Proposal Status | MAIN

Organization: Oregon State University

Proposal Detail:

Proposal Information

Proposal Number:	0628700
Proposal Title:	Collaborative Research: Net Carbon Transport and Reaction in the bottom Boundary Layer of an Upwelling Margin
Received by NSF:	03/15/06
Principal Investigator:	Burke Hales
Co-PI(s):	R. Kipp Shearman
	Zanna Chase
	Miguel Goni
	Robert Collier
Performing Organization:	Oregon State University

This Proposal has been Electronically Signed by the Authorized Organizational Representative (AOR).

NSF Program Information

NSF Division:	Division of Ocean Sciences
NSF Program:	BE: Carbon & Water in ES
Program Officer:	Donald L. Rice
PO Telephone:	(703) 292-8582
PO Email:	drice@nsf.gov

Proposal Status

Status As of Today Dated: **01/20/09**

Award **0628700** was made on **08/29/06** for **$ 1,893,778.00** with an effective date of **01/01/07**.

Award Duration: **36** (months)

Our records indicate that the following Annual Project Report(s) are due or overdue for the Award(s) listed below. Please submit the report(s) as soon as possible using the Project Reports System within FastLane.The report(s) will be considered overdue if not submitted by the Report Overdue Date mentioned for each report. Having an Overdue project report will affect/delay NSF actions on any other award related to the PI/Co-PI:

Award **0752576**: Annual Report **due** for period ending 03/31/2009 for **Burke Hales**

Reviews

All of the reviews of your proposal that have been released to you by your NSF program officer can be viewed below. Please note that the Sponsored Project Office (or equivalent) at your organization is NOT given the capability to view your reviews.

Document:	**Release Date:**
Panel Summary #1	Jul 26 2006 2:20PM
Review #1	Jul 26 2006 2:20PM
Review #2	Jul 26 2006 2:20PM
Review #3	Jul 26 2006 2:20PM
Review #4	Jul 26 2006 2:20PM

Context Statement

National Science Foundation
Directorate for Geosciences (GEO)
Carbon and Water in the Earth System (CWES)
Spring 2006

Context Statement

Proposals submitted to the Carbon and Water in the Earth System Competition were evaluated by panel review using the two NSF review criteria of intellectual merit and broader impacts as described in the NSF Grant Proposal Guide (NSF 04-23). Additional criteria are applied as specified in the program announcement NSF 06-514.

This competition was managed jointly by a team of Program Officers from the divisions comprising the GEO Directorate: ATM, EAR, and OCE. Team members interacted in selecting a panel of 46 experts with specific expertise on some aspect of each proposal and sent a request for an external review to at least four of these individuals. Their mail reviews provide independent evaluations of a proposal's strengths and weaknesses from the point of view of those close to the subject. It is the detailed content of these reviews - not the summary rating - that is critical to funding decisions.

On June 19-21, the advisory panel met at NSF in Arlington, VA, and reviewed 378 proposals representing 157 projects submitted for the 15 March, 2006 deadline. Panel discussions differ from mail reviews in that they consider the merits of each proposal relative to others in the round, including interpreting and evaluating mail reviewer comments. Panel summaries are brief synopses written by the panelists of the salient points emerging from the panel's discussion of your proposal. Verbatim copies of all the reviews and panel summaries used in the decision-making process are available to you and your co-investigator(s), if any, on the FastLane "Proposal Status" screen.

In addition to their mail review scores, the panelists scored each proposal after the discussion, and also assigned each of the projects to one of three categories. The number and percentage of projects placed in each category were:

Highly Competitive 33 21%
Competitive 61 39%
Not Competitive 63 40%

The total requested funding was ~$310M for an available budget of $32M.

After the panel meeting, the management team discussed these recommendations. In reaching our award decisions, we consider advice from the mail reviews and Panel discussions, along with factors such as program balance, the need to fund new PIs, funding of early-career people, budget levels, geographical distribution, and various other NSF policies. We reiterate that assessment is not done strictly on the numerical scores from the mail and panel review. A declination does not indicate that the National Science Foundation, panelists, or program officers are negative about either the principal investigator or a proposal. In fact, the Foundation uses information on the many fine proposals that cannot be supported to determine need for additional program support.

In reading the reviews, please keep in mind that the reviews are addressed to the NSF, and not necessarily to you, the investigator. Reviewers may make comments and criticisms without documentation or without suggestions for improvement. Some reviews may contain irrelevant, non-substantive, erroneous or ad hominem statements. The advisory panel and the Program Officers disregard such statements in arriving at a recommendation for the proposal.

Panelists had the option of not formally discussing a proposal if they feel that the mail reviews provide comprehensive advice to the Program and guidance to the investigators. In these cases, there will be a generic panel summary indicating concurrence with the mail reviews but providing no additional advice.

Annual reports are required for all NSF awards. Overdue projects reports may freeze NSF funding actions, including projects on which you are a co-principal investigator, so we encourage you to submit these reports at least 90 days before the end of the current year budget period. Final reports are also required. Final reports should be comprehensive and complete. We strongly encourage you to use the NSF-supplied report format to organize your report.

If you have questions regarding the review of your proposal, please contact the assigned program officer as shown in FastLane.

Back to Status Search Results

Proposal Status | MAIN

Organization: Oregon State University

Panel Summary #1

Proposal Number: 0628700

Panel Summary:
Panel Summary

Carbon and Water in the Earth System (CWES)
Panel Summary Template

Proposal Number: 0628700
PI: Hales
Institution:

Results of Prior Support (if applicable):

Intellectual Merit
Strengths

The panel felt the proposal is well-written with clear hypotheses that are testable. The work is well planned and has a lot of potential for understanding the Fe budget (upwelling of offshore waters) that drive high primary production, bottom-export of carbon from the shelf, and potential out-gassing of methane along the coast. The tracer experiments have great potential, with caveats noted below.
The results of this work can potentially be applied to other similar coastal regions
The addition of the ADCP is good.
The ROMS model looks fine for the project.

Weaknesses

Some issues raised by the panel included:
How does the molecular probe work contribute to answering the questions? Molecular probes may be relevant, but don?t seem essential.
Caveats with the tracer experiments - What other factors might cause changes in dye concentrations? Are the two dyes equally inert in seawater? This is important for the calculations to be made using ratios of the dye concentrations.
Expecting to make a complete mass balance of carbon (or anything else) based on the dyed water is a challenge. The three-dimensional aspect of water movement makes this difficult.
Would particle traps moored off the shelf enable collection of material exiting the upwelling area? This could help the researchers test some of their hypotheses concerning carbon export.
There should be some sort of fixed, long-term current measurement to tie this work together and to understand the impact of changing winds on bottom currents and other processes.

Broader Impacts
The new technology and techniques are an important contribution. Eight graduate and other undergraduate students will be involved in the work, which is a high educational impact. Inclusion of a science reporter in a cruise will educate the local populace and maybe others.

Synthesis Statement
This project is an innovative (but expensive) experiment to monitor export production from an upwelling shelf environment into the deep ocean. If the caveats about tracers are answered, it has the potential to yield extremely exciting results. The evasion of CH4 to the atmosphere, the export of DOM to the deep ocean, and the supply of Fe to surface waters all are critical components of biogeochemical cycles.

This proposal is deemed highly competitive for funding.

Panel Recommendation: Highly Competitive

Back to Proposal Status Detail

Proposal Status | MAIN

Organization: Oregon State University

Review #1

Proposal Number:	0628700
Performing Organization:	Oregon State University
NSF Program:	BE: Carbon & Water in ES
Principal Investigator:	Hales, Burke
Proposal Title:	Collaborative Research: Net Carbon Transport and Reaction in the bottom Boundary Layer of an Upwelling Margin
Rating:	Excellent

REVIEW:

What is the intellectual merit of the proposed activity?

This ambitious project to understand and quantify the production and off-shore transport of organic carbon in the benthic boundary layer has many interesting components. At a request of $3 M over three years, it is probably too large to fit into a core NSF program, but it certainly is looking at a large carbon export component of upwelling margins û 10 tons of carbon per meter of coastline per season. Hales said to a newspaper columnist that if that is extrapolated to the entire Oregon coastline (is that valid?) it would be about 5 megatons of carbon per year. Put in another way, æ100 millions tanks of gas for a mid-sized car.' That is an attention-grabber, but if the system is in steady state, it is not as if this is a way to sequester additional CO2 from the atmosphere since the CO2 in this system is thought to come from deeper, upwelled waters. The question is what happens if the BBL export stops for some reason (climate variability). Apparently Oregon has experienced fish kills in the past when the bottom water became anoxic. If the winds diminish long-term, the productivity is also likely to diminish, so a new steady state might be reached, but future impacts and scenarios were not really addressed. The real effort went into creating an innovative program to explain what is happening now. Hales and a few others have already published work on this problem, but mostly they were able to propose some good hypotheses to explain their results. They now seek to test those hypotheses. Collectively they have the instrumentation, or have proposed to modify/develop instrumentation that will make it possible to answer some of those questions. Clearly the high productivity is due to upwelling, but the source of Fe needs to be answered, and the benthic chambers and core incubations seem to address that well. Those methods will also help to ascertain the source of CH4. I am particularly intrigued by the double and triple purposeful tracer experiments to study off-shelf transport and onshore upwelling and possible degassing of CH4. Trying to trace water masses and movements is nearly impossible with normal hydrographic techniques, but the proposed method should provide good data. I would only caution that trying to do a POC mass balance for the whole dye patch could be very challenging, but nothing ventured, nothing gained. At least you should be able to clearly determine if the patch moves offshore and detaches from the bottom, allowing POC to settle out.

The organic carbon characterization is interesting, and the biomarkers are important to distinguish between land and marine sources, and POC versus DOC, but I am less convinced that some of the more

detailed organic chemistry and DNA/RNA analyses are necessary to answer the basic questions posed here given that CH4 measurements will be made in the water column, sediment and benthic chambers by others in the program. This is not a comment about the PIs involved in that work û they, like all others in the program, are very well qualified.

I was concerned that so little was being said about measuring winds in this wind-driven upwelling program until I got to Archer's modeling. I can only assume the program will be monitoring wind constantly during the field work. I would like to have seen some sort of wind record to better sense the duration of wind forcing and relaxation since the plan is to insert dye at certain parts of an event to follow the water. How regular are the events? In the same vein, it seems that SST would be valuable information for monitoring upwelling, though cloud cover would require additional filtering of SST data.

For shipboard measurements of currents, the plans to use ADCP are important. Likewise the ADCP on the SuperSlurper is good. My concern, however, is that this gives only a point in time for the current measurements at any one point. While this is helpful, in order to correlate the upwelling and relaxation events, it would be far better to have even one current meter moored in the area to know about long-term effects and model validation. Moorings may be difficult to maintain given the fishing activity on the shelf, but at least that should be stated as a reason for not doing it. An alternative is an uplooking ADCP in a housing protected from trawlers (beveled platform that is standard gear).

As I read all the measurements to be made I began to wonder how it would be possible during a two-week cruise that has to follow patches as well. A narrow shelf and shallow water certainly help û along with lots of hands.

What are the broader impacts of the proposed activity?

This proposal is innovative and will increase our knowledge of off-shelf transport of organic carbon. In doing so, it will train 8 new graduate students. I must admit, however, that if we produce 8 new students for every $3M project, the success rate of proposals will decline even further. I realize that not all of these students are PhD students and they are not all fully funded for the duration of the program, but it is more than I have seen on any proposal for some time. The conundrum, of course, is that universities are to be training new students, but the jobs and academic funding are not increasing as fast as the increase in new students. We need to think and plan and talk about what sort of jobs these new students will have. That is one of the 'broader aspects' of education.
Undergraduate students will also be involved in this work and the PI has contacted the media to participate on one of the cruises. This can be very helpful in 'spreading the word.' They also have other ways they are trying to reach out.

The knowledge gained from this project will help in understanding process on some upwelling shelves in other areas, but one cannot assume that all such shelves are the same since geography and wind patterns vary considerably.

Summary Statement

The bottom line is that I think they have a very good program that has a high probability of successfully answering the questions they pose. The questions are important, though I'd like to have seen a little more about the impact in that we have little control over the driving forces of upwelling. The PIs are well qualified and have shown innovation in their proposal. They may have to examine their priorities some for the measurements to be made.

Back to Proposal Status Detail

Download Adobe Acrobat Reader for viewing PDF files

National Science Foundation
4201 Wilson Boulevard, Arlington, Virginia 22230, USA
Tel: 703-292-5111, FIRS: 800-877-8339 | TDD: 703-292-5090

Proposal Status | MAIN

Organization: Oregon State University

Review #2

Proposal Number:	0628700
Performing Organization:	Oregon State University
NSF Program:	BE: Carbon & Water in ES
Principal Investigator:	Hales, Burke
Proposal Title:	Collaborative Research: Net Carbon Transport and Reaction in the bottom Boundary Layer of an Upwelling Margin
Rating:	Very Good

REVIEW:

What is the intellectual merit of the proposed activity?

This is a very ambitious project proposing to measure and model the biogeochemical and physical properties and their transports in the bottom boundary layer of the coastal upwelling margin. Previous studies by the lead PIs have presented a number of apparent paradoxes in the distribution of carbon, methane and iron in the near coastal region, and the proposal is aimed at resolving these issues.

The proposal is very well written and the research questions and suggested hypotheses have been well described. It is a very large group of PIs but they all come to the table with relevant expertise and their individual contributions to each part of the proposal are made clear. Many of the PIs have collaborated previously, and all seem to be productive in publication and dissemination of their science.

The proposed fieldwork contains much novel and new technology that should help to elucidate the biogeochemical cycles in the coastal regions. While I don't feel qualified to comment or assess all the described measurement techniques (pCO2, TCO2, POC,DOC, Ch4, Fe, V, S, T, benthic fluxes, tracer release - there are many!), the PIs have put together a comprehensive list of the likely accuracies and capabilities of their instrument systems and this is to be applauded. Some of this effort involves sensible modification of existing platforms, such as adding an altitude sensor to the SuperSucker so that the bottom boundary layer is directly and well-resolved by the ADCP and other biogeochemical sensors. The new technology developed as part of the proposed research will certainly have application in other coastal regions. The proposed survey pattern appears to consist of multiple cross-shelf surveys, so I naturally think of the influence of the strong along-shore flows in this environment, and the effect they may have on tracers moving laterally out of the region. But this should not present a problem in the on-offshore flows in the BBL. Rapid changes in the flow regime are also possible so that surveys just before the tracer release experiment may be complicated by development of velocity shear or circulation changes. Nonetheless, the PIs are highly experienced in these large-scale field campaigns and the 14 day survey periods allows for some lee-way in the timing of tracer releases.

What are the broader impacts of the proposed activity?

The new technology developed as part of the proposed research will have direct relevance and applicability to other new and ongoing field efforts. Many graduate students and undergraduate students will participate in all aspects of the proposed effort, from fieldwork to analysis stages. The inclusion of a teacher or educator in the fieldwork is also a good approach for making sure the excitement of this multi-disciplinary type of initiative gets exposed to students and the public at large.

Summary Statement

Back to Proposal Status Detail

Proposal Status | MAIN

Organization: Oregon State University

Review #3

Proposal Number:	0628700
Performing Organization:	Oregon State University
NSF Program:	BE: Carbon & Water in ES
Principal Investigator:	Hales, Burke
Proposal Title:	Collaborative Research: Net Carbon Transport and Reaction in the bottom Boundary Layer of an Upwelling Margin
Rating:	Multiple Rating: (Excellent/Very Good)

REVIEW:

What is the intellectual merit of the proposed activity?

In this project, the group of PIs will conduct tracer release experiments to monitor carbon and nutrient flux into/out of the benthic boundary layer (BBL) of a productive coastal upwelling environment. There are three clearly stated and important goals: 1) to monitor carbon export off-shelf, 2) to determine why Fe is not limiting PP and can support abundant diatom population, 3) to determine if sediment-derived CH4 evades to the atmosphere. All of these goals are important and appear feasible. The proposal focuses on two cruises, representing early spring and late summer seasons, and therefore different intensities of the upwelling environment. While a cruise in each of the four seasons probably would be preferable, the expense and logistics of this project make the two seasons as chosen seem like a reasonable plan. The proposal also appears to be strong in the overall planning and execution of the tracer additions and supplemental measurements.

Concerns: It is not clear how the benthic flux chamber experiments will add directly to the work, since most of the goals can be achieved through the experimental monitoring of the water masses and the tracer patch. The sediment reactivity studies seem extraneous. Also, I am significantly concerned about the use of Fluorescein and Rhodamine tracers and how changes in their relative ratios will be interpreted. The PIs state that relative loss of Fluorescein to Rhodamine will help determine extent of photoexposure of the water mass. However, nowhere is the relative particle reactivity or biodegradation index of these two tracers discussed. Rhodamine, in particular, is a N-containing compound and might be both 1) more long-term soluble and 2) more biodegradable than Fluorescein. However, if these concerns are adequately monitored or overcome, then the data from these cruises should be enormously interesting.

What are the broader impacts of the proposed activity?

The project will train 8 graduate students, will involve reporters from the local newspaper, and will participate in the Ocean Sciences and Math Collaborative program. Although this does satisfy the Broader Impacts criteria, it seems slightly thin for a proposal that involves 9 Co-PIs.

Summary Statement

Evaluation = Excellent/Very Good
This project is an enormous (and expensive) tracer release experiment to monitor export production from an upwelling shelf environment into the deep ocean. If the analytical issues involved with monitoring & understanding the distributions of the three tracers can be overcome, it has the potential to yield extremely exciting results. The evasion of CH4 to the atmosphere, the export of DOM to the deep ocean, and the supply of Fe to surface waters all are critical components of biogeochemical cycles. The project should be supported if possible.

Back to Proposal Status Detail

Proposal Status | MAIN

Organization: Oregon State University

Review #4

Proposal Number:	0628700
Performing Organization:	Oregon State University
NSF Program:	BE: Carbon & Water in ES
Principal Investigator:	Hales, Burke
Proposal Title:	Collaborative Research: Net Carbon Transport and Reaction in the bottom Boundary Layer of an Upwelling Margin
Rating:	Multiple Rating: (Excellent/Very Good)

REVIEW:

What is the intellectual merit of the proposed activity?

This proposal requests support for a process-oriented study of the Oregon coast upwelling system. In some ways, this is a mini-JGOFS-like proposal that focuses on an important and relatively unstudied portion of the marine environment. The hypotheses are specific [(1) offshore transport of POC during non-upwelling times; 2) documenting the source of iron driving high primary production rates; and 3) determining if methane associated with upwelling regime sediments makes it to the atmosphere)] and carbon related. The field plan is well conceived (distribution studies, rate measurements, and tracer injection studies) and should enable the researchers to address their hypotheses directly. Much of the research focuses on the use of the SuperSucker or new modifications of this system. I liked the use of the various tracers (Fluoresein, Rhodam. And SF6) to track the differences in chemical behavior among organic matter, dissolved iron, and methane. There is a lot of new technology built into this proposal (e.g., iron isotopes for examining dissolved iron sources, DNA/RNA characterization of methanotrophy and dentrification, near-bottom SuperSucker avoidance technology, as well as incorporating dissolved iron and methane into the arsenal of analyses for the SuperSucker).

I was surprised that primary production rates and Chl distributions were not measured as part of the field studies. These would be useful parameters to have when the modeling effort pulls together the various field measurements into a unified story. The researchers will have an indication of primary production from their PCO2 and TCO2 measurements as well as to some extent their oxygen distributions. Why not put a couple particle traps out on the slope to capture some of the organic matter exported from the shelf (during specific times of upwelling relaxation)?

What are the broader impacts of the proposed activity?

The approach and results of this study could be applied to other upwelling areas. The technology developed as part of this research could be used in a diverse set of oceanographic studies from the coastal zone to hydrothermal vents to open-ocean systems.

Summary Statement

This is a well conceived proposal regarding a complex, yet important, part of the marine realm, which from a carbon perspective has been relatively under-studied. The investigators are all high qualified for their areas of contribution.

Back to Proposal Status Detail