Observations of Arctic sea ice and ocean biogeochemistry in the new thinner ice era: the N-ICE2015 drift ice expedition

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To unravel the impacts of the thinning Arctic sea ice pack, a team of scientists set out on an expedition from January to June 2015 at 80 to 83°N north of Spitsbergen [1]. With the aim to advance our understanding of processes in the thinner ice and improve our capacity for future scenarios. We worked on a highly mobile and relatively thin sea ice with a snow cover that was thicker than expected. While thick snow modulated the greenhouse gas (GHG) flux to the atmosphere, newly formed sea ice with little snow acted as a GHG source.

New sea ice with less or no snow supported ice algae growth but with detrimental effects from higher ultraviolet exposure forcing the algae to produce large amounts of Mycosporine-like Amino-Acids (>25µg l^{-1}) as sunscreens.

In older ice with thicker snow (up to 0.5 m) limited ice algae build-up occurred, except when the heavy snow load submerged the ice surface and formed a potentially new Arctic sea ice habitat at the bottom of the snow pack, where algae flourished. Surprisingly the thick snow load did not hamper formation of a massive under-ice phytoplankton bloom (>300 mg Chl-a m^{-2}). The dynamic ice cover allowed openings between the ice floes that permitted enough sunlight to reach the ocean below. The bloom, dominated by the colony-forming haptophyte algae *Phaeocystis pouchetii*, caused near depletion of the nitrate inventory, a decline in dissolved inorganic carbon inventory by ~4 mol m^{-2} (48 gC m^{-2}) and an increase in pH. Diatoms had a minor contribution to the bloom. There was a potential biophysical feedback on ocean heating due to increased light absorption by phytoplankton in the bloom.

In this presentation we will summarize the findings from this unique campaign, and discuss potential consequences for the future Arctic.

[1] Granskog *et al*. (2016) *Eos Trans. AGU*, **97**, doi:10.1029/2016EO044097.