

Interactive comment on “Impact of air pollution control measures and regional transport on carbonaceous aerosols in fine particulate matter in urban Beijing, China: Insights gained from long-term measurement” by Dongsheng Ji et al.

Anonymous Referee #3

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General comments The manuscript describe how EC and OC concentrations changed at Beijing between 2013 and 2017. Hourly EC/OC data is important and informative. However, interpretation of data is not equally robust. In some parts, discussions are very speculative. This is the main weakness of this paper. Seasonal, diurnal and inter-annual variations are nicely discussed. Particularly discussion of long-term variations in EC and OC concentrations, using their own data is very informatiÅsve, but the part where discussion of long-term variations are extended to 2002 using literature information is not that convincing. Authors applied nonparametric wind regression to locate

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local sources. This is a new tool and nicely applied in this work. They also applied PSCF to identify distant sources. I do not really think distant sources can be differentiated from local ones with PSCF, because every single trajectory ends up in Beijing, which is a huge source itself.

Specific comments

Figure 1. What is the "star" in the figure? Figure 1. Where is the first ring road? 4. Ring road? G6 highway? Please put these names on the map, so that reader can understand which roads you are referring to, or describe roads with notations on the map, such as, G108 etc.

Lines 210 - 214. Authors discuss that concentrations of EC, OC and PM_{2.5} decreased from 2013 towards 2017. They should provide statistical significance of this comment. The difference between 14.0 ± 11.7 and 11.9 ± 11.3 (OC concentrations in 2013 and 2016, respectively) may or may not be statistically significant and must be tested. This comment also holds for EC and PM_{2.5} concentrations.

For the same discussion.

It will be better if authors should also present median concentrations of EC, OC and PM_{2.5} in table (maybe in parenthesis by the averages), which represent right-skewed data population better than average.

Line 230. "Compared to previous studies, the ratio of TC to PM_{2.5} became smaller" Last column in Table 1 suggests that TC-to-PM_{2.5} ratio did not change much between 2013 and 2018 in Beijing. Can the difference with "other" data be due to different characteristics of sampling locations, rather than time? Author's explanations with stringent measures make sense, but if that is the case shouldn't the TC/PM_{2.5} ratio decrease in five years between 2013 and 2018 at their site as well?

Line 237. Table you are referring to is Table 3 not Table 2.

Line 260 Authors should explain the criteria they used to classify air quality as Excel-

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lent, good, LP, MP HP and SP

Line 271 - 305 Authors discussed long-term variation in concentrations of EC, OC, SO₂, NO₂ and tried to relate them with variations in fuel use and traffic intensity. The discussion is very speculative. Particularly, attempts to link the drop in EC concentrations in 2010 (not in OC, not in SO₂ and NO₂) to moving a steel factory to somewhere else is not convincing.

More information should be provided about data they used from literature (2002 - 2012). Are these data from one study and from one measurement site, or are they from combination of various studies and various sites? This is important, because what you measure also depends on location of your sampling point. For example, can the drop they observed in EC concentrations in 2010 be an artifact due to different measurement point?

Authors should also explain why only EC concentration dropped but not SO₂ when a large steel industry stopped its operations in 2010.

Line 315 Does "unfavorable meteorological conditions" mean lower mixing height, slower winds? Please state. (Unfavorable met conditÅns are later explained Ån the text. It will be better if they can bring that explanatÅn here)

Lines 318 - 326 Authors observed decreasing EC and OC concentrations in "warm" months, but no similar decreasing trend in "cold" months. This is confusing, because throughout the manuscript they mentioned about more stringent measures of coal use, switching to cleaner forms of energy production etc. These all affect EC and OC concentrations in cold season, but they observed decreasing pattern in warm season. Please explain. Please, also state in the text, how you define cold and warm seasons.

Line 323. What does "cyclic accumulation and scavenging process" mean?

Line 371 "The amplitude of the diurnal variation in the EC concentrations was smaller in the last three years." Please support this with traffic counts.

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Line 393. "OC and EC exhibited higher concentrations on weekends than on weekdays" Statistical significance of the difference between 13.2 ± 1.8 (OC in WE) and 11.8 ± 1.8 (OC in WD) and between 3.9 ± 2.7 (EC in WE) and 3.6 ± 3.5 (EC in WD) must be tested. These numbers are close to each other.

Also, please check the standard deviations σ given for OC in both WD and WE. They are too small to be real.

Line 434 "This could be because vehicular emissions became the dominant pollution source and gradually replaced the industrial emissions in Beijing". Hand-waving. Must be removed.

Line 489 "... highlighting probable trans-boundary transport from highly industrialized regions upwind of the Hebei province of China ...", NWR is performed using surface meteorological data. How correct is it to infer long-distance transport with surface met data? Please explain in the text.

Line 493 "The joint probability data in Figs. 14 and 15 show" There is only 10 figures in this paper.

Line 500 "Considering that the NWR analysis can only provide an allocation of local sources, the PSCF analysis is a helpful complement to investigate potential advection of pollution over larger geographical scales" How realistic is it to attempt to locate distant sources using PSCF in the middle of a huge source like Beijing? No matter where they are coming from, all trajectories will end up in Beijing and will pick up pollutants emitted in Beijing. If every single trajectory is effected emissions in Beijing, it will be very difficult (probably impossible) to differentiate information trajectories carry about distant sources. If you agree with me, please remove PSCF from manuscript. If you do not agree with me, please explain how you avoid this drawback in the text.

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