

Reply to Anonymous Referee #1

We would like to thank both reviewers for their positive review. Point-by-point responses follow below, with the reviewer's comment repeated in blue and our response in black.

Specific and Mostly Minor Comments

There is inconsistent use of the nomenclature version 7.0 and 7.00 in the text.

We have corrected the inconsistent use of the version numbering throughout the manuscript. We are now referring to version 7.00 to be consistent with the SAGE II release notes.

(page 3, line 92) Can you better explain what horizontal resolution in square km means?

For any given altitude, where SAGE II reports data, the total spatial spread (area) over which the measurements contribute is much larger than the simple line of sight through a layer (0.5 km by maybe 130 km). It is a number of these that move their location in the atmosphere due to the motion of the space craft. The size of the volume depends on the beta angle, i.e. the elevation angle of the Sun with respect to the orbital plane of the spacecraft. This is explained in detail in a publication by Thomason et al. (2003), which we now included as a reference. We cited the wrong paper at this point and now corrected that.

(page 6, line 172) The statement with “removing all points less than a fixed relative error...” seems to be inconsistent with rule #3. Have I misunderstood?

Here we wanted to describe that using the relative error as a screening criterion will lead to biases and that applies to all data. However, we agree that the statement as it is can lead to confusion as rule #3 only concerns ozone values below 35 km. We have clarified that in the paper by including the following:

“Removing ozone values that have an associated relative error greater than a fixed value (e.g. rule #3) will bias the remaining data set (Fig. 2), leading to a larger positive value.”

(page 7, line 177) The two sentences that begin this paragraph seem to be repetitive.

We merged these two sentences into one to avoid repetition.

“To investigate the impact of each rule on the SAGE II ozone data, the usage rules outlined above were applied individually to the whole SAGE II ozone data set at a given altitude and within a given 10° latitude band.”

(page 7, line 185) This probably should read “percentage may be greater...”

Corrected.

(page 9, line 218) Can you clarify for me the statement about beta angles between -47 and 47 degrees? Aren't the low beta angles the good ones for making occultation measurements?

After a series of battery issues, instrument events were shortened in how long they collected data in order to reduce the battery drain during an event. In error, the data collection time for

an event, particularly for low beta angle/short duration events, were shortened to an extent that damaged data quality (mostly a normalization issue). Once this issue was identified, event data collection times were lengthened sufficiently to eliminate this problem. As mentioned in the paper, this issue does not apply to version 7.00 since it has been corrected (see Damadeo et al. 2013). We just wanted to explain to the reader why we do not address the screening recommendation according to the beta angles which is widely used in other studies.

I think the discussion about “short events” should be moved to a position in the text immediately following the description of the current rules, as it is a “current rule”.

That is a good suggestion and we moved the discussion of the ‘short-even’ rule to the end of section 2.

(page 10) Are the cross sections for ozone and Rayleigh tabulated somewhere. At a minimum the ones used in the analysis presented should be referenced.

We now included the values that we used in our calculations.

For Figure 4 is it possible to give an occultation identifier so a user can recreate the plot? In general if we the users want to employ these rules, we would benefit from some numerical examples in order to verify our calculations.

We clarified the data source of the profiles shown in Figure 4 in the caption in the revised manuscript.

(page 13) The calculation of the aerosol extinction at 600 nm seems out of place. I suggest putting it very close within the text to the other relevant calculations. This is for ease of reference for somebody using the “recipe”.

The calculation of the aerosol extinction at 600 nm required the Ångström coefficient, α that is described here. That is why we prefer to leave the calculation of k_a_{600} here but we added a sentence to clarify why the equation is shown at this point in the paper.

“ α together with the aerosol extinction coefficient at 1020 nm is then used to determine the aerosol extinction coefficient at 600 nm , following: ...”

The 200% discussion seems a little odd. Was it the intention of the data producer (Damadeo I assume) to discard these measurements? If so, this should just be clearly communicated.

The origins and intention of introducing the 200% relative uncertainty by the SAGE II team was to flag negative ozone values that had low but unrealistic uncertainties (as described in the paper) in the lower atmosphere. The filtering of the SAGE II data according to the 200% uncertainty has not typically been part of the standard usage rules but was described and recommended in the SAGE II v7.00 release notes. In the release notes, they simply recommended to exclude all lower altitude data points where the uncertainty was $\geq 200\%$, which Rob Damadeo (i.e. a data producer) has informed us was a “simple yet overly conservative way” to flag these anomalies. However, we believe from our analysis that only these artificially flagged data points, which have **exactly** 200% uncertainty, should be removed.

(page 25) The figure caption, and the figure, needs to include a),b) and c) indicators to clearly distinguish the altitude and latitude bins.

We implemented that change.

(page 24,line 470) The statement beginning “In this case...” is perhaps demonstrated throughout the paper, but it is not proven. It is intuitive that the statement is correct but much more work needs to be done to prove it. I suggest softening the language around the statement. It’s my opinion that you don’t need to prove it for the paper. This goes for other similar statements sprinkled throughout the paper.

We softened the language a little.