

## ***Interactive comment on “Modeling South America regional smoke plume: aerosol optical depth variability and shortwave surface forcing” by N. E. Rosário et al.***

**Anonymous Referee #3**

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General Comments:

This paper discusses the use of a coupled chemical transport model and a radiative transfer model to calculate aerosol optical thickness (AOT), surface shortwave irradiance, direct radiative forcing, and forcing efficiency over the Amazon Basin. The model's performance is then evaluated by comparing observations of AOT and shortwave irradiance with model output of the same. The only emission that was considered is smoke, and the results are (probably) relevant only to smoky conditions.

The paper's main purpose, in my view, is to document how well the coupled model can predict AOT, etc. In this regard, the model does reasonably well. Although the

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paper does not break a lot of new ground scientifically, the documentation of model performance is a sufficient reason for publication, because the performance is now available for all who wish to see, and it can be referenced by future studies, as needed.

Specific Comments:

The paper's exposition needs some help. In particular, the paper makes the distinction between static and dynamic runs, but this is not explained thoroughly in the text. I became particularly confused on reading the last few sentences of section 2. Does the dashed line in Figure 2 represent the static model? (Apparently, yes). Do the separate lines in Figure 2 represent the dynamic model? (Apparently, yes). This distinction should be made clearer, and discussed somewhat earlier in the paper (maybe around lines 10-15, page 17471, at which point the aerosol radiative models are first mentioned).

The authors conclude that differences between modeled results and observations are probably mostly driven by emissions. This seems to be a frequent conclusion for model evaluation studies, and points out the need to develop emission inventories of higher quality. The authors can optionally comment on this, if they think it is appropriate. It would be interesting to do some emission sensitivity runs to determine how the results changed with increases and decreases in emissions. This is too much to ask for this paper, but please keep it mind for future studies.

Technical comments:

The authors probably are not native English speakers, and they should be commended for writing a paper using fairly good English. However, there are a lot of grammatical errors – too many for me to list here. I recommend that the authors avail themselves of an editing service, so that these errors can be cleaned up.

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