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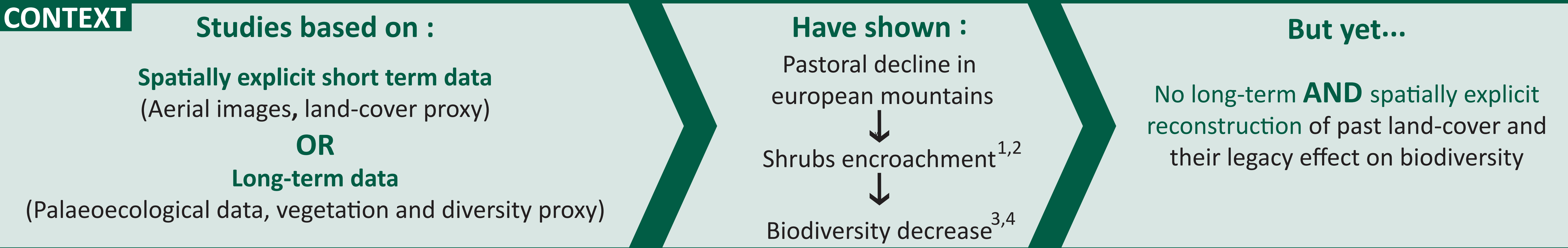
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Plancher C., Gaucherel C., Galop D., Houet T., Marquer L., Sugita S., Mazier F.



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

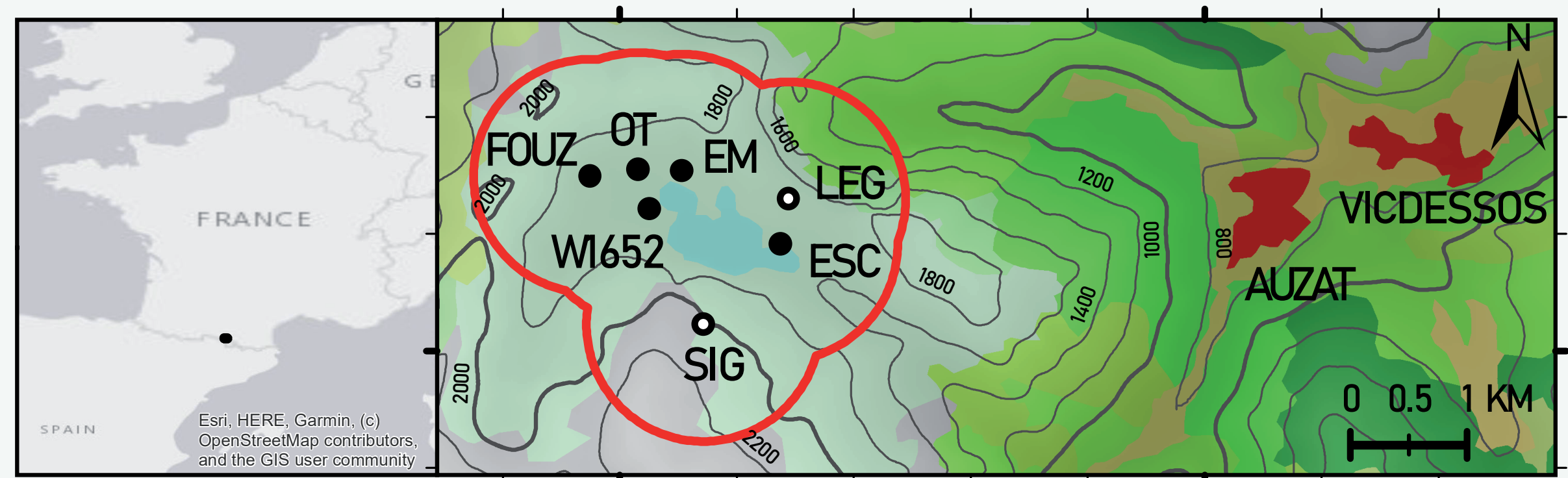


Figure 1 : Bassiès pollen sites : 2 small lakes (○) and 5 bogs (●). Red line: Target area for land-cover reconstruction

SITES AND DATASET

Landscape Reconstruction

Algorithm estimates⁵

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 maps²

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

Environmental maps

5 topographic and hydrographic variables

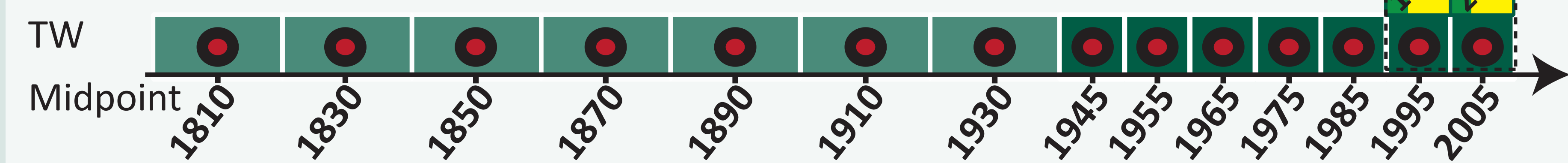


Figure 2 : Dataset and time windows. Environmental maps are considered constant over time.

METHOD STEPS⁵

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

- Probability densities, spatio-temporal autocorrelation :

● → ● Taxa distribution maps

- Multiple linear modelling : $a \cdot \text{Taxa} + b \cdot \text{Env} + c$, K-fold cross-validation

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

Past (●) + (Env) = (?) 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

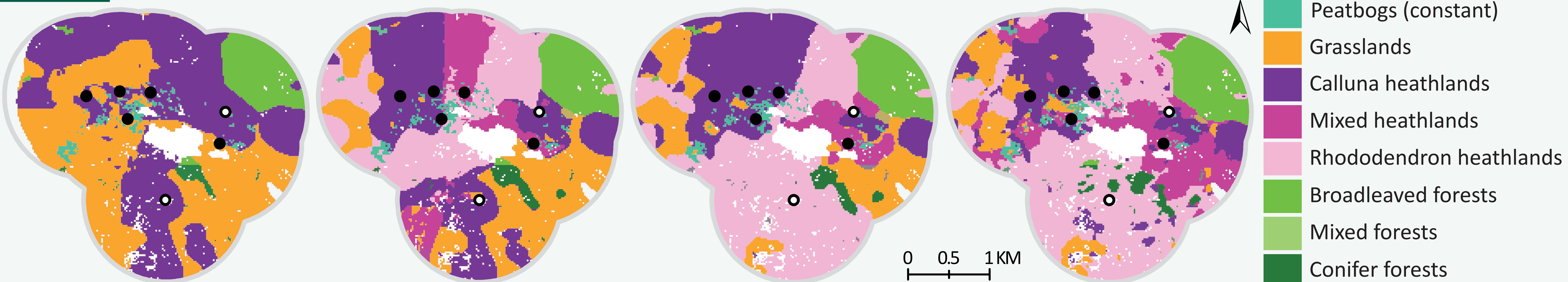


Figure 3 : Examples of pollen-based past land-cover maps

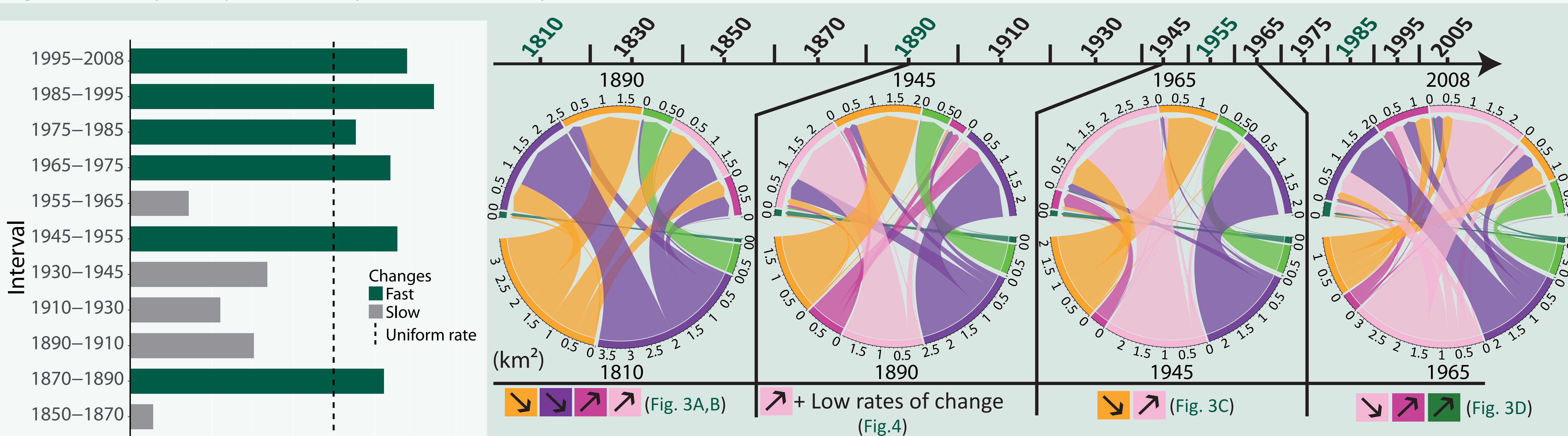


Figure 4 : Rates of land-cover changes between time windows midpoint

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

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

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

