ESTIMATION OF EXPOSURE TO URBAN AIR POLLUTION IN TWO CITIES USING A GAUSSIAN DISPERSION MODEL: THE EDEN-AIR PROJECT

Julien Galineau, *AIRLOR, France*
Nathalie Marquis, *AIRLOR, France*
Fabrice Caïni, *ATMO Poitou-Charentes, France*
Agnès Hulin, *ATMO Poitou-Charentes, France*
Johanna Lepeule, *Inserm, Team of Environmental Epidemiology applied to Reproduction and Respiratory Health, U823, Grenoble University, France*
Department of Environmental Health, Harvard School of Public Health, Boston, MA, United States, France
Rémy Slama, *Inserm, Team of Environmental Epidemiology applied to Reproduction and Respiratory Health, U823, Grenoble University, France*

Background and Aims: Air pollution exposure models used in epidemiology are often based on the network of air quality monitoring stations (AQMS). The spatial resolution of these models is limited, which is of concern in urban areas, where atmospheric pollutants exhibit strong spatial fluctuations. Dispersion models are expected to increase the spatial resolution. Our aim was to implement such a model in two cities using a harmonized methodology.
Methods: ADMS Urban dispersion model has been implemented in Nancy and Poitiers (France) to estimate the hourly atmospheric concentrations of nitrogen dioxide (NO_2) and particulate matter (PM_{10}). Domain size for each area is about 30km x 30km. The model relied on a spatialized and temporally-resolved emission inventory including data on traffic, industrial sources and heating, as well as on hourly data on meteorological parameters and background air pollution levels from AQMS. Traffic emissions were described with linear sources, while other sources were aggregated on a 1km-resolution grid. Validation of the model has been done by comparing hourly estimated concentrations with permanent stations measures.
Results: Annual concentrations measured by AQMS were 30 µg/m^3 for NO_2 and 22 µg/m^3 for PM_{10} in Nancy, and 20 µg/m^3 and 18 µg/m^3 in Poitiers. Hourly model predictions and measured concentrations at the AQMS locations exhibited a correlation of 0.6 for NO_2 and 0.5 for PM_{10} in Nancy (0.7, and 0.9, respectively, for Poitiers). In each area, the relative error between annual measured averages and model estimates was always below 30% for NO_2 and below 20% for PM_{10} (based on 7 locations in Nancy and 3 in Poitiers).
Conclusions: NO_2 and PM_{10} levels estimated by a dispersion model showed good correlation with measures, and low error in urban background and traffic locations. Implementing dispersion models in different cities in a standardized way appears feasible.
References: