Review of the Revised Manuscript
"Downward cloud venting of the Central African biomass burning plume during the West Africa summer monsoon" by Dajuma et al. acp-2019-617

We thank the Reviewer for her/his time to review the revised version of our manuscript. Please find below our point-by-point answers in red, modifications of the manuscript are in blue while the original Reviewer's comments are in black.

The authors have made major revisions to the original manuscript and have acted on all of the reviewers' comments. The manuscript is much improved. I now understand the parts of the methodology that originally were unclear. I only raise a few points that should be included in the final version. Figure 12 is a serious concern; the other points are relatively minor and only require minor wording or figure changes.

Thanks for your comments. Your constructive criticism has helped a lot to improve the manuscript.

1. Fig. 2--You use different color scales at 925 and 700 hPa. I believe you could use the 700 hPa color scale (0-12 m/s) at 925 hPa. Using the same color scale would make the comparison easier for the readers.

We agree with you. This figure has been updated in the manuscript.

2. Line 293—You could refer the reader to Fig. 5 to see the cold pools that you mention on line 293. You could then refer to Fig. 6c to see the convection. These references would not require the figures to be re-numbered.
This sentence now reads:

In Fig. 5 there are clear indications of cold pools related to convective cells developing over the Gulf over Guinea and the adjacent land areas, particularly over southern Ivory Coast (see Fig. 6c for precipitation).

3. Line 361-3 "… main burning areas in the southern hemisphere "Are you referring to burning in Africa or South America? Since you say "long range in line 363, I suspect you mean South America. The TRACE-A experiment proved that CO from South American can be transported to Africa where it is reinforced by African biomass burning before being transported farther east. However, when readers get to Line 379, long range seems to mean from central Africa (not nearly as long range as South America).
If you are unsure about the source, backward trajectories using the online version of Hysplit would provide an answer. However, if Africa is indeed the source, you probably could deduce that by looking at low altitude constant pressure maps. In any event you should provide some type of proof that you know the source. No figures would be needed.

We agree with you that this sentence was not clear enough. We are referring to burning in Africa specifically. The biomass burning aerosol originating from central/southern Africa burning activities, transported between 2 and 4 km is well documented (Chatfield et al., 1998; Mari et al., 2008; Das et al., 2017; Haslett et al., 2019). This sentence was modified according to your comment (line 361).
… main burning areas in southern and Central Africa.

4. Line 365—"West and north of the main plume" I am still not sure which area you are referring to because the sentence is rather vague. You could place an arrow on the figure to show it (define it in the caption). Or, you can rephrase the sentence to make the location crystal clear.

This sentence was rephrased to now read:

…west and north of the main plume at 2000 m (i.e. over the equatorial Atlantic Ocean near 15°W and arching into the Gulf of Guinea).

5. When I first got to line 366 and the word" suggest", I thought proof was not going to be _provided. However, you do provide proof in the following paragraphs. To avoid this, you could insert a new sentence after the word "aloft, something like, "That is the subject of following paragraph"

The following paragraph has been updated from line 366 onwards:

…suggest downward mixing into the PBL from aloft, which is further elucidated in the following paragraph.

6. Line 408—Be specific about the source of indications of a slow descent". I assume you mean subsidence associated with the nearby anticyclone, but it would do no harm to mention that again.

This sentence was modified according to your comment and is now in line 409:

Also here, a slow decent of the lower boundary of the plume is visible. This may come from large-scale subsidence associated with the southern branch of the Hadley cell and/or from turbulent mixing.

7. Line 412—What do you mean by "some indications" Once again, please be more specific.

This paragraph was modified according to your comment and now starts in line 413:

At 0°E (Fig. 8g) there is a distinct biomass burning plume centered at 5°S. The skewed shape of this feature suggests a relatively fast northward transport around 1000m above ground level. Individual mixing events are evident (green spikes underneath the main plume in Fig. 8g). North of the coast (marked by an arrow in Fig. 8g) there is a complicated vertical structure with local near-surface emissions, overhead advection, and vertical mixing to various degrees, particular during the daytime shown here.

8. The additional information and revisions in Section 5 greatly strengthen the manuscript. Thanks.

Thanks for your comment.

9. ***The most important issue I have is Fig. 12. Is it a time series with later times on the right side? I assume it is, but you must clearly say so. Also, you do not show any updrafts even though the cloud is growing taller. Therefore, the figure is meteorologically impossible—growing clouds must have updrafts. I have attached a figure from an elementary meteorological text that shows what I mean. Your middle panel does not show any precipitation. Therefore, downdrafts are very unlikely—only after precipitation occurs (your right panel) can downdrafts begin. In some way your figure must conform to accepted meteorological understanding of single cell precipitating clouds. Figure 12 must be remade.

There is a misunderstanding. Figure 12 is not a time series rather it but is meant to represent an instantaneous ensemble of different clouds. The caption of Figure 12 has been updated with the following sentence:

Shown is an ensemble of different cloud types with different vertical extents over the equatorial Atlantic.

We also extended line 547 to read:
"… schematically illustrated in Fig. 12, showing an ensemble of clouds with different vertical extents."