

Interactive comment on “Mobile-Platform Measurement of Air Pollutant Concentrations in California: Performance Assessment, Statistical Methods for Evaluating Spatial Variations, and Spatial Representativeness” by Paul A. Solomon et al.

Anonymous Referee #3

Received and published: 16 March 2020

General Comments: ————— This manuscript evaluates statistical methods used to characterize spatial variation and representativeness of mobile and stationary monitor measurements for several air pollutants across multiple cities in California. The ground-level pollutants include both gases and particulates. This method evaluation paper will have implications for the spatial characterization of air quality measurements, which aligns with AMT. The manuscript in its current state is not ready for publication and will benefit significantly from additional minor work.

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Specific Comments: ————— Line 137: Do the monitoring stations use the Network Time Protocol? If not, address discrepancies this may cause in measurement comparisons. Line 164: What is the impact of wind and GPS location uncertainties on data collected while stationary? Line 173: Where are the reported variabilities of the paired differences shown? Line 17: The time frame is misleading. Should indicate a few intensive (i.e. week to monthlong) campaigns were performed between May 2016 and September 2017. Lines 20-21: Lifetime of NO₂ is hours and O₃ is ~20 days in the troposphere. Observing the diurnal cycle and weekday weekend trends may be more appropriate than looking at a fortnight. Line 22: In-situ instrument or research-grade instruments. I'm sure they mean their instrument package. Line 31: Percentages of what? Concentration deltas? Line 75: Concentration decay rate from a point source will be highly variable and based on several meteorological parameters. Line: 109-110: What are the limitations of overnight calibration when cars are parked next to each other? Lines 106,109/110, 113: The first lines seem to imply the mobile platform intercomparison was made overnight, 113 implies it may have been only a short period (5 min, 30 min), the SI from their Apte et al. indicates it was several hours overnight. Not sure about an intercomparison in a parking garage either, especially if it was during a time when vehicles were entering or leaving (cold starts vs operating temp emissions). Line 119: Was the audit the same as is done with FRM/FEM monitors via the National Performance Audit Program (NPAP)? Line 122: In table 4 there needs to be an explanation of the scales and how EPA initially established each sitting. Line 125: Suggested to add sentence or phrase to cover why the other stations were not used. Sec. 2.3: Are there multiple BC and CH₄ instruments or just one that was moved between cars? I'm assuming this was done because of inlet restrictions. Sec. 2.3: Was CARB contacted to ensure BC and CH₄ observations were not present at sites? Some EPA sites have but don't advertise these observations. Lines: 247-249: Comparing different regions during different time periods without a detailed study of the meteorology is misleading if talking about local or neighborhood scales. Here are the climatological winds near San Joaquin Valley for March and November using

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data between 1973-2019 at Buchanan Field Airport in Concord, CA. Figure 1 shows the month of March may be experiencing inflow from the Chevron processing plant in Richmond and dust (Coarse mode, not reported) from Dutra Materials quarry in McNeers Beach, while to a much lesser extent in November (Figure 2). Since the data is presented as mean concentrations during the sampling periods, I'd bet the baseline PN concentrations are different for the two months. Lines 251-252: The deployed optical particle counter provided five size ranges why report only the smallest, then reference a paper regarding a measured size bin that was not reported in the paper? Lines 246-262: I'm not sure this section is representative and should be included here and should likely be absorbed by the following sections. Line 265: Typo. ...vehicles drove in the Los Angeles Line 270: Why was the mean relative difference between the two calibrations so high? An absolute difference of 5% NPAP would require corrective actions. The calibration gases and flow meters used should be traceable to NIST for re-evaluation. Sec. 3.2: When comparing inter-vehicle observations were the vehicles traveling the same route (i.e. following each other) or just driving the same neighborhoods and passing by each other? Line 294: Were the vehicles were running during the LAXH comparison or were the instruments moved to shelter power and the vehicle engines shutoff? Sec. 3.3: Last sentence of section, CH₄ emissions from vehicles is extremely small (something like <0.2% of anthropogenic emissions) and the lifetime of NO very short. This statement needs a citation, or it needs to be removed. Sec 3.4: This section will have a very large dependence on meteorological parameters. Sec. 3.4.1: The airmasses the vehicles are sampling are potentially different. An intervehicle comparison could be made in time and latitude. As it is, the comparisons are meaningless because we know the location of any vehicle at any given time and one may be sampling south of the Santa Ana Freeway and the other sampling all three major N-S freeways in the area. The attached Figure 3 shows winds are between 9am and 5pm averaged over Aug 3-16. Line 362: Driving near as in right past along Dowlen Dr or within n meters? Wilshire Blvd is ~200m as is Federal Ave. Line 392: What grid is used? Fig. 6: Needs legend, different colors for positive and negative intervehicle

differences and FMD differences not red/blue, which were used to identify specific vehicles in the same figure. Line 424: Enhancements based on what? FAMD is comparing observations at the same time, is the enhancement based on location as stated in the paragraph before or between May 1-12? Line 440: Routes for November 16th, 2016 are not in SI but referenced in text. Include Line 457: Are traffic count data available? Line 459: Enhancements compared to what, background? Line 529: Enhancements based on what? General: Overall distance bins should be the same for all missions. Seems like all the analysis times were weekday (do Google Street View vehicles drive on weekends)?

TECHNICAL CORRECTIONS: _____ Line 35: Suggested to add spatial variability context for pollutants to introduction as this has implications on reported uncertainties. Line 155: LOD is defined in Table 5 subtext, but not in text. Consider defining in main text. Lines 172-174: Suggested to remove 'merge' detail, as it seems superfluous to the reader, and combine the two sentences into one focusing on temporally coincident pairing. Lines 185, 190, 195, 200: 'Car B Difference' could be misleading. It is suggested to move the word 'Difference' to after the word 'Mean' (i.e., Mean Difference) or use wording such as 'Mean [Absolute] Difference between Car A and B' in the numerator. Line 206: Z is not defined. Line 216: MD already defined in line 185. Lines 211 and 222: Consistency in section references.

Interactive comment on Atmos. Meas. Tech. Discuss., doi:10.5194/amt-2019-501, 2020.

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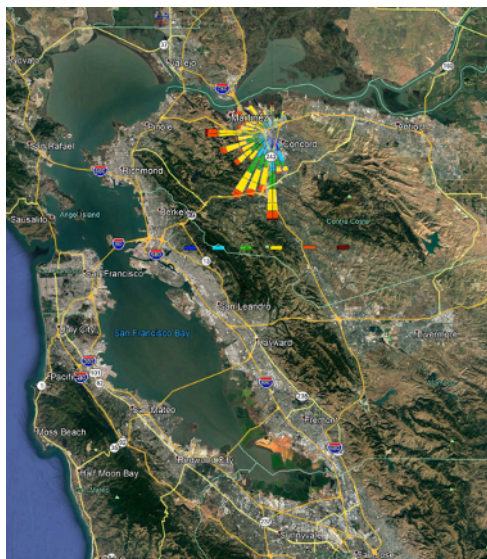


Fig. 1.

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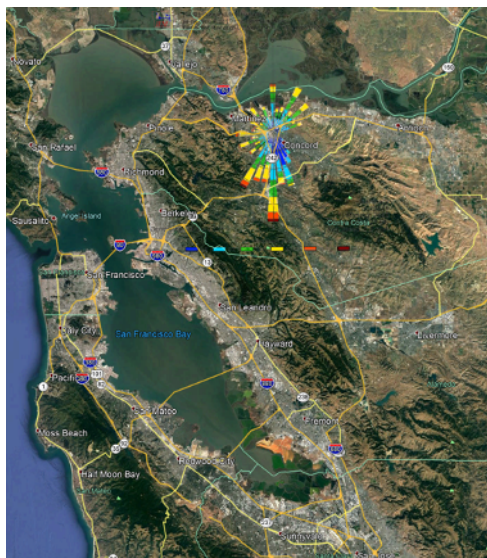


Fig. 2.

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