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The effect of primary production on nutrient chemistry along the Norwegian coast

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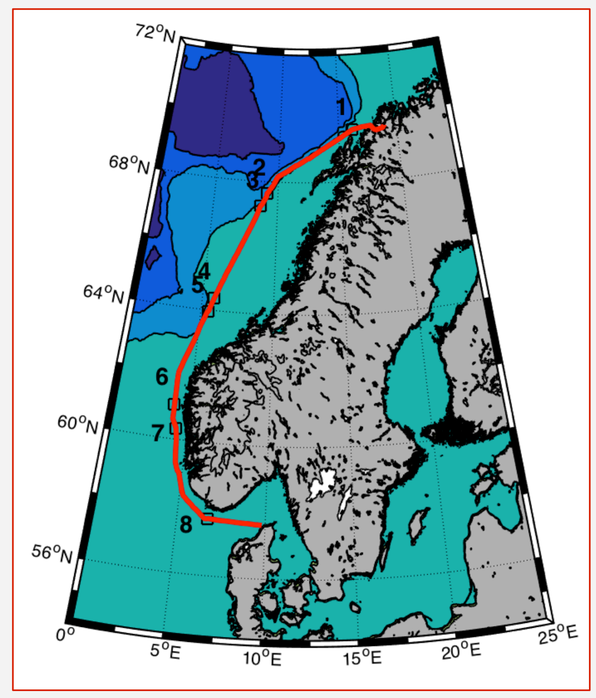
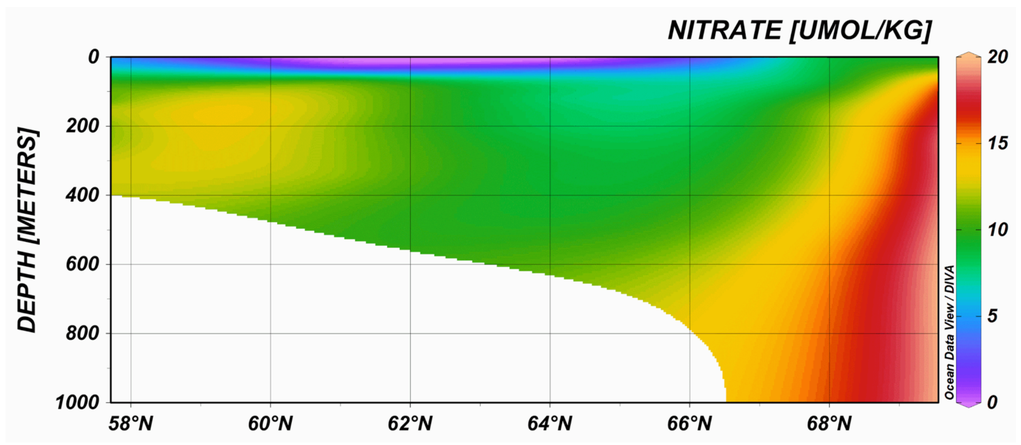
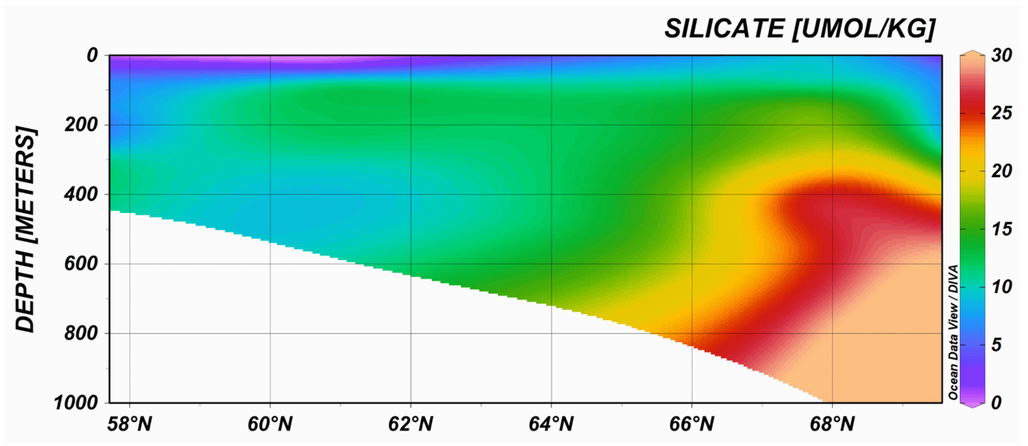
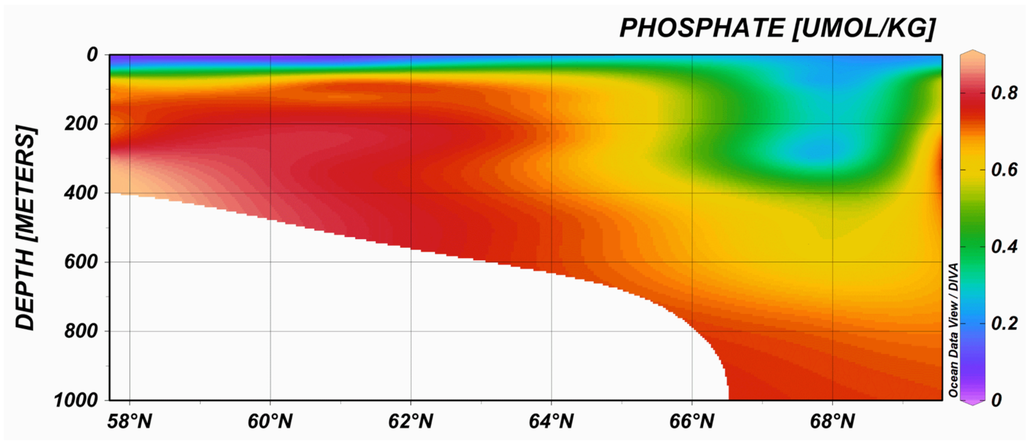


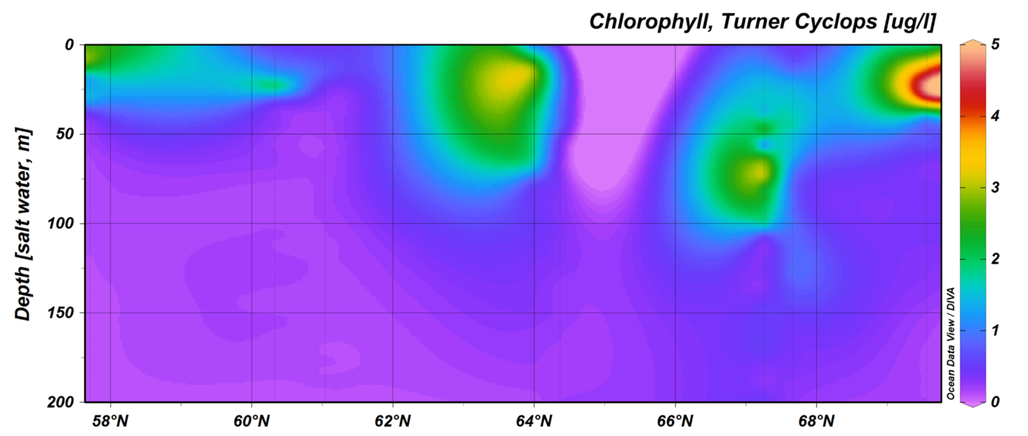
Introduction

During winter in the Norwegian sea, the reduction in solar radiation coupled with increased wind speeds results in mixing of the water column and the regeneration of nutrients including nitrate, phosphate and silicate to concentrations of approximately 12, 0.7 and 5 umol/kg respectively (Saetre, 2007). The onset of spring provides the water column with heat and light, which combine with the availability of nutrients to initiate a large bloom in phytoplankton. As the bloom takes place, the fixation of nutrients into organic matter changes the nutrient chemistry in the water column.







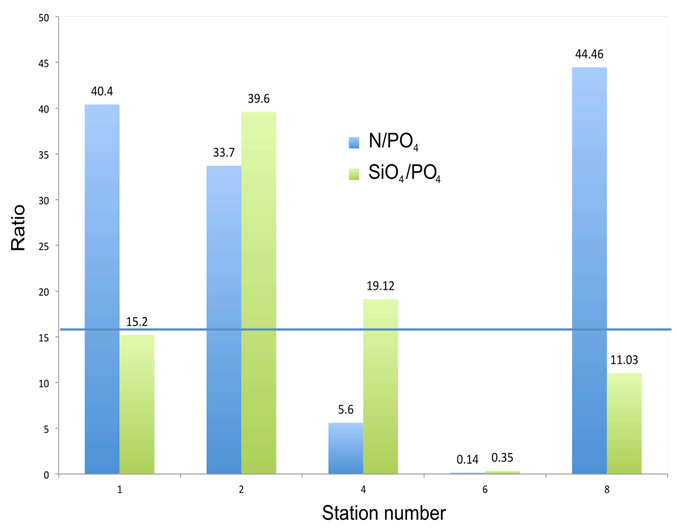


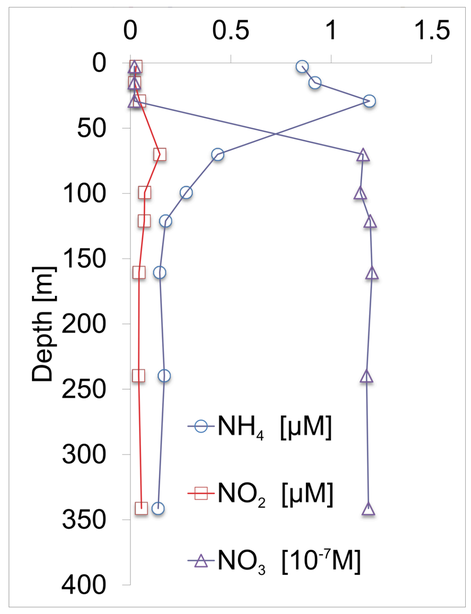
Box 1 Section plots showing the longitudinal progression of inorganic nutrients as well as chlorophyll a concentrations.

- Decrease of nutrients is observed where phytoplankton bloom (with high chlorophyll concentration) occurs.
- The bloom between 62N and 64N could be limited by the lack of nitrate, rather than silicate or phosphate.

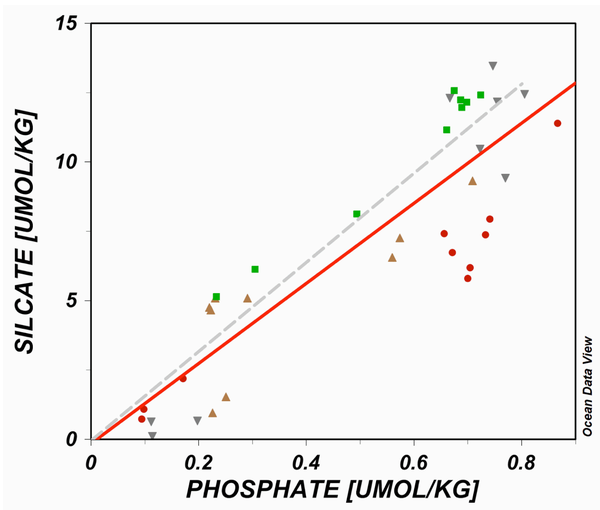
Box 2 A) Comparison of Nitrate and Silicate ratios to Phosphate B) Vertical profile of different nitrogen species at station 6

- Between stations 1 and 6, the NO_3 gradually became depleted as the stations further south had been subjected to the spring bloom for a greater time
- At station 8, the outflow from the Baltic was detected in the nitrate concentration
- Decaying organic matter (detritus) is respired by bacteria which leads to the gradual reduction of nitrogen from NH_4 to NO_3 (nitrification).
- This process can be observed in the watercolumn as detritus slowly sinks to the bottom





Box 3 Fingerprint of phytoplankton metabolism on the water chemistry of the norwegian coastal current.



- Stations show significant correlations between SiO_4 and PO_4
- The observed regression slope was 14.44 (red line)
- Diatoms require 16 mols SiO_4 per mole of PO_4 (grey dashed line)

Conclusion

The transect was designed to cover Northern regions that were undergoing the spring bloom, and regions further south where the bloom had already peaked. The effect of the different seasonal states is reflected in the biogeochemistry. The measurements can be used to estimate the limiting factor for primary production, which was dominated by the gradual depletion of nitrate as the season progressed. The ratio of nutrient uptake can also be used to estimate the composition of the bloom, which is likely to have been dominated by diatoms.

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