We are thankful to Referee 2 for the thoughtful and constructive comments. According to these suggestions, we have supplemented several references and made corresponding corrections/additions to the manuscript. Hereby are our detailed responses:

The authors report a data-set of dissolved CO concentration at 14 stations in Ria Formosa Lagoon collected on 25 and 26 May 2021 (n=28). The data are discussed in relation to basic environmental variables (temperature, salinity, FDOM) measured with a EXO-2 YSI probe. They made one incubation of CO photo-production.

The CO data were corrected by a factor of 3 due to analytical problem with the CO Gas Analyzer (that was not specified). This correction factor was computed by comparing atmospheric CO with data from atmospheric monitoring stations Mace Head (Ireland) and Terceira (Azores). While it is laudable that the authors are transparent about this correction, I think this is a problem because CO concentrations are quite close to equilibrium (saturation ratio on average of <8) so uncertainty on the dissolved concentration propagates to a large error on the saturation ratio.

Reply: Thank you for pointing out this issue. We acknowledged that the issue stems from a malfunction in the calibration system. There seemed to be errors with the calibration algorithm: The CO analyzer did not report any error during the warm-up progress including self-test after power-on, indicating that the detector, carrier gas pressure, and lamp were working normally. We repeated calibrations over time, using the same standard gases, to ensure that the detector consistently responds to the point calibration. The results were consistent and reproducible. However, the values obtained from the analyzer during the calibration were only about one-third of those given for the standard gases. Further, we compared the average atmospheric CO mole fraction for the same month (May 2021) from atmospheric monitoring stations in Mace Head and Teixeira. A correction factor f (3.12) was determined. This was the fundamental reason for using the correction factor f for the CO analyzer measurements.

Besides this, both water and atmospheric samples were all corrected by this factor, so the overall relative error in the saturation ratios was not affected. Moreover, our conclusion that the lagoon acted as a source of CO to the atmosphere is not affected by the correction.

The authors derived the FDOM data from the YSI EXO-2 when they had access to a UV-Vis Spectrophotometer (as stated) so they could have made spectrophotometric measurements of CDOM, with little extra consumables and workload. This would have been much more precise because my experience with the YSI EXO-2 is that the FDOM sensor tends to provide erratic measurements due to the interaction of scattering light on the sensors and presence of suspended particles in water. I would expect in a lagoon environment quite a lot of these interferences, I would not trust the FDOM data from the sensor.

While the Chl-*a* sensor of the YSI EXO-2 performs better than FDOM sensor, it is still not optimal (compares poorly with discrete Chla measurements), and again the authors could have gone into the trouble of measuring a relatively basic variable such as Chla concentration on 28 samples. The Chl-

a is not just a descriptive variable but is used to calculate the CO production by phytoplankton in the mass budget.

The production of CO in the dark was only estimated on one station at the effluent of the aquaculture facility. While I see from the M&M that these incubations require some work, I think it could have been feasible to make more of these incubations in different water masses of the Ria Formosa Lagoon, since the authors had all of this apparatus and equipment on site.

In conclusion, I find that the sampling effort of CO concentrations was "light" (only 14 stations during 2 consecutive days). It could have been useful to make surveys during low tide, or during other seasons. If the production of CO is mostly due to photo-production, it would have made sense to make night-day cycles. Indeed, CO concentrations change by a factor of 5 during night-day oscillations (Ohta 1997), so potentially a much stronger signal that the variability across the data-set.

Reply: Thank you for your insightful comments and observations regarding our data collection methods. We value and appreciate your expertise on the matter.

Regarding using the YSI EXO-2 sensor and its limitations in lagoon environments, we acknowledge the challenges associated with light scattering and suspended particles, which can potentially interfere with the readings. We are also aware of the benefits of using a UV-Vis Spectrophotometer for FDOM and chlorophyll-*a* measurements. However, this study was conducted under the ASSEMBLE+ Transnational Access Program, which is a short-term collaboration. Given the constraints and limited time available, we prioritized using available equipment to maximize the data collection within the given time frame.

Although the YSI-EXO sensor might not be the most optimal choice for analytical measurements, its application in our study was deemed fit for purpose. We would like to highlight that the YSI-EXO sensor is routinely used by CCMAR in its lagoon (Jacob et al., 2020; Cravo et al., 2022; Caetano et al., 2023). These studies have found the YSI-EXO sensor to provide valuable insights into lagoon dynamics and have successfully utilized the data in their analyses.

Regarding the Chl-*a* measurements, we understand the importance of precision, especially given its use in calculating CO production by phytoplankton. We acknowledge the potential variability between sensor and discrete measurements. However, for the scope and purpose of this specific investigation, the YSI-EXO Chl-*a* sensor provided us with the necessary data to draw our conclusions (e.g., Chl-*a* concentrations decreased from the Ramalhete to the Faro–Olhão inlet (Aníbal et al., 2019), in correspondence to increasing distance from the nutrient-rich plumes from the WWTP). Certainly, if the diurnal variation could be taken into account in the subsequent fieldwork investigation, the RF lagoon CO cycle would be more comprehensively deciphered.

Minor comments

In L200: Please note that the saturation ratio is proportional to the CO concentration because the saturation ratio is computed from the CO concentration, so this finding is meaningless; refer to Berges (1997).

Reply: Thank you for pointing out this issue. To clarify our statement, we modified it. It now reads, 'The waters of the Ria Formosa Lagoon were consistently supersaturated with CO at all stations, with saturation ratios ranging from 1.7 to 32.2 (mean ± SD: 7.7 ± 5.9; Fig. 5a).'

The authors mention they took samples in the late afternoon (~17:00h local time), so well after the maximum of daily irradiance (when CO would have been expected to be max. I imagine that the 14 stations spread over a distance of about 4km were not sampled instantaneously. Can you specify the time of sampling?

Reply: The sampling time on the 25th and 26th of May was around 17:00~18:38 and 16:00~17:35, respectively, and samples were processed immediately after that. Considering the limited time frame in which the sampling was conducted, we would not expect significant differences in CO. For clarity, this information is added to the revised version of the manuscript.

The sample abbreviation (T) is used for temperature either in °C or K

Reply: We have replaced the 'water temperature (T)' with 'water temperature (T in Celsius degrees)'.

The authors should explain why they sampled in quartz glass bottles?

Reply: We used quartz glass bottles two times: 1) for CO concentration measurements (see Section 3.1) and 2) for the incubation experiment (see Section 3.4). We used quartz glass bottles for the incubation experiment to ensure the highest light transmittance possible (also in the UV-B range). To inform the reader about this, we have added a more detailed description of the vials used: (DURAN®, quartz glass, GL 45, DWK Life Sciences, Germany).

In fact, for the measurements, we should have used opaque vials for the concentration measurements. In case to avoid the extra CO photoproduction in the vials, we stored the vials immediately in the dark after sampling. During the headspace pretreatment, the vials were covered with opaque plastic.

The authors should explain how the quartz glass bottles were closed gas-tight. With stoppers?

Reply: Bubble-free water samples were sealed with rubber stoppers and aluminum caps to determine dissolved CO. We added an explanation to the revised manuscript.

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