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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Meteorological-gaseous influences on seasonal $PM_{2.5}$ variability in the Klang Valley urban-industrial environment" *by* N. Amil et al.

Anonymous Referee #2

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The manuscript "Meteorological-gaseous influences on seasonal PM2.5 variability in the Klang Valley urban-industrial environment" by Amil et al. analyzes the chemical composition of PM2.5 aerosol samples collected in an urban environment characterized by emissions of several industrial activities and a nearby harbor. PM2.5 aerosol sources are then identified based on chemical characterization using chemical mass closure approach and positive matrix factorization (PMF) analysis. The manuscript discusses data collected during an entire year and representative of four different seasons, together with two haze episodes. In the referee's opinion, the set of data presented and discussed by the authors is interesting and worth of publication, nevertheless major corrections are needed before the manuscript could be accepted for

publication in ACP.

Major comments

The manuscript title is misleading. The text describes in several sections the correlation between meteorological parameters and PM composition and/or PM sources, although often the correlation, or the lack of correlation, is not discussed or justified. Similarly, the correlation between gas phase species and PM sources is presented, but not discussed. For example the correlation between dust and NO2 is observed, but no explanation or hypothesis are offered to the reader. I would suggest re-phrasing the title. An example could be: "Seasonal variability of PM2.5 composition and sources in the Klang Valley urban-industrial environment".

Results and discussion section presents monthly and annual averages of PM values. Formally, it is not correct to talk about monthly averages when only 1 week of each month was monitored. It would be more accurate to talk about weekly average representative of the month. This is important especially when comparing the mean values with mean values collected at other sites for the entire month, or when comparing with limits set by the WHO or by the legislations.

The discussion of PM2.5 to PM10 ratios needs revision and further discussion. The similar PM2.5 to PM10 ratio during the wet and the dry season indicates that meteorological parameters, specifically rainfall, are affecting in the same way fine and coarse particles. This is also confirmed by the good correlation of PM2.5 and PM10. Since it is likely that coarse particles are dominated by dust, and source apportionment and CMC show that dust is not a dominant component of PM2.5, it is unlikely that the correlation of fine and coarse particle mass was due to common sources at this site. Finally during INT1 period the PM2.5 to PM10 ratio is the highest. Is it possible to discuss this ratio at the light of the source apportionment results?

Results of the chemical mass closure analysis are presented reporting the absolute concentration of each PM component and the percentage mass contribution. The re-

sults are then discussed based on the percentage mass contribution. Since the goal of the discussion is to investigate the effect of meteorological parameters on PM sources, the mass fraction is not a useful measure since the normalization to the total mass removes some meteorological effects, like dilution or accumulation in the boundary layer, or removal by rainfall.

It is necessary to verify the consistency of PMF and CMC results, or discuss the differences. For example, during the HAZE period CMC indicates that dust accounts for 6% of PM2.5, while PMF assigns to dust 19% of PM2.5. Sea salts accounts for 1% of PM2.5 according to CMC, and 17% according to PMF.

The conclusions state: " The results of our study clearly suggest that chemical constituents and sources of PM2.5 were greatly influenced and characterized by meteorological and gaseous parameters". Although the conclusion is sound, it is in contrast with the discussion at pages 26439-26440 and the phrase :"on a seasonal scale daily PM2.5 mass during all seasons appeared to be affected by the gaseous parameters but not meteorological conditions". The correlation between PM concentration and meteorological parameters, discussed at pages 26439-26440, is actually not the correct approach to investigate the effect of the different meteorological variables. For example rainfall affects PM components removing particles from the air, but also leaves the soil and road surface wet, preventing or reducing the contribution of road dust during the following days ,as well. Wind direction is the average wind direction or the prevailing wind direction? The effect of WD on PM could be better investigated looking at the prevailing wind direction (or polar plots) associated to the different PMF factors. The discussion of how meteorological parameters affect PM and PM components should be revised through the text.

Minor comments

Introduction: It would be useful to add some more recent references to the first part of the introduction. In addition, please add some details about the sources identified by

previous studies in the area, or similar regions. For example, the author mentioned that previous source apportionment studies have been preformed in SEA, but the results are not reported. The introduction could mention which are the most important PM sources we should expect to find.

Trace elements: details about the preparation of ICP-MS standard solution can be moved to the supplementary section.

Black carbon. Since the instrument used in the present study is not common to most of the readers, please add some details about BC measurements. For example BC is measured based on optical or thermo-optical properties? Aerosol particles are collected on a substrate, like an aethalometer, or are suspended in the air, like a photoacoustic instrument? What are the assumptions made for the quantification of BC (for example, which is mass absorption cross sections?)

Quality assurance. Avoid to add a paragraph just to mention that QA details are reported in the supplementary.

Meteorological and gas measurements. Please specify which analytical techniques were used to measure the gas species. No further details are needed.

The neutralization ratio (page 26442 line 13) takes into account only ammonium and sulfate. Why the other anions and cations are not considered?

Technical corrections.

Please remove "comparatively" from sentences like comparatively higher than

To refer to tables and figures, the author can write table x reports or figure x shows. Do not write just the table or number figure out of a sentence.

Please replace > with "less than" through the manuscript. For example at line 15: season with less than 50% sample exceedance.

Page 26425 line 23 "particle with aerodynamic diameter less than 2.5 μm" instead of

"dp<2.5 μm"

Page 26427 line 20. Reid et al. instead of a study by Reid et al.

Page 26427 line 28. "Cluster analysis of back trajectory" instead of "Trajectory cluster"

Page 26429 line 3-7 please verify the number of decimal digits.

Page 26429 line 8 during SW monsoon

Page 26429 line 13 The aerosol sampling

Page 26430 line 4 "loaded quartz filter" instead of "loaded filter paper"

Page 26433 line 20 PM mass instead of filter mass.

Page 26435 line 3 did you mean missing values?

Page 26436 line 23 higher compared instead of higher ompared

Page 26439 line 6 A correlation with r=0.29, corresponding to r2=0.08 can not be considered significant. Revise the adjectives used to define the correlations through the text.

Page 26443 line 14 dust was instead of dust as

Page 26447 line 2 correlate with gaseous parameters instead of influenced by with gaseous parameters

Page 26449 line 9-12 revise this section. It is not clear.

Page 26454 line 26 page 26455 line 1. The weekly trend does not look significant enough to discriminate between days with higher concentration (Fridays) and days with lower concentrations (Wednesdays)

Figure 4a. Add factor labels to the panels.

Figure 5. Use different scale to report meteorological parameters because it is impos-

sible to read variation in temperature and difficult to appreciate the variability of RH.

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