

Interactive comment on “Nocturnal low-level clouds in the atmospheric boundary layer over southern West Africa: an observation-based analysis of conditions and processes” by Bianca Adler et al.

Anonymous Referee #1

Received and published: 23 September 2018

Review of "Nocturnal low-level clouds in the atmospheric boundary layer over southern West Africa: an observation-based analysis of conditions and processes" by Adler, B., K. Babic, N. Kalthoff, F. Iohou, M. Lothon, C. Dione, X. Pedruzo-Bagazgoitia, and H. Andersen. [Ref.: acp-2018-775]

This work characterizes nocturnal cloud formations (specifically stratus fractus and stratus) over a specific region of West Africa as observed during the ground based field project DACCIIWA. The work essentially builds on studies already published by other co-authors on this paper to expand analyses to multiple IOP cases and to help

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validate/understand modeled results.

This paper addresses a scientific topic within the scope of ACP, though it does not present a novel concept or approach since it essentially uses ideas and concepts from previous work. However, the fact that this region is particularly understudied and provides for a better understanding of cloud formation during the night in a monsoonal region, it is still of interest and value to the community.

The title accurately describes what they attempted to do in their experiment and the abstract summarizes the work. They do give proper credit to previous work and use well known papers by in this particular sub field. The overall presentation is well structured and broken up into distinct sections to help make the work better to understand. There are some minor writing styles writing style, grammar, typographical errors and other wording issues throughout the paper, but nothing that cannot be easily addressed. There accurately represent the mathematical formula for their heat budget. The figures can be improved, but again, nothing that is particularly difficult to be fixed.

This paper is publishable with minor revisions. Minor comments and suggestions are below. Specific comments are below.

MAJOR COMMENTS: 1. There could be more justification of why this region is of particular importance. In the conclusions section (page 16 line 32 through page 17 line 5) there is a good summary of this, but it is lacking in the introduction. 2. The figures (see specific comments below) can be improved to help the readers experience.

SPECIFIC FIGURE COMMENTS Figure 1) How long (on average) are these phases? Are they and hour? 5 hours? Are the sizes of the boxes in the figure related to how long each phase actually lasts? You can probably put a median and range for each phase in the caption. Does it vary from night to night by a lot? Figure 2) Are the three other marked areas that Ghana, and Nigeria locations mentioned on page 2? Abidjan is in the Ivory Coast not Nigeria. You don't list the countries here just the cities. In the caption identify Accra as the Ghana site, Abidjan as the Ivory Coast site and Cotonou

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and Save as the Benin sites (the text for the country names blend in with the coloration for the topography and make them harder to read. Perhaps use white for the country names and black for the sites? Figure 3) This figure has the potential to be very helpful to readers, however, everything is too small and the color shading is so dark it's hard to see the wind directions and other markings and contours. First, the x markers on the bottom of each panel are nearly impossible to see, they need to be bigger and bolded. Second, the shading should be lightened so you can see other things. Third, the triangles on top of each panel also need to be bigger, they're hard to see (partially because the green color doesn't show up well on a white background). In the caption you refer to the "stable, jet and stratus phases, which colors refer to these. You can put "stable (blue), jet (red), and stratus (green) to make this clear for the reader.

Figure 5) When the symbols (triangles and squares), does that mean that there was no stratus fractus?

Figure 6) These individual panels are small and hard to read, especially the text in the upper left corners of each panel for the times. It's impossible to read some of them. Since you have space for the IOP number perhaps put the time in the upper right hand corner ABOVE the panel in line with the IOP #. This way you can clearly see the time progression for each IOP. Where is Save on this map? Put a marker of some kind, perhaps in yellow or cyan that would stand out. Also, it would be interesting to see the flow directions on these maps. When you talk about the stratus expanding it would be a neat annotation to show the direction with an arrow of some kind to help readers visualize the changes.

Figure 9) In the caption "residuum" should be "residual"

Figure 10) For panel d) the Bulk Richardson number looks like it is going off of the axis. Why don't you just make the y-axis 0.6 or more so we can see how high it actually goes between 18:00 and 20:00, especially since you have the markers there for the stable phase.

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Figure 11) In the caption "Relation" should be "Relationship"

Figure 13) Enlarge the dots for CBH. They are hard to see. In the caption "Relation" should be "Relationship"

SPECIFIC TABLE COMMENT Table 1) There are so many shaded and the shading may or may not work well when published. Perhaps shade the ones that you're NOT going to use? This way you're blocking them out and the ones you are using are unshaded.

MINOR COMMENTS: ABSTRACT Line 5: "decisive" is an odd word choice (you actually use it throughout) and I think you may mean "necessary" Line 6-7: "The aim is to study LLC" should be "The DACCWA project studies LLC" Line 8: "Typical nocturnal phases" is unclear at this point, what do you mean by phase? Even in the abstract it should be clear what you are referring to. Line 12-14: What is the difference between "relative humidity" and "moisture" Line 13: "decisive" again would more appropriately be "necessary" Line 14: remove "the" before "the LLC" Line 16: remove "of" before "of LLC"

1. INTRODUCTION (page 2) Line 30-33: You list the locations for the ground stations but you don't mention "Savè" here (and then you do on the next page but don't specify it's in Benin. I suggest making a new Figure 1 that shows ALL of the ground sampling stations including Savè. Also, look at comments for Figure 2, Abidjan is in the Ivory Coast not Nigeria, what site is in Nigeria?

1. INTRODUCTION (page 3) Line 1: As per comment on the last page, you should specify that Save is in Benin, otherwise it is unclear at this point where your main location is. Line 13: "41-days" should be "41-day" Not plural. Line 18: "as well as" should be "and" Line 22: "as well as" should be "and"

2. DATA USED AND METHODS (page 3) Line 31: "found north and east of it." should be "found to the north and east."

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2. DATA USED AND METHODS (page 4) Line 6: “as well as” should be “and” – NOTE: In general you should use “and” instead of “as well as” you use this phrase much too frequently. Line 16: What do you mean by the “nominal times?” It is unclear in the context of this sentence.

2. DATA USED AND METHODS (page 5) Line 2: Why is the threshold -35 dBz? Do you have a reference for this? Is this the standard threshold for clouds or are you doing something specific for your analysis that differs from a standard used in other works? Line 29: Wording: “illustrate the LLC during the night” – perhaps a better choice would be “visualize the LLC during the night”

2. DATA USED AND METHODS (page 7) Line 27: “have a by minimum” should be “have a minimum” Line 25: “as well as” should be “and”

3. LLC CHARACTERISTICS (page 8) Line 14: “allows to obtain” should be “allows us to obtain” Line 25: In regards to this comment “indicated by the unfilled green and black markers” and Figure 3, these markers are VERY tiny and almost impossible to see the way the figure is sized. Even if they are a bit larger for the final paper these markers should be enlarged.

3. LLC CHARACTERISTICS (page 9) Line 1: 80 minutes (the root mean square error) is quite a long time in terms of cloud development and cloud properties. Clouds change quite rapidly and the difference between methods (ceilometer and cloud-radar) could provide very different interpretations. Line 7: “form already at” should be “form already” Line 8-9: “. . .only little (Fig. 6a). After that, the LLC suddenly start o expand to the south-west until they cover. . .” should be “. . .only a little (Fig. 6a). After, the LLC suddenly expands by xx% to the southwest until covering. . .” Also, be more specific about the expansion/increase in area, is it 1%, 10%, 5%? Line 13: “allowing to detect” should be “allowing for the detection of” Line 16: “. . .CBH are then rather homogeneous as visible at Save” should be “. . .CBH are rather homogeneous and visible at Save” NOTE: This sentence is unclear when you read it the first time, consider changing the

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way you are phrasing this to be more clear. Line 18: “grow in the subsequent” should be “grow during subsequent hours” Also, perhaps instead of “midnight” use 0000 so the time referencing is consistent. Line 21: “first LLC form” should be “LLC first form” Line 23: What latitudes are you referring to for the “roughly zonal band?” How wide is it?

5.1 RELATIVE HUMIDITY CHANGES (page 10) Line 22: What do you mean by “placement of the period?” It isn’t clear what you are referring to here. Line 27: “humidity increase are related” should be “humidity increase is related” Also, what do you mean by “only a little?” Be specific! 1%, 5%? Line 30: “lower layer are caused” should be “lower layer is caused” Also, this sentence is confusing. It is unclear what the “contribution of about 25%” refers to. Clarify.

5.1 RELATIVE HUMIDITY CHANGES (page 11) Line 1: “decisive” should be “necessary”

5.2.1 HEAT BUDGET ESTIMATES . . . (page 11) Line 19: “residuum” should probably be “residual” Usually, residuum is used in chemistry and “residual” is used for other things like math and physics.

5.2.2 SENSIBLE HEAT FLUX . . . (page 12) Line 3: “illustrated in the following” using the example” should be “illustrated using the example” Line 16: “ IOP 15 show a relation” should be “IOP 15 show a relationship” Line 31: “residuum” should be “residual”

5.3 TRIGGER MECHANISMS OF LLC (page 13) Line 18: “find a relation between” should be “find a relationship between” Line 21: there should be a comma after Zhu et al. (2001) Line 31: “mechanisms” should be “mechanism” Line 35: “top of layer” should be “top of the layer”

6. DISCUSSION (page 15) Line 9: “strong relation between” should be “strong relationship between” Line 10: “attribute these changes both to” should be “attribute both these changes to”

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7. SUMMARY AND CONCLUSIONS (page 16) Line 30: “model study” should be “modeling study”

Interactive comment on Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2018-775>, 2018.