

SYNTHESIS AND MODELING PROJECT OF THE U. S. JOINT GLOBAL OCEAN FLUX STUDY:

The Role of Oceanic Processes in the Global Carbon Cycle

Interagency Announcement of Opportunity

Deadline: *June 6, 1997*



U. S. JGOFS



NATIONAL SCIENCE FOUNDATION
Directorate for Geosciences, Division of Ocean Sciences
Chemical Oceanography and Biological Oceanography Programs



NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
Biological Oceanography and Ocean Biogeochemistry Program
Earth Observing System Interdisciplinary Research Program

SYNTHESIS AND MODELING PROJECT OF THE U. S. JOINT GLOBAL OCEAN FLUX STUDY The Role of Oceanic Processes in the Global Carbon Cycle

INTRODUCTION

The Division of Ocean Sciences of the National Science Foundation (NSF) and the Earth Observing System Interdisciplinary Science and Biological Oceanography Programs of the National Aeronautical and Space Administration (NASA) solicit research proposals to participate in the Synthesis and Modeling Project (SMP) of the U.S. Joint Global Ocean Flux Study (U.S.JGOFS). As the last major activity of U.S.JGOFS, the SMP is open to U.S. scientists without past involvement in U.S.JGOFS as well as past and present U.S.JGOFS investigators.

The expected funding for the initial activities in the SMP is approximately \$2.5 million per year for up to three years. The agencies expect that up to 20 awards will be made commencing in fiscal year 1998. The deadline for proposals is **June 6, 1997**. Preliminary award decisions will be made not later than October 15, 1997, which is the earliest possible start date.

To complete the topical coverage of the SMP and contingent upon the availability of funds, the agencies anticipate a second call for proposals in early 1998, with start dates as early as October 15, 1998.

Details of the scientific and implementation framework for the SMP are given in the *U.S.JGOFS Science Plan for Synthesis and Modeling*, which is available from the U.S.JGOFS Planning and Implementation Office, Woods Hole Oceanographic Institution, Woods Hole, MA 02543. The *Plan* is also available by Internet via the U.S.JGOFS Office homepage at <http://www1.who.edu/jgofs.html>

DESCRIPTION

The international Joint Global Ocean Flux Study was organized in the mid-1980's with the twin goals of (1) determining and understanding the processes controlling time-varying fluxes of carbon and associated biogenic elements in the ocean and (2) predicting the response of marine biogeochemical

processes to climate change. Organized as part of the U.S. Global Change Research Program, the U.S.JGOFS program has contributed to these goals through three types of studies:

- Regional processes studies designed to estimate geochemical inventories, fluxes, and process kinetics of direct relevance to oceanic carbon cycling. The North Atlantic Bloom Experiment (NABE), The Equatorial Pacific Process Study (EqPac), and the Arabian Sea Process Study (ASPS) have been concluded, although scholarly production is continuing. The field program of the Southern Ocean Process Study (AESOPS) is scheduled to end in 1998.
- Oceanic time-series stations for the study of annual to decadal phenomena relevant to the marine carbon cycle and to sea-air exchange of carbon dioxide. The Hawaii Ocean Time Series (HOT) and the Bermuda-Atlantic Time Series (BATS) have been operating continuously since the start of U.S.JGOFS. Work at BATS has also included bio-optical research sponsored by NASA.
- A global marine carbon dioxide survey, co-sponsored by DOE and NOAA, to achieve improved estimates of sea-air CO₂ exchange and of anthropogenic CO₂ inventories.

The central goal of the SMP is to synthesize results from these efforts into a set of models that can be used for prediction. Model development should be driven by data, and synthesis efforts should be undertaken with an eye to their utility for model development.

Satellite data are also relevant to SMP objectives. NASA, NASDA (National Space Development Agency, Japan) and other space agencies have recently launched, or will launch, a suite of satellite sensors to measure ocean color, ocean winds, sea surface temperature (SST) and ocean topography. Satellite ocean color scanners now collecting global data include POLDER (Polarization and Directionality of the Earth's

Reflectances) and OCTS (Ocean Color and Temperature Scanner) with firm plans for launch of SeaWiFS in 1997.

To help structure an approach to this central goal, the U.S.JGOFS Steering Committee has organized the SMP conceptually around three elements: (1) global and regional balances of carbon and related biologically active substances; (2) local carbon balances and their mechanistic controls; and (3) extrapolation and prediction. These elements are not stand-alone enterprises, but rather heuristics or points of departure that should support and point to one another.

1. Global and Regional Carbon Balances

The U.S.JGOFS database affords an unprecedented opportunity to develop regional and global mass balances for carbon and other substances with cycles linked with the carbon cycle. The global marine carbon dioxide survey offers a particularly attractive dataset for study. But how does one utilize the survey data, which have extensive spatial coverage but are not synoptic? How can global models be related to the observational databases generated by process studies and the oceanic time-series stations? How do anthropogenic inputs affect -- and how can they be *expected* to affect -- global carbon inventories and mass fluxes? These are only a few of the global-scale questions and challenges that need to be addressed in the SMP.

2. Local Carbon Balances and Mechanisms

Modeling the major mechanisms responsible for observed local inventories and fluxes of carbon and other substances is essential to the development of larger-scale models. There is therefore a need for mass balances for carbon and other associated substances at the process study and time-series sites as well as quantification of the principal controlling mechanisms. How are these mechanisms expressed spatially and temporally? How can these mechanisms and their interactions be parameterized to facilitate regional and global synthesis and modeling? Experience to date suggests that understanding the interdependencies of such mechanisms often, if not generally, requires resolution at the levels of production and export in the euphotic zone, transport and remineralization in the deep ocean, and diagenetic transformation in seafloor sediments.

3. Extrapolation and Prediction

To achieve the original objectives of JGOFS, observations made at small spatial and temporal scales must be scaled upwards to regional/global spatial scales and to seasonal/annual time scales -- and beyond. This element of the SMP will draw upon other components to understand and predict aspects of the cycling of carbon and other biologically-active substances in the past, present, and future ocean.

Major SMP Research Trajectories

Realizing the research goals of the SMP and, more generally, the fundamental objectives of U.S.JGOFS will require the coordinated efforts of a wide variety of investigators, both modelers and observationalists. The organization of principal investigators and proposals by teams and the continual interaction of teams with one another will be vital to the success of the SMP.

Nevertheless, individual investigators or teams should focus their efforts at the proposal level on one or more of the defined objectives of the SMP as described above. In general, proposals appropriate for the SMP should be directed toward one or more of the following five components:

- Global and regional balances of carbon and related biologically-active substances (Element #1).
- Euphotic zone production and export of carbon and related biologically-active substances (Element #2).
- Transport and remineralization of carbon and related biologically-active substances (Element #2).
- Sedimentary diagenesis of carbon and related biologically-active substances (Element #2).
- Extrapolation and prediction (Element #3).

Satellite and Other Remote Sensing Data

Through the interagency partnership of NASA and NSF, the SMP offers the opportunity to approach a number of these tasks using satellite and other remote-sensing technology. The list of possibilities includes, but is not limited to: (1) sea-air exchange of carbon dioxide in relation to global wind fields, scatterometry, and mixed layer dynamics; (2) seasonal and spatial patterns of global primary and new production, relationships to aeolian transport and nutrient inputs; (3) seasonal and spatial color signatures of pigments and dissolved organic matter and their relationship to the total carbon pool; and (4) modeling of satellite color data, and direct analysis of U.S.JGOFS process study and time-series station dynamics. In general, such proposals should include both data analysis and model development as integral components of the research plan.

PROPOSAL FORMAT

Proposals submitted in response to this Announcement of Opportunity should be prepared and submitted in accordance with the guidelines provided in the NSF brochure, *Grant Proposal Guide* (GPG) NSF 95-27. Single copies of this brochure are available at no cost from the Forms and Publications Unit, phone (703) 306-1130, or via e-mail from pubs@nsf.gov, or the NSF homepage (<http://www.nsf.gov/>). Proposals will be subjected to initial screening for the requirements in the GPG and will be returned without review or advance notification if deficiencies are found. Proposals will **NOT** be forwarded to other Programs if found to be inappropriate for this competition.

Prior to proposal preparation, prospective investigators are strongly advised to acquaint themselves with the contents of the official science and implementation plan for the SMP: *U.S.JGOFS Science Plan for Synthesis and Modeling*. Copies are available by mail from U.S.JGOFS Office (see address above) or electronically via the Internet from the U.S.JGOFS Office homepage at <http://www1.who.edu/jgofs.html>

The proposal should explicitly identify one or more of the five major SMP components above as the primary research focus. There should be a full scientific justification for the research and not simply a reiteration of justifications laid out in the SMP science and implementation plan.

Because of page limitations (*GPG*, page 5, Project Description), individual proposals with overly complex structure and large numbers of investigators are discouraged. Proposals should be written to allow adequate review of the details of goals and objectives, conceptual framework, methodological approaches, and plans for integration with other likely projects.

As discussed in the science and implementation plan, both formal and informal collaboration between modelers and observationalists is encouraged, but not required, in the development of individual proposals. Although formation of partnerships and team building are not required at the proposal submission stage, it is expected that all investigators participating in the SMP will establish such linkages in due course.

PROPOSAL SUBMISSION

All proposals must be submitted to NSF at the address below, including those involving federal scientists. Federal scientists will be eligible for funding by NASA but not by NSF. Foreign institutions are not eligible for funding through this announcement. Proposals submitted in response to this Announcement of Opportunity must be received by **June 6, 1997**, and be identified by entering "U.S.JGOFS SMP NSF 97-79" in the Program Announcement block of the cover page. Proposals received after the deadline will be returned to the sender without review.

An original and 20 copies of the proposal should be sent to:

Announcement Number **NSF 97-79)**
Chemical Oceanography Program
Division of Ocean Sciences
National Science Foundation
4201 Wilson Blvd., Room 725
Arlington, VA 22230

Investigators intending to submit proposals are requested to submit a brief statement of scope to:

Synthesis and Modeling Project
U.S.JGOFS Office
Woods Hole Oceanographic Institution
Woods Hole, MA 02543
Email: hlivingston@who.edu
FAX: 508-457-2161

For further information about proposal submission, inquiries should be directed to one of the following program officers:

Dr. Donald L. Rice, Chemical Oceanography Program, Division of Ocean Sciences, NSF: 703-306-1589; Email: drice@nsf.gov

Dr. Philip R. Taylor, Biological Oceanography Program, Division of Ocean Sciences, NSF: 703-306-1587; Email: prtaylor@nsf.gov

Dr. James A. Yoder, EOS Interdisciplinary Science and Biological Oceanography Programs, NASA: 202-358-0310; Email: jim.yoder@hq.nasa.gov

PROPOSAL REVIEW

Proposals will be evaluated on the basis of the four general criteria outlined in the NSF *Grant Proposal Guide* (p. 13) and in accordance with procedures for external merit review established by the NSF and NASA. Proposal responsiveness to the goals of the U.S.JGOFS SMP and the degree of complementarity with other projects will also be considered. NSF and NASA program officers will be assisted in proposal evaluation by a special U.S.JGOFS Panel convened specifically for that purpose.

Each proposal must include a plan for documentation, archiving, and dissemination of data and project results. All funded participants must adhere to data management policies applying to recipients of federal funding in the geosciences. Additionally, participants must adhere to data submission schedules and data management requirements established by the U.S.JGOFS Steering Committee, acting on behalf of the U.S.JGOFS Program. For details on the latter, please consult the U.S.JGOFS Office homepage on the World-Wide Web.

Those selected to receive funding from NASA will receive grants in accordance with the NASA regulations covering grants and cooperative agreements (14CFR, Part 1260).

ADDITIONAL INFORMATION

The National Science Foundation (NSF) and the National Aeronautical and Space Administration (NASA) provide awards for research in the sciences and engineering. The grantee is wholly responsible for the conduct of such research and preparation of the results for publication. The NSF and NASA, therefore, do not assume responsibility for such findings or their interpretation. The NSF and NASA welcome proposals on behalf of all qualified scientists and engineers, and strongly encourage women, minorities, and persons with disabilities to compete fully in any of the research and research-related programs described in this document.

In accordance with Federal statutes and regulations, and NSF and NASA policies, no person on grounds of race, color, age, sex, national origin, or disability shall be excluded from participation in, denied the benefits of, or be subjected to discrimination under any program or activity receiving financial assistance from the NSF and NOAA. **Facilitation Awards for Scientists and Engineers with Disabilities** provides funding for special assistance or equipment to enable persons with disabilities (investigators and other staff, including student research assistants) to work on an NSF project. Contact the program coordinator in the Directorate for Education and Human Resources. The telephone number is (703) 306-1636. The Foundation has TDD (Telephonic Device for the Deaf) capability, which enables individuals with hearing impairment to communicate with the NSF Information Center about NSF programs, employment, or general information. To access NSF TDD, dial (703) 306-0090; for FIRS, 1-800-877-8339.

PRIVACY ACT AND PUBLIC BURDEN

The information requested on proposal forms is solicited under the authority of the National Science Foundation Act of 1950, as amended. It will be used in connection with the selection of qualified proposals and may be disclosed to qualified reviewers and staff assistants as part of the review process; to applicant institutions/grantees to provide or obtain data regarding the application review process, award decisions, or the administration of awards; to government contractors, experts, volunteers and researchers as necessary to complete assigned work; and to other government agencies in order to coordinate programs. See Systems of Records, NSF-50, "Principal Investigator/Proposal File and Associated Records," 60 Federal Register 4449 (January 23, 1995), and NSF-51, "Reviewer/Proposal File and Associated Records," 59 Federal Register 8031 (February 17, 1994). Submission of the information is voluntary. Failure to provide full and complete information, however, may reduce the possibility of your receiving an award.

The public reporting burden for this collection of information is estimated to average 120 hours per response, including the time for reviewing instructions. Send comments regarding this burden estimate or any other aspect of this collection of information including suggestions for reducing this burden, to:

Herman G. Fleming
Reports Clearance Officer
Contracts, Policy and Oversight
National Science Foundation
Arlington, VA 22230

This program is described in the Catalog of Federal Domestic Assistance category 47.050

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The Foundation welcomes proposals from all qualified scientists and engineers, and strongly encourages women, minorities, and persons with disabilities to compete fully in any of the research and related programs described here.

In accordance with federal statutes, regulations, and NSF policies, no person on grounds of race, color, age, sex, national origin, or disability shall be excluded from participation in, denied the benefits of, or be subject to discrimination under any program or activity receiving financial assistance from the National Science Foundation.

Facilitation Awards for Scientists and Engineers with Disabilities (FASED) provide funding for special assistance or equipment to enable persons with disabilities (investigators and other staff, including student research assistants) to work on an NSF project. See the program announcement or contact the program coordinator at (703) 306-1636.

Privacy Act and Public Burden. Information requested on NSF application materials is solicited under the authority of the National Science Foundation Act of 1950, as amended. It will be used in connection with the selection of qualified proposals and may be used and disclosed to qualified reviewers and staff assistants as part of the review process and to other government agencies. See Systems of Records, NSF-50, "Principal Investigator/Proposal File and Associated Records," and NSF-51, "Reviewer/Proposals File and Associated Records," 56 Federal Register 54907 (Oct. 23, 1991). Submission of the information is voluntary. Failure to provide full and complete information, however, may reduce the possibility of your receiving an award. The public reporting burden for this collection of information is estimated to average 120 hours per response, including the time for reviewing instructions. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to: Herman G. Fleming, Reports Clearance Officer, Division of CPO, NSF, Arlington, VA 22230; and to the Office of Management and Budget, Paperwork Reduction Project (3145-0058), Wash., D.C. 20503.

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