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Interactive comment on "Comparison of the predictions of two road dust emission models with the measurements of a mobile van" *by* M. Kauhaniemi et al.

Anonymous Referee #1

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The authors describe the predictions of two road dust emission models which are compared with mobile measurements of tyre-induced suspension of road surface dust. Neither model performs particularly well and probably the most useful outcome of the paper is a better appreciation of the complexity of describing the processes determining the resuspension flux, and the consequent difficulties in estimating it.

Before attempting such an exercise again, the authors need to think very carefully about how best to design their experiments in ways that go well beyond the provisional thinking revealed in their conclusions. One of the key variables in resuspension processes is the surface loading of particulate matter in the appropriate size fraction on

the road surface. One of the models appears to have the information to calculate the surface dust loading but does not output the data, whilst the other model depends upon reference values of emission factors for road sanding and non-road sanding periods which are adjusted according to the prevailing road surface conditions. Failure to calculate the road surface dust loading, and failure to verify through measurements is a very important weakness. If such an exercise had been conducted, there would be greater clarity as to the reasons for model under-performance.

One of the underlying assumptions in this work is that movement of tyres over the road surface is the process determining resuspension and no consideration is given to turbulence in the vehicle wake as a cause of resuspension. This assumption may be correct but requires justification. Another factor requiring some thought is whether for a given tyre type (winter, summer, studded), the configuration of the tyre tread and the extent of wear of the tyre is a significant factor. The SNIFFER mobile laboratory used in this work has to be "calibrated" against emission factors and this exercise has been conducted. However, have the measured relationships changed due to wear or changing of tyres?

A further point which needs consideration especially in relation to the FORE model is how results will be extrapolated to other street locations. If the emission factors are to be incorporated within an urban model, then they need to be known for a range of street types rather than just a single street. The work with the FORE road dust model used reference values determined on a street in Stockholm but there appears to be no way in which these can be modified or made suitable for use in other locations. This is a huge weakness in the present approach unless a vast amount of work is done to determine reference emission factors for a wide variety of road situations.

There are also a number of relatively minor points requiring some attention:

(a) On page 4274, reference is made to a fraction of 0.2% PM10 in the applied road sand, based upon previous measurements. Does this percentage change in use as a

result of the grinding of the sand by continuous vehicle movement?

(b) The authors point out that one of the weaknesses relates to use of hourly data on the occurrence and intensity of precipitation (page 4282). Would it be preferable in future work to make on-site measurements of greater temporal resolution?

In summary, the paper can be recommended for publication, not because of what new knowledge it creates but because of its contribution to highlighting knowledge deficiencies which require resolution in order to enhance the skill of predictive models. These issues should be reflected more clearly in the final version of the paper.

Interactive comment on Atmos. Chem. Phys. Discuss., 14, 4263, 2014.