ATMOSPHERIC DISPERSAL OF HEAVY METALS AROUND AN URBAN AREA

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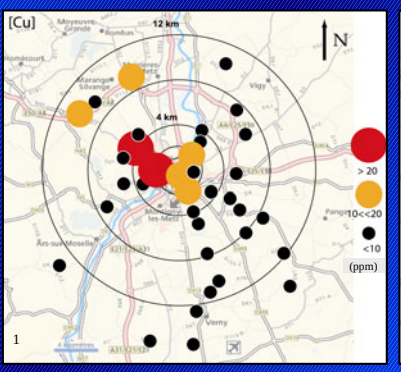
Problematic

Anthropogenic input of heavy metals (HM) such as Cd, Pb, Zn and Cu to the atmosphere may be responsible of hazardous pollution and their survey is then of key importance for all the living environments. A study of dispersal and fallout of anthropogenic HM in an urban area of 300,000 inhabitants (Metz, north-eastern France) is presented here. Measured concentrations and calculated Enrichment Factors (EF) in lichens indicate the anthropogenic impacts. The lead isotopic composition allows to distinguish between sources of lead emitted to the atmosphere.

ELEMENTAL



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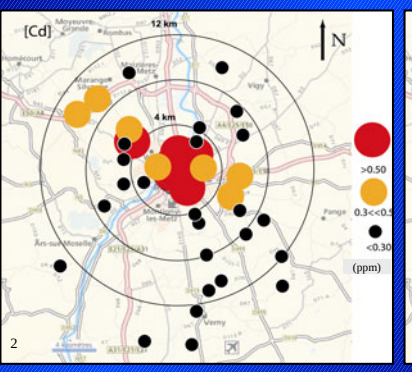

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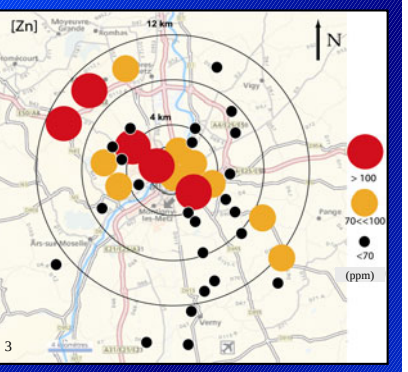

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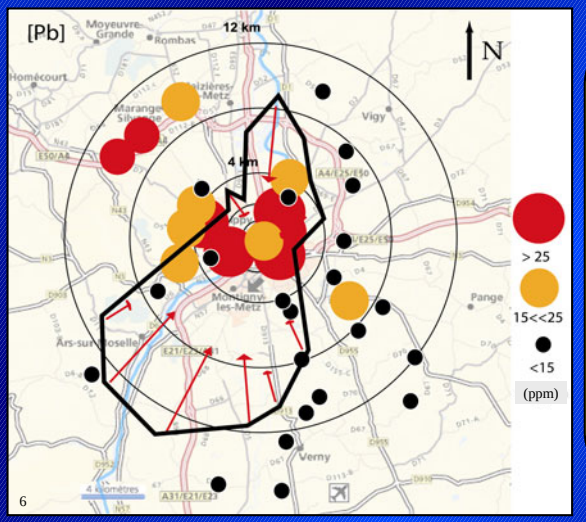
Heavy metal concentrations in lichens sampled around an urban area



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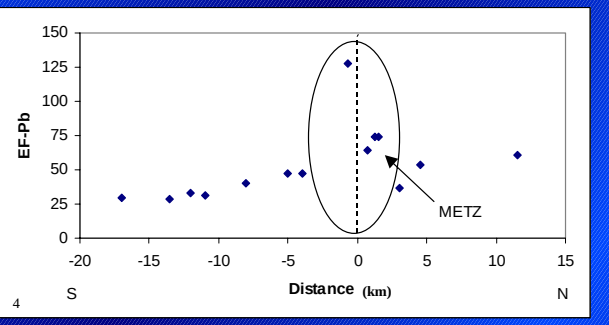
Atmospheric Dispersal

Along a N-S cross section (Fig.4), a systematic increase of Pb EF from the south toward the city centre is observed. The same pattern is found for other HM, as shown in figure 5 for Cd. This dispersion can be interpreted in the light of the major wind directions (Fig. 6). Winds from south to north are stronger and more frequent than the winds blowing from north to south. The smooth tailing of metals EF may be related to lighter winds, whereas stronger S-N winds may result in more erratic dispersion of atmospheric matter emitted from the urban area.



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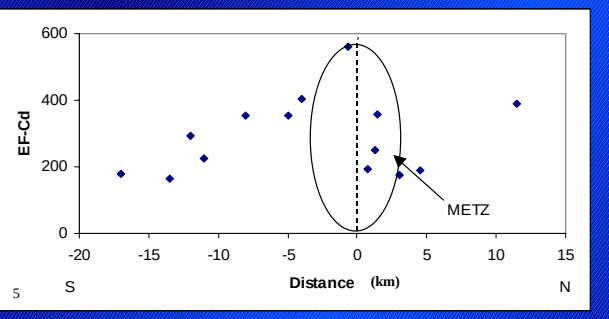

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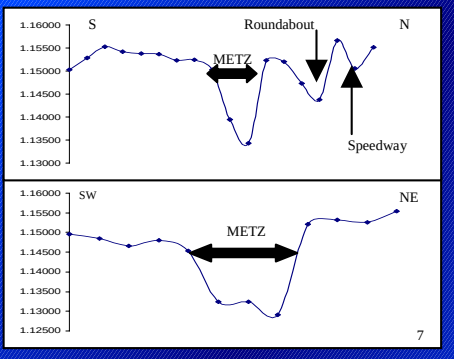
ISOTOPIC

Lead isotopes

Figure 7 represents cross sections, showing sharp isotopic gradients around the urban area and close to high circulation localities. Figure 8 indicates that lichens having low lead contents are characterise by high 206/207 Pb typical of industrial lead in France. Lichens having higher lead concentrations display a lower 206/207 Pb towards those typical of either unleaded gasoline and diesel or leaded gasoline (Figs 9, 10). The most radiogenic compositions might be explained by local industrial inputs such as metallurgical plants and coal power plants.



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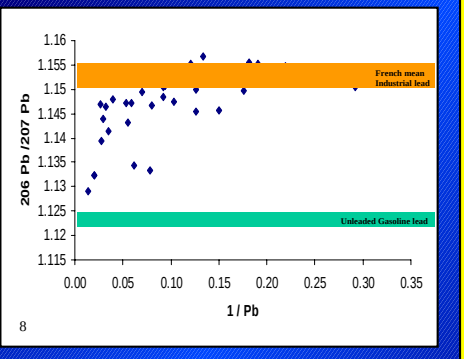

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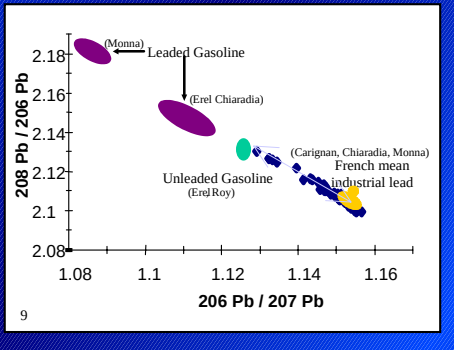

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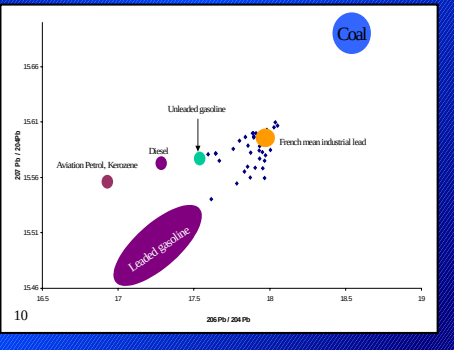

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Conclusions

-Concentration and EF increase from the south toward the city centre reflecting the relative inputs of anthropogenic activities (Figs. 1, 2, 3, 4, 5).

-The HM dispersion can be explain by the major wind directions (Fig. 6).

-A large variation of Pb isotopic composition is found within only a few km (1.13-1.155 for 206/207 Pb) (Fig. 7).

-Pb contents and isotopic compositions show a coherent relationship (Fig. 8).

-Many atmospheric lead sources around an urban area may be identified using the isotopic composition of lead in lichens (Figs. 9, 10).