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Tree growth response to drought partly depends on light requirement in a tropical forest of Central Africa

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OBJECTIVES

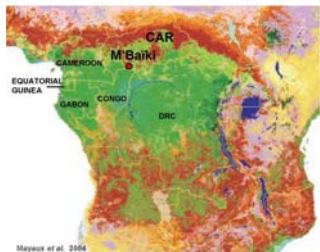
Because (i) studies on annual tree growth response to drought has led to contradictory results [1, 2, 3, 4], (ii) tree growth response to drought varies with species characteristics and (iii) there is only few studies in central Africa,

in this study, we assessed the impact of drought on tree growth, taking into account the variation in species response and the influence of tree size and light availability on growth

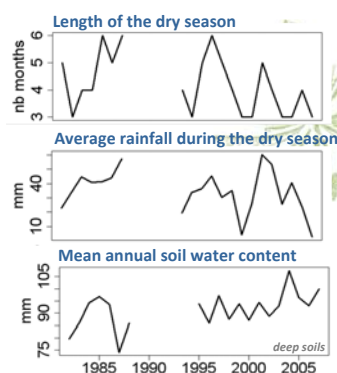
THE M'BAIKI EXPERIMENTAL SITE

Central African Republic

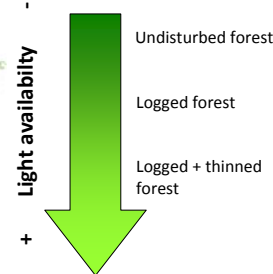
semi-deciduous rainforest
239 species / morphospecies
40 ha permanent sample plots
annual inventory



3 drought indices



disturbance gradient



METHODS

We simultaneously

1. Predicted tree growth response to drought

$$\Delta D_{kit} = X_{it} \beta_k + \varepsilon_k$$

$$\varepsilon_k \sim N(0, \sigma^2_k)$$

X_{it} : the 3 drought indices
tree diameter
2 light availability indices (stand basal area, density)

2. Classified species into K groups

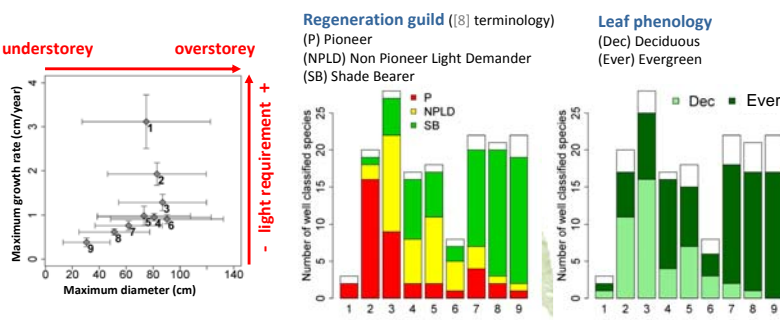
according to their growth response to drought, size, and light

3. Selected for each species group the covariates affecting tree growth

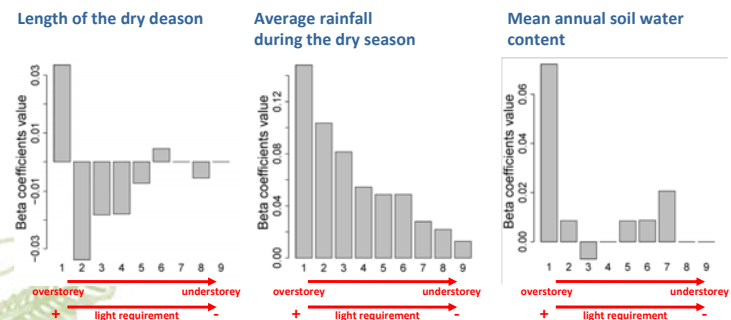
1. & 2. using **finite mixture of linear regression models** [5]
3. using **LASSO penalization** [6, 7]

RESULTS

9 species groups ordered along a light requirement gradient



Species groups response to the 3 drought indices



CONCLUSIONS

- On average, annual tree diameter growth decreases when drought increases [2, 4]
 - Growth response to drought partly depends on species groups light requirement
- [Pioneer/deciduous/overstorey] species tended to be more sensitive to drought than [shade-bearer/evergreen/understorey] species [9, 10]

SCIENTIFIC PARTNERS

CIRAD - French Agricultural Research Centre for International Development, France
CNRS - National Centre for Scientific Research, France
FRM - Forest Resources Management, France
Gemboux AgriBioTech - University of Liège, Belgium
IRD - Research Institute for Overseas Development, France
IRC - Joint Common Research Centre, Italy
University of Oxford - United Kingdom
University of Aberdeen, United Kingdom
University of Bayreuth, Germany
IRET - Research Institute in Tropical Ecology, Gabon
MINRST - Ministry of Scientific Research and Technical Innovation, Republic of the Congo
CRDPI - Research Centre on Sustainability and Productivity of Industrial Plantations, Republic of the Congo
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