

Interactive comment on “The dispersion characteristics of air pollution from world’s megacities” by M. Cassiani et al.

Anonymous Referee #1

Received and published: 29 November 2012

General Comments:

This paper presents results of forward simulations of megacity plumes with FLEXPART. The simulations are performed for a passive tracer as well as for Black Carbon with wet and dry deposition processes. The model results are used for 4 different sub-projects: to calculate transport distance, speed and height from the different megacities, to calculate deposition in the Arctic and in the Antarctic, and to calculate population exposure from individual megacity plumes both inside and outside of the source region.

Unfortunately, there is no measurement data used at all in the study, and the results are presented as if simulations were reality. The results for the passive tracer (BC_{tr}) and for the tracer with deposition turned on (BC_{dp}) are presented as if they were separate species that actually existed – for example as if we were looking at data for CO and

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CH₄ – whereas in fact they are both numerical representations of different things. The 4 different sub-projects are then described in shallow terms with a considerable amount of vague discussion which regrettably leads me to recommend against publication.

Specific Comments:

Fig. 2: Wouldn't a plot by latitudinal bands be clearer to interpret? Also, maybe some bar charts comparing megacity emissions with the other main categories would help situate the significance of the study.

The discussion of deposition is glossed over but is crucial to the results. This should be described in greater detail, and the explanation should include a consideration of the uncertainties. Small changes in the simulation of BC_{dp} would presumably make large differences in the results. This could even be tested in the model, with for example simulations evaluating the role of wet and dry deposition as well as convection for different megacities. At the moment, there is just a vague description of Jakarta as being wetter and Lima being drier, for example.

The transition from hydrophobic to hydrophilic is a crucial part of the deposition process for aerosols. This should be discussed in greater detail, and possibly some attempt made at accounting for it in the analysis.

The separation of lifetimes into logarithmic and linear seems suspect - are there references that serve as a precedent, or could you expand on the explanation as well as the justification for doing this?

pg64-ln24: Similar behavior for the lower atmosphere + within 1000km, not beyond. Is this an example of confusing BC_{tr} and BC_{dp} with reality? The part of BC_{dp} that has survived 10 days behaves like BC_{tr} – almost by definition? Although does it continue to? It shouldn't. Along these lines, what does Fig 6 say that is noteworthy?

What is the purpose of the distance calculation? There is a lot of data in the graphs, but it is not clear what the significance of it is.

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pg62-ln5 There is a fair amount of work on dispersion that could add precision to these vague comments instead of saying that latitude circles become larger near the equator. As a further example, the Po/Lagos discussion is insufficient.

pg65-ln20: "probably" – this is another example of vague speculation. Should have more support for discussion and leave speculation for the end.

pg68-ln8: What do these other studies show? What is the relationship to the present work?

The exposure study would not pass as a standalone paper, and seems to be squeezed in without much justification.

Technical Comments:

Table 1 caption: refer lifetime calculations to Fig 3 and to text so reader knows which items in the table are input data, and which are derived parameters.

64-10 define a. t. l.

Check English usage for "noteworthy." Further proofreading / editing is required, especially during the introduction.

BC described as a "compound"

Interactive comment on Atmos. Chem. Phys. Discuss., 12, 26351, 2012.