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WIBS-4+ bioaerosol sensor: an assessment of its intended-use, and an evaluation of alternative aerosol applications

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Background
This intensive real-time monitoring campaign was carried out over a two-month period in Saclay, a semi-urban centre, southwest of the city of Paris, France, and is an outer suburb/exurb of the city proper.

Methods
The Wideband Integrated Bioaerosol Sensor (WIBS) 4+ model was first compared to the traditional Hirst volumetric sampling method. It was evaluated for its ability to sample and detect ambient bioaerosol concentrations, namely fungal spores and pollen grains. Along with the WIBS device and the Hirst device, meteorological and pollution parameters were obtained from co-located monitoring devices at the research centre. This allowed the construction of several Multiple Linear Regression (MLR) algorithms.

Results
For fungal spores, significant predictors of concentration were the A WIBS channel, wind from the south and south-westerly directions, and NOx emissions. For pollen grains, the WIBS 4+ additional Xenon flashlamp (distinguishing the WIBS 4 from the WIBS 4+), which allowed for the D, DE, and E WIBS channel categories, was a strong predictor of concentrations, when combined with northerly and easterly winds, and atmospheric ammonia concentrations.

Additionally, the possibility of using WIBS 4+ technology to monitor aerosols that are non-biological was evaluated. Black carbon, which does fluoresce but does not need to be of biological origin, was found to strongly correlate with BC WIBS channel particles, along with various windspeed and wind direction parameters.

Conclusions
The work from this campaign shows the strong bioaerosol monitoring capabilities of the WIBS technology, the benefits of the additional Xenon flashlamp, and the potential alternative and novel uses for which the device can be deployed.

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