OUR COMMON FUTURE UNDER CLIMATE CHANGE

International Scientific Conference

ABSTRACT BOOK

7-10 July 2015 • Paris, France

This Abstract book is based on a compilation of all abstracts selected for oral and poster presentations, as of 15 May 2015.

Due to the inability of some authors to attend, some of those works will therefore not be presented during the conference.

OUR COMMON FUTURE UNDER CLIMATE CHANGE

Welcome to the Conference

Welcome to Paris, welcome to 'Our Common Future under Climate Change'!

On behalf of the High Level Board, the Organizing Committee and the Scientific Committee, it is our pleasure to welcome you to Paris to the largest forum for the scientific community to come together ahead of COP21, hosted by France in December 2015 ("Paris Climat 2015").

Building on the results of the IPCC 5th Assessment Report (AR5), this four-day conference will address key issues concerning climate change in the broader context of global change. It will offer an opportunity to discuss solutions for both mitigation and adaptation issues. The Conference also aims to contribute to a science-society dialogue, notably thanks to specific sessions with stakeholders during the event and through nearly 80 accredited side events taking place all around the world from June 1st to July 15th.

When putting together this event over the past months, we were greatly encouraged by the huge interest from the global scientific community, with more than 400 parallel sessions and 2200 abstracts submitted, eventually leading to the organization of 140 parallel sessions.

Strong support was also received from many public French, European and international institutions and organizations, allowing us to invite many keynote speakers and fund the participation of more than 120 young researchers from developing countries. Let us warmly thank all those who made this possible.

The International Scientific Committee deserves warm thanks for designing plenary and large parallel sessions as well as supervising the call for contributions and the call for sessions, as well as the merging process of more than 400 parallel sessions into 140 parallel sessions. The Organizing Committee did its best to ensure that the overall organization for the conference was relevant to the objectives and scope. The High Level Board raised the funds, engaged the scientific community to contribute and accredited side events. The Conference Secretariat worked hard to make this event happening. The Communication Advisory Board was instrumental in launching and framing our communication activities on different media. We are very grateful to all.

We very much hope that you will enjoy your stay in Paris and benefit from exciting scientific

interactions, contributing to the future scientific agenda. We also hope that the conference will facilitate, encourage and develop connections between scientists and stakeholders, allowing to draw new avenues in the research agenda engaging the scientific community to elaborate, asses and monitor solutions to tackle climate change together with other major global challenges, including sustainable development goals.

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Remote sensing observations from six AERONET sites and from MODIS from 1999 to 2013, provides a regional and temporal overview of changes in Amazonian atmosphere. Aerosol Optical Depth (AOD) at 550 nm of less than 0.1 is characteristic of natural conditions over Amazonia. At the arc of deforestation region, AOD values greater than 4 were frequently observed in the dry season. Combined analysis of MODIS and CERES showed that the mean direct radiative forcing of aerosols at the top of the atmosphere (TOA) during the biomass burning season was a high −5.6±1.7 Wm−2, averaged over whole Amazon Basin. For high AOD (larger than 1) the maximum daily direct aerosol radiative forcing at the TOA was as high as −20 Wm−2 locally. This change in the radiation balance caused increases in the diffuse radiation flux, with an increase of Net Ecosystem Exchange (NEE) of 18–29% for high values of AOD. Recently the GoAmazon project is analyzing the impacts of urbanization on atmospheric properties, and preliminary results shows important changes in ozone formation, secondary organic aerosol production and cloud properties.

From this analysis, it is clear that land use change in Amazonia shows alterations of many atmospheric properties, and these changes are affecting the functioning of the Amazonian ecosystem in significant ways. The potential impacts on global carbon cycle and on the hydrological cycle are large.

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P-2215-02

Climatic implications of rainforest transformations in Nigeria: quantitative and qualitative approaches

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This study examines forest transformation in the rainforest of Nigeria, focusing on the drivers of forest change, the climatic and societal implications on the local people. Both quantitative and qualitative approaches were used. Remote sensing was used to perform quantitative analysis while social methods were used as qualitative approached to evaluate the spatial and temporal rate of deforestation. A time series of Landsat data was used over the period from 1984 to 2011. Remote sensing change detection methods were used to assess forest transformation in rainforest reserves in the study area. Two forest reserves, Okomu and Sakponba/Urhonigbe, were examined to have detail case studies of intensified deforestation within forest reserves. The implications of these changes on local climate around the forest reserves were assessed. Social survey data, questionnaires and interviews, were used to assess societal implications of forest transformation on local people in the study area. Ancillary data such as population data, road network data, and climate data were used to assess the drivers of forest transformation and their implications. Correlation analysis was performed to assess the relationship between deforestation and population, road network, and surface temperature (ST) around the forest reserves. The results show that Okomu forest reserve nearly 50% of its area cover while Sakponba/Urhonigbe forest reserves loss about 90%. There are good relationship between deforestation and distance from road ($R2= 0.52$), also between population and deforestation with a correlation (R2) of 0.48. There appears to be a significant relationship between change forest cover and surface temperature with $R2= 0.46$. Thus, the major finding of this study is that a major cause of deforestation in the rainforest is a result of increased accessibility created by road network. Forest reserve with high rate of road accessibility has high rate of deforestation compared to the forest reserve with less road network. The results from this study also show that increased population appears to be driving people to access these forest areas, that the relationship between population and deforestation relatively significant. The major implication of deforestation on local climate is that ST tends to increase as the rate of deforestation increases. Area with high forest cover tends to experience low ST while area with high rate of deforestation appears to have high ST. The results from social survey show that the drivers of forest transformation in the rainforest of Nigeria are multifaceted. Such drivers include the influence of human activities such as communal and commercial logging, which are enhanced by high and rapidly increasing population, and accessibility to forest reserves through road transportation network. Corruption, lack of political will and unenforced environmental laws are other major drivers, though these are not easily understood in the study area because of lack of accurate data about them. This study is important to both governments and local people to see the need for better forest conservation.

P-2215-03

Predicting the combined impacts of climate change and selective logging in timber production forests of Central Africa

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In the design and the implementation of current rules of Sustainable Forest Management (SFM), still too little account is taken of the sensitivity of tropical forests to climate change. In the Congo Basin, forests cover 220 million hectares and represent an economic sector of utmost importance for the rural development as well as for national and regional climate strategies. Hence, these forests constitute a major challenge for both adaptation and mitigation.

A prerequisite to ensure the relevance and the effectiveness of SFM recommendations in this region is to elucidate the influence on forest dynamics of both climate change and harvesting pressure. This influence will likely consist of major shifts in structure and floristic composition. By opening the stands and increasing light availability, selective logging fosters the development of light demanding species. Some of these species, particularly the pioneers, are thought to be particularly drought sensitive so that global warming could strongly impact logged forests. The study of forest-climate-logging relationships needs therefore species-level predictions. However, the high diversity of tropical forests, in pair with the scarcity of data, hinders the correct fitting of species-specific models.

To investigate the combined effects of climate and harvesting influence on Central African forests, we conducted long-term simulations of forest dynamics under several scenarios of climate change and timber harvesting. Climate scenarios were based on outputs from simulations of the atmospheric model ARPEGE-Climate of the French National Centre for Meteorological Research (CNRM), performed within the Coupled Model Intercomparison Project Phase 5 (CMIP5) and under several Representative Concentration Pathway (RCP) scenarios of the International Panel on Climate Change (IPCC). We also used outputs fields such as soil water and potential evapotranspiration from the model CARbon Assimilation In the Biosphere (CARAIB) of University of Liège obtained under the same climatic scenarios. Logging scenarios were implemented by considering a wide range of felling intensities.

To carry out this work, we developed an innovative method based on a Mixture of inhomogeneous matrix models (MIMM) that permits to test and simulate the influence of timber harvesting and climate change on forest dynamics. While insuring a satisfactory fitting of vital parameters, such a methodology allowed us to reflect the diversity of tree ecological patterns, notably in response to climate variables. To do this, we simultaneously clustered species into groups according to species-specific ecological responses and identified group-specific explicative environmental and climate variables. To infer and validate model outputs, we used the M'Baïki site, in the Central African Republic (CAR), a unique experimental site that has been monitored for 30 years through a collaborative partnership with various French and CAR institutional and research organizations.