

Interactive comment on “Spring bloom onset in the Nordic Seas” by A. Mignot et al.

Anonymous Referee #4

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This paper contains some original thinking and analyses of the onset of spring bloom in the Nordic Seas. In situ data from the Nordic Seas on this process is sparse indeed, and the biooptical floats represent a very welcome advance in technology. The treatment of these data demonstrates neatly how the floats can be used to estimate a range of important variables determining the onset of the blooms. I agree with the comments and suggestions of referee #2 and #3, and I will therefore not repeat the points mentioned in their reviews. However, part of the text can be made more compact, especially in the treatment of processes that the floats do not measure due to limited resolution. In the abstract, it is stated that “blooms start” . . . “independently of division rates”, followed by stating that the phytoplankton enters a dormant stage in winter. This may or may not be true, but it can certainly not be documented by the data presented in the paper. The onset of the bloom is in the paper defined as the moment in time when the float sensors detect fluorescence above background. As

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the authors mention in other places of the manuscript, what happens before that is pure speculation. Certainly the physiological state of the algae in winter will have to be studied by other methods to reach reliable conclusions. Forming of sinking spores seems irrelevant in the area investigated, and the discussion on this process should be considerably shortened. Introduction, page 2, line 23: “North of the Arctic Circle, no light is received at the ocean surface during the polar nights. Phytoplankton growth is simply impossible for days to weeks”. The authors have not measured the light during the polar night, and I have never seen complete darkness there. However, I know of unpublished work that actually measured photosynthesis at 81°N in mid winter. Again, the authors should try to restrict their discussion to what can be extracted from their data. It is refreshing to see that the authors go all the way to extract both growth rate and mortality from their fluorescence data. However, we know very little about mortality (and division rates) during winter. I agree that grazing probably is very low, and that division rate also is low. However, the argument that the length of day triggers the onset hinges on the definition of the onset of the bloom. But the authors are aware that this is not necessarily unambiguous: 6 Conclusions line 25: “We cannot definitively conclude that this increase marked the bloom onset, because low Chl a accumulation could have started earlier in the season at levels below the fluorometer’s detection levels”. The treatment of the data is elegant, and the role of surface heat flux was quite enlightening. I look forward to see a revised version in print.

Specific comments 1 Intro page 2 line 5. “Phytoplankton division rates increase with abundance of nutrients and light.” Delete, next sentence is sufficient. Figure 2. I kept looking for white vertical lines in panel e, until I realized they were only present in a and b.

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