

Variability of edaphic conditions in metal-contaminated sites at multiple scales. A temperate and a tropical situations

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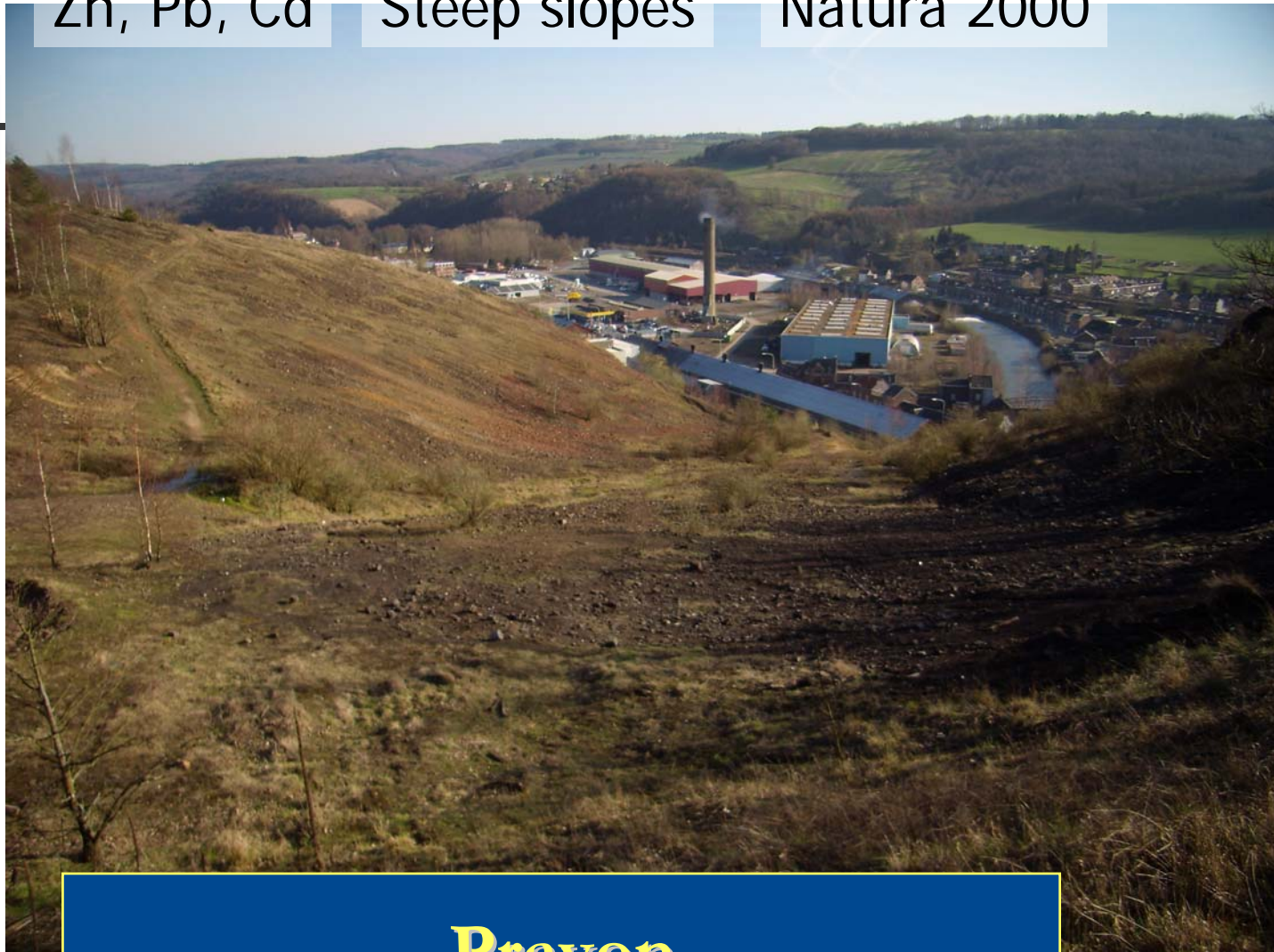
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Zn, Pb, Cd

Steep slopes

Natura 2000



Prayon

Cu, Co

Gentle slopes

Inhabited district



Lubumbashi

The « Katanga syndrom »



- Contamination
- Acidification
- Death of vegetation
- Erosion



Theme

Soil TE content generates ecological pressure
⇒ specific flora



Conservation



Remediation



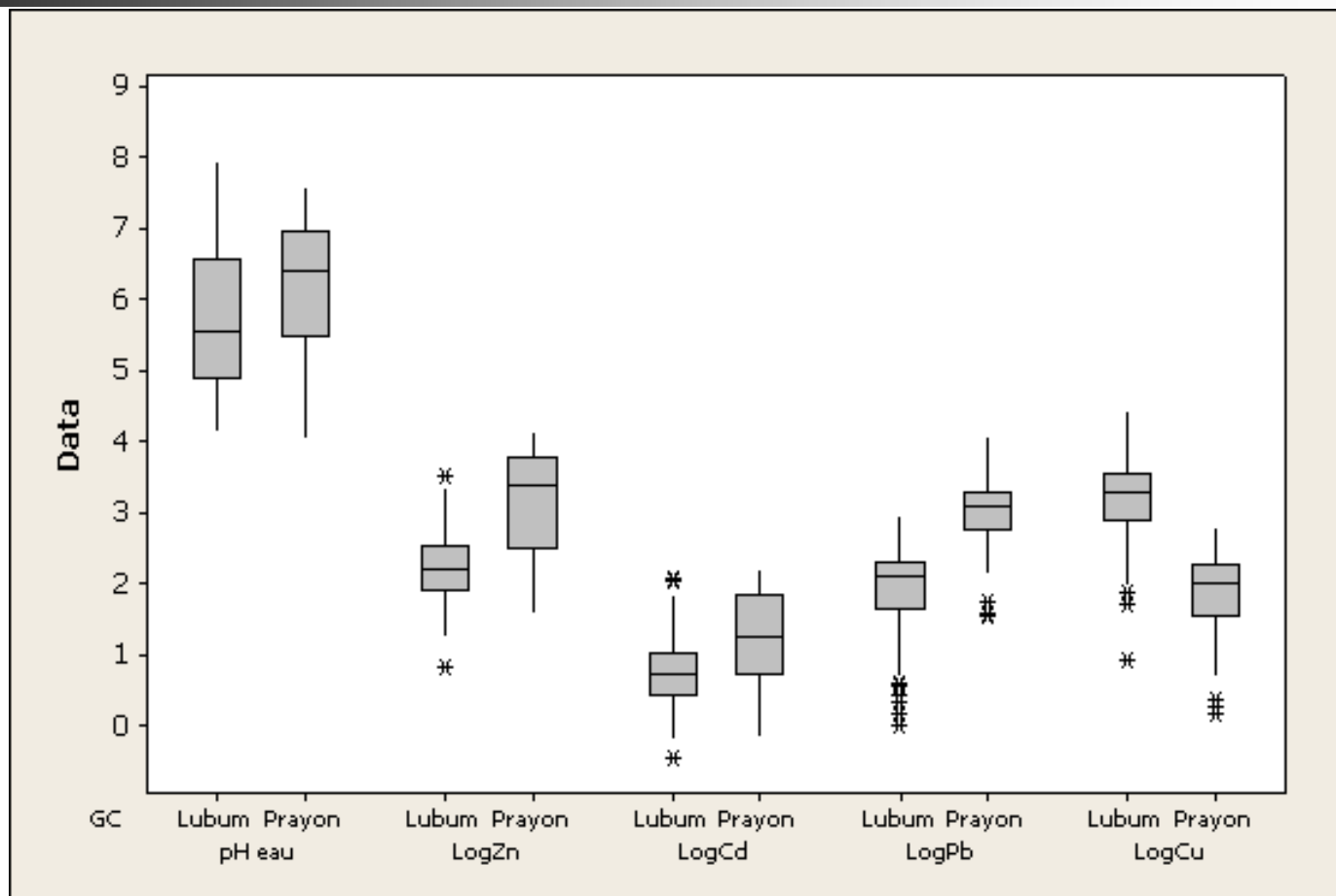
Questions

What range of ecological conditions?

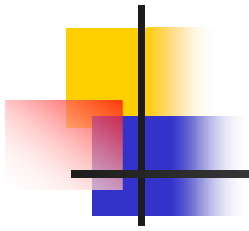
What consequences for site characterization ?
remediation?

Main results

1. What range of ecological conditions?







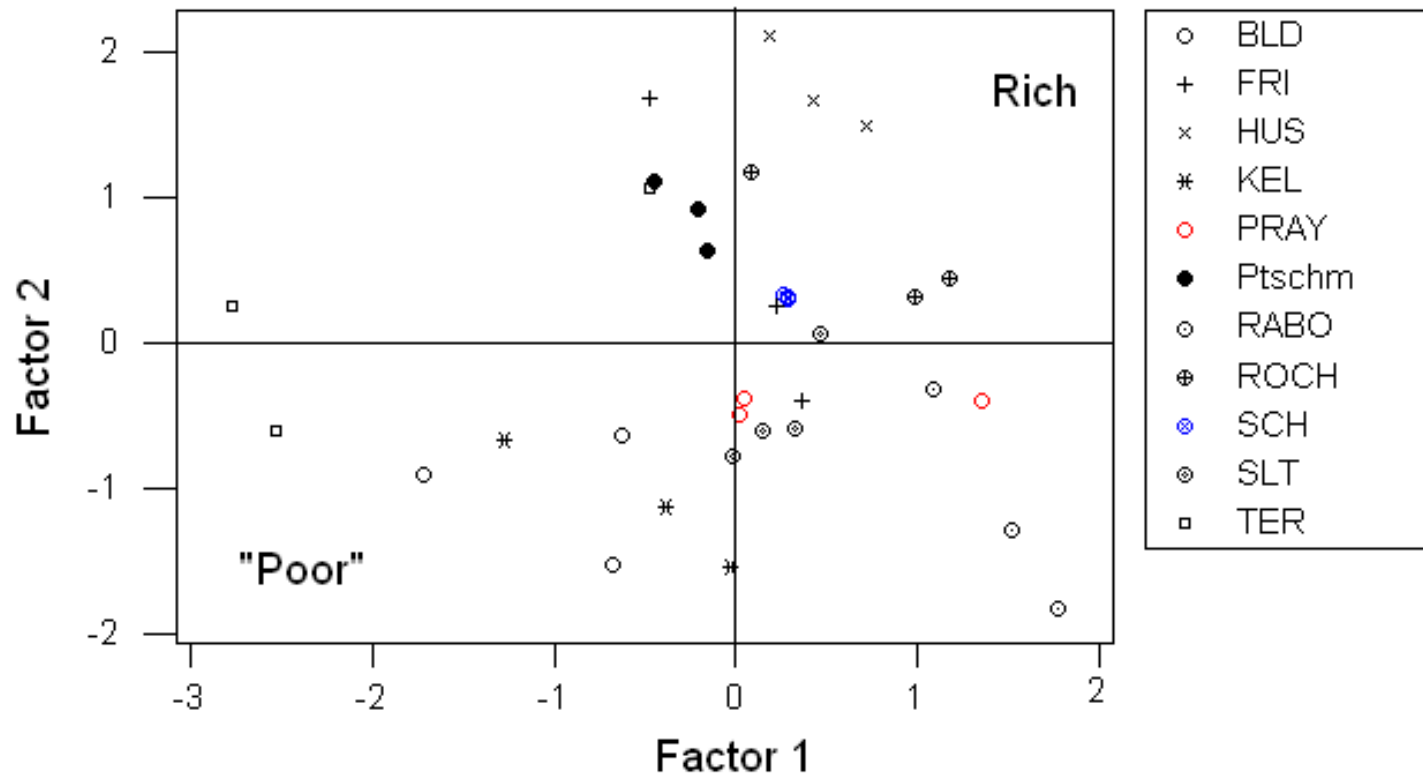
$$\text{Log} (M_{av}) = f (\log (M_T) \text{ pH} \log(\text{TOC}))$$

All	Cd	Pb
	Co	Zn
	Cu	
	Zn	

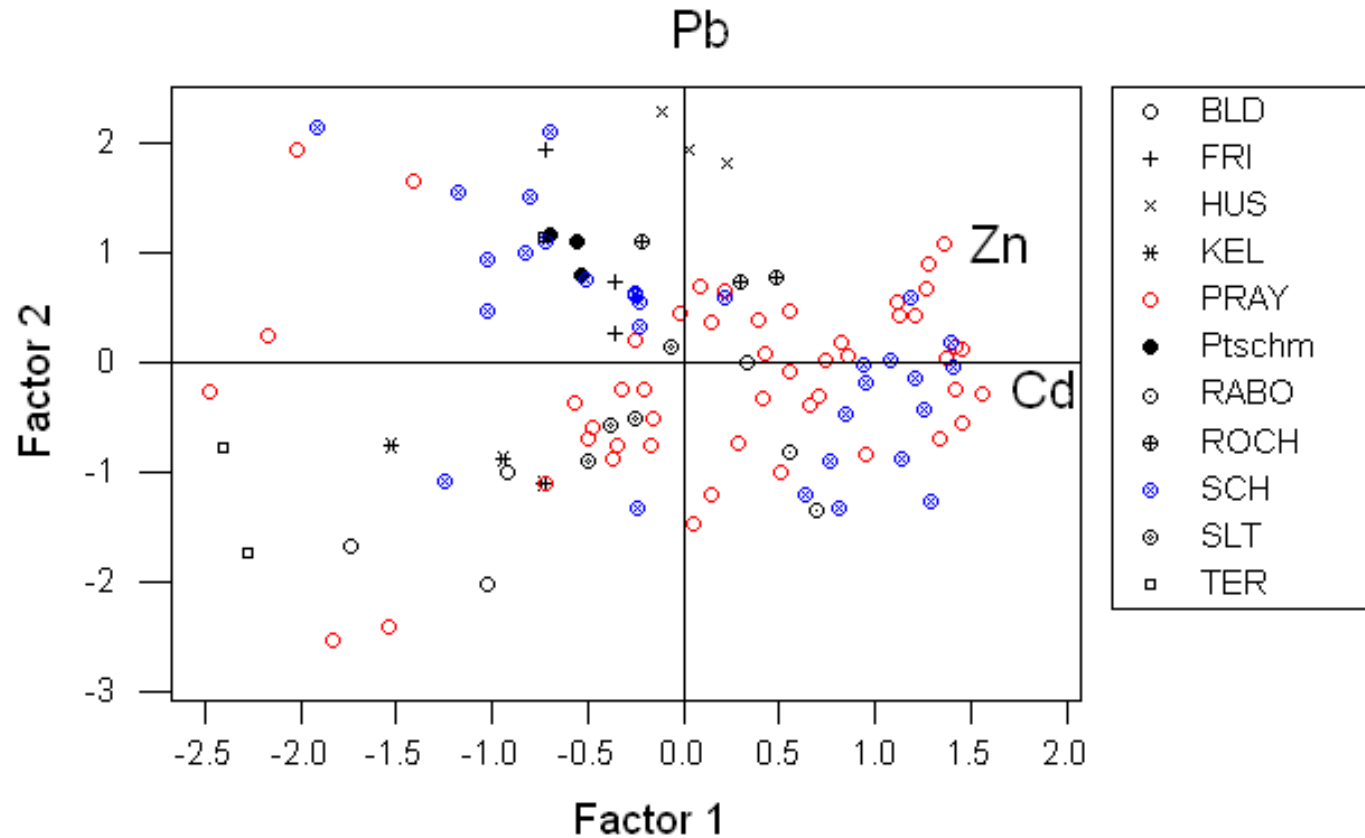
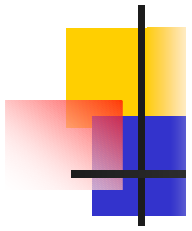
Site specific relationships



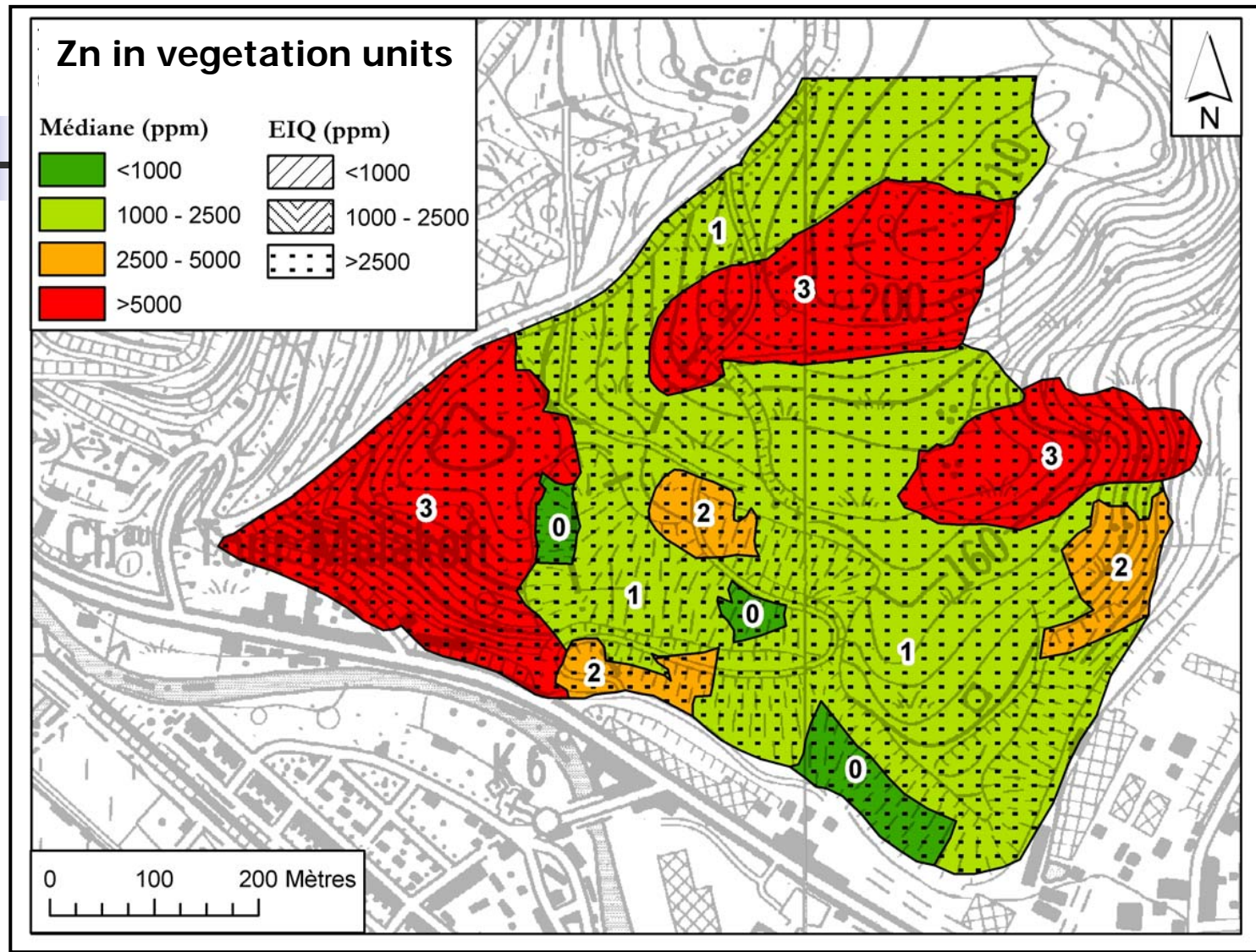
2. Variability within the sites : Prayon



Differences between sites appear important because triplets ($n=3$) seem closer to each other than to other groups



When sampling density rises, the within-site diversity appears much more important.



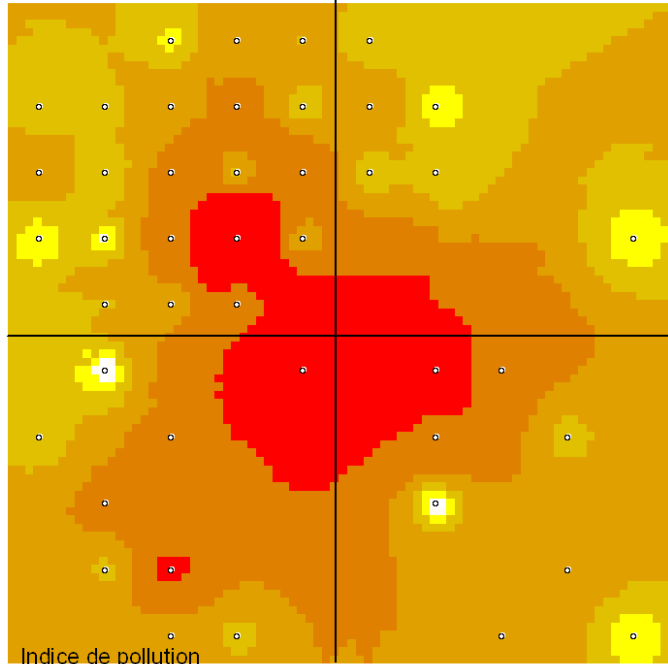
2. Variability within the sites : Lubumbashi



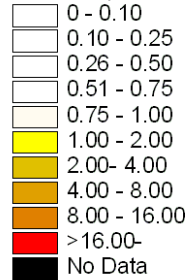
No significant difference of TE content between districts



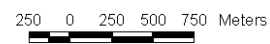
Synthetic pollution index



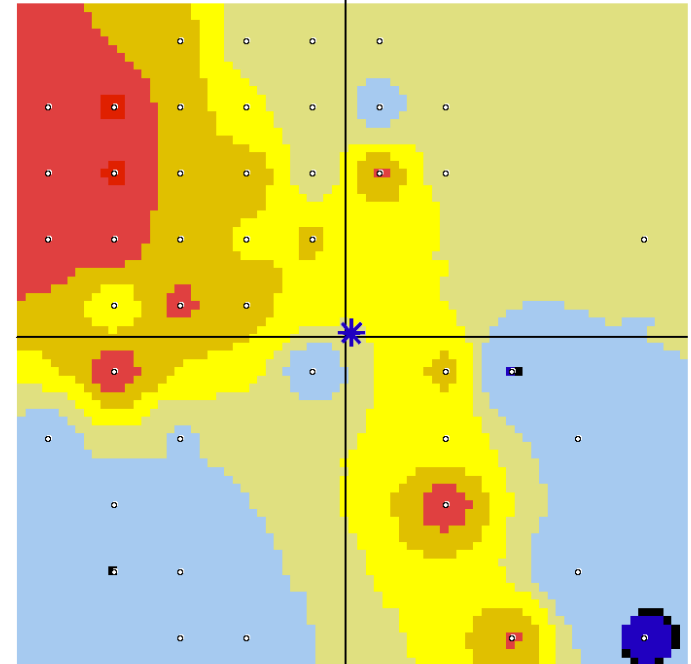
Indice de pollution



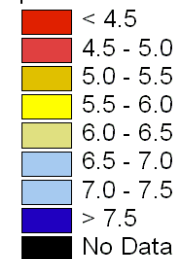
* Site Gecamines



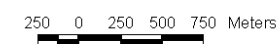
pHwater in Lubumbashi

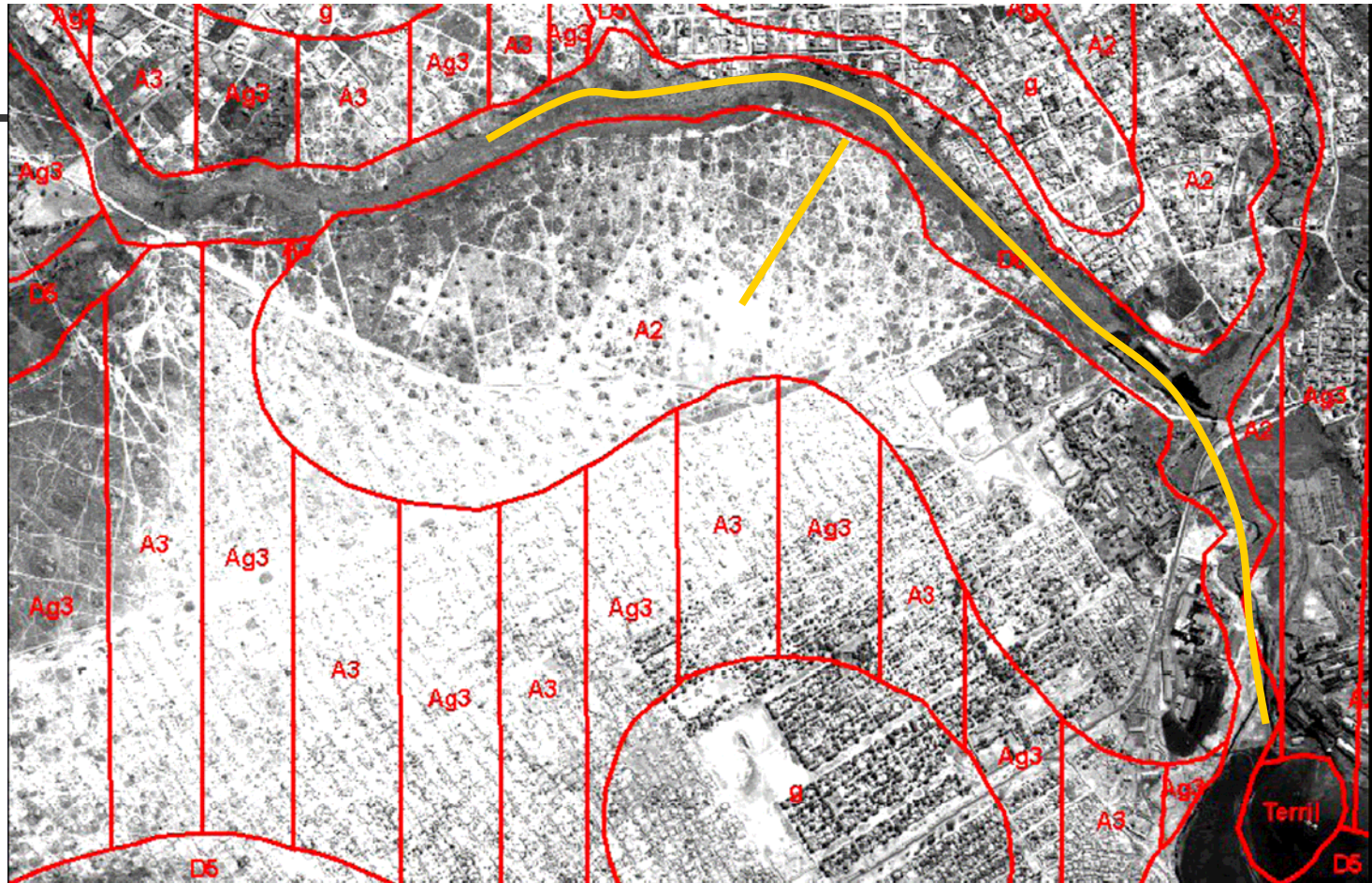


pH eau



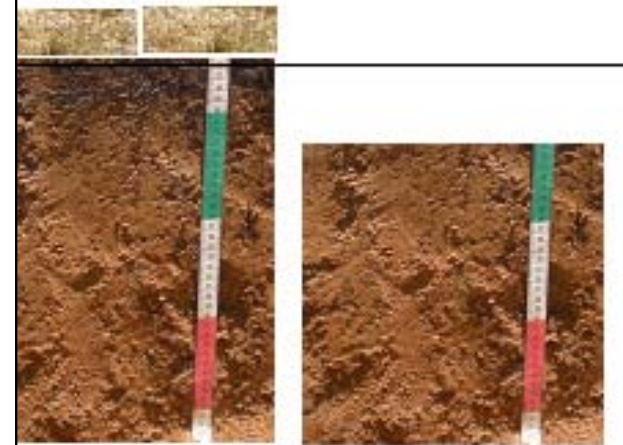
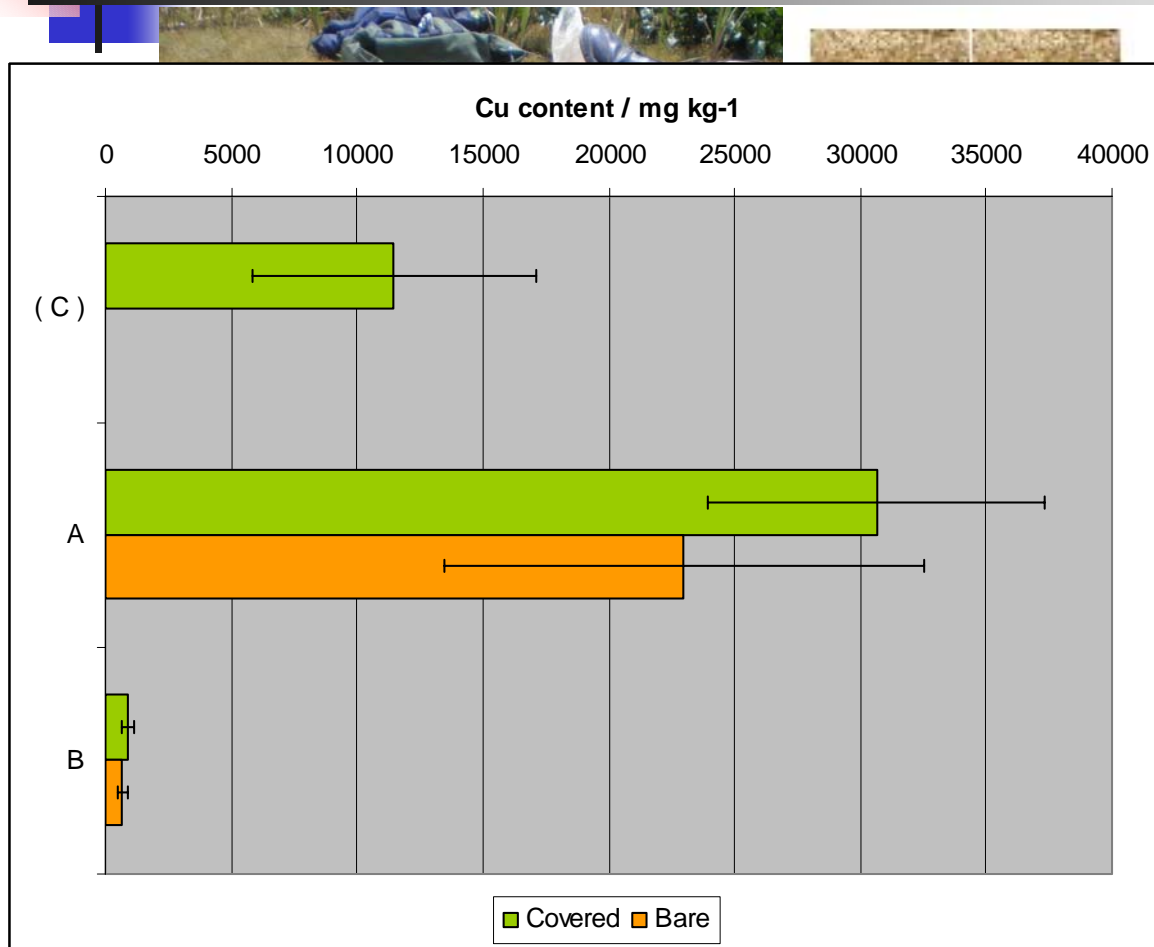
* Site Gecamines





The Gecamines district

Importance of the state of soil surface : Lubumbashi

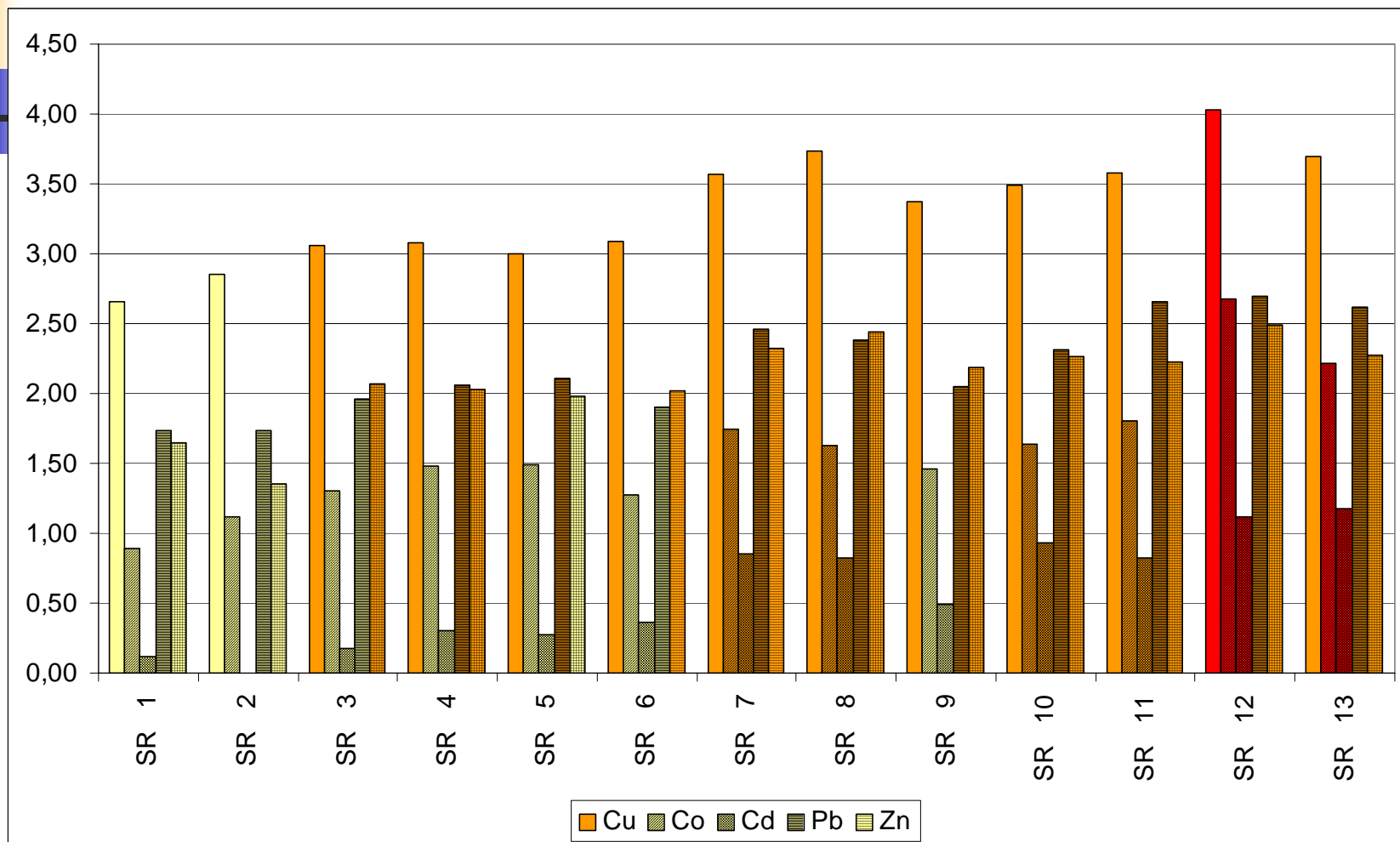


"Original"

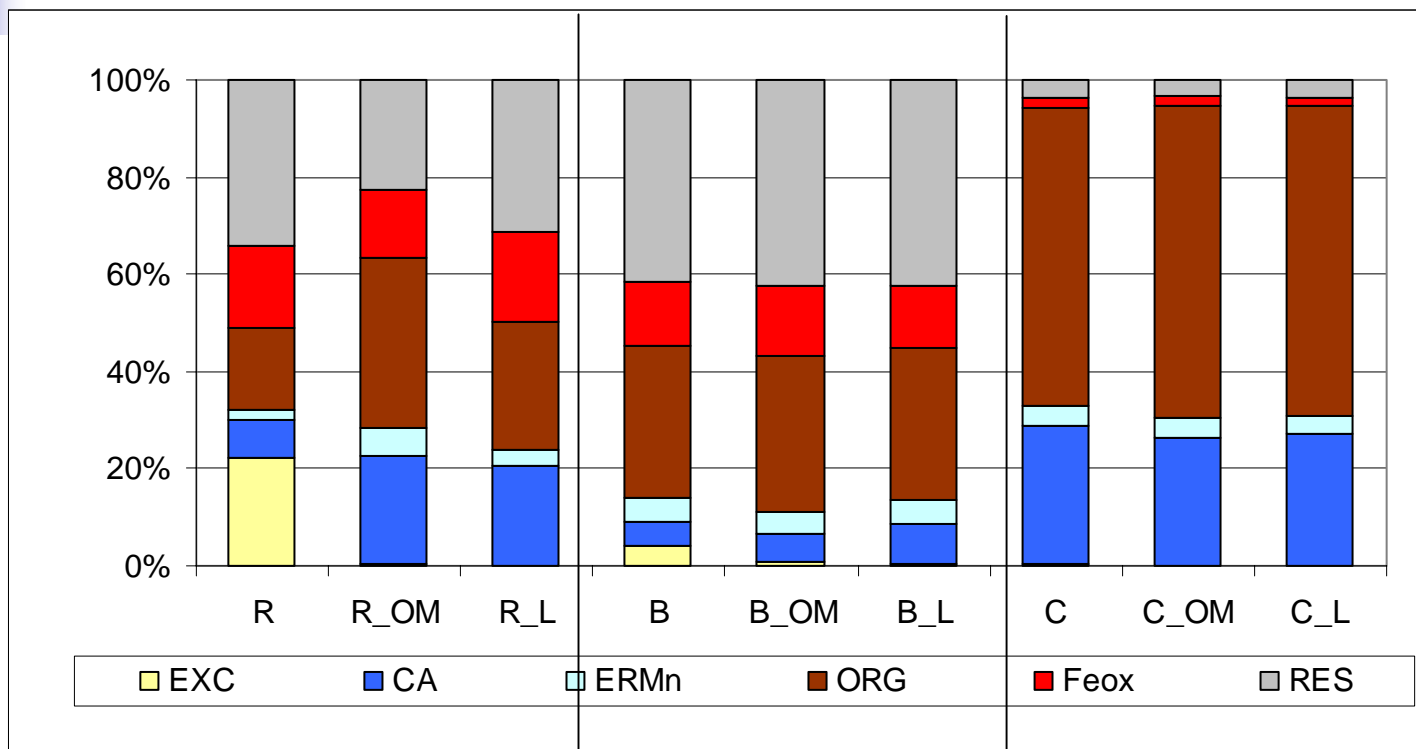
Eroded



TE in the sediments : Lubumbashi



3. Fractionation variability : Prayon



500
Red soil

11,000
Black Soil

35,000 mg kg⁻¹ Zn
Carbonated Soil



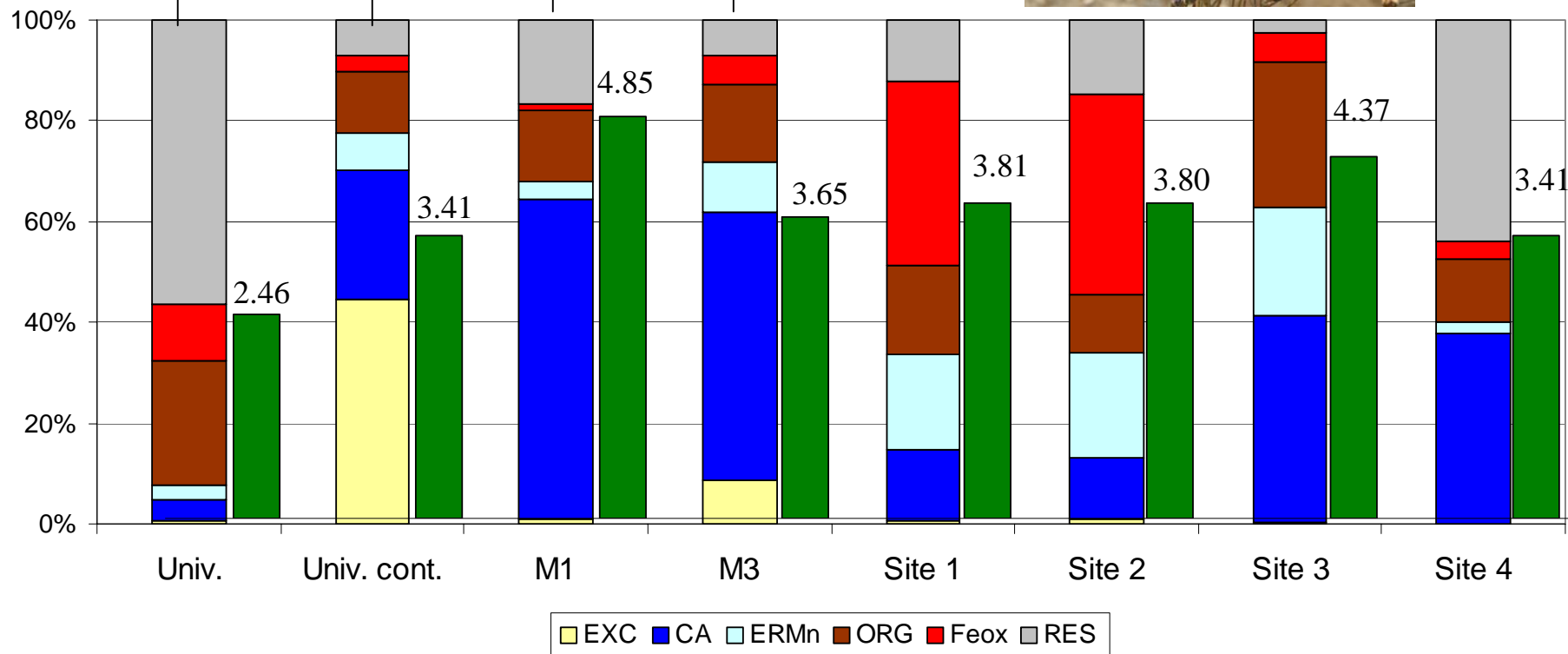
3. Fractionation variability : Lubumbashi



contaminated

Reference

+ CuSO₄



Need for a typology of the contaminations...

Conclusions

High variability whatever the scale considered
Importance of redistribution processes

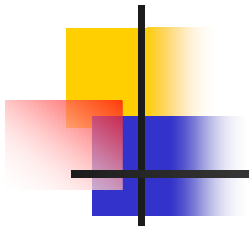


Definition of differentiated management areas

More research is conducted about...



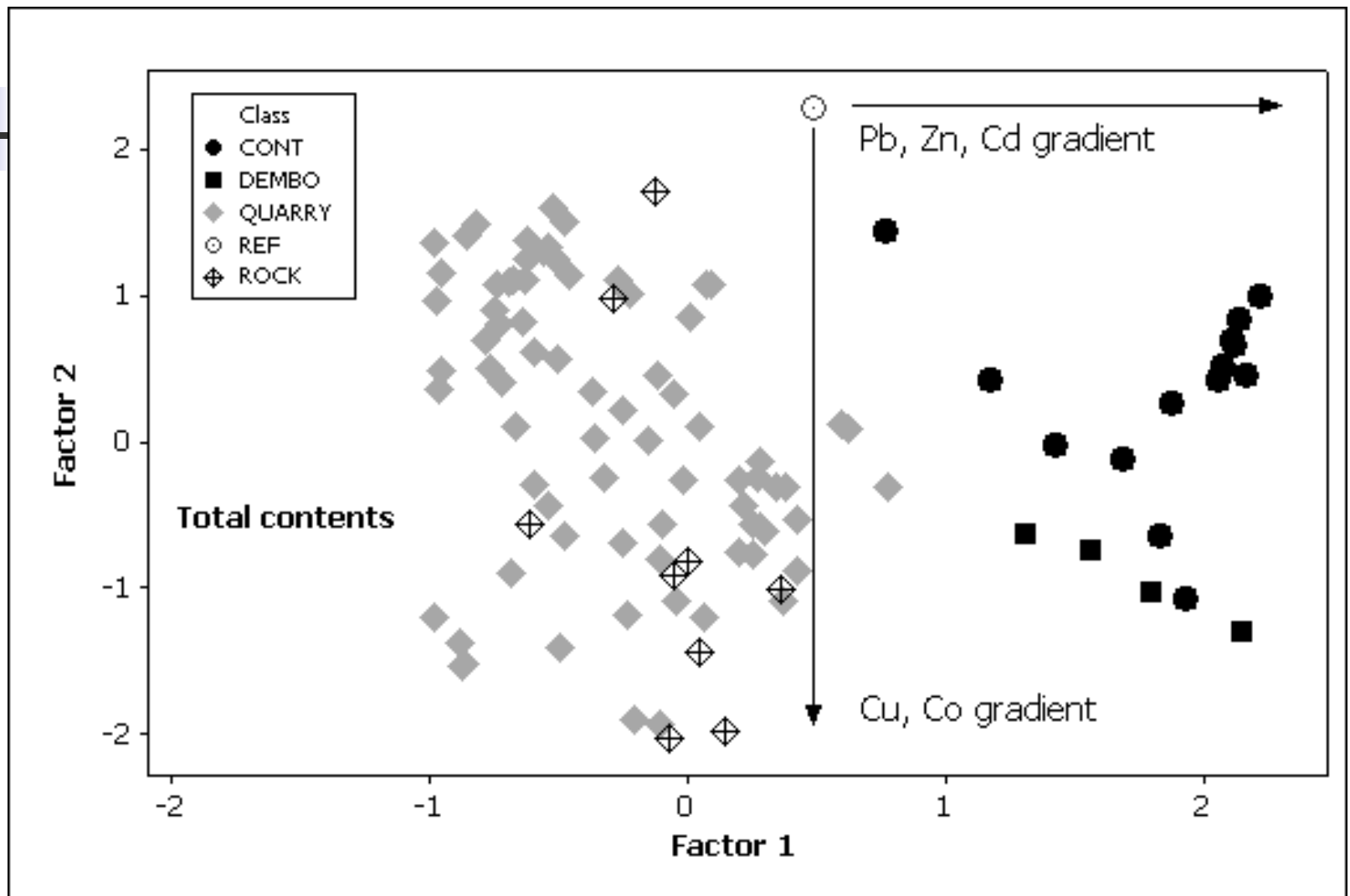
- (i) contaminations and physical-chemical conditions in the rhizosphere,
- (ii) plant tolerance for growing in multi-metallic contaminations,
- (iii) the ways to reduce the limitations for installation of vegetation



Thank You!



Form	Abbr.	Method
Exchangeable	EXC	25 ml 1 M MgCl ₂ , pH 7, shaking 1h
Acido-soluble	CAR	25 ml 1 M CH ₃ COO-Na + CH ₃ COOH, pH 5, shaking 3h
Easily reducible	ERM	25 ml 0.1 N NH ₂ OH.HCl + 0.01 N HNO ₃ , pH 2, shaking 30'
Organic matter	ORG	5 ml 35% (v:v) H ₂ O ₂ + 3 ml 0.02 N HNO ₃ , 2 h at 85°C 3 ml 35% (v:v) H ₂ O ₂ , 2 h at 85°C 10 ml 2 N NH ₄ NO ₃ in 20% (v:v) HNO ₃ , 30'
Fe and Al oxides	FOX	20 ml 1 N NH ₂ OH.HCl + 25% (v:v) CH ₃ COOH, 4h at 90°C
Residual forms	RES	2x (5 ml conc. HF + 1,5 ml conc. HClO ₄) + 10 ml 10% (v:v) HCl

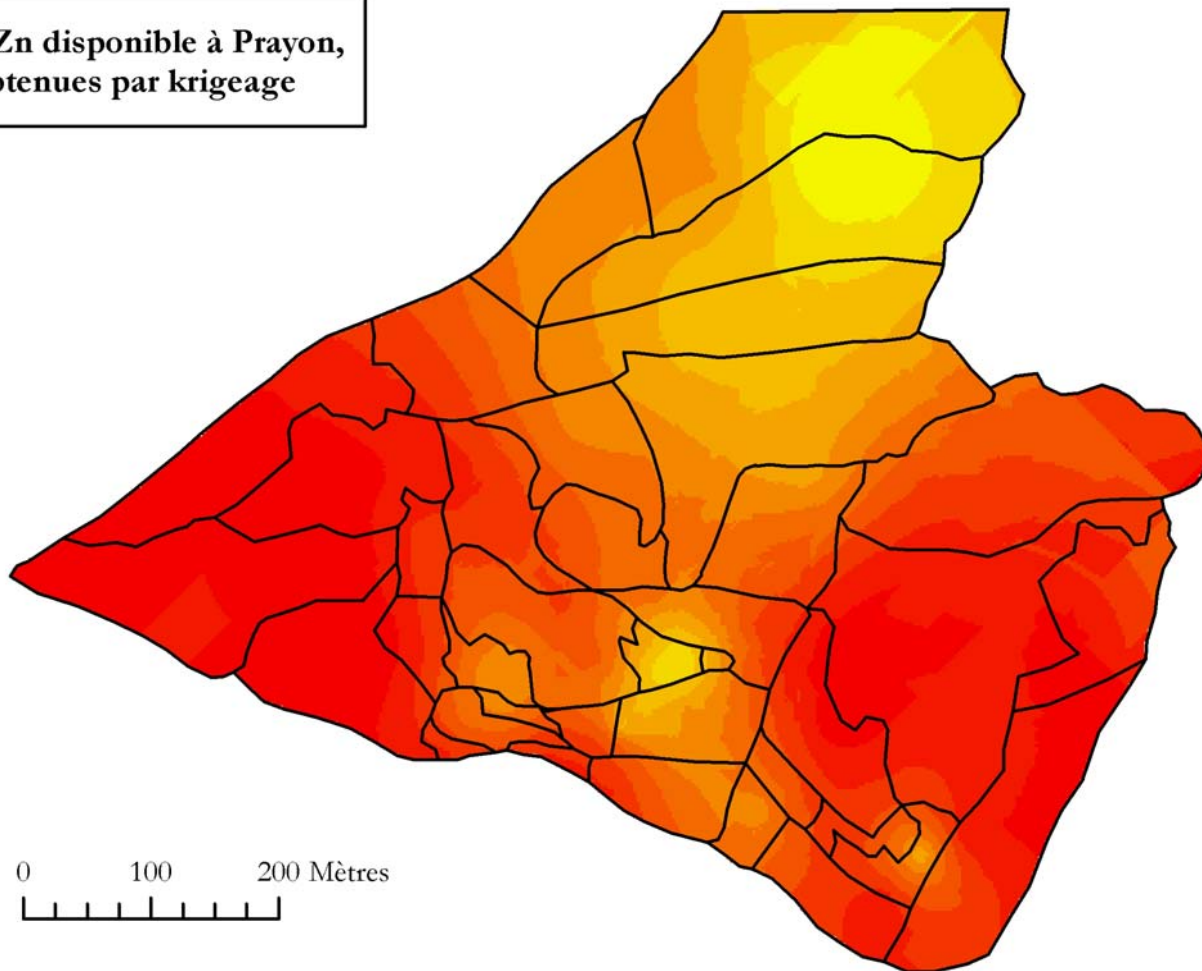
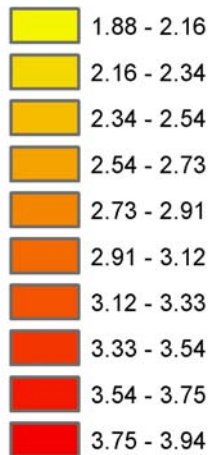




**Distribution du Zn disponible à Prayon,
interpolations obtenues par krigeage**

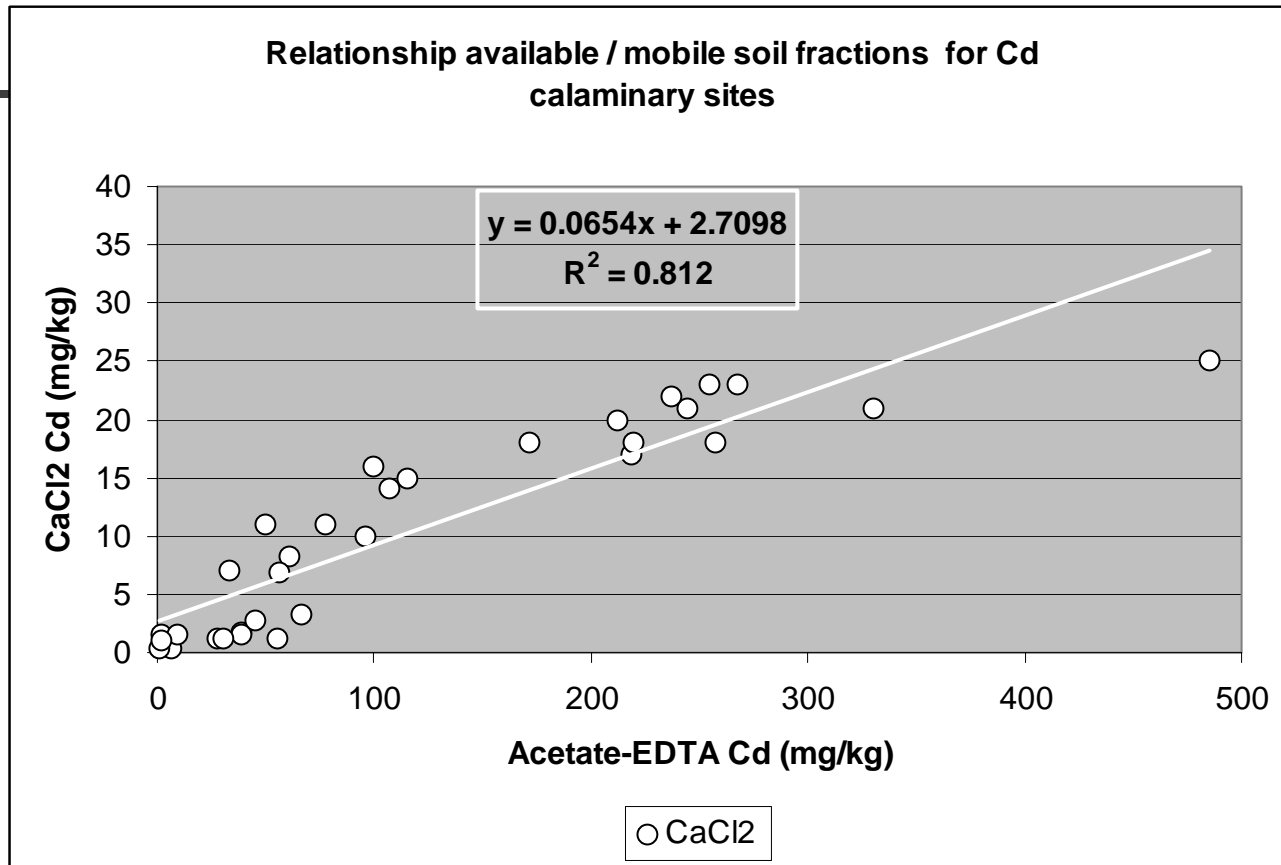
Unité envir.

log Zn (ppm)





Identification of mobilizable-mobile relationships



r^2 Zn : 0.444 ; Pb : 0.265

