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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Climate change threatens global water and food security, especially in arid regions where water availability is already a critical limiting factor of agricultural productivity. Yet, increasing atmospheric carbon dioxide (CO2) concentrations are expected to raise rates of crop photosynthesis whilst also increasing the ratio of crop yield to water use, or crop water productivity (CWP). The potentially large positive effects of rising CO2 on CWP will have major implications for increasing crop yields and reducing pressure on freshwater resources. However, to date there has been no systematic evaluation of global crop model simulation of CWP response to CO2 and climate change, and estimates of carbon fertilisation effects on crops based on observations continue to be controversial.

Our study addresses these gaps; by providing the first comprehensive global scale assessment of the combined effects of climate change and CO2 on global CWP using a large multi-model ensemble (originating from the Agricultural Modelling Intercomparison and Improvement Project (AgMIP), and by directly comparing model results with observations. Our modelling results suggest combined effects of climate change and CO2 are substantial, leading to increase in CWP by up to 13-27% globally (ensemble median, with a range of different crop types) by the 2080s relative to the 1980s. The range increases to 17-35% in water scarce arid regions. This suggests significant alleviation of negative effects of climate change on crop yield and pressure on water use in these regions. Yet, the spread of CWP results doubles when considering climate and CO2 effects, reflecting uncertainty in modelling methodology and assumptions about CO2 response, which are large due to the lack of experimental observations globally. We show the spatial distribution in the impacts on four major crops critical for global food security: maize, wheat, rice and soybean. Our results indicate CO2 fertilisation effects play a key role in future agricultural production and water management and emphasise the importance of extending experimental observation, especially in arid and semi-arid regions.

Our study addresses global scale modelling of an important dimension of agricultural production that is intimately connected with water resources. The effects of CO2 are shown to be large, key uncertainties are highlighted and needs for modelling and empirical research identified. These results demonstrate the need to diagnose further reasons for differences between crop model simulations of CWP and promote wider incorporation of CO2 effects in global food and water resource assessments.

P-2223-08

Options for a sustainable food future and agricultural sector greenhouse gases mitigation

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By 2050, the agricultural sector should produce food to feed an increased and wealthier population, while reducing environmental impacts. In particular, conversion of natural ecosystems and greenhouse gas emissions are serious potential impacts of agricultural production.

To take up this challenge, many options exist for the agricultural sector. Some are on the supply side, such as increasing the efficiency of livestock production, increasing the efficiency in crop production inputs, or a sustainable increase of aquaculture. Others are on the demand side, such as changes in diets, reduction of losses and wastes or, more controversially, reduction in population increase. The overall consequences of those options on land-use and greenhouse gas emissions, especially when taken together, are not easy to assess in a transparent and consistent way.

To tackle this challenge, a simple balance model with detailed biophysical modules is developped to assess the consequences in term of greenhouse gases emissions reductions of various options for the agricultural sector, under the constraint of feeding the world.

The reference year balances are based on FAOSTAT food commodity balances. Demand is set exogenously based on population and diets, trade is based on import dependence and export market shares, and loss coefficients are used. Transformation through livestock sectors and oil crops crushing allows to determine production, and, with exogenously set yields, land-use. In the reference case, yields and demands evolutions are based on FAO projections. Detailed modules of livestock, aquaculture, land-use change emissions, nitrogen cycle and rice methane emissions allow to determine transformation and emission coefficients, as well as the consequences of diverse options. The model integrates those informations at the global scale on several regions, allowing to assess in a transparent way the consequences of the options used together.

The methodology and the model results will be presented for change in livestock efficiency, rice methane emissions mitigation options, changes in diets and increases in nitrogen use efficiency.

P-2223-09

Detecting the early stage of Phaeosphaeria leaf spot infestations in maize hybrid lines under different climate change scenarios using in situ hyperspectral data

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Phaeosphaeria leaf spot (PLS) is considered as one of the major diseases that threat the stability of maize production in tropical and subtropical African regions. PLS is a foliar disease in maize caused by the ascomycete fungus Phaeospharia maydis (Henn.), and has spread widely in areas of high rainfall and moderate temperatures. PLS can result in a considerable reduction in photosynthetic leaf area as the spots coalesce , cause premature leaf drying thus reduce plant cycle and sharp decrease in grain size and weight and result in early plant death. The objective of the present study was to investigate the use of hyperspectral data in detecting the early stage of PLS in tropical maize. Maize ground-based hyperspectral data were collected at the field level from healthy and early stage of PLS over two years (2013 and 2014) using a handheld Spectroradiometer. Leave samples for full biochemical analysis ware collected form the healthy leaves and early stage of PLS to test the impact of PLS on the maize plant properties. An integration of a new developed guided regularized random forest (GRRF) and traditional random forest (RF) was used for feature selection and classification respectively. The 2013 dataset was used to train the model, while the 2014 dataset was used as independent test dataset.

Results show that there were statistically significant different in biochemical between the healthy leaves and early stage of PLS within certain biochemical variables such as nitrogen, phosphorus, calcium and magnesium. The new developed GRRF was able to reduce the high dimensionality of hyperspectral data by selecting key wavelengths with less autocorrelation. These wavelengths are allocated at 420 nm, 795 nm, 779, 1543 nm, 1747, nm and 1010 nm. Using these variable (n = 6), random forest classifier was able to discriminate between the healthy maize and early stage of PLS with and overall accuracy of 88% and kappa value of 0.75. This study demonstrates the potential of hyperspectral data in detecting the early stage of PLS in tropical maize. The study offers insight to the potential of large-scale mapping and monitoring of the