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PI/PD Name: Guillermo P Podesta

Gender: ☒ Male ☐ Female

Ethnicity: (Choose one response) ☒ Hispanic or Latino ☐ Not Hispanic or Latino

Race: (Select one or more)
- ☐ American Indian or Alaska Native
- ☐ Asian
- ☐ Black or African American
- ☐ Native Hawaiian or Other Pacific Islander
- ☒ White

Disability Status: (Select one or more)
- ☐ Hearing Impairment
- ☐ Visual Impairment
- ☐ Mobility/Orthopedic Impairment
- ☐ Other
- ☐ None

Citizenship: (Choose one) ☐ U.S. Citizen ☒ Permanent Resident ☐ Other non-U.S. Citizen

Check here if you do not wish to provide any or all of the above information (excluding PI/PD name): ☒

REQUIRED: Check here if you are currently serving (or have previously served) as a PI, co-PI or PD on any federally funded project ☒

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PI/PD Name: Rajagopalan Balaji

Gender: ☒ Male ☐ Female

Ethnicity: (Choose one response) ☐ Hispanic or Latino ☒ Not Hispanic or Latino

Race: (Select one or more)
- ☐ American Indian or Alaska Native
- ☒ Asian
- ☐ Black or African American
- ☐ Native Hawaiian or Other Pacific Islander
- ☐ White

Disability Status: (Select one or more)
- ☐ Hearing Impairment
- ☐ Visual Impairment
- ☐ Mobility/Orthopedic Impairment
- ☐ Other
- ☒ None

Citizenship: (Choose one) ☐ U.S. Citizen ☒ Permanent Resident ☐ Other non-U.S. Citizen

Check here if you do not wish to provide any or all of the above information (excluding PI/PD name): ☒

REQUIRED: Check here if you are currently serving (or have previously served) as a PI, co-PI or PD on any federally funded project ☒

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PI/PD Name: William E Easterling

Gender: ☒ Male ☐ Female

Ethnicity: (Choose one response) ☐ Hispanic or Latino ☒ Not Hispanic or Latino

Race: (Select one or more)
- ☐ American Indian or Alaska Native
- ☐ Asian
- ☐ Black or African American
- ☐ Native Hawaiian or Other Pacific Islander
- ☒ White

Disability Status: (Select one or more)
- ☐ Hearing Impairment
- ☐ Visual Impairment
- ☐ Mobility/Orthopedic Impairment
- ☐ Other
- ☐ None

Citizenship: (Choose one) ☒ U.S. Citizen ☐ Permanent Resident ☐ Other non-U.S. Citizen

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PI/PD Name: Richard W Katz

Gender: ☒ Male ☐ Female

Ethnicity: (Choose one response) ☐ Hispanic or Latino ☒ Not Hispanic or Latino

Race: (Select one or more)
- ☐ American Indian or Alaska Native
- ☐ Asian
- ☐ Black or African American
- ☐ Native Hawaiian or Other Pacific Islander
- ☒ White

Disability Status: (Select one or more)
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- ☐ Visual Impairment
- ☐ Mobility/Orthopedic Impairment
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- ☒ None

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PI/PD Name: Elke U Weber

Gender: ☐ Male ☒ Female

Ethnicity: (Choose one response) ☐ Hispanic or Latino ☒ Not Hispanic or Latino

Race: (Select one or more)
- ☐ American Indian or Alaska Native
- ☐ Asian
- ☐ Black or African American
- ☐ Native Hawaiian or Other Pacific Islander
- ☒ White

Disability Status: (Select one or more)
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- ☐ Visual Impairment
- ☐ Mobility/Orthopedic Impairment
- ☐ Other
- ☐ None

Citizenship: (Choose one) ☐ U.S. Citizen ☒ Permanent Resident ☐ Other non-U.S. Citizen

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List of Suggested Reviewers or Reviewers Not To Include (optional)

SUGGESTED REVIEWERS:

Dr. Norman Rosenberg
Dr. Michael Glantz
Dr. Daniel S. Wilks
Dr. Holger Meinke (Australia)
Dr. Cynthia Rosenzweig
Dr. Anthony Patt

REVIEWERS NOT TO INCLUDE:

COVER SHEET FOR PROPOSAL TO THE NATIONAL SCIENCE FOUNDATION

PROGRAM ANNOUNCEMENT/SOLICITATION NO./CLOSING DATE/if not in response to a program announcement/solicitation enter NSF 04-2

NSF 03-597 **12/03/03**

FOR CONSIDERATION BY NSF ORGANIZATION UNIT(S) (Indicate the most specific unit known, i.e. program, division, etc.)

BCS - BE: DYN COUPLED NATURAL-HUMAN

FOR NSF USE ONLY

NSF PROPOSAL NUMBER

0410348

DATE RECEIVED	NUMBER OF COPIES	DIVISION ASSIGNED	FUND CODE	DUNS# (Data Universal Numbering System)	FILE LOCATION
				152764007	

EMPLOYER IDENTIFICATION NUMBER (EIN) OR TAXPAYER IDENTIFICATION NUMBER (TIN)

590624458

SHOW PREVIOUS AWARD NO. IF THIS IS
☐ A RENEWAL
☐ AN ACCOMPLISHMENT-BASED RENEWAL

IS THIS PROPOSAL BEING SUBMITTED TO ANOTHER FEDERAL AGENCY? YES ☐ NO ☒ IF YES, LIST ACRONYM(S)

NAME OF ORGANIZATION TO WHICH AWARD SHOULD BE MADE

University of Miami Rosenstiel School of Marine&Atmospheric Sci

AWARDEE ORGANIZATION CODE (IF KNOWN)

0015362010

ADDRESS OF AWARDEE ORGANIZATION, INCLUDING 9 DIGIT ZIP CODE

University of Miami Rosenstiel School of Marine&Atmospheric Sci
4600 Rickenbacker Causeway
Key Biscayne, FL. 331491098

NAME OF PERFORMING ORGANIZATION, IF DIFFERENT FROM ABOVE

PERFORMING ORGANIZATION CODE (IF KNOWN)

ADDRESS OF PERFORMING ORGANIZATION, IF DIFFERENT, INCLUDING 9 DIGIT ZIP CODE

IS AWARDEE ORGANIZATION (Check All That Apply) (See GPG II.C For Definitions)
☐ SMALL BUSINESS ☐ MINORITY BUSINESS
☐ FOR-PROFIT ORGANIZATION ☐ WOMAN-OWNED BUSINESS

☐ IF THIS IS A PRELIMINARY PROPOSAL THEN CHECK HERE

TITLE OF PROPOSED PROJECT **Understanding and Modeling the Scope for Adaptive Management in Agroecosystems in the Pampas in Response to Interannual and Decadal Climate Variability and Other Risk Factors**

REQUESTED AMOUNT	PROPOSED DURATION (1-60 MONTHS)	REQUESTED STARTING DATE	SHOW RELATED PRELIMINARY PROPOSAL NO. IF APPLICABLE
$ **1,830,296**	**36** months	**06/01/04**	

CHECK APPROPRIATE BOX(ES) IF THIS PROPOSAL INCLUDES ANY OF THE ITEMS LISTED BELOW

☐ BEGINNING INVESTIGATOR (GPG I.A)
☐ DISCLOSURE OF LOBBYING ACTIVITIES (GPG II.C)
☐ PROPRIETARY & PRIVILEGED INFORMATION (GPG I.B, II.C.1.d)
☐ HISTORIC PLACES (GPG II.C.2.j)
☐ SMALL GRANT FOR EXPLOR. RESEARCH (SGER) (GPG II.D.1)
☐ VERTEBRATE ANIMALS (GPG II.D.5) IACUC App. Date _____
☐ HUMAN SUBJECTS (GPG II.D.6)
Exemption Subsection _____ or IRB App. Date _____
☒ INTERNATIONAL COOPERATIVE ACTIVITIES: COUNTRY/COUNTRIES INVOLVED (GPG II.C.2.g.(iv).(c))
AR
☐ HIGH RESOLUTION GRAPHICS/OTHER GRAPHICS WHERE EXACT COLOR REPRESENTATION IS REQUIRED FOR PROPER INTERPRETATION (GPG I.E.1)

PI/PD DEPARTMENT
Meteorology & Physical Oceanography

PI/PD FAX NUMBER
305-361-4622

PI/PD POSTAL ADDRESS
4600 Rickenbacker Causeway

Key Biscayne, FL 331491098
United States

NAMES (TYPED)	High Degree	Yr of Degree	Telephone Number	Electronic Mail Address
PI/PD NAME **Guillermo P Podesta**	**PhD**	**1987**	**305-361-4142**	**gpodesta@rsmas.miami.edu**
CO-PI/PD **Rajagopalan Balaji**	**PhD**	**1995**	**303-492-5968**	**Balajir@colorado.edu**
CO-PI/PD **William E Easterling**	**PhD**	**1984**	**814-863-0291**	**easter@gis.psu.edu**
CO-PI/PD **Richard W Katz**	**PhD**	**1974**	**303-497-8114**	**rwk@ucar.edu**
CO-PI/PD **Elke U Weber**	**PhD**	**1984**	**212-854-4427**	**euw2@columbia.edu**

Electronic Signature

CERTIFICATION PAGE

Certification for Authorized Organizational Representative or Individual Applicant:

By signing and submitting this proposal, the individual applicant or the authorized official of the applicant institution is: (1) certifying that statements made herein are true and complete to the best of his/her knowledge; and (2) agreeing to accept the obligation to comply with NSF award terms and conditions if an award is made as a result of this application. Further, the applicant is hereby providing certifications regarding debarment and suspension, drug-free workplace, and lobbying activities (see below), as set forth in Grant Proposal Guide (GPG), NSF 04-2. Willful provision of false information in this application and its supporting documents or in reports required under an ensuing award is a criminal offense (U. S. Code, Title 18, Section 1001).

In addition, if the applicant institution employs more than fifty persons, the authorized official of the applicant institution is certifying that the institution has implemented a written and enforced conflict of interest policy that is consistent with the provisions of Grant Policy Manual Section 510; that to the best of his/her knowledge, all financial disclosures required by that conflict of interest policy have been made; and that all identified conflicts of interest will have been satisfactorily managed, reduced or eliminated prior to the institution's expenditure of any funds under the award, in accordance with the institution's conflict of interest policy. Conflicts which cannot be satisfactorily managed, reduced or eliminated must be disclosed to NSF.

Drug Free Work Place Certification

By electronically signing the NSF Proposal Cover Sheet, the Authorized Organizational Representative or Individual Applicant is providing the Drug Free Work Place Certification contained in Appendix C of the Grant Proposal Guide.

Debarment and Suspension Certification

(If answer "yes", please provide explanation.)

Is the organization or its principals presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any Federal department or agency? Yes ☐ No ☒

By electronically signing the NSF Proposal Cover Sheet, the Authorized Organizational Representative or Individual Applicant is providing the Debarment and Suspension Certification contained in Appendix D of the Grant Proposal Guide.

Certification Regarding Lobbying

This certification is required for an award of a Federal contract, grant, or cooperative agreement exceeding $100,000 and for an award of a Federal loan or a commitment providing for the United States to insure or guarantee a loan exceeding $150,000.

Certification for Contracts, Grants, Loans and Cooperative Agreements

The undersigned certifies, to the best of his or her knowledge and belief, that:

(1) No federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

(2) If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, ''Disclosure of Lobbying Activities,'' in accordance with its instructions.

(3) The undersigned shall require that the language of this certification be included in the award documents for all subawards at all tiers including subcontracts, subgrants, and contracts under grants, loans, and cooperative agreements and that all subrecipients shall certify and disclose accordingly.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by section 1352, Title 31, U.S. Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure.

AUTHORIZED ORGANIZATIONAL REPRESENTATIVE	SIGNATURE	DATE
NAME **Otis B Brown**	**Electronic Signature**	**Dec 3 2003 6:00PM**

TELEPHONE NUMBER	ELECTRONIC MAIL ADDRESS	FAX NUMBER
305-361-4000	**obrown@miami.edu**	**305-361-4711**

*SUBMISSION OF SOCIAL SECURITY NUMBERS IS VOLUNTARY AND WILL NOT AFFECT THE ORGANIZATION'S ELIGIBILITY FOR AN AWARD. HOWEVER, THEY ARE AN INTEGRAL PART OF THE INFORMATION SYSTEM AND ASSIST IN PROCESSING THE PROPOSAL. SSN SOLICITED UNDER NSF ACT OF 1950, AS AMENDED.

B - PROJECT SUMMARY

Agroecosystems play a central role in world food production and food security. Managed agroecosystems combine the complexity, multiplicity of scales, and feedbacks of biophysical interactions in natural ecosystems with the additional intricacies of human decision-making (Dalgaard et al 2003).

Our overarching goal is to understand and model the workings and interactions of natural and human components in agroecosystems, with special emphasis on assessing the scope for active adaptive management in response to climate variability on interannual and inter-decadal scales. The prevalence of climate as a major risk source to agriculture, its importance in driving longer-term changes in production systems and land-use, the presence of effects on natural systems from human responses to climate variability, and the potential for societal benefits from climate information all justify our focus.

Our study area is the Argentine Pampas, a major agricultural area affected by El Niño-Southern Oscillation. Further, decadal rainfall trends and technological and economic events have prompted agricultural intensification and expansion towards marginal areas, and the predominance of soybeans. These changes threaten the sustainability of production and life support systems. To achieve our project goal:

- A conceptual model of the decision landscape in agricultural systems of the Pampas will be co-developed with farmers and technical advisors.
- Modern statistical approaches will be used to develop plausible scenarios of interannual and inter-decadal climate variability. These approaches will overcome mismatches between the coarse spatial/temporal scales of climate models and scales at which decisions are made.
- The climate scenarios will be coupled with both mechanistic crop models and simplified statistical models to place climate within the context of environmental and socioeconomic factors influencing farmers' decisions.
- Decision experiments will be used to detect presence of decision goals that differ from those frequently assumed in economic modeling.
- A probabilistic characterization of uncertainty will be built-in to our models from the outset. Ethnographic research will explore how best to communicate the uncertainty to decision makers.
- An integrated assessment involving a broad spectrum of stakeholders will yield a consensus agenda on sustainable agriculture in the Pampas.
- A study will be conducted among project participants to understand issues enabling or impeding effective integrative research.

Intellectual Merit. We will develop conceptual and procedural approaches to bridge the spatial and temporal scales of climate scenarios, regional impact assessment and resource management. The scale mismatch has been at the heart of problems of climate impact assessment (Hulme & Brown 1998).

We will undertake a fully probabilistic characterization of uncertainty, designed into the project from the outset, and based on modern statistical and computational techniques. The availability of uncertainty estimates will enhance the salience of our findings for stakeholders.

Our work improves on previous efforts to estimate the value of climate information by using alternative objective functions. Given the growing evidence that rational choice models fail as descriptions of information use and choice, estimates of information value based on more realistic choice models are needed.

Broader Impacts. The link between climate variability and decision-making is a fundamental issue that influences resource management in many regions and sectors. We will provide an integrated analysis of an important complex system (agricultural production) that involves interactions between several natural and human systems. We will train and mentor young scientists to address complex environmental problems using a diverse suite of approaches within multidisciplinary teams. Although focused on interannual and decadal scales, our assessment of impacts of climate variability and outcomes of alternative actions will provide useful insights for future agricultural adaptation to climate change.

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C. PROJECT DESCRIPTION

1. INTRODUCTION

The world faces the dual challenges of feeding a burgeoning 21st century population of perhaps 9 billion, while at the same time sustaining life support systems (Natl. Res. Council 1999). In recent decades, agricultural output outpaced human population growth and reduced famine. Nevertheless, in the near future the food supply must continue to expand, but must do so with reduced environmental consequences (Natl. Res. Council 1999). Innovative environmental information will be central to this expansion.

Agroecosystems play a central role in world food production and food security. Managed agroecosystems combine the complexity, multiplicity of scales, and feedbacks of biophysical interactions in natural ecosystems with the additional intricacies of human decision-making (Dalgaard et al 2003).

The overarching goal of this proposal is to understand and model the dynamic interactions of natural and human components in agroecosystems, with special emphasis on assessing the scope for active adaptive management in response to newly available knowledge (eg, climate information, insights on human decision-making) and ensuring sustainability of life support systems.

Agricultural stakeholders consistently rank climate variability among the top sources of risk to production or profits, *and the top risk that can be reduced.* Climate/crop interactions show marked non-linearities (eg, nonlinear growth responses to temperature and radiation), and threshold responses (increasing rainfall is generally favorable, but an excess may cause total loss of crops). Climate fluctuations occur on a range of temporal scales, from intra-seasonal to centennial and longer. We focus on two scales– seasonal-to-interannual and interdecadal– important for decision-making, resource management, and infrastructure planning.

On seasonal-to-interannual scales, the El Niño-Southern Oscillation (ENSO) phenomenon is the major single source of climate variability in many parts of the world (Trenberth & Stepaniak 2001). Advances in understanding and observations of the oceans and atmosphere have made it possible to predict with imperfect but usable skill ENSO-related sea surface temperature (SST) anomalies months in advance (Latif et al 1998; Goddard et al 2001). In turn, predicted SSTs and atmospheric general circulation models are used to predict regional seasonal mean precipitation and temperature (Mason et al 1999). Seasonal climate forecasts are being disseminated by several agencies around the world under the largely untested assertion that they are usable knowledge.

The emerging ability to forecast regional climate is a hallmark achievement of the first ten years of the U.S. Global Change Research Program (Stern & Easterling 1999) and creates an exciting natural laboratory to learn how an important and prevalent complex system such as agriculture may respond. Agricultural decision-makers can use seasonal climate forecasts to mitigate unwanted impacts and take advantage of favorable conditions (Hammer et al 2001).

Nevertheless, several studies have identified theoretical and practical obstacles to the use of climate information and forecasts (Pulwarty and Redmond 1997; Orlove & Tosteson 1999; Stern & Easterling 1999; Broad & Agrawala 2000; Glantz 2001; Broad et al 2002; Hartmann et al 2002; Lemos et al 2002; Patt & Gwata 2002). Some obstacles stem from limitations inherent to the climate system's complexities: forecasts have coarse spatial and temporal resolution, not all relevant climate variables can be predicted, the skill of forecasts is not well characterized or understood, contradictory predictions may coexist. Other obstacles include procedural, institutional, and cognitive difficulties in receiving/understanding information, or in the ability/willingness of decision-makers to modify their actions. Successful use of seasonal climate forecasts in agriculture must be based on understanding these constraints and how to overcome them.

Inter-decadal climate variability can have dramatic consequences on agroecosystems. A marked increase since the 1970s in spring-summer precipitation in the Pampas of central-

eastern Argentina, our study area, has contributed to significant changes in land use patterns (Castañeda & Barros 1994; Viglizzo et al 1995, 1997; Satorre 2001). Continuous cropping has replaced agriculture-pasture rotations in many places. More dramatically, areas that were climatically marginal (only fit for grazing) have become 100% agricultural. In contrast, the period 1930-1960 was much drier in the Pampas: in the 1930s wire fences were buried by storms like those in the Dust Bowl. Similar inter-decadal shifts between dry and wet epochs have been reported for the US (Lettenmaier et al 1994; Kunkel & Changnon 2003; Mauget 2003). Our study on the Pampas will provide insights from another realization of such shifts, allowing comparisons grounded in common experiences.

Climate variability and adaptive responses must be assessed within the specific technological, economic, institutional, and land tenure contexts in which they take place. Argentine agriculture underwent major changes in the last decades, particularly since the early 1990s (Satorre 2001; Schnepf et al 2001). Technological innovations such as short-cycle wheat varieties allowing a wheat/soybean double crop, no-tillage planting, and genetically modified varieties have played a major role in land-use changes in the Pampas (Senigagliesi et al 1997). Economic drivers also favored agriculturalization. Most of Argentina's agricultural production is exported; demand for animal protein especially in fast-growing economies-in-transition created a large market for grains. After elimination of taxes in the early 1990s, farmers received international commodity prices. This fostered investment in technology (larger farming machinery, greatly increased use of fertilizers and biocides). Despite re-introduction of crop export taxes in 2002, the devaluation of Argentine currency favored agriculture overall. The creation of governmental and stakeholder institutions for agricultural research and extension enhanced dissemination of technologies and allowed agricultural expansion. Finally, half of the area currently planted in the Pampas is *not owned* by farmers exploiting it. Short leases (usually one year) provide incentives to maximize short-term profits via agriculture.

The intertwined effects of climate, economic and social drivers have large consequences on complex natural/human systems. One example to which we return throughout the text is the expansion of soybean in the Argentine Pampas. Introduced in the early 1970s, the area planted with soybean reached 5.1 Mha in 1990 and exploded to 12.6 Mha in 2002. Argentine production tripled between the early 1990s (11 Ktons) and 2002 (35 Ktons).

The soybean expansion is not the result of explicit governmental policies or incentives, but rather is the emergent effect of tens of thousands of individual decisions on the amount of land dedicated to this crop each year in response to a context (climatic, environmental, economic) that favored soybean against other crops. Decisions (land allocation) made at the farm scale clearly influence much larger scales; however, such effects are more than the simple summation of individual behaviors and emerge from a system of interaction between individuals, each other and their environment (Schelling 1978).

1.1 Project rationale

Adaptive responses to climate and other risk factors require salient information to support decisions. Agricultural outcomes of decisions are more relevant to stakeholders than raw climate information: a farmer is more interested in receiving likely distributions of crop yields or economic returns than a seasonal precipitation forecast (see also Hammer et al 2001). A greater capacity is needed to convert raw climate information (seasonal forecasts, decadal climate projections) into distributions of outcomes for risk assessment and management.

To do so, outcomes of alternative decisions in agriculture can be simulated through process (crop growth) models that often require daily weather as input (Ritchie et al 1998). Historical daily series can be used, but often are short or unavailable. Alternatively, crop models could be driven with output from numerical ocean-atmosphere models used to simulate climate. Unfortunately, spatially coarse output from these models does not accurately represent conditions (particularly precipitation) at the scales of decisions (Easterling 1997). Models with higher

spatial resolution still do not produce daily values with realistic temporal structure (Mearns & Giorgi 1999), whereas plant growth shows a highly nonlinear sensitivity to the arrangement of daily weather (eg, lengths of dry or wet spells). We will develop disaggregation tools to bridge the typically coarse spatial and temporal scales of climate scenarios and the smaller scales of process models (agronomic, hydrological) used to explore outcomes under diverse climate scenarios (Wilby et al 1998; Corte-Real et al 1999; Palutikof et al 2002).

Scenario-building and simulation-based research can provide useful insights. However, strategies to deal with climate risks also must be grounded on a firm understanding of human decision-making under uncertainty within the complex context of agricultural production. Actual use of climate information in agricultural decisions and the production decisions themselves will most likely deviate from frequently used prescriptions (eg, maximization of subjective expected utility, SEU).

Decision-makers can pursue different non-standard decision goals. For example, our work with farmers in the Pampas indicates that minimization of decision regret (Loomes & Sugden 1982) is a goal frequently observed. The anticipation of looking "foolish" makes many farmers reluctant to act on probabilistic forecasts of climate conditions that may not materialize, even if the expected value of such action is shown to be positive. Another common decision goal is aiming for satisfactory target levels of returns, rather than profit maximization, reflecting the desire for cognitive simplification (Simon 1956; Payne et al 1990). Adequate simulation and prediction of responses to uncertain climate scenarios requires realistic models of risky decision making and probabilistic information use closely linked to observed decision processes (Stewart 1997).

Decadal climate variability and other drivers have contributed to a large increase in Argentine agricultural output (crop production has doubled in the last two decades). Nevertheless, the environmental consequences and the sustainability of production and life support systems are receiving increasing attention. Some relevant issues include:

- Despite widespread no-tillage planting intensive cropping already is having consequences on the environment, such as erosion, and loss of nutrients and organic matter (Casas 1998);
- Production systems that have evolved partly in response to increased rainfall may not be viable if (as is entirely possible) climate reverts to a drier epoch;
- Soybean currently covers almost half of the total cropped area in Argentina. Such a system may be brittle to shocks or surprises such as large climate anomalies or price fluctuations.

Unavoidable tradeoffs between productivity, stability, and sustainability will need to be addressed for agroecosystems in the Pampas (Viglizzo & Roberto 1998). On one hand, the Argentine economy is enjoying the competitive advantages of soybean production: this crop is the country's main export (AACREA 2003). On the other hand, are growing concerns about implications of the so-called "soybean monoculture." A bill recently submitted to the Argentine Congress calls the soybean expansion "alarming" (Huergo 2003) and proposes disincentives. The growing tension between objectives offers a unique opportunity for salient, credible scientific knowledge to inform policy-making.

1.2 Project goals

The broad goals of this project are to (a) understand and model impacts of interannual and inter-decadal climate variability and experiment with the use of climate information within an adaptive management framework, (b) understand and model agricultural decision-making in the light of climate variability, probabilistic climate information (eg, seasonal forecasts or decadal projections), and other factors (economic, social, technological), and (c) assess the environmental consequences of production systems that evolved in response to changing climate and technologies.

To achieve our goals, we will (1) map key components of the decision landscape in agricultural systems of the Pampas; (2) build plausible scenarios of interannual and inter-

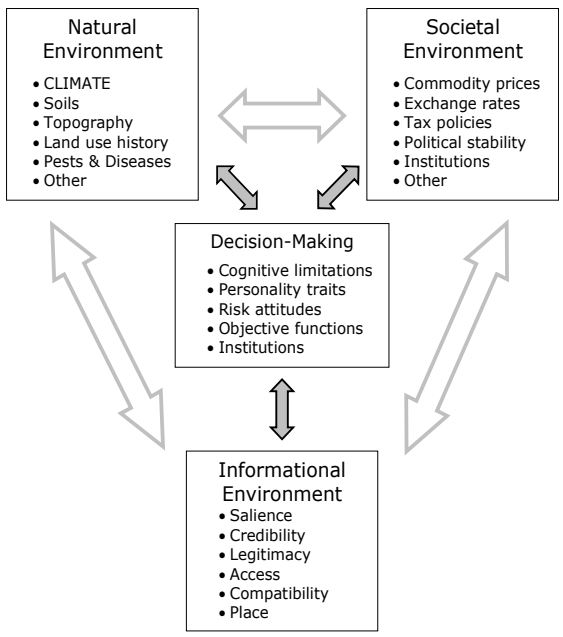
decadal climate variability; (3) assess impacts and outcomes of interannual and decadal climate variability and the scope for adaptive management of agroecosystems; (4) seek to understand how probabilistic climate information and uncertainty about outcomes are received and acted upon; (5) explore best practices for the design and communication of climate information and the characterization of uncertainty; (6) assess consequences on natural systems of human actions; and (7) conduct a self-reflective analysis of factors that promote or impede integrative science research and outreach with stakeholder participation.

1.3 Conceptual framework

Our conceptual framework (Fig. 1) includes three domains (natural, societal and informational) and a mediating process (decision-making). The natural and societal domains figure frequently in analyses of complex agroecosystems (cf, Morello and Mateucci 1997 for our target region). As stated above, we emphasize climate variability at various temporal scales as an important component of the natural environment.

A distinctive component of our framework is the informational domain, as we argue that it plays a central role in inducing active adjustments and adaptive behaviors in complex systems. Attributes of the informational domain include not only procedural aspects such as salience, legitimacy, credibility, and access (Cash et al 2003), but also proximate characteristics such as compatibility (match between information and needs) and place.

Figure 1. Our conceptual framework.



Although there are other interactions between domains (externalities, lighter arrows in Fig. 1), we focus here on decision-making as the major process (from a stakeholder viewpoint) mediating between domains. This component involves common human limitations in information processing (Plous 1993; Nicholls 1999; Stewart 2000), individual characteristics along cognitive or affective dimensions ("personality" variables and risk attitudes, Weber 2001), and individual differences in goals for decisions, ie, different objective functions. For adaptive responses, the decision-making process mediates and "filters" linkages (dark arrows) among domains: the result is a set of subjective perceptions of the values and likelihood of decision inputs and outcomes.

1.4 Project highlights

The project evolved from an NSF-funded incubation effort that yielded preliminary results (Section 2) and helped develop a diverse interdisciplinary team and partnerships with stakeholder groups. Several elements of this project are distinctive:

- A rich set of perspectives resulting from (a) linked modeling approaches for generation of climate scenarios and decision outcomes, (b) controlled experiments on decision-making and behavior, and (c) participatory research that will draw on contextual knowledge and stakeholders' experiences and preferences;
- The development of tools to support adaptive decision-making and learning by exploring outcomes from alternative actions in response to plausible climate scenarios on inter-annual and inter-decadal scales;
- A strong focus on understanding the dynamics of human behavior and decisions, particularly with respect to the twin problems of choice and uncertainty in the context of a real-world complex natural/human system;

- A probabilistic treatment of technical uncertainty integrally designed into the project;
- A reflective analysis of the challenges of interdisciplinary, multiple-place collaboration and stakeholder involvement in integrative science, designed to encourage collective learning and stimulate theory development;
- A diverse, yet cohesive and well-balanced team of investigators and outreach specialists that draws equally from a range of disciplines; and
- The active involvement of farmers and operational producers of climate information that will ensure the relevance of the research and stakeholders' ownership of the process, ultimately amplifying the project's impact.

2. RESULTS FROM NSF SUPPORT

● **Regional assessment of the effects of ENSO-related climate variability on the agricultural sector of Argentina and Uruguay.** Co-PIs: G. Podestá and D. Letson, U. of Miami. Award ATM-9711629 (Methods & Models for Integrated Assessment), Aug 97 to Jul 2000. Amount: $ 166,963. Statistical analyses and quantitative modeling showed ENSO impacts on crop yields in the Pampas. To elicit perceptions on climate risk we conducted interviews, focus groups, and a survey of 200 farmers. *Publications:* Six peer-reviewed papers (Section D) were published (Llovet and Letson 1999; Podestá et al 1999; Grondona et al 2000; Ferreyra et al 2001; Letson et al 2001; Podestá et al 2002). A manuscript on economic value of forecasts is under revision (Letson et al submitted). An MS thesis (Messina 1999), 7 non peer-reviewed articles and 13 abstracts resulted from the project.

● **Climate information and forecasts in agricultural production systems of the Argentine Pampas.** Co-PIs: G. Podestá, D. Letson, K. Broad, U. of Miami. Award BCS-0119851 (BE-CNH incubation grant), Sep 2001 to Feb 2003. Amount: $ 65,000. We placed emphasis on understanding the social, economic, and cultural contexts of the use of climate information to enhance agricultural decisions. We partnered with a farmers' group (AACREA) and operational producers of climate information (the Intl. Research Institute for Climate Prediction, IRI, and Argentina's Met Service). *Publications:* Two peer-reviewed papers have been accepted (Bartolomé et al, in press; Podestá et al, in press). A manuscript on "decision maps" will be submitted soon. A background paper was contributed to a NOAA workshop (Podestá et al 2003). A special supplement in the March 2003 issue of the AACREA magazine included four outreach articles on our work by Herzer et al, Penalba, Satorre et al and Royce.

● **Geophysical Statistics Program at the National Center for Atmospheric Research.** Co-PI: R. Katz, NCAR. Award DMS-9815344, July 1999 to June 2004. Amount $3,000,000. This project promotes collaboration between the statistical and geophysical sciences. It primarily funds postdoctoral appointments at NCAR for new Ph.D. statisticians. *Publications:* see list at www.cgd.ucar.edu/stats/publications.shtml.

● **A taxonomy of decision modes.** PI: Elke Weber, Columbia U. Award SES-00-79664, Aug 2000 to Jan 2003. Amount: $ 65,338. This project documented the qualitatively different ways in which people make decisions. The contrast between analytic and affective processing is most relevant for this proposal. *Publications:* Five peer-reviewed papers published or in review: Weber 2001; Loewenstein et al 2001; Ames et al 2002; Siebenmorgen etal 2002; Weber et al 2002.

3. CASE STUDY

The geographic focus of the project is the Pampas of central-eastern Argentina. Hall et al (1992) and Morello & Solbrig (1997) describe the region's climate, soils, and cropping systems. We chose the Pampas because of its importance to Argentina's economy (51% of exports, and 12% of GDP, 1999–2001; Díaz 2002) and because the region has marked interannual and inter-decadal climate signals (Ropelewski & Halpert 1987, 1989; Castañeda & Barros 1994; Vargas et al 1999; Rusticucci & Penalba 2000). Also, our prior work in the region will limit "spin-up" time. The similarity in production scale, crops grown and technology of the Pampas to those in other major production areas (the US Midwest, Brazil, Canada) with comparable climate signals (Parry 1985; Mauget & Upchurch 1999; Phillips et al 1999) suggest a broader relevance of our results.

3.1 Climate of the Pampas

The climate of the Pampas is influenced by multiple factors. The South Pacific exerts year-round influence through the mid-latitudes storm track and the Pacific-South American teleconnection pattern. Other influences are the South Atlantic Convergence Zone, and SSTs in the SW Atlantic (Liebmann et al 1999; Barros et al 2000; Robertson & Mechoso 2000).

ENSO is the major single source of seasonal-to-interannual climate variability (Grimm et al 2000; Montecinos et al 2000). There are marked links between ENSO and precipitation in the Pampas in Nov-Dec, a critical period for important summer crops. In these months, El Niño events are associated with higher median precipitation and higher likelihood of positive (wet) rainfall anomalies than other ENSO phases, whereas La Niña events show markedly lower median rainfall and a narrower range of anomalies (Podestá et al 1999; Rusticucci & Vargas 2002).

In addition to the interannual signal, the climate of the Pampas shows marked inter-decadal variability. A steady increase in annual precipitation (particularly in spring-summer) has been observed since the 1970s over most of central-eastern Argentina (Krepper at al 1989; Castañeda & Barros 1994; Rusticucci & Penalba 2000). Decadal precipitation signals are mimicked by streamflows of major rivers in the region (Paraná, Paraguay, Uruguay, and Negro) that show an increase most marked since about 1970 (García & Vargas 1998; Genta et al 1998; Robertson & Mechoso 1998).

3.2 Agricultural impacts of climate variability in the Pampas

ENSO has impacts on agriculture in the Pampas (Messina et al. 1999; Jones et al 2000; Podestá et al 2002). El Niño (La Niña) events have a positive (negative) effect on maize yields. Soybean yields decrease during cold events, but the impact of warm events is less marked (Podestá et al 1999).

In previous NSF work we linked climatic, agronomic, and financial models to characterize vulnerability to ENSO of *current* maize production systems in Argentina (Ferreyra et al 2001). We combined synthetic weather conditioned on ENSO phase (Grondona et al 2000), a maize simulation model (Ritchie et al 1998) and stochastic prices in an enterprise budget to derive probability distributions of profits for each ENSO phase. Strong consistency between model and historical results suggests this approach can be used confidently in new work.

3.3 Institutional context

The goal of enhancing and sustaining the ability of decision-makers to use climate information can be accomplished most effectively through existing "boundary organizations" that perform information communication and translation (Guston et al 2000; Agrawala et al 2001; Cash et al 2003). Our partner Asociación Argentina de Consorcios Regionales de Experimentación Agrícola (AACREA) is an example of a boundary organization. AACREA is a non-governmental, non-profit organization of farmers with a focus on dissemination of new technologies. Members join regional groups of 7–12 farmers assisted by a technical advisor. Each group meets monthly, a ready-made opportunity for researchers to interact with group members.

The Argentine Meteorological Service (Servicio Meteorológico Nacional, SMN) is a governmental organization charged with collecting, analyzing, and disseminating weather and climate information. SMN was identified by farmers as their primary source of climate information. SMN also can be viewed as a boundary organization, as it has a dual mandate for producing and communicating climate information.

3.4 Target study locations

We have selected two locations in the Pampas: Pergamino (33º 56' S, 60º 33' W) and Pilar (31º 41' S, 63º 53' W), that respectively represent near-optimal and relatively marginal agricultural conditions. Pergamino is in the most productive subregion of the Pampas (Paruelo & Sala 1993). Cropping systems include maize, soybean, and a wheat-soybean doublecrop. In contrast, Pilar is in the northern, semi-arid end of the Pampas (Dardanelli et al 1997). Characteristic rotations include maize and soybean. Contrasting climatic and ecological conditions between sites will let us explore differences in vulnerability to climate,

risk perceptions, and scope for adaptive management.

Total rainfall and the annual precipitation cycle vary between locations (Prohaska 1976; González & Barros 1996). Median annual precipitation is 937 mm (738 mm) in Pergamino (Pilar). In Pilar, the annual rainfall cycle has a marked winter minimum that, together with limited soil water storage, makes summer crops very dependent on ENSO-influenced spring precipitation. The winter minimum in Pergamino is less marked. Total Oct-Mar (spring-summer) median rainfall has varied significantly over time between the two sites, with Pergamino seeing a 12% increase between 1931-1950 and 1975-1994; Pilar increased by 33% between the same epochs.

4. OBJECTIVES AND METHODS

The work proposed is organized into seven major objectives. A brief description of methods and approaches associated with each objective is presented below.

Objective 1. Map key components of the decision landscape in agricultural production systems.

We will recruit and characterize about 30-35 farmers in each target location (Pergamino and Pilar). Though we acknowledge the diversity of agricultural producers (Pucciarelli 1997), we will focus on *individuals* who farm relatively large extensions (say, over 400 ha) that they own or rent (or both). Agriculture in the Pampas is in transition, and smallholders are becoming increasingly scarce. On the other end of the spectrum, large corporations operating farms in multiple locations involve entirely different decision-making structures. These considerations, together with resource constraints, justify our target choice.

We will use influence diagrams (Morgan et al 2002) to build a conceptual expert model of climate-related and other risk and context factors (eg, tax policies, exchange rate, commodity prices, technology) influencing agricultural production decisions. Participatory model building will involve farmers and technical advisors. Iterative refinement will ensure that important factors are not overlooked or, conversely, that no unnecessary detail is included. Simple models have advantages for addressing complex systems initially, as they make assumptions transparent and uncertainty more traceable (often not the case for larger, unwieldy models). Simple initial descriptions can evolve into increasingly complex models. We stress, however, that influence diagrams allow nesting of simple components, leading to fairly complex descriptions.

Intensive technologies offer a broad range of options for adaptive responses to climate information (Hammer 2000). We will construct decision maps and calendars to identify entry points for climate information as a first step to assess the scope for adaptation. The maps will characterize (a) production decisions, (b) their timing, and (c) realistic options and constraints. During the incubation stage, we built a pilot map for maize production in Pergamino; we will extend the approach to soybeans and wheat.

Through extended interviews and focus groups (Bernard 1995; Stewart & Shamdasani 1990), we will elicit farmers' knowledge and beliefs about climate variability on multiple scales, and explore how they conceptualize climate risk and respond to available information. Inaccurate perceptions may lead to inappropriate responses to climate (Taylor et al 1988; Hansen et al 2001).

Objective 2. Build plausible scenarios of inter-annual and inter-decadal climate variability.

We will implement approaches to "translate" seasonal climate forecasts (often probabilistic and categorical in nature) into site- and area-specific ensembles of relevant climatic variables (precipitation, temperature). The tools will then be adapted to generate scenarios of inter-decadal climate fluctuations. We will be able to generate multiple equally-likely realizations of interannual events (eg, an El Niño), or simulate various plausible decadal trends. For example, we may "run the climate movie backwards," simulating a return to a drier epoch in the Pampas.

Monthly/quarterly distributions of climate variables

Seasonal climate forecasts from operational agencies can range from the prediction of an El Niño or a La Niña event (that in turn influence regional climate conditions) to probabilistic statements about the likelihood of regional precipitation or temperature falling within certain categories (eg, "above normal", "below normal"). While meteorological specificity is sacrificed for long forecast lead time, such forecasts have demonstrable skill.

We will implement a bootstrapping procedure in which historical values at each location are resampled using weights defined by the predicted probabilities of each category. The resulting quarterly or monthly distributions of precipitation and temperature values (consistent with a forecast) will then be disaggregated into daily sequences using stochastic weather generators (see next section).

Synthetic daily sequences conditioned on seasonal forecasts

Several approaches have been proposed for the stochastic generation of daily weather variables (see review by Wilks & Wilby 1999). Most approaches are based on parametric or semi-parametric schemes. The recent development and successful application of nonparametric weather generators (Rajagopalan & Lall 1999; Yates et al 2003: Clark et al in press) offer an alternative to traditional parametric approaches. The nonparametric methods avoid subjective judgments about model forms and probability distributions (rarely tested formally). Furthermore, as data-driven methods, they can capture deviations from theoretical probability distributions and nonlinearities in the associations between variables (Wilks & Wilby 1999; Rajagopalan & Lall 1999).

We will adapt a nonparametric weather generator based on the K-nearest neighbor (K-NN) approach (Rajagopalan & Lall 1999; Yates et al 2003) to generate multiple equally-likely realizations of synthetic daily weather. In the K-NN approach, all weather variables are considered simultaneously as members of a feature vector for day *t*. The algorithm selects the next day *t+1* starting from day *t* from a set of potential nearest neighbors in the historical record. Generator performance will be tested using graphical and numerical diagnostics.

In many locations and seasons, daily weather sequences are influenced by large-scale climate signals, such as ENSO, atmospheric circulation (sea-level pressure fields, SLPs), SSTs, etc. Incorporating this information into the weather generation can help generate more realistic scenarios (Corte-Real et al 1999; Busuioc & von Storch 2003; Wilby et al 2003). In the parametric framework, models conditioned on climate indices have been proposed (Katz & Parlange 1993, 1996; Wilks 1999; Grondona et al 1999).

Climate indices or seasonal forecasts can be easily incorporated into the K-NN framework as conditioning variables (Yates et al 2003; Clark et al in press). Each historical year is weighted according to its "closeness" (in terms of the conditioning variables) to the scenario for which weather sequences are to be generated. Similar approaches have been tested successfully for streamflow forecasting in the Truckee/Carson rivers in Nevada and in northeastern Brazil (Grantz et al 2002; De Souza & Lall in press). We will experiment with various conditioning indices for the non-parametric generators: ENSO phase, tropical Pacific SSTs, probabilities of precipitation in the Pampas, etc.

Synthetic daily sequences conditioned on decadal climate projections

The construction of climate change scenarios for impact studies has received much attention (Riha et al 1996). Adapting parametric weather generators to simulate low-frequency climate trends can be done (Wilks 1992) but it is not trivial (Katz 1996). Non-parametric generators also can be used to produce lower-frequency variability. Yates et al (2003) adapted the K-NN generator to replicate an observed low-frequency trend or simulate a hypothetical climate trajectory. This procedure is based on resampling of the historical record that is biased according to the trends one wishes to reproduce or simulate. In this way, we will be able to generate multiple realizations of various interesting low-frequency scenarios.

Objective 3. *Assess impacts and outcomes of inter-annual and inter-decadal climate*

variability, and the scope for adaptive management in response to climate and other contextual factors.

The experimental use of climate information in decision making offers an excellent opportunity to apply principles of adaptive management science (Pulwarty & Melis 2001). This objective will involve a two-pronged modeling effort designed to explore the outcomes of adaptive responses to climate variability and other risk factors. Adaptive responses to climate variability will be posed as refutable hypotheses to be tested and evaluated within a modeling framework that allows learning to take place through interactions (feedbacks to) with stakeholder decision makers.

- *Mechanistic modeling* will link synthetic daily weather with process-level crop models and financial models to simulate outcomes (yields, economic returns) of alternative decisions under various climate scenarios. This allows us to gain deep understanding of the complexities of climate and decision making across scales.
- *Approximate modeling* will rely on simplified statistical or reduced-form models to describe effects of non-climate factors (eg, commodity prices, tax policies, technology) on decisions. This allows us to place climate within the context of environmental and socioeconomic factors influencing farmers' decisions.

Mechanistic modeling

We will use dynamic, process-level crop simulation models to quantify interactions between climate variability, human decisions, and the natural environment (Boote et al 1996). The models simulate crop growth and development as a function of inputs such as daily weather, and soil and cultivar characteristics. As the models simulate realistic outcomes of various management practices (eg, variety used, planting date, and fertilization amount) they will let us explore a large portion of the potential decision space.

We will use models in the Decision Support System for Agrotechnology Transfer (DSSAT, Jones et al. 1998) that have been calibrated and validated in many production environments, including the Pampas (Guevara et al 1999; Meira et al 1999; Mercau et al 2001). Our own validation work (Ferreyra et al 2001) ensures that model results agree with local expert opinion. Local experts have provided genetic coefficients needed by the models.

The mechanistic modeling component will be used to (a) explore the potential for adaptive management of agroecosystems on interannual and decadal scales, (b) pre-compute outcomes to be used as feedback to farmers in decision experiments to identify objective goals, and serve as input to (c) optimization procedures used to estimate value of climate information, and (d) the assessment of environmental consequences of agriculture (applications b-d described below).

Interannual climate variability. Multiple synthetic daily weather series consistent with interannual climate scenarios will be used as input to crop models to derive frequency distributions of outcomes (yields, economic returns) associated with particular combinations of management decisions. A realistic set of decisions and options to consider will be identified by stakeholders during participatory activities (Objective 1).

The existence of non-inferior (ie, approximately optimal) outcomes for different climate conditions and decisions will indicate the feasibility of adaptive management in response to seasonal climate forecasts. Unlike previous approaches, however, our selection of non-inferior options will be based on a realistic description of what decision-makers are trying to achieve (see next section).

Interdecadal climate variability. We will explore the viability of current agricultural production systems (which to a great extent have evolved in response to enhanced climate) under various types of decadal trends. For instance, we will explore outcomes of gradual or abrupt returns to drier conditions in the Pampas (eg, pre-1970s). Initially we can use *current* technology (ie, no adaptation). For multiple realizations of a trend, we will compute risk metrics (eg, the probability of yields or profits being below a threshold, Jones 2000) to determine if current production systems would be financially sustainable in a changed climate. As the lack of adaptive responses is unrealistic, we will then simulate adaptation to changing climate. In the

process, we will gain useful insights of possible adaptation alternatives for longer-term climate change.

Various studies have used historical data to assess the roles of climate and technological innovation as drivers of land use changes (Viglizzo et al 1995, 1997). Nevertheless, limitations inherent to historical records make it difficult to tease out the relative effects of climate amelioration and technology. In contrast, our ability to simulate specific climate trends, together with crop models that yield realistic outcomes of various technologies will allow us to isolate and understand better the roles of climate and technology in land use changes.

Interactions among scales. Although for clarity we discussed interannual and decadal climate variability separately, in reality they will be occurring simultaneously. This raises questions on interactions between scales, a topic central to complex systems. For example, in the presence of interannual variability, how long will it take farmers to realize/accept that a decadal trend is occurring (and thus take adaptive actions)?

A key issue regarding linkages between scales is to understand how adjustments to climate variability on shorter-time scales will constrain or enable adaptive responses on longer scales. For instance, expansion of agriculture into climatic or economic marginal areas during benign periods (eg, wet epochs, increased frequency of wet El Niño events) may increase future vulnerability if conditions revert (Parry 1985, Easterling 1997).

Interactions between temporal scales may produce counter-intuitive results of the use of information, another characteristic of complex systems. Policies intended to reduce short-term risks of crop failure may actually increase their vulnerability in the long-run (Easterling and Kok, 2002). For example, some forms of crop insurance have actually induced farmers to take on more risk than before. Will the availability of seasonal forecasts possibly induce farmers to take imprudent risks? Within this modeling framework, we will test the hypothesis that efforts to increase resilience to climate variability at short time scales increases climate vulnerability at long time scales.

A key issue to grasp linkages between scales is to understand how adjustments to interannual climate variability (proactive or reactive responses to anticipated or experienced climate) will constrain or enable adaptive responses on longer (decadal) time scales. How do we learn and respond to information about salient events on interannual scales (an intervention perturbing the system), in addition to the events themselves? What are optimal decision environments for adaptive management? Effective use of probabilistic climate information, especially in multiobjective and value-laden settings such as agroecosystems, requires flexible information-gathering and evaluation environments (Pulwarty & Melis 2001).

Simplified modeling

The process of evaluating and modeling complex nature-society interactions can become so overwhelmed in details that it might fail to produce usable results. Decision makers do not confront climate variability in a world in which "all else is equal." However, the search for "realism" in models often can become an end in itself. In contrast, the deliberate simplification of models can be a helpful strategy when underlying disciplinary understanding is incomplete and predictive power varies among disciplines (Natl. Research Council 1999). Simplified (although not simplistic) models facilitate characterization of uncertainty (Shackley et al 1998).

Our modeling efforts must accommodate limitations in current knowledge, time, and budget. For this reason, the second prong of our modeling component will rely on simplified models to describe the role of non-climate (ie, economical, technological) context factors.

We will use conjoint analysis (Wittink and Cattin 1989; Green & Srinivasan 1990; Darmon & Routiès 1999) to develop predictive models of specific decisions by individuals based on their preferences or reactions to combinations of values or levels of the contextual factors considered (eg, high/low commodity prices or input costs, land rents). A conjoint model is developed by presenting a decision-maker with various scenarios (or *profiles*) consisting of combinations of values of salient variables or

attributes reasoned to determine or influence a particular decision (see Objective 1). Stakeholders are asked to make a decision for each profile, based on the particular combination of factors where the decision may be expressed as a probability of acting on new climate information (Goicoechea et al 1982; Keeney & Raiffa 1976; Kleindorfer et al 1993; von Winterfeldt & Edwards 1986). Such an approach has been shown to be a robust method of measuring how people make tradeoffs when faced with multiple factor (attribute) decisions (Green and Srinivasan, 1990).

The conjoint model is created by linking a specific action or decision (dependent variable) with factor values in the scenarios (independent variables). Each profile and its stakeholder decision is an observation. We will use modern data mining techniques (eg, classification and regression trees) that allow flexible combination of quantitative and qualitative information and provide highly interpretable results (Hastie et al 2001). The resulting predictive model of preferences integrates internal goals and contextual factors.

Multiple profiles are prepared that attempt to encompass the multidimensional space of factors influencing the target decision. Reasonably rich scenarios can be developed, but the predictive ability of conjoint models decreases as more factors or levels are added to the scenarios (Green & Srinivasan 1990). In particular, factors that are somewhat abstract, or for which stakeholders may have difficulty envisioning their effects on specific decisions probably cannot be addressed effectively.

A single application of conjoint analysis only provides a snapshot. To capture the feedback effects of exposure to climate information, we will conduct the experiment twice (at the beginning and end of the project). Differences between both sets of results may result from the intervening exposure of farmers to climate information and increased awareness of climate variability. We will use these differences to document and understand the extent to which adaptive learning takes place in a complex world of multiple competing environmental and socioeconomic stresses and opportunities.

Objective 4. *Seek to understand how probabilistic climate information and uncertainty about outcomes are received and acted upon.*

The ability to forecast or simulate future climate scenarios enables a rational farmer to optimize her/his production systems with respect to expected conditions. Researchers have used many approaches to simulate ideal responses to climate scenarios and estimate the value of climate information (Mjelde et al 1998; Solow et al 1998; Chen et al 2002; Adams et al 2003; Meza & Wilks 2003; Meza et al 2003).

Actual decisions frequently deviate from prescriptions (eg, SEU maximization) typically used in economic modeling. Adequate simulation and prediction of responses to uncertain climate scenarios requires realistic models of risky decision making and probabilistic information use closely linked to observed decision processes (Stewart 1997). Such models also are required for sensible estimates of the value of information.

This objective brings greater focus to the actual decision to use probabilistic climate information than Objective 3. It involves two research lines that will be pursued in parallel, but with continuous interaction. The first line involves the empirical identification of the goals and objectives of farmers' decisions (objective functions) in the Pampas, and an assessment of the prevalence of decision objectives outside the conventional SEU model. The second line involves the estimation of the value of climate information under the assumption of different farmer objective functions.

Identification of farmers' objective functions

We will examine the objective functions of farmers through carefully designed decision experiments, supplemented by the surveys and focus groups used to develop the conjoint models. As justified in Objective 1, we will focus on individuals farming relatively large extensions, disregarding for now smallholders or corporate farming operations (corporate decision-making deserves separate study). We aim to detect three commonly observed deviations from idealized responses: loss aversion, regret, and bounded rationality (or satisficing).

Identification of loss aversion. Prospect theory (Kahneman & Tversky 1979; Tversky & Kahneman 1992) assumes that people show loss aversion. That is, outcomes below a reference point (eg, the expected or most likely outcome) are perceived as losses and have a larger impact than perceived gains. If the reference point is manipulated such that objective outcomes are unchanged but the perception and encoding of those outcomes change from relative gains to relative losses (or vice versa), prospect theory predicts that choices will change. Such changes in choice (referred to as framing effects, because of the way in which outcomes are "framed") have been observed in many studies, both in the lab and in the field (Camerer, 2001).

We will use framing manipulations to test whether farmers exhibit loss aversion. We will design realistic scenarios in which a set of external circumstances and decisions result in a particular outcome. Each scenario will have two versions, identical in all respects except for a manipulation of the decision maker's reference point, designed to place the outcome (objectively identical in both versions of a scenario) either above the reference point (a relative gain) or below it (a relative loss). The reference point shift can be achieved, for example, by focusing attention on either the high end or the low end of the distribution of possible outcomes, or by varying information that ought to be irrelevant to the task of evaluating the decision-maker's satisfaction with the current outcome (eg, providing the outcome for the same scenario in the previous year).

One of the two versions of several such scenarios (in which we vary the type, details, and context of the decision) will be given to one of two different groups of farmers. For each scenario, farmers will be asked to provide several evaluations, under the assumption that the described events and outcomes happened to them: (a) their level of satisfaction with the outcome, (b) their evaluation of the degree to which the outcome contributed to the economic viability of their farm operation, and (c) the likelihood with which they would have taken at least one action different from the one(s) described in the scenario. At a later time (say, 3-4 months later), we will present the two groups of farmers with the other version of the scenario (the one they did not see in the first session). We will analyze differences in responses (made by the same farmers) to the two versions of each scenario. Answers that do not differ significantly would indicate that the framing manipulation had no effect, and that a given farmer is encoding the decision outcomes in accordance with the conventional SEU model. In contrast, differences between answers in the direction predicted by prospect theory suggest encoding relative to a reference point and different evaluations for relative gains and losses.

Identification of regret. Post-decision regret occurs when a realized outcome is compared to the outcome that would have been obtained had the decision maker taken a different course of action, and is found to be inferior (Loomes & Sugden 1982). If the outcome of the alternative course of action is not known to the decision maker, regret cannot occur. Anticipating post-decision regret and acting such as to minimize its likelihood thus presumes that one DOES know what alternative actions would bring as results. We will take advantage of this fact by designing a series of decision experiments where farmers make production decisions on stylized farms that resemble their own, and for which we provide climate scenarios.

As in the previous section, there will be two versions of each decision task identical in all respects but one. In one version ("regret possible"), farmers will receive realistic feedback on the outcome of their own decisions (eg, about what varieties of crops to plant in various plots, how much fertilizer to use, etc), but also will be provided with feedback on how other actions would have fared under the observed climate conditions (outcomes will be pre-computed as part of Objective 3). As a result, farmers will know that they will be able to compare the results of their actions to several other actions they could have taken. The alternative actions will be presented as the actions of other farmers in their vicinity, and it will be pointed out that farmers will be able to learn not only from their own actions, but also from those of others. Farmers will be told that their decision and its outcomes

will also be shown to other farmers, so that others will also be able to learn from it. In contrast, in the "no regret possible" version, farmers will only receive feedback about the result/outcomes of their own set of actions.

We will present each target farmer with various decision exercises in two different occasions. The climate scenario will differ between exercises. Half of the farmers will see the first set of exercises in the "regret possible" version; the other half will see the "no regret possible" version. Each group will get the other version of scenario in a subsequent exercise.

Our hypothesis is that the "regret possible" versions will result in more conservative behavior, ie, that farmers will be more reluctant to change their practices from standard practice when they receive a forecast indicating different climate conditions if and when they anticipate that they (and others) might find out that they made the "wrong" decision.

Identification of satisficing. Satisficing refers to the fact that decision makers may strive to achieve satisfactory levels of returns on variables they care about, rather then trying to optimize on all dimensions. In utility function terms, satisficing is consistent with a function that has a positive (or negative) slope up to the satisfactory target level, after which changes in outcome value result in much reduced changes in utility. If we assess farmers' utility for different levels of components that enter into farm profitability (eg, crop yields and prices, input costs, etc), we can examine those utility functions for discontinuities in slopes after possible target levels.

We will use conjoint modeling (see Objective 3) for this part of the work. We will present farmers with a series of scenarios consisting of combinations of values of variables reasoned to determine or influence (dis)satisfaction with farm returns. The analysis will provide scale parameters for the different levels of each component dimension, which can be interpreted as utility levels. Examining those scale parameters (ie, plotting them as a function of level magnitude) will allow us to detect discontinuities that may represent satisficing target levels.

Estimates of the value of climate information

The second research line of this objective aims to estimate the economic value of climate information for agriculture. We will combine crop simulation results (from Objective 3) and a stochastic, nonlinear optimization model to estimate farm-level outcomes with and without climate information. We will then compare the two sets of outcome values to calculate information value (Letson et al. submitted).

Unlike previous work (eg, Adams et al 2003; Meza et al 2003), we will assess information value using several alternative objective function specifications. As an example of the conventional SEU approach, we will consider expected utility maximization with different degrees of constant relative risk aversion. In addition, we will consider non-standard objective function specifications that incorporate the phenomena of loss aversion, regret minimization, satisficing, and their combinations.

Objective 5. *Explore best practices for the characterization of uncertainty, and the design and communication of climate information.*

There are two steps involved in the task of communicating effectively uncertain climate information. The first one is to quantify uncertainty about future outcomes. The second step is to define how best to communicate the uncertainty to decision makers (Patt & Schrag 2003). Each of the steps entails challenges.

Characterization of uncertainty

A probabilistic treatment of uncertainty in forecasts and projections of agricultural outcomes of seasonal and decadal climate variability will be integrally designed into the project. Uncertainties salient for decision-making will be identified, characterized, and communicated. As Fischhoff (1994) pointed out: "a forecast is just the set of probabilities attached to a set of future events." Thus, the focal point for the uncertainty analysis is to provide probabilities not just for climate variables but for outcomes such as crop yields or profits, more salient to decision makers.

Methods. Methods to be used in the uncertainty analyses include sensitivity analysis, scenario

analysis, and fully probabilistic analysis based on Bayesian methods. Structural (or model) uncertainty will be taken into account through Bayesian model averaging. In some cases, approximate models (either statistical or reduced-form) will be utilized to facilitate the uncertainty analysis. An overview of uncertainty analysis in the closely related context of climate change is provided in Katz (2002).

Sensitivity analysis is helpful in identifying potential sources of substantial uncertainty. Unlike traditional approaches, more than one parameter will be varied simultaneously and the relative uncertainty of different parameters will be taken into account (Saltelli et al 2000). Scenario analysis, popular in climate change assessment, constitutes a further step toward full-fledged probabilistic uncertainty analysis (Morgan & Henrion 1990). Emphasis will be placed on experimental design, ensuring that the range of scenarios adequately span likely input values and that the relative likelihoods of different scenarios are taken into account.

Probabilistic analysis is the only form of uncertainty analysis that is ultimately acceptable. So it is natural that the Bayesian paradigm be adopted. As an alternative to brute force Monte Carlo simulation, so-called Markov chain Monte Carlo computational techniques have recently become viable to determine posterior probability distributions (Robert & Casella 1999).

Although structural (or model) uncertainty oftentimes constitutes the largest single source of uncertainty, it is frequently neglected. Bayesian "model averaging," that takes into account different possible forms of model structure, makes it feasible for probabilistic uncertainty analysis to reflect this source of uncertainty as well (Hoeting et al 1999).

Components. Project components to be treated in the uncertainty analysis include seasonal climate forecasts and decadal projections, crop process models, and weather generators used to produce climate scenarios (particularly involving disaggregation or downscaling).

Despite climate forecasts being inherently imperfect, not all forecast products are issued in the form of probabilities. With increases in computing power, ensemble climate forecasting is one method of obtaining probabilistic forecasts that is becoming feasible (Palmer & Raisanen 2002). Issues to be treated include smoothing (preferably by Bayesian methods) to reflect the limited ensemble size and re-calibration to correct for insufficient ensemble spread.

Crop process models, although categorized as deterministic, have a number of uncertainties, such as empirical functional forms and parameters that need to be tuned (Easterling et al 1996). One approach is to build an approximate statistical crop model (eg, through multiple regression) that will be more amenable to uncertainty analysis (Landau et al 2000).

Weather generators are used to produce climate scenarios; for instance, disaggregating seasonal forecast information (or teleconnections with ENSO events) into daily time series as input to crop models (Wilby & Wigley 1997; Wilks & Wilby 1999). Although relying on resampling-based weather generators instead of parametric ones eliminates some uncertainty sources, the uncertainty tied to the limited climate record remains. One way to assess such uncertainty is through what could be viewed as a two-stage procedure, varying the climate information on which the weather generator is based.

Communication of climate information

Uses and users of climate information are heterogeneous: one product will not fit all. The contents and formats of climate information (and, in general, all agricultural information) make implicit assumptions about what farmers are trying to achieve and how such information will be used. At a minimum, these assumptions should be made explicit and put to test.

Climate information has to be presented in a way compatible with users' purpose for using the information, and with their mental model of the task and of the world (ie, what things matter, etc; Morgan et al 1992). Our experiments to identify the objective functions that decision-makers truly are using will help guide the design of climate information.

We will examine the compatibility between currently available climate information and the decision-makers' mental representations of variability and change and other factors (from

Objective 1). To help overcome incompatibilities we will provide feedback to producers of climate information about the information that is used more effectively. We will work with SMN to design decision tutorials and decision aids to help farmers overcome cognitive and affective shortcomings (bounded rationality).

Institutional channels for climate information

We argued above (Section 3.3) that boundary organizations (BOs) can effectively connect providers and users of climate information. BOs are a useful alternative to the linear "pipeline" model of transfer of scientific knowledge, facilitating the multi-directional flow of information (ie, needs, output formats, results) between science and decision-makers (Cash & Moser 2000; Cash et al 2003).

We will assess the missions, functions, products, and flows of climate information within and between two BOs (AACREA and SMN), and between these organizations and other stakeholders. In a first stage, the mission, structure, and functions of each organization will be surveyed. We will identify key personnel to be interviewed extensively during a second stage.

Combining sociological and anthropological perspectives, we will explore the hypothesis that BOs contribute to effective use of climate information. We also will address issues such as (Cash 2001): What characteristics of BOs are most important under what circumstances? What kinds of problems are most amenable to being mediated by boundary organizations?

Objective 6. *Explore environmental consequences of human decisions in agroecosystems.*

This component will explore the implications of current high-input agricultural production systems on environmental conditions and life support systems. There is overwhelming evidence that continuous agriculture in parts of the Pampas already has contributed to physical degradation of soils. There is an increasing tendency for superficial compaction of soils after rain events, decreasing infiltration and increasing runoff and erosion (Solbrig & Vera 1997). In Pergamino, biological degradation of agricultural soils is illustrated by 37-53% decreases in organic matter (Senigagliesi et al 1997). Recent work reports chemical degradation and a negative nutrient balance in the Pampas. However, little is known about surface or subsurface water quality tied to growing use of fertilizers and biocides (Casas 1998).

The soybean expansion also has contributed to soil degradation. Soybean has a lower C/N ratio than other crops, and its residues decompose rapidly, causing loss of soil structure and organic matter. Soybean has a higher concentration of essential nutrients than cereals, thus it leads to a faster depletion of soil fertility (Viglizzo et al 1997). As soybean is double-cropped with wheat, the annual extraction of nutrients is increased.

Climate fluctuations can transform increased vulnerability of life support systems into criticalities. Further, climate variability may reduce the range of adaptation options. This strengthens the need to understand the role of climate variability when addressing environmental human impacts.

To address environmental issues associated with continuous agriculture, we could argue for isolated "technical" approaches For instance, we could recommend (and model the effects of) rotations including wheat and maize or pastures (to replace soil organic matter), minimal tillage to keep the soil covered, and balanced fertilization to replace nutrients (Solbrig 1998). Nevertheless, technical solutions that ignore the complex suite of factors and incentives that led to a situation will not work well in complex systems. Farmers are unlikely to adopt sustainable approaches if they perceive them as compromising short-term profits.

We propose a two-pronged approach to understand human effects on the natural components of agroecosystems. The two prongs will progress in parallel from the beginning of the project.

The first prong involves collaborative research with Argentine soil scientists and agroecologists to link our climate scenarios and mechanistic crop models with their soil models. This approach will help provide answers to "what if" questions to inform discussions with stakeholders.

The second prong involves an assessment process to address the "soybean monoculture" issue in particular and agroecosystem sustainability in general. The assessment will (a) develop alternative framings of the sustainability issue (currently perceived only as "soybean *versus* the other crops"), (b) help identify gaps in scientific knowledge, and (c) draw on the perceptions, and concerns of stakeholders. A variety of stakeholders (academic and governmental researchers, government agencies, farmer groups, NGOs, etc) will be engaged from the outset through exploratory focus groups, and scientist-stakeholder workshops (van Asselt & Rijkens-Klomp 2002).

The approach we propose is "an incubation effort within a full project." The assessment will result in co-production of a sustainability research agenda likely to be more relevant than a plan defined *a priori* by us. Stakeholders' ownership of the process will increase the likelihood of subsequent action (O'Connor et al 2000; Meinke et al 2001).

Dr. Otto Solbrig (Harvard Univ.) will lead the proposed assessment. He has studied the sustainability of Pampean agroecosystems for the last 10 years (Solbrig 1996, 1997, 1999, 2001, 2002, Solbrig & Vera 2001, Solbrig & Viglizzo 1999). Solbrig has edited four books resulting from conferences focusing on the multi-faceted nature of agricultural systems in the Pampas (Morello & Solbrig 1997, Solbrig & Vainesman 1998, Mateucci et al 1999, Solbrig et al 2001). Solbrig has the trust and credibility among both researchers and stakeholders that is required to lead effectively the assessment effort.

Objective 7. *Conduct self reflective analyses of factors that promote or impede integrated science research and outreach with stakeholder participation.*

Many complex problems can only be understood by pulling together insights and methods from many disciplines (Nissani 1997). Thus, a major goal of the Biocomplexity initiative is to develop communities of researchers able to work in diverse teams and across disciplinary boundaries. Participation of non-scientists also is needed in complex or unstructured problems (van Asselt & Rijkens-Klomp 2002).

Careful and systematic analyses of the determinants of success or failure of interdisciplinary collaboration and stakeholder involvement in integrative science projects still are needed. Few formal studies have explored the paradigms, institutions, and incentives that may nurture or impede the development and sustained productivity of integrative research groups (Schneider 1995).

Our incubation work yielded interesting (sometimes hard!) lessons about how to achieve interdisciplinary cooperation, and about the optimal level of creative tension resulting from disciplinary heterogeneity (while avoiding its frustrations). Yet, we need to understand better issues enabling/impeding effective integrative research. Relevant topics include:

- Methodological issues. How are differences in disciplinary language, reliance on qualitative vs. quantitative methods and understanding of common goals addressed (consensus, domination of one discipline, charismatic leaders, etc)? Which methods proved helpful, which problematic, and why?
- Institutional and bureaucratic issues that influence the motivation of participants: conflicting incentives (eg, academic publication vs production of stakeholder-oriented materials, interdisciplinary work vs career/grant evaluations by mostly disciplinary peer groups). Do respected publishing venues exist for integrative science?
- Interpersonal dynamics. What venues and communication methods have proved most fruitful for collaboration (eg, Internet, formal meetings, social events, group field trips)?
- Participation of stakeholders. What are advantages and disadvantages of stakeholder involvement at different stages of the project? How should outreach and communication of interdisciplinary knowledge be conducted to take maximum advantage of the participation of diverse stakeholder groups and institutions (government agencies, NGOs)?

This component aims to document in a structured and transparent way the process of

designing and conducting interdisciplinary research with stakeholder participation. Our goals are to learn from evaluation and re-analyses, share experiences to avoid repeating mistakes, and ultimately to stimulate theory development. To achieve these goals, we propose the following activities:

- A protocol for documenting and evaluating the interdisciplinary research process will be designed at the beginning of the project. A core group of 3-4 co-PIs will oversee the process.
- All participants will be asked to keep notes recording considerations, arguments, design choices, and aspects of the project that they find challenging, rewarding, or frustrating.
- One person from each 'clique' (ie, social science, agronomy, climate science) will record methodological issues that prove difficult to overcome within their group.
- Once a year, we will conduct self-reflective focus groups, both within and across cliques, to discuss above issues.
- At least one member from each clique will be involved in writing up final results.

5. EDUCATION AND OUTREACH PLAN

Teaching through research. Addressing complex environmental issues will require versatile scientists and engineers able to work well in multidisciplinary and cross-cultural teams, use a diverse suite of models and tools, and communicate complex ideas to decision-makers. We aim to attract and mentor bright students and junior scientists into career paths (in academia, government, or other sectors) requiring such talents. Students/junior researchers will be involved in research to the fullest extent and will be exposed (through peer-to-peer learning) to components outside their own disciplinary area.

Attracting students to integrative science. The number of students or junior researchers whose research we can support is necessarily limited. To attract a larger population of students into interdisciplinary science, we will conduct a semester-long seminar to expose participants to examples of integrative science. Our project will provide a unifying theme but we will stress the diverse perspectives of participants. The seminar will draw on our self-reflection to discuss opportunities and potential disincentives of interdisciplinary careers. The seminar will be held on Year 3 at Miami. It will use evolving webcast technology to involve faculty members and students at other participating institutions (Columbia, Penn State, NCAR) in order to generate a virtual classroom without walls.

Graduate and undergraduate educational resources. The participation of a postdoctoral statistician from NCAR's Geophysical Statistics Project (GSP) should result in at least one case study to be used in GSP's summer colloquia (held every other year to train graduate students). Our activities will be used as modules in an undergraduate course on decision making taught by E. Weber at Columbia. Collaboration with the proposed Columbia Ctr for Decision Making under Uncertainty (the proposal, led by Weber, has been short-listed by NSF) may lead to joint development of courses on decision making under climate uncertainty.

Training of agricultural advisors. AACREA technical advisors are excellent training targets, as each of them counsels many farmers. Advisors are trusted, legitimate intermediaries in the delivery of salient climate information. The absence of such intermediary role so far may explain farmers' reluctance to react to climate information. We will organize two training workshops (Yr 3) for technical advisors from AACREA and other institutions.

Outreach materials. A major lesson learned during the incubation is that communication with stakeholders must be ongoing (even in the absence of new results) to sustain their interest. We have budgeted for an outreach specialist that will produce quarterly materials (magazine articles, WWW site content) for stakeholders.

Resources for informal education. We will develop educational resources useful to a broad audience, such as climate-related and probability tutorials, to help agricultural decision-makers and the general public to understand climate variables and be comfortable with probabilities, and graphic displays. Resources will be refined during interactions with stakeholders, and made available through the WWW and other venues.

Statistical software tools. We will develop a statistical software toolkit for uncertainty analysis

including a suite of R functions (R is an open source statistical language). Similar toolkits already have been developed by NCAR's GSP (see www.cgd.ucar.edu/stats/software.shtml).

6. PROJECT SIGNIFICANCE

6.1 Intellectual merit

From a perspective of scientific innovation, we can highlight some contributions from our project. We will develop conceptual (adaptive learning environments) and procedural (disaggregation) approaches to bridge the spatial and temporal scales of climate scenarios and the scales associated with regional impact assessment and resource management. The scale mismatch has been at the heart of problems of climate impact assessment (Hulme & Brown 1998).

We will undertake a fully probabilistic characterization of uncertainty, designed into the project from the outset, and based on modern statistical and computational techniques. The availability of uncertainty estimates will enhance the salience of our findings for stakeholders.

Estimates of the economic value of climate information and forecasts may help justify public investments in such technology. Our work improves on previous efforts to assess the value of climate information by using several alternative objective functions. Given the growing evidence that rational choice models fail as descriptions of information use and choice in almost any contexts where they have been examined, estimates of information value based on more realistic choice models is absolutely necessary. This work also will advance the constructive engagement underway between economists and psychologists concerning preference elicitation.

Our objectives and tasks are highly consistent with strategic priorities (listed below in quotes) identified by NSF's Advisory Committee for Environmental Research & Education (NSF 2003). A major goal of our work is to "understand how human and natural systems respond to climate variability and change" and to do this we will create "useful regional scenarios of climate change and variability, including seasonal forecasts and decadal climate projections", and develop "dynamic simulation techniques to model the response of these systems and aid design of mitigation methods." We will explore "adaptive decision making [through] carefully monitored experimentation based on active cooperation among researchers, decision makers and affected communities." In studying flows of climate information we will explore "how institutions affect, filter, and evaluate dissemination of scientific knowledge about natural systems and the environment." Finally, our self-reflective study will aim for "a better understanding of interdisciplinary team formation and management."

6.2 Broader impacts

Our work will involve continuous two-way communication between scientists and non-scientists. The team draws from many disciplines and includes innovative international partnerships among governmental, academic, and private organizations. Junior researchers from the US and Argentina will develop strong collegial networks that will facilitate future international collaboration in interdisciplinary science.

The involvement of a farmer organization such as AACREA will increase significantly the venues for project outreach through farmer regional and national meetings, AACREA's monthly magazine, and periodic technical publications. AACREA has a considerable multiplying effect on technology dissemination: for each member, information has been estimated to reach 40 other farmers (ie, a total of ca. 50,000 farmers in Argentina). To ensure that our results are engagingly presented to a broad audience we will retain a professional science writer.

The link between climate variability and decision-making is a fundamental issue that influences resource management in many regions and sectors. We will provide an integrated analysis of an important complex system (agricultural production) that involves interactions between several natural and human systems. Although focused on interannual and decadal scales, our assessment of impacts of climate variability and outcomes of alternative actions will provide useful insights for agricultural adaptation to climate change.

7. MANAGEMENT PLAN

The proposed project duration is three years. This is motivated by the broad spectrum of expertise needed, and the consequent budget implications. Nevertheless, because of our previous work in the region, our incubation project, and in-place collaboration arrangements we are confident that we can complete our objectives within the proposed span.

7.1 Management structure

Project coordination. The management structure is intended to facilitate collaboration between investigators from several disciplines, ten institutions and two countries. Overall coordination and facilitation will be the responsibility of G. Podestá, who previously led interdisciplinary, international teams (NSF & NOAA funds). He will organize meetings and facilitate preparation of project papers, outreach publications, and grant reports. About half of the support requested for Podestá will cover project management; the rest will support his participation in research (he is on an 11-month research contract, no teaching).

Project meetings. Day-to-day decisions will be handled via periodic discussions among point persons designated by each group. We will hold a 3-day annual plenary meeting in Miami (as a central location) to review progress and plan subsequent activities. Prior to each annual meeting, investigators will be *contractually* required to submit progress reports for distribution to other participants and an External Oversight Committee (see below).

External Oversight Committee. This multi-faceted project can benefit from periodic feedback by unbiased reviewers. Three world-class scientists–Drs. Jim Jones (U. Florida), Jim O'Brien (Florida State U.), and Jim Hansen (IRI)–have agreed to serve in an External Oversight Committee (EOC) that will appraise our progress and provide criticism and guidance. EOC members will review progress reports and attend annual project meetings (letters of acceptance and CVs included as Suppl. Doc.).

Communication tools. Frequent interactions are essential to develop trust among researchers from diverse disciplines and stakeholders. Such interactions are challenging due to disciplinary biases, distance, language, and culture. We will use technology to facilitate collaboration and communication among investigators while limiting travel time and expenses. We will set up a project WWW site and a bulletin board for participants (Podestá designed and mainytained the IAI/UM Summer Institute site). We experimented successfully with IP-based audio/video conferencing. Most institutions have videoconferencing hardware, or equipment is being purchased.

7.2 Investigator qualifications and contributions

● ***University of Miami:*** *Guillermo Podestá* has explored a range of issues associated with effective application of climate information in agriculture and developed tools to translate seasonal forecasts into sectoral outcomes. He has cooperated with partner institutions in Argentina for several years. Podestá will not only provide project coordination and facilitation, but will be actively engaged in several components of the research. As research faculty, Podestá must support 100% of his time from extramural funds, thus he is requesting salary to cover both project management and research. *Kenneth Broad* is a social anthropologist who studies opportunities and impediments for use of climate information in various sectors (agriculture, water resources, fisheries). Broad will design the protocol for self-study of integrative science research. *David Letson* is a natural resource economist. He has studied the economic value of seasonal climate forecasts in Argentine agriculture and currently leads a regional climate assessment focused on the SE US. Letson will participate in experiments with stakeholders to detect non-traditional decision goals, and will lead simulations of the implications of these goals on the economic value of climate information. *Donald Olson* is involved in studies of climate in the South Atlantic as an oceanographer and has a long record of working in mathematical biology. His work will extend research funded by Biocomplexity to explore resource dynamics in response to changes in human exploitation at various scales. Olson will develop system models to explore the dynamics

of agricultural system response to climate forcing and changes in human behavior. Olson, a dedicated educator and mentor, will lead our interdisciplinary seminar.

● ***Columbia University:*** *Elke Weber* is an expert on behavioral models of decision making under risk and uncertainty. She has investigated psychologically appropriate ways to measure individual differences in risk taking in environmental decision making and policy. Weber will lead decision experiments to detect non-normative goals among farmers, and will explore associations between some of these goals and contextual and personal characteristics.

● ***Cooperative Institute for Research in Environmental Sciences:*** *Balaji Rajagopalan* has expertise on stochastic hydroclimatology and analyses of climate variability. He has developed non-parametric weather generators and resampling procedures to tie climate information, resource management and decision making. Rajagopalan will lead the development of interannual and decadal climate scenarios. *Roger Pulwarty* worked on two major adaptive management efforts in the US and managed a national integrated assessment program. Pulwarty will lead conceptual integration of components under an adaptive management framework.

● ***Harvard University:*** *Otto Solbrig* is an ecologist and population biologist. His research interests include complex systems and biodiversity, and the links between ecology and economics. Solbrig has experience in organizing and managing multidisciplinary projects. He will lead the assessment process to define a research agenda on sustainability issues. [NB: Solbrig will be supported through AACREA].

● **National Center for Atmospheric Research:** *Richard Katz* has expertise in the application of statistics to weather and climate and their impacts. He has co-edited the book *The Economic Value of Weather and Climate Forecasts* and is founder of the NCAR Geophysical Statistics Project to promote collaboration between atmospheric and statistical scientists. Katz will lead the probabilistic treatment of uncertainty, ensuring that it is an integral part of all components of the project.

● ***The Pennsylvania State University:*** *William Easterling* has published widely on issues of climate variability and change impacts on agriculture, including analysis of barriers to the use of climate forecasts. He has helped lead several large scale agricultural assessments of climate change (the MINK study and recent IPCC chapter on agriculture), and co-edited the NRC book *Making Climate Forecasts Matter.* He will lead the simplified modeling task and assess interactions between scales of climate variability.

● ***AACREA, Argentina:*** *Emilio Satorre* is Director of Agricultural Research at AACREA and Professor at the U. of Buenos Aires (UBA). Dr. Satorre will lead the agronomic modeling. He will facilitate interactions with stakeholders (farmers and their technical advisors) and will participate in development of training materials. [NB: To simplify management, Argentine institutions' budgets have been pooled in a contract to AACREA, which will disperse funds].

● ***CENTRO de Estudios Sociales y Ambientales, Argentina***: *Hilda Herzer* is Professor of Sociology at UBA and Academic Director of CENTRO, an NGO focused on research and training on social, economic, and environmental issues. Herzer will lead interactions with farmers to characterize factors influencing decision-making and explore perceptions of climate risk. CENTRO also will explore the role of institutions in the flow of climate information.

● ***Servicio Meteorológico Nacional, Argentina:*** Miguel Rabiolo is Deputy Director of Argentina's Met Service and Carlos Villanueva is Technical Director (overseeing the Agrometeorology and Climate Prediction sections). They are both trained in Meteorology. They will provide climate data and contribute to redesign seasonal climate information and other climate products based on the project's findings.

● ***University of Buenos Aires, School of Engineering, Argentina:*** *Angel Menéndez* has expertise in Physics and Numerical Simulation. He will lead efforts to integrate models of various subsystems studied into a consistent computational framework. He will collaborate with Katz in the characterization of uncertainty.

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Yates, D., S. Gangopadhyay, B. Rajagopalan, and K. Strzepek. 2003. A technique for generating regional climate scenarios using a nearest-neighbor algorithm. Water Resources Research, 39: 1199-1214.

Biographical Sketch

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A. Professional Preparation

Institution	***Major or Area***	***Degree and Year***
Undergraduate:		
University of Buenos Aires, Argentina	Agronomy	Ingeniero Agrónomo, 1979
Graduate:		
Rosenstiel School, Univ. of Miami	Biological Oceanography	Ph.D., 1987
Postdoctoral:		
NASA Goddard Space Flight Center (US Natl. Res. Council Fellowship)	Satellite Oceanography	1988–89
Rosenstiel School, Univ. of Miami	Satellite Oceanography	1989–91

B. Appointments

6/97 - Present	Research Associate Professor	Rosenstiel School, Univ. of Miami
4/91 – 5/97	Research Assistant Professor	Rosenstiel School, Univ. of Miami

C. Publications

Podestá, G.P., L. Nuñez, C.A. Villanueva, and M.A. Skansi. In Press. Estimating daily solar radiation in the Argentine Pampas. *Agricultural and Forest Meteorology.*

Podestá, G.P., D. Letson, C. Messina, F. Royce, R.A. Ferreyra, J. Jones, J. Hansen, I. Llovet, M. Grondona, J.J. O'Brien. 2002. Use of ENSO-related climate information in agricultural decision making in Argentina: a pilot experience. *Agricultural Systems 74: 371-392.*

Ferreyra, R.A., G.P. Podestá, C.D. Messina, D. Letson, J. Dardanelli, E.Guevara, and S. Meira. 2001. A linked-modeling framework to estimate maize production risk associated with ENSO-related climate variability in Argentina. *Agricultural and Forest Meteorology* 107: 177–192.

Letson, D., I. Llovet, G. Podestá, F. Royce, V. Brescia, D. Lema, and G. Parellada. 2001. User perspectives of climate forecasts: crop producers in Pergamino, Argentina. *Climate Research* 19: 57–67.

Grondona, M.O., G.P. Podestá, M. Bidegain, M. Marino and H. Hordij. 2000. A stochastic precipitation generator conditioned on ENSO phase: a case study in southeastern South America. *Journal of Climate*. 13: 2973–2986.

Podestá, G.P., C. D. Messina, M.O. Grondona and G.O. Magrin. 1999. Associations between grain crop yields in central-eastern Argentina and El Niño-Southern Oscillation. *Journal of Applied Meteorology* 38: 1488–1498.

Podestá, G.P. 1999. Tracking El Niño for informed policymaking. IAI's current and future contributions to El Niño research. InterAmerican Institute for Global Change Research, 1997-98 Annual Report.

Podestá, G.P., D. Letson, J. Jones, C. Messina, F. Royce, R. A. Ferreyra, I. Llovet, J. Hansen, J.J. O'Brien and D. Legler. 2001. Experiences in Application of ENSO-related Climate Information in the Agricultural Sector of Argentina. IRI International Forum on Climate Prediction, Agriculture and Development, Palisades, New York, 26-28 April 2000. Report IRI-CW/00/1, pp. 217-221.

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Jagtap, S.S., J.W. Jones, P. Hildebrand, D. Letson, J.J. O' Brien, G.P. Podestá, F. Zazueta and D. Zierden. 2002, Responding to stakeholders' demands for climate information: from research to practical applications in Florida. *Agricultural Systems* 74: 415-430.

D. Synergistic activities

Funding from NSF's Methods and Models for Integrated Assessment initiative made Dr. Podestá aware of the need to improve communication between social and natural scientists. As a result, he has served as scientific coordinator of the Summer Institute on Interdisciplinary Science in the Americas, a joint venture between the Univ. of Miami and the Inter-American Institute for Global Change Research (IAI) supported by NSF. The Institute's goal is to foster effective collaboration among early-career natural and social scientists in the Americas. Details can be found at http://www.rsmas.miami.edu/IAIUM.

E. Collaborators & Other Affiliations

Collaborators

Mario Bidegain	Dir. de Meteorologia, Uruguay	Carlos Lentini	University of Miami
Edmo Campos	Univ. of São Paulo, Brazil	David Letson	University of Miami
Julio Dardanelli	INTA, Argentina	Ignacio Llovet	Univ. of Belgrano, Argentina
R. Andres Ferreyra	Univ. of Florida	Graciela Magrin	INTA, Argentina
Peter Glynn	University of Miami	Santiago Meira	INTA, Argentina
Martin Grondona	Zeneca Semillas, Argentina	Carlos Messina	Univ. of Florida
Edgardo Guevara	INTA, Argentina	James J. O'Brien	The Florida State University
James Hansen	IRI, Columbia Univ.	Fred Royce	Univ. of Florida

Graduate & Post-Doctoral Advisors

Francis Williams (graduate)	Univ. of Miami (retired)	Wayne Esaias (postdoctoral)	NASA Goddard Space Flight Center
Otis Brown (postdoctoral)	Univ. of Miami		

Thesis Advisor & Postgraduate-Scholars sponsor

Dr. Ajoy Kumar	Univ. of Miami	Andres Ferreyra, M.S.	Univ. of Córdoba, Argentina
Dr. Martin Grondona	Zeneca, Argentina	Carlos Messina, M.S.	Univ. of Buenos Aires, Argentina
Dr. Manuel Arbelo	Univ. La Laguna, Canary Is. Spain		

RAJAGOPALAN BALAJI

A. PROFESSIONAL PREPARATION

Kurukshetra University, India, B. Tech. (with honors) in Civil Engineering, 1989
Indian Statistical, Calcutta, India, M. Tech. (with honors) in Operations Research and Quality Reliability, 1991
Utah State University, Logan, UT, USA, PhD in Civil Engineering (Stochastic Hydroclimatology), 1995

B. APPOINTMENTS

2000 (Aug) - present	Assistant Professor, Department of Civil, Environmental and Architectural Engineering, University of Colorado at Boulder.
2001 (June) – present	Fellow, Co-operative Institute for Research in Environmental Sciences (CIRES, University of Colorado, Boulder, CO.
2000 (Aug) – present	Adjunct Associate Research Scientist, International Research Institute (IRI), Lamont-Doherty Earth Observatory (LDEO), Columbia University, NY
1997 (July) – present	Research Assistant Professor, Utah Water Research Laboratory, Utah State University, Logan, UT
1999 (July) – 2000 (August)	Associate Research Scientist, International Research Institute (IRI), Lamont-Doherty Earth Observatory (LDEO), Columbia University, NY
1997 (July) – 1999 (June)	Associate Research Scientist, Lamont-Doherty Earth Observatory (LDEO), Columbia University, NY
1995 (April) – 1997(June)	Post-Doctoral Research Scientist, Lamont-Doherty Earth Observatory (LDEO), Columbia University, NY
1991 (Oct) – 1995 (April)	Graduate Research Assistant, Utah Water Research Laboratory, Utah State University, Logan, UT

C. HONORS AND AWARDS

Distinguished Utah State University Dissertation in Engineering: 1993-1995. Utah State University nomination for the Council of Graduate Schools Distinguished Dissertation Award.

Honorable mention, 1996 Award for the Outstanding Water Resources Dissertation in the field of Engineering and Physical Sciences,The Universities Council on Water Resources.

Nominated for the 1996 Lorenz G. Straub award for the most meritorious thesis in hydraulics and hydrology and finished in the top three.

Young Researcher award: 2003. Department of Civil Environmental and Architectural, University of Colorado, Boulder, CO.

D. RESEARCH INTERESTS

Stochastic Hydrology and Hydroclimatology; Nonparametric functional estimation techniques (probability density Functions, regression, scenarios generation, forecasting); Understanding low frequency climate variability and its signatures on regional hydrology; Incorporating climate information in water resources/hydrologic decision making; Understanding spatio-temporal variability in Indian summer monsoon; Stochastic modeling of hurricane tracks; Nonlinear Dynamics - recovering dynamics from data; Bayesian techniques for optimal combination of information from multiple sources and decision making.

E. PUBLICATIONS

(i) Publications most closely related to the proposed project

Young-Il Moon, B. Rajagopalan, and U. Lall., Estimation of Mutual Information Using Kernel Density Estimators, Physica Review E, 52(n3B), 2318-2321, 1995.

Rajagopalan, B., U.Lall and D.G. Tarboton, A Nonhomogeneous Markov Model for Daily Precipitation Simulation, ASCE, Journal of Hydrologic Engineering, 1(1), 33-40, 1996.

Rajagopalan, B., U. Lall, and M. A. Cane, Anomalous ENSO occurrences: an alternate view, Journal of Climate, 10(9), 2351-2357,1997.

Rajagopalan, B., and U. Lall, Nearest Neighbor Local Polynomial Estimation of Spatial Surfaces, Spatial Interpolation Comparison Contest 1997, Journal of Geographic Information and Decision Analysis, 2(2), 48-57, 1998.

Rajagopalan, B., and U. Lall, A Nearest Neighbor Bootstrap Resampling Scheme for Resampling Daily Precipitation and other Weather Variables,Water Resources Research, 35(10), 3089-3101, 1999.

Saouma, V., E. Hansen, B. Rajagopalan, Statistical and 3D Nonlinear Finite Element Analysis of Schlegeis Dam, *Proceedings of the Sixth ICOLD Benchmark Workshop on Numerical Analysis of Dams*, Salzburg, Austria, Oct 17 - 19, 2001

Rajagopalan, B., U. Lall, and S. Zebiak, Optimal Categorical Climate Forecasts through Multiple GCM Ensemble Combination and Regularization, Monthly Weather Review, 130, 1792 – 1811, 2002

Neuman, D., B. Rajagopalan and E. Zagona, A regression model for daily maximum stream temperature (in press) ASCE *Journal of Environmental Engg,* 2002

Yates, D., S. Gangopadhyay, B. Rajagopalan, and K. Strzepek, A nearest neighbor bootstrap technique for generating regional climate scenarios for integrated assessments Water Resources Research, 39(7), 1199, 2003.

(ii) Other significant publications

KrishnaKumar, K., B. Rajagopalan, and M.A. Cane, On the weakening relationship between the monsoon and ENSO, *Scienc*e, 284, 2156-2159, 1999.

Rajagopalan, B., E. Cook, U. Lall, B. Ray, Temporal Variability of ENSO-drought association in the South West US, Journal of Climate, 13, 4244-4255, 2000.

Tourre, Y., B. Rajagopalan, and Y. Kushnir, Dominant patterns of climate variability in the Atlantic ocean region during the last 136 years, Journal of Climate, 12, 2285-2289,1999.

Phillips, J., B. Rajagopalan, M. Cane, and C. Rosenzweig, The Role of ENSO in determining climate and maize yield variability in the US cornbelt, International Journal of Climatology, 19, 877-888,1999.

Rajagopalan, B., M. E. Mann and U. Lall, A multivariate frequency-domain approach to long-lead climatic forecasting, Weather and Forecasting, 13(1), 58-74, 1998.

F. SYNERGISTIC ACTIVITIES

Member, The American Geophysical Union

Member, Precipitation Committee, AGU Hydrology section.

Reviewer, Water Resources Research, Science, Geophysical Research Letters, Journal of Hydrologic Engineering, Journal of Climate, Tellus, NSF, NOAA and NASA proposals.

Organized a session titled *Low frequency climate variability signatures on regional hy drometeorological variables - implications to hydrologic forecasting and planning* at the Spring meeting of AGU, Boston, May, 1998.

Organized a session titled *In*corporating *climate variability information in water resources decision making",* at the Fall AGU, San Fransisco, Dec 2002.

G. COLLABORATORS & OTHER AFFILIATIONS

(i) Collaborators

Clark, M., CIRES/Univ. of Colorado at Boulder; *Kushnir, Y.,* Columbia Univ. at NYC; *K. Krishna Kumar,* Indian Institute of Tropical Meteorology, Pune, India; *Lall U.,* Columbia Univ. at NYC; *Ray, A., CDC-NOAA/*Univ. of Colorado at Boulder; *Strzepek, K.,* Univ. of Colorado at Boulder; *Zagona, E.,* CADWES/Univ. of Colorado at Boulder; *Zebiak, S.,* IRI/Columbia Univ. at NYC;

(ii) Graduate and Postdoctoral Advisors

Upmanu Lall, Columbia University, NY, *Mark Cane,* Columbia University, NY.

(iii) Theses Advised

David Newmann, CADSWES, University of Colorado, Boulder*, CO,*2001

James Prairie, CADSWES, University of Colorado, Boulder, CO, 2002

(iv)Advisors for Research Associates

Subhrendu Gangopadhyay, University of Colorado, Boulder, CO, 2002 -

Krishna Kumar, Visiting Fellow, CIRES/University of Colorado, Boulder, CO 2003-2004

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(i) Professional Preparation

University of North Carolina at Chapel Hill	Geography and History	B.A., 1976
University of North Carolina at Chapel Hill	Economic Geography	M.A., 1980
University of North Carolina at Chapel Hill	Geography-Climatology	Ph.D., 1984

(ii) Appointments

2001-date Director, Penn State Institutes of the Environment, The Pennsylvania State University
1999-date Professor of Geography and Earth System Science and Member of the Graduate School, also, Courtesy Professor of Agronomy, The Pennsylvania State University
1997-1998 Associate Professor of Geography and Earth System Science and Member of the Graduate School, The Pennsylvania State University.
1996-1998 Interim Director, National Institute for Global Environmental Change (NIGEC)–U.S. Department of Energy (located at the University of California at Davis).
1993-1997 Associate Professor of Agricultural Meteorology, Graduate Faculty Fellow, and Adjunct Associate Professor of Geography, University of Nebraska-Lincoln and University of Illinois--Champaign-Urbana.
1992-1997 Director, Great Plains Regional Center for Global Environmental Change (located at the University of Nebraska-Lincoln)
1991-1993 Assistant Professor of Agricultural Meteorology, University of Nebraska-Lincoln and Adjunct Assistant Professor of Geography, University of Illinois--Champaign-Urbana.
1987-1991 Fellow, Climate Resources Program, Resources for the Future (RFF), Adjunct Assistant Professor of Geography, University of Illinois--Champaign-Urbana and Adjunct Assistant Professor of Agricultural Meteorology, Univ. of Nebraska-Lincoln.
1987 Professional Scientist, Climate and Meteorology Section, Illinois State Water Survey, Champaign, IL and Adjunct Assistant Professor of Geography, University of Illinois- Champaign-Urbana.
1984-1986 Associate Professional Scientist, Climate and Meteorology Section, Illinois State Water Survey, Champaign, IL and Adjunct Assistant Professor of Geography, University of Illinois-Champaign-Urbana.

(iii)a. Five Relevant Publications

Easterling, W. E. 1997. Why regional studies are needed in support of full-scale integrated assessment modeling of global change processes. *Global Environmental Change,* Vol. 7, No. 4, pp 337-356.

Easterling, W. E., A. Weiss, C. Hays and L. Mearns. 1998 Spatial scales of climate information for simulating wheat and maize productivity: the case of the U. S. Great Plains. *Agricultural and Forest Meteorology*, 90: 51-63.

Easterling, W., L. O. Mearns, and C. Hays. 2001. Comparison of Agricultural Impacts of Climate Change Calculated from High and Low Resolution Climate Model Scenarios: Part II. Accounting for Adaptation and CO_2 Direct Effects. *Climatic Change*, 51: 173-197.

Polsky, Colin and William E. Easterling. 2001. A Methodology for a Multi-Scale Analysis of Land Use with an Application to the U.S. Great Plains. *Agriculture, Ecosystems and the Environment,* 85: 133-144.

Easterling, William E., Netra Chhetri, and Xianzeng Niu. 2003. Improving the Realism of Modeling Agronomic Adaptation to Climte Change: Simulating Technological Substitution. *Climatic Change* 60: 149-173.

(iii)b Five Other Significant Publications

Easterling, W. E., X. Chen, C. J. Hays, J. R. Brandle and H. Zhang. 1996. Improving the validation of model-simulated crop yield response to climate change: An application to the EPIC model. *Climate Research*, 6: 263-273. (Journal Series Paper No. 11339).

Easterling, W. E., C. Polsky, S. Aryeetey-Attoh, D. Goodin, M. Mayfield, and B. Yarnal. 1998. Changing Places, Changing Emissions: the Cross-Scale Reliability of Greenhouse Gas Emission Inventories in the U. S. *Local Environment*, 3(3): 247-262

Easterling, William E., James R. Brandle, Qinfeng Guo, Cynthia J. Hays and David S. Guertin. 2001. SEEDSCAPE--A Model for Simulating Biodiversity in Great Plains Ecosystems. *Ecological Modeling,* 140: 163-176.

Mearns, L. O., W. Easterling, C. Hays. 2001. Comparison of Agricultural Impacts of Climate Change Calculated from High and Low Resolution Climate Model Scenarios: Part I. The Uncertainty of Spatial Scale. *Climatic Change*, 51: 131-172.

Easterling, William E. and Kasper Kok. 2002. Emergent Properties of Scale in Global Environmental Modeling: Are There Any? *Integrated Assessment*, 3(2-3): 233-246.

(iv) Synergistic Activities

Member, Committee on Partnerships in Weather Services, National Research Council, 2001-2002.

Member, Climate and Global Change Working Group, Office of Global Programs, National Oceanic and Atmospheric Administration, 1998-present.

Convening Lead Author, Intergovernmental Panel on Climate Change, Third Assessment Report, Chapter 5: Ecosystems and their Services, 1998-2001.

Member, Scientific Advisory Committee, International Research Institute, Columbia University, 2002-present.

Chair, Panel on the Human Dimensions of Seasonal-to-Interannual Climate Variability, National Research Council, 1997-1999.

(v) Collaborators & Other Affiliations

(a) Collaborators and Co-Editors – *(last 48 months)*

Lenora Bohren, Colorado State University
Tom Downing, Oxford University
John Harrington, Kansas State University
Neal Lineback, Appalachian State University
Linda Mearns, Natl. Center for Atmospheric Res.
William Muraco, University of Toledo
William Parton, Colorado State University
Roland Schultze, University of Natal
B. L. Turner, Clark University
Elizabeth Walter-Shea, Univ. of Nebraska- Lincoln
Greg Carbone, University of South Carolina
Kathy Galvin, Colorado State University
Robert W. Kates, Independent Scholar
Diana Liverman, University of Arizona
Bruce McCarl, Texas A&M University
Dennis Ojima, Colorado State University
Cynthia Rosenzweig, NASA-GISS
Joel Smith, Stratus, Inc.
Colleen Vogel, University of Witswatersrand
Thomas Wilbanks, Oak Ridge Natl Lab.

(b) Graduate and Postdoctoral Advisors: Prof. Barry Moriarty (deceased)

(c) Graduate Students and Post-Doctoral Associates

Emma Archer, Post-Doctoral Associate, University of Capetown.
Xiafen Chen, M.S., 1996, Missouri Dept of Natural Resources
Netra Chhetri, Ph.D ABD, The Pennsylvania State University
Donald Chinery, M. S. ABT, The Pennsylvania State University
Nate Curritt, Ph.D. 2003, The Pennsylvania State University
Brian Dupont, M.S. ABT, The Pennsylvania State University
David Guertin, Post-Doctoral Associate, Middlebury College
Tania Lopez, M.S. 2002, The Pennsylvania State University
Xianzeng Niu, Ph.D. ABD, The Pennsylvania State University
Kelly Pollard, M. S, ABT, The Pennsylvania State University
Colin Polsky, M.S. 1998, Ph.D, 2002,. Student, The Pennsylvania State University
Elena Tsvetsinskaya, Ph.D., 1999, Boston University
Kim Zielinski, M.S., ABT, The Pennsylvania State University

BIOGRAPHICAL SKETCH: RICHARD W. KATZ

Home Page: *http://www.esig.ucar.edu/HP_rick.html*

a. Professional Preparation

University of Virginia	Mathematics	BA, 1970
Pennsylvania State University	Statistics	PhD, 1974
National Center for Atmospheric Research	Postdoctoral Fellow	1975-1976

b. Appointments

Senior Scientist, Environmental and Societal Impacts Group, National Center for Atmospheric Research (Scientist III, 1984-1994; Scientist II, 1983-1984), 1994-present

Research Associate and Assistant Professor (Research), Department of Atmospheric Sciences and Department of Statistics, Oregon State University, 1979-1983

Scientist I, Environmental and Societal Impacts Group, National Center for Atmospheric Research, 1976-1979

Statistician, Center for Climatic and Environmental Assessment, National Oceanic and Atmospheric Administration, 1974-1975

c. Publications

(i) Five closely related

Katz, R.W., M.B. Parlange, and C. Tebaldi, 2003: Stochastic modeling of the effects of large-scale circulation on daily weather in the southeastern U.S. *Climatic Change*, **60**, 189-216.

Katz, R.W., 2002: Techniques for estimating uncertainty in climate change scenarios and impact studies. *Climate Research*, **20**, 167-185.

Katz, R.W., and A.H. Murphy (editors), 1997: *Economic Value of Weather and Climate Forecasts*. Cambridge University Press, Cambridge, UK, 237 pp.

Katz, R.W., 1992: Role of statistics in the validation of general circulation models. *Climate Research*, **2**, 35-45.

Brown, B.G., R.W. Katz, and A.H. Murphy, 1986: On the economic value of seasonal precipitation forecasts: The fallowing/planting problem. *Bulletin of the American Meteorological Society*, **67**, 833-841.

(ii) Five other significant

Katz, R.W., 2002: Sir Gilbert Walker and a connection between El Niño and statistics. *Statistical Science*, **17**, 97-112.

Parlange, M.B., and R.W. Katz, 2000: An extended version of the Richardson model for simulating daily weather variables. *Journal of Applied Meteorology*, **39**, 610-622.

Katz, R.W., 1996: Use of conditional stochastic models to generate climate change scenarios. *Climatic Change*, **32**, 237-255.

Katz, R.W., and M.B. Parlange, 1993: Effects of an index of atmospheric circulation on stochastic properties of precipitation. *Water Resources Research*, **29**, 2335-2344.

Glantz, M.H., R.W. Katz, and N. Nicholls (editors), 1991: *Teleconnections Linking Worldwide Climate Anomalies: Scientific Basis and Societal Impact*. Cambridge University Press, Cambridge, UK, 535 pp.

d. Synergistic Activities

Principal Investigator, NCAR Geophysical Statistics Project, 1993-2004 (promoting collaboration between statistics and geophysical science)

e. Collaborators & Other Affiliations

(i) Collaborators

Brush, G. (Johns Hopkins University)
Ehrendorfer, M. (University of Innsbruck)
Naveau, P. (University of Colorado)
Parlange, M.B. (Johns Hopkins University)
Salas, J.D. (Colorado State University)
Winkler, R.L. (Duke University)

(ii) Graduate and postdoctoral advisors

Haight, F.A. (University of California, Irvine)

(iii) Thesis advisor and postgraduate-scholar sponsor

None

BIOGRAPHICAL SKETCH
Elke U. Weber

Department of Psychology and Graduate School of Business
Columbia University
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New York, NY 10027

Telephone: 212-854-4427
SSN: 012-62-1030
Date of Birth: April 6, 1957

Professional Preparation

1980	York University, Honors B.A., Summa cum Laude, Psychology
1984	Harvard University, M.A., Ph.D., Psychology (Behavior and Decision Analysis)
1984 - 1985	Natural Science and Engineering Research Council of Canada Post-Doctoral Fellow, Department of Psychology, University of Toronto.

Appointments

1999 -	Professor, Department of Psychology and Graduate School of Business, Columbia University
2000 -	Founder and Co-Director, Center for the Decision Sciences, Columbia University
2002 -	Academic Director, Jerome A. Chazen Institute of International Business, Columbia University
2002	Fellow, Wissenschaftskolleg (Institute for Advanced Study), Berlin, Germany
1995 - 1999	Professor, Department of Psychology, The Ohio State University
1985 - 1988	Assistant Professor, Department of Psychology, University of Illinois at Urbana-Champaign.
Winter 1995	Professor of Organizational Behavior and Leadership, Guest Chair, Graduate School of Corporate Management (WHU), Koblenz, Germany
1992 - 1993	Fellow, Center for Advanced Studies in the Behavioral Sciences, Stanford
1988 - 1995	Assistant and Associate Professor of Behavioral Science, Center for Decision Research, Graduate School of Business, University of Chicago

Selected Publications Most Related to Proposed Project

Weber, E. U. (1997). Perception and expectation of climate change: Precondition for economic and technological adaptation. In M. Bazerman, D. Messick, A. Tenbrunsel, & K. Wade-Benzoni (Eds.), Psychological Perspectives to Environmental and Ethical Issues in Management (pp. 314-341). San Francisco, CA: Jossey-Bass.

National Research Council Report: Making Climate Forecasts Matter, Stern, P. C., & Easterling, W. E. (Eds.), (1999), Washington, DC: National Academy Press. (E. U. Weber was member of writing panel and contributor to Chapter 4: "Making Climate Forecasts More Useful").

Windschitl, P. D., & Weber, E. U. (1999). The interpretation of 'likely' depends on context, but '70%' is 70%, right? The influence of associative processes on perceived certainty. Journal of Experimental Psychology: Learning, Memory, and Cognition, 25, 1514-1533.

Weber, E. U., Shafir, S., & Blais, A.-R. (in press). Predicting risk-sensitivity in humans and lower animals: Risk as variance or coefficient of variation. Psychological Review.

Loewenstein, G. F., Weber, E. U., Hsee, C. K., Welch, E. (2001). Risk as feelings. Psychological Bulletin, 127, 267-286.

Other Significant Publications

Weber, E. U., Baron, J., & Loomes, G. (Eds.) (2001). Conflict in decisions. Cambridge University Press.

Weber, E. U., Blais, A.-R., & Betz, N. (2002). A domain-specific risk-attitude scale: Measuring risk perceptions and risk behaviors. Journal of Behavioral Decision Making, 15, 263-290.

Weber, E. U. & Hsee, C. K. (1998). Cross-cultural differences in risk perception but cross-cultural similarities in attitudes towards risk. Management Science, 44, 1205-1217.

Weber, E. U., Böckenholt, U., Hilton, D. J., & Wallace, B. (2000). Confidence judgments as expressions of experienced decision conflict. Risk Decision and Policy, 5, 1-32.

Weber E. U., & Hsee, C. K. (1999). Models and mosaics: Investigating cross-cultural differences in risk perception and risk preference. Psychonomic Bulletin & Review, 6, 611-617.

Synergistic Activities

Panel Member , Human Dimensions of Global Change, National Academy of Sciences (1997 – 2003); President, Society for Judgment and Decision Making (1997-98); Panel Member, Human Dimensions of Seasonal-to-Interannual Climate Variability, National Academy of Sciences: Publication of book "Making Climate Forecasts Matter" (1997 – 1999); President, Society for Mathematical Psychology (2000-01)
Co-Editor, Risk Decision and Policy; Editorial Boards: American Journal of Psychology; Journal of Mathematical Psychology, Organizational Behavior and Human Decision Processes
Ad-Hoc Reviewer for over 20 other professional journals, Panel Member for NSF:Decision, Risk, and Management Science (1995-96): Ad-Hoc Reviewer for NSF:Economics, NSF:Social Psychology; NSF: Human Cognition and Perception; NSF: Methodology, Measurement, and Statistics programs; National Institute of Mental Health (NIMH); US Department of Commerce: NOAA; Israeli National Science Foundation; Hong Kong Research Grants Council

Collaborators and Other Affiliations

Collaborators and Co-Editors: Daniel Ames (Columbia U.), Jon Baron (U. of Pennsylvania), Nancy Betz (Ohio State U.), Ann-Renee Blais (Defense Canada, Toronto), Thomas Dietz (George Mason U.), Nives Dolsak (Indiana U.), Ido Erev (Technion, Haifa, Israel), Frank Flynn (Columbia U.), Ralph Hertwig (Max Planck Institute, Berlin), Christopher Hsee (U. of Chicago), George Loewenstein (Carnegie Mellon), Graham Loomes (U. of Newcastle, UK), Joe Nunes (USC), Elinor Ostrom (Indiana U.), Sharoni Shafir (Hebrew University, Israel), Paul Stern (National Academy of Science), Susan Stonich (UC Santa Barbara), Martin Weber (U. of Mannheim, Germany).
Graduate and Postdoctoral Advisors: R. Duncan Luce (Harvard and UC Irvine, Emeritus), Bennet B. Murdock (U. of Toronto, Emeritus)

Primary Thesis Advisor and Postgraduate-Scholar Sponsor

Graduate Students (current position): William Bottom (Washington University), Ann-Renee Blais (Defense Canada, Toronto), Veronique D'Estaintot (ESSEC, France), Linda Hynan (Baylor), Patricia Lindemann (Barnard), Yuri Tada (NASA Ames) [Total: 6]
Postdocs (current position): Daniel Ames (Columbia U.), Dan Goldstein (Columbia U.), Ralph Hertwig (Max Planck Institute, Berlin), Patricia Lindemann (Barnard), Sabine Marx (International Research Institute for Climate Prediction). [Total: 5]

Biographical Sketch

Kenneth Broad

Division of Marine Affairs and Policy
Rosenstiel School of Marine & Atmospheric Science, University of Miami
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A. Professional Preparation

Institution	***Major or Area***	***Degree and Year***
Undergraduate:		
University of California, Santa Barbara	Literature	BA, 1989
Graduate:		
Rosenstiel School, Univ. of Miami	Marine Affairs	MA, 1992
Columbia University	Anthropology	PhD, 1999
Postdoctoral:		
Columbia University, Lamont Doherty Earth Observatory (International Research Institute for Climate Prediction)	Applied Anthropology	1999-2000

B. Appointments

3/01-present	Research Assistant Professor	Rosenstiel School, Univ. of Miami
3/01-present	Adjunct Associate Research Scientist	Columbia University, Lamont Doherty Earth Observatory
6/00–3/01	Associate Research Scientist	Columbia University, Lamont Doherty Earth Observatory

C. Publications

Broad, K., A.P. Pfaff, and M.H. Glantz. 2002. Effective & Equitable Dissemination of Seasonal-to-Interannual Climate Forecasts: Policy Implications from the Peruvian fishery during El Niño 1997-98. *Climatic Change* **54**(4):415-438.

Agrawala, S. and K. Broad. 2002. Technology transfer perspective on climate forecast applications. In *Research in Science and Technology Studies: Knowledge and Technology Transfer*, edited by Marianne De Laet, Knowledge and Society series, vol. **13**: 45-69.

Broad, K. 2002. Producing & Using Climate Forecasts: Bridging the Supply and Demand Gap in Climate Forecast Production and Use, In *La Niña and Its Impacts: Facts and Speculation*, edited by M. H. Glantz. Tokyo: Public Affairs Section, United Nations University Press, pp. 246-252.

Bakun, A. and K. Broad (Editors). 2002. *Climate and Fisheries: Interacting Scales, Paradigms, and Policy Approaches*. New York: Columbia Earth Institute and International Research Institute for Climate Prediction, IRI Publication-IRI-CW/02/1, 70pp.

Agrawala, S., K. Broad, and D.H. Guston, 2001. Integrating Climate Forecasts and Societal Decision Making: Challenges to an Emergent Boundary Organization. *Science, Technology, and Human Values*, Vol. **26**, no. 4, 454-477.

Broad, K., and S. Agrawala 2000. The Ethiopia Food Crisis: Uses and Limits of Climate Forecasts. Science, Vol 289:1693-1694.

Broad, K. 2000. El Niño and the Anthropological Opportunity. Practicing Anthropology, Vol 22, No. 4:20-23

Broad, K., 2000. Practical and Conceptual Challenges to Climate Forecast Applications. In Proceedings from the International Forum on Climate Prediction, Agriculture and Development, Palisades, NY, April 26-28.

Carr, M. E., and K. Broad. 2000. "Satellites, society, and the Peruvian fisheries during the 1997-98 El Niño," in Satellites, Oceanography and Society. In D. Halpern (ed.). New York: Elsevier Science B.V. pp. 171-191.

Pfaff, A., K. Broad, and M. G. Glantz. 1999. Who benefits from Climate Forecasts? Nature 397:645-646.

D. Synergistic activities

Dr. Broad was a research associate for a project on the use of climate forecasts for fisheries management in Latin America which was funded by NSF's Methods and Models for Integrated Assessment program (Dr. Sarah Meltzoff, PI). This study necessitated the integrated analysis of climatic, ecological, behavioral, and policy data over a range of spatial and temporal scales. Results from this project have led to several publications (see above), and expansion of work into Peru where recommendations resulting from this study are being used to guide the design of an improved climate information dissemination strategy by the government. This strategy is intended to minimize inequities and obstacles to information use identified in the NSF supported research. Dr. Broad was also a co-PI for a NSF Biocomplexity Incubation Activity which addressed the integrated modeling of parameters relevant to the selection, management, and societal implications of Marine Protected Areas in the Bahamas. Three workshops were held to illicit ideas from academics and Bahamian stakeholders regarding selection of appropriate quantitative tools and empirical studies in support of an integrated modeling effort. Dr. Broad is a co-pi of a recently awarded NSF Biocomplexity award intended to model the optimal design of a marine reserve network in the Bahamas, taking into account sociocultural, economic, biological, and oceanographic variables.

E. Collaborators & Other Affiliations

Collaborators

Agrawala, Shardul	Columbia Univ.	Meltzoff, Sarah	Univ. of Miami
Brumbaugh, Daniel	American Museum of Natural History	Olson, Donald	Univ. of Miami
Carr, Mary-Elena	JPL-NASA	Orlove, Benjamin	UC Davis
DeSalle, Robert	American Museum of Natural History	Palumbi, Steve	Harvard Univ.
Glantz, Michael	NCAR	Pfaff, Alexander	Columbia Univ.
Guston, David	Rutgers Univ.	Podesta, Guillermo	Univ. of Miami
Hastings, Alan	UC Davis	Stoffle, Richard	Univ. of Arizona
Kramer, Phillip	Univ. of Miami	Vayda, Andrew Peter	Rutgers Univ.
Letson, David	Univ. of Miami	Zapata, Antonio	Universidad Catolica (Peru)

Graduate & Post-Doctoral Advisors

Comitas, Lambros	Columbia University
Bond, George	Columbia University
Cane, Mark	Columbia University
Glantz, Michael	NCAR
Orlove, Benjamin	UC Davis

Thesis Advisor & Postgraduate-Scholars sponsor

Lowe, Marie	Columbia University	Rotman, Federico	University of Miami
Vedwan, Neeraj	University of Georgia	Rice, Michelle	Columbia University
Taddei, Renzo	Columbia University		

Biographical Sketch

Hilda Maria Herzer
CENTRO: Estudios Sociales y Ambientales
Av. Roque Saenz Peña 1142, Buenos Aires 1035. Argentina
Telephone: 5411 43827040, E-mail: centro@datamarkets.com.ar

A. Professional Preparation

Institution	***Major or Area***	***Degree and Year***
Undergraduate:		
University of Buenos Aires, Argentina School of Philosophy and Letters	Sociology	Licentiate in Sociology.1967
Graduate:		
New York University. Graduate School of Arts and Sciences	Sociology	PhD 1971

B. Last Appointments

1988- Present	Regular professor. Urban Sociology .	Social Sciences School, University of Buenos Aires.
1990-Present	Researcher and Academic Director	CENTRO
1992-Present	Regular Professor.	Graduate School. Masters on Habitat and Housing. National University of Mar del Plata and Rosario, Argentina.

C. Publications

- "Flooding in the Pampean Region of Argentina: The Salado Basin" Herzer H. in Building Safer Cities. The Future of Disaster Risk. Kreimer et al. World Bank. Disaster Management Series 2003.
  "La participación de las organizaciones sociales" Herzer Hilda in Inundaciones en el área metropolitana de Buenos Aires. Kreimer et al . World Bank 2001.
- "El impacto ambiental de las inundaciones" Herzer H y Clichevsky N in Inundaciones en el área metropolitana de Buenos Aires. Kreimer et al . World Bank 2001.
- "Perspectiva histórica: las inundaciones en Buenos Aires" Herzer H y Clichevsky N in Inundaciones en el área metropolitana de Buenos Aires. Kreimer et al . Banco Mundial 2001.
- "Floods in Buenos Aires: Learning from the past". Herzer H y Clichevsky N. in Managing Disaster Risk in Emerging Economies Kreimer A. y Arnold M. Disaster Risk Management Series N.2, The World Bank. USA. 2000.
- "Grandes inundaciones en la ciudad de Pergamino: extraordinarias pero recurrentes. Análisis de un proceso de vulnerabilidad progresiva" H. Herzer et al. Revista REALIDAD ECONOMICA, Instituto Argentino para el Desarrollo Económico, N. 175. Octubre-Noviembre 2000 Buenos Aires. Pags. 92-118.
- "Predicción e imprevisión. Ese es el dilema social". Caputo, Celis, Gurevich, Herzer y Petit en Desastres y Sociedad. Revista semestral de la red de estudios sociales en prevención de desastres en América Latina. Lima, Perú. 1999.
- "Buenos Aires: pobreza, inundación y desastre" Herzer H. en Sección 3, págs 151-172, in Ciudades Latinoamericanas. Modernización y Pobreza. Ziccardi A y Reyes Luján S. UNAM, Programa Universitario de Estudios sobre la Ciudad. México D.F. México .1998
- "Degradación y desastres. Tres ejemplos de Argentina para reflexionar" Hilda Herzer & Raquel Gurevich in Realidad Económica. Revista de Economía .Instituto Argentino de Desarrollo Económico. 1996. Buenos Aires, Argentina.

- "Degradación y Desastres. Parecidos y Diferentes. Tres casos argentinos para pensar y algunas dudas para plantear." Hilda Herzer y Raquel Gurevich Chapter 5 in M.A.Fernández (ed) Ciudades en riesgo. Degradación Ambiental, Riesgos Urbanos y Desastres. LA RED.Red de estudios Sociales en Prevención de desastres en América latina. Perú 1996.

D. Synergistic activities

Development of the following projects related to the proposal, as director of research teams made up of social (geographers, sociologists, anthropologists,) and biological scientists

2003-06 Risk management and climate change. National Agency for Scientific and Technological Promotion- CENTRO

2001-02 Climate variability perception CENTRO-AACREA- University of Miami.

1999-2004 ENSO Disaster Risk Management in Latin America: A Proposal for the Consolidation of a Regional Network for Comparative Research, Information and Training from a Social Perspective. IAI Science. Collaborative Research Network Program by the Network for Social Studies on Disaster Prevention in Latin America: LA RED. Co-Pi .CENTRO

2001-2003 Disasters and society in Argentina. Production of a data base and its analysis. Conicet

1996-1999 Environmental Degradation, Urban Risk and Disasters in Latin America. (Case Study : Pergamino, Argentina) National Agency for Scientific and Technological Promotion - CENTRO

1996-98. Integrated Research Project. City Program. Urban policy and progressive vulnerability. Floods in the city of Buenos Aires. Research Institute, School of Social Sciences, University of Buenos Aires.

1995-1997.Floods in the city of Buenos Aires. Their treatment at the City Council. University of Buenos Aires

E. Collaborators & Other Affiliations

Ricardo Jordan. ECLAC Chile

Jorge Morello. Centro de Estudios Avanzados. UBA.

Nora Clichevsky. Conicet. Fac. de Filosofia y Letras. Geografía. UBA

Fernando Brunstein. Univ de Belgrano. Buenos Aires.

Papadopulous, Jorge. Universidad ORT. Montevideo. Uruguay

Andrés Velásquez, Observatorio Sismológico del Sur Occidente: OSSO, Universidad del Valle, Colombia.

Allan Lavell, Secretaría General de la Facultad Latinoamericana de Ciencias Sociales: FLACSO, Costa Rica.

Othón Cevallos, Escuela Politécnica Nacional: EPN, Ecuador

Virginia García Acosta, Centro de Investigaciones y Estudios Superiores de Antropología Social: CIESAS, México.

Anthony Oliver Smith, Anthropology Department, University of Florida, USA.

Fernando Ramírez, Red de Estudios Sociales en Prevención de Desastres en América Latina, Ciudad de Panamá, Panamá.

Andrew Maskrey, UNDP, Ginebra, Suiza.

Thesis Advisor & Postgraduate-Scholars sponsor

Carla Rodríguez	Univ. of Buenos Aires	Mercedes Di Virgilio	Univ. of Buenos Aires
Sabrina Caceres	Univ of Rosario, Argentina	Ana Nuñez.	Univ. of Mar del Plata Argentina
Andrea Catenazzi	Univ of Buenos Aires		
Gabriela Merlinsky	Univ. of Buenos Aires	Cecilia Arizaga	Univ. of Buenos Aires, Argentina

Total number of postgraduate-scholars advised: 7

Biographical Sketch
DAVID LETSON

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4600 Rickenbacker CSWY
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FAX: 305-361-4675
e-mail: dletson@rsmas.miami.edu
Internet: www.rsmas.miami.edu/divs/maf/people/dletson.html

EDUCATION

B.S. 1983 JAMES MADISON UNIVERSITY, Harrisonburg, Virginia. Bachelor of Science, Magna Cum Laude with distinction. 1979-1983. Double major in economics and English.

Ph.D. 1989 THE UNIVERSITY OF TEXAS AT AUSTIN. Ph.D. in economics, with concentrations in natural resource economics, public finance and mathematical economics. 1983-1989.

APPOINTMENTS

1995-Present ASSOCIATE PROFESSOR, Marine Affairs Division, Rosenstiel School of Marine and Atmospheric Science, Univ. of Miami, 4600 Rickenbacker CSWY Miami, FL 33149. Secondary appointment, Economics Dept. Voice: (305) 361-4083. FAX: (305) 361-4675. E-mail: dletson@rsmas.miami.edu. Internet: www.rsmas.miami.edu/divs/maf/people/dletson.html

11/89-7/95 ENVIRONMENTAL ECONOMIST, Natural Resources and the Environment Division, Economic Research Service, U.S. Department of Agriculture.

CURRENT INTERESTS

Letson specializes in natural resource economics and the economics of regulation. He is part of an interdisciplinary assessment of the value of climate information for southeastern agriculture. He is a member of the Southeastern Climate Consortium, a group of researchers from five universities (Auburn, Florida, Florida State, Georgia and Miami), in the disciplines of meteorology, agricultural engineering, hydrology, economics and anthropology. The Southeastern Climate Consortium receives support from the Office of Global Programs in the National Oceanic and Atmospheric Administration. Letson is also part of a multi-disciplinary team that is assessing possible consequences of climate change for South Florida for the USEPA's National Center for Environmental Research and Quality Assurance.

RELATED PUBLICATIONS

Ferreyra, R.; G. Podestá; C. Messina; D. Letson; J. Dardanelli, E. Guevara and S. Meira 2001. "A Linked-modelling Framework to Estimate Maize Production Risk Associated with ENSO-related Climate Variability in Argentina" *Agricultural and Forest Meteorology*. Vol. 107: 177-92.

Jagtap, S.S.; J.W. Jones, P. Hildebrand, D. Letson, J.J. O'Brien, G. Podestá, F. Zazueta, D. Zierden. 2002. "Responding to Stakeholder's Demands for Climate Information: From Research to Practical Applications in Florida" *Agricultural Systems*. Vol. 74(3): 415-30.

Letson, David and B.D. McCullough 1998. "Better Confidence Intervals: the Double Bootstrap with No Pivot" *American Journal of Agricultural Economics* Vol. 80(3): 552-59. August.

Letson, D.; I. Llovet, G. Podesta, F. Royce, V. Brescia, D. Lema and G. Parellada 2001. "User Perspectives of Climate Forecasts: Crop Producers in Pergamino, Argentina" *Climate Research* Vol. 19(1): 57-67. November.

Letson, D.; G.P. Podestá; C.D. Messina and R.A. Ferreyra "Effect of High Frequency Climatic Variability on the Range and Likelihood of ENSO Forecast Value for Agriculture" Climatic Change, submitted.

Letson, David and B.D. McCullough 2001. "ENSO and Soybean Prices: Correlation without Causality" *Journal of Agricultural and Applied Economics* Vol. 33(3): 513-21.

Letson, D.; J. Hansen; P. Hildebrand; J. Jones; J. O'Brien; G. Podestá; F. Royce and D. Zierden 2001. "Florida's Agriculture and Climatic Variability*" Florida Geographer* Vol. 32(1): 38-57.

Llovet, Ignacio and David Letson. 1999. "Condicionantes Sociales y Modelos Mentales en La Adopción de Información Climática entre Productores Agropecuarios del Norte de La Provincia de Buenos Aires" *Cuadernos del Programa Interdisciplinario de Estudios Agrarios* Vol. 9: 9-54.

Messina, C.D.; David Letson and J.W. Jones. "Tailoring Management of Tomato Production to ENSO Phase at Different Scales in Florida and Puerto Rico" Submitted, *Transactions ASAE*.

Podestá, G.; D. Letson, C. Messina, F. Royce, R. Ferreyra, J. Jones, J. Hansen, I. Llovet, M. Grondona and J. O'Brien. 2002. "Use of ENSO-related climate information in agricultural decision making in Argentina: a pilot experience" *Agricultural Systems*. Vol. 74(3): 371-92.

Podestá, G., D. Letson, J. Jones, C. Messina, F. Royce, R. Ferreyra, I. Llovet, J. Hansen, J. O'Brien and D. Legler. 2000. Experiences in Application of ENSO-related Climate Information in the Agricultural Sector of Argentina, pages 217-221. In: *Proceedings of the International Forum on Climate Prediction, Agriculture and Development*, April 26-28, 2000, Palisades, New York. International Research Institute for Climate Prediction Report IRI-CW/00/1.

RECENT SCIENTIFIC COLLABORATORS

Kenneth Broad (RSMAS), Noel Gollehon (U.S. Dept of Agriculture, Economic Research Service), James W. Jones (Univ. Florida), James W. Hansen (International Research Institute for Climate Change), Mark Harwell (RSMAS), Shrikant Jagtap (Univ. Florida), James O'Brien (Florida State Univ.), Donald Olson (RSMAS), David Zierden (Florida State Univ.).

GRADUATE ADVISOR. Dissertation supervisor: David Kendrick. Economics Dept., Univ. Texas.

GRADUATE STUDENTS ADVISED. Abdulhamid Alkhalifa(Ph.D.), Marcia Cristina Magalhaes de Almeida (Ph.D.), Roberto Cid (Ph.D.), James DeCocq, Helga Dienes, Shara Fisler, Gabriel Rulfo Garcia, William Hinsley, Chauncey Kelly, Christopher Len, Yair Lichtensztajn, Amie Lowe, Kris McFadden, Victoria Myers, Roxanne Nikolaus, Diane Toni Parras, Christopher Petry, Daryl Reed, Jose Antonio Rodriguez, Nadia Sbeih, Joseph Schittone, Rebecca Seidenfeld, John Webb Smith, Carolyn Steve, Roberto Torres, Erica Van Coverden, Arietta Venizelos, and Anne Wakeford. Total=28.

Biographical Sketch

Angel N. Menéndez

Department of Hydraulics and Department of Computer Sciences
Facultad de Ingeniería, Universidad de Buenos Aires
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A. Professional Preparation

Institution	***Major or Area***	***Degree and Year***
Undergraduate:		
University of Buenos Aires, Argentina	Physics	Licenciado en Física, 1975
Graduate:		
Iowa Inst. Hydr. Res., Univ. of Iowa	Hydraulics	Ph.D., 1983
Postdoctoral:		
Iowa Inst. Hydr. Res., Univ. of Iowa	Hydraulics	1983–84

B. Appointments

12/85 - Present	Associate Professor	Facultad de Ingeniería, Univ. Buenos Aires
04/84 – Present	Head of Comput. Hydr. Program	Hydraulics Laboratory, National Institute for Water (INA), Argentina

C. Publications

Menéndez, A.N., Sistema HIDROBID II para simular corrientes en cuencos, *Revista internacional de métodos numéricos para cálculo y diseño en ingeniería*, vol. 6, 1, 1990.

Carreras, P.E., Menéndez, A.N., Mathematical simulation of pollutant dispersion, *Jr. Ecological Modelling*, 52, November, 1990.

Cavaliere, M.A., Menéndez, A.N., Castellano, R., Estudio de las condiciones de agitación por oleaje en un puerto mediante simulación numérica, *Revista internacional de métodos numéricos para cálculo y diseño en ingeniería*, vol. 8, 4, 1992.

Menéndez, A.N., Simulación numérica de la sedimentación en canales de navegación, *Información Tecnológica - Revista Latino-americana*, Vol. 5, Nº 4, 1994.

Menéndez, A.N., Sedimentologic modelling based on the study scale, *Journal of Hydraulic Engineering*, ASCE, Vol. 123, No. 10, Oct. 1997.

Tarela, P.A., Menéndez, A.N., A model to predict reservoir sedimentation, *Lakes and Reservoirs: Research and Management*, 4, 1999.

Tarela, P.A., Menéndez, A.N., Numerical simulation of the wave pattern within a harbour due to ship waves, *International Journal of Computational Fluid Dynamics*, Vol. 16, No. 4, 2002.

Menéndez, A.N., ELEHCA: An expert system for local scour calculations, www.inmac.com.ar, 2000.

Menéndez, A.N., Software systems of the National Institute for Water (INA): EZEIZA V: a one-dimensional hydrodynamic model for flood routing; HIDROBID II: a two-dimensional horizontal hydrodynamic model for tidal-flow problems; MANCHAS: a two-dimensional horizontal pollutant and sediment

transport model; AGRADA: a two-dimensional vertical model for sedimentation in navigation channels.

D. Synergistic activities

Development of educational software (BARRA, CUERDA, DISPERSA, CANAL) for teaching numerical methods for partial differential equations. Collaboration in creating the Master degree in Numerical Simulation and Control, Facultad de Ingeniería, Univ. of Buenos Aires. Participation in a manual and in competitions for high-school students. Participation in discussion groups about development projects with government officials and non governmental organizations.

E. Collaborators & Other Affiliations

Collaborators

Vicente Barros	Univ. of Buenos Aires, Argentina	Alberto Piola	Univ. of Buenos Aires, Argentina
Jorge Codignotto	Univ. of Buenos Aires, Argentina	Andrés Rodriguez	Univ. of Córdoba, Argentina
Carlos Laciana	Univ. of Buenos Aires, Argentina	Mario Nuñez	Univ. of Buenos Aires, Argentina
Gustavo Nagy	Univ. de la República, Uruguay	Carlos Vionnet	Univ. del Litoral, Argentina.
Claudia Natenzon	Univ. of Buenos Aires, Argentina	Susana Vinzón	Universidad Federal de Rio de Janeiro, Brazil

Graduate & Post-Doctoral Advisors

B.R. Ramaprian (graduate & post-doc)	Univ. of Washington (retired)	V.C. Patel (postdoctoral)	Univ. of Iowa

Thesis Advisor & Postgraduate-Scholars sponsor

Graciela Molinari	Technologicall Institute of Buenos Aires), Argentina, ITBA	Carlos Vionnet	INA, Argentina
Ana Olalde	ITBA Aires), Argentina	Fabián Bombardelli	INA, Argentina
María C. Forbes	ITBA	Fabián Navarro	Univ. Buenos Aires, Argentina
Patricia Carreras	INA, Argentina	Pablo Tarela	Univ. Buenos Aires, Argentina
Miguel Cavaliere	INA, Argentina	Mariano Re	INA, Argentina
Martín Marazzi	INA, Argentina	Juan Weber	Univ. of Córdoba, Argentina
Christian Alvarez	Univ. Buenos Aires, Argentina	Evangelina Garavento	Univ. Buenos Aires, Argentina
Marcos Pittau	INA, Argentina	Alejo Sarubbi	Univ. Buenos Aires, Argentina
Martín Kind	Univ. Buenos Aires, Argentina		

Total number of students: 8
Total number of postgraduate-scholars advised: 11

CURRICULUM VITAE
DONALD OLSON

Rosenstiel School of Marine and Atmospheric Science, University of Miami
4600 Rickenbacker Causeway, Miami, FL 33149-1098

PERSONAL

Citizenship:	U.S.A.
Current Academic Rank:	Professor
Primary Department:	Division of Meteorology and Physical Oceanography
Office Telephone:	(305) 361-4074
Fax:	(305) 361-4696
E-mail:	don@rrsl.rsmas.miami.edu
WWW:	http://www.rsmas.miami.edu/divs/mpo/People/Faculty/Olson/

RESEARCH INTEREST

Dr. Olson's interests include ocean circulation dynamics, mesoscale phenomena, theory and observation of ocean frontal zones; drifter and satellite remote sensing studies of the surface circulation, tracer dynamics; processing studies of biophysical interactions and ecosystem modelling.

HIGHER EDUCATION:

University of Wyoming	Physics	B.S., 1974
Texas A&M University	Physical Oceanography	M.S., 1976
Texas A&M University	Physical Oceanography	Ph.D., 1979

EXPERIENCE

Texas A&M University	Graduate Research Assistant	1974 - 1979
	Assistant Research Scientist	1979
University of Miami	Meteorology and Physical Oceanography	
	Assistant Professor	1979 - 1984
	Associate Professor	1984 - 1990
	Professor	1990 - Present
	Associate Director - Undergraduate Marine Science Program	1999 - Present

PUBLICATIONS MOST RELEVANT TO THE PROJECT

Olson, D.B. 2002. Biophysical Dynamics of Ocean Fronts. *The Sea.,* **12**, 187-218.

Lima, I.D., Olson, D.B., Doney, S.C. 2002. Biological response to frontal dynamics and mesoscale

variability in oligotrophic environments: Biological production and community structure 2002, *J. Geophys. Res*., 107(C8), 10.1029/2000JC000393.

Lima, I.D., Olson, D.B, Doney, S.C. 2002. Intrinsic dynamics and stability properties of size-structured pelagic ecosystem models. *J. Plankton Research*, 24, (6) 533-556

Lima, I.D., Olson, D.B. and Doney, S. 2002. Biological Response to Frontal Dynamics and Mesoscale Variability in Oligotrophic Environments: A numerical modeling study. *J. Geophy. Res., 10.1029/2000JC000393,1-21.*

Cowen, R.K., K.M.M. Lwiza, S. Sponaugle, C.B. Limouzy-Paris and D.B. Olson. 2000. Connectivity of marine populations: Open or closed? *Science.,* **287**, 857-859.

Humston, R., J. Ault, M. Lutcavage and D.B. Olson. 2000. Schooling and migration of large pelagics relative to envionmental cues. *Fish. Oceanogr*., **9(2)**, 136 - 146.

Flierl, G., D. Grünbaum, S. Levin and D.B. Olson. 1999. From Individuals to Aggregation: The Interplay between Behavior and Physics. *J. Theor. Bio.*, **196**, 397 – 454.

Cosner, C., D.L. DeAngelis, J.S. Ault and D.B. Olson. 1999. Effects of spatial grouping on the functional response of predators. *Theor. Pop. Bio*., **56(1)**, 65 - 75.

Olson, D.B. 2001 Biophysical Dynamics of Western Transition Zones. Fish. Oceanogr. 10(2), 133-150.

COLLABORATORS & OTHER AFFILIATIONS

M. Aydin	M. Baringer	R. Bleck	J. Browder	J. McCreary
A. Bucklin	P. Calil	S.L. Cavendis	E. Campos	X. Zhu
S. Hooker	J. Cramer	G. Cresswell	C.Davis	D.L. DeAngelis
K. Van Scoy	Y. DuPenhoat	O. Esenkov	A. Ffield	A.L. Gordon
H.A. Figueroa	G. Flierl	S. Garzoli	G.J. Goni	M.E. Lutcavage
D. Grünbaum	P. Hacker	D. Hansen	R. Humston	T. Özgökmen
G.C. Johnson	S. Kamholz	E.C. Kanitz	T.R. Keen	A. Roubicek
J. Kindle	C. Lentini	S. Levin	T. Liu	P. Wiebe
J. Masters	R. Molinari	S.L. Cavendish	S. Ma	
J.M. Morrison	D.L. Musgrave	P. Niiler	B. O'Connor	
V. Coles	G. Reverdin	P. Richardson	T. Rossby	
R. Hood	S.L. Smith	A. Srinivasan	L.D. Talley	
Z. Top	D. Velhote	B.A. Warren	J. Waworuntu	

POSTDOCTORAL ADVISOR

1988 - 1990 Arthur J. Mariano (co-advisor)
1992 - 1995 Raleigh R. Hood
1994 - 1998 Gustavo Goni (co-advisor)

1 December 2003

Curriculum Vita (Summary)

Roger S. Pulwarty. Cooperative Institute for Research in Environmental Sciences/
Climate Diagnostics Center, University of Colorado, Boulder, Colorado 80309-0449

Education

BS Atmospheric Sciences (Hons. 1986). York University

Ph.D. (1994). University of Colorado, Boulder.
Dissertation Title: *"The Annual and Interannual Variability of Convection over the Tropical Americas" Advisors: R.G. Barry and H.R. Riehl*

Research and management experience

06/02-present	Research Scientist III: NOAA/CIRES/Climate Diagnostics Center University of Colorado, Boulder
10/98-05//02	Program Manager. Regional Integrated Sciences and Assessments U.S. Department of Commerce/National Oceanic and Atmospheric Administration. Silver Spring MD. 20910
08/94-09/98	Research Scientist: NOAA/CIRES/Climate Diagnostics Center University of Colorado, Boulder

Professional Activities

Project Manager: Vulnerability Assessment Component: Mainstreaming Adaptation to Climate Change in the Caribbean. GEF/World Bank (2003-2005)
National Research Council Committee on Climate Ecosystems, Infectious Diseases and Health (1999-2001)
NOAA Social Science Advisory Board (2001-2002)
AMS *Committee on Societal Impacts.* Chair
Co-chair U.S. Global Change Research Strategic Plan (2000-2001)
Inter-Agency Water Cycle Sciences Committee (1999-2002)
Chinese-American Frontiers of Science (National Academy of Sciences, 1999)
Editor (Human Dimensions): *Climatic Research (International journal)*
UCAR/IRI Post-doctoral Selection Committee (2001)
AMS National *Committee on Applied Climatology* (1996-1999)
National Science Foundation Science and Technology Centers External Advisory Panel: *Center for Analysis and Prediction of Storms (1996-1999)*

Recent Relevant Publications (by year)

Pulwarty, R., and S. Cohen: 2004: The communication and utilization of research-based information: Moving beyond climate impact assessments. *Global Environmental Change* (submitted)

Pulwarty, R., and J., Eischeid, 2004. Climate and agricultural production in the Caribbean: The Trinidad sugar industry. Caribbean J. Geography *(accepted)*

Pulwarty, R., 2003: Climate and Water in the West: Science, Information and Decisionmaking. *Water Resources Update* **124**, 4-12

Pulwarty, R, 2003: Transboundary Streamflow Changes. In Potter T., and B. Colman. (eds.). Handbook of Weather , Climate and Water: Fundamentals and Principles. McGraw Hill 865-884

Pulwarty, R. and Melis, T., 2001: Climate extremes and adaptive management on the Colorado River. *J. Environmental Management* **63***(3) 307-324*

Wohl, E.,Pulwarty, R., and J. Zhang, 2000: Assessing climate impacts. *Proc. Nat'l Academy of Sciences (USA)* 97 (21): 11141-11142

Comfort, L., Wisner, B., Cutter, S., Pulwarty, R., Hewitt, K., Oliver-Smith, A., Peacock, W., Wiener, J., Fordham, M., and F. Krimgold, 1999: Reframing disaster policy: The global evolution of vulnerable communities. *Environmental Hazards (Policy Forum) 1, 39-44*

Pulwarty, R., Barry, R., Hurst, C., Sellinger, K., and L., Mogollon, 1998: Precipitation on the Venezuelan Andes in the context of regional climate. *Meteorology and Atmospheric Physics* **16***, 217-237*

30 refereed papers and book chapters. One edited book: Hurricanes: Climate and Socio-economic Impacts (Springer, 1997) and one National Research Council committee report Under the Weather: Climate, Ecosystems and Infectious Disease (NAS 2001)

Presentations: Over 50 invited presentations *(excluding professional conferences)* to international, national, interagency, and private sector audiences on climatic impacts, tropical climate and the use of scientific information for policy and applications in vulnerability assessments, water resources, agriculture, and ecosystem management

Biographical Sketch

Miguel Angel Rabiolo

Deputy Director
Servicio Meteorológico Nacional
25 de Mayo 658, Ciudad Autónoma de Buenos Aires 1002, Argentina
Telephone: 54.11.5167 6767, E-mail: rabiolo@meteofa.mil.ar

A. Professional Preparation

Institution	***Major or Area***	***Degree and Year***
Undergraduate:		
University of Buenos Aires, Argentina	Meteorology	Lic. en Ciencias Meteorológicas. 1980

B. Appointments

1980 – Present	Deputy Director	Servicio Meteorológico Nacional
1991- Present	Professor	Escuela Tecnológica de Aeronáutica Profesional

C. Publications

M. Rabiolo. Textbook "Meteorología para Aviadores en el Hemisferio Sur".

E. Sierra, María M. Skansi, Silvia Pérez, C.Villanueva, M.Rabiolo, Silvia Berrios Cáceres. 2002. Desarrollo de un modelo de balance hidrologico seriado para el S.M.N. Under review.

D. Synergistic activities

M. A. Rabiolo is Deputy Director of Argentina's Meteorological Service, and he has responsibility for production of climate information products intended for various climate-sensitive sectors of Argentina.

E. Collaborators & Other Affiliations

Collaborators

Luis Rosso	S.M.N.	José Afonso	S.M.N.
Mónica Marino	S.M.N	Silvia Perez	Facultad de Agronomía, UBA.

Graduate & Post-Doctoral Advisors

Susana Gordillo	S.M.N.	Héctor Ciappesoni	S.M.N.
Daniel Barrera	FCEyN, UBA.		

Biographical Sketch

Emilio H. Satorre

Cátedra de Cerealicultura, Departamento de Producción Vegetal
Facultad de Agronomía, Universidad de Buenos Aires
Avda. San Martín 4453, Ciudad Autónoma de Buenos Aires, 1417 - ARGENTINA
Telephone: +54.11.45148742, E-mail: satorre@agro.uba.ar
also *Agricultural Technology area, AACREA*
Sarmiento 1236, Piso 5, Ciudad Autónoma de Buenos Aires, 1041 – ARGENTINA
Telephone: +54.11.43822076

A. Professional Preparation

Institution	***Major or Area***	***Degree and Year***
Undergraduate:		
University of Buenos Aires, Argentina	Agronomy	Ingeniero Agrónomo, 1980
Graduate:		
Dept. of Agricultural Botany, University of Reading, UK	Crop Ecology	Ph.D., 1988
Postdoctoral: None		

B. Appointments

5/02 - Present	Extension – Technology Area Coordinator	AACREA, Argentina
9/99 - Present	Research & Teaching - Full Professor	Dept. Plant Prod., Univ. Buenos Aires
11/98 - Present	Research – Independent Researcher	CONICET –Nat. Res. Council, Arg.
11/90 - Present	Extension – Coordinator of Agriculture	AACREA, Argentina
4/89 – 9/99	Res. & Teaching – Associate Professor	Dept. Plant Prod., Univ. Buenos Aires
1/90 – 11/98	Research – Adjunct Researcher	CONICET – Nat. Res. Council, Arg.
4/86 – 4/89	Res. & Teaching – Adjunct Professor	Dept. Plant Prod., Univ. Buenos Aires

C. Relevant Publications

Satorre, E.H. (2001). Production Systems in the Argentine Pampas and their Ecological Impact. In: Solbrig, O., Paalberg, R. and F. Di Castri (eds). **Globalization and the Rural Environment**. Cambridge, MA: *Harvard University Press*, pg 81-102.

Ghersa, C.M., Ferraro, D., Omacini, M., Martínez-Ghersa, M.A., Perelman, S., **Satorre, E.H.** and A. Soriano (2002). Sustainability in the Argentine Inland-Pampa: Inferences using landscape and farm level variables. *Agriculture, Ecosystems and Environment* 93:279-293.

Satorre, E.H., Benech, R.L., Slafer, G.A., De la Fuente, E.B., Miralles, D.J., Otegui, M.E. & R. Savin. (2003). *Producción De Granos. Bases Funcionales Para Su Manejo.* Editorial Facultad de Agronomía, UBA, Buenos Aires, Argentina. 783 pp. (ISBN 950-29-0713-2).

Mercau, J.L., V.O. Sadras, **E.H. Satorre**, C. Messina, C. Balbi, M. Uribelarrea, and A.J. Hall (2001). On-farm assessment of regional and seasonal variation in sunflower yield in Argentina. *Agricultural Systems* 67: 83-103.

Torner, C. , M.J. Sanchez de Arco, **E.H Satorre** y C. Fernández-Quintanilla (2000). A Comparison of the growth patterns and the competitive ability of four annual weeds. *Agronomie* 20: 147-156.

Ghersa, C.M., R.L. Benech-Arnold, **E.H. Satorre**, y M.A. Martinez Ghersa (2000). Advances in weed management strategies. *Field Crops Research* 67: 95-104.

Martinez-Ghersa, M.A., C.M. Ghersa y **E.H. Satorre** (2000). Coevolution of agricultural systems and their weed companions: implications for research. *Field Crops Research* 67:181-190.

Satorre, E.H. (1999). Plant density and distribution as modifiers of growth and yield. In: E.H. Satorre and G.A. Slafer (Eds) **Wheat: Ecology and Physiology of Yield Determination**. Food Products Press NY. USA. p 141-160.

Satorre, E.H. y Slafer, G.A. (1999). Wheat production systems of the Pampas. In: E.H. Satorre and G.A. Slafer (Eds). **Wheat: Ecology and Physiology of Yield Determination**. Food Products Press NY. USA. p 333-350.

Poggio, S.L., **Satorre, E.H**. & E.B. De La Fuente (2003). Structure of weed communities occurring in pea and wheat crops in the Rolling Pampa (Argentina). *Agriculture, Ecosystems and Environment (in press).*

D. Synergistic activities

In addition to his research & teaching position at the University of Buenos Aires, Prof. Satorre is Extension Coordinator for the area of technology of AACREA (Asociación Argentina de Consorcios regionales de Experimentación Agrícola) a farmer-run non-profit organization. His responsabilities with research and extension allow Prof. Satorre to effectively help in the transference of scientifically developed innovations to the production sector, and to provide his students with scientific and practical learning frames. He leads research groups at the University of Buenos Aires and plays an important role in disseminating state of the art technology to AACREA farmers.

E. Collaborators & Other Affiliations

Collaborators

Claudio Ghersa	IFEVA, CONICET,Arg.	Victor Sadras	CSIRO, Australia
César Fernández - Quintanilla	Comunidad de Madrid, España	Gustavo Slafer	Univ. Buenos Aires, Argentina
Roberto Benech	Univ. Buenos Aires, Argentina	Carlos Messina	Univ. of Florida
Fernando Andrade	Univ. Mar del Plata, Argentina	Fred Royce	Univ. of Florida
Antonio Hall	IFEVA, CONICET, Arg	James Jones	Univ. of Florida
Graciela Magrin	INTA, Argentina	James Hansen	IRI, Columbia Univ.

Graduate & Post-Doctoral Advisors

Alberto Soriano (Graduate)	Univ. of Buenos Aires (deceased)	Roy W. Snaydon (doctoral)	Univ. of Reading, UK (retired)

Thesis Advisor & Postgraduate-Scholars sponsor

MSc Roxana Savin	Univ. Bs As, Argentina	MSc A. Guglielmini	Univ. Bs As, Argentina
MSc M. Inés Leaden	Univ. M.del Plata, Arg.	MSc Federico Rizzo	DonMario Semillas,Arg
MSc Sergio Cepeda	INTA Pergamino, Arg	MSc Santiago Poggio	SECyT, Argentina
Dr. Candidate Fernando Menéndez	CONICET		

Total number of students: 1 one

Total number of postgraduate-scholars advised: 6

Biographical Sketch
OTTO THOMAS SOLBRIG

Department of Organismic and Evolutionary Biology
Harvard University, 22 Divinity Ave., Cambridge, MA 02138

A. Professional Preparation

Institution	**Major or Area**	*Degree and Year*
Undergraduate:		
University of La Plata, Argentina	Agronomy	
Graduate:		
Univ. of California Berkeley	Botany and Genetics	Ph.D., 1959

B. Appointments

Present	Bussey Professor of Biology, Emeritus	Harvard University

C. Publications

Solbrig, O. T. 1997. Towards a Sustainable Pampa Agriculture: Past Performance and Prospective Analysis. The David Rockefeller Center for Latin American Studies, Harvard University Working Papers on Latin America No. 96/97-6. 51 pp.

Solbrig, O. T. 1999. Biodiversidad, desarrollo económico y sustentabilidad en la pampa argentina. In: S. Matteucci, S.D., O. T. Solbrig, J. H. Morello, and G. Halffter. (Eds.), pp.107-130. Biodiversidad y uso de la tierra: conceptos y ejemplos de Latinoamérica. UDEBA, Buenos Aires Solbrig, O. T. 2000.

Solbrig, O. T. 2001. La Agricultura Argentina del Futuro: Entre la Productividad y la Conservacion. 9o. Congreso Nacional de AAPRESID. Conferencias :27-34

Morello, J. H. and O. T. Solbrig (eds.) 1997. ¿Argentina, Granero del Mundo, hasta cuando? Buenos Aires: Orientación Gráfica Editora, 280 pp.

Solbrig, O. T. and L. Vainesman, (eds.) 1998. Hacia una Agricultura Productiva y Sostenible en la Pampa Argentina. DRCLAS-CPIA, Buenos Aires, 272 pp.

Matteucci, S.D, O.T. Solbrig, J. Morello and G. Halfter (Eds.) (1999). Biodiversidad y Uso de la Tierra. UDEBA, Buenos Aires, 580 pp.

Solbrig, O. T. and E. Viglizzo. 1999. Sustainable farming in the Argentine Pampas: History, Society, Economy and Ecology. The David Rockefeller Center for Latin American Studies, Harvard University Working Papers on Latin America No. 99/00-1 44 pp.

Solbrig, O. T. and R. Vera. 2001. Impact of Globalization on the Grasslands of the Southern Cone of South America. The David Rockefeller Center for Latin American Studies, Harvard University Working Papers on Latin America No. 01-6. 51 pp.

Laterra, P. and O. T. Solbrig. 2001. Dispersal strategies, spatial heterogeneity and colonization success in fire-managed grasslands. Ecological modelling 139: 17-29.

D. Synergistic activities

Honors and Fellowships: International Prize for Biology (1998), Japanese Academy of Sciences; Fellow "San Pablo Foundation of Torino" (1990-1991); Willdenow Medal, Berlin Botanical Gardens (1979); Guggenheim Fellow (1975-76); Elected fellow of the Third World Academy of Sciences (1997) and the American Academy of Arts and Sciences (1974); Awarded the Congressional Antarctic Medal (1967); Awarded the Cooley Prize of the American Society of Plant Taxonomy (1961); elected member of Phi Betta Kappa, alpha of California (1959); elected member of Sigma-Xi (1958); James Gowey Fellow in Botany, University of California, Berkeley (1958-59).

National and International Committees: Member, Biology Advisory Committee, NSF (1992-1995); Senior Advisor, Man and the Biosphere Program, UNESCO (1990-1992); Member, Advisory Committee, International Congress of Systematic and Evolutionary Biology (1979-present) ; member, U.S. Advisory panel to the Interciencia Bioresources Program (1982-1992); Chairman, Decade of the Tropics Program IUBS (1982-1992) Member Coordinatring Committee of the IUBS/SCOPE/UNESCO Program in Biodiversity (1991-1999); Member, Committee for the International Council of Scientific Unions, of the U. S. National Academy of Sciences (1986-1989); Member General Committee of the Internacional Council of Scientific Unions (ICSU) (1988-1991); member advisory board, Institute for the teaching of Mathematics and Science to the American Adolescent, Simon's Rock College (1988-present); Member, International Review Panel on Ecology, Centre National de la Recherche Scientifiques, Montepellier, France (1987); Member, U. S. Executive Committee for the Man and the Biosphere (MAB) Program, U.S. Department of State (1983-87); MAB International advisory panel, UNESCO (1985-1987); Member international review committee IUBS (1980-82); member, resolutions committee, International Botanical Congress, Sydney (1981); Member (1976-79), then Chairman (1979-82), U.S. Committee for the International Union of Biological Sciences, National Academy of Sciences; Member, U. S.National Committee for the International Biological Program (1970-74); Member, organizing committee, International Botanical Congress, Seattle, Wash. (1969).

Editorial Boards: Member Editorial Committee, Biology International (1980-present), Topics in Evolutionary Biology, Oxford University Press (1983-2001), Darwiniana (1985-present), Journal of Biogeography (1988-present); Science AAAS (1984-1988), Annual Review of Ecology and Systematics (1975-80); Director (1982-1987), then Chairman (1988) Board of Trustees Biological Information Service (BIOSIS).

Biographical Sketch

Carlos Alberto Villanueva

Director Técnico
Servicio Meteorológico Nacional
25 de Mayo 658, Ciudad Autónoma de Buenos Aires 1002, Argentina
Telephone: 54.11.5167 6767, E-mail: cavi@meteofa.mil.ar

A. Professional Preparation

Institution	***Major or Area***	***Degree and Year***
Undergraduate:		
Universidad de Buenos Aires, Argentina	Meteorology	Lic. en Ciencias Meteorológicas, 1977

B. Appointments

1978 – Present	Research/Management	Servicio Meteorológico Nacional
1977-1978	Professor	Universidad de Buenos Aires

C. Publications

Podestá, G.P., L. Nuñez, C.A. Villanueva, and M.A. Skansi. In Press. Estimating daily solar radiation in the Argentine Pampas. *Agricultural and Forest Meteorology.*

E. Sierra, M.M. Skansi, S. Pérez, C. Villanueva, M. Rabiolo, Silvia Berrios Cáceres. In Press. Desarrollo de un modelo de balance hidrológico seriado para el S.M.N. In Pressr.

A.C. Ravelo, C. Rebella, C. Villanueva, R. Zanvettor, R. Rodriguez, W. Da Porta, M.M. Skansi. 1999. Desarrollo de un sistema para la detección, seguimiento y evaluación de las sequías agrícolas en argentina. Congreso de Agrometeorología.

D. Synergistic activities

E. Collaborators & Other Affiliations

Collaborators

Olver Boolsen	S.M.N.	María Skansi	S.M.N.
Marcelo Fontana	S.M.N.	Eduardo Sierra	Facultad de Agronomía , UBA
Hugo Conti	I.N.T.A		

SUMMARY PROPOSAL BUDGET

YEAR 1

FOR NSF USE ONLY		
PROPOSAL NO.	DURATION (months) Proposed	Granted
AWARD NO.		

ORGANIZATION: **University of Miami Rosenstiel School of Marine&Atmospheric Sci**

PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR: **Guillermo P Podesta**

A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	NSF Funded Person-months CAL	ACAD	SUMR	Funds Requested By proposer	Funds granted by NSF (if different)
1. **Guillermo P Podesta - PI**	4.00	0.00	0.00	$ 28,935	$
2. **Kenneth Broad**	2.00	0.00	0.00	12,154	
3. **David Letson**	2.00	0.00	0.00	15,661	
4. **Donald B Olson**	1.50	0.00	0.00	19,333	
5.					
6. (**0**) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)	0.00	0.00	0.00	0	
7. (**4**) TOTAL SENIOR PERSONNEL (1 - 6)	9.50	0.00	0.00	76,083	
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)					
1. (**0**) POST DOCTORAL ASSOCIATES	0.00	0.00	0.00	0	
2. (**1**) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)	3.00	0.00	0.00	17,235	
3. (**0**) GRADUATE STUDENTS				0	
4. (**0**) UNDERGRADUATE STUDENTS				0	
5. (**0**) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)				0	
6. (**0**) OTHER				0	
TOTAL SALARIES AND WAGES (A + B)				93,318	
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)				24,328	
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)				117,646	
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000.)					
21" TV monitors $ 900					
Analyses laptop 2,900					
Personal computer 3,400					
Polycom IB Videoconferencing terminal 4,500					
TOTAL EQUIPMENT				11,700	
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)				9,290	
2. FOREIGN				8,750	
F. PARTICIPANT SUPPORT COSTS					
1. STIPENDS $ 0					
2. TRAVEL 0					
3. SUBSISTENCE 0					
4. OTHER 0					
TOTAL NUMBER OF PARTICIPANTS (**0**) TOTAL PARTICIPANT COSTS				0	
G. OTHER DIRECT COSTS					
1. MATERIALS AND SUPPLIES				2,000	
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION				1,000	
3. CONSULTANT SERVICES				0	
4. COMPUTER SERVICES				600	
5. SUBAWARDS				361,723	
6. OTHER				12,500	
TOTAL OTHER DIRECT COSTS				377,823	
H. TOTAL DIRECT COSTS (A THROUGH G)				525,209	
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) **MTDC (Rate: 51.0000, Base: 276786)**					
TOTAL INDIRECT COSTS (F&A)				141,161	
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)				666,370	
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECTS SEE GPG II.C.6.j.)				0	
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				$ 666,370	$

M. COST SHARING PROPOSED LEVEL $ **0** AGREED LEVEL IF DIFFERENT $

PI/PD NAME: **Guillermo P Podesta**

ORG. REP. NAME*: **Otis brown**

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INDIRECT COST RATE VERIFICATION		
Date Checked	Date Of Rate Sheet	Initials - ORG

 ***ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET**

SUMMARY PROPOSAL BUDGET YEAR 2

FOR NSF USE ONLY		
PROPOSAL NO.	DURATION (months) Proposed	Granted
AWARD NO.		

ORGANIZATION
University of Miami Rosenstiel School of Marine&Atmospheric Sci

PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR
Guillermo P Podesta

A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	NSF Funded Person-months CAL	ACAD	SUMR	Funds Requested By proposer	Funds granted by NSF (if different)
1. **Guillermo P Podesta - PI**	4.00	0.00	0.00	$ 30,382	$
2. **Kenneth Broad**	2.00	0.00	0.00	12,762	
3. **David Letson**	2.00	0.00	0.00	16,444	
4. **Donald B Olson**	1.00	0.00	0.00	13,662	
5.					
6. (**0**) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)	0.00	0.00	0.00	0	
7. (**4**) TOTAL SENIOR PERSONNEL (1 - 6)	9.00	0.00	0.00	73,250	
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)					
1. (**0**) POST DOCTORAL ASSOCIATES	0.00	0.00	0.00	0	
2. (**1**) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)	3.00	0.00	0.00	18,097	
3. (**0**) GRADUATE STUDENTS				0	
4. (**0**) UNDERGRADUATE STUDENTS				0	
5. (**0**) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)				0	
6. (**0**) OTHER				0	
TOTAL SALARIES AND WAGES (A + B)				91,347	
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)				24,799	
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)				116,146	
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000.)					
PC computer $ 3,400					
printer 800					
TOTAL EQUIPMENT				4,200	
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)				9,290	
2. FOREIGN				4,770	
F. PARTICIPANT SUPPORT COSTS					
1. STIPENDS $ **0**					
2. TRAVEL **0**					
3. SUBSISTENCE **0**					
4. OTHER **0**					
TOTAL NUMBER OF PARTICIPANTS (**0**) TOTAL PARTICIPANT COSTS				0	
G. OTHER DIRECT COSTS					
1. MATERIALS AND SUPPLIES				2,000	
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION				2,500	
3. CONSULTANT SERVICES				0	
4. COMPUTER SERVICES				600	
5. SUBAWARDS				328,319	
6. OTHER				12,000	
TOTAL OTHER DIRECT COSTS				345,419	
H. TOTAL DIRECT COSTS (A THROUGH G)				479,825	
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) **MTDC (Rate: 51.0000, Base: 147306)**					
TOTAL INDIRECT COSTS (F&A)				75,126	
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)				554,951	
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECTS SEE GPG II.C.6.j.)				0	
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				$ 554,951	$

M. COST SHARING PROPOSED LEVEL $ **0** AGREED LEVEL IF DIFFERENT $

PI/PD NAME
Guillermo P Podesta

ORG. REP. NAME*
Otis brown

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 ***ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET**

SUMMARY PROPOSAL BUDGET YEAR 3

FOR NSF USE ONLY		
PROPOSAL NO.	DURATION (months) Proposed	Granted
AWARD NO.		

ORGANIZATION
University of Miami Rosenstiel School of Marine&Atmospheric Sci

PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR
Guillermo P Podesta

A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	NSF Funded Person-months CAL	ACAD	SUMR	Funds Requested By proposer	Funds granted by NSF (if different)
1. **Guillermo P Podesta - PI**	4.00	0.00	0.00	$ 31,901	$
2. **Kenneth Broad**	2.00	0.00	0.00	13,400	
3. **David Letson**	2.00	0.00	0.00	17,266	
4. **Donald B Olson**	1.50	0.00	0.00	21,723	
5.					
6. (**0**) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)	0.00	0.00	0.00	0	
7. (**4**) TOTAL SENIOR PERSONNEL (1 - 6)	9.50	0.00	0.00	84,290	
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)					
1. (**0**) POST DOCTORAL ASSOCIATES	0.00	0.00	0.00	0	
2. (**1**) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)	3.00	0.00	0.00	19,001	
3. (**0**) GRADUATE STUDENTS				0	
4. (**0**) UNDERGRADUATE STUDENTS				0	
5. (**0**) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)				0	
6. (**0**) OTHER				0	
TOTAL SALARIES AND WAGES (A + B)				103,291	
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)				28,990	
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)				132,281	
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000.)					
TOTAL EQUIPMENT				0	
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)				9,290	
2. FOREIGN				8,750	
F. PARTICIPANT SUPPORT COSTS					
1. STIPENDS $ **0**					
2. TRAVEL **0**					
3. SUBSISTENCE **0**					
4. OTHER **0**					
TOTAL NUMBER OF PARTICIPANTS (**0**) TOTAL PARTICIPANT COSTS				0	
G. OTHER DIRECT COSTS					
1. MATERIALS AND SUPPLIES				2,000	
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION				2,500	
3. CONSULTANT SERVICES				0	
4. COMPUTER SERVICES				600	
5. SUBAWARDS				357,679	
6. OTHER				11,000	
TOTAL OTHER DIRECT COSTS				373,779	
H. TOTAL DIRECT COSTS (A THROUGH G)				524,100	
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) **MTDC (Rate: 51.0000, Base: 166421)**					
TOTAL INDIRECT COSTS (F&A)				84,875	
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)				608,975	
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECTS SEE GPG II.C.6.j.)				0	
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				$ 608,975	$

M. COST SHARING PROPOSED LEVEL $ **0** AGREED LEVEL IF DIFFERENT $

PI/PD NAME
Guillermo P Podesta

ORG. REP. NAME*
Otis brown

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 ***ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET**

SUMMARY PROPOSAL BUDGET

Cumulative

FOR NSF USE ONLY		
PROPOSAL NO.	DURATION (months) Proposed	Granted
AWARD NO.		

ORGANIZATION: **University of Miami Rosenstiel School of Marine&Atmospheric Sci**

PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR: **Guillermo P Podesta**

A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	NSF Funded Person-months CAL	ACAD	SUMR	Funds Requested By proposer	Funds granted by NSF (if different)
1. **Guillermo P Podesta - PI**	12.00	0.00	0.00	$ 91,218	$
2. **Kenneth Broad**	6.00	0.00	0.00	38,316	
3. **David Letson**	6.00	0.00	0.00	49,371	
4. **Donald B Olson**	4.00	0.00	0.00	54,718	
5.					
6. ( ) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)	0.00	0.00	0.00	0	
7. (**4**) TOTAL SENIOR PERSONNEL (1 - 6)	28.00	0.00	0.00	233,623	
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)					
1. (**0**) POST DOCTORAL ASSOCIATES	0.00	0.00	0.00	0	
2. (**3**) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)	9.00	0.00	0.00	54,333	
3. (**0**) GRADUATE STUDENTS				0	
4. (**0**) UNDERGRADUATE STUDENTS				0	
5. (**0**) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)				0	
6. (**0**) OTHER				0	
TOTAL SALARIES AND WAGES (A + B)				287,956	
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)				78,117	
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)				366,073	
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000.) $ 15,900					
TOTAL EQUIPMENT				15,900	
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)				27,870	
2. FOREIGN				22,270	
F. PARTICIPANT SUPPORT COSTS					
1. STIPENDS $ 0					
2. TRAVEL 0					
3. SUBSISTENCE 0					
4. OTHER 0					
TOTAL NUMBER OF PARTICIPANTS (**0**) TOTAL PARTICIPANT COSTS				0	
G. OTHER DIRECT COSTS					
1. MATERIALS AND SUPPLIES				6,000	
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION				6,000	
3. CONSULTANT SERVICES				0	
4. COMPUTER SERVICES				1,800	
5. SUBAWARDS				1,047,721	
6. OTHER				35,500	
TOTAL OTHER DIRECT COSTS				1,097,021	
H. TOTAL DIRECT COSTS (A THROUGH G)				1,529,134	
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)					
TOTAL INDIRECT COSTS (F&A)				301,162	
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)				1,830,296	
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECTS SEE GPG II.C.6.j.)				0	
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				$ 1,830,296	$

M. COST SHARING PROPOSED LEVEL $ **0** AGREED LEVEL IF DIFFERENT $

PI/PD NAME: **Guillermo P Podesta**

ORG. REP. NAME*: **Otis brown**

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C ***ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET**

Budget Justification
University of Miami

"Understanding and Modeling the Scope for Adaptive Management in Agroecosystems in the Pampas in Response to Interannual and Decadal Climate Variability and Other Risk Factors"

Salaries: Salary support (33% effort) is requested for Dr. Guillermo Podestá. This request will support both his overall coordination of the project and his active participation in the research activities. Previous experience in multidisciplinary projects (including international, multidisciplinary collaboration supported by NSF, NOAA and the IAI) has shown the critical importance of an active coordination effort, which is time-consuming and detracts from time available for research. This proposal involves 10 institutions in two countries therefore coordination efforts will be extremely time-consuming. G. Podestá is a member of the research faculty at the University of Miami and thus must support 100% of his time from research funds (i.e., he cannot receive teaching support). Dr. Kenneth Broad (17% effort) will help design the protocols for the self-reflective study of barriers to interdisciplinary research, and he will help analyze the results of that component. Dr. David Letson (17% effort) will lead analyses of the economic value of climate information under various alternative objective functions, and will collaborate with the psychological research conducted by Dr. E. Weber (Columbia Univ). Dr. Donald Olson (13%, 8%, 13% on Years 1, 2 and 3) will play two roles. As an experienced and dedicated multidisciplinary educator, Dr. Olson will coordinate the interdisciplinary seminar to be held in Miami on Year 3, and webcast to all institutions. His second role will to serve as "mathematical ecologist at large". Olson has extensive experience in modeling biophysical systems, and has been interacting with colleagues in the Mathematics Department of UM. He will explore issues such as agent-based models for agricultural decision-making. Funds are requested for a senior research associate (25%) who will provide programming support and WWW design and maintenance.

Expendable Supplies: This request covers bookstore supplies, media for data storage (CDs, etc.), audio tapes, batteries, and hardware (cables, connectors) for recording focus groups and interviews with agricultural decision-makers. It also includes printer cartridges, and outside printing service of posters for meetings and presentations to stakeholders. Total request is $ 6000.

Travel:

a. Foreign travel.

To calculate the costs of foreign travel, we assume an average round-trip Miami-Buenos Aires economy airfare cost of $1000. Per diem (including lodging and meals) is assumed at $180 per day. Local transportation costs associated with foreign travel (airport transportation, etc.) assumed at $90.

1. Travel for G. Podestá. This investigator will make three trips per year to Buenos Aires for coordination, project management, and participation in research activities. *Dr. Podestá will not request per diem during stays in Buenos Aires.* However, he is requesting $1080 per year for per diem during two 3-day trips to the two study locations (i.e., 6 days at $180 per day).
2. Travel for D. Letson and K. Broad. These investigators will travel to Buenos Aires on Year 1 (coordination with local collaborators, research activities) and Year 3 (training sessions, meetings to summarize results and coordinate publications). The total cost of each trip will be $1990 (airfare + 5 days per diem + local transportation).
3. Travel inside Argentina. UM investigators will require travel to the two study areas (Pergamino and Pilar), located about 200 km and 600 km from Buenos Aires. Average cost of public transportation (not very available) or car rental to each location is budgeted at $210 per trip. One trip per year is requested to each location, for an annual total of $420. Per diem is included in the requests for each investigator.

b. Domestic travel. .

1. Travel to collaborating institutions. We request support to visit collaborating institutions in the US. We plan three trips per year (to Columbia, Penn State and the institutions at Boulder), to be allocated among the UM investigators according to needs of the research agenda, We assume an average cost of $500 for airfare and four days of per diem per trip (at $200 per day). Local transportation costs are $80 per trip. The annual cost of this item is $4140.
2. Travel to national scientific meeting. One UM investigatorswill attend one national scientific meeting per year to present project results. Average airfare is estimated at $500. Four days for per diem and lodging at $200 per day are requested, plus $150 registration costs and transportation costs of $80. The annual cost of this item is $1530.
3. Travel to meeting of Biocomplexity investigators. NSF is planning to convene a meeting of Biocomplexity investigators. A trip per year is budgeted to support one representative of this project (who could be from any of the institutions). Airfare is estimated at $500, and two days of per diem at $200 plus local transportation costs. Total cost per trip is $980.
4. Travel for External Oversight Committee member. Drs. J. Jones (University of Florida), J.J. O'Brien (The Florida State University) and J. Hansen (International Research Institute for Climate Prediction) have agreed to collaborate with this project in an advisory capacity. They will review project reports and participate in plenary project meetings once a year. Airfare for Drs. Jones and O'Brien is assumed to be $350; airfare for Dr. Hansen (New York- Miami) is assumed at $500. Each year, we assume two days of per diem (at $200) and local transportation costs of $80 for each of the EOC members. The total cost of this item is $2640 per year.

Other Direct Costs

1. *Software and books.* On Year 1 we will purchase software to facilitate development of integrated models (e.g., Analytica, or Decision Suite Tools) and to design and maintain WWW sites (GoLive). We will maintain statistical software (S-Plus), and will update operating systems, office suite software, graphics software (Illustrator) and antivirus software. A total of $3000 is requested for Year 1 (the Analytica or Decision Tools licence costs around $1200). On Years 2 and 3 we request $2500 for new software, maintenance and update, and technical books (about $400 per year in books).
2. *Publication costs.* This request is expected to cover page-charges in peer-reviewed journals. This item also includes the cost of publications (brochures, articles in agricultural magazines) targeting a lay audience of farmers. We are budgeting $1000 on Year 1, and $2500 on Years 2 and 3.
3. *Outside services.* This item includes two components. The first component includes fees for a professional, licensed Spanish-English translator who will translate protocols for decision experiments into Spanish and transcripts of focus groups and experiments with farmers into English. We request $2000 on Years 1-2 (when most interactions with stakeholders will take place) and $1000 on Year 3. The second request ($500 per month) is for a research assistant to help with project management, bibliographic searches, report preparation, etc. Because we will decide once we start the project where this assistant may be most needed (ie, the US or Argentina), for now we have listed this person as an outside consultant to have the flexibility to employ her/him in either case.
4. *Computer charges.* This request will cover the cost of fast Internet access in Buenos Aires. As Dr. Podestá will spend a significant amount of time in Buenos Aires overseeing project activities (no per diem charged), it will be most cost effective for him to communicate with colleagues in the US via Internet videoconferencing. The cost is about $50 per month, including the purchase of a DSL modem prorated among the three years.
5. *Long-distance telephone, postage, and duplication.* Frequent communication is a critical requirement to ensure success of a multinational, multi-institutional project. Although we will try to minimize the use of telephone, relying instead on instant messaging or videoconferencing, we are requesting $900 to cover long-distance telephone communications for all UM investigators. Assuming a cost of about $1.25 per minute to Argentina, this amount will give us about 60 minutes per month of long distance conversations (in reality, this will include domestic long-distance). A total of $300 per year is estimated for mailing documents, posters, etc. (as an example, sending an envelope by courier from Miami to Buenos Aires costs about $45). Duplication costs include about 300$ per year. Total request is $1500 per year.

Indirect Costs: The University of Miami indirect cost rate is 51% of Modified Total Direct Cost.

Capital Equipment: On Year 1 we will purchase a Polycom videoconferencing terminal (approximate cost $4500) to be located in Argentina (probably at AACREA Headquarters) and to be shared among all Argentine institutions. Another $900 will be used to purchase two 21" TV monitors in Argentina (to save on shipment of bulky equipment) for videoconferencing purposes. A desktop PC ($3400) will be

purchased for data processing and analyses and a laptop computer ($2900) for field work, presentations, etc. On Year 2, we will need to replace an aging desktop PC (estimated cost, $3400) Another $800 is requested for a printer that will need to be replaced by Year 2.

Subcontracts: Because the NSF requires that Biocomplexity proposals be submitted by a single institution, funds for collaborating institutions will be dispersed via subcontracts. The University of Miami charges overhead on the first $25,000 of a subcontract.

There are five subcontracts in this proposal. Four of them support US institutions: The Pennsylvania State University, Columbia University, the National Center for Atmospheric Research (NCAR) and the Cooperative Institute for Research in Environmental Sciences (CIRES), a joint institute between NOAA and the University of Colorado. The remaining subcontract will be issued to Asociación Argentina de Consorcios Regionales de Experimentación Agrícola, AACREA, a non-profit, non-governmental organization run by farmers in Argentina. To facilitate project management, AACREA has kindly agreed to disperse the funds going to the other two participating institutions in Argentina: CENTRO de Estudios Sociales y Ambientales, a non-governmental organization focusing on environmental and social issues, and an academic institution: the School of Engineering of the University of Buenos Aires. The Argentine Meteorological Service, a governmental agency, will participate at no cost to the project. The contributions of the four US institutions and Argentina's AACREA are summarized in the management plan, and their budgets are available to reviewers.

As NSF guidelines indicate that funding should go mostly to US institutions, we feel it is appropriate to justify the involvement of Argentine institutions. The participation of Argentine collaborators is critical for the success of this project. AACREA, a non-profit farmers' organization with a strong mandate for development and dissemination of agricultural technology, has been instrumental in facilitating access to agricultural stakeholders (farmers, their technical advisors) during the incubation stage. They have coordinated focus groups and surveys of farmers, and will continue to play this role. Most importantly, AACREA will allow unusual access to farmers' historical production and financial records invaluable to understand decision-making processes. AACREA's Director of Agricultural Research, Dr. Emilio Satorre, is also a full Professor at UBA's School of Agronomy, therefore he will recruit motivated undergraduate and graduate students to participate in research and outreach activities. AACREA's request includes funds for students. Their budget also includes the logistic costs of interactions with stakeholders (from making arrangements to renting meeting rooms). CENTRO is another non-profit NGO that includes sociologists, ecologists, biologists and social anthropologists with expertise on natural disasters, and climate risks. Five CENTRO scientists have participated actively in the incubation stage and will continue to contribute to the project's success. They have been responsible for designing and conducting interactions with stakeholders. The University of Buenos Aires' School of Engineering has been added to the project after incubation. Their contribution includes the participation of two senior physicists with experience in systems analysis, computational methods, and simulation. They will involve undergraduate students throughout the project.

Further, we note that several budget items included in the subcontracts to Argentine institutions will actually assist the research of US investigators. For example, an Argentine social scientist will be retained as a consultant to coordinate, supervise and help analyze the decision experiments that Dr. Elke Weber proposes to carry out. In summary, when all Argentine institutions are pooled, a large amount of talent and person/months will be made available to the project for a relatively small fraction of the total project cost.

Argentine collaborators would not be able to participate in this effort without NSF support. The unprecedented economic crisis that Argentina is currently undergoing has virtually suppressed governmental funding to science projects. We stress that without counterparts in Argentina we would not be able to carry out this project; certainly the cost would be substantially higher. The proportion of the overall budget allocated to Argentine collaborators is about 15%. Again, we strongly encourage reviewers to appreciate the human power that this percentage will provide.

SUMMARY PROPOSAL BUDGET

YEAR 1

FOR NSF USE ONLY		
PROPOSAL NO.	DURATION (months) Proposed	Granted
AWARD NO.		

ORGANIZATION
Asociacion Argentina de Consorcios Regionales de Experimentacion

PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR
Emilio H Satorre

A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	NSF Funded Person-months CAL	ACAD	SUMR	Funds Requested By proposer	Funds granted by NSF (if different)
1. **Emilio H Satorre**	**2.00**	**0.00**	**0.00**	$ **4,000**	$
2.					
3.					
4.					
5.					
6. (**0**) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)	**0.00**	**0.00**	**0.00**	**0**	
7. (**1**) TOTAL SENIOR PERSONNEL (1 - 6)	**2.00**	**0.00**	**0.00**	**4,000**	
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)					
1. (**0**) POST DOCTORAL ASSOCIATES	**0.00**	**0.00**	**0.00**	**0**	
2. (**3**) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)	**5.00**	**0.00**	**0.00**	**8,000**	
3. (**1**) GRADUATE STUDENTS				**5,100**	
4. (**0**) UNDERGRADUATE STUDENTS				**0**	
5. (**0**) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)				**0**	
6. (**2**) OTHER				**4,400**	
TOTAL SALARIES AND WAGES (A + B)				**21,500**	
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)				**0**	
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)				**21,500**	
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000.)					
Two laptops, digital camera $ **5,000**					
TOTAL EQUIPMENT				**5,000**	
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)				**1,800**	
2. FOREIGN				**7,100**	
F. PARTICIPANT SUPPORT COSTS					
1. STIPENDS $ **0**					
2. TRAVEL **0**					
3. SUBSISTENCE **0**					
4. OTHER **0**					
TOTAL NUMBER OF PARTICIPANTS (**0**) TOTAL PARTICIPANT COSTS				**0**	
G. OTHER DIRECT COSTS					
1. MATERIALS AND SUPPLIES				**1,520**	
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION				**350**	
3. CONSULTANT SERVICES				**35,000**	
4. COMPUTER SERVICES				**450**	
5. SUBAWARDS				**39,500**	
6. OTHER				**3,850**	
TOTAL OTHER DIRECT COSTS				**80,670**	
H. TOTAL DIRECT COSTS (A THROUGH G)				**116,070**	
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) **(Rate: , Base:)**					
TOTAL INDIRECT COSTS (F&A)				**0**	
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)				**116,070**	
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECTS SEE GPG II.C.6.j.)				**0**	
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				$ **116,070**	$

M. COST SHARING PROPOSED LEVEL $ **0** AGREED LEVEL IF DIFFERENT $

PI/PD NAME
Emilio H Satorre

ORG. REP. NAME*
Otis brown

FOR NSF USE ONLY		
INDIRECT COST RATE VERIFICATION		
Date Checked	Date Of Rate Sheet	Initials - ORG

 ***ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET**

SUMMARY PROPOSAL BUDGET YEAR 2

FOR NSF USE ONLY		
PROPOSAL NO.	DURATION (months) Proposed	Granted
AWARD NO.		

ORGANIZATION
Asociacion Argentina de Consorcios Regionales de Experimentacion

PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR
Emilio H Satorre

A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	NSF Funded Person-months CAL	ACAD	SUMR	Funds Requested By proposer	Funds granted by NSF (if different)
1. **Emilio H Satorre**	**2.50**	**0.00**	**0.00**	$ **5,000**	$
2.					
3.					
4.					
5.					
6. (**0**) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)	**0.00**	**0.00**	**0.00**	**0**	
7. (**1**) TOTAL SENIOR PERSONNEL (1 - 6)	**2.50**	**0.00**	**0.00**	**5,000**	
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)					
1. (**0**) POST DOCTORAL ASSOCIATES	**0.00**	**0.00**	**0.00**	**0**	
2. (**3**) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)	**5.00**	**0.00**	**0.00**	**8,000**	
3. (**1**) GRADUATE STUDENTS				**5,100**	
4. (**0**) UNDERGRADUATE STUDENTS				**0**	
5. (**0**) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)				**0**	
6. (**2**) OTHER				**4,000**	
TOTAL SALARIES AND WAGES (A + B)				**22,100**	
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)				**0**	
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)				**22,100**	
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000.)					
Video projector $ **3,100**					
TOTAL EQUIPMENT				**3,100**	
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)				**7,100**	
2. FOREIGN				**1,500**	
F. PARTICIPANT SUPPORT COSTS					
1. STIPENDS $ **0**					
2. TRAVEL **0**					
3. SUBSISTENCE **0**					
4. OTHER **0**					
TOTAL NUMBER OF PARTICIPANTS (**0**) TOTAL PARTICIPANT COSTS				**0**	
G. OTHER DIRECT COSTS					
1. MATERIALS AND SUPPLIES				**1,520**	
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION				**1,500**	
3. CONSULTANT SERVICES				**25,000**	
4. COMPUTER SERVICES				**650**	
5. SUBAWARDS				**39,500**	
6. OTHER				**3,565**	
TOTAL OTHER DIRECT COSTS				**71,735**	
H. TOTAL DIRECT COSTS (A THROUGH G)				**105,535**	
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) **(Rate: , Base:)**					
TOTAL INDIRECT COSTS (F&A)				**0**	
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)				**105,535**	
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECTS SEE GPG II.C.6.j.)				**0**	
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				$ **105,535**	$

M. COST SHARING PROPOSED LEVEL $ **0** AGREED LEVEL IF DIFFERENT $

PI/PD NAME
Emilio H Satorre

ORG. REP. NAME*
Otis brown

FOR NSF USE ONLY		
INDIRECT COST RATE VERIFICATION		
Date Checked	Date Of Rate Sheet	Initials - ORG

 ***ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET**

SUMMARY PROPOSAL BUDGET YEAR 3

FOR NSF USE ONLY		
PROPOSAL NO.	DURATION (months) Proposed	Granted
AWARD NO.		

ORGANIZATION
Asociacion Argentina de Consorcios Regionales de Experimentacion

PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR
Emilio H Satorre

A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	NSF Funded Person-months CAL	ACAD	SUMR	Funds Requested By proposer	Funds granted by NSF (if different)
1. **Emilio H Satorre**	**2.50**	**0.00**	**0.00**	$ **5,000**	$
2.					
3.					
4.					
5.					
6. (**0**) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)	**0.00**	**0.00**	**0.00**	**0**	
7. (**1**) TOTAL SENIOR PERSONNEL (1 - 6)	**2.50**	**0.00**	**0.00**	**5,000**	
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)					
1. (**0**) POST DOCTORAL ASSOCIATES	**0.00**	**0.00**	**0.00**	**0**	
2. (**3**) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)	**5.00**	**0.00**	**0.00**	**8,000**	
3. (**1**) GRADUATE STUDENTS				**5,100**	
4. (**0**) UNDERGRADUATE STUDENTS				**0**	
5. (**0**) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)				**0**	
6. (**2**) OTHER				**4,000**	
TOTAL SALARIES AND WAGES (A + B)				**22,100**	
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)				**0**	
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)				**22,100**	
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000.)					
TOTAL EQUIPMENT				**0**	
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)				**7,100**	
2. FOREIGN				**1,200**	
F. PARTICIPANT SUPPORT COSTS					
1. STIPENDS $ **0**					
2. TRAVEL **0**					
3. SUBSISTENCE **0**					
4. OTHER **0**					
TOTAL NUMBER OF PARTICIPANTS (**0**) TOTAL PARTICIPANT COSTS				**0**	
G. OTHER DIRECT COSTS					
1. MATERIALS AND SUPPLIES				**1,520**	
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION				**1,360**	
3. CONSULTANT SERVICES				**22,000**	
4. COMPUTER SERVICES				**650**	
5. SUBAWARDS				**39,500**	
6. OTHER				**3,463**	
TOTAL OTHER DIRECT COSTS				**68,493**	
H. TOTAL DIRECT COSTS (A THROUGH G)				**98,893**	
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) **(Rate: , Base:)**					
TOTAL INDIRECT COSTS (F&A)				**0**	
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)				**98,893**	
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECTS SEE GPG II.C.6.j.)				**0**	
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				$ **98,893**	$

M. COST SHARING PROPOSED LEVEL $ **0** AGREED LEVEL IF DIFFERENT $

PI/PD NAME
Emilio H Satorre

ORG. REP. NAME*
Otis brown

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INDIRECT COST RATE VERIFICATION		
Date Checked	Date Of Rate Sheet	Initials - ORG

 ***ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET**

SUMMARY PROPOSAL BUDGET

Cumulative

FOR NSF USE ONLY		
PROPOSAL NO.	DURATION (months) Proposed	Granted
AWARD NO.		

ORGANIZATION
Asociacion Argentina de Consorcios Regionales de Experimentacion

PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR
Emilio H Satorre

A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	NSF Funded Person-months CAL	ACAD	SUMR	Funds Requested By proposer	Funds granted by NSF (if different)
1. **Emilio H Satorre**	**7.00**	**0.00**	**0.00**	$ **14,000**	$
2.					
3.					
4.					
5.					
6. ( ) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)	**0.00**	**0.00**	**0.00**	**0**	
7. (**1**) TOTAL SENIOR PERSONNEL (1 - 6)	**7.00**	**0.00**	**0.00**	**14,000**	
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)					
1. (**0**) POST DOCTORAL ASSOCIATES	**0.00**	**0.00**	**0.00**	**0**	
2. (**9**) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)	**15.00**	**0.00**	**0.00**	**24,000**	
3. (**3**) GRADUATE STUDENTS				**15,300**	
4. (**0**) UNDERGRADUATE STUDENTS				**0**	
5. (**0**) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)				**0**	
6. (**6**) OTHER				**12,400**	
TOTAL SALARIES AND WAGES (A + B)				**65,700**	
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)				**0**	
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)				**65,700**	
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000.) $ **8,100**					
TOTAL EQUIPMENT				**8,100**	
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)				**16,000**	
2. FOREIGN				**9,800**	
F. PARTICIPANT SUPPORT COSTS					
1. STIPENDS $ **0**					
2. TRAVEL **0**					
3. SUBSISTENCE **0**					
4. OTHER **0**					
TOTAL NUMBER OF PARTICIPANTS (**0**) TOTAL PARTICIPANT COSTS				**0**	
G. OTHER DIRECT COSTS					
1. MATERIALS AND SUPPLIES				**4,560**	
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION				**3,210**	
3. CONSULTANT SERVICES				**82,000**	
4. COMPUTER SERVICES				**1,750**	
5. SUBAWARDS				**118,500**	
6. OTHER				**10,878**	
TOTAL OTHER DIRECT COSTS				**220,898**	
H. TOTAL DIRECT COSTS (A THROUGH G)				**320,498**	
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)					
TOTAL INDIRECT COSTS (F&A)				**0**	
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)				**320,498**	
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECTS SEE GPG II.C.6.j.)				**0**	
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				$ **320,498**	$

M. COST SHARING PROPOSED LEVEL $ **0** AGREED LEVEL IF DIFFERENT $

PI/PD NAME
Emilio H Satorre

ORG. REP. NAME*
Otis brown

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INDIRECT COST RATE VERIFICATION		
Date Checked	Date Of Rate Sheet	Initials - ORG

C ***ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET**

Understanding and Modeling the Scope for Adaptive Management in Agroecosystems in the Pampas in Response to Interannual and Deacadal Climate Variability and Other Risk Factors

Budget Justification

Asociación Argentina de Consorcios Regionales de Experimentación Agrícola

PI: Dr. Emilio Satorre

Salaries. Salary support (2.0, 2.5 and 2.5 months at $ 2000/month for Years 1-3) is requested for Dr. Emilio Satorre, who will serve as overall AACREA coordinator and he will provide student supervision during the planning effort. He will take part in the mechanistic crop modeling and in interactions with stakeholders. He will lead the production of decision maps for several crops. He will coordinate collaboration between Argentine and US researchers. He will lead the preparation of AACREA reports to NSF and other agencies.

Salary support (2.0 months for years 1-3, at $1600/month) are also requested for AACREA Regional and Technology coordinators (Fernando Ruiz Toranzo and Marcelo Torrent); Moreover 1 month per year of salary support is also requested for Guillermo Bernaudo (Buenos Aires- based Technical coordinator). They will make arrangements for planning workshops and meetings, and will coordinate interactions with stakeholders in North of Buenos Aires, North of Córdoba and at AACREA's Buenos Aires headquarters, respectively. They will organize and coordinate decision experiments and workshops and focal groups to explore environmental consequences of changes in climate scenarios. They will also help in research and education and training activities in Argentina. They will organize training seminars during and at the end of the project.

An AACREA professional science writer will also participate in the project (Ezequiel Tambornini; 4 months per year at $ 600/month). He will be in charge of producing outreach materials and WWW site content for farmers and a general audience. Salary support (5 and 4.0, and 4.0 months at $ 400/month) is requested for a research coordinator. He/she will provide research assistance for organizing surveys, focus groups, scientist-stakeholder workshops, seminars and specific training activities.

A graduate student will be hired to perform full time work for the project at $ 425/month; the student will incorporate research from the project into his/her PhD program. He/she will focus on the information that affects decision making but will also take part in activities linked to the modeling and decision making stage in the various regions. He/she may also help Dr. Satorre in reports preparation and scientific dissemination of results.

Equipment. Two laptop personal computers are required on Year 1 to carry out project activities (e.g. run statistical analyses and model simulations, conduct interactive model-building sessions with stakeholders, make presentations to stakeholders). The estimated cost of each laptop is $ 2200. A digital photo camera is also required to register stakeholder interactions. The estimated cost is $ 600. A computer projector (estimated cost is $ 3100) is required for the focal groups, scientist-stakeholder workshops, seminars and training activities; e.g. exercises planned for the focal groups would require projection, sound and image facilities.

International Travel. This budget item includes (a) a two-person meeting to Miami to participate in annual project meetings and interact with other investigators, and (b) a one-person round-trip to Miami or other US collaborating institution, for collaboration, writing papers, etc. We assume a round-trip airfare of $1100. Lodging and meals are budgeted at $150 per day (each person will stay 8 days). Local airport transportation and departure taxes were budgeted at $67 per trip.

Domestic Travel. Support is requested for travel expenses of AACREA research and support personnel to the study sites for focus groups, workshops, seminars and training activities. An average trip to a study location will involve 600 km of driving. For simplicity, we estimate overall costs of lodging, meals and transportation at $.025 per km. An average trip will cost $150. Because of the multiple activities planned by the US institutions, which will be supported in situ by AACREA personnel, we estimate that 12, 10 and 8 trips per year will be required on Years 1-3 ($1800, $ 1500 and $1200, respectively).

Material and Supplies. The yearly amount requested ($1520) will cover bookstore supplies in Argentina (estimated $410), magnetic media for archival of data and project documents (120 CDs at $1 per CD and 80 Diskettes at $5 per 10 units box), printer cartridges (14 at $50 per cartridge), and a replacement lamp for the computer projector ($250).

Computer services. A total of $ 1750 is requested to cover computers maintenance and service, and replacement of damaged components.

Consultants. A social scientist will be contracted as expert consultant for the project. The consultant will collaborate with Dr. Elke Weber (Columbia) in the coordination and implementation of decision making experiments designed by E. Weber to identify farmers' objective functions. The consultant will also help to prepare workshops and seminars and they will take part in education activities at various levels. This external social expertise assistance will complement the AACREA research team abilities in the ground. Honorarium support (12.0 months at $ 1000/month) is requested throughout the project.

A second consultant contract will be issued to Dr. Otto Solbrig (Harvard University) to design and lead an assessment process involving appropriate stakeholders to explore issues associated with sustainability of agroecosystems in the Pampas in the light of increasing agriculture and predominance of soybean. Dr. Solbrig will

help design a consensus research agenda in collaboration with scientists and stakeholders (governmental and academic researchers, farmer groups, private sector representatives such as crop breeding companies, non-governmental organizations focused on the environment, etc). The itemized cost of the consulting contract with Dr. Solbrig will include all expenses associated with the assessment effort (that is, rental of meeting rooms for scientist-stakeholder workshops, travel for stakeholders and a few students who do not have support, etc). Most of this logistic expenses ($15,000) are allocated to Year 1. Smaller amounts are requested for Years 2 and 3 ($5000 and $2000), for follow-up activities and Dr. Solbrig's travel to Argentina and Miami.

A third consultant will be enlisted to provide liaison with researchers at the Argentine Meteorological Service, as AACREA does not have personnel with expertise on climatology. The consultant will work with the Met Service to implement tutorials on the use of climate information, develop appropriate data bases of climate data needed for the analyses and simulation components, and collaborate with the Met Service in the critical assessment and re-design of communication materials. The consultant will be hired for 8 months each year, at a cost of $1000 per month.

Publications. This item includes duplication expenses ($ 350 per year during the first two years and $ 210 during the third year) for dissemination of outreach materials, publications costs of AACREA two supplement special reprints ($1150).

Rental of meeting places. Rental costs of rooms for meetings with stakeholders (focal groups, workshops and training activities) in the north of Buenos Aires, south of Santa Fe and north of Córdoba, and other related minor costs are taken into account in this item. The total request is for $ 3490.

Maps and Databases. The acquisition of long and actual climate databases of various places in the studied area is projected. Databases will be bought for various climatic variables in order to use them for crop simulation and climate analysis. Moreover, maps and satellite images of periods of extreme climatic conditions (drought, flooded, etc) will be bought to be used in focus groups and teaching activities. Database and image processing to generate verified ready-to-use products is included in the estimated cost by the provider. Total estimated cost in this item is $ 3283.

Communications. Coordination of a planning effort involving several CREA groups around Argentina and US institutions will require frequent communication among all participants, including extensive use of telephone arrangements. This budget item includes (a) shipment of project documents via courier ($200 per year for 5 packages from Argentina at about $40/shipment), (b) Long distance national telephone and fax expenses ($1450, for about 5500 minutes per year of domestic long-distance, or 450 minutes/month during the first year and half that figure during the next years), and (c) international long-distance telephone and fax expenses ($200 cover about 50 minutes per year).

Subcontracts. To facilitate project management, all funds for Argentine institutions will be concentrated within the AACREA subcontract with the University of Miami. As AACREA staff is experienced in managing contracts and grants, they will disperse funds to the other participating institutions and consultants.

Two subcontracts will be issued. The first one is with CENTRO de Estudios Sociales y Ambientales, for $20,000 a year. CENTRO researchers will lead the development of conceptual models of risk factors and will conduct focus groups to explore perceptions about climate at various scales. Finally, CENTRO will lead the survey of institutional structures of boundary organizations disseminating climate and other technical information.

The second subcontract will be issued to the School of Engineering of the University of Buenos Aires ($19,500 on Years 1-3). This group, led by Dr. Angel Menéndez, will develop a computational framework for the integration of various mechanistic models. They will also collaborate with Dr. Richard Katz (NCAR) in the characterization of uncertainty.

Overhead. AACREA will NOT charge any overhead on this contract.

SUMMARY PROPOSAL BUDGET

YEAR 1

FOR NSF USE ONLY		
PROPOSAL NO.	DURATION (months) Proposed	Granted
AWARD NO.		

ORGANIZATION: **Columbia University**

PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR: **Elke U Weber**

A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	NSF Funded Person-months CAL	ACAD	SUMR	Funds Requested By proposer	Funds granted by NSF (if different)
1. **Elke U Weber**	0.00	0.00	1.50	$ 28,359	$
2.					
3.					
4.					
5.					
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)	0.00	0.00	0.00	0	
7. (1) TOTAL SENIOR PERSONNEL (1 - 6)	0.00	0.00	1.50	28,359	
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)					
1. (0) POST DOCTORAL ASSOCIATES	0.00	0.00	0.00	0	
2. (0) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)	0.00	0.00	0.00	0	
3. (0) GRADUATE STUDENTS				0	
4. (0) UNDERGRADUATE STUDENTS				0	
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)				0	
6. (0) OTHER				0	
TOTAL SALARIES AND WAGES (A + B)				28,359	
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)				7,487	
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)				35,846	
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000.)					
TOTAL EQUIPMENT				0	
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)				1,076	
2. FOREIGN				3,047	
F. PARTICIPANT SUPPORT COSTS					
1. STIPENDS $ 0					
2. TRAVEL 0					
3. SUBSISTENCE 0					
4. OTHER 0					
TOTAL NUMBER OF PARTICIPANTS (0) TOTAL PARTICIPANT COSTS				0	
G. OTHER DIRECT COSTS					
1. MATERIALS AND SUPPLIES				0	
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION				0	
3. CONSULTANT SERVICES				0	
4. COMPUTER SERVICES				600	
5. SUBAWARDS				0	
6. OTHER				0	
TOTAL OTHER DIRECT COSTS				600	
H. TOTAL DIRECT COSTS (A THROUGH G)				40,569	
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) **MTDC (Rate: 63.5000, Base: 40569)**					
TOTAL INDIRECT COSTS (F&A)				25,761	
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)				66,330	
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECTS SEE GPG II.C.6.j.)				0	
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				$ 66,330	$

M. COST SHARING PROPOSED LEVEL $ 0 AGREED LEVEL IF DIFFERENT $

PI/PD NAME: **Elke U Weber**

ORG. REP. NAME*: **Otis brown**

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INDIRECT COST RATE VERIFICATION		
Date Checked	Date Of Rate Sheet	Initials - ORG

 ***ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET**

SUMMARY PROPOSAL BUDGET

YEAR 2

FOR NSF USE ONLY		
PROPOSAL NO.	DURATION (months) Proposed	Granted
AWARD NO.		

ORGANIZATION: **Columbia University**

PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR: **Elke U Weber**

A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	NSF Funded Person-months CAL	ACAD	SUMR	Funds Requested By proposer	Funds granted by NSF (if different)
1. **Elke U Weber**	**0.00**	**0.00**	**1.00**	$ **19,473**	$
2.					
3.					
4.					
5.					
6. (**0**) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)	**0.00**	**0.00**	**0.00**	**0**	
7. (**1**) TOTAL SENIOR PERSONNEL (1 - 6)	**0.00**	**0.00**	**1.00**	**19,473**	
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)					
1. (**0**) POST DOCTORAL ASSOCIATES	**0.00**	**0.00**	**0.00**	**0**	
2. (**0**) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)	**0.00**	**0.00**	**0.00**	**0**	
3. (**0**) GRADUATE STUDENTS				**0**	
4. (**0**) UNDERGRADUATE STUDENTS				**0**	
5. (**0**) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)				**0**	
6. (**0**) OTHER				**0**	
TOTAL SALARIES AND WAGES (A + B)				**19,473**	
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)				**5,180**	
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)				**24,653**	
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000.)					
TOTAL EQUIPMENT				**0**	
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)				**1,076**	
2. FOREIGN				**0**	
F. PARTICIPANT SUPPORT COSTS					
1. STIPENDS $ **0**					
2. TRAVEL **0**					
3. SUBSISTENCE **0**					
4. OTHER **0**					
TOTAL NUMBER OF PARTICIPANTS (**0**) TOTAL PARTICIPANT COSTS				**0**	
G. OTHER DIRECT COSTS					
1. MATERIALS AND SUPPLIES				**0**	
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION				**0**	
3. CONSULTANT SERVICES				**0**	
4. COMPUTER SERVICES				**600**	
5. SUBAWARDS				**0**	
6. OTHER				**0**	
TOTAL OTHER DIRECT COSTS				**600**	
H. TOTAL DIRECT COSTS (A THROUGH G)				**26,329**	
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) **MTDC (Rate: 63.5000, Base: 26329)**					
TOTAL INDIRECT COSTS (F&A)				**16,719**	
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)				**43,048**	
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECTS SEE GPG II.C.6.j.)				**0**	
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				$ **43,048**	$

M. COST SHARING PROPOSED LEVEL $ **0** AGREED LEVEL IF DIFFERENT $

PI/PD NAME: **Elke U Weber**

ORG. REP. NAME*: **Otis brown**

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 ***ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET**

SUMMARY PROPOSAL BUDGET YEAR 3

FOR NSF USE ONLY		
PROPOSAL NO.	DURATION (months) Proposed	Granted
AWARD NO.		

ORGANIZATION: **Columbia University**

PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR: **Elke U Weber**

A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	NSF Funded Person-months CAL	ACAD	SUMR	Funds Requested By proposer	Funds granted by NSF (if different)
1. **Elke U Weber**	**0.00**	**0.00**	**1.50**	$ **30,086**	$
2.					
3.					
4.					
5.					
6. (**0**) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)	**0.00**	**0.00**	**0.00**	**0**	
7. (**1**) TOTAL SENIOR PERSONNEL (1 - 6)	**0.00**	**0.00**	**1.50**	**30,086**	
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)					
1. (**0**) POST DOCTORAL ASSOCIATES	**0.00**	**0.00**	**0.00**	**0**	
2. (**0**) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)	**0.00**	**0.00**	**0.00**	**0**	
3. (**0**) GRADUATE STUDENTS				**0**	
4. (**0**) UNDERGRADUATE STUDENTS				**0**	
5. (**0**) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)				**0**	
6. (**0**) OTHER				**0**	
TOTAL SALARIES AND WAGES (A + B)				**30,086**	
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)				**8,063**	
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)				**38,149**	
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000.)					
TOTAL EQUIPMENT				**0**	
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)				**1,076**	
2. FOREIGN				**3,047**	
F. PARTICIPANT SUPPORT COSTS					
1. STIPENDS $ **0**					
2. TRAVEL **0**					
3. SUBSISTENCE **0**					
4. OTHER **0**					
TOTAL NUMBER OF PARTICIPANTS (**0**) TOTAL PARTICIPANT COSTS				**0**	
G. OTHER DIRECT COSTS					
1. MATERIALS AND SUPPLIES				**0**	
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION				**0**	
3. CONSULTANT SERVICES				**0**	
4. COMPUTER SERVICES				**600**	
5. SUBAWARDS				**0**	
6. OTHER				**0**	
TOTAL OTHER DIRECT COSTS				**600**	
H. TOTAL DIRECT COSTS (A THROUGH G)				**42,872**	
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) **MTDC (Rate: 63.5000, Base: 42872)**					
TOTAL INDIRECT COSTS (F&A)				**27,224**	
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)				**70,096**	
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECTS SEE GPG II.C.6.j.)				**0**	
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				$ **70,096**	$

M. COST SHARING PROPOSED LEVEL $ **0** AGREED LEVEL IF DIFFERENT $

PI/PD NAME: **Elke U Weber**

ORG. REP. NAME*: **Otis brown**

FOR NSF USE ONLY		
INDIRECT COST RATE VERIFICATION		
Date Checked	Date Of Rate Sheet	Initials - ORG

 ***ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET**

SUMMARY PROPOSAL BUDGET

Cumulative

FOR NSF USE ONLY		
PROPOSAL NO.	DURATION (months) Proposed	Granted
AWARD NO.		

ORGANIZATION: **Columbia University**

PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR: **Elke U Weber**

A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	NSF Funded Person-months CAL	ACAD	SUMR	Funds Requested By proposer	Funds granted by NSF (if different)
1. **Elke U Weber**	**0.00**	**0.00**	**4.00**	$ **77,918**	$
2.					
3.					
4.					
5.					
6. ( ) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)	**0.00**	**0.00**	**0.00**	**0**	
7. (**1**) TOTAL SENIOR PERSONNEL (1 - 6)	**0.00**	**0.00**	**4.00**	**77,918**	
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)					
1. (**0**) POST DOCTORAL ASSOCIATES	**0.00**	**0.00**	**0.00**	**0**	
2. (**0**) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)	**0.00**	**0.00**	**0.00**	**0**	
3. (**0**) GRADUATE STUDENTS				**0**	
4. (**0**) UNDERGRADUATE STUDENTS				**0**	
5. (**0**) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)				**0**	
6. (**0**) OTHER				**0**	
TOTAL SALARIES AND WAGES (A + B)				**77,918**	
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)				**20,730**	
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)				**98,648**	
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000.)					
TOTAL EQUIPMENT				**0**	
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)				**3,228**	
2. FOREIGN				**6,094**	
F. PARTICIPANT SUPPORT COSTS					
1. STIPENDS $ **0**					
2. TRAVEL **0**					
3. SUBSISTENCE **0**					
4. OTHER **0**					
TOTAL NUMBER OF PARTICIPANTS (**0**) TOTAL PARTICIPANT COSTS				**0**	
G. OTHER DIRECT COSTS					
1. MATERIALS AND SUPPLIES				**0**	
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION				**0**	
3. CONSULTANT SERVICES				**0**	
4. COMPUTER SERVICES				**1,800**	
5. SUBAWARDS				**0**	
6. OTHER				**0**	
TOTAL OTHER DIRECT COSTS				**1,800**	
H. TOTAL DIRECT COSTS (A THROUGH G)				**109,770**	
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)					
TOTAL INDIRECT COSTS (F&A)				**69,704**	
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)				**179,474**	
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECTS SEE GPG II.C.6.j.)				**0**	
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				$ **179,474**	$

M. COST SHARING PROPOSED LEVEL $ **0** AGREED LEVEL IF DIFFERENT $

PI/PD NAME: **Elke U Weber**

ORG. REP. NAME*: **Otis brown**

FOR NSF USE ONLY		
INDIRECT COST RATE VERIFICATION		
Date Checked	Date Of Rate Sheet	Initials - ORG

C ***ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET**

BUDGET NARRATIVE

A. SALARIES AND WAGES

Prof. Elke Weber will lead the experiments to detect the presence of non-normative objective functions among farmers in the Pampas. She will be compensated with 1.5 months of summer salary in years one and three and one month in the second year. A 3% cost of living increase is included in the salary calculations.

B. FRINGE BENEFITS

The year-wise fringe benefit rate applied to the PI salary is 26.4% in year 1, 26.6% in year 2 and 26.8% in year 3.

C. TRAVEL

Argentina

One trip per year in years one and three to Buenos Aires is requested for E. Weber for planning, analysis and project monitoring purposes. Round trip economy airfare is estimated at $1000 per trip. An additional $150 is requested for local (NYC and Buenos Aires) travel expenses. Seven days of per diem at the federally established per diem rate of $271 have also been budgeted for each year.

Miami

One trip per year is requested for E. Weber to meet with colleages at the University of Miami. Economy air fare is budgeted at $400 per trip. An additional $100 is requested for local travel expenses. Four days of per diem at Miami's federally established per diem rate of $144 are also included.

D. OTHER

Computer Costs

The budget includes an annual $600 fee from the Institute for Social and Economic Research and Policy which covers access to and upkeep of ISERPs computer network, server and services.

Indirect Costs

In accordance with Columbia University's May 1, 2002 negotiated agreement with the Department of Health and Human Services, a 63.5% indirect cost rate has been applied to the modified total direct cost.

SUMMARY PROPOSAL BUDGET

YEAR 1

FOR NSF USE ONLY		
PROPOSAL NO.	DURATION (months) Proposed	Granted
AWARD NO.		

ORGANIZATION
National Center For Atmospheric Research

PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR
Richard W Katz

A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	NSF Funded Person-months CAL	ACAD	SUMR	Funds Requested By proposer	Funds granted by NSF (if different)
1. **Richard W Katz**	0.50	0.00	0.00	$ 0	$
2.					
3.					
4.					
5.					
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)	0.00	0.00	0.00	0	
7. (1) TOTAL SENIOR PERSONNEL (1 - 6)	0.50	0.00	0.00	0	
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)					
1. (0) POST DOCTORAL ASSOCIATES	5.40	0.00	0.00	21,060	
2. (0) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)	0.00	0.00	0.00	0	
3. (0) GRADUATE STUDENTS				0	
4. (0) UNDERGRADUATE STUDENTS				0	
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)				0	
6. (0) OTHER				0	
TOTAL SALARIES AND WAGES (A + B)				21,060	
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)				10,404	
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)				31,464	
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000.)					
TOTAL EQUIPMENT				0	
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)				1,000	
2. FOREIGN				1,800	
F. PARTICIPANT SUPPORT COSTS					
1. STIPENDS $ 0					
2. TRAVEL 0					
3. SUBSISTENCE 0					
4. OTHER 0					
TOTAL NUMBER OF PARTICIPANTS (0) TOTAL PARTICIPANT COSTS				0	
G. OTHER DIRECT COSTS					
1. MATERIALS AND SUPPLIES				0	
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION				0	
3. CONSULTANT SERVICES				0	
4. COMPUTER SERVICES				4,161	
5. SUBAWARDS				0	
6. OTHER				0	
TOTAL OTHER DIRECT COSTS				4,161	
H. TOTAL DIRECT COSTS (A THROUGH G)				38,425	
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) **MTDC (Rate: 49.5000, Base: 34264)**					
TOTAL INDIRECT COSTS (F&A)				16,961	
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)				55,386	
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECTS SEE GPG II.C.6.j.)				0	
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				$ 55,386	$

M. COST SHARING PROPOSED LEVEL $ 0 AGREED LEVEL IF DIFFERENT $

PI/PD NAME
Richard W Katz

ORG. REP. NAME*
Otis brown

FOR NSF USE ONLY		
INDIRECT COST RATE VERIFICATION		
Date Checked	Date Of Rate Sheet	Initials - ORG

 ***ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET**

SUMMARY PROPOSAL BUDGET YEAR 2

FOR NSF USE ONLY		
PROPOSAL NO.	DURATION (months) Proposed	Granted
AWARD NO.		

ORGANIZATION
National Center For Atmospheric Research

PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR
Richard W Katz

A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	NSF Funded Person-months CAL	ACAD	SUMR	Funds Requested By proposer	Funds granted by NSF (if different)
1. **Richard W Katz**	0.50	0.00	0.00	$ 0	$
2.					
3.					
4.					
5.					
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)	0.00	0.00	0.00	0	
7. (1) TOTAL SENIOR PERSONNEL (1 - 6)	0.50	0.00	0.00	0	
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)					
1. (0) POST DOCTORAL ASSOCIATES	5.40	0.00	0.00	21,060	
2. (0) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)	0.00	0.00	0.00	0	
3. (0) GRADUATE STUDENTS				0	
4. (0) UNDERGRADUATE STUDENTS				0	
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)				0	
6. (0) OTHER				0	
TOTAL SALARIES AND WAGES (A + B)				21,060	
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)				10,404	
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)				31,464	
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000.)					
TOTAL EQUIPMENT				0	
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)				1,000	
2. FOREIGN				1,800	
F. PARTICIPANT SUPPORT COSTS					
1. STIPENDS $ 0					
2. TRAVEL 0					
3. SUBSISTENCE 0					
4. OTHER 0					
TOTAL NUMBER OF PARTICIPANTS (0) TOTAL PARTICIPANT COSTS				0	
G. OTHER DIRECT COSTS					
1. MATERIALS AND SUPPLIES				0	
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION				0	
3. CONSULTANT SERVICES				0	
4. COMPUTER SERVICES				4,161	
5. SUBAWARDS				0	
6. OTHER				0	
TOTAL OTHER DIRECT COSTS				4,161	
H. TOTAL DIRECT COSTS (A THROUGH G)				38,425	
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) **MTDC (Rate: 49.5000, Base: 34264)**					
TOTAL INDIRECT COSTS (F&A)				16,961	
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)				55,386	
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECTS SEE GPG II.C.6.j.)				0	
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				$ 55,386	$

M. COST SHARING PROPOSED LEVEL $ **0** AGREED LEVEL IF DIFFERENT $

PI/PD NAME
Richard W Katz

ORG. REP. NAME*
Otis brown

FOR NSF USE ONLY		
INDIRECT COST RATE VERIFICATION		
Date Checked	Date Of Rate Sheet	Initials - ORG

 ***ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET**

SUMMARY PROPOSAL BUDGET YEAR 3

FOR NSF USE ONLY		
PROPOSAL NO.	DURATION (months) Proposed	Granted
AWARD NO.		

ORGANIZATION
National Center For Atmospheric Research

PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR
Richard W Katz

A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	NSF Funded Person-months CAL	ACAD	SUMR	Funds Requested By proposer	Funds granted by NSF (if different)
1. **Richard W Katz**	**0.50**	**0.00**	**0.00**	$ **0**	$
2.					
3.					
4.					
5.					
6. (**0**) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)	**0.00**	**0.00**	**0.00**	**0**	
7. (**1**) TOTAL SENIOR PERSONNEL (1 - 6)	**0.50**	**0.00**	**0.00**	**0**	
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)					
1. (**0**) POST DOCTORAL ASSOCIATES	**5.40**	**0.00**	**0.00**	**21,060**	
2. (**0**) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)	**0.00**	**0.00**	**0.00**	**0**	
3. (**0**) GRADUATE STUDENTS				**0**	
4. (**0**) UNDERGRADUATE STUDENTS				**0**	
5. (**0**) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)				**0**	
6. (**0**) OTHER				**0**	
TOTAL SALARIES AND WAGES (A + B)				**21,060**	
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)				**10,404**	
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)				**31,464**	
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000.)					
TOTAL EQUIPMENT				**0**	
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)				**1,000**	
2. FOREIGN				**1,800**	
F. PARTICIPANT SUPPORT COSTS					
1. STIPENDS $ **0**					
2. TRAVEL **0**					
3. SUBSISTENCE **0**					
4. OTHER **0**					
TOTAL NUMBER OF PARTICIPANTS (**0**) TOTAL PARTICIPANT COSTS				**0**	
G. OTHER DIRECT COSTS					
1. MATERIALS AND SUPPLIES				**0**	
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION				**0**	
3. CONSULTANT SERVICES				**0**	
4. COMPUTER SERVICES				**4,161**	
5. SUBAWARDS				**0**	
6. OTHER				**0**	
TOTAL OTHER DIRECT COSTS				**4,161**	
H. TOTAL DIRECT COSTS (A THROUGH G)				**38,425**	
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) **MTDC (Rate: 49.5000, Base: 34264)**					
TOTAL INDIRECT COSTS (F&A)				**16,961**	
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)				**55,386**	
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECTS SEE GPG II.C.6.j.)				**0**	
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				$ **55,386**	$

M. COST SHARING PROPOSED LEVEL $ **0** AGREED LEVEL IF DIFFERENT $

PI/PD NAME
Richard W Katz

ORG. REP. NAME*
Otis brown

FOR NSF USE ONLY		
INDIRECT COST RATE VERIFICATION		
Date Checked	Date Of Rate Sheet	Initials - ORG

 ***ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET**

SUMMARY PROPOSAL BUDGET

Cumulative

FOR NSF USE ONLY		
PROPOSAL NO.	DURATION (months) Proposed	Granted
AWARD NO.		

ORGANIZATION
National Center For Atmospheric Research

PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR
Richard W Katz

A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	NSF Funded Person-months CAL	ACAD	SUMR	Funds Requested By proposer	Funds granted by NSF (if different)
1. **Richard W Katz**	**1.50**	**0.00**	**0.00**	$ **0**	$
2.					
3.					
4.					
5.					
6. ( ) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)	**0.00**	**0.00**	**0.00**	**0**	
7. (**1**) TOTAL SENIOR PERSONNEL (1 - 6)	**1.50**	**0.00**	**0.00**	**0**	
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)					
1. (**0**) POST DOCTORAL ASSOCIATES	**16.20**	**0.00**	**0.00**	**63,180**	
2. (**0**) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)	**0.00**	**0.00**	**0.00**	**0**	
3. (**0**) GRADUATE STUDENTS				**0**	
4. (**0**) UNDERGRADUATE STUDENTS				**0**	
5. (**0**) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)				**0**	
6. (**0**) OTHER				**0**	
TOTAL SALARIES AND WAGES (A + B)				**63,180**	
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)				**31,212**	
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)				**94,392**	
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000.)					
TOTAL EQUIPMENT				**0**	
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)				**3,000**	
2. FOREIGN				**5,400**	
F. PARTICIPANT SUPPORT COSTS					
1. STIPENDS $ **0**					
2. TRAVEL **0**					
3. SUBSISTENCE **0**					
4. OTHER **0**					
TOTAL NUMBER OF PARTICIPANTS (**0**) TOTAL PARTICIPANT COSTS				**0**	
G. OTHER DIRECT COSTS					
1. MATERIALS AND SUPPLIES				**0**	
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION				**0**	
3. CONSULTANT SERVICES				**0**	
4. COMPUTER SERVICES				**12,483**	
5. SUBAWARDS				**0**	
6. OTHER				**0**	
TOTAL OTHER DIRECT COSTS				**12,483**	
H. TOTAL DIRECT COSTS (A THROUGH G)				**115,275**	
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)					
TOTAL INDIRECT COSTS (F&A)				**50,883**	
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)				**166,158**	
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECTS SEE GPG II.C.6.j.)				**0**	
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				$ **166,158**	$

M. COST SHARING PROPOSED LEVEL $ **0** AGREED LEVEL IF DIFFERENT $

PI/PD NAME
Richard W Katz

ORG. REP. NAME*
Otis brown

FOR NSF USE ONLY		
INDIRECT COST RATE VERIFICATION		
Date Checked	Date Of Rate Sheet	Initials - ORG

C ***ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET**

Budget Justification, Proposal #2004-026
National Center for Atmospheric Research
NSF 03-597 RFP (via The University of Miami)

Understanding and Modeling the Scope for Adaptive Management in the Pampas in Response to Interannual and Decadal Climate Variability and Other Risk Factors

1. *Senior Personnel*: Richard Katz is contributing two weeks of his time per year to this project.

2. *Postdoctoral Fellow*: One Postdoctoral Fellow will work on this project at .45 FTE per year. The Postdoctoral Fellow will be a member of the NCAR Geophysical Statistics Program and will work on a probabilistic treatment of uncertainty utilizing sensitivity analysis, scenario analysis, and Bayesian Markov chain Monte Carlo and Bayesian model averaging.

3. *Fringe Benefits*: Following standard UCAR procedure, fringe benefits are charged on regular salary, at an assumption of 85% worktime, at 49.4% (FY04 rate) of salary. Given the fact that Postdoctoral Fellows have little vacation time available, the assumption of 90% worktime is used for these positions.

4. *Travel*: In Year 1 and Year 2, $1,800 has been budgeted for R. Katz to travel to Buenos Aires, Argentina, to visit with colleagues at the University of Buenos Aires. In Years 1, 2, and 3, $1,000 has been budgeted for travel by R. Katz to visit colleagues at The University of Miami. In Year 3, $1,800 has been budgeted for R. Katz to attend a domestic professional conference.

5. *Indirect Costs*: The National Center for Atmospheric Research (NCAR) charges 49.5% (FY04 rate) on modified total direct costs (MTDC) to cover its indirect costs.

SUMMARY PROPOSAL BUDGET

YEAR 1

FOR NSF USE ONLY		
PROPOSAL NO.	DURATION (months) Proposed	Granted
AWARD NO.		

ORGANIZATION
Pennsylvania State Univ University Park

PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR
William E Easterling

A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	NSF Funded Person-months CAL	ACAD	SUMR	Funds Requested By proposer	Funds granted by NSF (if different)
1. **William E Easterling**	**0.00**	**0.00**	**0.30**	$ **4,483**	$
2.					
3.					
4.					
5.					
6. (**0**) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)	**0.00**	**0.00**	**0.00**	**0**	
7. (**1**) TOTAL SENIOR PERSONNEL (1 - 6)	**0.00**	**0.00**	**0.30**	**4,483**	
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)					
1. (**0**) POST DOCTORAL ASSOCIATES	**0.00**	**0.00**	**0.00**	**0**	
2. (**0**) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)	**0.00**	**0.00**	**0.00**	**0**	
3. (**1**) GRADUATE STUDENTS				**17,469**	
4. (**0**) UNDERGRADUATE STUDENTS				**0**	
5. (**0**) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)				**0**	
6. (**0**) OTHER				**0**	
TOTAL SALARIES AND WAGES (A + B)				**21,952**	
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)				**2,520**	
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)				**24,472**	
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000.)					
TOTAL EQUIPMENT				**0**	
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)				**1,600**	
2. FOREIGN				**3,000**	
F. PARTICIPANT SUPPORT COSTS					
1. STIPENDS $ **0**					
2. TRAVEL **0**					
3. SUBSISTENCE **0**					
4. OTHER **0**					
TOTAL NUMBER OF PARTICIPANTS (**0**) TOTAL PARTICIPANT COSTS				**0**	
G. OTHER DIRECT COSTS					
1. MATERIALS AND SUPPLIES				**0**	
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION				**0**	
3. CONSULTANT SERVICES				**0**	
4. COMPUTER SERVICES				**0**	
5. SUBAWARDS				**0**	
6. OTHER				**12,073**	
TOTAL OTHER DIRECT COSTS				**12,073**	
H. TOTAL DIRECT COSTS (A THROUGH G)				**41,145**	
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) **Total MTDC (Rate: 44.0000, Base: 29072)**					
TOTAL INDIRECT COSTS (F&A)				**12,792**	
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)				**53,937**	
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECTS SEE GPG II.C.6.j.)				**0**	
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				$ **53,937**	$

M. COST SHARING PROPOSED LEVEL $ **0** AGREED LEVEL IF DIFFERENT $

PI/PD NAME
William E Easterling

ORG. REP. NAME*
Otis brown

FOR NSF USE ONLY		
INDIRECT COST RATE VERIFICATION		
Date Checked	Date Of Rate Sheet	Initials - ORG

 ***ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET**

SUMMARY PROPOSAL BUDGET COMMENTS - Year 1

SUMMARY PROPOSAL BUDGET YEAR 2

FOR NSF USE ONLY		
PROPOSAL NO.	DURATION (months) Proposed	Granted
AWARD NO.		

ORGANIZATION
Pennsylvania State Univ University Park

PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR
William E Easterling

A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	NSF Funded Person-months CAL	ACAD	SUMR	Funds Requested By proposer	Funds granted by NSF (if different)
1. **William E Easterling**	**0.00**	**0.00**	**0.30**	$ **4,641**	$
2.					
3.					
4.					
5.					
6. (**0**) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)	**0.00**	**0.00**	**0.00**	**0**	
7. (**1**) TOTAL SENIOR PERSONNEL (1 - 6)	**0.00**	**0.00**	**0.30**	**4,641**	
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)					
1. (**0**) POST DOCTORAL ASSOCIATES	**0.00**	**0.00**	**0.00**	**0**	
2. (**0**) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)	**0.00**	**0.00**	**0.00**	**0**	
3. (**1**) GRADUATE STUDENTS				**18,080**	
4. (**0**) UNDERGRADUATE STUDENTS				**0**	
5. (**0**) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)				**0**	
6. (**0**) OTHER				**0**	
TOTAL SALARIES AND WAGES (A + B)				**22,721**	
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)				**2,609**	
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)				**25,330**	
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000.)					
TOTAL EQUIPMENT				**0**	
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)				**1,656**	
2. FOREIGN				**3,105**	
F. PARTICIPANT SUPPORT COSTS					
1. STIPENDS $ **0**					
2. TRAVEL **0**					
3. SUBSISTENCE **0**					
4. OTHER **0**					
TOTAL NUMBER OF PARTICIPANTS (**0**) TOTAL PARTICIPANT COSTS				**0**	
G. OTHER DIRECT COSTS					
1. MATERIALS AND SUPPLIES				**0**	
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION				**0**	
3. CONSULTANT SERVICES				**0**	
4. COMPUTER SERVICES				**0**	
5. SUBAWARDS				**0**	
6. OTHER				**13,280**	
TOTAL OTHER DIRECT COSTS				**13,280**	
H. TOTAL DIRECT COSTS (A THROUGH G)				**43,371**	
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) **Total MTDC (Rate: 44.0000, Base: 30091)**					
TOTAL INDIRECT COSTS (F&A)				**13,240**	
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)				**56,611**	
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECTS SEE GPG II.C.6.j.)				**0**	
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				$ **56,611**	$

M. COST SHARING PROPOSED LEVEL $ **0** AGREED LEVEL IF DIFFERENT $

PI/PD NAME
William E Easterling

ORG. REP. NAME*
Otis brown

FOR NSF USE ONLY		
INDIRECT COST RATE VERIFICATION		
Date Checked	Date Of Rate Sheet	Initials - ORG

 ***ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET**

SUMMARY PROPOSAL BUDGET

YEAR 3

FOR NSF USE ONLY		
PROPOSAL NO.	DURATION (months) Proposed	Granted
AWARD NO.		

ORGANIZATION
Pennsylvania State Univ University Park

PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR
William E Easterling

A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	NSF Funded Person-months CAL	ACAD	SUMR	Funds Requested By proposer	Funds granted by NSF (if different)
1. **William E Easterling**	**0.00**	**0.00**	**0.30**	$ **4,803**	$
2.					
3.					
4.					
5.					
6. (**0**) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)	**0.00**	**0.00**	**0.00**	**0**	
7. (**1**) TOTAL SENIOR PERSONNEL (1 - 6)	**0.00**	**0.00**	**0.30**	**4,803**	
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)					
1. (**0**) POST DOCTORAL ASSOCIATES	**0.00**	**0.00**	**0.00**	**0**	
2. (**0**) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)	**0.00**	**0.00**	**0.00**	**0**	
3. (**1**) GRADUATE STUDENTS				**18,713**	
4. (**0**) UNDERGRADUATE STUDENTS				**0**	
5. (**0**) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)				**0**	
6. (**0**) OTHER				**0**	
TOTAL SALARIES AND WAGES (A + B)				**23,516**	
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)				**2,700**	
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)				**26,216**	
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000.)					
TOTAL EQUIPMENT				**0**	
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)				**1,714**	
2. FOREIGN				**3,214**	
F. PARTICIPANT SUPPORT COSTS					
1. STIPENDS $ **0**					
2. TRAVEL **0**					
3. SUBSISTENCE **0**					
4. OTHER **0**					
TOTAL NUMBER OF PARTICIPANTS (**0**) TOTAL PARTICIPANT COSTS				**0**	
G. OTHER DIRECT COSTS					
1. MATERIALS AND SUPPLIES				**0**	
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION				**0**	
3. CONSULTANT SERVICES				**0**	
4. COMPUTER SERVICES				**0**	
5. SUBAWARDS				**0**	
6. OTHER				**14,609**	
TOTAL OTHER DIRECT COSTS				**14,609**	
H. TOTAL DIRECT COSTS (A THROUGH G)				**45,753**	
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) **Total MTDC (Rate: 44.0000, Base: 31144)**					
TOTAL INDIRECT COSTS (F&A)				**13,703**	
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)				**59,456**	
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECTS SEE GPG II.C.6.j.)				**0**	
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				$ **59,456**	$

M. COST SHARING PROPOSED LEVEL $ **0** AGREED LEVEL IF DIFFERENT $

PI/PD NAME
William E Easterling

ORG. REP. NAME*
Otis brown

FOR NSF USE ONLY		
INDIRECT COST RATE VERIFICATION		
Date Checked	Date Of Rate Sheet	Initials - ORG

 ***ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET**

SUMMARY PROPOSAL BUDGET

Cumulative

FOR NSF USE ONLY		
PROPOSAL NO.	DURATION (months) Proposed	Granted
AWARD NO.		

ORGANIZATION
Pennsylvania State Univ University Park

PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR
William E Easterling

A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	NSF Funded Person-months CAL	ACAD	SUMR	Funds Requested By proposer	Funds granted by NSF (if different)
1. **William E Easterling**	**0.00**	**0.00**	**0.90**	$ **13,927**	$
2.					
3.					
4.					
5.					
6. ( ) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)	**0.00**	**0.00**	**0.00**	**0**	
7. (**1**) TOTAL SENIOR PERSONNEL (1 - 6)	**0.00**	**0.00**	**0.90**	**13,927**	
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)					
1. (**0**) POST DOCTORAL ASSOCIATES	**0.00**	**0.00**	**0.00**	**0**	
2. (**0**) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)	**0.00**	**0.00**	**0.00**	**0**	
3. (**3**) GRADUATE STUDENTS				**54,262**	
4. (**0**) UNDERGRADUATE STUDENTS				**0**	
5. (**0**) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)				**0**	
6. (**0**) OTHER				**0**	
TOTAL SALARIES AND WAGES (A + B)				**68,189**	
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)				**7,829**	
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)				**76,018**	
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000.)					
TOTAL EQUIPMENT				**0**	
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)				**4,970**	
2. FOREIGN				**9,319**	
F. PARTICIPANT SUPPORT COSTS					
1. STIPENDS $ **0**					
2. TRAVEL **0**					
3. SUBSISTENCE **0**					
4. OTHER **0**					
TOTAL NUMBER OF PARTICIPANTS (**0**) TOTAL PARTICIPANT COSTS				**0**	
G. OTHER DIRECT COSTS					
1. MATERIALS AND SUPPLIES				**0**	
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION				**0**	
3. CONSULTANT SERVICES				**0**	
4. COMPUTER SERVICES				**0**	
5. SUBAWARDS				**0**	
6. OTHER				**39,962**	
TOTAL OTHER DIRECT COSTS				**39,962**	
H. TOTAL DIRECT COSTS (A THROUGH G)				**130,269**	
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)					
TOTAL INDIRECT COSTS (F&A)				**39,735**	
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)				**170,004**	
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECTS SEE GPG II.C.6.j.)				**0**	
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				$ **170,004**	$

M. COST SHARING PROPOSED LEVEL $ **0** AGREED LEVEL IF DIFFERENT $

PI/PD NAME
William E Easterling

ORG. REP. NAME*
Otis brown

FOR NSF USE ONLY		
INDIRECT COST RATE VERIFICATION		
Date Checked	Date Of Rate Sheet	Initials - ORG

C ***ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET**

THE PENNSYLVANIA STATE UNIVERSITY
PENN STATE INSTITUTES OF THE ENVIRONMENT

Detailed Budget

Period of Performance: June 1, 2004 - May 31, 2007

Title: Understanding and Modeling the Scope for Adaptive Management in Agroecosystems in the Pampas in Response to International Decadal Climate Variability and Other Risk Factors"

CATEGORY	% TIME	Year 1	Year 2	Year 3	TOTAL COSTS
Personnel:					
Salaries - Category I					
Easterling, W.E., PI	2.5%	4,483	4,641	4,803	13,927
Graduate Assistant - Category II	50.0%	17,469	18,080	18,713	54,262
Subtotal, Personnel					
Fringe Benefits:					
27.0% of Category I		1,210	1,253	1,297	3,760
7.5% of Category II		1,310	1,356	1,403	4,069
Subtotal, Fringe Benefits		2,520	2,609	2,700	7,829
Subtotal, Personnel and Fringe Benefits		24,472	25,330	26,216	76,018
Other Direct Costs:					
Travel:					
State College to Miami		1,600	1,656	1,714	4,970
State College to Buenos Aires, Argentina		3,000	3,105	3,214	9,319
Subtotal, Travel					
Graduate Assistant Tuition Remission		12,073	13,280	14,609	39,962
Subtotal, Other Direct Costs		16,673	18,041	19,537	54,251
Total Direct Costs		41,145	43,371	45,753	130,269
Indirect Costs		12,792	13,240	13,703	39,735
Total Costs		53,937	56,611	59,456	170,004

BUDGET NOTES

1. Salary costs are based on salary rates (fiscal 2003-04) escalated 3.5% beginning July 1 of each subsequent year. University policy has been to award salary increases on the basis of merit only. The estimated average merit increase in salaries is 3.5%.

2. Fringe benefits rates are negotiated and approved by the Office of Naval Research, Penn State's Cognizant Federal Agency. Approved rates are 27.0% for Category I, 7.5% for Category II, 8.1% for Category III, and 0.3% for Category IV for the current fiscal year of July 1, 2003 through June 30, 2004. If this proposal is funded, the rates quoted above shall be subject to adjustment for any period subsequent to this period if superseding government approved rates have been established.

   Category I – All salaries except those included in Categories II, III and IV.
   Category II – Graduate assistants.
   Category III – Non-student wages and fixed term II.
   Category IV – Student wages when enrolled for coursework.

3. All travel will be in accordance with University travel regulations. Travel estimates are based on costs that were incurred on previous projects of a similar nature for federal and state agencies.

4. Tuition is calculated using the predetermined rates of $4,175/semester and $2,088/summer term. An escalation factor of 10.0% is applied in the fall semester of each subsequent year.

5. Indirect costs rates are negotiated and approved by the Office of Naval Research, Penn State's Cognizant Federal Agency. The fixed rate for July 1, 2002 and forward is 44.0% (on campus) of MTDC. The address of the Cognizant Federal Agency is: Mr. David J. Wyner, Administrative Contracting Officer, Office of Naval Research, Chicago Regional Office, 230 South Dearborn, Room 380, Chicago, IL, 60604-1595. Phone (312) 886-5423, FAX (312) 353-6089 OR 2094, E-mail: wynerd@onr.navy.mil.

SUMMARY PROPOSAL BUDGET

YEAR 1

FOR NSF USE ONLY		
PROPOSAL NO.	DURATION (months) Proposed	Granted
AWARD NO.		

ORGANIZATION
University of Colorado at Boulder

PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR
Rajagopalan Balaji

A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	NSF Funded Person-months CAL	ACAD	SUMR	Funds Requested By proposer	Funds granted by NSF (if different)
1. **Rajagopalan Balaji**	0.00	0.00	1.00	$ 8,194	$
2. **Roger Pulwarty**	1.00	0.00	0.00	5,910	
3.					
4.					
5.					
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)	0.00	0.00	0.00	0	
7. (2) TOTAL SENIOR PERSONNEL (1 - 6)	1.00	0.00	1.00	14,104	
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)					
1. (0) POST DOCTORAL ASSOCIATES	0.00	0.00	0.00	0	
2. (0) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)	0.00	0.00	0.00	0	
3. (1) GRADUATE STUDENTS				20,688	
4. (0) UNDERGRADUATE STUDENTS				0	
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)				0	
6. (0) OTHER				0	
TOTAL SALARIES AND WAGES (A + B)				34,792	
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)				3,652	
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)				38,444	
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000.)					
TOTAL EQUIPMENT				0	
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)				3,725	
2. FOREIGN				0	
F. PARTICIPANT SUPPORT COSTS					
1. STIPENDS $ 0					
2. TRAVEL 0					
3. SUBSISTENCE 0					
4. OTHER 0					
TOTAL NUMBER OF PARTICIPANTS (0) TOTAL PARTICIPANT COSTS				0	
G. OTHER DIRECT COSTS					
1. MATERIALS AND SUPPLIES				1,530	
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION				0	
3. CONSULTANT SERVICES				0	
4. COMPUTER SERVICES				210	
5. SUBAWARDS				0	
6. OTHER				4,763	
TOTAL OTHER DIRECT COSTS				6,503	
H. TOTAL DIRECT COSTS (A THROUGH G)				48,672	
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) **MTDC; predetermined for period 7/1/02 - 6/30/04 (Rate: 48.0000, Base: 3667) (Cont. on Comments Page)**					
TOTAL INDIRECT COSTS (F&A)				21,328	
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)				70,000	
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECTS SEE GPG II.C.6.j.)				0	
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				$ 70,000	$

M. COST SHARING PROPOSED LEVEL $ 0 AGREED LEVEL IF DIFFERENT $

PI/PD NAME
Rajagopalan Balaji

ORG. REP. NAME*
Otis brown

FOR NSF USE ONLY		
INDIRECT COST RATE VERIFICATION		
Date Checked	Date Of Rate Sheet	Initials - ORG

 ***ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET**

SUMMARY PROPOSAL BUDGET COMMENTS - Year 1

**** I- Indirect Costs**
MTDC; predetermined for period 7/1/04 - 6/30/05 (Rate: 48.5000, Base 40346)

SUMMARY PROPOSAL BUDGET YEAR 2

FOR NSF USE ONLY		
PROPOSAL NO.	DURATION (months) Proposed	Granted
AWARD NO.		

ORGANIZATION
University of Colorado at Boulder

PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR
Rajagopalan Balaji

A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	NSF Funded Person-months CAL	ACAD	SUMR	Funds Requested By proposer	Funds granted by NSF (if different)
1. **Rajagopalan Balaji**	**0.00**	**0.00**	**1.00**	$ **8,514**	$
2. **Roger Pulwarty**	**1.00**	**0.00**	**0.00**	**6,140**	
3.					
4.					
5.					
6. (**0**) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)	**0.00**	**0.00**	**0.00**	**0**	
7. (**2**) TOTAL SENIOR PERSONNEL (1 - 6)	**1.00**	**0.00**	**1.00**	**14,654**	
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)					
1. (**0**) POST DOCTORAL ASSOCIATES	**0.00**	**0.00**	**0.00**	**0**	
2. (**0**) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)	**0.00**	**0.00**	**0.00**	**0**	
3. (**1**) GRADUATE STUDENTS				**21,495**	
4. (**0**) UNDERGRADUATE STUDENTS				**0**	
5. (**0**) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)				**0**	
6. (**0**) OTHER				**0**	
TOTAL SALARIES AND WAGES (A + B)				**36,149**	
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)				**3,795**	
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)				**39,944**	
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000.)					
TOTAL EQUIPMENT				**0**	
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)				**1,518**	
2. FOREIGN				**0**	
F. PARTICIPANT SUPPORT COSTS					
1. STIPENDS $ **0**					
2. TRAVEL **0**					
3. SUBSISTENCE **0**					
4. OTHER **0**					
TOTAL NUMBER OF PARTICIPANTS (**0**) TOTAL PARTICIPANT COSTS				**0**	
G. OTHER DIRECT COSTS					
1. MATERIALS AND SUPPLIES				**255**	
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION				**0**	
3. CONSULTANT SERVICES				**0**	
4. COMPUTER SERVICES				**216**	
5. SUBAWARDS				**0**	
6. OTHER				**5,224**	
TOTAL OTHER DIRECT COSTS				**5,695**	
H. TOTAL DIRECT COSTS (A THROUGH G)				**47,157**	
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) **MTDC ; predetermined for period 7/1/04 - 6/30/05 (Rate: 48.5000, Base: 3503) (Cont. on Comments Page)**					
TOTAL INDIRECT COSTS (F&A)				**20,582**	
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)				**67,739**	
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECTS SEE GPG II.C.6.j.)				**0**	
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				$ **67,739**	$

M. COST SHARING PROPOSED LEVEL $ **0** AGREED LEVEL IF DIFFERENT $

PI/PD NAME
Rajagopalan Balaji

ORG. REP. NAME*
Otis brown

FOR NSF USE ONLY		
INDIRECT COST RATE VERIFICATION		
Date Checked	Date Of Rate Sheet	Initials - ORG

 ***ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET**

SUMMARY PROPOSAL BUDGET COMMENTS - Year 2

**** I- Indirect Costs**
MTDC, predetermined for period 7/1/05 - 6/30/06 (Rate: 49.0000, Base 38537)

SUMMARY PROPOSAL BUDGET

YEAR 3

FOR NSF USE ONLY		
PROPOSAL NO.	DURATION (months) Proposed	Granted
AWARD NO.		

ORGANIZATION
University of Colorado at Boulder

PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR
Rajagopalan Balaji

A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	NSF Funded Person-months CAL	ACAD	SUMR	Funds Requested By proposer	Funds granted by NSF (if different)
1. **Rajagopalan Balaji**	**0.00**	**0.00**	**1.00**	$ **8,846**	$
2. **Roger Pulwarty**	**1.00**	**0.00**	**0.00**	**6,379**	
3.					
4.					
5.					
6. (**0**) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)	**0.00**	**0.00**	**0.00**	**0**	
7. (**2**) TOTAL SENIOR PERSONNEL (1 - 6)	**1.00**	**0.00**	**1.00**	**15,225**	
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)					
1. (**0**) POST DOCTORAL ASSOCIATES	**0.00**	**0.00**	**0.00**	**0**	
2. (**0**) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)	**0.00**	**0.00**	**0.00**	**0**	
3. (**1**) GRADUATE STUDENTS				**22,333**	
4. (**0**) UNDERGRADUATE STUDENTS				**0**	
5. (**0**) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)				**0**	
6. (**0**) OTHER				**0**	
TOTAL SALARIES AND WAGES (A + B)				**37,558**	
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)				**3,943**	
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)				**41,501**	
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000.)					
TOTAL EQUIPMENT				**0**	
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)				**2,753**	
2. FOREIGN				**0**	
F. PARTICIPANT SUPPORT COSTS					
1. STIPENDS $ **0**					
2. TRAVEL **0**					
3. SUBSISTENCE **0**					
4. OTHER **0**					
TOTAL NUMBER OF PARTICIPANTS (**0**) TOTAL PARTICIPANT COSTS				**0**	
G. OTHER DIRECT COSTS					
1. MATERIALS AND SUPPLIES				**50**	
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION				**1,380**	
3. CONSULTANT SERVICES				**0**	
4. COMPUTER SERVICES				**0**	
5. SUBAWARDS				**0**	
6. OTHER				**5,725**	
TOTAL OTHER DIRECT COSTS				**7,155**	
H. TOTAL DIRECT COSTS (A THROUGH G)				**51,409**	
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) **MTDC; predetermined for period 7/1/05 - 6/30/06 (Rate: 49.0000, Base: 45794)**					
TOTAL INDIRECT COSTS (F&A)				**22,439**	
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)				**73,848**	
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECTS SEE GPG II.C.6.j.)				**0**	
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				$ **73,848**	$

M. COST SHARING PROPOSED LEVEL $ **0** AGREED LEVEL IF DIFFERENT $

PI/PD NAME
Rajagopalan Balaji

ORG. REP. NAME*
Otis brown

FOR NSF USE ONLY		
INDIRECT COST RATE VERIFICATION		
Date Checked	Date Of Rate Sheet	Initials - ORG

 ***ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET**

SUMMARY PROPOSAL BUDGET

Cumulative

FOR NSF USE ONLY		
PROPOSAL NO.	DURATION (months) Proposed	Granted
AWARD NO.		

ORGANIZATION: **University of Colorado at Boulder**

PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR: **Rajagopalan Balaji**

A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	NSF Funded Person-months CAL	ACAD	SUMR	Funds Requested By proposer	Funds granted by NSF (if different)
1. **Rajagopalan Balaji**	0.00	0.00	3.00	$ 25,554	$
2. **Roger Pulwarty**	3.00	0.00	0.00	18,429	
3.					
4.					
5.					
6. ( ) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)	0.00	0.00	0.00	0	
7. (**2**) TOTAL SENIOR PERSONNEL (1 - 6)	3.00	0.00	3.00	43,983	
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)					
1. (**0**) POST DOCTORAL ASSOCIATES	0.00	0.00	0.00	0	
2. (**0**) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)	0.00	0.00	0.00	0	
3. (**3**) GRADUATE STUDENTS				64,516	
4. (**0**) UNDERGRADUATE STUDENTS				0	
5. (**0**) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)				0	
6. (**0**) OTHER				0	
TOTAL SALARIES AND WAGES (A + B)				108,499	
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)				11,390	
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)				119,889	
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000.)					
TOTAL EQUIPMENT				0	
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)				7,996	
2. FOREIGN				0	
F. PARTICIPANT SUPPORT COSTS					
1. STIPENDS $ **0**					
2. TRAVEL **0**					
3. SUBSISTENCE **0**					
4. OTHER **0**					
TOTAL NUMBER OF PARTICIPANTS (**0**) TOTAL PARTICIPANT COSTS				0	
G. OTHER DIRECT COSTS					
1. MATERIALS AND SUPPLIES				1,835	
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION				1,380	
3. CONSULTANT SERVICES				0	
4. COMPUTER SERVICES				426	
5. SUBAWARDS				0	
6. OTHER				15,712	
TOTAL OTHER DIRECT COSTS				19,353	
H. TOTAL DIRECT COSTS (A THROUGH G)				147,238	
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)					
TOTAL INDIRECT COSTS (F&A)				64,349	
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)				211,587	
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECTS SEE GPG II.C.6.j.)				0	
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				$ 211,587	$

M. COST SHARING PROPOSED LEVEL $ **0** AGREED LEVEL IF DIFFERENT $

PI/PD NAME: **Rajagopalan Balaji**

ORG. REP. NAME*: **Otis brown**

FOR NSF USE ONLY		
INDIRECT COST RATE VERIFICATION		
Date Checked	Date Of Rate Sheet	Initials - ORG

C ***ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET**

University of Colorado at Boulder
Cooperative Institute for Research in Environmental Sciences

BUDGET JUSTIFICATION

SALARIES: Dr. Roger Pulwarty is requesting a calendar month for his contribution. He will integrate all components of the project from an adaptive management perspective. Dr. Rajagopalan Balaji is requesting one month of summer salary. He will lead the development of interannual and decadal climate scenarios. One graduate student will work on compiling information and reports for the self-reflective study on interdisciplinary collaboration.

TRAVEL. One trip per year to Miami for project meetings is budgeted for both Pulwarty and Balaji. Also, funds are requested for one trip per year to a national meeting to present research results.

MATERIALS AND SUPPLIES. This request covers bookstore supplies, magnetic media, paper, printer cartridges, etc.

COMPUTER SERVICES. This covers the cost of network access.

GRADUATE TUITION REMISSION. Listed under "other" (Section G.6) funds are requested for in-state tuition remission for the graduate student.

INDIRECT COSTS. IDRC is 48% on Year 1, 48.5% on Year 2, and 49% on Year 3.

GUILLERMO PODESTA - CURRENT AND PENDING SUPPORT

CURRENT

Co-PI NASA 4/1/01-3/31/04 $107,060 award total
19% effort
Continued processing and extension of the AVHRR Pathfinder Oceans Global Sea Surface Temperature Dataset and associated matchup database

PI NOAA-OGP 7/1/2002- 6/30/2003 $599,995 award total
$91,570 19% effort
Climate Information System for Agriculture and Water Resources Management in the Southeastern USA

PI NSF 09/15/2001 – 12/31/2003 $65,000 award total
$23,626 22% effort
Climate Information and Forecasts in Agricultural Production Systems of the Argentine Pampas: Planning for their Effective Use in Decision-Making

Co-PI USDA-RMA 09/01/2002 – 08/31/2004 $91,000 award total
10% effort
Risk Reduction for Agriculture Specialty Crops in the Southeast United States

PENDING

Co-PI NSF 4/1/2004-3/31/2007 Request: $ 249,790
(subcontract to Columbia University)
10%, 25%, 25% effort
Center for the Study of Individual and Group Decision Making Under Climate Uncertainty

PI NOAA-OGP 1/1/2004 – 12/31/2003 Request: $80,570
25% effort
Building capacity to use climate information and forecasts to enhance decision-making in agriculture: An application to the Argentine Pampas

Co-PI NOAA-OGP 1/1/2004 – 12/31/2003 Request: $ 192,664
(subcontract to University of Colorado)
17% effort
Translation of seasonal climate forecasts and decadal variability into skilful hydroclimate predictions: Applications to resource management and decision making in the Río de la Plata Basin and the Argentine Pampas

Co-PI NOAA-OGP 1/1/2004 – 12/31/2003 Request: $ 162,194
(subcontract to Columbia University)
4% effort
Decision-making in agricultural production in the Argentine Pampas:
Alternative choice process formulations and the value of climate information

Rajagopalan Balaji – Current and Pending Support

SOURCE	PROJECT TITLE	AWARD AMOUNT	DURATION	TIME COMMITTED
NSF (current)	Interannual and Interdecadal Climate Variations and Floods in the Western United States (with U. Lall, PI). Project at Columbia University	$278,852	10/1/99 - 9/30/03	0.5 month summer
NSF (current)	The Changing Seasons? Detecting and Understanding Climate Change (with U. Lall, PI). Project at Utah State University (partly sub-contract to University of Colorado – Boulder)	$266,236	8/31/97 - 11/30/03	1.0 month summer (2003), Graduate student and postdoc support
USBR (current)	Watershed and River System Management for the Truckee-Carson	$75,000	7/1/02 - 9/30/03	1.0 month summer
NOAA (current)	Understanding the spatio-temporal variability of the North American Monsoon: Implications to Water Resources Management in the South Western US (with E. Zagona, M. Clark, S. Gangopadhyay and A. Ray Co-PI)	$213,427	9/1/03 - 8/31/06	1.0 month summer
NSF (current) SGER	Estimation of Structural Systems Reliability Under Hurricane Hazard (Co-PI Dan Frangopol and Ross Corotis)	$40, 000	8/1/03 - 7/31/04	0.75 month summer
NASA (pending)	Development of Improved Hydrologic Forecasting Capabilities Using Space-based Observations	$507,880	10/1/03 - 9/30/06	0.5 month summer for the first two years and 1 month summer in the last year.
NSF (pending)	The role of tropical Asian landcover changes in altering large-scale atmospheric circulations : interaction with ENSO and the Asian summer monsoon (PI Tom Chase)	$370,772	1/1/04 - 12/31/06	1.0 month summer
NSF (pending) CAREER	Climate Induced Portfolio of Infrastructure Risk : Understanding, Estimation, Prediction and Management	$510,378	3/1/04 - 2/28/08	1.0 month summer
NOAA (pending)	Robustness of policy options available to adapt to climate extremes in Colorado River Basin (PI M. Clark, Co-PI, E. Zagona, S. Gangopadhyay, R. Pielke Jr.)	$295,411	4/1/04 - 3/31/07	0.5 month summer
NOAA (pending)	Translation of seasonal climate forecasts and decadal variability into skilful hydroclimate predictions : Applications to resource management and decision making in the Rio de la Plata Basin, Argentina (Co-PI, G. Podesta, M. Clark, S. Gangopadhyay, E. Zagona)	$382,872	1/1/04 - 31/12/07	0.25 month summer in year 1 1.0 month summer in years 2 and 3
NOAA (pending)	Use of streamflow forecasts in reservoir operations under current and modified management frameworks (PI, M. Clark, Co-PI, S. Gangopadhyay, E. Zagona, A. Ray)	$354,356	1/1/04 - 31/12/07	0.5 summer month

Current and Pending Support

(See GPG Section II.D.8 for guidance on information to include on this form.)

The following information should be provided for each investigator and other senior personnel. Failure to provide this information may delay consideration of this proposal.

Investigator: **William E. Easterling**

Other agencies (including NSF) to which this proposal has been/will be

Support: X Current

Project/Proposal Title: **Building the Role of Seasonal Climate Forecasts in South Africa**

Source of Support: UCAR/Visiting Scientist Programs

Total Award Amount: $36,115 Total Award Period Covered: 10/01/02-6/30/04

Location of Project: Penn State

Person-Months Per Year Committed to the Project. Cal: 1 Acad: Sumr:

Support: X Pending

Project/Proposal Title: **Understanding and Modeling the Scope for Adaptive Management in Agroecosystems in the Pampas in Response to Interannual and Decadal Climate Variability and Other Risk Factors (this proposal)**

Source of Support: University of Miami Rosenstiel School of Marine & Atmospheric Science

Total Award Amount: $170,004 Total Award Period Covered: 06/01/04-05/31/07

Location of Project: Penn State

Person-Months Per Year Committed to the Project. Cal: 1 Acad: Sumr: 0.3

Support: X Pending

Project/Proposal Title: **Development and Analysis of a Climate-based Agricultural Index for Long-Term Monitoring**

Source of Support: NOAA (Proposal number GC03-205)

Total Award Amount: $156,711 Total Award Period Covered: 01/01/03-12/31/04

Location of Project: Penn State

Person-Months Per Year Committed to the Project. Cal: 1 Acad: Sumr:

Support: X Pending

Project/Proposal Title: **Health-Environment Alliance and Network: A Collaborative Infrastructure for Enhanced Understanding and Prediction of Linked Weather, Climate and Human Health Outcomes**

Source of Support: National Aeronautic and Space Administration

Total Award Amount: $5,245,878 Total Award Period Covered: 07/01/03-06/30/08

Location of Project: Penn State

Person-Months Per Year Committed to the Project. Cal: 0. Acad: Sumr:

Support: X Pending

Project/Proposal Title: **Climate Impact Modeling and Analysis Project (CIMAP)**

Source of Support: U.S. Department of Agriculture

Total Award Amount: $448,416 Total Award Period Covered: 08/01/03-07/31/06

Location of Project: Penn State

Person-Months Per Year Committed to the Project. Cal: 0.5 Acad: Sumr:

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*If this project has previously been funded by another agency, please list and furnish information for immediately preceding funding period.

Current and Pending Support

(See GPG Section II.D.8 for guidance on information to include on this form.)

The following information should be provided for each investigator and other senior personnel. Failure to provide this information may delay consideration of this proposal.

Investigator: **William E. Easterling (continued)**	Other agencies (including NSF) to which this proposal has been/will be

Support: X Pending

Project/Proposal Title: **Partnerships for Innovation in the Development of a Global Hydrogen Economy**

Source of Support: National Science Foundation

Total Award Amount: $600,000 Total Award Period Covered: 01/01/04-12/31/06

Location of Project: Penn State

Person-Months Per Year Committed to the Project. Cal: 0 Acad: Sumr: 0

Support: X Pending

Project/Proposal **NIRT: Nanotechnology and Its Publics**

Source of Support: NSF

Total Award Amount: $1,999,082 Total Award Period Covered:

Location of Project: Penn State

Person-Months Per Year Committed to the Project. Cal: Acad: Sumr: 0

Support: X Pending

Project/Proposal Title: **IGERT: Integrated Training Program in Carbon Cycle Science and Management**

Source of Support: NSF

Total Award Amount: Total Award Period Covered: 06/01/04-05/31/09

Location of Project: Penn State

Person-Months Per Year Committed to the Project. Cal: Acad: Sumr: 0

Support:

Project/Proposal Title:

Source of Support:

Total Award Amount: Total Award Period Covered:

Location of Project:

Person-Months Per Year Committed to the Project. Cal: Acad: Sumr:

Support:

Project/Proposal Title:

Source of Support:

Total Award Amount: Total Award Period Covered:

Location of Project: Penn State

Person-Months Per Year Committed to the Project. Cal: Acad: Sumr:

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*If this project has previously been funded by another agency, please list and furnish information for immediately preceding funding period.

Current and Pending Support

(See GPG Section II.D.8 for guidance on information to include on this form.)

The following information should be provided for each investigator and other senior personnel. Failure to provide this information may delay consideration of this proposal.

Investigator: Dr. Richard Katz

Other agencies (including NSF) to which this proposal has been/will be

Support: ☒ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title: Geophysical Statistics Program at the National Center for Atmospheric Research

Source of Support: NSF/DMS

Total Award Amount: $ 3,000,000 Total Award Period Covered: 07/01/99 - 6/30/04

Location of Project:

Person-Months Per Year Committed to the Project. Cal: Acad: 1.8 Sumr:

Support: ☐ Current ☒ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title: A Statistics Program at NCAR

Source of Support: NSF/DMS

Total Award Amount: $ 4,210,822 Total Award Period Covered: 07/01/04 - 6/30/09

Location of Project:

Person-Months Per Year Committed to the Project. Cal: Acad: 1.2 Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Source of Support:

Total Award Amount: $ Total Award Period Covered:

Location of Project:

Person-Months Per Year Committed to the Project. Cal: Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Source of Support:

Total Award Amount: $ Total Award Period Covered:

Location of Project:

Person-Months Per Year Committed to the Project. Cal: Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Source of Support:

Total Award Amount: $ Total Award Period Covered:

Location of Project:

Person-Months Per Year Committed to the Project. Cal: Acad: Sumr:

*If this project has previously been funded by another agency, please list and furnish information for immediately preceding funding period.

CURRENT AND PENDING SUPPORT

Dr. Elke U. Weber
Columbia University

Pending:
Preferences as Memory
National Science Foundation
479,578
3/1/04-2/28/07
Columbia University
1.0 Summer Months

Decision-Making in Agricultural Production in the Argentine Pampas: Alternative Choice Process Formulations and the Value of Climate Information
National Oceanic and Atmospheric Administration
258,561
4/1/4-3/31/7
Columbia University
.5 summer months

Center for the Study of Individual and Group Decision Making Under Climate Uncertainty
NSF
7,189,048
4/1/4-3/31/9
Columbia
1.0 calendar months

Kenneth Broad's Support

CURRENT

CoPI NOAA-OGP 7/1/2002- 6/30/2006 $599,995 award total
$158,125 23% effort
Climate Information System for Agriculture and Water Resources Management in the Southeastern USA (660125)

PI NOAA-Columbia University 03/15/2001 – 06/30/2003 $189,447 67 % effort
Advancing Integrated Climate Forecast Applications Research
(660896 MT 662761 sub01)

PI NOAA 07/01/2001 – 6/30/2006 $85,823 21% effort
Assessing Climate Applications Research and Implementation
Projects (668065)

CoPI NSF-Museum of Natural History 10/15/2001 – 09/30/2006 $742,106 award total
$254,218 17% effort
Coupled Natural and Human Dynamics in Coral Reef Ecosystems: The Effect of Marine Reserve Network Design (668576 sub20 664731 MT)

CoPI NSF 09/15/2001 – 12/31/2003 $65,000 award total
$20,687 0% effort
Climate Information and Forecasts in Agricultural Production Systems of the Argentine Pampas: Planning for their Effective Use in Decision-Making

PENDING

CoPI NOAA 08/01/2002 – 07/31/2007 $1,538,357 proposal total
8% effort
CRES 2002: Interdisciplinary Coral Ecosystem Research (An Interdisciplinary Study of the Coral Reef Ecosystem of Salt River National Historical Park and Ecological Preserve, St. Croix, US Virgin Islands) (R0200293)

Current and Pending Support

(See GPG Section II.D.8 for guidance on information to include on this form.)

The following information should be provided for each investigator and other senior personnel. Failure to provide this information may delay consideration of this proposal.

Co-Investigator: Hilda Herzer

Other agencies (including NSF) to which this proposal has been/will be

Support: ☒ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title: ENSO Disaster Risk Management in Latin America: A proposal for the consolidation of a Regional Network for Comparative Research, Information and Training from the Social Perspective.

Source of Support: IAI-Interamerican Institute for Research on Global Change

Total Award Amount: $ 58,000 Total Award Period Covered: 1/09/2000-30/10/2003

Location of Project: Centro. Estudios Sociales y Ambientales

Person-Months Per Year Committed to the Project. Cal: Acad: 3 Sumr:

Support: Current ☒ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Building capacity to use climate information and forecasts to enhance decision-making in agriculture: An application to the Argentine Pampas

Source of Support: NOAA Office of Global Programs through University of Miami

Total Award Amount: $ 6000 Total Award Period Covered: Jan 1 2004 – Dec 31 2004

Location of Project:

Person-Months Per Year Committed to the Project. Cal: Acad: 2 Sumr:

Support: Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Source of Support:

Total Award Amount: $ Total Award Period Covered

Location of Project:

Person-Months Per Year Committed to the Project. Cal: Acad: Sumr:

Support: Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Source of Support

Total Award Amount: $ Total Award Period Covered:

Location of Project

Person-Months Per Year Committed to the Project. Cal: Acad: Sumr:

Support: ☐ Current Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Source of Support:

Total Award Amount: $ Total Award Period Covered:

Location of Project:

Person-Months Per Year Committed to the Project. Cal: Acad: Sumr:

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*If this project has previously been funded by another agency, please list and furnish information for immediately preceding funding period.

DAVID LETSON'S SUPPORT

CURRENT

CoPI NOAA-OGP 7/1/2002- 6/30/2006 $647,098 award total
19% effort
Climate Information System for Agriculture and Water Resources Management in the Southeastern USA (660124)

PI NOAA Educational Partnership Program 10/30/2003– 09/30/2004
$103,132 5% effort
Environmental Cooperative Science Center (66008N)

PI NOAA-MARFIN 10/01/2002 – 12/31/2003 $87,723 8% effort
Economic Valuation of Marine Reserves in the Florida Keys as Measured by Diver Attitude and Preferences: Implications for Valuation of Non-Consumption Uses of Marine Resources (660832)

CoPI NSF 09/15/2001 – 12/31/2003 $65,000 award total
$20,687 0% effort
Climate Information and Forecasts in Agricultural Production Systems of the Argentine Pampas: Planning for their Effective Use in Decision-Making

PI USDA-RMA 03/01/03 – 09/30/05 $91,000 award total
10% effort
Risk Reduction for Agriculture Specialty Crops in the Southeast United States (661275)

PENDING

PI Columbia University / NOAA OGP $162,194
8% effort
Decision-Making in Agricultural Production in the Argentine Pampas: Alternative Choice Process Formulations and the Value of Climate Information (R0400063)

Current and Pending Support

(See GPG Section II.D.8 for guidance on information to include on this form.)

The following information should be provided for each investigator and other senior personnel. Failure to provide this information may delay consideration of this proposal.

Investigator: Dr. Angel Menéndez

Other agencies (including NSF) to which this proposal has been/will be

Support: ☒ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title: Impact of Global Change on the Coastal Areas of the Río de la Plata: Sea Level Rise and Meteorological Effects

Source of Support: AIACC

Total Award Amount: $100,000 Total Award Period Covered: 2/15/02-2/14/05

Location of Project: Univ. of Buenos Aires

Person-Months Per Year Committed to the Project. Cal: Acad: 3 Sumr:

Support: ☒ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title: Floods: genesis, socio- economical cost, adaptation and prevention

Source of Support: Univ. of Buenos Aires

Total Award Amount: $50,000 Total Award Period Covered: 3/1/01-2/28/04

Location of Project: Univ. of Buenos Aires

Person-Months Per Year Committed to the Project. Cal: Acad: 2 Sumr:

Support: ☒ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title: Protección Ambiental del Río de la Plata y su Frente Marítimo: Prevención y Control de la Contaminación y Restauración de Hábitats

Source of Support: UNDP/GEF

Total Award Amount: $65,000 Total Award Period Covered: 3/1/02-4/1/03

Location of Project: INA

Person-Months Per Year Committed to the Project. Cal: Acad: 3 Sumr:

Support: ☐ Current ☒ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title: Study of the Advancement of the Paraná Delta on the Río de la Plata

Source of Support: ANPCyT-Secyt (Argentina)

Total Award Amount: $10,000 Total Award Period Covered: 12/1/02-11/30/04

Location of Project: INA

Person-Months Per Year Committed to the Project. Cal: Acad: 2 Sumr:

Support: ☐ Current ☒ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:Translation of climate forecasts and decadal variability into skilful hydroclimatic Predictions: Applications to resource management and decision-making in the Rio de la Plata Basin

Source of Support: NOAA/OGP (through University of Colorado)

Total Award Amount: $ 27,000 Total Award Period Covered: 1 April 2004 – 31 March 2007

Location of Project:

Person-Months Per Year Committed to the Project. Cal: Acad: 1.5 Sumr:

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*If this project has previously been funded by another agency, please list and furnish information for immediately preceding funding period.

Current and Pending Support

(See GPG Section II.D.8 for guidance on information to include on this form.)

The following information should be provided for each investigator and other senior personnel. Failure to provide this information may delay consideration of this proposal.

Investigator: Dr. Angel Menéndez | Other agencies (including NSF) to which this proposal has been/will be

Support: ☐ Current ☒ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support
Project/Proposal Title: Decision-making in agricultural production in the Argentine Pampas: Alternative choice formulations And the value and design of climate information

Source of Support: NOAA/OGP (through University of Miami and Columbia University)
Total Award Amount: $ 25,500 Total Award Period Covered: 1 Apr 2004 – 31 Mar 2007
Location of Project:
Person-Months Per Year Committed to the Project. Cal: Acad: 1.5 Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support
Project/Proposal Title:

Source of Support:
Total Award Amount: $ Total Award Period Covered:
Location of Project:
Person-Months Per Year Committed to the Project. Cal: Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support
Project/Proposal Title:

Source of Support:
Total Award Amount: $ Total Award Period Covered:
Location of Project:
Person-Months Per Year Committed to the Project. Cal: Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support
Project/Proposal Title:

Source of Support:
Total Award Amount: $ Total Award Period Covered:
Location of Project:
Person-Months Per Year Committed to the Project. Cal: Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Source of Support:
Total Award Amount: $ Total Award Period Covered:
Location of Project:
Person-Months Per Year Committed to the Project. Cal: Acad: Sumr:

*If this project has previously been funded by another agency, please list and furnish information for immediately preceding funding period.

Current and Pending Support

(See GPG Section II.D.8 for guidance on information to include on this form.)

The following information should be provided for each investigator and other senior personnel. Failure to provide this information may delay consideration of this proposal.

Investigator: Dr. Donald Olson

Other agencies (including NSF) to which this proposal has been/will be

Support: ☒ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:"Biocomplexity: Collaborative Research: Factors affecting and Impact of Diazotropic Microorganisms in the Western Equatorial Atlantic Ocean" (PI)

Source of Support: NSF

Total Award Amount: $267,580 Total Award Period Covered: 01/01/00-12/31/04

Location of Project: RSMAS

Person-Months Per Year Committed to the Cal: 7% Acad: Sumr:

Support: ☒ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title: "Biocomplexity of the Bahamian Ecosystem" (PI)

Source of Support: NSF

Total Award Amount: $45,401 Total Award Period Covered: 10/15/01-09/30/06

Location of Project: RSMAS

Person-Months Per Year Committed to the Cal: 4% Acad: Sumr:

Support: ☒ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title: "Source,Tropic Opportunities and Fate of Billfish Larvae in the Diverse Pelagic Habitats of the Straits of Florida" (Co-PI)

Source of Support: NSF

Total Award Amount: $185,035 Total Award Period Covered: 08/01/02-07/31/06

Location of Project: RSMAS

Person-Months Per Year Committed to the Cal: 4% Acad: Sumr:

Support: ☒ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title: "Theory and Observations of Ocean Fronts: Lagrangian Studies of Marginal Seas" (PI)

Source of Support: ONR

Total Award Amount: $263,266 Total Award Period Covered: 02/15/03-09/30/04

Location of Project: RSMAS

Person-Months Per Year Committed to the Cal: 17% Acad: Sumr:

Support: ☐ Current ☒ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title: "Carbon Exchanges and Storage in the North Atlantic Subtropical Gyre" (Co-PI)

Source of Support: NASA

Total Award Amount: $1,103,017 Total Award Period Covered: 10/01/03-09/30/06

Location of Project: RSMAS

Person-Months Per Year Committed to the Cal: 17% Acad: Sumr:

Support: ☐ Current ☒ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title "Assestment of regional Spiny Lobster stock abundance trends and linkages that explain Florida (Co-PI)

Source of Support: FLORIDA SEA GRANT COLLEGE PROGRAM

Total Award Amount: $195,002 Total Award Period Covered: 10/01/03-09/30/05

Location of Project: RSMAS

Person-Months Per Year Committed to the Cal: 6% Acad: Sumr:

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*If this project has previously been funded by another agency, please list and furnish information for immediately preceding funding period.

Current and Pending Support

(See GPG Section II.D.8 for guidance on information to include on this form.)

The following information should be provided for each investigator and other senior personnel. Failure to provide this information may delay consideration of this proposal.

Support: ☐ Current ☒ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title: "The Cross-Shelf Transport, diapause-habitat and spring patchiness of Neocalanus copepods and And patch use by dominant fishes in the North Gulf of Alasta" (Co-PI)

Source of Support: NORTH PACIFIC RESEARCH BOARD

Total Award Amount: $ 586,713 Total Award Period Covered: 06/01/03 – 05/31/06

Location of Project: RSMAS

Person-Months Per Year Committed to the % Cal: 14% Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Source of Support:

Total Award Amount: Total Award Period Covered:

Location of Project:

Person-Months Per Year Committed to the % Cal: Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Source of Support:

Total Award Amount: Total Award Period Covered:

Location of Project:

Person-Months Per Year Committed to the % Cal: Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Source of Support:

Total Award Amount: Total Award Period Covered:

Location of Project:

Person-Months Per Year Committed to the % Cal: Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Source of Support:

Total Award Amount: Total Award Period Covered:

Location of Project:

Person-Months Per Year Committed to the % Cal: Acad: Sumr:

*If this project has previously been funded by another agency, please list and furnish information for immediately preceding funding period.

Current and Pending Support

(See GPG Section II.D.8 for guidance on information to include on this form.)

The following information should be provided for each investigator and other senior personnel. Failure to provide this information may delay consideration of this proposal.

Investigator: Dr. Roger Pulwarty	Other agencies (including NSF) to which this proposal has been/will be

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support
Project/Proposal Title: NO EXTRAMURAL SUPPORT

Source of Support:
Total Award Amount: $ Total Award Period Covered:
Location of Project:
Person-Months Per Year Committed to the Project. Cal: Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support
Project/Proposal Title:

Source of Support:
Total Award Amount: $ Total Award Period Covered:
Location of Project:
Person-Months Per Year Committed to the Project. Cal: Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support
Project/Proposal Title:

Source of Support:
Total Award Amount: $ Total Award Period Covered:
Location of Project:
Person-Months Per Year Committed to the Project. Cal: Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support
Project/Proposal Title:

Source of Support:
Total Award Amount: $ Total Award Period Covered:
Location of Project:
Person-Months Per Year Committed to the Project. Cal: Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support
Project/Proposal Title:

Source of Support:
Total Award Amount: $ Total Award Period Covered:
Location of Project:
Person-Months Per Year Committed to the Project. Cal: Acad: Sumr:

*If this project has previously been funded by another agency, please list and furnish information for immediately preceding funding period.

Current and Pending Support

(See GPG Section II.D.8 for guidance on information to include on this form.)

The following information should be provided for each investigator and other senior personnel. Failure to provide this information may delay consideration of this proposal.

Investigator: Miguel A. Rabiolo

Other agencies (including NSF) to which this proposal has been/will be

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title: NO EXTRAMURAL RESEARCH SUPPORT

Source of Support:

Total Award Amount: $ Total Award Period Covered:

Location of Project:

Person-Months Per Year Committed to the Project. Cal: Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Source of Support:

Total Award Amount: $ Total Award Period Covered:

Location of Project:

Person-Months Per Year Committed to the Project. Cal: Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Source of Support:

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Project/Proposal Title:

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Person-Months Per Year Committed to the Project. Cal: Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Source of Support:

Total Award Amount: $ Total Award Period Covered:

Location of Project:

Person-Months Per Year Committed to the Project. Cal: Acad: Sumr:

*If this project has previously been funded by another agency, please list and furnish information for immediately preceding funding period.

Current and Pending Support

(See GPG Section II.D.8 for guidance on information to include on this form.)

The following information should be provided for each investigator and other senior personnel. Failure to provide this information may delay consideration of this proposal.

Investigator: Emilio H. Satorre	Other agencies (including NSF) to which this proposal has been/will be

Support: ☒ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title: Procesos Claves de la Invasión de Malezas en Cultivos Primavero-Estivales e Inverno-Primaverales: Dispersión, establecimiento y competencia.

Source of Support: Agencia Nacional de Promoción de Ciencia y Tecnología (ANPCyT), Argentina

Total Award Amount: $ 47,150 Total Award Period Covered: 11/1/2000-10/31/2003

Location of Project: Cátedra de Cerealicultura, Facultad de Agronomía, Universidad de Buenos Aires, Argentina

Person-Months Per Year Committed to the Project. Cal: Acad: 5 Sumr:

Support: ☐ Current ☒ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title: Translation of seasonal climate forecasts and decadal variability into skilful climate predictions: Applications to resource management and decision-making in the Río de la Plata Basin

Source of Support: NOAA/OGP (through University of Colorado)

Total Award Amount: $ 24,000 Total Award Period Covered: 1 Apr 2004 to 31 Mar 2007

Location of Project:

Person-Months Per Year Committed to the Project. Cal: Acad: 2 Sumr:

Support: ☐ Current ☒ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title: Building capacity to use climate information and forecasts to enhance decision-making in agriculture

Source of Support: NOAA/OGP (through University of Miami)

Total Award Amount: $ 6,000 Total Award Period Covered: 1 Jan 2004 to 31 Dec 2004

Location of Project:

Person-Months Per Year Committed to the Project. Cal: Acad: 1 Sumr:

Support: ☐ Current ☒ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title: Decision-making in agricultural production in the Argentine Pampas: Alternative choice process Formulations and the value and design of climate information

Source of Support: NOAA/OGP (through Columbia University)

Total Award Amount: $ 25,500 Total Award Period Covered: 1 Apr 2004 – 31 Mar 2007

Location of Project:

Person-Months Per Year Committed to the Project. Cal: Acad: 2 Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Source of Support:

Total Award Amount: $ Total Award Period Covered:

Location of Project:

Person-Months Per Year Committed to the Project. Cal: Acad: Sumr:

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*If this project has previously been funded by another agency, please list and furnish information for immediately preceding funding period.

Current and Pending Support

(See GPG Section II.D.8 for guidance on information to include on this form.)

The following information should be provided for each investigator and other senior personnel. Failure to provide this information may delay consideration of this proposal.

Investigator: Dr. Otto T. Solbrig

Other agencies (including NSF) to which this proposal has been/will be

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support
Project/Proposal Title: NO CURRENT EXTRAMURAL SUPPORT

Source of Support:
Total Award Amount: $ Total Award Period Covered:
Location of Project:
Person-Months Per Year Committed to the Project. Cal: Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support
Project/Proposal Title:

Source of Support:
Total Award Amount: $ Total Award Period Covered:
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Person-Months Per Year Committed to the Project. Cal: Acad: Sumr:

*If this project has previously been funded by another agency, please list and furnish information for immediately preceding funding period.

Current and Pending Support

(See GPG Section II.D.8 for guidance on information to include on this form.)

The following information should be provided for each investigator and other senior personnel. Failure to provide this information may delay consideration of this proposal.

Investigator: Carlos A. Villanueva	Other agencies (including NSF) to which this proposal has been/will be

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support
Project/Proposal Title: NO EXTRAMURAL RESEARCH SUPPORT

Source of Support:
Total Award Amount: $ Total Award Period Covered:
Location of Project:
Person-Months Per Year Committed to the Project. Cal: Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support
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Location of Project:
Person-Months Per Year Committed to the Project. Cal: Acad: Sumr:

*If this project has previously been funded by another agency, please list and furnish information for immediately preceding funding period.

UNIVERSITY OF
FLORIDA

Institute of Food and Agricultural Sciences
Agricultural and Biological Engineering

289 Frazier Rogers Hall
PO Box 110570
Gainesville FL 32611-0570
Voice (352) 392-1864 ext 289
Fax (352) 392-4092
World Wide Web http://www.agen.ufl.edu
E-mail jjones@agen.ufl.edu

November 26, 2003.

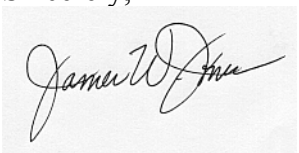
Dr. Thomas Baerwald
The National Science Foundation
4201 Wilson Boulevard
Arlington VA 22230

Dear Dr. Baerwald,

I am writing to inform you that I am willing to serve as a member of an External Oversight Committee for the project "Understanding and Modeling the Scope for Adaptive Management in Agroecosystems in the Pampas in Response to Interannual and Decadal Climate Variability and Other Risk Factors" being submitted by the University of Miami and other institutions to NSF's Biocomplexity in the Environment, Coupled Natural and Human Systems research announcement.

If this project is funded, I understand that my commitment would entail attendance to the annual plenary meetings planned by the project, the review of progress reports, and the provision of independent advice and guidance to the project investigators. My biographical sketch will be submitted as part of the University of Miami proposal.

Sincerely,



James W. Jones
Distinguished Professor

Biographical Sketch

James W. Jones

Agricultural and Biological Engineering Department
University of Florida
Museum Road, PO Box 110570, Gainesville, Florida 32606, USA
Telephone: 353-392-1864 ext. 289, E-mail: jjones@agen.ufl.edu

A. Professional Preparation

Institution	***Major or Area***	***Degree and Year***
Undergraduate:		
Texas Tech University	Agricultural Engineering	Batchelor of Science, 1967
Graduate:		
Mississippi State University	Agricultural & Biological Engineering	MSc., 1970
North Carolina State University	Biological & Agricultural Engineering	PhD, 1975

B. Appointments

1978-Present	Associate Professor–Professor - Distinguished Professor	Agricultural & Biological Engineering Department, Univ. of Florida
1967-1977	Research Engineer/Assistant Professor	USDA-ARS and Agricultural & Biological Engineering Dept., Mississippi State Univ.

C. Selected Publications

Jones, J. W., J. W. Hansen, F. S. Royce, and C. D. Messina. 2000. Potential benefits of climate forecasting to agriculture. Agr. Ecosystems & Env. 82:169-184.

Podestá, G.P., D. Letson, C. Messina, F. Royce, R.A. Ferreyra, J. Jones, J. Hansen, I. Llovet, M. Grondona, J.J. O'Brien. *In Press.* Use of ENSO-related climate information in agricultural decision making in Argentina: a pilot experience. *Agricultural Systems. [To appear in late 2002]*

Braga, R. P., J. W. Jones, B. Basso. 1999. Weather risk in site-specific crop management profitability. In: Proc. Fourth International Conference on Precision Farming. ASA-CSSA-SSSA, Madison, WI,USA. pp. 1853-1863.

Hansen, J. W., and J. W. Jones. 2000. Scaling up crop models for climate variability applications. Agricultural Systems 65:43-72.

Hansen, J. W., A. H. Hodges, and J. W. Jones. 1998. ENSO influences on agriculture in the Southeastern United States. J. of Climate 11:404-411.

Hansen, J. W., J. W. Jones, C. F. Kiker, and A. H. Hodges. 1998. El Nino-Southern Oscillation impacts on winter vegetable production in Florida. J. Climate 12:92-102.

Hansen, J.W., J.W. Jones, A. Irmak and F.S. Royce. 2001. ENSO impacts on crop production in the southeast US. Impact of Climate Variability on Agriculture. American Society of Agronomy Special Publication no. 63, pp. 55-76.

Hatch, U., S.S. Jagtap, J.W. Jones and M. Lamb. 1999. Potential effects of climate change on agricultural water use in the southeast US. Am. J. Water Res. 35(6):1551-1561.

Jones, J. W., J. J. O'Brien, G. Podesta, and D. Letson. 2001. Application of seasonal climate forecasts to agriculture in the Southeastern United States. Proceedings of 12th Symposium on Global Change and Climate variations. Amer. Meteor. Soc.45 Beacon Street, Boston. pp. 126-127.

Royce, F., J. J. Jones, and J. W. Hansen. 2002. Model-based optimization of crop management for climate forecast applications. Trans. ASAE 44(5):1319-1327.

Letson, D., J.W. Hansen, P.E. Hildebrand, J.W. Jones, J.J. O'Brien, G.P. Podestá, F.S. Royce and D.F. Zierden. 2001. Florida's agriculture and climate variability: Reducing vulnerability. The Florida Geographer 32: 38–57.

Jagtap, S.S., J.W. Jones, P. Hildebrand, D. Letson, J.J. O' Brien, G.P. Podestá, F. Zazueta and D. Zierden. In Press, Responding to stakeholders' demands for climate information: from research to practical applications in Florida. *Agricultural Systems.*

D. Synergistic activities

J. W. Jones has been involved in research on climate effects on cropping systems for over twenty years. He has led a team of researchers in the development of dynamic crop models that simulate the interactions between crops, soil, weather, and management. These models are now widely used as a tool for studying climate variability impacts on agricultural systems and for exploring options for improving management to reduce risks. During the last six years, he has been applying these agricultural models for these purposes in South America, Central America and the USA. He continues to lead two projects in the SE USA in which research results are being introduced to the agricultural Extension Services and to farmers to learn how to produce information that will help them in their recommendations and decisions.

E. Collaborators & Other Affiliations

Collaborators

Bill Batchelor	Iowa State University	L. H. Allen, Jr.	Univ. of Florida
W. G. Boggess	Oregon State Univ.	David Letson	University of Miami
Kenneth Boote	University of Florida	Ken Campbell	Univ. of Florida
Guillermo Podesta	University of Miami	Graciela Magrin	INTA, Argentina
Christian Gary	INRA, France	Santiago Meira	INTA, Argentina
Upton Hatch	Auburn University	Pete Hildebrand	Univ. of Florida
G. Hoogenboom	University of Georgia	James J. O'Brien	Florida State University
James Hansen	IRI, Columbia Univ.	L. A. Hunt	Univ. of Guelph, Canada
James Jones	Univ. of Florida	Walter Bowen	IFDC
Cynthia Rosenzweig	Columbia University	Joe Ritchie	Michigan state University
Ido Seginer	Technion, Israel	P. K. Thornton	Univ. of Edinburgh, UK
F. S. Zazueta	University of Florida	Gordon Tsuji	University of Hawaii
Linda Mearns	NCAR	Johan Scholberg	University of Florida

Graduate & Post-Doctoral Advisors

Dale Threadgill	Univ. of Georgia	Henry Bowen	North Carolina State Univ.

Thesis Advisor & Postgraduate-Scholars sponsor

Andres Ferreyra, PhD	Fred Royce, PhD	Ricardo Braga, PhD	Shrikant Jagtap, PhD
Carlos Messina, PhD	Ayse Irmak, PhD	Miguel Calmon,Postdoc	Arjan Gijsman,Postdoc
Jawoo Koo, PhD	Joep Luijten, PhD	Theo Mavromatis	Thomas Engel,Postdoc
Clyde Fraisse, Postdoc	Barry Jacobson, MSc	James Hansen, PhD	Arie Kenig,Postdoc
Babak Negahban, PhD	Ravic Nijbroek, MSc	Ernie Piper, PhD	Moin Salam,Postdoc
Johan Scholberg, PhD	Sarah Wirtz, MSc	Piara Singh,Postdoc	Y. Hwang, PhD
N. Pickering, Postdoc	Pierce Jones, PhD	M. Fernandez, Postdoc	Gail Wilkerson, PhD

The Florida State University
Center for Ocean - Atmospheric Prediction Studies

Dr. James J. O'Brien - Director
Robert O. Lawton Distinguished Professor

December 1, 2003

Dr. Thomas Baerwald
The National Science Foundation
4201 Wilson Boulevard
Arlington, VA 22230

Dear Dr. Baerwald,

I am writing to document my willingness to serve as a member of an External Oversight Committee for the project, "Understanding and Modeling the Scope for Adaptive Management in Agroecosystems in the Pampas in Response to Interannual and Decadal Climate Variability and Other Risk Factors" being submitted by the University of Miami and other institutions to NSF's BioComplexity in the Environment, Coupled Natural and Human Systems Research Announcement.

If this project is funded, I understand that my commitment would entail attendance to the annual plenary meetings planned by the project, the review of progress reports, and the provision of independent advice and guidance to the project investigators. My biographical sketch will be submitted as part of the University of Miami proposal.

Sincerely,

James J. O'Brien
Professor of Meteorology and Oceanography
Center for Ocean-Atmospheric Prediction Studies
The Florida State University

rp

Tallahassee, FL 32306-2840
Tel: (850) 644-4581 Fax: (850) 644-4841

E-mail: obrien@coaps.fsu.edu
WWW: coaps.fsu.edu

Biographical Sketch of
Dr. James J. O'Brien

Secretary of Navy Professor, Meteorology & Oceanography
Center For Ocean-Atmospheric Prediction Studies
Florida State University
Tallahassee, Florida 32306-2840

E-mail: obrien@coaps.fsu.edu,
Internet: www.coaps.fsu.edu
Phone: (850) 644-4581
Fax: (850) 644-4841

(i) Professional Preparation

Rutgers University	Chemistry	B.S., 1957
Texas A&M University	Meteorology	M.S., 1964
Texas A&M University	Meteorology	Ph.D., 1966

(ii) Appointments

Secretary of Navy Professor, Meteorology & Oceanography – present
State of Florida Climatologist, 1999-
Florida Commission on Hurricane Loss Projection Methodology, 1999-
AAAS, President, Atmospheric and Hydrological Science, 1995 - 1998
Associate Editor, *Monthly Weather Review*, 1992 – 1998
IAPSO, President, 1987 – 1991
Associate Editor, *Continental Shelf Research*, 1986 - 1998
Editor, *Journal of Geophysical Research: Oceans,* 1984 - 1988, 1988 - 1990
Associate Editor, *International J. Math and Computer Modeling*, 1984 -
President, Oceanography Section, American Geophysical Union (AGU), 1980-1982

(iii) Publications

2002 The Spring Transition From Horizontal to Vertical Thermal Stratification on a Mid-Latitu Continental Shelf, *J. Geophys. Res.-Oceans*, **107(C8)**, 3097, doi:10.1029/2001JC000826 (with Morey, S. L.).

2002 Early detection of tropical cyclones using SeaWinds-derived vorticity. *Bull. Amer. Meteor. Soc.* **83**, pp. 879-889, (with Sharp, R.J., and M.A. Bourassa).

2002 The dynamics of the East Australian Current System-The Tasman Front, the East Auckland Current, and the East Cape Current, *J. Phys. Oceanogr.*, **Vol 31 No.10**, pp. 2917-2943, (with Tilburg, C., H. Hurlburt, and J. Shriver).

2002 Ocean color variability in the Tasman Sea. *Geophysical Research Letters*, **Vol. 29, 10**, pp. 125-1 to 125-4, (with Tilburg, C.E., and B. Subrahmanyam).

2003 SeaWinds Validation with Research Vessels, *J. Geophys. Res.,* **108**, D0120.1029/ 2001JC001081, (with Bourassa, M.A., D.M. Legler, and S.R. Smith).

2003 Scatterometer-derived research-quality surface pressure fields for the Southern Ocean. *J. Geophys. Res.,* submitted, (with Hilburn, K. A., and M. A Bourassa).

2003 Decadal variability of the convective activity in the Labrador Sea: Contribution of the Preconditioning, *J. Geophys. Res.,* (in review), (with Mizoguchi, K., S. L. Morey, J. Zavala-Hidalgo, N. Suginohara, and S. Häkkinen).

2003 The annual cycle of riverine influence in the eastern Gulf of Mexico, *Geophys. Res. Let.,* in review, (with Morey, S. L., W. W. Schroeder, and J. Zavala-Hidalgo).

2003 Cyclonic Eddies Northeast of the Campeche Bank from Altimetry Data, *J Phys. Oceanogr.,* **Vol. 33, 3**, pp. 623-629 (with Zavala-Hidalgo, J., and S. L. Morey).

(iv) <u>Synergistic Activities & Honors</u>

Medal of Honor, Liege University, Belgium, 1978
Fellow, American Meteorological Society, 1981
Fellow, Royal Meteorological Society, 1983
Secretary of Navy Professor in Oceanography, 1985
Sverdrup Gold Medal in Air-Sea Interaction, 1987
ONR Distinguished Ocean Educator, 1989
Fellow, American Geophysical Union, 1987
Fellow, AAAS, 1998
Foreign Fellow, Russian Academy of Natural Science, 1994
Medal of Honor, Ocean University of Quindao, China, 1999
Robert O. Lawton Distinguished Professor, FSU, 1999
Member, The Norwegian Academy of Science and Letters, 2000

(v) <u>Collaborators & Other Affiliations</u>

Tim Barnett, Scripps, UCSD
Bernard Barnier, Univ. of Grenoble
Tony Busalacchi, NASA-Goddard
Mark Cane, Lamont, Columbia Univ.
Mike Freilich, Oregan State University
John Kindle, NRL-Stennis
Gary Lagerloef, Earth and Space Research
Mojib Latif, Univ. of Hamburg
David Legler, US CLIVAR Office
Mark Luther, Univ. of South Florida
Dennis Moore, NOAA/PMEL
Mike Toner, Old Dominion University
David Weissman, Hofstra University
Lisan Yu, WHOI

Ph.D. Advisor: Professor Robert O. Reid, TAMU

IRI INTERNATIONAL RESEARCH INSTITUTE FOR CLIMATE PREDICTION

1 December 2003

Dr. Thomas Baerwald The National Science Foundation 4201 Wilson Boulevard Arlington VA 22230

Dear Dr. Baerwald,

I am writing to document my willingness to serve as a member of an External Oversight Committee for the project, "Understanding and Modeling the Scope for Adaptive Management in Agroecosystems in the Pampas in Response to Interannual and Decadal Climate Variability and Other Risk Factors," being submitted by the University of Miami and other institutions to NSF's Biocomplexity in the Environment, Coupled Natural and Human Systems research announcement.

If this project is funded, I understand that my commitment would entail attendance to the annual plenary meetings planned by the project, the review of progress reports, and the provision of independent advice and guidance to the project investigators. My biographical sketch will be submitted as part of the University of Miami proposal.

Sincerely,

Dr. James Hansen Associate Research Scientist

Phone: 845-680-4410 E-mail: jhansen@iri.columbia.edu

Biographical Sketch

James W. Hansen

International Research Institute for Climate Prediction Columbia University P.O. Box 1000 61 Route 9W, Monell Bldg. Palisades, NY 10964-8000, USA +1-845-680-4410 (voice), jhansen@iri.columbia.edu (e-mail)

A. Professional Preparation

Institution	Major or Area	Degree & Year
Undergraduate:		
University of Hawaii, Manoa	General Tropical Agriculture	B.S. 1985
Graduate:		
University of Hawaii, Manoa	Agronomy and Soil Science	M.S. 1989
University of Florida	Agricultural and Biological Engineering	Ph.D. 1996
Postdoctoral:		
University of Florida	Agricultural application of climate prediction; Multiple criteria land use evaluation	1996-1998

B. Appointments

1999-present Associate Research Scientist Int'l. Research Institute for Climate Prediction

1999 Assistant Scientist Agricultural & Biological Engineering, U. Florida 1996-1998

Postdoctoral Associate Agricultural & Biological Engineering, U. Florida

C. Publications

(i) Five publications most closely related to proposed project

Hansen, J.W. (2002). Realizing the potential benefits of climate prediction to agriculture: issues, approaches, challenges. *Agricultural Systems* 74:309-330.

Podestá, G., Letson, D., Messina, C., Royce, F., Ferreyra, Jones, J., Llovet, I., Hansen, J., Grondona, M., and O'Brien, J. 2002. Use of ENSO-related climate information in agricultural decision making in Argentina: a pilot experience. Agricultural Systems 74(3):371-392.

Royce, F.S., J.W. Jones, and Hansen, J.W. (2001). Model-based optimization of crop management for climate forecast applications. *Transactions of the American Society of Agricultural Engineers* 44:1319–1327.

Jones, J.W., Hansen, J.W., Royce, F.S., and Messina, C.D. (2000). Potential benefits of climate forecasting to agriculture. *Agriculture, Ecosystems and Environment* 82:169-184.

Messina, C.D., Hansen, J.W., and Hall, A.J. (1999). Land allocation conditioned on El Niño-Southern Oscillation phases in the Pampas of Argentina. *Agricultural Systems* 60:197-212.

(ii) Five other significant publications

Hansen, J.W. and Mavromatis, T., (2001). Correcting low-frequency bias in stochastic weather generators. *Agricultural and Forest Meteorology* 109:297-310.

Hansen, J.W., Jones, J.W., Irmak, A., and Royce, F.S. (2001). ENSO impacts on crop production in the Southeast US. In *Impacts of El Niño and Climate Variability on Agriculture*. ASA Spec. Publ. 63. Amer. Soc. of Agronomy, Madison, WI. pp. 57-78.

Hansen, J.W. and Jones, J.W. (2000). Scaling-up crop models for climate variability applications. *Agricultural Systems* 65:43-72.

Hansen, J.W., Jones, J.W. and Beinroth, F.H. (1998). Systems-based land use evaluation in the south coast of Puerto Rico. *Applied Engineering in Agriculture* 14:191-200.

Hansen, J.W. and Jones, J.W. (1996). A systems framework for characterizing farm sustainability. *Agricultural Systems* 51:181-201.

D. Synergistic Activities

Editor, *Agricultural Systems*. This interdisciplinary journal focuses on interactions within and among agricultural systems, and encourages integration of knowledge among those disciplines that underpin agriculture.

Director, Advanced Training Institute on Climate Variability and Food Security. The institute (http://iri.columbia.edu/outreach/meeting/ATI2002/) combines intensive training, competitive project grants and a follow-up workshop. The curriculum combines concepts and methods from the physical, biological, social and systems sciences to equip developing country agriculture and food security professionals to apply climate prediction to food insecurity and rural poverty. Project grants ensure follow up and embed knowledge and approaches in participants' institutions.

Steering committee member, International CLIMAG Program.

E. Collaborators & Other Affiliations

(i) Collaborators

Amissah-Arthur, A. (IRI), Aslam Gill, M. (Pakistan Natl. Agric. Res. Ctr.), Bindraban, P.S., (Plant Res. Intl., Wageningen, The Netherlands), Boer, R. (Bogor Agric. U., Indonesia), Broad, K. (U. Miami), Easterling, W. (Pennsylvania State U.), Ferreyra, R.A. (U. Florida), Gadgil, S. (Indian Inst. Sci.), Goddard, L. (IRI), Goldberg, R. (Goddard Inst. Space Stud.), Grondona, M. (Zeneca Semillas, Argentina), Hall, A.J. (U. Buenos Aires, Argentina), Hammer, G. (Qld. Dept. Primary Industries, Australia), Hezer, H. (CENTRO, Argentina), Hill, H.S.J. (Texas A&M U.), Indeje, M. (IRI), Irmak, A.
(U. Florida), Jones, J.W. (U. Florida), Krishna Kumar, K. (Indian Inst. Tropical Meteor.), LaRow, T. (Florida State U.), Letson, D. (U. Miami), Llovet, I. (U. Belgrano, Argentina), Love, A. (Texas A&M U.), Lyon, B. (IRI), Manton, M.J. (Bureau of Meteor., Australia), Mavromatis, T. (U. Florida), Mearns,
L. (Natl. Ctr. for Atmos. Res.), Meinke, H. (Qld. Dept. Primary Industries, Australia), Menendez, A.
(U. Buenos Aires, Argentina), Mercau, J. (U. Buenos Aires, Argentina), Messina, C.D. (U. Florida), O'Brien, J.J. (Florida State U.), Mjelde, J.W. (Texas A&M U.), Nunez, M. (U. Buenos Aires, Argentina), Parellada, G. (U. Belgrano, Argentina), Phillips, J. (Bard College), Podestá, G. (U. Miami), Potgieter, A. (Qld. Dept. Primary Industries, Australia), Robertson, A. (IRI), Royce, F.S. (U. Florida), Satorre, E. (AACREA / U. Buenos Aires, Argentina), Selvaraju, R. (Tamil Nadu Agric. U., India), Toranzo, F.R. (AACREA, Argentina), Ward, N. (IRI), Weber, E. (Columbia U.), Zazueta, F. (U. Florida), Zierden, D.F. (Florida State U.)

(ii) Graduate and postdoctoral advisors

Jones, J.W. (U. Florida), Yost, R.S. (U. Hawaii)

(iii) Thesis advisor

Irmak, A. (U. Florida). Total graduate students advised: 1. Total postdoctoral scholars sponsored: 1.

UNIVERSITY OF CALIFORNIA, LOS ANGELES

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DEPARTMENT OF ATMOSPHERIC SCIENCES
7127 MATH SCIENCES BUILDING
405 HILGARD AVENUE
LOS ANGELES, CALIFORNIA 90095-1565

November 24, 2003

Dr. Thomas Baerwald
The National Science Foundation
4201 Wilson Boulevard, Arlington, Virginia 22230, USA

I am writing in my capacity as Chair of the panel on Variability of American Monsoon Systems (VAMOS), which is part of the Climate Variability component (CLIVAR) of the World Climate Research Programme (WCRP). The goal of VAMOS in the Americas is to improve the understanding of the monsoons in the context of the global climate system, enhance the capacity for seasonal to interannual climate predictions, and assess anthropogenic climate change impacts. The VAMOS Panel's strategy to achieve these goals is based on the identification of scientifically important climate phenomena with demonstrated potential for predictable components, the encouragement of partnerships between scientists in interested countries, and the contribution to the development of national and international research plans. These activities are complemented by the promotion of broad participation in field programs – both to bring local expertise to an international setting and to enhance scientific exchange and capacity building. VAMOS current plans are centered on two internationally coordinated efforts to improve prediction of warm season precipitation. The subject of this letter is of relevance to one of those efforts: the Monsoon Experiment South America (MESA). MESA has already started with funding from NSF, NOAA and other agencies in Brazil and Argentina.

In South America, VAMOS has identified the Plata Basin as a climate-hydrology system with components that are potentially predictable with useful skill from seasons in advance and whose variability has important impacts on human activities. WCRP/CLIVAR and WCRP/GEWEX have both agreed to form the PLATIN Science Study Group to further the understanding of those components in the specific context of the Plata Basin. I am co-chair of this group representing CLIVAR and Professor Pedro Leite da Silva-Dias (U. Sao Paulo, Brazil) is co-chair representing GEWEX. PLATIN provides a framework for integration of regional projects leading to improved predictions of the climate and hydrology system of the basin, and the coordination of those projects at the highest international level (WMO/WCRP). The challenge addressed is to develop a solid scientific foundation while maintaining a harmonious dialogue with producers and users of climate information. PLATIN is also participating in a program led by the five countries in the basin and funded by the Global Environmental Facility (GEF). The program aims to develop a framework for sustainable water resources management in the La Plata Basin, with respect to the hydrological effects of climatic variability and change, and as such will increase the scientific infrastructure of the basin.

PLATIN intends to collaborate closely with research teams on different aspects of the Plata basin climate and hydrology as well as applications and human impacts. An excellent example of an activity PLATIN will be eager to collaborate on is the proposal being submitted by the University of Miami and other US and Argentine institutions, G. Podesta PI, to the NSF program Biocomplexity in the Environment, Coupled Natural and Human Systems.

Sincerely,

C. R. Mechoso, Professor
WCRP/CLIVAR/VAMOS Chair
CLIVAR/GEWEX PLATIN Co-Chair

CENTRO

estudios sociales y ambientales

Avda. Roque Saenz Peña 1142, 5º
(1035) Buenos Aires – Argentina
Teléfono: (5411) 4382-7040
Fax: (5411) 4325-7712

Buenos Aires, November 21, 2003

Dr. Thomas Baerwald
The National Science Foundation
4201 Wilson Boulevard, Arlington, Virginia 22230, USA

Dear Dr. Baerwald,

This letter is to document the intent of **CENTRO - estudios sociales y ambientales** of Argentina to participate in the project being submitted by the University of Miami and other US and Argentine institutions as part of the NSF's Biocomplexity in the Environment announcement of opportunity (NSF 03-597). The project explores how climate information (both the description of recent climate conditions and predictions of expected climate in the next 3-9 months) influences decision-making in agricultural production systems of the Argentine Pampas.

CENTRO. Estudios Sociales y Ambientales (CENTRO) is a non-profit private organization founded in 1991. Its goals are research, technical assistance and training on social economic, political and environmental issues. CENTRO's staff includes several researchers with backgrounds in social and natural sciences. One of CENTRO's areas of expertise is disaster and risk management. CENTRO' s researchers are well trained to deal with quantitative and qualitative methodological techniques and within them with the organization of focus groups.

CENTRO has strong institutional interest to increase the understanding of the interactions between different components of a complex agroecosystem, emphasizing the decision-making process related to production- specially the use of probabilistic climate forecasts- in order to enable sustainability, and we hope to advance towards this goal through close collaboration with the diverse interdisciplinary team assembled for the proposal to the NSF.

If funding is awarded, CENTRO researchers will participate in:

1. Identify the interaction between physical, socio-cultural, economic and psychological variables and define the role they play in the decision making process.

CENTRO

estudios sociales y ambientales

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Fax: (5411) 4325-7712

2. Evaluate the specific weight risk factors have in the decision making process related to production. Identify the uncertainty sources in the decision making processes, and how they vary according to the different types of producers- Pergamino and Pilar.

3. Identify how coping and/or adaptive farming strategies adopted by producers in order to minimize risk may affect other components of the system.

4. Identify farmers' understanding of probabilistic climate forecasts in order to learn how to communicate information about climate variability.

5. Collaborate in the construction of a conceptual risk model

6. To explore the mismatch or misfit between the predictive capabilities and communication abilities of producers of climate information, and the expectations, needs and beliefs of potential users of predictions in order to improve (build capacity) the use of climate information to enhance decision-making in agricultural production in the Pampean Region, Argentina.

We look forward to collaborate in this project with colleagues from the United States and Argentina, and thank the NSF for its consideration of the proposal.

Sincerely,

Santiago Bignone
Presidente
CENTRO. Estudios Sociales y Ambientales

November 12, 2003

Dr. Thomas Baerwald
The National Science Foundation
4201 Wilson Boulevard, Arlington, Virginia 22230, USA

Dear Dr. Baerwald,

This letter is to document the intent of the *Facultad de Ingeniería de la Universidad de Buenos Aires (School of Engineering, University of Buenos Aires, FIUBA)* to participate in the project being submitted by the University of Miami and other US and Argentine institutions as part of the NSF's "Biocomplexity in the Environment" announcement of opportunity (NSF 03-597). The project explores how climate information (both the description of recent climate conditions and predictions of expected climate in the next 3-9 months) influences decision-making in agricultural production systems of the Argentine Pampas.

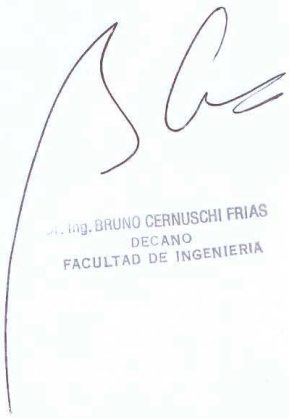
The University of Buenos Aires is a public institution, founded in 1821. It is the largest university in Argentina, with more than 100 academic departments, organized into 13 faculties. The University offers master's, doctoral, and specialist degree programs. FIUBA is the leading engineering school in Argentina. The researchers participating in this proposal are affiliated with the Hydraulics Unit, a component of the Civil Engineering Department. The main research activities of this Unit focus on River Hydraulics, Hydrology, Numerical Modeling, and Impacts of Climate Change. FIUBA, as part of the University of Buenos Aires, has strong institutional interest in participating in interdisciplinary projects and in enhancing links with stakeholders, and we hope to advance towards this goal through close collaboration with the diverse interdisciplinary team assembled for the proposal to the NSF.

Unfortunately, the critical economic situation that Argentina is currently undergoing has resulted in a drastic reduction in the amount of funds available for research. Therefore, FIUBA's ongoing research activities and, specifically, its participation in the present proposal are quite dependent on funding from foreign sources. If funding is awarded, FIUBA researchers will be responsible for the implementation, validation, and application of the integrated model of the decision-making process in agricultural production systems, interacting with other researchers in the team to build the formulation, and define validation and application criteria. Four students are expected to complete undergraduate theses within the framework of this project. Specific FIUBA activities are described in more detail in the project description and in the FIUBA statement of work submitted as part of the proposal.

We look forward to collaborating in this project with colleagues from the United States and Argentina, and thank the NSF for its consideration of the proposal.

Sincerely,

Dr. Bruno Cernuschi Frías
Decano
Facultad de Ingeniería
Universidad de Buenos Aires
Paseo Colón 850
(1127) Ciudad Autónoma de Buenos Aires, Argentina
Telephone: 54.11.4342.6272
E-mail: decanato@fi.uba.ar



FUERZA AÉREA ARGENTINA
COMANDO DE REGIONES AÉREAS
SERVICIO METEOROLOGICO NACIONAL

November 26, 2003

Dr. Thomas Baerwald
The National Science Foundation
4201 Wilson Boulevard, Arlington, Virginia 22230, USA

Dear Dr. Baerwald,

This letter is to document the intent of the Servicio Meteorológico Nacional (SMN, National Meteorological Service) of Argentina to collaborate actively in the project being submitted by the University of Miami and other US and Argentine institutions as part of the NSF's Biocomplexity in the Environment announcement of opportunity (NSF 03-597). The project explores the scope for adaptive management of agricultural production systems of the Argentine Pampas in response to interannual and interdecadal climate variability.

The SMN is a governmental agency established in 1872. It has an operational mandate to collect weather and climate data throughout Argentina and to produce weather forecasts. In the last few years, SMN has been developing experimental climate outlooks, which have been received with great interest by numerous Argentine stakeholders (from the farming industry to civil defense organizations). The SMN has strong institutional interest in enhancing the generation and dissemination of climate information in Argentina, and we hope to advance towards this goal through close collaboration with the diverse interdisciplinary team assembled for the proposal to the NSF.

SMN researchers will collaborate with project investigators in all aspects of the project. In particular, SMN will help assess the role of institutions in the dissemination of salient and credible climate information. SMN staff will interact with other researchers in the team to develop improved formats and contents for climate information.

We look forward to collaborating in this project with colleagues from the United States and Argentina, and thank the NSF for its consideration of the proposal.

Sincerely,

Comodoro Miguel Angel Rabiolo
Subdirector General
Servicio Meteorológico Nacional
25 de Mayo 658
(1002) Buenos Aires, Argentina
Telephone: 54.11.5167.6718
E-mail: rabiolo@meteofa.mil.ar

A A C R E A

ASOCIACION ARGENTINA de CONSORCIOS
REGIONALES de EXPERIMENTACION AGRICOLA

November 25, 2003

Dr. Thomas Baerwald
The National Science Foundation
4201 Wilson Boulevard
Arlington, VA 22230, USA

Dear Dr. Baerwald,

This letter is to state the support of the Asociación Argentina de Consorcios Regionales de Experimentación Agrícola (AACREA) to the research proposal being submitted by University of Miami and other US and Argentine scientists within the "Biocomplexity in the Environment" announcement of Opportunity (NSF 03-597). AACREA by this mean express its willingness to collaborate with the University of Miami and fully participate in this effort if funding is awarded by the NSF. However, any specific financial or personnel commitments are contingent upon funding availability.

AACREA is a non-profit organization developed and managed by farmers to advance and contribute to dissemination of agricultural technology. AACREA was founded 42 years ago; since then it has been repeatedly recognized for its contribution to the development of agriculture and the agricultural sector in Argentina. AACREA farmers join groups of 7-12 producers coordinated by a professional agronomist that provides information and technical guidance. Currently there are about 140-150 CREA groups in Argentina, involving upproximately 1400 farmers supported by about 140 technical advisors. AACREA has a strong commitment towards dissemination of technological and managerial innovations; although the number of members represent a relatively small proportion of argentine farmers, AACREA has a considerable multiplying outreach effect: for each AACREA member, information has been estimated to reach about 40 other farmers, i.e. a total about 56,000 farmers in Argentina.

AACREA will participate in various stages of the proposed research effort. Farmers from CREA groups, advisors and researchers will actively help to elucidate the various aspects related to the decision making process. Professionals and researchers will also work on various hypothesis concerning the structure, error and use of climatic information in the Argentinean agriculture. AACREA will be represented in the research effort by Dr. Emilio Satorre, our academic coordinator for the Agriculture Technology area. AACREA regional coordinators, such as Ing. Agr. Fernando Ruiz Toranzo that was involved in a previous planning activity performed under a NSF opportunity, will also take part in this project. Dr. Satorre will lead and coordinate the various AACREA task groups involved in the project and AACREA planned activities, if funding is granted.

As mentioned above AACREA is a non-profit organization and funds for collaborative scientific research are provided by public agencies and agreements with industries. The participation of AACREA in the research proposed could only be done with economic support from NSF. We at AACREA look forward to interacting with colleagues at the University of Miami and other US Centers as well as the local Institutions taking part in this initiative.

Sincerely

Ing. Marcelo Carrique
President
AACREA

SARMIENTO 1236 5º PISO (C1041AAZ) BS. AS. ARGENTINA
aacrea@aacrea.org.ar / www.aacrea.org.ar
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PENNSTATE

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November 25, 2003

Dr. Otis Brown, Dean
Rosenstiel School of Marine & Atmospheric Science
University of Miami
4600 Rickenbacker Causeway
Miami FL 33149-1098

Dear Dr. Brown,

I am writing to state the commitment of The Pennsylvania State University to participate in the proposal entitled "Understanding and Modeling the Scope for Adaptive Management in Agroecosystems in the Pampas in Response to Interannual and Decadal Climate Variability and Other Risk Factors" being submitted by the University of Miami to the Bicomplexity in the Environment, Coupled Natural and Human Systems initiative of the US National Science Foundation.

If funding is awarded, our institution will receive a subcontract from the University of Miami for a total amount of $170,004. The project will begin on June 1, 2004 and will extend over three years.

The investigator leading the Penn State component of the work proposed will be Dr. William Easterling, who will lead the development of approximate, reduced-form models to capture the effects of contextual factors on agricultural production decisions among Argentine farmers.

For administrative issues regarding this proposal please contact Paul M. Antolosky (Phone: 814-863-0681; pma3@psu.edu).

We look forward to a productive collaboration with the University of Miami and the other institutions participating in the proposal.

Sincerely,

R. Killoren
Associate Vice President for Research
Osp@psu.edu; 814-865-1372

NCAR

National Center for
Atmospheric Research

Office of the Director

P. O. Box 3000, Boulder, CO 80307-3000
Phone: 303.497.1111 Fax: 303.497.119
www.ucar.edu

November 26, 2003

Dr. Guillermo Podesta
University of Miami
Rosenstiel School of Marine and Atmospheric Sciences
4600 Rickenbacker Causeway
Miami, FL 33149-1098

Dear Dr. Podesta:

I am pleased to submit for your consideration NCAR proposal #2004-026, entitled "Understanding and Modeling the Scope for Adaptive Management in Agroecosystems in the Pampas in Response to Interannual and Decadal Climate Variability and Other Risk Factors." Dr. Richard Katz is NCAR's Principal Investigator on this project. The total amount requested for NCAR is $166,159 for a three-year period. The first year request for FY 2004 is for $55,386.

Please note this proposal is subject to the review of our sponsor, the National Science Foundation. Should the University of Miami choose to award the proposal, funds for NCAR (DUNS# 078339587) should be provided by direct agreement with the University Corporation for Atmospheric Research. Arrangements can be made with:

Ms. Gina L. Taberski
Manager of Sponsored Agreements
UCAR Contracts Office
P.O. Box 3000
Boulder, CO 80307-3000
Telephone (303) 497-2132

Please refer to the NCAR proposal number on all correspondence with UCAR.

Should you have questions regarding the proposal, please contact Dr. Katz at (303) 497-8114 or, on administrative matters, contact the NCAR Budget and Planning Office, Ms. Sharon Hurley at (303) 497-1105 or Mr. Tim Hundsdorfer at (303) 497-1118.

Sincerely,

Larry Winter
Deputy Director

Enclosure

cc: UCAR Sponsored Agreements
V. Holzhauer

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National Science Foundation.

COLUMBIA UNIVERSITY
IN THE CITY OF NEW YORK

OFFICE OF PROJECTS AND GRANTS

November 25, 2003

Dr. Otis Brown, Dean
Rosenstiel School of Marine & Atmospheric Science
University of Miami
4600 Rickenbacker Causeway
Miami FL 33149-1098

Dear Dr. Brown,

I am writing to state the commitment of Columbia University's Institute for Economic Research and Policy to participate in the proposal entitled "Understanding and Modeling the Scope for Adaptive Management in Agroecosystems in the Pampas in Response to Interannual and Decadal Climate Variability and Other Risk Factors" being submitted by the University of Miami to the Bicomplexity in the Environment, Coupled Natural and Human Systems initiative of the US National Science Foundation.

If funding is awarded, our institution will receive a subcontract from the University of Miami for a total amount of $179,474. The project will begin on June 1, 2004 and will extend over three years.

The investigator leading the Columbia component of the work proposed will be Dr. Elke Weber, who will design, supervise, and analyze a series of decision experiments intended to detect the occurrence of non-normative objective functions among Argentine farmers.

For administrative issues regarding this proposal please contact Ms. Kristin Murphy via telephone 212.854.0712 or e-mail (km632@columbia.edu).

We look forward to a productive collaboration with the University of Miami and the other institutions participating in the proposal.

Sincerely,

Michelle J. Steer
Projects Officer
212.854.6851
ms2289@columbia.edu

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

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Washington, DC 20005
Tel: 202 326 6490
Fax: 202 289 4958

December 3, 2003

Dr. Thomas Baerwald
The National Science Foundation
4201 Wilson Boulevard,
Arlington, Virginia 22230

Dear Dr. Baerwald:

This letter confirms the support of AAAS to the project "Understanding and Modeling the Scope for Adaptive Management in Agroecosystems in the Pampas in Response to Interannual and Decadal Climate Variability and Other Risk Factors", to be submitted to NSF by the University of Miami. The goals of this project are to (a) understand and model impacts of interannual and inter-decadal climate variability and the scope for adaptive management of agricultural production systems, (b) understand agricultural decision-making in the light of climate variability, probabilistic climate information, and contextual factors (economic, social, technological), and (c) assess the environmental consequences of production systems that evolved in response to improved climate and technologies. This study is of particular interest to AAAS as it relates to an ongoing project that addresses a larger spatial scale encompassing the Pampas.

The AAAS project seeks to analyze the effects of land transformation and climate variability on ecosystem functions and services in one of the largest and relatively untamed South American watersheds: The Plata River Basin. This study intends to initiate and expand an international network of scientists that will increase understanding of environmental, socio-economic, and atmospheric components of LULC change. This initiative would greatly benefit from collaborative efforts with the University of Miami and other partners of the project both in the US and Argentina by gaining insights of smaller scale assessments, such as the farm-level, as we try to understand the relative importance of the social and physical constraints on land use changes including agricultural intensification and expansion. In turn, the study in the Argentina's pampas would benefit from potential comparative studies of climate information and agricultural decision-making at greater scales beyond national boundaries. Finally, the proposed study by the University of Miami will promote increased international and institutional collaboration through greater interchange of scientist and capacity building.

We look forward for this mutually fruitful collaboration.

Sincerely,

Marina S. Ratchford

Marina Ratchford
Senior Program Associate, Latin America and the Caribbean

December 2, 2003

Dr. Otis Brown, Dean
Rosenstiel School of Marine & Atmospheric Science
University of Miami
4600 Rickenbacker Causeway
Miami FL 33149-1098

Dear Dr. Brown,

I am writing to state the commitment of the University of Colorado and the NOAA Joint Institute, Cooperative Institute for Research in Environmental Sciences (CIRES) to participate in the proposal entitled "Understanding and Modeling the Scope for Adaptive Management in Agroecosystems in the Pampas in Response to Interannual and Decadal Climate Variability and Other Risk Factors" being submitted by the University of Miami to the Bicomplexity in the Environment, Coupled Natural and Human Systems initiative of the US National Science Foundation.

If funding is awarded, our institution will receive a subcontract from the University of Miami for a total amount of $211,587. The project will begin on June 1, 2004 and will extend over three years.

The investigators leading the CIRES component of the work proposed will be Dr. Balaji Rajagopalan, who will lead the generation of synthetic scenarios of interannual and interdecadal climate variability, and Dr. Roger Pulwarty, who will participate in the effective integration of the multiple project components.

For administrative issues regarding this proposal please contact Ms. Lisa Tedesco, Proposal Analyst, (303) 492-0896, Lisa.Tedesco@colorado.edu.

We look forward to a productive collaboration with the University of Miami and the other institutions participating in the proposal.

Sincerely,

Laurence D. Nelson, Director
Office of Contracts and Grants