



# A pollen-based land-cover atlas covering the last 200 years of Bassies valley vegetation changes: results from a new spatialization method

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# A pollen-based land-cover atlas covering the last 200 years of Bassies valley vegetation changes : results from a new spatialisation method

Plancher C., Gaucherel C., Galop D., Houet T., Marquer L., Sugita S., Mazier F.



## CONTEXT

Studies based on :

Spatially explicit short term data  
(Aerial images, land-cover proxy)

OR

Long-term data

(Palaeoecological data, vegetation and diversity proxy)

Have shown :

Pastoral decline in european mountains  
↓

Shrubs encroachment<sup>1,2</sup>  
↓

Biodiversity decrease<sup>3,4</sup>

But yet...

No long-term **AND** spatially explicit reconstruction of past land-cover and their legacy effect on biodiversity

## OBJECTIVES

- Atlas of past land-cover over 200 years
- New perspectives to study long-term relationship between land-use / land-cover and biodiversity

## MATERIAL AND METHOD

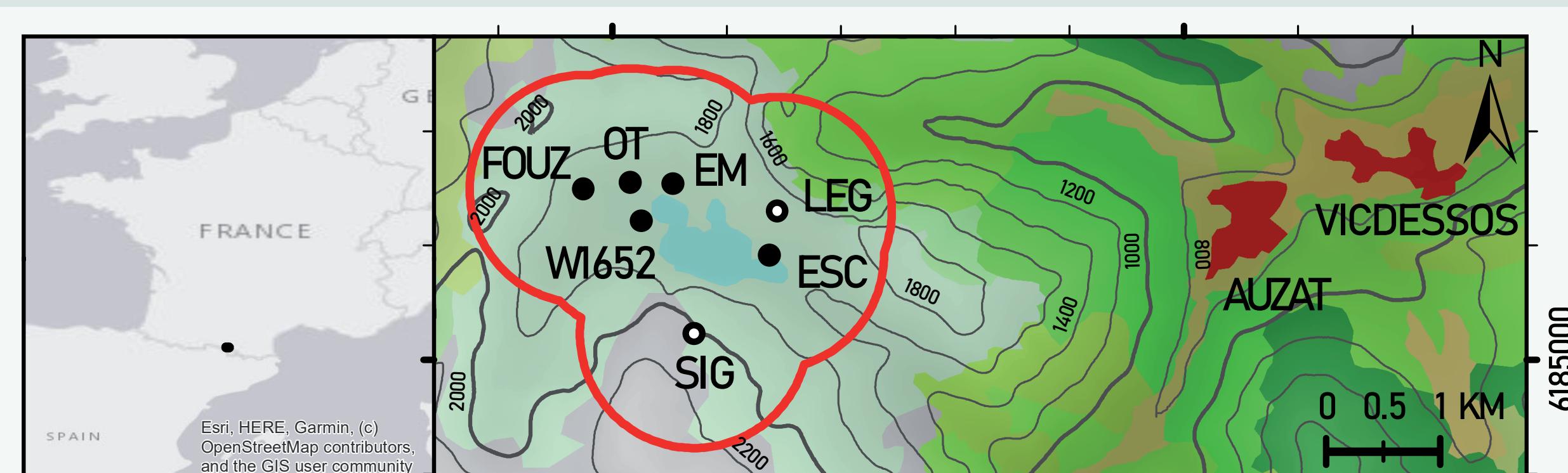


Figure 1 : Bassies pollen sites : 2 small lakes (○) and 5 bogs (●). Red line: Target area for land-cover reconstruction

## SITES AND DATASET

### Landscape Reconstruction

#### Algorithm estimates<sup>5</sup>

Pollen % → Vegetation % of 20 dominant taxa in a 1 km radius around each site (Fig.1) for 10 to 20-year time windows

TW

Midpoint

1810 1830 1850 1870 1890 1910 1930 1945 1955 1965 1975 1985 1995 2005

### Land-cover maps<sup>2</sup>

From 1993 and 2008, 8 land-cover types 20m resolution

### Environmental maps

5 topographic and hydrographic variables

Figure 2 : Dataset and time windows. Environmental maps are considered constant over time.

## METHOD STEPS<sup>5</sup>

### ① Spatialisation models learning using sub-actual ● and [ ] (Fig.2).

- Probability densities, spatio-temporal autocorrelation :

● → ○ Taxa distribution maps

- Multiple linear modelling : [ ] = a ● + b [ ] + c , K-fold cross-validation

### ② Spatialisation models prediction of past land-cover maps.

Past ● + [ ] = [ ] Retrospective land-cover models predictions and type selection at each pixel

Softwares : Multiscale Heterogeneity Map, ArcMap, RStudio

## RESULTS

A) 1810

B) 1890

C) 1955

D) 1985

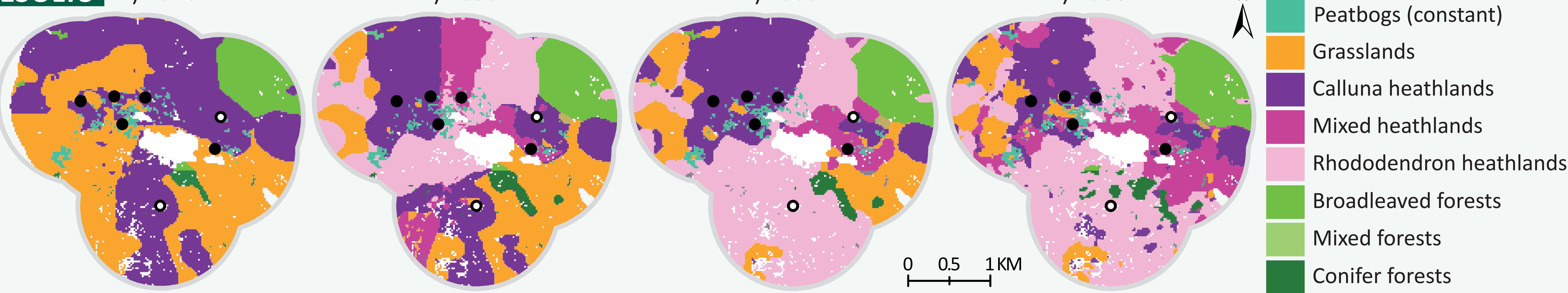


Figure 3 : Examples of pollen-based past land-cover maps

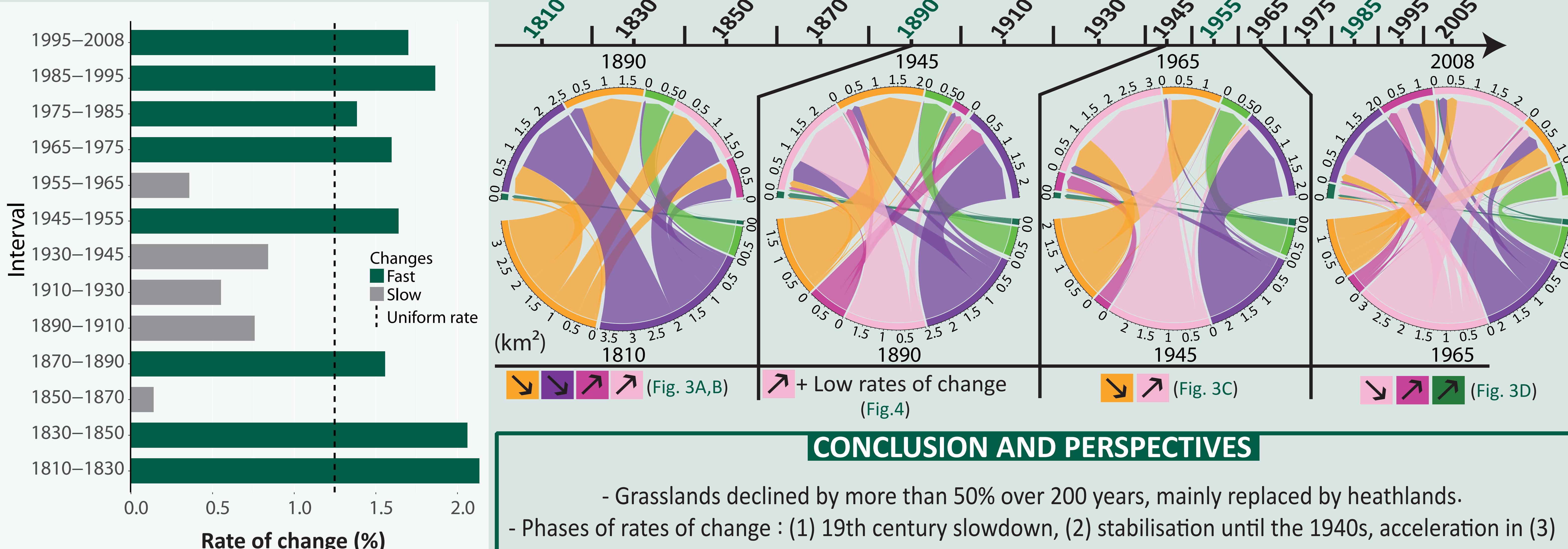


Figure 4 : Rates of land-cover changes between time windows midpoint

## CONCLUSION AND PERSPECTIVES

- Grasslands declined by more than 50% over 200 years, mainly replaced by heathlands.
- Phases of rates of change : (1) 19th century slowdown, (2) stabilisation until the 1940s, acceleration in (3) the 1950s and (4) from the 1970s.

Past land-uses ↗ Land-cover configuration/composition ↗ Current biodiversity

<sup>1</sup> MacDonald et al., 2000. Journal of Environmental Management 59, 47–69 ; <sup>2</sup> Houet et al., 2012. Sud-Ouest Européen 33, 41–56 ; <sup>3</sup> Galop et al., 2011. PAGES News 19, 53–55 ;

<sup>4</sup> Herrault et al., 2015. Landscape Ecology 31, 877–893 ; <sup>5</sup> Plancher et al., in prep.