**Atmospheric
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Discussions

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**Interactive
comment**

Interactive comment on "Site representativity of AERONET and GAW remotely sensed AOT and AAOT observations" *by* Nick A. J. Schutgens

Anonymous Referee #3

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Summary

In this well written manuscript the author conducts an observing system simulation experiment (OSSE) to study the representativity of remotely sensed aerosol optical thickness (AOT) and absorbing aerosol optical thickness (AAOT) observations made at the locations of AERONET and GAW stations. For the OSSE, GEOS-5 Nature Run (G5NR) simulation data for year 2016 is used. The scientific methods and assumptions in the manuscript are valid and mainly clearly outlined. The experiment is mostly described with sufficient details to make reproduction of the results possible. The author evaluates the OSSE and G5NR with real AERONET data and shows that at least for AOT the OSSE and G5NR have significant skill and the conclusions may therefore be generalised to real observations. The manuscript explores the representativity of AOT

and AAOT in many different ways and discusses the findings with sufficient details. The conclusions given are supported by the results given in the manuscript. The manuscript is an extension to the previous work carried out by the author and it contains new contributions to the field of aerosol remote sensing and modeling. The manuscript will be a valuable resource for everyone carrying out AOT comparisons between models and observations and I recommend that the manuscript should be published in ACP after minor revision.

General Comments

There are 23 figures in the manuscript. Many of the figures have very short and incomplete captions and the reader is required to find another figure with more complete caption to fully understand the figures. Also in Figure 7 the caption refers to a colour bar that is presented in other figure. The author should make the figures more self-explanatory for example by adding missing colour bar and add more details to figure captions.

Sometimes figures are referred by using "Fig." and sometimes "Fig". Please see the journal instructions and correct.

Throughout the manuscript, the representation erros are shown as relative representation error. It would be interesting to see or at least have a comment on the absolute representation errors. This would show if high representation errors mainly correspond to small AOT values only or are there relatively large errors present also in cases with large AOT.

Specific Comments

p.2 l.14 "return times" Would "overpass times" or "revisit times" be more commonly used term to be used here?

p.5 l.1 "The maximum cloud-fraction was slightly tuned..." Please clarify what you mean by "slight tuning".

p.6 l.7 "...we will limit our analysis to latitudes below 60°." In Figure 4, there are stations at above 60 degrees.

p.7 l.9 For reproduction of the results, please list the sites that were removed from the analysis.

p.7 l.20 Is AOT threshold of 0.25 correct? To my understanding the threshold at 440 nm is 0.4 and it depends on the spectral dependence of AOT (Angstrom Exponent) what it will be at 550 nm. So for me this seems a bit low value for the threshold. Please make sure the reader understand that you have used a "non-standard" value of 0.25 or correct to match the true AERONET threshold (throughout the manuscript, same limit mentioned for example on p.9 l.13).

p.9 l.22 Altitude of -410 meters, is this correct?

p.9 l.29 Here notation "r" is used for representation ranking by Kinne et al. (2013). In some parts of the manuscript "r" is used to denote correlation coefficient so there is a conflict here. Please correct throughout the manuscript to remove the possible misunderstandings.

p.13 l.12 "G5NR and the OSSE are evaluated and found to show significant skill." This result was found for AOT, not for AAOT. Please clarify that this statement applies only to AOT to avoid misunderstandings.

p.18 Figure 1 Bottom row, what are the differences between solid and dashed lines?

p.21 Figure 9 Please define DS. Also on the upper right corner the text is overlapping with the figure and may be difficult to read.

p.25 Figure 16 What are the dashed lines?

p.27 Figure 20 "r" is not defined.

p.28 Figure 21 If possible, please add the another colour bar from Fig. 7.

Typos

p.2 l.5 "As aerosol are..." missing "s"

p.2 l.14 "S16b"?

p.8 l.20 "nd"

p.9 l.34 "Sofar"

p.10 l.1 "...can not observed..."

p.10 l.20 "Sgnificant"

p.11 l.6 "Fig. ??."

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Discussion paper