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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 #3

Received and published: 10 October 2018

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

This study uses plentiful surface-based and radiosonde-based data to study the onset of low cloud cover as it forms in Benin between the coast and inland areas. Data primarily come from profilers and radiosondes with satellite cloud data also used. The goal of the study is to decipher which mechanisms are primarily responsible for low cloud formation in the area. During the study period, it is shown that cloud cover generally follows the arrival of a jet of cool marine air surging northward from the coast

in the evening. The horizontal advection of cool air by this nocturnal jet is the primary driver of cloud formation, though sensible heat and radiational flux divergence also contribute to cooling. Changes in humidity are negligible in the period preceding cloud formation, suggesting that cooling by cold air advection, not moistening is the main process responsible for cloud formation.

The observational network used is well suited for this study and the methods describing the data are well explained. The study argues convincingly that northward cold-air advection associated with the nocturnal jet is the primary driver of cooling and cloud formation. Aside from a few small suggestions, I would recommend publishing with only very minor revisions.

Comments:

One thing that I would like to know is how representative this short observation period is compared to long-term averages. With less than 15 IOPs over 7 weeks, it is possible that we are observing anomalous conditions or an odd year/season. Can the authors put their observation period into climatological context, showing whether there are any outstanding or unique conditions present during the period? Conditions such as SST offshore, monsoon strength, wind or temperature anomalies. . .

The authors present numbers concerning the % of cooling associated with three different mechanisms. These numbers look reasonable, but it would be good to explain in a little more detail how they were calculated, and especially how much uncertainty there is. I don't get a good sense from the text about the error in the results.

There are some minor copy editing issues, but I'm sure the journal will address these without my nitpicking.

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