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Particulate carbon export during a bloom of Emiliania huxleyi in the Northwest European continental margin (northern Bay of Biscay)

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Coccolithophores, the dominant pelagic calcifiers in the oceans, play a key role in the marine carbon cycle through calcification, primary production and carbon export, the main drivers of the biological CO2 pump. Massive blooms of Emiliania huxleyi are observed each year at the continental margin of the Bay of Biscay. The BG02/11 cruise (RV Belgica), supported by near-real time remote sensing data, was conducted in early May 2002, along a transect on the outer shelf of the Northern Bay of Biscay between the La Chapelle Bank (southern region of the transect) and Goban Spur (northern region of the transect) (47.0°-50.5°N, 5.0°-11.0°W). Biogeochemical variables including primary production, calcification, partial pressure of CO2 (pCO2), chlorophyll-a (Chl-a), particle load, particulate organic and inorganic carbon (POC, PIC), Th-234 were measured in surface waters to assess particle dynamics, and carbon export in relation to the development of a coccolithophore bloom. We observed a marked northward decrease in water irradiance, Chl-a concentration and calcification rates: the bloom exhibited lower values and may have been less well developed in the Goban Spur area. There was also a large northward decrease in particulate 234Th settling fluxes along the transect from La Chapelle Bank to Goban Spur. The export fluxes of POC and PIC from the top 80 m, determined using the ratios of POC and PIC to Th-234 of particles, ranged from 81 to 323 mgC m-2 d-1 and from 30 to 128 mgC m-2 d-1, respectively. The highest fluxes were observed in waters presenting a well-developed coccolithophore bloom, as shown by high reflectance of surface waters. Despite the high calcification rates at the southernmost stations, surface waters were a net sink of atmospheric CO2 during this cruise. These results tend to demonstrate the enhancement of coccolithophore blooms on the efficiency of the surface community to export carbon to deep ocean. However, improvements in the estimation of POC and PIC export during coccolithophore blooms are needed to not only understand the present calcification to primary production (C:P) ratio, but also to help understand future sequestration of organic and inorganic carbon to the deep ocean.