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Atmospheric Measurement Techniques Discussions

Interactive comment on "Emission Monitoring Mobile Experiment (EMME): an overview and first results of the St. Petersburg megacity campaign-2019" *by* Maria V. Makarova et al.

Anonymous Referee #1

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The paper "Emission Monitoring Mobile Experiment (EMME): an overview and first results of the St. Petersburg megacity campaign-2019" by Makarova et al. presented the study conducted in St. Petersburg for GHG and NOx emission assessments. Different methods including the differential column measurements using two solar tracking spectrometers (EM27SUN), mobile DOAS measurements and in-situ measurements are combined to achieve this goal. Deploying the mass balance method, their obtained emission flux numbers of CO2 and CH4 are much higher compared to the numbers of the emission inventories. The descriptions of the campaign are well elaborated and data analysis is clearly structured. However, several comments needed to be addressed before the consideration of the publication.

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1) The abstract presents a lot of technical details, such as the data processing activities in four steps. I recommend to remove these.

2) Part of the methodology is based on emission assessments using differential column measurements equipped with two solar-tracking spectrometers upwind and downwind of the city. The authors could consider to include Chen et al. (2016): “Differential column measurements using compact solar-tracking spectrometers”, where the same principle has been used, as a reference in line 100.

3) Page 9: The authors have determined the optimum integration time by examining the “half width” of the short term variations. Another possibility to determine the optimum integration time is to use the Allan variance analysis. This approach was used in Chen et al. (2016).

4) Page 9: please add units to the parameters denoted in equation (1).

5) Section 4.4: I have doubts about the definition of the effective air parcel path length. By deriving the effective path length including only the “polluted path”, and excluding the “clean path”, you are determining the emission flux of the industrial and traffic (the polluted areas), but not the emission flux of the whole city. So it could be not fair to compare these numbers to the emission inventories of the city, which may result in much higher emissions compared to the emission inventory.

6) Line 358: repetition of “April 25”, please delete the second one.

7) Equation 2: It is not clear what kind of wind speeds are taken for the consideration, please elaborate it.

8) Equation 2: you can determine the square root of the error terms instead of adding them

9) Figure 5: there is no unit for the color bar [0-25]. The river is drawn as blue, but it looks confusing because the blue color is also assigned to the color bar.

10) Figure 7: you could show the scaled results instead. It will illustrate how the close the curves are to each other after the scaling process.

11) Figure 8: It is not very clear from the description which paths you took for determining the effective path length, are these paths from different days? Please elaborate these further. Do you have only one effective path length for all the days for each meteorological data set (LOCAL, GDAS, and HYSPLIT)? If so, how the effective path lengths vary given by different meteorological data set?

12) Table 4: The big discrepancies between the estimate in the paper and the emission inventory could be partially attributed to the usage of the effective path length, so the flux density determined in this study is focused on the industry area and traffics whereas the inventory is the averaged flux in the city. Please discuss this possibility.

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