

Review for manuscript acp-2020-157, "Quantifying Bioaerosol Concentrations in Dust Clouds through Online UV-LIF and Mass Spectrometry Measurements at the Cape Verde Atmospheric Observatory."

In this study, the authors describe long-term observations of fluorescent particles at Cabo Verde Observatory collected using a UV-LIF instrument, the WIBS-4M. They also use observations of fluorescent bioparticles and dust particles (collected by a single particle mass spectrometer, a LAAP-ToF) from the ICE-D intensive field campaign to inform the interpretation of the longer WIBS dataset in regard to mixed dust-bioparticle types. They found that ~0.5% of all particles measured by the WIBS contained biological material, and that particle concentrations were elevated due to terrestrial influences. They also report a WIBS cluster that correlates with mixed-dust particles from the ICE-D field campaign.

There is considerable interest in both measuring bioaerosol contributions and distinguishing between dust, bioparticles, and mixed dust bioparticles. There are few long-term observational studies, so the topic is worth study. My recommendation is that the manuscript is not published without major revisions.

General comments

Use of a forced trigger+9 σ threshold for WIBS measurements has been shown to reduce potential non-biological interferences mineral dust samples, but not for all particle types, e.g. soot. This is particularly important because much of the analysis in the paper depends upon the assumption that all fluorescent particles are biological (page 7, line 15). This should be addressed somehow.

Using two different versions of the WIBS is a weakness of the study. I think that some context on the difference between the 4A and 4M would be helpful in order to understand to how equivalent these two datasets are. Additionally, I found it difficult to tell whether the particle clustering from the two WIBS datasets was performed together or separately. If so, some comparison between the two sets of clusters would be helpful to make sure that they are really equivalent. Also, how was the WIBS-4M calibrated? The manuscript only mentions the 4A.

More information is needed on the back-trajectory analysis. How many were released, and how often? Some context on what the Openair package analysis provides would be helpful for the reader.

For the LAAP-ToF measurements, it should be noted that simply using CN^- and CNO^- as boolean-type markers for biological material is suspect. They are pretty non-specific and found in a number of different particle types. This is discussed in detail by Zawadowicz et al. (2017). While these markers have mostly been found to be elevated in agricultural soils, the reason for this has not been explained (i.e. are these actual cells or just organic matter on the dust particle). Thus, the conclusion that CL3 is a mixed dust-bacterial type is not well-founded.

After the introduction and for the rest of the manuscript, there are numerous places where there are line breaks that do not result in a new paragraph (see Page 4, line 17). These line breaks should either be removed, or a new paragraph started to be consistent with the rest of the manuscript. There are numerous formatting choices that do not follow the style guidelines. I've highlight some of these in the specific comments below, but this list is not exhaustive.

Specific comments

Page 4, line 13. I think that reporting meteorological conditions from Carpenter et al. is not needed as there is contemporaneous meteorological data at the site, which should be reported instead.

Page 4, line 15. ms should be m s^{-1} .

Page 4, line 23. Was the WIBS-4M calibrated?

Page 4, line 30. There appear to be too many parentheses on this line.

Page 4, line 31. There needs to be a space before Liu.

Page 5, line 1. "WIBS-4" should be "WIBS-4A."

Page 5, line 3. There are two spaces in front of 1000.

Page 5, line 3, 4, 5, 6. There should be a space between the number value and its unit.

Page 5, line 5. The LAAP-ToF can measure both refractory and non-refractory aerosol, and presumably did so here. I would recommend removing.

Page 5, line 5. The LAAP-ToF and the WIBS measure different diameters (D_{va} and D_o) and this information should be included here.

Page 5, line 9. "anc" should be "and."

Page 5, line 10. This sentence is not clear. Does Saharan dust influence both prior to 15 August and mid July?

Page 5, line 22. Do abbreviations (e.g. UV-LIF) need to be re-introduced if they are introduced in the abstract? I thought they did, but maybe the editors can weigh in.

Page 5, line 25. Why just the negative spectra? Isn't the LAAP-ToF capable of acquiring dual polarity spectra?

Page 6, line 32. These first two sentences are similar and should be combined.

Page 7, line 13. "Interferences" should be "interferents."

Page 7, line 15. Savage et al. (2017) found that applying the 9 sigma threshold helped reduce weakly fluorescent dust particles, but that it had no effect for soot, which needs to be discussed and accounted for in the analysis.

Page 7, line 17. What is D_{p50} ?

Page 9, line 3. Space between "Fig." and "1a."

Page 10, line 3. The sentence starting on this line and the one following it should be combined.

Page 14, line 3. Sentences starting with "Figure X" should use the unabbreviated version (per style guidelines).

Page 16, line 2. A reference to Figure 6 should be included somewhere in this paragraph.

Table 1. Units should be given for size. In the caption, asymmetry should be un-capitalized.

Figure 1. Panels should be labelled with two parentheses around each label. I would suggest adding it in the panel in the upper left corner as it does look a little strange above. This extends to the caption.

Effective diameter should not be capitalized and should be abbreviated to match figure label.

Figure 2. Labelling is not clear across plots. Caption needs to describe each panel. Panels need to follow style guidelines.

Figure 9. For the inset plot, it appears that the x-axis shows the fractional of SilicateBio. Is that fraction of all particles, or fraction of silicate particles with bio?