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Atmospheric Measurement Techniques Discussions

# *Interactive comment on* "A method to derive the Site Atmospheric State Best Estimate (SASBE) of ozone profiles from radiosonde and passive microwave data" *by* E. Maillard Barras et al.

**Anonymous Referee #2**

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This manuscript shows the results of combining 2 measurement profiles which cover different altitude ranges into a single profile, and then comparing the results to MLS. The primary interesting result is how the lower stratospheric RS data influences the SOMORA retrievals at higher altitudes, but this effect gets very little attention.

The authors say that they have produced 3 profiles a week for the period 2011 to 2013, yet the only time series shown (Figure 5) is for May and June of an (I think) unidentified year. A 2-year timeseries of the differences between SOMORA and SASBE RS at a range of altitudes throughout the stratosphere should not be difficult to produce and would make this a much more interesting paper.



The primary interesting result in this paper is in Figure 6. The differences between the SASBE RS and SOMORA profiles at altitudes as high as 55km require some additional discussion. Given that the standard deviation between these profiles and the MLS profiles has not improved, and the difference is only $\sim$2%, I would hesitate to categorize this as an "improvement", since neither SOMORA nor MLS have demonstrated an absolute accuracy to this level. If the standard SOMORA a priori in the troposphere and lower stratosphere (i.e. altitudes where SOMORA is insensitive) is set to the average of the RS data does this difference go away? Or is this difference caused primarily by a bias between SOMORA and the RS at altitudes where SOMORA measurements are influencing the retrievals? Is there a seasonal cycle? Is it consistent from year-to-year? Much of this could be answered with a timeseries plot.

Page 3404 – "The off-diagonal elements are parameterized with an exponentially decaying correlation function using a correlation length of 3 km." This seems not unreasonable, but is there any particular reason for this choice?

Page 3405 – The authors claim that the "observation error is to the greatest extent due to the thermal noise in the spectral data". Possibly this is the largest source purely random error, but there needs to be some discussion of the many other important sources of errors in 110 GHz O3 measurements – e.g. uncertainties in the tropospheric optical depth, baseline uncertainties, and uncertainties in the pointing.

Page 3406 - "uncertainty of the ozone measurement is of the order of 5–10% depending on the altitude". Is this systematic error, random error, or some combination thereof.

Page 3407 – "The off-diagonal elements are parameterized with an exponentially decaying correlation function using a correlation length of 150m below 25 km which corresponds to the vertical resolution of the RS ozone profile." Given that the grid spacing is 500m, this means that the off-diagonal elements are nearly zero, correct? This should be made clear.

Page 3410 – The abbreviation 'resp.' is unusual.

Figure 2 – At least a few of the curves need to be labeled to show what altitude they represent. Also, are they shown for every km? Every 2 km?

Figure 5 – The text indicates that the x-axis on this plot represents both time and ozone concentration, but there is no labeling for the latter. On this very compressed scale there is no point in showing results above $\sim$30km.

It is impossible to tell from Figure 5 whether there is any correlation between SOMORA measurements in the lower stratosphere and the RS measurements (after convolution with the SOMORA averaging kernels). This information would certainly be of interest.

I am disappointed that the RS data was not used more directly to calculate a baseline term for the SOMORA data which could have been applied to the SOMORA forward model to reduce the biases between SOMORA and the RS in the lower stratosphere. Assuming such a baseline is constant over some period (which it well may be), this would allow for SOMORA measurements to lower altitudes during periods when RS data is unavailable. Hopefully such work will be presented in a future manuscript. I would welcome any thoughts from the authors as to the feasibility of such an approach.

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