

THE INTERNATIONAL RESEARCH INSTITUTE
FOR CLIMATE PREDICTION

LINKING SCIENCE TO SOCIETY

IRI



Annual
Report

2002-2003

COLUMBIA
UNIVERSITY

Contents

The mission of the IRI is to enhance the impacts of seasonal climate fluctuations, in order to in developing countries. This mission is to be conducted of forecast and information products, with an emphasis

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ON THE COVER



Phil Bliss has been a freelance illustrator working in Rochester, NY since 1979. His work has been used in a wide variety of ways, ranging from children's books to corporate identity. The illustration on our annual report cover is one that evolved from a growing concern for our environment. Phil believes that being an illustrator carries with it a responsibility to encourage healthy attitudes in society.

This report is printed on recyclable, wood-free, acid-free paper.



IRI

society's capability to understand, anticipate and manage
improve human welfare and the environment, especially
through strategic and applied research, education and capacity building, and provision
on practical and verifiable utility and partnerships.



Unanticipated variations in climate can have a major impact on the lives of people. The consequences can be serious even for those privileged to live in the world's more affluent societies — witness the problems experienced by the French during the unusually warm summer of 2003. For developing countries, capacities to adjust are understandably more limited.

For a society dependent on rainfed agriculture, unexpected drought can result in starvation: almost half the population of Ceará, the northeastern province of Brazil, lost their lives when the rainy season failed to emerge in 1877-79 following several years of abundant rain. Excessive rain, with or without violent storms, can have consequences that are comparably serious, resulting often in damages to infrastructure, erosion of essential soil nutrients, and frequently in the spread of debilitating diseases such as malaria, cholera and dengue fever. The mission of the IRI is to ensure that advances in our ability to forecast climate can be applied to mitigate at least some of the more serious consequences of unanticipated climate variability. There is an important opportunity to improve the lives of people most at risk in that advances in our ability to develop meaningful long range forecasts are most impressive for the tropics and sub-tropics, for regions of the globe populated by some of the world's poorest and most vulnerable societies. Since the establishment of the IRI, we have been striving to meet these challenges, working with developing countries to advance strategies to allow them to cope more effectively with the impacts of climate variability and change.

A climate prediction in itself is of limited use to policy makers. How do we translate a prediction expressed in statistical language (probability that temperature or precipitation will be higher or lower than the average) to the formulation of a meaningful policy to anticipate the impact of a possible future drought in a particular region, or a season of excessive heat or rainfall? Success requires a comprehensive understanding of the region and its strengths and vulnerabilities. It requires regional expertise, united with an understanding of the limitations of a physical forecast and its potential implications. It requires an integration of disciplinary skills, linking strengths in physical science — meteorology and hydrology for example — with expertise in important areas of application such as agriculture and public health, all combined with an understanding of what is economically and practically possible. To meet these challenges, the IRI has assembled an extraordinary staff of talented scientists from an exceptionally diverse range of national and professional backgrounds. Learning from each other and from colleagues in the regions in which they have chosen to work, they are making a unique contribution to the application of climate science to society.

There have been a number of important developments at the IRI over the past year. Dr. Stephen Zebiak assumed leadership of the IRI following the resignation of Dr. Antonio Divino Moura, the founding Director General of the IRI, who left the IRI to return to his native Brazil. Under the capable

leadership of Dr. Zebiak, the IRI has engaged in a rigorous process resulting in the formulation of an important strategic plan. The plan identifies a number of critical skills defined as underpinning activities viewed as essential to the core mission of the IRI. It distinguishes between core activities and specific regional applications. A more detailed discussion of the core and specific applications is included in the body of this report. The report outlines a number of programs and projects in which the IRI is engaged with a variety of partners across the globe helping developing countries adapt better to the challenges of climate variability and change.

To oversee its activities and strategic planning, the IRI continues to be guided by a distinguished group of global leaders with a diverse range of experience and expertise comprising the Board of Overseers. It has been a very busy year for the Board. The Board convened its second and third meetings in January and June of this year and commended the IRI on its impressive progress. The Board is convinced that the IRI has assembled an excellent staff and that it is on track to ensure that its core expertise can be applied to an important range of climate related applications in a variety of regions of the world. The Board decided that functions related to the IRI external partnership development and resource mobilization and support, assigned previously to the Secretariat to the Board, should be implemented in the future through the office of the Director General. In this context, Dr. Stephen Zebiak has been appointed to fill an additional position as Secretary to the Board. A key objective for the Board over the coming year will be to work with the management and staff of the IRI to diversify its sources of funding and to ensure that the IRI realize fully and as soon as possible the international status and recognition implicit in its name.

The Board continues to benefit from the advice of its International Science and Technical Advisory Committee (ISTAC). We would like to take this opportunity to acknowledge the members of ISTAC for their expertise and for their dedication to advance the mission of the IRI. The Board is indebted especially to ISTAC's founding co-chairs Professors Ed Sarachik and Elke Weber for their outstanding service and leadership. We offer our best wishes to Professor Weber as she steps aside to concentrate on her academic responsibilities at Columbia University and express our thanks to Professor Sarachik for agreeing to a further three year term.

On behalf of the Board, I would like to express our appreciation for the unflagging support of Professor Jeffrey Sachs, the Director of Columbia University's Earth Institute, for the leadership of Dr. Stephen Zebiak and for the dedicated efforts of Assistant Director Carolyn Mutter and all of the staff in maintaining the forward momentum of the IRI during this transition period. On behalf of the Board, I would like also to thank Roberto Lenton, Alissa Schmeltz, and Christie Walkuski for their advice over the past several years and for their commitment to the objectives of the IRI, and to wish them well as they assume new responsibilities.



Michael B. McElroy



Stephen Zebiak (l.) and Michael McElroy at IRI.

DIRECTOR GENERAL'S STATEMENT

Millions of lives around the world

are adversely affected by climate-related environmental crises each year. Over the period of this report (July 2002 – June 2003), famine has continued to threaten Southern Africa. Heavy rainfall and flooding in early 2001 reduced the food stocks available in 2002, while more recent drought conditions contributed to another significant decrease in the maize harvest in the region. Fortunately, a major humanitarian crisis had so far been averted as of December as food imports have largely kept pace with the cereal gap in the six most affected countries. However, more than 1 million metric tons of imported foods were anticipated to be needed through the end of March. In Ethiopia, approximately 11.3 million people will require 1.44 million metric tons of food aid during 2003, as a result of several years of drought conditions and poor rains during the 2002 rainfall seasons significantly contributing to the deteriorating situation in the Greater Horn. In Southern Asia, the failed 2002 monsoon was followed by a cold wave that killed over 1,700 people in India and surrounding countries, exacerbating already poor conditions for India's crops. In Australia, 71% of the country is in serious or severe drought, affecting a variety of sectors in January and officials have partially blamed Australia's worst-ever trade deficit of almost \$3 billion on the drought's impact on rural exports.

Several of the impacts in these and other regions can be related to the influence of the moderate El Niño that has evolved over the period of this report. The event offered a good opportunity for communicating the variability in strength of El Niño events, and the importance of prior climatic and socio-economic conditions in exacerbating (or reducing) impacts for specific regions. It also offered an opportunity to reiterate the message that intervention necessitates research through an array of interrelated disciplines to provide societies with the tools to cope with this variability.

Increasingly, there are opportunities to engage with the climate change community through a range of disciplines that are ever more concerned with validation of approach, development of effective coping strategies, and reductions of vulnerability in populations over a range of time scales.

During the past year, the IRI has made significant progress in framing complex problems and applying climate information, including probabilistic climate forecasts, in practical decision settings over several regions and through critical sectors of health, water, agriculture, and sustainable livelihoods. Some examples are provided in this report. Progress has been accelerated through an expansion and restructuring of the IRI research agenda to embrace more comprehensively the intricate interface between climate and society, wherein lie the opportunities to realize the societal benefits that are our goal. Equally important to real progress is the continued building of critical institutional and research collaborations that provide the necessary collective knowledge, ground-truthing and practical capacity to make a difference.

Dr. Antonio Divino Moura, the founding Director General of the IRI, concluded his tenure in that position in the fall of 2002. The IRI owes much to him in providing the vision and the initial leadership that underpin present successes. The IRI continues to benefit from the strong support of Professor Jeffrey Sachs, director of the Earth Institute at Columbia University, the IRI Board of Overseers, chaired by Professor Michael McElroy of Harvard University, the Central Weather Bureau of Taiwan, and the support and financial sponsorship of the U. S. National Oceanic and Atmospheric Administration Office of Global Programs.

Stephen E. Zebiak



“The IRI approach facilitates progress toward innovations that are truly useful to societies.”



A tremendous opportunity

has emerged from advances in climate science in recent years, which demonstrate that some aspects of climate variability exhibit predictability on time scales of one to several seasons lead-time. This new

knowledge has been put to the test in developing and applying new tools to forecast climate variability. In very concrete terms, the forecasting exercise has established the validity of the research results (while showing room for further improvement), and opened the door to considering the practical use of short-term climate information. These developments gave rise first to the concept, and the establishment, of the IRI.

The work of the IRI, by intent, spans a very wide spectrum. It involves climate science – monitoring, modeling, and forecasting. It involves impacts assessments, decision system analyses and decision tool development, across multiple climate sensitive sectors (agriculture, water, health, fisheries, and disaster management). It involves capacity building, communication, collaboration, and in situ prototyping of innovations in the use of climate information in practical settings. Finally, it involves institutional and policy analyses of constraints and opportunities in the use of climate information and tailored products. The IRI's agenda addresses climate on spatial scales from local to global,

and temporal scales from one season to several decades, but emphasizes variability on the time scales of one to several seasons.

Within the climate arena, there are presently no other operational centers whose primary focus is the seasonal-interannual time scale.

The concentration enables a unique leadership role for the IRI. For example, the type and format of climate forecast product that has become the worldwide standard for seasonal prediction was originated by the IRI. However, the future of the IRI leadership role will largely be realized through problem-driven work requiring simultaneous

engagement of both disciplinary research and projects in actual decision settings throughout the world (especially in vulnerable regions). For this, the IRI also requires breadth of expertise – amplified by the extensive networks of professional associates in each of the disciplines and regions. The advantages this approach provides are:

- a multi-disciplinary culture enabling comprehensive, problem-oriented project scoping; and
- two-way feedback mechanisms that result in climate-related products developed to address the needs, or constraints, of users, facilitating progress toward innovations that are truly useful to societies.



LEVERAGING THE CORE

During this programmatic year, the IRI introduced a multi-dimensional description to its research, programs, and activities. Expertise areas including agriculture, water, health, and climate science, define one important dimension. It is critical to the success of the IRI that it is seen as having world-class talent in areas that routinely arise in addressing the use of climate information in societal decision settings. An overlapping, but somewhat more problem-focused description of the IRI agenda is presented in what it has termed Underpinning Activities. These are the generic, ongoing research areas that are regarded as essential to any current or future comprehensive project connecting climate and relevant societal applications: climate prediction, environmental monitoring, impacts analysis, decision systems,

institutional/policy analysis, and outreach/education. The third, crucially important dissection of the IRI is through its programs and regional projects. These provide the specific context in which research innovations, capacity building, and ultimately the value of IRI endeavors are measured. Programs set out the framework for launching inter-related projects.

The IRI core is the subset of the IRI formally identified with its ongoing underpinning activities, associated disciplinary expertise/experience, and supporting infrastructure. Note that according to this definition, the core does not encompass the entire IRI in any sector or discipline, or even the entire infrastructure.

The concept of the IRI core becomes important primarily in considering

the resourcing for the institute. Resourcing significantly beyond the major funding presently provided by NOAA/OGP and Columbia University in the US and the CWB in Taiwan is needed to accomplish the mission. This includes an increased number of targeted grants associated with specific place-based projects or disciplinary research projects. It also includes significant gifts that may allow the development of an endowment, new infrastructure, education initiatives, and visitor support, for example. For all these areas, core resources add to the scope or achievements made possible by the grant or gift. First and foremost, the IRI core brings intellectual resources across relevant disciplines, as well as a growing body of collective knowledge and experience that can inform and guide new initiatives.



“The IRI’s programs and regional projects provide the specific context in which research innovations, capacity building, and ultimately the value of IRI endeavors are measured.”



DR. JAMES P. McEVINONA;
JACK HOLLINGSWORTH; P. VIRROT/MHO

PARTNERSHIP AND NETWORK BUILDING

The vision of the IRI depicts an innovative science institution working with a network of collaborating institutions to accelerate the ability of societies worldwide to cope with climate fluctuations. IRI's network of partners is essential for success. In order to effectively address the complex set of problems associated with climate variability, the IRI typically works in areas that require strong regional and expert partnerships.

We are constantly engaging in partnerships that link government agencies, public institutions, development organizations, and civil society with the scientific community. The IRI is particularly keen on engaging in partnerships that bring together the professional communities concerned with climate variability and prediction, disasters management, and climate change. We continue to recognize the opportunity for increased synergy between these communities in addressing the needs of the developing world through research partnerships and collaborations. Without these essential collaborative partnerships, the IRI would be ineffective in leveraging resources for undertaking these complex problems as well as finding relevant outcomes for the decision-maker to utilize.

Equally as important as developing individual partnerships with various stakeholders, the IRI believes it is

BOGOR AGRICULTURAL UNIVERSITY, INDONESIA ☉ METEOROLOGICAL AND GEOPHYSICAL AGENCY OF THE REPUBLIC OF INDONESIA ☉ PHILIPPINE AGRICULTURAL ADMINISTRATION ☉ METEOROLOGICAL AND ASTRONOMICAL SERVICES ADMINISTRATION

The IRI, the Asian Disaster Preparedness Centre, Bangkok, and its partners are actively engaged in fostering a major project in the Southeast Asian region that includes the Philippines, Indonesia and Vietnam. The project is problem motivated and focuses on how society can cope with the impacts of climate variability impacts. Partners at the regional, national, sub-national and provincial level representing meteorological, water and agricultural agencies, are coming together to develop a proposal that incorporates capacity building in all stages of the project. This proposal is unique in that from the beginning the local people are engaged in framing the problem and empowered to develop solutions.

fundamental to work with and build upon the work of existing networks such as the World Meteorological Organization (WMO) and the Global Change System for Analysis, Research, and Training (START), so as to help ensure that there is more effective coordination and connections among efforts.

Recognizing that significant gaps still exist in addressing the issues associated with climate variability, the IRI supports the development of a

growing collective capacity to enable developing countries to cope more effectively with climate variability and change. The goal is to work with developing countries to identify and tackle the impacts of seasonal to inter-annual climate variability as well as to build adaptive capacity in an effort to cope with global climate change. The approach is to engage both leaders and resource providers in an ongoing dialogue that will improve understanding of issues and opportunities for shared advancement.

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research activities focus on a

spectrum of areas that, together, underpin the capability of the IRI to address societal problems relating to climate.

These underpinning activities are informed by user needs, and from requirements of regional projects and programs.

They include:

- ☉ Climate Modeling and Prediction
- ☉ Climate and Environmental Monitoring Research
- ☉ Impacts Research
- ☉ Decision Systems Research
- ☉ Institutions and Policy Systems Research
- ☉ Capacity Building, Outreach and Education

Climate Modeling and Prediction

Continual improvement and development of new climate prediction information and products, increasingly informed by problem-driven needs; and the provision of secondary information that informs use, such as reliability, range of uncertainty, and trend or climate change assessments are primary motivations to advancements in this area. This is accomplished by targeted research efforts both within the IRI, and through significant external collaborations involving networks of climate scientists worldwide

working on critical aspects of model development and climate forecasting research. Important objectives and outcomes are:

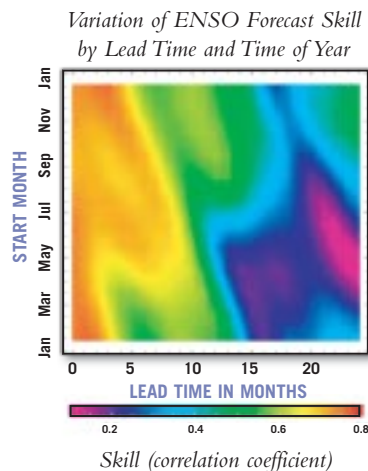
Improve global climate prediction systems.

A diagnosis of aspects of forecast errors led to the creation of a simple statistical representation for the general circulation model (GCM) atmospheric fields, used to help separate signal from noise influences. The signal model was coupled to the 'MOM3' ocean GCM (OGCM).



EMMA ARCHER

Separately, issues of coupled correction methods were investigated, where changes in the wind fields were introduced to minimize surface temperature errors. Model output statistics were employed to further improve final predictions based on a multivariate (simultaneous) transformation between subsurface temperature and surface temperature fields. All of these changes have produced improvements (using a 20 year period of hindcast evaluation) relative to the original coupled GCM forecasts.



A separate effort has been focused more on the hybrid and intermediate class of forecast models; here a new intermediate ocean model has been coupled to a statistical atmosphere derived from atmospheric GCM (AGCM) ensemble simulations (as above), and methods of coupling and initialization examined for their impact on prediction skill. Forecast skill can be improved greatly by utilizing an inverse method to infer the subsurface temperature connection to surface (not explicitly modeled), and then to initialize the coupled model in a manner compatible with this. The coupled system appears very competitive with existing systems and will be analyzed in real time as an addition to the standard forecast suite in 2004.

A third effort is aimed at producing what would be the first single-tier global climate forecast system at the IRI (that is, the same model predicts both sea surface temperature (SST)

evolution and regional climates over continental regions). This will incorporate a variant of an ocean thermodynamic mixed layer model together with a full AGCM. This will allow us to assess systematic errors associated with forced SST simulations as used now, associated with inconsistent heat fluxes and balances at the ocean-atmosphere surface. We expect this to be an important addition to the IRI forecast suite in the next year.

We have also worked with the NOAA Applied Research Centers (ARCs) ocean group to bring online a new version of the ocean model, and to initiate a real-time data assimilation facility here at the IRI, to support coupled predictions with several of the above new systems.

As a further enhancement of the forecast system, the IRI is investigating alternatives to develop multi-model SST forecast scenarios, for feeding into the second tier ensemble climate forecasts. We have performed sensitivity analyses to determine which aspects of SST are most important to stratify for the multi-scenario system. The goal is to have an objective framework for producing a fixed number of scenarios, from a larger number of forecasts with known hindcast skill performances.

Enhance, and tailor, climate forecast methodologies and products.

We have made significant improvements in our objective multimodel ensemble forecast methodology. A better performing combination was created using a calibration step to measure model skills relative to a climatology benchmark. Further work has been undertaken on detecting tropical cyclones in global models. Additional global models were investigated, and temporal averaging methodologies were compared. A composite analysis was done to clarify physical mechanisms, and a new tracking algorithm implemented. Sources of systematic error are being investigated, and several basin cyclone prediction products are now being delivered routinely. Work on model output statistics has shown very significant improvements in regional forecast skills for certain regions of the globe. Some of these are routinely being used in regular forecasts, and in informing regional applications.





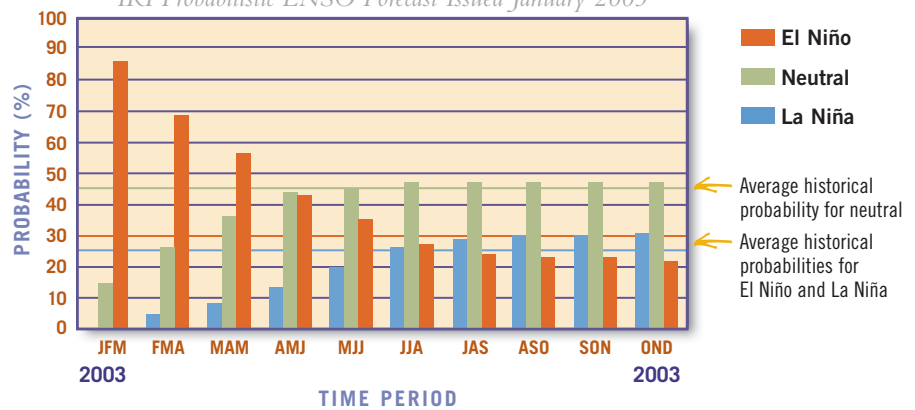
Produce regular forecasts with diagnostics and validation.

The IRI routine monthly products have continued, with the addition of an El Niño outlook, and a probabilistic El Niño - Southern Oscillation (ENSO) forecast product. Skills of climate hindcasts using predicted SST are being examined to provide a more accurate estimator of expected forecasts performance than the currently used upper limit estimates based on observed SST.

Additional highlights of work in this area for the year include:

- A thorough analysis of real-time IRI forecast performance for 1997 – present.
- A new statistical forecast scheme for tropical Pacific SST.
- Addition of the AGCM run at the Experimental Climate Prediction Center (ECPC) of Scripps Institution of Oceanography to the suite of input predictions for IRI's monthly climate forecasts.
- Strengthened collaborations with other centers on forecasting issues, including the Climate Prediction Center of NOAA, CWB and Fundação Cearense de Meteorologia e Recursos Hídricos (FUNCEME).
- A new ARCs activity being pursued in collaboration with the National Centers for Environmental Prediction (NCEP)

IRI Probabilistic ENSO Forecast Issued January 2003



and the Climate Diagnostics Center (CDC) which involves comparing simulations with climate models (using observed SST) with forecasts (predicted SST) to assess predictability, and attribution of observed climate and model forecast errors.

- Participation in World Meteorological Organization (WMO) coordination of global forecast producing centers, on issues of forecast data formats, multimodel ensembling, and data exchange.

Improve forecast resolution.

Several projects are continuing in the areas of statistical and dynamical downscaling, which are seen as critical to many forecast applications. Basic methodological work is aimed at a better understanding of the fundamental limitations of climate downscaling. To this end, resolution analyses are being conducted using different nesting, buffering and

other strategies. Additional areas of focus include:

- Realistic simulation of higher order statistics of the climate, such as occurrence of dry spells. This work has resulted in joint development and transfer of an operational system to FUNCEME in Brazil, and it is now being run there as further research on improvements is conducted here.
- Similar work is advancing for the region of East Africa. Here we include land surface interactions, and results are directly informing user needs in the underway project work.
- In the area of statistical methods, Hidden Markov Model methods are being analyzed for use in spatial and temporal downscaling from GCM forecasts. We compare such schemes, together with simpler 'K-nearest neighbors', analogues, etc. with dynamical schemes, to assess their relative performance and costs.



Climate and Environmental Monitoring Research

Current and comprehensive real-time climate monitoring is critical to our efforts. Analysis of recent climate anomalies and diagnosis of physical mechanisms associated with climate anomalies are essential for our understanding of the climate system. These results are then analyzed for their significance over longer time periods, to provide historical context. This effort is being enhanced by the development of climate and environmental data and analysis tools and climate and vulnerability indices for use in conjunction with seasonal forecasts. Research is targeted to address problem-driven region-specific projects and programs within the IRI and with collaborators worldwide. Main work areas are to:

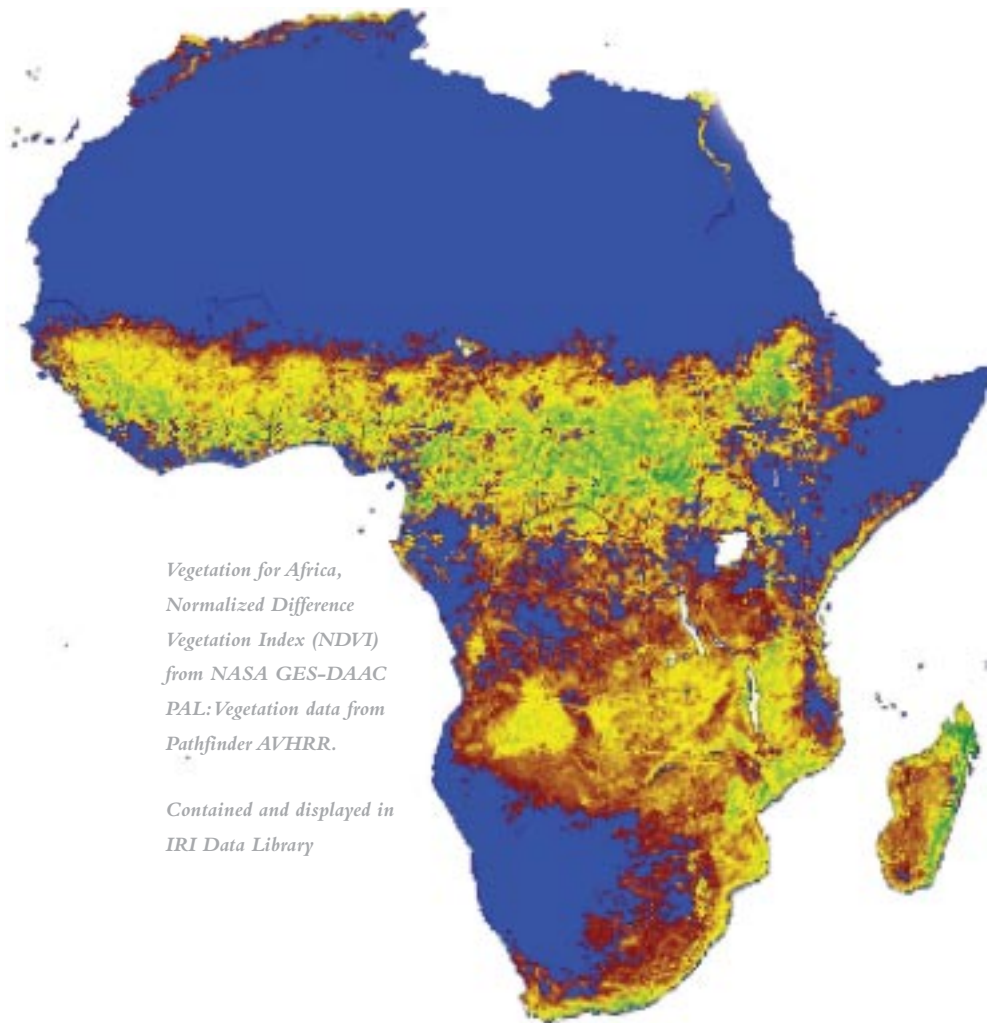
Enhance climate databases or monitoring and analysis.

Monthly model ensemble data are now available through the Data Library. Output can be accessed by variable, date, and ensemble member for all seasonal forecast models run by the IRI. The Data Library capabilities were also expanded to include access and provision of data in standard Geographical Information System (GIS) formats to encourage and facilitate interdisciplinary research.

Analysis and diagnosis of the physical climate system.

Understanding the physical climate system is essential for the useful application of climate information and forecasts. A number of regional-based climate diagnostics studies were performed to provide a greater understanding of the climate system.

These include diagnoses of the mechanisms associated with: droughts in Central Southwest Asia and in Central America, floods in Venezuela, rainfall over central Brazil and inter-annual variability of tropical cyclones in the Northwest Pacific.



In many countries, frequent disasters are significant obstacles to economic development and human security. This map shows countries in Africa shaded according to the total number of people killed or affected during disasters over the past 20 years, standardized by 1997 GDP per capita. The darkest shaded countries experience the most frequent disasters and losses in relation to GDP per capita. In these countries, and particularly in those experiencing high rates of climate-related losses, it is important to reduce climate-related vulnerability and risk.

Develop generalized and user-specific climate indices and climate vulnerability indices.

The Weighted Anomaly Standardized Precipitation (WASP) Index was further improved. The IRI-developed WASP is a simple, single-variable index to measure the relative surplus or deficit of precipitation on a number of different time scales to reflect a spectrum of needs to assess water-related stress in various user communities.

Develop and build sector-specific and project/program-specific data sets and tools.

The IRI has access to a large number of climate and environmental data sets through the Data Library and other publicly available sources. Data was re-organized and reprocessed to make it more useful for specific projects and programs. This data includes: high resolution (1 km) satellite global vegetation index, historical station rainfall data for Brazil and western Africa and satellite-derived estimates of dust.

Improve access to climate data, project-specific data sets, sector-specific data sets, and forecast products.

The quality and availability of real-time climate data for monitoring,

impacts studies and forecast verification has been reduced over the past several years. A project was initiated in conjunction with the NOAA Climate Prediction Center to evaluate real-time station-only temperature and rainfall data. Other activities include:

- Development of a tutorial to introduce the Data Library to new users including members of the IRI staff, partners and general users.
- Systematic and automated updating of data set descriptions to provide non-expert users easier access to climate data.
- Development of a gazetteer to support place-name searches of the Data Library, Climate Impacts Database and Climate Impacts Reference Database.
- Leadership in the development and implementation of Distributed Ocean Data Sets (DODS) and Thematic Real-time Environmental Data Distributed Services (THREDDS) data exchange and format protocols.

Document the environmental impacts of the 2002-03 El Niño with a prototype real-time impacts database.

Real-time, publicly available sources of reported information on

environmental, social and economic impacts were archived and examined. This impacts data provides a starting point for in-depth climate impacts studies. A Climate Impacts Database with search capability and four years of data was designed and implemented in support of this project and the IRI Climate Information Digest and Highlights.

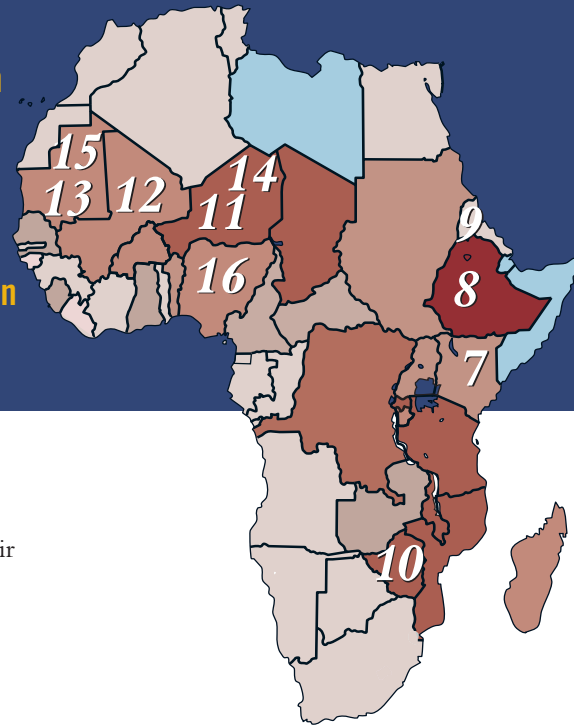
Evaluate prototype real-time environmental impacts database.

The media coverage of the 2002-03 El Niño in India, Australia, South Africa and the United States is being investigated in a project with the Earth Institute at Columbia University.

Disseminate climate and impacts information to a wide spectrum of users.

The web site is IRI's primary tool for dissemination of climate and impacts-related information. A newly developed IRI ENSO-web provided information about the evolving 2002-03 El Niño to a broad user base. A one-page "ENSO Quick Look" was implemented to provide ENSO information in plain language to the media and general public. In addition, a major web site redesign project was initiated.

These countries frequently have to borrow money on an emergency basis for disaster reconstruction. This drains financial and human resources away from economically productive uses. The numbers on the map depict approximate locations of collaborative projects, keyed to project information tables located in the next section of this report (p.20).



Impacts Research



EDDY POSTHUMA DE BOER/IFRC

Impacts research is closely linked with research on institutions and policy systems, climate and environmental monitoring, and decision systems analysis. Central to the approach are partnership-building network meetings and workshops in which partners bring data and expertise needed to assess how climate contributes to important socio-economic outcomes. This collaborative research contributes to efforts to build capacity (ours, and our partners) to understand how climate affects society and to minimize climate-related losses while capitalizing on favorable climatic conditions.

Sectoral/thematic expertise is required to assess climate impacts through familiarity with, and competence in, the relevant theory, methods, and data. There are many data issues and methodologies being explored by those trying to identify causal relationships between climate variables

and societal outcomes, and test their significance. These methodologies include the use of geographical information systems, time series analysis and geostatistics. Data for impacts research comes from both primary research and secondary analysis of existing data.

Our interest in developing an understanding of climate impacts on vulnerable communities in the developing world brings particular opportunities and potential difficulties. From an analytical perspective the vulnerability of these populations to climate events and the lack or weakness of protective mechanisms (such as use of air conditioning to prevent heat stress, or extensive measures to prevent climate-related infectious disease) mean that these relationships are often at their most explicit. However, in these areas of the world, a major constraint to the development of policies and programs, which can mitigate against such effects, is the lack of accurate information that can be used to create evidence. We therefore work closely with local researchers, and national and international partners whose task is to create and improve the very data our analysis is dependent on. Current activities undertaken within this underpinning activity are:

- Active engagement with dengue experts for South East Asia in support of dengue forecasting.
- Investigation into climate-related losses and risks. One example is the Hotspots Project, which is jointly implemented by the World Bank, IRI, the Center for International Earth Science Information Network (CIESIN), and the Center for Hazards and Risk Research (CHRR). The Hotspots Project is a global disaster risk assessment that models risk as a function of natural hazards and vulnerability of exposed populations and economically important assets.
- Involvement in the Roll Back Malaria WHO and the Environmental Health Program supported by the US Agency for International Development (USAID) to refine and assess the context of malaria control through climate-based statistical and biological models activities in a number of African countries.



RENZO TAUDEI (1), JACK HOLLINGSWORTH (2), ROSALIND COHEN (WIKI-MEDIA COMMONS) (3)

“ With well-defined decision strategies and access to climate and environmental information for a large set of years, it becomes possible to explore the consequences of implementing that decision strategy. ”

Decision Systems Research

We undertake decision systems research to support the integration of modern climate information into sectoral decisions, such as in agriculture and water resource management. This involves development or enhancement of decision tools and strategies to better incorporate climate risk and related environmental information. It includes exploration of new methodologies for tailoring information specific to real decision systems. A further important element includes retrospective simulation of decision system performance over a large set of past years, to estimate the expected benefits of implementing changes.

Methodologies and information are generated that assist users in evaluation management alternatives for risk reduction and improved outcomes. The work is relevant for decisions over a range of scales, from local (e.g. farm-level), to regional (e.g. watershed management), to strategic economic and environmental considerations at national and international scales. It relies on a sufficient understanding of the relationship between climate and the variables important for decision-making. Impacts research is a prerequisite to progress where the understanding of this relationship is not yet sufficient.

Primary objectives and outcomes of research in decision systems are to:

Develop or enhance decision tools and decision strategies, so that they can, as best as possible, incorporate climate information and forecasts.

A pilot for this effort is underway in the Ceará project of NE Brazil (See p. 21, Americas section for further details) that involves the development of a new strategy for adaptively managing and allocating water resources in reservoirs using seasonal to inter-annual forecasts. The pilot effort focuses initially on the development of decision strategies for annual allocation over a several year period. Other decision systems that can be explored for uptake of climate/environmental information are emerging in other regional projects, such as management of Rift Valley Fever in livestock and associated trade implications for the Greater Horn of Africa.



Develop and test methodologies for extracting the climate information and forecasts that fit the needs of the decision strategies.

Decision strategies require information at varying scales and for a variety of environmental variables. Focusing on the seasonal timescale, the information may be developed through both environmental monitoring and/or information rooted in seasonal climate predictions. How to extract the required information from the predictable component of seasonal climate is a key research topic. The extraction of the information from GCM output can be undertaken using statistical transformations or using dynamical downscaling methods. Methodological advances are emerging through testing in different physical locations, often as part of regional projects. Improved methodologies to predict crop yield are necessary for exploring decisions in the agriculture sector.

Evaluate and document risk reduction and other benefits from implementing the climate informed decisions, through simulating the performance of the system using climate information and forecasts from a large set of past years.

With well-defined decision strategies and access to climate and environmental information for a large set of years, it becomes possible to explore the consequences of implementing that decision strategy. This has been done to simulate the management of a reservoir in Ceará. Quantifying the extent to which spill losses can be reduced through management strategies that incorporate probabilistic streamflow forecasts provides tangible evidence on the benefit of adding climate information to additional decision strategies across a range of sectors, as well as for broader considerations within the water sector. For example, it is anticipated that hydrologic model outputs will be expanded to predict likely water quality, consequences for ecology, long-term degradation of water resources through soil erosion, salinization, and the impact of prior resource utilization. After these evaluations, it is then possible to arrive at a well-informed suite of products, and a range of possible response strategies, the consequences of each response strategy having been quantitatively estimated.

Contribute to the experimental uptake of the methods in real-time.

The methodologies and analyses introduced above are best advanced in close collaboration with regional partners, with the appropriate sectoral and/or operational specialists. This helps to ensure the tools that are developed and the decision strategies that are being explored are feasible and have potential to be used in real-time, given the broader social and institutional context. A further important aspect will be contributing to the development of methodologies to evaluate the decisions made in real-time and learning from the experiences.

“... this has been done to simulate the management of a reservoir in Ceará.”



GIANLUCA GUIDOTTI



Institutional and Policy Systems Research

The aim of institutional and policy systems research is the development and improvement of methods and conceptual models for the analysis and design of policies and institutional infrastructure to enable societies to act and reduce their vulnerability to seasonal and inter-annual climate fluctuations. The goals are to:

- gain understanding of institutional infrastructure to manage impacts of climate variability in diverse sectors and spatial scales in regions of interest to IRI;
- gain understanding of key policies required to help reduce

vulnerability of households, communities and societies to climate variability; and

- formulate conceptual models for the design and implementation of key policies and institutional infrastructure to promote sustainable development in the face of climate variability in regions of interest to IRI.

The research agenda is presently being advanced in the context of specific regional projects. This ensures that the approaches and methodologies contribute to the actual

needs of the region, as well as to the academic requirement of rigor. The research will be undertaken in collaboration with experts both in approach as well as from the region. We aim to advance tangible results in the project time frame, and to formulate a 3-5 year plan of action for this research area. The regional projects selected for formal institutional and policy systems research currently include IRI projects in Ceará, the Greater Horn of Africa, and South East Asia.



SHIV SOMESHWAR (r.), MARIO KOKIC/IFRC (l.)



Capacity Building, Outreach and Education

These activities are developed and implemented primarily in the context of ongoing work with partners in regions, rather than as stand-alone efforts. Many IRI staff members contribute to these activities according to the topics and regions that are targeted. Capacity building and training materials, including curricula, texts and interactive media, are advanced collaboratively with educational and regional partners.

As part of capacity building efforts, the IRI provides support to Regional Climate Outlook Forums (RCOFs) to improve climate variability management at the national level by:

- Enhancing the capacity of climate forecasters to implement approaches and evaluate their expected skill when applied in real-time.
- Enhancing capacity among RCOF partners to achieve measurable improvements in selected aspects of climate variability management.

The new twelve-month M.A. Program in Climate and Society, scheduled to begin in Fall 2004 will train professionals and academics to understand and cope with the impacts of climate variability and climate change on society and the environment. This rigorous program emphasizes the problems of developing societies. IRI scientists have been actively contributing towards the development of the course syllabus. The development of new academic programs provides increased opportunity for teaching and mentoring by IRI staff in the future.

ASIA/PACIFIC

ASEAN Specialized Meteorological Centre,
Singapore

Asian Disaster Preparedness Center,
Thailand

Bogor Agricultural University, Indonesia

Bureau of Meteorology, Australia

Central Weather Bureau, Taiwan

Department of Primary Industries,
Queensland

Flood Forecasting Centre, Bangladesh

Frontier Research System for
Global Change, Japan

Indian Institute of Science

Japan Meteorological Agency

Meteorological and Geophysical Agency of
the Republic of Indonesia

National Central University, Taiwan

National Taiwan University

Philippine Atmospheric, Geophysical and
Astronomical Services Administration

Tamil Nadu Agricultural University, India

The Mahaweli Authority, Sri Lanka

The Queensland Department of
Natural Resources







GLOBAL

PROJECT TITLE

OBJECTIVE

PARTNERS

1) Identification of Global Natural Disaster Risk Hotspots

Deliver a global first-order natural disaster risk assessment for all major natural hazards.

Center for Hazards and Risk Research
 Center for International Earth Science Information Network
 World Bank
 United Nations Development Program
 United Nations Environment Program
 Working Group 3 on Risks, Vulnerability and Impacts of the International Strategy for Disaster Reduction
 United Nations Office for the Coordination of Humanitarian Affairs
 Atmospheric and Environmental Research, Inc.
 National Center for Atmospheric Research
 Middlesex University
 World Food Program
 Norwegian Geotechnical Institute
 United States Geological Survey

2) El Niño Drought Impacts in 2002/2003: A Comparative Study of National Media Coverage

Use social scientific methods of media analysis to understand the social effects of and responses to climate anomalies in particular countries by reviewing publicly available national media coverage.

University Corporation for Atmospheric Research
 Earth Institute, Columbia University

3) Data Library Mirror Site Pilot Project

Provide local Data Library access and functionality.

Central Weather Bureau, Taiwan

4) Malaria Early Warning Systems (In Development)

Help inform changes in epidemic risk in countries or regions where epidemic malaria is a significant public health problem.

Technical Support Network on Epidemic Prevention and Control
 Liverpool School of Tropical Medicine
 Ministries of Health in Uganda, Sudan, Niger, Mali, Burkina Faso, Eritrea and Botswana



JACK HOLLINGSWORTH (r.), EMMA ARCHER (top)

Argentine Association of Regional Consortiums for Agricultural Experimentation
 Centro de Previsão de Tempo e Estudos Climáticos, INPE, Brazil
 Fundação Cearense de Meteorologia e Recursos Hídricos, Brazil
 Instituto del Mar del Peru
 State of Ceará, Brazil

LATIN AMERICA

IRI PARTNERS & COLLABORATORS



PROJECT TITLE

OBJECTIVE

PARTNERS

5) Impacts of Water Resource Management Choices in Ceará, Brazil: Roles of Streamflow Forecasts, Rainfall Forecasts and Participatory Decision Making

Provide decision support to policy makers involved in reducing vulnerability to drought.

Fundação Cearense de Meteorologia e Recursos Hídricos, Ceará, Brazil
 Secretariat for Water Resources
 Companhia de Gestão dos Recursos Hídricos
 Universidade Federal do Ceará
 University of Miami
 School of International and Public Affairs, Columbia University
 Earth and Environmental Engineering, Columbia University

6) Climate and Fisheries (In Development)

Plan for a Fisheries Outlook Forum and coordinate with experts on tuna and climate issues in the Central and Western Pacific on developing specific applications activities for small island states.

University of Miami

AMERICAS

IRI PARTNERS & COLLABORATORS

Center for Ocean-Land-Atmosphere Studies
 Columbia University
 Florida State University
 Johns Hopkins School of Public Health
 Hydro-Québec
 National Aeronautics and Space Administration
 National Oceanic and Atmospheric Administration
 ● Office of Global Programs
 ● National Weather Service
 ● National Centers for Environmental Prediction
 ● National Center for Atmospheric Research
 ● Geophysical Fluid Dynamics Laboratory
 ● Climate Diagnostic Center

National Institutes of Health
 Scripps Institution of Oceanography
 United States Agency for International Development
 USAID Office of Foreign Disaster Assistance
 United States Geological Survey
 University of California, Los Angeles
 University of California, Irvine
 University of Hawaii, Manoa
 University of Miami
 University of South Florida
 University of Washington

NORTH AMERICA



UNAR (top)



PROJECT TITLE

OBJECTIVE

PARTNERS

AFRICA

7) Regional Climate Prediction and Risk Reduction in the Greater Horn
Computing Infrastructure and Technical Support to the GHA Program

Improve monitoring, prediction and applications for early warning of climatic hazard events in support of disaster reduction and other regional sustainable development objectives. Provide effective computing, technical, and modeling support toward DMCN setting up its own region forecast system, training its researchers/staff in system management and managing the impacts of the regional climate fluctuations.

Drought Monitoring Centre, Nairobi
World Meteorological Organization
Inter-African Bureau of Animal Resources
USAID Famine Early Warning System
United States Geological Survey
University of Nairobi
National Aeronautics and Space Administration
World Food Program

8) Determinants of Meningitis in Ethiopia

Develop forecasting models to predict meningitis epidemics within sub-Saharan Africa by incorporating epidemiological, weather and environmental information at the local level; improve epidemic meningitis control through a better understanding of the etiology of the disease in its epidemic form and the local environmental determinants.

Liverpool School of Tropical Medicine
Ethiopian Ministry of Health

9) Malaria Stratification in Eritrea

Create a malaria stratification map for the Ministry of Health in Eritrea that can be used as a baseline for indicating areas prone to epidemics.

Environmental Health Project
Ministry of Health, Eritrea

10) Mitigating the Effects of Hydro-climatic Extremes in Southern Africa

Improve multi-sector, short- and long- term climate risk management and emergency response to climate variability throughout the Southern Africa region.

Drought Monitoring Centre, Harare
World Meteorological Organization
Southern Africa Development Community
Regional Remote Sensing Unit
University of Cape Town
South Africa Weather Service
United States Geological Survey

11) Climate and Malaria in Niger

Develop a local research group with new abilities to better stratify malaria endemicity and analyze and forecast epidemics of malaria in Niger through the creation of new malaria control tools involving remote sensing and geographical information systems.

Centre de Recherche sur les Méningites et les Schistosomes
Direction pour la Surveillance et le Contrôle Epidémiologique of the Ministry of Health
Programme National de Lutte contre le Paludisme of the Ministry of Health
African Centre of Meteorological Applications for Development
Regional Training Centre for Agrometeorology and Operational Hydrology and their Applications



PROJECT TITLE

OBJECTIVE

PARTNERS

<p>12) Evaluation of Malaria Early Warning for Roll Back Malaria – World Health Organization</p>	<p>Evaluate the current status of Malaria Early Warning Systems in African countries at risk of epidemic malaria through analysis of select country experiences on forecasting/warnings/alerts using rainfall anomaly maps and other tools.</p>	<p>World Health Organization – Roll Back Malaria/Healthmapper</p>
<p>13) Development of a Multi-model Ensemble System for Seasonal to Inter-annual Prediction</p>	<p>Collaborate with European researchers on multi-model ensemble approaches to enhance seasonal to internannual prediction skill. Assess the potential economic value of such forecasts for malaria control in Africa.</p>	<p>European Centre for Medium Range Weather Forecasting Geography Department, Liverpool University</p>
<p>14) Dust and Dry Season Analysis for the Sahel <i>(In Development)</i></p>	<p>Create health-relevant gridded climate and environmental data sets for use in regional and local analysis of climate/land use/health interactions.</p>	<p>University Abdou Moumouni of Niamey Goddard Institute for Space Studies at Columbia University African Centre of Meteorological Applications for Development Regional Training Centre for Agrometeorology and Operational Hydrology and their Applications, Niger National Meteorological Services in West Africa</p>
<p>15) ENSEMBLE-based Predictions of Climate Changes and their Impacts <i>(In Development)</i></p>	<p>Collaborate with European efforts to advance policy relevant information on climate and climate change and its interactions with society, focused on opportunities for Africa.</p>	<p>Liverpool University Geography Department European Centre for Medium-Range Weather Forecasts, UK Ensemble team (72 institutes/partners)</p>
<p>16) West Africa Regional Programme <i>(In Development)</i></p>	<p>Increase the well-being of people in poor countries through reduced vulnerability to climate events shown to be linked to adverse health outcomes.</p>	<p>African Centre of Meteorological Applications for Development World Health Organization Multi-Disease Surveillance Centre Centre de Recherche sur les Méningites et les Schistosomoses</p>

AFRICA (con't.)

IRI PARTNERS & COLLABORATORS

- African Centre of Meteorological Applications for Development, Niger
- Drought Monitoring Centre, Harare, Zimbabwe
- Drought Monitoring Centre, Nairobi, Kenya
- Egyptian Ministry of Water Development
- Regional Remote Sensing Unit, Zimbabwe

AFRICA



EDDY POSTHUMA DE BOER/IRI/C (1)



PROJECT TITLE

OBJECTIVE

PARTNERS

<p>17) Applying Climate Information to Enhance the Resilience of Farming System Exposed to Climatic Risk in South and South East Asia</p>	<p>Demonstrate and deliver benefits from climate forecast information for agricultural decision makers, and plot a course for large-scale, sustained operational support of seasonal climate prediction within India, Pakistan and Indonesia.</p>	<p>Queensland Department of Primary Industries Pakistan Agricultural Research Council Centre for Atmospheric and Oceanic Sciences, Indian Institute of Science Department of Agricultural Meteorology, Tamil Nadu Agricultural University Indian Institute of Tropical Meteorology Department of Geophysics and Meteorology, Bogor Agricultural University Global Change System for Analysis, Research and Training</p>
<p>18) Sri Lanka Natural Disaster, Drought Mapping and Vulnerability Case Study</p>	<p>Develop integrated natural disaster hazard characteristics for Sri Lanka and support planning for damage mitigation as well as relief measures.</p>	<p>Center for Hazards and Risk Research Center for International Earth Science Information Network</p>
<p>19) Integrated River Basin Management: Climate variability and adaptation strategies for Sri Lanka</p>	<p>Develop climate and hydrologic data and diagnostic resources toward improved decision capability in water use, food security, health, and the environment.</p>	<p>Mahaweli Authority of Sri Lanka National Water Resources Authority of Sri Lanka Sri Lanka Ministry of Irrigation and Water Resources University of Peradeniya, Sri Lanka</p>
<p>20) Evaluation of Climate and Habitat Interactions Affecting the Conservation and Management of Asian Elephants in Southeast Sri Lanka</p>	<p>Assess the utility of seasonal climate forecasts in the management of elephant ecology.</p>	<p>Center for International Earth Science Information Network Center for Environmental Research and Conservation Mahaweli Authority, Sri Lanka Indian Institute of Science, Bangalore</p>
<p>21) Climate Change Impact and Adaptation Assessment Project in Sri Lanka</p>	<p>Identify adaptation options and assess their feasibility of implementation; build capacity of natural and social scientists; undertake assessment studies.</p>	<p>Sri Lanka Department of Meteorology Sri Lanka Association for Advancement of Science Tea Research Institute Coconut Research Institute University of Peradeniya</p>
<p>22) Managing Climate Variability to Improve Livelihoods in South and South East Asia: Methods, Tools and Policies <i>(In Development)</i></p>	<p>Demonstrate improvements in livelihoods subject to high climate variability in South and South East Asia through development of a livelihood framework, decision support tools and increased capacity building.</p>	<p>Asian Disaster Preparedness Centre, Bangkok</p>

PROJECT TITLE

OBJECTIVE

PARTNERS

23) Climate Forecast Applications for Disaster Mitigation in Indonesia and Philippines: Demonstrations, Tools and Capacity Building <i>(In Development)</i>	Help develop sustainable end-to-end institutional systems in Indonesia and Philippines that demonstrate improvements in the performance of climate sensitive sectors at the community level with the capacity to achieve similar success nationally in other locations.	Asian Disaster Preparedness Centre, Bangkok Bureau of Meteorology and Geophysics, Indonesia Philippine Astronomical, Geophysical, Atmospheric Service Administration Bogor Agriculture University, Indonesia Ministry of Agriculture, Indonesia
24) Analysis of Impacts of Climate Variability on Vector-borne Disease Transmission in Sri Lanka and the Development of an Early Warning System <i>(In Development)</i>	Formulate a methodology to undertake malaria risk hazard analysis.	Lamont-Doherty Earth Observatory International Water Management Institute Mahaweli Authority, Sri Lanka University of Sri Jayawardhenapura Anti-malaria campaign of the Department of Health, Sri Lanka
25) Seasonal Rainfall Prediction to Enhance Smallholder Farmer Livelihoods in Semi-Arid Peninsular India <i>(In Development)</i>	Contribute to sustained advances in prosperity and livelihood security within rural communities in semi-arid Peninsular India, through the application of seasonal forecasts to smallholder farming.	Central Research Institute for Dryland Agriculture Indian Institute of Tropical Meteorology National Research Centre for Medium Range Weather Forecasting M.S. Swaminathan Research Foundation International Crops Research Institute for the Semi-Arid Tropics Queensland Department of Primary Industries
26) Managing Climate Impacts In Central Southwest Asia <i>(In Development)</i>	Produce a foundation of assessment and information needed for the development of capacity for early warning and effective response to climate-related impacts in the vulnerable semi-arid countries of Central Southwest Asia.	National Center for Atmospheric Research National Oceanic and Atmospheric Administration United States Geological Survey
27) Climate Forecast Applications for Disaster Mitigation in Vietnam <i>(In Development)</i>	Facilitate the creation of end-to-end systems that demonstrate improvements in the performance of climate-sensitive sectors at the community level, with the capacity to achieve similar success nationally.	Asian Disaster Preparedness Centre, Bangkok
28) Adapting to Climate Change by Managing Climate Variability in Southeast Asia <i>(In Development)</i>	Incorporation of past climate trend in Climate Field School system to enable the stakeholders to assess their utility in planning for adaptation to long-term climate trend.	Asian Disaster Preparedness Centre, Bangkok Bureau of Meteorology and Geophysics, Indonesia Regency of Indramayu, Indonesia



PROJECT TITLE

OBJECTIVE

PARTNERS

CLIMATE PREDICTION RESEARCH AND DEVELOPMENT

Forecast Operations

Provide the most accurate forecasts possible; assess the degree of seasonal climate predictability that can be made for any region and season to help prioritize among potential regional projects, and inform users of the potential skill of forecasts for their region.

Max Planck Institute, Germany
National Aeronautics and Space Administration/Goddard Space Flight Center
Center for Ocean-Land Atmosphere Studies
Queensland Dept. of Natural Resources
Centro de Previsão de Tempo e Estudos Climáticos
Climate Prediction Center/National Centers for Environmental Prediction/National Oceanic and Atmospheric Administration
Scripps Institute of Oceanography

Improving SST Prediction

Provide the most accurate and reliable predictions possible of global SSTs and of ENSO probabilities.

European Centre for Medium-Range Weather Forecasts
National Centers for Environmental Prediction

Prediction of Tropical SST Using Coupled Models

Provide SST forecasts with leads of 0 to 6 months in the tropical oceans which are used in the IRI two tier forecasting system.

Center for Ocean-Land Atmosphere Studies
Texas A&M University

Data Assimilation for Coupled Predictability and Prediction

Improve understanding of how data assimilation impacts coupled model forecasts.

National Oceanic and Atmospheric Administration Applied Research Center/ODASI – Geophysical Fluid Dynamics Laboratory
Center for Ocean-Land Atmosphere Studies
National Oceanic and Atmospheric Administration's Seasonal to Interannual Prediction Project

Model Infrastructure Support and Development

Update the system currently used for coupling major IRI component models; implement the ESMF coupling system for ECHAM 4.5 and MOM4 at IRI; explore whether use of a different land surface model in ECHAM would be beneficial to simulation of near surface temperature and precipitation of seasonal time scales.

Attribution of Climate to SST Forcing

Determine what regions/times and what regional/temporal scales of boundary forcing (for now, SST) must be predicted accurately/reliably in order to make reliable climate forecasts.

National Centers for Environmental Prediction/Climate Prediction Center
Climate Diagnostics Center
Center for Ocean-Land Atmosphere Studies
National Aeronautics and Space Administration/Goddard Space Flight Center
Geophysical Fluid Dynamics Laboratory

RENZO TADDEI

PROJECT TITLE

OBJECTIVE

PARTNERS

Understanding the Physical Mechanisms of Regional Climate Variability	Improved understanding of the physical mechanisms of regional climate variability on interannual-to-interdecadal time scales, through modeling and diagnostic studies.	University of California, Los Angeles Dept. of Atmospheric Sciences Jet Propulsion Laboratory University of Maryland National Aeronautics and Space Administration/Goddard Space Flight Center National Center for Atmospheric Research Texas A&M University
Dynamical Downscaling Methodology and Application	Downscale coarse-resolution GCM prediction to small areas of interest with fine resolution to facilitate multiple climate application; develop capacity to undertake regional climate modeling in countries with weak technical infrastructure.	
Climate Downscaling: Modeling and Forecasting	Advance our understanding of predictability at regional spatial scales and seasonal and subseasonal temporal scales; develop tools for downscaling.	Fundação Cearense de Meteorologia e Recursos Hídricos
The Predictability of Onset and Character of Warm Season Rains in South America Using a Nested Modeling System	Examine higher order rainfall statistics from a gridpoint regional climate model nested in GCM historical ensemble integrations.	National Oceanic and Atmospheric Administration/ Climate Diagnostics Center University of Lund, Sweden
Forecasting Tropical Cyclone Activity Using Atmospheric General Circulation Models	Develop and improve operational tropical cyclone forecasts products, increasing coastal societies preparedness for tropical cyclone impacts.	South African Weather Service Max Planck Institut für Meteorologie
Statistical Methods	Incorporate statistical analysis of historical information into seasonal climate predictions through: <ul style="list-style-type: none"> i. Improved multi-model global GCM climate forecasts. ii. MOS correction of global GCM climate forecasts. iii. Statistical forecasts of SST. iv. Statistical downscaling of GCM predictions for tailored forecast products. 	University of California, Irvine South African Weather Service

PROJECT TITLE

OBJECTIVE

PARTNERS

Climate Diagnostics Research

Enhance society's ability to understand, anticipate, and cope with climate variability via:

1. Improved understanding of the physical climate system on seasonal to interannual (to decadal) timescales through observational and modeling studies in focused regions of interest.
2. Development of capacity to provide rapid-response analysis of recent climate events in order to inform and advise appropriate IRI interests.

National Oceanic and Atmospheric Administration Applied Research Center
Climate Diagnostics Center
National Oceanic and Atmospheric Administration/Climate Prediction Center
Texas A&M University
Geophysical Fluid Dynamics Laboratory
University of Buenos Aires
Indian Institute of Tropical Meteorology
National Center for Atmospheric Research

Environmental Information Systems Database Development

Provide frequently updated, near 'real-time', information on those various environmental processes that are considered useful to the IRI's regional programs.

Center for International Earth Science Information Network
United States Geological Survey
National Aeronautics and Space Administration
Atmospheric and Environmental Research

IRI Data Library

Facilitate data exchange by providing a WWW data library that provides multi-disciplinary access to data needed to study short-term climate change and its impact.

Central Weather Bureau, Taiwan
Thematic Real-time Environmental Data Distributed Services
OpenDAP Distributed Ocean Data Sets

Map Rooms – Capability Enhancements

Enhance society's ability to understand climate variability and its synergistic relationship with other environmental factors.

IRI Climate Information Digest

Create awareness of ongoing climate events around the world and the impacts they have on society, to provide some basic education about the change of seasons and climatology, and to provide context for seasonal forecasts.

National Oceanic and Atmospheric Administration/Office of Global Programs

Variability, Trends and Change
(In Development)

Provide mechanisms and tools for society to cope with climate variability on all temporal scales by placing IRI seasonal climate information and predictions in the context of lower frequency variability, trends and change.

Atmospheric and Environmental Research, Inc.
Climate Prediction Center



PROJECT TITLE

OBJECTIVE

PARTNERS

Global Climate-Related Losses and Risks: Measurement, Documentation and Analysis
(In Development)

Improve risk management practice at all scales through evidence-based analysis of historical losses and risk factors.

- Center for Research on the Epidemiology of Disasters
- La Red
- Asian Disaster Reduction Center
- United Nations Office for the Coordination of Humanitarian Affairs
- International Strategy for Disaster Reduction
- Economic Commission on Latin America and the Caribbean
- World Bank
- United Nations Disaster Management Training Program
- United Nations Development Programme
- Center for Hazards and Risk Research
- Center for International Earth Science Information Network
- Inter-agency Geographic Information Support Team
- United Nations Environment Programme
- Earth Institute, Columbia University

IMPACTS RESEARCH



QUINTILIANO DOS SANTOS/IFRC (top), NASA-JSC (1)



PROJECT TITLE

OBJECTIVE

PARTNERS

DECISION SYSTEMS RESEARCH

Using Climate Information to Forecast Reservoir Inflows in NE Canada

Test the use of hydroclimatic information and measures of atmospheric circulation to make seasonal forecasts of streamflow for 15 basins in the Québec-Labrador region, where hydropower is of large importance.

Hydro-Québec's Research Institute
Ouranos

Climate-Based Crop Forecasting Methodology Development and Intercomparison
(In Development)

Contribute to welfare of rural communities dependent on crop production by advancing the use of dynamic climate forecasts for prediction of crop production at multiple scales, and quantitative analyses of crop and farm management responses to forecasts.

Climate-Informed Decision Strategies for Optimal Water Resource Management and Climate Hazard Reduction
(In Development)

To integrate rainfall forecasts and climate information to inform and optimize decisions systems for improved water resource management.

Central Weather Bureau, Taiwan
National Central University, Taiwan
National Water Authority, Taiwan
Taiwan Universities

INSTITUTIONS AND POLICY SYSTEMS

Projects are in development.



EWMA ARCHER (top)

PROJECT TITLE

OBJECTIVE

PARTNERS

<p>Regional Climate Outlook Forum Support, Africa 1. Training for Climate Forecasters 2. Knowledge Clearinghouse for Capacity Building and Outreach</p>	<p>Improve climate variability management at the national level in Africa by: 1. Enhancing the capacity of climate forecasters to implement approaches. 2. Enhancing capacity among RCOF partners to achieve measurable improvements in selected aspects of climate variability management.</p>	<p>Drought Monitoring Centre, Nairobi Drought Monitoring Centre, Harare African Centre of Meteorological Applications for Development World Meteorological Organization National Oceanic and Atmospheric Administration/Office of Global Programs</p>
<p>Climate - Society Reference Tool</p>	<p>Advance research and activities related to the applications of climate information by facilitating multi-disciplinary cooperation.</p>	<p>National Oceanic and Atmospheric Administration/Office of Global Programs</p>
<p>Master's Program in Climate and Society: Preparing Course Syllabus and Program Teaching</p>	<p>Provide advanced education in the social and natural sciences as they relate to climate variability and climate change.</p>	<p>Columbia University Lamont-Doherty Earth Observatory School of International and Public Affairs, Columbia University Earth Institute, Columbia University</p>
<p>Advanced Training Institute on Climatic Variability and Food Security</p>	<p>Equip young agriculture and food security professionals in developing countries to apply advances in climate prediction at a seasonal lead time to ongoing efforts on climate-sensitive aspects of agricultural production, food insecurity and rural poverty.</p>	<p>Global Change System for Analysis, Research and Training The David and Lucile Packard Foundation</p>
<p>Dynamical Downscaling Training <i>(In Development)</i></p>	<p>Foster a network of expertise for cutting-edge issues and methods in climate downscaling.</p>	<p>National Oceanic and Atmospheric Administration/Office of Global Programs Columbia Center for New Media Teaching and Learning</p>

CAPACITY BUILDING, OUTREACH AND EDUCATION



IRI PARTNERS & COLLABORATORS

- Abdus Salam International Centre for Theoretical Physics, Italy
- Fishmeal Exporters Organization, France
- Institut du Recherché pour le Developpement, France
- Liverpool School of Tropical Medicine, UK
- Max Planck Institute, Germany

EUROPE

ED SIMPSON (top), GERMAN RED CROSS/IFRC (1)

FUNDING SOURCES

FY 02-03

NOAA Office of Global Programs

\$ 8,690,845

Columbia University

\$ 2,371,167

Central Weather Bureau of Taiwan

\$ 900,000

USAID

\$ 1,489,210

Other

\$ 264,952

Total

\$13,716,174

Other
USAID
Central Weather Bureau of Taiwan
Columbia University
NOAA Office of Global Programs

Major sources of funding for 2002-2003 include the

NOAA Office of Global Programs (64%), Columbia University (17%), US Agency for International Development (11%), and the Central Weather Bureau of Taiwan (7%), with other sources (START, DOE, Hydro-Québec, UCAR-THREDDS, QDPI, Camp Dresser McKee) accounting for the remainder.

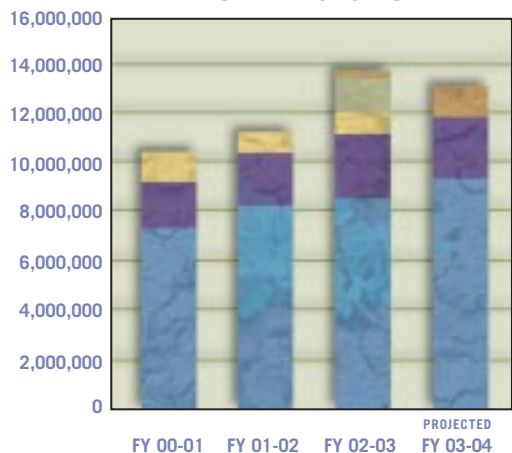
Fund sources for 2002-2003 totaled \$13.7M, \$0.6M more than was anticipated from prior year projections, and an increase of 21% from fiscal year 2001-2002. The increase is primarily due to some multi-year grants being awarded as a lump sum in 2002-2003. This results in an apparent decrease in funding to \$13.3M for 2003-2004, that would otherwise show as approximately equal funding for both years. A significant departure for 2003-2004 is the absence of significant support from the Central Weather Bureau of Taiwan, owing to legislative budgetary restrictions for that year. Note, however, that the amount of funds from 'other' sources for 2003-2004 increases significantly from about \$0.25M to about \$1.35M. This includes current or pending support



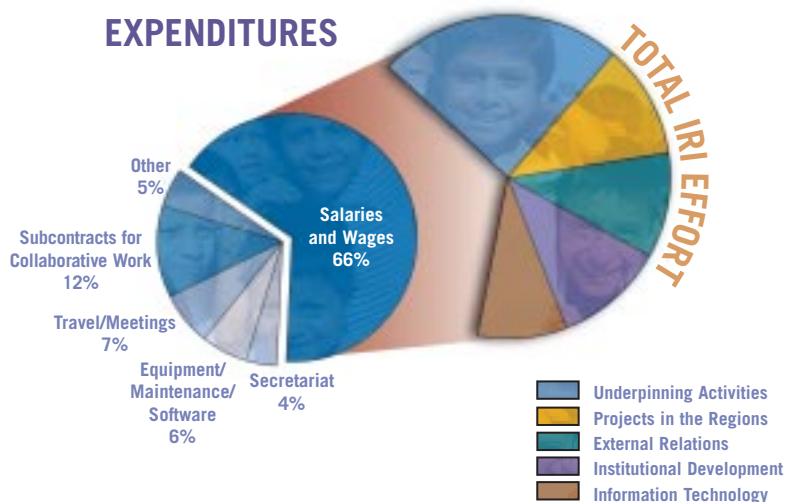
NOAA-DOC (001); THOMAS K. GIBSON/FLORIDA KEYS NATIONAL MARINE SANCTUARY/NOAA-DOC (2, 2 & 3); EDDY POSTHUMA DE BOER/IFRC (2, 3)



IRI FUNDING GROWTH



EXPENDITURES



from the several of the above listed sources plus Rockefeller, FUNCEME (Brazil), UCLA, NSF, AER, NIH, UCSB, and U Miami.

The funds for 2002-2003 predominantly supported the people of the

IRI (70%), of which nearly 70% was in support of research staff, and the remaining in administrative (17%) and technical (13%) support. Additional project support (12%) was provided to subcontracted collaborators at other institutions.

Further expense areas included travel and meetings (7%), and equipment and software (6%). The remaining amount (5%) results from expenses such as publications, supplies, and discretionary spending.

IRI PARTNERS & COLLABORATORS

- Consultative Group on International Agricultural Research
- Food and Agriculture Organization
- Global Change System for Analysis, Research and Training
- Inter-American Institute for Global Change Research
- International Strategy for Disaster Reduction
- National Meteorological and Hydrological Services
- United Nations Development Programme
- United Nations Educational, Scientific and Cultural Organization
- United Nations Environment Programme
- World Bank
- World Health Organization
- World Meteorological Organization

INTERNATIONAL





LEADERSHIP TEAM

Stephen E. Zebiak	Director General; Director, Prediction Research; Senior Research Scientist	Maxx Dilley	Director, Africa Program; Co-Director, Impacts Research; Research Scientist	Shiv Someshwar	Director, Institutions and Policy Systems Research; Director, Asia Program; Research Scientist
Anthony Barnston	Director, Forecast Operations	Carolyn Z. Mutter	Assistant Director for Science Management; Coordinator, Capacity Building, Outreach, and Education	Madeleine Thomson	Director, Impacts Research; Co-Director, Africa Program; Research Scientist
Reid Basher	Director, Applications Research (now at ISDR, Geneva, Switzerland)	Leo Ostwald	Manager, IRI Computing	M. Neil Ward	Director, Decision Systems Research
Stephen Connor	Co-Director, Climate and Environmental Monitoring Research	Chester Ropelewski	Director, Climate and Environmental Monitoring Research; Acting Director, Latin America and Caribbean Program		

RESEARCH STAFF

Shardul Agrawala	Associate Research Scientist	Eli Galanti	Postdoctoral Research Scientist (Israel)	Labao Lan	Senior Staff Associate
Sankar Arumugam	Postdoctoral Research Scientist (India)	Alessandra Giannini	Associate Research Scientist	Huilan Li	Staff Associate
Bryson Bates	Visiting Research Scientist (Australia)	Lisa Goddard	Research Scientist	Bradfield Lyon	Associate Research Scientist
Michael Bell	Staff Associate	Emily Grover	Staff Associate	Galit Marcus	Research Assistant
M. Benno Blumenthal	Data Library Manager	James Hansen	Associate Research Scientist	Sabine Marx	Postdoctoral Research Scientist (Germany)
Suzana Camargo	Associate Research Scientist	Deborah Herceg	Research Assistant	Simon Mason	Research Scientist
Ariaster Chimeli	Postdoctoral Research Fellow (Brazil)	Meiji Honda	Visiting Research Scientist (Japan)	Ben Mohamed	Visiting Research Scientist (Niger)
Rashed Chowdhury	Postdoctoral Research Fellow (Bangladesh)	Ching-Kai Hsiao	Visiting Research Scientist (Taiwan)	Ousmane Ndiaye	Staff Associate
John del Corral	Senior Staff Associate	Matayo Indeje	Postdoctoral Research Fellow (Kenya)	Valerie Obsomer	Visiting Research Scientist (Belgium)
Yongjiu Dai	Visiting Research Scientist (Georgia Tech)	Tahl Kestin	Postdoctoral Research Fellow (Australia)	Ruvini Perera	Research Assistant
David DeWitt	Research Scientist	Upmanu Lall	Senior Research Scientist	Cristina Perez	Postdoctoral Research Scientist (US)
				Alexander Pfaff	Associate Research Scientist



PERSONNEL AT A GLANCE

RESEARCH STAFF *(continued)*

Jian-Hua (Joshua) Qian Associate Research Scientist
Andrew Robertson Research Scientist
Anji Seth Associate Research Scientist

Ashish Sharma Visiting Research Scientist (Australia)
Oli G.B. Sveinsson Postdoctoral Research Scientist (Iceland)
Liqiang Sun Associate Research Scientist
Renzo Taddei Research Assistant

Michael Tippett Associate Research Scientist
Sylvia Trzaska Postdoctoral Research Scientist (France)
Rong-Hua (Ron) Zhang Associate Research Scientist
Lareef Zubair Associate Research Scientist

AFFILIATES AND ADJUNCTS

Affiliated Faculty

Mark Cane Vetlesen Professor, Columbia University Earth and Environmental Sciences; Applied Physics and Applied Math
Dana Fisher Assistant Professor, Columbia University Sociology
Steve Rayner Associate Professor, Columbia University Sociology, International Affairs

Adam Sobel Assistant Professor, Columbia University Applied Physics and Applied Math; Earth and Environmental Sciences

Affiliated Tropical Agriculture Staff

Lisa Dreier Program Manager
Cheryl Palm Senior Research Scientist
Pedro Sanchez Director
Nora Simpson Administrative Assistant

Adjunct Researchers

Mathew Barlow Staff Scientist, Atmospheric and Environmental Research, Inc.
Kenneth Broad Assistant Professor, University of Miami
Ping Chang Professor, Texas A&M
Richard Kleeman Professor, NYU - Prediction Research
Ben Orlove Professor, University of CA, Davis
Jennifer Phillips Assistant Professor, Bard College
Balaji Rajagopalan Assistant Professor, University of Colorado

INSTITUTIONAL SUPPORT

Office of the Director General

Georgiana Aybar Project Aide
Ann Binder Manager, Staff and Operations
Risë Fullon Financial and Information Services Assistant
Tricia Preble Outreach Communications Coordinator

Computer Systems

Sara Barone Analyst/Programmer
Jia Fang Intermediate Analyst/Programmer
Xiaofeng Gong Senior Analyst/Programmer
Brendon Hoch Intermediate Analyst/Programmer

Hua Sheng Intermediate Analyst/Programmer
Jeff Turmelle Intermediate Analyst/Programmer

Administrative Support

Maria Salgado Senior Secretary
Sandra Vitelli Senior Secretary

Leadership Team

**Stephen E. Zebiak**

*Director General;
Director, Prediction Research;
Senior Research Scientist*

Dr. Zebiak has worked in the area of ocean-atmosphere interaction and climate variability since obtaining his Ph.D. from the Massachusetts Institute of Technology in 1984. He was co-author of the first dynamical model used to predict El Niño successfully. Dr. Zebiak is currently the chair of the International CLIVAR Working Group on Seasonal-to-Interannual Prediction, and co-chair of the U.S. CLIVAR Seasonal-to-Interannual Modeling and Prediction Panel. At the IRI, Dr. Zebiak coordinates coupled model efforts, data assimilation/forecast system development, predictability, and climate dynamics research for seasonal-to-interannual time scales. He also helps to foster active collaboration between the IRI and other national and international centers engaged in climate modeling and prediction. He is concurrently serving as the Director General.

**Anthony Barnston**

Director, Forecast Operations

Prior to arriving at the IRI at the end of June 2000, Barnston was an operational seasonal climate forecaster and developmental researcher in empirical prediction methodology at the Climate Prediction Center of NOAA for 17 years. He was Editor of the Experimental Long Lead Forecast Bulletin from 1992-97. With his forecast staff, Barnston ensures the production of a range of IRI forecast products issued on a monthly basis for the globe, including forecasts of sea surface temperatures, outlooks for seasonal precipitation and temperature anomalies, and extreme event forecasts. His goal is the continual improvement of the IRI's forecast operation, including the generation of new versions of the forecasts tailored to specific user groups.

**Reid Basher**

*Director, Applications Research
(now at ISDR, Geneva, Switzerland)*

Before joining the IRI in July 1999, Dr. Basher was responsible for climate research and applications work at New Zealand's National Institute of Water and Atmospheric Research. He has been a lead author in impacts reports of the Intergovernmental Panel on Climate Change (IPCC), and is Chair of the Working Group on Climate Data of the World Meteorological Organization (WMO). At the IRI, Dr. Basher was responsible for guiding research in application methodologies, for development of strategies for the application of climate predictions, and for strengthening worldwide collaborations in applications research.

**Stephen Connor**

*Co-Director, Climate and Environmental
Monitoring Research*

Dr. Connor has a background in Development/Natural Resource Economics and has specialized in the geography of infectious disease in Africa. During the last 12 years he has worked extensively in sub-Saharan Africa for the UK Medical Research Council, the UK Department for International Development's Malaria Knowledge Programmes, and is an advisor to WHO's Roll Back Malaria Technical Resource Network on Epidemic Prevention and Control. Dr. Connor investigates the interaction of climate, environment, economy and social vulnerability in determining the patterns and persistence of infectious disease in the developing world.

**Maxx Dilley**

*Director, Africa Program;
Co-Director, Impacts Research;
Disaster and Risk Management;
Research Scientist*

Dr. Dilley is a Geographer with experience in designing and implementing programs in disaster and risk management. Prior to coming to the IRI in November, 2001, he worked for two years at the World Bank Disaster Management Facility and for seven years at the U.S. Agency for International Development's Office of U.S. Foreign Disaster Assistance. Dr. Dilley is responsible for developing the IRI's program in disaster and risk management and he also plays a role in IRI partnership development in support of the IRI Secretariat.

The IRI
employs a truly
international
staff consisting of
over 70 people
with diverse
backgrounds.



Carolyn Z. Mutter

Assistant Director for Science Management; Coordinator, Capacity Building, Outreach, and Education

Dr. Mutter received her Ph.D. from Columbia University in 1991. Prior to joining the IRI in 1997, Dr. Mutter was an associate research scientist at Lamont-Doherty Earth Observatory, where she undertook a dozen major marine geophysical and ocean drilling cruises. She has served as Adjunct Professor (Oceanography) at Barnard College, and as a member of the US Science Advisory Committee. In her present role, Dr. Mutter oversees planning, program development, day-to-day fiscal and operational oversight, and communications for the IRI.



Leo Ostwald

Manager, IRI Computing

Ostwald has held systems engineering/administration positions for various organizations, including Bank of America, Naval Atlantic Meteorology and Oceanography Center, and Computer Sciences Corporation. He holds M.S. degrees in Physical Oceanography and Engineering Acoustics from the Naval Postgraduate School. Ostwald administers and ensures maximum ongoing system performance and availability for the IRI's full-time operational activities. He has lead responsibility for IRI systems, including high performance computing platforms, mass storage facilities, UNIX/LINUX workstations, PC's, remote site communications and scientific visualization.



Chester Ropelewski

Director, Climate and Environmental Monitoring Research; Acting Director, Latin America and Caribbean Program

Before joining the IRI, Ropelewski served as a research meteorologist with the Climate Prediction Center, U.S. National Weather Service of NOAA. As Chief of the Center's Analysis Branch from 1990-97 he directed research and operational climate monitoring for over a dozen senior level climate research scientists. His primary research interests include studies of the El Niño/Southern Oscillation and its influence on rainfall and temperature, the analysis and display of climate information, the influence of the land surface on atmospheric processes and the detection of global climate change. At the IRI, Ropelewski leads the IRI effort to develop methods and data sets to improve monitoring of the climate system, to disseminate climate information for the IRI, and to implement the IRI Climate Information System.



Shiv Someshwar

Director, Institutions and Policy Systems Research; Director, Asia Program; Research Scientist

Dr. Someshwar joined the IRI in April of 2002 from the Rockefeller Foundation, where he was Assistant Director for Global Inclusion/Environmental Programs. Dr. Someshwar is formulating a multi-country research program in Asia on reducing livelihood vulnerability and increasing systems resilience to climate variability, and helping launch the Master's in Climate and Society Program at Columbia University. He also works with the IRI Secretariat on partnerships to advance goals of the IRI.



Madeleine Thomson

Director, Impacts Research; Co-Director, Africa Program; Research Scientist

Dr. Thomson has worked for the last 20 years in operational research for infectious disease control (mainly in Africa): onchocerciasis, malaria, kala azar, meningococcal meningitis. She has focused on the potential value of climate and environmental driven models which can be used to create risk maps and early warning systems for epidemics. She is a frequent contributor to the WHO Roll Back Malaria Technical Support Network for Prevention and Control of Malaria Epidemics, a member of the WMO-CCI Expert Team 3.8 on Health-related Climate Indices and their Use in Early Warning Systems and is Lead Author, Millennium Ecosystem Assessment in the Condition Working Group Chapter 16 on infectious disease.



M. Neil Ward

Director, Decision Systems Research

Dr. Ward joined the IRI in April of 2000 from the University of Oklahoma, where he was principal investigator for a range of climate research topics. Dr. Ward also has extensive experience in operational forecast products and systems from his work in Europe. At the IRI, Dr. Ward focuses on the link between forecast products and user applications. In this role, he works in the field with collaborators to better understand requirements, and also with the forecast research and production team at the IRI, to ensure that the feedback users provide becomes incorporated into improved forecast developments.

Research Staff



Shardul Agrawala *(on leave)*
Associate Research Scientist

Dr. Agrawala is involved in research on qualitative and quantitative assessments of societal vulnerability to seasonal climate variability, the intersection of climatic and social factors in precipitating famines and other humanitarian crises, the linkages between research on human dimensions of global climate change and seasonal climate variability, and institutional aspects related to improving linkages between forecast science and social applications. Dr. Agrawala received his Ph.D. from Princeton University in 1999.



Sankar Arumugam
Postdoctoral Research Scientist (12/01-Present)

Dr. Arumugam received his Ph.D. in water resources engineering from Tufts University and M.S. degree in water resources and environmental engineering from Indian Institute of Technology Madras. He is involved in developing hydrologic forecasting models, linking seasonal hydroclimatic forecasts with river basin planning models and designing decision analysis framework to promote integrated water management practices that can reduce vulnerability of the society from climate related disasters.



Bryson Bates
Visiting Research Scientist (6/02-3/03)

Dr. Bates obtained his Ph.D. in Civil Engineering at the University of New South Wales in 1985. He is a Principal Research Scientist for CSIRO Land and Water in Perth, Western Australia and currently leads a divisional project on Hydroclimatic Processes and Impacts.



Michael Bell
Staff Associate

Before joining the IRI in 2001, Bell received his M.S. in meteorology at the University of Oklahoma studying West African rainfall variability. Bell works in support of the climate monitoring activities of the IRI, including the continued development of the Climate Information System, production of the monthly Climate Information Digest, and support of the IRI Data Library.



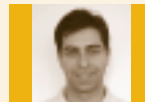
M. Benno Blumenthal
Data Library Manager

Dr. Blumenthal facilitates data exchange and multidisciplinary access to data worldwide through the creation and development of a large and growing library and website for the study of short-term climate variability. Dr. Blumenthal has been at the IRI since August 1997, following ten years of climate research and the development of the prototype IRI Data Library at Lamont-Doherty Earth Observatory.



Suzana Camargo
Associate Research Scientist

Dr. Camargo evaluates the ability of Atmospheric General Circulation Models (AGCMs) to simulate real climate. She is presently exploring the potential use of AGCMs in forecasting the seasonal frequency and location of typhoons and hurricanes. Before joining the IRI in June 1999, Dr. Camargo conducted research at the Max-Planck Institute for Plasma Physics, Germany and São Paulo State University, Brazil. She received her Ph.D. in Physics from the Technical University of Munich, Germany, in 1992.



Ariaster Chimeli
Postdoctoral Research Fellow (8/01-5/03)

Dr. Chimeli received his Ph.D. in Economics from the University of Illinois at Urbana-Champaign in 2001. He is involved with the development of a comprehensive applications program in the State of Ceará, Brazil.



Rashed Chowdhury
Postdoctoral Research Fellow (8/01-7/03)

Dr. Chowdhury received his Ph.D. in 1998 from the University of Tsukuba, Japan. His research focuses on human aspects of flooding problems and he has keen interest in addressing the gaps in the understanding of the complexity between disaster prevention and mitigation measures in public institutions.



John del Corral
Senior Staff Associate

Del Corral is supporting the work of the IRI Data Library by developing and maintaining the Taiwan mirror site and developing a geospatially referenced gazetteer database that is linked to the Data Library. He also contributes to the planning and development of the IRI web site. del Corral has held positions at the National Center for Atmospheric Research, the Atmospheric Sciences Research Center, Scripps Institution of Oceanography, and the Institute for Computational Earth System Science. He was part of the IRI Forecast division from 1997-1999 and rejoined the IRI in July 2002.



Yongjiu Dai
Visiting Research Scientist (7/02-9/02)

Dr. Dai is a Research Scientist II at the School of Earth & Atmospheric Sciences, Georgia Tech and Professor of Cheung Kong Scholar Program at Beijing Normal University. He obtained his Ph.D. from the Institute of Atmospheric Physics, Chinese Academy of Sciences, Beijing, China.



David DeWitt
Research Scientist

Dr. DeWitt specializes in the construction and use of coupled atmosphere-ocean general circulation models (GCMs) with emphasis on seasonal to interannual predictability research. Prior to arriving at the IRI in July 1999, Dr. DeWitt spent 5 years engaged in similar research at the Center for Ocean-Land-Atmosphere Studies.



Eli Galanti
Postdoctoral Research Scientist (10/02-Present)

Prior to arriving at the IRI in October 2003, Dr. Galanti worked on his Ph.D. thesis, entitled “ENSO dynamics and predictability – A study using a hybrid-coupled model and the adjoint method” at the Weizmann Institute, under the guidance of Prof. Eli Tzipermann. His current research interests include coupled ocean-atmosphere dynamics, mainly with relation to seasonal climate prediction, as well as physical ocean dynamics and thermodynamics. At the IRI, Dr. Galanti focuses on understanding the interannual dynamics of the global tropical ocean-atmosphere system, and on setting up an improved dynamical system for the prediction of the global tropical SST.



Alessandra Giannini
Associate Research Scientist

Dr. Giannini conducts fundamental research on the mechanisms underlying interannual to interdecadal variability of climate in tropical regions. She is interested in understanding the basic dynamics of monsoons and in providing her climate expertise to region-and sector-specific projects ongoing at the IRI. Her joining the IRI, upon completion of a post-doctoral fellowship at NCAR, is a return to LDEO/Columbia, where she completed her Ph.D. in 2001.



Lisa Goddard
Research Scientist

Dr. Goddard is part of a team that studies climate dynamics and potential predictability, assesses climate prediction tools, advances strategies for research, development and implementation of climate forecasts, and produces monthly Net Assessment forecasts for the IRI. She has worked with the IRI since receiving her Ph.D. in Atmospheric and Oceanic Sciences from Princeton University in 1995.



Emily Grover
Staff Associate

Grover has a B.S. degree in Atmospheric, Oceanic, and Space Sciences from the University of Michigan and a M.S. degree in Meteorology from Penn State University. She works with various aspects of the Data Library including developing documentation, user interfaces, and working with the applications community.



James Hansen
Associate Research Scientist

Dr. Hansen investigates application of climate predictions to agricultural decision-making, particularly in smallholder farming systems of the tropics, using systems methodology including production system simulation, stochastic weather generation, optimization and farm-scale economic evaluation. Prior to arriving at the IRI in August 1999, he served on the faculty of the University of Florida, where he conducted similar research that contributed to the establishment of a statewide climate information extension program.

Research Staff *(continued)*



Meiji Honda

Visiting Research Scientist (3/02-7/03)

Dr. Honda is collaborating on research in climate variability and predictability. He was at University of Tokyo as a postdoc, and is visiting under the exchange program established through the IRI and Frontier.



Ching-Kai Hsiao

Visiting Research Scientist (7/01-8/02)

Dr. Hsiao is from the Department of Agricultural Economics, National Chung Hsing University, Taiwan. Professor Hsiao was awarded Fulbright funding to advance a project in economic applications of climate forecasts for Taiwan, which will consider the state and problems of Taiwan water resources and explore potential economic values and policy analysis possible from collaborative work with the IRI.



Matayo Indeje

Postdoctoral Research Fellow (2/01-Present)

Dr. Indeje performs research on regional climate modeling. He provides expertise in development of tools for downscaling global climate forecasts to regional scales suitable for user applications and also support in training programs at IRI. Prior to joining the IRI in October 2000, Dr. Indeje received his Ph.D. from North Carolina State University and has previously worked at the Drought Monitoring Centre, Nairobi in operational climate forecast products.



Tahl Kestin

Postdoctoral Research Fellow (10/00-6/03)

Dr. Kestin's research focuses on improving the communication of climate information and seasonal forecasts. Her projects include examining the effectiveness of communication in the media and on the Internet, studying how people interpret climate information, and designing and delivering new communication materials. She received her Ph.D. in 2001 from Monash University, Melbourne, Australia.



Upmanu Lall

Senior Research Scientist

Dr. Lall's principal areas of expertise are statistical and numerical modeling of hydrologic climatic systems and water resource systems planning and management. He is a Professor of Earth and Environmental Engineering at Columbia University and a Senior Research Scientist in hydrologic applications at the IRI. Prior to joining the IRI, Dr. Lall was a Professor at the University of Utah and Utah State University.



Labao Lan

Senior Staff Associate

Dr. Lan is responsible for the porting and adaptation of codes for their efficient operation in a parallel computing configuration, and helps in the design and implementation of more versatile and comprehensive infrastructures. Dr. Lan received his Ph.D. in Geology from the University of Minnesota in 1992.



Huilan Li

Staff Associate

Prior to joining the IRI in November 2001, Li received a M.S. in Climatology from the Institute of Atmospheric Physics, Chinese Academy of Sciences in 1999 and a M.S. in Atmospheric Science from the University of Wyoming in 2001. Li's research focus is on dynamical and statistical downscaling and the impacts of land surface interactions. Li also works on enhancements in model infrastructure and supports documentation and training materials of relevance.



Bradfield Lyon

Associate Research Scientist

Dr. Lyon is engaged in observational studies of seasonal to interannual climate variability, particularly drought, and is involved in real-time global monitoring efforts. His work includes the development of diagnostic tools for climate monitoring, analysis, and for climate applications. Dr. Lyon received his Ph.D. in Meteorology from Massachusetts Institute of Technology and joined the IRI in 1999.



Galit Marcus

Research Assistant (5/01-9/03)

Marcus currently studies environmental decision-making through the Post-Baccalaureate Psychology Program at Columbia University. She has a BArch and is pursuing graduate studies in development and environmental economics.



Sabine Marx

Postdoctoral Research Scientist (5/03-Present)

Dr. Marx received her Ph.D. from Carnegie Mellon University in Medical History (2002) and M.S. degree from the University of Cologne, Germany, in Sociology, Psychology and Pedagogy (1994). Her work focuses on understanding perceptions of climate variability and cognitive determinants of forecast use by farmers. She also supports the development of the Health and Climate in West Africa Programme, and performs research on public and scientific perceptions of the relationship between climate and health in contemporary and historical perspectives.



Simon Mason

Research Scientist

Dr. Mason engages in a variety of research related to the IRI's forecasting effort. He oversees production of GCM predictions and assists in production of Net Assessment forecasts. He arrived at the IRI in late 1997, following several years of research experience in South Africa. Dr. Mason was previously based at Scripps Institution of Oceanography.



Ben Mohamed

Visiting Research Scientist (1/02-7/03)

Dr. Mohamed, Director, Institute for Radio-Isotopes, Abdou Moumouni University in Niamey, Niger, is a visiting Fulbright Scholar. He is the Chair of the Scientific Advisory Committee for the African Centre of Meteorological Applications for Development and a Professor at the University of Niamey. He is a world expert on dust and other aerosols in West Africa and has been active in the climate outlook forums for West Africa and the science developments and capacity building that are needed to further applications.



Ousmane Ndiaye

Staff Associate

Ndiaye earned an engineering degree in Meteorology from The Hydrometeorological Institute of Training and Research (IHFR) of Oran (Algeria) in 1996 and a M.S. degree of Atmospheric Physics from the University of Paris XII Val-de-Marnes in 1998. Ndiaye is a meteorology professional at the Senegalese National Service (DMN) and was an associate researcher to the "laboratoire de Physique de l'Amosphere Simeon Fongang" (LPASF) of the University of Dakar, Senegal. He is a visiting researcher under CLIVAR project, investigating the interannual rainfall variability over Sahel with the Regional Spectral Method (RSM) and the ECHAM (GCM).



Valerie Obsomer

Visiting Research Scientist (6/02-11/02)

Obsomer has worked in the field of applied GIS, decision support systems and data management for development projects for the past 4 years. She was a senior scientist at the Natural Resources Institute, England and at the Liverpool School of Tropical Medicine.



Cristina Perez

Postdoctoral Research Scientist (12/02-Present)

Dr. Perez received her Ph.D. in Applied Mathematics from the University of Colorado at Boulder and earned her B.S. in Mathematics at the University of North Carolina in Chapel Hill. Her research interests include tropical meteorology, specifically precipitation dynamics and the El Niño-Southern Oscillation, and climate predictability.



Alex Pfaff

Associate Research Scientist

Dr. Pfaff is an Assistant Professor of Economics and International Affairs at Columbia University. He completed his Ph.D. at Massachusetts Institute of Technology in 1995. His focus is the interplay between the environment and economic growth and development, particularly in the area of land use.

Research Staff (continued)



Jian-Hua (Joshua) Qian

Associate Research Scientist

Dr. Qian works on the development, testing and validation of regional scale forecast systems, and downscaling methodologies to address nesting strategies, physical parameterizations, initialization, forecast validation and analysis, and the dynamics of regional scale climate variability. Dr. Qian received his Ph.D. in Atmospheric Science from North Carolina State University.



Andrew Robertson

Research Scientist

Dr. Robertson came to the IRI in November 2001 from the Department of Atmospheric Sciences at UCLA, where he was principal investigator on NOAA and DOE research grants concerned with climate variability on interannual-to-interdecadal time scales. Dr. Robertson seeks to advance understanding of short-term regional climate predictability and to develop useful seasonal-to-interannual predictions of applications-relevant quantities with small spatial and temporal scales.



Anji Seth

Associate Research Scientist

Dr. Seth researches the role of regional processes in climate and climate variability using observations and nested regional climate models. Prior to joining the IRI in 1999 she conducted research as a post-doctoral fellow and NOAA grant principal investigator at the National Center for Atmospheric Research (NCAR). As a lead developer of the IRI's climate monitoring and information systems, Dr. Seth is developing research methods to improve understanding of the evolution of societal impacts related to climate anomalies.



Ashish Sharma

Visiting Research Scientist (1/02-12/02)

Dr. Sharma earned his Ph.D. in Civil and Environmental Engineering from Utah State University in 1996. He is a Senior Lecturer at the University of New South Wales, Sydney, Australia. His research interests include forecasting of hydro-climatological variables and water resources management.



Oli G.B. Sveinsson

Postdoctoral Research Scientist (7/02-Present)

Dr. Sveinsson received his Ph.D. in hydrologic sciences and engineering from Colorado State University in 2002. He is currently involved in developing seasonal forecasts of reservoir inflows for the Québec-Labrador region, Canada, where hydropower is of large importance.



Liqiang Sun

Associate Research Scientist

Dr. Sun performs research on forecast methodology and the application of nested regional models to higher resolution forecasts. Prior to joining the IRI in October 1997, Dr. Sun received his Ph.D. from North Carolina State University.

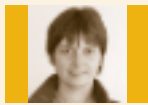




Michael Tippett

Associate Research Scientist

Dr. Tippett works in the area of ocean data assimilation, researching how best to introduce observational data into numerical models, a vital element in producing better forecasts of coupled ocean-atmosphere variability. Prior to joining the IRI in June 1999, Dr. Tippett obtained his Ph.D. in Mathematics from New York University and spent several years working at the Max Planck Institute for Plasma Physics in Germany, and the Center for Weather Prediction and Climate Studies in Brazil.



Sylwia Trzaska

Postdoctoral Research Scientist (10/02-Present)

Dr. Trzaska received her Ph.D. from the Universite de Bourgogne, Dijon, France in September 2002. Her work focused on diagnostic and modeling studies of the relationships between sea surface temperatures and rainfall in Western and Southern Africa and the respective roles of ENSO and Atlantic variability. Her research at the IRI involves studies of air-sea interactions and climate variability in the Atlantic region and the potential benefits for seasonal climate prediction.



Rong-Hua (Ron) Zhang

Associate Research Scientist

Dr. Zhang engages in modeling of large-scale ocean circulation and air-sea interaction associated with interannual and decadal climate variability, and has performed extensive and intensive studies in modeling and data analyses. Prior to arriving at the IRI in July 1999, Dr. Zhang conducted similar research for 4 years at the University of Rhode Island.



Lareef Zubair

Associate Research Scientist

Dr. Zubair researches aspects of Asian climate, hydroclimatic predictions, climate change and adaptation to climate. Prior to joining the IRI, he worked for five years as a Senior Lecturer and a Research Fellow in environmental engineering and computational mathematics at the University of Peradeniya and the Institute of Fundamental Studies in Sri Lanka. He received his Ph.D. from Yale University in 1993.



Affiliates and Adjuncts

AFFILIATED FACULTY



Mark Cane

*Vetlesen Professor, Columbia University,
Earth and Environmental Sciences;
Applied Physics and Applied Math*

Dr. Cane is a Professor of Earth and Climate Sciences in the Dept. of Earth and Environmental Sciences and in the Dept. of Applied Physics and Applied Mathematics at Columbia University. He also serves as a member of the IRI's International Science and Technical Advisory Committee (ISTAC). With colleague Steve Zebiak, Dr. Cane, who received his Ph.D. 1975 in Meteorology from M.I.T., devised the first numerical model able to simulate El Niño and the Southern Oscillation (ENSO).



Dana R. Fisher

*Assistant Professor, Columbia University,
Sociology*

Dr. Fisher is an Assistant Professor in the Department of Sociology at Columbia University. She just finished a book, *National Governance and the Global Climate Change Regime*. Presently, she is working with IRI researchers on a project that analyzes the ways that media coverage of climate events are related to political and climate events in countries that are vulnerable to ENSO. Dr. Fisher received her Ph.D. and M.S. from the University of Wisconsin-Madison.



Steve Rayner *(on leave)*

*Associate Professor, Columbia University,
Sociology, International Affairs*

Dr. Rayner is a Professor of Environment and Public Affairs in the School of International and Public Affairs at Columbia University, where he also holds joint appointments in the Department of Sociology and the IRI. Before coming to Columbia, Dr. Rayner held the rank of Chief Scientist at the Pacific Northwest National Laboratory. He received his Ph.D. in Anthropology from University College, London, in 1979.



Adam Sobel

*Assistant Professor, Columbia University,
Applied Physics and Applied Math;
Earth and Environmental Sciences*

Dr. Sobel has been collaborating with the modeling and prediction research team on atmospheric and climate dynamics since he was appointed Assistant Professor, Department of Applied Physics and Applied Mathematics and Department of Earth and Environmental Sciences at Columbia University in early 2000.

AFFILIATED TROPICAL RESEARCH STAFF



Lisa Dreier

Program Manager

Prior to joining the Earth Institute, Dreier worked on a variety of international environmental and economic development issues, as a consultant to the North American Development Bank and the World Bank; through six years of work with the Environmental Defense Fund; and as an advisor to numerous NGOs in the U.S., South America and Asia. Dreier holds two graduate degrees from U.C. Berkeley (an M.A. in Energy and Resources and an M.P.P. in Public Policy). She manages development of the Earth Institute's new Tropical Agriculture Program, and serves as staff coordinator of the Millennium Project's Hunger Task Force.



Cheryl Palm

Senior Research Scientist

Prior to joining the Earth Institute, Dr. Palm was Senior Scientific Officer at the Tropical Soil Biology and Fertility Program in Nairobi, Kenya from 1991 to 2001, and is currently an Honorary Senior Research Fellow with the TSBF Institute of CIAT, the Centro Internacional de Agricultura Tropical. Dr. Palm received her B.S. and M.S. in Zoology from the University of California, Davis and a Ph.D. in Soil Science from North Carolina State University.



Pedro Sanchez

Director

Prior to joining the Earth Institute, Dr. Pedro Sanchez served as Director General of the World Agroforestry Centre (ICRAF) in Nairobi, Kenya (91-01), with research in 20 countries of Africa, Latin America and Southeast Asia. He is also Professor Emeritus of Soil Science and Forestry at North Carolina State University. Dr. Sanchez received his B.S. in Agronomy and M.S. and Ph.D. in Soil Science from Cornell University. He was the recipient of the 2002 World Food Prize.



Nora Simpson

Administrative Assistant

Simpson is the Program Assistant for the Tropical Agriculture team. She has worked in an administrative capacity with Goldman Sachs and Morgan Stanley, and as a Research Assistant in the U.S. Senate and the Columbia Center for Urban Research and Policy. She is a recent graduate of Columbia University.

ADJUNCT RESEARCHERS



Mathew Barlow

Staff Scientist, Atmospheric and Environmental Research, Inc.

Dr. Barlow examines Pacific Ocean variability and the spatial evolution of ENSO. His research focuses on decadal Pacific Sea Surface Temperature (SST) variability. He also develops real-time drought monitoring tools for evaluating malaria vulnerability in Africa. Dr. Barlow earned a Ph.D. in Meteorology from the University of Maryland in 1999. He was at the IRI from 7/99 - 8/02, first as a Postdoc and then as an Associate Research Scientist.



Kenneth Broad

Assistant Professor, University of Miami

Dr. Broad identifies the social implications of the use of climate information by decision-makers in different sectors (e.g., fisheries, water resources, agriculture, health) in South America, Indonesia, and the United States. He coordinates multinational, multidisciplinary teams of social, physical and natural scientists working on numerous projects. Dr. Broad has worked with the IRI since 1996, and is now at the Rosenstiel School of Marine and Atmospheric Science, University of Miami. He completed his Ph.D. in Anthropology at Columbia University in 1999.



Ping Chang

Professor, Texas A&M University

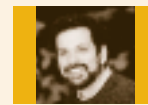
Dr. Chang received his Ph.D. in Atmospheric and Oceanic Sciences from Princeton University in 1988. He taught at Texas A&M University (TAMU) from 1990-1998 and was the Head of Physical Oceanography there from 1995-2000. He is currently an Adjunct Professor at the Institute of Oceanology and Director of The Joint Center of Ocean Circulation and Climate/Environment Studies at the Chinese Academy of Sciences.



Richard Kleeman

Professor, New York University

Dr. Kleeman received his Ph.D. in Mathematical Physics from Adelaide University in 1986. He was a visiting senior research scientist at the IRI from 1997-98. Dr. Kleeman is currently an Associate Professor of Mathematical Sciences at NYU.



Ben Orlove

Professor, University of CA, Davis

Dr. Orlove is a Professor of Environmental Studies at University of California at Davis. He completed his Ph.D. at Berkeley in 1975 and is the author of seven books and over forty articles on social aspects of environmental and economic change, focusing primarily in Latin America.



Jennifer Phillips

Assistant Professor, Bard College

Dr. Phillips came to the IRI in January 2000 after spending six years at NASA's Goddard Institute for Space Studies. Her Ph.D. from Cornell (1994) focused on plant/water relations and international agriculture. She is a former Fulbright scholar and NATO research fellow. At the IRI, Dr. Phillips works on climate applications in agriculture, and improving decision-making with seasonal climate forecasts.



Balaji Rajagopalan

Assistant Professor, University of Colorado

Dr. Rajagopalan engages in research related to the prediction of climate variability and the use of predicted information in hydrologic applications. He is currently at the University of Colorado at Boulder.

Institutional Support

OFFICE OF THE DIRECTOR GENERAL



Georgiana Aybar

Project Aide

Aybar came from years of work in international relations, finance, law and church affairs. She created and maintains a large database to send out IRI materials and products and coordinates travel, visitors, conferences, and seminars. Aybar works on special projects for the IRI Directorate, including information and services coordination and event coordination and preparation.



Ann Binder

Manager (Staff And Operations)

Binder prepares budgets and sub-contracts in support of IRI and its projects. She compiles income streams and affiliated program budgets into a coherent single financial plan to serve the IRI, its funding agencies, and collaborative business resources. Binder coordinates human resources for the IRI and assembles information, documents, and hiring plans in coordination with the Lamont-Doherty Earth Observatory and Columbia University. She also works with governmental organizations that facilitate visitor and post-doctoral programs.



Risë Fullon

Financial and Information Services Assistant

Fullon is responsible for the organization, maintenance, and analysis of current and pending project data and budgets for IRI's project management database. She brings over 10 years of database development and knowledge management experience from the public accounting and real estate industries. She earned a B.A. in Broadcast Communications at the University of the Philippines.



Tricia Preble

Outreach Communications Coordinator

Preble received a B.S. in Biology from the State University of New York College at Geneseo in 1995, and M.S. degrees in Biology and Business Management from the State University of New York at Stony Brook in 1998. Preble provides technical writing and graphical services for IRI products and publications, and is responsible for coordinating outreach and information management efforts.

COMPUTER SYSTEMS



Sara Barone

Analyst/Programmer

Barone is responsible for developing and operating a database for geophysical data, and assisting scientists in the retrieval of data. She also develops graphics tools for display and analysis of geophysical data and provides guidance for data storage systems and software tools. Barone has degrees in Computer Science, Mechanical Engineering from UNICAMP, Brazil and Energy and Environmental Science from New York University.



Jia Fang

Intermediate Analyst/Programmer, Web Manager

Dr. Fang provides specialized programming support to the design, redesign, maintenance, and ongoing development of the IRI website. Prior to joining the IRI in February 2000, she obtained her Ph.D. in Geophysics from the Lamont-Doherty Earth Observatory at Columbia University. She has played a leading role in the software development of the IRI Climate Impacts Database associated with the Climate Information Digest publication.

Secretariat for International Affairs and Development



Roberto Lenton

Executive Director

Dr. Lenton, a citizen of Argentina, received a Civil Engineering degree from the University of Buenos Aires and M.S. and Ph.D. degrees in Water Resources Systems from the Massachusetts Institute of Technology (MIT). Prior to joining the IRI, Dr. Lenton was Director of the Sustainable Energy and Environment Division (SEED) at the United Nations Development Programme in New York, a position he held from 1995 to 2000, Director General of the International Water Management Institute (IWMI) from 1987 to 1994 and Program Officer with the Ford Foundation in New Delhi and New York from 1977-1986.



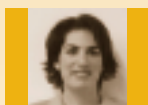
Xiaofeng Gong
Senior Analyst/Programmer

Dr. Gong performs global and regional climate simulations and plays a central role in the execution of model predictions for use in the IRI forecast system. Prior to arriving at the IRI in January 1999, he obtained his Ph.D. in Meteorology at the University of Oklahoma in 1998.



Brendon Hoch
*Intermediate Analyst/Programmer,
Desktop Systems Management*

Hoch has been at the IRI since July 1997, after receiving a M.S. in Atmospheric Sciences from Ohio State University. Hoch supports and maintains all desktop computing platforms, provides programming and routine system administration and provides a range of technical expertise for facilities utilized by the IRI. He also provides expertise in the development and utilization of IRI software products in support of training programs.



Alissa Schmeltz
Special Advisor

Schmeltz received a B.S. in Environmental Policy and Behavioral Science from the University of Michigan, School of Natural Resources and the Environment and a M.I.A. from Columbia University's School of International Affairs and Development. Prior to joining the IRI, Schmeltz served as a policy analyst in the Office of the Executive Vice Provost at Columbia University from 1998-2001; from 1996-1998 she was a researcher at the NOAA Office of Global Programs; and from 1995-1996 Schmeltz worked for the President's Council on Sustainable Development.



Hua Sheng
Intermediate Analyst/Programmer

Dr. Sheng holds a Ph.D. from the Institute of Atmospheric Physics, Chinese Academy of Science, Beijing, China. He has a strong background in modeling and simulation, data assimilation, data analysis and diagnostics in general circulation model (GCM) for climate forecasting. His primary duties at the IRI include implementing climate forecast models, post processing and analysis of their output data, maintenance and upgrading of the IRI's climate forecast systems, and management of the forecast database.



Jeff Turmelle
*Intermediate Analyst/Programmer,
Systems Support*

Turmelle joined the IRI in September of 2001 after four years as a system manager on the *R/V Maurice Ewing*. He has a B.S. degree in Computer Science from University of Lowell, Massachusetts. Turmelle is part of the systems administration team and is responsible for maintaining the computing infrastructure of the IRI.



Christie Walkuski
Administrative Assistant

Walkuski is currently pursuing undergraduate degrees in Environmental Science and Creative Writing at Purchase College, State University of New York. She has previously enjoyed work at various non-profit advocacy organizations that focused on a range of social and environmental issues. Her academic interests include Environmental Policy and Law, and Botany, which she hopes to pursue further in graduate school.

ADMINISTRATIVE SUPPORT



Maria Salgado
Senior Secretary

Salgado's education experience serve her well in the IRI's international environment. Educated in the Philippines and Japan (B.A. in psychology, M.S. in Social Psychology/Organizational Behavior), she has worked in Japanese, French and American banks in various financial capacities, and at the United Nations Children's Fund (UNICEF) in market research, product development and inventory management. At the IRI, Salgado provides administrative support to the directors of Prediction Research, Forecast Development, and Decision Systems Research and their staff, including conference organization, travel arrangements and routine office functions.



Sandra Vitelli
Senior Secretary

Vitelli assists in organizing professional conferences and meetings for Training, Applications and Monitoring. She facilitates the coordination of events by arranging calendars, travel and accommodation preparations for visiting scientists, including reimbursement vouchers related to expenses and dissemination of reports. She also provides daily office support.



CHRISTOPHER BLACK/IRI

29 June – 15 July 2002

Identifying collaborators on communication project, Uganda.

24 August – 2 Sept 2002

10th Climate Outlook Forum for the Greater Horn of Africa and IRI regional project planning meetings, Nairobi, Kenya.

26-29 August 2002

10th Climate Outlook Forum for the Greater Horn of Africa, Nairobi, Kenya.

2-7 September 2002

SARCOF 6 & USAID project meetings, Harare, Zimbabwe.

2-9 September 2002

Climate Outlook for Southern Africa and to plan IRI project activities in the region, Nairobi, Kenya and Harare, Zimbabwe.

7-11 October 2002

Start-up Meeting for Mediterranean Climate and Agriculture project, Casablanca, Morocco.

10-16 November 2002

Annual Agromet Meeting, Harare, Zimbabwe.

18-22 November 2002

3rd Pan-African Multi-lateral Initiative on Malaria Conference, Arusha, Tanzania.

19-22 November 2002

CLIVAR WGSIP Meeting, Cape Town, South Africa.

25-29 November 2002

Southern Africa Regional Atmospheric Modeling Workshop, University of Pretoria, South Africa.

27 November 2002

Meeting of the Working Group for Climate Impacts and Applications – Southern Africa (WGCIA), Mount Edgecombe, South Africa.

1 December 2002 – 18 January 2003

Coordinate and plan DMCN/IRI regional climate modeling activities, Nairobi, Kenya.

10-18 January 2003

Meetings and field visits with members of research team, Uganda.

11 February 2003

USAID Greater Horn of Africa Climate Outlook Forum Meeting, Nairobi, Kenya.

3-5 March 2003

Climate Outlook Forum, Entebbe, Uganda.

25 March – 8 April 2003

Downscaling Training Course, Nairobi, Kenya.

27-28 March 2003

Global Climate Observing Systems (GCOS) Meeting, Niamey, Niger.

Madeleine Thomson

9-14 April 2003

Climate Outlook Forum, Harare, Zimbabwe.

Simon Mason

9-13 June 2003

West Africa Climate Outlook Forum, Niamey, Niger.

Neil Ward

21-23 June 2003

Workshop on Development of Rift Valley Fever Virus Activity Forecast Model, Port Said, Egypt.

Maxx Dille, Matayo Indeje

23 June – 5 July 2003

WHO Mission, Uganda.

Steve Connor

29 June – 15 July 2003

Collaborator identification for communication project, Uganda.

Benjamin Orlove

Europe



ANDREW MACCOLL/IFRC

September 2002

Meeting to establish a global climate partnership, organized by the IRI Secretariat, London, UK.

Maxx Dille, Roberto Lenton, Shiv Someshwar

5-6 September 2002

Workshop on Informing Development Agenda, University of Reading, UK.

Steve Connor

8-12 September 2002

The 3rd European Congress on Tropical Medicine, Lisbon, Portugal.

Steve Connor

16-20 September 2002

International Workshop on Regional Integrated Assessment of Climate Impacts, Castelvécchio Pascoli, Italy.

Tahl Kestin, Bradfield Lyon, Anji Seth

February 2003

Global Change and Human Health, Paris, France.

Madeleine Thomson

10-13 February 2003

WMO Workshop of Global Producers of Seasonal to Interannual Forecasts, Geneva, Switzerland.

Tony Barnston

Europe con't.

Maxx Dilley

March 2003

Working Group III, International Secretariat for Disaster Reduction (ISDR) in disaster vulnerability, risk and impacts assessment, Geneva, Switzerland.

Steve Connor

April 2003

Vulnerability and Health Alliance Workshop – the DFID funded workshop aims to develop a framework document on vulnerability and infectious disease, Liverpool, UK.

*Eli Galanti, Lisa Goddard,
Sylvia Trzaska*

5-10 April 2003

American Geophysical Union-European Geophysical Society (AGU-EGS) Meeting, Nice, France.

Steve Zebiak

5-24 May 2003

WMO Congress, Geneva, Switzerland.

Steve Connor

23-27 May 2003

Alliance Programme on Sustainable Development, Paris, France.

Maxx Dilley

June 2003

USAID South Africa planning meeting, Geneva, Switzerland.

Joshua Qian, Anji Seth

6-10 June 2003

Workshop on Regional Climate Modeling at the International Center for Theoretical Physics (ICTP), Trieste, Italy.

Madeleine Thomson

27 June – 11 July 2003

Liverpool School of Tropical Medicine, UK collaborative visit and Development of a European Multimodel Ensemble system for Seasonal to Interannual Prediction project (DEMETER) meeting, Kiel, Germany.



THEOIR GUDMUNDSSON/IFRC

March – June 2002

Visiting Scientist at the Institute for Global Change Research (IGCR); Frontier Research System for Global Change (FRSGC), Tokyo, Japan.

Lareef Zubair

16 June – 12 July 2002

Project work: interviewed research candidates, attended meetings, and gave lecture series at the University of Peradeniya, Sri Lanka.

Lareef Zubair

3-5 September 2002

Climate Outlook Forum, Harare, Zimbabwe.

Simon Mason

22-25 September 2002

International Symposium on Physico-Mathematical Problems Related to Climate Modeling and Prediction, Shanghai, China.

*Jian-Hua Qian, Liqiang Sun,
Rong-Hua Zhang*

24-26 September 2002

Seasonal Climate Forecasts in Agriculture Conference, Coimbatore, India.

James Hansen

12-17 October 2002

GLOBEC Focus-1 and Open Science Meeting, Qingdao, China.

Neil Ward

18-19 October 2002

Strategic discussions on IRI-ASEAN Specialized Meteorological Centre (ASMC) collaboration project, Singapore.

Neil Ward

December 2002 – January 2003

Project Work, Mahaweli Authority and Ministry of Water Resources and Irrigation, Sri Lanka.

Lareef Zubair

2-6 December 2002

Workshop on Climate System Monitoring, Diagnosis and Prediction in the Asia-Pacific Region, Tokyo, Japan.

Steve Zebiak

4-5 December 2002

Seasonal Climate Monitoring and Prediction Workshop, IRI/Central Weather Bureau of Taiwan, Taipei, Taiwan.

*John del Corral, Emily Grover,
Chet Ropelewski*

4-6 December 2002

IRI/Central Weather Bureau of Taiwan collaborative meetings, Taipei, Taiwan.

*Tony Barnston, Simon Mason,
Steve Zebiak*

January 2003

Mahaweli River project work, Sri Lanka.

Lareef Zubair

27-28 February 2003

JAMSTEC Workshop on Climate and Social Change, Yokohama, Japan.

*Shiv Someshwar, Neil Ward,
Steve Zebiak*

March 2003

Symposium on Extreme Climate Events, Bangkok, Thailand.

Maxx Dille

1-16 March 2003

Extreme Climate Event project evaluation, Manila, Philippines; Jakarta, Indonesia; Hanoi, Vietnam; Bangkok, Thailand.

Shiv Someshwar, Neil Ward

Australia, Asia & the Pacific Islands

Neil Ward

10-11 March 2003

Strategic planning discussions, ASMC, Singapore.

*Bryson Bates, Roberto Lenton,
Lareef Zubair*

16-23 March 2003

3rd World Water Forum, Kyoto, Japan.

Chet Ropelewski, Anji Seth

24-28 March 2003

7th International Conference on Southern Hemisphere Meteorology and Oceanography Meeting, Wellington, New Zealand.

Shiv Someshwar

April 2003

Centre for Science and Environment meeting, New Delhi, India.

James Hansen

12-16 May 2003

Seasonal Climate and Crop Forecasting Methods for South Indian Rainfed Agriculture Workshop, Pune, India.

James Hansen

19-20 May 2003

Project Planning Workshop, Indian Institute of Tropical Meteorology, Pune, India.



JACK HOLLINGSWORTH



MARCO KONIC/IFRC

Central & South America



4 July-14 September 2002

Ceará project meetings at FUNCEME, Fortaleza, Brazil.

5-9 August 2002

Brazilian Meteorological Congress, Fos de Iguacu, Brazil.

12-15 August 2002

Project Workshop: The Role of Climate Perceptions, Expectations and Forecasts in Farmer Decision-making in the Argentine Pampas; and Climate Information and Forecasts in Agricultural Production Systems of the Argentine Pampas. Buenos Aires, Argentina.

14 August 2002

Lecture at the Institute of Astronomy, Geophysics and Atmospheric Sciences, São Paulo University, São Paulo, Brazil.

19-26 August 2002

4th International Workshop on Climate Outlook for the Semi-Arid Regions, Fortaleza, Brazil.

20-23 August 2002

Forum, Nature and Society in the Brazilian Semi-Arid, Fortaleza, Ceará, Brazil.

17-18 October 2002

17th Southeastern South American Climate Outlook Forum, Mariano Roque Alonso, Paraguay.

29-31 October 2002

Climate Outlook Forum, Lima, Peru.

31 October 2002

Meetings regarding extension of existing MOU with IMARPE, Lima, Peru.

November 2002

Climate Outlook Forum, Ecuador.

17-18 December 2002

Climate Outlook Forum, Fortaleza, Brazil.

6-8 February 2003

Workshop on the South Atlantic Climate Observing System, Angra dos Reis, Brazil.

24-26 February 2003

CLIVAR and Global Environmental Change and Food Systems (GECAFS) Proposal Planning Workshop, St. James, Barbados.

Ariaster Chimeli

Antonio Moura

Kenneth Broad, James Hansen

Suzana Camargo

Antonio Moura

Suzana Camargo

Andrew Robertson

Tony Barnston, Kenneth Broad, Antonio Moura

Antonio Moura

Maxx Dille, Chet Ropelewski

Liqiang Sun

Andrew Robertson

Anji Seth

James Hansen

2 July 2002

Meeting regarding IRI seed funding project plans for the NSF project with Guillermo Podestá, Palisades, NY.

Bradfield Lyon

5 July 2002

Southwest Asia project meeting in Washington, DC.

Steve Zebiak

24-25 July 2002

Meeting at GFDL, Princeton, NJ.

Ousmane Ndiaye, Liqiang Sun

31 July – 2 August 2002

4th International Regional Spectral Model (RSM) Meeting, Los Alamos, NM.

Lisa Goddard

12 August 2002

Forecast Observation Meeting, NCEP, Washington, DC.

Michael Tippett

14 August 2002

USDA Forest Service Atmospheric Sciences Research Program Meeting, Fairfax, VA.

Maxx Dilley

16-17 August 2002

Meeting with USAID officials regarding IRI Africa Projects, Washington, DC.

*Tony Barnston, Maxx Dilley,
Bradfield Lyon, Antonio Moura,
Carolyn Mutter, Chet Ropelewski,
Shiv Someshwar, Madeleine Thomson*

September 2002

Earth Institute El Niño Briefing, Washington, DC.

Antonio Moura

6 September 2002

Meeting with NOAA officers, Silver Spring, MD.

Antonio Moura, Carolyn Mutter

17 September 2002

Workshop on Atmospheric/Climate and Oceans/Resource Management Stakeholders, sponsored by NOAA, Boston, MA.

*Tony Barnston, Suzana Camargo, David
DeWitt, Lisa Goddard, Ben Mohamed,
Andrew Robertson, Adam Sobel,
Liqiang Sun, Neil Ward, Steve Zebiak*

18-20 September 2002

US CLIVAR Workshop on the Dynamics and Predictability of the Atlantic ITCZ and Its Regional Climate Influences, Palisades, NY.

Lisa Goddard

25 September 2002

US Commission on Ocean Policy, Great Lakes Regional Meeting, Climate Prediction Panel, Chicago, IL.

*Kenneth Broad, Ariaster Chimeli,
Upmanu Lall, Antonio Moura,
Alex Pfaff, Renzo Taddei*

27 September 2002

Ceará Project meeting for future field projects and activities 2002-2003, New York, NY.

Shiv Someshwar

October 2002

Conference of Parties 8, UNFCCC, New Delhi, India

10 October 2002

APAM Geoscience Brownbag, Department of Applied Physics and Applied Mathematics, Columbia University, New York, NY.

21-25 October 2002

27th Annual Climate Diagnostics Workshop, Fairfax, VA.

22-23 October 2002

ARCs ODA Consortium and/or ARCs Council Meetings, Fairfax, VA.

23-25 October 2002

Climate Information for Applications, Human Dimensions of Climate Change, Principal Investigators meeting, Seabrook Island, SC.

28 October – 1 November 2002

15th Conference on Biometeorology/Aerobiology and 16th Congress of Biometeorology, Kansas City, MO.

November 2002

Research meeting with Heloisa Rojas-Corradi on analysis of daily rainfall for South America, Palisades, NY.

4-5 November 2002

Canadian CLIVAR Meeting in Montreal, Canada.

10-14 November 2002

51st Annual Meeting of the American Society for Tropical Medicine and Hygiene Meeting, Denver, CO.

10-24 November 2002

Uniting Sciences: Solutions for the Global Community. 2002 Annual Meeting, American Society of Agronomy (ASA)-Crop Science Society of America (CSSA)-Soil Science Society of America (SSSA), Indianapolis, IN.

18 November 2002

World Bank El Niño Presentation, Washington, DC.

18 November 2002

THORpex meeting on Serviceable Climate-Weather Forecasting, Silver Spring, MD.

19-21 November 2002

Supercomputing Conference, Baltimore, MD.

3-5 December 2002

NOAA US Climate Change Program Planning Workshop, Washington, DC.

6-10 December 2002

American Geophysical Union (AGU) Fall Meeting, San Francisco, CA.

Suzana Camargo

Tony Barnston, Suzana Camargo, Lisa Goddard, Bradfield Lyon, Jian-Hua Qian, Chet Ropelewski, Liqiang Sun, Michael Tippett, Steve Zebiak, Rong-Hua Zhang

Tony Barnston, Eli Galanti, Lisa Goddard, Michael Tippett, Steve Zebiak

Reid Basher, Tahl Kestin, Anji Seth

Madeleine Thomson

Anji Seth

Oli Sveinsson

Madeleine Thomson

James Hansen

Tony Barnston, Maxx Dilley, Madeleine Thomson

Neil Ward

Leo Ostwald

Carolyn Mutter, Shiv Someshwar, Neil Ward

David DeWitt, Bradfield Lyon

North America con't.

*Kenneth Broad, Ariaster Chimeli,
Upmanu Lall, Antonio Moura*

Steve Zebiak

Madeleine Thomson

Chet Ropelewski

Madeleine Thomson

*Bradfield Lyon, Chet Ropelewski,
Michael Tippett*

Lisa Goddard

Andrew Robertson

Maxx Dilley

David DeWitt

Andrew Robertson, Sylvia Trzaska

David DeWitt

*Maxx Dilley, Madeleine Thomson,
Steve Zebiak*

David DeWitt

Eli Galanti, Michael Tippett

*Upmanu Lall, Chet Ropelewski,
Shiv Someshwar, Steve Zebiak*

Andrew Robertson

9-11 December 2002

Ceará Project meeting on research progress, New York, NY.

10 December 2002

Meeting with NOAA administrators, Washington, DC.

8 January 2003

Meeting with Environmental Health Programme, USAID, Washington, DC.

9-10 January 2003

NAME Science Workshop, Boulder, CO.

31 January 2003

Millennium Ecosystem Assessment, Health and Climate in West Africa,
Johns Hopkins University, Baltimore, MD.

9-13 February 2003

83rd Annual American Meteorological Society (AMS) Meeting, Long Beach, CA.

12-13 February 2003

National Association of Science Writers Workshop, Denver, CO.

24-28 February 2003

Collaborative meetings, UCLA/UCI, Los Angeles, CA.

March 2003

Impacts Data Meeting, Washington, DC.

6-7 March 2003

NCAR AMWG/NVWG Meeting, Denver, CO.

17-19 March 2003

Department of Energy Climate Change Prediction Program meeting,
Charleston, SC.

3-4 April 2003

NOAA PanAmerican Climate Studies (PACS) Panel meeting, Washington, DC.

15 April 2003

NOAA Briefing, Washington, DC.

15-20 April 2003

NCAR Computer Training, Boulder, CO.

19-23 April 2003

Coupled Data Assimilation Workshop, Portland, OR.

23-24 April 2003

AMS Policy Workshop, Washington, DC.

23-26 April 2003

6th VAMOS Panel Meeting, Miami, FL.

27 April – 1 May 2003

ZOPE Computer Training, Fredericksburg, VA.

1 May 2003

Lecture on “Variability of the South American Monsoon System”,
Duke University, NC.

7-9 May 2003

Spatial Metadata and Clearinghouse Training, CIESIN, Palisades, NY.

9-16 May 2003

Intermediate X and OSF Motif Programming Course, Boston, MA.

12-16 May 2003

Polar Meteorology/Climate Variations Meeting, Hyannis, MA.

15 May 2003

EFMS Infrastructure Meeting, Princeton, NJ.

20-21 May 2003

Millennium Assessment: Expert Panel on Infectious Diseases, Montreal, Canada.

20-23 May 2003

Computer Training in MPI-I/O and Power 4 for SP Users, Boulder, CO.

28-30 May 2003

Tropical Biases Workshop, Princeton, NJ.

June 2003

National Center for Atmospheric Research Climate System Model Meeting,
Breckenridge, CO.

2-3 June 2003

Northeast Tropical Workshop, Rhinebeck, NY.

4-6 June 2003

NASA ISO Workshop, Washington, DC.

10-13 June 2003

NESDIS Data User's Workshop, Boulder, CO.

12-13 June 2003

US/New Zealand Partnership information meeting, Honolulu, HI.

14-18 June 2003

AGU Chapman Conference, Ecosystem Interactions with Land Use Change,
Santa Fe, NM

23-27 June 2003

World Water and Environmental Resources Congress, Philadelphia, PA.

Jeff Turmelle

Andrew Robertson

John del Corral

Xiaofeng Gong

Chet Ropelewski

David DeWitt

Steve Connor, Madeleine Thomson

Huilan Li

*David DeWitt, Eli Galanti,
Adam Sobel, Steve Zebiak*

David DeWitt

Suzana Camargo

David DeWitt

Michael Bell, Emily Grover

Tony Barnston

Madeleine Thomson

*Sankar Arumugam, Tony Barnston,
Rashed Chowdhury, Alessandra Giannini,
Upmanu Lall, Andy Robertson,
Oli Sveinsson, Lareef Zubair*

Peer reviewed articles and books

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, **13**, 45-69.

Bakun, A. and **K. Broad.** 2003. Environmental 'loopholes' and fish population dynamics: comparative pattern recognition with focus on El Niño effects in the Pacific. *Fisheries Oceanography*, **12(4/5)**, 458-473.

Bakun, A. and **K. Broad.** 2002. The IRI-IPRC Pacific Climate-Fisheries Workshop. *Fisheries Oceanography* **11(3)**, 189-190.

Bishop, C.H., C.A. Reynolds and **M.K. Tippett.** 2003. Optimization of the Fixed Global Observing Network in a Simple Model. *J. Atmos. Sci.*, **60**, 1471-1489.

Bretherton, C.S., and **A.H. Sobel.** 2002. A simple model of a convectively coupled Walker circulation using the weak temperature gradient approximation. *J. Climate*, **15**, 2907-2920.

Bretherton, C.S., and **A.H. Sobel.** 2003. The Gill model and the weak temperature gradient approximation. *J. Atmos. Sci.*, **60**, 451-460.

Broad, K., 2003. Biological and Societal Impacts of Climate Variability: An example from Peruvian Fisheries. In *Handbook of Weather, Climate and Water: Atmospheric Chemistry, Hydrology, and Societal Impacts*. Edited by T. Potter and B. Coleman. New York: *John Wiley & Sons*, pp. 817-832.

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.

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.

Broad, K., 2002. Book review of *El Niño 1997-98: The Climate Event of the Century*, Stanley Changnon (ed.), *Climatic Change*, **53(4)**, 523-527.

Broad, K., 2002. (En)gendering Climate. *InterCoast*, **41**(Winter), 22-23.

Camargo, S.J., and **S.E. Zebiak.** 2002. Improving the detection and tracking of tropical cyclones in Atmospheric General Circulation Models. *Weather and Forecasting*, **17**, 1152-1162.

Camargo, S.J., and **S.E. Zebiak.** 2002. Improving the Detection and Tracking of Tropical Cyclones in Atmospheric General Circulation Models. *Weather Forecasting* **17**, 1152-1162. Summary in Nowcast, Papers of Note, *Bull. Amer. Meteor. Soc.* **84**, 181-182 (2003).

Cazes-Boezio, G., **A.W. Robertson.** C.R. Mechoso, 2003. Seasonal Dependence of ENSO Teleconnections over South America and Relationships with Precipitation in Uruguay. *J. Climate*, **16(8)**, 1159-1176.

Chia, H. Hsing, and **C.F. Ropelewski.** 2002. The interannual variability in the genesis location of tropical cyclones in the Northwest Pacific. *J. Climate*, **15(20)**, 2934-2944.

Chiang, J.C.-H., and **A.H. Sobel.** 2002. Tropical temperature variations caused by ENSO and their influence on the remote tropical climate. *J. Climate*, **15**, 2616-2631.

Chimeli, A.B., 2003. Optimal dynamics of environmental quality in economies of transition. *The Economics of Transition*, **11(1)**.

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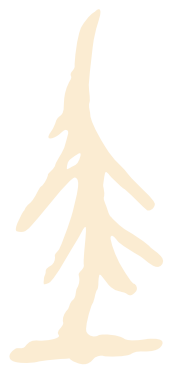


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KENNETH BROAD



ACMAD

African Centre of Meteorological Applications for Development, Niamey, Niger

ADRC

Asian Disaster Reduction Center

AER

Atmospheric and Environmental Research, Inc.

AGCM

Atmospheric General Circulation Model

AGRHYMET

Regional Training Centre for Agrometeorology and Operational Hydrology and their Applications, Niger

AGU

American Geophysical Union

AMS

American Meteorological Society

APN

NSF Asian-Pacific Network for Global Change Research

ARC

NOAA Applied Research Center

ASA

American Society of Agronomy

ASEAN

Association of Southeast Asian Nations, Jakarta, Indonesia

ASMC

ASEAN Specialized Meteorological Centre

BWDB

Bangladesh Water Development Board

BMG

Meteorological and Geophysical Agency, Indonesia

CCNMTL

Columbia Center for New Media Teaching and Learning

CDC

NOAA Climate Diagnostics Center, Arlington, US

CERC

Center for Environmental Research and Conservation, Columbia University, New York, US

CERMES

Centre de Recherche sur les Méningites et les Schistosomoses

CHRR

Center for Hazards and Risk Research, Columbia University, Palisades, US

CIESIN

Center for International Earth Science Information Network, Columbia University, Palisades, US

CLIVAR

Climate Variability and Predictability Study of the WCRP

COF

Climate Outlook Forum

COGERH

Companhia de Gestão dos Recursos Hídricos, Ceará, Brazil

CPC

NOAA Climate Prediction Center, Washington, DC, US

CPTEC

Centro de Previsão de Tempo e Estudos Climáticos, INPE, Brazil

CRED/ITAG

Center for Research on the Epidemiology of Disasters

CSSA

Crop Science Society of America

CWB

Central Weather Bureau, Taipei, Taiwan

DEMETER

Development of a European Multimodel Ensemble System for Seasonal to Interannual Prediction Project

DMC

Drought Monitoring Centre

DMCH

Drought Monitoring Centre, Harare

DMCN

Drought Monitoring Centre, Nairobi

DODS

Distributed Ocean Data Sets

DOE

US Department of Energy, Washington, DC, US

DSCE

Direction pour la Surveillance et le Contrôle Épidémiologique of the Ministry of Health

ECLAC

Economic Commission on Latin America and the Caribbean

ECMWF

European Centre for Medium-Range Weather Forecasts, Shinfield Park, UK

EGS

European Geophysical Society

EHP

Environmental Health Project

ENSO

El Niño Southern Oscillation

EWRI

Environmental and Water Resources Institute of the American Society of Civil Engineers

FAD

Food and Agriculture Organization of the United Nations, Rome, Italy

FAS

Foreign Agricultural Service of USDA

FFWC

Flood Forecasting and Warning Center of the BWDB

FRSGC

Frontier Research System for Global Change, Tokyo, Japan

FUNCEME

Fundação Cearense de Meteorologia e Recursos Hídricos, Ceará, Brazil

GCM

General Circulation Model

GECAFS

Global Environmental Change and Food Systems

GFDL

Geophysical Fluid Dynamics Laboratory, Princeton, US

GHA

Greater Horn of Africa

GIS

Geographical Information System

GISS

Goddard Institute for Space Studies at Columbia University, New York, US

GIST

Geographic Information Support Team

GLOBEC

Global Ocean Ecosystems Dynamics, Leonardtown, US

GSFC

NASA Goddard Space Flight Center

ICAR

Indian Council of Agricultural Research

ICTP

International Center for Theoretical Physics

IREQ

Hydro-Québec's Research Institute

IFPRI

International Food Policy Research Institute

IGCR

Institute for Global Change Research

IITM

Indian Institute of Tropical Meteorology

IMARPE

Instituto del Mar del Peru, Lima, Peru

IRI

International Research Institute for Climate Prediction, Palisades, US

ISDR

United Nations International Strategy for Disaster Reduction

ISTAC

International Science and Technical Advisory Committee

ITCZ

Intertropical Convergence Zone

JAMSTEC

Japan Marine Science and Technology Center

LDEO

Lamont-Doherty Earth Observatory, Columbia University, Palisades, US

MOU

Memorandum of Understanding

NAME

North American Monsoon Experiment

NASA

National Aeronautics and Space Administration, Washington, DC, US

NCAR

National Center for Atmospheric Research, Boulder, US

NCEP

NOAA NWS National Centers for Environmental Prediction, Camp Springs, US

NDVI

Normalized Difference Vegetation Index

NGO

Non-Governmental Organization

NIH

National Institutes of Health, Bethesda, US

NMHS

National Meteorological and Hydrological Services

NOAA

National Oceanic and Atmospheric Administration Office, Washington, DC, US

NSF

National Science Foundation, Arlington, US

NSIPP

NASA's Seasonal to Interannual Prediction Project

DAU/IBAR

Organization of African Union/ Inter-African Bureau of Animal Research

OCHA

UN Office for the Coordination of Humanitarian Affairs

ODA

Ocean Data Assimilation

OGCM

Ocean General Circulation Model

OGP

NOAA Office of Global Programs, Silver Spring, US

PACS

NOAA PanAmerican Climate Studies

PAGASA

Philippine Astronomical, Geophysical, Atmospheric Service Administration

RSM

Regional Spectral Model

RVF

Rift Valley Fever

SADC

Southern African Development Community, headquartered in Botswana

SARCOF

Southern Africa Region Climate Outlook Forum

SIPA

School of International and Public Affairs, Columbia University, New York, US

SSSA

Soil Science Society of America

SST

Sea Surface Temperature

START

Global Change System for Analysis, Research and Training, Washington, DC, US

THORpex

The Observing-system Research and predictability experiment

THREDDS

Thematic Real-time Environmental Data Distributed Services

TOMS

Tropospheric Ozone Monitoring Satellite

UNDP

UN Development Programme

UNEP

UN Environment Programme

USAID

US Agency for International Development, Washington, DC, US

USDA

United States Department of Agriculture

USGS

United States Geological Survey

VAMOS

Variability of the American Monsoon System

WASP

Weighted Anomaly Standardized Precipitation Index

WCRP

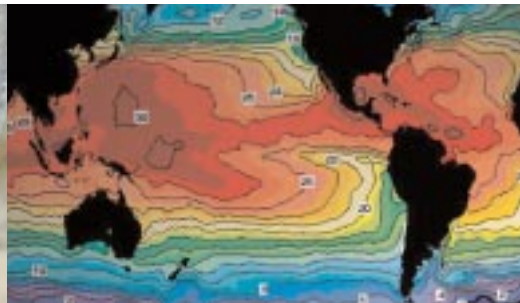
World Climate Research Program

WMO

World Meteorological Organization of the UN, Geneva, Switzerland

JACK HOLLINGSWORTH





INTERNATIONAL RESEARCH INSTITUTE FOR CLIMATE PREDICTION

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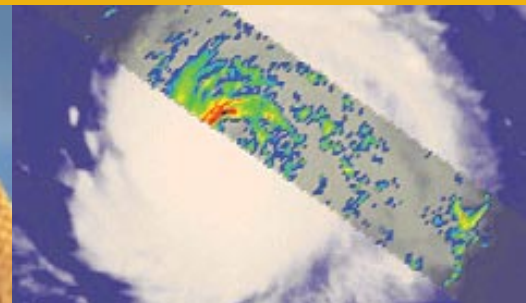
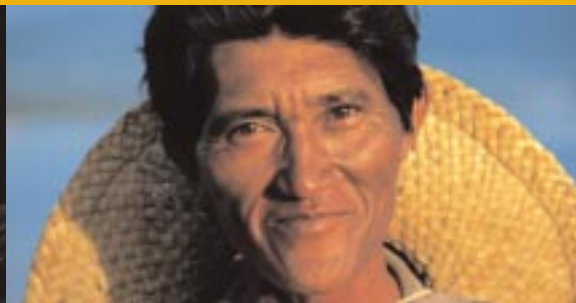
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Columbia University, New York, US

Dr. Louis W. Uccellini
NOAA/NCEP, Camp Springs, US



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