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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Characterising energy budget variability at a Sahelian site: a test of NWP model behaviour" *by* Anna Mackie et al.

Anonymous Referee #1

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This work shows the comparison between modeled and observed radiation properties at the site of Niamey. The authors use a multivariate analysis to correlate the various model discrepancies with different physical processes in the atmosphere. This is a very interesting approach leading to the quantification of the relative contribution of several parameters in radiative transfer calculations. The model in general follows the seasonal trends but significant discrepancies appear on a daily basis comparison with observations. Most of the findings from the multivariate analysis are not conclusive except from albedo, ice water path and aerosol optical depth. At this point I recommend publication with major revisions. More specifically:

1. Evaluating the performance of a global model at a single station is not a common method for extracting robust results and limiting the study in Niamey limits also the

significance of this work. You should present and discuss also the comparison with other measuring sites preferably at areas with different climate properties.

2. The considerations about the constant positive bias in modeled albedo are in my opinion some of the most important findings of this work. Following my previous consideration, it is possible that such albedo bias is also present in different areas worldwide. Improving the surface / soil model in the model (possibly incorporating NDVI observations) could probably improve the overall model performance since a more physically based representation of surface fluxes will also affect cloud formation (hopefully towards the correct direction). As a first step I would encourage that you perform a test run with the modified albedo in 43r1 (as you present in section 4.2.2) and see how this will affect the model results.

Minor Comments

-How do you explain the great variability in daily measurements compared to the model results in Figures 2, 3?

-P4, L17 "ERA-I has also been evaluated by other studies in West Africa (Marsham et al., 2015)."

Please state briefly what are the results of these evaluations for ERA-I.

-P6, L28: "However, the the majority"

Please correct

-P7, L3-4 and elsewhere "Wet season average bias in DLR and ULR is small at 0 and 1 Wm-2, respectively"

Averaging over a long period of negative and positive biases can result in almost zero average bias but this is probably misleading. Using absolute bias could provide more insight on the model performance.

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