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Interactive Comment

Interactive comment on "Spatio-temporal variations in PM_{10} concentrations over Seoul estimated using multiple empirical models together with AERONET and MODIS data collected during the DRAGON-Asia campaign" *by* S. Seo et al.

Anonymous Referee #2

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General comments:

This paper evaluates the performance of empirical models for studying spatio-temporal variability of PM10 concentration over Seoul using AERONET and MODIS AOD, and other ancillary data including boundary layer height (BLH), relative humidity (RH), and effective radius (Reff) of the aerosol size distribution during the DRAGON-Asia campaign in 2012. The methods/results are well documented and summarized. The topical

area is also suitable for the special issue ("Meso-scale aerosol processes, comparison and validation studies from DRAGON networks") in ACP journal. I favor publication of this paper in ACP with some clarifications and minor changes.

Specific comments:

1. The title appears to be a bit descriptive and awkward. Reword it to be concise.

2. Making scatter plots of measured PM10 against major parameters (e.g., AOD, BLH, RH, Reff, AE, and their combinations) may give some insights of the relationship between them. And linear fits can be added as well.

3. In Table 5, results were well summarized by various statistical measures, however, I wonder if they are statistically significant among models. Are their performances significantly different among models (M1 $\sim$ M6)?

4. R2 (coefficient of determination) is a more appropriate quantity than R (correlation coefficient) in explaining the performance of empirical linear models throughout this paper. Refer to a statistics textbook.

5. What empirical models are best for estimating PM10? And Why? These things need to be clearly discussed and stated in abstract and conclusion. I expect the best performances from M3 and M5 because they look close to the form of equation 3. If not, explain why. Even the best performance of M5 during the winter season (R=0.81, R2 = 0.66) in Table 7 shows remaining 34% variance is not explained by the model. What other factors should be taken into account for future improvement?

6. Page 21730, lines 20-24: it does not necessarily support that AOD at a finer spatial resolution from such as GOCI or MODIS would help to improve the predictability of PM10. In general, the accuracy of MODIS AOD from a higher spatial resolution of 3km is not better than that from a standard product of a 10 km resolution, especially in urban areas due primarily to inadequate characterization of surface properties (Refer to the paper, "MODIS 3 km aerosol product: applications over land in an urban/suburban

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region", L. A. Munchak, R. C. Levy, S. Mattoo, L. A. Remer, B. N. Holben, J. S. Schafer, C. A. Hostetler, and R. A. Ferrare, Atmos. Meas. Tech., 6, 1747-1759, 2013). Moreover, very accurate point measured AOD data from AERONET after additional cloud screenings were already tested in this study. Further in-depth discussion about possible factors and mechanism other than AOD for improving the predictability of PM10 is expected to enhance the quality of this paper.

Interactive comment on Atmos. Chem. Phys. Discuss., 14, 21709, 2014.