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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Cost effective determination of vehicle emission factors using on-road measurements" *by* N. Hudda et al.

Anonymous Referee #4

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There is a strong need for field-based measurements of emission factors and emission rates from road traffic to provide data collected under realistic conditions as opposed to the idealised driving cycles used for regulatory purposes. The authors make a compelling case for on-road measurements of the kind which they describe and their methods appear to provide a useful advance.

The paper is extremely short on experimental detail and more is needed in the main paper to provide value to the readers. Issues which need to be addressed include quality assurance, the measurement technique for PAH (not currently mentioned at all) and the location(s) of the off-road background measurements. Was a single site used and is this representative for all of the freeways sampled? Regarding the PAH, measurements were made with a continuous PAS sensor, and there need to be caveats

over the considerable sensitivity variations for different PAH compounds and the fact that changes in the PAH mixture may manifest themselves as apparent changes in concentration.

There is one very major issue which it is essential to address in depth before the work should be accepted for final publication. The abstract states that "..... it captured much or most of the variability in EFs due to inter-vehicle differences". It is very unclear to the reviewer to what extent inter-vehicle differences are captured. It is indicated in the methods section that 10 second averages were used to determine concentrations on freeway segments. Does this mean that the data in the histograms in Figures 2 and 3 are derived from 10 second averages? If this is the case, why is the total number of observations so low? Is a 10 second observation commensurate with determining the emission factor from an individual vehicle? This seems very unlikely when the sampling vehicle is travelling on a busy highway and is potentially influenced by the plumes of many vehicles. It is essential that this point should be resolved or else the meaning of the distributions shown in the figures will be entirely obscure. The authors put interpretation on the spread of EF values which may not be warranted.

The second major point which needs to be clearly brought out is that the work assumes that there are only two classes of vehicle, i.e. light-duty vehicles operating on gasoline fuel and heavy-duty vehicles operating on diesel fuel. Are things actually that clear-cut in California? Could the techniques be applied in Europe where there is a substantial light-duty fleet using diesel?

Other points which should be addressed are as follows:

Page 18719, sentence starting on last line – this states that "our study used a hybrid approach, combining individual plume impacts into longer averages that still manage to capture the spread and skew of individual EFs". This is an unsupported statement that needs to be backed up by quantitative information as suggested above.

Page 18725, line 7 – what is NOx/NO? Does this mean a ratio, or both NOx and NO,

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or what?

Page 18726 – line 15 – this refers to a NO2/NOx fraction but seems to have a different meaning from NOx/NO referred to above.

Page 18727 – the work on diurnal variations in emission rates is interesting but inadequately explained. Are the diurnal variations based wholly on the measured vehicle counts or do they take account of the speed and driving mode dependence of the emission factors?

Table 1 – the labelling of footnotes appears to be incorrect especially with regard to numbers 2 and 3.

Interactive comment on Atmos. Chem. Phys. Discuss., 12, 18715, 2012.