Geophysical Research Abstracts
Vol. 17, EGU2015-4708, 2015
EGU General Assembly 2015

A new post-processing tool for the source-related element tracing in biogeochemical models: A case study for the North Sea

Fabian Große (1), Markus Kreus (2), and Johannes Pätsch (3)

(1) Scientific Computing, Department of Informatics, University of Hamburg, Bundesstr. 45a, D-20146 Hamburg, Germany (fabian.grosze@informatik.uni-hamburg.de), (2) Institute for Hydrobiology and Fisheries Science, University of Hamburg, Olbersweg 24, D-22767 Hamburg, Germany (markus.kreus@zmaw.de), (3) Institute of Oceanography, University of Hamburg, Bundesstr. 53, D-20146 Hamburg, Germany (johannes.paetsch@zmaw.de)

The mitigation of eutrophication and its concomitants, like harmful algal blooms or deoxygenation of bottom waters, is one of the major aspects of the ecological management of coastal marine ecosystems. In the past, biogeochemical models helped to significantly improve the understanding of the interaction of the physical and biological processes behind eutrophication. Nevertheless, the quantification of the influence of source-related nutrient inputs to eutrophication in a specific region remains an important issue, since it is as crucial for an efficient management as it is difficult to obtain.

About a decade ago, a method applicable to biogeochemical models had been developed allowing for the tracing of elements from different sources, e.g. phosphorus and/or nitrogen from two different rivers, throughout the whole process chain of the applied model. This tracing method – often referred to as 'trans-boundary nutrient transport' (TBNT) – provides additional information about the contributions from different sources to the overall amount ('bulk') of an element in each part of the model domain. This information constitutes the basis for the quantification, evaluation and optimisation of nutrient reduction targets for the tributaries of a marine ecosystem. In the meantime, the TBNT method has been applied to a variety of different biogeochemical models, e.g. to quantify the influence of nutrient loads from different rivers or atmospheric deposition on phytoplankton blooms or to determine the source-related composition of total nitrogen in different parts of an ecosystem. However, for all of these applications the method was directly implemented into the considered model, and thus was model-dependent and required an individual solution to deal with the model specifics like grid structure, programming language etc.

For the application of the TBNT method to the ECOHAM model (ECOlogical model HAMburg), we further developed the approach by creating a post-processing software which uses the standard 'bulk' output of a regular model simulation for the TBNT calculation. This output includes the 3D fields of all state variables containing the traced element and all fluxes transforming these state variables into each other. Besides this the tool only requires standardised information about the model grid and the involved state variables and fluxes. Thereby, the new software avoids direct changes in the model code, and therefore provides a model-independent tool for the application of the TBNT method. The basic functioning and the main features of the new software are presented in a North Sea case study using ECOHAM.