New projects

LUCID – Land-Use and Climate, IDentification of robust impacts

Nathalie de Noblet-Ducoudré[1] and Andy Pitman[2]

[1] Laboratoire des Sciences du Climat et de l'Environnement, Unité mixte CEA-CNRS-UVSQ, Gif-sur-Yvette cédex, France
[2] Climate Change Research Centre, University of New South Wales, Sydney, Australia

LUCID

Over the last decade there has been a tremendous increase in the literature regarding the impact of land cover change on climate at the regional and global scale. However, the results of the impact of large scale land cover change on the Earth's climate varies from "significant and large", "only local to the perturbation", or "small enough to be ignored" in the literature. This variability is mainly due to the fact that modelling groups have used different models, different land parameterizations, different land-cover maps, different model configurations and different experimental protocols. Inspite of controversial results, the land cover change community has clearly demonstrated the importance of the land cover change on climate. In discussions within GEWEX-GLASS and IGBP-iLEAPS, a sense that the land cover change community had proven *to itself* that land cover change was important, but not proven to the major modelling groups *how important* it is led to a decision to launch a major experiment to evaluate the impact of land-use induced land-cover changes on climate.

Under the auspicies of IGBP-iLEAPS and GEWEX-GLASS, a project called LUCID (Land-Use and Climate, IDentification of robust impacts) has therefore been launched. LUCID is self describing: we are not trying to identify model-specific sensitivities to land cover change, rather we seek to explore, using methodologies that the major climate modelling groups recognise, those impacts of land cover change that are *robust* – that is, above the noise generated by model variability.

Our objective is therefore to *identify* and *quantify* the impacts of land-used induced land-cover changes on the evolution of climate between the pre-industrial epoch and present-day. We will use a) multi-model and b) ensemble simulations to *assess the robustness of the identified changes*. Assessments of the impacts of land cover change *will explore the mean climate*, *climate variability* and *climate extremes*. Assessment will also be made on the potential impact land-use induced land-cover change can have on the sea-surface temperatures and on ocean circulation. Among the final objectives is to build the case, if the case can be proven, to ensure land-cover changes are included in any future assessments by the IPCC.

Three sets of simulations have been designed to be run by different climate models. Our intent is to identify robust changes via simulations that first use prescribed sea-surface temperatures and sea-ice extent, but then move rapidly to coupled model simulations since these are the tools now used for climate projection. Our strategy was to perform fixed SST experiments first, to (we hope) establish the value of the subsequent more expensive simulations.

1) The first set includes snap-shot simulations with prescribed sea-surface temperatures and sea-ice extent of the present-day climate (1992-2002) and of pre-industrial times (1870-1900). Simulations will differ by the land cover distribution that will reflect the observed changes in both crops and pasture between both time periods. To assess the robustness of the results we will conduct ensemble simulations.

2) The second set includes transient simulations over the past 150 years (1870 to 2002), with prescribed SSTs and sea-ice. They will be run following the protocol designed within the C20C project.

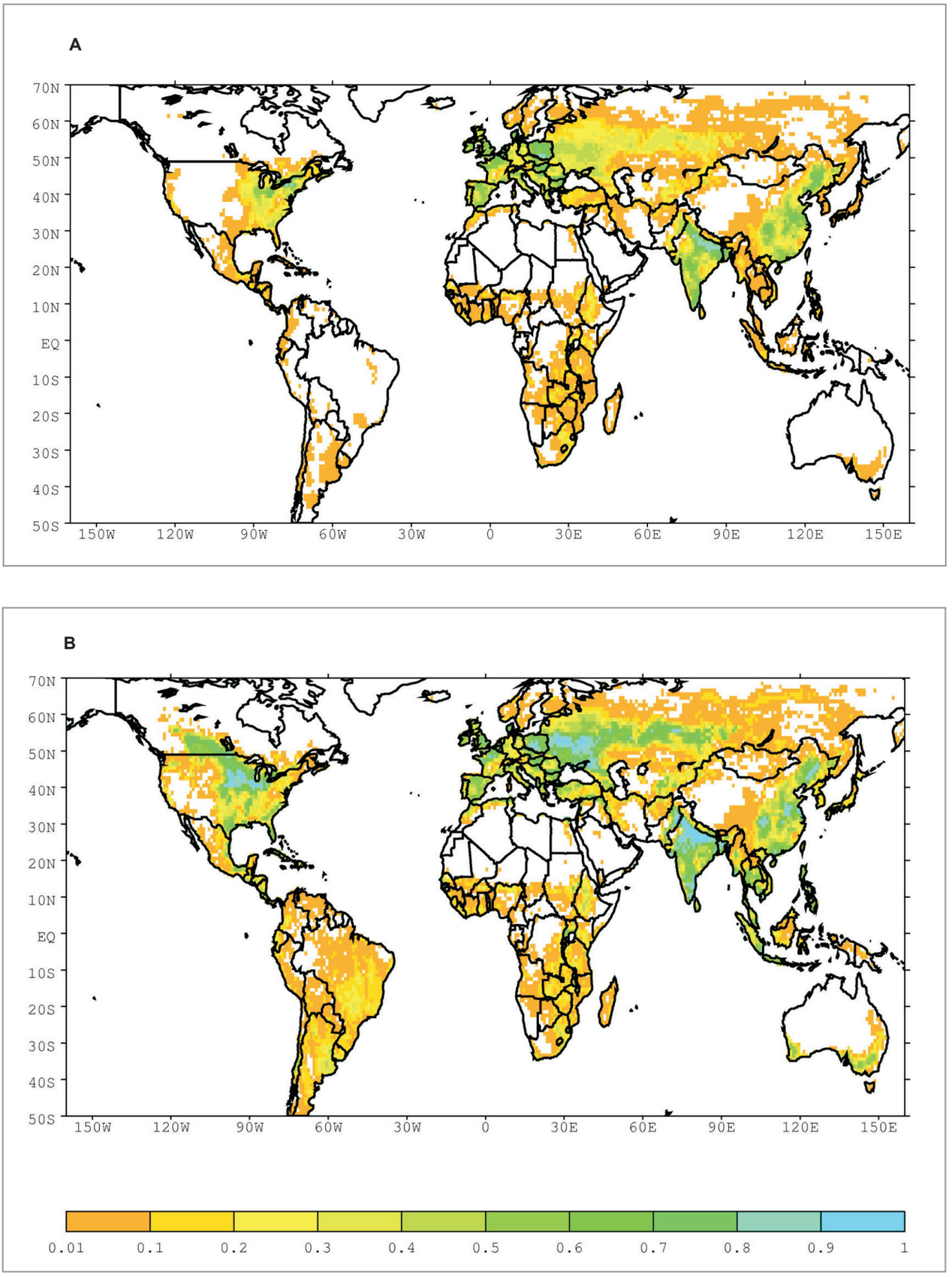
3) Then finally, within the European project ENSEMBLES, IPCC simulation will be re-run with coupled atmosphere-ocean general circulation models, from 1850 till 2100 following the A1b economical scenario.

The simulations in steps 2 to 3 will be run with and without land-use induced land-cover changes.

nathalie.de-noblet@lsce.ipsl.fra.
pitman@unsw.edu.au

lucid@dsm-mail.saclay.cea.fr
This email address is used to reach all scientists who have declared interest in the project and who will participate either by running some or all experiments or by carrying out some diagnoses.

1. Ramankutty N. and Foley J.A. 1999. Estimating historical changes in global land-cover: croplands from 1700 to 1992. Global Biogeochemical Cycles 13, 997-1027.
2. Goldewijk K.K. 2001. Estimating global land-use change within the past 300 years: the HYDE database. Global Biogeochemical Cycles 15, 417-433.



Extent of crop areas for a) pre-industrial times and b) present-day. The extent is expressed as the fractional area occupied by crops within each 0.5°x0.5° grid cell. This extent results from a combination of two datasets, the one derived from Ramankutty and Foley [1], and the one provided within the HYDE database [2].