



Supplement of

Spring bloom onset in the Nordic Seas

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Figure S1. Bloom observed by float IMR1 during the fall-spring 2010-2011. (a) Time evolution of the vertical distribution of [Chl *a*]. The asterisks indicate the vertical profiles where the ML fluorescence values are not significantly different from the deep fluorescence values. (b) Time evolution of the vertical distribution of potential density σ_{θ} . The black and white continuous lines are the mixed layer, H, and euphotic layer depths, H_{eu}, respectively. (c) Time

1 series of the vertical integral and the average concentration of [Chl *a*] in the ML (<Chl>, blue

- 2 lines and [Chl]_{ml}, orange line). The dashed lines are the standard deviations around the average
- 3 cycle of $[Chl]_{ml}$.(d) Time series of the daily surface heat flux Q_0 (black line) and the daily
- 4 surface PAR corrected for cloud cover, PAR(0) (red line). (e) Time series of the division rates

5 averaged over the ML depth and over a day as described in section 4bi. The two black vertical

6 lines and the gray shading indicate Δt_{onset} , the time period during which bloom onset is possible.

7 The first vertical line marks the end of the polar night. The second black vertical line indicates t_E ,

8 the sampling profile during which the ML fluorescence become significantly different from the

9 deep fluorescence values (i.e., emergence of signal from noise).

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Figure S2. Same as Fig. S1, but for the float IMR 1 during the winter-spring 2011-2012.



Figure S3. Same as Fig. S1, but for the float IMR 2 during the winter-spring 2010-2011.



Figure S4. Same as Fig. S1, but for the float IMR 2 during the winter-spring 2011-2012. This
figure is equivalent to Fig. 2 in the main paper and it is reproduced here for completeness.



Figure S5. Same as Fig. S1, but for the float IMR3 during the winter-spring 2010-2011.



Figure S6. Same as Fig. S1, but for the float IMR3 during the winter-spring 2011-2012.



Figure S7. Same as Fig. S1, but for the float IMR4 during the winter-spring 2014-2015.







Figure S9. Same as Fig. S1, but for the float IMR6 during the winter-spring 2014-2015.



Figure S10. Same as Fig. S1, but for the float IMR7 during the winter-spring 2013-2014. The two black vertical lines and the gray shading indicate the onset of the bloom. In panel (e), the continuous red and blue lines are the daily mixed layer averaged division rate $(1/H < \overline{\mu} >)$ and the phytoplankton loss rates (m), respectively, computed as discussed in section 4b. This figure is equivalent to Fig. 3 in the main paper and it is reproduced here for completeness.



3 Figure S11. Same as Fig. S10, but for the float IMR8 during the winter-spring 2014-2015.



Figure S12. Time series of iPAR just beneath the sea surface at local noon. The blue points are

the observations made by the float IMR9 and the red points are the estimates using Eq. (2) for
the same location and time of the day than the measurements.