

Review Report (Manuscript ID: egusphere-2026-3186)

General Comments:

Thielecke et al. present a 3-week mesocosm experiment to examine how Si modulates the succession of the Arctic spring phytoplankton community, composed predominantly of the haptophyte *Phaeocystis* and the diatom *Chaetoceros*. The results show clear Si gradient effects: when N & P are depleted, *Chaetoceros* outcompetes *Phaeocystis* in $>3 \mu\text{M}$ treatments. The authors conclude that “Si availability does not govern initial *Phaeocystis*–diatom competition, but is the primary determinant of diatom bloom magnitude”.

I appreciate the authors did lots of measurements and analyses in this Arctic experiment with eight levels of Si availability, although each level had only one mesocosm ($n = 1$). There are plenty of data presented in the manuscript. Unfortunately, this manuscript is not well-organized, loose, and lengthy, leading a reader like me getting lost sometimes. The methods of statistics applied should be further revised to show/reflect purposes of analyses. I feel the text would need to be significantly shortened (25~50%). Some contents, as listed below, also need to be clarified or corrected before considering acceptance.

Specific Comments:

I. Abstract:

[Line 22] “macronutrient additions”.

II. Introduction:

[Line 77–79] I got confused about the references cited in the sentence. In Assmy et al. (2017 Sci. Rep.), the only statement about Si concentration is “Silicic acid concentrations in the upper 50 m during the bloom period remained close to winter values at $4.0 \pm 0.4 \mu\text{mol L}^{-1}$ (Fig. S8), suggesting that no substantial diatom growth had taken place in these waters...”. On the other hand, Assmy et al. (2023 Prog. Oceanogr.) have also described that their “data also clearly show that low silicic acid concentrations are not a prerequisite for *Phaeocystis* to bloom as also supported by earlier observations...”.

[Line 91–92] Why and how the ratio between diatom and *Phaeocystis* is important for primary productivity and export production?

III. Methods:

[Line 156] The “realized” average concentration... please consider to replace the adjective by other word (observed or measured?).

[Line 175] The seawater pH.

[Line 193] Seawater pH.

[Line 193–195] I don't understand the statements of thermodynamic equilibrium constants. Please rewrite them for clarity.

[Line 207–208] Please cite references for the oxidized method. What is the recovery of the applied method?

[Line 210–213] Please check the cited references are proper. What is the recovery of the method applied in this study?

[Line 263–267] The statements are somewhat unclear. Are these referred to specific element (C/N/Si) uptake rate? Is the percentage referring to atom%? But the Eq.1 seems referring to absolute uptake rate (Line 267–268).

[Line 269–270] I don't understand this statement. The atom% of the stable isotopes are not acquired from the control set or initial sampling at T0 (Line 239)? Are the values for blank?

[Line 293] Atom%.

[Line 301] Please revise the equations as Eq.2 and Eq.3.

[Line 358–368] I suggest moving the statistics part to section 2.5.9.

[Line 382–383] I don't understand this statement. What levels are included in the treatment and what is the sample size ($n=?$) of each treatment level?

[Line 383] Please clarify what relationships are examined using Spearman.

IV. Results:

[Line 393–394] I suggest just presenting PAR, which is much intuitive for phytoplankton study, and adding a short phrase to remind readers there was polar day during the experiment.

[Line 401] $4.2 \mu\text{mol kg SW}^{-1}$? Please check the unit.

[Line 405] ...during days "3.5"-10... I don't understand what does 3.5 mean. (The number appears again in Line 419)

[Line 423–436, 457] The values of Spearman's correlation coefficient are got from sample rather than population. Please use r_s rather than p . Similar issue is also found in Line 428 (" r " = 0.63) and Line 509–510. Besides showing the r_s numbers, I encourage the authors present the scatter plots of Spearman correlations and the later model I linear regressions (in Supplementary is ok).

[Line 475–549] I suggest combining the sections of 3.4 & 3.5 and then streamlining the

contents. The original texts seem superfluous and some information could be reorganized and moved into Supplementary.

[Line 559–575] I suggest presenting regression equations rather than just Pearson's r or +0.23% per $\mu\text{M Si}$, for example.

[Line 572–573] "...with budget closure improving significantly at higher Si additions (-0.30% residual per $\mu\text{M Si}$ added, $p = 0.048$, $R^2 = 0.50$, Fig. 10b)." I don't get it, specifically Fig. 10 shows 10 $\mu\text{M Si}$ mesocosm, but "High Si additions ($\geq 20 \mu\text{M}$)" (Line 561) is noted.

[Line 585] Should be 3.7. I think this section (with Fig. 11, and Fig. 5) might be one of the most important results, while the other results could be used to explain how the succession happens.

[Line 588–589] Wilcoxon rank-sum test is not mentioned in the Methods. Sample sizes of *Chaetoceros* and *Phaeocystis* biovolumes should be noted.

[Line 591–592] The differences in average growth rate could be examined using randomized block design of three-way ANOVA (Si and species as treatments, and phase as block).

[Line 604–612] But soon I got confused in these statements, as small flagellates were included. I wonder if it would be better to show the results when the flagellates data was removed.

V. Discussion:

[Line 660] The cited reference was not found in the Bibliography list.

[Line 664–666] I got confused about the statements and Fig. 13. What are the thresholds to decide the type of limitation during the experiment? Furthermore, as samples were collected every two days, how to present the data point each day in Fig. 13?

[Line 670–717] It seems there are too many details in this section. Please consider to streamline and reorganize the section. Similar issue in the following sections.

VI. Conclusion:

[Line 858–860] Please consider to rewrite the sentence or reconstruct it into two sentences.

VII. Tables and Figures:

[Table 2] Should be Table 1. Please revise the statistical symbols following the abovementioned comments..

[Figure 1] Please reorganize the layout. Add a latitude line to show the boundary of arctic region. Add new labels or enlarge existed labels to clearly show important seas, lands, and spots (such like Kongsfjorden and Svalbard). A combination of Figure 1 and Figure 2 might

work.

[Figure 5] Add “Day” in front of the experiment day for each panel.

[Figure 12] The label of the X-axis should be Si availability. Maybe move the data of small flagellates into Supplementary?

[Figure 13] Please see the comment of [Line 664–666].

VIII. Bibliography:

[Line 1007] I don’t see the reference of “De La Roche & Passow, 2004 L&O 49:245-255” listed here (cited in Line 660).