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Geoscientific Model Development Discussions

Interactive comment on "A novel model evaluation approach focussing on local and advected contributions to urban PM_{2.5} levels – application to Paris, France" *by* H. Petetin et al.

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We would like to thank the first referee for its good appreciation and explain with more details some points he raised.

1. Vertical gradients in the first layer : The referee wonders the profit of applying a vertical gradient in the first layer in order to take into account the potential influence of dry deposition at ground. At rural sites, measurements are performed at around 3 m above ground level (a.g.l.) and indeed, vertical gradients may exists in the first 40 m a.g.l. due to deposition that decreases concentrations at ground. However, the absence of buildings is assumed to increase the vertical homogeneity, and the

measurement can probably be considered as representative. Conversely, urban areas are complex environments and strong vertical gradients may exist in the first 40 m a.g.l., mainly due to the presence of buildings that disrupt the horizontal and vertical mixing. However, as the urban site (PAR) is located on the rooftop of a building at around 20 m a.g.l., the measurements are assumed to be quite representative for the 40 m thick first model layer.

2. Uncertainties at the daily scale (page 6405, line 14-20) : The referee asks the reasons of the decrease of uncertainties at large time scale (month, year). The decrease of uncertainties when considering monthly or annual average with respect to daily ones comes from a simple mathematical consideration, that the uncertainty decreases with the root of the number of days, when considering errors on individual days as independent. I will add that sentence at 6405-18 : "[. . .] time scale. Such a decrease comes from a simple mathematical consideration, that the uncertainty decreases with the root of the number of days, when considering errors on individual days as independent.".

3. Minimum boundary layer height (page 6407) : The referee wonders the origin of the minimum boundary layer height (BLH) value (150 m) applied in our simulations. In the CHIMERE model, a minimum BLH may be set over urban areas in order to indirectly correct the absence of urban heat island (UHI) effect (known to increase the BLH) in the meteorological input data. It mainly affects the BLH during nighttime, when the UHI effect is the highest (and the BLH the lowest). Of course, it is a very simplistic correction since this UHI effect is influenced by various parameters (e.g. building density and morphology, anthropogenic heat fluxes) and thus varies depending on the location or the season. Note that this minimum value applies to a 100% urban cell, and decreases proportionally to the amount of non-urban landuse within the cell (the minimum BLH at the SIRTA, a suburban site, where its measurements have been performed) is thus around 120 m). That value of 120 m roughly corresponds to the lowest values (actually, the 2nd percentile) observed at SIRTA during the 1 year round campaign. Additionally, as mentioned in the paper (and reminded by the referee comment of Sandry Pal),

one should keep in mind that BLH estimations (from LIDAR observations in our case) during nighttime remain uncertain, and to our sense it thus appears difficult to discuss more deeply that point. I will change at 6409-22-23 : "In our case, the value of 150 m is chosen for a 100% urban cell (and decreases proportionally to the amount of non-urban landuse within the cell), based on the 2nd percentile (120 m) of BLH measured at the SIRTA suburban site.".

4. Technical comments (page 6394, line 9) : ", etc." will be removed.

5. Technical comments (page 6394, line 29) : I only mean that the pollution produced locally (associated to local emissions) adds to the regional background. I will simply change the end of sentence into "[. . .] adds to the local urban pollution increment".

Interactive comment on Geosci. Model Dev. Discuss., 6, 6391, 2013.