Interactive comment on "Arctic (Svalbard Islands) Active and Exported Diatom Stocks and Cell Health Status" *by* Susana Agustí et al.

Anonymous Referee #2

Received and published: 17 December 2018

This MS sheds a light on the role and fate of diatoms over a course of a spring bloom in the Arctic Ocean, based on the estimates of their mortality, senescent rate, and the population with fast sinking rate. These estimations were designed to test a hypothesis in which Si-depletion triggers (1) senescence of diatoms and (2) selective sinking of the dying population. Because of intense CO_2-sequation in the Arctic Ocean, this hypothesis is valuable to be tested, but the results in this study unlikely support this hypothesis. For example, high % living diatoms in the upper layer was achieved at Stns 6, 7 and 8 with low silicic acid concentration, but this result doesn't meet (1). It could be explained, at least partly, by rapid selective sinking of dead populations as shown in Fig. 5. But, low % living diatoms at Stn. 4 with high silicic acid concentration was resulted from shift of equilibrium point between mortality rate and sinking rate toward

C1

higher mortality than at the stations with high % living diatoms, again far away from (1). I am a little bit concerned about reliability of the incubation experiment because of lack of positive control (light incubation). My question is if senescence was actually induced by darkness, despite of low silicic acid concentration and difference in incubation temperature from sampling temperature. Also, I am concerned about reproducibility of the results from the sinking experiment. But, large variation in % living of aphotic diatoms is very interesting and dose it relate to selective sinking of dying/dead population? A unique feature of this study is collection of natural microphytoplankton community by the Bottle-Net, and thus I would like to suggest to conduct more detailed species-level analysis to test the hypothesis or put aside the hypothesis.

Specific comments

Incubation experiment: How did Authors get a highly active population (93.3% of % living) besides moderate % living population (average, 59.4%)?

% biomass in aphotic zone: Values in text and Fig. 4 seem not to meet the results in Table 1, if they are calculated as the ratio of Aphotic diatoms/(Aphotic diatoms + Photic diatoms), and the axis titles of Fig. 4 seem to be inverted. Please check them. But I would suggest to delete Fig. 4, because a negative correlation appears to be achieved by only one result of Stn. 4. Why was the upper sampling depth of some aphotic samples (Stns 4, 5, 7 and 8) set at deeper than 10 m below of the lower sampling depth of the upper layer? Do the terms of "upper layer", "photic layer" and "the surface layer" mean distinct depth zones?

Table 1: Chlorophyll a concentrations and mixed layer depth are valuable for understanding of the status of the study site.