

We sincerely thank the reviewers for their valuable feedback, and we are especially grateful to the editor for his patience and efforts on our review paper. We have responded to the reviewers' comments point by point and outlined our modification plan to address the corresponding issues as requested.

Responses to Reviewer 2

This paper has a highly worthwhile aim with closing an important gap in the literature by reviewing agricultural VOC emissions. But I unfortunately have to agree with the other referee that the manuscript left me unsure how the overview given can be useful for modeling and the atmospheric chemistry community in general.

My main concerns are:

- The scope of the review is much narrower than the title suggests. For example, it seems to be focusing purely on field crops that are common in temperate climates. Important BVOC emitters such as fruit trees, or others that are relevant in warmer climates, are ignored.

Reply: Thanks for this comment. We have already stated our main aim in line 6 of the abstract in the original text. In the new revision, we will narrow our title to make the aim of the paper clearer.

- I think the authors could have done a more thorough job in reviewing the literature and in supporting some of their statements with references.

Reply: Thank you for the comment. We would like to affirm that we conducted a detailed review of the topic we focused on. Regarding the comments about the lack of support for some statements, we will carefully go through the paper again and check them in detail.

- I am missing a clear direction statement/recommendation of what the numbers given can or should be used/useful for.

Reply: We will add the corresponding statements explaining the reasons for showing data as values at the beginning of each section in the revised version. To briefly clarify:

The aim of this paper largely dictates the way we present the data. Our goal is to summarize the current processes related to agricultural arable crops, soil, and management practices, highlighting which research areas remain unclear and require further study. For modeling purposes, we realized that using a single PFT definition (e.g., MEGAN v2.1) and less focus on OVOC (Karl et al., 2009) do not meet the needs or match real environmental situations. Therefore, we present the current knowledge on emission factors for arable crops in Table 5 of our review paper. Additionally, the emission values in Tables 1 and 2 clarify our statement on the necessity for species-specific emission factors for each compound. As mentioned before, we can improve the logical presentation of data in each section in the revised version.

- In conclusion, I am afraid that I cannot recommend the manuscript's publication in its current form. To give the authors more time to revise I would rather reject the manuscript.

Some concrete points:

l. 14 Guo et al. is a modeling study. You could add a reference of actual measurements showing the relevance of BVOCs for urban air quality. But I am not sure if urban biogenics are the best introduction into this paper on agricultural emissions.

Reply: Thanks. We will consider this comment in the revised version.

l. 15 citations are missing for the examples given

Reply: The reference for line 15 was given in line 754.

l. 18-20 for the impact of agricultural BVOCs on atmospheric chemistry, you could also cite

*Bsaibes, S., Gros, V., Truong, F., Boissard, C., Baisnée, D., Sarda-Esteve, R., Zannoni, N., Lafouge, F., Ciuraru, R., Buysse, P., Kammer, J., Gomez, L. G., and Loubet, B.: Characterization of Total OH Reactivity in a Rapeseed Field: Results from the COV3ER Experiment in April 2017, *Atmosphere*, 11, 261, <https://doi.org/10.3390/atmos11030261>, 2020.*

*Pfannerstill, E. Y., Arata, C., Zhu, Q., Schulze, B. C., Woods, R., Seinfeld, J. H., Bucholtz, A., Cohen, R. C., and Goldstein, A. H.: Volatile organic compound fluxes in the agricultural San Joaquin Valley – spatial distribution, source attribution, and inventory comparison, *Atmos. Chem. Phys.*, 23, 12753–12780, <https://doi.org/10.5194/acp-23-12753-2023>, 2023.*

Reply: We appreciate and agree with your suggestions.

*l. 30 maybe another relevant paper to cite here: Rinnan, R. and Albers, C. N.: Soil Uptake of Volatile Organic Compounds: Ubiquitous and Underestimated?, *J. Geophys. Res. Biogeosci.*, 125, e2020JG005773, <https://doi.org/10.1029/2020JG005773>, 2020.*

Reply: We will add this in the corresponding section.

l. 42: Please also clarify that you exclude emissions from animal agriculture like dairies and openly stored silage, which are a big source of VOCs in some regions, and address the above mentioned scope comment.

Reply: Thank you for this comment. We will add this to make it more clear to the audience.

Table 1: In some regions of the world, citrus and other fruit trees are important for agriculture. They emit large amounts of highly reactive monoterpenes and should therefore be included in this review, I think. Otherwise, the review should specify already in the title and make clear that this is just for “field crops” and excludes fruits and other tree crops.

On citrus monoterpenes: e.g.

*Fares, S., Gentner, D. R., Park, J.-H., Ormeno, E., Karlik, J., and Goldstein, A. H.: Biogenic emissions from Citrus species in California, *ATMOSPHERIC ENVIRONMENT*, 45, 4557–4568, <https://doi.org/10.1016/j.atmosenv.2011.05.066>, 2011;*

*Gentner, D. R., Ormeño, E., Fares, S., Ford, T. B., Weber, R., Park, J.-H., Brioude, J., Angevine, W. M., Karlik, J. F., and Goldstein, A. H.: Emissions of terpenoids, benzenoids, and other biogenic gas-phase organic compounds from agricultural crops and their potential implications for air quality, *Atmos. Chem. Phys.*, 14, 5393–5413, <https://doi.org/10.5194/acp-14-5393-2014>, 2014. [This paper’s SI has a big table with emission factors for many agricultural BVOC emissions]*

Reply: As stated in line 6 of the abstract, arable crops are the key species we focus on in this paper. For citrus, multiple papers, including the two mentioned by the reviewer, clearly describe their significant contribution. Interested readers can refer to these articles for more details.

Table 2, footnote a: Since there is no publication cited here, the data need to be published somewhere with a doi as specified in the data availability policy of ACP.

Reply: Since the references are too long to show, we will add a table in the supplement to make the usage clearer.

Table 2: It is not clear to me why forest soil emissions are included here (if you wanted to include data from forest soils and not just agricultural soils, there are far more studies of forest soil VOC emissions from many different places that would need to be included). Also, I am not sure if the few studies included in this table are all there is on VOC emissions from agricultural soils. Just a 2-minute internet search gave me more publications that report emission rates from agricultural soils, e.g.

Juan Zhao, Zhe Wang, Ting Wu, Xinming Wang, Wanhong Dai, Yujie Zhang, Ran Wang, Yonggan Zhang, Chengfei Shi, Volatile organic compound emissions from straw-amended agricultural soils and their relations to bacterial communities: A laboratory study, Journal of Environmental Sciences, Volume 45, 2016, Pages 257-269, <https://doi.org/10.1016/j.jes.2015.12.036>.

And the Abis et al. 2020 paper that the authors cite in other contexts. If there are reasons to exclude such studies from the compilation, it would be helpful if the authors defined the criteria of their selection of data more clearly.

Reply: Section 2.1 focuses on bare soil as the title described, which data presented are without the effects of management practices. The papers mentioned by Reviewer 2 focus on fertilization mixed with soil, which is not what we intend to present here. We will cite Zhao's article in the section on organic fertilization, where Abis et al., 2020 is also cited.

2.3 flowering emissions have also been discussed in some publications on citrus

l.95: "emission rates from this period" – do you mean "soil emission rates"?

l. 175: The sentence is grammatically incorrect and content-wise unclear.

Tables 4/5: This paper's SI has a big table with emission factors for many crop BVOC emissions that should not be ignored in this review: Gentner, D. R., Ormeño, E., Fares, S., Ford, T. B., Weber, R., Park, J.-H., Brioude, J., Angevine, W. M., Karlik, J. F., and Goldstein, A. H.: Emissions of terpenoids, benzenoids, and other biogenic gas-phase organic compounds from agricultural crops and their potential implications for air quality, Atmos. Chem. Phys., 14, 5393–5413, <https://doi.org/10.5194/acp-14-5393-2014>, 2014.

Fig. 1 I like the sentiment, but the realization could be improved... where do H2O and CO2 go, for example? it is a bit much information in a small space, making it confusing. Do the animals shown contribute anything? I don't see animal agriculture discussed in the paper.

Fig. 2: I would refrain from using Comic Sans in a scientific figure.

Reply: We will revise section 2.3 accordingly.

- Data availability: upon request is not acceptable according to the data policy of ACP. Please make the data available in a publicly accessible repository.

Reply: We understand the importance of making data readily available and are committed to transparency. While we can publish the data from our own research, some of the data included in this review are sourced from other authors and groups. To respect their intellectual property, we indicated that these data are 'available upon request.' We will clarify this in the manuscript and will gladly assist in facilitating access to the data through the corresponding groups, should any requests arise.