

Interactive comment on “Methodology for High Quality Mobile Measurement with Focus on Black Carbon and Particle Mass Concentrations” by Honey Dawn C. Alas et al.

Anonymous Referee #1

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This manuscript provides recommended techniques and protocols for mobile measurements of particulate matter. The recommendations stem largely from planning and implementation of the 2017 CARE study in Rome. As the authors note, the utility of mobile measurements has increased in recent years with increased availability of more compact (and less costly) instruments and with growing appreciation of the extent and importance of heterogeneity in air quality and its relevance for exposure and health impacts. It seems appropriate and valuable to have some guidelines for the community that can lead to improved data quality and inter-study comparability. A challenge in developing such guidelines is that the techniques, tools, and goals of different studies are diverse. Some of the recommendations provided in the manuscript are sufficiently

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broad to be more generally useful, but many are too restrictive and would be applicable only for studies very similar to the CARE study. Furthermore, much of the guidance is pretty straightforward and would be considered common sense for many readers, while some such as the OPSS correction procedure, though useful, seems outside the primary focus of the paper. I agree that the analysis and correction techniques used for the specific set of instruments used during CARE are valuable, but it seems they should accompany the discussion of the results from that study (presumably in Costabile et al., 2017) and not be included here. Portions of the manuscript were seemingly adapted from step-by-step protocols or best-practices employed by the research team. Though there is nothing inherently wrong with doing so, the results is certain recommendations that aren't needed for the readers of AMT such as the importance of calibration (the subject of three sub-sections), and others that need to be modified to be relevant for researchers using different instruments in different environments and with different objectives. I feel that this could be publishable, but only following major revision to shift the emphasis towards the more general guidelines for making and analyzing mobile measurements. It would also be valuable for the authors to discuss what they might do (or already have done) differently based on what was learned during the CARE study. Are there alternative instruments or techniques that they are considering? And how would recommendations differ for measurements made with a CPC and/or a filter pack, with or without an OPSS?

Minor comments in order of the location in the text:

Page 3, line 10: I don't question that the measurements were well done and the dataset was valuable, but these don't seem to me to be elaborate.

Table 1: The authors should discuss the tradeoffs between using an arguably more accurate reference instrument (e.g., MAAP) and a duplicate of that used for the mobile measurements. I appreciate that there are advantages, but issues such as different wavelengths and potentially differing interferences from scattering particles, humidity, ... introduce uncertainty.

Table 1: The TSI OPSS model number should be provided here (I recognize that it is provided in the text).

Page 6, line 18: Related to my comments above, statements such as “The AE51 units must be compared against a multi-angle absorption photometer (MAAP. . .” may have been useful for the authors during their study but would not be for groups using other combinations of instruments.

Page 6, line 25: And related to other comments made above, statements such as “In deciding on the length of the length of the route and the duration of a run. . .the operating time of the instruments and rest time for the runners should be considered. If multiple runs are done within one day, the charging time of the instruments should be considered as well.” simply seems too evident to include in a scientific manuscript.

Page 9, line 5: This is a more general comment, but is most closely related to the discussion starting here. Some consideration should be given to the potential bias introduced by following the same route each day while emissions and meteorology change in a somewhat predictable way. The use of the reference site may help account for concentration trends caused by factors such as boundary layer height development in the morning. But the choice to put the reference site away from the largest emissions sources could result in greater sensitivity to boundary layer dynamics along the route close to sources than at the reference site.

Page 18, line 1: Related to the comment above about things the authors might do differently next time, it would be useful to include a discussion here about what tradeoffs they feel would be justified to have an OPSS capable of detecting smaller particles. It simply seems that the uncertainty introduced by the corrections needed could be reduced significantly.

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