Reviewer Comments

Vehicle-based monitoring is an important supplementary technique for quantification of greenhouse gases emissions and improvement of the emission inventory's accuracy, the methodologies of which needs to be set up in a standardized and internationally accepted way. This study modifies the Gaussian plume Bayesian optimal estimates to compare the calculated methane emissions with the known values of release experiments based on two different types of mobile platforms, taking the residence time of the monitoring instruments into account.

The main finding of this study is obvious that the asymmetry of the concentration curves with time becomes more significant for slower flow-rate equipment, because the averaged concentrations of air samples would be heavily affected by the enhancements much higher than the background concentrations in a more fully-mixed condition. In order to eliminate the influence of instrument residence time, the study emphasizes the enhancement areas of plume measurements as a more robust and comparable method rather than commonly-used enhancement heights to quantify emissions. Whether the newer method makes sense from the perspective of the physical principle of Gaussian atmospheric diffusion formula needs to be clarified and proved before calculations, but this essential part is not provided. A clear definition of the most important concept, the residence time of the instrument, is not provided in this article. Besides, the authors also made some mistakes in explaining the relationship between the residence time of the instrument and the sampling frequency (Lines 161-162). According to the paper [1] cited by this article, the residence time of an instrument consists of the transit time and the rise time. The former is the time for the air mass moving for the inlet to the analyzer cavity, increasing with lower flow-rate for the instrument. In contrast, the latter is the time delay between an initial step change in gas concentration and the response in measured concentration of the analyzer, not linearly correlated with sampling frequency. At last, the organization and writing of the manuscript also needs to be improved. For example, the introduction is not well-structured with redundancy and irrelevancy.

In view of these shortcomings, I recommend rejection.

Reference

1. Takriti, M., et al., *Mobile methane measurements: Effects of instrument specifications on data interpretation, reproducibility, and isotopic precision.* Atmospheric Environment, 2021. **246**.