A statistical framework for the validation of a population exposure model based on personal exposure data

Delphy Rodriguez, Myrto Valari, Konstantinos Markakis, Sébastien Payan

Geophysical Research Abstracts
Vol. 18, EGU2016-8025, 2016
EGU General Assembly 2016

A statistical framework for the validation of a population exposure model based on personal exposure data

Delphy Rodriguez (1), Myrto Valari (2), Konstantinos Markakis (2), and Sébastien Payan (1)
(1) LATMOS, UPMC, Paris, France (delphy.rodriguez@latmos.ipsl.fr), (2) LMD, Ecole Polytechnique, Palaiseau, France

Currently, ambient pollutant concentrations at monitoring sites are routinely measured by local networks, such as AIRPARIF in Paris, France. Pollutant concentration fields are also simulated with regional-scale chemistry transport models such as CHIMERE (http://www.lmd.polytechnique.fr/chimere) under air-quality forecasting platforms (e.g. Prev'Air http://www.prevair.org) or research projects. These data may be combined with more or less sophisticated techniques to provide a fairly good representation of pollutant concentration spatial gradients over urban areas. Here we focus on human exposure to atmospheric contaminants. Based on census data on population dynamics and demographics, modeled outdoor concentrations and infiltration of outdoor air-pollution indoors we have developed a population exposure model for ozone and PM2.5. A critical challenge in the field of population exposure modeling is model validation since personal exposure data are expensive and therefore, rare. However, recent research has made low cost mobile sensors fairly common and therefore personal exposure data should become more and more accessible. In view of planned cohort field-campaigns where such data will be available over the Paris region, we propose in the present study a statistical framework that makes the comparison between modeled and measured exposures meaningful.
Our ultimate goal is to evaluate the exposure model by comparing modeled exposures to monitor data. The scientific question we address here is how to downscale modeled data that are estimated on the county population scale at the individual scale which is appropriate to the available measurements. To assess this question we developed a Bayesian hierarchical framework that assimilates actual individual data into population statistics and updates the probability estimate.