As before, we thank the Reviewers for their comments, which have improved the manuscript. We are happy that the current state of the manuscript only requires minor revisions. We describe below (in blue) how we applied these suggested changes and we hope these comments are satisfactory for the Editor to approve the final manuscript for publication.

Reviewer #1:

The manuscript demonstrates substantial improvement post-revision, with robust data supporting its conclusions and clear relevance to regional carbon budgeting. While minor issues persist (e.g., statistical clarity, uncertainty quantification), these are addressable through revisions:

Remaining Limitations:

Statistical Methodological Details: The statistical approaches (e.g., Welch's t-test) and corrections for multiple comparisons (e.g., Bonferroni) are not explicitly described, potentially undermining result reliability. Clarification in the Methods or figure captions is recommended.

We added the following text to the manuscript: "Statistical differences between groups are assessed using a Welch's t-test (Matlab function ttest2), with a rather strict significance level of 0.01 to avoid false positives. This statistical method tests the null hypothesis that two populations, with not-necessarily equal variances, have equal means, and is appropriate to compare our spring and neap tide groups."

Data Gaps and Continuity: Missing data handling during Ferry Box maintenance (e.g., interpolation or exclusion) and systematic biases from sensor replacements (e.g., pCO_2 sensor changed four times) require further discussion.

FerryBox maintenance does not interfere with data availability, since it is done only when the ship is in port. The analyses in the manuscript are performed with original quality-controlled measurements. While there are gaps in the dataset selected for this manuscript due to the ship not sailing or problems with the system, we show that we have enough consecutive repeating journeys to capture the spring-neap cycles and to characterize the biogeochemical differences between spring and neap tide conditions.

Sensor replacements are an integral part of long-term autonomous instrument deployments. They limit the potential influence of instrument drift on data quality. For most of the FerryBox parameters, water samples measured in the laboratory are used for sensor data correction. For the pCO_2 data that the reviewer mentioned, there is no reference material. Instead, we send the sensors to the manufacturer for pre- and post-calibration and we apply the corrections to the raw data in post-processing. This ensures a span-drift correction based on the runtime of the instrument. Finally, the data are checked for consistency around the times of sensor replacement to ensure no "jumps" in the data exist. These methods are described in Macovei et al. (2021a), where our data are compared to another ship's measurement. In Macovei et al. (2022), we find a very good match between our pCO_2 data and a Copernicus model in the central North Sea. The pCO_2 data are published in the PANGAEA repository (Macovei et al., 2021b).

The following sentences have been added/edited in the manuscript: "The pCO2 sensor was changed 4 times and appropriate data processing methods were applied, as described by Macovei et al. (2021b), to ensure a span-drift correction, and quality-controlled (Macovei et al., 2021c) to ensure no abrupt changes in the data occurred"; "All the statistical analyses are made

using original, quality-controlled data. There are sufficient data without gaps to capture consecutive spring and neap tide events and also to characterize the typical state of the system during the spring and neap tidal stages."

Uncertainty Quantification: While atmospheric station variability was addressed, the covariance between wind speed temporal variability and pCO_2 (e.g., high pCO_2 during spring tides coinciding with low winds suppressing fluxes) remains unassessed. Sensitivity analyses or expanded error margin discussions are advised.

There is no reason why the wind speed should be associated with the spring-neap tidal stage. The driving factors are different and disconnected. We checked this hypothesis by extracting daily averaged wind speed data in the Humber estuary from the ERA5 Reanalysis product for the first 6 months of the year 2017, when we also had a high data availability for pCO_2. We created a daily averaged dataset from our original tidal amplitude data to match the wind speed data (n=181). We found no correlation between these two datasets. A linear model fit produced a coefficient of determination of 0.003, and the correlation is insignificant (Pearson's p-value of 0.45). We added clarification text to the manuscript justifying that the choice of average wind speed is appropriate: "We found no correlation between the daily averaged wind speed data and the tidal amplitude (Pearson's p-value of 0.45, tested on 181 data points in the first six months of 2017). Since there was no association of the higher pCO_2 at spring tides with, for example, higher wind speeds, we therefore use the climatological average of the ERA5 wind speed in the Humber Estuary of 6.9 m s^{-1}. This isolates the investigated influence on sea-air carbon fluxes to tidally-driven seawater pCO_2, and not to wind speed."

Reviewer #2:

The authors have correctly revised the manuscript following my suggestions during the discussion. There are two minor points that could be further improved :

1 - The authors now mention that " We converted the ISFET pH measured on the total scale to the NBS scale before calculating," (L192 of the revised manuscript). The conversion between pHT and pHNBS is not so trivial to me. I recommend that the authors mention how this has been done.

The following sentence has been added to the manuscript text: "This conversion was performed using CO2SYS, with the associated values of temperature, salinity and pCO_2 for each pH value." The reference for CO2SYS is already given above in the text.

2 - In the response to my comments on the fact that average wind speed has been used to estimate air-sea CO2 fluxes, the authors have correctly justified there choice by mentioning "there is no indication of an association of higher seawater at spring tide with, for example, stronger wind speeds, therefore the calculations using the averages are appropriate for our aims." I would suggest to add this justification in the manuscript when mentioning that averaged wind speeds have been used.

We responded to Reviewer #1 above about a similar concern and statistically demonstrated the lack of correlation between wind speed and tidal amplitude. The following clarification text was added to the manuscript: "We found no correlation between the daily averaged wind speed data and the tidal amplitude (Pearson's p-value of 0.45, tested on 181 data points in the first six

months of 2017). Since there was no association of the higher pCO_2 at spring tides with, for example, higher wind speeds, we therefore use the climatological average of the ERA5 wind speed in the Humber Estuary of 6.9 m s^{-1}. This isolates the investigated influence on sea-air carbon fluxes to tidally-driven seawater pCO_2, and not to wind speed."

Aside from these minor changes, I would be happy to recommend this manuscript for publication.

Macovei, V. A., Voynova, Y. G., Becker, M., Triest, J., and Petersen, W.: Long-term intercomparison of two pCO2 instruments based on ship-of-opportunity measurements in a dynamic shelf sea environment, Limnology and Oceanography: Methods, 19, 37-50, 10.1002/lom3.10403, 2021a.
Macovei, V. A., Voynova, Y. G., Gehrung, M., and Petersen, W.: Ship-of-Opportunity, FerryBox-integrated, membrane-based sensor pCO2, temperature and salinity measurements in the surface North Sea since 2013. PANGAEA, 2021b.
Macovei, V. A., Callies, U., Calil, P. H. R., and Voynova, Y. G.: Mesoscale Advective and Biological Processes Alter Carbon Uptake Capacity in a Shelf Sea, Frontiers in Marine Science, 9, 2022.