

## **Environmental magnetism and magnetic mapping of urban metallic pollution (Paris, France)**

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Airborne pollution in dense urban areas is nowadays a subject of major concern. Fine particulate pollution events are ever more frequent and represent not only an environmental and health but also a real economic issue. In urban atmosphere, the so-called PM<sub>2.5</sub> (particulate matter < 2.5  $\mu\text{m}$  in diameter) and ultrafine fractions (< 100 nm) due to combustion, causes many adverse health effects. Environmental magnetic studies of airborne PM collected on air filters or plants have demonstrated their potential to follow the metallic pollution and determine their sources (Sagnotti et al., 2012). In this study, we report on magnetic measurements of traffic-related airborne PM in the city of Paris, France. Two distinct environments were sampled and analyzed along the Seine River: the aquatic environment in studying fluvial bank and river bed sediments and the atmospheric environment by regarding magnetic particles trapped in adjacent tree barks (*Platanus hispanica*). About 50 sediment samples and 350 bark samples have been collected and analysed to determine their magnetic properties (susceptibility, hysteresis parameters, IRM, frequency-dependent susceptibility) and to estimate the presence and spatial concentration of superparamagnetic or multi-domain particles for each sample type.

The bark results allow proposing a high spatial resolution mapping (< 50 m) of magnetic susceptibility and frequency dependent susceptibility on a 30 km long profile along the river. Variations in that profile may be linked to the atmospheric metallic pollution. In addition to that, the sampling of banks and riverbed sediments of the Seine allow a global estimation on the anthropogenic versus detrital and biologic input in the city of Paris. The first results presented here show a general increase of the concentration in magnetic particles from upstream to downstream Paris probably linked to urban pollutions as previously observed for suspended particulate matter (Franke et al. 2009; Kayvantash, 2016).

Sagnotti, L., & Winkler, A. (2012). On the magnetic characterization and quantification of the superparamagnetic fraction of traffic-related urban airborne PM in Rome, Italy. *Atmospheric environment*, 59, 131-140.

Franke, C., Kissel, C., Robin, E., Bonté, P., & Lagroix, F. (2009). Magnetic particle characterization in the Seine river system: Implications for the determination of natural versus anthropogenic input. *Geochemistry, Geophysics, Geosystems*, 10(8).

Kayvantash, D., 2016. Characterization of ferruginous particles in the Seine River using environmental magnetism, Ph.D. thesis, MINES ParisTech/LSCE, France.