

Amazon-AMAZON-PIRE Field Course Information Packet
Santarem, Pará, Brazil
July 13-23, 2008

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1. Welcome

Congratulations on your admission to the Amazon-PIRE field course!

The Amazon-PIRE field course will expose you to an intensive introduction to the science and field methods for understanding tropical forest ecology and the associated biogeochemistry of water, carbon, and trace gases. As important, the course provides a foundation for you to develop longer-term sustained international collaboration with Brazilian and U.S. participants. Best of all, you will experience all of this within the world's largest rainforest and along the majestic Amazon River! In addition to the scientific foundation of the course, you will also get the chance to experience the culture of the port City of Santarem, the nearby beach-town of "Alter do Chao," and experience the Amazon river by boat on the last day.

The purpose of this document is to give you the information and tools you need to prevent unpleasant surprises. Please read the following information carefully and **BRING THIS PACKET WITH YOU TO BRAZIL**. Also, please fill out the entrance questionnaire at the Amazon-PIRE website, so that we can get to know you ahead of time and also have you start communicating with your fellow course students.

Feel free to contact us with any questions.

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3 Course Details

3.1 Course Organization and Activities

For almost two weeks you will be part of an intensive field course that will provide full undivided attention of renowned experts in eco-hydrology, ecosystem dynamics, plant eco-physiology, soil hydrology, and trace gas dynamics.

The course will consist of field work and student projects in the morning (when it's generally cooler and less likely to rain in the forest), lectures in the afternoon and early evening. The student projects are the most important part of this course, since during those you will spend most of your time collaborating with Brazilian students and really learn to apply the technique(s) to solve a specific problem.

First, the instructors will demonstrate several field techniques and the students will get to know each other. On the third day, you will choose your project and two collaborators. The projects will be conducted under the guidance of a

faculty mentor. Other faculty members are available for discussion on each topic as well.

3.2 Course Objectives

From the course you will learn:

- how to measure plant and ecosystem response to changes in light, moisture, and nutrient inputs from the leaf and soil chamber to the whole ecosystem level.
- how to scale measurements in a dynamic forest with remote sensing tools
- the challenges of doing fieldwork in difficult environments and remote settings
- how to interact effectively with foreign collaborators
- an appreciation of global change (land-use and climate) pressures on the Amazon forest
- an appreciation of local versus global perspectives of the Amazon forest
- an amazement for the sea-of-green, i.e., the Amazon forest.

3.3 Teaching Faculty Bios

Plinio de Camargo (Professor, CENA, University of Sao Paulo, Brazilian Director AMAZON-PIRE). Dr. Camargo specializes in ecosystem isotope ecology, and has coauthored more than 50 articles on tropical carbon and water dynamics of forest ecosystems and land use change of Brazil.

Joost van Haren (Senior graduate student, University of Arizona, course coordinator). Specializing in biogeochemistry, Joost van Haren's dissertation focuses on plant soil interaction and how this affects greenhouse gas production. From 1996 to 2004, he was in charge of the analytical facilities at Biosphere 2.

Alfredo Huete (Professor, Soil, Water and Environmental Science, University of Arizona). Dr. Huete is an expert in satellite monitoring of earth surface processes and soil-vegetation-climate interactions in tropical and arid ecosystems. He is a member of the NASA MODIS Science Team and the NPOESS program aimed at developing satellite vegetation products for long term environmental monitoring.

Travis Huxman (Associate Professor, Ecology and Evolutionary Biology and Director Biosphere 2, University of Arizona). Dr. Huxman is a broadly trained plant physiological ecologist interested in plant evolution, ecosystem ecology and global change. His research focuses on ecosystem and plant physiological responses to short and long term climate perturbations.

Shirley Kurc (Assistant Professor, School of Natural Resources, University of Arizona). An expert in water, energy and carbon cycling in water-limited systems, Dr. Kurc has extensive experience teaching field application of eddy-covariance techniques.

Raimundo Cosme de Oliveira Jr. (Director Embrapa Oriental, Santarem). Specializing in soil nutrient and trace gas dynamics, Dr. Oliveira has 20 years of research experience in tropical agriculture and forest ecosystems in Amazonia.

Ralph Renger (Associate Professor, College of Public Health, University of Arizona). Dr. Renger's area of specialization is planning and assessment of health programs and policies. He will introduce the concept of root cause analysis and demonstrate how it can assist decision making.

Scott Saleska (Assistant Professor, Ecology and Evolutionary Biology, University of Arizona, US Director AMAZON-PIRE). With a background in physics, ecology, and atmospheric science, Dr. Saleska's research focuses on how climate interacts with plant physiology, demography, and ecological processes to influence or control biogeochemical cycling from local to global scales. He has worked in the Amazon region since 1999.

Jim Shuttleworth (Professor, Hydrology and Water Resources, University of Arizona). Dr. Shuttleworth's research focuses on surface hydrology, in particular soil-vegetation-atmosphere interactions and enhancing hydrological understanding of policy makers and stakeholders. He was the first to apply eddy-covariance techniques in the Amazon basin in the 1980's. In 2006 he was awarded the International Hydrology Prize.

Hudson da Silva (Assistant Professor, Universidade Federal do Pará). Hudson da Silva's research focuses on carbon cycling in forests and soils with a focus on soil, litter, and coarse woody debris respiration.

Rodrigo da Silva (Professor, Universidade Federal do Pará). Dr. da Siva's research focuses on how land-use change affects atmospheric dynamics and energy, water, and carbon balances.

3.4 Course Literature

We will compile a list of key journal articles chosen by the faculty that will be required reading for the class. Over the next two months, the pdf's will be made available through the course website, so you can bring them along on your journey to relieve some of the boredom of the long airplane travel and overnight wait in the Manaus airport.

The course does not have a specific text book, but for reference we recommend (the pertinent chapters will be made available through the AMAZON-PIRE website):

“Methods in ecosystem science” (2000) Eds. Sala O.E., Jackson R.B., Mooney H.A., and Howarth R.W. Springer-Verlag New York, Inc., and

“Plant Physiological Ecology” (1989) Eds. Pearcy R.W., Ehleringer J., Mooney H.A., and Rundel P.W., Chapman and Hall, New York.

For background information about the Amazon basin, tropical forests and Brazil we recommend:

A neotropical companion (1999) John C. Kricher. This book gives a good review of the plant and animals in the Amazon ecosystems of the new world tropical forests. Though not a field guide to plants or animals, it provides an excellent source of examples of ecosystem interactions.

The last forest (2007) Mark London and Brian Kelly. A very readable account of all sides involved in Amazon deforestation that also excellently captures an Amazonia traveler's impressions.

3.5 Presentations

At the outset of the course, during the first evening at the base camp, we will ask everyone to make a brief (2 minute) presentation that describes you and your research interests. The main research project presentations will be at the end of the course, when you and your project group will make a group presentation of your work to the other students and faculty.

3.6 Post-Course Research Potential

We will offer small (\$500-\$1000) stipends for students who write excellent, one page research proposals for a project that can be concluded within a month and with the equipment at hand.

4 Preparing for travel

4.1 A word on International Courtesy

US participants will be guests in Brazil and we expect respectful behavior towards the local people and fellow course participants during your trip and field-course. Avoid any illegal activity or behavior. For example, collection of biological materials in the Amazon region for transportation out of the country is strictly forbidden without authorization. Personal collections could lead to significant jail time and very likely would cause the end of this program. US customs also strictly prohibit the entry of animal and plant materials.

4.2 Essential Travel Documents

PASSPORT: valid for at least 6 months prior to its expiration date, and with at least one blank page available for the visa stamp; If you do not already have a U.S. passport, then it is almost certainly too late for you to obtain one in time to attend the course. If you have a passport that will expire too soon, then please coordinate with Lorena Brewster during the visa application agency to have it renewed during the visa application process (see "VISA" section below).

VISA: You will need a visa for entry into Brazil and for going into the field. Information on how to obtain a Brazil Vitem I visa is available on the AMAZON-PIRE website. Lorena will coordinate the visa application process for all participants.

Please contact her with questions as soon as possible. Because it may take up to 30 days to get a visa, you will need to start the application process by June 1, 2008 or your spot will be automatically given to a student on the waiting list. **Do NOT** apply for a tourist visa independent of coordinating with us, or you may end up receiving a visa that does not provide authorization to work in the forest as part of a field course.

YELLOW VACCINATION RECORD: This is a record of your vaccinations, in particular the yellow fever vaccination, which is required for travel in the Amazon region of Brazil. (see section below on Health).

AIRLINE TICKETS: If you have obtained your own source of funding for travel (or are covering it yourself) please feel free to purchase your airline tickets to meet the schedule of the course. We will also be arranging travel through a travel agent that is familiar with bookings to Brazil. Please contact Lorena directly about this option for travel arrangements (see section below on Travel Arrangements for more details).

4.3 Health

While the image of the Amazon forest conjures up fear and wonder for many Americans, our research sites are exotic but not especially dangerous. We have years of experience in the field without serious disease or injury, and malaria is not endemic in this region of the Amazon. Field sites are fully equipped with first aid equipment. Transport (either truck or fast boat) will be available 24 hours per day in order to evacuate a sick or injured person to a hospital within 2 hours. The Tapajos forest has hazards familiar in Arizona (poisonous snakes, scorpions, and centipedes) that can pose some risk if cornered. As a precaution, we will have on hand fresh stocks of anti-venom prior to each annual course, to be applied in emergencies by trained physicians available at local hospitals. As stinging insects are a hazard to those with allergies, susceptible students and researchers are required to carry injectable epinephrine (*Epipens* available by prescription). The field course will include a safety training component to inculcate basic precautions for field work and basic first aid.

The basic health-related requirements for participating in the course are:

- You must have **proof of health insurance** to participate in this course.
- You must provide us with at least **one emergency contact person** prior to travel.
- **4-6 weeks before travel** please **consult your health care provider**, travel clinic, or health department on the recommended immunizations and medication. The CDC website (www.cdc.gov/travel/destinationBrazil.aspx) is also an excellent source of medical travel information.
- **Recommended vaccinations:** yellow fever, hepatitis A, typhoid, diphtheria, tetanus, and polio. You very likely already have the last three vaccinations on this list, but diphtheria and tetanus might not be current.
- Rooms at the base camp, where we will stay most of the time, are nearly bug-free. Though not necessary there, a permethrin-impregnated **mosquito net** does provide extra peace of mind for a good night sleep for optimum

enjoyment and learning during the course.

Some basic background on tropical diseases is outline below:

Yellow fever: there have been recent outbreaks of yellow fever in some areas of Brazil, therefore yellow fever vaccination is required for travel into the Amazon region. Plan a visit to you travel health department well in advance to obtain the vaccination, and make sure to include your vaccination record (a standard yellow card) among your travel documents (see section on Essential Travel Documents, above).

Hepatitis A: make sure you are immunized against hepatitis A. If you have had the first step of the vaccine within the past year, get a booster that will give you protection for 10 years.

Denque: there is no remedy or vaccine against the dengue virus, besides bringing repellent and a mosquito net. Denque is endemic in the city of Santarém, but relatively rare in the forest, where we will be spending most of our time.

Malaria: is not currently found in the region around Santarém, and we on the research and teaching staff who have been working at this site for many years do not take medical malaria prophylactic. If it makes you feel more comfortable, you may obtain malaria prophylactic (e.g. mefloquine, often called by its brand name Lariam) before the trip from your doctor. Malaria medicines have some side effects, and not everyone can take them. Your doctor can advise you.

Chagas disease: though rare around Santarem, one can easily prevent this potentially debilitating and deadly decease. The best method of prevention is an insecticide (permethrin) treated mosquito net.

Schistosomiasis: this disease can be picked up by swimming in contaminated rivers and lakes. The disease is rare at Alter de Chao and the remote beaches we will visit during the boat-trip.

4.4 Money

You can change US dollars into Brazilian Reais (R\$) in some US airports (e.g. Miami), and in major Brazilian airports (Manaus, Sao Paulo, Rio de Janeiro). Perhaps the most efficient approach is to use your ATM/bank card to make withdrawals from within Brazil. This is easy at most airports, and even within the city of Santarém, a number of banks have ATM machines that will accept international withdrawals. The Banco do Brasil and HBSC downtown Santarem on Rua Barbosa take ATM cards. Check for the machines with VISA and CIRRUS signs. Be aware that after 9 pm and on Sundays you might not be able to take more that R\$100 (~\$60, as of March 2008). Normally the maximum is R\$1000. Changing cash currency in Santarém, by contrast to the ATM method, is difficult; there is only one location where you can change foreign currency.

4.5 Pre-course reading

Orient yourself with the course literature and field research project ideas (to be posted on the Amazon-PIRE website) to start thinking about the subject matter of the course, and about the possible research projects that might interest you.

4.6 Pre-course student contact

Please use our website to contact the other students in the course so that you can start communicating with them before Brazil. This will help speed up the process of finding research project partners.

4.7 What to Bring

a. PASSPORT: VALID for at least SIX MONTHS after you leave Brazil and with at least TWO BLANK pages for visa stamps.

BRAZIL VISA and YELLOW BOOK with vaccination record.

b. ATM/Bank card and a small amount of emergency cash.

c. CLOTHING AND PERSONAL ITEMS. Travel as light as possible. Any suitcase will do, but the Brazilian customs agents are more lenient with people traveling with regular suitcases over backpackers. Bring a small 'old' backpack that you can bring into the field and don't mind to get dirty. Sheets, pillowcases, and towels are provided at the base camp. There are no washing or drying machines at the base camp. You will have to take care of your own laundry. We will be spending most of our time in the forest, as such bring clothes and personal items (clothes, hat, glasses, watch, etc.) that you do not mind getting sweaty, muddy, or lost.

- Shirts. For the forest make sure to bring a couple of old shirts that cover the body (extra layer against bugs), thin cotton ones are best since they will dry fast.
- Pants. Light-weight pants of which the legs can be unzipped are excellent for in the field
- Underwear. Light-weight as well, but bring as many pairs as you can fit. Underwear is also great to fill suitcase spaces.
- Socks. Simple cotton socks, long enough to put you pant legs into your socks and to protect your legs well above your ankles. This gives you more time when ants are crawling up you pant legs.
- Shoes. Solid boots like timberlands or rubber boots are recommended. Soles with excellent profile are recommended for scaling fallen trees and walking on wet clay-rich soils. At the base camp you can wear flip-flops, sandals, or tevas. Running shoes are recommended for the avid runner and sports person. However, we do not recommend running along the BR-163, since the road is quite dangerous. Likewise playing soccer on the field next to the base camp is discouraged.
- Shorts. For during classroom and leisure time shorts or skirts are the optimum clothing items.
- Swimsuit. We will visit Alter de Chao and make a boat trip thus bringing swimming gear is essential. Locals also swim in the stream (igarape) right next to the base camp. Though refreshing after a long slogging day in the forest, we recommend against swimming there -both alligators and snakes have been sighted in and around the stream.
- Towel. Though towels are provided at the base camp, a large towel comes in handy at the beach, though together with a book it is a dead-giveaway for an estrangeiro.

- Light sweater/jacket. The climate is warm and nights are mild at the base camp and in Santarem. However, especially on the river and during the travel a light sweater or jacket could be more comfortable.
- Laundry bag/pillowcase. Good for keeping dirty clothes between washings
- Hat. Santarem is ~ 2 degrees south of the equator and the sun is very strong, even though it is often rainy and shady within the forest. We recommend you bring a shade hat, which will also protect your head and neck from falling insects.
- Bandanas. Come in handy to keep sweat out of your eyes.
- Sunglasses. Same with the hat; good sun protection is essential along the Amazon. Cheap sunglasses can be bought at the downtown market along the river.
- Spare eyeglasses, contact lenses, or prescriptions. Please prevent a waste of valuable time having to go into town by bringing spares with you.
- High rated sunscreen. Sun protection is essential along the Amazon. Albeit not cheap, sunscreen is available in Santarem.
- Toiletries. Make sure you bring your preferred soaps, shampoos, toothpaste, etc. These items are readily available, but very likely not your brand, nor do they come cheap.
- Rain-poncho. Bring a light foldable rain poncho to protect you, your field gear and notebooks against strong tropical downpours.
- Umbrella. Like a rain-poncho, it may come in handy in the forest, and in town.
- Clothespins. To hang your clothes to dry, close bags, etc.
- Insect repellent. 100% DEET definitely does work, but is better kept on the outside of clothes. Locals use andiroba to protect against chiggers and I can attest from personal experience that it works well, but you pretty much have to take a bath in the stuff.
- Personal medical supplies. If you have any medical condition that requires medication, including allergies/sensitivities to bees and/or other insect sting, please bring an abundant supply of the prescription with you.
- Flash light. The generator at the base camp will be turned off around 10-11 pm, which leaves the camp pitch-black. Head-lamps are especially handy.
- Extra batteries. They are expensive in Santarem and again valuable time would be lost if you have to go back to Santarem to pick some up.
- Digital camera. This may be a trip of a lifetime, therefore, you will be glad to share it with your family and friends.
- Silica gel (or dry rice grains). To keep important things dry.
- Memory stick/flash drive. To back-up and share data.
- Music. MP3 make travel more enjoyable and are good to provide personal space in crowded conditions, but overuse is not recommended since it prevents you from really interact with Brazilians; one of the reasons to travel to Brazil for this field course.
- Laptop computer. If you have one please bring it.
- Hammock. Great for for leisure time and the beach and boat trips. Best bought at the downtown Santarem market (R\$20-150).

4.8 Essential field equipment

- Day pack for field use. Good for samples, notebooks, poncho/umbrella, camera, and other essentials for a day in the forest
- Water bottle or canteen, large, since you will drink a lot in the forest.
- Pocket knife. A good field scientist does not leave home without it, the Swiss army knives or leathermans are especially handy.
- Watch. A simple cheap and water resistant digital watch makes coordination and sampling easier during a field campaign.
- Lecture notebook. For taking notes during the lectures. People with laptops can use them to take notes.
- Field notebook(s). Waterproof rite-n-rain notebooks and waterproof pen(s) or pencils are recommended and easy to get (any University bookstore has them). Bring multiple of each since the notebooks are small and fill up rapidly and pens are easily lost in the forest.
- Felt pens (sharpies) for marking samples.
- Clip-board. Handy surface to take notes, especially the metal closable ones are very good.
- Plastic ziplock bags, one pack of 100 zippered sandwich bags is sufficient.

4.9 Travel arrangements to Brazil

There are several routes to Santarem. The shortest way to travel there is from Miami to Manaus and then Santarem. If you do not want to fly to Miami in the US, then you are stuck going through Fortaleza, Sao Paulo, or Rio de Janeiro. This can be an option for if you want to travel more through Brazil anyway, but not recommended if you just come for the course.

We can help in booking the ticket, especially when your travel is funded through the program. We will also try to get a special deal for the whole group and we will inform you if we are successful or not. If you want to book your ticket yourself here are some options:

- go to your local travel agent, especially one that is specialized in adventure travel is good,
- book your ticket through internet sites such as cheaptickets, expedia, orbitz, etc.

4.10 Arriving in Brazil/Santarem

Please plan to arrive in Santarem at least one or two days before the course starts. One can never predict travel delays. Also, getting to Santarem early will help you adjust to the climate and get to know the area a bit before the class starts.

Before you arrive in Santarem, you will enter Brazil in Manaus -we recommend you book on the flight from Miami to Manaus, to avoid flying through Sao Paulo, which adds many hours to your travel time. At the airport in Manaus you will have to go through immigration, then pick up your bags and clear customs, which should be rapid and easy in Manaus, since the airport is relatively small. Before you can check-in for the flight to Santarem you will have to wait for ~4 hours in the main

airport hall. Make sure you keep a close eye on your bags during this wait, since the airport hall is open to the general public.

The airport at Santarem is even smaller than in Manaus and is very easy to navigate. If you inform us of your flight schedule we can arrange your pickup at the airport, even if you arrive several days early.

5 International/Emergency contact

The base camp is outfitted with a satellite connection and wireless internet access, which makes email the preferred mode of communication with the rest of the world. In case of an emergency, friends and family can also contact the Santarem LBA office at (+55(93)3523-4138; paulo@lbasantarem.com.br). The Santarem office can then contact us through satellite phone.

6 Field Dangers

The biggest danger of the Amazon forest is getting lost! Therefore it is strictly required that all students enter the forest with at least one person familiar with the forest.

Yes, the forest contains jaguars, poisonous snakes, huge stinging ants, and black scorpions, but the chances that you encounter, let alone get bitten by, them is relatively small. At all times be aware of your surroundings and do not try to do something rapidly or without first taking a good look around for potential danger. Also, while in the forest follow the suggestions of the local guides (mateiros), who are intimately familiar with the dangers of the forest and can help you from disturbing potentially dangerous animals.

7 Anti-Discrimination and Anti-Sexual Harassment Policy

The University of Arizona prohibits unlawful discrimination, including harassment, on the basis of race, color, religion, sex, national origin, age, disability, veteran's status, sexual orientation, or gender identity. Sexual harassment is a form of sex discrimination that is specifically prohibited by this policy. The University's Sexual Harassment Policy is based on the provisions of Title VII of the Civil Rights Act of 1964, the Education Amendments of 1972, and other applicable laws that prohibit discrimination because of sex. A pdf copy of the policy can be obtained at the following website: <http://fp.arizona.edu/affirm/shpolicy.htm>. Anyone interested is encouraged to review the policy, regardless of whether you are concerned about an offense, an allegation of offense, or just interested.

8 Last Comment

We hope that our course will generate a close knit group of students that remember this course as their greatest educational and personal experience.

Until July,

Joost, Lorena, Plinio, and Scott.