

Dear Editor,

Please find below our point-by-point reply to the referee's comments. We are sorry that some issues remained in the previous version of the manuscript and believe that all of them have been addressed satisfactorily in the present version. The review process has improved the quality of our manuscript. We trust that it now meets the standard of publication of Biogeosciences.

Regards,
Cale Miller on behalf of all coauthors

Overall, the paper indeed improved significantly between versions 1 and 2. However, it is imo still pretty far from being publishable: The text is in parts still clumsy/sloppily and not very accurately written. This might be due to the 1st author being rather unexperienced, but at least two very experienced co-authors should also take care of a scientifically proper text.

We thank the reviewer for taking their time and making the effort to provide significant feedback aimed at improving the paper. We feel the manuscript has improved significantly from the overall review process. We carefully considered and respected the comments from all reviewers. The significant rewrite in the first iteration should reflect our dedication to this. Subsequently, we have enhanced the manuscript further, as detailed below in the following changes.

However, we believe it is important to state that about 75% of the comments from the reviewer pertain to changes in grammatical structure for sentences that were not grammatically incorrect. In this regard, we truly appreciate the time and effort devoted to enhancing the manuscript, but we feel that as long as the grammar is correct, it is at the discretion of the authors to choose which writing style is most fitting, while considering the reviewer's comments to improve clarity, which we have done. Thanks to the thoroughness of the reviewer, we identified only a few true grammatical errors, and we sincerely appreciate the insights provided by the reviewer, all of which have been addressed and corrected.

Furthermore, the very important figure 1 is somewhat better than the previous figure - but still (due to poor execution), confusing and far from a professional sketch that the paper requires (and deserves).

We have remade figure 1 and believe that this iteration is more intelligible and representative of the presented system.

Finally, I don't know if this is due to being unexperienced or active ignorance or not taking the reviewers serious: (At least) in three cases in the answer to reviewers comments the authors write that they changed the text according to the reviewers suggestion - but actually did not do so:

1) they still write 'setpoint' instead of 'nominal value'

We have certainly taken all comments by the reviewer seriously. Note that the first example was indeed changed in correspondence with the line number in the revised manuscript. However, we did not change ‘setpoint’ to ‘nominal’ throughout as it was not explicitly suggested. The native English language lead author and coauthors felt that 'setpoint' was a very suitable word choice in our case as it is commonly used. However, as this is a minor point and following the specific recommendation of the reviewer, we have now replaced 'setpoint' with 'nominal' throughout.

2) they still write ‘valve-open percentage’ instead of 'valve opening percentage'

The reviewer is correct and we apologize for this overlook. We have changed it in the revised version.

[Both are no major points, still they should not write that they changed it - and then don't...!]

3) In their responses to the 1st reviews, they advertise a figure on oxygen data from the mesocosms, which would have improved the paper, significantly. However, its missing in this version....

I don't know what to say...

We believe this is a misunderstanding. To resolve this, we quote our first reply to the reviewer below:

“Finally, the structure of the paper as well as the language are not always clear and precise (you may ask a native speaker to review the text) and – as no biological data are shown – the proof is missing that the system can create a biological effect (I don’t really doubt this but it has to be shown).

« We have gone through the manuscript with finer detail to ensure lucidity throughout. We respectfully disagree with the reviewer that there needs to be evidence of a biological effect. As per the suggestion of reviewer # 2, we have chosen to remove details about the biological component and focus more on the system itself. We agree with this suggestion as the aim of the manuscript is to show the functionality and assess the potential to manipulate environmental parameters, not to assess a biological response. We have, however, provided a figure below (see attachment PDF) showing the continuous measurement of oxygen during an incubation to provide a visual of the biologically induced response. Experimental results that utilized this system are Miller et al. (community-level effects, sbm: doi:10.2139/ssrn.4563719) and Lebrun et al. (organismal-level effects, sbm: 10.5194/egusphere-2023-1875). »

Perhaps the reviewer believed that our objective was to add this figure to the revised manuscript. However, we only provided the figure in the response to the reviewer’s original comment for clarity.

Thus, we certainly acknowledge the reviewer’s comment, as we did before, and provided evidence with our previous response. At that juncture, we choose to remove nearly all mention of the biological data (as suggested by reviewer # 2 during the first round of review), making the addition of an oxygen figure irrelevant—this was our reasoning for not including the figure in the manuscript. We did not choose to ignore this comment but found no room in the new version of the manuscript where such a figure would be relevant.

Details (again, mixed minor and major):

L 72: ‘...will be affected when / while assemblages adjust...’ _ **We have changed the wording and replaced “as” with “while”.**

L 74: ‘Methodological approaches to assesS and characterizE the responseS of organisms...’ _ **This sentence has been rewritten as the changes suggested by the reviewer did not follow parallel structure with the rest of the sentence. We have incorporated the suggested changes by the reviewer in the revised sentence.**

LL 74-79: Sentence too long (and weird): Make a full-stop after the parentheses in L 77! **This sentence has been rewritten and split where suggested.**

L 109: write ‘above’ _instead of ‘previously’ _ **Done.**

L 112: ‘In THE initial deployment...’ _ **Done.**

L 143: replace ‘shoal’ _by ‘reduce’ _ **Done.**

L 144: ‘...in the Kongsfjorden environment...’ _ **Changes done.**

L 144–146: Make it two sentences: ‘... _deployment of the SalTExPreS. It was placed on a concrete platform...’ _ **We have split this sentence and adopted the suggestions.**

L 148: Replace ‘represent’ _by ‘simulate’ _ **Done.**

L 149: Replace ‘examined’ _by ‘supervised’ _ **Done.**

LL 149-150: Rephrase. It sounds like the communities can be found at 7m depth for 54 days, while you want to say that the experiment took 54 days... _ **We have rephrased this sentence to address the concern raised by the reviewer. We now state:**

“The SalTExPreS was utilized to implement three treatment scenarios in a fractional-factorial design to simulate expected future conditions in Kongsfjorden for a 54-d experiment that supervised the productivity, survival, and growth response of mixed kelp communities surveyed at 7 m (maximum depth of collection).”

L 152: ‘- the details’: delete ‘the’ _ **Done.**

L 150–153: Move this sentence to the end of the paragraph! **This sentence has been moved to the end of the paragraph.**

L 157: ‘11m’ _confusing: You want to simulate a -7m community but measure the fjord conditions at 11m??? **The 7 m depth was the maximum collection depth and the depth of comprehensive surveys describing community assemblages in the literature. The underwater observatory COSNYA site is located at a depth of 11 m. We did not have the ability to relocate the fixed COSNYA monitoring station. We have rewritten the sentence to: “The chosen treatment and salinity perturbations were applied as offset values from *in-situ* fjord conditions, which were measured at an underwater observatory fixed at 11 m depth and captured the natural variability of the fjord system.”**

L 166: 7m or 11m??? **This is 7 m as stated.**

L 171: Now its 10m??? Clarify! **The pump was situated at 10 m which was 1 m higher than the 11 m *in-situ* data measurements at the underwater observatory. This was done to prevent clogging from sediment which we had experienced before the experiment began. We have added the following in the revised manuscript: “To prevent clogging from sediment, the pump was situated at a 10 m depth ensuring a safe height above sediment resuspension from the floor.”**

L 172: ‘... _that was tapped into an underwater intake pipe AND that fed a header tank...’ _ **Done.**

L 176: ‘plumbed’...? What do you ant to say? **We do not understand the reviewer’s question. Plumbed is the past participle of plumb and is the intended word.**

L 178 and L181: Dot missing after ‘Fig’ _ **Done.**

L 182: ‘...from the tap which IS fed by the...’ _(guess this is still the case.) **Done.**

L 185: delete last part of the sentence (‘, where flow rates of 7 – _8 L...’ _) as this is redundant to the previous information given. **This portion of the sentence has been deleted and rewritten as suggested.**

L 186: replace ‘incubations’ _by ‘interruptions’ _ **Done.**

L 188 write: ‘(3 treatments and 1 control, each with 3 replicates)’ _ **Done as suggested.**

LL 191-192 write: ‘Fiberglass insulation at the outside of each mesocosm reduced unintended changes in treatment water temperature.’ _ **We have changed this sentence to reflect the suggestion by the reviewer.**

L 193: delete comma after ‘warmed’ _ **The Oxford comma has been deleted.**

L 196: no hyphen between flow and line_ **Done.**

LL 197-198: move '12 in total' _ to the end of the sentence : (12 in total, Fig. 1) **Done.**

LL 203–205: redundant and commonplace: rephrase! **We have rewritten these two sentences and removed any redundancy.**

L 205: delete 'all' _ **Done.**

L 206: delete comma after 'valves' _ **We disagree; the Oxford comma for this sentence improves clarity for the listed actions.**

LL 206–207 just write: '...logged every minute and displayed on the user interface (Fig. A3).' _ **We have revised the sentence accordingly.**

L 209 (and throughout the whole manuscript!): r_e_p_l_a_c_e_ _'s_e_t_p_o_i_n_t'_ _b_y_ _'n_o_m_i_n_a_l_v_a_l_u_e'_ _ **“setpoint” has been replaced with “nominal” or “nominal value” here and throughout.**

L 231: 1st mention of 'PLC': define here as 'Programmable Logic Controller (PLC)!' **Done.**

L 231: '...informing ON proper communication...' _ **Done.**

L 233 (and elsewhere): r_e_p_l_a_c_e_ _'v_a_l_v_e_o_p_e_n_p_e_r_c_e_n_t_a_g_e'_ _b_y_ _'v_a_l_v_e_o_p_e_n_i_n_g_p_e_r_c_e_n_t_a_g_e'_ _ **We have removed the stylistic compound modifier and changed “open to “opening.” There were no other sentences where this needed to be done.**

L 237: % is no unit of concentration! Write: '... O2 saturation (%),..' _ **We have corrected this error.**

L 247, 249 and elsewhere: replace 'control condition' _by 'control treatment' _or just 'control' _ **We have changed “control condition” to just “control” here and throughout.**

L 251: comma after 'period' _ **Due to the restructuring of the sentence as mentioned below, a comma is not needed here. See response to comment below.**

L 251 'across the 3 replicates', clarify: does this mean this is the average off the deviation over all 3 control replicates - or was the average in each replicate less than 0.3°C? **The reviewer's second interpretation is correct. We have adjusted the sentence to remove any ambiguity in the interpretation by the reader.**

L 251-254: replace 'was based on' _by 'was achieved by'. Furthermore: This sentence doesn't make sense at all: The ability to read data does not help to keep regulation quality high (low deviation from the nominal value). The fast response of the system to changes in the ferrybox data is the key player here... **We have changed “based on” to “achieved by” and replaced the**

word “read” with “interpret and respond to...” which we hope gives better clarity to the message being conveyed. This change also highlights the comment by the reviewer’s reference to “fast response.”

L 253-254: put last part of the sentence (after the comma) into parentheses. **Done.**

L 262 write: ‘...situated at 90 m depth in the fjord was used from...’ _ **We have added the words “depth in the fjord” to the sentence as suggested.**

L 263-264: write: ‘...at 10 m depth was repaired.’ _ (motor malfunction info is irrelevant) **Done.**

L 275: replace ‘deployment’ _ by e.g. ‘experiment’ _ **Done.**

L 281-282: delete: ‘...after the final incremental increase was programmed.’ _ **Done.**

L 2282-284, Rephrase: I don’t understand this sentence... _ **This sentence has been split for clarity.**

L 303-304: Please discuss: The ability to add warmed seawater also to the control system would allow for keeping the control stable even when using the 90m backup pump (in a future setup). **We have added a sentence following this one to reflect the statement made by the reviewer.**

L 311: replace ‘inaugural’ _ by ‘first’ _ **We have replaced “inaugural” with “first.”**

L 317: replace ‘permits the’ _ by ‘allows for the’ _ **We have replaced “permits” with “allows for.”**

L 325, write: ‘Since the initial experiment, we implemented a number of changes to improve the performance of the system which have been realized during a second experiment in ...’ _ **We have changed this sentence to the one suggested by the reviewer.**

L 332-334, write: ‘...kept deviations in the 9 different mesocosms at $< 0.5^{\circ}\text{C}$ for 94% of the time (79% in the first experiment). **Done.**

L 334: ‘During the first experiment...’ **Done.**

L 335: ‘largeR deviations’ _ **Done.**

L 336: ‘...flow rates OF $< 2 \text{ L min}^{-1}$...’ _ **Done.**

L 337: Simple software modifications _ **Done.**

L 340-341, just write: ‘...data were maintained solved most of the issues.’ _ **We have changed this sentence to reflect the reviewer’s suggestion.**

L 343, write: ‘...and clogging of the seawater inlet are issues that need to be addressed whenever...’ _ **This sentence has been revised to reflect the latter portion of the suggested changes. The sentence now includes “...and clogging of the seawater intake ports.” This is a slightly different suggestion than given by the reviewer but is more accurate given how the pump functions.**

L 345: How do you prevent clogging or remove the stucked material? Can the pumping direction be reversed? **The pump was 1 m above the seabed as explained in the revised manuscript (lines 172–173). It provides reasoning for the 10 m and 11 m difference between the pump depth and the COSYNA Observatory logging depth.**

L 346-347, write ...’ _independently regulate experimental conditions in a ...’ _ **Done.**

L 350: replace ‘its’ _by ‘the system’s’ _ **Done.**

L 351: new sentence after ‘(e.g. tidally).’ _

L 351: replace ‘mimic a future scenario’ _by ‘mimic future scenarios’ _ **Done.**

Figure 1:

- Sensor labels too small
- ‘Control’ _doesn't make sense as the violet/dark blue line also supplies the 'treatments'
- misleading: are the yellow marked valves 'pressure regulation valves' or 'pressure sensors' (as stated in the text below)? Or aren't the yellow marked things in the photos the same as in the sketch?
- Black line: where does the freshwater enter the system (and where starts the arrow that points at the hose in the photo)
- Overall: using some colorful lines as the actual pipes/tubes of the system - and other colorful lines as arrows that point at the fotos is very confusing and generally unacceptable for a scientific sketch.

I suggest that you use a number code (like in the foto - and write the same numbers next to the respective line or valve in the sketch.

- It is very important to be exact into each single detail in this figure!

Figure 1 has been redrawn to address these comments.

- L 539: that lead to all 12 3-way regulator valves **We have added “3-way” to the text.**

- L 544: photosynthetically without capital ‘P’ _ **Done.**

Figure 2:

- L 560-561: Not ‘regulation’: Never write what can be interpreted from a figure in the caption, but just what can be seen! Just write: 'Mean temperature offsets of all applied conditions. Blue: offset of the control from the FerryBox. Dark green, light green and yellow: offsets of the

treatments 1, 2 and 3 from the control, respectively.' **We have removed “regulation of the” from the sentence and added two additional sentences as suggested by the reviewer.**

- L 562: end sentence after 'standard deviation'. (Short sentences are good!) **Done.**

Figure 3: 'mean' values: averaged across how many single datapoints? resp. across how much time???

We have added the details asked for by the reviewer to the figure caption: values occur every minute spanning more than 60 d.