

SURFACE DISSOLVED INORGANIC CARBON DYNAMICS IN THE GULF OF BISCAY (JUNE 2006-MAY 2007 AND MAY 2008)

Suykens Kim, Bruno Delille and Alberto v. Borges

Université de Liège, Unité d'Océanographie Chimique, Sart Tilman, Batiment B5,
Allée du 6 Août 17, 4000 Liège
E-mail: kimsuykens@ulq.ac.be

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 surface measurements during the three cruises. Seawater Chlorophyll-a (Chl-a) values in the study area indicate that seasonal cycles of phytoplankton biomass were remarkably similar in 2006 and 2007 with a first peak in mid-April associated to diatoms and a second peak in late May associated to coccolithophorids. During both cruises, Total Alkalinity (TA) values showed strong non-conservative behaviour, indicative of the impact of calcification. TA anomalies were positively related to the degree of stratification, in agreement with the ecophysiology of coccolithophores, whereby these organisms flourish in nutrient depleted and high light availability conditions. The largest TA anomalies were observed in the high reflectance coccolith patch where we also observed an increase in the partial pressure of CO₂ normalized at a constant temperature of 13°C (pCO₂@13°C), in agreement with the transfer of CO₂ from the bicarbonate pool during calcification. TA anomalies were of similar amplitude during both cruises, indicating that calcification affected markedly the dissolved inorganic carbon dynamics. During both cruises, pCO₂ values ranged from 250 to 375 µatm and the area was found to act as a sink for atmospheric CO₂. pCO₂@13°C in the water column was negatively related to TA anomalies in agreement with an overall production of CO₂ related to calcification. Hence, the calcifying phase of the *E. huxleyi* bloom decreased the sink of atmospheric pCO₂, but did not reverse the direction of the flux. pCO₂@13°C values in June 2006 lie below the values in May 2007, due to the cumulated impact of primary production on pCO₂, since the 2006 cruise was carried out later in the year than the 2007 cruise.