

## ***Interactive comment on “Deriving Photosynthetically Active Radiation at ground level in cloud-free conditions from Copernicus Atmospheric Monitoring Service (CAMS) products” by William Wandji Nyamsi et al.***

**Anonymous Referee #3**

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The manuscript submitted to Biogeosciences titled, “Deriving Photosynthetically Active Radiation at ground level in cloud-free conditions from Copernicus Atmospheric Monitoring Service (CAMS) products” by Wandji Nyamsi et al. presents one aspect of a larger project developing radiation modeling for the bottom of the atmosphere. This includes a sequence of recent articles lead by the current lead author. The specific objective of this study appears to be testing the use of CAMS atmospheric products for inputs to an existing numerical radiation transfer model. The model itself is cited, as is the spectral resampling technique used here, referred to as the ‘new method’. What

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is new in THIS study seems to be the use of the CAMS products; columnar aerosol optical depth (AOD), ozone (O<sub>3</sub>) and water vapor (H<sub>2</sub>O) inputs to the radiation model.

The general accuracy of the simulated cloud-free PAR is impressively high at 7 locations with strong regional differences likely in AOD and H<sub>2</sub>O. However, a number of questions seem to remain that are central to the research objective. These include, “What causes the tendency of the model to perform well at lower PAR levels and over-estimate at higher values (e.g. Fig. 2), and cause slope >1 in general? Did this appear in previous evaluations of the model?” “Can the differences in accuracy found between the seven stations be used to inform the cause of inaccuracy?” “The model over-estimate appears to be correlated with a tendency of the model to over-estimate under low zenith angles and/or under low AOD. Why is this?” “Is the cause of this inaccuracy related to the CAMS data set or is it the radiation model itself?”

The answers to these questions seem important to the objectives of this study, because they should provide leads towards future model improvements. As presented, I find the manuscript needs to overcome two major obstacles currently inhibiting its potentially useful contribution to Biogeosciences.

1. Surprisingly, little information is provided about the CAMS product, especially accuracy assessments of AOD, O<sub>3</sub> and H<sub>2</sub>O vapor products from past studies. This context is necessary to assess the efficacy of using it for inputs to radiation modeling. It may also provide some useful insight into the cause of the over-estimate of PAR in simulations found here.

2. Analysis doesn't seem to test the CAMS input specifically, but rather the CAMS-driven radiation simulations against observations. This could be done by comparing these simulations to those using standard (e.g. monthly average) AOD, H<sub>2</sub>O and O<sub>3</sub> for a site. Sensitivity simulations for variations in these input variables would also help shed light on the sensitivity of model accuracy to each of these inputs (or discussed, if reported elsewhere). My guess is that this shows AOD is key. I believe AOD is

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also measured at the observation sites? Could the CAMS product be evaluated to determine if, for example, the over-estimate could be related to a bias in CAMS AOD?

Minor comments: Specific objective of this study is not really clear. Nor is it clearly separated from the other model developments in this sequence. There seems to be significant overlap as written.

It would be helpful to the readership of this journal for the authors to articulate more fully in the introduction and discussion sections, the implications of these methods and results to biogeoscience research in general.

Methods, why not include the Modeling Efficiency Coefficient (Nash and Sutcliffe 1970)? It's a very direct test of model performance, including bias and random error.

There is no discussion section. This would be a useful place to investigate answers to the questions above based on the evidence presented in results.

The manuscript needs to be carefully edited for small but frequent lapses in grammar, or clarity in expression.

L128: What is 'fine rock'?

L137: End of sentence unclear - 'instant instances' is confusing alliteration. Anyway to rewrite using other words such as 'periods', 'frequency'...?

In discussing Fig's 2 and 4, What is an 'identity line'?

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