

Interactive comment on “Impacts of Current and Projected Oil Palm Plantation Expansion on Air Quality Over Southeast Asia” by S. J. Silva et al.

Anonymous Referee #1

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Silva et al. perform a model investigation into the impacts of a specific type of land cover change onto regional air quality in southeast Asia. They test the sensitivity of surface O₃ and aerosol AOD to the historical expansion of palm oil plantations in Kalimantan and Sumatra and to a “business-as-usual” projection of plantation expansion to 2020. Increases in ozone deposition velocity driven by the plantation expansion into primary vegetation counterbalance somewhat the enhanced ozone from the oil palm isoprene emissions. Still, the model results suggest that poor air quality events are increased in some nearby urban centers from the expansion of the plantations and could be further increased in the near future. Attempts to support the results of the simulations with satellite-derived data were inconclusive given the difficulty in isolating the relatively small palm oil impact on regional chemistry.

I found this to be a well-designed study that reached interesting conclusions regarding

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terrestrial impacts on urban air quality. These types of impacts are often overlooked but this study is a good example for how land cover changes can be important. The manuscript is also well written in my view with an appropriate amount of detail about the chemistry and model setup included, and clearly presented figures. I recommend publication after minor revisions that are listed below.

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.

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.

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?

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.

Pg 5, Line 9: Delete “that”

Pg 6, Lines 12-14: Does the palm oil PFT always replace the tropical forest PFT or does

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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.

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

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?

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.

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?

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