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

Frédéric Gazeau (1,2), Pieter van Rijswijk (3), Lara Pozzato (3), Jack Middelburg (3,4)
(1) CNRS-INSU, Laboratoire d’Océanographie de Villefranche, Villefranche-sur-mer, France (f.gazeau@obs-vlfr.fr, +33 4 93 76 38 34), (2) Université Pierre et Marie Curie-Paris 6, Observatoire Océanologique de Villefranche, Villefranche-sur-Mer, France, (3) Netherlands Institute of Ecology (NIOO-KNAW), Centre for Estuarine and Marine Ecology, Yerseke, The Netherlands, (4) Faculty of Geosciences, Utrecht University, Utrecht, The Netherlands

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 µmol N m⁻² 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.