Geophysical Research Abstracts, Vol. 8, 03492, 2006
SRef-ID: 1607-7962/gra/EGU06-A-03492

Modeling the potential response of ocean biogeochemistry to climate change.

Gehlen M., S. Alvain, L. Bopp, C. Moulin

LSCE/IPSL, Laboratoire CEA-CNRS-UVSQ, France (marion.gehlen@cea.fr / Fax : + 1 69 08 30 73)

The growing awareness of the potential for large scale perturbations of marine ecosystems to occur in response to climate change drives the rapid development of marine biogeochemical models. While these models are of increasing complexity in terms of the description of the upper ocean ecosystem, the fate of export production is mostly represented in a simplistic way. Next to the development of appropriate process parameterisations, the identification of suitable data sets is essential for an integrated description of the biological pump and its validation. Here we present numerical experiments carried out with the OPA/PISCES model. The PISCES model distinguishes two phytoplankton (diatoms and nanophytoplankton) and two zooplankton size classes. The capability of the model to reproduce the distribution patterns of siliceous versus non-siliceous phytoplankton in the present day ocean is tested by comparing model output to a new satellite product. The latter allows the quantification of the contribution of diatoms to ocean colour. Next we address the sensitivity of export fluxes to the parameterisation of particle dynamics. Model output is compared to observed particle fluxes and the composition of surface sediments. After a validation of the model for the present day ocean, we investigate the response of marine productivity and carbon uptake to climate change by using PISCES as a component of the coupled IPSL climate model (IPSL-CM4). During the global warming experiment atmospheric pCO2 was increased at a rate of 1% per year from pre-industrial levels to reach 4XCO2. Similar to previous results, our model predictions suggest a reduction in primary production by 15%. In addition, they highlight a decoupling of primary and export production with the latter being reduced by 30%. The pronounced effect on export production reflects changes in ecosystem structure and the corresponding modifications of deep fluxes.