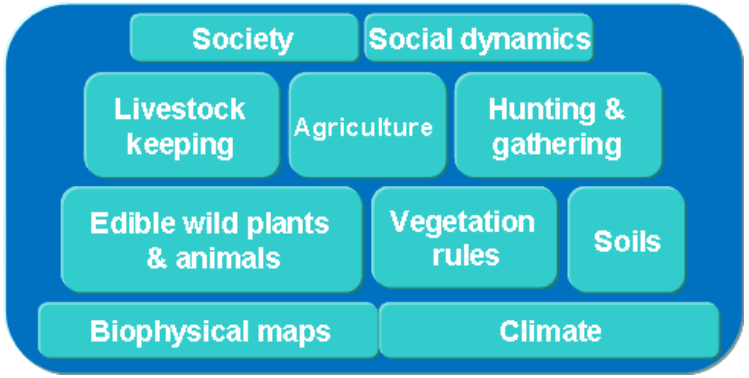
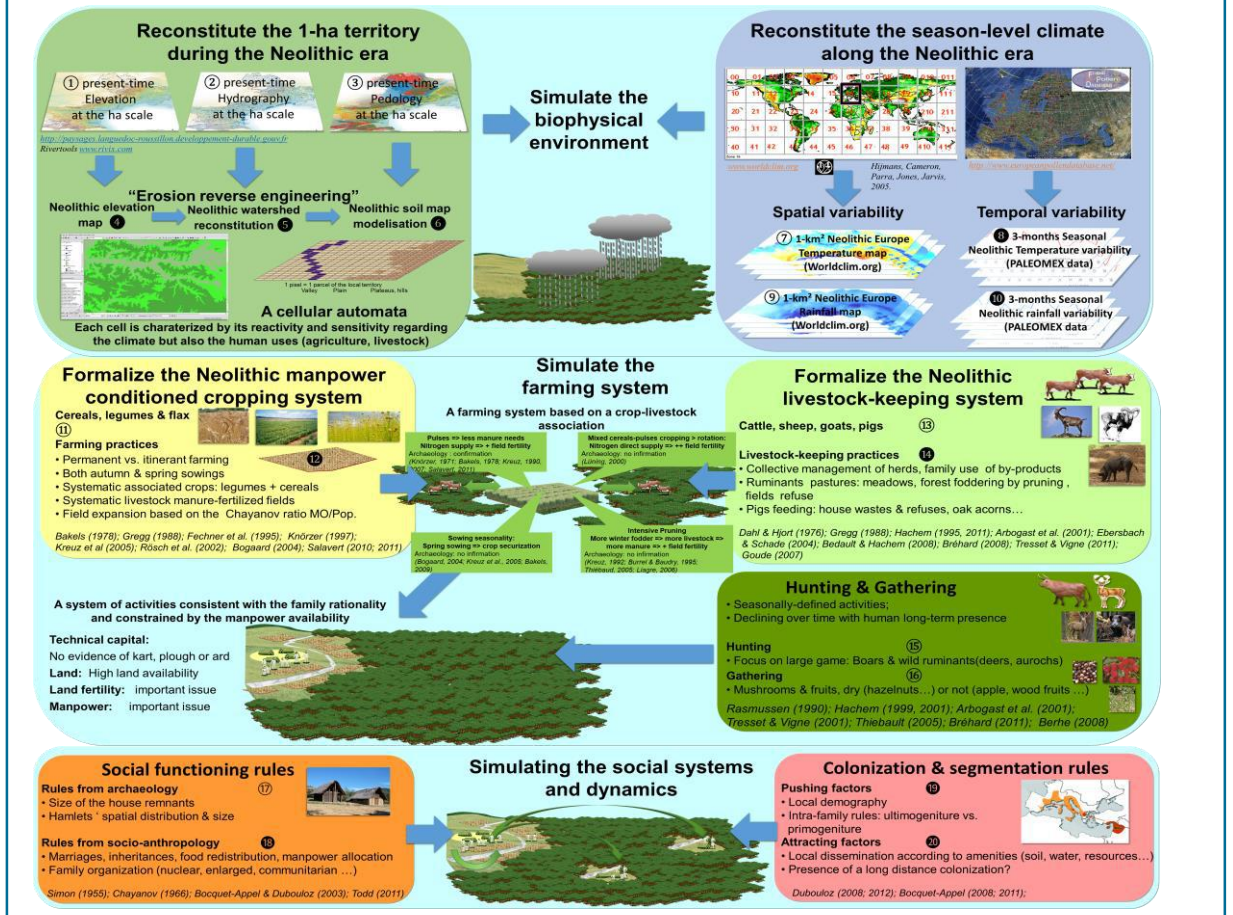
Spatial and temporal reconstruction of present and past vegetation cover in Languedoc-Roussillon.

Reconstituting socio-ecosystems, both past and present, through spatial modeling, means to construct a modular model combining both spatial, temporal and social dynamics at the right mesh.

The MASSTABA approach: Modules Multi-Agent Socio-Spatialisés éTagés et Agencés en Briques Articulées



It implies building first the biophysical settings on which human entities will evolve, meaning where they would draw resources through cropping livestock-keeping, hunting, fishing and gathering.



Components of a Neolithic socio-ecosystem model

Spatial and temporal reconstruction of present and past vegetation cover in Languedoc-Roussillon.

The idea is here to avoid the circular reasoning taking from paleo-environmental databases data for reconstituting paleolandscapes.

We better chose to use already existing flora for extracting the most often cited and by then the most relevant criteria for charcaterizing lineous species' dependencies to biotope variables.

	European Atlas **32 lineous species**	**Rameau Flora** **95 lineous species**	**Baseflor** **95 lineous species**
Temperature	• Mean annual temperature • Mean temperature of the coldest month		• Temperature
Light	• potential radiation in spring & summer		• Light
Rainfall	• Annual rainfall • Rainfall of the driest month • Seasonal rainfall variability		• air humidity
Soil		• Water retention capacity • Water pH	• Soil pH • Edaphic humidity • Salinity • CEC • organic matter content
Others		• Elevation	

Investigated floras for assessing relevant criteria

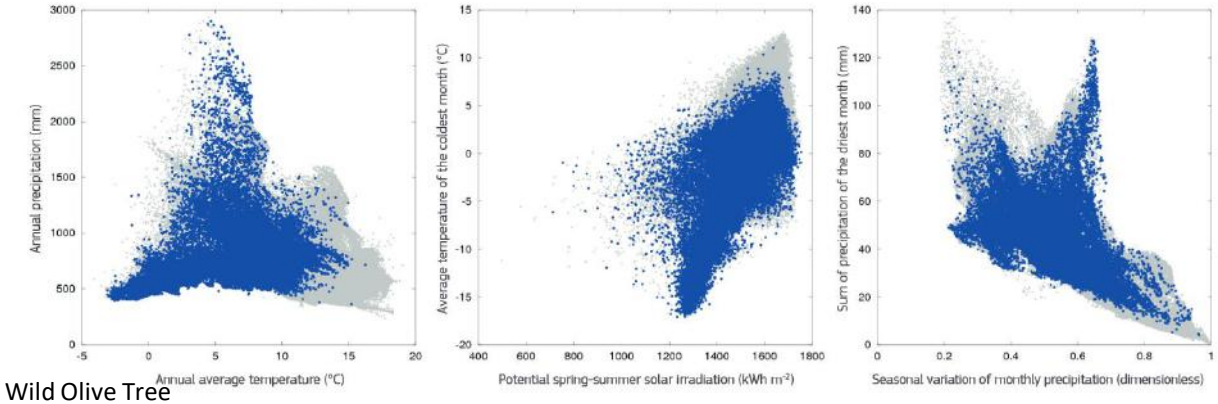
Spatial and temporal reconstruction of present and past vegetation cover in Languedoc-Roussillon.

The 6 variables selected are:

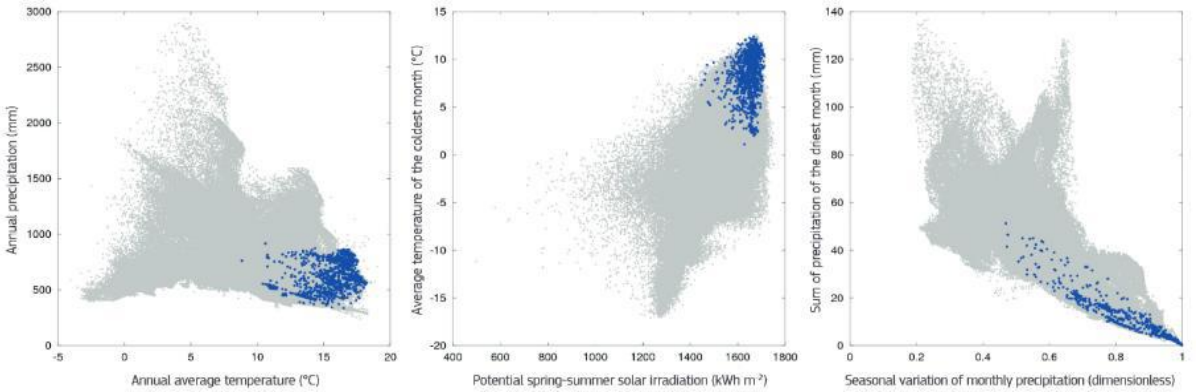
- Annual rainfall
- Annual average temperature
- Potential spring-summer solar irradiation
- Rainfall of the driest month
- Average temperature of the coldest month
- Seasonal rainfall variability

All selected 96 lineous species of Languedoc-Roussillon are positioned along these variables such as here scots pine & wild olive tree.

The Scots Pine



The Wild Olive Tree



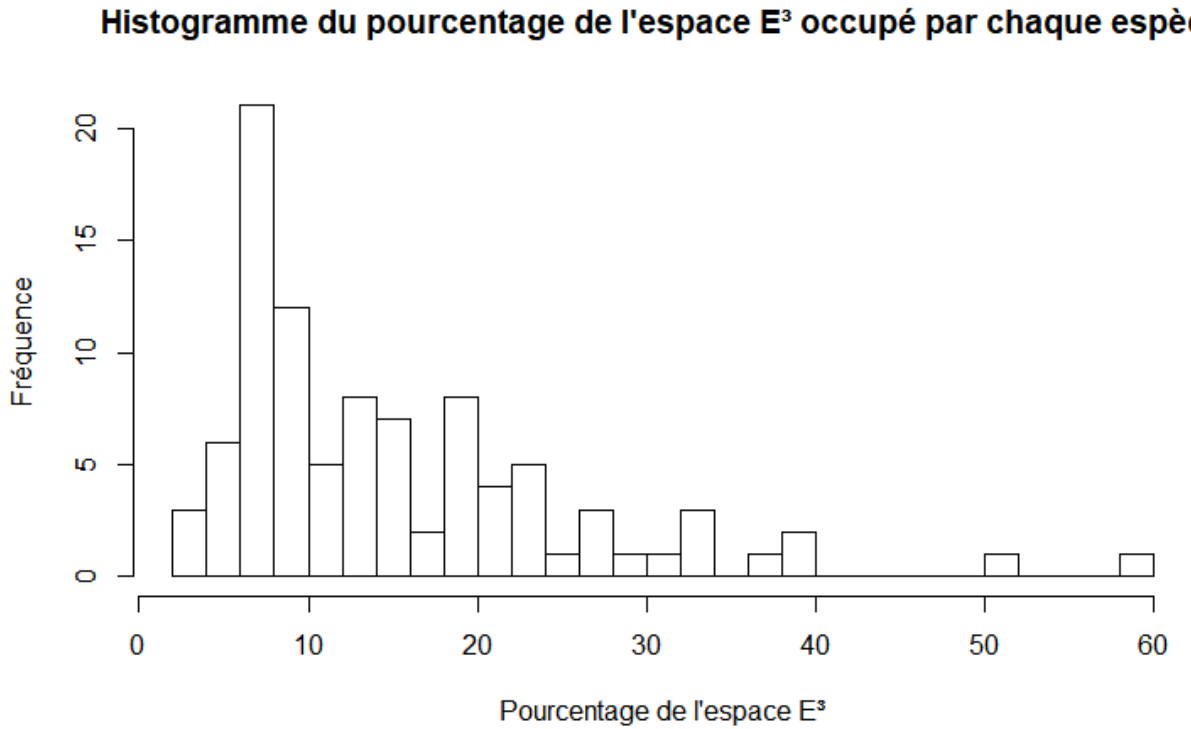
Self-ecology of two species native to Languedoc-Roussillon according to 6 factors using the European Atlas, the flora of Rameau and Baseflor.

(Grey dots: sites where the species has not been observed; blue dots: sites where the species is documented.

Spatial and temporal reconstruction of present and past vegetation cover in Languedoc-Roussillon.

We then classify all the selected species according to the ecological occupation of the the E3 space corresponding to the 3 most recurrent parameters (mean annual temperature, soil water balance, soil pH)

10 species with the widest niche: Scots pine (60%), warty birch (51%), common juniper (39%), goat willow (39%), mountain ash (37%), purple willow (34%), aspen (33%), creeping broom (33%), checker tree (31)%), downy birch (28%) => pioneer species



Distribution of species' niche size, expressed as a percentage of E³ space (mean annual temperature, soil water balance, soil pH)

Spatial and temporal reconstruction of present and past vegetation cover in Languedoc-Roussillon.

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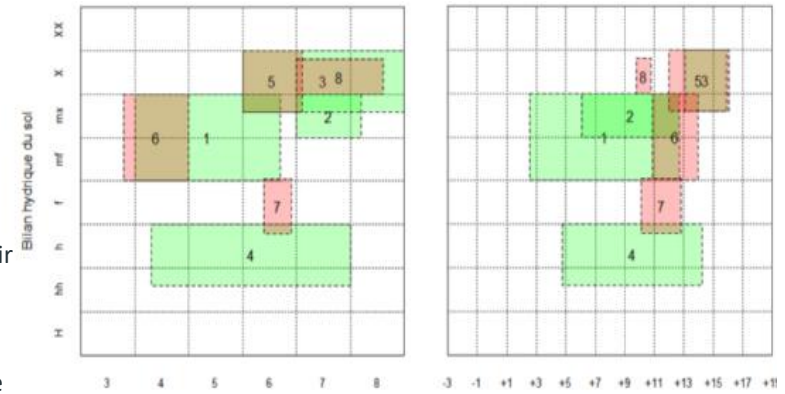
- Les PFTs:
  1. Large spectrum, temperate forest
  2. Large spectrum: Pionneer tree species
  3. Large spectru, Pioneer bush species (juniper, willow)
  4. Restricted spectrum: cold mountainous (fir birch, yew, lime tree, beech, checker)
  5. Restricted: warm: Mediterranean trees (pines)
  6. Restricted: hygrophilic trees (pedunculate oak, alder, burdock, etc.)
  7. Restricted: warm: termophilic bushes
  8. Estricted: acid, warm & humid (heather, …)
  9. Very restricted: humid, strictly warm (buckthorns…)
  10. Restricted: Halophilic species on seashores



	1	2	3	4	5	6	7	8
N	6	24	8	4	22	4	14	13
%Tannu	64 %	73 %	58 %	50 %	52 %	81 %	92 %	93 %
%pH	-	-	-	-	88 %	75 %	-	63 %
%hydr	89 %	-	81 %	51 %	49 %	60 %	-	83 %
%E³	58 %	73 %	48 %	26 %	23 %	33 %	95 %	55 %
%E³/N	9,67 %	3,04 %	6 %	6,5 %	1,05 %	8,25 %	6,79 %	4,23 %

Grouping into PFTs of the 95 woody species of Languedoc-Roussillon: Description and spaces of survival and growth parameters.

Spatial and temporal reconstruction of present and past vegetation cover in Languedoc-Roussillon.

Several points are missing:

- Natural hazards (fires, tree falls, tempests, frosts, droughts;
- Commensality between lineous species
- Salinity?
- Tree distribution actualism

However,
Using resent-time data for reconstructing tree common behavior
And
Combining it with maps of elevation, pedology and climate reconstruction from already settled databases,

We plan to settle a dynamic reconstitution of the vegetation cover history over Languedoc-Roussillon in a theoretical scenario with no humans, using a cellular automata

Last step: introducing Neolithic human farming families as model entities