

Review on Biogenic silica production and diatom dynamics in the Svalbard region during spring by Krause et al.

Krause et al. investigated phytoplankton, especially diatoms, and nutrients at 9 stations in the Atlantic sector north of 76°N. They measured silicate, nitrate plus nitrite, chlorophyll a, biogenic silica, determined diatom assemblage, estimate productivity and export (based on sediment traps). The silicic acid concentration in the upper 50 m was always below 5 $\mu\text{mol L}^{-1}$ and at most stations below the nitrate plus nitrite concentration. At several stations $[\text{Si}(\text{OH})_4]$ was below 1 or even 0.5 $\mu\text{mol L}^{-1}$ in the upper 20 m. In order to investigate Si uptake limitation, the authors performed on board growth experiments over a range of $[\text{Si}(\text{OH})_4]$ at 4 stations. Michaelis-Menten functions for silicic acid uptake (Eq.1) were fit to the data yielding estimates for maximum uptake rates (V_{max}) and half-saturation constants (K_S). Let me suggest listing these estimates in a table. The estimates for K_S are much higher than some estimates (for different diatom species) reported in the literature (for example, Paasche, 1973a,b), however, lower than the higher values given by Kristiansen et al. (2000). What might explain this large range and these differences? Could it be influenced by factors (other nutrients, grazing) differing between the various investigations/experiments? The manuscript contains valuable new data, is well written, and will be of interest to many readers of Biogeosciences. I recommend publication after minor revisions.

Further remarks/suggestions:

L123-129 Description of trap deployment was not very detailed ('at 3-7 depths between 20 and 150-200 m, based on bathymetry'). It would be good to add a list with depths and bottom depths (or a reference where to find this information).

L132-134 Freezing sample for nutrient analysis: Procedures (thawing, measurements how long after thawing) and quality control (freeze certified reference material in parallel with samples) have been discussed in the literature (for example, Macdonald et al., 1986, Clementson & Wayte, 1992, Dore et al., 1996). Could you please give more details on the procedures and quality control?

L136-138 "Phosphate was analyzed, but N:P ratios for nutrients were, on

average, 8 among all stations, suggesting that N was likely more important than P for primary production." N:P is below Redfield thus N might be limiting primary production before P. However, 'N was likely more important than P for primary production' sounds strange. Please rewrite.

L145,148,225 $60^{\circ}\text{C} \rightarrow 60^{\circ}\text{C}$, $-20^{\circ}\text{C} \rightarrow -20^{\circ}\text{C}$, $-2-1^{\circ}\text{C} \rightarrow -2$ to $+1^{\circ}\text{C}$ (no gaps; please check whole manuscript)

L175 please rewrite "dividing by the depth integration" \rightarrow dividing by depth-integrated values

L199 ml \rightarrow mL

L205-206 using C:Si (instead of Si:C) would avoid the exponent -1 in Eq.(2) and give values more in Redfield-style, i.e. molar Si:C = 0.13 \rightarrow 7.7 C:Si (only slightly higher than the Redfield C:N). What's the uncertainty of the Si:C estimate?

L295-296 "The rate of diatom biogenic silica production was reduced by ambient $[\text{Si}(\text{OH})_4]$ in 95% of the samples examined." sounds strange. I guess you mean 'was kinetically limited by ambient $[\text{Si}(\text{OH})_4]$ ' based on comparison with estimated K_S values or based on enhancement factors.

L317,548 Spearman's Rho Test: add number of data $n = \dots$

L380-384 What about grazing?

References

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