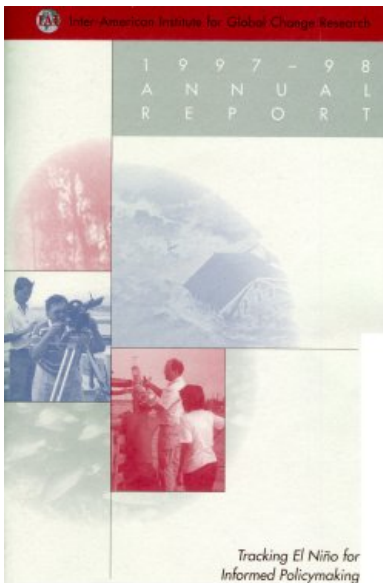


Inter-American Institute for Global Change Research

1997–98 Annual Report

Tracking El Niño for Informed Policymaking



IAI's Mission is to develop the capacity to understand the integrated impact of present and future global changes on regional and continental environments in the Americas and to promote collaborative research and informed action at all levels. (IAI Scientific Advisory Committee, 1997)

Global Change refers to changes in the global environment (including alterations in climate, land productivity, oceans or other water resources, atmospheric chemistry, and ecological systems) that may alter the capacity of the Earth to sustain life. (Extracted from U.S. Global Change Act, 1990)

Contents

- [Introduction from the Director, Armando Rabuffetti](#)
- [Message from the Scientific Advisory Committee Chair, John W. B. Stewart](#)
- [Tracking El Niño for informed Policymaking: IAI's Current and Future Contributions to El Niño Research](#)
- [The Science Agenda](#)
- [New Funded Research and Opportunities](#)
- [Global Environmental Facility Grant Activities](#)
- [Workshops, Conferences, and Seminars](#)
- [IAI Agreements with National Scientific and/or Funding Organizations](#)
- [Conference of the Parties, Executive Council, Scientific Advisory Committee, Directorate Staff, and Communications](#)
- [Publications](#)

- [Financial Statement](#)
- [Acronyms](#)

Introduction from the Director

Dear Friends,

This past year has been a fruitful one for the Inter-American Institute for Global Change Research both in its institutional and scientific development.

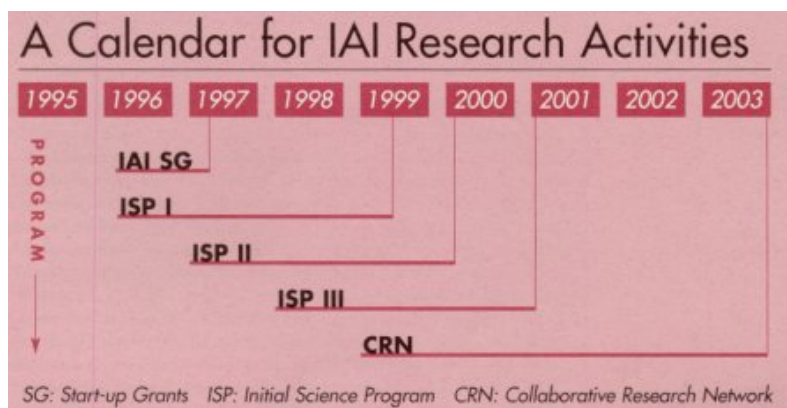
During the 1997–1998 year, Colombia, Ecuador, Guatemala, Jamaica, and the Dominican Republic ratified the IAI Agreement, increasing to 18 the number of IAI-member countries. And sustained efforts are being made to increase the participation of scientists and institutions from other Central American and Caribbean countries.

Scientific advances in the region continued to be made through the reorganization of the IAI Science Agenda, the full implementation of the Initial Science Program (ISP), and the announcement of opportunities to establish, over the next five years, the Collaborative Research Network (CRN) Program.

The IAI Scientific Advisory Committee (SAC) worked extensively during 1997–1998 on reorganization of the Science Agenda. This was done to address more comprehensively new themes emerging in the global change arena, and to emphasize the importance of activities integrating both the physical and the socio-economic dimensions of global change. A detailed description of this reorganization is given in The Science Agenda section of this report.

The ISP now consists of 38 projects—with overall IAI support of U.S. \$4 million. These projects cover the various themes of the Science Agenda, and involve institutions of at least two (and usually three or four) member countries. An IAI Science Forum was convened June 3, 1998, in Washington, D.C., to discuss results emerging from some of these research projects, and several articles have been submitted or published in scientific journals on a number of these topics (*see the Publications section of this report*).

A significant number of CRN proposals—of up to five years in duration, and including scientists and institutions from at least four member countries—were submitted during 1998 in response to the November 1997 announcement of CRN grants. These proposals are currently undergoing peer review. The IAI expects to support 10 to 12 of these projects, spending at least U.S. \$10 million. A vision for the IAI scientific program development up to the year 2003 is given in Figure 1.



Capacity building for the region was undertaken through two very important activities. One was a specific capacity-building project conducted with Global Environmental Facility (GEF) support and executed by the World Meteorological Organization (WMO). The other is the implementation of a Data and Information System (DIS) with a central node in Brazil and local nodes in each member country.

In addition to these accomplishments, I want to highlight the very important and timely venture that IAI embarked upon over the past year: attending to regional needs that resulted from the past El Niño event. Because of the significant impact the El Niño phenomenon had on most of the IAI countries, IAI—in close cooperation with the U.S. National Oceanographic and Atmospheric Administration/Office of Global Programs, International Research Institute for Climate Prediction, WMO, and local public and private organizations—has supported a series of regional climate outlook forums and conferences in South America, Central America, and the Caribbean. These meetings assembled scientists from international and national institutions, and produced regional climate forecasts for the next three to four months, thus providing policymakers and decisionmakers with the most reliable scientific and technical information for each region. These meetings also provided the opportunity for decisionmakers to tell scientists what type of information they need and when they need it to make effective decisions.

Another important venture of IAI over the past year is an effort to enlarge the funding level of IAI to better serve its programs and projects. Although IAI has been able to support a significant number of high-quality research projects, the current budget of IAI does not allow for supporting all the scientifically excellent and regionally relevant project proposals that it receives.

During 1997–1998, significant efforts were made to develop cooperation agreements between IAI and the countries' national funding agencies for science and technology. As detailed in the IAI Agreements section of this report, various memoranda of understanding have been signed, and some specific agreements to co-fund research are in place.

IAI's mission is an exciting one, since any endeavor commenced at the institutional or scientific level could result in increased collaboration among the countries of the Americas.

Finally I want to acknowledge the country representatives to the Conference of the Parties and to the Executive Council for their continued support of IAI's institutional development, as well as the members of the Scientific Advisory Committee, who have provided IAI with a permanent scientific orientation. Finally, the IAI Directorate staff deserves great commendation for its commitment and dedication, which were, as ever, instrumental in seeing to it that the large number of IAI activities were accomplished during the year.

Sincerely,
Armando Rabuffetti

Message from the Scientific Advisory Committee Chair

Dear Colleagues,

I would like to take this opportunity to reflect on how the Scientific Advisory Committee (SAC) has guided the scientific development of the IAI and also to relay the challenges ahead.

As one of several regional networks for global change research in the world, IAI and its activities should be consistent with those of other international research programs. At the same time, IAI should strive to address the needs of the region it represents.

The program that SAC has administered over the past six years has been designed to develop an understanding of global change processes as they affect the Americas. The program has engaged scientists, sociologists, and policymakers to help them shape effective regional policies about these processes. The program also has strongly supported inter-country research and interdisciplinary projects—especially those integrating research by life scientists, economists, and regional policymakers—in an effort to build a comprehensive understanding and a sharing of data and knowledge on a regional basis. But, by and large, these efforts have only addressed the physical sciences and the economics involved; the new challenge is to incorporate into global change research the behavioral sciences, or how people react to global change. It is an extremely difficult task, but one that is essential.

Also important is the need for IAI activities to complement the activities of internationally focused global research programs, and to better understand the effects of global change at regional and local levels. The International Geospheric Biosphere Programme (IGBP) is an example of an internationally focused research program that IAI needs to complement. At its recent fifth scientific meeting, IGBP presented the results from eight of its core projects, and from activities addressing data management, modeling, and capacity building. Integrating these results with similar results from other organizations would lead to enhanced understanding of global phenomena and, eventually, to better policymaking and resource management. But the challenge is to apply this internationally based knowledge to better understand the effects of global change at regional and local levels. It is precisely in this area that IAI will play an important role.

In recent years, the IAI Science Agenda has evolved to reflect, in a more comprehensive way, the emerging priorities of integrating natural and social sciences and tailoring research to regional needs. The four main issues of the agenda are: understanding climate variability in the Americas; comparative studies of ecosystems, biodiversity, land use, and water resources of the Americas; changes in the composition of the atmosphere, oceans, and fresh waters; and integrated assessments, human dimensions, and applications.

Our work to date has attracted so much attention from scientists working in the Americas that the demand for funding has greatly exceeded our capacity to respond. Only a very small percentage of the excellent projects that have come our way has been funded. Nevertheless, the program has stimulated imaginative projects and will be an essential component of future efforts to understand the causes and effects of global change in the Americas, and of our capacity to suggest solutions on a regional scale.

Sincerely,
John W. B. Stewart

Tracking El Niño for Informed Policymaking

IAI's Current and Future Contributions to El Niño Research

*By Guillermo P. Podesta
University of Miami, Rosenstiel School of Marine and Atmospheric Science*

The El Niño* event of 1997–1998 was one of the most closely monitored and talked about environmental events in recent history. It had significant social and economic impacts throughout the Americas. This essay expresses the view of a scientist in the IAI region about the contributions that IAI has made toward understanding El Niño-related impacts and assisting IAI-member countries in translating El Niño-related research into sound policy.

IAI recognized early on the importance of inter-annual climate variability in the Americas, such as that brought on by El Niño, and the opportunities offered by the emerging ability to predict seasonal climate. Indeed, inter-annual climate variability was one of the seven original themes in IAI's Science Agenda and has continued to be an important component of IAI's scientific activities. Projects related to inter-annual climate variability have received a substantial proportion of the total funding awarded by IAI for both planning (Start-up Grants) and initial scientific activities (Initial Science Program).

Initially, most of IAI's projects focused on the general impacts of El Niño-like events on regional climate throughout the Americas. The 1997–1998 El Niño event ravaged Peru and Ecuador, where heavy flooding and mudslides caused several hundred deaths, drove thousands of people from their homes, affected fishery catches, and washed away valuable farmland and highways. Strong rainstorms hit the coast of California and caused severe floods in the northeastern part of Argentina. Floods also affected southern Brazil and sections of Uruguay. In other parts of the IAI region, the opposite problem occurred: lack of precipitation. In northeastern Brazil, a marked drought significantly reduced food supplies and caused large forest fires. But El Niño-related climate variability did not only have negative effects. For example, abundant

summer precipitation in the Argentine Pampas (the flatlands of central-eastern Argentina) resulted in all-time high maize and soybean yields. And El Niño conditions have been linked with fewer cyclones or hurricanes in the tropical Atlantic and Caribbean.

A shift in the El Niño-related research agenda has begun to take place in the last couple of years. Scientists in the IAI region and elsewhere have realized that the emerging ability to predict climate offers an exciting opportunity to turn scientific results into “useable knowledge” for the benefit of policymakers and the public. Consequently, the IAI research agenda has expanded beyond the climate-related effects of El Niño to include a description of impacts on vulnerable societal sectors such as agriculture, fisheries, water resources, and human health. Most important, a major new goal of the IAI has been the exploration of mechanisms needed for the effective production, dissemination, and use of El Niño-related climate information tailored to the needs of specific regions or socioeconomic sectors.

The IAI explicitly encouraged this “end to end” approach (i.e., from producers of climate information to users of that information and back) during the last round of the ISP program. As a consequence, the spectrum of IAI scientists involved in El Niño research has broadened significantly. Agronomists, hydrologists, fishery scientists, economists, sociologists, and experts from other disciplines have participated in recent El Niño-related workshops sponsored by IAI in partnership with organizations such as the National Oceanic and Atmospheric Administration (NOAA), the International Research Institute for Climate Prediction (IRI), and the World Meteorological Organization (WMO). This encouraging development may contribute to addressing two of IAI’s pending assignments: increasing the involvement of social scientists in IAI-sponsored research, and facilitating effective collaboration between natural and social scientists.

It is not sufficient to simply produce more accurate climate forecasts to derive societal benefits; climate information has value only if it serves to modify, in some way, the actions taken by decisionmakers in the public and private sectors.

Various other aspects of the El Niño impact on regional climates still need to be addressed by scientists throughout the Americas. In countries close to the tropical Pacific (e.g., Peru and Ecuador), the links between El Niño and local climate are reasonably well defined. However, in other parts of the IAI region, especially in extra-tropical regions, the links are more variable and other factors may play a role, modulating or influencing the El Niño signal. These effects need to be understood better to improve regional predictability. More attention also needs to be given to researching other impacts of El Niño besides the often-analyzed precipitation and mean temperature readings. For instance, an El Niño-related shift in the probability distributions of frosts or dry and hot spells may have significant influence on agricultural production, energy production and consumption, and human health. Scientists from the IAI region have a detailed understanding of regional climates, and are, therefore, in a unique position to address many of these issues.

In the future, IAI should continue to pursue activities that are part of its mission to bridge the gap between scientific research and policymaking. Research is needed to learn how to

communicate climate information, including uncertainty, in terms useful for making decisions. It is not sufficient to simply produce more accurate climate forecasts to derive societal benefits; climate information has value only if it serves to modify, in some way, the actions taken by decisionmakers in the public and private sectors. In many cases, however, users lack the knowledge necessary to appropriately incorporate climate information into their management or decision-making processes. Decision-support tools must be developed to explore the outcomes of various alternative actions in response to a climate scenario, such as a forecasted El Niño event.

Translating reliable but uncertain El Niño-related climate forecasts into improved policymaking will continue to be a major challenge for the near future. This challenge, however, is beyond the capabilities of a single research institution or even a single nation. Effective and productive communication and collaboration will be required among scientists from many different disciplines and from many different nations, as well as between scientists and policymakers. The IAI has a unique opportunity to establish a distinctive niche for itself by facilitating this collaboration through its research network and its links with governments in the

Americas.

* The term El Niño originally was used to denote a warm ocean current appearing every few years around Christmas time off the coasts of Peru and Ecuador. Currently, however, El Niño refers to the warm phase of a complex, two-way interaction between the ocean and the atmosphere in the Pacific Ocean, called El Niño-Southern Oscillation (ENSO) phenomenon.

The Science Agenda

When the countries of the Americas established the IAI in 1992, an initial Science Agenda of seven research themes was defined (see [1996–1997 IAI Annual Report](#)), which served as the programmatic foundation to support initial scientific activities.

The agreement establishing the IAI stated that the Science Agenda should be dynamic and should evolve to permanently incorporate new scientific priorities and to address changes in the needs of the region's countries. With that in mind, this past year the IAI Scientific Advisory Committee reorganized the initial Science Agenda into a new framework of four broad themes. This reorganization was a result of the pressing need to include human dimension and socio-economic concepts in the global change arena, as well as the need to integrate both scientific and economic aspects into information that can be of regional relevance to our member countries.

These four themes are:

1. Understanding Climate Variability in the Americas

- El Niño and Inter-annual Climate Variability
- Ocean-Land-Atmosphere Interactions
- Hydrology and Water Resources

2. Comparative Studies of Ecosystems, Biodiversity, Land Use, and Water Resources in the Americas

- Tropical Ecosystems and Bio-Geo-Chemical Cycles
- Biodiversity
- Comparative Studies of Oceanic, Coastal, and Estuarine Processes
- Comparative Studies of Terrestrial Ecosystems
- Changes in Land Use, Land Cover, and in Hydrology and Water Resources

3. Changes in the Composition of the Atmosphere, Oceans, and Fresh Waters

- High-Latitude Processes (Ozone)
- Bio-Geo-Chemical Cycles
- Comparative Studies of Regional Air and Water Pollution

4. Integrated Assessments, Human Dimensions, and Applications

New Funded Research and Opportunities

The goal of IAI's funded activities is to promote collaborative efforts among countries and institutions of the Americas to develop research networks addressing the themes of the IAI Science Agenda. To accomplish this goal, the IAI established three main programs: the Start-up Grant (SG) program, the Initial Science Program (ISP), and the Collaborative Research Network (CRN) program.

The SG program, conducted during 1995–1997, was specifically designed to encourage investigators to begin collaboration on the long-term research proposals that will serve as the core of the IAI research network. As already indicated in the 1996–1997 Annual Report, 37 grants, for a total of U.S. \$1.7 million,

were awarded to researchers throughout the Americas, and 50 planning meetings were held that allowed for significant participation of scientists from all member countries.

The ISP was designed to initiate or augment ongoing scientific activities in research, training and education, data collection, and information modeling for all themes of the IAI Science Agenda. As indicated in the 1996–1997 Annual Report, 23 projects—at U.S. \$2.3 million—were awarded under the first and second round of this program. During 1997–1998, a third round of the ISP, for a total of U.S. \$1.6 million, was implemented. The IAI Executive Council stipulated that approximately one-third of the funds awarded should support proposals on El Niño and inter-annual climate variability, with particular emphasis on the application of regional forecasts to specific socio-economic sectors such as agriculture, fisheries, water resources, and human health. The Executive Council also indicated that projects entirely devoted to training and education activities should be supported. Finally, the participation of institutions from at least three member countries was established as a requisite.

In all cases, of course, the evaluation of the submitted proposals involved the peer-review system of a panel of experts and the IAI Scientific Advisory Committee. The following evaluation criteria were considered: scientific excellence, multinational and multidisciplinary participation, regional relevance of the proposed research, contribution to capacity building, and in-kind contributions of the participating institutions.

Below is a listing of the awarded projects under the ISP Round III, including the names of the participating scientists, along with the award provided by the IAI. The U.S. National Science Foundation (NSF) provided substantial funds for this third round of the ISP. The U.S. National Aeronautics and Space Administration (NASA) and the U.S. National Oceanographic and Atmospheric Administration (NOAA) also contributed partial or complete funding for some of the awarded projects.

Initial Science Program—Round III

Earth System and Global Change Education Workshops: Building IAI Capacity with a Science and Education Network

IAI Award: U.S. \$117,000

Johnson, Donald R. (Universities Space Research Association—USA); Piola, Alberto R. (Servicio de Hidrografía Naval—ARGENTINA); Calliari, Lauro Julio (Fundação Universidade do Rio Grande—BRAZIL); Campos, Edmo J.D. (Universidade de São Paulo—BRAZIL); Juma, Noorallah G. (University of Alberta—CANADA); Ulate, Gilbert Vargas (Universidad de Costa Rica—COSTA RICA); Ledesma Vasquez, Jorge (Universidad Autónoma de Baja California—MEXICO); Nagy, Gustavo J. (Universidad de la República, Facultad de Ciencias—URUGUAY)

Training and Education in the Context of the “LBA Experiment”

IAI Award: U.S. \$100,000

Nobre, Carlos A. (INPE—BRAZIL); Sá, Tatiana Deane de Abreu (EMBRAPA—BRAZIL); Nobre, Antonio Donato (INPE—BRAZIL); Krug, Thelma (INPE—BRAZIL); Marengo, José A. (INPE—BRAZIL); Artaxo, Paulo (Universidade de São Paulo—BRAZIL); Martinelli, Luiz Antonio (Universidade de São Paulo, CENA—BRAZIL); Brown, Irving Foster (Universidade Federal do Acre—BRAZIL); Llerena, Carlos A. (Universidad Nacional Agraria La Molina—PERU); Keller, Michael (USDA Forest Service—USA); Ramírez, Armando J. (Universidad Católica de Venezuela—VENEZUELA)

UNAM-UCR-NCAR Tutorial on Regional Weather and Climate Modeling for Latin America

IAI Award: U.S. \$27,000

Warner, Thomas T. (NCAR—USA); Amador A., Jorge Astua (Universidad de Costa Rica—COSTA RICA); Magaña Rueda, Victor Orlando (UNAM—MEXICO)

Benefits of Incorporating ENSO Forecasts into Reservoir Operation and Hydroelectric Power Distribution Procedures

IAI Award: U.S. \$116,000

Waylen, Peter (University of Florida—USA); Mesa, Oscar (Universidad Nacional de Medellín—COLOMBIA); Poveda, Germán (Universidad Nacional de Medellín—COLOMBIA); LaPorte, Sadi (ICE—COSTA RICA); Candanedo, Claudia (IRHE—PANAMA)

Comparative Assessment of Agricultural Uses of ENSO-Based Climate Forecasts in Argentina, Mexico, and Costa Rica

IAI Award: U.S. \$117,000

Jones, James W. (University of Florida—USA); Magrin, Graciela Odília (INTA—ARGENTINA); Ramírez O., Patricia (Instituto Meteorológico Nacional-IMN—COSTA RICA); Collado, Jaime (IMTA—MEXICO); Martínez, Polioptro (IMTA—MEXICO)

An International Study on the Health Effects of ENSO in the Americas

IAI Award: U.S. \$87,300

Confalonieri, Ulisses E. C. (Fundação Oswaldo Cruz—BRAZIL); Casas, Suzana Isabel Curto de (CONICET—ARGENTINA); Burgos, Juan Jacinto (Universidad de Buenos Aires—ARGENTINA); Aron, Joan L. (Science Communication Studies—USA); Buck, Alfred A. (U.S. National Institutes of Health—USA)

Spawning Habitat of Small, Pelagic Fish in Relation to ENSO and Global Change

IAI Award: U.S. \$117,000

Checkley Jr., David M. (University of California-San Diego—USA); Braun, Mauricio (IFOP—CHILE); Serra, Rodolfo (IFOP—CHILE); Baumgartner, Timothy M. (CICESE—MEXICO); Carrasco, Sulma (IMARPE—PERU); Hunter, John R. (NOAA, National Marine Fisheries Service—USA); Scheiber, Harry N. (University of California-Berkeley—USA)

Variations in Spatial and Temporal Precipitation Patterns in the Trade Convergence Region

IAI Award: U.S. \$103,000

Soley, Francisco Javier (Universidad de Costa Rica—COSTA RICA); Donoso, María Concepción (CATHALAC—PANAMA); Pabón Caicedo, José Daniel (Universidad Nacional de Colombia—COLOMBIA); Cárdenas, Pedro (Instituto de Meteorología—CUBA); Naranjo Díaz, Lino R. (Instituto Meteorológico de Cuba—CUBA); Santos L., José Luis (ESPOL—ECUADOR); Cornejo de Grunauer, M. Pilar (ESPOL—ECUADOR); Collado, Jaime (IMTA—MEXICO); Corro T., Víctor Raúl (INRENARE—PANAMA); Him, Carlos (Universidad de Panamá—PANAMA); González, Ricardo (Universidad Tecnológica de Panamá—PANAMA); Franceschi, Paulina (USMA—PANAMA); González, Ricardo (Universidad Tecnológica de Panamá—PANAMA); Bezdek, Hugo F. (NOAA—USA); Leaman, Kevin D. (University of Miami-RSMAS—USA)

Applications of Multiple Lead-Time Climate Predictions in the Region of Central America and the Caribbean

IAI Award: U.S. \$81,000

Díaz, Henry F. (NOAA—USA); Amador A., Jorge Astua (Universidad de Costa Rica—COSTA RICA); Morales, Tomás (UNAM—MEXICO); Magaña Rueda, Víctor Orlando (UNAM—MEXICO); Pulwarty, Roger S. (CIRES/University of Colorado—USA)

The Impact of Accelerated Sea-Level Rise on Nutrient Cycling and Productivity in Karst and Deltaic Ecosystems in the Gulf of Mexico and Caribbean Area: Ecological and Socio-Economic Implications

IAI Award: U.S. \$116,000

Day, Jr., John W. (Louisiana State University—USA); Gold Bouchot, Gerardo (CINVESTAV-IPN—MEXICO); Medina, Ernesto (IVIC—VENEZUELA)

Natural and Anthropogenic Control on the Hydrology and Biogeochemistry of a Meso-Scale Andean Amazon River Catchment: Integrating Andean Systems into Basin-Wide Investigation

IAI Award: U.S. \$117,000

Llerena, Carlos A. (Universidad Nacional Agraria La Molina—PERU); Quintanilla Aguirre, Jorge (Universidad Mayor de San Andrés—BOLIVIA); Krusche, Alex Vladimir (Universidade de São Paulo—BRAZIL); Victoria, Reynaldo Luiz (Universidade de São Paulo—BRAZIL); Ruiz, José Efraín (Universidad de los Andes—COLOMBIA); Galarraga-Sánchez, Remigio H. (Escuela Politécnica Nacional—ECUADOR); Becker, Alfred (Potsdam Institute of Climate Impact Research—GERMANY); McClain, Michael E. (Universidad Nacional Agraria La Molina—PERU); Richey, Jeffrey E. (University of Washington—USA)

Global Change Effects on Biogeochemical and Hydrological Determinants of Structure and Function in Cerrado Ecosystems

IAI Award: U.S. \$116,200

Franco, Augusto Cesar (Universidade Nacional de Brasília—BRAZIL); Goldstein, Guillermo (Universidad

de Buenos Aires—ARGENTINA); Bustamante, Mercedes (Universidade Nacional de Brasília—BRAZIL); Meinzer, Frederic C. (Hawaii Agricultural Research Center—USA)

Relationships between the Antarctic Vortex Dynamics, Chemistry, and Ozone Depletion and Southern Midlatitude Stratosphere and Upper Troposphere

IAI Award: U.S. \$117,000

Canziani, Pablo Oswaldo (CONICET—ARGENTINA); Pisciotano, Gabriel J. (Universidad de la República-Facultad de Ingeniería—URUGUAY); García, Rolando R. (NCAR—USA)

A Regional Assessment of Land Use Impact on Ecosystem Function and Structure in Temperate Areas of North and South America

IAI Award: U.S. \$116,200

Paruelo, José M. (Universidad de Buenos Aires—ARGENTINA); Ghera, Claudio M. (INTA—ARGENTINA); Hall, Antonio J. (UBA—Universidad de Buenos Aires—ARGENTINA); Tomasini, Roque G.A. (EMBRAPA—BRAZIL); García Préchac, Fernando (Universidad de la República-Facultad de Agronomía—URUGUAY); Burke, Ingrid C. (Colorado State University—USA)

Effects of Species and Functional Diversity on Ecosystem Function: A Comparison between Arctic Tundra and a Temperate Grasslands/Shrubland System

IAI Award: U.S. \$116,000

Díaz, Sandra Myrna (CONICET—ARGENTINA); Cabido, Marcelo R. (Universidad Nacional de Córdoba—ARGENTINA); Chapin III, F. Stuart (University of Alaska—USA); Cuevas, Elvira (IVIC—VENEZUELA)

It was also during 1997–1998 that the IAI initiated what can be considered its most important medium-term program to date: the Collaborative Research Network (CRN) program. This is another step toward the integration of scientists and countries on research activities that will be organized around the four themes of the IAI Science Agenda. The program requires a team of researchers from at least four member countries to work together in preparing proposals to form the IAI Research Network. The announcement was made in November 1997, requesting submission of proposals of up to U.S. \$1 million, with awards to be made by late 1998. A total of U.S. \$10 million already has been committed to support this program by NSF, and additional contributions from other member countries are currently being negotiated.

In addition to the support for scientific activities provided through the ISP and the CRN, the IAI has another mechanism called the Director's Special Fund. It is intended to provide support for specific activities that contribute to extending the work of IAI and its network, such as new planning activities and country workshops, Data and Information System (DIS)-related projects, or even research proposals requesting little funding. The Director, after the ad-hoc review and consultation with the appropriate IAI bodies, has the authority to fund such activities. It is through this mechanism that the following research project also has been funded during the 1997–1998 year:

Estimation of ENSO Effects on Sugar Cane Yields in Several Latin-American Countries

IAI Award: U.S. \$35,000

Utset Suástegui, Angel (ISCAH—CUBA); López, José (UNAM—MEXICO); Rincones, Carlos (FONAIAP—VENEZUELA).

Global Environmental Facility Grant Activities

From 1995 to 1998, the IAI has been conducting a very important capacity-building project funded by the Global Environmental Facility (GEF) Program and executed by the World Meteorological Organization (WMO). This project, Regional Cooperative Activities to Support Global Change Research in IAI countries, has pursued the following objectives:

- to expand and improve the scientific and technical human resources capabilities relevant to global change issues in IAI member countries;
- to establish a reasonable and uniform data processing capability in each member country and to develop

a data exchange system in the Americas; and

- to develop standardized methodologies for the collection and processing of basic data relevant to global change research.

In addition to the United Nations Development Program/GEF contribution of U.S. \$3 million, the government of Brazil has significantly supported this project by donating software, including Geographic Information and Image Processing System (SPRING) and Meteorological Software System (METVIEW), to all countries participating in the project. The U.S. National Science Foundation also has supported project activities with a total of U.S. \$350,000.

A list of the participating countries and their focal institutions, along with a description of the basic equipment donated to each country and the training already offered through the project, is included below.

Countries/Institutions:

Argentina

Comisión Nacional Para el Cambio Global, Secretaría de Ciencia y Técnica

Bolivia

Servicio Nacional de Meteorología e Hidrología, Ministerio de Desarrollo Sostenible y Medio Ambiente

Brazil

Instituto Nacional de Pesquisas Espaciais, Ministério da Ciência e Tecnologia

Chile

Servicio Nacional de Meteorología, Fuerza Aérea de Chile

Colombia

Instituto de Hidrología, Meteorología y Estudios Ambientales, Ministerio de Desarrollo Sostenible y Medio Ambiente

Costa Rica

Instituto Meteorológico Nacional, Ministerio de Energía y Minas

Cuba

División de Ciencias Naturales y Básicas, Agencia de Ciencia y Tecnología, Ministerio de Ciencia, Tecnología y Medio Ambiente

Dominican Republic

Departamento de Inventarios de Recursos Naturales, Subsecretaría de Recursos Naturales, Secretaría de Estado de Agricultura

Ecuador

Instituto Nacional de Meteorología e Hidrología, Ministerio de Energía y Minas

Jamaica

University of West Indies at Mona

Mexico

Instituto Nacional de Ecología, Secretaría Nacional de Medio Ambiente, Recursos Naturales y Pesca

Panama

Dirección Nacional de Cuencas Hidrográficas, Instituto Nacional de Recursos Naturales Renovables

Paraguay

Facultad de Ciencias Exactas y Naturales, Universidad Nacional de Asunción

Peru

Instituto Geofísico del Perú

Uruguay

Comisión Nacional Sobre el Cambio Global

Venezuela

Dirección General Sectorial de Información Ambiental, Ministerio del Ambiente y de los Recursos Naturales Renovables

Basic Equipment Provided to Each Country:

- One microcomputer workstation, with Ethernet card and Internet connection
- SPRING software
- METVIEW software
- Color plotter, laser printer
- Digitizing table
- Scientific publications
- Landsat images

Basic Training Offered by the Program:

- 250 students from 130 institutions trained for two weeks in Geographical Information System (GIS) techniques, through courses offered in each of the project's member countries.
- 11 students from eight countries trained for two months in intensive GIS techniques in GIS SPRING software at the National Institute for Space Research (INPE) in Brazil.
- 27 students from 14 countries trained for two weeks in the METVIEW software.
- 13 short-term fellowships of up to six months in duration to study IAI Science Agenda themes in several universities and/or research institutions of IAI member countries.

Workshops, Conferences, and Seminars

IAI gives high priority to the support of workshops, conferences, and seminars that deal with issues of regional relevance and that bring together scientists, decisionmakers, and government officials from the Americas. During 1997–1998, IAI gave precedence to its activities providing information and advice to national governments and the sectors most affected by the adverse climatic conditions wrought by El Niño. These activities are described in the Introduction from the Director letter at the beginning of this report. They also are described below, along with other scientifically or institutionally important meetings that were sponsored by IAI during this period.

Scientific/Technical Development

- Pacific South America Climate Outlook Forum, Applications Workshop and Conference, October 28–30, 1997, Lima, Peru—co-sponsors included Instituto Geofísico del Perú (Peruvian Geophysics Institute), Instituto Nacional de Pesca (National Institute of Fisheries) of Peru, IRI, NOAA/OGP, Sea-Land Advisory Services Inc., and WMO.
- Southeast South America Climate Outlook Forum, Applications Workshop and Conference, November 9–12, 1997, Montevideo, Uruguay—co-sponsors included the Rural Association of Uruguay (ARU), IRI, NOAA/OGP, and WMO.
- Northeast South America Climate Outlook Forum, Applications Workshop and Conference, January 19–21, 1998, Fortaleza, Brazil—co-sponsors included Fundação Cearense de Meteorologia e Recursos Hídricos (Meteorology and Water Resources Ceará Foundation), INPE, IRI, NOAA/OGP, and WMO.

- Climate Outlook Forum for the Mesoamericas, May 18–19, 1998, Panama City, Panama—co-sponsors included Centro del Agua del Trópico Húmedo para América Latina y el Caribe (Water Center for the Humid Tropics of Latin America and the Caribbean), IRI, NOAA/OGP, USAID/OFDA, and WMO.
- Climate Outlook Forum and Natural Disaster Preparedness Discussion, May 21–22, 1998, Kingston, Jamaica—co-sponsors included IRI, NOAA/OGP, University of the West Indies, and USAID/OFDA.
- Understanding Stratospheric Ozone and UV-Radiation: Past Accomplishments and Future Opportunities, March 9–11, 1998, Buenos Aires, Argentina—co-sponsors included the Argentinean Secretariat for Science and Technology and the U.S. National Aeronautics and Space Administration.
- IAI Science Forum: Global Change in the Americas, June 3, 1998, Arlington, VA, USA—the U.S. National Science Foundation was a co-sponsor.

Regional Collaboration

Conference/Workshop on Integration of Caribbean Countries to the IAI, July 9–10, 1997, Mayaguez, Puerto Rico—co-sponsors included the U.S. National Science Foundation and CoHemis from the University of Puerto Rico.

Institutional Meetings

- Conference of the Parties: June 4–5, 1998, Arlington, VA, USA
- Executive Council: November 19–20, 1997, Panama City, Panama; June 1–2, 1998, Arlington, VA, USA
- Scientific Advisory Committee: April 14–15, 1998, Santiago de Chile, Chile

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IAI Agreements with National Scientific and/or Funding Organizations

IAI is strongly committed to increasing collaborative activities with the national agencies of science and technology of IAI-member countries. Such collaborations most efficiently use the intellectual and monetary resources available in the region to promote global environmental change research and capacity-building activities. During 1997–1998, several agreements have been signed between IAI and various national institutions that enlarge collaboration and in some cases provide increased levels of funds to support the excellent scientific research proposals the IAI is receiving. A list of these agreements, including countries, institutions involved, the nature of each agreement, and its starting date, is given below:

<i>Country</i>	<i>Institution</i>	<i>Type of Agreement</i>	<i>Starting Date</i>
ARGENTINA	Science and Technology Development Agency	Co-funding mechanism to support research in IAI Science Agenda themes	June 1998
BRAZIL	INPE	Co-funding mechanism to develop the IAI Data and Information System (DIS)	November 1997
	National Council for Research (CNPq)	Memo of Understanding (MOU) documenting areas and activities of common interest	June 1998
CHILE	CONICYT	MOU documenting areas and activities of common interest	July 1997
CUBA	Ministry of Science, Technology, and Environment	MOU documenting areas and activities of common interest	March 1998
USA	University of Indiana and the Anthropological Center for Training and Research	Co-funding mechanism for short-term training in human dimensions of global change	February 1998
	University of Yale and the Economic Growth Center	MOU to develop joint research projects on global change and to develop joint seminars and training opportunities	June 1998

Conference of the Parties, Executive Council, Scientific Advisory Committee, Directorate Staff, and Communications

*Ratifying IAI Countries
AS OF JUNE 30, 1998*

<i>Argentina</i>	<i>Ecuador</i>
<i>Brazil</i>	<i>Guatemala</i>
<i>Canada</i>	<i>Jamaica</i>
<i>Chile</i>	<i>Mexico</i>
<i>Colombia</i>	<i>Panama</i>
<i>Costa Rica</i>	<i>Paraguay</i>
<i>Cuba</i>	<i>Peru</i>
<i>Dominican Republic</i>	<i>United States of America</i>
<i>Uruguay</i>	<i>Venezuela</i>

IAI Conference of the Parties (CoP)

Argentina *

Carlos Eduardo Ereño, Comisión Nacional para el Cambio Global

Brazil *

Marcio Nogueira Barbosa, Instituto Nacional de Pesquisas Espaciais, INPE ; Antonio M. A. MacDowell, Ministério da Ciência e Tecnologia

Canada *

Gordon McBean, Environment Canada; Robert Halliday (a), National Hydrology Research Institute; Fred Wrona (b), Environment Canada

Chile

Mauricio Sarrazin, Comisión Nacional de Investigación Científica y Tecnológica (CONICYT)

Colombia

Pablo Leyva, Instituto de Hidrología, Meteorología y Estudios Ambientales (IDEAM)

Costa Rica *

Patricia Ramírez Obando, Instituto Nacional de Meteorología

Cuba *

Soledad Díaz Otero, Ministerio de Ciencia, Tecnología y Medio Ambiente; Bárbara Garea, Ministerio de Ciencia, Tecnología y Medio Ambiente

Dominican Republic

Moisés Alvarez, Oficina de Planificación de la Presidencia de la República (ONAPLAN)

Ecuador

Santiago Carrasco, Secretaría Nacional de Ciencia y Tecnología (SENACYT)

Guatemala

Juan F. Asturias, Comisión Nacional del Medio Ambiente (CONAMA)

Jamaica

Anthony Chen, University of West Indies at Mona

Mexico *

José Carlos Tenorio Marañón, Instituto Nacional de Ecología (INE); Carlos Gay García, Instituto Nacional de Ecología (INE)

Panama *

Arístides Lorlesse Gómez, Instituto Nacional de Recursos Naturales Renovables (INRENARE)

Paraguay

Ruben García, Facultad de Ciencias Exactas y Naturales, U.N.A.; Genaro Coronel, Facultad de Ciencias Exactas y Naturales, U.N.A.

Peru

Pablo Lagos, Instituto Geofísico del Perú

Uruguay *

Raúl Michelini, Comisión Nacional para el Cambio Global

USA *

Robert W. Corell (Executive Council Chair), National Science Foundation (NSF); J. Michael Hall, National

Oceanic and Atmospheric Administration (NOAA); Nancy Maynard, National Aeronautics and Space Administration (NASA)

Venezuela
Luis Pale

* Member countries of the Executive Council for the period 1996–1998.

Scientific Advisory Committee (SAC)

John W. B. Stewart
University of Saskatchewan, Canada (SAC Chair)

Luiz Bevilacqua
Academia Brasileira de Ciencias

Otis Brown
University of Miami, USA

Humberto Fuenzalida
Universidad de Chile, Chile

Diana Liverman
University of Arizona, USA

Ernesto Medina
Instituto Venezolano de Investigaciones Científicas (IVIC)

Fernando Ortega
Centro de Antropología, Cuba

Carlos O. Scoppa
Instituto Nacional de Tecnología Agropecuaria (INTA), Castelar, Argentina

Ronald Woodman
Instituto Geofísico del Perú, Perú

Rubén Lara Lara
Centro de Investigaciones Científicas y Educación Superior de Ensenada (CICESE), México (ex-oficio)

IAI Directorate Staff

Armando Rabuffetti
Director

Bradford Wilcox
Scientific Officer

to be hired
Financial Officer

Marcella Ohira
Communications/Project Officer

Luís Marcelo Achite
IAI DIS Manager

to be hired
Project Manager

Marcelo de Souza
Account Assistant

Ligia Fróes
Secretary

Luciana Queiroz
Secretary

Antonio Oliveira
Clerk

IAI/GEF/WMO Project Staff

Eduardo Banús
Project Director

Gerardo Kuntschik
Assistant

Isabel Vega
Secretary

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Homepage
<http://www.iai.int>

Publications

Institutional

- Agreement Establishing the Inter-American Institute for Global Change Research and Declaration of Montevideo. 18 pp. IAI/Legal Document 1/1992.
- Agreement between the Government of Brazil and the Inter-American Institute for Global Change Research Concerning the Headquarters of IAI. 10 pp. IAI/Legal Document 2/1995.

Scientific and Technical

• Proceedings of the Conference/Workshop on the Caribbean Countries and the Inter-American Institute for Global Change Research (IAI). 150 pp. March 1998. Jorge Velez-Arocho and Fernando Gilbes, editors.

• El Niño y la Predicción Climática: Informes a la Nación sobre nuestro Cambiante Planeta. 23 pp. October 1997. Edited by IAI, U.S. National Oceanic and Atmospheric Administration/Office of Global Programs (NOAA/OGP), University Consortium for Atmospheric Research (UCAR), Instituto Nacional de Pesca del Perú (National Institute of Fisheries). (Translated from *El Niño and Climate Prediction. Reports to the Nation on Our Changing Planet*. Spring 1994, No 3. NOAA/OGP, UCAR).

Scientific/Technical Articles from IAI-supported projects

• Bianchi, A. A., A. R. Piola, A. P. Osiroff, M. Charo, "Upper Ocean Variability and Mixing in the Brazil/Malvinas Confluence," *WOCE Newsletter* 27:10–12, 1997

• Bianchi, A. A., A. R. Piola, A. P. Osiroff, "Variabilidad en la Confluencia Brasil/Malvinas, Resúmenes Expandidos," *VII Congreso Latinoamericano de Ciencias del Mar* 1:81–82, 1997

• Bierly, E. W., G.J. Gilman, E. San Roman, R. Morales, T. Tavares, "Capacity Building in Atmospheric Chemistry," *IGACTivities Newsletter* 8:2–8, 1997

• Cabido, M, N. Ateca, M. Astegiano, A. Anton, "Distribution of C3 and C4 Gases Along an Altitudinal Gradient in Central Argentina," *Journal of Biogeography* 24:197–204, 1997

• Campos, E. J. D., "A Circulação Oceanica e as Mudanças Globais," *Indicadores Ambientais*, Pontífica 23–28, 1997

• Diaz, S., M. Cabido, "Plant Functional Types and Ecosystem Function in Relation to Global Change," *Journal of Vegetation Science* 8:463–474, 1997

• Enfield, D. B., "Relationships of Inter-American Rainfall to Topical Atlantic and Pacific SST Variability," *Geophysical Resources Letter* 23:3505–3508, 1996

• Enfield, D. B., D. A. Mayer, "Tropical Atlantic SST Variability and Its Relation to El Niño-Southern Oscillation," *Geophysical Research* 102:929–945, 1997

• Krishnamurti, T. M. Tewari, D. Chakraborty, J. Marengo, P. Silva Dias, P. Satyamurty, "Downstream Amplification, A Possible Precursor to Major Freeze Events over Southeastern Brazil," *Florida State University Report* 98–3, 1998

• Machado, I., L. M. Barros, E.V. Sampaio, "Phenology of Caatinga Species at Serra Talhada, PE, Northeastern Brazil," *Biotropica* 29:57–68, 1997

• Markgraf, V., J. Betancourt, K. Aasen-Rylander, "Late-Holocene Rodent Middens from Rio Limay, Nequen Province, Argentina," *The Holocene* 7:323–327, 1997

• Perez, Harguindeguy, N., S. Diaz, H. Comelissen, M. Cabido, "Comparación Experimental de la Tasa de Descomposición Foliar de Especies Vegetales del Centro-Oeste de Argentina," *Ecología Austral* 7:87–94, 1997

• Piola, A. R., A. L. Rivas, "Corrientes en la Plataforma Continental," *El Mar Argentino y sus Recursos Pesqueros*, E. Bosqui (ed.) 119–132, 1997

• Pourchet, M., S. K. Bartarya, M. Maignan, J. Jouzel, J. F. Pinglot, A. J. Aristarain, G. Furdada, V. M. Kotyakov, E. Thompson, N. Preiss, N. W. Young, "Distribution and Fall-out of Cs137 and Other Radionuclides over Antarctica," *Journal of Glaciology* 43:435–455, 1998.

Theses from IAI-supported projects

- Estrada, H, Evaluación de las Cubiertas Vivas de Mucuna Deerengianum y Canavalia Ensiformis como Mejoradoras de la Calidad del Suelo de la Milpa de la Zona Henequenera de Yucatan, Mexico, M.Sc. thesis, Autonomous University of Mexico (UNAM), Mexico, 1997
- Lentini, C, Estudo das Variabilidades da Temperatura da Superfície do Mar na Plataforma Continental Sudeste da América do Sul, M.Sc. thesis, University of São Paulo (USP), Brazil, 1997
- Marrack, L, The Relationship between Water Motion and Rhodolith-Forming Species in Lithophyllum in the Gulf of California, M.Sc. thesis, San José State University, USA, 1997
- Riosmena, R, A Taxonomic Reassessment of Rhodolith-Forming Species of Lithophyllum in the Gulf of California, M.Sc. thesis, San José State University, USA, 1997
- Velhote, D., Modelagem Numérica da Ressurgência de Quebra de Plataforma Induzida por Vertices Ciclônicos da Corrente do Brasil na Bacia dos Santos, M.Sc. thesis, University of São Paulo (USP), Brazil, 1997.

Informational

- Regional El Niño Workshops, Infosheet: IAI/Information Document 2/1998
- Ozone UV-B Radiation Workshop, Infosheet: IAI/Information Document 3/1998
- Scientific and Planning Activities of the Inter-American Institute for Global Change Research (1995–1998), 20 pp., IAI/Information Document 4/1998

IAI Newsletter

- Quarterly Publication, Issues #15 (July 1997), #16 (December 1997), and #17 (April 1998)

Grants Announcement

- IAI Collaborative Research Network Program (CRN), November 1997

Financial Statement

STATEMENT OF FINANCIAL POSITION	1998	1997
FOR YEARS ENDED JUNE 30, 1997, AND JUNE 30, 1998		
ASSETS	US\$	US\$
<u>CURRENT ASSETS</u>		
Cash and cash equivalents	564,199	253,428
Accounts receivable (less allowance for doubtful accounts)	35,372	27,530
Other current assets	1,721	6,210
Total current assets	601,292	287,168
<u>FIXED ASSETS</u>		
Computer equipment	14,687	9,866

Less accumulated depreciation	(4,215)	(1,973)
Fixed assets—net	10,472	7,893
TOTAL	611,764	295,061
LIABILITIES AND NET ASSETS	US\$	US\$
<u>CURRENT LIABILITIES</u>		
Accounts payable	74,050	30,402
Initial Science Program Round III—Scientific awards	203,226	—
Deferred revenue	90,000	31,428
Total current liabilities	367,276	61,830
NET ASSETS—Unrestricted	244,488	233,231
TOTAL	611,764	295,061
STATEMENT OF ACTIVITIES		
FOR THE YEARS ENDED JUNE 30, 1997, AND JUNE 30, 1998		
CHANGES IN UNRESTRICTED NET ASSETS	US\$	US\$
<u>REVENUES AND DONATIONS</u>		
Contributions from member nations	755,123	795,300
National Science Foundation awards	600,000	—
Donated services, utilities, and use of fixed assets	420,211	741,861
Interest income	18,253	2,765
Total revenues and donations	1,793,587	1,539,926
<u>EXPENSES</u>		
Management and general expenses	1,182,330	1,306,695
Initial Science Program Round III expenses	600,000	—
Total expenses	1,782,330	1,306,695
INCREASE IN NET ASSETS	11,257	233,231
NET ASSETS, BEGINNING OF YEAR	233,231	—
NET ASSETS, END OF YEAR	244,488	233,231

SCHEDULE OF EXPENSES	US\$	US\$
Salaries and benefits (international staff)	467,123	371,141
Other staff salaries	155,644	353,449
Security	79,404	92,359
Telecommunications	55,285	75,341
Travel	105,927	95,334
Rental Charges	83,657	141,180
General Expenses	90,181	43,234
Other costs (Newsletter, cost of meetings, etc.)	145,109	134,657
TOTAL	1,182,330	1,306,695

This information is extracted from IAI's Financial Statements for the years ended June 30, 1998, and June 30, 1997. IAI's Financial Statements were audited by Deloitte Touche Tohmatsu International, São Paulo, Brazil. We will be pleased to supply a full copy on request.

Acronyms

APN

Asia Pacific Network for Global Change Research

CEOS IDN

Committee for Earth Observation Satellites International Directory Network

CONICYT

National Councils for Science and Technology

COP

IAI Conference of the Parties

CRN

IAI's Collaborative Research Network

DIS

Data and Information System

EC

IAI Executive Council

ENRICH

European Network for Research in Global Change

ENSO

El Niño-Southern Oscillation

GEF

Global Environmental Facility

GIS

Geographical Information System

IGBP

International Geosphere-Biosphere Programme

IHDP

International Human Dimensions of Global Environmental Change Programme

INPE

National Institute for Space Research

IOC

Intergovernmental Oceanographic Commission

IPCC

Intergovernmental Panel on Climate Change

IRI

International Research Institute for climate prediction

ISP

IAI Initial Science Program

METVIEW

Meteorological Software System

NASA

U.S. National Aeronautics and Space Administration

NOAA

U.S. National Oceanographic and Atmospheric Administration

NOAA/OGP

U.S. National Oceanographic and Atmospheric Administration/Office of Global Programs

NSF

U.S. National Science Foundation

SAC

IAI's Scientific Advisory Committee

SG

IAI's Start-Up Grants Program

SPRING

Geographic Information and Image Processing System

START

Global Change System for Analysis, Research, and Training

UNDP

United Nations Development Program

UNEP GRID

United Nations Environment Programme Global Resource Information Data Base

UNESCO

United Nations Education, Scientific, and Cultural Organization

USAID/OFDA

U.S. Agency for International Development/Office for Disaster Preparedness and Emergency Management

USGCRP

United States Global Change Research Program

VAMOS

Variability of the American Monsoon System

WCRP

World Climate Research Programme

WMO

World Meteorological Organization