

Major revision iteration of article egosphere-2024-1320:

Seasonal carbon fluxes from vegetation and soil in a Mediterranean non-tidal salt marsh

This study investigated GHG exchange in understudied ecosystem, namely non-tidal salt marshes. The study combines in-situ CO₂ – CH₄ soil fluxes in both flooded and non-flooded periods in different habitats, with CO₂ vegetation fluxes from dominant species. The study highlights potential drivers behind the differences between species and the 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 NO₂ and SF₆ in the text so maybe the authors don't need to reference it here. Also is NO₂ meant or is it N₂O?

Line 34: compared to the atmospheric ...

Line 62: Since it determines which process ...

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

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)

Line 125: After measuring CO₂ 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).

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 CO₂ 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 CO₂ fluxes over long periods, such as 24h (Keith and Wong, 2006).

Line 192: “C_CO₂ and C_CH₄ were calculated by multiplying the amount of CO₂ and CH₄ emitted with 12/44 and 12/16, respectively, with 12 the molecular weight of carbon, 44 the molecular weight of CO₂, and 16 the molecular weight of CH₄. 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⁻³). 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⁻³).~~”

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

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

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

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.

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

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

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

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.

Line 439: Nevertheless, it should ~~also~~ be noted that the methodology used to determine soil CO₂ and CH₄ 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 CH₄ and CO₂ measurements. Thus, an effect caused by these methodological differences cannot be excluded.

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 CO₂ emissions, as it has been found at La Pletera. At La Pletera, the ~~A~~ reduction of soil CO₂ emissions ~~to the atmosphere~~ during flooding conditions can be explained by the fact that CO₂ 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

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

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. .

6 Conclusions -> 5 Conclusions