Responses to comments

Journal: Atmospheric Chemistry and Physics

Manuscript ID: acp-2022-739

Title: "Impacts of land cover changes on biogenic emission and its contribution to ozone and secondary organic aerosol in China"

Dear Editor,

We appreciate your comments to help improve the manuscript. We tried our best to address your comments and detailed responses and related changes are shown below.

Comments:

1. Although the manuscript largely improved in the revised version, still some work is needed before the final acceptance. In particular you should slightly rewrite the abstract. Although acronyms are possible in the abstract, I would strongly advice to reduce them, as they are now flooding the entire abstract. Maybe you could refrain from using the C1-C5 notation there and list only the experiment in full, so to slightly reduce the acronyms number.

Response: Thanks for your comments. The notation C1-C5 was replaced with the full name of the experiment.

Changes in manuscript:

Abstract (Lines 21-30 in the revision): BVOC emissions in China range from 25.42 to 37.39 Tg in 2016 and are mainly concentrated in central and south-eastern China. Changing the LC inputs for the MEGAN model has a more significant difference in BVOC estimates than using different LAI datasets. The combination of C3S LC and GLASS LAI performs better in the CMAQ model, indicating that it is the better choice for BVOC estimations in China. Among all cases, the highest contribution of BVOCs to O_3 and SOA can reach 12 ppb and 9.8 μg m^{-3}, respectively. Changing the MEGAN inputs further impacts the concentrations of O_3 and SOA, especially changing LC datasets. The relative difference between MCD12Q1 LC and C3S LC is over 52% and 140% in O_3 and biogenic SOA (BSOA) in central and eastern China. Overall, the BSOA difference is mainly attributed to the isoprene SOA (ISOA), a major contributor to BSOA. The relative differences in ISOA between different cases are up to 160% in

eastern China. Therefore, our results suggest that the uncertainties in MEGAN inputs should be fully considered in future O_3 and SOA simulations.

2. Please have also a further check on the text flow and the language, as in many place this is still hard to follow. Although there will be a language proof, the meaning of the sentence must be clear already in the main manuscript.

Response: Thanks for your suggestion. The text flow and the language of the manuscript were thoroughly reviewed to ensure that it was clear and easy to follow.

3. Here some example of possible improvements:

3.1. line 39 : "will alter the concentration"

Response: Revised accordingly.

Changes in manuscript:

Introduction (Lines 37-38 in the revision): "In addition, changes in BVOC emissions also apparently alter the concentrations of key pollutants that affect the climate. In particular, O_3, methane (CH4) and aerosols. O_3 and CH_4 can warm the climate, while the aerosols have a cooling effect by scattering solar radiation. (Unger, 2014a, b)"

3.2. line 45-46 : "ranges" instead of "are ranged"

Response: Revised accordingly.

Changes in manuscript:

Introduction (Lines 44-45 in the revision): "Global annual inventories of the isoprene emission range from 500 to 750 Tg yr^{-1} (Guenther et al., 2006) and those of monoterpene emissions range from 74.4-157 Tg yr^{-1}"

3.3. line 53 : "[...] estimations and further result in uncertainties on the impacts of BVOC on O3 and SOA"

Response: Revised accordingly.

Changes in manuscript:

Introduction (Lines 51-52 in the revision): "Those factors can influence the accuracy of estimations and further result in uncertainties on O_3 and SOA."

3.4. line 88 : " [...] satellite datasets as input into the MEGANv2.1 model to estimate the BVOC emissions and then couple the results with [...]"

Response: Revised accordingly.

Changes in manuscript:

Introduction (Lines 87-88 in the revision): "… satellite datasets as the MEGANv2.1 inputs to estimate the BVOC emissions and then determine their impacts on air quality by using a source-oriented model."

Reference

Guenther, A., Karl, T., Harley, P., Wiedinmyer, C., Palmer, P. I., and Geron, C.: Estimates of global terrestrial isoprene emissions using MEGAN (Model of Emissions of Gases and Aerosols from Nature), Atmos. Chem. Phys., 6, 3181-3210, 10.5194/acp-6-3181-2006, 2006.

Unger, N.: On the role of plant volatiles in anthropogenic global climate change, Geophys. Res. Lett., 41, 8563-8569, 10.1002/2014GL061616, 2014a.

Unger, N.: Human land-use-driven reduction of forest volatiles cools global climate, Nat. Clim. Change, 4, 907-910, 10.1038/nclimate2347, 2014b.