

Interactive comment on “Stochastic fields method for sub-grid scale emission heterogeneity in mesoscale atmospheric dispersion models” by M. Cassiani et al.

Anonymous Referee #1

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General comment

In this paper by Cassiani et al., a stochastic field method is used within the framework of a mesoscale model to examine the influence of sub-grid scale emission heterogeneity on the mean and higher-order concentration fields. The predictions are compared with large-eddy simulation results, and the implications of the method for modelling chemical transport are also elucidated. The paper is well written, and I find it quite interesting. I recommend its publication subject to the following minor comments.

Specific comments

The first paragraph of Introduction is a little biased. It gives the impression that gener-

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ally emission inventories are much more detailed than the atmospheric model resolution and that the emission inventory techniques are more advanced than atmospheric modelling methods. I think these statements need to be toned down because I do not think that it true. Atmospheric mesoscale models can now resolve hundreds of metres, but on the other hand emission uncertainty with associated coarse resolution is still a big problem in air quality models.

The approach followed by the authors uses the IEM technique. Cassiani has also previously used the IECM (Interaction by Exchange with the Conditional Mean) technique, which is supposed to be superior, and I wonder why this technique was not followed in the present work. Some reasons need to be given, and whether the results would have been different.

Is there a way of validating the model results with real-world data? In the paper, an idealised emission distribution is used, and its representativeness to the field situation is uncertain.

As far as I can tell, the paper does not mention as to what kind of atmospheric flow was simulated. Was it convective? Would there be bigger differences as a result of emission heterogeneity in other boundary layers?

I find the whole of Section 4 too verbose, and it will be good to cut down on unnecessary text, to keep the reader interested.

Technical corrections

Fig. 1: The grids labelled E and F are not used anywhere in the paper, so these labels should be deleted.

Figures, especially 2-4: There is a lot of wasted space in these figures. I suggest using log scale along the x-axis in these plots (may be in all figure from 2 onwards).

Section 4.5, 3rd para: ‘...these issue’ should be ‘...these issues’.

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Section 4.4 and elsewhere: I think Skewness should be skewness.

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