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Dissolved inorganic carbon dynamics in the Gulf of Biscay (June 2006)

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The biogeochemical properties of an extensive bloom of the coccolithophore, Emiliania huxleyi, at the shelf break in the northern Gulf of Biscay was investigated in June 2006. Total Alkalinity (TA) values in the water column showed strong non-conservative behaviour indicative of the impact of calcification, with the highest TA anomalies (up to 26 μmol kg^{-1}) in the high reflectance coccolith patch. Partial pressure of CO_2 (pCO_2) values ranged from 250 to 338 μatm and the area was found to act as a sink for atmospheric CO_2. Overall, pCO_2@13˚C (pCO_2 normalized at a constant temperature of 13˚C) in the water column was negatively related to TA anomalies in agreement with an overall production of CO_2 related to calcification. Hence, the calcifying phase of the E.huxleyi bloom decreased the sink of atmospheric pCO_2, but did not reverse the direction of the flux. Rates of pelagic respiration up to 5.5 mmol O_2 m^{-3} d^{-1} suggested a close coupling between primary production and respiration and/or between organic carbon content and respiration. Benthic respiration rates were quite low and varied between 2 and 9 mmol O_2 m^{-3} d^{-1}, in agreement with the fact that the study area consists of sandy sediments with low organic matter content. Benthic respiration was well correlated to the chlorophyll a content of the top 1 cm of the sediment cores. Evidence was found for dissolution of $CaCO_3$ due to the acidification of superficial sediments in relation to the production of CO_2 and the oxidation of H_2S in the oxic layers.