

Typology of soils from peri-industrial areas of the Walloon region (Belgium) based on trace metal elements contents

Pereira B.*, Titeux H. & Sonnet Ph.

Soil Science Unit, Earth and Life Institute, Université catholique de Louvain (UCL); 1348 Louvain-la-Neuve (BELGIUM)

*E-mail : benoit.pereira@uclouvain.be

Objectives

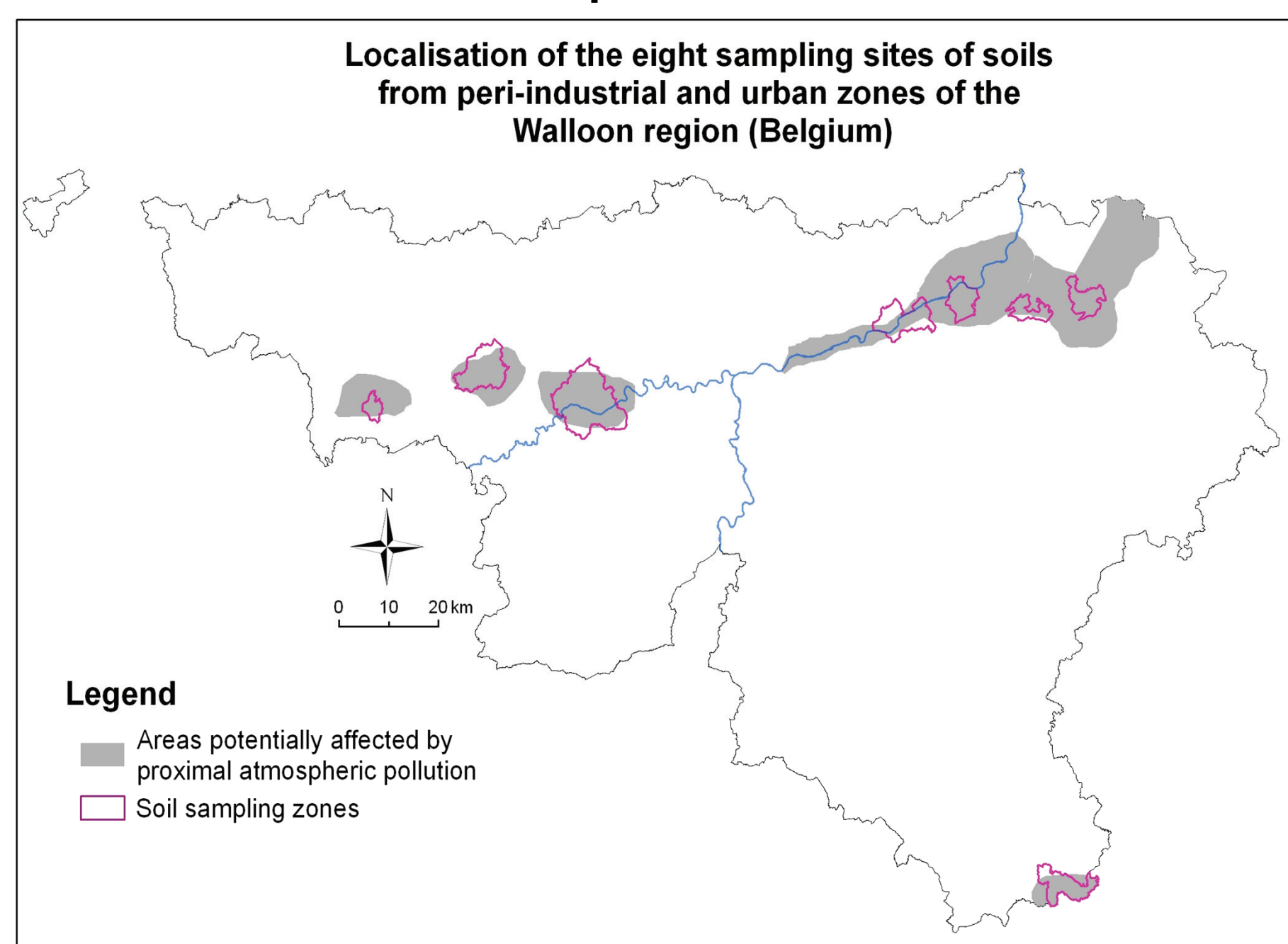
To characterize the distribution of pollutant concentrations in urban and peri-industrial soils through a descriptive model.

→ prediction and mapping of pollutant levels

Sampling scheme

8 zones were sampled to represent different current and historical industrial context.

In each zone, 70 to 200 sites were sampled at one or two different depths.

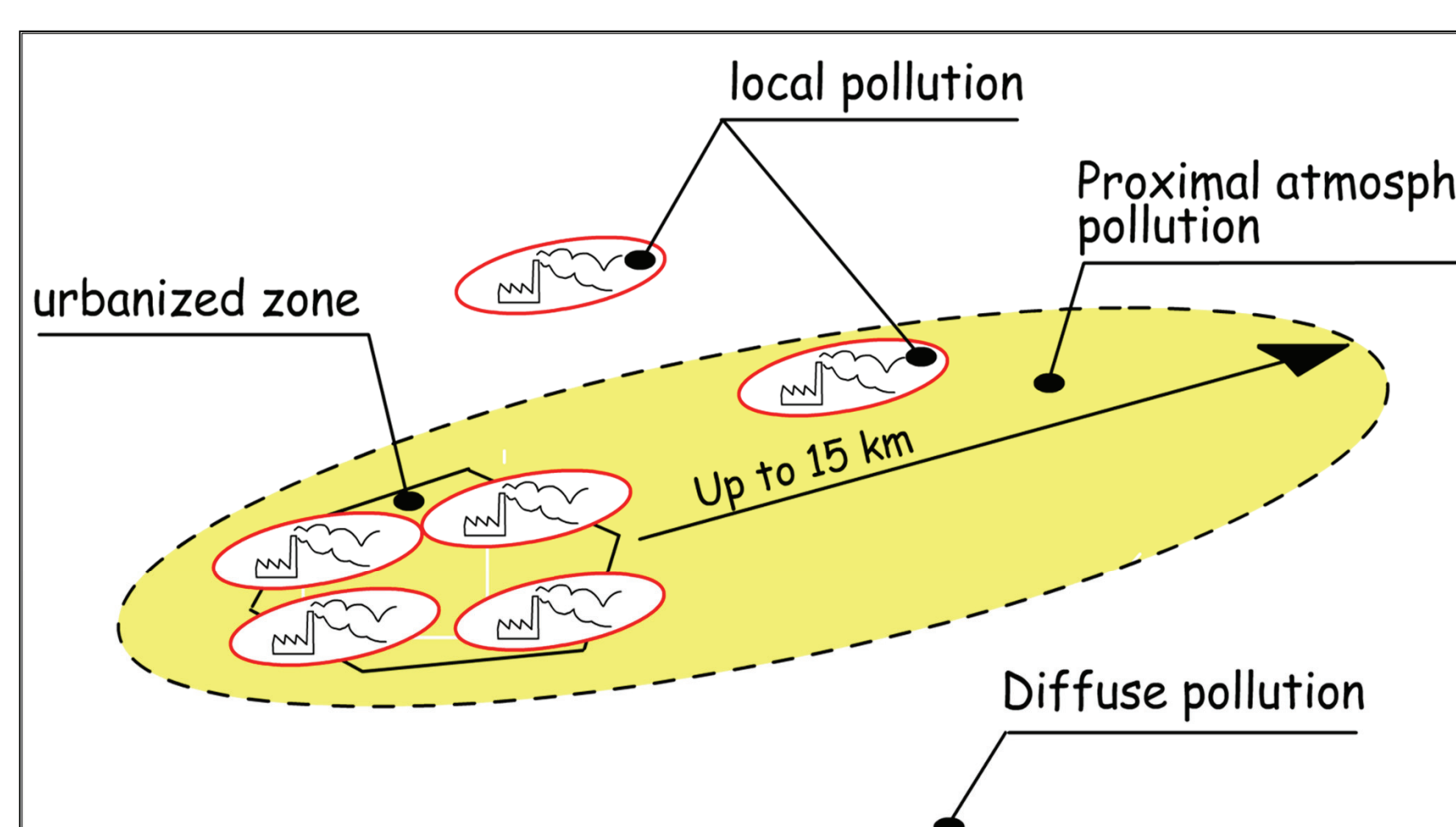
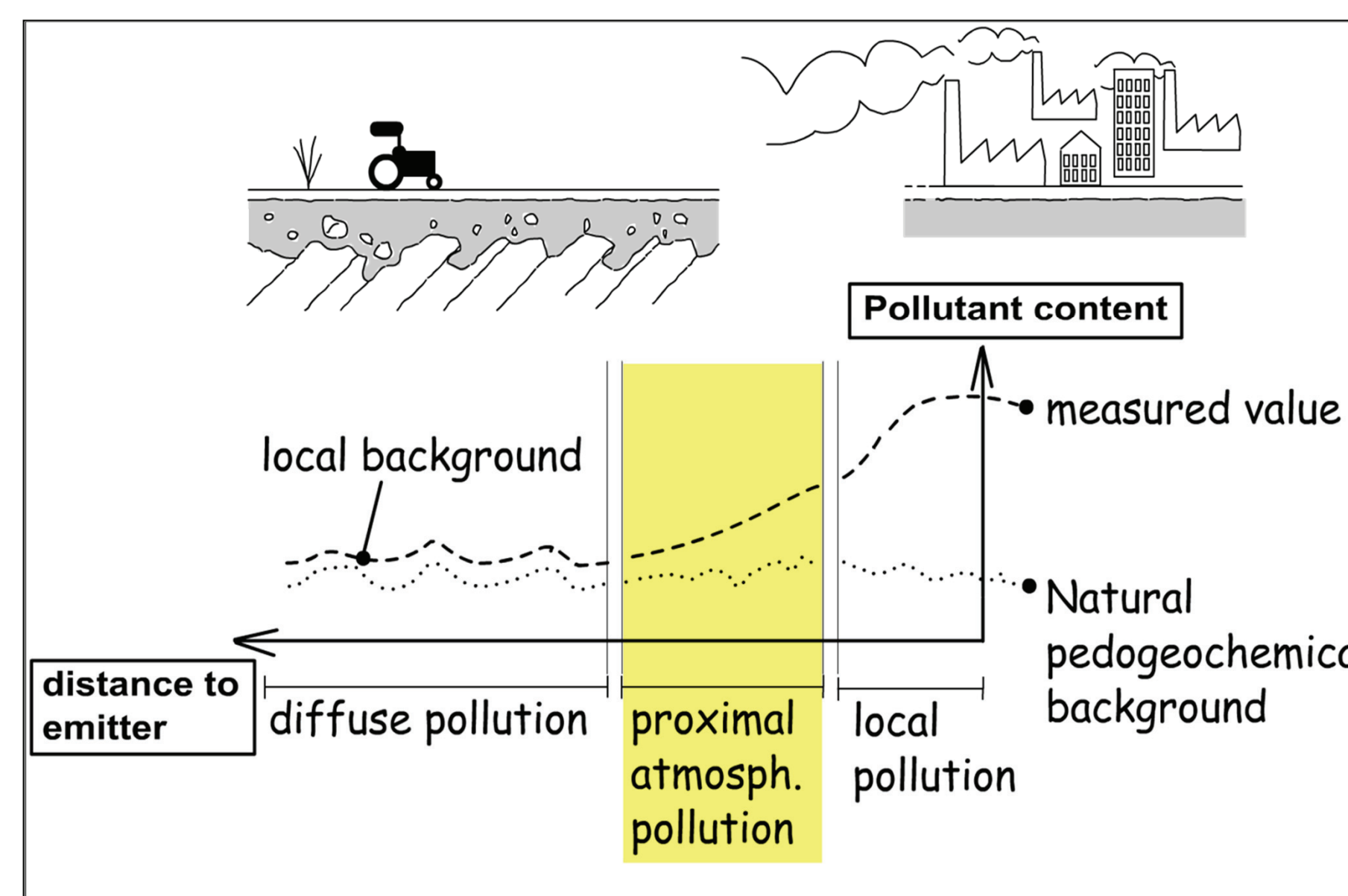


Soils from urban and peri-industrial regions

→ presence of technogenic substrates and the fallout of smoke and dust dispersed by the winds in the vicinity of pollution sources.

Field of study: soil affected by proximal atmospheric pollution (area in yellow in the following figures)

Soils in urban and peri-industrial context have undergone variable level of anthropization



Urban soil database constitution

1. Site description

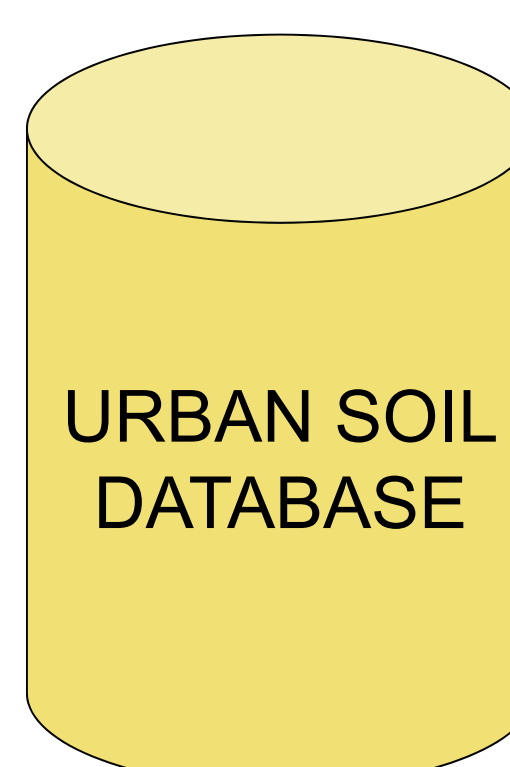


2. Soil description



3. Sample analysis

1. General properties (pH, granulometry, organic matter content)
2. Pseudo-total concentration (aqua regia extraction) for major (Fe, Al, Ca, ...) and trace element (As, Cd, Cu, Sb, Tl, Zn...).
3. Organic pollutant concentration (PAH, BTEX, EOX, ...).



Typology building

Among the main factors behind the ETM concentrations, identifying modalities that have a significant impact on the concentrations

"NATURAL" FACTORS

Results from soil database about background concentration (POLLUSOL 1, SPAQuE)

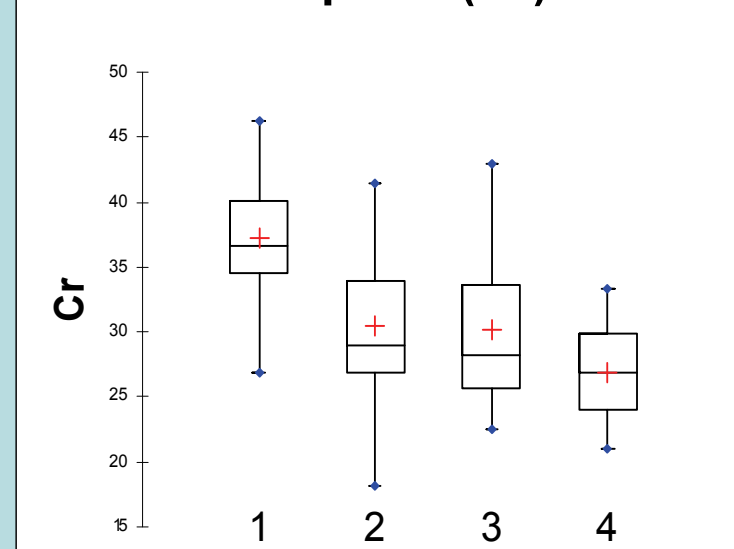
Geopedological substrate

Ex : luvisol formed on silty clay loams (quaternary loess deposits)

Soil category

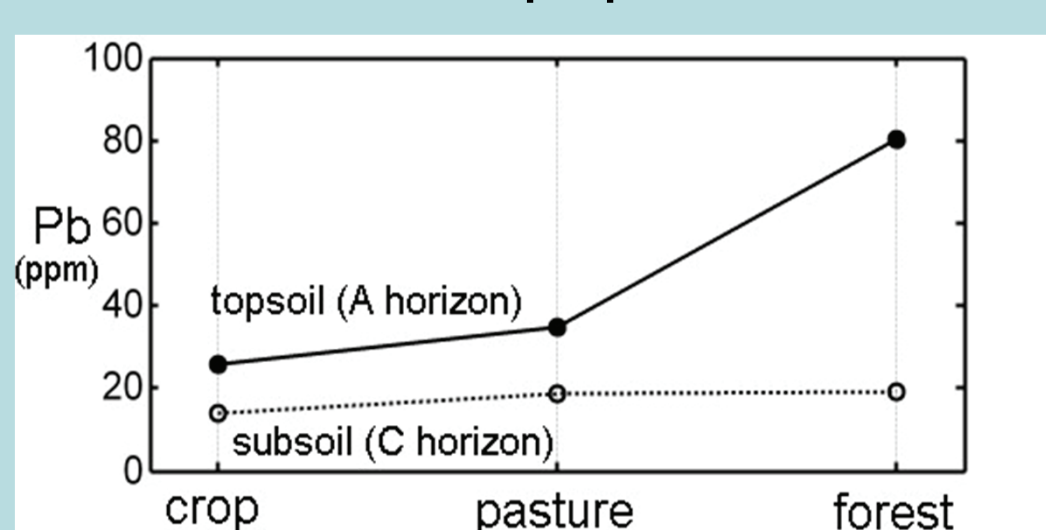
- 1 Brown soil with illuvial clay accumulation B horizon, well drained
- 2 Brown soil with illuvial clay accumulation B horizon, poorly drained
- 3 Brown soil not differentiated in horizons, well drained
- 4 Brown soil not differentiated in horizons, poorly drained

Box plots (Cr)



Land use

Ex : Forest, crop, pasture



TECHNOGENIC DIRECT TRANSPORTATION FACTORS

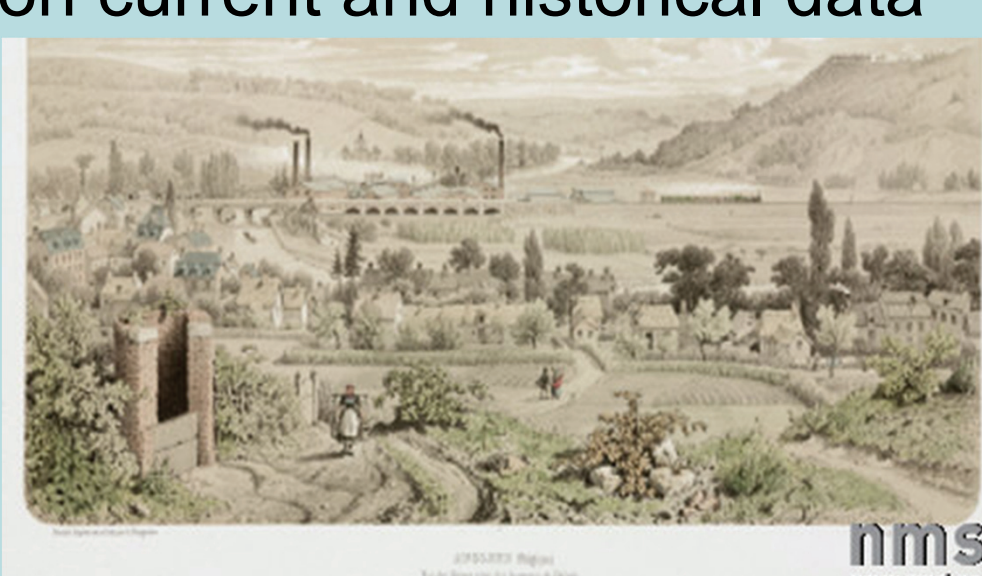
Technogenic material : amount and nature

Ex : slag, foundry sand, brick, ...
Cf. Titeux & all « Identification of industrial stony residues in urban soils made of filling materials: a step toward prediction of trace element content ? » in SUITMA 2011

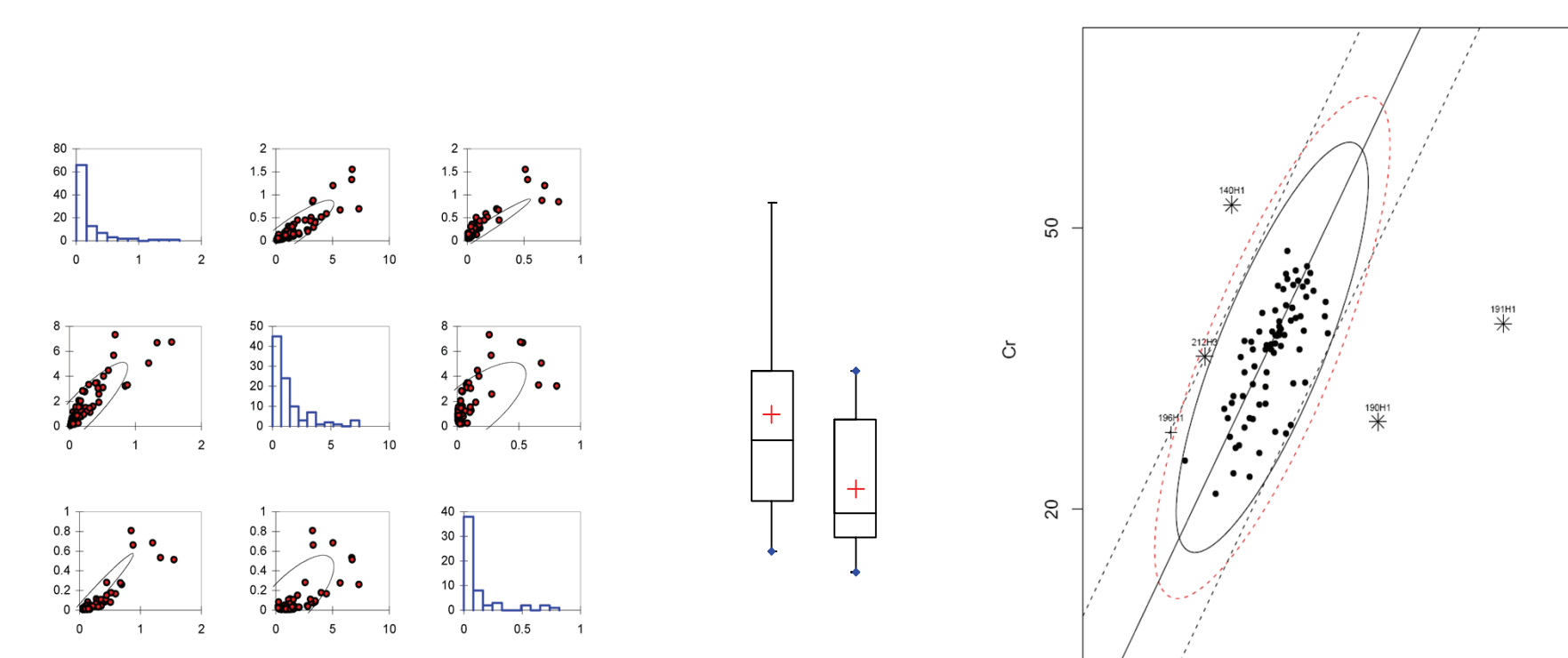
INDUSTRIAL ATMOSPHERIC DEPOSITION FACTORS

Industrial context

Modelisation of deposition from industrial activities (i. e. non-ferrous metallurgy) based on current and historical data



Classification of soils by using statistical and graphical tools



Development of a predictive model for mapping pollutant concentration in urban and peri-industrial area

