



## **Spatial and temporal variability of the partial pressure of CO<sub>2</sub> (pCO<sub>2</sub>) and air-sea CO<sub>2</sub> exchanges in the Southern Bight of the North Sea with a particular focus on the eutrophied Belgian coastal zone**

N. Gypens (1), A.V. Borges (2), L.S. Schiettecatte (2), G. Billen (3), C. Lancelot (1)  
(1) Université Libre de Bruxelles, Belgium, (2) Université de Liège, Belgium, (3) Université Pierre et Marie Curie, France

(ngypens@ulb.ac.be)

The MIRO-CO<sub>2</sub> model, resulting from the coupling between an ecological module (Lancelot et al. 2005, Marine Ecology-Progress Series 289:63-78) and a chemical module describing the carbonate system (Gypens et al. 2004, Biogeosciences 1:147-157), is used to describe the spatial, seasonal and interannual variations of air-sea CO<sub>2</sub> exchanges in the Southern North Sea submitted to eutrophication and increased atmospheric pCO<sub>2</sub>. The present-day identification of CO<sub>2</sub> sink (source) regions is obtained by coupling the MIRO-CO<sub>2</sub> model with the 3D hydrodynamical model COHSNS (Lacroix et al. 2004, Journal of Sea Research, 52, 149-163) implemented in the English Channel and the Southern Bight of the North Sea between 4°W (48°N) and 52.5°N (4.5°E). The long-term (1950-2000) evolution of surface pCO<sub>2</sub> and air-sea CO<sub>2</sub> exchanges are studied by coupling the MIRO-CO<sub>2</sub> model to the RIVER-STRAHLER model (Billen et al. 2005, Hydrobiologia 540:47-67) and implementing it in a 0D multi-box frame. This historical construction of air-sea CO<sub>2</sub> fluxes suggests that the Belgian coastal zone shifted from a source of CO<sub>2</sub> before 1960 (low eutrophication) towards a sink during the seventies to the late eighties due to high N and P loads of anthropogenic origin. The period after 1990 was characterized by a progressive decrease of P loads concomitant with a decrease of the CO<sub>2</sub> sink. In 2000, the Southern Bight of the North Sea was at equilibrium with the atmosphere.