

Interactive comment on “The life cycle of nocturnal low-level clouds over southern West Africa analysed using high-resolution simulations” by Bianca Adler et al.

Anonymous Referee #1

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This paper analyses the formation and evolution of low-level clouds which form in monsoon season in southern West Africa. From high resolution NWP simulations, the authors identify a front of high relative humidity which propagates inland overnight and drives the cloud formation, with uplift triggered by the orography and gravity waves. The paper is well written and interesting, and I believe suitable for publication subject to some minor amendments and further analysis.

Comments:

P3, L9-12 - these two sentences seem contradictory. You first state that a sub-grid cloud scheme is not applicable, and then go on to say that using one delays the transition of stratiform to convective clouds. Without any observations to compare against,

C1

you cannot say whether this delay in convective initiation is a good or bad thing. Obviously a detailed discussion of the use of cloud schemes at $\sim 500\text{m}$ resolution is beyond the scope of this paper, but the authors should make it clear that the use of cloud schemes at this resolution is highly uncertain and it's not clear whether they are applicable or not (see, e.g. the discussion in Boutle et al. 2016). The authors can also use their observation of the difference in convective initiation as motivation for further study - DACCWA presumably took the observations that will allow someone to analyse the timing of the stratiform to convective transition, and how important the cloud scheme is in this.

P3, L27 - is hourly really frequent enough to update the LBCs? I would have thought ~ 15 mins would be more appropriate. Have you tested the sensitivity of the simulations to this choice?

P4, L2 - why have you chosen to compute LWP below 1000m, when Figs 2 & 3 clearly show that the cloud extends above this height. Where are the clouds tops? Why not compute LWP up to the cloud top?

P6, L10 - a bit more discussion on why a phase lag of 90 degrees implies gravity waves, or a citation, would help the reader understand better what is going on here.

P9, L20-24 - given part of the motivation for the paper is informing the measurement strategy for DACCWA, it would be good if you can give a bit more detail here on how these results have/did influence the measurements. What observations will be taken where, how will you track the relative humidity front, how will you observe the gravity waves, etc etc

Typos:

P1, L22 - I think it should just say 'MSL' in brackets

P2, L21 - should say "These results" instead of "This results"

P4, L4 - should say "allowing us to distinguish"

C2

P9, L19 - should say "The simulations reveal"

References:

Boutle, I. A., Finnenkoetter, A., Lock, A. P. and Wells, H. (2016) The London Model: forecasting fog at 333m resolution. *Q. J. R. Meteorol. Soc.*, 142, 360-371, doi:10.1002/qj.2656

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