LandUse6k
Putting History to Work on Climate Change
A Workshop on Land Use Classification

October 22-23, 2015
University of Chicago Center in Paris, France
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How can evidence from history, archaeology, and historical geography inform global climate models? Historical data are used in modeling present and future climate, but these reconstructions are based not on the vast repository of historical scholarship, but on other models. Until now, historical scholars have not had the opportunity to contribute directly to climate change science even though evidence for human land use, from foraging and farming to mining and industry, constitutes critical evidence in reconstructing past land cover (vegetation) and climate.

LandCover6k is an international working group dedicated to data-based reconstruction of both land cover (using pollen data) and land use (using archaeological and historical data). Representing an ambitious attempt to aggregate and synthesize evidence for land use and land cover change across the Holocene, we welcome participation from scholars around the world.

This second meeting of LandCover6k focuses on the classification of global human land use systems in preparation for the work of data aggregation and synthesis. Between c. 10,000 years ago and CE 1850, humans practiced a wide range of land use strategies, strategies with variable levels of impact on local and regional vegetation. We invite participation from archaeologists, historians, geographers, anthropologists, ecologists, and others interested in the historical diversity of human land use.

The meeting format is a workshop, designed to develop an initial draft of a hierarchical, scalable land use classification that can be applied globally and across the Holocene. The meeting is also meant to promote interaction within the community of historical scholars and to introduce opportunities for broader interaction with the paleoscience community.

October 22

8:30 - 9:00
Registration, Coffee

9:00
Welcome & Logistics

9:15 - 9:45
Marie-José Gaillard-Lemdahl
Introduction to Landcover6k, Q&A

9:45 - 10:15
Kathleen D. Morrison
Introduction to the land use project, introduce regional coordinators, Q&A

10:15 - 10:30
Marco Madella
Integrating Land Use and Land Cover

10:30 - 10:45
Mats Widgren
Global Agriculture Project, Q&A

10:45 - 11:00
Coffee Break

11:00 - 11:10
Boris Vannière
Paleofire Database

11:10 - 11:30
Emily Hammer
Preliminary comments on data aggregation and mapping, Q&A

12:00 - 13:00
Lunch

13:00 - 14:30
Working Groups

14:30 - 14:45
Coffee Break

14:45 - 15:45
Working Groups

15:45 - 16:00
Break

16:00 - 17:00
Groups report back, Discussion

19:30
Conference Dinner at Le Train Bleu

October 23

9:00 - 9:15
Announcements

9:15 - 10:30
Working Groups

10:30 - 11:00
Coffee Break

11:00 - 12:30
Working Groups

12:30 - 13:00
Groups report back, Discussion

13:00 - 14:30 Lunch
Not provided, please seek your own lunch

14:30 - 14:45
Announcements

South/Central America coordinators on Amazon meeting, Zsolt Pinke on Eastern Europe meeting, and others

14:45 - 16:00
Group discussion, Next steps
Past anthropogenic land-use and land-cover change at the global scale for climate modelling studies: PAGES LandCover6k working group

Working group leaders: Marie-José Gaillard (Linnaeus University, Department of Biology and Environmental Science, Sweden), Kathleen Morrison (University of Chicago, Archeology/Anthropology, USA)

Website: http://www.pages-iGBP.org/ini/wg/landcover6k/intro

Authors: Marie-José Gaillard, Kathleen Morrison and Nicki Whitehouse (Plymouth University, School of Geography/Earth and Environmental Sciences, UK)

The great challenge of PAGES LandCover6k

The major goal of the new PAGES working group LandCover6k is to achieve reconstructions of past land-use and anthropogenic land-cover change for the purpose of climate modelling studies (Gaillard et al., 2015a), and in particular for questions related to land-use change as an anthropogenic climate forcing (e.g. Gaillard et al., 2010; 2015b). LandCover6k focuses on the period of the Holocene for which anthropogenic deforestation is significant, i.e. from 6k years ago or earlier depending on the continent/region. LandCover6k has links to other research programs, in particular IHOPE (Integrated History and Future of People on Earth), GLP (Global Land Project), PMIP (Palaecoclimate Modelling Intercomparison Project), and PAGES-GPWG (Global Paleofire Working Group), as well as with the INQUA commissions on Palaeoclimate (PALCOMM; http://www.inqua.org/PALCOMM/) and Humans and Biosphere (HABCOM; http://www.inqua.org/habcom/index.html ). LandCover6k involves a large network of palaeoecologists, archaeologists and historians, as well as major international actors within the fields of anthropogenic land-cover change (ALCC) modelling (Klein-Goldewijk et al., 2011; Kaplan et al., 2009) and climate modelling. The work is organized into three main activities:

i) pollen-based reconstructions of past land-cover change and mapping, ii) land-use reconstructions and mapping based on archaeological and historical data, and iii) ALCC modelling using i) and ii) as evaluation tools and constraining proxy data of ALCC. The major challenges of this initiative are:

• to upscale historical and archaeological data on land-use and anthropogenic land-cover to the globe, i.e. to categorize land-use over the earth using a standardized approach

• to obtain the necessary parameters to reconstruct land cover in the past using pollen data and models of the pollen-vegetation relationship including models of pollen dispersal and deposition

• to build up databases of pollen records as well as historical and archaeological data from all parts of the world where anthropogenic activities have modified vegetation significantly over time

• to coordinate three large communities of scientists, namely palynologists, archaeologists and historians

The scientific background – why this initiative?

Climate change is due to a number of forcings, natural and anthropogenic. Changes in vegetation cover on the globe can be natural (mainly climate-induced), or anthropogenic (due to various land-uses and their changes). Vegetation on land and its change impact climate by modulating exchanges of energy, water and greenhouse gases with the atmosphere through biogeochemical and biogeophysical processes. These effects either feed back into climate (if due to natural, climate-induced vegetation) or they represent a climate forcing (if due to anthropogenic land-use changes, e.g. deforestation). Through these processes, land-use change may amplify or reduce climate change due to other forcings (natural or anthropogenic forcings). A land-use change can lead to decreased temperatures, in which case it can be a “mitigating factor” as it can reduce climate warming. Biogeochemical forcing from land-use change, especially involving the carbon cycle, have received much attention. Biogeophysical forcing from land-use change has received less attention although it can have an effect of comparable magnitude as the biogeochemical forcing, but of opposite sign, i.e. it can cancel the biogeochemical effects of e.g. tree planting (see references in Gaillard et al., 2015b). Quantifying the net result of both biogeochemical and biogeophysical forcing is thus of prime importance if those processes are to be used in climate mitigation strategies.

Past anthropogenic land-cover reconstructions for climate modelling

Climate models have been developed and tested over many decades and have resulted in complex Earth-system models (ESMs) in which the atmosphere, the ocean and land-surface processes are coupled. By using a model-data comparison approach, i.e. comparing model outputs with actual climate data over decades, centuries, and millennia back in time (paleoclimate data), models can be evaluated and improved. In order to account for anthropogenic land use in climate-modelling studies of the past, approaches were developed that use models of human population growth in the past and evidence from historical and archaeological sources to produce scenarios of past anthropogenic land-cover change (ALCC, or anthropogenic deforestation) (e.g. Klein-Goldewijk et al. 2011; Kaplan et al., 2009; Pongratz et al, 2008). However, these ALCC scenarios show very significant differences in the fraction of past deforested land depending on the method used (Gaillard et al. 2010), which seriously hampers studies of interactions between land-use change and climate in the past. Thus, there is an imminent need for independent descriptions of past vegetation cover based on empirical data and an improved ALCC history at both regional and global scales.

Objective, quantitative long-term records of past changes in vegetation cover are still limited in space. Until a few years ago, it was not possible to translate fossil pollen found in lake sediments or peat into a quantitative description of the past vegetation. Sugita (2007) developed an algorithm for inverse modeling of the relationship between pollen and vegetation (Regional Estimates of Vegetation Abundance from Large Sites, REVEALS) that makes it possible to translate fossil pollen data into vegetation cover (in % cover of individual plant taxa or groups of plant taxa) at regional spatial scales. The REVEALS model was tested and validated in several parts of Europe (e.g. Hellman et al., 2008), and in North America (Sugita et al., 2010). REVEALS reconstructions were achieved for part of Europe (Trondman et al., 2015), and can be used to evaluate and improve ALCC scenarios. Beside Europe, the application of REVEALS is now in progress in other parts of Europe.

Climate change: anthropogenic deforestation matters at both global and regional spatial scales

The effect of historical land-use change on global climate was studied in many climate modelling studies, of which those
The PAGES LandCover6k working group aims to capitalize on the developments of pollen-based reconstructions of past vegetation cover in Europe in a large, globally coordinated effort. The ultimate goal of LandCover6k is to produce useful outputs for climate/earth system modelers in particular, but also for ecologists, conservation bodies, land-use managers, and policy-makers. The specific aims are:

- produce pollen-based land-cover reconstructions for regions of the world where human impact has been particularly intense over the Holocene in the past.
- produce maps of generalized land-use over the globe based on historical and archaeological data. An example of how such a land-use categorization might look is the categorization proposed for sub-Saharan Africa by Kay and Kaplan (2015).
- evaluate the existing ALCC scenarios with the combined information from the pollen-based reconstructions (land-cover reconstructions), archeological and historical data (land-use reconstructions).
- improve the ALCC models (Primarily HYDE and KK) and produce spatially continuous land-cover descriptions integrating all the available empirical information at hand (above).

We strive to achieve this final product within six years. The ambitious and challenging plan of LandCover6k requires a large, well-organized group of devoted scientists. The group is coordinated by experts in pollen-based reconstructions of vegetation cover, pollen databases, historical and archaeological data on land use, mapping of recent land-cover change, modelling of anthropogenic land-cover change, and climate modelling. Moreover, the working group is divided into nine subgroups, of which five are regional subgroups, each with two to three coordinators (a minimum of one palynologist and one historian or archaeologist), i.e. North America, Latin America, Europe, Africa, and Asia with Oceania.

**References**


Hotel Information

Hotel IBIS Paris Bercy Village
19, place des Vins de France
Tel: +33 (0) 1 49 28 06 06

The hotel is about a 15 minute walk from the University of Chicago Center in Paris.

Conference Dinner

Le Train Bleu
Gare de Lyon, Place Louis Armand
Ph: 33 1 43 43 09 06

Dinner will begin at 19:30.

Paris Contacts

The University of Chicago Center in Paris
6, rue Thomas Mann
75013 Paris, France
+33 (0) 1 53 94 78 80

For urgent inquiries in Paris, please contact:

Sébastien Greppo
Administrative Director
University of Chicago Center in Paris
sgreppo@uchicago.edu
+ 33 (0) 6 25 33 00 26

Madeleine McLeester
Program Assistant
University of Chicago Program on the Global Environment
maddie@uchicago.edu

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Participants

Andrew Bauer
Stanford University
ambauer@stanford.edu

Anne Casile
Institut de Recherche pour le Développement
anne.casile@ird.fr

Pablo Cruz
CONICET (National Scientific and Technical Research Council)
saxrapablo@gmail.com

Basil Davis
Université de Lausanne
basil.davis@unil.ch

Jonas DeSouza
University of Exeter
jonas.gregorio@yahoo.com.br

Erle Ellis
University of Maryland, Baltimore County
ece@umbc.edu

Laure Emperaire
Institut de Recherche pour le Développement
laure.emperaire@ird.fr

Thomas Foster
The University of Tulsa
thomas.foster@utulsa.edu

Marie-José Gaillard
Linnaeus University
marie-jose.gaillard-lemdahl@lnu.se

Albert Hafner
University of Bern
albert.hafner@iaw.unibe.ch

Emily Hammer
University of Chicago
emhammer@uchicago.edu

Hajnalka Herold
University of Exeter
h.herold@exeter.ac.uk

José Iriarte
University of Exeter
j.iriarte@exeter.ac.uk

Andrea Kay
University of Lausanne
andrea.kay@unil.ch

Kees Klein Goldewijk
Utrecht University
c.g.m.kleingoldewijk@uu.nl

Jan Kolář
Czech Academy of Sciences
janik.kolar@seznam.cz

Elizabeth Kyazike
Kyambogo University
elizabethkyazike@rocketmail.com

Julian Laabs
University of Bern
julian.laabs@iaw.unibe.ch

Marie-Pierre Ledru
Institut de Recherche pour le Développement
marie-pierre.ledru@ird.fr

Carsten Lemmen
C.L. Science Consult and Helmholtz-Zentrum Geesthacht
science@carsten-lemmen.de

Umberto Lombardo
Universitat Pompeu Fabra
umberto.lombardo@upf.edu

Marco Madella
Universitat Pompeu Fabra
marco.madella@icrea.cat

Shira Maezumi
University of Exeter
s.y.maezumi@exeter.ac.uk

Nicolas Maughan
Aix-Marseilles University
nicolas.maughan@gmail.com

Madeleine McLeester
University of Chicago
mcleester@uchicago.edu

Sathaporn Monprapussorn
Srinakharinwirot University
satha13@hotmail.com

Kathleen Morrison
University of Chicago
morrison@uchicago.edu

Shilpa Pandey
Birbal Sahni Institute of Palaeobotany
shilpa.bsip@gmail.com

Zsolt Pinke
University of Pécs and Szent István University
pinkezsolt@gmail.com

Laura Popova
Arizona State University
Laura.Popova@asu.edu

Mark Robinson
University of Exeter
markrobinson.uk@gmail.com

Stéphane Rostain
CNRS (National Center for Scientific Research)
stephen.rostain@mae.u-paris10.fr

Rakesh Saini
Dr Harisingh Gour Central University
rakesh83jnu@hotmail.com

Andrew Sluyter
Louisiana State University
asluyter@lsu.edu

Benjamin Sultan
IRD - LOCEAN / IPSL
benjamin.sultan@ird.fr

Peter Szabo
Institute of Botany of the Czech Academy of Sciences
peterszabo@ibot.cas.cz

Prisca Tanui-Too
Mou University
ptoo212@gmail.com

Enric Tello
University of Barcelona
tello@ub.edu

Jean Vacher
Institut de Recherche pour le Développement
jean.vacher@ird.fr

Boris Vannière
Institute of Ecology and Environment
boris.vanniere@univ-fcomte.fr

LuAnn Wandsnider
University of Nebraska-Lincoln
lwandsnider1@unl.edu

Mats Widgren
Stockholm University
mats.widgren@humangeo.su.se

Wenjing Yu
National Museum of History and Nature
yuwenjing92@outlook.com
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