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MECHANISMS CONTROLLING THE AIR-SEA EXCHANGES OF CO2 IN THE EUTROPHICATED COASTAL WATERS OF THE SOUTHERN BIGHT OF THE NORTH SEA: A MODELLING STUDY

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Nowadays, there is still a great uncertainty on the sink versus source role of the coastal zone for atmospheric CO2. As a first step to reduce this uncertainty we constructed a complex biogeochemical model to investigate the impacts of anthropogenic and terrestrial organic carbon and nutrients from the Scheldt estuary on the functioning of the Phaeocystis-dominated ecosystem of the Southern Bight of the North Sea and the related air to sea CO2 exchange. The model results of the coupling of a physico-chemical module describing the seawater carbonate system and the air-sea exchange of CO2 to the existing biogeochemical model MIRO (Lancelot et al., 1997). The upgraded MIRO was implemented in the Southern Bight of the North Sea and simulations were run over the 1993-1999 period. The prediction capability of the upgraded MIRO model is assessed by comparing modelled fCO2 with existing field data in the Southern Bight of the North Sea. MIRO simulations are further used to analyse the seasonal dynamics of CO2 exchange at the air-sea interface and their controlling factors. Particular attention is given to wind speed, seawater temperature and biological processes, in particular those associated to the Phaeocystis bloom. Finally an annual budget based on carbon flows simulations allows to estimate the role of the Southern Bight of the North Sea as a source or sinking for atmospheric CO2.