MODELLING PRESENT-DAY DIATOM PHAEOCYSTIS BLOOMS IN BELGIAN COASTAL WATERS AND THEIR RESPONSE TO NUTRIENT ENRICHMENT

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Massive blooms of Phaeocystis colonies are recorded every spring in the Belgian coastal zone (Southern Bight of the North Sea) submitted to riverine nutrient loads over-enriched in nitrogen compared to phosphorus and dissolved silica. Phaeocystis blooms usually occur between the spring and summer diatom blooms and their relative importance varies between years. The reason for the observed interannual variability is not known yet and no link has been established with changing riverine nutrient loads in spite of a clear decrease in P since the late 80's. Here, we use the complex mechanistic MIRO model describing C, N, P and Si cycling through aggregated chemical and biological components of the pelagic and benthic realms to assess and understand the present day role of nutrient loads variability on the magnitude of the diatom Phaeocystis blooms in the Belgian coastal waters. For this application MIRO is implemented in a multi-box frame delineated on the basis of the hydrological regime and river inputs and is run over the 1989-1999 period using real PAR and riverine nutrient loads forcings. The model predictions are compared with monthly-averaged field observations of nutrients and phytoplankton recorded in the central Belgian coastal zone (51°26.05 N; 02°48.50 E) during the simulated period. Model results analysis shows that Phaeocystis blooms are sustained by new sources of nitrate but regenerated ammonium and phosphate originated from the organic matter degradation associated with the previous diatom bloom. The height of Phaeocystis blooms is therefore indirectly determined by the winter stock of dissolved silica which determines the magnitude of the early-spring diatoms. Overall the predicted annual mean of diatoms and Phaeocystis is determined by the annual loads of P and N respectively. Additional MIRO runs are conducted to explore the ecosystem response to several nutrient scenarios under contrasting climate (rainfall) conditions which impact differently on N and P sources.