

Interactive comment on “Modelling of the urban concentrations of PM_{2.5} on a high resolution for a period of 35 years, for the assessment of lifetime exposure and health effect” by Jaakko Kukkonen et al.

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Received and published: 20 January 2018

General comments

This paper discusses the long-term evolution of urban scale PM_{2.5} concentrations as input information for health impact assessment studies. The authors are very experienced in air pollution research and had key contributions to several important projects, as well as to significant previous publications.

The main novelty in this work is indeed the duration of the study period, which is indis-

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pensable, if the air quality information is to be used for lifetime environmental exposure assessment. This requirement forced the authors to numerous assumptions, given that essential input information is lacking, mainly for the first decades of the study period. Apart from this novelty, this paper deserves to be published in ACP, as it demonstrates that useful scientific results can be obtained following a pragmatic approach, i.e., adopting a simplified methodology and working with reasonable assumptions.

An important achievement of the authors is the quantification of the PM_{2.5} emission trends for both vehicular traffic and small-scale combustion, underlining the importance of the latter sector for future air pollution abatement.

Specific comments

In their updated manuscript version, the authors took into account several remarks communicated to them in the initial paper evaluation phase. Yet, there are still several aspects calling for further improvements of this paper prior to its publication:

(1) The updated version of the manuscript includes the statement that the contribution of shipping to the total PM_{2.5} concentrations can be higher than 20% within a distance of one kilometer from the harbor. At the same time it is stated that the target spatial resolution in this study is as high as 10 meters. In view of this obvious contradiction, the authors should consider shipping (and possibly also other) emissions in their UDM-FMI simulations, at least for a number of years (e.g., 2012-2014) to investigate the impact of these emission sources. It is likely that these additional calculations will allow them to justify convincingly their decision to concentrate on vehicular traffic and small-scale combustion.

(2) Two scaling assumptions are made in the overall analysis of vehicular traffic emissions: Firstly for traffic flow, using the mileage trend data (base year for the data: 2008), and secondly for exhaust emissions, using ratios of total exhaust emissions for different years (base year for the emission inventory: 2012). This reviewer accepts the authors' opinion that data are hardly available for the 80's and the 90's of the previous century,

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but this is certainly not the case for the present decade. Therefore, the scaling results should be compared with information for both traffic volume data and the exhaust emissions for selected road links in more recent years than 2008 and 2012, respectively. By the way, in the manuscript it is mentioned that a substantial road reconstruction work was in progress during 2010-2011 in central Helsinki. Wouldn't it be a good idea to modify the scaling results to account for the consequences of this reconstruction?

(3) In their section 2.3.2 the authors discuss in detail the contributions of various heating sources and other fireplaces, adopting again a scaling procedure. Yet, what about advances in technology and fuel used? Given the technological improvements of the furnaces applied, is it realistic to assume that the emission factors remained unchanged over the 35 years? Besides, several new fuel types (e.g., pellets) were introduced in this long period. These issues should be discussed in the paper.

(4) Regarding meteorology, the same parameters are used for the whole of the Helsinki Metropolitan Area covering approximately 1000 square kilometers. Perhaps it is unavoidable to work with this assumption in view of the overall pragmatic approach in this paper, yet the authors should discuss in quantitative terms the uncertainties possibly arising from this simplification.

Technical corrections

The manuscript is carefully written and well structured, and no language errors could be detected. So, no corrections of technical nature are necessary.

Interactive comment on Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2017-968>, 2018.