Temporal dynamics of functional diversity in permanent grassland along a fertilisation gradient

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RESEARCH TEAM

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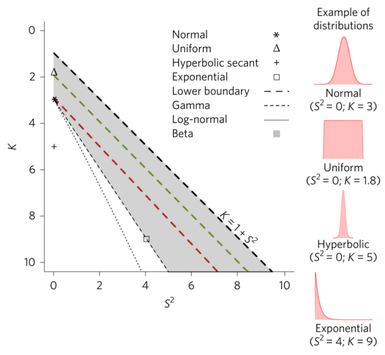
INTRODUCTION

Trait abundance distributions (TADs) are a major driver of the **functioning** of **ecosystems** [1].

By impacting **disturbance** and **fertilization** rates, **land management change** may impact **TADs** with long term consequences for **diversity** and **stability** of **plant assemblage** [2, 3].

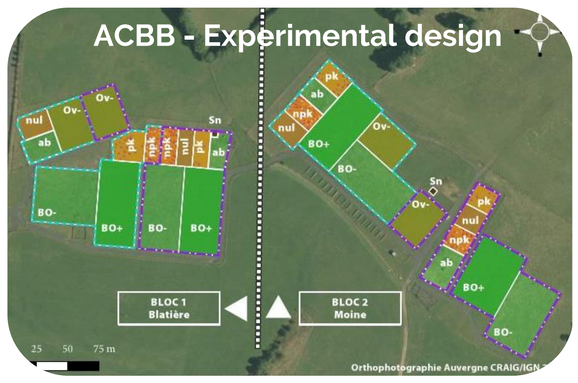
The information held in TADs can be used to infer **ecological assembly rules** [4, 5, 6].

We used a novel analytical framework (The **Skewness-Kurtosis relationships**, SKR) focusing on the shape of TADs to evaluate how **land management** changes community assembly rules and impact the long term dynamics of species assemblage in **permanent grassland.**



MATERIAL & METHODS

- **Long term** experiment on Massif-central (885 m asl) **managed mowed permanent grassland (nul, PK, NPK | 4 plots per treatment)** with **18 years** of **constant land use** [7].
- **Species relative abundance** measured on a yearly basis.



[https://www.soere-acbb.com]

Functional trait data extract from the **TRY** Plant Trait Database [8] :

SLA - LDMC - Leaf N/P

(Mean trait's value caculated per species)

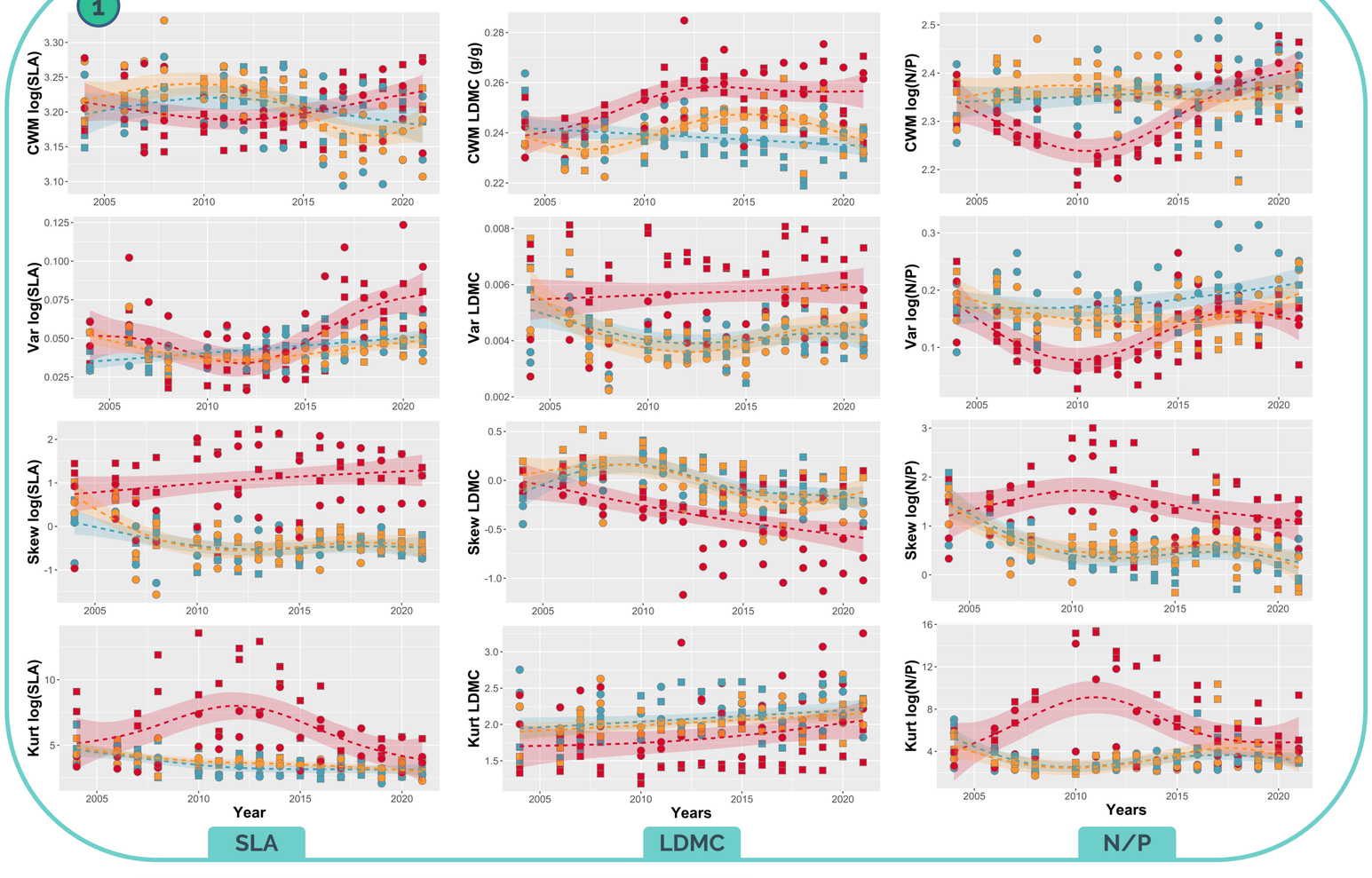
Statistical analysis [3, 4] :

- **Temporal dynamic** of the **TADs**.
- **Skewness-Kurtosis Relationship** (SKR).
- Comparison to **random expectations**.
- The **stability of TADs**.

Legend & Colours	Treatment	Block
	nul	1
	PK	2
	NPK	
	Null Model	

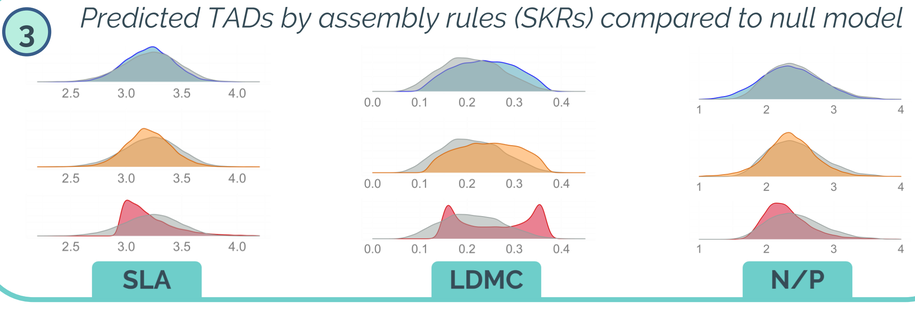
RESULTS & DISCUSSION

Temporal dynamic of TADs using the Mean, Variance, Skewness and Kurtosis

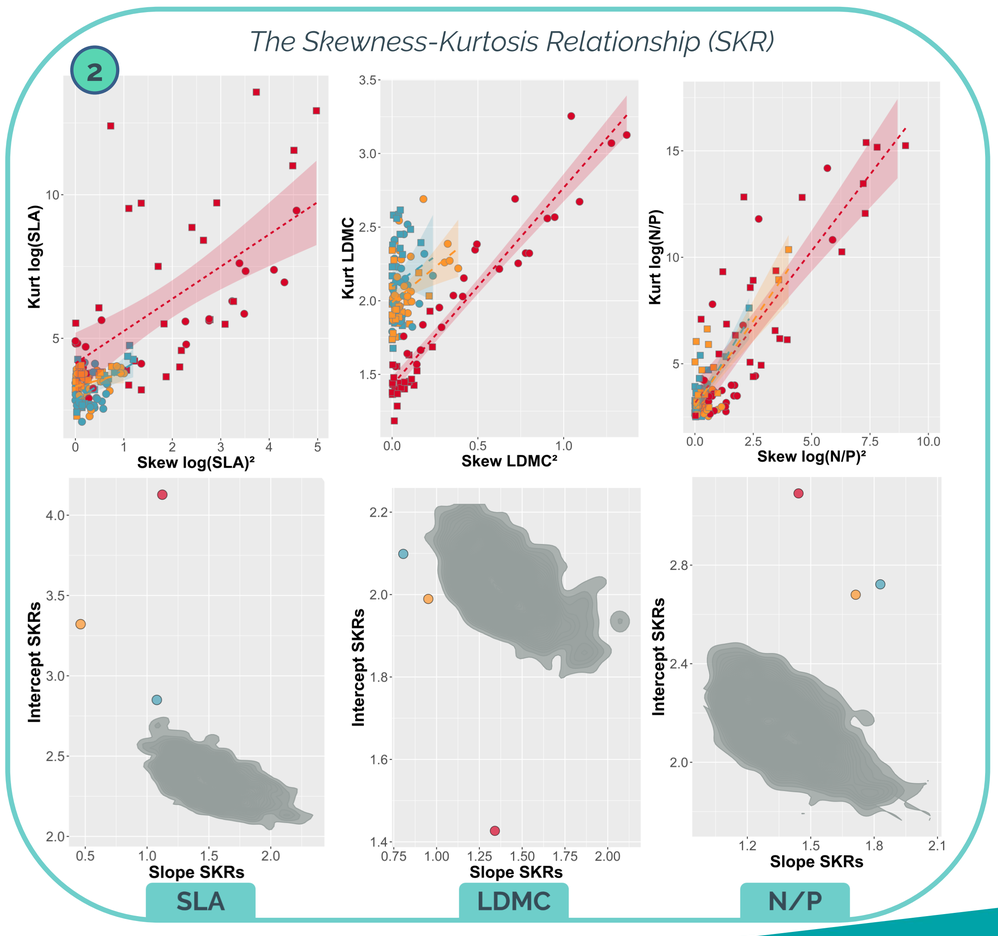


1. **Complex temporal trajectories of TADs** in each land use treatment suggesting for **transient dynamics** [9].
2. However, TADs follow **non random SKR relationships** linked to fertilisation rate ; suggesting for **land use-dependent assembly rules**.
3. **NPK fertilized mowed grassland** are **less functionally diverse** (bimodal, hyperbolic, skewed distribution) than **PK and nul fertilized mowed grassland** which present **more even distributions**.
4. Differences in TADs is associated to strong differences in plant assemblage stability along a fertilisation gradient. **High fertilized** grassland show **TADs variability** whereas **low fertilized** grassland show **remarkable TADs constancy** (lower than expected by chance).

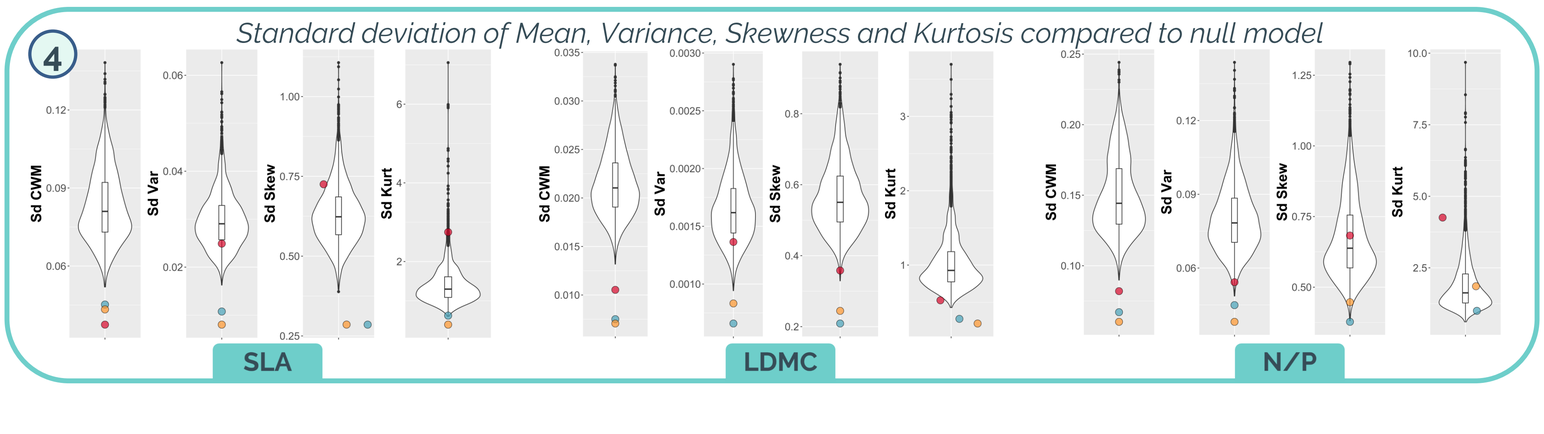
Predicted TADs by assembly rules (SKRs) compared to null model



The Skewness-Kurtosis Relationship (SKR)



Standard deviation of Mean, Variance, Skewness and Kurtosis compared to null model



CONCLUSION & PERSPECTIVES

- **Land use is changing assembly rules** with important consequences on **temporal community dynamic** and **plant assemblage stability**.
- **Next steps :**
  - A better understanding of the **underlying biological processes**.
  - **Take into account intraspecific trait variation** related to **land management**.

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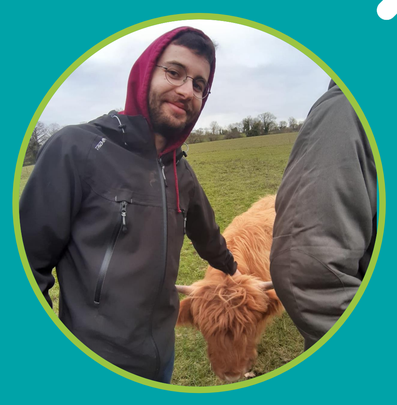

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