Second Review of "Drone CO_2 Measurements During the Tajogaite Volcanic Eruption" by Ericksen et al. (2024)

The manuscript by Ericksen et al. (2024) applies Unpiloted Aerial System (UAS) platforms to measure carbon dioxide (CO_2) concentrations and carbon isotope ratios during the 2021 eruption of the Tajogaite Volcano in Spain. This study used a Dragonfly UAS outfit with systems for measuring CO_2 concentrations and carbon isotopic ratios for 10 transects through volcanic plumes during the eruption. Using measured CO_2 concentrations and winds, applying gaussian assumptions, led to emission rate estimates of $4.6\pm0.46 \times 10^3$ to $2.8\pm0.28 \times 10^4$ t day^{-1} (4.6 to 28 kt day^{-1}). These emission rates are much more consistent compared to recent literature estimates compared to what was presented in the first version of the manuscript. Overall, the authors did a decent job in addressing my initial comments. The only major concern that remains is the author's minimal effort to estimate uncertainty in the CO_2 flux estimates. Please see my comment below. I think an improved uncertainty estimate, following other recent research cited below, would make this publication suitable for publication.

Major Comments

1. The uncertainty estimates of the CO_2 fluxes in this study are likely much too conservative. Many studies have shown that modeled winds (this study uses ERA5 model predicted wind speeds) are much larger than 10% (e.g., Nassar et al., 2017, 2021; Reuter et al., 2019; Johnson et al., 2020; Lin et al., 2023). Especially when you consider model wind speed and direction. Also, studies have shown it is not safe to assume a linear impact of wind speed on model prediction uncertainties (Nassar et al., 2017)? While wind speed/direction likely does have a majority impact on the overall uncertainty, it is not safe to neglect the other sources of uncertainty (e.g., measurement error, background concentration error, vertical distribution. etc.). It would be easy for this study to follow methods from recent research which quantify uncertainties from point-sources (.g., Nassar et al., 2017, 2021; Reuter et al., 2019; Johnson et al., 2020; Lin et al., 2023) to calculate more representative uncertainty values for this study.

References

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