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Interactive comment on “Estimates of fire emissions from an active deforestation region in the southern Amazon based on satellite data and biogeochemical modelling” by G. R. van der Werf et al.

Anonymous Referee #2

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Fires play an important role in the global carbon cycle, and yet the processes that determine fire emissions are complex, local, and crucially involve human drivers. Therefore, fire has so far eluded attempts at accurate modelling on the global scale. This manuscript describes an interesting approach that goes in the direction of tackling this problem. By using simple modelling approaches, but basing their calculations on rather detailed regional data and remote sensing products, the authors have been able to bridge important gaps in scale, that are in principle applicable across the globe.

The text is generally well written and comprehensible. As the authors show themselves,

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the modelling approach is rather simple, which leads to a significant under-estimate in the spatial variability of the fire fluxes. The authors fully document and acknowledge this.

In general, I find that the scientific insights this paper provides are somewhat limited, although interesting, but the methodology proposed is promising with some improvements. I would therefore recommend full publication as in BG, with some minor improvements in presentation:

1 - In general, the approach used to account for the different fire activities and possible land use changes could be presented in more detail, while less details is needed for developing carbon model of which only a small part is really used (the one that leads to the calculation of biomass). I would suggest presenting those in a matrix from (land from - to -), or similar, at least for the land use change. At present, it is difficult to follow through the myriad of cases and exceptions.

2 - A figure summarizing all the data sources would be much welcome.

Some specific comments:

Page 3539, bottom: Since the NDVI is sensor dependent (as the bands it involves are not the same for each sensor), it is not clear whether the cited methodology to go from NDVI to FAPAR can be applied to MODIS, or has been specifically tuned to the MODIS bands involved. This needs commenting.

Page 3540, top: epsilon is 0.5, but in what units. Could also mention briefly what the basis is for selecting this value, rather than just citing the CASA model original paper.

Section 2.2.4, "conversion of pasture or Cerrado to cropland (secondary vegetation)". This sounds as if Cerrado was a secondary vegetation cover. Please comment.

Page 3542, 2nd para: "Based on phenology...". Please detail how phenology is observed here.

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Page 3543, top para: This one would greatly benefit from an explanatory schematic diagramme.

Same page, bottom para: "Sect. 2.2.5". This section seems to be missing.

Same para: here, a 2D table with comments would probably help.

Section 2.5, last sentence: This is because DECAF has $\epsilon=0.5$ constant for all land cover and vegetation types, isn't it? Please mention.

Section 3.3 "If we also take soil carbon ...". Didn't you earlier explain that the soil carbon model had not been calibrated yet? Please clarify.

Section 4.2, 2nd para, beginning: How is the word "related" qualified here? It would be good to see the results of a proper statistical test so that we can better judge this statement. In particular since it relates to an important result.

Section 4.3, 1st para, 2nd last sentence: fires will also vary to seasonal variation in fire flux, something that could be detected through the atmospheric CO₂ signal. This might be an important way of verifying this model once it has been developed to the pan-tropics.

Page 3552, last sentence: Please re-iterate here why DECAF biomass estimates are conservative? The reader might not remember here.

Page 3553, 2nd sentence "lower the uncertainty": Will you decrease uncertainty when it comes to the average, or at what spatial scale. I cannot see why moving to the pan-tropics should decrease uncertainty. I would rather expect it to increase. At least if you look at regional averages of the same size as this one (i.e. at the same spatial scale). Please be more specific and qualify the statement.

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