BIOMAGNETIC MONITORING AS AN URBAN AIR QUALITY ASSESSMENT

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Background: High-levels of urban particulate pollution are known to affect human health. European legislature states that the levels of particulate matter, so called PM_{10} (particles < 10 μm in size), should not exceed 50 $\mu g/m^3$ on more than 35 days per year in a given city – unless their origin can be shown to be natural, e.g., volcanic ash. To try to meet these European requirements and to minimize high-levels of PM_{10}, it is important to understand the origin of PM_{10}, its spatial distribution and transport mechanisms.

However, current air quality networks obtain poor spatial monitoring resolution due to high investment and maintenance costs. Especially in heterogeneous urban environments, spatial monitoring resolution is generally too limited.

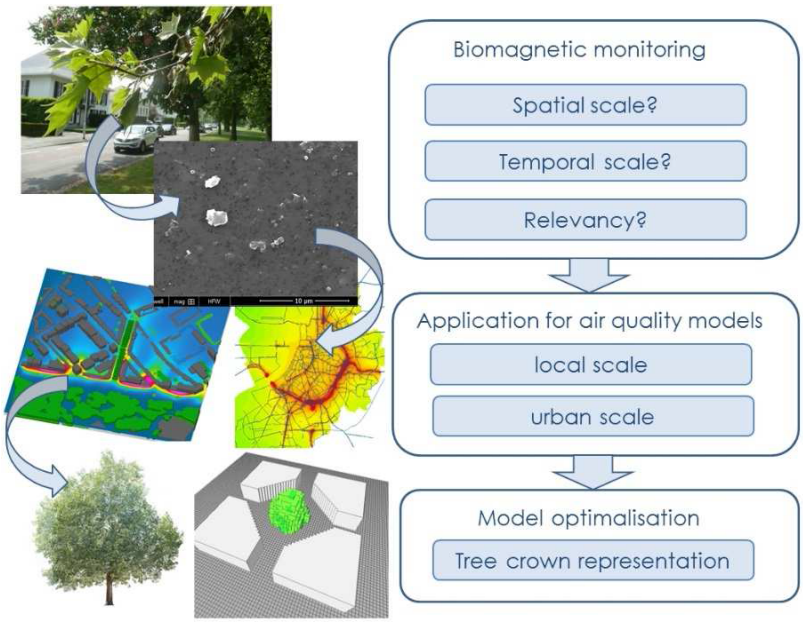

Figure 1. Schematic of planned PhD.

Biomagnetic monitoring of roadside plant leaves presents a promising monitoring approach to capture spatio-temporal variation of air pollution. Hofman and colleagues (Hofman and Samson, 2014; Hofman et al., 2017) evaluated biomagnetic monitoring of leaf-deposited particles for both air quality monitoring and modelling purposes, on both spatial and temporal resolutions. Nevertheless, lack of information on magnetisable composition and health-relevancy of magnetic minerals in atmospheric particles impedes the general application of biomagnetic monitoring in environmental air quality assessments. This research project aims to address this gap by evaluating the magnetisable composition of urban atmospheric particles in more detail, its potential for source attribution in urban areas, and the health-relevancy of biomagnetic properties. While the magnetic mineralogy, grain size and concentration will reflect PM source-contributions, associations with heavy metals and/or elemental carbon might emphasize biomagnetic monitoring as a novel health-related PM proxy.

Project: This PhD project aims to implement a large scale biomagnetic monitoring campaign in London (UK).

Student Profile: This project is a combined (urban) field and laboratory project and would suit a candidate with an interest environmental science. Candidates should have a good degree in any area of science. Good laboratory skills also desirable, as are the ability to communicate.

Hofman, J. & Samson, R., 2014. Biomagnetic monitoring as a validation tool for local air quality models: A case study for an urban street canyon, Environment International, 70, 50-61, doi: 10.1016/j.envint.2014.05.007.

Hofman, J., Maher, B. A., Muxworthy, A. R., Wuyts, K., Castanheiro, A., and Samson, R., 2017, Biomagnetic Monitoring of Atmospheric Pollution: A Review of Magnetic Signatures from Biological Sensors: Environmental Science & Technology, v. 51, no. 12, p. 6648-6664.

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