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Atmospheric Measurement Techniques Discussions

Interactive comment on "Relative drifts and biases between six ozone limb satellite measurements from the last decade" *by* N. Rahpoe et al.

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Interactive Discussion

Discussion Paper

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Interactive Comment

Final Response to Referee 1

N. Rahpoe

30 July 2015

Abstract

We would like to thank the Anonymous Referee 1 for their effort to carefully read the paper and giving us valueable comments to improve the paper.

0.0.1 Why is Eqn. 1 written as δ_i=2* $\frac{x_c - x_r}{X_c + X_r}$?

The proper notation was wrong, and we corrected the indices to the following:

δ_i=2* $\frac{xc_i - xr_i}{Xc + Xr}$

0.0.2 Why do you use average profiles X_c and X_r instead of the actual profiles for that coincident pair (x_{ci} and x_{ri})?

Maybe there is a misunderstanding in case of Equation 1, since I was not clear enough.

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δ_i=2*$\frac{xc_i - xr_i}{Xc + Xr}$

xcr$_i$ = Single Profiles
Xcr = Mean of the collocated single profiles for a given month and latitude band.

Δ_m=Monthly mean of the δ_i's

The reviewer points out the possibility of impact of drift on the relative differences, which is true if we have had calculated the Xc and Xr as total mean for the entire time series. In this case, it would be difficult to interpret the drift and biases.

But we actually do the mean for the collocated single profiles for given latitude bin and month. Then the relative differences which is used in the regression analysis are monthly means. In this case those concerns have less impact. In addition this equation is even more robust, because it is not sensitive to the outliers, in case there is low value of ozone for single profiles.

We added a sentence to be more precise.

0.0.3 Is an autocorrelation considered in your regression model? If not, the reported uncertainties will be biased low . If so, how is it applied and how are the data gaps accounted for?

An autocorrelation was not considered in submitted version. Taking this point into account, we now performed the regression analysis again by using the autocorrelation method as stated in reference in the papers (Weatherhead et al. 1998). The autocorrelation is calculated by using lag 1 month of the noise timeseries. The noise is the residual of the first regression step and the gap filled timeseries. Gaps have been filled by a simple linear interpolation between the gap points.

In the second step then the autocorrelation is used to evaluate the regression coefficients and the covariance matrix.

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0.0.4 Page 3706, Line 24: 'Most probably, this is due to diurnal ozone variations'. What are the diurnal sampling characteristics of each instrument? Are the biases in the observed diurnal cycle of each instrument? Is there a bias in the difference of the local solar times of coincident pairs

This statement has been dropped out. Instead we added a short paragraph (Sect. 5.1) clarifying the possible impact of local time differences on the differences in ozone for different altitudes and added the reference to Studer et al. 2013 paper.

0.0.5 Page 3701, Line 11

The typo has been corrected.

0.0.6 Page 3701, Line 14, Is data filtering applied to different data sets? If so, where do these filtering criteria come from?

We give now a detailed explanation on what filtering has been applied in Section 3. The filtering criteria come mainly from the data provider recommendations.

0.0.7 Section 2, What is the natural measurement of each instrument (e.g., number density on altitude or VMR on pressure)? This is listed for some but not all of the instruments used. How are non-conforming data sets converted to the same units?

A table is added to give all information of the instruments regarding native grid and ozone units. The comparison unit for all data sets is vmr on a 1 km grid. This information has been added in Section 3.

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0.0.8 It seems as though the regression model is applied separately for each altitude and latitude band. However , Section 3 does not specifically mention that the regression is applied in separate latitude bands or what those bands are. This should be added to the paper.

Information about the latitude bands is added.

0.0.9 The legends for Figures 1-3 get in the way of the data. This should be cleaned up. Additionally, I would recommend removing boxes around legend items.

Done

0.0.10 The size of the text for Figure 4 is too small and will be very difficult to see in a final paper format.

This Figure has been dropped, and we concentrate the discussion of the regression based on Figures 5-10 (now Figs. 4-9).

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0.0.11 The size of the text for Figs. 5-10 is also too small. I also think that the figures will be very difficult to read in final paper format. However, given the information content the authors wish to display, I do not know if there is a better way to do this. Additionally, while the uncertainties in the various biases and drifts are important, perhaps a plot showing the significance level would be more appropriate since this is what the authors talk about in the results more than actual values of the uncertainties. It would also make it easier for the reader to immediately see what results are and are not statistically significant.

We increased the text size for Figs. 5-10. The suggestion to replace the error plots was very helpful. We now replaced the error plots by the same plot of the instrumental range, but shading out the insignificant values with grey colour. This will help the reader to identify immediately the significant values.

0.0.12 Grammatical Corrections

Done

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