Model output from nutrients-phytoplankton-zooplankton-detritus (NPZD) model, Gulf of Maine/Georges Bank from SMAST/UMassDartmouth in 1999 (Phytoplankton Blooms project)

Website: https://www.bco-dmo.org/dataset/473155
Data Type: model results
Version: 18 Dec 2013
Version Date: 2013-12-18

Project
» Interannual Variability of Coastal Phytoplankton Blooms in the Gulf of Maine and Their Relationships to Local and Remote Forcings (Phytoplankton Blooms)

Contributors	Affiliation	Role
Chen, Changsheng	University of Massachusetts Dartmouth SMAST (UMASSD-SMAST)	Principal Investigator
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Dataset Description

The nutrients-phytoplankton-zooplankton-detritus (NPZD) model was described by Ji et al. (2008) (Citation: **Ji, R.**, C. Davis, C. Chen, and R. Beardsley, 2008. Influence of local and external processes on the annual nitrogen cycle and primary productivity on Georges Bank: A 3-D biological-physical modeling study. *Journal of Marine Systems*, 73:31-47. DOI: 10.1016/j.jmarsys.2007.08.002). Many key aspects of lower trophic level food web dynamics are described in this model using methods that are widely accepted in the marine ecosystem modeling community, including (1) Michaelis–Menten kinetics in nutrient uptake, (2) Holling type II functional response of zooplankton grazing on phytoplankton, (3) temperature/light-dependent growth for phytoplankton and temperature-dependent grazing and respiration for zooplankton, (4) self-shading of phytoplankton growth, and (5) sinking of phytoplankton and detritus.

Note: The "Get Data" button, above, goes to an external site where the data files are hosted:
http://www.smast.umassd.edu:8080/thredds/catalog/models/fvcom/NECOFS/Archive/NPZD/catalog.html

Methods & Sampling

See the following for more information:
The 3-D Model Framework (a description of the 3-D model on the project website)
The nc header file (.txt file, including description of variables)

Also see the following publication for methodology:

Ji, R., Davis, C., Changsheng, C., and Beardsley, R. 2008. Influence of local and external processes on the annual nitrogen cycle and primary productivity on Georges Bank: A 3-D biological–physical modeling study. Journal of Marine Systems, 73: 31-47. DOI: 10.1016/j.jmarsys.2007.08.002

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Parameters

Parameter	Description	Units
Other	Refer to data files and nc header file (.txt) for information about parameters.	n/a

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Deployments

lab_SMAST-model

Website	https://www.bco-dmo.org/deployment/58054
Platform	SMAST/UMassD
Start Date	1999-01-01
Description	model results

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Project Information

Interannual Variability of Coastal Phytoplankton Blooms in the Gulf of Maine and Their Relationships to Local and Remote Forcings (Phytoplankton Blooms)

Website: http://www.whoi.edu/sbl/liteSite.do?litesiteid=22693&articleId=34467

Coverage: Northwest Atlantic, Gulf of Maine

Description from NSF Award Abstract:
The aim of this project is to explore the interaction of remote climate based forcing with local forcing to impact phytoplankton blooms in coastal and shelf regions with a coupled biological-physical model. Phytoplankton bloom dynamics are a classic example of biological-physical interactions in the ocean (Gran and Braarud, 1935; Sverdrup, 1953). Yet it is still a challenge to identify the dominant processes controlling the interannual variability of phytoplankton blooms in coastal and shelf seas where multiple-scale biological and physical processes interact. The unstructured-grid, finite-volume, coastal ocean model (FVCOM, built within the GLOBEC Georges Bank Program) bridges the multi-scale physical processes of the Gulf of Maine and includes both local and remote forcing. Twelve years of prognostic simulation and assimilation experiment products, with careful comparison/validation with field measurements, provide a unique background and tools with which to explore the interannual variability of ecosystem dynamics in the Gulf of Maine. **This project will examine relationships between the dynamics of spring and fall phytoplankton blooms in the Gulf and local and remote forcing. A specific focus is the variability Scotian Shelf Water and Slope Water inflows.** A series of numerical experiments will be conducted to test long-standing and recently-proposed hypotheses, including the impact of the North Atlantic Oscillation as it influences Warm Slope Water versus Labrador Slope Water dynamics, which in turn affect nutrient fluxes to the Gulf of Maine and vertical fluxes between surface and deep waters. The influence of surface water freshening (related to Scotian Shelf Water inflow, in turn believed to be affected by global warming) on the vertical density structure of the water column, winter convection, and consequently, the timing/magnitude of blooms, will also be addressed. The process-oriented coupled biological and physical model experiments will focus on the date-rich period 1998-2001 when pronounced large-scale forcing conditions occurred.

Providing new insights into the influence of large-scale forcing on the dynamics and productivity of coastal ocean ecosystems will be a significant advance in our understanding of phytoplankton blooms dynamics, which has been traditionally focused on local forcing and seasonal changes. The project will provide a web-based open archive of the 1995-2006 coupled model hourly physical and biological output, and produce a tested coupled biological-physical model system available for other ongoing (e.g. ECOHAB) and future ecosystem studies in the Gulf of Maine and other coastal oceans. The web-based ocean forecast model system being developed by UMASSD-WHOI will benefit directly from this project by helping to optimize the design of ocean observatories and help shape the future of interdependent model-observing systems.

Note: This project is an NSF Collaborative Research project.

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-0727033
NSF Division of Ocean Sciences (NSF OCE)	OCE-0726851

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