Geophysical Research Abstracts
Vol. 17, EGU2015-6844, 2015
EGU General Assembly 2015


# Parameters estimation in marine ecosystem models: limitations of typical standing stock observations

Ulrike Loeptien and Heiner Dietze
GEOMAR -Helmholtz Centre for Ocean Research Kiel, Kiel, Germany (uloeptien@geomar.de)

Marine biogeochemical models coupled to 3-dimensional numerical models of the climate system have matured to general tools employed to assess impacts of a warming world and to explore geo-engineering options. Typically, the nucleus of these biogeochemical modules is based on a set of partial differential equations which describe the interaction between prognostic variables such as nutrients, phytoplankton, zooplankton, and sinking detritus. The dynamics of those differential equations is governed by a set of parameters such as, e.g., the maximum growth rate of phytoplankton. These parameters are, per se, not known. A generic way to estimate these parameters in 3-dimensional (and computationally expensive) frameworks are trial-and-error exercises where parameters are changed until a ”reasonable” similarity with observed standing stocks of prognostic variables is achieved. Based on recent advances in compute hardware, offline techniques and optimization the development of more objective approaches to estimate parameters are underway. Here we add to the ongoing development by exploring with twin experiments (i.e. synthetic “observations”) the demands on observations that would allow for a more objective estimation of model parameters. We start with parameter retrieval experiments based on “perfect” (synthetic) observations of standing stocks which we, step by step, distort to approach realistic conditions and confirm our findings with real-world observations. We illustrate that even modest noise (10%) inherent to observations can forestall the parameter retrieval already and that, e.g., the parameters occurring in the hyperbolic Michaelis-Menten (MM) formulation (that is commonly used to describe nutrient and light limitation of phytoplankton growth) are particularly difficult to constrain.