**Atmospheric
Measurement
Techniques**
Discussions

Interactive comment on "Round-robin evaluation
of nadir ozone profile retrievals: methodology and
application to MetOp-A GOME-2" *by* A. Keppens et
al.

Anonymous Referee #1

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The manuscript "Round-robin evaluation of nadir ozone profile retrievals: methodology and application to MetOp-A GOME-2" by Keppens et al. presents a methodology for validation of ozone profile retrievals and includes an example with applying this methodology to evaluate two independent GOME-2 retrievals. The presented methodology includes an analysis of information content of each dataset, selection and preparation (unit conversion, scale interpolation, smoothing) of reference datasets, and validation against ground-based ozonesonde and lidar profiles used as a reference. This paper fits into the scope of the problems discussed in AMT. However, some parts of the paper need further clarification. The paper can be published in AMT after minor

changes.

Specific comments:

Abstract: all acronyms (like ESA, KNMI, WMO etc.) should be spelled out when they are used in the manuscript for the first time.

P. 11502, par.1, l. 5-9: I don't quite understand the statement "...the relative DFS variation is much smaller...", because earlier on p. 11501, l.16 it is written that "The DFS difference between OPERA and RAL is remarkable". Please, clarify that.

p.11508, par. 1, l. 5: I would suggest to replace the word "unrealistic" and list objective, scientific criteria used to filter data (2-3 sigma from climatology etc.).

P11510, sec. 6.2, l. 19: There is a formula for computing space-time distance between two profiles. However, it is not numbered as all other equations. Please, do that.

Sec 6.4. I found this section very confusing, I think it requires some work to clearly present the method (see specific comments below).

P. 11512, l.3-6: Another approach to smooth the ground-based profiles is suggested, that requires interpolation of the rows of the averaging kernel matrix onto the fine vertical scale. The motivation to use this approach is not clear for the reviewer. The averaging kernels are scale dependent retrieval characteristics, and interpolation on the fine vertical scale can introduce some additional uncertainties. Please, explain the reason/reasons for adapting this approach in the study.

P. 11512, l. 22-26: From this sentence it is not clear that you mean unit conversion of correlative ground-based data and not satellite profiles. Please, change this sentence to make it clear.

P. 11513, l. 1-2: It states that nine different approaches to covert correlative data had been used. Unfortunately, it is very difficult to see all approaches. I would suggest to list all approaches and number them from 1 to 9. So, it would be easy for readers to

follow you, and, additionally, it might help you to organize results listed in section 7.2.

P. 11513-11514, eq. 9-10, 12-13: what is x_p here? Is it a priori profile used in the satellite retrieval algorithm or ground-based mean? Please, specify.

P. 11513-11514, eq. 9-10, 12-13: In these equations some terms have bars and some do not. Does the bar on the top mean the coarse vertical resolution? Please, specify that in the text. I would also suggest to skip subscript 'g' (in x_g), since in this section only unit conversion and smoothing of the ground-based data are discussed.

P. 11514, eq. 11: Please, define ΔL used in eq. 11. It had not been introduced.

P. 11514, eq. 12: Please, define smoothed profiles by adding subscription/superscription to the corresponding terms. Right now in eq. 12 the term on the left side is the same as the second factor of the first term on the right side of the equation. Please, keep consistent definitions throughout the manuscript.

P. 11516, l. 9-14: Q has not been defined.

P. 11516, l.21-22: Please, explain how re-gridded ground-based uncertainties were computed. Measurement uncertainties are closely tight to the vertical scale used in the retrieval algorithm, thus a simple vertical re-gridding from the fine scale to the coarse scale can lead to overestimation of the error.

P. 11518, l. 5-8: It is not quite clear what is 'former' and 'latter' here. It would be better to replace them by 'fine' and 'coarse resolution' approaches.

P11518, l.12-23: I guess the difference between VMR/partial columns and ND is expected. ND represents absolute ozone concentration, while VMR shows the ratio relative to air concentration, and partial columns are integrated, smoothed characteristics of ozone distribution that also depend on air pressure.

P. 11521, l.24: I would suggest to replace "...some users" by "some user requirements".

P. 11521, l.21-24: The color code that indicates whether the dataset requirements met

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or not is mentioned in the Conclusions. However, I don't see any color coding in Table 4. Did you meant something also? Please, explain.

Figure 1: Red crosses for lidar stations are not seen on the figure. I would suggest to change the color and type of symbols for lidar stations (e.g. yellow squares) to make them easy to see.

Figure 3: Black lines on these plots show centroids, however the term "centroid" has not been introduced in the text yet. It would be better to move a definition of "centroid" in the text before discussing results presented on Fig. 3.

Figure 8: Plots on Fig. 8 are too small, it is very difficult to see anything. Please, enlarge all plots.

Figure A1: The figure is small. Please, increase the font size for the text.

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