The authors would like to thank the referee for taking the time to review this paper and for the many helpful comments that will be used to improve it. The referee's comments/concerns are listed below in red text, while the authors' responses to each comment are written below in black text.

The manuscript deals with an important problem and provides a lot of useful analysis on the SAGE III data, but in my opinion motivation for the project and how these corrections are intended to be used needs to be expanded upon. I believe the main motivation for this work is so that SAGE II can be brought to ~750 nm for CREST/GLoSSAC, but this is never explicitly stated. I understand the authors wish to present a general technique, but many choices made by the authors are directly motivated by this specific application (e.g. the AE wavelengths, correction factors only given at the SAGE III wavelengths) chosen, and unless the reader knows this beforehand it can be hard to follow. As a reader I cannot think of another application beyond this at least for the current instruments we have, if the authors have other applications in mind they need to be explicitly stated. To be clear, I believe the conversion of SAGE II is a very important application, but the authors should provide concrete (rather than vague) examples of how this work is going to be used early in the manuscript to help the reader understand the authors choices.
p.9 l 188 "Repeating this analysis for multiple channels provides slopes and intercepts of this behavior that can be used when converting aerosol from other instruments when measurements of the desired wavelength are not available. ..."
- Here and the rest of the paragraph is when the motivation for this work is given, some of this information similar needs to be in the introduction/abstract.
p. 9 l 196 "In theory, this work could be repeated using other possible wavelength pairs to compute the AE such as the combination of 756 and 1544 nm."
- I understand the author's desire to present a general technique, but do the authors have another application in mind besides converting SAGE II using the 520/1021 AE?

We tried to add mention of the motivation behind this work (i.e., to aid in the conversion of aerosol data between wavelengths for the purpose of instrument intercomparisons and the improvement of multi-instrument climatologies) in the abstract, introduction, results, and conclusions.

p. 2 l 40 "The only assumption used in the retrieval is that the "aerosol spectrum" (i.e., extinction as a function of wavelength) should be slowly varying in almost all stratospheric conditions"
- The authors probably mean the only assumption on aerosol microphysical parameters or something similar since there are many assumptions made in the SAGE III retrieval.

This has been changed to "The only assumption regarding aerosol used in the retrieval"

p. 3 l. 55 "For this study AE is evaluated using the 520 and 1021 nm channels as this is one of the most common pairs for evaluating the AE using SAGE data"
- Going back to my general comments, on the first read through I did not pick up that here SAGE is meant more generally, i.e. for SAGE II. And as far as I can tell this is the only hint so far as to what this correction is actually going to be used for at this point.

We try to be explicit, which is why "SAGE III/ISS" is written out so much (or sometimes "SAGE II") instead of just shortening it to "SAGE" such that "SAGE" refers to any SAGE instrument.

p.3 l.63 "since at lower altitudes the signal in this channel drops significantly from molecular scattering..."
- The same dip is also visible in the highest altitude in the picture (23 km) during the Hunga-Tonga eruption, so it can be caused by molecular scattering or large aerosol optical depth. For the Hunga-Tonga time period in particular, is it possible that the signal due to direct forward scattering is no longer insignificant as assumed by SAGE III?

We have added additional wording to better clarify this. The "dip" we refer to (specifically using the word dip in quotations and described at the end of Section 2) is seen as the difference between exes and squares in Fig. 1 in the 520, 602, and 676 nm channels. The large bias in the 384 nm channel is again shown as the large difference between exes and squares. In this case, a large drop/bias is not seen at higher altitudes, only lower altitudes as a result of a very weak signal because molecular scattering is so high. What the reviewer is referring to at higher altitudes is a change in the shape of the aerosol spectrum as a byproduct of changes in particle size, but notice how the exes and squares are much better aligned at 384 nm at the three higher altitudes when compared to the three lower altitudes.

p.4 l 85 "The 1 km buffer is meant to avoid any field-of-view or smoothing effects."
- Has the SAGE III data been post-processed with one of the standard altitude smoothing filters?

The SAGE III/ISS data used here has not been post-processed with any smoothing. The smoothing to which we refer has to do with the Level 1 retrieval algorithm that provides some smoothing of packet-level data during processing of transmission data prior to the vertical binning process that produces transmission data on a standard grid at 0.5 km intervals. We have noticed that SAGE (II & III) can sometimes have some blurring of the final data product in the presence of strong vertical gradients such as from clouds.

p.6 l 135 "extinction of the sun"
- Does this mean the solar only spectra that is used for normalization?

The noise floor applies to data that is not just exoatmospheric (i.e., where there is no net extinction/attenuation). Basically, the instrument measures uncalibrated intensity represented as counts in the detector. These count values will fluctuate even when staring at some uniform source. If the source dims by some amount smaller than the amplitude of the fluctuations, it can be difficult to differentiate this dimming from the noise. Effectively, the instrument can only reliably measure optical depths in the attenuated atmosphere that are so small.

p.8 l 179 "it seems that theoretical Mie-based corrections for the AE interpolation bias are smaller than, though still fairly consistent with, those derived here from SAGE III/ISS measurements."
- This should be expanded upon. Mie scattering is the fundamental physics behind these errors, are you saying that these previous corrections did not include some factor (large enough particles, correct composition) or are you saying that there is a potential bias in the SAGE III extinction spectrum? I'm sure as the authors know, there are a few recent studies on deriving

aerosol microphysical parameters from SAGE III extinction spectra, this could have implications for that.

It is honestly impossible to say for certain whether the discrepancies between previous Mie-based studies and this SAGE measurement-based study come from a “fault” in the former or the latter or perhaps a bit of both. While there is some inherent uncertainty in the measurements, they are based on observations and retrievals that make no real inherent assumptions about the properties of aerosol. The theory-based studies, however, must make some assumptions about aerosol microphysical parameters. We do not currently have any reason to believe in any biases in the SAGE data that would affect the conclusions of this study at this time. It would require a far greater effort to attempt to reconcile these discrepancies than is within the scope of this study, but it is true that using data and measurements to improve our understanding of the assumptions that are often placed on aerosol parameters is an extremely important topic. We have added some text to this paragraph and would welcome the reviewer’s feedback.

Entire manuscript-> In many cases the units for extinction are missing

The units for extinction have been added throughout the text.