Effect of ocean acidification on an Arctic phytoplankton community

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Ocean acidification (OA) is thought to influence cold regions first and hardest due to the high solubility of CO_2 and the resulting low carbonate saturation state. Therefore, a large CO_2 mesocosm perturbation experiment was carried out in the Kongsfjord (Spitsbergen) in June/July 2010. The impact of OA on the phytoplankton community was monitored in nine mesocosms (water volume ~ 50 m^{-3}) with CO_2 concentrations ranging from ca. 180 to 1400 ppm. The influence of CO_2 was monitored before (days $0 - 12$) and after (days $13 - 30$) nutrient addition (N, P and Si). The development and changes in the phytoplankton community were determined by microscopy, pigment analysis (rp-HPLC), flow cytometry and with a multi-fluorescence probe.

The data analysed until now indicate that the phytoplankton community composition was not affected by elevated CO_2 before nutrient addition. After nutrient addition, however, the composition of the phytoplankton community in mesocosms with low and high CO_2 developed differently: high CO_2-mesocosms had higher peridinin concentrations (marker pigment for dinoflagellates) than low CO_2-mesocosms and the opposite pattern was found for fucoxanthin (marker pigment mainly for diatoms). Thus, the preliminary results suggest that future changes in CO_2 may affect succession and distribution of phytoplankton taxonomic groups and species and this may potentially affect the biogeochemical cycling.