final typesetting.

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