

# CoForChange

Predicting the effects of global change on forest biodiversity in the Congo Basin

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## Determinants of species and trait distributions in moist forests of the Congo Basin

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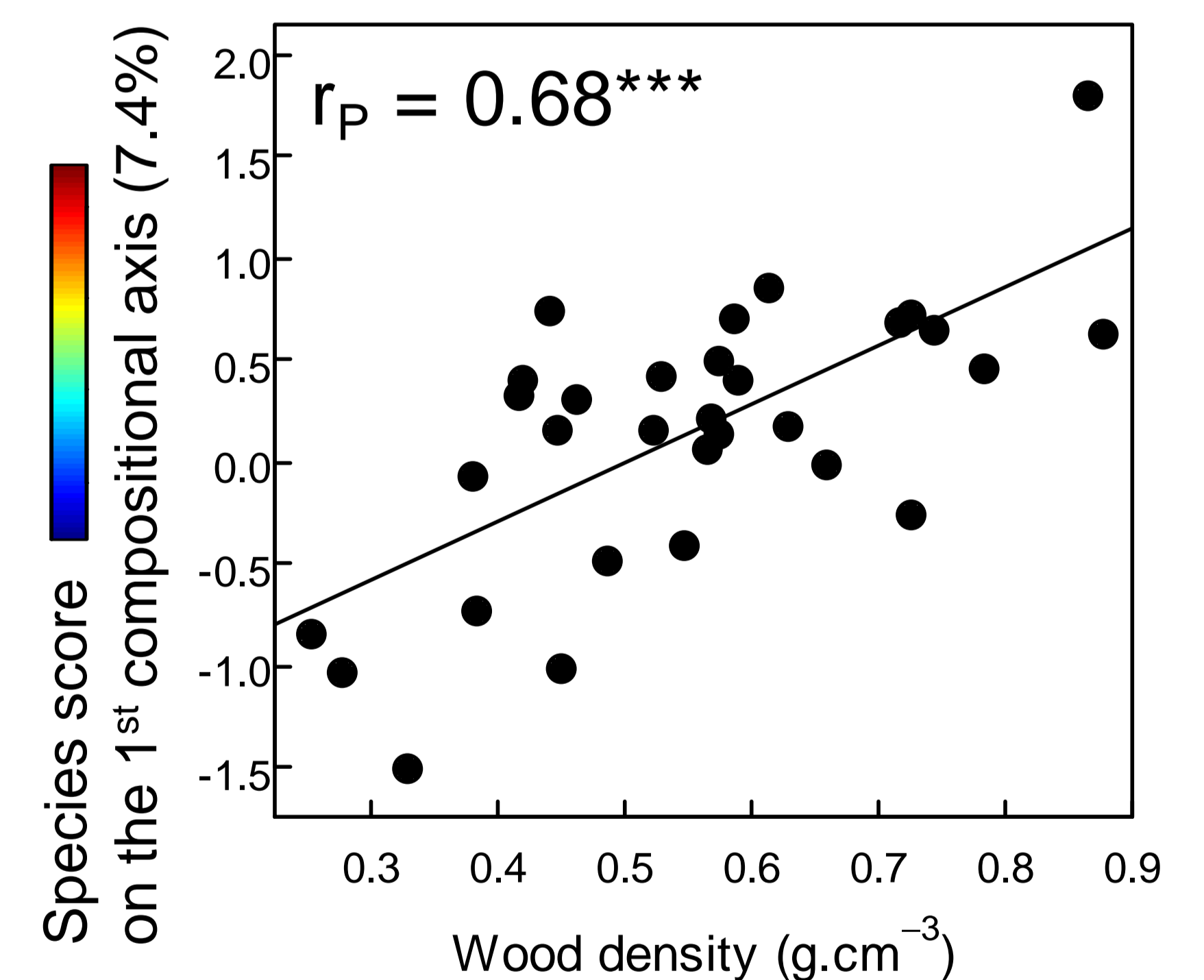
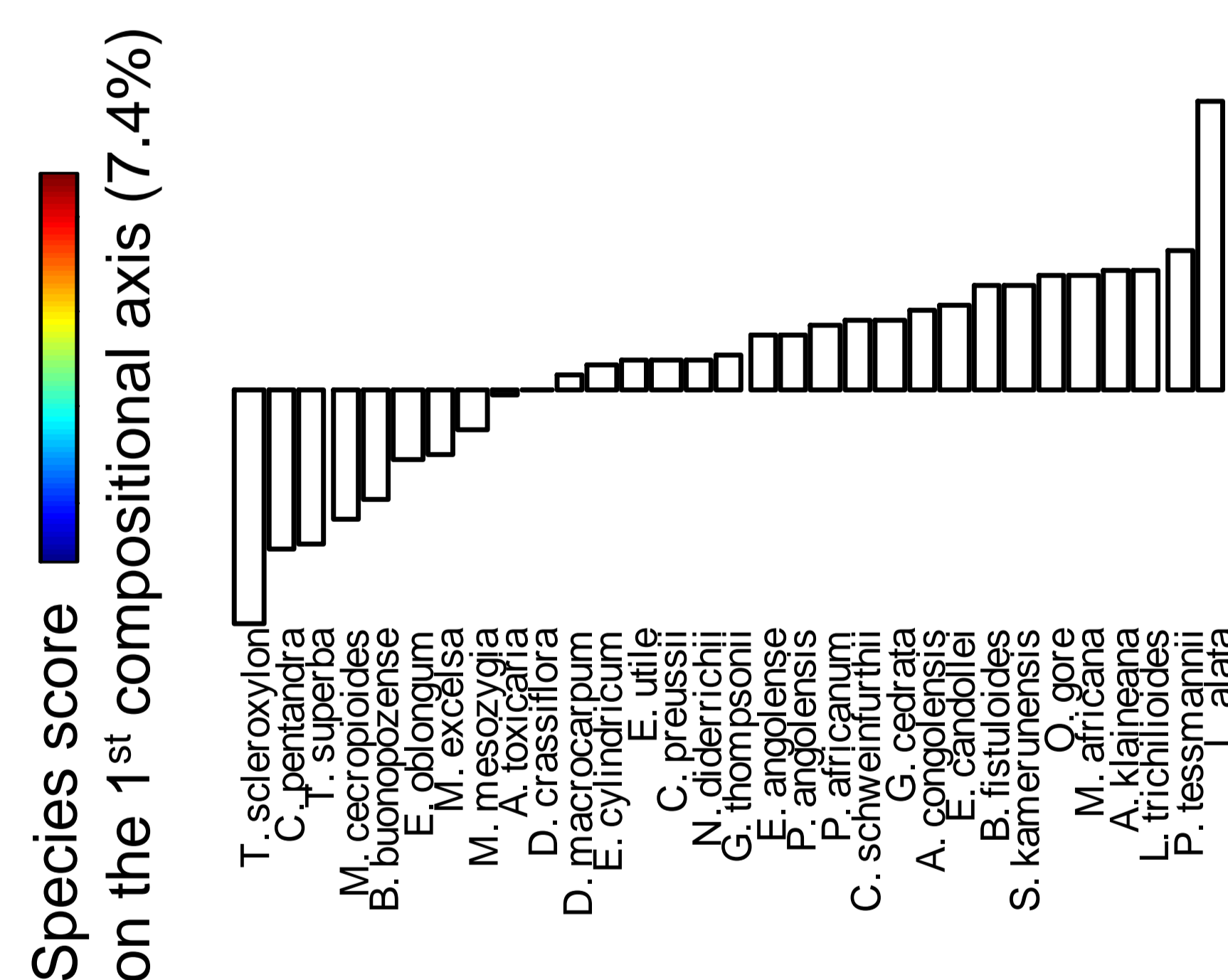
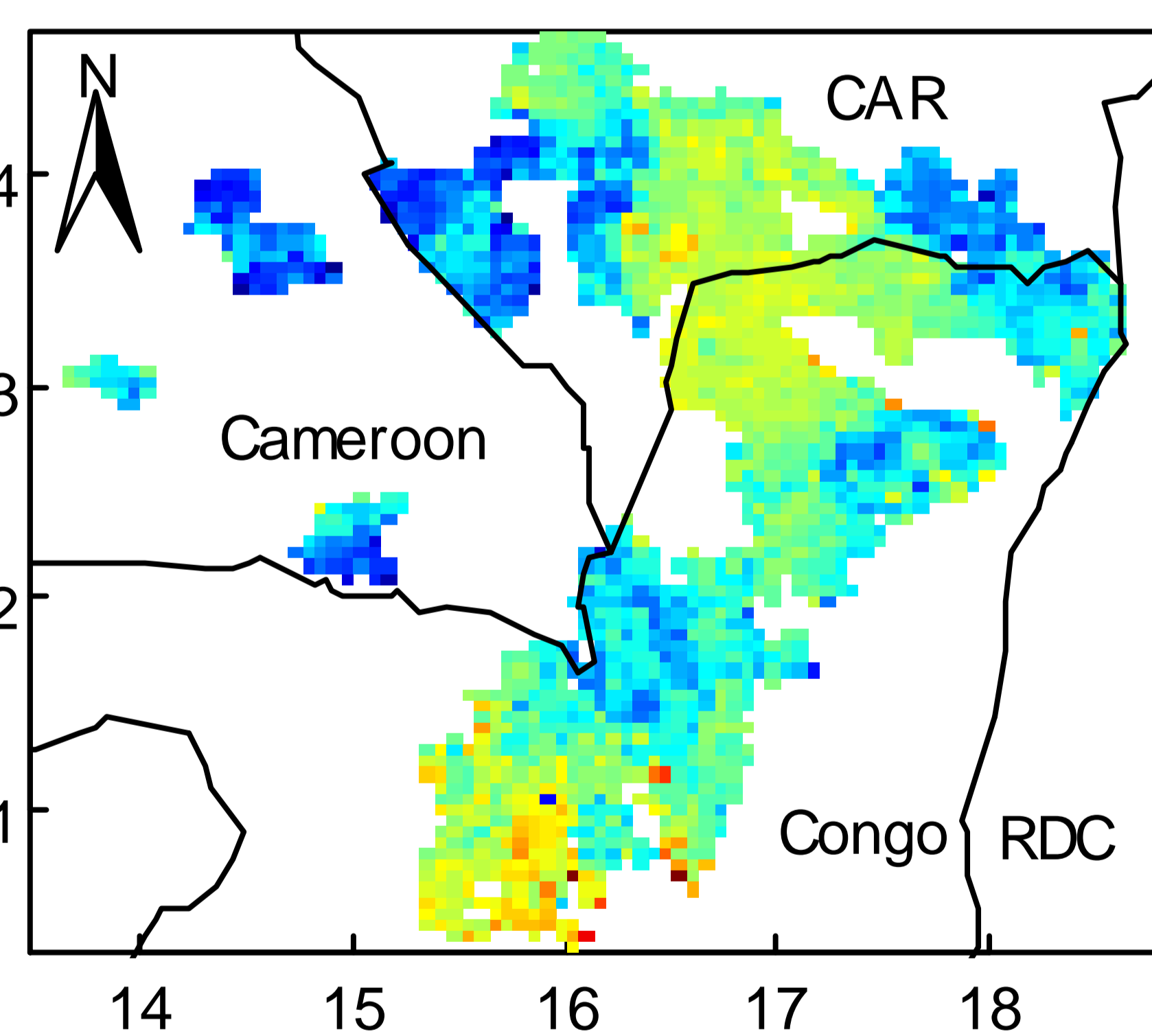
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The factors shaping distribution patterns at a regional scale in the tropics remain poorly understood and especially the relative role of environmental, historical or neutral factors (Svenning *et al.* 2006).

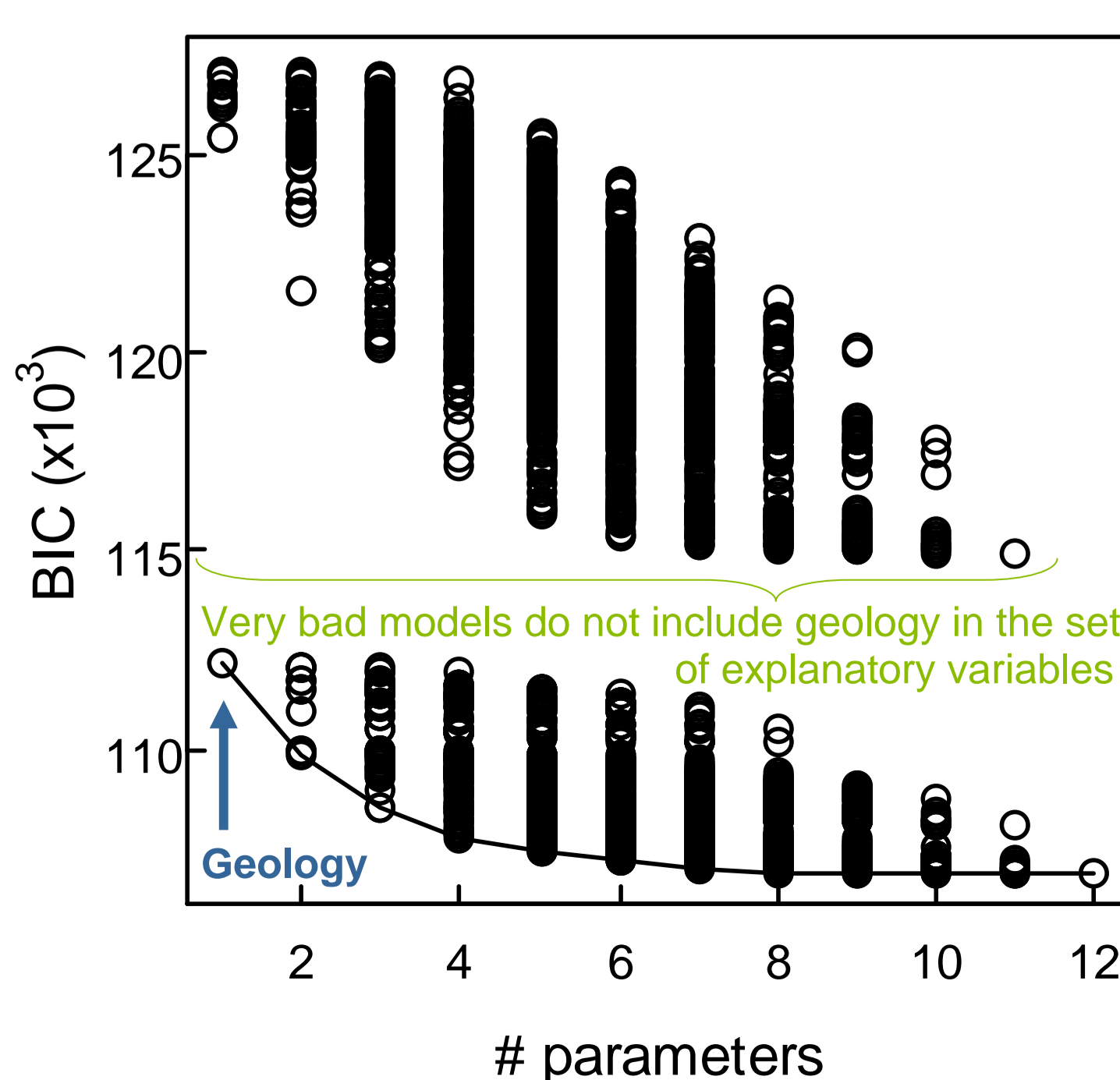
### Aim of the study

→ To identify the determinants of the distribution of common tree species at the northern edge of the Congo Basin

## Results



The first compositional gradient (7.4% explained variance) highlighted **two contrasting species assemblages** associated with two spatial patterns. Species, such as *Triplochiton scleroxylon*, *Terminalia superba*, and *Ceiba pentandra*, with negative scores on the first compositional axis and low wood density had **disjunctive spatial patterns** (in blue on the map), being absent from a central zone in the study area and from the most southern area. Dense wooded species, such as *Lophira alata*, *Pachyelasma tessmannii*, *Lovoa trichilioides*, with positive scores reached high abundance in the two zones avoided by the previous species.



The **geological substrate** was of major importance for the distribution of the studied species while climate, topography, recent history and limited dispersal had little impact. The two contrasted species assemblages were associated with nutrient-poor and/or dry sandy soils on sandstone substrate.

These findings on tree species distribution and its determinants will have major implications for the management and conservation of tropical forests in the Congo Basin.

### Literature cited

Legendre, P. 1993. Spatial autocorrelation: trouble or new paradigm? *Ecology*:1659-1673.  
Svenning, J. C., B. M. J. Engelbrecht, D. A. Kinner, T. A. Kursar, R. F. Stallard, and S. J. Wright. 2006. The relative roles of environment, history and local dispersal in controlling the distributions of common tree and shrub species in a tropical forest landscape, Panama. *Journal of Tropical Ecology* 22:575-586.

## Material & Methods

### Species and trait

We analyzed the distribution pattern of **31 common tree species** in an area of more than 7 million hectares in the Central African Republic, Cameroon and the Republic of Congo using commercial inventories performed by timber companies. Specific **wood density** was extracted from the CIRAD data base of wood properties.

We identified the variations in species composition and the underlying variations in species distribution with a **correspondence analysis** of the plot × species abundance matrix

### Environment, history and space

Environmental factors pertaining to **climate** (mean annual rainfall and seasonality) and **topography** (slope and altitude) corresponded to satellite records (METEOSAT and SRTM). **Geology** was obtained from national maps. The **recent history** of anthropogenic disturbance (dense or disturbed forest) was extracted from topographical maps of the 1960's. The role of **spatial autocorrelation**, indicative of dispersal limitation, was investigated through a trend surface analysis (Legendre 1993).

To identify the relative role of the environment, space and history in the variations in species composition, we performed a **model selection procedure**. We built all possible linear models without interaction terms. The Bayesian Information Criterion (BIC) was used to select the best model (i.e. with the lowest BIC) and identify the role of each explanatory variable.

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