Ocean Biogeochemical Model Development Team (OBMDT)

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The purpose of this document is to announce the formation of the GFDL-Princeton Ocean Biogeochemical Model Development Team (OBMDT), initially a subdivision of the Ocean Model Development Team (OMDT). First, the OBMDT mission is described in terms of its overall scientific goals. Then the functional configuration and implementation phases of OBMDT are described. Finally, the specific implementation strategy and anticipated timeline for OBMDT are provided.

Mission Statement

OBMDT's primary purpose is to develop state-of-the-art global biogeochemical models coupled to ocean circulation models in coordination with OMDT, and to deliver these models to the ocean biogeochemistry science community. **The central goal is a tool for study of the impact of climate change and variability on ocean ecosystems and carbon cycling.** In addition, it is anticipated that a variety of models will be developed for general investigations of the biogeochemical cycling of elements within the ocean. Currently, there are four main scientific research foci among the members related to the central goal of climate impacts:

Calibration of ocean physics through comparison of model and observed tracers
Understanding controls on elemental cycling within the ocean
Estimation of gas exchange with atmosphere
Biological feedbacks on ocean physics

In order to address these foci, OBMDT will first undergo a model configuration phase. In this phase, OBMDT will subsume specific tracer-related ocean and coupled model development tasks from OMDT. OBMDT will coordinate closely with OMDT to assure both compatibility of branches of code under development and frequent incorporation of full tracer compatibility in the main branch of the publicly-available code.

In the model implementation phase, OBMDT will meet on an approximately monthly basis to discuss:

Review status and assure that components necessary to achieve the central goal are being developed in a timely fashion without overlap and conflict between individual efforts.

Biogeochemical schemes to be used in the model (e.g. short wave absorption by chlorophyll, interior remineralization and dissolution, dissolved organic matter cycling, nitrogen cycling, ice effects).

Physical parameterizations most consistent with observed tracer fields such as temperature, salinity, ^{14}C and CFCs.

Specific formulation of physical and biogeochemical dynamics, forcing, boundary conditions, resolution and timescales for computationally intensive runs (e.g. run to steady state in coarse resolution, high resolution hind-casts, high resolution climate change prediction).

Implementation Responsibilities

The primary implementation goal is a state of the art, global ocean biogeochemical model suitable for climate impact studies as described in the attached tables. The implementation strategy involves first recuperating previous functionality available to the Princeton-GFDL community in MOM3. The biogeochemical workhorse in MOM3 was a simple Ocean Carbon Model Inter-comparison project – Phase II (OCMIP2), in which biological production was diagnosed from restoring phosphate to surface data and partitioning of particulate and dissolved matter was assumed to be constant. This type of model is useful for diagnosing new production, particle export. Estimating size of carbon pumps. Fertilization studies. Implementation will then switch to augmenting the model with new capabilities previously unavailable to the Princeton-GFDL community. These include such improvements as explicit phytoplankton growth and iron cycling, active ice coupling to air-sea gas exchange, short-wave penetration and iron deposition, resolution of the Arctic Ocean, biological feedback on physics through short-wave penetration. The OBMDT strategy for implementing this Individual tasks related to this include:

Generic ocean tracer capability
"OCMIP2 – Biotic" standard biogeochemistry
Generic ocean-atmosphere tracer coupling capability (with CMDT)
OCMIP2 - CFCs, carbon isotopes, tritium-helium
Full restoring model
Phytoplankton model
Coupling within full earth system model

Proposed Initial Team Membership

Team leaders: Dunne, Gnanadesikan

Potential Members: Slater, Sweeney, Simeon, Russell, Sarmiento, Toggweiler, Griffies, Harrison, Cooke, Arbic, Hallberg

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