

## ***Interactive comment on* “First in situ estimations of small phytoplankton carbon and nitrogen uptake rates in the Kara, Laptev, and East Siberian seas” by Bhavya P. Sadanandan et al.**

### **Anonymous Referee #1**

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General Comments: A review on the manuscript, "First in situ estimations of small phytoplankton carbon and nitrogen uptake rates in the Kara, Laptev, and East Siberian seas." This paper reports the recent data on distribution patterns of small phytoplankton in different regions with different environmental conditions such as sea ice concentration and DIN:P. This paper contains new information for understanding small phytoplankton in the recent environmental changes in the Arctic Ocean. I believe that the contents, including data, of the manuscript should be eventually published. A review of figures and tables found them to be appropriate. However, I have some comments mainly about the clarity of the manuscript. I recommend the journal to accept this work after some minor revisions.

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Specific comments: Page 3, Lines 49-52: Hill et al., 2005 → Hill and Cota, 2005, Arrigo et al., 2015 → Arrigo and van Dijkend, 2015, Bélanger et al., 2013 → Bélanger et al., 2008?, Wassmann and Slagstad, 2011 → Wassmann et al., 2011. Please check references throughout the text!!

Page 3, Line 60: McLaughlin and Carmack, 2010 → McLaughlin et al., 2010

Page 4, Line 70: Bélanger et al., 2013 → check the reference!

Page 4, Line 74: Vancoppenolle et al., 2013 → this citation is no in reference list!

Page 5, Line 94: Does your measured carbon uptake correspond to NPP or primary production? You need consistency for that throughout the text. Otherwise, you need to define NPP.

Page 6, Line 132: “The chlorophyll (chl) samples” → Does it mean the chlorophyll a? Or does it contain chlorophyll a, b, and c? Kind of confused in the text!

Pages 6-7: In materials and methods section, there is no description for how to measure water temperature and salinity, although water temperature and salinity data are used in Table 1 and described in the text. Please describe a detail method for the water temperature and salinity measurement!

Page 7, Line 134: Lee et al.,2005 → Lee and Whitledge, 2005

Page 7, Line 149: “Niskin bottles attached to CTD” → CTD spell out!

Page 8, Line 165: Slawyk et al. 1977 → Slawyk et al. (1977)

Page 9, Lines 180-184: No unit for the salinity!

Page 9, Line 182: When I read this sentence, I thought that you investigated for a late summer in 2013.

Page 9, Lines 189-191: I think authors may need to redraw figure 2 because I don't know whether the subsurface chlorophyll maximum actually exists in this figure. I think

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it is only the results of some stations.

Page 9, Line 193: “Fig. 3 & 4” → Figs.

Page 10, Line 211: Parkinson, 2002 → this citation is no in reference list!

Page 11, Line 227: “Table 2, Fig. 3 & 4” → Figs.

Page 11, Line 239: Kirk, 1983 → this citation is no in reference list!

Page 11, Line 240: Shiklomanov, 2000 → Shiklomanov et al., 2000

Page 12, Lines 252-258: “The depth-integrated NO<sub>2</sub>-+NO<sub>3</sub>- concentrations varied between” → “. . .concentrations in the euphotic zone varied. . . .” You do not show euphotic zone depth. Add euphotic zone depth in Table 1. If the difference in the depth of euphotic is large, the result may be influenced in nutrients budget. Also, I think that the meaning of “high concentrations of NO<sub>3</sub>+NO<sub>2</sub> and phosphate” are ranked based on only nitrogen data and mentioned stations are not special compared to other stations.

Page 12, Line 262: this the stations → what stations?

Page 12, Line 257: “Table 1, Fig. 3 & 4” → Figs.

Page 13, Line 268: “higher than those of present study area” → You do not show daily data for carbon uptake rates! Add your data based on daily carbon uptake rates!

Page 13, Line 272: Glibert et al., 2011 → this citation is no in reference list!

Page 13, Line 288: It is necessary to investigate whether there is a relationship between SST and small phytoplankton uptake rate. You are dealing with an entirely different ecosystem as you mentioned.

Page 14, Lines 290-293: "However, Fig. 5 show a weak,...." → Authors just stated that possibility of small phytoplankton efficiency to peak at nutrient stoichiometry close to Redfield's ratio. In my opinion, the DIN: P ratio of less than 16 means mainly nitrogen limitation in ocean. If DIN: P is the degree of nitrogen limitation, it can be interpreted

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that small phytoplankton is just advantageous to survive better than large. I wonder why the contribution of small phytoplankton is below 50% despite of the nitrogen limitation. Why did this happen? I guess that DIN:P ratios below 8 seem to affect the rate of phytoplankton uptake regardless of size based on limited data in this study.

Page 14, Lines 299-300: “between small phytoplankton uptake are DIN:P” → “and” instead of “are”

Page 15, Line 316: “Fig. 6 & 7” → Figs.

Page 15, Line 323: Glibert et al., 1982 → Glibert, 1982

Page 15, Line 314: “ the bottom water. ....(1000-1700 hours) turnover times compared to” → “... turnover times for NH<sub>4</sub><sup>+</sup> substrate...” And what does mean bottom depth? Is it correspond to 1% light depth? Define the bottom depth in euphotic zone!

Page 15, Line 316: “both NO<sub>3</sub><sup>-</sup> and NH<sub>4</sub><sup>+</sup> substrates” → at surface water???? Or throughout the euphotic zone?

Page 16, Line 339: “quantum efficiency/yield” → quantum efficiency (or quantum yield)

Page 16, Line 341: “in Fig. 8 and 9” → Figs.

Page 16, Lines 355-356: Wassmann and Slagstad, 2011 → Wassmann et al., 2011, Tremblay et al., 2002 → this citation is no in reference list! Please check the reference!

Page 17, Line 374: Legendre et al. (1993) → 1992?, check the reference! Please, double check and correct them, if needed.

Page 17, Line 375: “large phytoplankton cells (45 μm)” → check the cell size. I think it probably means > 5 μm.

Page 29, Fig. 2: Rephrase legend for Fig. 2

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