

RAINFOR People

Luzmila Arroyo Padilla (*Chiqui*)

Museo de Historia Natural
Noel Kempff Mercado
/Missouri Botanical Garden,
Santa Cruz - Bolivia



When did you join RAINFOR?

I joined the RAINFOR group in 2001, re-measuring the plots in the Parque Nacional Noel Kempff Mercado.

Which are your main research interests?

I am interested in ecology, but I have also been working with floristics. My interest in the latter is due to the fact that we have lots of forested areas, but we don't have enough knowledge of their florist composition and structure.

Are you involved in any projects at the moment?

Currently I am the Assistant to the Director of the Missouri Program, in Bolivia; an associate researcher at the Museo de Historia Natural Noel Kempff Mercado; and the Field Coordinator in Bolivia for the RAINFOR Project. I am dedicating much of my time to training of others in conservation and ecology, both in the field and in my teaching.



It has been a few months since our last Newsletter and we have lots of interesting news to share with you about what has been happening within the network!

We invite you to visit <http://www.geog.leeds.ac.uk/projects/rainfor/> for regular news updates.

- **Forest Plots.net** - If you haven't visited Forest Plots (www.ForestPlots.Net) recently, we encourage you to do so. Once you have your login/password combination you can explore the website in more detail. This project is associated with RAINFOR, and provides a web-accessible secure repository for the whole network's forest inventories, of which there are currently over 234 plots, plus hundreds more from across the tropics. Plot owners can safely store, manage, and analyse their data here.
- Read up on the **Field Campaigns** the RAINFOR people have been involved in across Amazonia, on the RAINFOR website: http://www.geog.leeds.ac.uk/projects/rainfor/pages/campaigns_eng.html

Recent fieldtrips include Brazil, Bolivia, Ecuador and Peru!



Iquitos, Peru
(2011)



Team – Acre, Brazil
(2011)



Ecuador
(2011)



Team - Madre Dios, Peru
(2011)

In Memoriam of Sandra Patiño

We bring the unhappy news from Colombia that Sandra Patiño, wonderful friend and colleague to many, passed away recently.

Below are some moving pieces from colleagues.

“Sandra,

Imagine that you are completing a long day of fieldwork measuring a forest plot somewhere in the Amazon. It's a new site and the boots you bought a few days earlier are feeling particularly uncomfortable at the end of the day. Trudging back to the camp, you find several others of your new colleagues and friends are feeling the same, and when you take off your boots you notice the size is just a bit smaller than the boots you remember buying. Strangely, others find the same; someone, it seems, had swapped around the almost-identical black rubber boots that we had left outside the previous night. The explanation dawns.....”Saaandra!!” Sandra would smile innocently – “Oh dear.....really???” And the group would dissolve into laughter and exhausted smiles. Sandra's infectious sense of humour, her practical jokes, but above all her compassion for those she encountered made her a remarkable friend and colleague. We shared fieldwork in Ecuador, Brazil and Peru, time in Jena, Germany, and in 'Casa RAINFOR' in Leeds. During fieldtrips, her ability to unite a disparate group of people through kindness and laughter were incomparable: they were good times, for all those touched by them.

Sandra's unique qualities inspired others throughout her career working with research groups around the world, and it is remarkable to reflect on the happy memories that she has bequeathed to so many of us. Her friendship uniquely linked so many people in so many different places.

Sandra had an independent approach to her life and science: she always questioned the received understanding about a certain set of results and the way in which the scientific world works. She made you think harder and in novel ways about tropical forests. But Sandra also dared to dream far beyond the boundaries that constrain most of us and encouraged us to wonder what may lie beyond the stars of a warm tropical night.

Tim”



“Sandra, as well as being an original ecophysiological and ecologist, contributed enormously to the Rainfor project since the beginning more than 10 years ago. This was part of much too short a career that took her to dozens of locations across the Amazon, and earlier to Borneo in her doctoral research with John Grace.

Sandra also had a truly unique sense of fun and a very special way of looking at the world and life's ups and downs. She will be missed enormously.

Oliver”

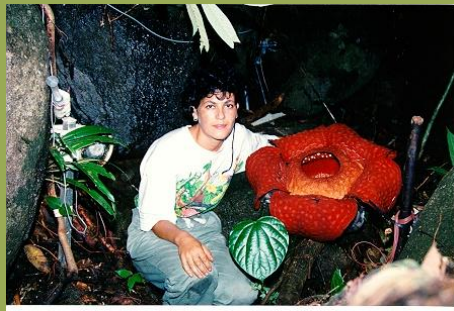
Attached to this Newsletter is also a heartfelt presentation prepared by our Colombian colleagues for the “VI Congreso Colombiano de Botánica”, in Cali, in August.

In Memoriam of Sandra Patiño

And finally a photo album from our colleague Kuo-Jung Chao, entitled: “Our beloved friend Sandra Patiño”.



Sandra always had a lot of tricks!



Sandra's PhD in Borneo



She was a fun loving person



And was really friendly to everyone



Hard working in the field



Even in the hotel!



But she never forgot to have fun!



We will never forget her big smile...



Fieldwork in Acre



Botanical samples
(Acre, Brazil)



Acre Workshop Participants

- **May 2011:**

- The University of Leeds signed a Research Agreement with **La Comunidad de Monte Grande** (Bolivia), with the objective to monitor woody plants in the permanent plots previously established by local researchers in the forest managed by this community in Bolivia. As well as contributing to the **Forest Plots.net** database, and involving local researchers when possible in new fieldtrips and training courses.
- The RAINFOR website includes an updated Google map on the [field sites page](#) where all the RAINFOR plots established so far have been pinned to make it easier for visitors to visualise the geographical context of all our work across the Amazon basin. This has been upgraded, so that clicking on each location provides additional key information (geographical coordinates, census dates, and plot investigators).
- **RAINFOR Facebook Page** [Page](#) has been created as an alternative communication tool. It will be a location in which formal and informal announcements can be made and information shared among participants. We invite you to click "Like" on our page!
- An updated version of the **Coarse Woody Debris Protocol** is now available to download in English, Spanish and Portuguese from the RAINFOR website: http://www.geog.leeds.ac.uk/projects/rainfor/pages/manuals_eng.html
- Also available to download from the same page, in all 3 languages, is the **Intensive Soil Sampling Protocol Manual**.

- **June 2011:**

- The University of Leeds signed a Research Agreement with the **Servicio Nacional de Áreas Naturales Protegidas** (SERNANP) (Peru), with the objective of collaborating in completing the installation of permanent plots in the Reserva Comunal el Sira, Eastern Peru, initiated by the project "Biodiversidad y cambio climático en la Reserva Comunal el Sira", supported by the GDZ (German Aid Agency), in Peru.
- **Acre Field Campaign** - **Ted Feldpausch** returned from a one month expedition to south-western Amazonia, Acre, Brazil in a first step under the new 'urgency' RAINFOR-Moore grant (**Oliver Phillips, Jon Lloyd**) to determine how trees respond to drought, especially the 2010 'drought of the century,' - the second major Amazonian drought in only five years. Subsequent work at focal field sites will evaluate tree response across Amazonia. Read more about the fieldtrip [here](#)
- **Ted Feldpausch** (Univ Leeds, UK), **Carlos Quesada** (INPA, Brasil), **Marcos Silveira** (UFAC, Brasil), **Chris Doughty** (Oxford, UK), **Flavia Costa** (PPBio, INPA, Brasil) and **Cleber Salimon** (UFAC) led a RAINFOR-Moore sponsored workshop in Rio Branco, Acre, Brasil. The workshop, "**Environmental science in Amazonia: RAINFOR as a catalyst to integrate projects under a regional network, analyse data and develop manuscripts**" was hosted at the *Escola da Floresta*, and taught methods in data analysis and manuscript development. The 1-week workshop brought together 26 RAINFOR students, field technicians and collaborators from Brazil, Venezuela, Colombia, Peru and Bolivia and six instructors from Brazil and the UK and provided an opportunity to learn new techniques, meet RAINFOR collaborators from other regions, and share ideas and results. Each student presented his/her results during the workshop and developed an outline and preliminary analysis for a manuscript. **Foster Brown** provided a mid-week guest lecture. Many thanks go to **Marcos Silveira** and students from his laboratory who provided excellent support in organising the workshop and hosted a warm welcome dinner to the students and professors at a local ranch.



Fieldwork in Ecuador



Fieldwork
(Madre de Dios, Peru)



- **July 2011:**

- **Research Exchange** – Dr. Beatriz Marimon, Dr. Ben Hur Marimon and their student Claudinei dos Santos (UNEMAT, Mato Grosso, Brazil) visited the University of Leeds from July-Sep for research exchange and ForestPlots.net database training.

- **RAINFOR News** – "*Forests absorb one-third of global fossil fuel emissions*". Click [here](#) to download the article.

- **July – August 2011 - Ecuador Fieldtrip**

After only one year, the RAINFOR team formed by Abel Monteagudo, Victor Chama, Antonio Peña (Peruvians), Julia Salvador, Roberto Raza, Noemí Muquis and Juan Pablo Santos (Ecuadorians) remeasured eight permanent plots in rainy tropical forests in Ecuador. In addition to remeasuring the 4 plots in the protected area of Jatun Sacha, these were also completely retagged. After completing this first phase the team moved to the city of Coca for a short break. From Coca the team went via foot and also crossed the Napo River to reach the Yasuni Research Station, to remeasure and retag the two 1 km long and 10 meters wide plots, with the collaboration of Bolivar Enemenga, native of the surrounding native communities. Then for two days we remeasured the permanent plot which was seasonally flooded (lowland). After this phase, the team moved to via boat to the Biodiversity Station of Tiputini to remeasure and retag the two plots there: one near the station which due to the increase of water levels in the Tiputini river caused by heavy rains was completely flooded, despite this situation the team was able to complete the remeasurement; the other plot located almost 40 minutes by foot, was remeasured without any problems. The eight Ecuadorian plots were successfully remeasured and retagged, and the few recruits collected from 2010 to 2011 were registered and recorded. It is worth mentioning that in this campaign two Ecuadorian colleagues were involved in the campaign from start to finish.

- The Moore Foundation RAINFOR grant supports the publication of this new book entitled **Bosques de Venezuela (Un homenaje a J. P. Veillon) (Ed. Esp.) No. 10** (2011). The publication has 335 pages, for which 55 authors from 18 institutions collaborated. It can be downloaded [here](#)

- **August 2011:**

- The RAINFOR field code sheets are now available to download from the RAINFOR website, also in **Malay**:

http://www.geog.leeds.ac.uk/projects/rainfor/pages/manuals_eng.html

- **Claudinei dos Santos** was featured in a full page story in the Mato Grosso State University paper about his work with RAINFOR. PDF version is attached to this Newsletter.

- **August - September 2011 – Madre de Dios (Peru) Fieldtrip**

The recent RAINFOR permanent plots remeasurement campaign took place between the months of August and September 2011. For about seven weeks a team formed by Abel Monteagudo, Victor Chama, Nadir Pallqui, Amador Pfuro, Ítalo Treviño, Yuri Huillca and Antonio Peña, firstly travelled from the city of Puerto Maldonado, via the Tambopata River, settling in the Explorer's Inn, in the Tambopata National Reserve. They proceeded to remeasure 8 permanent plots in different forest types, and besides recording diameter measurements they also recorded, for each living individual, additional information relating to the position of crown and liana infestation. The new permanent plot TAM-09 installed in 2010 was remeasured, and parallel to this the team also identified botanical specimens in the field, with the aid of binoculars, and proceeded to collect some samples for later identification. Close to the new plot is the recently completed Tower (43m high) which had lots of new equipment for measuring and monitoring gas fluxes, etc. Culminating this first part the team returned to the city of Puerto Maldonado for a short break. The team, now without Victor and Nadir, travelled by boat up the Madre de Dios River for about two hours to the casa ITA of the Inkaterra Ecological Reserve to remeasure 4 plots of 500m in length by 20 metres wide. In little more than a week the task was completed.

- **August - September 2011 – Madre de Dios (Peru) Fieldtrip** (cont.)

In summary, the 12 permanent plots in the region of Madre de Dios were satisfactorily completed, including the collection of recruits which could not be identified in terms of species in the field. These collections are being dried for later identification, assembly and deposit in the herbarium of HOXA in the province of Oxapampa, in the Central Jungle of Peru and the Herbarium CUZ of the Universidad Nacional de San Antonio Abad del Cusco.



Fieldwork
(Madre de Dios, Peru)



San Martín de Amacayacu

• **September 2011**

- **Claudia Pandolfo Paz**, the first Moore Fellow for the INPA project, has just concluded her master's degree. Claudia defended her thesis entitled "Distribution of soil organic carbon fractions in pristine forests in the Amazon Basin: the role of soil properties, leaf litter quality and climate", on the 16th Sep, and was unanimously accepted for the PhD in Ecology program at INPA. Claudia was supervised by Dr. Regina Luizão and Dr. Beto Quesada.
- The Museo Paraense Emilio Goeldi kindly sent us a copy of a tribute article entitled "**O amazônida Samuel Soares de Almeida (1958-2011)**". The PDF can be downloaded from this page: http://www.geog.leeds.ac.uk/projects/rainfor/pages/publications_eng.html
- We welcome **Georgia Pickavance** and **Sophie Fauset**, who have joined us at the University of Leeds, as Database Assistants working on the ForestPlots database and RAINFOR plot map.

• **October 2011**

- **May 2010 - October 2011 – Madre de Dios (Peru) Fieldtrip**

Rosa Goodman and crew have weighed 52 trees and 95 palms in Madre Dios, Peru, as part of a two-year field campaign to improve biomass estimates in this region.

- **Carlos Alberto Quesada** (Beto) gave an interview to National Geographic Brazil about the work he has done with the RAINFOR Project: <http://viajeaquil.abril.com.br/materias/reserva-de-carbono?pw=1>
- **Amacayacu News (Colombia)** – update from Adriana Prieto C.

Spatial and temporal variation of the floristic composition, growth and turnover in terra firme forests in the Colombian Amazon

In 1991 intensive botanical fieldwork began which allowed the identification of plant species of PNN Amacayacu and culminated in the publication of the Amacayacu National Natural Park's Flórua, which contains detailed information about the species in simple language and with corresponding illustrations.

Since 1991, four plots of one hectare each (20 metres x 500 metres) have been established, in southern Colombia in the Amacayacu National Natural Park; two near the mouth of the creek water Agua Pudre in the river Amacayacu (south sector); and two near the mouth of the creek Lorena in the river Cotuhé (northern sector), to study the diversity and local distribution of tree species. This project was undertaken with the support of the indigenous communities of Mocagua, Macedonia, El Vergel, Palmeras, San Martín de Amacayacu, Caña Brava, Pupuña and Buenos Aires, who offered their hospitality and valuable assistance during the field phase.

- **Amacayacu News (Colombia) (cont.)**



**Agustín Rudas LL.
and Adriana Prieto C.**
(Universidad Nacional de Colombia)



★ Parcelas permanentes

AGP= Agua Pudre; LOR= Lorena

Climate changes may affect forests growth, biomass, and mortality; it is important to remeasure trees in each plot to study how they have changed since 1992 when they were first inventoried. Re-censuses with RAINFOR support have been completed by different teams from the Universidad Nacional de Colombia (campuses in Bogota and in Leticia), and the Humboldt Institute, in 2004, 2005, and 2006. A further complete re-measurement will be made in October and November this year by graduate students from the Instituto de Ciencias Naturales de la Universidad Nacional, the indigenous community of San Martín, and Park officials.



Fieldwork in Bolivia



- We are delighted to announce that the call for submission of titles and abstracts for the forthcoming special issue in the ***Plant Ecology and Diversity on 'Ecosystem Dynamics of Amazonian Forests'*** has been a resounding success! We have received approximately 40 abstracts thus far, most of which are for studies being led by South American researchers. Abstracts have been received for proposed submissions on several important aspects of ecosystem dynamics of Amazonian forests, including: carbon allocation, biomass dynamics, tree mortality processes, litter fall dynamics, nitrogen cycling and soil respiration. The Guest Editors for the Special Issue will be Yadvinder Malhi, David Galbraith, Luiz Aragão and Tim Baker and the **deadline for paper submission is January 31, 2012**. We look forward to receiving the submitted manuscripts!
- The intensive carbon cycling group of the RAINFOR network has had a successful year! We have completed close to 2.5 years of data collection and are approaching the end of the project. It is now time for the Moore fellows to start to analyze and write up the results. We have started this process during the data analysis conference in Acre, Brazil, where we analyzed the data collected over the previous few years. There were many interesting and novel findings that we will soon publish. In order to publish our results, we have organized a special issue in Plant Ecology and Diversity. We have encouraged each of the Moore fellows to write up their results for this special issue. PDRA researcher Chris Doughty will help with this process because most of the Moore Fellows do not have much writing experience or English fluency. We therefore are writing the papers together using an online editor (Google documents) which allows interactive writing among several people on different continents at the same time. We hope that this writing method could serve as a model for interactive paper writing between researchers in the UK and scientists in tropical countries. Articles will be submitted at the end of January and will be available to the global research community next year.
- **Bolivia Field Campaign** – Roel Brienen returned from a fieldtrip to Bolivia to remeasure seven permanent plots in the Bolivian Amazon, and to do some preliminary tree ring sampling. He also visited the Universidad Mayor San Andres in La Paz, and gave a talk at the Instituto Boliviano de Investigacion Forestal (IBIF), in Santa Cruz. To read more about this fieldtrip, click [here](#)

- July - October 2011 – JACARE Fieldtrip (Peru)

The months July to October saw the start of a major collaboration between RAINFOR and the Global Ecology Group at the Carnegie Institute, led by Greg Asner. The aim of the project (named JACARE, the Joint Amazon Carnegie RAINFOR Expedition) is to link forest canopy chemistry, physiology, composition and function with over flights of the Carnegie Airborne Observatory (CAO). The CAO collects lead-technology data on the structure and composition of the forest canopy using lidar and hyperspectral lasers, so that the chemistry and structure of individual canopy trees can be mapped. There is potential that within a few years we may be able to map tropical forest structure. Chemistry, composition and ecosystem function at landscape level. This may also allow detection and mapping of signals from drought, such as occurred in 2010.

Coupled to over flights was a major field data collection conducted by Carnegie and RAINFOR teams over several RAINFOR sites in Peru, including Tambopata, Cusco Amazonico, the Andean transect and Allpahuayo, Jenaro Herrera and Sucusari, with a particular focus on RAINFOR intensive sites. Overall 1900 canopy trees were sampled for canopy chemistry and leaf and wood anatomy, and a large fraction of these were also sampled for leaf gas exchange properties. The exciting but challenging fieldwork lasted 85 days, and the vast dataset collected will require many more months and years of analysis and interpretation. Field work was supported and conducted by participants from UNSAAC (Cusco), PUCP (Lima), INPA (Manaus, Brazil), USP (Sao Paulo, Brazil), Carnegie (Stanford, USA), ANU (Canberra, Australia), JCU (Cairns, Australia) and the UK Universities of Oxford, Leeds and Edinburgh. The whole mission was supported by the Gordon and Betty Moore Foundation.

A beautiful slideshow of the JACARE expedition can be seen at:

<http://vimeo.com/envirofoto/review/30781944/cde0276131>



Photo credited to Jake Bryant/Envirophoto



AMAZONICA NEWS

- **29-30th June 2011** – The School of Geography (University of Leeds) hosted the **AMAZONICA/MOORE/TROBIT** combined annual project meeting, with around 30 participants from around the UK and beyond focussing on the carbon balance of the Amazon region. **Manuel Gloor** and **Oliver Phillips** coordinated the meetings. Many thanks to Joana Ricardo and Samantha Bowman for their valued behind-the-scenes help, and to everyone in our postgraduate and research community for their enthusiastic involvement.

Riverine Carbon – Contribution by Leena Vihermaa (Glasgow University)

Tambopata February - April 2011 Fieldtrip

The first long term field campaign at the Tambopata site was carried out in spring 2011. Sampling points were established in two small streams at the site and in La Torre and Tambopata rivers. During the 3 months campaign, samples for dissolved inorganic carbon (DIC) analysis were collected from these streams and rivers, targeting the hydrological variability. This meant regular night time sampling during the rain events in order to track the changes in water level. Less frequently dissolved organic carbon (DOC) samples were also collected. These samples were filtered on field and the filter paper used to quantify the particulate organic carbon (POC).

A floating chamber connected to an IRGA was used to measure CO₂ fluxes from these water bodies directly on field. DIC analysis using the headspace method yields both $\delta^{13}\text{C}$ and total CO₂ concentration data. Using the water chemistry data, potential for out gassing is calculated. The field CO₂ fluxes provide a point of comparison for these calculated flux estimates. Furthermore, at these sampling points water chemistry variables such as pH, conductivity and dissolved oxygen were monitored at high resolution. Also the water temperature and atmospheric pressure were logged. The small streams were gauged with pressure sensors, the cross sections measured and the relationship between stage height and flow velocity assessed to allow calculating discharge.

Discharge data are required to calculate carbon budgets in the streams. In addition to speciating the DIC pool for the potential out gassing, the water chemistry data can be used to model carbon concentrations out with the sample collection periods as these data loggers were left in-situ to collect data.

The results of this field campaign yielded information on the wet season carbon fluxes. The next field campaign will start in early September and last until mid-December 2011. The aim of the upcoming trip is to sample the end of the dry season as well as to catch the interesting transition period from dry to wet when the small stream that have been dry fill with water.

- August 2011

Contribution by Tomas Domingues (Universidade de S. Paulo)

Last August, the new 43 metres tower at the Explorer's Inn, Tambopata (The SAGES-RAMIRO tower) became fully operational and is constantly monitoring the exchange of Carbon, water and energy between the atmosphere and the forest. By taking readings 10 times each second (10Hz), it will enable calculations of how much Carbon is being taken from the air by leaves through photosynthesis and how much is being respired back to the atmosphere. Also, pioneering measurements of flux of methane gas (CH₄) will not only help constrain the annual carbon budget of that tropical vegetation, but will also provide invaluable information on the influence of seasonality over the processes governing the decomposition of organic matter.



Leena Taking DOC sample



Leena's Lab



Flux Tower – Tambopata, Peru

Report of Activities from the University of Edinburgh

Principal Investigator Professor John Grace

Other researchers: Anitra Fraser and Sigrid Dengel (Edinburgh) and Humberto da Rocha, Gabriel Brito Costa, Helber Custodio de Freitas, Eduardo Gomes Lopes, Anatalio Batista, Emilia Brasilio, Tomas Domingues (São Paulo)

Acquisition of instrumentation, commissioning and calibration.

The aim in this project is to measure simultaneously the fluxes of CO₂, CH₄, H₂O and heat over examples of S. American vegetation. In Brazil, the field site selected is the flooded forest area near Bananal Island, next to the Rio Araguaia. The first half of the work was in the UK. The instrumentation to measure CH₄ fluxes is only just emerging, and it was necessary to work with the companies that supply the fast methane analysers before the equipment could be shipped to Brazil. The instruments of choice were

Li-Cor CO₂ analyser, 7200
Li-Cor CH₄ analyser, 7700
Los Gatos fast CH₄ analyser

After testing the instruments in the laboratory we ran a demonstration experiment at a site in Scotland in 2010. We chose a sheep pasture, as we could be sure that there would be a significant and more or less known flux of methane. This work is about to be published in *Global Change Biology*.

The same instrumentation was shipped to Brazil, and after a number of tests in São Paulo, it was set up at a site next to the River Araguaia.

River Araguaia campaign (Feb-March 2011)

Set up

The instrumentation was established on the edge of the river. The rationale was: one half of winds come from river, the other half from *varzea* (seasonally inundated woodland), and so for only one station it will be possible to measure fluxes from two different sorts of land cover.

Methane

Methane concentrations were between 1.8 and 2.1 parts per million (ppm), with a pronounced variation between day and night. At night the concentrations were higher and more variable. Overall, the fluxes indicated that both land covers are a source of methane to the atmosphere. Methane fluxes by day were up to 25 nmol m⁻² s⁻¹. At night they were lower, only a few nmol m⁻² s⁻¹. There were a few instances where the system was behaving as a sink, and then it was only a small sink. We have compared the results with other studies (ours is the first study of methane fluxes from *varzea* as far as we know). The fluxes we observed were not as high as agricultural systems in Europe, but comparable to wetlands elsewhere. We presume that the methane comes from flooded patches of forest, and from biological processes in the river. The fluxes need careful consideration in the light of the climatology of the site, and the complexity of the local patterns of air movement.

Carbon dioxide

The carbon dioxide concentrations varied between 370-380 ppm by day to 400-440 ppm by night. This pattern has been observed by others, and can be explained by the nocturnal respiration of micro-organisms at night and the photosynthesis of green plants during the day. At night, the meteorology is often stable and so the carbon dioxide accumulates. The fluxes of carbon dioxide show an overall carbon sink of the *varzea*: the woodland absorbs about 15 μmol CO₂ m⁻² s⁻¹ by day and gives off around 5 μmol CO₂ m⁻² s⁻¹ by night. There is therefore an excess of photosynthesis over respiration, as has been found by several other studies of forest in Brazil. The river surface shows a slight diurnal trend, but overall it is a weak source of CO₂ the respiration being slightly offset by aquatic photosynthesis by day.

Conclusions of this campaign

The campaign established the feasibility of the methodology and provided some valuable first results which will make an early paper for submission to a journal. It gives us the first estimate of the methane and carbon dioxide fluxes for a *varzea* system, though we do expect to see considerable season variation.

Report of Activities from the University of Edinburgh (cont.)

Parallel work in Peru

Parallel work in Peru is in progress. A 43m tower was established near the river Tambopata and in September 2011 we will begin to set up the instrumentation, building on the expertise and experience developed in Brazil.

Plans for the coming year

In the coming year we will endeavour to carry out new work in Brazil, extending the riverside measurements to obtain a seasonal picture. We plan to run the equipment on a nearby tower already established by Humberto da Rocha and others. The logistics for this type of measurement are most challenging, as the tower is immersed in water, and we need to make a site visit to decide on the best way to proceed. We also need to collaborate closely on our first paper. This will be submitted to a high profile journal (as it is the first measurement of methane from whole-ecosystem varzea). The data set is rather small however, and we do need to make progress to reduce the uncertainty on the flux estimates. These fluxes will be compared to those obtained by others in Amazonica using aircraft measurements and those derived from satellite observations by Palmer and colleagues in Edinburgh. A top priority for the coming year is however to establish the flux measurements in Peru, through collaboration between Edinburgh, Sao Paulo and the Catholic University of Lima. Another priority is to prepare a review chapter on the terrestrial fluxes for a forthcoming synthesis of the Large Scale Biosphere-Atmosphere Processes in Amazonia.

• October 2011

Professor John Grace was interviewed by Neo, a journal of the Catholic University of Peru. The full article about our work in Peru can be found attached to this Newsletter.

Below are 2 slides that illustrate the tower, in Peru.

New flux tower in Peru for CO₂ and CH₄

- Pristine forest
- On soil of high fertility
- First in Peru

Conociendo la Reserva

CON UNA EXTENSIÓN DE 274.690 HECTÁREAS DE SELVA PLUVIAL, LA RESERVA NACIONAL DE TAMBOPATA SE ENCUENTRA UNIDA EN EL DESEMPEÑO DE ALGUNAS DE LAS MEJORES CONDICIONES PARA REALIZAR INVESTIGACIONES SOBRE EL BIOMASA DE BIOMASA.

Torre Ramiro Chacón - SAGES

Terreno de 40.5 metros de altura, torres de concreto de 6 metros de altura.

EQUIPO INSTALADO:

- Un conjunto de 3 puentes sobreelevados y torres.
- 4 analizadores de metano (LI7700) (1 CO2 Bioscience)
- Análisis de flujo de carbono (LI7700) (1 CO2 Bioscience)
- Sensor de flujo de calor (LI7700) (1 CO2 Bioscience)
- Sensor de radiación infrarroja (LI7700) (1 CO2 Bioscience)
- Sensor de temperatura/humedad (MPH59C)
- Sensor de velocidad del viento (MPH59C)
- Regulador y estabilizador de voltaje (LI7700) (1 CO2 Bioscience)
- Alimentador de batería (Campbell Scientific)
- Radiómetro (MFR3) (Campbell Scientific)

EN SU CONSTRUCCIÓN:

- 1 CO2 Bioscience
- Alimentador de batería (Campbell Scientific)
- Radiómetro (MFR3) (Campbell Scientific)

Administración

Los componentes de investigación, monitoreo biológico, y servicios de capacitación al personal nacional e internacional se encuentran en la reserva nacional de Tambopata, como parte de un contrato de administración con la empresa Pajalán S.A.S.

103 hectáreas de reserva nacional de Tambopata, 103 hectáreas de reserva nacional de Tambopata, 103 hectáreas de reserva nacional de Tambopata, 103 hectáreas de reserva nacional de Tambopata.

10,982 hectáreas de reserva nacional de Tambopata, 10,982 hectáreas de reserva nacional de Tambopata, 10,982 hectáreas de reserva nacional de Tambopata, 10,982 hectáreas de reserva nacional de Tambopata.

Neo 3, October 2011

Tambopata tower, Peru. Flux sensors installed September 2011

Li-7700 methane sensor

Campbell CSat3 sonic anemometer

Li-7200 CO₂/H₂O sensor

7 m² solar panels, with 1050 amp-hr storage batteries

Research Collaboration: University of Edinburgh, Pontificia Universidad Católica del Peru (PUCP), Universidade de São Paulo (USP), University of Oxford, University of Glasgow, University of Leeds, Scottish Alliance for Geoscience, Environment and Society (SAGES)

Report of Activities from the Universidade Federal do Acre with regards to the activities of MT-5

Local Responsible Coordinator: Cleber Salimon Ibrahim;

Collaborators at the University of Glasgow: Susan Waldron and Leena Vihermaa

PhD student: Eliete Sousa dos Santos (SCENE)

PIBIC fellow graduate student: Rodrigo Gomes (UFAC)

MT-5. River flows of carbon

At present we are still in an intensive collection phase both in the rainy season (January and February 2011) and also during the dry season (July, August and September 2011). Thus, we have made collection (see below the measured variables) in two streams (a second-order [Igarapé Floresta] and another third order [Igarapé unnamed]), a small river (3m dry season width [Caeté River]), a small to medium size river (20-30m dry season width [River do Rola]), two medium-sized rivers (50-100m dry season width [Acre and Iaco Rivers]) and a large river (dry season 100-200m [Purus River]).

In each of these locations, on each date of collection the following is sampled:

- 3 replicas of water for nutrient analysis;
- 3 replicas of water for analysis of Dissolved Organic Carbon;
- Measure of the partial pressure of CO₂ (pCO₂);
- Measure flow of CO₂ from the river surface to the atmosphere;
- Measurement of water flow rate;
- Measure of pH, dissolved oxygen, water electric conductivity, water temperature and air;
- 3 replicas of water for isotopic analysis of dissolved carbon (both organic and inorganic).

FUTURE SAMPLING AND ANALYSIS

In the next phases (year two) all these samples will be repeated to determine the temporal representation of the data obtained in year 1, in addition, we intend to expand the following:

- Improve the laboratory (CENA and in partnership with the University of Glasgow), develop a technique to determine the carbon isotope ratio ($\delta^{13}\text{C}$) separately for bicarbonate, CO₂ and dissolved organic carbon;
- Establish a micro basin site where more than 80% of its area has suffered deforestation and replicate all collections described above to test the effect of deforestation on the dynamics of dissolved carbon in small water bodies and also the flux of CO₂ from the water into the atmosphere;
- Establish a network of micro basins (20 with more than 80% forested areas, 20 with more than 80% deforested areas) to evaluate the spatial variability of physical and chemical characteristics of water, dissolved inorganic carbon and the flux of CO₂ from the water into the atmosphere;
- Estimate the degree of fragmentation of the landscape in the eastern state of Acre, where all these samples are and will be carried out.

Latest publications

2011

Araujo-Murakami A., Parada A.G., Terán J.J., Baker T.R., Feldpausch T.R., Phillips O.L., and Brien R.J.W. (2011) **Necromass in forests of Madre de Dios, Peru: a comparison between terra firme and lowland forests**. Facultad de Ciencias Biológicas UNMSM, *Rev. peru. biol.* 18(1): 113- 118 (Abril 2011)

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