

## ***Interactive comment on “Refinement of a model for evaluating the population exposure in an urban area” by J. Soares et al.***

### **Anonymous Referee #1**

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#### General comments

The paper presents a refinement of the EXPAND model to evaluate the population exposure to air pollutants. It gives a thorough description of an up-to-date approach to evaluate exposure in urban areas keeping into account pollutants concentration and human time activity variability in time and space. The model development proposed consists mainly in the integration of different modules to describe pollutants emission, atmospheric dispersion, population time activities and exposure.

A few details need to be clarified to complete the modelling system description and some aspects of the presented application over Helsinki area need to be discussed in more detail to better identify and possibly quantify the simulation limits.

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It would be advisable to enhance the final summary of data and models applied that can be considered local and need to be replaced to enable the application of the proposed methodology in regions characterized by different climatic and social conditions.

## Specific comments

### Section 2.2.1

Pag. 2340 Lines: 10-11 Are emissions estimated using pollutant dependent emission profiles for each vehicle category? Are those profiles Finland specific or are they generally applicable to the European vehicle fleet in different locations?

Lines: 15-22 The meaning of these sentences is not very clear. Does the mentioned evaluation aim to analyse the emission variation from 2005 to 2008? No specific result concerning this item is presented in the rest of the paper.

Pag. 2341 Lines: 3-5 It would be worth specify if the mentioned resuspension emission model is strictly specific for the Nordic countries or if can be applied even in regions where road sending is episodic and can generally be neglected.

### Section 2.2.3

Pag 2342 Lines 8-10 The impact of the choice to neglect small-scale wood combustion on model results should be better evaluated and possibly quantified. It is not clear if the whole residential heating contribution has been neglected and why. Are public and private buildings located within the city core heated by natural gas boilers or district heating facilities possibly included among point sources?

### Section 2.3

Pag 2342 Lines: 25-26 Does LOTOS model simulation, used to evaluate long range transport contribution, include Helsinki emissions or have they been excluded? In the former case some emission contribution could be double counted, even if the limited regional model resolution would smooth the effect.

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## Section 2.4

Pag. 2344 Lines: 4-5 Is the information referred to shops and recreational activities limited to working people or does it include statistics concerning the presence of costumers in shops, etc.?

## Section 3.1

Pag. 2349 Lines: 13-15 157t PM2.5 emissions from wood combustion with respect to 322t from traffic seems quite low with respect to the estimation of house heating contribution to PM emissions in other European areas. Could you provide a little more detail about this evaluation? The referred paper is in Finnish.

What is the fraction of total PM2.5 emissions due to wood combustion? It can provide a first estimation of the emission error/underestimation caused by neglecting this contribution.

### Section 3.4.1

Pag. 2354 Lines: 2-3 The infiltration factor has been previously introduced as  $F_{inf} \leq 0$  (page 2345). Could you explain how can it assume values larger than one?

### Section 3.4.2

Pag. 2354 Lines: 12-14 Can you give an estimate of the uncertainty due to the small scale combustion contribution?

## Section 4

Pag 2355 Lines 1-9 It would be useful the introduction of a table resuming the improvements introduced in the new version of the presented model, e.g. through the comparison with the previous version features.

Lines:13-14 Stationary sources and shipping have been considered for 2009 simulations only (page 2340, lines 4-5).

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Lines: 15-18 The fraction of PM2.5 emission neglected should be possibly mentioned.

Pag 2357 Lines: 12-17 Data and models that need to be provided to make the proposed methodology applicable elsewhere should be better specified to make easier to understand the possible need of local investigations concerning e.g. emission details, infiltration factors,...

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Interactive comment on Geosci. Model Dev. Discuss., 7, 2335, 2014.

**GMDD**

7, C517–C520, 2014

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