REQUEST FOR ASSISTANCE

Ocean Research Interactive Observatory Networks:

Conceptual Science Experiments for the Establishment of the Ocean Observatories Initiative Infrastructure

CONTACTS

Programmatic: Dr. Peter Milne (pmilne@joiscience.org)
Administrative: Ms. Emily Griffin (egriffin@joiscience.org)

TARGET DATES:
Letters of Intent (optional): March 14th 2005
Full Proposals: May 23rd 2005

SUMMARY OF APPLICATION REQUIREMENTS

Applications in the form of detailed conceptual proposals for ocean science research experiments using the Ocean Observatories Initiative (OOI) are being sought by the Ocean Research Interactive Observatory Networks (ORION) Project Office, in coordination with the National Science Foundation’s (NSF) Division of Ocean Sciences (OCE). Successful detailed conceptual proposals will be used to further refine science and engineering designs for the OOI facility to be constructed using Major Research Equipment and Facilities Construction (MREFC) funds and to specify the initial experimental and instrumentation needs of the user community for the OOI.

Detailed conceptual proposals must present innovative, high-quality scientific objectives and experimental plans that require the use of OOI infrastructure as defined below. Successful detailed conceptual proposals will have well-described scientific objectives that relate to, or advance beyond the scientific themes identified in the recent multi-disciplinary community driven ORION Workshop Report (San Juan, PR) and the OOI science plan (both will be posted at http://www.orionprogram.org). Detailed conceptual proposals should focus on scientific advances that cannot be achieved solely with traditional expeditionary approaches possible with NSF's current field facilities. Infrastructure requirements identified as necessary for executing these projects will strongly guide implementation plans for the OOI. Proposed experiments should take advantage of the real-time, continuous data stream, high bandwidth, and ample power provided by platforms of the OOI and should be identified as having high relevance to implementation plans for the OOI as outlined in recent community documents, including the OOI science plan which will soon be available on the ORION Project Office website (http://www.orionprogram.org).

The current request for assistance in the form of detailed conceptual proposals to be submitted to the ORION Project Office does not imply that proposal budgets will be supported in whole or in part by the Project Office or by the NSF. Budget details of proposed activities will be essential in defining expected resource needs and allocation efforts for future planning. The format of this request in other respects mirrors the guidelines for proposals submitted to the Division of Ocean Sciences, National Science Foundation.
INTRODUCTION

The ocean is increasingly viewed as highly dynamic with processes, phenomena and systems that interact and feedback in complex ways that are not well understood. These interactions and feedbacks occur at scales, intensities and frequencies that can be difficult to capture with traditional discrete expeditionary sampling. Expeditionary sampling is also an ineffective way of recording aperiodic events that are a critical component of ocean dynamics. These events are likely to play an important role in many long-term environmental changes as well as in regime shifts observed in ocean systems. To characterize the range of temporal processes occurring in the ocean, new types of infrastructure are needed that are capable of providing in situ, long-term, high-resolution observations of critical environmental parameters. Such infrastructure will make available novel platforms for oceanographic discovery and facilitate cutting-edge oceanographic investigations. Emerging technological capabilities are enabling the investigation of complex atmospheric, ocean, and earth system processes and the inter-linkages among them along with a new intellectual approach: adaptive "observatory" science. This approach will allow the study of multiple inter-related properties, variables, and processes over a range of time and space scales.

With funding from the MREFC account, NSF’s Division of Ocean Sciences plans to initiate construction of an integrated observatory network, the Ocean Observatories Initiative (OOI), that will provide the oceanographic research and education communities with a new mode of access to the ocean. The OOI has three elements: 1) deep-sea buoys, which could be deployed in harsh environments such as the Southern Ocean, to investigate global-scale processes; 2) a regional cabled network in the northeast Pacific Ocean on the Juan de Fuca plate consisting of interconnected sites on the seafloor spanning several geological and oceanographic features and processes; and 3) new construction or enhancements to existing facilities leading to an expanded network of coastal observatories. The scientific problems driving the need for OOI infrastructure are broad in scope and encompass nearly every area of ocean science. Once established, the observatories constructed as part of this initiative will provide earth, ocean, and atmospheric scientists with unique opportunities to study multiple, interrelated processes over timescales ranging from seconds to decades; to conduct comparative studies of regional processes and spatial characteristics; and to map whole-earth and basin scale structures.

The infrastructure for all components of the OOI include both dedicated fiber-optic cables to shore and moorings capable of two-way communications with a shore station. For coastal observing systems it is envisioned that both technologies could be utilized. Seafloor junction boxes connected to this primary backbone will support individual instruments or instrument clusters at varying distances from cables as well as the moorings. These junction boxes include undersea connectors that provide not only the power, time distribution, and two-way communication needed to support seafloor instrumentation, but also the capability to exchange instrumentation in situ when necessary for conducting new experiments or for repairing existing instruments. In order to expand the spatial "footprint" around junction box investigators should consider either acoustic modem or extension cable links up to 100 km as appropriate. Conceptual designs for OOI infrastructure have been described in numerous community reports. More detailed engineering specifications of the science user requirements are described in soon to be released documents related to the coastal and global components of the OOI facilities and in an existing feasibility report for the regional cabled system.

The ORION Project Office, in cooperation with NSF’s Division of Ocean Sciences, is requesting detailed conceptual proposals for experiments from interested investigators and/or teams of investigators. The goal of this proposal request is to define the nature and cost of the primary infrastructure needed to support highest priority science as determined by the ocean research community. Detailed conceptual proposals should have clearly stated scientific objectives and an experimental plan that relates to, or advances beyond the innovative scientific themes in the ORION
workshop report and the OOI science plan (http://www.orionprogram.org ). Proposed experiments can range from single PI to large team efforts. Successful detailed conceptual proposals will be used in the development of an Implementation Plan for the construction phase of the OOI. Selection and inclusion of highly ranked detailed conceptual proposals in the initial OOI Implementation Plan will help ensure that the infrastructure needed to enable experiments proposed will be constructed as part of the OOI. As a follow on, proponents of the most highly ranked detailed conceptual proposals will be encouraged to submit full proposals to the National Science Foundation for funding of aspects of the science experiment not provided for by OOI funds.

Additional information on the OOI and ORION Program and this call for proposals can be found on the ORION website (https://www.orionprogram.org/dcp ) and may be amended as new information becomes available.

PROGRAM DESCRIPTION

Technological and Research Program Goals

The goal of this request is to define the nature, cost, and infrastructure needs of high priority ocean observing experiments as has been outlined in numerous community reports. Detailed conceptual proposals must describe the architecture of the enabling infrastructure required and any supporting instrumentation that will be needed. Proposed experiments should take advantage of the real-time, continuous data stream, high bandwidth, and ample power provided by platforms of the OOI. The development of detailed conceptual proposals will require Proponents to consider the experimental plan needed to accomplish the science being proposed and should clearly justify the need for ocean observatory infrastructure to facilitate this science. The most successful detailed conceptual proposals will formulate truly innovative, integrative science programs with goals that are currently unable to be achieved using more traditional expeditionary oceanographic facilities, including currently active monitoring and observatory activities and capabilities. In addition to experimental information, detailed conceptual proposals are required to discuss the future potential for advancements in education, outreach, and training should the proposed infrastructure be emplaced.

Highly ranked detailed conceptual proposals will form the basis of ongoing implementation planning for the five-year construction of the OOI and will provide the information needed to start the iterative process of developing specific OOI system design and operational requirements. Detailed conceptual proposals will also provide NSF with information needed for long-term resource planning. As such, budget details are requested for both the scientific and infrastructure aspects of the proposed experiment. Detailed conceptual proposals are intended to help define the scope, capability and mix of the required infrastructure and as such, they should describe the mix of observing assets required to support the proposed high priority science. Proposal teams should identify and describe additional capabilities required to support the proposed high priority science where necessary. Proponents are asked to provide budget estimates that are as accurate as possible.

Detailed conceptual proposals for experiments using the regional cabled observatory must be located within the broad region of sites defined by the Regional Cabled Observatory Networks (of Networks) (RECONN) community workshop (http://www.geo-prose.com/cabled_wksp ). In all cases these sites were of multi-disciplinary interest. There are no restrictions on the locations for coastal and global arrays.

The description of the experimental plan must include a detailed science justification as well as the following: scientific rationale, hypotheses, approach, justification for infrastructure proposed, justification for the data to be collected, and a justification for the need for real-time or near real-time data. The need for mobile platforms and sensors should be clearly discussed and put in context of the fixed infrastructure proposed. Detailed conceptual proposals should include costs for essential sensors as well as mobile platforms that must be dedicated to the proposed experimental site.
For the experimental plan proposed, proponents are asked to provide details related to the categories below, as specifically as possible. Additional detailed questions related to each of these categories can be found on the ORION Program Office website. In the future, Proponents of highly ranked detailed conceptual proposals will be asked to work with ORION systems engineers to enhance the engineering information in each of these categories.

- Power requirements
- Communications requirements
- Resource requirements
- Connectivity requirements
- Time distribution requirements
- Description of cyberinfrastructure requirements
- Special deployment requirements
- Instruments and other platforms (AUV’s, ROV’s, ships, etc.) needed to support the experiment including an estimate of each instrument’s operational readiness
- Expected sensor maintenance cycle (including biofouling)

For each site Proponents should indicate the specific equipment that is proposed for deployment and over what time frame. The detailed conceptual proposal must incorporate as much detail as possible with respect to the instrumentation requested. This information should include known specifications (size, weight in air/water, power requirements, data transmission requirements, mechanical/optical/acoustic considerations, etc), any associated characteristics or needs (moving parts, pumps, winches, electrical connectors, video, acoustic links, etc.), and any potential conflicts with other users (power, power surges, electrical noise, acoustic noise, data transmission issues, physical conflicts).

Letters of Intent (optional)

It is requested that a non-binding letter of intent be submitted electronically to the ORION Project Office (egriffin@joiscience.org) by March 14th 2005 to assist in organization of the review process. The letter of intent should include: names and affiliations of the Principal Investigator and co-Principal Investigator(s); telephone and facsimile numbers as well as email addresses of the Principal Investigator, a list of participating institutions and organizations, and a brief description (not more than 500 words) of the proposed experiment. These letters should also contain an alphabetical list of the expected proposal participants and also suggest at least five non-conflicted reviewers. Letters of intent will not be evaluated or used in the decision-making process. The submission of a letter of intent enables the ORION Project Office, with guidance from NSF, to begin identifying potential reviewers well before the submission deadline.

Preparation and Submission of Detailed Conceptual Proposals

Detailed conceptual proposals must not exceed 25 pages in length including text but excluding tables, figures, and references and cover materials. Detailed conceptual proposals must also include the following items that do not count against the page limit:

- an official detailed conceptual proposal cover sheet (found at http://www.orionprogram.org), complete with an abstract of 400 words or less, a statement of the scientific objectives, and a list of the proposed sites,
- budget forms and budget justification for the proposed study (see below),
- a two-page curriculum vitae or biographical sketch for the lead proponents,
- a list of at least five potential unconflicted reviewers external to the ORION advisory structure (see www.orionprogram.org for current committee membership).

A suggested outline for the proposal document is given below, although PIs may adjust the format as desired. The page limits for each section are provided for guidance only, although the overall page
limit (25 pages) will be adhered to. Copies of submitted proposals will be shared with NSF (OCE) Program Officers.

**Suggested Proposal Outline:**

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<td>Cover Sheet</td>
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<td>Abstract and Summary</td>
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<td>Program Rationale and Key Scientific Hypotheses</td>
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<tr>
<td>Scientific Objectives</td>
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<td>Experimental Design and Observing Requirements</td>
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<td>(if the field effort requires the use of facilities in addition to those supported by the NSF OOI, appropriate information on these should be included. A delineation of the research objectives to be met by the deployment of each facility should be given. Specification of the duration and siting of the observing effort should also be given along with indication of flexibility and alternatives consistent with the scientific objectives)</td>
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<td>Program Management Considerations</td>
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<td>Data Management Considerations</td>
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All proposal submissions must be received electronically by the ORION Project Office (http://www.orionprogram.org) by May 23rd, 2005. Proponents should submit the required materials online as a single PDF document using a 12-point font, 1.5 line spacing, and 2.5-cm margins. The ORION Project Office will not accept items that arrive late, do not meet all of the specified requirements, or do not print properly using Acrobat Reader 5.0 (available at http://www.adobe.com). All project summaries will be posted on the ORION Project Office website to enable the collaboration and integration between projects during the review process and so that the broader research community is aware of the detailed conceptual proposal being submitted to define the infrastructure of the OOI.

Each detailed conceptual proposal must contain a budget outlining the costs for all infrastructure proposed using NSF Form 1030 that is standard for all NSF proposals. This form is available though FastLane (http://www.fastlane.nsf.gov) or on the ORION Project Office Website (http://www.orionprogram.org). For those detailed conceptual proposals requesting to use cabled observatories, only costs for infrastructure beyond the backbone fiber optic cable and junction box should be included. For moored buoy observatories, only infrastructure costs beyond the buoy, mooring, EOM cable and seafloor junction box or acoustic modems should be included. For buoys with acoustic modem data transfer systems, estimated costs should include everything downstream of the attached mid-water or seafloor acoustic modem. In most cases, infrastructure will be emplaced through a “science operator” or through groups contracted from the ORION Project Office. Therefore, salary requests related to infrastructure deployment should not be included. A budget justification of up to three pages is authorized to provide the necessary documentation of proposed costs.

**Detailed Conceptual Proposal Review**

A well-prepared detailed conceptual proposal should:
- clearly state the scientific objectives and explain how those objectives will be realized using the infrastructure proposed;
- clearly state the time duration for initial deployment and expected acceptance or performance criteria to determine the furtherance of deployment beyond an initial time period;
- justify the need for ocean observatory infrastructure to accomplish the scientific objectives and present a well-defined strategy for addressing these objectives;
- clearly state the technical requirements for the proposed system using the guidance provided above;
- describe any available data characterizing proposed location(s) and any plans for acquiring additional data;
- describe any special logistical requirements and/or non-standard measurement technologies that will be required;
- discuss the relationship(s) to other programs if any.

In addition to the standard NSF review criteria, reviewers will be asked to comment on:

1. Importance and uniqueness of the proposed research
2. The adequacy of the experimental and research plan for hypothesis definition and testing
3. The readiness of the of the experimental design and proposed technology
4. Structure of the proposed field program
   a) major gaps or weaknesses, if applicable
   b) essential components of the overall effort
5. Qualifications and competence of all participants

Reviewers will also be asked to advise Proponents on how to improve or revise their detailed conceptual proposal. For highly ranked detailed conceptual proposals with similar goals and for co-located experiments that are suitable for placement on a common platform, the panel may seek to recommend that proponents combine proposed efforts. The overall goal of the review process is to develop an initial implementation plan that most effectively accommodates the broadest range of high priority science. Normal NSF rules on conflict of interest will be adhered to.

REFERENCES


