Effect of CO_2 concentration on suspended particle dynamics during a mesocosm bloom experiment (Peece II)

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The influence of seawater CO_2 concentration on the abundance and size of suspended particles (2-40 μm) was investigated during a mesocosm experiment at the large scale facility (LFS) in Bergen. In nine outdoor enclosures the partial pressure of CO_2 (pCO_2) in the seawater was modified by an aeration system. The triplicate mesocosm treatments simulated low ($\sim$190 parts per million by volume (ppmV) CO_2), present day ($\sim$370 ppmV CO_2) and high ($\sim$700 ppmV CO_2) CO_2 conditions. The inorganic nutrients nitrate and phosphate were added initially to the mesocosms to induce phytoplankton blooms. Samples for suspended particles were collected daily over a period of 19 days and analysed with the Coulter Counter and by Flow Cytometry. First results indicate that the CO_2 treatment significantly affected the size distribution of solid particles, and led to larger surface to volume ratios at lower pCO_2. Size is important for diffusion-limited exchange processes at the cell surface as well as for gravitational settling of the solid particles. The observed changes in particle size distribution are therefore discussed with respect to organic matter production and potential sedimentation in the mesocosms during the bloom. An outlook on possible implications of our findings for the future carbon cycling and export in the ocean will be presented.