

EGU23-9195

EGU General Assembly 2023

© Author(s) 2023. This work is distributed under the Creative Commons Attribution 4.0 License.



## **A low-cost airbox network to assist air quality policy-making and citizen involvement: Eindhoven city, Southeast Brabant, the Netherlands**

**Jun Zhang**<sup>1</sup>, Ruben Goudriaan<sup>1</sup>, Janot Tokaya<sup>2</sup>, Arjan Hensen<sup>1</sup>, Daniëlle van Dinther<sup>1</sup>, Sjaak Kaandorp<sup>1</sup>, Marcus Blom<sup>1</sup>, and Arjan Plomp<sup>1,3</sup>

<sup>1</sup>TNO, Environmental Modelling, Sensing and Analysis Group, Petten, Netherlands (jun.zhang@tno.nl)

<sup>2</sup>TNO, Climate, Air and Sustainability Group, Utrecht, the Netherlands

<sup>3</sup>PBL Netherlands Environmental Assessment Agency, Den Haag, the Netherlands

Air pollution may threaten both human health and ecosystem vitality in Eindhoven city, the Netherlands. Although air quality changes are monitored hourly with high-end equipment at multiple national stations, it remains difficult for individual cities or citizens to trace local air quality based on national-scale information. A monitoring network of 44 low-cost airbox sensors was established around Eindhoven city to measure atmospheric concentrations of particulate matter (PM<sub>10</sub>, PM<sub>2.5</sub>, PM<sub>1</sub>) and nitrogen dioxide (NO<sub>2</sub>) at 10-min intervals from January 2021 onwards, with ultra-fine particle (UFP) sensors added at 3 dedicated sites around the airport. To address local government and citizen's health concerns, the monitoring network was spread among three major areas: urban area (23), Eindhoven airport (3), and rural area outside of the city (18). The urban area was further divided into clean-background area, downtown, industrial zone, traffic intensified ring-roads and highways. Based on a one-year seasonal and diurnal analysis, we concluded that at least 70% of the average PM concentration was determined by the regional background contribution whilst 60% - 72% of total PM<sub>10</sub> was contributed by fine particles with a diameter below 2.5 µm. On average, the PM values of the urban background area were still 10 - 15% higher than those for the rural area despite the assistance of city-greening facilities (such as tree-lined streets and parks). However, higher PM<sub>10</sub> values were also frequently observed downwind of the livestock farms within the rural area across seasons. On the other hand, NO<sub>2</sub> concentrations were mainly driven by local sources' behavior, notably traffic emissions during morning and evening rush-hours. The three UFP sensors located around the airport showed more frequent peaks and higher values related to flight activities and airport traffic, also outside the airport terrain. The combined results underline the importance of taking spatial variability of urban air pollution sources into explicit account. Moreover, a good-quality airbox real-time monitoring network will allow local policy-makers to take proper actions to mitigate air pollution, inform local citizens and reduce health impacts at the appropriate scale.