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A community-based research on air quality using the magnetic bio-monitoring technique.

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This study is part of a broader project focusing on the role of tree hedgerows on air quality around an experimental site located along the A9 motorway east to Montpellier in France. Three vegetated mounds were built for this purpose by the motorway company and the city of Saint-Aunès, a riparian city of 3500 inhabitants in the peri-urban area of Montpellier. A regulatory metrology on air quality is performed by the regional air agency, Atmo-Occitanie by means of a network of 14 dust sensors. Our challenge is the calibration and the implementation of the magnetic bio-monitoring technique on and around the vegetated mounds by means of a model of Participatory Action Research. The first objective is to produce high-resolution maps of the deposits of anthropogenic toxic metals on tree-leaves and passive filters collected thanks to a citizen network. To help in the interpretation of the maps of environmental magnetism parameters, such as Isothermal Remanent Magnetization and low-field magnetic susceptibility, we designed and built an experimental wind tunnel in which analog modelling of metal deposition of known concentrations, at different wind speeds, and on different local plant species are carried out. The unit is 6-meters long with a 0.86 square meter of inner section. The air flow is generated and controlled by an axial fan having a maximum delivery rate of 28300 cubic meters a day. The tunnel is fully equipped with aerosols counters (1 LOAC and 5 low cost SDS011) and with 2 hot wire and thermistor anemometers plus a network of 6 rotating vane anemometers.
To date, more than 50 households collaborate on the project, the citizen mobilization being still in progress. The first maps of dust deposits on plant leaves and passive filters as seen by environmental magnetism measurements corroborate the scenario inferred by the regulatory metrology : the vegetated mounds do not mitigate the concentration of the particulate matter emitted by the motorway traffic. More citizen mapping are in progress to validate this first conclusion. Results of the first experiments carry out in the wind tunnel will be available very soon and will be presented during the EGU meeting.