REAL-TIME MONITORING OF AIR POLLUTION IN URBAN AREAS USING A 3D SIMULATION TOOL

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Air quality concerns a major health issue. Atmospheric pollution causes around the premature death of 7 million people worldwide, according to the World Health Organization. As in other major metropolitan areas, this problematic is particularly acute in the Parisian region, where more than 2.3 million people are exposed to pollution levels that do not comply with regulations. In the first line, people present near high traffic roads such as the highway or road with high traffic density. The area around the complex sport names “Stade de France” is the most urbanized part of the department of Seine-Saint-Denis, or this area is surrounded by the both highway (A86 and A1) which support higher traffic. On this area, concentrations of air pollutants remain well above the thresholds set by the regulations, being up to twice the limit values.

Urban air quality monitoring has gone beyond just observing concentration values through measurement networks. The objective is to set up a platform to monitor air quality through 3D modeling around the “Stade de France”. This platform use a real time function to produce uninterrupted and up-to-date production of pollutant maps on the surroundings the urban site.

This type of platform is based on CFD modeling in order to monitoring of local air quality with complexes area (voluminous building, neighborhood, complexes road network with bridge, crossing…). Simulations are made by coupling the CFD models for local wind flows simulation with more classical Lagrangian models for dispersion modelling. The scales cover areas of the order of four square kilometer and meshes at the scale of the street (ten meters). The platform targets primary pollutants for which simulation of micro-scale transport and diffusion is relevant. Particularly targeted are fine particles included particles as PM10 and PM2.5.

The modeling platform is also provided with an inversion module of dispersion which makes it possible, thanks to a sensor network to be deployed, to establish a link between the measurement and the emission source with retro-modeling in a complex urban environment. By using these sensors, the source of pollution and the emitted quantity of each of the sources of pollution can be identified. The identification of the release from atmospheric concentration measurement is based on weighed least squares.

Key words: 3D dispersion, Lagrangian puffs, real-time dispersion, source emission definition, urban areas, CFD, traffic emissions.