

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[1,2]

↓

Biodiversity decrease[3,4]

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

SITES AND DATASET

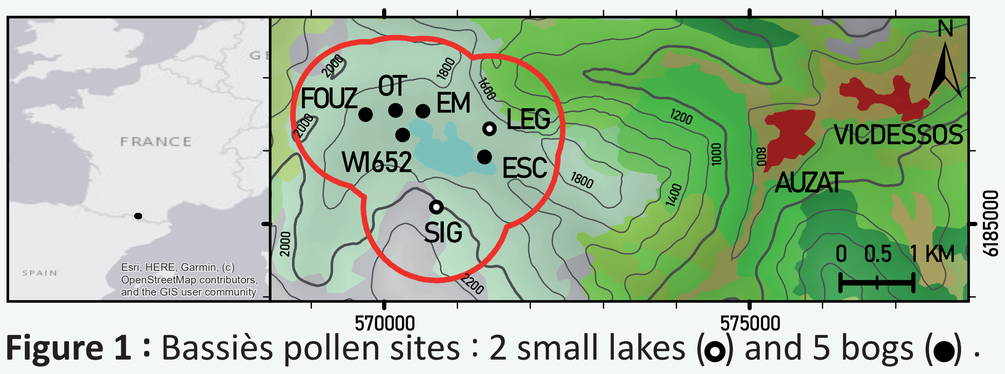


Figure 1 : Bassiès pollen sites : 2 small lakes (◎) and 5 bogs (●). Red line: Target area for land-cover reconstruction

Landscape Reconstruction Algorithm estimates[5]

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

Land-cover maps[2]

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

Environmental maps

5 topographic and hydrographic variables

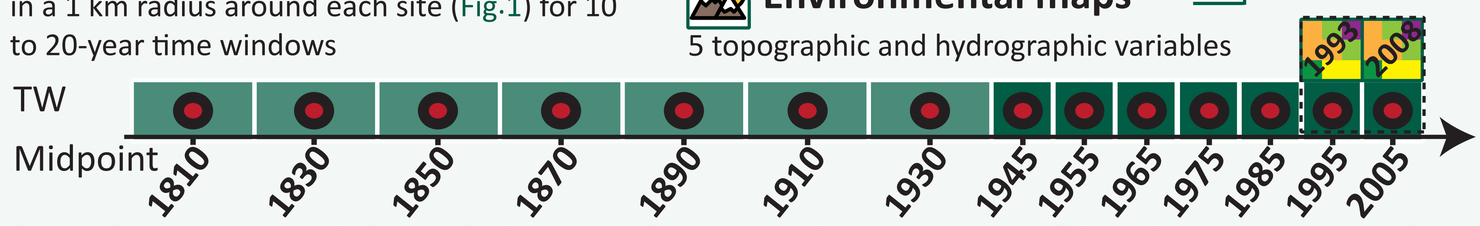


Figure 2 : Dataset and time windows. Environmental maps are considered constant over time.

METHOD STEPS[5]

① **Spatialisation models learning** using sub-actual ● and land-cover maps (Fig.2).

- Probability densities, spatio-temporal autocorrelation : ● → ◎ Taxa distribution maps
- Multiple linear modelling : land-cover map = a ◎ + b environmental map + c , K-fold cross-validation

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

Past ◎ + environmental map = ? Retrospective land-cover models predictions and type selection at each pixel

Softwares : Multiscale Heterogeneity Map, ArcMap, RStudio

RESULTS

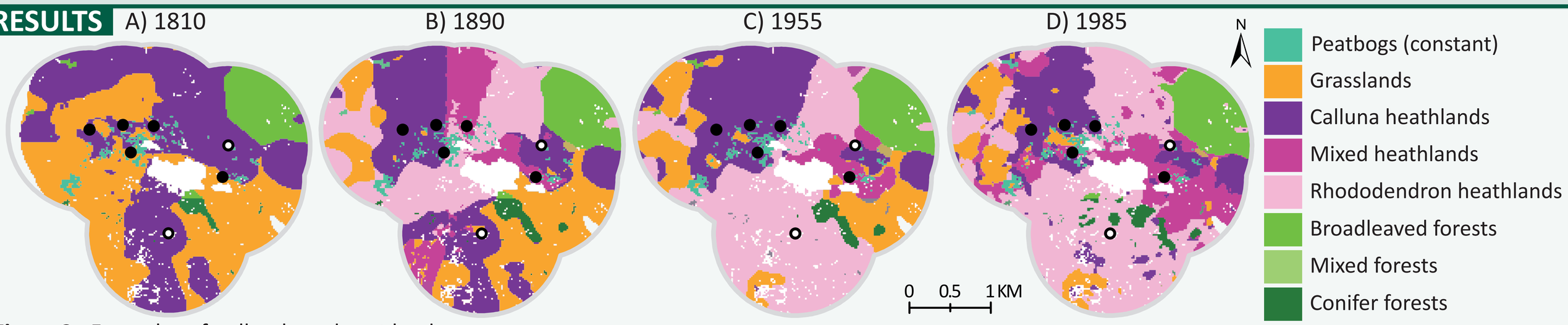


Figure 3 : Examples of pollen-based past land-cover maps

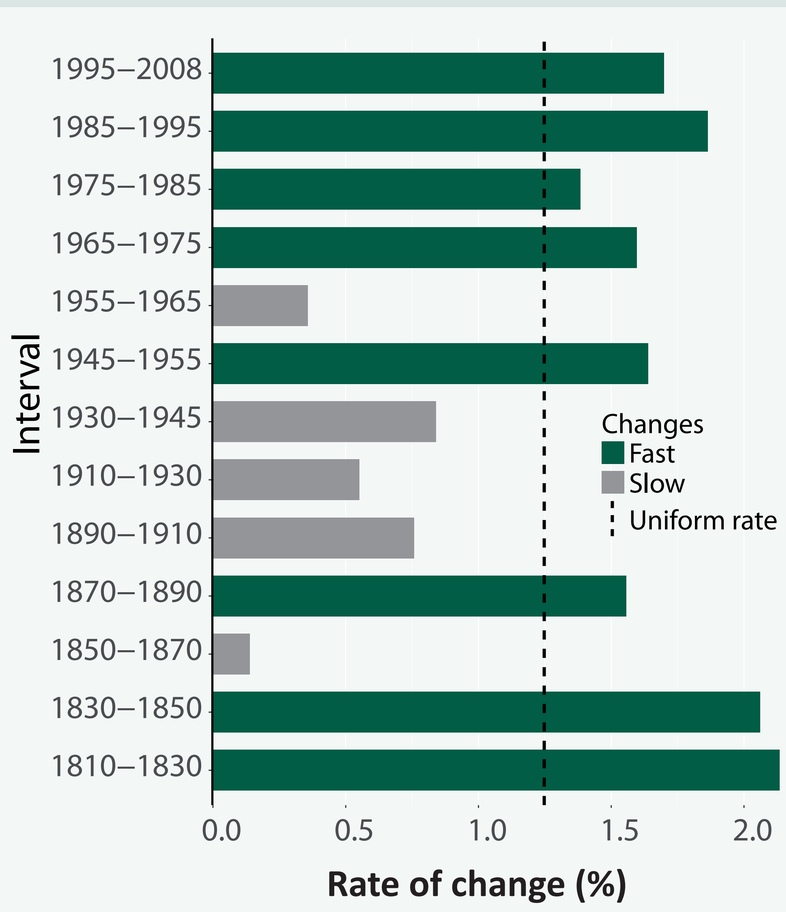
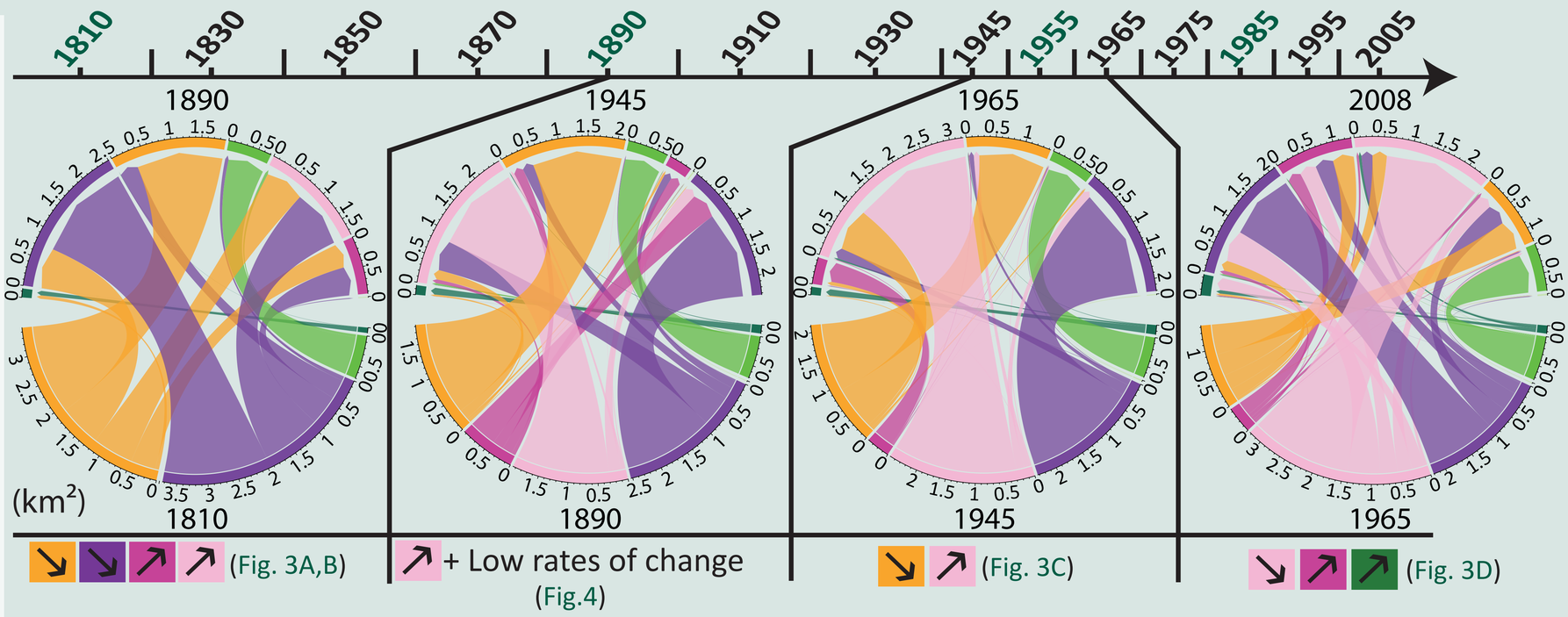


Figure 4 : Rates of land-cover changes between time windows midpoint



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

[1] MacDonald et al., 2000. Journal of Environmental Management 59, 47–69 ; [2] Houet et al., 2012. Sud-Ouest Européen 33, 41–56 ; [3] Galop et al., 2011. PAGES News 19, 53–55 ; [4] Herrault et al., 2015. Landscape Ecology 31, 877–893 ; [5] Plancher et al., in prep.

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