Biogeosciences Discussions

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Comment on bg-2022-201

Anonymous Referee #2

Referee comment on "Carbon monoxide (CO) cycling in the Fram Strait, Arctic Ocean" by Hanna I. Campen et al., Biogeosciences Discuss., https://doi.org/10.5194/bg-2022-201-RC3, 2022

Manuscript entitled "Carbon monoxide (CO) cycling in the Fram Strait, Arctic Ocean" studied the cycling of CO in the surface waters of the Fram Strait. The authors measured CO production and consumption rates in various incubation experiments at four sites in summer. They conclude that ocean acidification does not affect CO gross production (GP_{CO}) and consumption (□$_{CO}$) rates. And the combination of high CDOM and low NO_3^- concentration favored high rates of CO production and CO consumption. Therefore, the authors identified both CDOM and NO_3^- as key drivers of CO cycling. This manuscript facilitates a better incorporation of both terms into biogeochemical models, and would improve both CO emission estimates for the Arctic realm, and the assessment of how atmospheric CO emissions will affect the radiative budget and oxidative capacity of the Arctic atmosphere. The Reviewer supports this manuscript for publication in *Biogeosciences* if the authors could carefully address the following comments.

Specific comments:

- Page 3 Lines 88-91: The author is requested to clarify the abbreviation meaning of pH in the manuscript. If it represents ocean acidity, why adjust the values to -0.14 and -0.3? And, can the acidity be negative? If the pH represents the concentration of CO_2, how is the pH regulated? Please explain it in detail.
- Page 3 Line 92: The authors are advised to supplement the total alkalinity (TA) and dissolved inorganic (DIC) concentrations ranges at the four sites collected for this manuscript.
- Page 4 Lines 99-100: "All incubators were continuously flushed with ambient seawater to keep bottles at ambient temperature". Does the ambient seawater flush incubators wash the outside of the tank or circulate inside seawater?
- Page 5 Lines 136-137: The authors mentioned the seasonal variation of CO in the Arctic surface water, but the four sampling stations were all completed in summer, so please explain it in detail.
- Page 5 Lines 160-162: What is the range of ocean acidity in terms of lower pH? In addition, how to conclude that the pH has no effect on neither □$_{CO}$ nor GP_{CO} significantly during the incubations?
- Figure 2: The points in Figure 2 are too scattered, can they represent good correlations?

- The author mentioned in the manuscript that CO consumption is due to microorganisms and phytoplankton. Would the author consider using some testing methods to analyze the consumption of these microorganisms and phytoplankton to confirm the experimental results?
- What is the purpose to measure the CO concentration development during dark and light incubations in Section 3.1? The results and discussion section should correspond to the research objectives presented in the introduction section.