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Benthic remineralization in the northeast European continental margin (northern Bay of Biscay)

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We report a data-set of sediment characteristics and biogeochemical fluxes at the water-sediment interface at the northeast European continental margin (northern Bay of Biscay). Cores were obtained in June 2006, May 2007 and 2008, at 8 stations on the shelf break (120 to 180 m), and at 2 stations on the continental slope (520 m and 680 m). Sediment-water fluxes of dissolved oxygen (O2), total alkalinity (TA), nitrate (NO3-), and dissolved silicate (DSi) were measured at a total of 20 stations. Sediment characteristics include: grain size, chlorophyll-a (Chl-a) and phaeopigment (Phaeo) content, particulate organic (POC) and inorganic (PIC) carbon content, and 234Th and 210Pb activities. Sediments were sandy (fine to coarse) with organic matter (OM) (1.0 - 4.0 %) and Chl-a (0.01 - 0.95 μg g-1) contents comparable to previous publications in the same region, and a relatively high PIC fraction (0.8 - 10.2 %). Sediment-water O2 fluxes (-2.4 to -8.4 mmol O2 m-2 d-1) were low compared to other coastal environments and correlated well with OM and Chl-a content. 234Th activity profiles indicated that Chl-a sediment content (apparently the main driver of total benthic organic carbon degradation) was mainly controlled by physical mixing processes related to local hydrodynamics. The correlation between sediment-water fluxes of O2 and NO3- indicated a close coupling of nitrification/denitrification and total benthic organic carbon degradation. Dissolution of biogenic silica (0.05 to 0.95 mmol m-2 d-1) was uncoupled from organic carbon degradation, characterized by sediment-water O2 fluxes. The link between sediment-water fluxes of TA and O2 indicated metabolic driven dissolution ($\sim 0.33 \pm 0.47$ mmol m-2 d-1) of calcium carbonates (CaCO3) in the sediments which represented $\sim$ 1 % of the pelagic calcification rates due to coccolithophores. These rates were below those reported in sediments of continental slopes and of the deep ocean, probably due to the high over-saturation with respect to CaCO3 of the water column overlying the continental shelf sediments of the northern Bay of Biscay. Rates of total benthic organic carbon degradation and CaCO3 dissolution were low compared to water column rates of primary production, aphotic community respiration and CaCO3 production obtained during the cruises.