Community comments:

Fang et al. provide an interesting study of the biogeochemistry of volatile organic compounds in a freshwater wetland. The study measured the air-wetland exchange of VOCs through year-long in situ field experiments and investigated the impact of plant litter decomposition on these measured VOCs. Overall, this manuscript is well organized and most of results are clearly explained, and it fits within the scope of Biogeosciences. However, some issues in the current manuscript still need to be addressed. Thus, I recommend it for publication after a minor revision.

Reply: Thank you for the helpful comments and providing us the opportunity to revise the manuscript. We have carefully addressed the comments in point-by-point form as shown below.

1. The abstract is well written but includes many abbreviations that are not needed in the abstract text and should be removed. Why do you include an abbreviation for a definition that you use one time only? These abbreviation explanations (NMHCs, OVOCs, VOSCs) should be moved to the manuscript text.

Reply: Revised as suggested. (Line 30, 32, 34)

2. The references are outdated, especially in the Introduction section. Please replace with more recent studies.

Reply: Revised as suggested.

3. In general, the experiment is designed comprehensively and the aim is clear. One question, however, is whether the authors measured the background VOCs of the chamber itself or whether these VOC concentrations were very low and could be neglected? I cannot find any relevant information in the manuscript.

Reply: Thanks for the comments. In fact, as you mentioned, this preliminary experiment was done. Based on your comments, we have added some detailed information about background VOCs of the chamber in the revision, which was also provided as follows:

"*A blank test was carried out by enclosing the chamber with the Teflon film. First, high-purity N_2 (99.999%) was used to purge the chamber and remove the ambient air in the chamber. After that, cleaned canisters were used to collect the first air sample from the chamber and then the second sample and third sample were collected after 30 and 45 minutes, respectively. During sampling, high-purity N_2 was gently added into the chamber to equalize the gas pressure. The target VOCs reported in this study were not detected.*" (Text S1)

References

Hornyák-Mester, E., Mentes, D., Farkas, L., Hatvani-Nagy, A.F., Varga, M., Viskolcz, B., Muránszky, G., Fiser, B., 2023. Volatile emissions of flexible polyurethane foams as a function of time. ***Polym. Degrad. Stab.*** 216, 110507. https://doi.org/10.1016/j.polymdegradstab.2023.110507.

Lattuati-Derieux, A., Thao-Heu, S., Lavédrine, B., 2011. Assessment of the degradation of polyurethane foams after artificial and natural ageing by using pyrolysis-gas

chromatography/mass spectrometry and headspace-solid phase microextraction-gas chromatography/mass spectrometry. ***J. Chromatogr. A.*** 1218, 4498-4508. https://doi.org/10.1016/j.chroma.2011.05.013.

4. I am a little interested in the AH emissions reported in the manuscript. As we know, AHs have traditionally been considered as anthropogenic VOCs. Are there any possible reasons or mechanisms for the emission of AHs from natural environments?

Reply: Yes. As you mentioned, studies on biogenic AH emission were quite limited. Because AHs are generally considered as anthropogenic pollutants. However, recent studies reported that biogenic emission could be a potential source of atmospheric AHs. For example, several studies found biogenic AH emissions in the decomposition of wheat straw, eutrophic lakes and oceanic environments (Rocco et al., 2021; Wohl et al., 2023; Wu et al., 2023; Fang et al., 2025).

The mechanisms of biogenic AH emission are very complex and are involved in many biogeochemical processes. Living plants can rapidly produce AHs and release them into the ambient air to protect against biotic and abiotic stresses (Misztal et al., 2015). Moreover, plant litter itself contains AHs when it falls to the ground and may release a certain number of AHs when broken down. Our previous study found that toluene emission during straw decomposition was about three times higher under flooded condition than under non-flooded condition, and was positively correlated with bacteria and fungus number, microbial biomass carbon, CO_2 flux under flooded condition, but their negative relationships were found under non-flooded condition. These results

reflect that toluene could be mainly produced by microorganisms during straw decomposition under anerobic or anoxic conditions (Wu et al., 2023).

In addition, different AH species might have different formation mechanisms. For example, Wohl et al. (2023) revealed that toluene and benzene measured in seawater had different biological sources. Rocco et al. (2021) also found that benzene strongly correlated with ethylbenzene and xylenes, but not with toluene in marine phytoplankton emission.

Overall, biogenic AH emissions do occur in natural environment and are generated through a series of biogeochemical processes that require more studies to explore and clarify.

References:

Misztal, P.K., Hewitt, C.N., Wildt, J., Blande, J.D., Eller, A.S.D., Fares, S., Gentner, D.R., Gilman, J.B., Graus, M., Greenberg, J., Guenther, A.B., Hansel, A., Harley, P., Huang, M., Jardine, K., Karl, T., Kaser, L., Keutsch, F.N., Kiendler-Scharr, A., Kleist, E., Lerner, B. M., Li, T., Mak, J., Nölscher, A.C., Schnitzhofer, R., Sinha, V., Thornton, B., Warneke, C., Wegener, F., Werner, C., Williams, J., Worton, D.R., Yassaa, N., Goldstein, A.H., 2015. Atmospheric benzenoid emissions from plants rival those from fossil fuels. ***Sci. Rep.*** 5, 12064. https://doi.org/10.1038/srep12064.

Rocco, M., Dunne, E., Peltola, M., Barr, N., Williams, J., Colomb, A., Safi, K., Saint-Macary, A., Marriner, A., Deppeler, S., Harnwell, J., Law, C., Sellegri, K., 2021. Oceanic phytoplankton are a potentially important source of benzenoids to the

remote marine atmosphere. ***Commun. Earth Environ.*** 2, 1–8. https://doi.org/10.1038/s43247-021-00253-0.

Wohl, C., Li, Q.Y., Cuevas, C.A., Fernandez, R.P., Yang, M.X., Saiz-Lopez, A., Simó, R., 2023. Marine biogenic emissions of benzene and toluene and their contribution to secondary organic aerosols over the polar oceans. ***Sci. Adv.*** 9, eadd9031. https://doi.org/10.1126/sciadv.add9031.

Wu, T., Zhao, X.Y., Liu, M.D., Zhao, J., Wang, X.M., 2023. Wheat straw return can lead to biogenic toluene emissions. ***J. Environ. Sci.*** 124, 281–290. https://doi.org/10.1016/j.jes.2021.08.050.

Fang, H., Wu, T., Ma, S.T., Miao, Y.Q., Wang, X.M., 2025. Biogenic emission as a potential source of atmospheric aromatic hydrocarbons: Insights from a cyanobacterial bloom-occurring eutrophic lake. ***J. Environ. Sci.*** 151, 497−504. https://doi.org/10.1016/j.jes.2024.04.011.

5. Line 179: volatile organic sulfide compounds (VOSCs)

Reply: Revised as suggested. (Line 190)

6. Line 227-228. Monoterpene can be detected by GC/MSD method (Yuan et al. 2023. Emissions of isoprene and monoterpenes from urban tree species in China and relationships with their driving factors). The canister sampling used in the experiment may not be appropriate to capture these higher-molecular-weight species.

Reply: Thank you for carefully reviewing our manuscript. As you stated, canister sampling combined with GC/MSD method can be used for analyzing monoterpenes. The higher molecular weight species mentioned in the manuscript referred to the sesquiterpenes. In the updated version, we have revised "monoterpenes" as "*sesquiterpenes*". (Line 242)

7. Line 398: Change abbreviations "VOSCs" as "Volatile organic sulfide compounds".

Reply: Revised as suggested. (Line 411)