

# Newsletter



## DFG Research Unit 816:

Biodiversity and Sustainable Management of a Megadiverse Mountain Ecosystem in Southern Ecuador

4/2008

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## Speaker's Corner

### Status Symposium

After one and a half year of research in the first phase of the Research Unit (RU), the Status Symposium marked a milestone for our scientific progress but also for our embeddedness in the science region of southern Ecuador. Our new concept with ten extended keynotes in Spanish on the first day, followed by twenty-six brief contributions from RU members and cooperating partners – most of them in English – was well acknowledged by the audience. Next year the second part of the Symposium will be strictly in English. The accompanying poster session rounded off a successful meeting.



The 12<sup>th</sup> Status Symposium took place from 11<sup>th</sup> to 12<sup>th</sup> of September in the Auditorio Pio Jaramillo of the Universidad Técnica Particular de Loja (UTPL). The Symposium offered 36 oral presentations in a new concept. The conference was attended by more than 200 scientists and students mainly from Ecuador and Germany as well as from other countries like Peru. Photo: Felix Matt.

## Minister of Environment Presents Goals

A benchmark for our excellent collaboration with the national authorities was the invitation for a meeting with the honorable Minister of Environment (MAE) of the Republic of Ecuador, Marcela Aguiñaga Vallejo, along the Symposium: We discussed our role for the sustainable development and the protection of biodiversity and ecosystem services in southern Ecuador. In her presentation later in the Symposium, she informed about the goals and new structures of national environmental policy and governance.

## Assembly Decided about Registrations

Several administrative topics were discussed in the following member assembly of the RU. One major point also in the discussion with Nature and Culture International (NCI) was the occupancy rate of the research station (Estación Científica San Francisco, ECSF). Among others, we have decided to limit the number of staff per subproject to a maximum of three persons at a time. This rule will be implemented in the electronic station registration system.

## Data Warehouse

The database workshop held at the Universidad Técnica Particular de Loja (UTPL) on 13<sup>th</sup> of September heralds the launch of our novel data warehouse system which is now online, waiting for uploads from the RU members (please read about its details in section New Data and Publications in this Newsletter).



Official presentation of the new NOAA-AVHRR station at the UTPL. The station receives data from the NOAA-AVHRR sensor (Advanced Very High Resolution Radiometer) which measures radiation reflected by and emitted from the earth-atmosphere system in the visible and infra-red spectrum. The photo shows the tracking unit encompassing the receiving dish antenna. From left to right: Dr. Rütger Rollenbeck, Prof. Dr. Jörg Bendix, Ing. Víctor González and Dipl. Geogr. Andreas Fries. Photo: Felix Matt.

## Cooperation and Outreach

Several activities took place with our partner universities Universidad National Loja (UNL) and UTPL: The new NOAA-AVHRR receiving station, a donation of the project B3.1 (Bendix) from the University of Marburg, was officially inaugurated with the GIS department of the UTPL.

With this receiving station, NOAA-AVHRR satellite images of Ecuador and surrounding countries can be continuously ingested. Data will be archived at the UTPL and the RU. They are available for all researchers. It should be emphasized that this station is the third in the country and the first in the South. It gives UTPL the unique opportunity to establish a national satellite data archive for southern Ecuador.



The rector of the National University of Loja (UNL), Dr. Gustavo Villacís Rivas (left) and the speaker of the RU, Prof. Dr. Jörg Bendix are undersigning a new Memorandum of Cooperation. One major focus of the agreement which was signed on September 19<sup>th</sup> is a further strengthening of our capacity building activities. Photo: Felix Matt.

## Extending Education

In the context of extending capacity building and education, an initiative was taken to augment our efforts in a mutual funding of research projects and Ecuadorian Ph.D. candidates. The general idea is to develop a bilateral agreement between the German (DFG) and Ecuadorian (SENACYT, Secretaría Nacional de Ciencia y Tecnología) research agencies for co-funding additional joint Ph.D. projects of the RU with the local universities. To start this process, a meeting of the RU, the local universities (UTPL, UNL), the DFG representative Dr. Dietrich Halm and representatives of the German Academic Exchange Service (DAAD) from Lima, Prof. Dr. Waltraud Kofer and Prof. Dr. Eric Gabriel Cosio, and from Quito, Dr. Jochen Plötz, was organized at the research station. It was decided to start with a bilateral cooperation between DFG/DAAD and the local universities UNL and UTPL. The

remaining task is now to elaborate additional joint project ideas until 1<sup>st</sup> of December 2008 for which the local universities will provide funds for their Ph.D. candidates while DFG and DAAD are generally willing to cover traveling costs for the supervision of the selected Ph.D. candidates to Germany after a successful approval of the project ideas.



Meeting of the Ecuadorian and the German research agencies at the Research Station (ECSF). Together with the speakers of the Research Unit they discussed the potential of bilateral programs for funding ecuadorian Ph.D. students in additional joint projects between the German (Deutsche Forschungsgemeinschaft, DFG, and German Academic Exchange Service, DAAD), and the local university agencies. Photo: Felix Matt.

Medium-term, this initiative shall be institutionalized by including the Ecuadorian research foundation SENACYT. In a meeting with the speaker of the RU and the director Marcelo Torres Paz of the National Secretariat of Planning and Development SEMPLADES (Secretaría Nacional de Planificación y Desarrollo) office Loja, Paz stated that a regional SENACYT office responsible for southern Ecuador (provinces Loja, Zamora-Chinchipe and El Oro) will be established in Loja due to 18<sup>th</sup> of January 2009. The direct contact will certainly facilitate and foster the discussion process to develop the bilateral agreement.

### RU Inspires Brainstorming in Peru

The “Model Loja” catches attention by other scientific organizations of, or working in Latin America, since it is the fruitful cooperation of a German group of researchers (financed from the German side) with local Ecuadorian universities, mediated by a local foundation (Nature and Culture International, NCI). The above mentioned meeting of our RU with representatives of DFG, DAAD and the Loja Universities also stimulated the interest of colleagues from Peru in such a mode of coopera-

tion. A brainstorming has started recently in the Pontifica Universidad Católica of Peru. In that case, representatives of an international cooperation enterprise for sustainable development (the German Gesellschaft für technische Zusammenarbeit, GTZ) in Peru had shown interest in a comparable model during a meeting in Lima last year.

### Publications Presented

Finally, it was a pleasure to present the publications derived from our research activities in the previous RU402 to our counterparts from university and administration: like the special issue of Ecological Studies (see Newsletter no. [1/2008](#), page 12) and the Checklist of Species (see Newsletter no. [2/2008](#), page 9).

This was also done at the annual reception of NCI: we also introduced a new popular scientific book in Spanish about our work, elaborated by Katalin Kiss and Prof. Dr. Achim Bräuning in collaboration with NCI. This publication is of special importance for transferring basic science to the public and thus, for environmental education (see section New Data and Publications in this Newsletter). An English translation is still pending, as it is for our activities in the DFG-science TV project.

Jörg Bendix  
Speaker of the Research Unit  
Erwin Beck  
Deputy Speaker of the Research Unit



The speaker of the RU, Prof. Dr. Jörg Bendix (right) hands over a package of scientific books to Ing. Renzo Paladines, the director of Nature and Culture International (NCI) in Ecuador. The publications summarize some of the scientific results and discussions from the preceding RU, entitled “Functionality in a Tropical Mountain Rainforest: Diversity, Dynamic Processes and Utilization Potentials under Ecosystem Perspectives”. The investigations and research of the current RU build on these published results too. Photo: NCI.

## News from the ECSF

### Estación Científica San Francisco

#### Global Positioning System

The differential Global Positioning System (DGPS) is now fully functioning. Test measurements of geodesic points were carried out to verify the exact position of our reference station in Loja. First measurements in the ECSF area were promising. The results will be presented in one of the next newsletters. Soon you will find more technical details about the DGPS in the intranet of the TMF website ([www.tropicalmountainforest.org](http://www.tropicalmountainforest.org)). If you have questions about the DGPS please contact the station-managers.



The technician Alberto Bravo carries out first measurements with the mobile DGPS unit. In the future we will provide an inventory of the most important installations, plots and sampling sites of the RU which already exist. Photo: Jörg Zeilinger.

#### New Regulations for Tourist Stays

As a tourist you are now entitled to stay in Ecuador only for up to 90 days during any 12 month period. There's no longer the possibility of an extension as a tourist. If you want to visit Ecuador for more than 90 days you have to apply for a visa before your journey, because otherwise airlines may refuse transportation. Postdocs and Ph.D.-students can apply for a 12-III visa. Diploma students and trainees have to contact the nearest Ecuadorian consulate. More details will be provided in the new version of the station tips.

#### Road Construction

Traffic is often delayed due to partly blocked lanes, since the road works between Loja and Zamora are still going on.

*Felix Matt & Jörg Zeilinger,  
Local Advisory Board*

## News from NCI

### Supporting Science

The recent Status Symposium was attended by the minister of the environment, who presented a letter of intention for cooperation with our non-profit organization, Nature and Culture International (NCI), and the RU.

On September 12<sup>th</sup>, NCI presented its annual report. During this event, the book "El Bosque húmedo de montaña," the Spanish version of the book "Bergregenwald," by Katalin Kiss and Professor Dr. Achim Bräuning, was released (for details see section New Data and Publications in this Newsletter).

NCI supported this initiative by translating the book into Spanish and printing 1,500 copies. The first 500 brochures will be distributed for free, and the rest of the booklets will be offered for \$5.00 each. NCI will also promote the use of these books within Loja's universities. Hopefully, with their support, an interactive CD of the book can be produced that can be used by students in their basic study.

*Helmut Sonnert*

## Community Management of Natural Areas

Nature and Culture International (NCI) has been mediating in a conflict between the Ecuadorian government and the Shuar people by inventing a new legal form of natural reserve that serves the needs of both the Shuar community and the Ministry of the Environment (MAE).

Originally, the Sistema Nacional de Áreas Protegidas (National System of Protected Areas) in Ecuador was created for areas without human inhabitants. For the indigenous people, this resulted in the loss of territory, since their traditional use of the forest is prohibited by the "strict protection" rules of the Sistema Nacional de Áreas Protegidas. This restriction generated a heated socio-environmental conflict when MAE declared the Cerro Plateado Area of the watershed of Alto Nangaritza as an Área de Bosque y Vegetación Protectora (Area of Forest and Vegetation Protection).

In this traditional Shuar area, comprising the northern Cordillera of El Condor and the higher Nangaritza region, one of the most diverse and richest ecosystems on earth has evolved. The forest is relatively well conserved, but this has not occurred by chance and does not pertain to unoccupied land. Rather, it is the result of a culture that practices sustainable land use.

When MAE declared this area protected, the Shuar people felt that their traditional way of living (fishing, hunting, recollecting plants) was in jeopardy. The tensions intensified rapidly to the point that several technicians of the environmental NGO Arco Iris were held hostage by Shuar community members in order to negotiate an appeal.

At this point, NCI was asked by MAE and the Shuar community for mediation in this conflict. Since then, we have been working on the consolidation of ancestral territory of the Asociación de Centros Shuar Nankais (of the lower Nangaritza district) and on the recognition of 26,000 hectares as the Área Natural Comunitaria Shuar MURA NUNKA-Entsa Jiniarma (which is the same area as Cerro Plateado, but using the old Shuar name).

NCI conducted several studies of the forms and implications of historical Shuar land use. In this way, and for the first time in Ecuador, NCI was able to identify actively a legal form of protection that more effectively serves the needs of both the Shuar community and the MAE. The main features of this legal construct are:

- the conservation of the ecosystem,
- water protection,
- mining prevention,
- the recognition of Shuar territory, and
- the rights of the Shuar community to ancestral use of this territory.

The drafts of the Estudio de Alternativas de Manejo (Study of Management Alternatives - requisite of MAE) and of the Acuerdo Ministerial (Ministerial Agreement) are now completed. We assume that the Shuar communities will present them shortly to MAE for approval.

We hope to receive state recognition of a new natural reserve that will recognize the traditional land uses of the Shuar community soon.

In this section NCI ([www.natureandculture.org](http://www.natureandculture.org)) describes its activities. This time Trotsky Riera writes about NCI's work with the Shuar.



Shuar ancestral territory at Alto Nangaritza: The Tsenkean (Shuar, Tsen-ganga in Spanish) river flows through MURA NUNKA-Entsa Jiniarma. The water is dark due to its origin from the sandstones upland. Photo: NCI, Ecuador.

## Science News

### Local Climate and Tree Growth

To detect the influence of seasonal climate on tree growth, the Dendroecology group (project A1.1) studies stem diameter variations of selected tree species in two different mountain ecosystems: In the tropical mountain rain forest around the RBSF and in the dry forest of Reserva Laipuna close to the Peruvian border. We used point dendrometers with a spatial resolution of 5 µm in 30 min intervals, which are also able to detect short-term stem diameter variations that result from fluctuations in the water status of the tree. Climate data are provided from meteorological stations run by Richter's group (project B1.4).

A comparison between the seasonal growth dynamics and stem diameter changes in relation to local climate is shown in the Figure: The four studied individuals of *Cedrela cf. montana* at RBSF show strong synchronous diameter fluctuations even in short dry periods. As indicated by the daily sums of rainfall and the graph of air humidity available moisture was low during these periods. Surprisingly, a few consecutive dry days are sufficient to cause a drastic decrease in cambial activity.

At the dry forest site in Laipuna *Terminalia valverdeae* (D) stops growing at the end of the

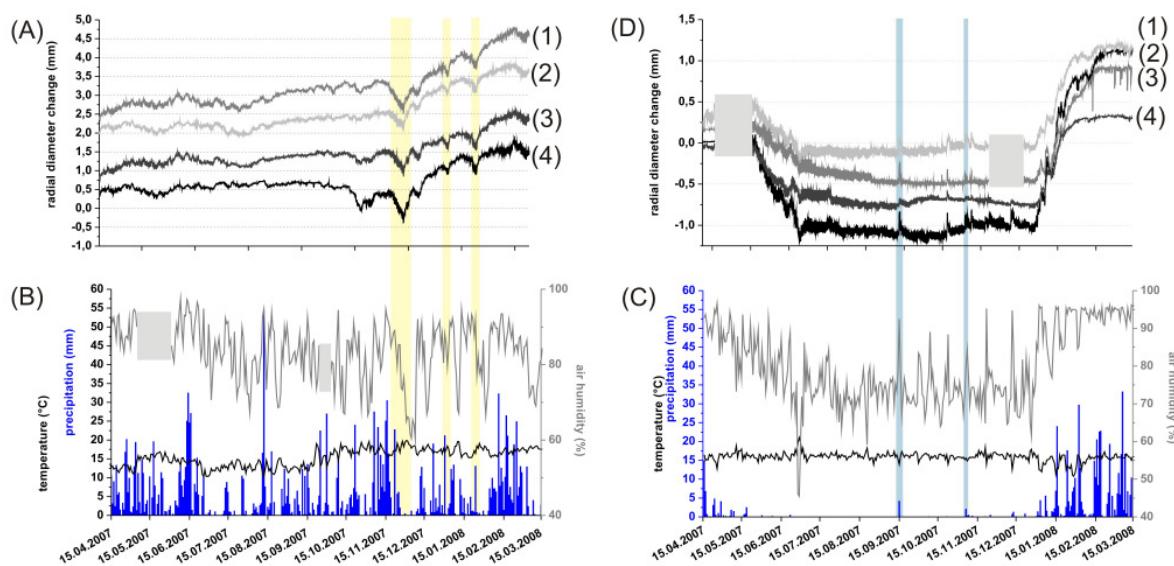
wet season around mid-May: stem diameters shrink synchronously in all trees. With the beginning of the wet period in January, stem diameters of all studied individuals increased rapidly.

Cambial growth starts jointly around mid-January, when stem diameters of all trees exceed the maximum diameters reached at the end of May of the previous year. It is interesting to note the specific reaction to the extreme climatic conditions lasting from 28<sup>th</sup> to 30<sup>th</sup> of June 2007 (in D), when mean daily temperature rose to 20°C and relative air humidity dropped to 45%. This short-term climate event is caused by a change in the wind direction from dominantly southern to northern directions and induced strong stem shrinkage in *Terminalia*.

The diurnal stem diameter variations (SDV) observed in our study are mainly triggered by radiation, which controls the atmospheric water pressure deficit and hence tree transpiration. On sunny and dry days, SDV amplitudes are larger than on cloudy and wet days.

Our results demonstrate that even in very humid tropical mountain climates, cambial activity of trees reacts very sensitive to moisture availability. Tree growth is by no means continuous throughout the year.

Franziska Volland-Voigt,  
Peter v. Schnakenburg & Achim Bräuning



Periods of cambial activity are restricted to phases of continuous humid conditions at RBSF and to the peak of the rainy season – ranging from January to March - at Laipuna. Daily and seasonal stem diameter variations (figures A and D) in relation to local climate (B and C). A: Synchronous stem diameter variations (SDVs) of four *Cedrela cf. montana* individuals (1 to 4). D: Synchronous SDVs of four *Terminalia valverdeae* trees (1 to 4). Yellow bars mark dry weather conditions at the RBSF. Blue bars depict single rain events within the dry season at Laipuna. Images: Achim Bräuning & Michael Richter.

## Mycorrhizal Fungi for Growth and Rehabilitation of Orchids

Orchids do not only develop gorgeous flowers but also display a life history trait that is exceptional in the plant kingdom: The dust-like seeds need fungi to stimulate germination and to nourish the embryo (protocorm) by supplying carbohydrates and minerals since they lack a nutritive tissue. Thus, orchids can only establish where they find an appropriate fungus (mycobiont) that invades the protocorm cells and establishes the interface for nutrient transport across the plasma membrane (mycorrhiza). Molecular identification combined with ultrastructural investigations of orchid mycobionts revealed that orchids and fungi are rather selective in partnerships.

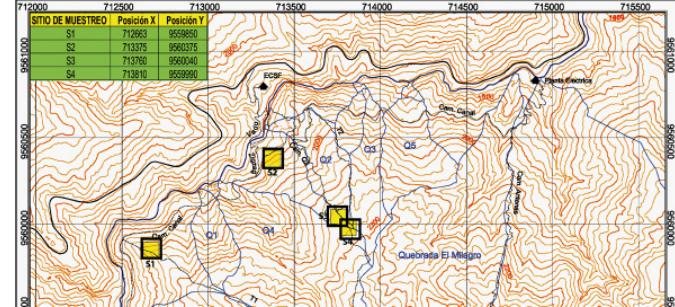
### Orchids Search for Fungi

Orchids in temperate forests of the northern hemisphere dominated by Pinaceae or Fagales, and in the Dipterocarpacae forests of East Asia are associated with fungi that form ectomycorrhizas with these trees. The fungi deliver sugars obtained from the trees to achlorophyllous, mycoheterotrophic, but also to green, so called mixotrophic orchids.

In tropical forests where ectomycorrhiza forming trees and fungi are missing or very rare - like in the Andean tropical mountain rain forests - orchids need to search for other fungi to nourish the protocorms. Although the Glomeromycota that form arbuscular mycorrhizas with the trees in tropical lowland and mountain rain forests can support heterotrophic plants of diverse families (Gentianaceae, Burmanniaceae, Polygalaceae, Petrosaviaceae, Triuridaceae, Corsiaceae), they never were found to support orchid seed germination or protocorm development.

### Fungi in the RBSF Area

According to data published so far - including those obtained by us in the Reserva Biológica San Francisco (RBSF) - green orchids in these forests associate with three fungal groups, Tulasnellales, Sebacinales (subgroup B, Sebacina vermifera group), and with Ceratobasidiales. All three groups are falling into Heterobasidiales (Basidiomycota), according to their septal pores and basidia formation. The fungi deliver sugars obtained from decomposition of organic material to the orchid protocorms. Sugar transport from the adult, green orchids to germinating seeds in close neighborhood is also expected, as the same fungi are harbored in roots of the green plants.



Localization of the four sites for orchid mycobiont investigations. 56 plots were installed each is one square meter in size: eight plots with terrestrial and eight plots with epiphytic orchids, on two different sites in the pristine forest. One site is in a 40 years old regenerating forest, the "Handtuchfläche", and the other is on a large man-made landslide, the "Orchideen-Regenerationsfläche". Image: Ingrid Kottke.

### Flourish or Fail

Narrow or broad selectivity for mycobionts, thus, appears as an important bottleneck on recruitment and maintenance of orchid species. The growth and maintenance of mycobionts is influenced by the environment like the substrate or climate conditions. However, these factors are unstudied so far. We therefore aim to elucidate the ecological conditions useful for the fungi to predict proliferation or failure of establishment of orchid populations.

In our previous research project we established the molecular techniques for isolation and identification of orchid mycobionts in the Centro de Biología Celular y Molecular of the UTPL and identified the mycobionts of four closely related epiphytic orchids. Results showed low specificity of the associations, but a reduction in number of mycobionts at higher altitude (2100 m) indicating climatic influence on distribution.



The enormous regeneration potential of orchids on landslides is surprising since they are expected to germinate only in the presence of appropriate fungi. Our research is done on orchids regenerating on a man made landslide where wooden stairs were built to reach the upper part (left) and on small land slides with *Elleanthus* sp. as pioneer colonizers (right). Photos: Ingrid Kottke.

## Tulasnellales dominate in Epiphytes

In our current project (project B 1.3) we search for dominant mycobionts of unrelated terrestrial and epiphytic orchids to clarify narrow or broad associations, the fungal community structures and relationships with climate conditions in different habitats across multiple spatial scales. A climate model currently developed by the group around Jörg Bendix will provide monthly insolation, rainfall and temperature at 10 m<sup>2</sup> resolution inside the forest as well as on open areas.

We installed 56 plots on four sites and roots of four to five terrestrial, humus-epiphytic and stem-epiphytic orchids were sampled per plot. The DNA was extracted. First results from mycobiont sequences of one orchid individual per plot indicate a dominance of Tulasnellales in epiphytic and terrestrial/humus-epiphytic orchids, and Sebacinales to be more frequent in terrestrial orchids.

## Pioneers

The regeneration potential of some "pioneer orchids" on man-made landslides but also in the regenerating forest was revealed to be tremendous. As obvious from our observations this regeneration is not restricted by a lack of mycobionts: Orchids are even the first plants establishing on fresh landslides along roads and these small plants of *Elleanthus* sp. are already well supplied with *Tulasnella* mycelia.

The spores of these fungi are obviously vigorously spread by wind or even water flow supporting the hypothesis that in case of fungi "everything is everywhere". We expect, however, that the mycobionts cannot become established "everywhere" but will need special environmental conditions and hosts.

Ingrid Kottke



Left: The root section from pioneering *Elleanthus* sp. already displays colonization by mycobionts in the cortical cells (arrows; fungi are stained by methyl blue). Right: A crusty fructification of a *Tulasnella* species (black arrows) close to the orchid's roots of an unidentified species. Image and Photo: Ingrid Kottke.

## First Ecological Fire Experiment

Because of rainy weather we postponed our first fire experiment by one week to September 25<sup>th</sup> 2008. After a short briefing of all participants at ECSF, fire fighter groups were formed, equipped, and placed in the fire protection corridor around the area. At the side, the two infrared sensors were brought into position and the fire was lighted.



Many people were involved in the first fire experiment and assisted to prevent the fire to take over on areas which we didn't want to burn. We like to thank all people who gave a helping hand: Our station managers, the fire fighters of Zamora, Gabriel Gaona and the students from the UTPL, the researchers from the ECSF and last but not least the catering group at the station who did a great job for the well-being of the participants of the experiment! Photo: Marlen Bauer.



To analyze the outcome of the experiment, we wanted to take pictures of the area in which the fire test took place. A helium balloon turned out to transport the camera (red arrow) better than the kite tested before, since the kite changed directions with the wind. We are now glad to provide photos of the burnt state and the site before burning. Photo: Kristin Roos.

After a short time, however, the fire died out and in the end only a little more than one third of the 50x20m plot area was burned. Accordingly only some of the soil temperature sensors showed a reaction. Regrowth of the vegetation on the burned sides is now monitored regularly.

Before the fire, one day, and one week after the fire the group of Hamer & Makeschin (project B2.1) collected samples of the ash and the mineral layer at three different depths to obtain information about the influence of fire on nutrients and the microbial community structure. In addition soil respiration was measured. Schüssler's group (project B1.1) collected root samples to analyze the effects of burning on arbuscular mycorrhiza fungi. In spite of incomplete burning of the entire area we consider this first fire experiment as a successful test rendering valuable practical experiences for the next trial in spring 2009 before the onset of the heavy rains.

*Kristin Roos*

## Pasture Fertilization Experiment (FERPAST)

Since April this year soil respiration measurements were run on the various treatment plots within the project B2.1 (Hamer & Makeschin). Our experiments are conducted with the help of our undergraduate student of the UTPL Cristhian Chiriboga and our co-worker William Rodriguez. Differences in soil respiration rates ( $\text{CO}_2$ -emissions) are detected: Urea treated plots show higher  $\text{CO}_2$ -emissions. This is probably due to an N induced stimulation of carbon mineralization and higher root respiration rates.

After the second fertilization in July soil samples were taken from all plots to analyze initial impacts of fertilization on soil microbial characteristics and nutrient availability. At the moment this work of our Ph.D. student Karin Potthast is supported by three undergraduate students Konstantin Greipl, Axel Heinemann, and Marion Kohlert. They are carrying out their diploma theses focusing on P stocks in above- and belowground biomass, P fertilization effects on mineralization processes, P availability and P incorporation into microbial biomass.

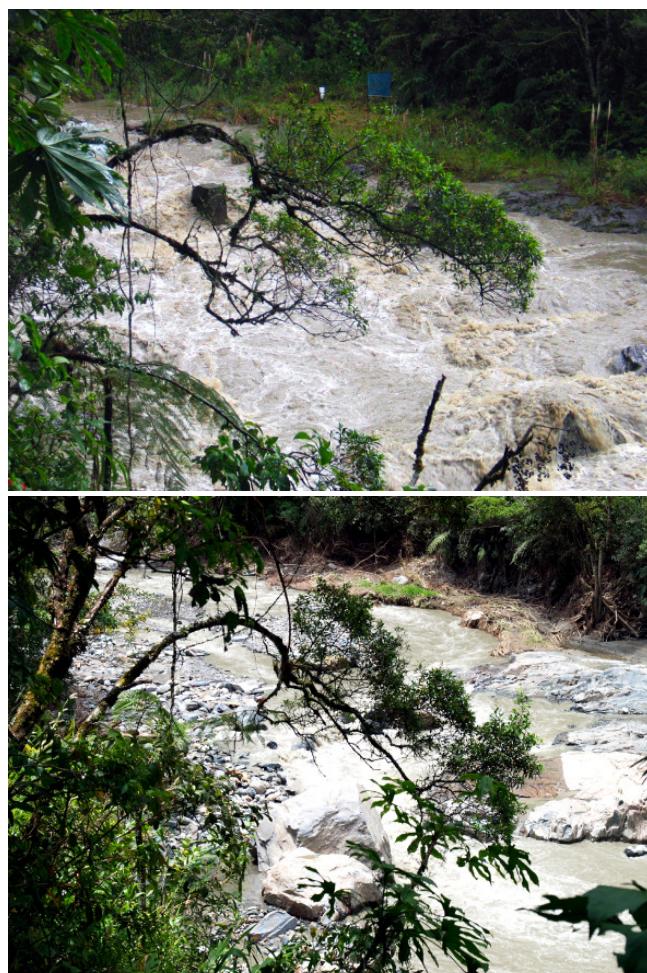
The effects of the third fertilizer addition to the pasture plots – conducted in September 2008 – are now being analyzed.

*Ute Hamer*

## Short Note on Weather Extremes

The year 2008 is characterized by extreme weather events in the whole area of southern Ecuador. In the beginning of the year, El Niño-like conditions off the coast of Ecuador, normally not associated with La Niña conditions in the central Pacific, led to severe inundations at the coast (Province Guayas) in the surroundings of Guayaquil. At the same time, intermitting outbreaks of easterly air masses caused torrential rainfall in the areas of Catamayo and Vilcabamba which, among others, destroyed the main connection road between Loja and La Toma airport end of March 2008 due to a rain-triggered landslide.

The central ECSF area was more or less unaffected by these weather anomalies. However, mid October, a torrential rain event affected also our core study area sites. On October 11<sup>th</sup>, a strong



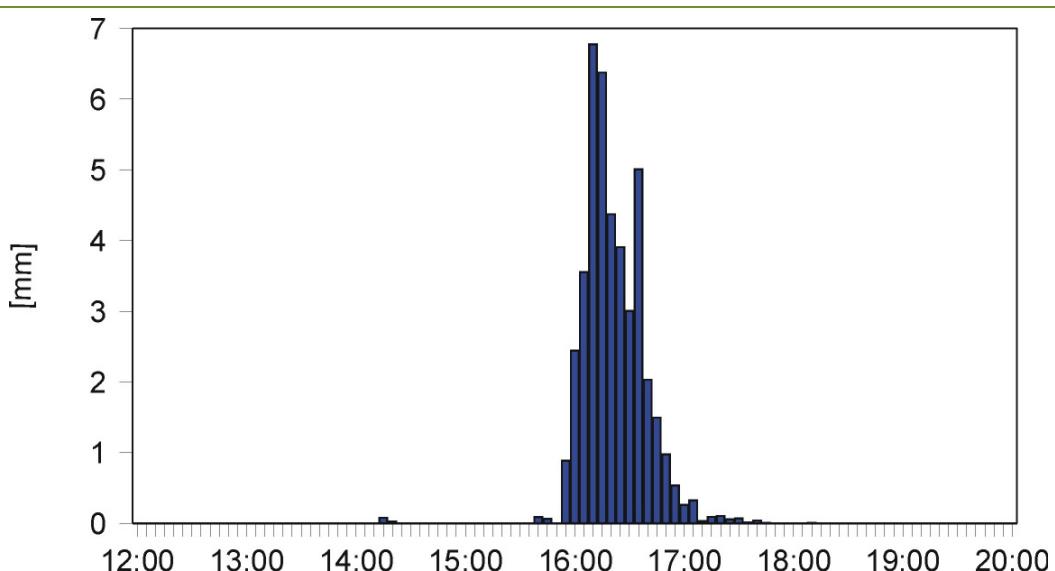
Fate of the fog water sampler station "Rio": In 2004 the station is standing on the river bank (close to the white dot in the image on top). After the flash flood in October the site and the sampler station were washed away because the river changed its bed (image below). Photos: Felix Matt.

and most likely thermally induced convective storm released huge amounts of rainfall in the afternoon (see Figure), especially in the higher parts of the Rio San Francisco Valley centered on El Tiro (see Table). As a result, the river bed of the Rio San Francisco was translocated by a flood flushing away huge boulders down the valley. Installations of the fog water sampler site "Rio" were washed away (projects A3.1, B3.1) and also the river gauge installations of project B3.2 were affected.

*Text, data and photos: Jörg Bendix, Andreas Fries, Thorsten Peters, Felix Matt*

### Rain on the day of the flash flood

	Rainfall on Oct. 11 <sup>th</sup> , 2008 [mm]	[%] of monthly mean
ECSF Scat	3.1	1.8
El Tiro (Richter)	42.9	25.1
Antennas Scat	36.3	11.2



Rainfall measured with the scatterometer at the Cerro del Consuelo radar station on October 11<sup>th</sup>, 2008. Image: Andreas Fries and Jörg Bendix.

## Event Calendar

February 16 <sup>th</sup> to 17 <sup>th</sup> 2009	<b>Planungstreffen</b> In the workshop we want to set up the second phase of the RU.
Place:	<u>Bildungszentrum Kardinal-Döpfner-Haus</u> , Freising, Germany
Begin:	Febr. 16 <sup>th</sup> (10 <sup>00</sup> a.m.)
End:	Febr. 17 <sup>th</sup> (5 <sup>00</sup> p.m.)
Deadline:	Registrations accepted until Dec. 12 <sup>th</sup> by email: <a href="mailto:aramayo@forst.wzw.tum.de">aramayo@forst.wzw.tum.de</a>
	Further questions? Call +49 (0)8161-714690 Prof. Dr. Michael Weber & team

## People and Staff

### New Staff Member



**Martin Sondermann** started his Master thesis at the University of Giessen (project B3.2) in November 2008. His focus will be the biological water quality assessment in different subcatchments of the Río San Francisco watershed. A comparison of macroinvertebrate assemblages between pasture and forest creeks, as well as a comparison of aquatic invertebrate biodiversity among different elevations are planned.

*Amelie Bücker*

## New Data and Publications

### Latest Publication

#### New Brochure

**K. Kiss & A. Bräuning** (2008): El bosque húmedo de montaña - La investigación de la diversidad de un ecosistema en el Sur del Ecuador.



The brochure provides an overview of activities and some results of the former RU 402. The publication with more than 160 color photographs and diagrams is written for a general audience like interested local citizens, policy-makers, eco-tourists, pupils and students. It also gives basic information about major aspects of our study area, like geography and climatology, biodiversity and human dimensions. The authors appreciate once more the contributions from all colleagues which formed the basis of this book that received considerable public attention.

An English version is under way and will be available by the end of this year. Printed copies are offered by the NCI office in Loja.

Achim Bräuning

### News from the Data Warehouse

As announced at the 2008 Status Symposium in Loja, data warehouse of the RU available at [www.tropicalmountainforest.org](http://www.tropicalmountainforest.org) now encompasses the first version of the scientific database (project Z1.1) including a web-interface for fully guided data upload, search and data download. Thereby, the data is stored inside relational tables which ensure that individual queries by the dimensions of the dataset and individual data access are possible. The generally standardized export file format is comma separated values (csv).

For the storage of meta information, the Ecological Metadata Language structure has been implemented as relational database (140 tables) along with the data attributes defined and agreed on after the last database workshop in July 2007 (306

attributes). The already existing metadata from the preceding RU402 has been transferred to the RU816 data warehouse (187 geographic coverages, 185 procedure steps and 67 instruments). In addition, some datasets (mainly meteorological) from RU402 have also been included.

Concerning the new web interface which is available in the "Data" section of the website, all users can now create new datasets or add data to an already existing dataset. The main difference between these two options is that for the former, all necessary meta information has to be submitted to the system while for the latter, the already existing meta information is used and only the measurement method has to be changed if necessary. Also in the "Data" section the user will find the query and download functions of the new interface. If a dataset consists of more than a single attribute (e. g. temperature and rainfall), then the user can choose if only one or all attributes of a selected dataset should be downloaded. In addition, meta information for each dataset can be downloaded as an ASCII file.

For more information on data upload and the like please ask your team members who have joined the database workshop 2008 in Loja or have a look at the manual for the data interface available in the "General information" section under "Documents and Services". We hope you enjoy the new interface and start uploading your datasets any time soon.

If you find any bugs or have any further question please do not hesitate to contact our helpdesk via [help@tropicalmountainforest.org](mailto:help@tropicalmountainforest.org).

### Workshop Report

#### Mycorrhizas in Tropical Forests

Scientific knowledge on mycorrhizas increased significantly during the last 30 years, and mycorrhizas are now recognized as the most wide spread mutualistic interaction, driving evolution and maintenance of organism diversity. However, data from tropical forest ecosystems are still rare and restricted to few intensely studied areas. At same time most of these ecosystems are highly endangered and disappearing rapidly. We therefore aimed to promote interest and activities in research on mycorrhizas in tropical forests by organizing a workshop on this topic at the UTPL which took place from 22<sup>nd</sup> to 25<sup>th</sup> of September 2008.

## First International Workshop

The conference, for the first time, unified scientists from 12 countries, all experienced in field work in tropical forests, ranging from Latin America (Ecuador, Colombia, and Panama), Guadeloupe/Fr. Guyana, United States and Europe (United Kingdom, France, Belgium, Germany, Estonia) to East Africa (Ethiopia) and East Asia (see Figure, page 13).

Dr. Ian Alexander, Regius Professor of Botany, School of Biological Sciences, University of Aberdeen opened the workshop by a comprehensive overview on "Mycorrhizas in tropical forests – looking backwards and forwards". In 16 further oral presentations and 14 posters the workshop addressed the distinct mycorrhizal types and the diversity of mycobionts in neotropical and palaeotropical, wet and seasonally dry, lowland and mountain rain forests (see box page 14).

## Disentangling Diversity, Biogeography and Evolution of Mycorrhizas

The workshop focused on disentangling diversity of mycorrhizal fungi, and biogeography and evolution of mycorrhizas in tropical forests considering a wide spectrum of plant and fungal groups and the tropical forests as a cradle and a museum of mycorrhizal interactions.

The fungal taxa can now be studied by molecular tools, opening a so far black box, but many problems on molecular species delimitations are still unsolved. Arthur Schüßler presented molecular species concepts for some groups of arbuscular mycorrhiza (AM) fungi. Sabrina Setaro together with Markus Göker developed a statistically based concept to improve phylotype delimitation.

High diversity of AM fungi was found in all the investigations on tropical trees (Laura Aldrich-Wolfe, Ingeborg Haug, Tesfaye Wubet, Scott Mangan). Experiments indicated that tropical tree seedlings depend on distinct AM fungi for most effective support and such interactions are most likely important in shaping both tree and AM fungi communities (Scot Mangan, Maria Claudia Diez), but no general conclusion on preference or redundancy of AM fungal associations to specific hosts was obtained from forest samples.

Several presentations focused on orchid mycorrhizas. Tulasnellales were confirmed as the dominating mycobionts in epiphytic and terrestrial orchids in Reserva Biológica San Francisco (RBSF), Ecuador (Paulo Herrera and Juan Pablo Suarez), but Sebacinales are also present, while Ceratobasidiales are seemingly more common in Colombian forests (Tupac Otero). Delimitation of

Tulasnellales species by describing and sequencing teleomorphs collected in the RBSF are very promising to solve taxonomic problems in this fungal order (Dario Cruz, Juan Pablo Suarez). Myco-heterotrophic orchids from Asian Diptero-carpaceae forest share ectomycorrhizal fungi and receive carbon from the surrounding trees, as was previously found in temperate forests, but orchids from Africa and the Caribbean islands, devoid of ectomycorrhizal fungi, associate with saprobic fungi and receive carbon from rotten wood or debris as derived from isotopic methods (Marc-André Selosse).

Very specific colonization patterns were described from myco-heterotrophic plants that associate with AMF and only occur in tropical forests (Stephan Imhof).



Workshop participants took the chance to get to know the páramo ecosystem at El Tiro Pass at 2700 m a.s.l. on the excursion day. The mycorrhiza experts also hiked into the tropical mountain rainforest at lower elevations and visited the Estación Científica San Francisco (ECSF), the station of the RU. Photo: Ingrid Kottke.

## New Paradigms in Mycorrhizology

The participants agreed to a change in several long standing paradigms in mycorrhizology:

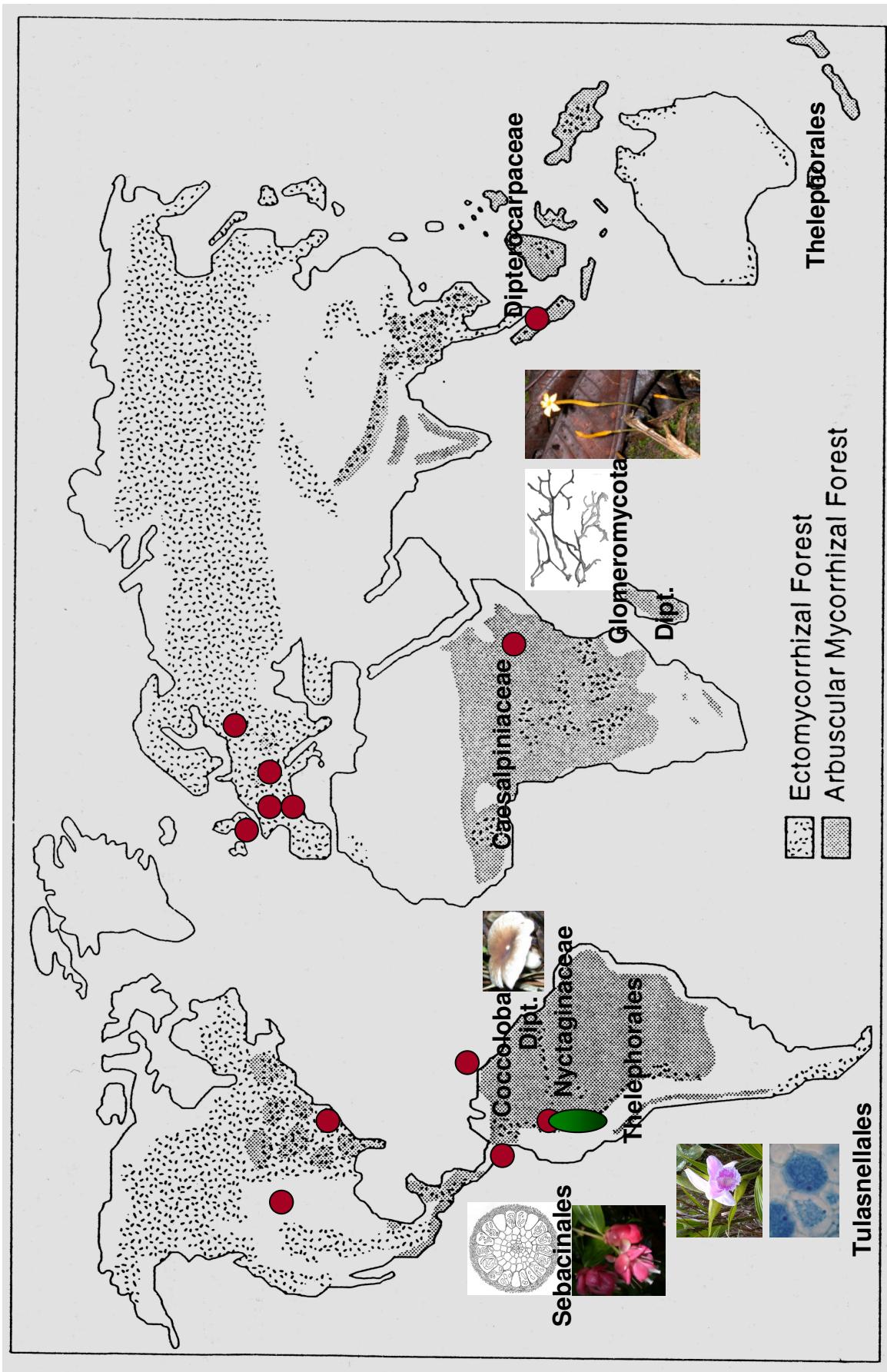
(1) The worldwide distribution of ectomycorrhizal and arbuscular mycorrhizal forests (see Figure) cannot be explained by considering only climate and soil conditions any longer. Instead, plant and fungal evolution and palaeo-biogeography are now accepted as main driving forces to understand the occurrence of ectomycorrhizal Diptero-carpaceae, Nyctaginaceae, and Polygonaceae in the tropics (Bernard Moyersoen, Ingeborg Haug, and Amadou Ba).

(2) The presented study by Amadou Ba made clear that flooding does not impede mycorrhization, but is important for the wetland trees like *Pterocarpus officinalis* (Fabaceae) along the Caribbean coastland, rivers and mountains.



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# Mycorrhizas in Tropical Forests



One of the hypotheses in current mycorrhizology which was rejected during the workshop deals with the driving forces which influence the occurrences of mycorrhizas. The map shows the worldwide distribution of ectomycorrhizal and arbuscular mycorrhizal forests. Names of the mycorrhiza groups presented at the workshop are listed near their native habitats. Green dot marks Andean tropical mountain rain forest area. Red dots indicate the location of the institutes and the places of field work of the participants. Map modified after Moser, 1967.

## Future Meetings

The workshop was considered as an excellent forum and further co-operation and meetings are aimed at by the participants. Foreign participants were fascinated by the field excursion to RBSF and the El Tiro Pass and impressed by the ongoing research of the RU and of the UTPL. Ecuadorian coworkers from UTPL and UNL were especially stimulated in their current and future research.

The organizers want to thank UTPL for kind hospitality and excellent logistic support. The workshop was financially supported by the German Federal Ministry for Economic Cooperation and Development (BMZ) and the German Research Foundation (DFG), in the frame of the Research Unit.

*Ingrid Kottke & Juan Pablo Suarez*

### More About the Mycorrhiza Workshop

Booklet with program, abstracts and a list of the participants:

[http://www.mycorrhiza-research.de/pdf/Booklet\\_v27Ag08.pdf](http://www.mycorrhiza-research.de/pdf/Booklet_v27Ag08.pdf).

Summary of interviews taken by UTPL:  
<http://es.youtube.com/watch?v=6bbgNVid304>

Whole Workshop:

<http://www.mycorrhiza-research.de>

## Miscellaneous

### Deadline

The editorial deadline for the next issue of the TMF-Newsletter is: February 19<sup>st</sup> 2009. Please send your information for the next newsletter including photos and images to [esther.schwarz-weig@wissensworte.de](mailto:esther.schwarz-weig@wissensworte.de)

*Esther Schwarz-Weig  
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## GIS-Course



Adriana Tutillo, a Ph.D.-student from the group around Perdita Pohle (project C1.2) held an introductory class in ArcGIS 9.2. The geographic information system (GIS) captures, stores, analyzes, manages, and presents location data. She addressed the topics to students and investigators of the Universidad Nacional de Loja (UNL) from the laboratory of dendrochronology. Photo: Lab. Dendocronol.

## Imprint

### DFG Research Unit 816

More information about research, the scientific and the local advisory board, and all principal investigators in the Tropical Mountain Forest (TMF) is available at: [www.tropicalmountainforest.org](http://www.tropicalmountainforest.org).

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