Activities CRN II, 1 September 2006 – 31 August 2007

Under CRN II twelve projects (see Table 1) have been approved for funding by the IAI Executive Council at their 21st meeting in Puerto Vallarta, Mexico, September 8-9, 2005.

Grant agreements have been signed by all projects and project activities have started on 1 July 2006, with exception of CRN2060 starting on 1 June 2006 and CRN2048 starting on 1 September 2006.

With the implementation of CRN II the IAI Directorate has taken a very active role in the development of international and interdisciplinary science through linking projects, balancing the program and initiating regional and topical cooperation. Starting with the Ubatuba meeting, this approach was continued during the "initial meetings" (specified in the NSF proposal) of the CRN II PIs and AIRs in Edmonton, Canada (April 10-14, 2006) and in Buenos Aires, Argentina (May 4-5, 2006).

Particularly projects CRN2021, Arturo Sanchez and CRN2014, Ricardo Berbara are cooperating closely and share protocols and sites in Brazil, Costa Rica, Mexico and Venezuela. Several joint project meetings have been held during Project Year 1.

The connection between the projects involved in the Caribbean initiative (CRN2048 DeRaga, CRN2050 Liu, CRN2061 McClain) is less advanced, which is however, expected. Initial contacts have been made and closer collaboration and exchange of data and results is expected in the more advanced stages of the projects. The linkage between CRN2061 and the ESSP (Earth System Science Partnership) core project LOICZ (Land-Ocean Interactions in the Coastal Zone) has been further approached. A meeting between the LOICZ Executive Officer, the IAI Director and the Scientific Officer was held in Sao Jose dos Campos, Brazil on the planning of a joint science-practitioners workshop in the region (likely Costa Rica) later in 2007 or early 2008. During the discussion it became apparent that there is also be a potential link of CRN2076, Alberto Piola to the joint IMBER-LOICZ Continental Margins and Shelf Biogeochemistry activity. The IAI Directorate will pursue this after receiving additional information from LOICZ.

The biodiversity projects CRN2005, Guillermo Sarmiento and CRN2015, Sandra Diaz have started their collaboration through their teams at the Instituto Multidisciplinario de Biología Vegetal, Córdoba, Argentina.

Kam-Biu Liu, CRN2050, represented the IAI Directorate at the expert meeting of the United Nations Framework for Climate Change Convention (UNFCCC) in Jamaica, February 2007, focusing on vulnerability assessment and adaptation strategies for small island developing states (SIDS). Liu made a presentation on behalf of IAI and CRN2050 underscoring the need for a long-term perspective and accurate scientific information in hurricane risk assessment and vulnerability of the Caribbean region. The meeting enabled him to establish contacts with Caribbean decision makers and researchers, thus enhancing the possibility for stakeholder involvement into the project.

Edwin Castellanos CRN2060, Michael McClain CRN2061, Fabien Quetier CRN2015, Romulo Menezes (CRN2014), Guillermo Sarmiento CRN2005 participated at the IAI-IICA-SCOPE synthesis meeting on the application of ecological knowledge to landuse decision, IICA, San Jose, Costa Rica, December 12-15, 2006. The meeting followed the format of a SCOPE rapid assessment and it is expected that it will result in a publication or book. At this stage the individual chapters prepared during the meeting are under review.

Esteban Jobbagy, CRN2031 and Gerardo Wilson, CRN2021 participated at the joint IAI-IDRC-CLIVAR/VAMOS workshop on landuse planning and adaptation to global change in the La Plata Basin and Central Brazil, Buenos Aires, Argentina, March 28-31, 2007. The workshop laid the foundation for a proposal to IDRC for a program on rural development and landuse change that will be administered by the IAI (if approved by IDRC).

The IAI, the US-NSF and SCOPE, held a joint session on "Collaborative Regional Global Environmental Change (GEC) Networks in the Americas Opportunities for Stakeholders and Governance", during the Earth Systems Science Partnership (ESSP) Open Science Conference, held from November 9-12, 2006 in Beijing, China. The session provided a forum for discussing GEC science changes throughout the Americas, focusing on the changing context of GEC science funding and governance; new partnerships required to enhance GEC science relevance within the policy, resource management and education communities; and mechanisms to establish and maintain engagement with diverse stakeholders. Two CRN II projects contributed to the session:

1. Kam-Biu Liu, CRN2050, oral presentation "Stakeholders and GEC Science"
2. Edmo Campos, CRN2076, poster presentation "Global Environmental Change Research and Stakeholders Involvement: An Example in South America".

Details and presentations are available at http://www.iai.int/meetings/scientific/essp.htm

Table 1: IAI – Second round of the Collaborative Research Network – CRN II *(as of 24 May 2007)*

Project #	Title	PI	Countries *(PI country in bold)*	Funding US$
CRN2005	From Landscape to Ecosystem: Across-scales Functioning in Changing Environments (LEAF in Change)	**Sarmiento,** Guillermo	**VEN,** ARG, BRA, CAN, (GER)	497.720
CRN2014	Functional links between aboveground changes and belowground activity with land use in the Americas: Soil biodiversity and food security. Acronym: AMFOODS	**Berbara,** Ricardo Luis Louro	**BRA**, BOL, CAN, CHI, CUB, ECU, MEX, USA	650.000
CRN2015	Functional Biodiversity Effects on Changing Ecosystem Processes and Services and Sustainability: An Interdisciplinary Approach	**Diaz,** Sandra Myrna	**ARG,** BOL, BRA, CR, USA	711.937
CRN2017	South American Emissions, Megacities, and Climate (SAEMC)	**Klenner,** Laura Gallardo	**CHI,** ARG, BRA, COL, PER, USA	633.560
CRN2021	Understanding the human, biophysical and political dimensions of tropical primary and secondary dry forests in the Americas	**Sanchez Azofeifa,** Gerardo Arturo	**CAN,** BRA, CR, CUB, MEX, USA, VEN	1.064.885
CRN2031	Land use change in the Rio de la Plata Basin: Linking biophysical and human factors to predict trends, assess impacts, and support viable land-use strategies for the future.	**Jobbagy,** Esteban	**ARG,** BRA, PAR, URU, USA	924.052
CRN2047	Documenting, understanding and projecting changes in the hydrological cycle in the American Cordillera	**Luckman,** Brian	**CAN,** ARG, BOL, BRA, CHI, MEX, USA	756.000
CRN2048	Tropical cyclones: current characteristics and potential changes under a warmer climate	**De Raga,** Graciela Binimelis	**Mexico,** Costa Rica, Cuba, USA	343.000
CRN2050	Paleotempestology of the Caribbean Region: A Multi-proxy, Multi-site Study of the Spatial and Temporal Variability of Caribbean Hurricane Activity	**Liu,** Kam-Biu	**USA,** CAN, CR, MEX	698.300
CRN2060	Effective Adaptation Strategies and Risk Reduction towards Economic and Climatic Shocks: Lessons from the Coffee Crisis in Mesoamerica	**Castellanos,** Edwin J.	**GUA**, CR, MEX, USA	579.987
CRN2061	Caribbean Coastal Scenarios	**McClain,** Michael	**USA**, CUB, DR, JAM, (PR)	427.426
CRN2076	SACC: An International Consortium for the Study of Oceanic Related Global and Climate Changes in South America.	**Piola,** Alberto	**ARG**, BRA, CHI, URU, USA	814.208

Status of the projects under CRN II

CRN2005, From Landscape to Ecosystem: Across-scales Functioning in Changing Environments (LEAF in Change), PI Guillermo Sarmiento.

The different components (regional scale studies, palynological work and dendrochronology) have been implemented and transects for detailed ecosystem studies have been selected. The data processing and modeling component is in its initial phase. The project is currently involving 2 Post-docs, 9 PhD students, 8 MSc students and 11 undergraduates. Two publications have been accepted for publication.

CRN2014, Functional links between aboveground changes and belowground activity with land use in the Americas: Soil biodiversity and food security. Acronym: AMFOODS, PI Ricardo Berbara.

The study sites have been identified in all participating countries and the characterization of the sites (ecophysiology, soil classification etc.) is ongoing. Work has started on the creation of an AMFOODS website. The increased synergies with CRN2021 have produced very good initial results. The PI attended two TROPI-DRY workshops in Venezuela and Brazil to combine protocols and field work strategies. The project activities are currently involving 6 PhD students, 4 MSc students and 2 undergraduate students. The project has been able to raise additional funds mainly for scholarships: Fulbright Foundation, USA (1 PhD), CNPq and CAPES, Brazil (1 PhD, 2 MSc, 2 research assistants) and ESPE, Ecuador, (funds to include Galapagos Island sites).

CRN2015, Functional Biodiversity Effects on Changing Ecosystem Processes and Services and Sustainability: An Interdisciplinary Approach, PI Sandra Diaz.

The project has hired a post-doc Project Officer (Dr. Fabien Quetier) and consolidated the research teams. A project workshop has been held in La Cumbre, Argentina, March 8-10, 2007 to establish the general conceptual framework, statistical design and measuring protocols. The field sites have been selected in Argentina, Bolivia, Brazil and Costa Rica and site inventories have started. The team organized a post-graduate course, attended by 18 participants from 7 countries, on 'methods in functional diversity assessment' in Cordoba, Argentina, March 12-16, 2007. Social survey work has been initialized in Alaska and first stakeholder interviews have been held in Argentina. The project is currently involving 3 Post-docs, 9 PhD students and 1 MSc student. The project has 3 peer reviewed papers in press, 9 book chapters or other non-periodicals and gave 5 presentations at international events. The project has been submitted for formal endorsement to the Global Land Project (GLP) of the Earth System Science Partnership (ESSP).

CRN2017, South American Emissions, Megacities, and Climate (SAEMC), PI Laura Klenner Gallardo.

The project is based on four topics: a) Mobile and Stationary emissions scenarios estimate and evaluation; b) Dynamical down-scaling of climate change scenarios; c) Pilot implementation of chemical weather forecast network and tools for South American megacities; d) Prospective characterization of aerosols in and downwind from South American megacities. These areas complement each other, and once integrated they establish a key component for Earth System Modeling in the Americas. Significant advances have been made in all areas, including measuring campaigns, modeling work and outreach. Eight (8) students are developing theses work related to various SAEMC research topics.

Along the development of the project, an Information and Technology (IT) research group has emerged. In addition to maintaining the project webpage and facilitating the operation of sophisticated models and platforms, they have optimized the use of available computer facilities and made it possible to interconnect various systems (grid computing). To date these activities have been developed in Chile but they are expected to be coordinated with other research centers soon, particularly in Brazil.

A project website has been established at: http://saemc.cmm.uchile.cl

CRN2021, Understanding the human, biophysical and political dimensions of tropical primary and secondary dry forests in the Americas, PI Arturo Sanchez-Azofeifa.

All project components have started the ecological site characterization and social science work has commenced in Brazil, Costa Rica and Mexico. The social science component in Venezuela will start in project Year 2. A coordination meeting held at Isla Margarita, Venezuela, in July 2006, also produced *The Declaration of Isla Margarita*, a document that emphasizes the importance of research and conservation of tropical dry forests in the Americas, and is a key element for media interactions and outreach activities. On that occasion, all investigators also signed an agreement on the free and open exchange of data.

A book of Tropi-Dry research protocols is being edited by Dr. Jafet Nassar, Dr. Jon Paul Rodríguez, Dr. Mauricio Quesada and Dr. Arturo Sánchez-Azofeifa. This book will be submitted to *Ediciones IVIC* for publication both in English and Spanish (mid 2007). A special issue on the sustainability of tropical dry forests in the Americas has been accepted by the board of editors of the Proceedings of the National Academy of Sciences of the United States (PNAS). This high impact special issue will be published at the end of 2008. A paper entitled "*Land cover change and conservation in the area of influence of the Chamela-Cuixmala Biosphere Reserve, Mexico*" has been submitted to Biological Conservation.

In preparation for the first collection of ecosystem structure and composition, a custom database has been developed that will be used for data storage and quality control. This database can be found at http://tropi-dry.eas.ualberta.ca:8080/database/. The database currently is password protected.

Among the different activities related to regional collaboration the project has developed strong links with the CRN2014, AMFOODS and is building further linkages with two other biodiversity research networks, CRN2005 and CRN2015. The project has been endorsed by DIVERSITAS in February 2007 and is preparing a request for endorsement to the Global Land Project.

CRN2031, Land use change in the Rio de la Plata Basin: Linking biophysical and human factors to predict trends, assess impacts, and support viable land-use strategies for the future. PI Esteban Jobbagy.

All components started their activities in July 2006. A network of existing pilot study areas for detailed landuse characterizations through remote sensing has been expanded from grasslands towards dry and humid forests. The continent-wide analysis of NDVI trends and ecosystem functional types is in progress. The evaluation of land cover impacts on ecosystems and services includes impacts on soil organic matter, effects on fires, afforestation impacts on ecosystem services and hydrological impacts of agricultural expansion in eastern Paraguayan watersheds. The coupled climate-groundwater-landuse dynamics are analyzed in the inner Pampas. The group is also developing a Land Ecosystem Change Utility for South America (Lechu-SA), an internet-based tool allowing a collaborative identification of landuse/function change and giving easy access to long-term series of NDVI. A project website will be launched in May 2007.

The project is currently involving 5 Post-docs and 12 graduate students.

CRN2047, Documenting, understanding and projecting changes in the hydrological cycle in the American Cordillera, PI Brian Luckman

The project experienced some delays with the establishment of agreements with Co-PI institutions (Bolivia until Jan 2007), but all components have now started their activities. An initial science meeting was held April 2-3, 2007 back-to-back with the CONCORD (Climate Change: Organizing the Science for the American Cordillera) meeting, April 4-6, 2007 in Mendoza, Argentina. The meeting was also attended by the working group on snow and ice of the IHP-LAC UNESCO (UNESCO International Hydrological Program, Latin America & Caribbean) and some biosphere managers on the American Cordilleran transect. The meeting provided an excellent platform to publicize CRN activities and develop collaborative links. Each country component has specific tasks and a number of field campaigns have been carried out and produced new sets of tree-ring chronologies. The Argentinean group has compiled data on precipitation variations, streamflow and floods for several provinces and river basins for the past four centuries. In Canada field investigations involved the updating and re-sampling of tree-ring sties in Alberta for the reconstruction of streamflow of the St. Mary's River, flowing into the Canadian Prairies. The Mexican component held a dendrochronological training course December 3-8, 2006 at the Laboratorio Nacional de Dendrocronologia, INIFAP, Mexico, involving 20 participants. The project is currently involving 2 PhD students, 3 graduate students and 5 undergraduate students.

CRN2048, Tropical cyclones: current characteristics and potential changes under a warmer climate, PI Graciela Binimelis De Raga.

The project experienced some delays in the finalization of the grant agreement with IAI and Co-PIs, extending until late 2006. A new collaboration was established with Dr. O. Sanchez, who is part of the research network of the Instituto Politécnico Nacional Mexico. He will contribute to the analysis of ocean satellite data. Preliminary results on the analysis of sea surface height anomalies in the research area in the East Pacific indicate that high anomalies in SSH can be associated with warmer temperatures in the oceanic mixed layer. The high anomaly observed from February to May is replaced by a low anomaly that peaks in amplitude in November. This reversal in the sign of the anomaly appears to be related to the propagation of Kelvin coastal waves northward from the Equator that become unstable in the region of the Gulf of Tehuantepec.

A second project goal is to determine (from observations and modeling results) the key dynamical mechanisms leading to the intensification of tropical cyclones and their decay. The study attempts to estimate the evolution of the balance between the time rate of change of absolute circulation of a cyclone, the convergence of absolute vorticity and friction. The group uses FNL data and GFS model runs (both from NCEP) in order to analyze the relative importance of each term in the development and intensification of the storms. A series of runs with the global model GFS were performed to evaluate the vertical structure of the drag force and determine the range of validity of the bulk formula to estimate the friction term.

Two PhD students are currently involved in the project. Both will present their results at the AGU Spring meeting, May 21-25, 2007, Acapulco, Mexico.

CRN 2050, Paleotempestology of the Caribbean Region: A Multi-proxy, Multi-site Study of the Spatial and Temporal Variability of Caribbean Hurricane Activity, PI Kam-Biu Liu.

The project activities started late due to complications in contract negotiations between the IAI and

LSU. Still, considerable progress is been made in laying the groundwork for project activities. Several project Co-PIs in the U.S. and Canada are actively planning fieldwork in the Caribbean region to be undertaken in summer and/or fall 2007. Local coordination meetings have been held among Co-PIs in Central America, and in Costa Rica preparation has been made for hiring undergraduate and graduate students for building the historic regional hurricane impacts database. At LSU a project website is being designed and is expected to be online in the first half of 2007. Data collection has started as a necessary step towards building a socio-economic database for the Caribbean region, which is vital for the development of a GIS on societal vulnerability for the region. Contact has been made with scientists in Nicaragua and Honduras in preparation for new paleotempestological fieldwork in these countries in the future.

On behalf of the IAI Directorate, in February 2007, the PI attended the United Nations Framework Convention on Climate Change (UNFCCC) expert meeting in Jamaica, which focused on the theme of vulnerability assessment and adaptation strategies for small island developing states (SIDS). His presentation on behalf of the IAI and CRN2050 underscored the need for a long-term perspective and accurate scientific information in hurricane risk assessment and vulnerability reduction for the Caribbean region, hence the importance of paleotempestology research. Professional contacts were made with decision makers and researchers from Caribbean nations

CRN2060, Effective Adaptation Strategies and Risk Reduction towards Economic and Climatic Shocks: Lessons from the Coffee Crisis in Mesoamerica, PI Edwin Castellanos

Fieldwork teams from Mexico, Guatemala, Honduras and Costa Rica, have selected eleven study areas. Criteria such as ethnicity, size of their landholdings, altitude of their lands, and length of time that coffee has been produced for the market, were chosen to capture a wide range of perspectives on the impacts of global changes and adaptation strategies being used in order to cope with the associated risks.

Each country team has generated data through semi-structured interviews, participant and non-participant observation, and by reviewing archival evidence. Interviews have been conducted with coffee growers, non-governmental organizations, government authorities, technical staff of coffee cooperatives, and researchers, among others. The teams have also collected records, reports and other documents related to national laws, coffee production and markets, climate, development programs, and organizations working with coffee producers. Data generated through interviews and participant observation have been either transcribed or summarized into digital archives. The data generated to date suggest farmers' livelihoods in all the areas have been impacted at different scales by fluctuation of prices, climatic events, and presence of pests/diseases. Impacts may vary according to the size of the farm (production), the altitude, and the level of organization. While generating the data, several common goals have been identified between CRN2060 and a CATIE (Costa Rica) project focusing on livelihood strategies for coffee growers. A collaboration has been established to enhance the database generated in the Mesoamerica region. CATIE is mainly working in Honduras and Nicaragua and it is planned to share methodologies and discuss results jointly.

A brochure has been printed to promote the project among stakeholders in the four countries.

CRN2061, Caribbean Coastal Scenarios, PI Michael McClain.

The project has renewed its partnership with the UNESCO International Hydrology Program (IHP). The PI met with the UNESCO Regional Hydrologist for Latina America and the Caribbean, Maria Donoso, and discussed the engagement of UNESCO-IHP National Committees from each

participating country in the CCS Project. These include the national committees of the Dominican Republic, and Jamaica.

Science activities for year 1 involved compiling regional-scale data required for the modeling activities and developing a working version of the model for each island. A first version of the model is being developed in Miami and will be transferred to university partners on the islands at the beginning of year 2. The model will not be calibrated but will provide a working template for further refinement, calibration, and verification in collaboration with local partners. The compilation of existing regional geospatial datasets has been completed. In total 477 data layers have been compiled. Data compiled thus far have been organized into an island-specific geospatial database. Data layers were clipped to island extents and projected in a common projection for overlaying. Metadata are being created. To-date, 344 metadata parsable XML records have been created, 151 of which have been quality-controlled and are ready for distribution via the project web portal. XML records for all 477 layers will eventually be made available through the portal. This product of the project will become a valuable resource for other researchers interested in the region. It remains to be linked to the IAI DIS. The stored data have been processed to produce the basic input data files required by the model we are using (SWAT).

CRN2076, SACC: An International Consortium for the Study of Oceanic Related Global and Climate Changes in South America

Two regional modeling efforts are being conducted. A ROMS application, carried out at IO-USP (Brazil), is devoted to understand the role of mesoscale and sub-mesoscale in mode water formation in the Brazil/Malvinas. A second modeling activity carried out during the past year at Oregon State University (USA) and Universidad del Sur (Argentina) is aimed at characterizing the circulation over the southwestern Atlantic shelf, and to investigate the mechanisms that lead to shelfbreak upwelling and the development of the shelfbreak front. A highly realistic simulation used the Princeton Ocean Model nested within the Parallel Ocean Circulation Model. To investigate the dynamical mechanisms that lead to shelfbreak upwelling and the formation of the Patagonia shelfbreak front, a highly idealized model set-up was used. A new mechanism for the generation of shelfbreak upwelling that depends on the downstream spreading of a cyclonic boundary current (e.g., the Malvinas Current) is being proposed. These results have been submitted for publication.

In September 2006 a high resolution biological, physical and geological survey was conducted across the eastern mouth of the Strait of Magellan. The activities took advantage of a winter cruise sponsored by a GEF project. The survey, carried out on board *R/V PUERTO DESEADO*, provides the first set of multidisciplinary high-resolution data of the waters flowing from the southeast Pacific into the rich southern Patagonian shelf, a process which shapes the thermohaline properties and influences the distribution of several species, from zooplankton to commercial fish. In early February 2007 an additional research cruise was carried out in southern Brazil off Cape Santa Marta Grande, and the Albardão frontal system. The survey, carried out by FURG on *R/V ATLANTICO SUL,* employed state of the art biological sampling gear to capture the three-dimensional structure of plankton distribution to determine the physical mechanisms that control biological processes in highly productive regions of the western South Atlantic. The survey also included a low resolution along-shelf section.

The project is currently involving 2 Post-docs, 5 PhD students, 2 MSc students and 1 undergraduate student.

In response to IAI Directorate's request to develop greater policy relevance and improve the communication tools with stakeholders the project has included a new component *"Advance*

integrated fishery and oceanographic information system, BioMare", with additional funds from IAI.