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Earth System Dynamics
Discussions

Interactive comment on "The biomass burning contribution to climate-carbon cycle feedback" *by* Sandy P. Harrison et al.

Anonymous Referee #2

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The manuscript by Harrison and colleagues is a welcome addition to the literature on the role of fire in the Earth and climate systems. Its novel angle stems from its simplicity and ability to derive information from the paleo record that has relevance for today's changing climate.

Overall, I appreciate the relative simplicity of the article, along with its transparency (i.e., R code in the Supplementary Materials) and brevity. I am personally more of an expert on the 'modern' component of this manuscript (global fire patterns and emissions during the satellite record), so can offer little critical review of the methods employed for the charcoal and methane components. That said, results from the paleo analysis are considerably more exciting than those from the modern component, which by themselves are limiting due to the small sample size and confounding effects of anthropogenic

influence, which the authors acknowledge.

Accordingly, I have only minor comments to offer:

-[pg 2, L23] Humans also of course influence fire ignition

-[pg 3, L 20] Might also reference van der Werf et al 2017, which is the paper associated with GFED4:

van der Werf, G. R., Randerson, J. T., Giglio, L., Leeuwen, T. T. van, Chen, Y., Rogers, B. M., Mu, M., Marle, M. J. E. van, Morton, D. C., Collatz, G. J., Yokelson, R. J. and Kasibhatla, P. S.: Global fire emissions estimates during 1997–2016, Earth System Science Data, 9(2), 697–720, doi:https://doi.org/10.5194/essd-9-697-2017, 2017.

-[pg 10] Shouldn't the references for Arora et al. (2014) be Arora et al. (2013)?

-[pg 10, L 13] It would be worthwhile knowing the global land climate-carbon cycle feedback from Arora et al. (2014) for only the models that did not include fire as an interactive process. I think this should be possible from the information provided in the paper (Table 2)?

-Can the authors make an attempt to compare their estimates to those of past studies that calculate the global forcing associated with changes in fire regimes over time such as Ward et al. (2012)? Doing so would, I believe, require translating the feedback parameters into forcings (W/m2) as a function of temperature change over the historical and future periods. Of course differences would be largely due to the impacts of humans, but these could be calculated and compared in various ways based on the authors' current assessment. Doing so may provide a helpful interpretation of their results in the context of previous work on fire's influence on future climate change (human affected and 'natural').

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