Geophysical Research Abstracts
Vol. 16, EGU2014-14783, 2014
EGU General Assembly 2014

How significant are Phaeocystis colony blooms in the present-day Southern North Sea compared to a reconstructed pristine situation: a model study

Christiane Lancelot (1), Paul Passy (2), and Nathalie Gypens (1)

(1) Université Libre de Bruxelles, Ecologie des Systèmes Aquatiques, Bruxelles, Belgium , (2) CNRS FIRE FR-3020, Box 123, 4 place Jussieu, 75005, Paris, France

We performed simulations with the existing MIRO&CO 3D ecological model to assess the present-day magnitude and geographical extent of undesirable *Phaeocystis* colony blooms in the Southern Bight of the North Sea (SNS) receiving nutrient inputs by large European rivers. The criterion of 4 10^6 *Phaeocystis* cells L^{-1} of Lancelot et al. (2009) is used to scale the presence of undesirable bloom. These simulations are compared with a reconstructed pristine SNS ecosystem making use of nutrient inputs calculated by the Seneque/Riverstrahler model of the river system when all human activities on the watershed have been erased. Interannual variability is considered by performing model runs for two contrasted meteorological years: wet (2001) and dry (2005). Results show a large excess of nitrogen (N) and phosphorus (P) delivery to the SNS of i.e. respectively 12 and 5 times the pristine situation. In contrast the total silicon (Si) delivery is decreased with respect to natural conditions although not shown for every river. Qualitatively, pristine river inputs are shown a large excess Si for pristine but excess N for both 2001 and 2005, when compared to the agreed N, P and Si requirement of coastal diatoms.

Responding to the river nutrient inputs, either natural or of anthropogenic origin, phytoplankton blooms are simulated in the vicinity of the river mouths, especially in the eastern SNS receiving 78-98% of the direct river inputs and where nutrients cumulate along a SW-NE gradient, allowing the bloom to form a wide ribbon parallel to the coast. A short time-delay is simulated between the western and eastern SNS due to light limitation imposed by the large sediment inputs discharged by the Thames. A spring diatom-*Phaeocystis* succession is simulated for both present-day and pristine. Pristine diatoms dominate the bulk of the phytoplankton community; *Phaeocystis* colonies develop in the whole domain, especially in the Thames and Scheldt river plume though their biomass remains low and never exceed the threshold of 4 10^6 cells L^{-1}. In contrast under present-day conditions, *Phaeocystis* colonies start growing when diatoms reach their maximum in April, co-occur with and supplement them in May and June. Overall wet weather conditions are a little more favorable to *Phaeocystis* than diatoms. The geographical coverage of undesirable *Phaeocystis* blooms varies between dry/wet years but potentially reaches 72% of the modeled SNS domain distributed in three spots: the eastern band (90%), the Thames plume (6%) and a small offshore area (4%) possibly connected to the eastern band.