

Reply to Reviewers

We sincerely appreciate the two reviewers for their time and efforts to improve the revised manuscript. The minor comments from the second reviewer are reproduced below followed by our responses in blue. The corresponding edits in the manuscript are highlighted with track changes.

Reviewer #2:

The added analysis of additional impacts that affect HCHO abundance and that may vary with drought severity (such as NO_x and mixing height) has strengthened this paper, and help provide additional support for its conclusions on drought impacts on isoprene emissions. I have a few minor technical corrections to suggest, but would otherwise recommend publication.

(1) Line 137: Suggest including a reference for the OMI NO₂ product used here.

Response: Thanks for the suggestion. The reference (Nickolay et al., 2019) was added in the main texts.

(2) Figure 4b: I think the units for the dashed lines are incorrect (should be 10¹⁴ molec/cm²?). Also, the title of the panel suggests that the dashed lines represent relative changes in NO₂, but they are absolute differences from N₀, correct?

Response: Thanks for catching the error. The unit has been changed to 10¹⁴ molec/cm². It is correct that the dashed lines are absolute differences from N₀. We have clarified this in the subtitle of Figure4b in the main texts.

(3) Line 231-232: While it makes sense that one might expect more HCHO photolysis during drought due to more clear, sunny days, are there any studies to cite here that have documented this effect?

Response: Two references (Naimark et al., 2021; Wang et al., 2017) were added to the main texts.

References:

Naimark, J. G., Fiore, A. M., Jin, X., Wang, Y., Klovenski, E., and Braneon, C.: Evaluating Drought Responses of Surface Ozone Precursor Proxies: Variations With Land Cover Type, Precipitation, and Temperature, *Geophys. Res. Lett.*, 48, e2020GL091520, <https://doi.org/10.1029/2020GL091520>, 2021.

Nickolay A. Krotkov, Lok N. Lamsal, Sergey V. Marchenko, Edward A. Celarier, Eric J. Bucsela, William H. Swartz, Joanna Joiner and the OMI core team (2019), OMI/Aura NO₂ Cloud-Screened Total and Tropospheric Column L3 Global Gridded 0.25 degree x 0.25 degree V3, NASA Goddard Space Flight Center, Goddard Earth Sciences Data and Information Services Center (GES DISC), Accessed: [last access: 4 October 2022], <https://doi.org/10.5067/Aura/OMI/DATA3007>.

Wang, Y., Xie, Y., Dong, W., Ming, Y., Wang, J., and Shen, L.: Adverse effects of increasing drought on air quality via natural processes, *Atmospheric Chem. Phys.*, 17, 12827–12843, <https://doi.org/10.5194/acp-17-12827-2017>, 2017.