Answers to Interactive comment by Anonymous Referee #2 on ”Differences in Aerosol Absorption Ångström exponents between correction algorithms for Particle Soot Absorption Photometer measured on South African Highveld” by Backman et al. 2014

Answers to the major comments

Comment: "*I would recommend that Section 2.2 (Instruments) needs more detail. The wavelengths of the PSAP, MAAP, and nephelometer should be provided for reference.*"
Answer: In the revised manuscript, the wavelengths of the different instruments will be provided in Section 2.2 as kindly suggested by the referee.

Comment: "*How were the nephelometer measurements interpolated to the PSAP wavelengths, i.e., using a constant scattering Angstrom exponent or the measured values?*"
Answer: The nephelometer measurements were interpolated (or extrapolated) to the PSAP wavelength using the momentary two wavelength AE closest to the desired wavelength and not using a constant scattering Ångström exponent for the whole data-set. This was clarified in the text in an additional paragraph added to Seciton 2.2 in the revised manuscript.

Comment: "*Was the MAAP measurement also interpolated to PSAP wavelengths? If so, how, given that MAAP is operated at only one wavelength?*"
Answer: No. The PSAP was interpolated to the MAAP wavelength. This is stated in Section 3.1 in conjunction with the interpretation of the intercomparison between the two different instruments. The comparison (between the PSAP and the MAAP) was done at the MAAP wavelength of 637 nm because a AE cannot be calculated from the MAAP as the referee notes.

Comment: "*It would be helpful to include typical dilution ratios in this section (near 9739-21). What was the typical magnitude of the absorption coefficient after dilution, and was this significantly above the detection limit?*"
Answer: The typical dilution ratios were added to the text as suggested. However, to add discussion on the detection limit to the text on page 9739 seems a bit premature. As pointed out by the referee it is important to state the magnitude of the instrument signal after dilution and was therefore added to the text of Section 2.3.1 (Preprocessing). After dilution, the uncorrected absorption coefficient was on average 1.4 Mm^{-1}. Noise of the PSAP ($\delta\sigma_{0,DIL}$) is given in Section 2.3.1 which is less than 0.01Mm^{-1} for longer averaging times than 100 seconds. This was added to the discussion of the section.

Comment: "*For the analysis of Transmittance (Tr) ranges by comparing PSAP and MAAP data in Figure 3, is there any indication that MAAP transmittance could have biased (or provided more noise to) the analysis? I assume that MAAP and PSAP transmissions did not change synchronously, so can a further analysis be done to only assess data when both instruments are in the same Tr range?*"
Answer: The reason for the bivariate fits of Fig. (3) was that both the PSAP and MAAP data are subject to uncertainties and noise. As can be seen in the figure, lower values of light absorption in both instruments spread out from the regression line and is indicative of noise associated with both measurements. The referee is right in the assumption that the filter changes were not synchronous. The data logging of the MAAP was not conducted using the mode that provides filter-transmittance information. Thus, the analysis suggested by the referee cannot be carried out. During the writing process the idea dawned but could not be persued due to the lack of MAAP transmittance data. The MAAP changed the sampling spot roughly once per day so it could be feasible to stitch together a picture of how these parameters are related; however, not with this data set.

Comment: "*On page 9747, can the authors comment on what happens at Transmission ~ 0.45 to manifest as a local minimum in the data? I do not believe this is discussed in the paper.*"
Answer: In the revised manuscript, this local minimum is discussed. A likely cause of the local minimum is that it is due to fewer data points in combination with succeeding data points when the MAAP showed lower values than the PSAP. In other words, as the number of data points decrease, so does the dispersion of the data points in time. The observed dip could thus simply be a coincidence since the low number of data points (as shown in Fig. 4b) are not statistically as solidly founded as for higher *Tr* values. This will be addressed in the revised version of the manuscript. The figure was changed so that the Tr on the x-axis is at a wavelength

of 530 nm which shifts the local minimum from 0.45 to 0.35 in the revised manuscript.

Comment: "*I suggest being more quantitative in the abstract and conclusion sections. As written, only qualitative descriptions are used to illustrate the results. For example, using 'significant differences' could be bolstered with numeric values.*"
Answer: True. This is changed in the revised manuscript. It makes more sense to state the quantitative findings rather than the qualitative.

Answers to the minor comments

Comment: "*Page 9735 Line 24 spelling change to 'species'*"
Answer: Changed accordingly.

Comment: "*Page 9736 Line 13 'dependency OF light interaction'*"
Answer: Changed accordingly.

Comment: "*Page 9736 Line 22 remove the unnecessary sentence: 'When… (SAE).'*""
Answer: It might feel like stating the obvious, however, we would prefer to keep the sentence to aid a uninitiated reader.

Comment: "*Page 9741 Line 18 please fix this sentence, it is not clear.*"
Answer: The sentence was corrected. A word has mistakenly been left out of the sentence.

Comment: "*Page 9742 Line 14 are = is*"
Answer: Changed accordingly.

Comment: "*Page 9742 Line 25 please define terms in Equation (7)*"
Answer: The omission will be corrected in the revised manuscript.

Comment: "*Page 9749 Line 9 chan = can*"
Answer: Changed accordingly.

Comment: "*Figure 4 I suggest removing the percentile lines to improve the readability of the figure. It is quite busy currently.*"
Answer: The percentile lines were removed from the figure to improve the visual presentation.