

Management efforts reduced desert locust outbreaks despite climate change



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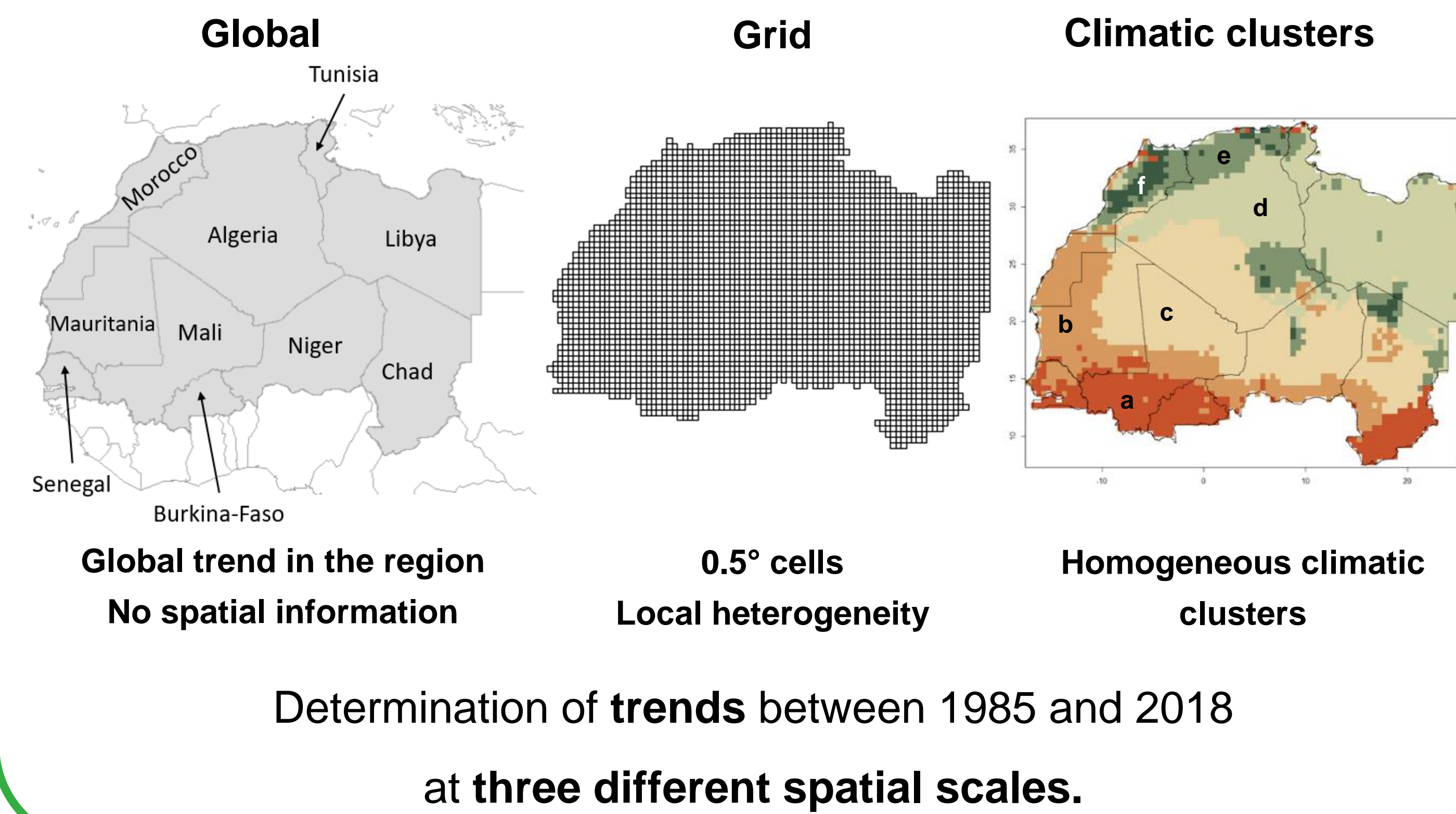
1. CIRAD, UMR CBGP, F-34398 Montpellier, France 2. CBGP, Univ Montpellier, CIRAD, INRAE, Institut Agro, IRD, Montpellier, France 3. INRAE, UMR CBGP, F-34398 Montpellier, France

CONTEXT

Desert locusts form swarms that can cause major **damage to crops** and **pastures**, threatening the **food security** of populations from **West Africa** to India. Since swarm formation is driven by favorable weather conditions, **climate change** could have a significant impact in how this agricultural risk evolves over time. However, we need a better understanding of spatial and temporal heterogeneity in climate change in the region, as well as its interaction with management practices in order to understand its potential effect on agricultural risks associated with the desert locust.

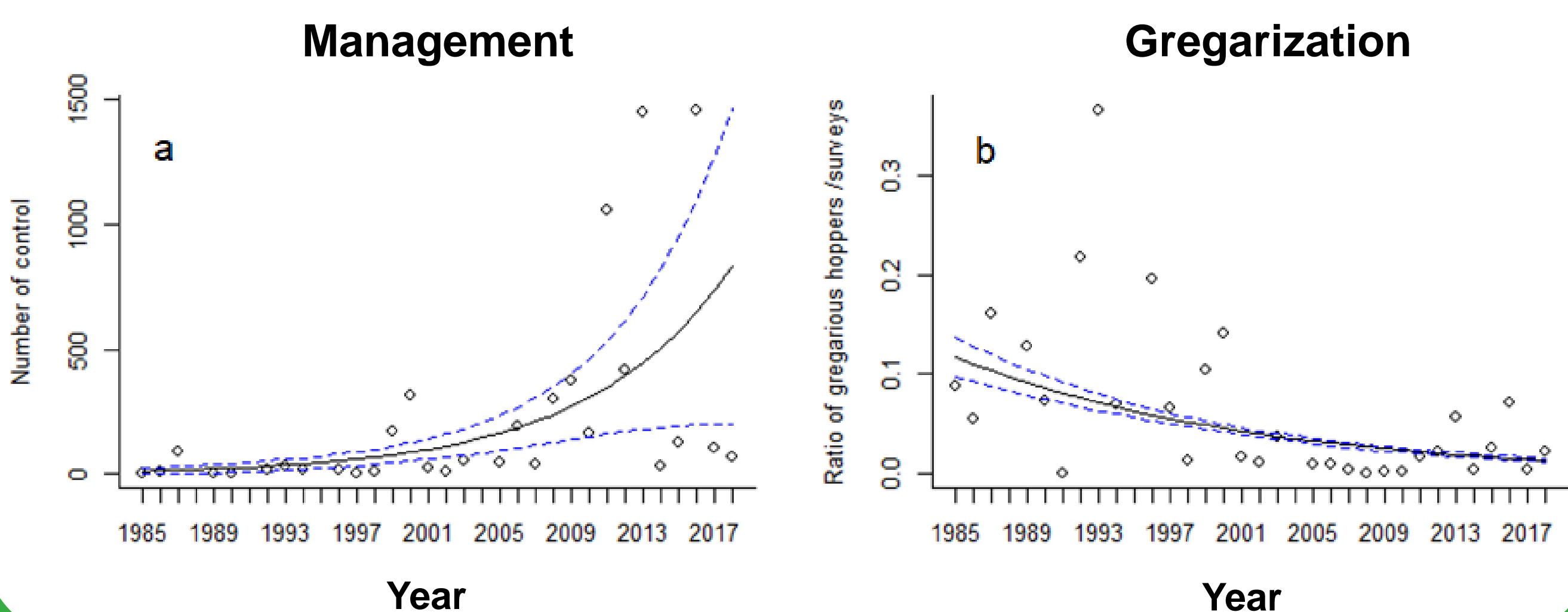
Multi-scale analyses of past climate change impacts on desert locust population dynamics

METHODS



RESULTS – 1. Global scale

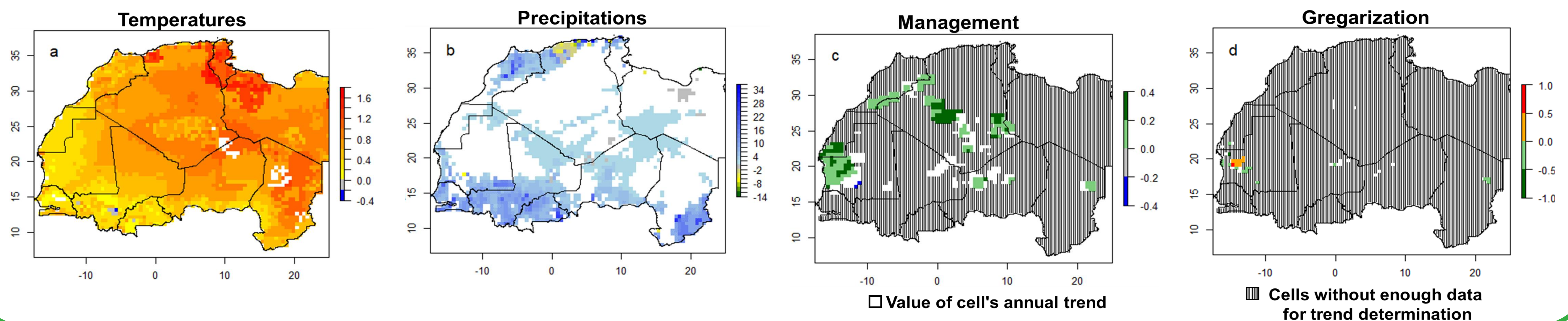
Observed temperatures and precipitations have increased.
Management effort increased, especially since the 2000s.
Gregarization decreased overall.



RESULTS – 2. Cell scale

Presence of **spatial heterogeneity** in temporal trends.
Temperatures have **risen** everywhere (gradient S.W → N.E).
Precipitations have **increased** in the south and north, but there was also many trends which were **not significant** (white area).

Management has mainly **increased**.
Contrary to the global results, there were areas where **gregarization** has **decreased** and others where it has **increased**.



RESULTS – 3. Cluster scale

Like the cell scale, we have the two trends in gregarization.
The clusters where gregarization has increased are also those where the **increase in management** is strongest.

Cluster	Temperatures		Precipitations		Management	Gregarization
	Mean	Trend	Mean	Trend		
a) Sahelian band	++	(***)	+++	(***)	~	-
b) Saharo-sahelian	++	(***)	+	(*)	++	+
c) South Sahara	++	(***)	~	~	+	-
d) North Sahara	+	(***)	~	~	++	+
e) Low mountains	+	(***)	+	(*)	+	~
f) High mountains	+	(***)	++	~	NA	NA

CONCLUSION

Climate change has created more **favorable conditions** for the desert locust, especially in West Mauritania, South Algeria.

Management has evolved at different rates, even though the **efforts have increased** consistently over time. West Mauritania, south of Occidental Sahara and Algeria are where it has increased the most.

These spatial heterogeneities reveal a fundamental **interaction** between management and climate change potential effects.

➔ Intensive effort of management have **helped to limit outbreaks**.