Response to Reviewer #2’s Comments

In this paper, authors want to Estimation of the vertical distribution of particle matter (PM2.5) concentration based on machine learning algorithms, that's a good idea. This is a problem worth studying. Before publication, there are some problems to pay attention to.

Response: We greatly appreciated the reviewer’s positive comments on our manuscript, which greatly improve the quality of our manuscript. We have made efforts to adequately address the reviewers' concern one by one. For clarity purpose, here we have listed the reviewer' comments in plain font, followed by our response in bold italics.

1 ¼Œthe author get the aerosol EC profile from a mie lidar, using a Lidar ratio as a Constant hypothesis, which is 50. if you can give an Error caused by constant assumption, it will be better.

Response: Good suggestion! According to the previous study (Liu et al., 2017), the standard deviation of the assumed lidar ratio is about 20%, the uncertainty for EC derived by lidar is about 10%-20%. We have added it in the text.

Reference: Liu, B., Ma, Y., Gong, W., & Zhang, M. (2017). Observations of aerosol color ratio and depolarization ratio over Wuhan. Atmospheric Pollution Research, 8(6), 1113-1122.

2, in part 5 Summary and conclusions, please Refine the summary part, and give some constructive discussion ¼Œ it will be better.

Response: Good suggestion! According to your suggestion, we rewrite the Section 5. “After using traditional LM and other four ML algorithms to predict the PM2.5 mass concentrations profile. The results show that the performance of ML algorithms is better than traditional LM algorithm. This is due to the ML models consider the effect of meteorological variables, and can conduct the temperature and humidity correction to improve the inversion accuracy. Moreover, for the four ML algorithms, the RF model is the most suitable model for PM2.5 estimations, followed by XGB model, last are SVM and KNN models. The difference in model performance is due to the difference in the decision tree structure of the model. Each ML algorithm has its own decision-making method to consider the weight of input parameters.

Combined with the importance value of input variables and the deviation of results, the results indicated that the higher weight of the meteorological parameters in the model, the smaller deviation of the results.”