

Interactive comment on “Sensitivity tests for an ensemble Kalman filter for aerosol assimilation” by N. A. J. Schutgens et al.

Anonymous Referee #1

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In the paper “Sensitivity tests for an ensemble Kalman filter for aerosol assimilation” by N. A. J. Schutgens et al., the authors performed sensitivity tests for an EKF aerosol assimilation model that assimilates the AERONET AOT and AAE data. The authors evaluated the system behaviors with respect to several parameters including the region size, the ensemble size, the local pitch size, the inflation factor, and several of other conditions. The authors honestly reported their results as well as their frustrations for some of the issues. However, I would only recommend publication of this article if the authors could clear my concerns as listed below.

- 1) Did the authors perturb the meteorology? It looks like they are only perturbing sources. The meteorology is also likely to be important.
- 2) Assimilating AOT and then verifying AOT is relatively easy. With their experimental
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setup can they verify concentration?

- 3) Are the results of their study (sensitivity tests) also sensitive to the input datasets? For example, if the authors increase or decrease the number of observation sites, would their test results vary? How about using satellite aerosol products such as MODIS?
- 4) The authors mentioned a few times that their system is in an instability stage under certain conditions. What are the causes of the instability? Would this happen if they increase or decrease the number of the AERONET sites, or perturb the meteorology?
- 5) Are there any reasons for the authors to pick the six specific AERONET locations for validation? What about using different validation sites? Would the results change if the authors do so?
- 6) The authors suggested that assimilation of AAE is preferential to assimilation of AOT at two difference wavelengths. Are there any physical reasons for that?
- 7) It would be beneficial to readers, if the authors show a map of the locations of the AERONET sites used in their study.
- 8) Page 5952, line 5-6, “Emission of sulfate and carbon is based on emission map derived from various datasets” need references.
- 9) What kind of AERONET data were included in this study? Level 1.5? Level 2.0?

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