

***Interactive comment on* “Changes in the aerosol direct radiative forcing from 2001 to 2015: observational constraints and regional mechanisms” by Fabien Paulot et al.**

Anonymous Referee #1

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This paper discusses the use of the GFDL-AM3 model for interpreting changes in the outgoing radiation budget as a result of changes in aerosol emissions. The direction of the paper is very interesting as a result as it could provide a basis for updating the direct radiative forcing estimates from aerosols. However, at this time this paper needs substantial revisions before it can be accepted for publication or even given a serious review. In particular there are two main concerns that I have. Concern 1 is that the paper is nearly un-readable with the extensive use of acronyms and jargon, which in turn makes it challenging to understand their conclusions. Concern 2 is that the paper effectively does not consider the role of fires in their model / data comparisons. Consequently, the comparisons between data and model over India Asia (in particular)

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and anywhere in the tropics will be substantively compromised (e.g. Ramanathan and Carmichael, Nat Geo 2008 and references therein). In fact it seems likely that their poor model/data comparison in the tropics is likely because fires are not obviously considered in the comparison.

Below are examples of sentences and paragraphs that need to be made more clear. I should point out that their writing approach is infused in nearly every section so the authors really just need to examine every single sentence in this paper and determine how to “de-acronym” and “de-jargon” the sentence.

I think this sentence is possibly the worst offender: Line 155: “Figure 2 shows that $\Delta m, yRstucsaf$ is most sensitive to $\Delta m, y(salb)$, so we use two independent estimates of surface albedo derived from CERES EBAF ($salbCE$) and MODIS ($salbM$). The associated estimates of SDRECS will be denoted as SDRECSCE and SDRECSM, respectively, hereafter. We use GEOS5 for WVP and $qo3$, similar to CERES SYN. “

Below are other “minor” comments. I should point out that I can probably cut out a large fraction of the paper and attempt to make suggestions about changing the “readability” and grammar. However, I would really want to see this paper cleaned up and my concern about fires addressed before going through and providing a more thorough review

Line 165: What does this mean? this is apparently one of the many “p-tests” that gets used about the literature but essentially has no meaning if not explained.

Line 216: (fix this statement) “Changes in AOD are dominated by spring and summer”
Line 231: ??? Again too much acronyms / jargon. What is conclusion about these differences? Line 353. . . no biomass burning as part of anthropogenic emissions? The bulk of fires is due to human activities so this is an odd statement. Perhaps you mean the subset that is not human driven? That said, you would see substantial differences between observed and actual outgoing radiation if you leave this term out (which you apparently do over the tropics).

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