Atmospheric Chemistry and Physics Discussions

Atmos. Chem. Phys. Discuss., referee comment RC3
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Comment on acp-2021-391

Anonymous Referee #3

Referee comment on "Environmental effects on aerosol–cloud interaction in non-precipitating marine boundary layer (MBL) clouds over the eastern North Atlantic" by Xiaojian Zheng et al., Atmos. Chem. Phys. Discuss., https://doi.org/10.5194/acp-2021-391-RC3, 2021

The authors analyze the impact of the environment on the aerosol-cloud interactions (ACI) from ground observations over the eastern north Atlantic. They find that both lower-trosospheric stability and turbulent kinetic energy influence the connection between water vapor, cloud-microphysics, and subsiquently ACI. For instance, they find that higher lower-tropospheric stability leads to higher cloud drop concentrations and ACI.

Overall, I think this paper is both well thoughout and written. However, I do have a number of issues that I would appreciate clarification on. Note that, even though I split my comments between major and minor, this is more of just a distinction between general and technical comments. Therefore, I recommend publication once these comments are addressed.

Major:

Line 147: Is LTS the most appropriate variable to use over the northeast Atlantic, considering the much larger influence of midlatitude cyclones compared to subtropical regions?

Line 171: How many potential non-precipitating cloud cases were there, and do your results suggest that most MBL clouds produce precip over the northeast Atlantic?

Line 193: You could highlight that the median LTS of 19.1 K is close to the value (18.55 K) used by prior studies to separate stratocumulus from shallow cumulus.

Line 226: You compare the logarithmic ratio that you find to other studies, but I don't understand what it actually means.

Figures 5 - 7: There doesn't appear to be much of a trend in the scatter plots, so what is the R^2 value for these regressions? Maybe this could be fixed by constraining your axes to closer to the limits of your datapoints?

Minor:

Line 77: "relatively shallower" should be "relatively shallow"

Line 78: I think "and is prone to" should be and "are prone to"

Line 80: "marine boundary layer maintained by" should be "marine boundary layer which is maintained by"

line 85: "regime of active coalescence process" should either be "regime of the active coalescence process" or "regime of active coalescence"

line 106: "particularly disentangling" should be "particularly by disentangling"

line 121: "operates at 910 nm laser beam" doesn't make sense, and maybe could be "operates at 910nm"

line 159: "from Doppler lidar" should either be "from a Dopplar lidar" or "from the Dopplar lidar"

line 183: "lay" should be "lie"

line 388: Unless I missed something why is Figure 5b discussed before Figure 5a, could you just flip those subpanels?

Figure 1: This may just be my printout, but the median dashed lines are difficult to see. Could you use a thicker line or a different color?