

**INTER-AMERICAN INSTITUTE FOR  
GLOBAL CHANGE RESEARCH**



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### **3<sup>rd</sup> CRN PI/ IAI-IGBP Meeting “Building Global Change Networks in the Americas”**

**27-28 January, 2003 – Mendoza, Argentina**

The meeting was opened by the IAI Director, Dr. Gustavo Necco, who gave a warm welcome to the delegates of IGBP, APN, NASA, NOAA, ZMT, START, DIVERSITAS, GLOBEC, PAGES, NSF, IHDP, WCRP, IAI SAC members, and CRN PIs. He mentioned one of the major aims of the meeting, which constituted a unique occasion in Latin America, was to gather the top level scientists working in the IAI CRN Projects to exchange views and ideas, to interact and learn from their experience and to receive some guidance for future work. The International Geosphere-Biosphere Program (IGBP) is now launching a new highly multidisciplinary and multi-institutional approach to tackle global change problems. The IAI Director considered this approach very interesting and expressed the willingness of IAI to interact with IGBP and thanked the IGBP representatives for attending the joint meeting.

Will Steffen –IGBP Executive Director thanked the IAI on behalf of IGBP for the invitation to the meeting, as it represents an opportunity to know the excellent global change research that is being developed in the Americas and to build connectivity through the meeting. He mentioned the meeting in Punta Arenas and the Symposium held afterwards, which also showed world class science.

The 14 PIs of the projects supported by the IAI CRN Program made the presentations on the progress made in the 3<sup>rd</sup> year of their projects, as summarized below.

### **IAI Collaborative Research Network-CRN Presentations**

#### **BIOGEOCHEMICAL CYCLES UNDER LAND USE CHANGE IN THE SEMIARID AMERICAS.**

##### **Holm Tiessen CRN 001**

The differing geochemistry of the sites was used for comparative studies that facilitated the identification of underlying controls on biogeochemical cycles. Through the close cooperation with land users, three focal points have emerged:

- 1) The role of natural vegetation (and species) in ecosystem resilience and soil quality.
- 2) Biomass transfers and management as a tool for maintaining land quality
- 3) The management of restoration and conservation of grazing and agricultural lands.

Contributions to these topics are central to the efforts at all network sites, and a complemented by other work, some of which is conducted within the CRN funded by non-IAI sources.

##### **Major research areas and activities**

+Research activities center on the study of biogeochemical cycles under different land use in family agriculture systems in northeastern Brazil and Yucatan and on different pasture management in La Pampa. More specifically, they are working on 6 main research activities: 1) Soil organic matter quality; 2) Soil erosion 3) Belowground C cycling; 4) Phosphorus control on C cycling and primary productivity 5) Impact of climatic variability on biomass productivity; and 6) the effect of management on agro ecosystem stability and productivity. In NE Brazil three aspects receive special attention: a) Cultivation of *Opuntia* sp.; b) Implementation of agro forestry systems; and c) Management of organic amendments. In Argentina, the carbon cycle is being studied in the context of plant community structure and pasture degradation. In Mexico, soil fertility and plant productivity

are studied in a system, contrasting in geochemical composition with the Brazilian sites. In Venezuela ecosystem structure and function is being examined and related to litter quality and nutrient availability.

In Brazil:

### 1) Soil organic matter quality

- Increasing soil degradation produces a decrease in the C management index (a measure of mineralizable P) and therefore of potential organic nutrient supply.
- This decrease was due to decreases in C stocks rather than decreases in soil C quality.
- The light fraction (also used in Argentina), obtained by flotation in water, is a labile pool with a turn over time of 6 months (during the rainy season).

### 2) Soil erosion

- Using the  $^{137}\text{Cs}$  technique, we estimated that soil losses, due to erosion in overgrazed pastures or areas cultivated on slopes to annual crops, averaged 493 tons  $\text{ha}^{-1}$  in 35 years.
- Based on  $^{137}\text{Cs}$  results, 43% of C losses were attributed to erosion while 57% were due to soil organic matter mineralization.
- Belts of *Opuntia*, cultivated densely in contour rows, were able to retain an average of 30 tons  $\text{ha}^{-1}$  year $^{-1}$  of soil in cultivated areas.

### 3) Belowground C cycling

- They obtained the first results of annual C-CO<sub>2</sub> fluxes through the mineral soil surface in pastures in NE Brazil, which amounted to 490 g  $\text{m}^{-2}$  year $^{-1}$ . Results for Atlantic altitude forest or a native leguminous tree plantation C-CO<sub>2</sub> fluxes (litter mat included) were 473 and 534 g  $\text{m}^{-2}$  year $^{-1}$ , respectively. They are also gathering data on fine root production within these sites.

### 4) Phosphorus control on C cycling and primary productivity

- P availability is the main factor controlling accumulation of OM in the soil. As total P concentrations increased, another factor, probably water, begun controlling OM accumulation
- Land degradation affected the relationship between the organic and inorganic P pools, because it promoted P<sub>o</sub> mineralization, but the transformation of P<sub>o</sub> into P<sub>i</sub> did not result in an increase of available P.

### 5) Impact of climatic variability on biomass productivity

- Traditional land use systems (native pastures and cultivation of maize and beans) were significantly affected by drought, with declines of up to 40 to 50% in grain and forage production. They observed that these fluctuations strongly affect the sustainability of the family farms, particularly regarding the availability of forage to sustain livestock.

### 6) Management actions to increase agro ecosystem stability

- The cultivation of *Opuntia* leads to an increase and an stabilization of biomass production in family farms (average of 5900 kg  $\text{ha}^{-1}$  year $^{-1}$  of dry matter). This is especially important because it can be "stored" in the field until it is needed for the animals during the dry season.
- They have recently added a detailed monitoring and analysis (funded by the CRN) to an alley cropping field study with *Gliricidia sepium*, implemented by ASPTA. This will be the Ph.D. project of Aldrin Perez, one of your new graduate students.
- Analysis of a 6 year field study showed that the incorporation of cattle manure or green manure alone led to no significant increases in potato yields, the main cash crop in the region, while the combination of these two organic amendments increased yields up to 150%.

7) The relationships between soils and native tree species were studied at 4 sites in NE Brazil with analyses in Saskatoon as part of a MSc. thesis.

In Mexico:

### 1) Reduction of weed competition in milpas

- "Free" weed control offered to the farmers reversed their decision to abandon land.
- Weed suppression was very effective in year one of the trial and resulted in substantially improved maize productivities on older milpas. In year two, droughty conditions and bad timing of the herbicide application resulted in deficient weed control, and yields were only marginally improved.
- Weed control in the third season was as good as in year 1, and showed that it had the greatest impact on older milpas. Yields were entirely lost in the hurricane.

2) Nutrient availability and interaction with soil moisture- N, K, Zn, Mn and Cu contents of Maize leaves were marginal to deficient. A newly established trial to examine the effects of nutrient

availability on tree establishment, as well as its interactions with water availability was severely set back by the hurricane, and no results are available.

In Venezuela:

1) Vegetational changes during the last 60 years. (O. Tremont and E. Cuevas).

- Aerial photographs from 1936 until 1994 were scaled to 1:25000 and geographically referenced. The changes in vegetation type were established and measured with the following results: Of a total of 650ha analyzed, there has been an increase of 18.5% in regenerated areas.

- Not all areas have regenerated with the same rate as nearness to forested areas and fire prevention were identified as the two principal factors in regeneration dynamics. The secondary savanna areas have taken longer to go into forested conditions due to previous loss of the A soil horizon by erosion and strong negative effects of the seasonal climatic conditions due to lack of complex vertical structural complexity.

- The past 25 years have been mostly dry due to strong El Niño conditions. Global climate conditions are conditioning the rate of regeneration in the area.

2) Amounts and quality of soil organic matter (SOM) and its precursors (F. Herrera, E. Cuevas, C. Alceste, , G. Aguiar).

- Turnover of fine roots was determined based on biomass/necromass ratios according to diameter to 40 cm depth. Roots were considered live according to color and pliability.

The results show that very fine roots (< 1mm diameter) have the highest turnover in the forests (biomass/necromass ratio between 2 and 3). In the secondary savanna turnover is very slow with necromass always higher than biomass, regardless of season, 0.3 – 0.5).

As fire maintains low aboveground biomass in the savanna, fine roots become the major source of SOM in this system.

- Above-ground components are still being analyzed

3) Determination of limiting nutrients:

Data from root in-growth studies show that there is differential nutrient limitation according to plant community and dominance of functional groups. Grass dominated areas, such as the secondary savannas are primarily limited by nitrogen. Tree-dominated communities, such as the secondary forest, reflect a more complex interaction among nutrients, although phosphorus seems to be a limiting factor in this system. Fine root response confirms the differential nutrient limitation estimated for these communities based on the N/Presin ratios of the soil. It is not the absolute value of the nutrient but the interaction with other nutrients that determine the limitation in the ecosystem.

### Students, Training & Education activities (workshops etc.), Publications

PhD	5
MSc	1
Undergraduate	16
Workshops	1
Journals articles submitted	2
Journals articles in press	3
Journals articles publish	6
Book Chapters	7
Proceedings and Presentation at scientific meetings	15

### Contributions

The work of the CRN has shown the importance of mutual interactions and feed-backs between land quality and vegetation cover. This mutual interaction has made attribution of cause and effect difficult. As the network matures, this problem is addressed with complementary approaches at all sites. The new postdoctoral fellow will aid this process by modeling project findings, particularly for Brazil and Argentina.

The close cooperation with farmers, ranchers and rural organizations in Argentina, Brazil and Mexico has stimulated interest in the farming sector, has helped formulate research goals and guarantees the extension and application of results.

In Venezuela interaction with NGO's and members of surrounding municipalities San Antonio de los Altos and Carrizal is allowing us to train interested persons in methods of recovery of degraded areas. The vegetational mosaic is also serving as a source of native species to be used in efforts of assisted reforestation.

## **ASSESSMENT OF PRESENT, PAST AND FUTURE CLIMATE VARIABILITY IN THE AMERICAS FROM TREE-LINE ENVIRONMENTS**

**Brian Luckman CRN003**

### **Treelines are Climate Sensitive Ecotonal Environments**

Tree-ring records from open-grown trees surviving at their physiological limits contain strong and simple climate signals

\_ Upper treeline is usually temperature sensitive

\_ Lower treeline often moisture sensitive

Greater Possibilities for long continuous records

\_ cold and/or dry conditions ideal for preservation

\_ protected isolated stands

\_ sub fossil wood

\_ old trees

Multiple species may yield different signals/records from the same site

Some species have a wide latitudinal range;

Douglas fir 17-55°N mountain hemlock 40-61°N Engelmann/ white spruce 38-69°N

### **Annual Resolution**

*Tree rings Glaciolacustrine sequences High elevation ice cores*

### **Decade-Century Resolution**

*Glacier fluctuations, Tree-line fluctuations. Palynological records, Diatoms, Chironomids etc*

Alpine sites with strong vertical environmental gradients offer the potential to reconstruct both temperatures and precipitation from the same region.

Alpine treeline sites can yield multiple complementary biological and physical records in close proximity with diverse proxy climate signals Treelines are clearly recognized and easily identified research sites that have often been the subject of considerable prior research but, there are problems with access and the lack of in-situ or long climate records

### **Significant Achievements**

- 5666 year Fitzroya Chronology
- 1854 year ENSO reconstruction
- Extensive new Yukon collections
- Valdivia Fieldweek
- Inception of integrated studies and data base along the transect
- New 300-500 yr chronologies (subtropical Argentina & Bolivia)
- New workable tropical species in Peru and Bolivia
- Expanded dendroglaciological studies ( Canada, Chile, Argentina, Alaska)
- Network of precipitation reconstructions in southern Canadian Cordillera
- New drought and stream flow reconstructions in Mexico

### **Tropical Dendrochronology**

Reconstruction of climate variability in low latitudes has been hampered by the lack of suitable annually-resolved proxy climate records.

( i ) expanding site networks of species known to have annual rings to their equator ward limits

( ii ) exploring the potential of new species.

The goals are:

( i ) expanding site networks of species known to have annual rings to their equator ward limits

### **Publications, Conference Presentations, Training Students, Web-page, Workshops and Field weeks**

Journals articles publish	18
Journals articles In press	8
Journals articles submitted	9
Books	0
Book Chapters	8
( " in press)	3
Proceedings and Presentations at Scientific Meetings	78
Training Students	42
<a href="http://www.cricyt.edu.ar/iai">www.cricyt.edu.ar/iai</a>	
Workshops and Field week	3

### **Labs created by this project**

- Basic equipment, technician and First dendroclimate laboratory in MEXICO.
- La Paz, Bolivia, operational October 2000 First tree-ring Laboratory in BOLIVIA
- Piura, Peru April 2001 (with PESCA funds) First tree-ring laboratory in PERU.

### **Unique contributions**

#### **Contributions to science**

- Multi scale and multi disciplinary approach
- Insights into climate variability at global, regional and local scales
- Major advances in dendrochronology of sub-tropics and tropics extend range and new species
- first annual data from many areas
- Comparative interhemispheric studies
- Strong development of land SST linkages in climates.
- Dendroglaciology material.
- Building chronology networks

#### **Human dimensions applications**

- Dendrochronology is a versatile technique with applications by several disciplines leading to great potential for applied work.
- Water management, stream flow reconstruction and drought studies
- Forestry and resource management/ conservation.
- Measures of ecosystem health, pollution effects, Carbon sequestration
- Natural Hazards- understanding, mapping, magnitude and frequency (risk assessment) avalanches, floods, landslides, tsunamis etc
- Role of fire in landscapes
- Archeology, human resource history etc, ecosystem health and human health

#### **Capacity building**

- Development of three new tree-ring laboratories
- Field week and training courses
- Students from Argentina, Bolivia, Brazil, Chile, Canada, Cuba, Nicaragua, Mexico, Peru, United States.

#### **Next Steps: Programs will continue as planned**

- Develop a basic transect wide database
- Integrate results along the transect (begun)
- Continue regional collections and reconstructions

- Maintain search for new tropical species
- Expand networks in the semi-arid sub tropics (Links with Thompson ice-core work?)
- Increase emphasis on drought and water supply applications
- Develop and demonstrate new applications in human dimensions field
- Continue and seek sponsors for field weeks and maximize training
- Seek funding to continue integrated ,international projects

## CATTLE RANCHING IN THE AMAZONIAN COUNTRIES

**Charles Wood CRN 009**

The purpose of this project is to identify the social, economic, and environmental factors associated with landholders' decisions to invest in cattle, to clear forest for pasture, and to engage in varying degrees of pasture management.

The research design is predicated on the assumption that comparative analyses of the factors that drive the expansion of cattle ranching and pasture management in different regional and national contexts provide the basis for identifying policy initiatives capable of reducing the rate of deforestation in the Amazon.

It is widely understood that the expansion of cattle ranching accounts for a substantial proportion of the deforestation in the Amazon region of South America, yet the variables that drive the process of land use change are only partially understood.. Data collection is done by interdisciplinary teams of researchers who carry out in-depth interviews with large and small landholders in Peru, Ecuador, in four regions of the Brazilian Amazon.

### **Contributions**

- Development of interdisciplinary methods to investigate the processes by which landholders make land use decisions that influence the deforestation of tropical forests.
- Providing an understanding of the social, economic, and environmental factors drive land use and land cover change.
- Introducing social science perspectives and methods into the agricultural and animal sciences.
- Introducing agricultural and animal science perspectives and methods into the social sciences.
- Identifying the way in which market structures and institutional arrangements drive land management decisions.
- Development of networks among different scholarly communities.
- Stimulating the development of new projects.
- Supporting graduate training among student participants.

### **Publications, Presentation in scientific meetings, Workshops, Students, Web-page**

Journals articles publish	1
Papers in Scientific Meetings	7
Book Chapters	4
Course/Workshops)	4
PhD	5
MSc	6
<a href="http://www.latam.yfl.edu/iaj">http://www.latam.yfl.edu/iaj</a>	

## THE ROLE OF BIODIVERSITY AND CLIMATE IN THE FUNCTIONING OF ECOSYSTEMS: A COMPARATIVE STUDY OF GRASSLANDS, SAVANNAS, AND FORESTS

# Oswaldo Sala CRN 012

## Central objective

- The impact of global change on the relationship between biodiversity and ecosystem functioning
- The Americas offer an extraordinary opportunity to address the relationships between climate, biodiversity, ecosystem functioning and global change

The impact of global change on the relationship between biodiversity and ecosystem functioning is at the heart of many of the most pressing environmental problems that are currently facing the globe. The Americas, with its broad variance in climate, natural biodiversity, and land use, and the striking climatic similarities between the North and the South, offer an extraordinary opportunity to address the relationships between climate, biodiversity, ecosystem functioning and global change.

It is a unique setting with similar gradients of precipitation and temperature in the North and the South but contrasting biotic conditions determined by the different evolutionary history and the current pattern of human utilization.

The scientific objectives are to understand the individual and interacting effects of biodiversity and climate on the functioning of ecosystems. Moreover, they intend to develop a research network involving six countries and a number of scientists encompassing a wide variety of research interests and expertise. Finally, they will generate information and train young scientists to contribute to the development of policy in issues such as biological conservation, land management, and sustainability.

## Research Activities

- Biodiversity and ecosystem functioning: manipulative experiments in semiarid ecosystems
- Biodiversity and ecosystem functioning: Forest and savanna ecosystems with different natural levels of diversity

## Creation of diversity gradient

### Biodiversity and ecosystem functioning

- 6 dominant species
- 3 shrubs (*Mulinum*, *Senecio*, *Adesmia*)
- 3 grasses (*Stipa* spp., *Poa ligularis*)
- 6 species 1 species 2 species 4 species

### Biodiversity, land-use change and biogeochemistry

- Mixtures of 1,2, and 3 species litter bags
- Placed under the three grass species
- Effects of plant species and litter type on
- Decomposition processes and nitrogen turnover
- Removal of palatable species results in reduced decomposition

### Above- and Belowground Biodiversity in Patagonian Forests

- Site diversity and belowground processes
- Decomposition of litter mixtures

### Bamboo flowering

- Massive flowering of understory bamboo (*Chusquea culeou*) and its effect on native forest biodiversity



- **Bamboo in Patagonia**
- Massive flowering event of monocarpic bamboo grasses in Patagonia in 2001-2002 (last event 1940-41)
- After flowering, massive mortality of bamboo occurs, a nonspecific dominant in the under story (94% mortality in current 2002 census)
- Signal responsible for triggering flowering is currently unknown
- What are the ecosystem consequences for changes in germination of native forest species, maintenance of biodiversity and alterations of biogeochemical cycles? Is this a window of opportunity?

#### **Regional controls of biodiversity**

Network of grazing exclosures Uruguayan-Argentinean transects of grazing exclosures.  
Precipitation as a determinant of forest diversity Tropical-temperate comparisons of forest biodiversity and climate

#### **Publications, web-page, training courses, Students**

Journals articles publish	15
Journals articles in press	5
Books	0
Books Chapters	2
Books Chapters in press	1
<a href="http://www.ifeva.edu.ar/crn/">http://www.ifeva.edu.ar/crn/</a>	
Training course	1
PhD	7
MSc	2

### **ENHANCED ULTRAVIOLET-B RADIATION IN NATURAL ECOSYSTEMS AS AN ADDED PERTURBATION DUE TO OZONE DEPLETION**

**Maria Vernet CRN 026**

#### **Improving multi-channel instrument calibration within the IAI UV-B radiometer network**

- The usual techniques to calibrate multi-channel radiometers are lamp and sun calibrations
- Since the filter radiometer (GUV-511) can be considered a broadband instrument, compared to the spectro-radiometer SUV then, the above-described multi-regressive approach was applied to improve the calibration
- Empirically, we determined that, including the azimuth angle as a parameter into the multi-regression equation and applying a non-linear function, instead of a single coefficient, to correct for SZA, better results were obtained.

#### **Salt Marshes**

- The general objective of our study was to quantify the impact of UV-B on the physiology, development and reproduction of salt marsh plants along the Americas. A wide geographical range provides us a broad range of UV-B levels in the natural environment.

#### **Influence of plant morphology on UV-B sensitivity**

+Salicornia has apical meristems and, as a result, is susceptible to the detrimental effect of UV-B  
Marsh plants with basal meristems (Juncus and Spartina) are less affected by UV-B than marsh plants with apical meristems.

### Influence of Anatomy vs Physiology to UV-B sensitivity in Salt Marshes

+Present UV-B levels seem to be detrimental to the development and reproduction of *Salicornia*. At the same time, this plant has a mechanism to increase the absorption of UV-B as this detrimental radiation increases. This is accomplished via the synthesis of UV-B absorbing pigments, a process that may take energy from other processes such as seed formation and growth.

### Effect of colored dissolved organic matter (CDOM) on UV-B radiation in Andean lakes

- There are two distinct groups of lakes in the southern Andes and Antarctica:
- One group has higher than expected value of photolability. This group is formed by Antarctic lakes, Lake Schmolli and Lake Huillinco. They believe that the composition of CDOM in these lakes is predominantly autochthonous as opposite to allochthonous in the remaining lakes (set I).
- In the remaining lakes the  $K_b$  values can be assumed to be normally distributed.

### Physical-Optical-Chemical-Biological variables measured in lakes

<ul style="list-style-type: none"> <li>• <b>Dependent variables</b></li> <li>• KB305</li> <li>• KB340</li> <li>• KD320</li> <li>• KD440</li> </ul> <p><b>Independent Physical Variables</b></p> <ul style="list-style-type: none"> <li>• KD340</li> <li>• Log A_D305</li> <li>• Log A_D340</li> <li>• Log A_D440</li> <li>• A_D305I</li> <li>• A_D340I</li> <li>• A_D440I</li> <li>• Longitude</li> <li>• Latitude</li> <li>• Log Conductance @25C <math>\mu\text{S} / \text{cm}</math></li> <li>• Conductance @25C <math>\mu\text{S} / \text{cm}</math></li> </ul>	<ul style="list-style-type: none"> <li>• <b>Independent Optical Variables</b></li> <li>• SLOPE_UVA</li> <li>• SLOPE_UVB</li> </ul> <p><b>Independent Chemical Variables</b></p> <ul style="list-style-type: none"> <li>• Alkalinity</li> <li>• Log alkalinity</li> <li>• DOC (mg / l)</li> <li>• Log DOC</li> <li>• pH</li> <li>• Conductance @25C <math>\mu\text{S} / \text{cm}</math></li> <li>• Non Ocean conductance</li> </ul> <p><b>Independent Biological Variables</b></p> <ul style="list-style-type: none"> <li>• Variable F-ratio</li> <li>• Log CHL</li> <li>• CHL</li> </ul>
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They used step wise multiple regression to develop predictive models for UV-B photo-lability ( $K_b$ ) based on physical-biological-chemical variables.

### The best model for lakes with allochthonous organic matter (set I) was:

For $K_b$ 305	Coefficient	p-value
Constant (i.e., ordinate)	0.592	<0.001
pH	-0.015	0.06
Slope UVB	10.826	< 0.001
Log AD 305	-0.104	0.015
Log DOC	0.120	0.015
N=71 r-square: 0,527		

### The best predictive model for lakes with autochthonous organic matter (set I) was:

For $K_b$ 305	Coefficient	p-value
PH	-0.326	0.04
Log AD 305	-4.336	0.001
Log AD 340	5.646	0.001
Log AD 440	-1.417	0.012
r-square= 0.702		

Photo-lability (305 nm  $K_b$ ) of CDOM in lakes

- The regression models account for about 52% of the variance in photo-lability at 305 nm, which is a substantial portion of the total variability considering that this is a first order study.
- The single best predictor seems to be the absorption properties in the water, i.e. the spectral slope in the UV-B range in the CDOM.

### Marine Coastal Assemblages. Mesocosm Experiments

a) Rimousky, Québec; b) Ushuaia, Tierra del Fuego; c) Ubatuba, Sao Paulo

#### Diatom Growth under UV-B Treatment

- a control mesocosm (NUV-B), exposed only to natural sunlight (green)
- a high UV-B treatment (HUV-B), exposed to natural + overhead lamp UV-B corresponding to 60 % ozone depletion (blue)
- + Nitrogen (dark colors)
- Nitrogen (light colors)

#### Latitudinal Gradient in UV-B Effect on Coastal Marine Coastal Assemblages

- In **RIMOUSKI**, phytoplankton was more sensitive to UV-B enhancement. When UV-B stress was combined with N-depletion, photo inhibition increased and growth rate decreased (relative to UV-B stress only). These results support a combined stress amplification (6, 8), likely related to a decreased capacity for photoprotection and/or repair (8).
- In **UBATUBA**, cells were more tolerant to enhanced UV-B conditions, irrespective of nutrient stress. In this site, cells are exposed year-long to high PAR+UV irradiance. Acclimation to high PAR may increase UV-B tolerance (6). Preliminary results suggest that high turnover rate of the D1 protein and synthesis of mycosporine-like amino acids (MAAs) may help counteract photo damage at this site.
- In **USHUAIA**, cells from the HUVB mesocosm were less photo inhibited than those from the mesocosm exposed to natural sunlight. In contrast, the growth of diatoms was halted under HUVB, green algae showed an increase under these conditions that may have contributed to maintain photochemical yield (Fv/Fm) in HUV-B conditions.

#### Publications, Workshops, web-page, Students

Journals articles publish	7
Journals articles submitted	2
Books Chapters in press	3
Workshops	3
<a href="http://www.monamb.furg.br">www.monamb.furg.br</a>	
<a href="http://webs.advance.com.ar/subediaz">http://webs.advance.com.ar/subediaz</a>	
<a href="http://www.uqar.gc.ca/uvbproject">www.uqar.gc.ca/uvbproject</a>	
<a href="http://www.mediatedmodeling.com">www.mediatedmodeling.com</a>	
<a href="http://www.serc.si.edu/uvb/CISnet.htm">http://www.serc.si.edu/uvb/CISnet.htm</a>	
PhD and MSc	19

#### Plans for Year 4

- Two main activities are planned:
  - Analyze data
  - Publish results
- To accomplish analysis and publications:
  - Meetings and workshops within each group
  - Meeting in April 2003 with at least one person from each group (7)
  - Meeting of ecological modeler (Dr. Momo) with each of the experimental groups (4)
  - Meeting of social scientist modeler (Dr. van der Belt) with each of the experimental groups (4)

## **ENSO DISASTER RISK MANAGEMENT IN LATIN AMERICA: A PROPOSAL FOR THE CONSOLIDATION OF A REGIONAL NETWORK FOR COMPARATIVE RESEARCH, INFORMATION, AND TRAINING FROM A SOCIAL PERSPECTIVE**

**Eduardo Franco CRN 031**

Proposal for the Consolidation of a Regional Network for Comparative Research, Information and Training from a Social Perspective.

The Program corresponds to the IAI Science Agenda theme “Integrated Assessment, Human Dimensions and Applications”.

- It will fill a major gap in scientific understanding on the disaster risks associated with ENSO events, climate variability and global change in the region and on the relationships between risk accumulation and unsustainable development models and practices. At the same time it will increase understanding of the organizational systems, structures and approaches used to manage ENSO disaster risk..

### **The Program’s general objective is:**

- to produce, disseminate and utilize for educational purposes new scientific knowledge and information on the patterns, causes and management of ENSO disaster risk in Latin America.

### **The components and, at the same time, specific objectives of the program are:**

- To develop a regional network on ENSO disaster risk management in Latin America.  
To produce new scientific information:
- On the evolution of hazard, vulnerability and risk patterns associated with ENSO in Latin America,
- On the social, economic, territorial and political processes underlying those risks and
- On the relevance, effectiveness and efficiency of ENSO disaster risk management organizational systems, structures and approaches;
- To influence ENSO disaster risk management policy formulation and decision making at the national and international levels, through the development of interactive information systems and publications which maximize the dissemination of information on ENSO disaster risks and their management;
- The development of training and educational materials and their integration with ongoing training and higher education programs in the region.

### **Comparative Research Project on ENSO Disaster Risk Patterns**

The 1997/98 ENSO event highlighted the availability of improved forecasts with significant early warning potential. At the same time, it demonstrated the lack of systematic knowledge on the spatial, temporal and semantic patterns of ENSO disaster risk in the different countries.

The construction of databases on **El Niño, La Niña and Neutral Years** disaster occurrence as well as those related to other oceanic and atmospheric agents, using the DESINVENTAR software and methodology. These databases, in general, cover the period 1970 – 2002 and include over 55,000 records.

- A first approximation to the analysis of the semantic, spatial and temporal characteristics of ENSO-related disaster events in the 8 countries involved in the CRN.
- Preliminary work on the correlation between ENSO disaster risks (the focus of these records) and the social, economic, political and territorial processes that help explain these risks in each of the countries, including the development of a standardized methodology in order to guide this work.

### **Work plan adjustments**

Due to financial reasons the Master’s Program in Risk Management and Disasters in the Facultad Latinamericana de Ciencias Sociales (FLACSO) has not been commenced and the program funds allocated for grants on this program have consequently not been executed . The team is currently developing an alternative program for the execution of the grant, which will start this year.

## Publications, Workshops, Students, Web-page, Data bases

Journals articles publish	18
Books in preparations	2
Book Chapters	2
ENSO Regional Workshops	3
Workshops in the countries affected by ENSO	35
MSc	12
Undergraduate	49
<a href="http://www.desenREDando.org.pe">http://www.desenREDando.org.pe</a>	
<a href="http://www.ensolared.org.pe">http://www.ensolared.org.pe</a>	
Data bases El Niño/La Niña disasters occurrence 1979 - 2000	55.000 records

### **MULTI-OBJECTIVE STUDY OF CLIMATE VARIABILITY FOR IMPACT MITIGATION IN THE TRADE CONVERGENCE CLIMATE COMPLEX**

**Pilar Cornejo CRN 038**

#### **1st year: Organization and data bases**

Data center established with on-line access to data bases  
 PI workshops to organize work, show preliminary results  
 Published work in Physical Processes (PP - 7 papers)  
 Participation in regional Climate Outlook Forums  
 Constituent (end user) workshops

#### **2nd year: Research & applications**

Admin: Bibliographic exchange (ARIEL) and access to journals  
 Additional work on data sets by most groups  
 PP: 16 ref. papers from Miami, Jamaica, Costa Rica, Venezuela  
 HD: 12 non-ref. books, reports, abstracts (Ecuador, Panama)  
 PP: Started work on software for Climate Outlook Forums (COFs)  
 PP: Trained met service personnel in use of Matlab  
 HD: Climate-agriculture links (Ecuador & Panama)  
 HD: Impact mitigation models in health sector (Panama, Ecuador)  
 HD: Aquaculture production - climate links & impacts  
 DH/PP: Hydropower & climate in Panama  
 HD: Real-time ocean climate index for fisheries (Ecuador)

#### **Atlantic Multidecadal Oscillation**

- Phase of Atlantic SST affects the distribution of ENSO tele-connection to North American winter rainfall especially strong along the Gulf of Mexico coastline.

#### **Relationships with tropical east Pacific & North Atlantic**

- Warm ocean ==> air temperature increases, precipitation decreases
- Not known yet how ENSO is modulated
- Multidecadal climate shifts in Central America
- Correlations of Ta & SSTA modes

#### **Tropical N. Atlantic SSTA and Venezuela rainfall**

- Pacific & Atlantic SST modes considered
- North Atlantic has greatest impact
- Early rainy season most affected (May-June-July)
- Tropical N. Atlantic SSTA mode.

### Western Hemisphere Warm Pool

- Defined as the area of water with SST > 28°C
- Depth of 28°C is approximately the mixed layer depth

### Why is the Warm Pool important?

- Convection and rainfall are affected
- **Additional reasons...**
- The flow of moisture into the U.S. and Central America are affected
- There is a strong relationship with the number of Atlantic hurricanes

### Large interannual variability of WP

- WP area has large interannual departures in comparison with its mean. The largest warm pools occur the summer following El Niño peaks.
- But not all EN events are followed by large warm pools. If they can understand why, they may very well develop an important forecasting tool.

### 20°C isotherm <==> Ecuadorean shrimp

Shrimp production correlates strongly with El Niño

- This study began with the observation that historical low levels of shrimp production and plagues and viruses are associated with cool offshore temperatures (La Niña) and the opposite for warm temperatures (El Niño).

### What does the “Pelado Index” say in 2002?

- In early 2002 the index went below the critical level for several months
- This was followed by a hiatus at mid-year • In the boreal fall the anomalous condition set in again and continued to present. • These events correlate well with the history of the 2002-2003 El Niño event.

### Agriculture studies (Ecuador)

- At Escuela Superior del Litoral (ESPOL)
- In context of thesis research (Indira Alvarez)
- Development of crop-local climate indexes
- Work with corn (maiz) and rice (arroz) yields
- End product: Maps of risk by province and event intensity.

### Regional Integration (Part I)

- Purpose: Provide support and training for Climate Outlook Forums (COFs)
- Financing: They obtained outside funding from NOAA/OGP to supplement IAI resources
- Developing specialized PC/GUI software for use by COF participants (based on Matlab but in a non-proprietary way)
- Software uses uniform methods and climate indices to obtain tercile climate forecasts at national level using local data
- Training will take place by expanding COFs by one day in Central America and eastern Caribbean
- Software will be distributed to participants and their institutions on CD

### Regional Integration (Part II)

- \_ Establish a Virtual Applications Center (VAC)
- \_ Purpose: Make climate information and forecasts available to governments and client-producers in a useful and user-friendly manner
- \_ It is a computational and internet solution but the end product does not necessarily depend on the development technology (e.g., could be a radio broadcast)
- \_ Operation largely autonomous, based on the use of “intelligent agents”
- \_ Personalized to type of application or user
- \_ Intelligent agents update data and forecasts automatically and prepare tailored products
- \_ Visualization provided dynamically depending on available bandwidth
- \_ Work to begin in 2003 at ESPOL (Ecuador) but will require supplementary resources to finish.

### Difficulties encountered in CRN-038

\_ Overall, CRN-038 has been scientifically productive and is on the road to producing useful climate applications, but...

\_ The productivity has been non-uniform, with some countries, institutions and individuals accounting for most or all of the results

\_ They attribute this to our initial lack of familiarity with some of the invited participants and to perceived pressure from IAI for proposals to present eclectic assemblages of countries and applications

\_ The project needs to undergo a "mid-life" reorganization: A: Put non-producers on notice and discontinue their involvement if appropriate. B: Focus on most successful applications and recruit new people of known productivity.

### Publications, Papers in Scientific Meetings, Workshops, Students, Web-page

Journals articles publish	15
Book Chapters	5
Papers in Scientific Meetings	14
Workshops	6
PhD/MSc	11
<a href="http://www.cathalac.org/">http://www.cathalac.org/</a>	

## COMPARATIVE STUDY OF GLOBAL CHANGE EFFECTS ON THE VEGETATION OF TWO TROPICAL ECOSYSTEMS

Juan F. Silva CRN 040

To study the structure and function of tropical mountain To study the structure and function of tropical mountain and savanna ecosystems along environmental and disturbance and savanna ecosystems along environmental and disturbance gradients and to relate them to global change gradients and to relate them to global change.

RICAS is a process: the construction of a network with common questions and goals and the training of young scientists and graduate students from ecology into the global change approach.

### The theater

- The two main **savanna** areas of SA, in Brazil, Venezuela and Colombia
- The **páramos** in Venezuela and Colombia
- The **mountain forests** in Venezuela, Colombia and Argentina
- 

### Exchange

Has been an essential tool in the process of building up the network, bringing together the various approaches and methods and developing methods a comparative view.

The exchanges imply research, training, teaching, and advising.

### Main Lines of Research

- Dynamics of water in Mountain Forests and replacing pasture lands.
- Structural and functional responses of mountain ecosystems along environmental and perturbation gradients.
- Structural and functional responses of seasonal savannas along environmental and perturbation gradients.

### Some preliminary results

- +DISTRIBUTION AND DYNAMICS OF WOODY SPECIES IN SEASONAL SAVANNAS
- +DYNAMICS OF WOODY COVER IN REGULARLY BURNT SAVANNAS
- +DYNAMICS OF GALLERY FOREST IN A REGULARLY BURNT SAVANNA
- +RELATIVE INCREASE OF AREA IN GROVES AND GALLERY
- +ANNUAL RELATIVE RATE OF INCREASE OF GROVES
- +IN CONTRAST TO FIRE, WATER STRESS IS SERIOUSLY AFFECTING SEEDLINGS AND JUVENILES OF SEED-RELYING TREE SPECIES.

### Woody Savanna

- WET: 721 mm / DRY: 229 mm
- 70% of total water used in DRY season comes from below 2m.

### Natural Grassland

- WET: 402 mm / DRY: 71 mm
- 50% of total water used in DRY season comes from below 2m.

### LITTERFALL

Cerrado: 1.0 TC.ha<sup>-1</sup>.yr<sup>-1</sup>  
 Amazônia: 7.0 TC.ha<sup>-1</sup>.yr<sup>-1</sup>

### SOIL RESPIRATION

Cerrado: 13.5 TC.ha<sup>-1</sup>.yr<sup>-1</sup>  
 Amazônia: 16.5 TC.ha<sup>-1</sup>.yr<sup>-1</sup>

### Carbon Stocks tC/ha

	Cerrado	Amazonia
AERIAL BIOMASS	17.3	180
ROOTS	20.6	64
SOIL ORG. MAT.	324.8	162
<b>TOTAL</b>	<b>362.7</b>	<b>406</b>

### RUN-OFF (% pp)

- Run-off in the more diverse Colombian grassland is higher and seems dependent of total pp

### IN THE PARAMO

- Floristic and functional diversity along altitudinal gradients...
- 10 tribes, 22 genera and 47 species of grasses
- From 12 SPP examined, 10 were tolerant to freezing (5 were C4)

### Students, Workshops and Courses, Web-page, Data bases

Students	34
Graduates students	12
Workshops	1
<a href="http://www.icae.ciens.ula/ricas/ricas.html">http://www.icae.ciens.ula/ricas/ricas.html</a>	
Data Base: (1) Plantas y Paramos de Venezuela	
Data Base: (2) Arboles de la Sabana Tropical	
Data Base: (3) Precipitación estaciones climáticas en los llanos Venezolanos	



## Michael McClain CRN 047

A regional research initiative to develop the scientific understanding of Andean Amazon river ecosystems necessary for their effective management in the face of land-use and climate change.

### Mission & Objectives

The Andean Amazon Rivers Analysis and Monitoring (AARAM) project is a regional research initiative to develop the scientific understanding of Andean Amazon river ecosystems necessary for their effective management in the face of land-use and climate change.

1. Determine the current spatial distribution of land use and climate in the region.
2. Quantify the temporal fluxes of water, sediments, and solutes at points representative of the spatial variability of land use and land cover.
3. Determine the processes (natural and anthropogenic) which control the spatio-temporal variation in these fluxes.
4. Translate project findings into quantitative models which can be used for the effective resource management of land, water, and human resources.

The Andean Amazon Rivers Analysis and Monitoring (AARAM) project is a regional research initiative to develop the scientific understanding of Andean Amazon river ecosystems necessary for their effective management in the face of land-use and climate change.

- Student Training
- Public Outreach
- Decision-maker support

Research activities are conducted in pilot catchments in each of the Andean Amazon Nations

- Río Caquetá - Colombia
- Río Napo - Ecuador
- Río Pachitea - Peru
- Río Alto Beni – Bolivia

### Areas of Solid Progress

1. Basin-scale analyses of land cover, landscape composition and configuration, deforestation dynamics, aquatic habitat detection, and the socioeconomic factors controlling configuration and dynamics.
2. Basin-scale characterizations of water quantity and quality.
3. Process-level studies of interactions between terrestrial and aquatic systems in the little studied montane zone.
4. Detailed studies of human use of aquatic resources and socioeconomic controls on decisions in resource management.
5. Student training with 30 thesis/internship projects completed or in progress at 9 different universities as of Jan. 2003.

### Areas of Modest Progress

1. Process-level studies of controls on in-channel biogeochemical dynamics.

**Action:** Implement high-frequency sampling at select stations in each pilot basin.

2. Synchronization of sampling frequencies and standardization of sampling and analytical methodologies across stations.

**Action:** Contract field activities coordinator to oversee sampling of all stations and subsequent analyses. Month reporting of results to Co-PIs and semi-annual additions to IAI-DIS.

3. Preparation of regional syntheses and common research publications.

**Action:** Re-focus Co-PI priorities and support small working groups to produce joint products and publications.

4. Preparation of policy-relevant regional assessments to inform discussions in political and resource management arena.

**Action:** Re-focus Co-PI priorities and support small working groups to produce joint products and publications relevant to policy and resource management discussions.

### Activities and Findings

1. Landscape/Waterscape Analyses and regional datasets for model layers.
2. Basin wide runoff and water quality patterns.
3. Process studies at the terrestrial/aquatic interface of montane zones.
4. Detailed studies of human resource use and cultural and socioeconomic controls.
5. Recent volunteer activities.

### Landscapes

- Vegetation
- Soils
- Precipitation
- They found approximately 1,200 km<sup>2</sup> (or ~10% of the 12,500 km<sup>2</sup> study area) to be deforested between 1986 and 1996. The most important drivers of deforestation at the Parroquia scale were road building and population density. At the scale of individual farms the number of family members above the age of 12 was also found to be positively correlated with deforestation. (Mena, 2001)
- They compared current land use to prescribed “best uses” and identified areas of conflict where current land use is other than that prescribed, areas of potential that had not yet been exploited for the prescribed use, and areas of appropriate use where the current use matched the prescribed use. (Gann, 2003)
- They conducted a study of classification techniques for accurately detecting types of aquatic habitats. Three techniques were examined; a) a hybrid unsupervised-supervised approach, b) a supervised classification, and c) a three end member linear mixing model. Based on ground control points, the mixing model approach performed best. (Rosselli, 2003).

### Basin-Scale

- Sampling Stations
- Conductivity (mS)
- Nitrate (µM)
- Contributing Areas

### Process Level

	Riparian	Upland
Density of trees (#/100m <sup>2</sup> )	7.5	5.6
Average dbh (cm)	18.5	16.4
Avg height of canopy (m)	12.1	11.2
% abundance of tree ferns	11.6	30.2
# species /subparcel (400 m <sup>2</sup> )	29.9	22.4
% exclusive species	60.2	9.6
<b>Prominent Families</b>		
• Melastomataceae		
• Lauraceae		
• Cyatheaceae		
• Myrtaceae		
• Euphorbiaceae		
• Rubiaceae		

• Clusiaceae
<b>Total: 687 trees / 156 Species</b>

#### Stocks & Flows of Interest

- Analytes: NO<sub>3</sub> , NH<sub>4</sub> , TDN, TPN, N<sub>2</sub> O, 15 NO<sub>3</sub> ,
- Summary of N Fluxes: Kg N / ha / yr

#### Publications, Students, Web-page

Journals articles publish		2
Books		2
Book Chapters		4
Other Publications in press		8
Students Thesis		9
<a href="http://amazonrivers.org/aaram/">http://amazonrivers.org/aaram/</a>		

#### Contributions

- High profile project that has and is raising awareness at national and local levels about links between global change issues and riverine resources in understudied part of the Americas.
- Effective training of students in a discipline (biogeochemistry) which is severely under-represented in their countries.
- Direct science support to grassroots efforts to better manage riverine resources.
- Coordinated effort to quantify and communicate Andean influences on larger lowland Amazon.

## DIAGNOSTICS AND PREDICTION OF CLIMATE VARIABILITY AND HUMAN HEALTH IMPACTS IN THE TROPICAL AMERICAS

Ulises Confalonieri CRN 048

#### Methodology

##### Climate Sensitive - Diseases

Retrospective

- Prospective (2000/2004)

#### Analysis

- **Malaria** (Brazil, Colombia, Venezuela and Mexico)
- **Dengue Fever** (Brazil, Mexico and Jamaica)

#### Multi-Disciplinary Approach

- **Malaria**
  - Modelling (system dynamics)
  - Epidemiology
  - Field Entomology
  - Vulnerability Analysis

#### Brazil: Research Activities: Research Activities:

- Field data collection and organization.
- Field data collection and organization.
- Analysis of correlation between ENSO parameters and malaria index in northern Amazon.
- Analysis of correlation between ENSO parameters and malaria index in northern Amazon.
- Preliminary analysis of malaria incidence as related to precipitation and land cover variation in a municipality in the Amazon.
- Preliminary analysis of malaria incidence as related to precipitation and land cover variation in a municipality in the Amazon.

**Findings and Achievements: Findings and Achievements:**

- Characterization of a natural decrease in malaria incidence during ENSO years in northern Amazonia, Brazil.
- Characterization of a natural decrease in malaria incidence during ENSO years in northern Amazonia, Brazil.
- Organization of a large data set on meteorological data (precipitation) and epidemiological data on tropical diseases, especially malaria and dengue
- Organization of a large data set on meteorological data (precipitation) and epidemiological data on tropical diseases, especially malaria and dengue fever.

**Adjustments (Objectives/Workplan): Adjustments (Objectives/Workplan):**

- Reduction in the duration of the entomological field work due to a budget cut.
- Expansion of data collection (malaria/precipitation) and analysis to another Amazonian state in Brazil, due to poor data quality and poor institutional support.

**Contributions: Contributions:**

- Demonstration of a linkage between a tropical infectious disease (malaria) and the ENSO phenomenon, in a specific area, as a subsidy to the development of a climate-health early warning system.
- Development of a conceptual model on the social vulnerability of the population to the health impacts of climate variability in tropical America.
- Assemblage, in digital format, of large time series of malaria data (up to 40 years), on a monthly basis, that otherwise would be lost.

**Jamaica**

- Development of regression models for predicting climate in Jamaica and other Caribbean Islands.
- A separately funded project commenced, with the participation of the CRN project members as advisors: "The Threat of Dengue Fever – Assessment of Impacts and Adaptation to Climate Change in Human Health in the Caribbean".
- Results from preliminary retrospective studies:
  - Dengue epidemics have a pronounced seasonality (peaking in the later half of the year).
  - Dengue epidemics have a pronounced seasonality (peaking in the later half of the year).
  - Dengue epidemics in the Caribbean are more probable in an El Niño or El Niño + 1 year.
  - There appears to be a close association of the epidemic with temperature.

**Colombia**

- Development of a mathematical model to explain malaria incidence linked to climatic parameters.
- Studying the linkages between entomological and climatological variables through field and laboratory work.
- Creation of a Geographical Information System for Malaria in Colombia (SIGMA).

**Study Sites:**

- Endemic-epidemic regions for malaria in the lowlands of Colombia:
  - Nuqui (northwestern Colombia).
  - Nuqui (northwestern Colombia).
  - El Bagre (Pacific Coast).
  - El Bagre (Pacific Coast).

**Findings**

Temperature strongly affects the life cycle of *An. albimanus*, the main malaria vector. Modeling efforts confirm the importance of temperature in explaining malaria incidence.

**Mexico: Activities**

- Epidemiological data collection: nine regions (3 states).
- Climatological data (temperature; relative humidity and precipitation).
- 56 time series of data on malaria, dengue (up 17 years) and climate variables.

**Findings:**

- Preliminary analysis (vector control variables not included) show an association
- Precipitation/malaria stronger than for temperature.
- Important outbreaks of dengue fever were observed during the 1997-1998 ENSO.
- Modeling efforts confirm the importance of temperature in explaining malaria incidence.

**Venezuela: Findings**

- Positive correlation of malaria with mean relative humidity and monthly minimum
- Temperature.
- Problems: Problems: • Political-institutional instability in the country caused a 8-month delay in activities.

**Activities: Study Sites**

- Bolivar (southern plains malaria), Sucre (coastal malaria)

**Retrospective data collection (monthly)**

- epidemiological
- climatological
- entomological (just started).

**USA: CHIEX Features**

- CRN training programs -- summaries.
- CRN research projects -- summaries -- Brazil, Colombia, Venezuela, Mexico, Jamaica.
- New projects -- dengue in the Caribbean (START), Brazilian vulnerability to health impacts of climate change (CT Brazil).
- Select projects by disease (malaria, dengue).
- Publications and presentations (CRN) -- full text in some instances.
- Networking -- meetings, other CRNs -- regionally and within country.
- Members, institutions, frequently asked questions (FAQs).
- English-language site with resource-limited Spanish and Portuguese translation.

**In the News**

- Two news items every month using CRN members as resources (more hits at the site).
- Directed at scientists and decision-makers in climate and health.
- Primary geographic focus is the tropical Americas; also a global perspective.
- Example -- Caribbean El Niño News Network (<http://www.cennn.org>) (w/ IRI).

**Publications, Workshops and Congress, Students, Web-page**

Journals articles publish		5
Journals articles in press		1
Books Chapters		1
Congress and Workshops presentations		6
PhD		4
MSc		5
Undergraduate		5
<a href="http://chiex.net/">http://chiex.net/</a>		

**DEVELOPMENT OF A COLLABORATIVE RESEARCH NETWORK FOR THE STUDY OF REGIONAL CLIMATE VARIABILITY AND CHANGES, THEIR PREDICTION AND IMPACT, IN THE MERCOSUR AREA**

## Mario Nuñez CRN 055

ProSur is a Collaborative Research Network (CRN) to promote research into the causes of climate variability in the Mercosur region of South America.

### Main Goal

**To advance the knowledge of regional climate variability and to advance the knowledge of regional climate variability and**

- *THE ROLE OF LARGE-SCALE SEA SURFACE TEMPERATURE VARIATIONS IN DETERMINING CLIMATE VARIABILITY IN SOUTHEAST AMERICA.*
- *TO STUDY THE TROPICAL-EXTRATROPICAL INTERACTIONS RELATED TO THE CIRCULATION AND PRECIPITATION VARIABILITY OVER THE MERCOSUR AREA.*
- *IMPACTS OF CLIMATE VARIABILITY ON SECTORS OF SOCIAL AND ECONOMIC IMPORTANCE IN THE MERCOSUR REGION.*
- 

### Capacity Building

- The network is making a significant contribution to the capacity building in the region by training Ph.D. students, who will contribute to the development of policy in issues of climate variability and change, and prediction of climate.
- An enhancement of the smaller groups is being promoted (e.g., with Groups in Paraguay and (e.g., with Groups in Paraguay and Uruguay).

### Potential for interaction with policy makers and stakeholders

- The MERCOSUR region of South America is home to more than 200 million people. That population is profoundly affected by both short- and long-term climate variability.
- The majority of the MERCOSUR's Gross Domestic Product is centered in the study region and a large percentage of its energy is hydroelectric.
- The CRN will intent to bridge the gap between the science result generated by the program and the information needs of decision policy makers providing mechanisms to transform research into information designed to address specific problems.

### Pilot Projects

- Two Pilot Projects in PROSUR
- A regional pilot project focused on hydrology is now in execution leaded by Vicente Barros.
- The objective of this pilot project is to assess the impact of climate variability on surface runoff and stream flow for the Rio de la Plata Basin (Cuenca del Plata) and its sub-basins.

### Second Pilot Project

- Initiative for an Integrated Project on Human Dimensions of floods in the La Plata basin.
- **MAIN GOAL**
  - ⇒ Risk Management.
  - ⇒ Impact.
  - ⇒ Vulnerability.
  - ⇒ Mitigation Strategies.
- This is an interdisciplinary proposal in which natural and social scientists are being involved from Argentina, Brazil, Uruguay, Paraguay and USA.

### Data Analysis and Management

- Investigators at CDC, CIMA, CPTEC and USP are collaborating Investigators to produce a set of daily records from more than 2000 stations south of 15° S with a uniform format.
- These data were obtained from various public and private sources in Brazil, Paraguay, Argentina, and Uruguay.

- While station density varies substantially in space and the quality of the records differs, most records begin in the mid- 1970s and continue until near the end of the last millennium.
- The data have already been useful in several diagnostic studies undertaken by scientists within PROSUR.

#### **Principal themes in the PROSUR Agenda now under developing**

- Interdecadal, interannual and intraseasonal climate variability. Impacts and mechanisms.
- Extreme Events.
- South American low level Jet.
- Land surface processes.
- Atmospheric Modeling.

#### **The goals for the last year were**

- Promote the research and interactions among PIs on the floods in La Plata Basin
- To promote studies on the physical and dynamical processes of extreme events in the MERCOSUR area.
- Assess the degree of understanding of this Assess by stakeholders and population in the context of Human Dimension Pilot Project.
- To develop and support activities related to South American Low Level Jet Field Experiment Support modeling studies to investigate climate variability.

#### **The main effort is going to dedicated to the Pilot Project on floods along the following lines**

- a) To assess the main climatic forgings.
- b) To develop a conceptual a model of the climate and or synoptic forgings of the major floods in the Uruguay River. .
- c) To understand what climate forgings in the Middle Paraná, than other El Niño are responsible for great floods, and if there a remote forcing, how is the acting mechanism.
- d) To develop an objective statistical model to estimate the occurrence of major floods major in the Lower Paraná.
- e) To understand, the physical forcing of the different climate the response to El Niño events of 1982- 83 and 1997- 98

*One of the objectives of the Human Dimensions Pilot Project is to analyze the social communication of climate events, in particular, catastrophic floods related to El Niño events in selected case studies over the Rio de la Plata basin.*

#### **Four main groups of stakeholders could be identified a priori as participants of social communication processes.**

- **The scientific community, the media, public institutions and the public.**
  - ⇒ The **scientific community** generates the climatic information, particularly climate prediction.
  - ⇒ The **media** covers and disseminates the information to the public.
  - ⇒ **Public institutions** use (or not) the scientific production to resolve social problems.
  - ⇒ The **public** includes many kind of users, which makes use of the information in different degrees and quality.
  - ⇒ In particular, in order to analyze the media coverage, a database accounting for the dissemination of the information concerning El Niño 1997/98 was constructed; a four month fellowship was financed by the project.
  - ⇒ Media coverage database: The database was built based on the information publish in "Clarín" and "La Nación" newspapers (The main newspapers with national coverage over Argentina) from January 1<sup>st</sup> 1997 to December 31<sup>st</sup> 1998.
  - ⇒ The fields considered in this data base are: date, title, subtitle, topics, newspaper section, relevance of the article (area), classification of the article (e.g. scientific,

descriptive, etc), author, source of the information, impact type, impact places, quantifiable (e.g., costs, evacuated people, etc.)

- ⇒ Recent scientific advances resulted in the emerging capability to predict, with usable skill, the occurrence of ENSO events and, thus, the increased likelihood of floods.

An example of products significant to development of human resources, economy and solution of social problems

- ⇒ Several studies that have been developed in the project are related to research using the AGCM of CPTEC/INPE, Brazil. These include seasonal simulations and predictions and analysis of features associated to extreme events of precipitation over the PROSUR area, as floods or droughts.
- ⇒ Verification of the behaviors of synoptic systems, as frontal systems over the area, and smaller scale features, as the characteristics of the Low Level Jet have been analyzed in model results.
- ⇒ The results are important to seasonal prediction and have impacts on the economy and social problems.

#### **Publications, Workshops, Presentation abstracts, Visits Scientist, Students, Web-page**

Journal articles/books chapters/submitted/publish	25
Workshops	3
Presentations abstracts	47
Visits of Scientist	3
PhD	15
MSc	7
<a href="http://cima.at.fcen.uba.ar/prosur">http://cima.at.fcen.uba.ar/prosur</a>	

### **SOUTH ATLANTIC CLIMATE CHANGES (SACC): AN INTERNATIONAL CONSORTIUM FOR THE STUDY OF GLOBAL AND CLIMATE CHANGES IN THE WESTERN SOUTH ATLANTIC**

**Edmo Campos CRN 061**

#### **Summary**

++The South Atlantic Climate Change (SACC) Consortium is a result of efforts sponsored by the IAI through the Start Up Grant and the ISP Programs. Since 1996, SACC has promoted a series of activities that lead to the development of a number of observational and modeling studies of oceanic and atmospheric processes relevant to climate change in the WSA region.

++Through the CRN Program, the IAI has provided financial support for maintaining the cooperative of research institutions that coordinate and integrate the ongoing and future work.

++A substantial part of the research efforts coordinated by SACC aims the understanding of the role of shelf SST variations on the regional climate. The SACC promotes the international collaboration and facilitates the coordination of much needed observational work to be carried out over the continental shelves of Argentina, Uruguay and Brazil.

++Among the research activities are efforts to construct a high quality regional data base of hydrographic and satellite information; investigations of the links between the hydrological cycle and other climate features over the continent; and changes in the Atlantic ocean circulation and the associated SST anomalies.



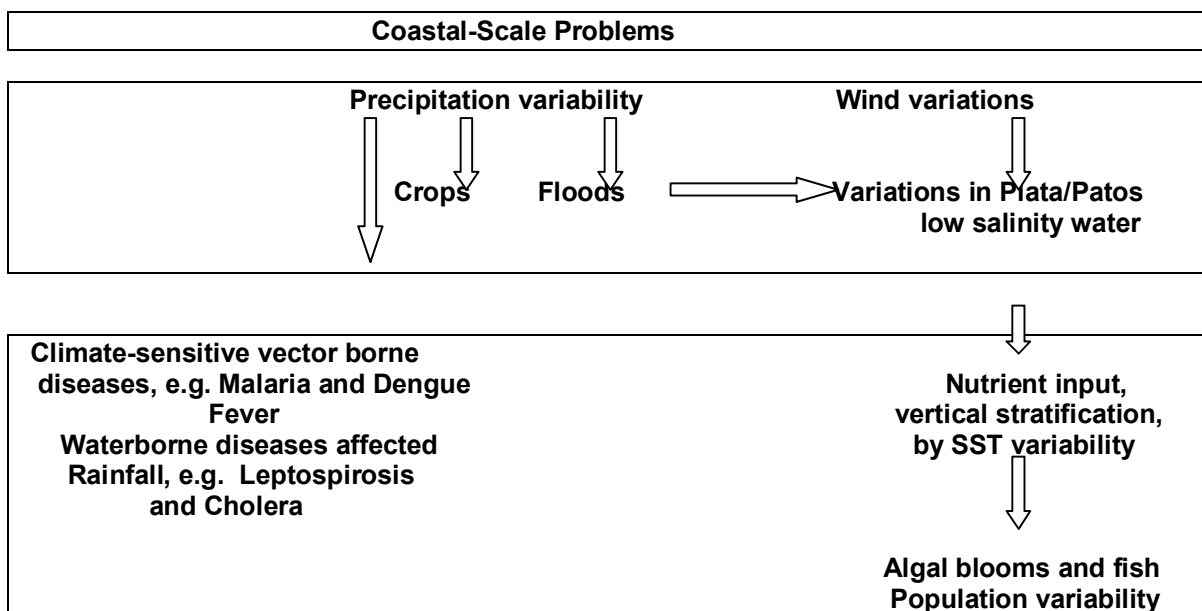
++The SACC is also promoting the investigation of key biological processes as a response to natural and human induced environmental variability in selected Western South Atlantic systems

#### **SACC Goals:**

++The SACC Consortium was idealized as a mean to coordinate and enhance human and institutional resources in the South American participating countries, in order to advance the understanding of the coupled effects of global change and climate variability on the oceanic, atmospheric and terrestrial ecosystems of the Western South Atlantic region.

#### **The primary goal of SACC is:**

++*To understand the interactive relationship of the southwestern South Atlantic sea surface temperature (SST) and the regional and larger scale climate behavior.*



#### **Basin-scale interactions**

- Sub tropical SST anomalies
- Land precipitation anomalies
- Circumpolar SST anomalies
- Atlantic water vapor flux
- Low level jet

The South Atlantic links the North Atlantic to the other oceanic basins and plays a key role in the global thermohaline circulation.

- **SACC is a CLIVAR related project in the Atlantic Sector**

- Since 1996 the SACC scientists have been pointing to the lack of research efforts in the South Atlantic Sector.
- As a result of this effort, an international workshop is being sponsored by the IAI, the IOC/GOOS and the WCRP/CLIVAR for discussing the basis of a Climate Observing System for the South Atlantic (SACOS).

#### **Major Scientific Topics under Investigation**

- Impact of Rio de la Plata Discharge over the Continental Shelf – Project NICOP (Funded by ONR, FAPESP, the Brazilian Navy (CHM) and other agencies in S. America)

- Climate variability in the South Atlantic – Project VARIAS (Funded by FAPESP and CNPq)
- The effects of South Atlantic SST variability on the South American climatic conditions (supported with IAI SACC/CRN funds and Argentine funding agencies)
- The Tropical Atlantic variabilities – Project PIRATA (several of SACC investigators are key players in the PIRATA Project)
- The dynamics of the Brazil-Malvinas Confluence and the adjacent continental shelf (Project carried out by the Argentines, in cooperation with French colleagues.

#### **Project NICOP: Major Funding:**

• ONR (US\$ 190 K), FAPESP (US\$ under negotiation), Brazilian Navy, Uruguayan Air force  
Participating Institutions:

Argentina: SHN, UBA, UNS; Brazil: IOUSP, INPE, FURG, CHM; Uruguay: FCIEN/UR, SOHMA, FAU; United States: NRL/SSC

Oceanographic Cruise carried out by the Brazilian Navy, as part of the Project NICOP during Aug-Sep/2002.

#### **Project VARIAS**

**Major Funding:** • FAPESP (US\$ 120 K), CNPq (fellowships)

**Participating Institutions:** Argentina: SHN; Brazil: IOUSP, INPE/CPTe; United States: RSMAS, LANL; The Netherlands: KNMI.

#### **PIRATA Project**

++The PIRATA (Pilot Research Moored Array in the Tropical Atlantic) is a project designed by a group of scientists involved in CLIVAR, and is implemented through multi-national cooperation. The purpose of PIRATA is to study ocean-atmosphere interactions in the tropical Atlantic that are relevant to regional climate variability on seasonal, interannual and longer time scales.

Contributions are provided by Brazil (INPE, USP and DHN), by France (IRD, Météo-France, CNRS, Universities and IFREMER) and by the USA (NOAA/PMEL, NASA and Universities).

++In 2000, the SACC group promoted in Fortaleza the PIRATA W.E. Workshop for discussing the rationales for a western extension of the PIRATA array.

Based on the results, a Western Enhanced PIRATA Project is being proposed by the Brazilian SACC Investigators.

#### **Publications, Workshops, Students, Web-page**

Journals articles publish		6
Journals articles submitted		3
Scientific presentations		5
Book Chapters		1
Workshops		1
PhD		8
MSc		2
<a href="http://glaucus.fcien.edu.uy/pcmya/sacc/">http://glaucus.fcien.edu.uy/pcmya/sacc/</a>		

### **EASTERN PACIFIC CONSORTIUM FOR RESEARCH ON GLOBAL CHANGE IN COASTAL AND OCEANIC REGIONS**

**Timothy Baumgartner CRN 062**

#### **Overarching Scientific Goal:**

++Clarify the response/interaction of the Eastern Pacific boundary regions to natural variability and human-induced changes in the global climate system, and to anticipate the consequences of these forces on the regional oceanic and coastal ecosystems and the societies interacting with these systems.

**Scientific Framework:**

Research is broadly organized on the basis of interhemispheric comparative studies of the principal coastal and oceanic ecosystems

- 1) Humboldt and California Current systems,
- 2) The Eastern Tropical Pacific, including examination of the interaction of the tropics with mid-latitudes in regulating large-scale Pacific climate and regional ecosystem response.
- 3) Sub Polar Regions of poleward flow (and the associated systems of fjords inland seas).

**SHARED INTERESTS AMONG EPCOR NATIONS:**

1. Develop/enhance scientific basis for long-term sustainability of marine resources
2. Mitigate the multitude of impacts on the health of the coastal ocean resulting from growing human populations interacting with changing climate.

**Need to foster “Sustainable Ecosystem Management” in the face of human-induced changes in the climate system and the disruption of natural ecosystem structure and functioning by direct intervention from harvesting.**

**This includes:**

- 1) Understanding interaction of human harvesting with natural variability in the climate system and its ecological response -- and how this information can be incorporated into real management systems,
- 2) Providing an adequate response to the unique transboundary problem of shared resource management, adapting management scenarios to proper scales of ecological space and time.

**Fundamental Organizing Principles:**

++EPCOR is designed to take advantage of the potential synergy from presently or previously uncoupled programs through implementation of a broadly interdisciplinary approach to define and understand the global change issues important to the coastal and oceanic regions of the eastern Pacific.

++IAI funding available for EPCOR allows us to provide the intellectual and scientific framework along with the multinational perspective to create significant added value to existing national research efforts and to aid in development of practical applications from their scientific results.

++EPCOR is intended to serve as a platform for building a long-term Inter-American research effort with a productive lifetime extending significantly beyond the current five years of available IAI funding.

**DEVELOPING SCIENTIFIC APPLICATIONS AND EXPANSION INTO HUMAN DIMENSIONS**

1. The integration of natural science with societal needs was designed into structure of the EPCOR CRN from the beginning; planning for HD activities began in earnest in Year-3 and will be major priority in final two years of funding, with coordination/collaboration between our CRN, GLOBEC, GECAFS.
2. Developing information, understanding of resource management goals and mechanisms from member nations: identifying changes in management regimes across political boundaries (e.g. Fisheries Roundtable at Vina del Mar, Chile, 2002).
3. Developing tools for coordination of management, industry and scientific activities across national boundaries (e.g. development of Trinational Sardine Forum, Hunter and Baumgartner, 2000, 2001, 2002).
4. Beginning work on development of Climate-Ocean-Fisheries EXPERIMENTAL Forecasts in conjunction with NOAA supported programs (example from diagnostics work in NE Pacific with OPYC model by Auad and Miller with Baumgartner).

**Intersections with Programs outside the IAI:**

IGBP:

GLOBEC – Membership on SSC, active in Focus Grp Programs and membership in SPACC program

JGOFS – Membership on SSC

LOICZ – Membership in Focus Grp Program  
 PAGES – Close Collaboration  
 IOC—SCOR: Collaboration with Executive Director's Office  
 GOOS Program – Developing Collaboration Proposal submitted to IOC  
 IRI: Collaboration with the Pacific based "Climate and Fisheries" Project  
 LME Program: Weak connection to development of initial proposal to GEF for Humboldt Current Large Marine Ecosystem Program, through IMARPE (Peru) and IFOP (Chile)  
 Intersection with Program Inside the IAI-CRN: SACC = An international consortium for study of global and climate change in Western and South Atlantic: Weak beginning of development of strategic plan to unify efforts for sustainable funding.

#### **SCIENTIFIC APPROACHES**

- RETROSPECTIVE - COMPARATIVE STUDIES TO CREATE KNOWLEDGE FRAMEWORK
- MODELING-DIAGNOSTICS AT BASIN-AND REGIONAL SCALES
- DEVELOPING/MAINTAINING/COORDINATION OF REGIONAL OCEAN SURVEYS CONDUCTED AT REGULAR INTERVALS
- DEVELOPING COASTAL MONITORING NETWORKS
- DEVELOPING/COORDINATING REGIONAL SATELITE STUDIES AND MONITORING PROGRAMS.

#### **RETROSPECTIVE APPROACH: USE OF HISTORICAL FISHERIES DATA**

++Tracing year-to year shifts in concentration of sardine biomass using ratios of CPUEs from the fishing grounds off central and southern California (1932-1951).

++Tracing year-to year shifts in concentration of sardine biomass using ratios of CPUEs from the fishing grounds off central and southern California (1932-1951).

#### **RETROSPECTIVE APPROACH: PALEO V. INSTRUMENTAL DATA SERIES**

++Anchoveta scale-deposition series reconstructed from shelf off Peru (Callao), compared to regional sea surface temperature anomaly series developed from COADS data (Baumgartner et al., in prep.).

#### **RETROSPECTIVE APPROACH: DATA FROM HISTORICAL OCEAN SURVEYS**

++Averaged distribution of sardine food (1949-1969) from CalCOFI macrozooplankton surveys (ml/m<sup>3</sup>)

#### **MODELLING-DIAGNOSTICS APPROACH:**

++Basin-scale ocean response of SST to the 1976-77 canonical regime shift to compare NE to SE Pacific response. Note that unlike ENSO system, the interannual change is more heavily weighted to the change in extratropics although overall geographic patterns of SSTA are similar: a response to change in structure of basin-wide wind field.

#### **MODELLING-DIAGNOSTICS APPROACH:**

++Large-scale ocean response to forcing over an idealized regime shift = change in physical dynamics and conditions of the sardine habitat = Horizontal currents in the model mixed layer.

#### **DEVELOPING / MAINTAINING REGULAR OCEAN SURVEYS**

++IMECOCAL SAMPLING GRID OF OCEAN STATIONS OCCUPIED FOUR TIMES PER YEAR OFF BAJA CALIFORNIA, MEXICO. (ALSO DIFFERENCES IN SEA LEVELS AND TEMPS ARE MONITORED BETWEEN GUADALUPE ISLAND AND THE COAST) THIS PROGRAM CONCIIVED IN THE ISP PHASE OF IAI; NOW MAINTAINED W/ FUNDING FROM MEXICO—CONACYT.

#### **COORDINATION OF OCEAN SURVEYS:**

++Distribution of sardine spawning during April, 2000, in relation to zooplankton distribution From combined CUFES surveys by CalCOFI and IMECOCAL.

++Coordination of CALCOFI and IMECOCAL surveys incorporating CUFES sampling for sardine eggs shown (plus other species not shown) overlain on zooplankton distributions.

#### **Publications, workshops, Students, Web-page**

Journal articles publish	3
Journal articles submitted	2
Book Chapters	2
Workshops	3
PhD	1
MSc	3
<a href="http://www.cisece.mx/~iaiepcor/">http://www.cisece.mx/~iaiepcor/</a>	

### **ANALYSIS OF CLIMATE VARIABILITY AND ITS IMPACTS IN THE MEXICO, CENTRAL AMERICA AND CARIBBEAN REGION**

**Victor Magaña CRN 073**

#### **Executive Summary**

++The main objective of the proposed study is to improve our understanding of the elements that control regional climate variability in the Mexico, Central America and Caribbean region, in order to provide more accurate climate predictions to some socioeconomic sectors.

++Data bases development, Empirical studies, Dynamical models for the atmosphere and ocean, hydrological analyses, agricultural production models, Evaluation of the socioeconomic impacts of climate variability field experiments to test some hypothesis on regional climate variability.

#### **DURING THE 2<sup>nd</sup> YEAR THE MOST IMPORTANT RESEARCH ACTIVITY WAS:**

++Experimento Climático en Climático en Las Albercas de Agua Caliente de Agua de las Américas. Data analysis phase.

#### **Publications, Students, Data Base, Web-page**

Journal articles publish	10
Books Chapters	3
PhD	1
MSc	6
BSc	4
Data Base: Monthly means of PCP and T daily precipitation	
<a href="http://macuca.atmosfcu.unam.mx/">http://macuca.atmosfcu.unam.mx/</a>	

#### **Findings and Achievements**

- ⇒ New challenges in climate prediction:
  - +Summer precipitation – observed
  - +CCM3 – with observed SST.

#### **Contributions**

+“Usos de pronósticos de la lluvia en evaluación de riesgo agrícola”

#### **Participation in Scientific Initiatives**

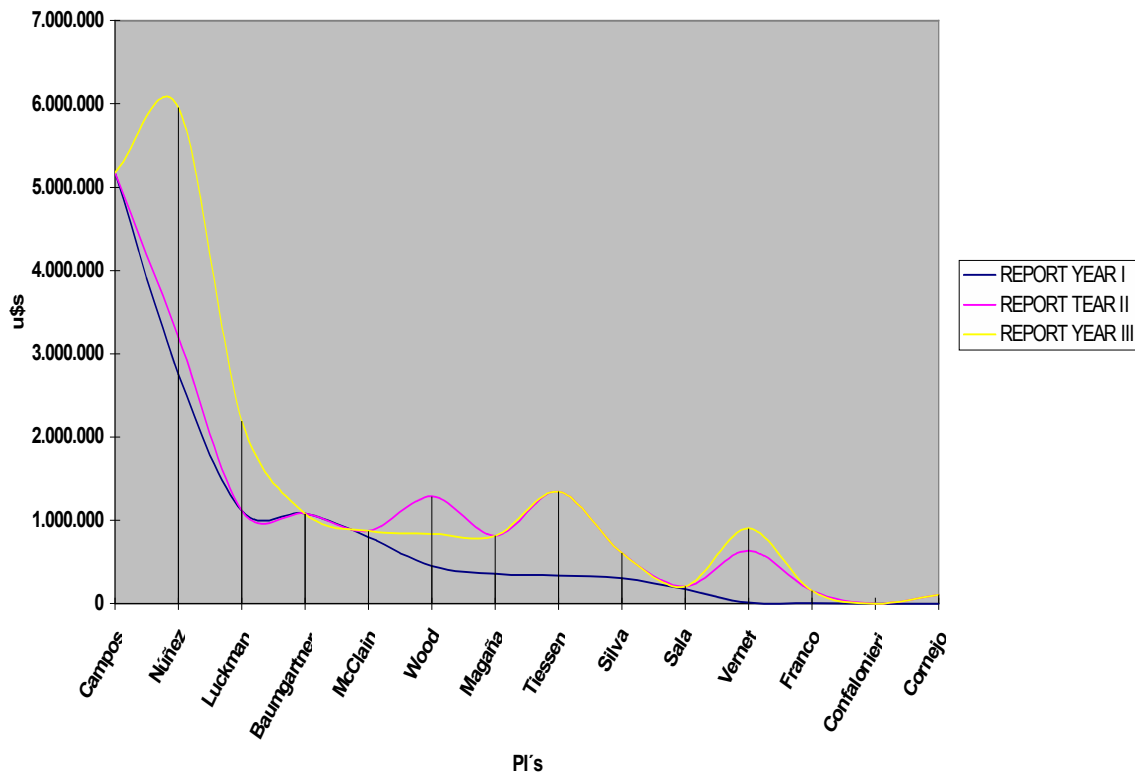
- + MANE
- +TEXMEX II
- +CAM-MIT

### Future Work

- ⇒ Results from ECAC
- ⇒ Numerical Climate Predictions
- ⇒ Participation in Climate FORA
- ⇒ Capacity Building
- ⇒ Early Warning Systems.

### ADDITIONAL OR PARALELL FUNDS

#### ADDITIONAL OR PARALELL FUNDS YEAR 2003



### The following are the invited presentation to the meeting:

- The International Geosphere Biosphere Program (IGBP). 2003: New Challenges, New Structure - Guy Brasseur – IGBP Chair – Max Planck Institute for Meteorology, Hamburg, Germany
- Past Global Change (PAGES) – IAI: PEP 1 Project as an example for Interagency Collaboration for Global Change Research - Vera Markgraf Chair of PAGES
- Global Ocean Ecosystem Dynamics Program (GLOBEC): A Status Report and Future Directions - Cisco Werner –Chair of GLOBEC

- **The Land project transition team. Changing disturbance regimes, societies and the planet. Sandra Lavorel, Co-Chair of the Land project transition team, CNRS, University Joseph Fourier**
- **The Global Carbon Project. Pep Canadell – Executive Director of the Global Carbon Project**
- **Center for Marine Tropical Ecology (ZMT). A ZMT Initiative: Coastal Ecosystems Change in Tropical Countries. Ruben Lara , Bremen - Germany**
- **Asia - Pacific Network for Global Change Research (APN) - Martin Rice: Programme Manager Communication and Development, Japan**
- **The International Human Dimensions Program (IHDP). Michael Brklacick, Director Global Environmental Change And Human Security Project, Carleton University, Canada**
- **Global Change System for Analysis, Research and Training (START)– Roland Fuchs, Director of START, Washington D.C., USA**
- **World Climate Research Programme (WCRP) – V. Satyan, Director World Climate Research Modeling , WMO, Geneva, Switzerland**

General discussion on CRNs and options for collaboration with other organizations.

**Guy Brasseur:** The representatives of IGBP were very impressed with the CRN project presentations, not only because of the scientific quality, but also because of the educational dimension from which IGBP should learn. Moreover, they are very interested because of the overlap that exists between the program the IAI has been developing and what the IGBP is trying to accomplish. They propose to look for ways in which the IAI and IGBP can work together in the form of a partnership of equal partners. This would be beneficial for both institutions, as the IAI is focusing on the Americas and a lot of interactive processes that involve land, atmosphere and oceans, and the IGBP is not focusing on a region in particular, but trying to see all the Earth function and the way processes, especially processes in certain regions, affect the global system, and vice-versa, how global change could affect certain regions of the world.

Forms of cooperation:

- Links at the Director or Secretariat level.
- The IGBP Science Committee could invite the IAI SAC Chair to their meeting once a year, and transmit the information to the IAI.
- Project level: Each of the IGBP projects (PAGES, GLOBEC, IGAC, land, ocean, GAIM, etc.) are run by a Scientific Steering Committee (SSC) (about 10-16 members). The idea is to add to the SSC a number of correspondent members that would be selected based on interest in the program and the need to establish communication. For example, some of the CRN PIs could become correspondent members of GLOBEC or other programs. These correspondent members would be a step in what can become deeper collaboration.
- To create a network of scientific institutions, to link the institutions that sometimes work very independently, and to create a balance in this network, for example balance between the northern and southern hemispheres, in order to work together, exchange people, etc. If this network is to be created, the IGBP would need the help of the IAI.

The general conclusion is that as much as possible together, IGBP and IAI should do. The institutions should not compete, not duplicate, but work together which is the sense of what IAI and IGBP are doing.

**Will Steffen:** He commented on more specific ways the IAI and IGBP can work together. There are some CRN projects such as CRN 62 (it is seen as the seed of something bigger and longer term and can be linked with GLOBEC), CRN 03 (part of PEP 1 transect of PAGES) and Variability in the South Atlantic (can be linked with CLIVAR). The CRN projects are designed to address issues across the Americas, and the Americas are part of the global system. Every region is connected to every other and the role of IGBP is putting the regions in a global context.

The agendas of the IAI, APN, northern industrialized countries, and so on should be put together at some level, as everything is related to one planet. The IGBP is now in the transition stage and is developing a more regionally oriented round-global agenda. So the IGBP is open to people with experience in regional work to help them design a better global agenda that takes into account regional differences.

The idea is to work not only with IAI, but also with APN, START and other groups to develop an agenda for Earth System Science that recognizes the importance and the linkage of regions. If this is achieved, then the next round of CRNs will almost naturally contribute to the global picture like the examples mentioned before.

**Luiz Bevilacqua:** Maybe for the first time there is a concrete proposal for joint work. The invitation of the IAI SAC Chair to the meeting of the IGBP Scientific Committee will be discussed at the IAI SAC meeting.

**Martin Rice:** There is a lot of synergy between the themes in the projects of APN and IAI. Looking ahead to future collaboration, the APN will receive funds from the Japanese Ministry of Environment, for an initiative that will last for 6 or 7 years and will focus initially on climate, food and water, and as part of the capacity building component, APN will promote joint programs. At the SAC meeting, APN and IAI will discuss future programs. APN has also held talks with IGBP and worked closely with START on the capacity building element.

**Tim Baumgartner:** The CRN project was designed as a platform for future work. One of the results after the five years would be a strong matrix of institutions ready to launch another five years of programs.

**Brian Luckman:** His project is looking to cooperation. The CRN is focused on techniques and developing the database needed to address long-term climate related questions. The CRN has made it possible to build links between the existing and new tree-ring laboratories in the Americas. He agrees on that the IGBP and IAI need to recognize the major training centers and provide the facilities and funds to exchange personnel and students to the benefit of the community.

**Victor Magaña:** He worked with VAMOS previously. In the beginning, VAMOS moved slower than the IAI, but when the relationship between CLIVAR VAMOS and the IAI became clearer. VAMOS has more regional programs (Low level Jet, NAME, etc.) that are moving on. It was after VAMOS that CLIVAR understood that IAI had a lot to do so those programs really started moving. As there are not so many scientists in Latin America, many are members of VAMOS and IAI, so the relation between these programs is almost natural.

**Joan Aron (CoPI of CRN 48):** When working with regional groups, the definition of the regions is very important. The Americas is a unit, but this does not happen with the rest of the world, and defining the regions will be an issue to consider.

**V. Satyan (WCRP):** He attended the meeting to see how interactions can be implemented between WCRP and IAI and WCRP and APN. The nature of WCRP projects is global (GEWEX, CLIVAR, among others), but they also have continental components. WCRP would be keen to support IAI activities, at the regional scientific project and capacity building levels.

**Paul Filmer:** NSF is committed to funding the regional institutes and considers they are IAI, APN, START and some activity within ENRICH. These institutes appear in the current budgets and in the



long-range plans. There is at the moment a widespread interest in the different US agencies; they are looking at these regional efforts and links to START, APN, IGBP, and WCRP. He mentioned a discussion on the future of IAI and the way the institute can interact with observing systems. Those linkages are very positive for the US government and the IAI. Showing proposals that include this kind of linkages or trying to create those linkages is very important in the IAI review process. The External Review of the IAI as a whole is ongoing, and that the IAI meeting with IGBP is very positive. As the review continues, IGBP will be approached to inform about the interaction with IAI.

**Julia Paegle:** One thing is to link regional programs to the global agenda and another thing is the implementation of a global agenda at a regional level.

**Luiz Bevilacqua:** The idea is to link regional programs to the global agenda.

**Guy Brasseur:** IGBP thinks that the IAI and APN should be part of the development of the global agenda, and this should be done by establishing links. In addition to the IGBP global activities, there are other global programs such as WCRP, IHDP, DIVERSITAS, and they all work together in the ESS-P and have established a number of projects (carbon, water, food and health in the future) and this is another opportunity for the IAI to get involved and help building these programs.

**Roland Fucks** (START) is co-sponsored by IGBP, IHDP, WCRP, and maybe in the future DIVERSITAS and has the task of capacity building linked to regional research activities. It has worked with APN and in Africa, but is looking for ways of working more closely with the IAI. It sees the way the IAI merged the capacity building and research activities in the CRN. There are two activities in which START needs the help of the IAI, not necessarily financial. The difficulty is that there are not enough applicants from the Americas and START does not know how to reach the community in the Americas. The application deadline was 31 January 2003, but has been extended.

**Enrique Puliafito** (Instituto para el Estudio del Medio Ambiente – Universidad de Mendoza): The Institute that he leads is working on this subject and is willing to cooperate with this workshop. He also mentioned that the IAI should include this theme in the Science Agenda.

**Will Steffen:** IGAC is making a study of the city of Mexico and has some names to provide.

- Young Scientists' Global Change Conference, November 16-19, 2003, Trieste, Italy, sponsored by ESS-P, APN, IAI, START, Third World Academy of Science, US GCRP.
- Organized by an International Committee, chaired by Peter Tyson, composed of young scholars
- Up to 100 young scientists will be selected to present oral or poster presentations and compete for the Crutzen Prize for Best Paper.
- Abstracts accepted until 14 March 2003 (already over 550 expressions of interest have been received)
- Selection Process: Reviewers (April-early May); Selection Committee (May 29-30, 2003 in Trieste); Awards Committee (to meet during the conference).
- It's open to any subject of global change science and to all countries or regions.

**Mary Kalin Arroyo** (Diversitas) An International program of biodiversity science was launched in 1991 and is sponsored by ICSU, IUBS, IUMS, SCOPE, and UNESCO. In March 2001 the five sponsors of DIVERSITAS requested the scientific community to build a new integrative biodiversity research program.

Global change is affected by biodiversity and vice-versa, so these two issues have to be analyzed together. The Americas are very important for the diversity issue, as they are a rich biodiversity region, one of the richest in the world and are suffering tremendous impacts. It is also a model since it runs from the Arctic to the Antarctic.

Goals:

**Martin Rice:** APN and IAI are discussing a regional workshop on a specific theme.

**Mary Kalin Arroyo:** Another point of cooperation can be the CP-3 project, which looks at the economics of sustainable development.

**Mike Brklacich** (IHDP)-The International Human Dimensions Program is about

- The ways in which individuals and societies contribute to local, regional and global environmental change are influenced by Global Environmental Change Mitigate and adapt to Global Environmental Change

The IHDP is an international, interdisciplinary, non-governmental science program dedicated to promoting and coordinating Human Dimensions research aimed at describing, analyzing, understanding the Human Dimensions of Global Environmental Change.

A lot of work has been done in Amazonia, in cooperation with the CRN

The opportunity for collaboration is the IHDP core projects and in joint projects. He announced the next Open Meeting of the HD Community in Montreal, Canada.

**Luiz Bevilacqua:** The human dimensions component has always been a requirement in the IAI projects.

**Holm Tiessen:** IHDP was keeping itself small on purpose because of the human possibilities they had in the different initiatives. Has this changed?

**Hartwig Kremer** (LOICZ) has existed for ten years and presents the plan for the next ten years. Thanked the IAI and NSF for their active cooperation since 1999. IAI has made it possible for a large group of multidisciplinary scientists from the IAI region to participate in LOICZ activities.

The SSC and the broader scientific community (more than 2,000 people working for LOICZ) have come up with five overarching thematic issues, which will compose the scientific agenda.

The new LOICZ 2003-12: Land-Ocean interface and key scientific themes

LOICZ is considering a partnership with IHDP and the science plan will be developed jointly and should be ready for approval by early 2004. The agenda can be developed jointly with IAI as well. LOICZ is also collaborating or holding discussions with SOLAS, PAGES and are already in discussion with the food system, carbon and the water systems. LOICZ is going to change its structure.

Options for enhancing collaboration between LOICZ and IAI:

- Project level: The river catchments-coast integrated studies could collaborate with the CRN dealing with the Amazon and how to join these efforts into a broader South American catchments study.
- LOICZ can provide a platform to engage with the global change community
- Institutional level: Could be part of an IPO
- Science plan development: on-going and open process

**Lynne Hale:** The land-ocean interface could be given a more prominent place in some of the IAI projects.

**Ulrich Saint-Paul** ,The Center for Tropical Marine Ecology (ZMT) plans and implements partnerships and projects to understand and manage tropical marine ecosystems, engages in educational activities in the field of tropical ecology, cooperates in scientific capacity building in tropical countries, and facilitates coordination and communication among scientists and institutions active in the area. For over ten years, the focus area of ZMT activities has been Latin America.

Present and past effects of climate and sea level changes on the tropical coastal region: An integrated network approach

ZMT has cooperation projects with Brazil, Costa Rica, Puerto Rico, Venezuela, Chile, Peru etc. It is prepared to cooperate within Latin America in order to focus more intensively on these global change aspects in the future, especially because the coastal zone is an area that has not been studied in depth by the IAI previously.

#### **V. Satyan** (World Climate Research Project-WCRP)

##### Scientific Strategy

To provide a framework for the international planning and coordination of observational and modeling efforts as useful and appropriate for the effective pursuit of the program's objectives, with emphasis on the global atmospheric, oceanographic, cryospheric, hydrological and land surface components of the physical climate system.

The CLIVAR monsoon projects and teleconnections from the adjacent oceans: CLIVAR VAMOS in the IAI region, CLIVAR Africa, CLIVAR Asian-Australian Monsoon

WCRP's long-range vision: integrated assessments for management, policy and development; climate impact prediction; operational climate prediction system; operational climate observing system; Earth System models.

WCRP is one of the partners of ESS-P, together with IGBP, IHDP and DIVERSITAS, and participates in the Joint Projects on Global Sustainability: Water, Food, Carbon.

The WCRP would like to establish links with the IAI and APN in the programs and capacity building.

**Oswaldo Sala** (SCOPE) is the Scientific Committee on Problems of the Environment. While IGBP and DIVERSITAS coordinate on-going research efforts, SCOPE synthesizes understanding. In the past, SCOPE and IGBP worked together in many ways.

SCOPE has three cluster programs: environment & human health, biodiversity and sustainability, within which there are 10-12 projects. SCOPE has a new mode of operation, the Rapid Assessment Programs (RAP) and raises funds for them. One was finished in October and they are about to start another in Ubatuba, Brazil evaluating the carbon cycle in conjunction with the Global Carbon Project. They also have the resources for two more RAPS, one on emerging ecosystems (urban environment) and the other on the nitrogen cycle. So there are many points for interaction with IAI.

The IAI Director commented on the proposal of IGBP, of publishing a book on global change in the Americas in the IGBP book series, which would depend on the PIs, as they are the ones who work on the subject.

**Will Steffen:** Although it is an IGBP series, IGBP wants to be open, broad and inclusive with the whole global change community. There are books on the projects led by Will Steffen and only one regional book, which was edited by START and is called Regional - Global Linkages. It reports on southern Africa and three regions in Asia. LBA have agreed to write a book on the program, focusing on the Amazon Basin. The possibility of publishing a book in the IGBP series with the IAI logo on the cover and reaching the world research community is an offer that the IAI should consider.

**Guy Brasseur:** The IAI will have to create an editorial board with scientists from the American community.

**Juan Silva:** The PIs will contact persons from other programs that are more related to their CRNs to discuss ways of collaboration.

**Holm Tiessen:** The discussion about possible links should be held during the meeting or linkages at the operational level should be facilitated, which would also require some advance discussion in the meeting.

**Pep Canadell:** As the Executive Officer of one of the Global Carbon Projects, he would like to see a direct communication between the core project officers and the specific networks. So, besides supporting Brasseur's proposal for a variety of high-level links, send for example the IAI Annual Reports electronically to the core project officers and these send information on potential activities to all relevant networks. He suggested to develop very simple ways of communicating from the networks where the research takes place straight in the core projects where the research is organized, besides the institutional high-level communication.

**Gustavo Necco:** This is suitable for the DIS Information System

**Hartwig Kremer:** A brief description of the scientific scope and interests of each of the participants added in the participants' list would allow direct contact between participants according to the subjects.

**Oswaldo Sala:** He appreciated Brasseur's proposal as it meant concrete actions: Invitation of the IAI SAC Chair to the SSC meetings and the proposal about correspondent members. He suggested that the IAI SAC should consider making a similar offer to the IGBP.

**Oswaldo Sala:** A successful book is one that has a clear theme. So, the first thing to do is to identify the theme. The fact that all the CRN projects are funded by the IAI is not going to make a good book. The other point is to think who the readers will be.

**Baumgartner:** It could be three themes: land, ocean, and atmosphere in one or three books.

**Guy Brasseur:** Gives the example of the questions posed by LBA to write the book and suggests that similar questions be found for the IAI book. For example, find a question that would involve land, ocean, and the atmosphere. The crosscutting of these will bring many other subjects. Then, answering a question that is valid for the Americas will result in an extremely useful book for decision makers, the scientific community, and students.

**Mary Kalin Arroyo:** Many of the CRN projects are evolving in isolation. Many of them are devoted to the atmosphere and oceans, but not much is done about land. The idea is to avoid making a list of reports in a book. On the other hand, doing a synthesis will give the IAI an idea of where the gaps are.

**Oswaldo Sala:** Supports Brasseur's proposal on the central question for the book.

**Julia Paegle:** A unifying subject could be the Rio de la Plata Basin, as it covers the problems in the ocean, the Andes, change in the sediments in the Pilcomayo and the Bermejo, tributaries, land use changes, electric plants in Brazil, wastes in the Rio de la Plata and their effects on the coast, the influence of the Atlantic sea surface temperature on South America.

**Hartwig Kremer:** Supported the comment. There are many activities beyond IAI and IGBP, which have to do with water cycles and water in a broader context, that of the water continuum from the rivers down to the continental shelf, and human global interaction. Such a book would make a difference to all the initiatives that are ongoing. It would be a good idea to integrate the multidisciplinary science of the CRNs.

**Gustavo Necco:** It can be discussed at the SAC meeting and then with the PIs. This will be a project by itself.

**Lynne Hale:** One thing that IAI and IGBP might consider together is trying to link these different ideas, whether it is a book, or a discussion about policy or the two or three significant questions made and the questions made globally. IAI can make a strong contribution through its many activities.

**Holm Tiessen:** One thing that IAI, IGBP and other organizations have in common is a tremendous amount of experience on how to organize and run networks. Perhaps these transactions and the know-how is in itself something worth documenting and making useful.

**Guy Brasseur:** The IAI should try to identify a scientific question or a question of practical importance for the scientists and use all the means available to try to address the question. For example, what will be the environment of the Americas in 50 years from now? But it has to be a relatively broad question so that many of the results obtained can be used. The IAI was created to address issues, and for the funding agencies, it will be motivational to see that all the money that has been invested in the IAI has helped answering fundamental questions.

**Gustavo Necco:** Perhaps all the suggestions made can be used to make other materials that could be distributed to the community.

**Holm Tiessen:** One unifying word might be “risk,” as what the CRNs are really looking at are changes in land use, oceans, productivity, risks to societies of climatic events, and increased risk of climatic events under different land conditions.

**Michael McClain:** He has been thinking on the ideas of collaboration and felt dissatisfied with the emerging possibilities because they may not be as deep as hoped. There is a fundamental incompatibility between IAI and IGBP. IGBP and the other projects start with a question, and then they look for the scientists to address it, whereas the IAI functions with the NSF model, which is to identify some general themes and then leave it to the community of creative people to come up with the specific issues to tackle. So, maybe the IAI has to fit into the IGBP process or define new sets of questions that follow an IGBP or other kind of model. The issue is reorganizing the IAI.

**Holm Tiessen:** Does not agree, as some 10-15 years ago, IGBP was going through the same process. They needed to define where were going, and go through a process that has taken a long time, a globalization of IGBP, a shrinking back into regional and national networks and again a feedback to the globe. The IAI came ten years later and maybe it can learn something from the experience of IGBP.

**Guy Brasseur:** IGBP has a long history of planning and defining the questions for the future, and then the groups try to find answers. So it is easier to move to synthesis in phase II, when they are working on the results of phase I. But at the time of phase I, IGBP was very much like the IAI: they had a number of disciplinary communities. Then the IGBP spent a lot of time on making the integration exercise, which was extremely useful but also very difficult. Maybe they did not completely succeed, as they were not ready for it. The proposal of publishing the book should lead the IAI to think how to establish the agenda for the future and perhaps work with some of the IGBP projects will link the IAI with some of the questions that are posed. However, in spite of the difference in the planning mechanism, it is still useful for the IAI having worked for several years on issues to try to understand what has been really learnt from this experience. The IAI can achieve this by picking a few crosscutting subjects for a synthesis.

**Baumgartner:** Recognized the difference between IAI and IGBP but considered it a virtue.

**Holm Tiessen:** SCOPE challenged the IAI to make a synthesis on resilience and risk and see whether in the land use change and the coastal use, the risks associated with production and society are dependent on the climatic conditions that the other programs are dealing with.

**Will Steffen:** The synthesis proposed by IGBP and the RAP proposed by SCOPE are different in objectives and operation. The IGBP does not assess, they use the word synthesis because it is pulling together the scientific knowledge that a group like IAI have achieved and trying to find new concepts or new ways of looking at an important system or scientific question. That is why to organize the synthesis around some scientific questions is not the same as putting 14 chapters on the 14 CRNs. A synthesis is longer than a RAP and probably more difficult and forces the IAI to rethink the science that has been done and will be done. It is extremely valuable, as it changes the way of thinking on what should be done and how the questions should be addressed. The synthesis in the end advances the field. So the broad issue of change in the Americas, the role of local and regional change, the role of global systemic change and how they intersect and interplay in the Americas is a broad and fascinating topic. What the IAI may want to think of is what insights and new ways of thinking about these complex questions the CRNs and the other IAI projects have come up with. This will force the projects to develop together. Moreover, it will trigger new ideas, new questions, and new ways of working as a regional group of networks in the future.

**Michael McClain:** How much time does it take from the setting of the question and the complete synthesis and how many people are generally involved? How many workshops generally occur? How much of a budget does it usually require? Just to have an idea of what will be taken on.

**Will Steffen:** The time is about three years and about half of that is devoted to discussion. An ordinary IGBP Core Project has around 500 scientists in the world, from which about 50 become active in the synthesis and another 100 are correspondent members. The number of meetings varies; the minimum is three of 20-30 up to 50 people. These meetings require a budget of about 100-150 K. The funds are easy to raise because the product is very specific. If the IAI wants to take this primarily as a synthesis of the 14 IAI CRNs and the previous projects, it should bear an IAI label, and the IGBP synthesis will be a vehicle for the process. IGBP is just offering the book series that is widely read around the world now. However, the IAI can think of expanding to involve the researchers of the Americas from the IGBP Core Projects (IGAC, GCT, and so on) and still carry the IAI logo. The IAI may want to focus on IAI or to expand to global change in the Americas, with IAI, IGBP, WCRP, IHDP, which would be a much bigger enterprise but it could be a very powerful book.

**Holm Tiessen:** The light version of that process would be the RAP as it has been practiced by SCOPE for some of the projects. The end product of the RAP is a book published within 18 months from the call for background chapters. There will be about 8 background chapters, 3-4 crosscutting, and one synthesis chapter in a typical book. It would be impossible because of the deadlines to have 14 background chapters (1 for each CRN). The challenge therefore will be that there will have to be an attempt at a synthesis at the level of the IAI individual projects. The call is centered on a topic from SCOPE, usually suggested by someone from the wider scientific community, for example risk and resilience and the global change in the Americas. There will be about 8 first authors and any number of second authors on the background chapters. The background chapters are prepared before a scientific meeting the purpose of which is to write the crosscutting chapters. The background chapters at that point are reviewed by a standard peer review process and used as a background material for the crosscutting chapters. The crosscutting synthesis is made at the meeting. There will be a Scientific Steering Committee overseeing that process. They will be then in charge of the synthesis chapter for the book. This relatively compact and rapid process will not produce the same kind of reflection, long-term evaluation and synthesis of the entire IAI program. No doubt the IAI will have to go through the overall synthesis at some stage but the RAP will be a complementary process that will be the seed of an overall synthesis process.

SCOPE has no funding. SCOPE is strictly an organizer and gives logistical support to these projects, which will look for funding under the auspices of SCOPE. The cost of a RAP is 100-120 K.

The 18 months period starts when the authors are requested to write the background chapters. Usually it is 6 months for the authors to write the white papers that will become chapters, then the meeting and then 6 more months to review the material, finish the crosscutting and then 6 months for production.

**Michael McClain:** Why should this issue be discussed at the SAC?

**Luiz Bevilacqua:** Every scientific product has to be discussed in the SAC, and the organizing of the activities belongs to the Directorate. Otherwise, there could be a duplication of work. Everything that has a scientific content has to be recognized by the SAC.

**Holm Tiessen:** It would have to be approved by SCOPE as well. The SAC will have to talk to SCOPE directly after the proposal is made. It should be seen as a joint effort. SCOPE and the SAC will have to discuss whether only the IAI or other programs are included in the RAP. The SCOPE SSC decides who the authors should be and the way to achieve the best final product. Given the constraints of the process and the volume that can be handled in a fast-track production it will probably be limited to the IAI participants.

**Juan Silva:** He expressed his concern about the different scales, the second decade of the IAI and the strategies for this second decade. This concerns the CRNs and their future. Many of the elements discussed will be helpful for that definition. The definition of new different goals and strategies will affect the future of the CRNs. What will happen after the CRN 5-year period is finished? Will the IAI remain as a set of unconnected CRN projects or will it move to a common network of networks? What will the funding agenda for the next decade be? Same funding agencies? How will this affect the goals and future?

**Gustavo Necco:** This is something the SAC must discuss. For example, what to do about the existing CRNs and what CRNs to maintain, support the existing CRNs or new ones. This should be clearly discussed to have an answer for the Conference of the Parties in June.

**Will Steffen:** The synthesis of IGBP projects turned out to be a renewal, because it forced them to see what they had learnt and what the new questions were and how to proceed to answer those questions.

**Michael McClain:** This is something that the CRNs could do in their 4<sup>th</sup> and 5<sup>th</sup> years. Effective collaboration between IGBP and other programs and IAI is more related to the CRN projects working together with the IGBP projects than to a synthesis book. This is because the IAI funds projects and IGBP takes on-going research to answer posed questions.

**Oswaldo Sala:** The PIs want to know what the SAC thinks about a mid-course readjustment of the projects, as they recognize that some projects are performing better than others. The questions to the SAC are about support, and the freedom the PIs have.

**Luiz Bevilacqua:** This will be discussed at the SAC, but the PIs should be responsible for the good progress of the projects, so if they feel that some component is not doing well, they should first call the attention of the Directorate to follow up the situation.

**Gerhard Breulman:** The PIs can make readjustments in their projects.

**Victor Magaña:** As the projects are in the middle of their period and the plan was made for 5 years, he finds no way of synthesizing them at this moment.

**Michael McClain:** Changed his mind. The moment is good, as a synthesis will allow defining future questions and work.

**Holm Tiessen:** The network of networks, one of the objectives of IAI, although difficult, is beginning to appear as the possibility of cooperation with one or two of the individual networks. It is a slow growth process.

## Annex I – List of Participants

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