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From the Dutch coastal zone to the North Sea: a phytoplankton perspective

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A three-dimensional Eco-Hydrodynamical model (Delft-3D ECO) has been developped to describe the biogeochemical processes occurring along the Dutch coastal zone and in the southern bight of the North Sea. Developped as part of many projects, this model has been used during the last ten years in environmental impact assessments and management issues. In 2007, the model has been validated for the period 1996-2003 as part of an intercalibration study of the North Sea models (i.e. OSPAR workshop). The model predicts the transport of particulate and dissolved substances as well as the biogeochemical processes up to phytoplankton production and competition for light and nutrients. Phenomena like temperature stratification in the summer or salinity stratification close to the river mouthes are reproduced for they contribute to the patterns of nutrients, suspended solids and hence phytoplankton production. Three functional groups of phytoplankton are modelled: diatoms, dinoflagellates and marine flagellates. In addition, the species *Phaeocystis* is also included since it has already been responsible for harmful blooms along the Dutch coast in the past. The model reproduces the areas of productivity, and illustrates the comparative importances of loads and boundaries input. It also allows to detemine what are the limiting factors for phytoplankton production in time and space, and hence contributes to better understand the effects of a nutrient-load reduction in the southern North Sea. The model results are compared with a fifteen-years dataset of field measurements, including nutrients and chlorophyll *a* concentrations as well as phytoplankton abundances.