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Interactive comment on "Effects of dust additions on phytoplankton growth and DMS production in high CO_2 northeast Pacific HNLC waters" *by* J. Mélançon et al.

Anonymous Referee #1

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General comments:

This paper investigates the impacts of dust or iron additions on phytoplankton community with and without CO2 enrichment in the northeast Pacific, which is known as a HNLC region. The experimental design is unique, and the incubation is conducted appropriately. The authors present a novel dataset regarding the effects of dust addition and/or increased CO2 on natural phytoplankton community in the HNLC area.

However, the introduction and material and methods are insufficiently constructed to explain the importance of this work. For example, it is not clear from the manuscript why the authors use CJ-2 dust as Fe source. It would be better to cite previous works

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regarding Fe solubility and, if available, effects of dust addition on phytoplankton. The method of statistical analysis should also be described in sufficient detail with the threshold value (e.g., $p<0.05$) to determine statistical significance. In addition, some of the discussions are lack of adequate referencing.

I recommend that the authors make a greater attempt to improve the manuscript. This paper can be accepted in the Biogeosciences after revision considering the comments below.

Specific comments:

Page 12284, lines 24-25. Is this statement correct? I believe that diatoms possess highly efficient CCMs than coccolithophores as described in the previous review by Reinfelder (2011, Annu. Rev. Mar. Sci.). Please revise this section.

Pages 12284-12285, Introduction. The topic of duct should be described and it should be separated from that of Fe, because it is unclear whether Asian duct might serve as a Fe source or not.

Pages 12286-12287, Experimental setting and location. Please give the temperature and salinity in the sampling site.

Page 12288, lines 2-4. It is difficult to understand experimental conditions without the previous paper by Nishikawa et al. (2000) due to the lack of information about CJ-2 dust in the manuscript. Please describe the properties (e.g., size, chemical composition, and iron solubility) of CJ-2 dust in more detail in this section or discussion. Ooki et al. (2009, J. Geophys. Res. Atom.) might serve as a useful reference for the iron dissolution property.

Page 12290, lines 19-21. In this sentence, the authors described that the 6 groups were quantified by CHEMTAX. However, table 3 shows 8 algal groups in the pigment ratio matrix for CHEMTAX analysis. Which is correct? In addition, the authors should provide the reference or method used to determine the initial pigment:chl a ratios in the

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table 3.

Page 12292, Statistical analysis: The threshold value (e.g., p<0.05) for determining statistical significance should be described in this section.

Page 12294, lines 14-16. “The highest POC concentration. . .” Is this statement indicates that the POC concentration in the Dust treatment was significantly higher than that of Dust+Acid treatment and the other treatments?

Page 12295, lines 20-21. “These results suggest a. . .” This statement would be described in the discussion.

Page 12295, lines 22-28. “Phytoplankton can acquire. . .is likely to be.” These statements seem better placed in the discussion.

Page 12297, line 25 (and elsewhere). It is better to use “μatm” instead of “ppm” for the unit used to express partial pressure.

Page 12297, line 26. The period can be omitted.

Page 12297, lines 25-27. “The abrupt decrease. . .(Figs. 2a and 3c)” In this statement, why can the authors say that the community composition was unaffected by CO2? Since the effects of acidification on the community composition were not described statistically in the results, it is hard to accept the statement. Rather, in the figure 3, chl a biomass of diatoms, haptophytes, and pelagophytes seems to have increased in the Control+Acid treatment relative to Control treatment.

Page 12298, line 11-14. In the discussion regarding the CO2 effect on the HNLC water, it should be noted that the other experiment conducted using HNLC water demonstrated strong negative effects on diatoms at elevated CO2 levels (Sugie et al. 2013, Biogeosciences; Endo et al. 2015, Biogeosciences).

Page12299, lines 5-7. This statement requires supporting references regarding the response of DOC and/or TEP productions to ocean acidification. For example, Yoshimura

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et al. (2014, Deep Sea Res. I) reported minimal effects of increased CO2 on DOC production in the Fe-limited phytoplankton communities.

Page 12300, lines 26-29. How did the authors make sure that phytoplankton growth was limited by Fe availability? I feel that the decrease in carbon fixation rate is insufficient to explain Fe limitation for phytoplankton without references. Given that Fe was released and re-adsorbed by the dust, DFe concentration might have remained constant by a balance between dissolution and re-adsorption. This paragraph needs to be reconsidered.

Pages 12301-12302, "In order to further explore. . .was detected with the two factors". These statements seem better placed in the material and methods or results.

Page 12302, lines 18-19. This statement is inconsistent with Fig. 3c, which indicates that chl a concentration of haptophytes increased in the Fe and Dust treatments relative to control treatment.

Figures 1-5. Sample size should be described in the figure captions.

References cited

Reinfelder, J. R.: Carbon concentrating mechanisms in eukaryotic marine phytoplankton, Annu. Rev. Mar. Sci., 3, 291–315, 2011.

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Sugie, K., Endo, H., Suzuki, K., Nishioka, J., Kiyosawa, H., and Yoshimura, T.: Synergistic effects of pCO2 and iron availability on nutrient consumption ratio of the Bering Sea phytoplankton community, Biogeosciences, 10, 6309–6321, 2013.

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matter production response to CO2 increase in open subarctic plankton communities: Comparison of six microcosm experiments under iron-limited and-enriched bloom conditions, Deep-Sea Res. I, 94, 1–14, 2014.

Interactive comment on Biogeosciences Discuss., 12, 12281, 2015.