

Atmos. Chem. Phys. Discuss., referee comment RC2
<https://doi.org/10.5194/acp-2021-132-RC2>, 2021
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Comment on acp-2021-132

Anonymous Referee #2

Referee comment on "Examining the competing effects of contemporary land management vs. land cover changes on global air quality" by Anthony Y. H. Wong and Jeffrey A. Geddes, Atmos. Chem. Phys. Discuss.,
<https://doi.org/10.5194/acp-2021-132-RC2>, 2021

Wong and Geddes present work comparing the relative influence of land use/land cover change (LULCC) and agricultural reactive nitrogen emissions on air quality over modern timescales. They carry out this work using the GEOS-Chem chemical transport model along with a variety of updated emissions inventories and satellite products. In the end, they find that both effects can be important for regional air quality and trends in both LULCC and reactive nitrogen emissions should be considered when assessing multi-decadal trends in air quality. The manuscript is generally well structured and describes a thorough investigation. I can likely recommend this paper for publication after the following minor points are addressed.

Major Comments

The large number of specific geographical regions referenced in the manuscript substantially reduces the readability of the work. For example, how do the changes over Myanmar track with the changes across Southeast Asia (Germany and Benelux, Southern Russia and Kazakhstan, Southern Amazonia and Paraguay, etc.)? I suggest the authors standardize locations more consistently if possible.

Following the text on lines 152-162 and the supplement, the GEOS-Chem model appears

to have reasonably large issues in the simulation of SNA. Annual mean biases of 30-50% are not necessarily consistent with the model capturing “the present-day annual means of surface SNA” as stated on Line 161. The authors should describe how these biases influence the interpretation of the results in this work (e.g., are biases in annual magnitudes sufficiently unimportant for the simulation of changes in SNA?).

Despite the nonlinearity in the response of atmospheric composition to changes in surface fluxes, the changes in ozone and PM due the combined effects of agricultural emissions and LULCC (Tables 3 and 4) are nearly linear with respect to the individual process changes. Do the authors have any hypotheses as to why this might be?

Minor Comments

L23-25: This statement is sufficiently qualified to be nearly meaningless and could be much stronger. Your work does more than demonstrate possible impacts which imply potential importance!

L143-145: Are there other LULCC impacts on meteorology which the authors think might important that aren't addressed through changing the roughness length?

L183-186: What is the potential size and influence of this effect on the results in this work?

L195-196: This seems like a bigger issue than just in Southeast Asia as it relates to oil palm plantations. Presumably everywhere that relatively large land cover changes occur that are not represented in the datasets used here will be missed.

There are minor grammatical errors throughout the manuscript, related dominantly to article use and subject-verb agreement. Some of these are listed below:

L11 “cause reduction” to “cause a reduction”, “level” to “levels”

L12 "level India, China and eastern US" to "levels in India, China and the eastern US"

L14 "Across" to "across"

L35 "...introduce an enormous amount"

L340 "likely"