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Atmospheric Chemistry and Physics Discussions

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 #2

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Review of "Nocturnal low-level clouds in the atmospheric boundary layer over southern West Africa: an observation-based analysis of conditions and processes"

In this paper, the night-time formation of low level clouds over the West African Monsoon region, or to be more precise, over southern Benin, is analyzed based on observations made during a field campaign. The relative contribution of relevant processes is analyzed based on radiosonde, lidar, radar, and ground measurements. Measurements from this region are very rare, this alone would make the paper an interesting read. Furthermore, research questions directly related to current difficulties in the

modelling of the West African Monsoon system are addressed. The paper conforms findings from prior modeling studies. Accordingly, it does not necessarily provide new insights, but confirms previous work, which was not based on observational evidence. I explicitly welcome the publication of such studies. The manuscript fits well into the scope of ACP and is based on new data.

The manuscript is suggested for publication after the below listed concerns are addressed.

MAJOR COMMENTS: 1. There is a second manuscript from the same group of authors under review at ACP. In the other manuscript (acp-2018-776) one particular night is discussed in more detail, while in this manuscript statistics over 11 nights are presented. Methods and results show a significant overlap. This manuscript refers a lot to the other manuscript, almost every section contains something like "more details can be found in BabicÌĄ et al. 2018". Although the authors discuss their second paper briefly in the introduction, it is not immediately clear to the reader which research questions the other one does not answer and why a second one is necessary.

MINOR COMMENTS: 1. Page 4, Line 14-15: IPO 10 was not used, because no clouds did form during this night. It is okay to leave out a day if the conditions don't fit, but it would still be interesting to check the results on the basis of this day. How does it differ from the other days? Was the jet weaker? Any other differences? In the discussion, the omitted day could be addressed again. The findings may help to explain why clouds did not form.

2. Page 11, Line 2-3: "The small moisture changes indicate that the moisture content in the maritime air mass is roughly the same as in the continental ABL, i.e. no pronounced zonal moisture gradient prevails between Savè and the coast." This statement don't seems to be in agreement with "Once Savè is within the maritime inflow air mass, specific humidity decreases working against the cooling with respect to the relative humidity change". Fig 8c also suggests that the advected air is drier. What is the

reason if there is no moisture gradient between the coast and Savè?

3. Page 11, Line 22: The threshold of TOTmax e-1 looks a little arbitrary, where does it come from?

4. Page 13, Line 14: The calculation of LCL from surface values don't seems to be necessary in the presence of radiosondings. Please comment on the reason not to use the radiosondings for this purpose.

5. Page 15, Line 15: Reason for LLJ formation: In my opinion, the maritime inflow is a direct consequence of the relaxation of the friction force and the pressure gradient related to the Saharan heat low. From that point of view, I don't see a different mechanism at work. Please comment a bit more on the difference and on the driving force of the maritime inflow.

6. Figure 1: please extent the figure caption a bit to include the abbreviations. The figure is referred to in the text before the introduction of the balance equation.

7. Figure 6: The labels are hardly readable, which means that it does not become immediately clear that the development over time is shown.

TYPOS etc.: 1. Page 8, Line 8: "vertical" instead of "horizontal" profiles are meant, correct?

2. Page 10, Line 6: Is "z/CBH" a name of a variable? Something like "z subscript CBH"?

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