

Interactive comment on “Potential sensitivity of photosynthesis and isoprene emission to direct radiative effects of atmospheric aerosol pollution” by S. Strada and N. Unger

Anonymous Referee #1

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General: This is a quite straightforward modelling experiment that determines the sensitivity of photosynthesis and isoprene emissions to changes in anthropogenic aerosol loadings. Nevertheless, it examines an important topic, and I found the paper an enjoyable read and the results interesting. The paper is well written with good clear graphics. I recommend publication after only a few minor comments have been answered.

Specific Comments:

Additional experiments: It would be quite interesting to see the model response to coupled changes in the aerosol emissions, e.g., 50% increase in industrial vs. 50%

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decrease in biomass burning, and vice versa. I think this would add another dimension to the paper, but shouldn't limit the paper's acceptance if the model simulations are too time-consuming to perform.

Abstract: There are couple of instances where a little more explanation is needed so that a reader can clearly understand the full details of the study. For example, on a first read I'm left wondering what 'complex canopies' are, and exactly what you mean by 'cooling in the Amazon Basin'. It is clear when you read the manuscript further, but not when you read the abstract alone. I suggest the authors just take a little more time to carefully improve the abstract.

Page 25440, lines 3: Section number missing.

Page 25441, lines 19–23: I had to read this twice first time around. I would bullet point these different simulation types and indicated more clearly that different emissions are removed (e.g., 'all anthropogenic emissions including biomass burning are removed...' and '...biomass burning emissions only are removed...' etc.)

Section 2.2: I can see why understand why a long simulation is needed, but a little more justification on why the first 12 years (& not 10 or 15 years) are discarded, and why only for example the last 20 years (& not 30 years) are used.

Section 3.2, Page 25445, line 2: I may be interpreting Table 1 wrong, but simNObb has a notable effect on SOA ACB reducing it from 1.37 to 1.14.

Section 3.2.2: I think that it would be prudent to discuss changes in leaf temperature actually here (& included figure S11 or S12 in the main manuscript) in preparation for the following discussions on isoprene emissions. Or maybe have a new section 3.2.3 instead.

Section 4: I appreciate the author's discussion on the study's limitations. But I think not allowing leaf phenology to respond to the changes in aerosol emissions is a significant issue. Canopy inputs are changing and thus ecosystems will respond accordingly.

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Is there anyway this effect can be quantified in this system set-up or has its likely magnitude been quantified in a similar study. I think this problem should also be directly mentioned in the abstract as well.

Table 1: I would find this table quicker to understand if the changes were in percentages but it is not critical. Also one could expand the table to include the relevant numbers for regional changes so as to correspond to the discussions in sections 3.3.1 to 3.3.3 of the main text.

Comment: There are a lot (!) of figures in the Supplementary Material but few if any of these figures are actually referenced in the main text. If its important than they should be mentioned in the main text.

Interactive comment on Atmos. Chem. Phys. Discuss., 15, 25433, 2015.