

Interactive comment on “Strategies of Method Selection for Fine Scale PM_{2.5} Mapping in Intra-Urban Area Under Crowdsourcing Monitoring” by Shan Xu et al.

Anonymous Referee #2

Received and published: 4 February 2019

General comments: Overall this is an interesting paper comparing methods for estimating spatial concentrations of PM_{2.5} using crowd sourced low-cost sensor measurements. I think it will be highly valuable for many researchers in the field interested in spatial variation. However, I think there is a lack of discussion of the limitations of low-cost optical particle sensors especially with the limited performance evaluation presented in this manuscript. I suggest major revisions for this paper. There are a number of places where the text is unclear and the authors should take care to thoroughly edit the next draft of this paper.

Specific comments:

Abstract: It's not clear what the different periods are referring to, morning versus afternoon? Line 19: I don't think that a range is the best statistic to show that 2 sets of numbers are "clearly different". Line 48: What do you mean by: "and a promising access to the prevention of exposure risks for individuals in their daily life."

Page 3 line 24-25: What does "data consistency" mean? Can you please elaborate. Also, where do you get the resolution data from? The manufacturer? Lab studies? Please cite.

Page 3 Line 30: Why would you only select 30 monitors to collocate? Without the collocation data from the other monitors you have no idea what the bias is of the other measurements.

Section 2.2.1: Can you mention if these monitors or internal sensors are commercially available or have been evaluated in any other studies, etc. Oh, I see in the supplement they are SDL307 but I think this may be important to add to the text.

Page 3 Lines 28-29: This is confusing to me. I don't see K factors anywhere when I look at the figure. Please clarify this sentence and/or move the figure reference to a more appropriate location.

Page 3 Line 30-Page 4 Line 3: I think the performance needs more discussion. How do the monitors compare to each other? If you are looking at spatial variability, bias/error between different monitors will be important. Were all monitors at the reference site for the same period? Is this 1-hr data shown in the plot or some other averaging time? Knowing the bias of individual monitors is very important because it will help determine at what threshold you can say there is likely spatial variation versus just bias in the sensor measurements. In addition, RH is known to significantly influence optical PM measurements. RH should be reported throughout. If RH is >75% during one of the periods (1,2, or comparison) this may be an issue. In addition, you have no data above ~100 ug/m³ but during your second period the concentrations are in the 170-180 range. I think it is important to know how the sensors perform at these

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high concentrations if you are going to try to draw conclusions. Has any previous work evaluated these sensors at high concentrations? You cannot assume that just because they work well from the 40-100 range they will work the same below and above that.

Page 5 lines 17-18: Meteorological data with a spatial resolution of roughly 0.4 sites per 100 km² (wind speed, atmospheric pressure, relative humidity, temperature) that -I think it might be clearer to just list the number of stations you had in total over your sampling area.

Section 2.1.2: I'm not clear how this data is crowdsourced can you please include more information about how each monitor got to each monitoring point.

Page 6 lines 19-21: Is this the highest and lowest one-hour average from a single site and single monitor? Why are these and the times they occurred important?

Line 20: These what? Averages?

Line 20-21: I don't know what the numbers in parenthesis are please clarify

Lines 25 and 26: Is there more traffic at noon than at morning rush hour? Also is the average concentration at the different hours significantly different?

Figure 3. Does each of these points represent a single monitor? Why are they fewer monitors during period 2?

Line 13: I don't understand what you are comparing that increased. What is the first set of numbers versus the second set of numbers?

Line 14: What do you mean significant and steady decrease? Decreased by hour by the same amount?

Page 7 Line 30: Since readers can see the individual R2 on the figure it may be easier to digest if you just include an average or range instead of so many lists of numbers.

Page 8 Line 5: I read this paragraph a couple times and I'm still a bit confused which

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method performs the best. Can you add a summary sentence at the end just stating the conclusion? Or reorganize more clearly.

Section 3.3: Can you clarify: did you use 90% training sites for only the sensor measurements and then only 90% of the reference stations? As far as I could tell previously you only used withholding from the sensor data and didn't evaluate the models using the reference data?

Page 8 line 9: "Significant difference can be found between two sources," what do you mean?

Page 8 Line 13: What do you mean three-step growth?

Page 8 Line 15: I don't understand based on the figure it seems like there are almost no factories and roads in the top left corner but that is where most of the pollution is.

Page 8 Line 30-Page 9 Line 3: I think you need to mention though the limitations of low-cost monitors and the inaccuracies in these measurements compared to federal methods.

Page 9 Line 10: It seems likely the low-cost sensors may have been saturated at the high concentrations and this may have led to the difference between the sensors and the reference methods.

Technical corrections:

Suggest rewording the title for clarity, possibly: Strategies of method selection for Fine Scale PM2.5 mapping in an intra-urban area using crowdsourced monitoring

Fine particulate matter (particulate matter singular remove s)

Line 9: to "the" public – there are a number of grammatical errors throughout the text and I have not had a chance to identify them all in this review. Please review for grammar.

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Page 6 Line 20 ug/m3 formatting

Page 7 Line 4: Remove “had” assuming you are talking about this work where the sites experienced extreme PM

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