

We thank the referee for their consideration of our manuscript. Below are our responses to each of the comments, including the proposed changes to our revised manuscript.

General Comments

1. I wonder if anything can be said about the credibility of the year 2020 projections since we are only four years away from 2020. There are some data available on forest area for 2015 from the FAO (<http://www.fao.org/3/a-i4808e.pdf>) which show about the same rate of forest loss in Indonesia between 2010-2015 as in 2005-2010, although not a perfect proxy for palm oil expansion in the two specific regions considered in this study.

The reviewer raises a good point. The projections from Marlair et al. (2015) and Austin et al. (2015) that we use are specifically for 2020, however, given uncertainties in these trajectories, we have changed the way we discuss the 2020 projections throughout the manuscript. To focus on the important notion that it is a near-term future, and not a precise prediction, we have added several sentences at the end of section 2.2:

"It is important to note that the 2020 distribution used here is the best estimation of a near-term future wherein large increases in oil palm plantations continue to occur. The distribution may not be an accurate prediction for the specific year 2020. It is meant to represent a realistic near-term scenario, and for this reason we refer to it from here on as the "future" distribution."

Throughout the paper, we now typically refer to "near-term future" rather than 2020.

2. It would be helpful to include the locations and names of the major urban areas referred to in the text in one of the early figures, possibly figure 1a, especially given that their relative locations are important for palm oil plantation impacts

Thank you for this suggestion. A figure and descriptive sentence was added in section 2.1, the model description:

"A map of the Asian domain, and the region of particular interest to this study is shown in Figure 1."

Minor Comments

Pg 4, Line 3: Can you comment on how the high fire emissions and dry conditions associated with the beginning of an el nino event in late 2006 may or may not impact your annual average results?

We took this comment into consideration, and completed simulations using 2007 and 2008 meteorology and emissions. These results indicate that the absolute magnitude of changes presented in this work are not highly sensitive to the choice of model year. The relative changes are more sensitive to the choice of model year, wherein the high

amount of fires in 2006 lead to more modest relative changes. We have added a sentence on P4 L8-9 in the manuscript:

"Additional simulations using emissions and meteorology from 2007 and 2008 indicate that the choice of model year does not substantially influence the results of this work."

Pg 5, Line 4: I think the "native forest" here refers not to a new PFT but to broadleaf evergreen trees as mentioned later in the sentence, this could be made more clear so the reader understands exactly what is being changed. The need to reduce the isoprene emission factor by 4 times over the default seems like it could be a major issue for global studies given that this forest PFT is dominant in the region, topic for another study maybe.

The reviewer is correct, we have added an explanatory phrase to the text: "(considered to be broadleaf evergreen tropical trees)"

The reduction in isoprene emission factors over broadleaf evergreen trees is confined to only over Southeast Asia. As such, it is likely not a major issue for global studies.

Pg 5, Line 9: Delete "that"

Done.

Pg 6, Lines 12-14: Does the palm oil PFT always replace the tropical forest PFT or does it replace all PFTs in a grid cell, including crops and grasses, based on the original fraction of the PFTs? It is suggested later on in the text that other land cover types besides forest are being converted to palm oil (Pg 8, Line 2) but it would be helpful to have this made clear on Pg 6.

Clarified in the text to: "fractional coverage of all pre-existing vegetation classes from the base land map are reduced accordingly."

Pg 8, Line 26-27: Is the 10% mentioned here also relative to the Modern Palm simulation?

Added "relative to the Modern Palm simulation" to the end of that sentence.

Pg 12, Lines 10-13: Does the overlap in the "Palm" and "Ocean" filtering regions dilute the palm oil signal in the results shown in figures 14 and 15?

No it does not. Only satellite measurements over the given regions were selected from within the larger bounding boxes. We have modified the figure to clarify this.

Pg 13, Lines 18-19: This sentence was a bit unclear to me and I think the rest of the paragraph stands well enough on its own such that this sentence could probably be deleted.

The sentence has been deleted.

Pg 14, Line 1: The 30% increase in ozone – is this relative to the no-palm world, or to 2010, and is this the palm oil plantation contribution alone or does this include increases in other sources of ozone?

This is relative to the no palm simulation, and is only the plantation contribution.

The sentence has been altered to be more clear:

"If the oil palm crop expansion continues unabated, near-term future ozone concentrations in urban regions could be up to 30% higher (compared to the no palm scenario) due to the plantations alone."

References

Austin, Kemen G., Prasad S. Kasibhatla, Dean L. Urban, Fred Stolle, and Jeffrey Vincent. "Reconciling Oil Palm Expansion and Climate Change Mitigation in Kalimantan, Indonesia." PLoS ONE 10, no. 5 (May 26, 2015): e0127963. doi:10.1371/journal.pone.0127963.

Marlier, Miriam E., Ruth DeFries, Derric Pennington, Erik Nelson, Elsa M. Ordway, Jeremy Lewis, Shannon N. Koplitz, and Loretta J. Mickley. "Future Fire Emissions Associated with Projected Land Use Change in Sumatra." Global Change Biology 21, no. 1 (January 1, 2015): 345–62. doi:10.1111/gcb.12691.