

Atmos. Chem. Phys. Discuss., referee comment RC1
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Comment on acp-2021-88

Anonymous Referee #1

Referee comment on "Measurement report: Impact of African aerosol particles on cloud evolution in a tropical montane cloud forest in the Caribbean" by Elvis Torres-Delgado et al., Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2021-88-RC1>, 2021

Torres-Delgado et al. "Measurement Report: Impact of African Aerosol Particles on Cloud Evolution in a Tropical Montane Cloud Forest in the Caribbean"

This study investigate the impact of African aerosol particles on cloud evolution in a tropical montane cloud forest in the Caribbean based on case studies using measurements from Aircraft, satellite and back-trajectory model. It shows interesting results while I do not think the conclusion are very robust at this moment. Personally, I think this study is worthy to be published in ACP after a major revision.

Introduction part: The authors may consider reading and citing the recent studies in addition to the studies at early years. For example, the direct solar radiation effect of dust from Africa on the meteorology (Sun et al., 2020, doi: 10.1029/2020JD033454).

Line 23-25, The authors mentioned "Great studies" but only providing one reference. More references are necessary here. Actually, there are huge amount of studies regarding aerosol-cloud-radiation interaction studies, along with the uncertainties, such as Stephens (2005, doi:10.1175/JCLI-3243.1), Garrett and Zhao (2006, doi:10.1038/nature04636), Li et al. (2011, doi:10.1038/ngeo1313), and Li et al. (2019, doi:10.1029/2019JD030758).

Line 38-39, could the authors provide the exact or estimated hours for the cloud

existence? That would be helpful to the readers.

Line 54, "cloud properties"

Section 2.1 About the sampling site map: If possible, the trade winds and the metropolitan area could be indicated in the map.

Line 86-91, I wonder if PM₁₀-PM₁ is better to represent the dust aerosols rather than PM₁₀. If it is, the authors may consider using the difference.

Line 101-102, are the size range for diameters or radius?

Line 101-106, For the cloud microphysical properties measured by BCP, have the authors removed the observations within the first 2 bins as most methods used due to their large uncertainties?

Line 108-110, more information about the weather data is necessary and helpful.

Line 116-118, I do not understand what do you mean "those with one standard deviation or less than the average are labeled as "low dust" cases". Please explain or modify.

Line 120-127, please provide more information about the model setup (such as physics and dynamics modes, the released particle numbers, and so on), and whether you used the clustering. The errors could vary with the location, topography, and meteorology. As indicated by Zhao et al. (2009, doi:10.1029/2008JD011671) for California region, the trajectory uncertainty could be more than 20% just due to errors in meteorology (such as boundary layer height and winds).

Line 176-182, these are interesting. I wonder how large the air speeds are. Personally, I think local emissions could play more important role when the wind speeds are low.

Line 192-197, SAE and AAE have not been defined yet. Please define them. Also, regarding the derivation of dust aerosols from low SAE and high AAE, recent studies could be referred, Yang et al. (2021a, b; doi:10.5194/acp-2020-921; doi:10.5194/acp-2020-1139), and Zheng et al. (2017, doi:10.5194/acp-17-13473-2017).

Figure 4. the figure quality need improve.

Line 286-299, For aerosol-cloud interaction study, or for cloud seeding studies, it is necessary for us to know the cloud status including the cloud phase (warm clouds or supercooled liquid/mixed-phase clouds) and cloud microphysical properties. As Dong et al. (2020, doi:10.1029/2020EA001196) showed, the cloud seeding effect is distinct for adding IN particles when the cloud are supercooled liquid phase clouds. If the clouds are warm clouds, dust cannot affect the clouds by serving as IN, while they can modify cloud properties by serving as CCN. Thus, I would recommend the authors provide the information of cloud properties before the dust aerosols arrive (along with the cloud properties after the dust aerosols arrive).

Section 3 and 4, I wonder how the cloud droplet size distribution (since there are aircraft observations) varies with the dust amount.

Section 4. I love this dicussion section about the potential causes for the observed findings. However, I do not feel very confident about the conclusions the authors obtained, particularly considering the highly complicated aerosol-cloud interactions with various influential factors. I wonder if the authors could provide more robust evidence. If not, I would suggest the authors weaken their tone to the conclusions.