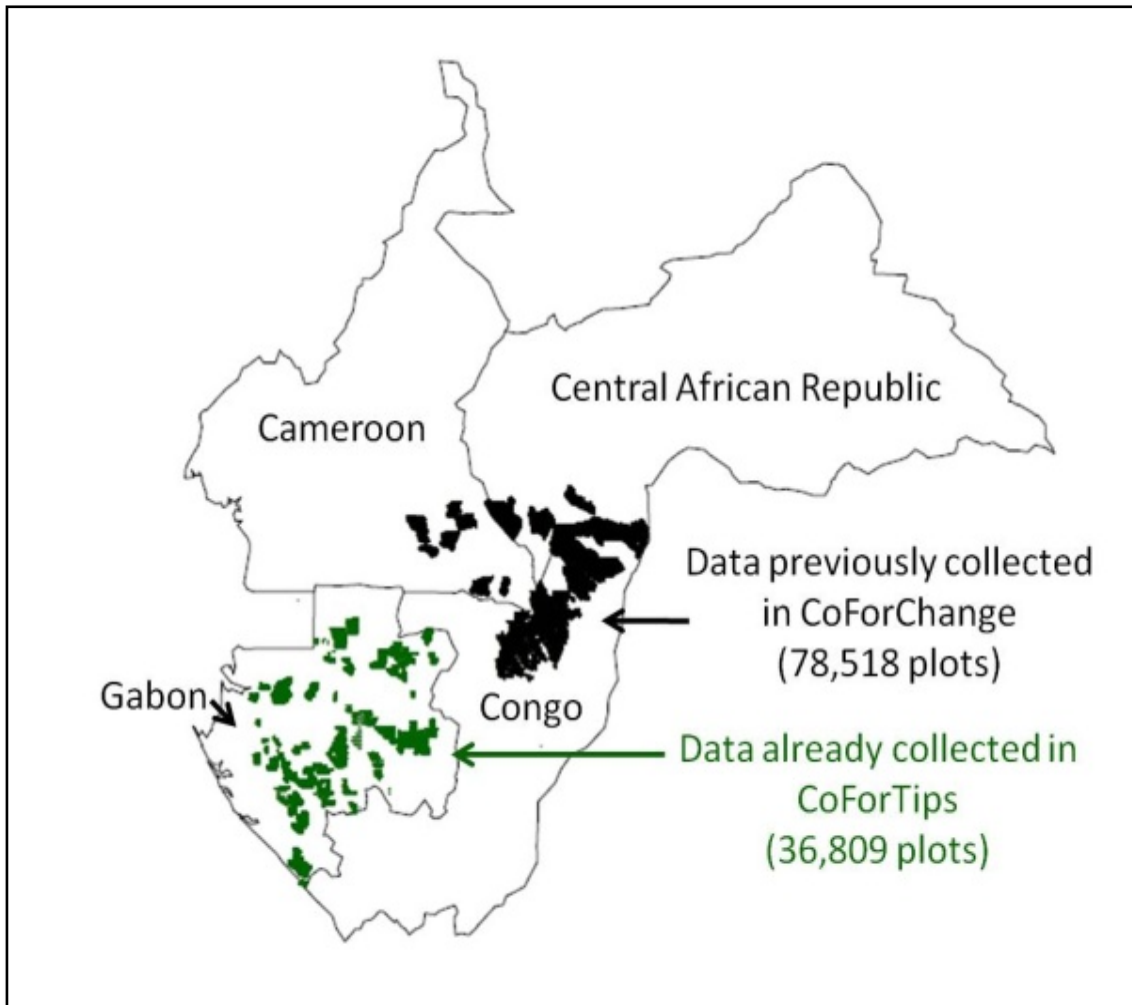# WP. 1. Biodiversity and resilience landscapes

Participants

Nicolas Barbier, Xavier Bry, Guillaume Cornu, Valéry Gond, Sylvie Gourlet-Fleury*, **Maxime Réjou-Méchain**, Frédéric Mortier, Raphaël Pélissier*, Catherine Trottier, Gaëlle Viennois.

*PI

Compiling floristic inventories of the Central African forests

7,500,000 trees

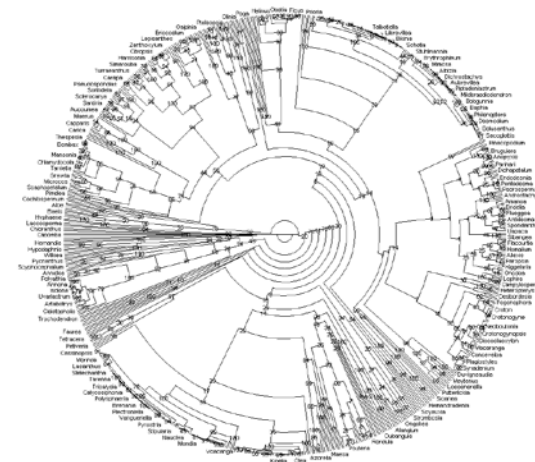# *Compiling information on species characteristics and uses*

Functional traits

1231 african species (Benedet et al. *in prep*)

- Dispersal syndrome: 95%
- Deciduousness: 79%
- Max height: 94%
- Wood density: 71%
- Seed vol: 86%
- Leaf area: 95%

Molecular phylogeny

Markers: MatK/rbcl

Medicinal uses

- PROTA *(Plant Resources Of Tropical Africa)*
- PRELUDE *(Medicinal Plant Database)*

584 species

Codes for pathologies   Classes of usages

Compiling information on environment

- **SOIL** (HWSD/IIASA)

- **ALTITUDE** (SRTM)

- **WETNESS** (http://africasoils.net/)

- **BIOCLIMATIC VARIABLES** (AFRICLIM)
Current and futur predictions (2055, 2085)
under two scenarios:

   - rcp45: concerted rapid CO_2 mitigation

   - rcp85: 'business-as-usual'

- **CWD** (Chave et al. 2014)

- **MIR, NIR, RED** (http://africasoils.net/)

- **EVI** (V. Gond, G. Cornu)

- **RADAR BAND L** (Stéphane Mermoz)

- **GEOMORPHOLOGY** (N. Barbier)

- **ANTHROPOGENIC PRESSURE**
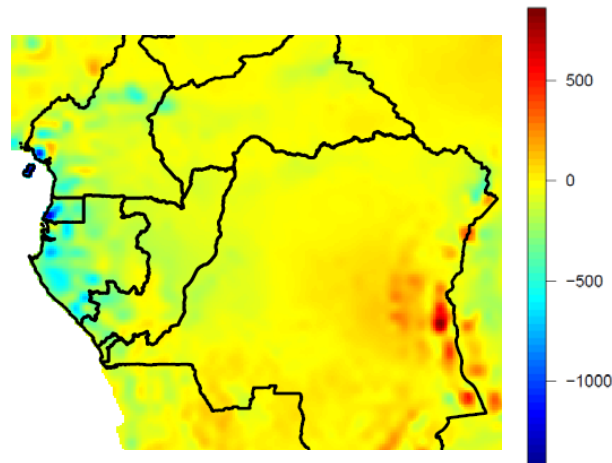
Annual rainfall (present-2085, rcp85)

Toward an anthropogenic Index
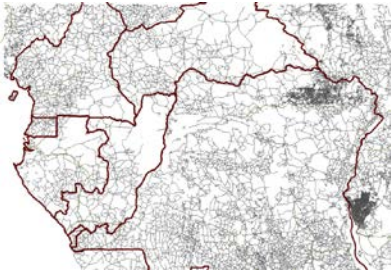
gROADSv1
(+ rail road)
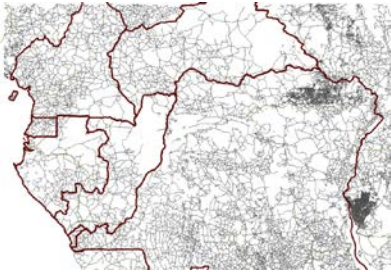

FAO rivers
(Strahler index <6)

Smaller distance to a road, river or rail road

=

DistTransport

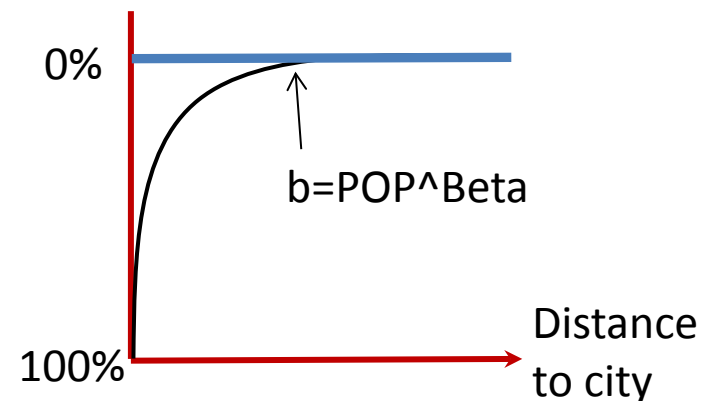# *Toward an anthropogenic Index*

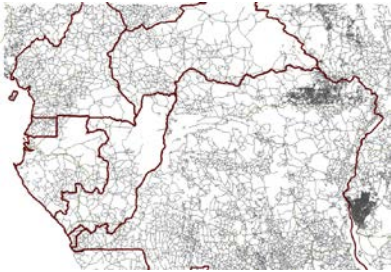gROADSv1
(+ rail road)

FAO rivers
(Strahler index <6)

Grumpv1 +
10 cities Natural Earth

Smaller distance to a road, river or rail road
=
DistTransport

CityInfluence=X%*POP

0%

b=POP^Beta

100%

Distance to city

Toward an anthropogenic Index

gROADSv1
(+ rail road)

FAO rivers
(Strahler index <6)

Grumpv1 +
10 cities Natural Earth

DistTransport   **CityInfluence**

Normalisation

$$Xnorm = sqrt(X + 1) / \max(sqrt(X + 1))$$

AntropoIndex=log(InflVilles/ DistTransport)
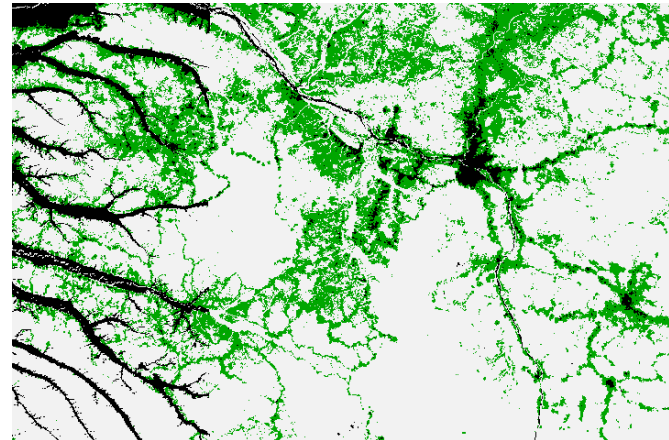
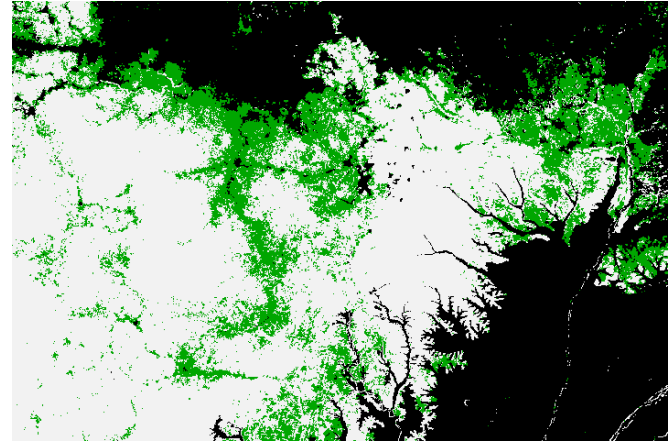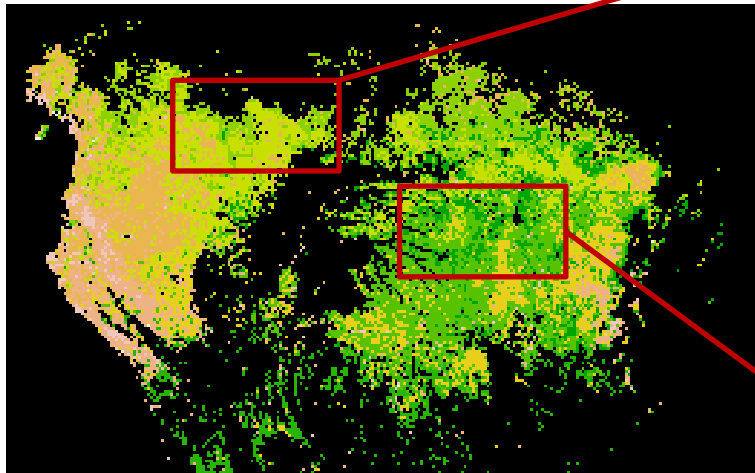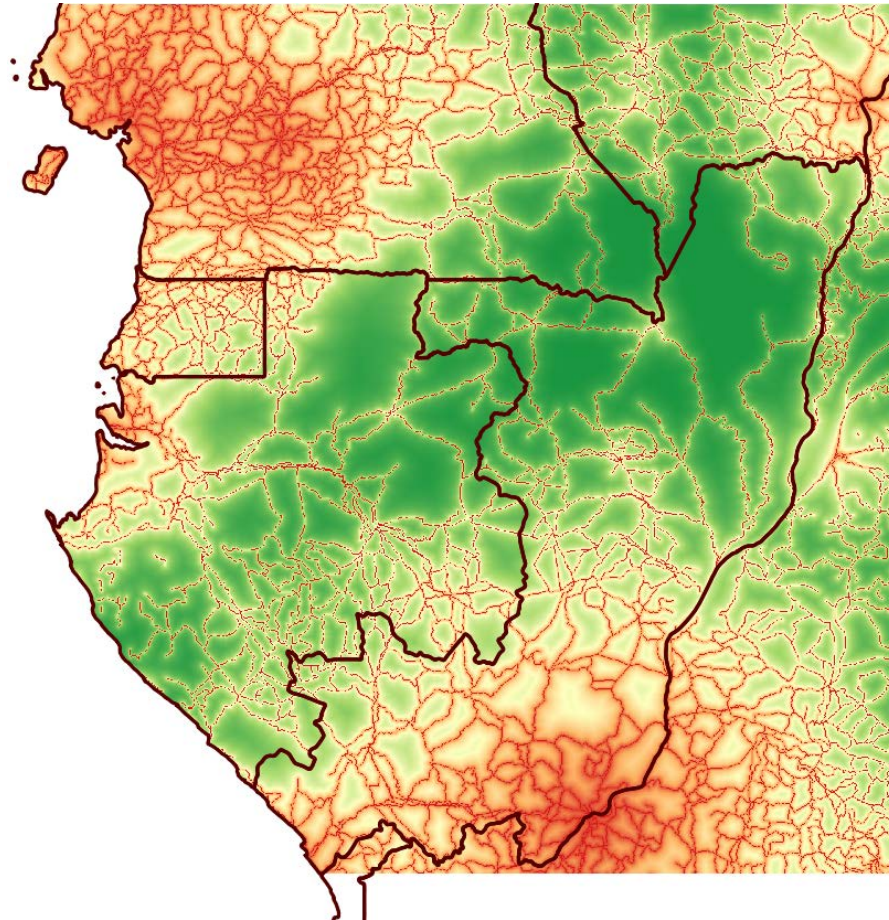# *Toward an anthropogenic Index*
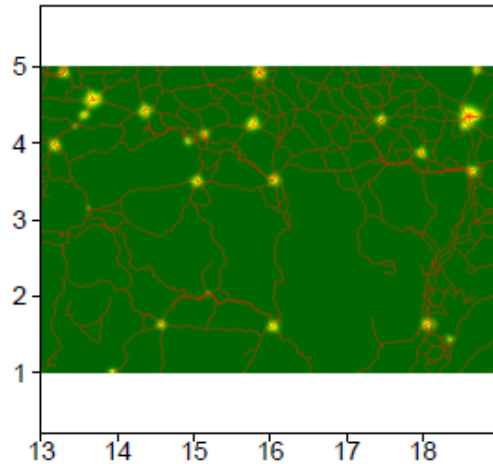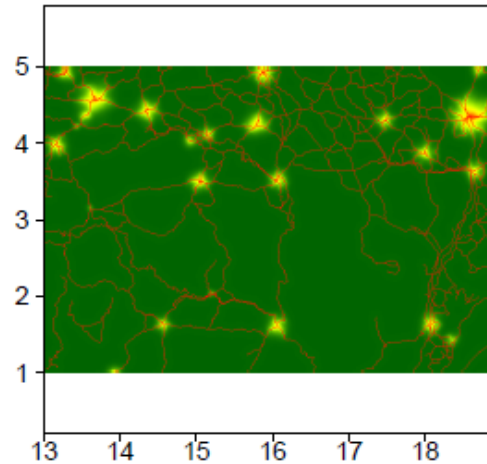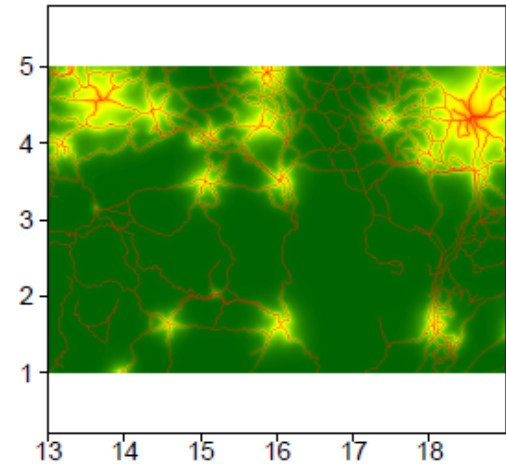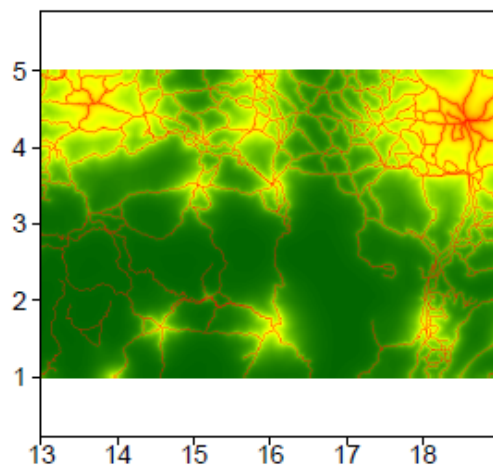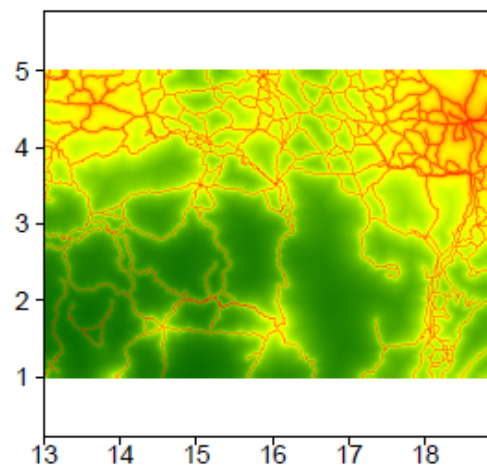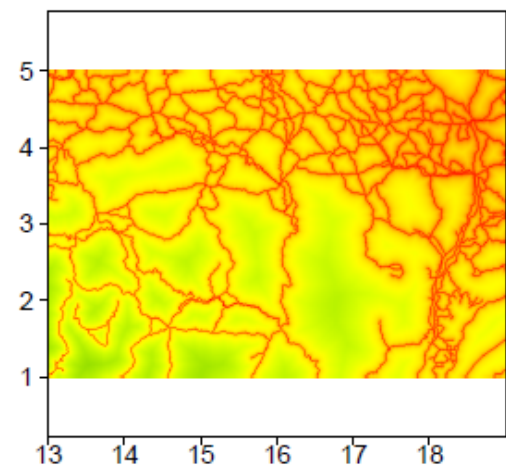
Toward an anthropogenic Index
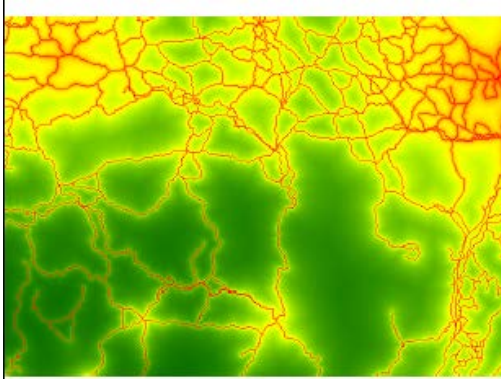
Carte V. Gond/G. Cornu

Toward an anthropogenic Index
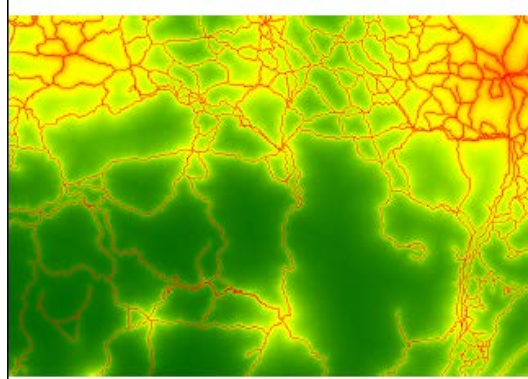
MCMC approach ......
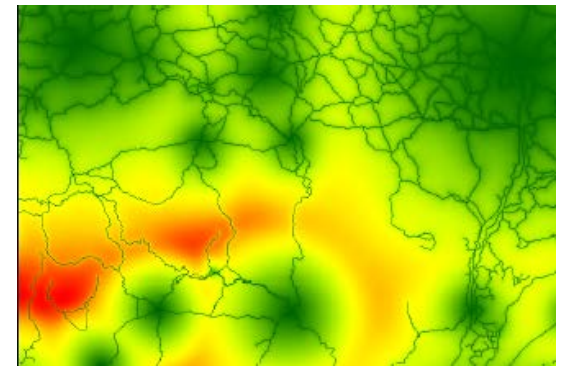(performance AUC=0.78 et 0.68)
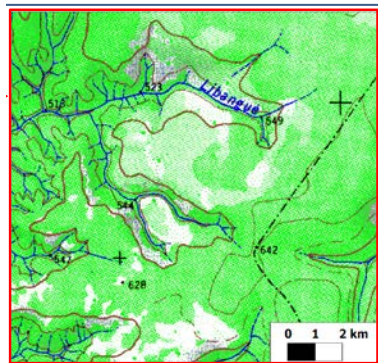
Toward an anthropogenic Index

POP 2000

POP 2000 x 2

Differences

+

Historical
cities?!

Planned
infrastructures?!

planned mines?!
planned agrobusiness?!
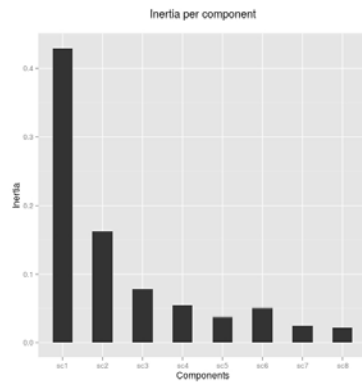.....

e.g. 1950s IGN maps

e.g. Mosnier *et al.* (2014)

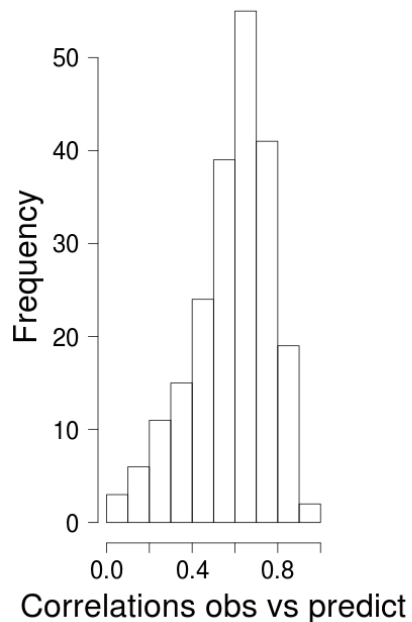# *Predicting floristic composition in space and time*
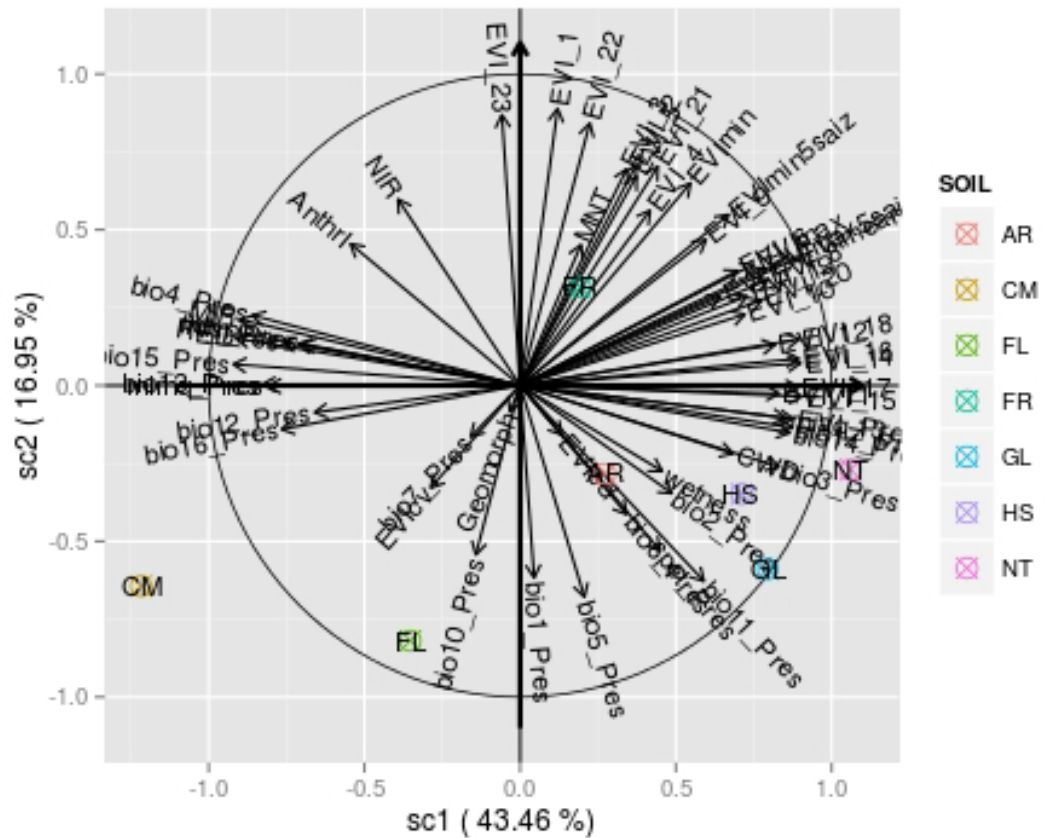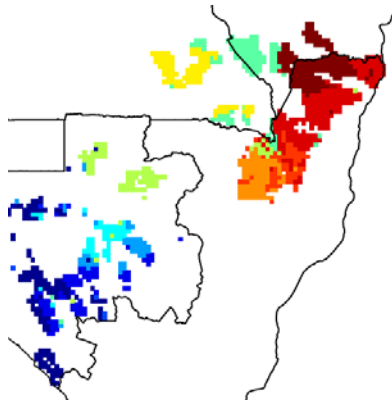
SCGLR

Predicting floristic composition in space and time

SCGLR

Species level

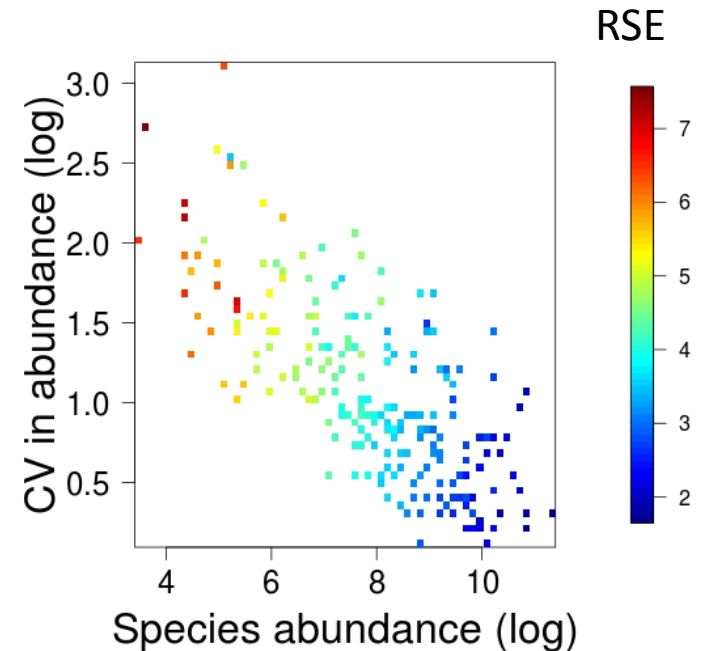With Remote Sensing

Without Remote Sensing

RSE
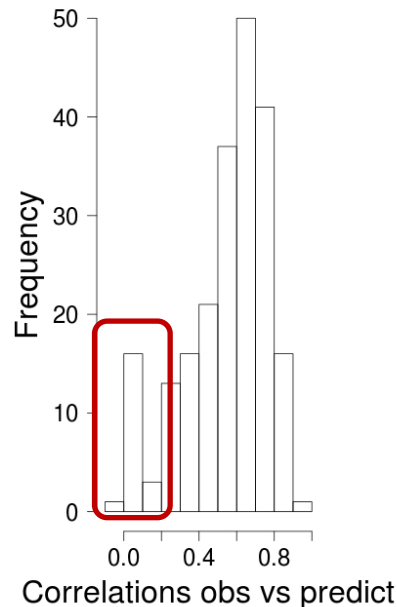
Mean= 0.58
Median=0.62

Mean= 0.54
Median=0.60

Predicting floristic composition in space and time

SCGLR

Community level

CA Axe 1 — r= 0.93 (Inferred scores vs Real scores)

Without RS: r=0.92

CA Axe 2 — r= 0.81 (Inferred scores vs Real scores)

Without RS: r=0.70

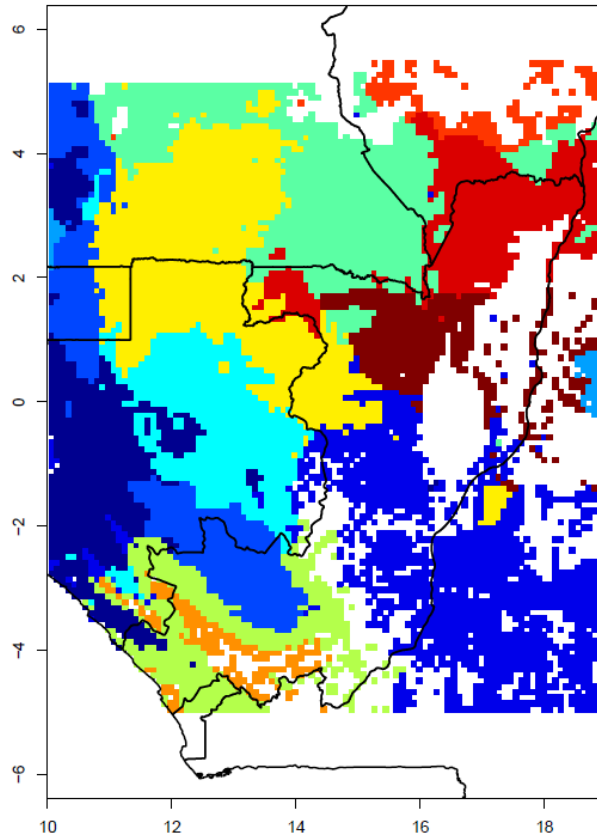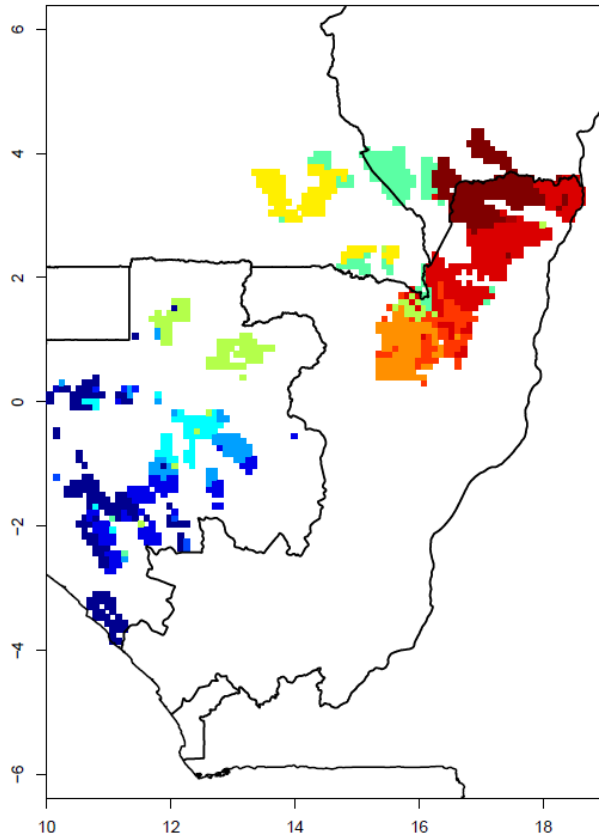CA Axe 3 — r= 0.84 (Inferred scores vs Real scores)
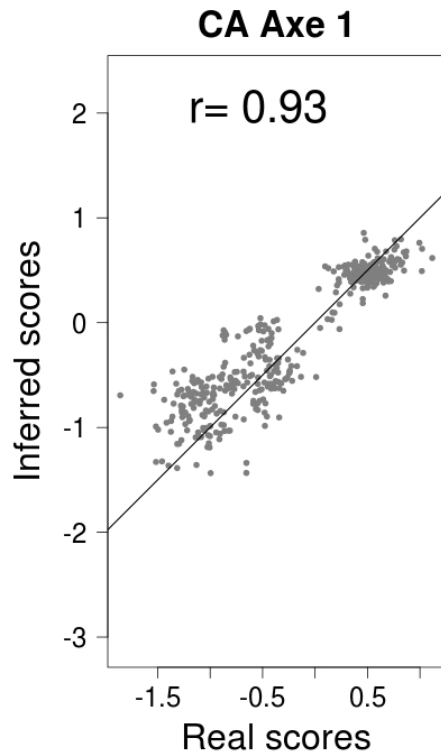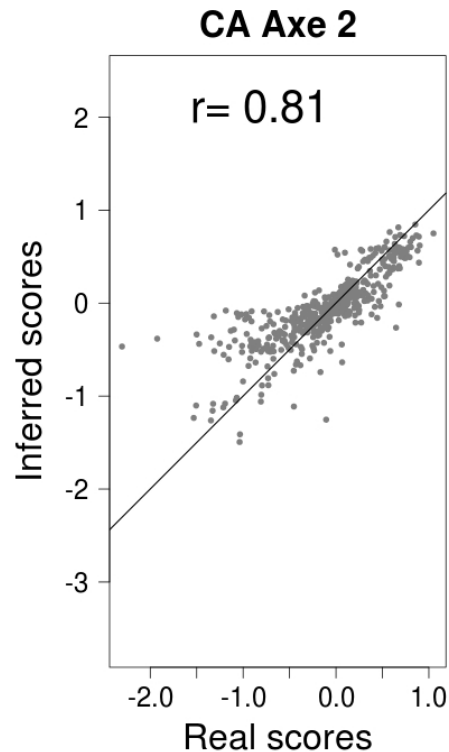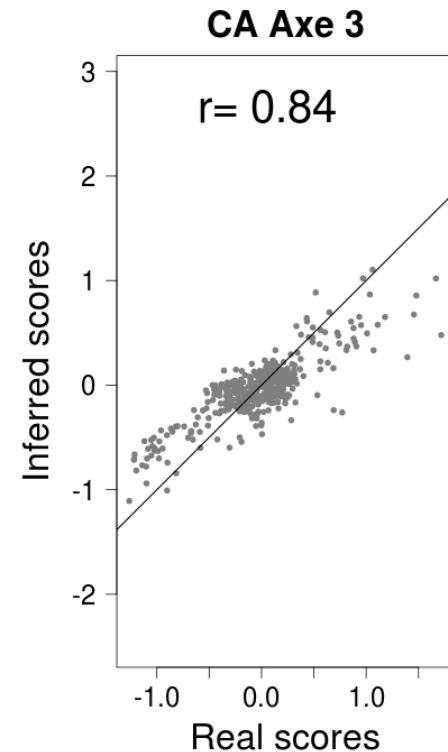
Without RS: r=0.79

Predicting floristic composition in space and time
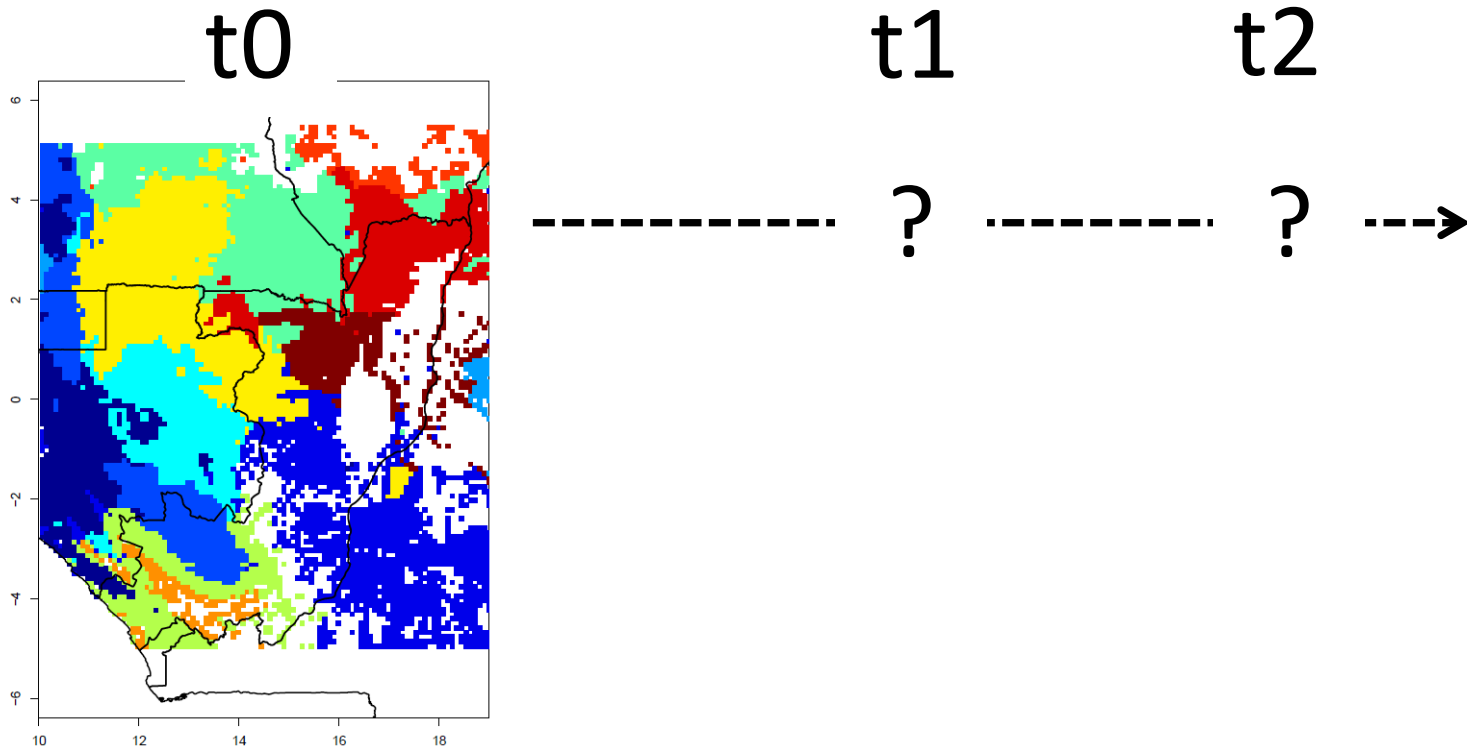
SCGLR

Spatial extrapolation

Predicting floristic composition in space and time

SCGLR

Temporal extrapolation

Predicting floristic composition in space and time

SCGLR

Temporal extrapolation

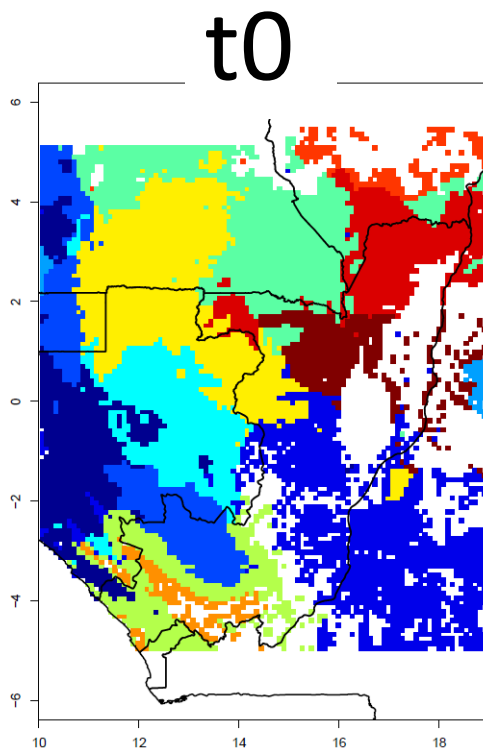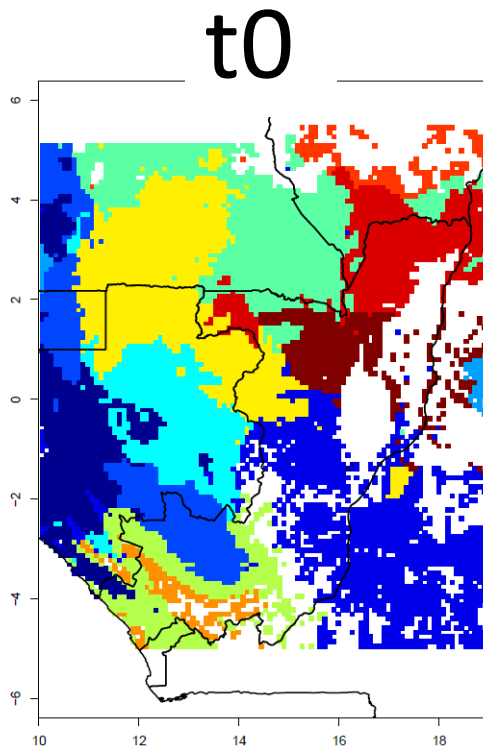# *Predicting floristic composition in space and time*

SCGLR

Temporal extrapolation

t0

ARE
YOU
WINNER
OR
LOSER?

Functionally clustered?

Phylogenetically clustered?
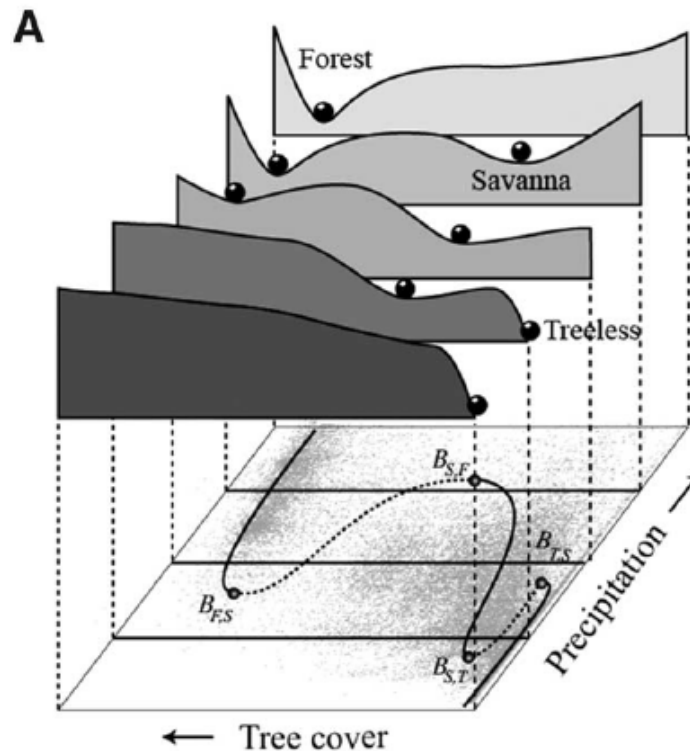
Medicinal use,
Wood density,
….

Toward a resilience landscape

« Theory »

14 OCTOBER 2011   VOL 334   **SCIENCE**

Global Resilience of Tropical Forest and Savanna to Critical Transitions

Marina Hirota,[1] Milena Holmgren,[2*] Egbert H. Van Nes,[1] Marten Scheffer[1]

Toward a resilience landscape

« In practice »

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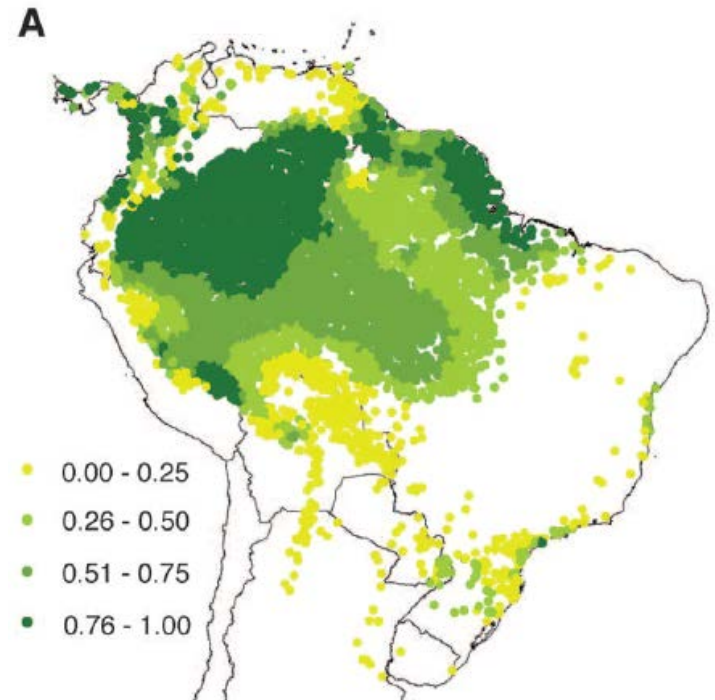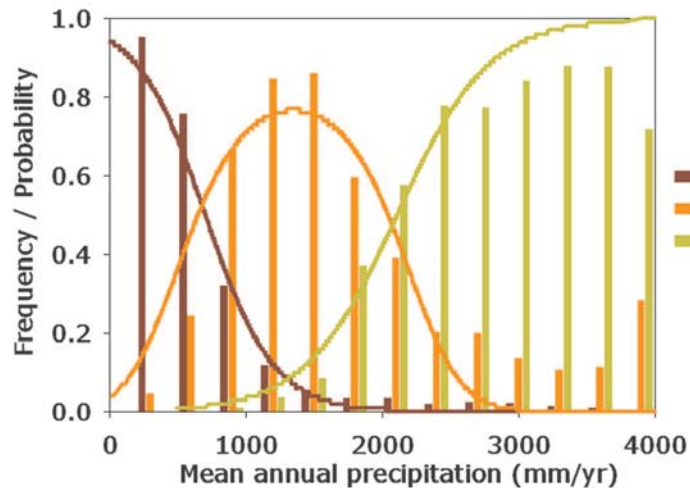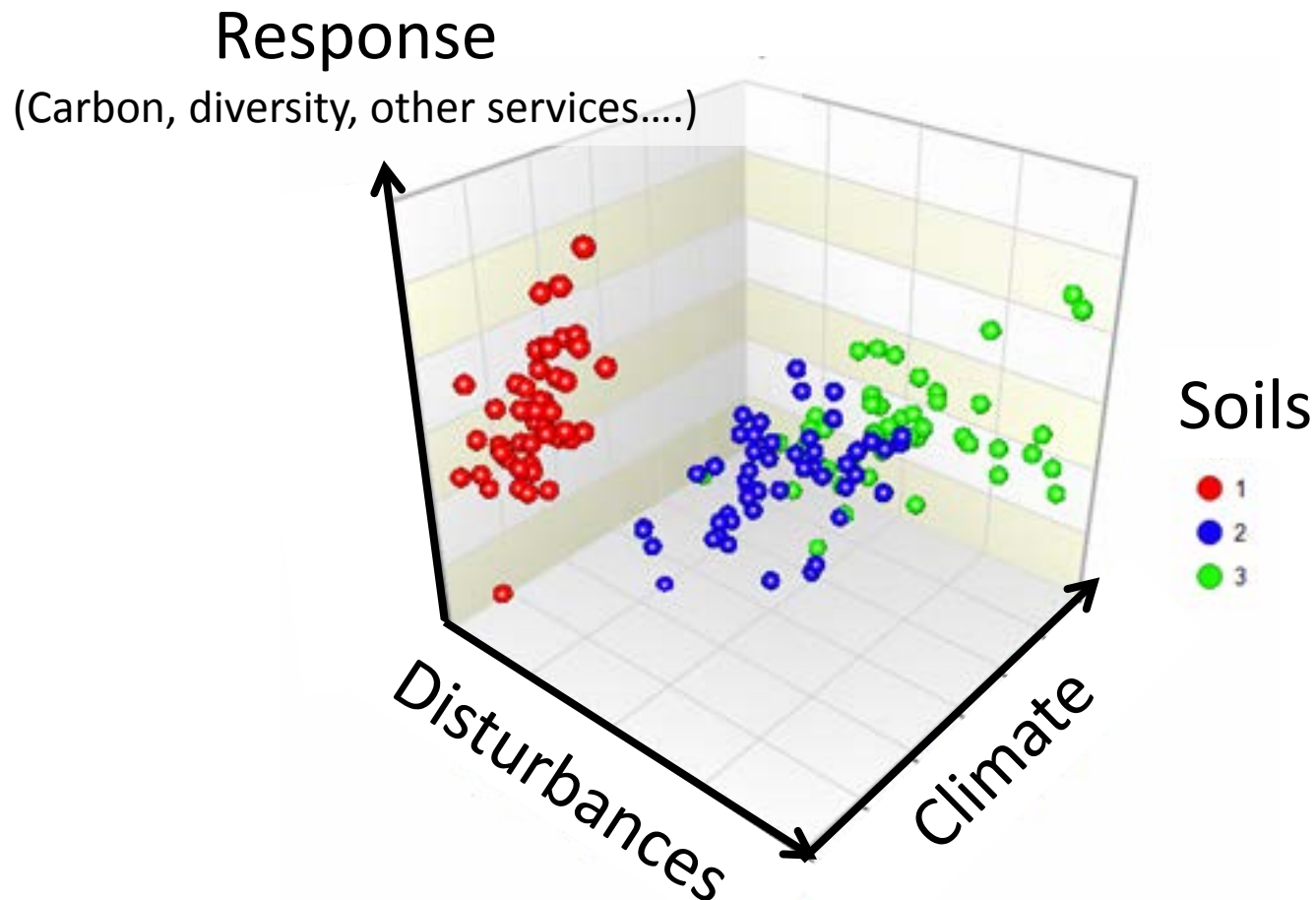
Toward a resilience landscape

« In our challenging case… »

Toward a resilience landscape

« In our challenging case... »

Need to develop a conceptual framework and adapted models

Merci…