

## ***Interactive comment on “Synergism between elevated $p\text{CO}_2$ and temperature on the Antarctic sea ice diatom *Nitzschia lecointei*” by A. Torstensson et al.***

**Anonymous Referee #2**

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General comments: This paper described the synergistic effects of temperature and  $\text{CO}_2$  on a sea ice diatom, it is an important issue since polar species are much more sensitive to ocean warming, while received few attention. The interesting finding of this paper is both temperature and  $\text{CO}_2$  can reduce ice diatom's FA, which may affect their nutritional value. The weakness of this paper is lack of focusing, introduction and discussion parts are not well organized.

Specific comments: Introduction: P6640 L25-26, this group had an explanation why ocean acidification has positive, negative or neutral effects (Gao et al., 2012 Nature Climate Change) The statements of CCM (first paragraph of page 6641) is odd to be

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shown here, better to delete this paragraph, or the author should more specifically to rewrite this paragraph, relate it with particular environments of polar area.

M&M 2.6 the title is misleading, PP measurement with AZ is not a method to determine CA activity, I suggest to delete the title, and incorporate this paragraph into “2.5 Primary productivity”.

Results: 3.1 Provide the enhanced percentage due to temperature and  $\text{CO}_2$ , I saw the increase is roughly 50% for both growth rate and PP, this is a good correlation, while not for Fv/Fm, which just a potential value under dark, not the real value when photosynthesis is active. If the author measured effective quantum yield, please add into Fig 2, which reflects the photosynthetic activity under light, and comparable with growth rate and PP.

delete “3.3 carbonic anhydrase activity” and merge the paragraph into “3.1”

Table 1 is not necessary in this paper, better to remove it, the author can state the significance in the text. Fig3 and 5 can be put together as 2 panels and labeled with A and B.

Discussion: This part to me is long-windedness, the author can use less words to say the same thing. P6649 L20-27 “However . . . 35°C”, these sentences are of no help to the discussion P6650 L10, delete “CA activity” P6650 L14-17 “Engel . . .  $p\text{CO}_2$ ”, can be shorten as “Engel et al. (2013) observed an increase in PPDOC of Arctic phytoplankton assemblage under high  $\text{CO}_2$ ”. Please check the whole text carefully, some information (e.g. location, technique) provided by the author from the reference are irrelevant to the discussion, the reader can track to the cited papers if they are interested. P6650 L23-25, some words are not necessary, e.g. “in earlier studies”, “from the Bering Sea”, “treated with elevated temperature” (you have said photosynthesis increased with temperature in the previous sentence, ), actually, this sentence can be shorten as “as found by Hare et al 2007 in phytoplankton populations”, because you are trying to use this paper to support your findings in previous sentence. P6651 L16

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delete "is well known to" P6654 Better to shorten CCM part

References: Li et al (Biogeosciences 9, 3931-3942 2012) reported a synergistic effect of ocean acidification, UV and temperature on a diatom, might be useful for comparison with your data

The author should revise the discussion accordingly, to make sentences concise.

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Interactive comment on Biogeosciences Discuss., 10, 6637, 2013.

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