



## **Benthic dissolved inorganic carbon dynamics in the Gulf of Biscay (June 2006, May 2007 and May 2008)**

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The biogeochemical properties of an extensive bloom of the coccolithophore, *Emiliana huxleyi*, at the shelf break in the northern Gulf of Biscay was investigated in June 2006, May 2007 and May 2008. We report the results from the benthic measurements during the three cruises. Benthic respiration rates were quite low and varied between 2 and 9 mmol m<sup>-2</sup> d<sup>-1</sup>, 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 (Chl-a) content of the top 1 cm of the sediment, and to the grain size fraction smaller than 63 μm, indicating the influence of turbidity to the deposition of fresh material. Chl-a values in May 2007 and 2008 were higher than in June 2006 in agreement with the fact that the 2007 and 2008 cruises were conducted after the first large peak of phytoplankton biomass associated to diatoms, visible on the Seawifs Chl-a values in the study area, and that the 2006 cruise took place after the second smaller peak associated to coccolithophores. <sup>210</sup>Pb<sub>x,s</sub> profiles (of the 2007 and 2008 stations) indicate that the sediments are well mixed and steadily accumulated below the mixed layer (up to 10 cm depth in the sediments). <sup>234</sup>Th<sub>x,s</sub> activities show a deposition of fresh material in the upper 2 cm of the sediments at almost all stations (2007 and 2008). A negative relation between <sup>234</sup>Th<sub>x,s</sub> and Chl-a remains to be investigated but could relate to rapid resuspension zones, a delay in bloom arrival of detritus to the surface sediments or increased remineralization through aerobic and anaerobic pathways based on high bioturbation rates. Based on the co-variance of water-sediment TA fluxes and O<sub>2</sub> consumption, evidence was found for dissolution of CaCO<sub>3</sub> due to acidification of superficial sediments in relation to the production of CO<sub>2</sub> by respiration, as shown by the positive correlation between the dissolved inorganic carbon (DIC) flux and respiration. There was an increase in nitrate in the overlying water of the sediment cores, ranging from 0.03 to 1.2 mmol m<sup>-2</sup> d<sup>-1</sup> over an average incubation period of 42 hours, however some stations give evidence of denitrification. There is an increase in silicate at all stations of 0.05 to 1.0 mmol m<sup>-2</sup> d<sup>-1</sup>.