Analysis of marine productivity and chlorophyll a with inverse techniques

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Distribution of carbon, nutrients,and oxygen in the ocean is strongly affected by the production of biomass near the ocean surface. Seasonal chlorophyll a concentrations simulated by carbon cycle models differ from the observed values. These differences are of complex nature, related to an inadequate parameterization of the coupling of the physical and biogeochemical system, and to uncertainties in the observations. In contrast to the bias between observed and model chlorophyll a, the models generally reproduce the large scale structure of the nutrient concentration. In this study we explore and discuss potential causes of the model-data differences by sensitivity studies with a marine ecosytem model (HAMOCC4) using optimized flow fields from data assimilation experiments. These sensitivity experiments are designed to be a first step towards an inverse ecosystem model to quantify large scale interannual-to-decadal fluctuations of the marine carbon cycle.

In addition we discuss future plans to provide a synthesis of geochemical tracer distribution, such as dissolved carbon, nutrients, and alkalinity, to define the current biogeochemical state of the ocean and predict its future evolution in response to climate change.