

Interactive comment on “Impact of long-range transport over the Atlantic Ocean on Saharan dust optical and microphysical properties” by Cristian Velasco-Merino et al.

Anonymous Referee #3

Received and published: 22 January 2018

The study by Velasco-Merino et al. describes properties of dust that is transported from the Saharan region to the Caribbean Basin, based on almost 20 years of AERONET data. Trajectory calculations are done to identify mineral dust outbreaks. Although some improvements are necessary, it can be a valuable contribution on dust properties in this region. Particularly, the use of HYSPLIT for the selection of events is interesting, yet the current implementation may not be applicable.

General comments

To determine a link between the Caribbean and African sites, 10-days backwards particle trajectories were calculated starting from 3 heights at each site using HYSPLIT.

C1

Details of these simulations are lacking, but it reads as if single trajectories were used. Given the uncertainty of these calculations, it is a rough assumption that there is a link (or not) if only a single trajectory passes one of the African sites. How many trajectories were calculated per day? Do you find the same number of links if you use multiple trajectories? (And consequently, does it change results of the analysis on particle properties?) Can you add statistics of how often the links were seen at all 5 Caribbean sites simultaneously?

The properties of dust are studied mostly based on column observations. Observations were thus influenced by the presence of other aerosol (layers). In case HYSPLIT trajectories at multiple heights indicate a link with African sites, other influences are of course not excluded but a better agreement might be visible in the data. Do you obtain similar results if you analyse such events specifically?

The conclusions that the volume particle size distribution shape shows no changes and the effective radius decreases appear contradicting.

Does the transport duration influence the observed changes?

Although the structure of the manuscript is clear, the text is at times hard to follow. There are many mistakes and naming is not consistent throughout the manuscript. I strongly recommend to carefully revise the manuscript (especially the conclusions), preferably with help of a native speaker.

Specific comments

Introduction: Since the aim of the study is to investigate changes in dust optical and microphysical properties during long-range transport you could add some words on these properties. What properties do you mean, why are they relevant, what is known already? The relevance of your findings on these topics should also be discussed more in the results/conclusions sections.

P4, Line 7 “if any of these passes”. Do you mean any of these trajectories?

C2

P4, Line 9-10 "In case .. will be used". Unclear

P4, Line 14 "often", can you quantify this?

P4, line 16 +/- 1 day adjustment; unclear

P4, Line 32 3174 days; Are these single days or summed from all 5 data bases? (For example, does 1 day with a link at each site count as 5?)

P5, line 10; unclear what you mean

P5, line 21; remove "almost perfect"

P7, line 5, shape of size distribution is the same; is this to be expected from previous studies? Please discuss.

P7, line 30, 15%; The percentage relative to the cases with data (1162) may be more relevant to report.

P8, line 10, "four"; should this be 3?

Section 5.2; It could be helpful to add a table with these numbers (number dusty days Sahara, number dusty days Caribbean etc.)

P9, line 30; It is clear that negative differences are influenced by other aerosols. Also positive differences may be influenced by other aerosols. The actual difference for mineral dust could thus be larger, this should be discussed.

P10, line 1; The inversion process needs more explanation than just a reference.

P11, line 15; You suggest that on days with larger AOD, losses during transport are larger. It could be interesting to look at particle properties on these days; e.g. are shifts in size distribution also larger on these days?

Figure 4, caption; please add an explanation of "Inter-annual Monthly".

Interactive comment on Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2017-1089>,
C3

2017.