



Impacts of ocean acidification on sediment processes in shallow-waters of the Arctic Ocean

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An experiment was conducted in May 2009 in Ny-Alesund (Spitzbergen) on the effects of ocean acidification on sediment biogeochemistry. Sediment cores sampled close to Ny-Alesund harbour were exposed to several pCO₂ (pH) conditions: 380, 540, 750, 1120 and 4000 ppm for a period of 3 weeks. On five occasions during the experimental period, the sediment cores were isolated during 24h for fluxes measurements. At the end of the experimental period, denitrification and bio-irrigation rates were measured in each core over a 24h incubation period using ¹⁵N tracers and bromide, respectively. After these incubations, sediment samples were taken at several depth intervals and analysed for grain size distribution, pigment concentrations and total/organic carbon and total nitrogen content as well as isotopic compositions (¹³C) of total and organic carbon. Results show no effect of increased CO₂ levels on sediment nutrient fluxes and respiration. Significantly higher alkalinity and dissolved inorganic carbon fluxes were observed at the most severe CO₂ treatment (4000 ppm) most likely due to enhanced sediment carbonate dissolution. Denitrification rates ranged between 10.8 and 35.4 $\mu\text{mol N m}^{-2} \text{d}^{-1}$ and did not significantly differ between the different pCO₂ treatments. No bio-irrigation activity has been recorded as no significant decrease of bromide has been detected after the 24h incubation in any of the treatments. Finally, the increase of pCO₂ did not have any significant effects on the composition of the sediment with respect to pigments, to organic and total carbon and nitrogen concentrations and to the carbon isotopic signatures.