

## Supplemental Information

### S1 Corrections for freezing temperature depression

The water activity of the sample was calculated from the salinity of the sample and using the online Extended AIM Aerosol Thermodynamics Model (<http://www.aim.env.uea.ac.uk/aim/aim.php>; Friese and Ebel, (2010); Wexler and Clegg, (2002)). Then  
5 the water activity of a salt solution in equilibrium with ice at the freezing temperature of the sample was determined. From the difference of these two water activities, the freezing temperature in the absence of salts was calculated. For further details see Fig. 1 in Koop and Zobrist (2009).









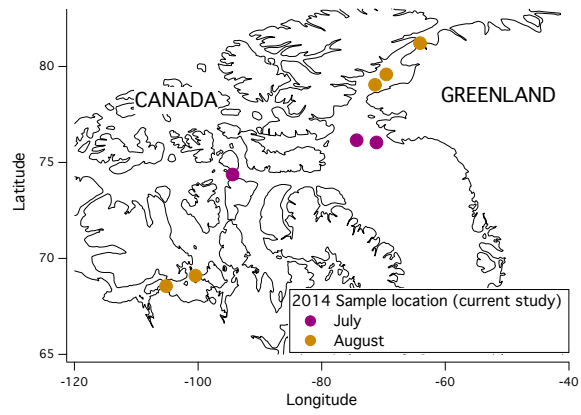
Station	Photos	Notes	Station	Photos	Notes
2		Behind iceberg and sheltered from wind. Sunny day, relatively flat sea surface. Macroalgae spotted approx. 75m away from sampling area. Wind speed: 4.6 m/s.	7		A little wavy, close to ice. Wind speed: 6.7 m/s.
4		Very flat, calm, glassy looking open water. No icebergs in sight. Wind speed: 1.4 m/s. Slick	8		Approx. 200m away from ice island. Partly cloudy. Calm and glassy sea surface. Wind speed: 0.7 m/s. Slick
5		Wavy, open water. Foggy. Wind speed: 3.1 m/s.	9		Overcast and raining. ~15m away from ice with brown material (possible animal faeces). Flat, calm and glassy sea surface. Wind speed: 2.4 m/s.
6		Uniform sea surface, near ice. Overcast. Wind speed: 2.4 m/s.	10		Glassy sea surface. Macroalgae floating approximately 5 m away. Partly sunny. Wind speed: 4.6 m/s. Slick

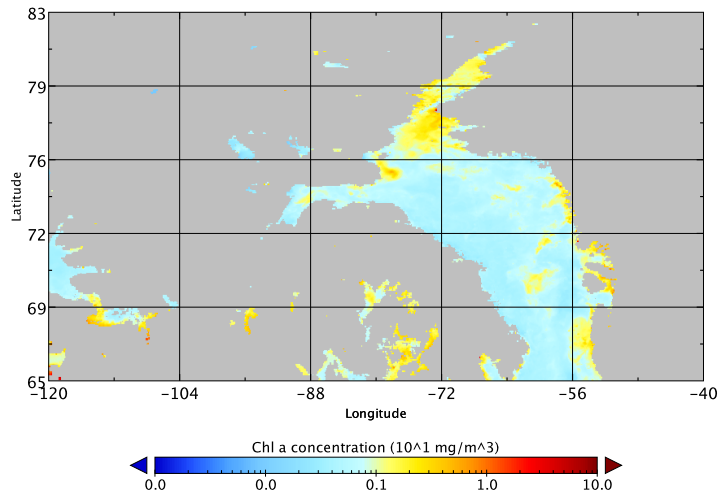
Table S1 - Conditions at sampling stations.

Biological variable	Microlayer T <sub>10</sub> -value			Bulk seawater T <sub>10</sub> -value		
	R	p	n	R	p	n
Phytoplankton abundance	-0.7	0.058	6	-0.5	0.138	6
Bacterial abundance	-0.7	0.071	6	-0.4	0.189	6

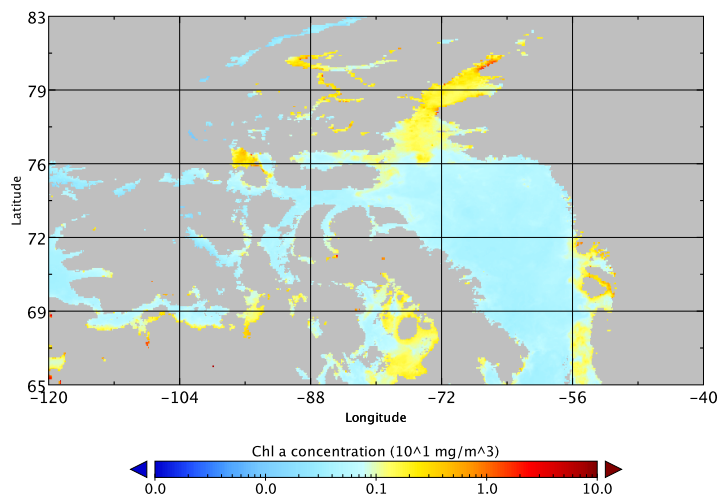
Table S2 - Correlation analysis between phytoplankton and bacterial abundance in the microlayer and bulk seawater and T<sub>10</sub>-values for the microlayer and bulk seawater.



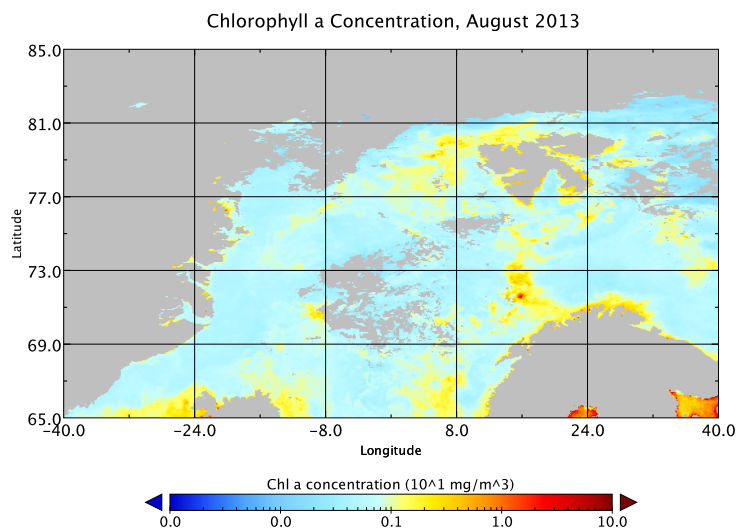
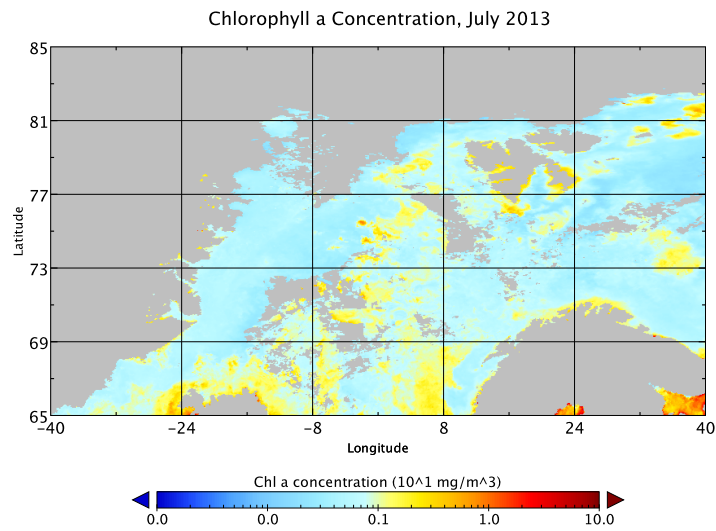
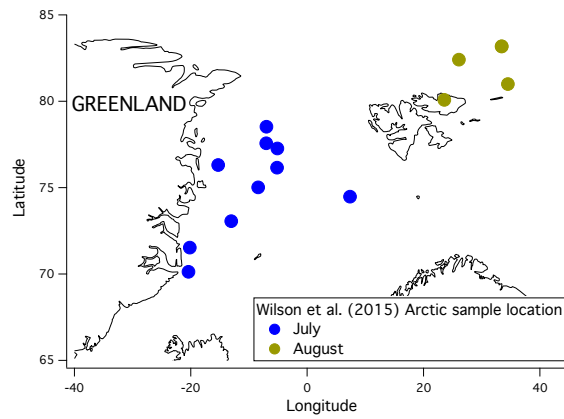
Chlorophyll a Concentration, July 2014



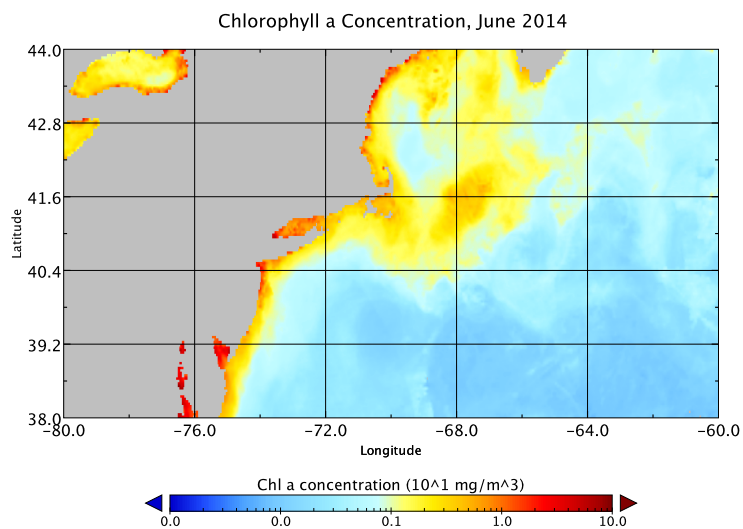
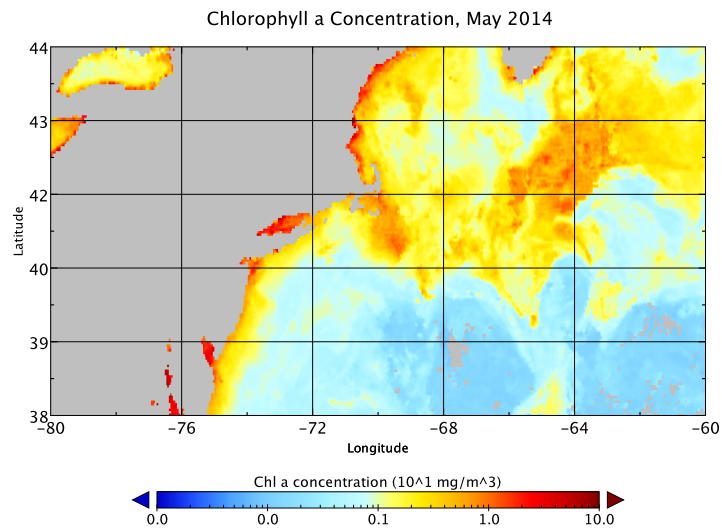
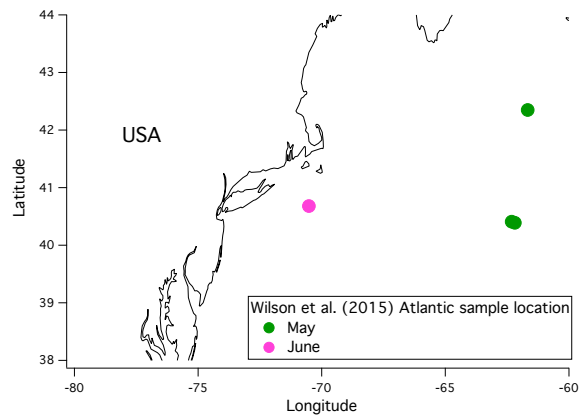
Chlorophyll a Concentration, August 2014



5 Figure S1 - Sample locations and monthly average chlorophyll *a* concentrations for sampling during the current study. Chlorophyll *a* concentrations were obtained from the NASA Ocean Biology Distributed Active Archive Centre (OB.DAAC).



5 **Figure S2 - Sample locations and monthly average chlorophyll *a* concentrations for sampling during the Wilson et al. (2015) study in the Arctic. Chlorophyll *a* concentrations were obtained from the NASA Ocean Biology Distributed Active Archive Centre (OB.DAAC).**



5 Figure S3 - Sample locations and monthly average chlorophyll *a* concentrations for sampling during the Wilson et al. (2015) study in the Atlantic. Chlorophyll *a* concentrations were obtained from the NASA Ocean Biology Distributed Active Archive Centre (OB.DAAC).

## References

- Friese, E. and Ebel, A.: Temperature dependent thermodynamic model of the system  $\text{H}^+$ - $\text{NH}_4^+$ - $\text{Na}^+$ - $\text{SO}_4^{2-}$ - $\text{NO}_3^-$ - $\text{Cl}^-$ - $\text{H}_2\text{O}$ ., *J. Phys. Chem. A*, 114, 11595-11631, 2010.
- 5 Koop, T. and Zobrist, B.: Parameterizations for ice nucleation in biological and atmospheric systems., *Phys. Chem. Chem. Phys.*, 11, 10839–10850, 2009.
- NASA Goddard Space Flight Center, Ocean Ecology Laboratory, Ocean Biology Processing Group. Moderate-resolution Imaging Spectroradiometer (MODIS) Aqua chlorophyll concentration Data; NASA OB.DAAC, Greenbelt, MD, USA. Accessed on 04/17/2017
- 10 Wexler, A. S. and Clegg, S. L.: Atmospheric aerosol models for systems including the ions  $\text{H}^+$ ,  $\text{NH}_4^+$ ,  $\text{Na}^+$ ,  $\text{SO}_4^{2-}$ ,  $\text{NO}_3^-$ ,  $\text{Cl}^-$ ,  $\text{Br}^-$ , and  $\text{H}_2\text{O}$ , *J. Geophys. Res.*, 107, 4207, 2002.
- Wilson, T. W., Ladino, L. A., Alpert, P. A., Breckels, M. N., Brooks, I. M., Browse, J., Burrows, S. M., Carslaw, K. S., Huffman, J. A., Judd, C., Kilhau, W. P., Mason, R. H., McFiggans, G., Miller, L. A., Nájera, J. J., Polishchuk, E., Rae, S., Schiller, C. L., Si, M., Temprado, J. V., Whale, T. F., Wong, J. P. S., Wurl, O., Yakobi-Hancock, J. D., Abbatt, J. P. D., Aller, J.
- 15 Y., Bertram, A. K., Knopf, D. A. and Murray, B. J.: A marine biogenic source of atmospheric ice-nucleating particles, *Nature*, 525, 234–238, 2015.