

Interactive comment on “Biomass Burning Aerosol as a Modulator of Droplet Number in the Southeast Atlantic Region” by Mary Kacarab et al.

Anonymous Referee #1

Received and published: 5 November 2019

This paper gives results from the recent ORACLES campaign off the western coast of Africa during the biomass burning season. Specifically, the authors report observations of CCN, aerosol size distribution, and vertical updraft velocity collected during research flights within the marine boundary layer. This work convincingly demonstrates that cloud droplet variability can be limited by updraft velocity of aerosol concentration. Classifying conditions into such regimes could be useful to global models attempting to represent aerosol indirect effects in this important region. This paper was very well written and concise. I believe it should be published mostly as is; however, I ask the reviewers to address a few questions and consider amending the manuscript to include the answers to these questions for clarity.

1. In Figure 1, can you add the mean AOD over the time period? 2. I do not understand

C1

why, if you measured the updraft velocities, you need to assume a Gaussian distribution of updraft velocities? (e.g. line 178) What happens if you use your observed updraft velocities rather than the Gaussian assumption? Or, are your observations consistent with a Gaussian assumption? 3. Why do you assume these kappa values (line 185)? Are there sensitivities associated with these assumptions? 4. You hint in the conclusion that there may be some relationships between BC absorption and updraft velocities, but downplay these effects somewhat. What additional information would you need to better establish this relationship and/or its significance? Why do you downplay the effects? 5. You hint in line 363 that models may overestimate wet deposition if they assume activation when it isn't really occurring. It could be very useful to elaborate on if most models probably make this overestimate and how that could impact the extent of the BB plume. 6. Further, it would be useful to suggest ways models could incorporate your results to better represent aerosol-cloud interactions in this important region.

Interactive comment on Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2019-791>, 2019.

C2