Reviewer 1,

thank you very much for your detailed and constructive feedback provided within your major and smaller comments, which helped us to improve the manuscript.

The original manuscript and the study design focused on determining temporal variability and exploring biogeochemical interactions in summer, probably the most interesting season regarding GHG dynamics, and in a very complex and heterogeneous ecosystem. Many coastal peatlands (about 40,000 ha in MV) could be rewetted in this way, so there is a large potential and importance for rewetting coastal peatlands, partly with the option of rewetting with brackish waters. Due to the complex ecosystem and novel technology we used, we put strong emphasis on technical description, data analysis and interpretation of the underlying drivers and biogeochemical processes.

We also saw the issue that there is little literature on the rewetting of coastal peatlands by means of dyke removal. Furthermore, comparability to other studies is limited by very different environmental settings, so that the existing literature and data must be analyzed in a complex way, for example, by extracting only measurements from the summer months, to reach comparability to our measurements.

However, we understand that both reviewers saw the shortcoming of not putting our work in a broader perspective and suggested a better discussion of the findings in the framework of existing literature, and we are very thankful that the reviewers pointed this out.

We have taken many measures to reorganize and improve the text based on the major comments. We have analyzed the comments of both referees (RF1 and RF2) and identified major commonalities and strong similarities in the argumentation. We adressed these similarities between the referee comments by joint measures in the two responses to the referees (authors response (ACs)) which prompted us to formulate identical responses that address the following:

A) Restructuring of the abstract to better address the scientific question of greenhouse gas dynamics and the underlying biogeochemical drivers
B) Restructuring of the introduction to provide more context on the relevance of greenhouse gas reduction and to indicate that novel technology was used for this study
C) We tried to improve the clarity of the scientific question by emphasizing the biogeochemical interpretation before the technical description at appropriate points. For this reason, we also moved the discussion on the match between sensor data and results from discrete water sampling (former chapter 4.5) to the appendix.
D) We did our best to discuss our results on CO2 and CH4 fluxes in a broader scientific context by adding a new section 4.4.1. to the discussion.

In the following, we have reposted the comments by the reviewer (in bold) and placed our responses below them. Envisaged text changes/amendments are indicated by quotation marks.

1. Major Comment(s)

Unclear balance between technical and scientific aspect of paper

The paper mostly reads as a technical paper, and describes these parts very well (technical aspects and comparison between methods). Nevertheless, the authors also claim that they want to assess a scientific question (last sentence of Introduction). This part however seems a little lit snowed under in the Discussion. A little bit more context on this in the Introduction as well as in the Discussion would be nice.

For example: can the authors place their results in a clearer/ broader perspective ? I am aware that there are limited studies on brackish ecosystems, but a comparison can be made between concentrations and fluxes of different (rewetted) peatlands, not only of brackish systems, and maybe a quick number of surroundings seas and rivers as well. Place the results into perspective: if moving from the terrestrial area (rivers and/or dry peatlands) to the sea, what is the gradient of fluxes, and how do your results fit in? Also, a table (maybe in Appendix) might be a nice way to present the different flux magnitudes of different (rewetted) peatland studies, which will help the reader placing the results in perspective. Also, are your results specific for this climate region? These climate rewetting activities are mostly active in Europe, but would it be possible to make a reference to a same situation in a tropical region?

Overall, I think that the interpretation of the scientific part needs to be elaborated. Nevertheless, the comments above serve only as ideas, feel free to find a different way to place your results in a broader perspective.

Reply:

A) Abstract

Significant changes are proposed for the abstract to better reflect the clarifications and extensions envisaged for the revised manuscript.

- Shortening of a section which will be moved to the introduction (line 17-21)
- Inclusion of a sentence highlighting the novelty of the measurement technology (line 24)
- Inclusion of the Spearman correlation to better indicate the focus on the analysis of drivers and biogeochemical processes (line 26)

Taking account also minor changes requested by RF1 and RF2, we wil provide a new version of the abstract:

“**Abstract.** Rewetting peatlands is an important measure to reduce greenhouse gas (GHG) emissions from land use change. After rewetting, the areas can be highly heterogeneous in terms of GHG exchange and depend, for example, on water level, vegetation, temperature, previous use, and duration of rewetting. Here, we present a study of a coastal peatland that was rewetted by brackish water from the Baltic Sea and thus became part of the coastal shallow Baltic Sea water system through a permanent hydrological connection. Environmental heterogeneity and the brackish water column formation, require improved quantification techniques to assess local sinks and sources of atmospheric GHGs. We conducted nine weeks of autonomous and high-resolution, sensor-based bottom water measurements of marine physical and chemical variables at two locations in a permanently flooded peatland in summer 2021, the 2nd year after rewetting. For the study, we used newly developed multi-sensor platforms (landers) customized for this operation. Results show considerable temporal fluctuations of CO_2 and CH_4, expressed as multi-day, diurnal and event-based variability and spatial differences for variables dominantly influenced by biological processes. Episodic and diurnal drivers are identified and discussed based on Spearman correlation analysis. The multi-day variability resulted in a pronounced magnitude of measured GHG partial pressures during the deployment ranging between 295.0–8937.8 µatm (CO_2) and 22.8–2681.3 µatm (correspond to 42.7–3568.6 nmol L^{-1}; CH_4), respectively. In addition, the variability of the GHGs, temperature, and oxygen was characterized by pronounced diurnal cycles, resulting e.g., in a mean daily variability of 4066.9 µatm for CO_2 and 1769.6 µatm for CH_4. Depending on the location, the diurnal variability led to pronounced differences between the measurements during the day and night, so that the CO_2 and CH_4 fluxes varied by a factor of 2.1–2.3 and 2.3–3.0, respectively, with higher fluxes occurring over daytime. The rewetted peatland was further impacted by fast system changes (events) such as storm, precipitation and major water level changes, which impacted biogeochemical cycling and GHG partial pressures. The derived average GHG exchange amounted to 0.12 ± 0.16 g m^{-2} h^{-1} (CO_2) and 0.51 ± 0.56 mg m^{-2} h^{-1} (CH_4), respectively. These fluxes are high (CO_2) to low (CH_4) compared to studies from temperate peatlands rewetted with freshwater. Comparing these fluxes with the previous year (i.e., results from a reference study), the fluxes decreased by a factor of 1.9 and 2.6, respectively. This was potentially due to a progressive consumption of organic material, a suppression of CH_4 production, and aerobic and anaerobic oxidation of CH_4, indicating a positive evolution of the rewetted peatland into a site with moderate GHG emissions within the next years."

B) Introduction

Significant changes are proposed in the introduction.

To set the topic into a broader context, we want to give more information in the first paragraph (from line 43).

"Mitigating climate change requires a reduction in anthropogenic emissions of the greenhouse gases (GHGs) carbon dioxide (CO_2) and methane (CH_4) and the effective removal of CO_2 from the atmosphere (IPCC 2022). In all climate scenarios with a realistic probability to reach the Paris Agreement, aiming to keep anthropogenic temperature increase "well below 2 °C" (IPCCSR15, IPCC2023), land use, land use changes and forestry (LUCLUF) play an important role. Still, a large part of the hard to abate residual emissions projected in these scenarios for the 2nd half of this century come from the agricultural sector. Land use options with a large potential for climate mitigation include, for example, forestry, agriculture (pasture and cropland), wetlands, and bioenergy, (Roe et al, 2019, Shukla et al., 2019). In addition, in coastal areas, blue carbon options such as restoration and expansion of mangroves, salt marshes and seagrass meadows are suggested to have some potential for CO_2 removal (Macreadie et al., 2019, Duarte et al., 2013). The rewetting of formerly drained peatlands has been identified as one of the most promising approaches to lower CO_2 emission of used land, potentially even allowing turning (or re-establishing) some of these areas into CO_2 sinks (IPCC 2014, Wilson et al., 2016). Peatlands cover vast areas in partiuclar in Northern Europe, Northern Asia and western North America (Global Peatland Database / Greifswald Mire Centre (2024), and a large fraction of this area has been drained for agricultural use (UNEP (2022)).

Pristine peatlands and shallow coastal regions [...]"

Additional changes will be made from line 66 onwards.

“Rewetting of degraded peatlands reduces CO_2 emissions by preventing aerobic decomposition of OM. The low solubility of O_2 and the slower transport across the overlying water body limits the availability of oxygen in the waterlogged peat soils for soil decomposition, which reduces aerobic mineralization and favors anoxic conditions, enhancing organic carbon burial (Parish et al., 2008; Kaat and Joosten, 2009). In the long-term, a re-establishment [...]”

In the sentence that begins in line 72, an addition is made.

“However, the effects of brackish water on GHG emissions are still unclear, although beneficial effects such as lower CH_4 emissions compared to rewetting with freshwater are likely due to the availability of sulfate (SO_4^{2-}), a phenomenon better investigated for some coastal ecosystems, e.g. mangroves (Cotovicz et al., 2024), which could promote the activity of sulfate-reducing bacteria (SRB).”

In the paragraph beginning in line 92, some minor changes are made to emphasize the novelty of the instrumentation we used, resulting in the following text.

“In this work, two newly developed, mostly identical lander systems were deployed, which are designed as autonomous platforms hosting a wide range of marine sensors. The landers were placed as fixed platforms on the sediment surface, and were customized for this deployment with cabled power supply and uninterrupted high-resolution data acquisition. The systems can [...]”

We would like to add more information from line 96 onward.

“We performed sensor measurements of the partial pressures of CO_2 and CH_4 and a suite of physicochemical variables (i.e, water temperature, salinity, water level, O_2 saturation, turbidity, phosphate, nitrate, water velocity, and chlorophyll *a*) with high temporal resolution in the range of seconds and minutes in a recently flooded peatland over a period of around nine weeks in the summer of 2021. The high-resolution measurements were combined with discrete sample analysis, and GHG emissions of CO_2 and CH_4 were derived.

The rewetting of the coastal peatland [...]”

Due to reconstruction, the sentence in line 100„The high-resolution measurements were combined with discrete sample analysis, and GHG emissions of CO_2 and CH_4 were derived.“ is deleted/is moved to another position

The paragraph beginning in line 101 will be modified,resulting in the following text:

“The focus of this study is on exploring the time scales for the variability of GHG distribution and its drivers, as highly variable conditions are assumed. The nine week time-series is used to derive main cyclic as well as episodic variability in CO_2 and CH_4 concentrations and fluxes, and relate it physicochemical drivers. The impact of the temporal variability on the estimation of GHG emissions or with respect to discrete sampling strategies is assessed. By comparing GHG fluxes with a study conducted one year earlier (i.e., 2020, the first year after rewetting; Pönisch and Breznikar et al., 2023), the potential evolution towards further weakening of the CO_2 and CH_4 source strength is discussed.”

C) Emphasizing the biogeochemical interpretation before the technical description/measurement technique

With this points we implemented the following major changes:

a. We have changed the sequence of chapters 2.2 and 2.1 so that the study site and the study design are introduced first and then the technology.

   A new sentence must be included in line 147: "Two submersible landers equipped with sensors were used for autonomous multi-parameter investigations in the shallow water of the rewetted peatland through integrated high-resolution measurements."

   The first sentence in the line 109 must be shortened: "The two novel submersible landers are platforms for advanced autonomous multi-parameter investigations in shallow water. The entirety of the carrier frame [...]"

b. Moving section 4.5, which is indeed very technical and deals with the quality of the data and improvements for further missions, to the appendix. The new section will be "Appendix F: Assessment of the data quality and implications for future lander deployments" in line 863.

   In addition, the heading in line 787 is renamed to avoid confusion into „C3 Quality assessment of sensor GHG measurements".

   To assure the reader that we carried out a series of quality assessment measures, we would like to insert a short paragraph at the beginning of the discussion section starting in line 438 with a link to the corresponding appendix F. Subsequently, we start the discussion of the biogeochemical findings.

   "With the deployment of two novel landers in a complex and heterogeneous environment of the rewetted peatland, it is important to integrate strategies to assess the quality of the sensor data. Therefore, we have conducted various measures and analyses to build confidence in the sensor data, which are discussed in detail in Appendix F together with the future implications for the deployment of the landers. Apart from the fact that quality assessment is complex, we can show that the sensor data are suitable for interpretation based on two main analyzes: First, the similarity of the main trends in the data series from both landers strongly suggests the appropriate sampling strategy for dynamic ecosystems. Second, with strong effort on discrete samplings and laboratory analysis, we observed both good agreements but also discrepancies compared to the sensor data. With all quality measures applied, we were able to achieve a robust post-processing which allows comprehensive biogeochemical interpretations."

D) Discussion of our results on CO2 and CH4 fluxes in a broader scientific/existing literature

a) We summarized GHG flux data from other environments at the terrestrial-marine interface, which will placed in the Appendix F2 "Selected greenhouse gas emissions of CO2 and CH4 along the land-sea-interface" in line 863:

"Table 1: Selected greenhouse gas emissions of CO2 and CH4 along the land-sea-interface in relation to the derived GHG fluxes from our study.

Carbon dioxide fluxes

from land	from streams	from restored peatland (s)	from this study	from open shallow water (brackish/salty)

0.07 g m^{-2} h^{-1} (drained unutilized land)[1]	−0.03–0.24 g m^{-2} h^{-1} (review with 34 study sites about streams in temperate Europe)[2]	0.02 g m^{-2} h^{-1} (open water) to 0.09 g m^{-2} h^{-1} (emergent vegetation stands, Germany)[3] −0.04 g CO$_2$ eq. m^{-2} h^{-1} (review of 38 restored peatlands)[4]	0.12 ± 0.16g m^{-2} h^{-1}	0.01 g m^{-2} h^{-1} (Bornholm sea)[5] 0.0007 g m^{-2} h^{-1} (Bothnian Bay)[6]
References of adapted numbers: 1 Tiemeyer et al., (2020); 2 Mwangada et al., (2023); 3 Franz et al., (2016); 4 Bianchi et al., (2020); 5 Thomas and Schneider, (1999); 6 Löffler et al., (2012)				

Methane fluxes

from land	from streams	from restored peatland (s)	from this study	from open shallow water (brackish/salty)
0.6 mg m^{-2} h^{-1} (drained unutilized land)[1]	1.3–12.8 mg m^{-2} h^{-1} (Donau river, Germany)[2]	1.48 mg m^{-2} h^{-1} (emergent vegetation stands) to 6.05 mg m^{-2} h^{-1} (open water, Germany)[3] 29.68 mg m^{-2} h^{-1} (occasional brackish impact)[4] 3.2 mg m^{-2} h^{-1} (rewetted organic soils)[1]	0.51 ± 0.56 mg m^{-2} h^{-1}	39.9–104.2 mg m^{-2} h^{-1} (June/July, shallow water of the Baltic Sea)[5] 0.015–0.024 mg m^{-2} h^{-1} (continental shelves)[6]
References of adapted numbers: 1 Tiemeyer et al., (2020); 2 Lorke and Burgis, (xxxx); 3 Franz et al., (2016); 4 Hahn et al., (2015), 5 Heyer and Berger, (2000), 6 Bange et al., (1994)				

“

b) We plan to insert a new section “4.4.1 Assessment of the GHG fluxes with fluxes at the land-sea-interface”, in which the fluxes from our peatland are placed in a broader context, based on the almost complete Table 1.

Section 4.4 must be altered and shortened so that 4.4.1 can be added. The old text was changed from line 572.

“Greenhouse gas fluxes for CO$_2$ and CH$_4$ could be derived from the high-resolution sensor data as measurements were made narrowly below the water surface (< 1.25 m) and a direct coupling of water at the lander with the surface water was assumed. Although the peatland showed a slight CO$_2$ uptake in early June (**Fehler! Verweisquelle konnte nicht gefunden werden.**a), accompanied by stable but slightly decreasing chlorophyll *a* concentrations, the ASE was clearly dominated by a flux of CO$_2$ to the atmosphere. This amounted to 0.12 ± 0.16 g m^{-2} h^{-1} derived from both landers. Increasing fluxes through early July stabilized with a simultaneous strong increase in chlorophyll *a* concentration. Overall, CO$_2$ emissions in the peatland were controlled by the simultaneous occurrence of primary production and mineralization, with the latter predominating for an overall net CO$_2$ outgassing. The derived CH$_4$ fluxes of 0.51 ± 0.56 mg m^{-2} h^{-1} showed a stable development during the measurement period with a slight trend to lower fluxes in August (**Fehler! Verweisquelle konnte nicht gefunden werden.**b), also strongly controlled by mineralization prozesses of OM.”

The planned section 4.4.1 “Assessment of the GHG fluxes with fluxes at the land-sea-interface” will be structured by following the bullet points. The main focus will be on the assessment of our fluxes in relation to the magnitude of the fluxes at the sea-land-interface, in relation to the variability (e.g., diurnal cyclicity) and in relation to the magnitude of CH4 release compared to freshwater systems

CO2

- Peatland fluxes in the study area are around one order of magnitude higher than emissions reported in other peatland studies.
- In a shallow lake formed on a formerly drained fen, CO2 emissions 9 years after flooding ranged from 0.02 g m^{-2} h^{-1} (open water) to 0.09 g m^{-2} h^{-1} (emergent vegetation stands) (Franz et al., 2016).
- Compared to land-based emissions (e.g., drained unused land, cropland, forestry), emissions in the study area are significantly higher (Tiemeyer et al., 2020).
- Greenhouse gas fluxes from rivers and streams in temperate European latitudes, often influenced by human activities, are of a similar magnitude to the study area (−0.03 to 0.24 g m^{-2} h^{-1}; Mwangada et al., 2023).
- Emissions from shallow waters of the Baltic Sea or the North Sea are much smaller than those from the rewetted brackish peatland (Thomas and Schneider, 1994; Löffler et al., 2012).

CH4

- Derived CH_4 fluxes are significantly lower than those from peatlands which were rewetted with brackish water (Couwenberg et al., 2011; Hahn et al., 2015; Franz et al., 2016).
- CH_4 emissions from a shallow lake rewetted with freshwater ranged from 1.48 mg m^{-2} h^{-1} (emergent vegetation stands) to 6.05 mg m^{-2} h^{-1} (open water), even 9 years post-rewetting (Franz et al., 2016).
- In a dry fen converted to a shallow lake with occasional brackish water, CH_4 fluxes reached 29.68 mg m^{-2} h^{-1} in the first year post-rewetting (Hahn et al., 2015).
- Derived CH_4 fluxes are comparable to CH_4 emissions from drained, unused land-based systems (Tiemeyer et al., 2020).
- Derived CH_4 fluxes are much lower than those reported for the German river Donau (1.3–12.8 mg m^{-2} h^{-1}; Lorke and Burgis). Also variability is much lower.
- Shallow coastal waters show high CH_4 flux variability, e.g., Baltic Sea summer fluxes: 39.9–104.2 mg m^{-2} h^{-1}
- Continental shelf fluxes are lower compared to our fluxes and amounted to 0.015–0.024 mg m^{-2} h^{-1} (Heyer and Berger, 2020; Bange et al., 1994).

2. Smaller comments

Line 30) *The diurnal variability led to a pronounced discrepancy between the measurements during the day and at night as well as depending on the location, resulting in CO 2 and CH4 fluxes that varied by a factor of 2.1–2.3 and 2.3–3.0, respectively.*

The sentence is not fluent, and discrepancy might sound too negative for what you are describing.

Reply: Thank you for pointing this out. Differences between daytime and nighttime GHG fluxes were expected, but of this magnitude were a key finding of this study. Such differences make it clear that discrete samplings during daytime can lead to difficulties in interpretation. We would suggest the following adjustments:

"Depending on the location, the diurnal variability led to pronounced differences between the measurements during the day and night, so that the CO2 and CH4 fluxes varied by a factor of 2.1–2.3 and 2.3–3.0, respectively, with higher fluxes occurring over daytime."

Furthermore, to make the figures easier to understand, we provided the information on the diurnal differences recorded by the landers in line 427:

"Hence, atmospheric GHG fluxes are 2.1- (lander 2) and 2.3-fold (lander 1) higher for $p\mathrm{CO}_2$ and 2.3- (lander 2) and 3.0-fold (lander 1) higher for $p\mathrm{CH}_4$ during the day than at night (**Fehler! Verweisquelle konnte nicht gefunden werden.**)."

Line 74) *However, the effects of brackish water on GHG emissions are still unclear, although beneficial effects such as lower CH4 emissions compared to rewetting with freshwater are likely due to the availability of sulfate (SO42−)*

One sentence to explain here why SO4 is beneficial would be good.

Reply: The information as to why SO4 is probably positive comes in the following sentences and is closely related to the triggered activity of SRB. However, I can understand your point and therefore we restructured the entire part, beginning from line 72 until the end of the paragraph:

"However, the effects of brackish water on GHG emissions are still unclear, although beneficial effects such as lower CH_4 emissions compared to rewetting with freshwater are likely due to the availability of sulfate (SO_4^{2-}), which could promote the activity of sulfate-reducing bacteria (SRB). SRB can limit CH4 production, as they outcompete methane-producing microorganisms (methanogens) for substrates (Segers and Kengen, 1998; Jørgensen, 2006; Segarra et al., 2013). Further, the availability of SO42− favors anaerobic oxidation of methane (AOM), which could keep CH4 emissions low (e.g., Boetius et al., 2000; Knittel and Boetius, 2009). In addition to the expected positive effect on the reduction of CH4 emissions, flooding with brackish water can reduce CO2 emissions by avoiding the former aerobic peat decomposition."

Line 92) Is it possible to add one sentence, somehow describing what a lander is? Most people wont be familiar with this term. Is it a floating device? Ankered to the ground? Does it move around within a certain area? Approx size? I know that it is described in more detail later, but it helps readers to have a little bit of an idea already.

Reply: This is an important point, therefore we would like to add the following in line 93: "In this work, two lander systems were used, […]. The landers were placed as fixed platforms on the sediment surface with cabled power supply."

Line 105: In the Introduction, twice a reference to an earlier study is made (Pönisch and Breznikar et al., 2023). Since your study seems to be a follow up study of this earlier study, maybe the reader can be informed briefly what were the main findings of the first study were, and how your set up/goals were different (maybe more details in discussion, but maybe already 1 or 2 sentences in the Introduction). In this way, your article is readable without forcing the reader to look up the othr article.

> Reply: This is a good hint. One main outcome was the comparison of the "brackish GHG fluxes" to "freshwater GHG fluxes". Therefore, we will add two sentence after line 101. :
>
> "[…]. Pönisch and Breznikar et al. (2023) showed that CO2 fluxes were high in the first year of rewetting with brackish water, while CH_4 fluxes were low compared to freshwater rewetting. Their study however relied on weekly to biweekly discrete water sampling and could not ressolve variabilty on shorter time scales."

Line 146: wrong reference formatting. This is visible at more places in article, please check this. (for example, line 433:

Moreover, we used the published data from (Pönisch and Breznikar et al., 2023)

instead of

Moreover, we used the published data from Pönisch and Breznikar et al., (2023)

> Reply: Thanks for the comment. The formatting will match the journal's guidelines in the typeset article. For clarification on this particular reference: This publication is a shared first-authorship with both first authors contributing equally to the work.. The citation program presently used has trouble to correctly represent this, but it will be adjusted to match the journal's guidelines in the final typeset manuscript.

Line 164: The CONTROS HydroC® CO2 only goes to 1000 uatm. I assume that the authors have ordered a different version/adaptation? Specify that.

> Reply: Thank you for your comment and attention to detail. The manufacturer's product data sheet states the measuring range as 200 - 1000 µatm, however, with the footnote that other ranges are possible on request. This is the case here: We use the regular version of the sensor, but have asked the manufacturer whether he can extend the calibration range until 6000 µatm. This is possible without technical adjustments, only with adaptation of the calibration points and calibration curve to the desired, extended range. This process was also done in another study and this is already stated in the appendix (see line 760): "In a recent study, an NDIR unit was calibrated up to 25,000 µatm with only minor adjustments of the polynomial calibration curve (Canning et al., 2021)."

Line 171: ***The resolution of data acquisition was set to 5 minutes (min) for lander 1 and 10 min for lander 2:*** **Why the difference? Add a sentence to clarify this.**

> Reply: The difference is due to a problem with the programming of the sensor or, better stated, a problem with the data processing unit (software problem). After discovering this during deployment, we decided to leave the settings as they were. There is no scientific reason for this. I will insert the following sentence after the sentence in line 172:
>
> "[…] was set to 5 minutes (min) for lander 1 and 10 min for lander 2. A technical limitation led to the different recording interval."

Line 314 (and other places): it is unclear which instrument measures pCH4 (ppm) and which measure cCH4 (nmol L), and which formula is used to convert between both. Add a reference or formula.

> Reply: Thanks for the comment. I will try to solve this situation before line 314 by adapting the data handling section in line 259:
>
> "Data processing, analysis and visualization were performed using R (R Core Team, 2022). The R packages that were used to calculate *p*CO2 (based on bottle CT and pH data), to convert *p*CH4 (measured by HC-CH4 sensors) to concentrations, and CH4 concentrations (derived from bottle data) to pCH4 are descried in Appendix D."
>
> Furthermore, we added more information in Appendix D. We added a further sentence and a reference in line 844.
>
> "The conversion between pCH4 and cCH4 was performed according to Wiesenburg and Guinasso (1979)."

Line 497: white space missing

> Reply: Thanks. I also changed the number "12" to the word "twelve", as the numbers up to twelve are normally written as words.

Line 565: Clear comparison to literature for fluxes. But why is this not done a little bit for concentrations pCH4 and pCO2. Are these concentrations high compared to sea water? Or *(*German) rivers? As also mentioned in the first general comment, place your results better in perspective.

> Reply: With the two major comments by you and by referee 2, we have changed parts of the discussion section to put the results in a broader context.

Line 596: *The most important ones are*. → sentence incomplete

> Reply: Thanks. A punctuation point was wrong. The sentence will be changed to: "The most important ones are slightly different sampling height, which was in Pönisch and Breznikar et al., 2023 ~ 20 cm below the water surface and ~ 60–90 cm in our study; different sampling approach; and possible inter-annual variations, which cannot be addressed with only two years."

Line 600: *The comparison suggests that the CO2 and CH4 fluxes in the second summer after inundation were lower by a factor of1.9 and 2.6, respectively compared to the first (Table 2).*

These are interesting numbers. Can they be compared to numbers from other studies? Could such a reduction of 1.9 to 2.6 really be real? The authors bring these numbers back in the Conclusion, so it is an important number. Discuss better.

> Reply: That's right, we also found these figures interesting, but they should be treated with caution. We also pointed this out in the subsequent discussion - interannual variability and different methods lead to complex comparability.
>
> Unfortunately, a comparison with other studies is very difficult, as there are hardly any/no comparable boundary conditions for which a comparison would be appropriate.
>
> We assume that the decline is in particular due to the progressive decomposition of organic material. OM can come from dead plant biomass, peat or newly formed biomass through primary production. As the Pönisch and Breznikar study identified this availability of OM as

the main driver for high CO2 emissions, it seems realistic that a reduction in the availability of OM for biological processes will reduce emissions. In principle, the reduction seems realistic to us.

Overall, we think that the basic arguments of the discussion are already there, but need to be better linked in the text. We have therefore rearranged the section and linked it better. We have also added literature. We did changes from line 604

"Although, as mentioned above, interannual variability rather than a trend cannot be excluded […]. In general, the decay of vegetation from the formerly drained peatland and the decomposition of the organic-rich topsoil, foster a strong mineralization of OM and promote CO2 and CH4 production (Heyer and Berger, 2000; Hahn-Schöfl et al., 2011). The observed decline between the first and second year is realistic, as this decomposition of OM was to be expected and represents a typical transition phase (Kalhori et al., 2024)."