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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Comparisons of urban and rural $PM_{10-2.5}$ and $PM_{2.5}$ mass concentrations and semi-volatile fractions in Northeastern Colorado" *by* N. Clements et al.

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Referee Comment: This work consist in the interpretation of the time and spatial variation of the concen- trations of fine (PM2.5) and coarse (PM2.5-10) particulate matter during a three years period at four urban and at two background sites in Denver. Levels of PM are ob- tained from the measurements carried out with TEOM and FDMS instruments. These measurements permitted to estimate the semi volatile PM. Concentrations obtained at each site were correlated with the other monitoring sites. A higher homogeneity was observed for PM2.5 whereas the spatial distribution of the coarse fraction showed a higher dependence on the distance to the source and on

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the wind direction and speed. Relative humidity was also fount to differentially influence levels of fine and coarse PM. Thus, for RH >50%, levels of PM coarse tend to decrease whereas PM fine tends to increase. The method used is sound, although the correlation between the instruments used is not showed.

Author Response: We appreciate the reviewer's careful reading and summary of our paper.

Referee Comment: However, the wok presented here seems not to be a novel contribution. Thus, the work is similar to that previously published by the authors in 2012 about 1 year monitoring. The present paper extends the study period to 3 years and includes also the semi volatile fraction as derived from TEOM measurements, covering a number of sites. But, most of the conclusions obtained were presented before in the mentioned paper.

Author Response: The reviewer is correct that the current manuscript follows up on work presented in Clements et al. (2012), but is not correct in suggesting this is therefore not a novel contribution. Clements et al. (2012) presented results and analysis of data from approximately the first year of our three-year measurement study. The current work presents results and analysis from the full three-year effort. Thus comparison of the three-year monitoring results with those from the first year is itself a novel contribution, and is important for determining whether results from the initial year are or are not representative for a longer time period. The new paper presents and discusses all results in light of the longer measurement record and other new information, and does not repeat results or conclusions from the prior paper. The fact that in some cases the findings are similar to those from the earlier work is in itself a new insight, as the robustness of the shorter record with regard to monthly and seasonal patterns could not be assessed without the longer monitoring campaign.

Furthermore, the current paper goes well beyond the earlier one in numerous respects. In particular, the current paper includes analysis of the semi-volatile fractions of PM2.5

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and PM10-2.5, which were not examined in our earlier work. In fact, little prior work has been documented in the literature to examine the assumption that PM10-2.5 is mostly non-volatile. The current paper also includes analysis of associations of PM2.5 and PM10-2.5 with gas-phase pollutants, vehicle counts, and additional meteorological variables, which were not available earlier. We also examine how our findings compare with and are informed by other recent literature that had not been published at the time of our earlier study.

Reference: Clements, N., Piedrahita, R., Ortega, J., Peel, J.L., Hannigan, M., Miller, S.L., Milford, J.B.: Characterization and nonparametric regression of rural and urban coarse particulate matter mass concentrations in Northeastern Colorado, Aerosol Sci. Tech. 46,108-123, 2012.

Referee Comment: Minor comments: Introduction: As regards for the impact on health of the PM2.5-10 fraction you should refer to Stafoggia et al. (2013). These authors demonstrated that "PM2.5 and PM2.5–10 were positively associated with cardiovascular and respiratory admissions in eight Mediterranean cities Stafoggia M, et al. 2013. Short-term associa- tions between fine and coarse particulate mat- ter and hospitalizations in Southern Eu- rope: results from the MED-PARTICLES project. Environ Health Perspect 121:1026– 1033; http://dx.doi.org/10.1289/ehp.1206151

Author Response: We appreciate the reviewer's highlighting Stafoggia et al. (2013) and agree that it is a valuable contribution to the literature on associations between PM in different size fractions and hospital admissions. However, for brevity we did not intend to provide a comprehensive review of the epidemiologic literature on health effects of PM2.5 and PM10-2.5. Instead, the introduction to our paper provides a point of entry into this literature by citing the seminal review article on the topic (Brunekreef and Forsberg, 2005) along with a more recent review and meta-analysis that provides an update on the literature (Adar et al., 2014). We note that Stafoggia et al. (2013) is included in the review by Adar et al. that we have already cited.

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Referee Comment: Table 1: It should be improved including the instruments used at each sites Table 2. Spell out “COV”

Author Response: We appreciate these suggestions. The revised tables are attached below as a pdf supplement.

Please also note the supplement to this comment:
http://www.atmos-chem-phys-discuss.net/15/C11930/2016/acpd-15-C11930-2016-supplement.pdf

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Interactive comment on Atmos. Chem. Phys. Discuss., 15, 24587, 2015.