Geophysical Research Abstracts
Vol. 14, EGU2012-5008, 2012
EGU General Assembly 2012

Historical changes in carbon dioxide (CO_2) and dimethyl sulphide (DMS) emissions in the eutrophied Southern North Sea

N. Gypens (1), A.V. Borges (2), and C. Lancelot (1)

(1) Université Libre de Bruxelles, Ecologie des Systèmes Aquatiques, Bruxelles, Belgium (ngypens@ulb.ac.be), (2) Université de Liège, Unité d'Océanographie Chimique, Institut de Physique (B5), B-4000,

Anthropogenic activities after the Second World War have severely increased river nutrient [nitrogen (N) and phosphorus (P)] loads to European coastal areas. The resulting N: P: Si imbalance (compared to phytoplankton requirements) stimulated in the Southern North Sea the growth of Phaeocystis colonies modifying the functioning of the ecosystem and, therefore, the carbon but also the biogenic sulphur cycles. Phaeocystis is a significant producer of DMSP (dimethylsulphide propionate), the precursor of DMS. When emitted to the atmosphere the DMS has a cooling effect on the climate contrarily to the CO_2 greenhouse gas. Since the late 1990's specific nutrient reduction policies have however considerably reduced P loads while N is maintained. In this application we explore, with a mathematical tool, the effects of changing N and P loads on air–sea CO_2 exchanges and DMS marine emissions. The chosen model is the MIRO-CO_2-DMS, a complex biogeochemical model describing carbon, biogenic sulphur and nutrient cycles in the marine domain. Model simulations are performed for the contemporary period since 1950, using real forcing fields for sea surface temperature, wind speed and atmospheric CO_2 and RIVERSTRAHLER model simulations for river carbon and nutrient loads. Results are discussing the importance of human activities and river inputs of carbon and nutrients on the eutrophication of coastal areas, their ability to absorb atmospheric CO_2 and the importance of DMS emissions associated with phytoplankton blooms, especially Phaeocystis.