EVALUATING THE RIVER DE-EUTROPHICATION GAIN ON THE MAGNITUDE OF *PHAEOCYSTIS* BLOOMS IN THE SOUTHERN NORTH SEA BETWEEN 1985 AND 2005: A MODEL STUDY

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High-biomass blooms of undesirable Phaeocystis colonies occur each spring in the eutrophied eastern English Channel and Southern North Sea area (including the Belgian coastal zone, BCZ) as a result of excess river nutrient loads. Over the last 60 years, nitrogen (N) and phosphorus (P) delivery to the coastal sea has shown up and down variations related to human activity. After 1950, an accelerated increase of nutrient loads was reported due to a combination of increased human population, socio-economic development and intensive agriculture that cumulated in the mid-1980s (eutrophication period). After this period, nutrient reduction measures were slowly implemented (de-eutrophication period), leading in particular to an important decrease in P loads subsequent to the removal of phosphates in washing powders. Today the P delivery has decreased to earlier values of 1960 while the N decrease is less important leading to an imbalanced N:P enrichment of the receiving coastal waters, yet characterized by elevated spring blooms of Phaeocystis colonies.

Biogeochemical models which are based on chemical and biological principles and describe ecosystem carbon and nutrient cycles as a function of environmental forcing are ideal tools to investigate the link between phytoplankton blooms and changing environmental conditions. An updated version of the existing MIRO model (Lancelot et al., 2005) describing diatom/Phaeocystis blooms and related nutrient cycles in Phaeocystis-dominated ecosystems has been implemented in the Eastern English Channel and Southern North Sea over the 1985-2005 period to investigate the link between the magnitude of Phaeocystis colony blooms and the decrease in nutrient loads. The analysis of model simulations focuses on the BCZ for which survey data are available for the 1988-2000 period. The maximum cell abundance reached by Phaeocystis in the BCZ shows no clear trend, being modulated by the up and down fluctuations of available N stocks. On the contrary a 35% decrease of the bloom duration is simulated for the period and is correlated with the decrease in P loads. These results suggest that a significant decrease in the blooms of this undesirable species would not occur without a further significant decrease in N loads. Accordingly, one can expect these significant changes to be delayed by the diffuse nature of the main N source, i.e. NO3 (mainly resulting from agricultural practice) which can be captured in water tables and then progressively restored with a memory effect.

References

Lancelot C., Y. Spitz, N. Gypens, K. Ruddick, S. Becquevort, V. Rousseau, G. Lacroix and G. Billen. 2005. Modelling diatom and *Phaeocystis* blooms and nutrient cycles in the Southern Bight of the North Sea: the MIRO model. Marine Ecology Progress Series 289:63–78.