

Goal and products of PAGES LandCover6k 2018-2020

Past Global Land Cover and Land Use for Climate Modelling

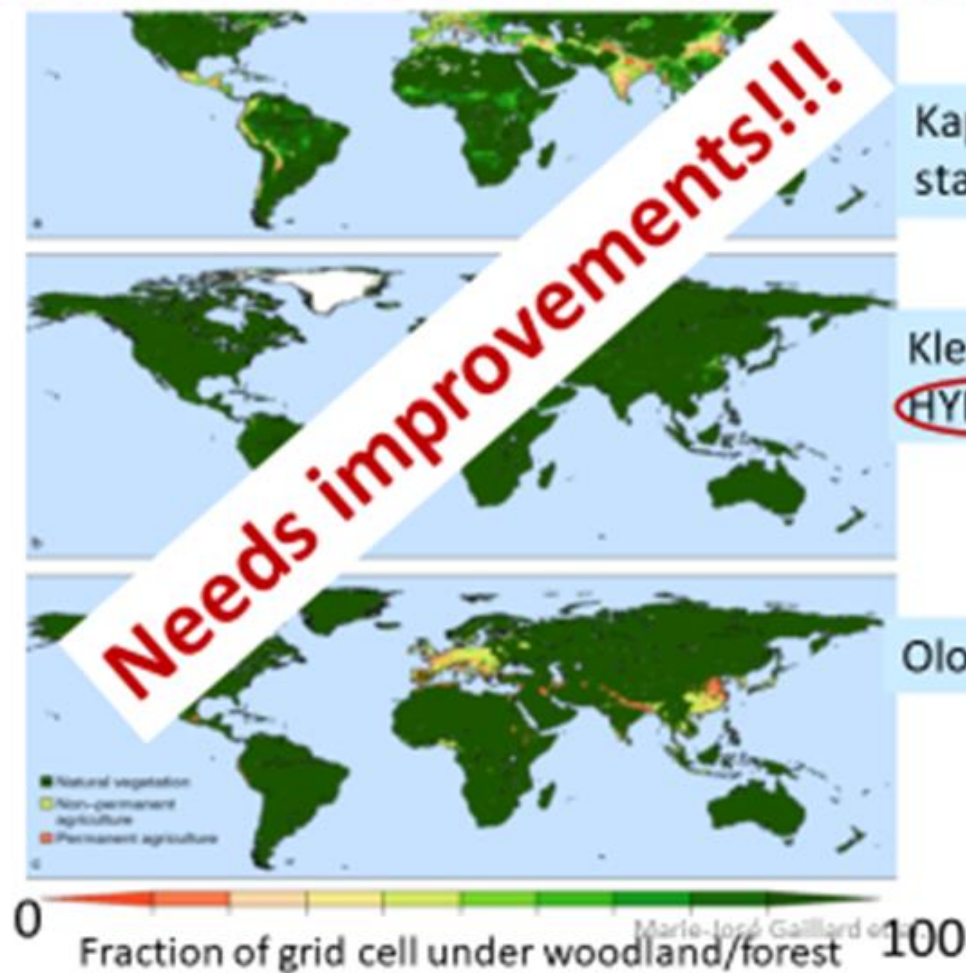


Marie-José Gaillard, Linnaeus University, Kalmar, Sweden

Andria Dawson, Ralph Fyfe, Esther Githumbi, Emily Hammer, Sandy Harrison, Furong Li, Marco Madella, Kathleen D. Morrison, Benjamin Stocker, Marc Vander Linden, Nicki J. Whitehouse

Note the difference in open land!

AD 1 ca. 2000 BP
Early Iron Age



Kaplan et al. (2009)
standard scenario

Klein Goldewijk et al. (2010)
HYDE 3.1

Olofsson & Hickler (2008)

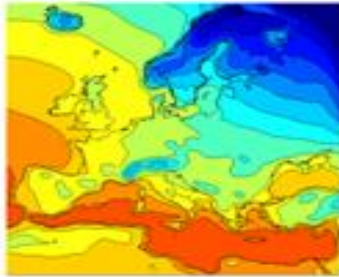
Review in Gaillard *et al.* (2010)
Clim Past 6

Example from LandClim I: Strandberg et al. 2014, Clim Past WINTER and SUMMER TEMPERATURES – 200 BP (1750 CE)

Potential
vegetation

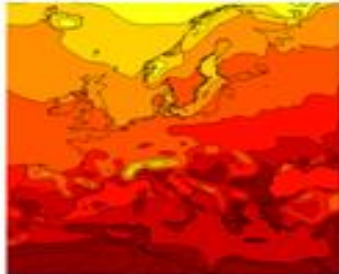
0.2k_V

DJF



WINTER

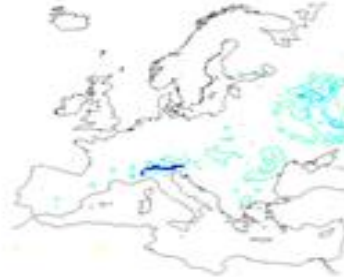
JJA



SUMMER

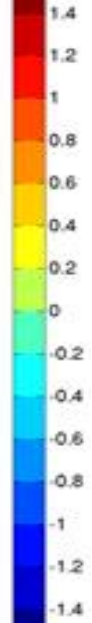
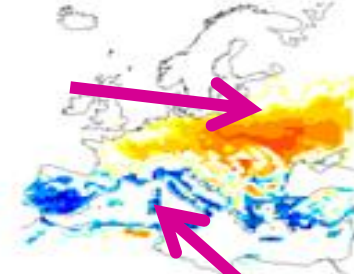
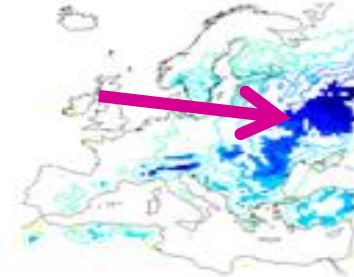
+ anthropogenic vegetation
HYDE

0.2k_V+H - 0.2k_V



KK

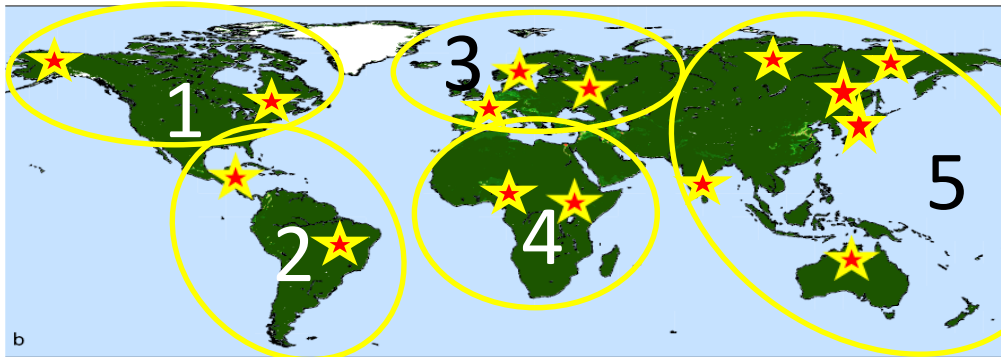
0.2_V+K - 0.2k_V



Started in February 2015

<http://pastglobalchanges.org/landcover6k>

First period 2015-2017; re-endorsed for **second period 2018-2020**



- 5 large regions
with their coordinators

- 4 main activities:

- 1. pollen-based land-cover reconstructions (REVEALS)="land-cover"
- 2. History/archaeology-based land-use reconstructions="land use"
- 3. Anthropogenic land-cover change (ALCC) modelling
- 4. Co-design of climate and carbon cycle modelling experiments

LandCover6k strategy

modified from Harrison et al., *GMD*

<https://doi.org/10.5194/gmd-13-805-2020>



Pollen-based
REVEALS
LAND COVER

7 → **simulated**
VEGETATION ← 6

VEGETATION MODELS

2 →

HYDE
LAND-USE
Database

Kaplan's
KK/ALVAR
scenarios

1 →

3 →

CLIMATE
EARTH-S
MODELS
Experiments

BioGeoChem.
BCG MODELS
Experiments

4 →

simulated
CLIMATE

5 →

CO2

8 ↑↓

EMP.
CO2

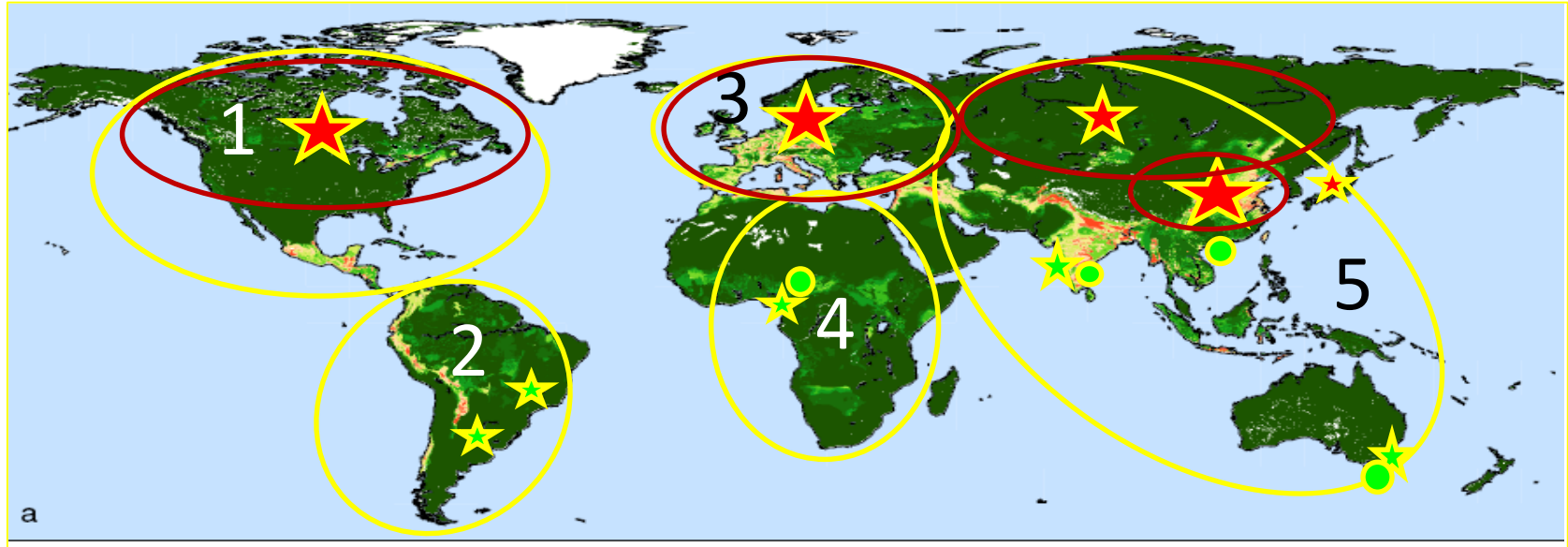
Archaeology-based
LAND USE MAPS
LOOK-UP TABLES

- per-capita land-use
- Type of grazing animals
- Date of first arrival of agriculture
- Population data (14C – based)
- Etc.

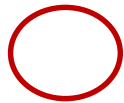
EMPIRICAL LAND COVER AND
LAND USE DATA

ANTHROP. LAND-COVER
CHANGE ALCC SCENARIOS

ES and CC
MODELS



Single – many RPP study(ies)



REVEALS-based land-cover - gridded



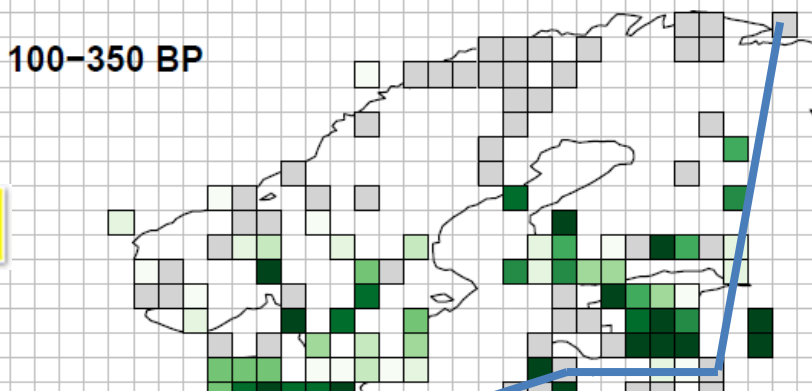
Single sites-few sites

New REVEALS reconstruction Europe

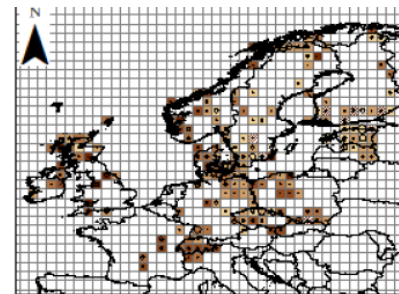
LandClim II: Example: Cereal type Githumbi, Fyfe et al. in prep.



100-350 BP

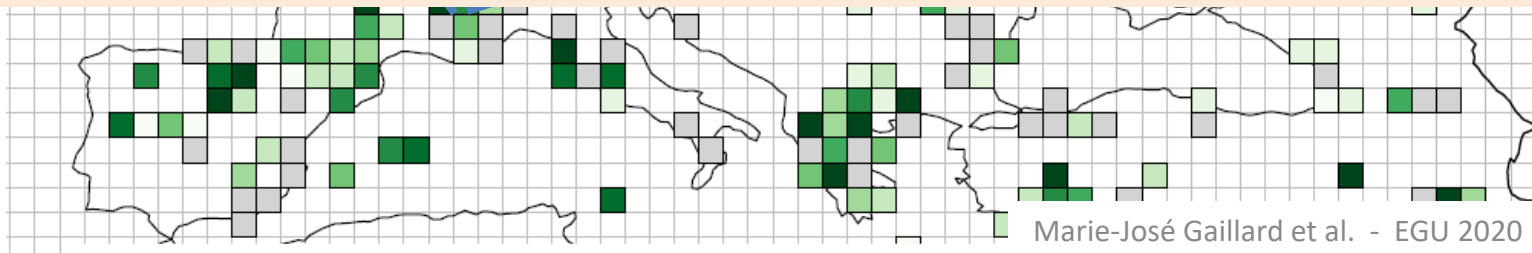


Trondman et al. 2015



doi: [10.1111/gcb.12737](https://doi.org/10.1111/gcb.12737)

TRANSIENT RECONSTRUCTIONS FROM 11.7 k until today:
0-100, 100-350, 350-700, and **500 yrs time windows** from 700 BP:
700-1200, 1200-1700, 1700-2200, etc...



Marie-José Gaillard et al. - EGU 2020 BG 3.32

light green: $\leq 1.5\%$

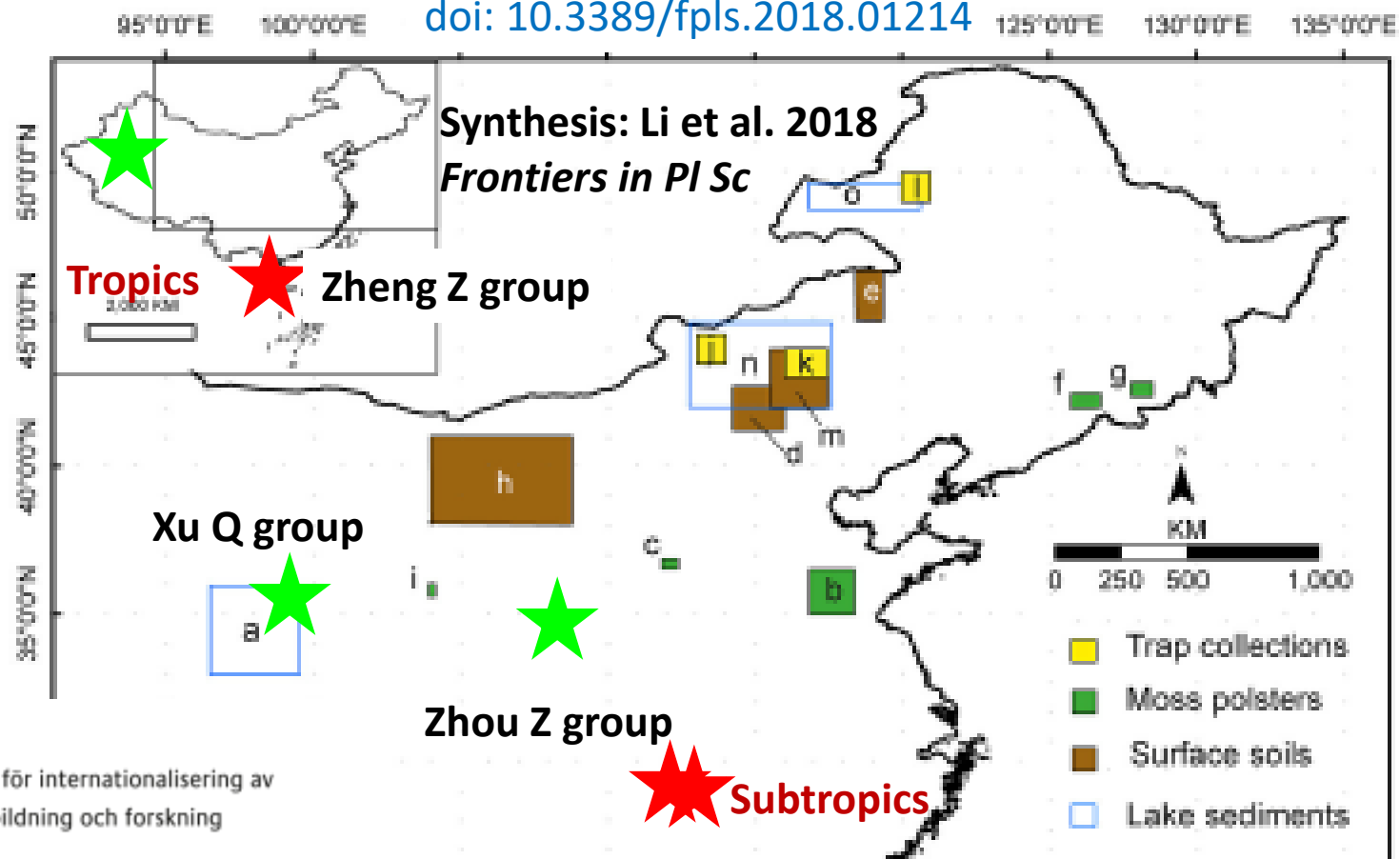
intermediate green: $>1.5\% - 5\%$

dark green: $> 5\%$

Collaboration with Chinese scientists (STINT)

Relative pollen productivities in China 2015-2019

doi: 10.3389/fpls.2018.01214



STINT

Stiftelsen för internationalisering av
högre utbildning och forskning

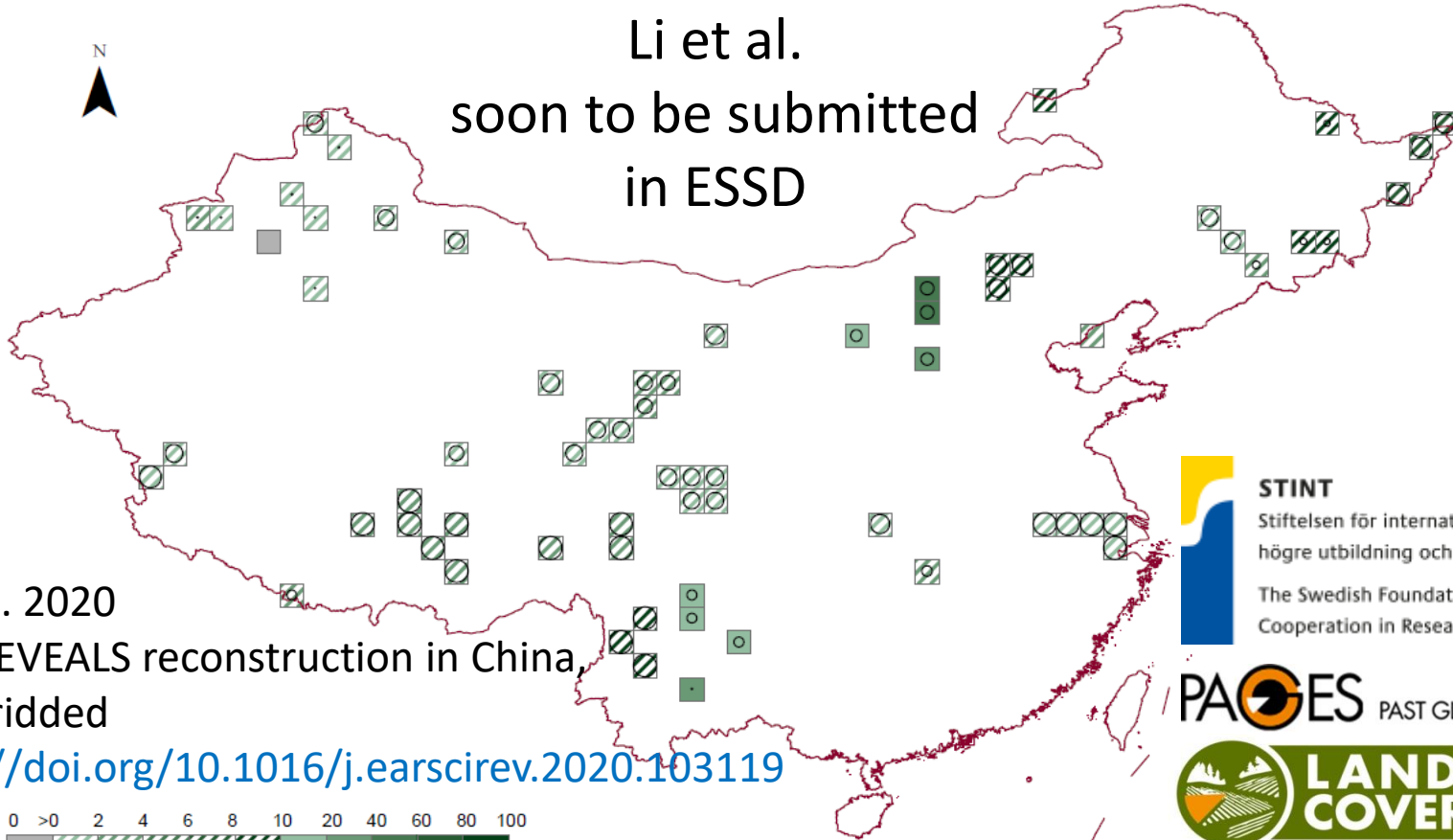
The Swedish Foundation for International
Cooperation in Research and Higher Education

Linnéuniversitetet

Marie-José Gaillard et al. - EGU 2020 BG 3.32 8

Cover of the gridded REVEALS reconstruction in China

Li et al.
soon to be submitted
in ESSD



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högre utbildning och forskning

The Swedish Foundation for International
Cooperation in Research and Higher Education



PAST GLOBAL CHANGES



**LAND
COVER 6K**



Linnéuniversitetet

Li et al. 2020

First REVEALS reconstruction in China,
non-gridded

<https://doi.org/10.1016/j.earscirev.2020.103119>

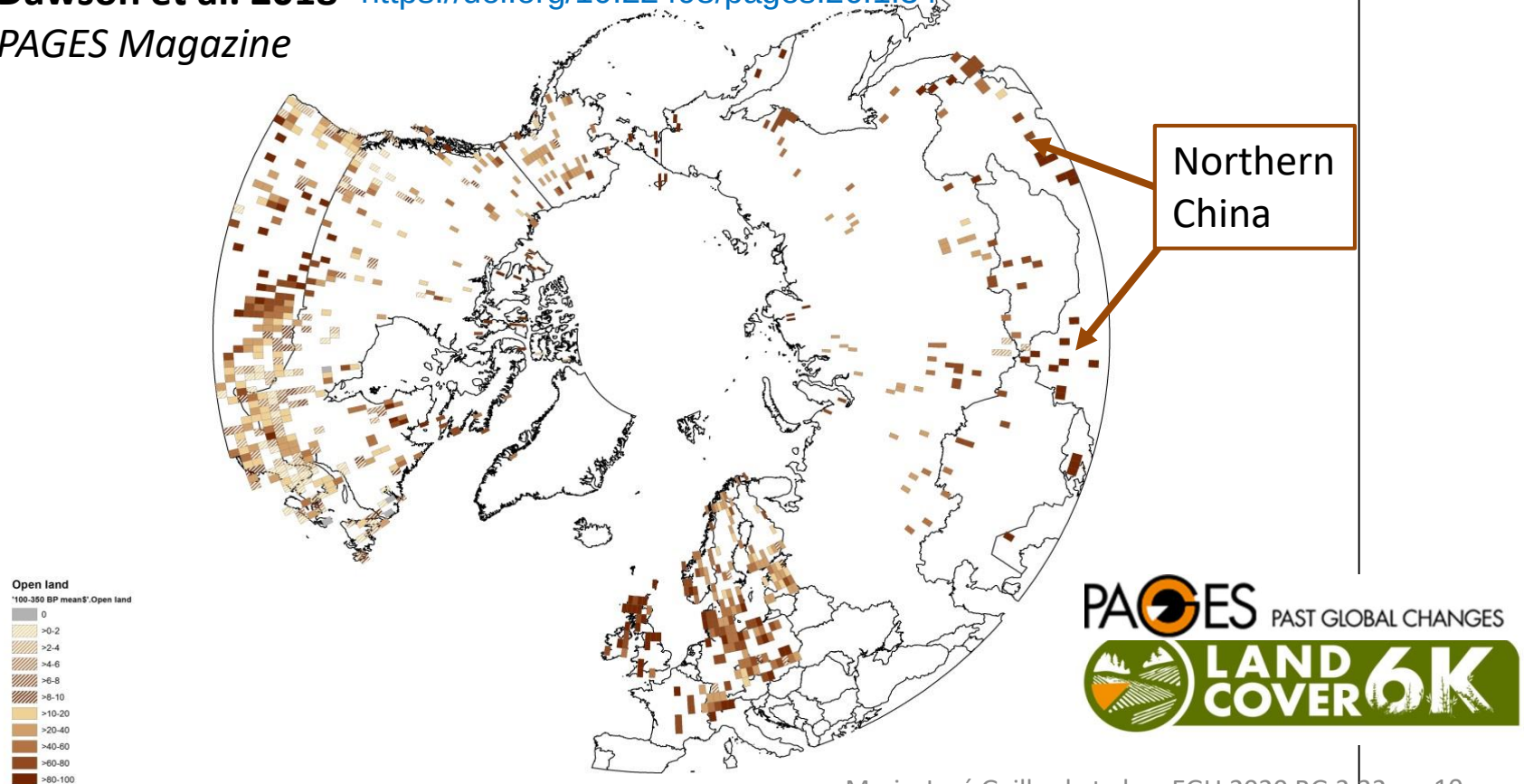
Largest synthesis of REVEALS estimates so far

Northern Hemisphere $\geq 40^\circ \text{N}$

Open land 100-350 cal BP (AD 1600-1850)

Dawson et al. 2018 <https://doi.org/10.22498/pages.26.1.34>

PAGES Magazine



Archaeology-based LAND USE MAPS & LOOK-UP TABLES

Publication in progress

- **Global land-use categorisation**
- Short publication
doi.org/10.22498/pages.26.1.8
- Full publ. soon submitted
- **Land-use maps + database**
- **per-capita land use**
- Type of grazing animals and crops
- Date of first arrival of agriculture
- Etc.

PLANS AHEAD

- publication of LandCover6k results (2020-2022);
- LC6k land cover and land use “products” **Open Access** (archived in **PANGAEA**)
- Use LandCover6k products following the **published protocol, Harrison et al.** (from 2020) – use of the results in **IPCC reports**
- proposal of new **PAGES working group** (two phases: 2021-2026)