

Interactive comment on “The radiative impact of out-of-cloud aerosol hygroscopic growth during the summer monsoon in southern West Africa” by Sophie L. Haslett et al.

Anonymous Referee #1

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Review of “The radiative impact of out-of-cloud aerosol hygroscopic growth during the summer monsoon in southern West Africa”

This publication discusses the relationship between aerosol optical depth (AOD) and relative humidity. The study presents aircraft observations over western Africa of sub-micron aerosol size distributions and chemical composition along with observations of RH from aircraft and radiosondes. The authors use these measurements to estimate typical hygroscopic growth factors and AOD. Overall, the paper is clearly written and the authors note the strengths and limitations of the analysis. The measurements and analysis are interesting and of use to the aerosol and climate community. After

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addressing a few minor comments, I would recommend publication in ACP.

1. The AOD calculations included here are only for sub-micron aerosol mass. From the representative the distributions in Figure 8 and Figure 3, there appears to be a fair amount of mass greater than 1 micron. I think some discussion of the limitation in size range and how this affects the AOD calculations should be included. Would a possible coarse mode composed of dust likely have a lower HGF than the accumulation mode (assuming dust to be hydrophobic)? How does this affect the AOD variability due to RH?

2. The authors assume the chemical composition measured by the AMS to be constant across the size distribution from the SMPS (20 - 500 nm). How valid is this assumption and how sensitive are the results? If the inorganic species contribute more to the Aitken mode peak and the organics to the accumulation mode peak, does this not reduce the calculated HGF?

3. In Figure 2, are the black carbon concentrations from the SP2 (and not the AMS)?

4. The interquartile range is used to provide an assessment of typical variability in aerosol concentration, but does this capture very high aerosol episodes (biomass burning, dust) that may impact West Africa? I suggest including a brief statement on this.

5. Why was only the accumulation mode used in the calculation of AOD? From Figure 3b, it seems there is some volume missing from the fitted-accumulation-mode distribution.

6. As a small stylistic suggestion, the first part of Section 3 could be a sub-section (for instance, 3.1 Observations). I thought the measurements of aerosol properties and RH was an interesting part of the study. Including it under a sub-section could help highlight this.

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