

# Answers to the reviewer comments of the manuscript egusphere-2024-1320 after the major revisions iteration

Here we show the answers to the reviewer comments of our manuscript (egusphere-2024-1320) after the major revision iteration. The comments of the reviewer are marked in black, the answer to the comments in blue and the changes that we have made in green. Line numbers refer to the revised manuscript where the changes are marked.

## Comments Reviewer:

This study investigated GHG exchange in understudied ecosystem, namely non-tidal salt marches. The study combines in-situ CO<sub>2</sub> – CH<sub>4</sub> soil fluxes in both flooded and non-flooded periods in different habitats, with CO<sub>2</sub> vegetation fluxes from dominant species. The study highlights potential drivers behind the differences between species and de difference between seasons

The authors clearly took the advice of the previous referees well in consideration. I appreciate the inclusion of the map with the study site location, the table with soil data as well as the graphs with climate data in the supplementary material. The data representation in the article improved and the inclusion of extra tables with mean values in supplementary promotes easy data access.

I also appreciate the additions and corrections carried out in the article as well as the better framed results, taking into account the possibility of discrepancies due to the comparison of different methods used in this study. The authors also nuance their results by adding that the discrepancies with other studies may be due to the fact that they use different methods compared to other studies. The overall readability of the article improved a lot. The method section more clearly explains the used variables and equations and also the discussion section is now clearer, nicely highlighting the important results.

Some more rather small corrections could be made to improve readability:

Line 33: You don't mention NO<sub>2</sub> and SF<sub>6</sub> in the text so maybe the authors don't need to reference it here. Also is NO<sub>2</sub> meant or is it N<sub>2</sub>O?

We have changed these references by citing them as reports instead of web page, as it is recommended by the authors

(see the citation recommendations in:)

[https://gml.noaa.gov/ccgg/trends\\_doi.html](https://gml.noaa.gov/ccgg/trends_doi.html)

<https://gml.noaa.gov/ccgg/trends/global.html>

In this way, the name of the authors appears in the citation instead of the title.

That is, we have eliminated (Trends in globally-averaged CO<sub>2</sub> determined from NOAA Global Monitoring Laboratory measurements.; Trends in globally-averaged CH<sub>4</sub>, NO<sub>2</sub>, and SF<sub>6</sub> determined from NOAA Global Monitoring Laboratory measurements.) and we have added "(Lan et al., 2023b, a)" (line 30).

We have also corrected the N<sub>2</sub>O since NO<sub>2</sub> was wrong (which appears in title of the report in the reference list).

Line 34: compared to the atmospheric ...

Done (line 31).

Line 62: Since it determines which process ...

Done (line 58).

Line 76: to our knowledge, not one study has been performed in ...

Done (line 71).

Line 110: The salinity of the water table is around 0.86 ‰, being typical the sea water intrusion during summer, which moves the saltwater wedge inland, increasing groundwater salinity until levels similar to those of the sea (approximately 32 ‰) (Menció et al., 2017)

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The salinity of the water table is around 0.86 ‰. During summer, sea water intrusion typically happens, which moves the saltwater wedge inland and increases groundwater salinity until levels similar to those of the sea (approximately 32 ‰) (Menció et al., 2017)

Done (lines 104-106).

Line 125: After measuring CO<sub>2</sub> fluxes in the field, the used plant fractions were collected and stored in a fridge until sampled area was determined in the laboratory (within the next 24h).

Done (line 119).

Line 162: .... temperature and humidity variations throughout the day and night could affect the concentration of gas components in the sample (Rochette and Hutchinson, 2005), not being this a problem by using the soda-lime method, which can integrate soil CO<sub>2</sub> fluxes over 165 long periods, such as 24h (Keith and Wong, 2006). The number of flooded and non-flooded plots, as well as the method use in every sampling day are detailed in Table S2.

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... temperature and humidity variations throughout the day and night could affect the concentration of gas components in the sample (Rochette and Hutchinson, 2005). This is not a problem when using the soda-lime method, which therefore can integrate soil CO<sub>2</sub> fluxes over long periods, such as 24h (Keith and Wong, 2006).

Done (lines 154-155).

Line 192: "C\_CO<sub>2</sub> and C\_CH<sub>4</sub> were calculated by multiplying the amount of CO<sub>2</sub> and CH<sub>4</sub> emitted with 12/44 and 12/16, respectively, with 12 the molecular weight of carbon, 44 the molecular weight of CO<sub>2</sub>, and 16 the molecular weight of CH<sub>4</sub>. To convert emissions per unit area to emissions per grams of soil, we estimated the volume of soil beneath the chamber by multiplying the chamber area by the considered

~~soil depth (20 cm), and then multiplying this volume by soil bulk density (g soil cm<sup>-3</sup>). SOC values were taken from previous measurements performed in July 2015 and 2016 in the same experiment 195 (Table S3), after observing that these values exhibited stability and remained constant over the studied years (Carrasco-Barea et al., 2023). To convert emissions per unit area to emissions per grams of soil, we estimated the volume of soil beneath the chamber by multiplying the chamber area by the considered soil depth (20 cm), and then multiplying this volume by soil bulk density (g soil cm<sup>-3</sup>).~~

Done (lines 182-186).

Line 254 ... ~~and neither~~ between night NER and minimum air temperature

Done (line 243).

Line 284: The highest ~~soil temperatures (Ts)~~ were registered during ...

→ Introduce abbreviations only once, the first time they are mentioned.

Done (line 274).

Line 286: Significant differences in the seasonal ~~volumetric water content (VWC)~~ of the soil were ...

→ Introduce abbreviations only once, the first time they are mentioned.

Done (lines 276-277).

Line 289: ~~soil electrical conductivity (EC)~~ was significantly higher in the ...

→ Introduce abbreviations only once, the first time they are mentioned.

Done (line 279).

Line 400: ... were also very high despite that the minimum temperature was ....

Done (line 385).

Line 436: ..., while it is occasional at La Pletera; only 1-2 times per year, leaving the soil flooded for some days in the salt meadow to several weeks or even months in the glasswort sward.

We have made these changes, but we also changed “in the salt meadow ~~to~~ several weeks...” for “in the salt meadow and several weeks...” (lines 420-421).

Line 439: Nevertheless, it should ~~also~~ be noted that the methodology used to determine soil CO<sub>2</sub> and CH<sub>4</sub> fluxes in this study, differs from ~~that~~ the one generally employed in the studies listed in Table 1, since most of them used gas chromatography for both CH<sub>4</sub> and CO<sub>2</sub> measurements. Thus, an effect caused by these methodological differences cannot be excluded.

Done (lines 423-426).

Line 443: ~~In fact,~~ Previous studies under field (Kathilankal et al., 2008; Moffett et al., 2010) or laboratory (Jones et al., 2018; Wang et al., 2019) conditions support a negative effect of flooding on soil CO<sub>2</sub> emissions, as it has been found at La Pletera. At La Pletera, theA reduction of soil CO<sub>2</sub> emissions ~~to the atmosphere~~ during flooding conditions can be explained by the fact that CO<sub>2</sub> molecules diffuse 10000 times slower in water than in air (Kathilankal et al., 2008). However, since different methods were

used to measure soil respiration in flooded and non-flooded soils, this comparison should be interpreted with caution

Done (lines 427-431).

Line 469: Despite no soil anaerobic conditions, (~~which is~~ necessary for the growth of methanogens), would be expected during summer because of the low soil VWC at La Pletera salt ...

Done (line 436).

Line 492: although it is worth mentioning that only Hirota et al. (2007) took samples after 24h of chamber closure, as ~~it was performed~~ done in the present study. .

Done (line 457).

6 Conclusions -> 5 Conclusions

Done (line 468).