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Interactive comment on "A study on harmonizing total ozone assimilation with multiple sensors" *by* Yves J. Rochon et al.

Yves J. Rochon et al.

yves.rochon@canada.ca

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- A re-organization of some sections and some section contents will be conducted in consideration of the specific comments provided in the supplement of the referee. The 'roadmap' to the organization of the paper will be accordingly revised and more specific in the introduction.

- We appreciate and benefited from the referee's familiarity of the most recent publications on total column ozone satellite measurements (for the specific comments in the supplement) and appreciate the referee's advice on the structure of the paper.

- We will look into shortening the paper, including a reduction in the number of figures. This was also recommended during the earlier review stage and is to be done (and

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Discussion paper

continued) following the discussion phase. As well, the referencing to figures in the Supplement of the paper will be notably reduced.

- This paper was originally intended to be more of an assimilation study. The bias correction aspect eventually became more encompassing. For clarity in the paper, focus will be placed on total column bias correction and resulting total column results from assimilation of data from multiple instruments.

- A reason for assimilating data from product sets which usually have larger biases before bias correction, GOME-2A specifically in the case, is to ensure data availability when other sources become unavailable. It is true that one could always include a means of automatically turning off use of some data sets when others are available. This consideration for potential exclusion assumes that total column ozone data sources with larger biases provide a daily spatial coverage similar to, or within, the range of other data sources being assimilated.

- The added assimilation of partial column measurements was intended originally to be part of this paper. However, results obtained from the assimilation of these data indicated that some optimization work was required to assimilate these data without inducing biases, this most notably seen in the lower stratosphere and upper troposphere. It was therefore decided to deal with the assimilation of partial columns in a later study. As consequence, the use of OMPS-NP and SBUV-2 in this paper was restricted to the comparisons of their equivalent total columns.

- The assimilation of MLS (and especially the evaluation relative to MLS) was to have played a more prominent role if the assimilation of partial columns had been included. The assimilation of MLS was also not being targeted for near-real time assimilation.

- As part of the reduction in size and figures of the paper, and in consideration of the above and below comments, we suggest removing, from the paper, the section and nearly all figures on the ozone field vertical structure (and instead providing this in the supplement without referencing in the paper).

- Assuming this remains a single paper, the elements of section 2 regarding the assimilation system (and covariances) could be moved to a later section to be provided after the bias correction results. Here is a possible general and more sequential re-ordering of the paper content considering the referee comments:

1. Introduction

2. Overview of observations sets

- Subsections for the different observation sets

3. Evaluation of OMI-TOMS column ozone with ground-based data

- Description of colocation criteria and evaluation approach

- Results and discussion

4. Comparison and bias correction of satellite measurements

- Methodologies (to refer to the colocation criteria in section 2; there will be referencing to section 4 as some approaches use model forecasts resulting from assimilation)

- Results (including the extension of the OMI-TOMS evaluation with SBUV/2)

5. Impact on Assimilations

- Presentation of assimilation system and covariances

-Results

6. Conclusion

Comments and other perspectives on the re-organization would be appreciated.

- For the conclusion, we will see what we can do for the revision and adding some numerics. The exclusion of numerics in the current conclusion section was intentional, with the intention to focus on the main general points.

Responses to the referee's specific comments are provided in the accompanying supplement.

Please also note the supplement to this comment:
https://www.atmos-chem-phys-discuss.net/acp-2018-614/acp-2018-614-AC1-supplement.pdf

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Interactive comment on Atmos. Chem. Phys. Discuss., https://doi.org/10.5194/acp-2018-614, 2018.

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