

Atmos. Chem. Phys. Discuss., referee comment RC2
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Review of Opacka et al., 2021

Anonymous Referee #2

Referee comment on "Global and regional impacts of land cover changes on isoprene emissions derived from spaceborne data and the MEGAN model" by Beata Opacka et al., Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2021-95-RC2>, 2021

This manuscript details the impact of choice of land use and land cover on magnitudes and trends of modeled isoprene emissions in MEGAN-MOHYCAN. Three satellite-based datasets are used (MODIS, ESA CCI-LC, GFW), as well as national inventories, which may be based on suborbital and/or satellite-based observations. The manuscript highlights discrepancies in the methodologies for constructing land cover maps, and the uncertainty in translating these maps into maps of PFT-types at a given spatial resolution, as is required for use in MEGAN-MOHYCAN. The authors provide a final recommendation of incorporating continuous fine resolution tree cover fields into LULC maps.

Overall, the analysis is thorough, and the discussion is clear and useful. The manuscript is suitable for publication in ACP. I have only a minor few questions, given below.

1.) Line 20: "At national level, the increasing trends in forest cover reported by some national inventories (in particular for the US) are contradicted by all remotely-sensed datasets". I anticipate this section will peak substantial interest for a variety of audiences. I suggest adding a brief clause as to the cause of the discrepancies (a short reference to section 3.3).

2.) Figure 9 and supporting discussion: Zhu et al. (2017) attribute trends in HCHO in the Northwestern US to increasing forest cover. Is this compatible with your results?

3.) Can the authors briefly comment on discrepancies in the magnitude of monoterpene emission trends (as in the summary, second bullet, or as in Figure 7)? While not the focus of this work, the results would be interesting given the high variability in trends in the northern latitudes.

4.) In section 5, CO₂ inhibition is turned on, whereas it is neglected previously. This leads to some confusion as to whether the emission trends presented previously apply to the HCHO trends shown here. I suggest incorporating the CO₂ inhibition factor throughout.

References:

Zhu, L., Mickleby, L. J., Jacob, D. J., Marais, E. A., Sheng, J., Hu, L., Abad, G. G., and Chance, K. (2017), Long-term (2005–2014) trends in formaldehyde (HCHO) columns across North America as seen by the OMI satellite instrument: Evidence of changing emissions of volatile organic compounds, *Geophys. Res. Lett.*, 44, 7079– 7086, doi:10.1002/2017GL073859.