

Interactive comment on “Conceptual model of diurnal cycle of stratiform low-level clouds over southern West Africa” by Fabienne Lohou et al.

Anonymous Referee #2

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"Conceptual model of diurnal cycle of stratiform low-level clouds over southern West Africa" by Lohou et al.

Summary: This paper presents a conceptual model for the diurnal cycle of low-level stratiform clouds over southern West Africa during the summer monsoon. This paper is relevant to a special issue on the DACCIIWA field campaign and is worthy of publication in a special issue of ACP on the subject. For a conceptual model paper its presentation must be perfect and most of the comments below pertain to this point. These are all minor points, though there are several of them.

Major Comments:

1) Important to have consistency throughout. In the abstract the phrase "low-level

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stratiform clouds" occurs while in the title it is written as "stratiform low-level clouds". Because "low-level stratiform clouds" is used throughout the manuscript, a more consistent title would be "Conceptual model of the diurnal cycle of low-level stratiform clouds over southern West Africa".

2) A better initialism than "LLC" for "low-level stratiform clouds" would be "LLSC", and for three reasons. The first reason is that "stratiform" is an integral adjective in the clouds studied in this manuscript. A second reason is that to sound out in one's mind "LLC" the word "stratiform" does not occur, so only "low-level clouds" appear, but one knows that "stratiform" is important so one has to insert the word into the "LLC" initialism, making it just a tad bit harder to read the paper. The third, and final, reason is that "LLC" is too close to "LCL", inviting confusion. In one place (at least) the authors mix them up too. Whoops!

3) Figure 2 must be perfect, yet it has a number of things that need to be improved. In the figure caption the words "The greenish rectangles and triangles" occur. First, the figure looks to contain more blues than greens. Second, the horizontal advection symbol is neither a rectangle nor a triangle. As a result, this part of the caption is not helpful and needs to be cleaned up.

Second, the sentence in the caption that reads "The white dashed curves indicate the lifting condensation level (LCL)." needs more explanation in the caption than provided. It is not until Pages 13-14 that they are discussed. Something like "Each of the three LCL curves represents one scenario (of three) of CBL development found during the DACCIIWA field campaign (Section 3.2.3)." should be added to the caption. Also, "Scenario 1", "Scenario 2", and "Scenario 3" should be used as labels for the dashed lines in the figure. See marked up manuscript.

Each little rotation symbol in columns 2 and 3 of Figure 2 needs a precise meaning. For example, based on the text, the clockwise rotating symbols in the middle of the stratus layer in column 3 would seem to indicate downward mixing caused by cloud-

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top cooling. If this is correct, the symbols make sense; if this is not correct, this is an example of these symbols causing confusion. The clockwise rotating symbols in the sub-cloud layer of column 3 seem to indicate downward mixing caused by the jet shear. Correct? If so, what does the counter-clockwise rotation symbol mean near the surface along the low level jet curve in column 2? Right above it is a clockwise rotating symbol so the juxtaposition of the two is confusing. Moreover, in a conceptual model the juxtaposition of two such symbols should be made perfectly clear in the text. In column 2 there is also a counter-clockwise rotation symbol at $Z^* = 1.5$. What does this mean? According to its location along the low level jet curve, it might be taken to mean upward mixing due to shear. But in column 3 the rotation symbol at about $Z^* = 2.2$ is clockwise, perhaps indicating downward mixing due to cloud-top cooling. If so, why is it placed right on top of the low level jet curve in column 3?

For Figure 2 to be most effective, every drop of ink on it needs a clear purpose and one that is described in the text and easily remembered.

4) Figures 2 and 3 work really well together. Fun to read about them. The text on Pages 10 and 11 was a bit ambiguous in making perfectly clear that the curves in Figures 4 and 5 were averages over different phases. Or perhaps stated differently, it is disconcerting to see figures based on averages over different phases when the point of the paper is a conceptual model of the distinctness of the phases themselves. Figures 4 and 5 must contain averages over the four distinct phases to be most effective, even if some of the averages from one phase to the next are similar. All in all, Figures 4 and 5 were not intellectually satisfying, especially in comparison to Figures 2 and 3.

Minor Details:

0) A marked-up manuscript is being returned to the authors. It may contain detailed comments that they may find useful. The handwriting on the manuscript is not always so good, which is unfortunate. My apologies!

The more important points in the marked-up manuscript now follow.

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1) The first paragraph on Page 5 (Lines 1-11) is not relevant to the main story of the manuscript and can be removed. The sentence on Lines 6-8 was relevant and can be moved to Page 16, Lines 20-25, as additional factors to consider.

2) The legends of color dots in Figures 1a and 1b need labels.

3) "Q" is not defined in Eq. 1 on Page 10.

4) The authors need to rethink their use of "the day after." This finally became clear on the bottom of Page 11. Here, it is stated that stratus occurs from 2200 UTC on day 1 out to 0500 UTC on day 2. In this case "the day after" on Line 26 would mean there is a day 3. Maybe just using "day 1" and "day 2" would be simpler and more exact.

5) The change in significant digits on Page 11, Lines 8-21, was a bit jarring.

6) Not sure that the sentence on Page 13, Lines 13-15, means exactly the same thing as the sentence on Lines 3-5 of the Figure 7 caption.

7) Page 13, Line 12: Never seen the word "summit" in this context. How about "radar cloud top"? If not "radar cloud top" this word needs to be defined.

8) The words "most likely" and "can" showed up a bit on Page 16. These are weak words in this context because they imply a weaker conceptual model. They should be removed from the manuscript in some way.

9) Figure 3: The x-axis tick marks must represent hours. So, the x-axis labels should have the units of time in them. Perhaps "(hr)"?

10) Figures 4a and 4b: The y-axis tick mark labels should have the same number of significant digits.

The two "RES" lines in Figure 4b should have the same color because they both represent residual curves. To distinguish between them, one can add (TURB) to "RES" in the left column legend and (TURB+RAD) to "RES" in the right column legend.

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And again, one set of curves for each phase would be much more effective.

11) Figure 7 visible and infrared images: The features in the visible and infrared images do not seem to line up. Is it because their fields of view and their orientations do not line up? The infrared images seem to have a color bar at the bottom of the images whereas the visible images have no grey scale. It would be helpful to have visible and infrared images with the same fields of view and the same orientation relative to north (top), south (bottom), west (left), and east (right) relative to the page. Also, some sort of grey and color bars with labels would be helpful. These changes would make the images work better together.

By "incertitude", is "uncertainty" meant"? If so, why not use "uncertainty"?

Please also note the supplement to this comment:

<https://www.atmos-chem-phys-discuss.net/acp-2019-566/acp-2019-566-RC2-supplement.pdf>

Interactive comment on Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2019-566>, 2019.