World Forum on Urban Forests
Mantova 2018

The Past - Changing Environment
PS 1.4 Cocozza

Dendrochemistry to reconstruct environmental pollution in urban forestry context

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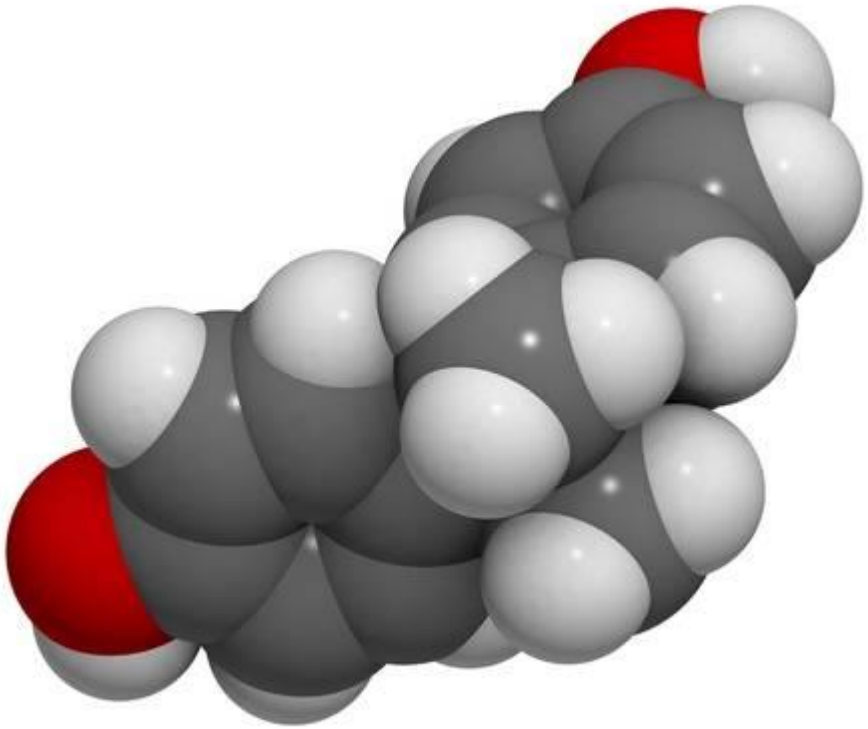
Changing Environment

Trees are affected by urban and industrial pollution
in relation to the degree and time of the pollution, tree species, habitat conditions,
orography of the area and the location of trees in relation to emitters.

The Past

Tree rings have been recognized for a long time as a source of many information, a useful tool for analysing environmental changes with a detailed reconstructions of tree growth, wood density (e.g. Conkey 1988), anatomical features of the wood (e.g. Fritts et al. 1991), the elemental composition (dendrochemistry) (e.g., Lepp 1975) and stable isotopes.

Dendrochemistry

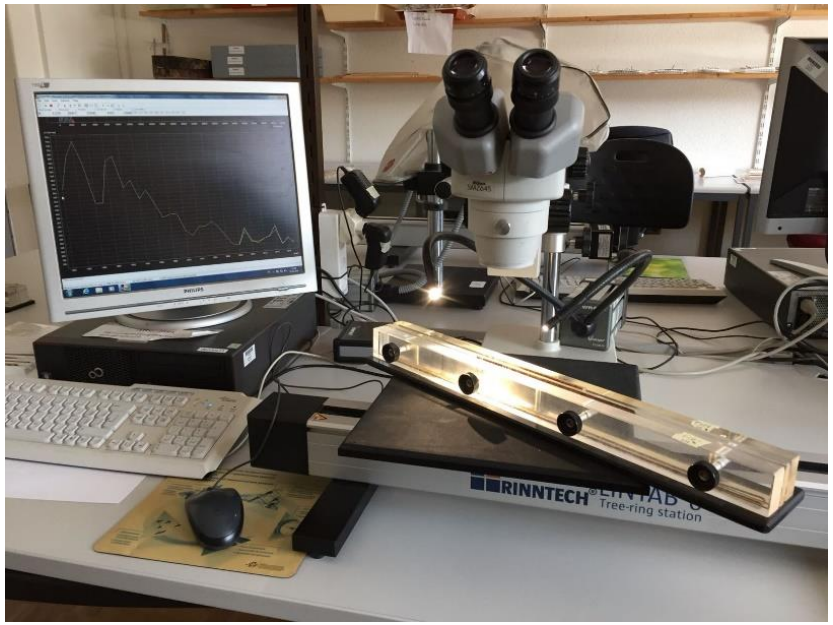


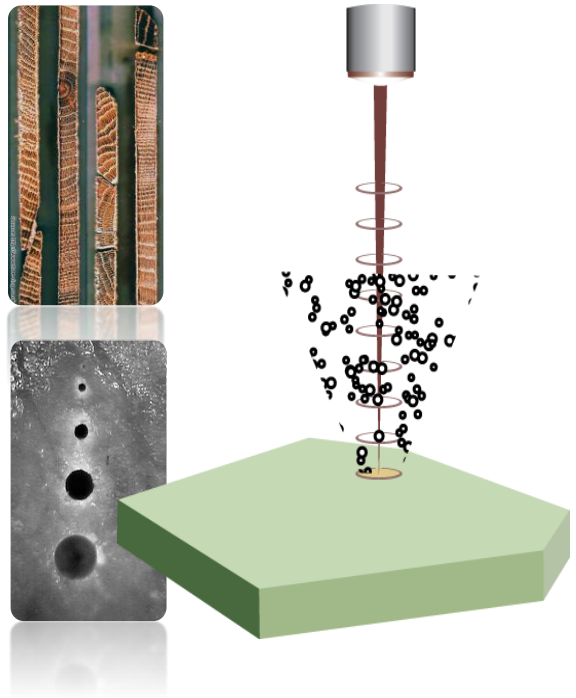
Dendroecology
is the tree-ring analysis
to answer ecological questions

Chemistry
is the analysis of compounds, composed of atoms, i.e. elements, and molecules, i.e. combinations of atoms

Methodology

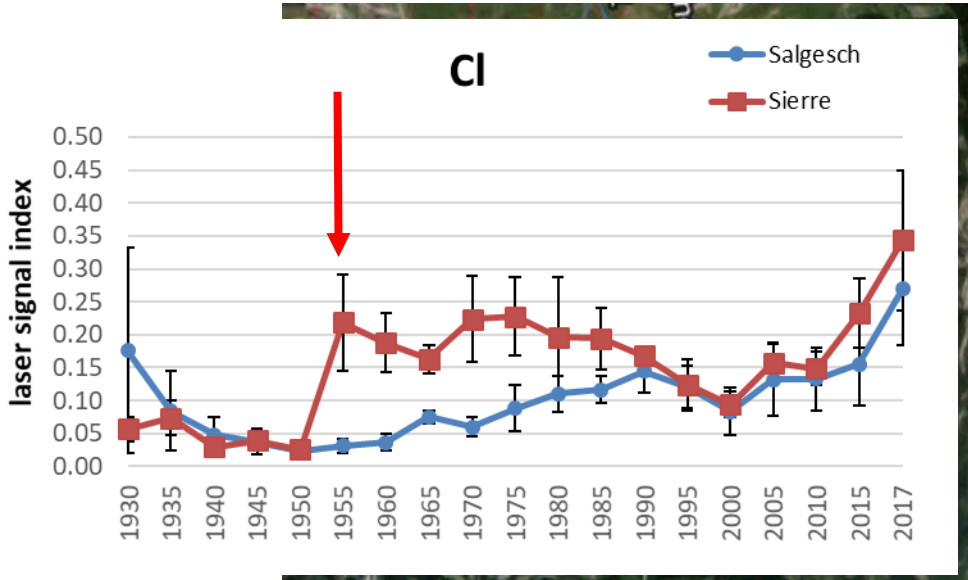
Laser ablation-inductively coupled plasma-mass spectrometry (LA ICP-MS)
for the detection of trace elements





Laser index in tree-ring

$$I_x = (Level_x - Level_{lowest}) / (Level_{highest} - Level_{lowest})$$


Cl
Salgesch
Sierre
laser signal index
0.50
0.45
0.40
0.35
0.30
0.25
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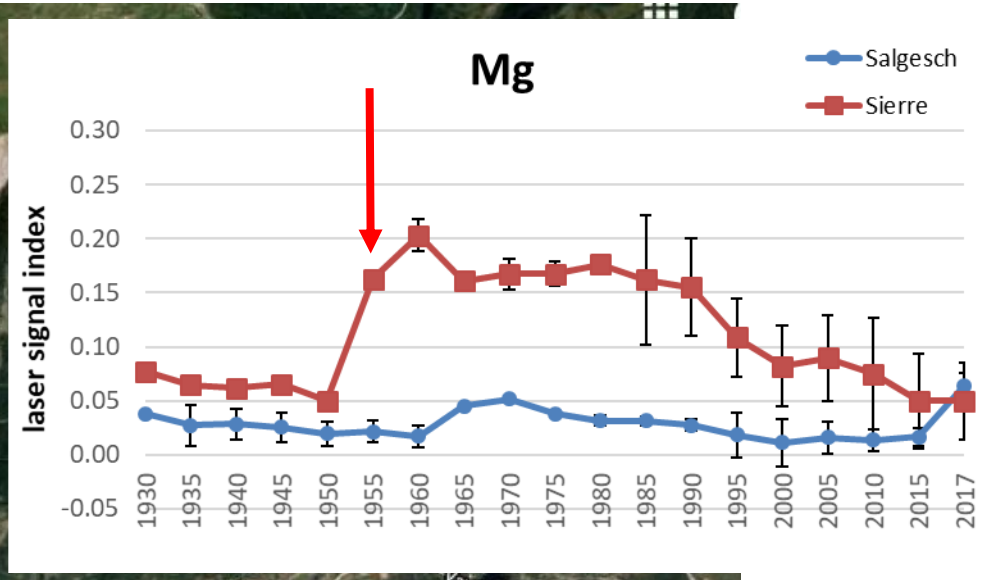
1930 1935 1940 1945 1950 1955 1960 1965 1970 1975 1980 1985 1990 1995 2000 2005 2010 2015 2017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Sierre
laser signal index
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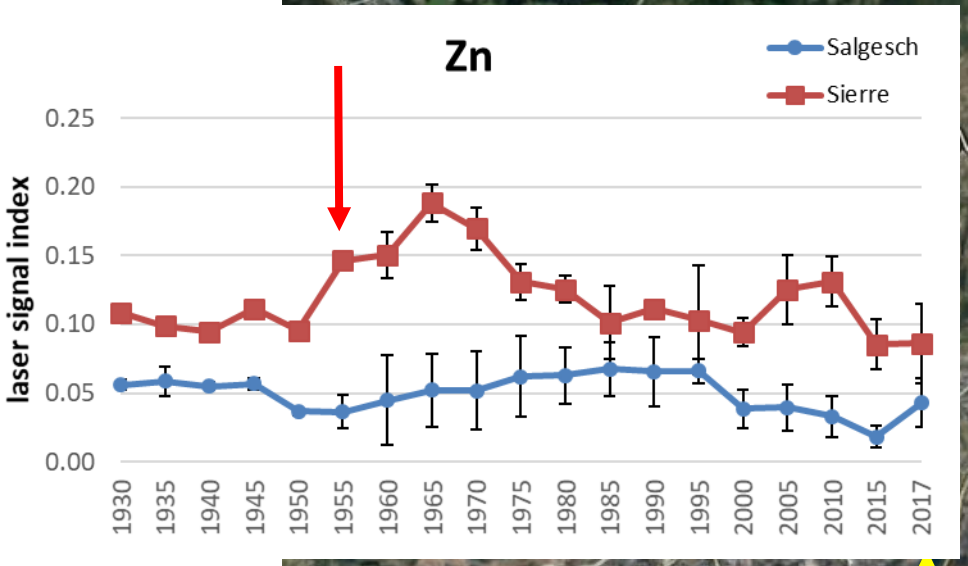
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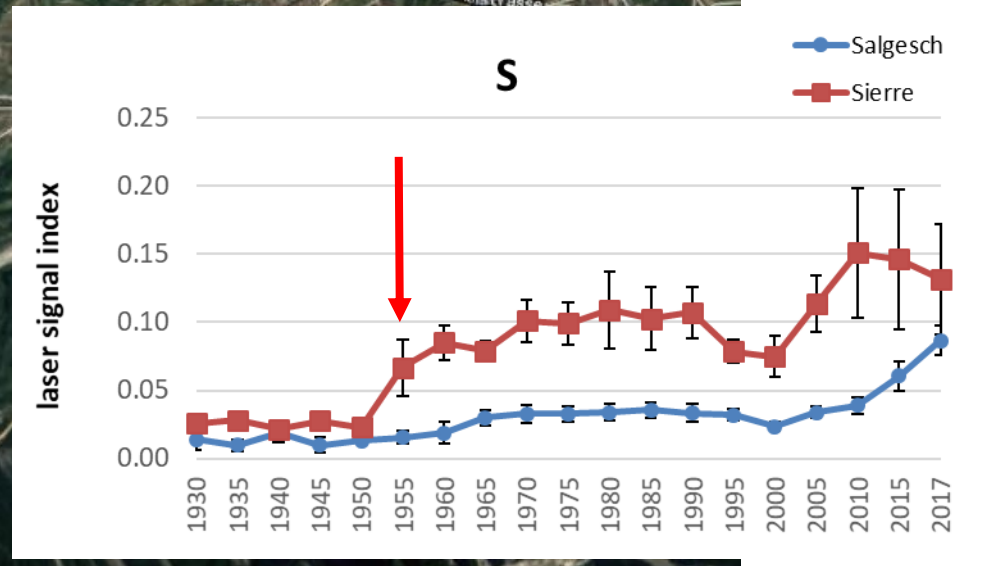
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Salgesch
Sierre
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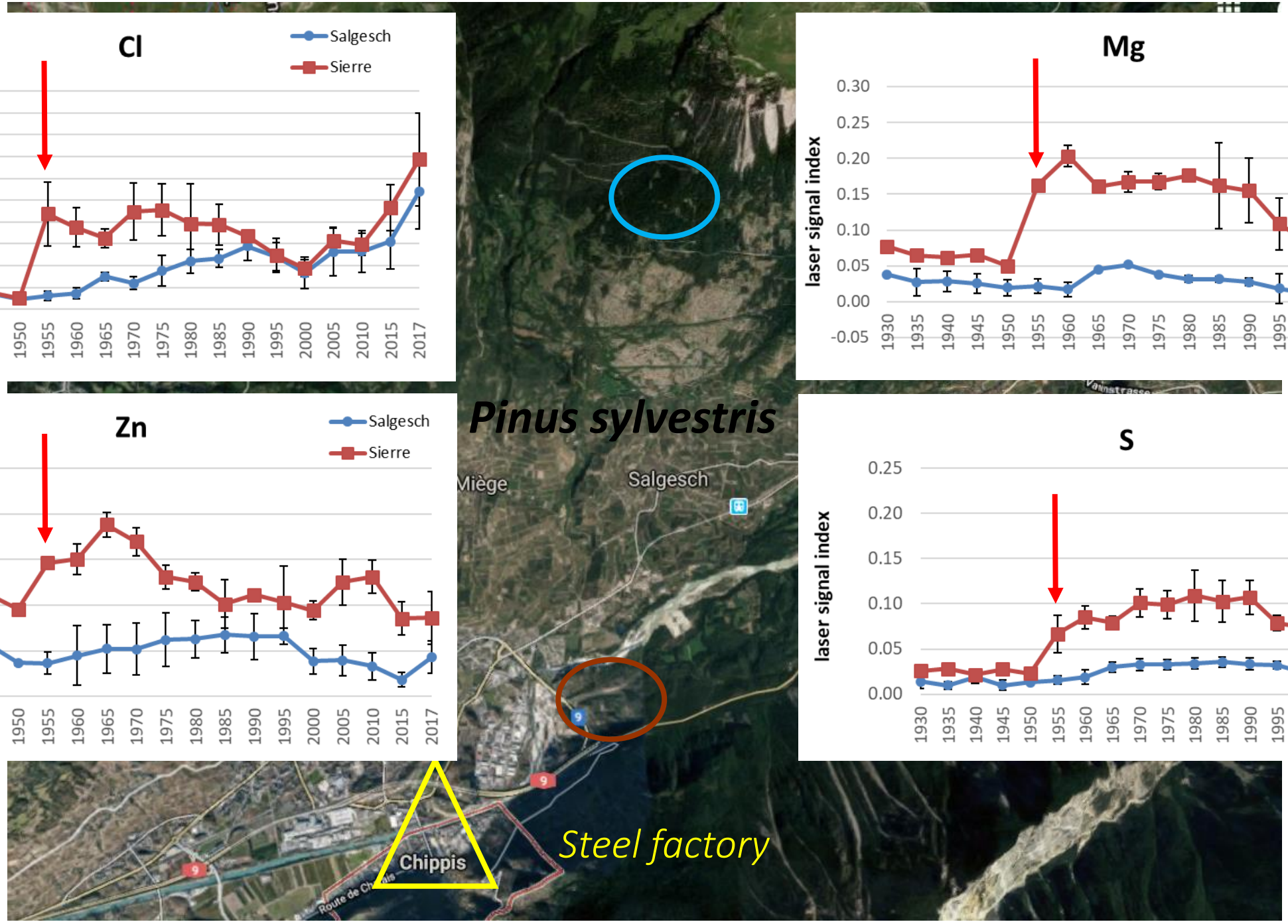
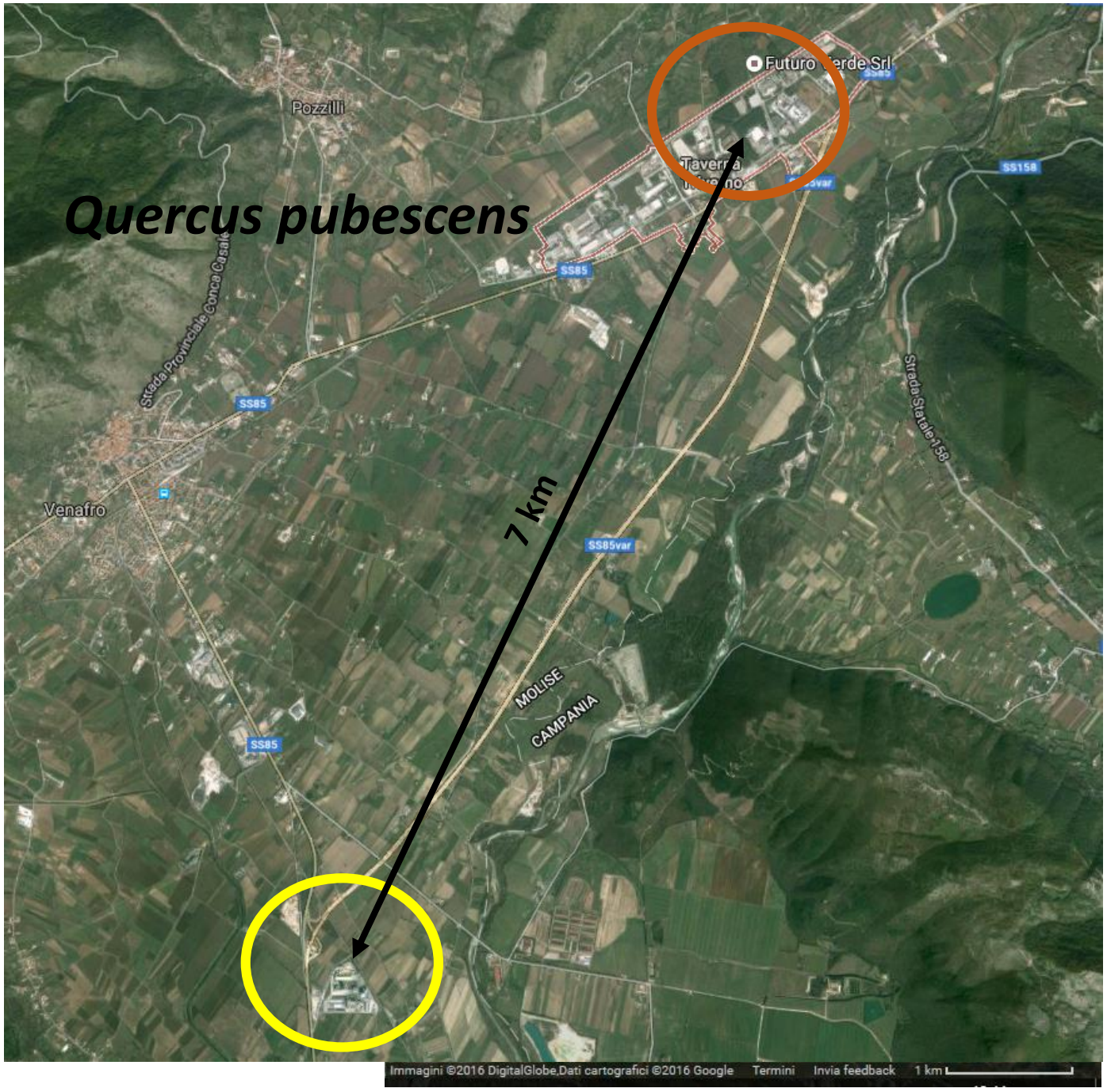
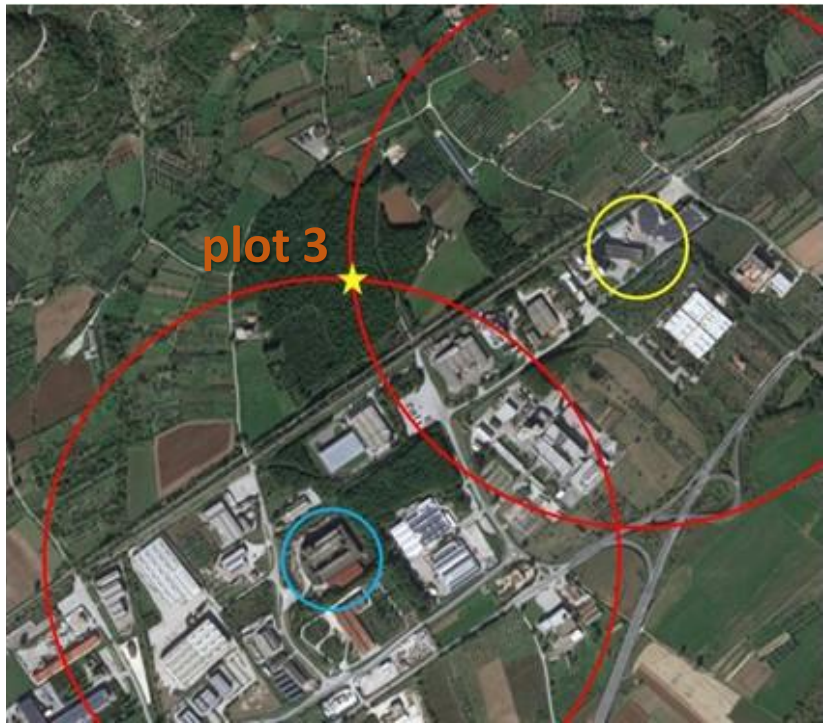
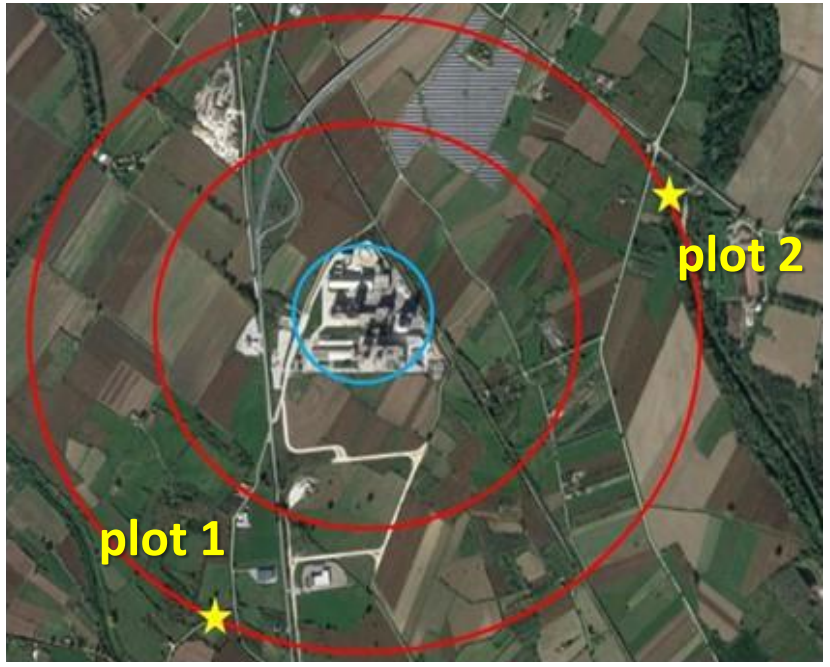

Pinus sylvestris
Miège
Salgesch
Chippis
Steel factory


Quercus pubescens
Futuro Verde Srl
Pozzilli
Taverna
SS158
SS85
Strada Provinciale Conca Casale
Venafro
7 km
SS85var
Strada Statale 158
MOLISE
CAMPANIA
SS85
Immagini ©2016 DigitalGlobe,Dati cartografici ©2016 Google
Termini
Invia feedback
1 km


plot 3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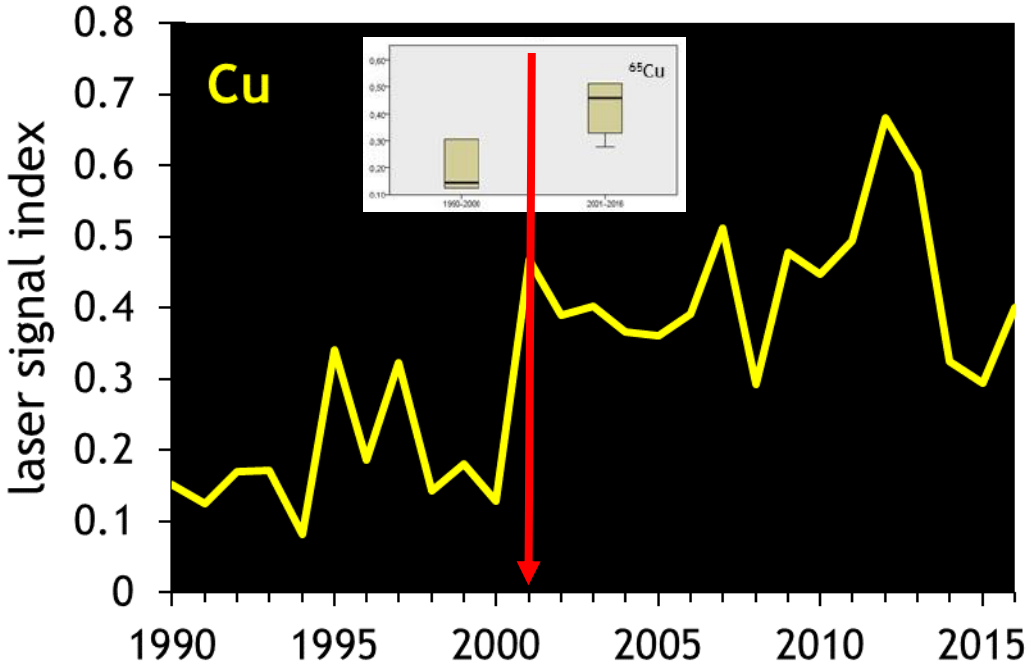
plot 1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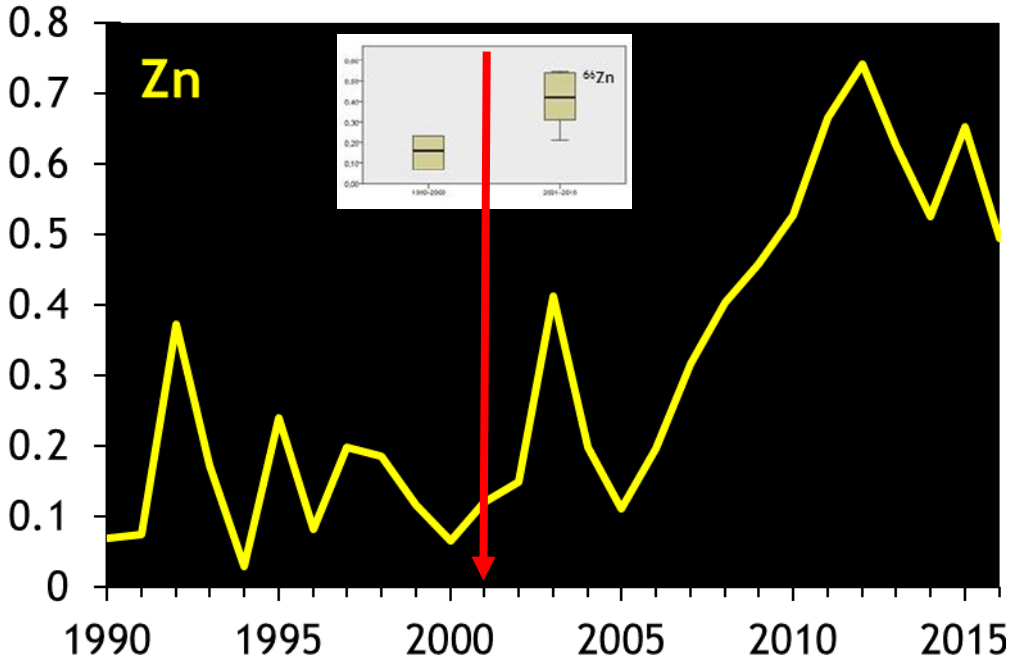
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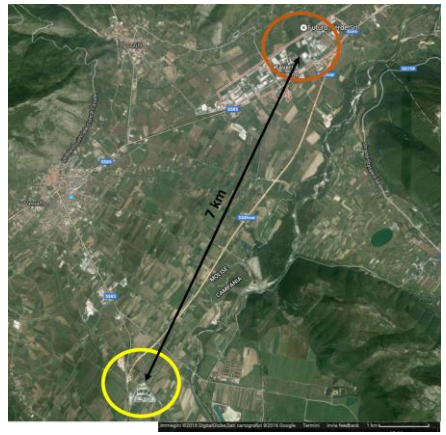
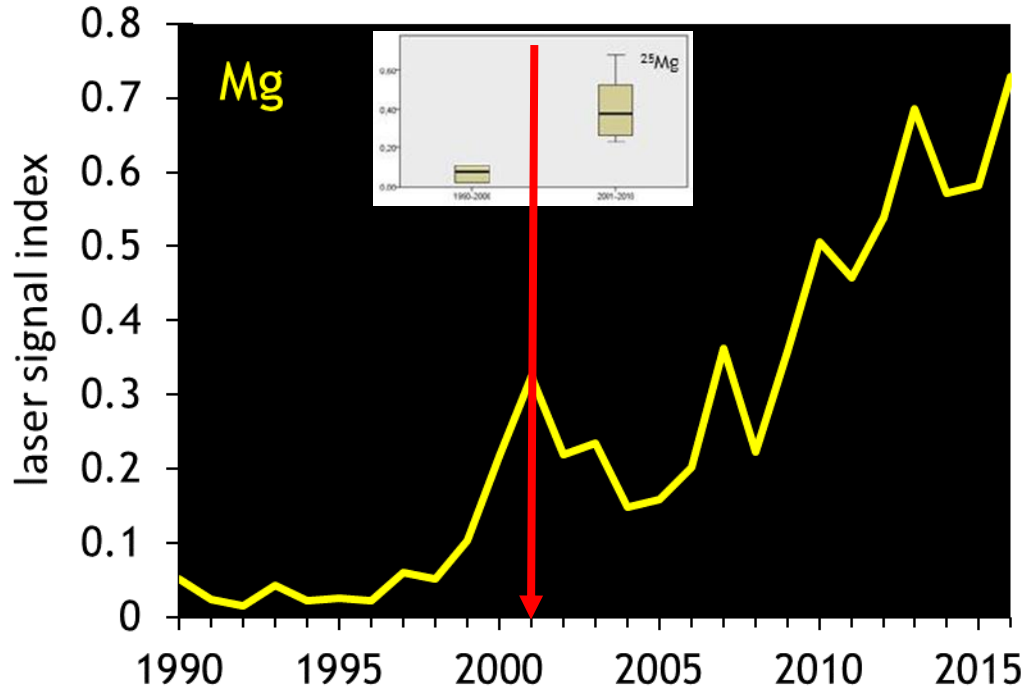

7 km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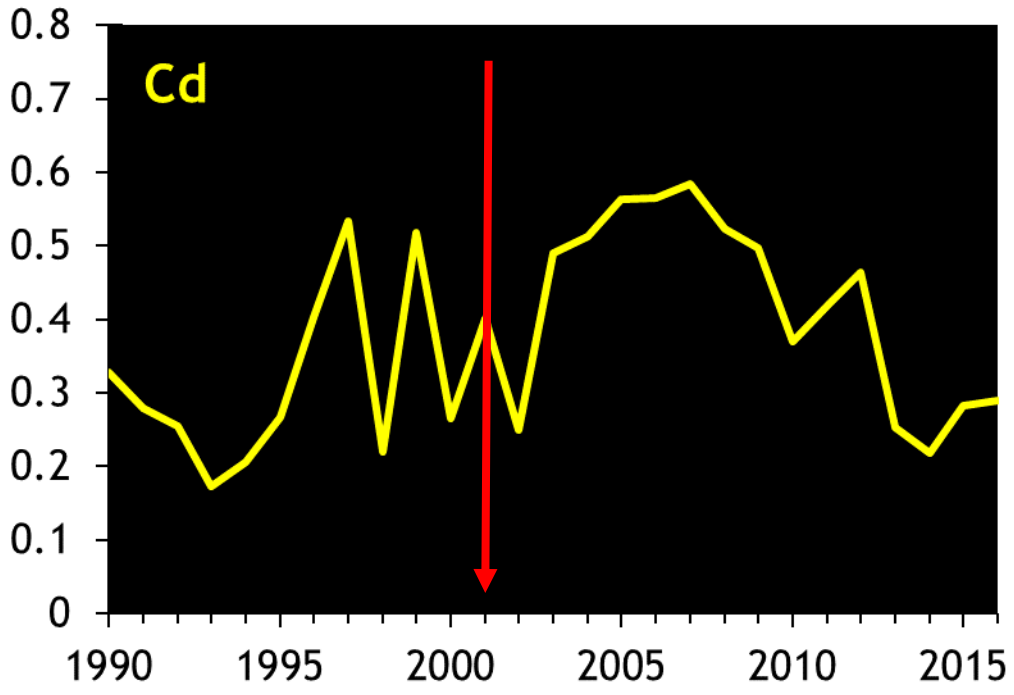
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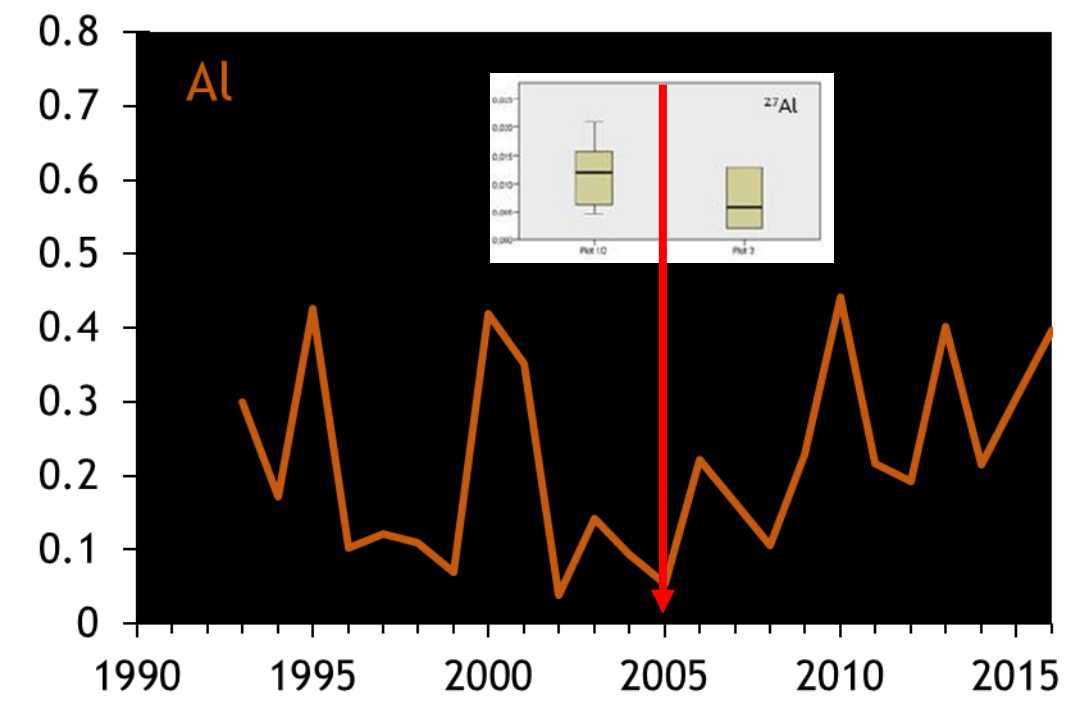
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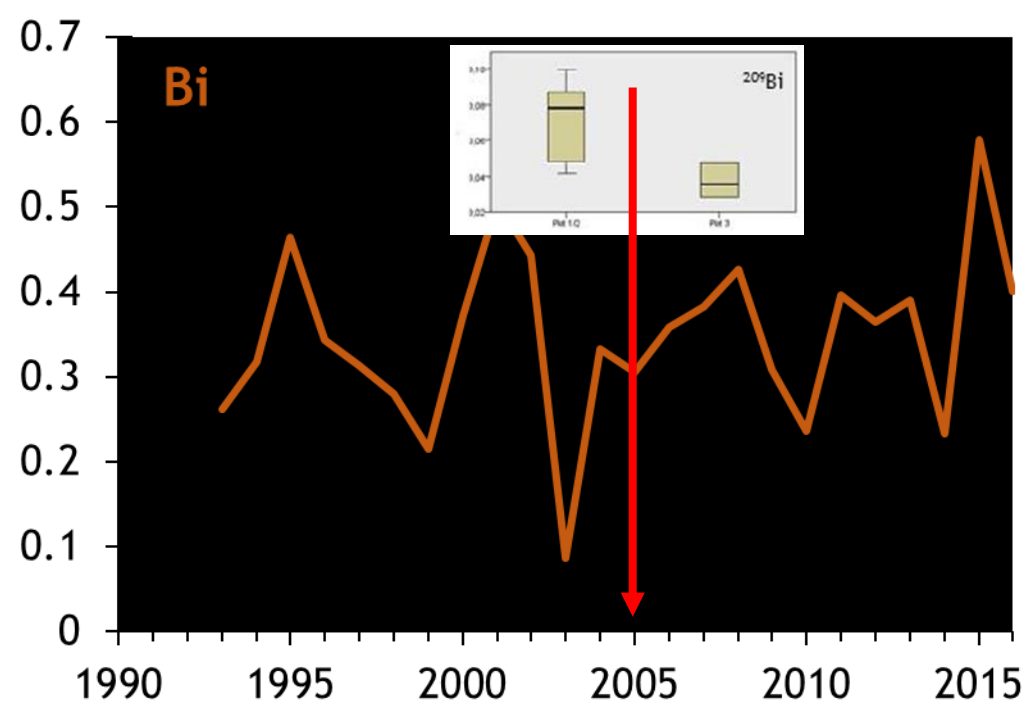
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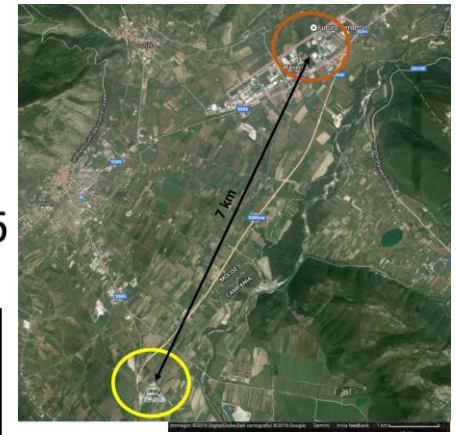
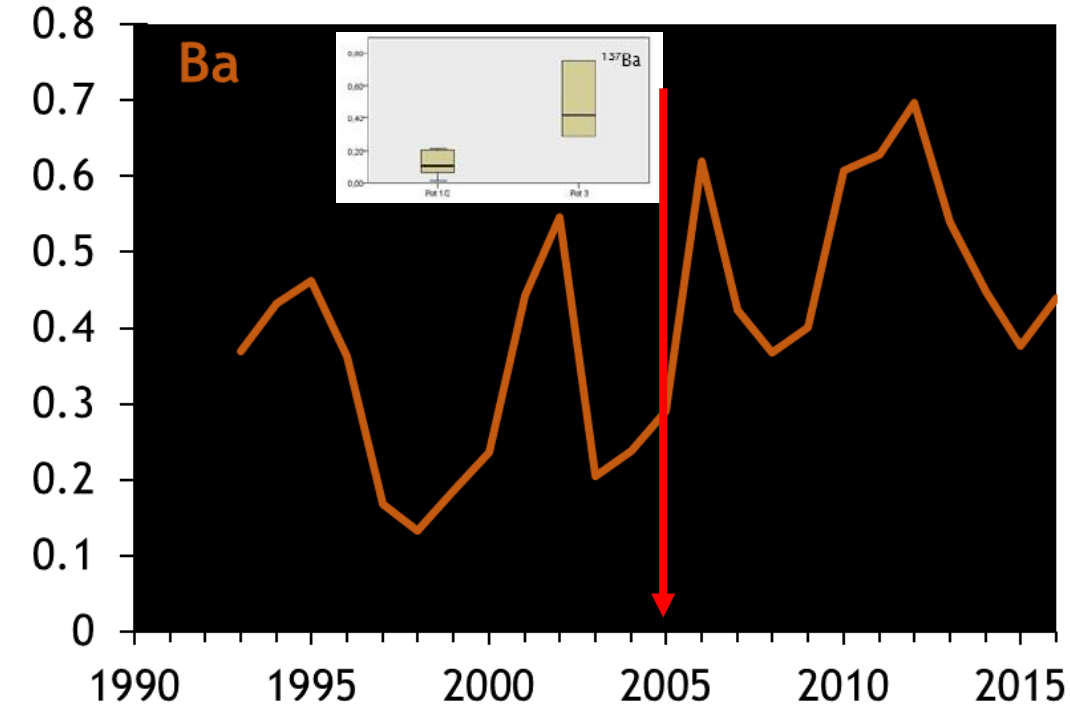

7 km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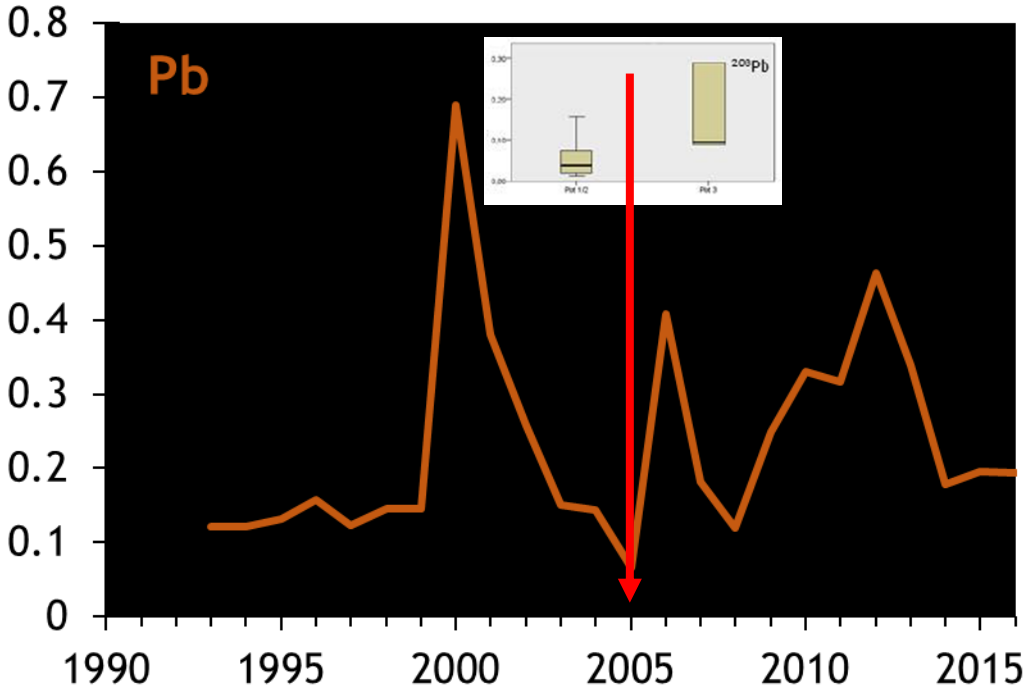
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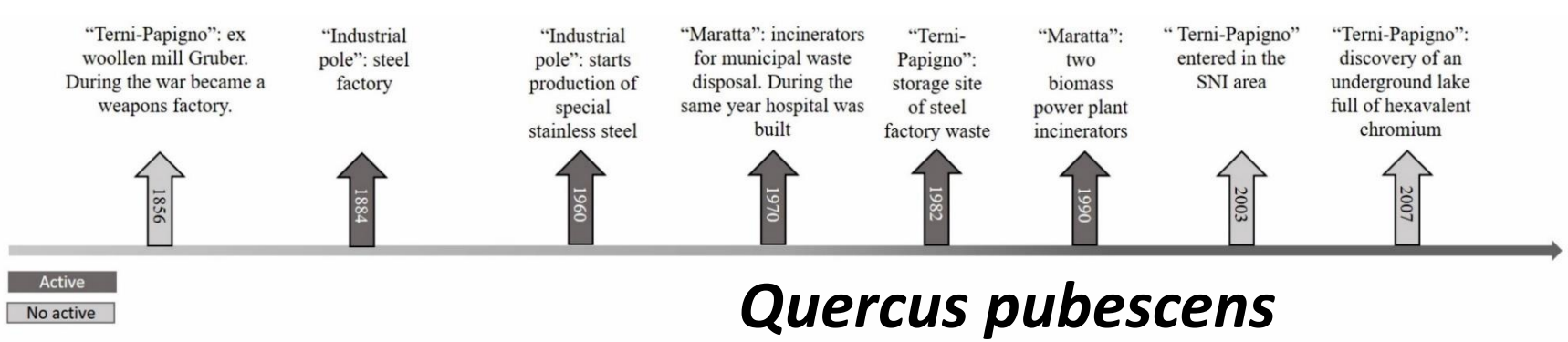
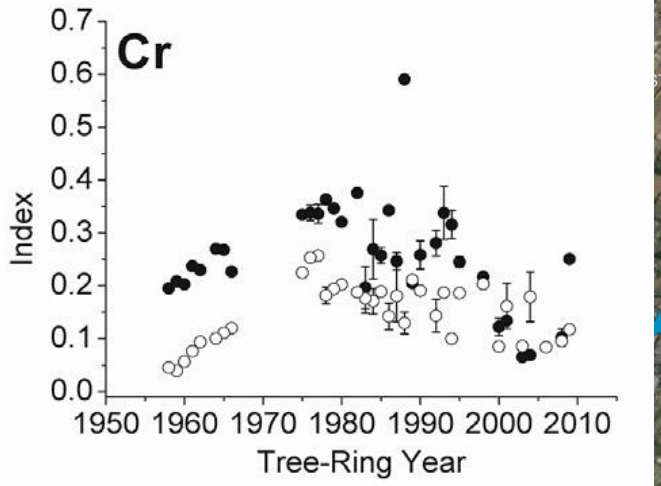
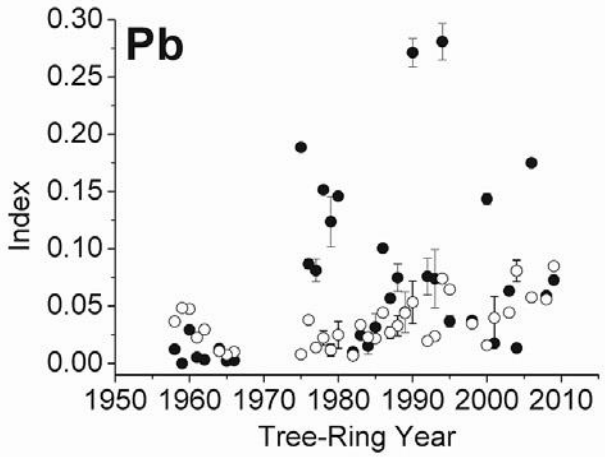
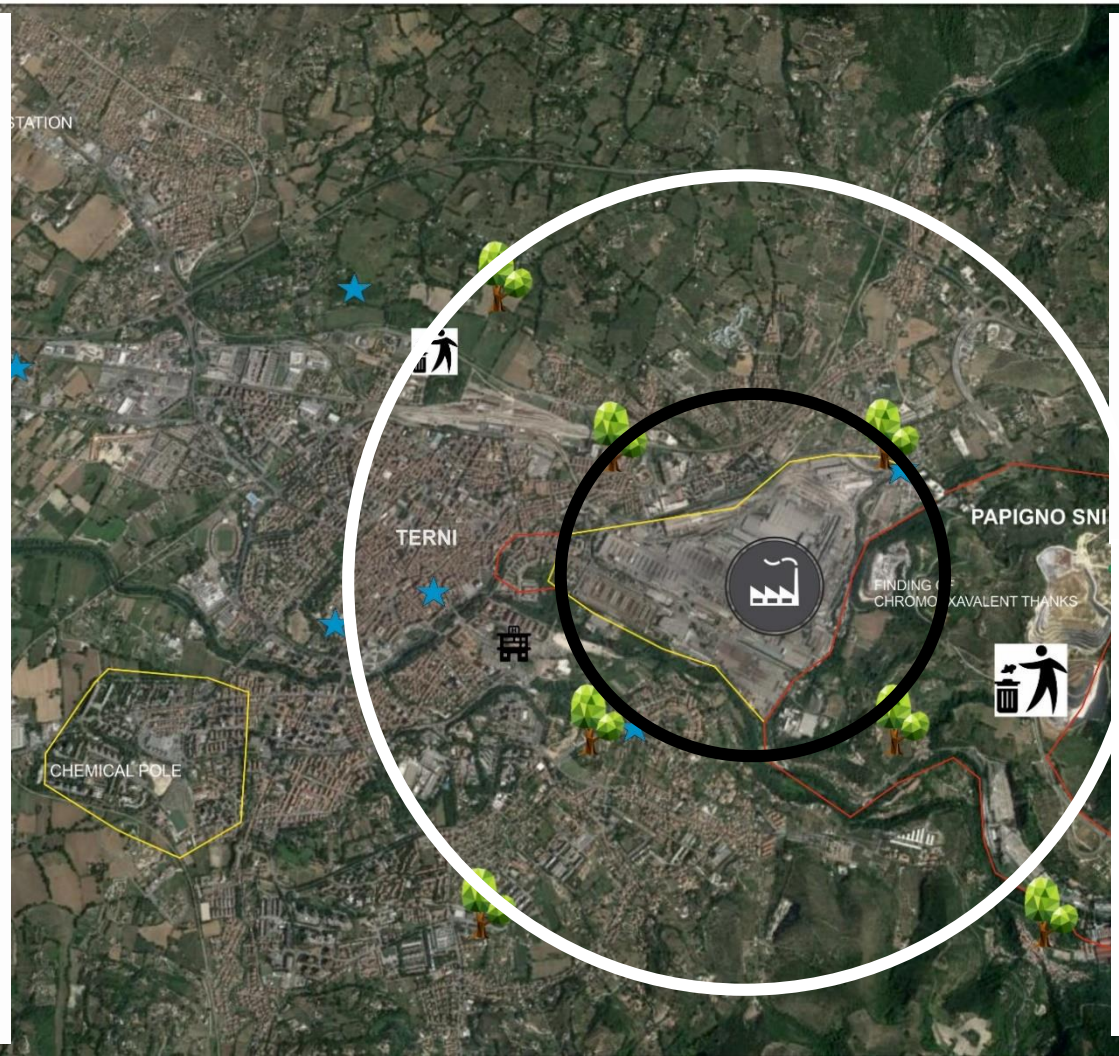
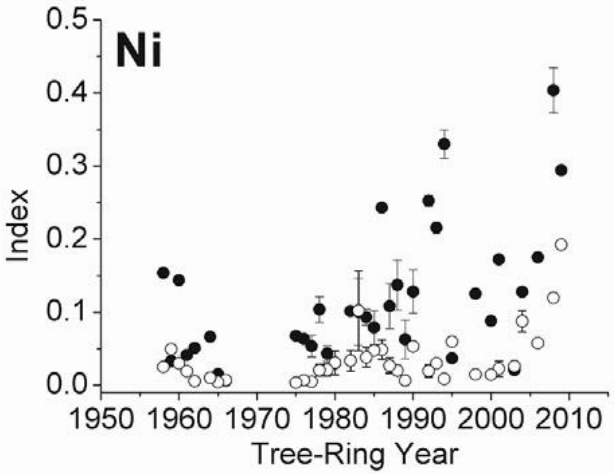


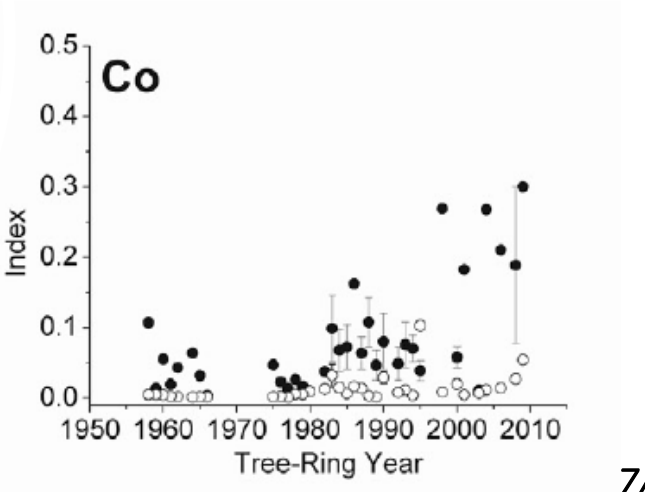
Quercus pubescens



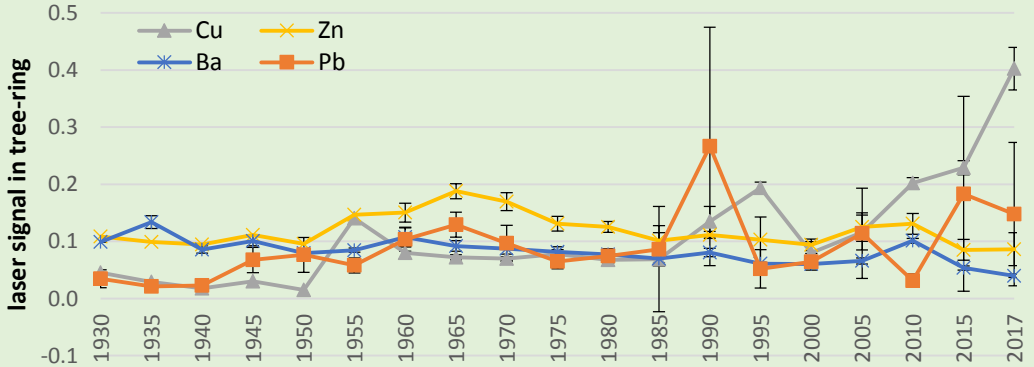








… What is the research impact of dendrochemistry?

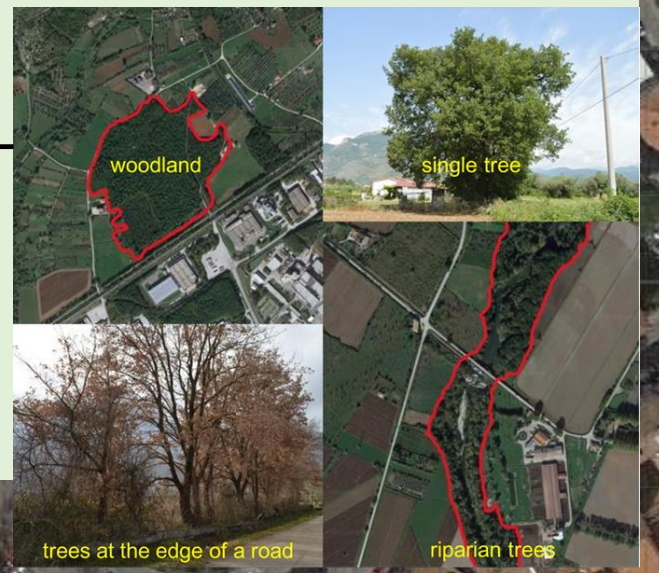


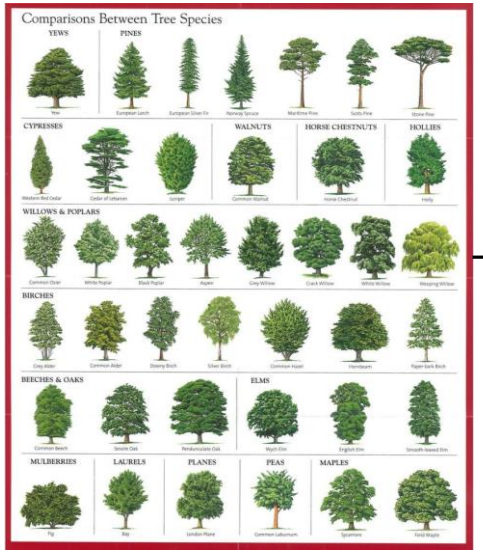
Tree-rings represent a widely available source of **long-term data.**

Availability of **historical pollutant loading**
(not available from monitoring station data)!

High value of trees outside forest and greenspaces
in urban contest to provide several ecosystem services!

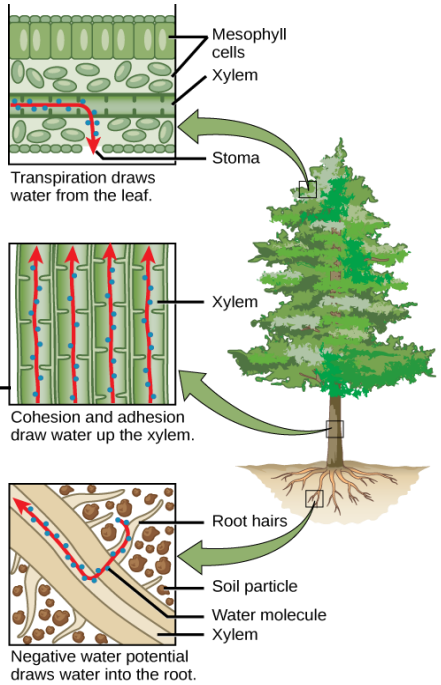
The data are useful in determining the policies needed
to control airborne pollution as input information for future
air quality modelling.



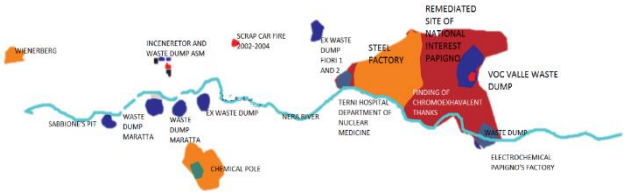


… must be taken into account

the accumulation of heavy metal depends
by trees (**which species?**) and pollutant (**chemical specificity?**)



accumulation processes are described by
plant-pollutant relationship
(e.g., radial translocation, root, leaf or bark absorption)



appropriate sampling are necessary
to improve the **definition of spatial and temporal pollutant trends**

Thank you for the attention!

Claudia Cocozza