Thank you for your efforts on this manuscript. The comments are valuable and very helpful for revising and improving this work. The detailed responses to the comments are given below one by one.

1. The initial conditions is very important to model simulation. This manuscript investigated the duration of initial concentrations. The degree of agreement between initial conditions and observations largely the model performance in the first hours. I suggested that the authors compared initial conditions with observations. If possible, the manuscript can design different initial conditions.

Response: In our manuscripts, we have compared the simulated and observed $PM_{2.5}$ concentrations in December 2016. So here we compared the model results in the sensitivity experiments of R1120, R1124, C24 and CT24 with the observation from the time of the simulation started to 00:00 UTC on December 1st, shown in Figure 1. Although the degree of agreement between initial conditions and observations largely the model performance in the first hours, the results of sensitivity experiments for restart mechanism showed that 27 hours of simulation can eliminate the influence of the initial value and improve the simulation results under the same emission and meteorological field. One of the best ways to improve model performance is to consider the assimilation of the initial conditions. But this technology is more difficult, we are still developing.

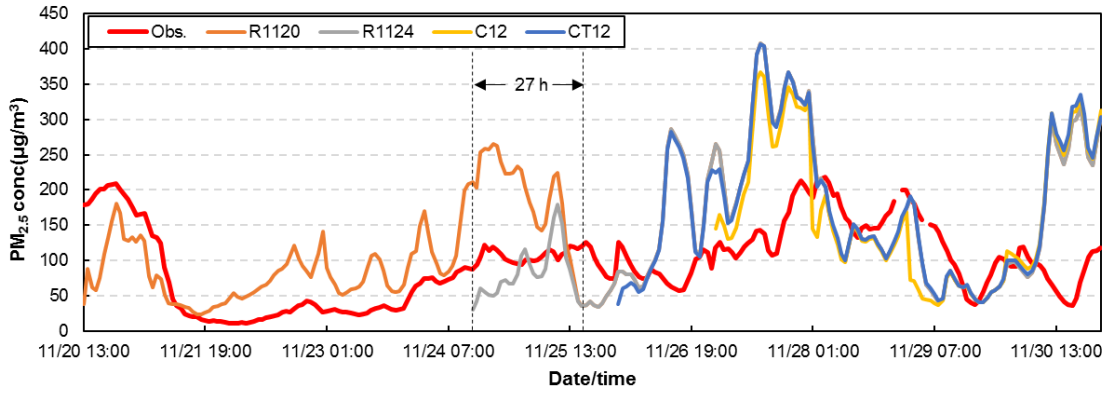

Figure 1. The time series of daily observed and simulated $PM_{2.5}$ concentrations averaged from 13 NSAQ Observation Stations from the time of the simulation started to 00:00 UTC on December 1st.

2. The impact of initial conditions is different on different species. I suggested that different components (SO_4, NO_3, NH_4, primary PM) or SO_2 NO_x were discussed.

Response: While verifying the model performance of $PM_{2.5}$ concentrations, this study also verified the model performance of sulfur dioxide (SO_2) and nitrogen dioxide (NO_2) concentrations, which are the important precursors of SO_4 and NO_3, parts of particulate matter, based on CAMx simulation under the initial restart mechanism. Figure 2 shows the time series of daily average SO_2 and NO_2 concentrations and the statistical results are listed in Table 1. The model has an obvious overestimation of SO_2, with an average bias of 156.31 μg/m^3, and the observed SO_2 concentration is only 18% of the simulated value. The main reason is that the implementation of desulfurization projects for important emission sources such as coal-fired power plants in recent years has not been fully considered, which has led to overestimation of SO_2 emissions in the emission inventory. Li et al. (2017) found that the SO_2 emissions

in China have decreased by 75% during the year 2007 to 2016, that is, SO_2 emissions in 2016 were about 25% of 2007. If the simulated SO_2 concentrations are divided by 4, the statistical parameters will be greatly improved, shown in Table 1. Also the intensity of emissions reduction has uneven spatial distribution. In summary, the overestimation of SO_2 is due to the lack of relevant data. The model performance of NO_2 concentration is better, the IOA reaches 0.82, and the MB is only 3.32μg/m^3. There is high consistency of variation trend between the simulated and observed concentrations of SO_2 and NO_2, with R being 0.81 and 0.75, respectively. The varication of SO_2 and NO_2 will be added in our revised manuscripts followed this comment.

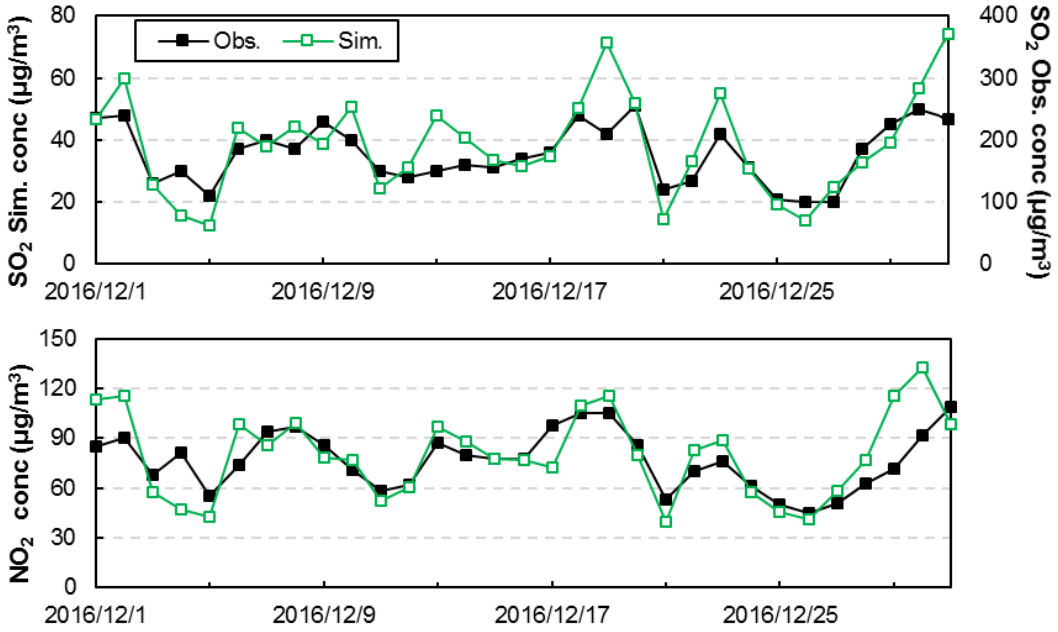

Figure 2. The time series of daily observed and simulated SO_2 (top)and NO_2 (bottom) concentrations averaged from 13 NSAQ Observation Stations during December 2016 in Xi'an.

Table 1. Statistical verification parameters of SO_2 and NO_2 during December 2016in Xi'an.

Species	Mean(μg/m^3)		R	MB	ME	NMB	NME	RMSE	IOA
	Obs.	Sim.		(μg/m^3)	(μg/m^3)				
SO_2	35.45	191.76	0.81	156.31	156.31	4.41	4.41	171.73	0.11
SO_2/4		47.94	0.81	12.49	14.09	0.35	0.40	18.19	0.66
NO_2	76.77	80.09	0.75	3.32	12.86	0.04	0.17	17.13	0.82

3. More clear figure captions like figure 7 is needed.

Response: We have revised the figure caption. The more clear figure captions are as follows:

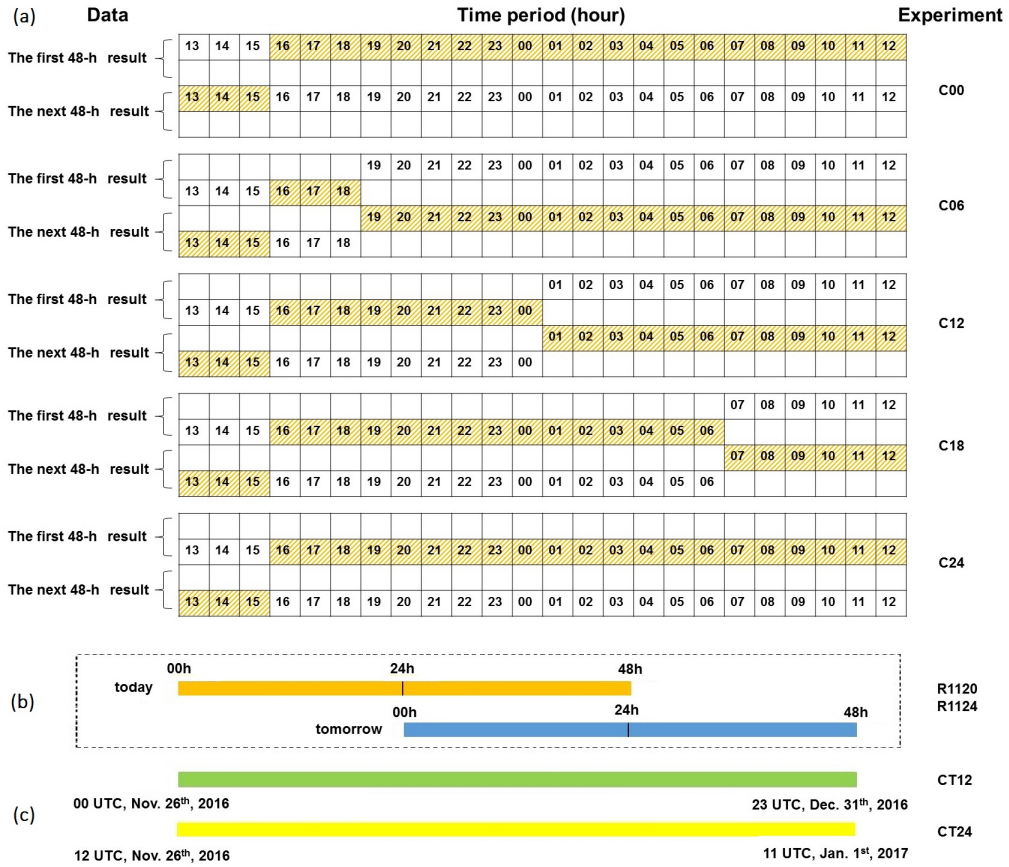

Figure 7. The time period for each initial condition experiments. **(a)** shows the time period for Clean initial condition (mark C) experiments. The output files of CAMx were initialized at 13:00 UTC every day and the CAMx model forecasted the next 48 hours' $PM_{2.5}$ concentrations in each cycle simulation. The sensitivity experiments C00, C06, C12, C18, and C24 extract different time periods (0~24h, 6~30h, 12~36h, 18~42h and 24~48h, respectively) in each output file as valid data, represented by the grids with number. Each grid represents an hour and the numbers on the grids indicate the hours of the data. The grids with numbers represents the valid time period for each output file. In order to analyze from 0:00 Beijing time (16:00 UTC) every day, the 24-hour data of a day is cut and merged from 16:00 UTC in the valid time period of each output file. And the shaded grids represent the data for one single day. **(b)** shows the time period for Restart (mark R) experiments. The meteorological data of the period 12~36 h was cut to estimate the $PM_{2.5}$ concentrations by restart mechanism. The first day of the simulation starts at 12:00 UTC, and the following days starts at 00:00 UTC. **(c)** show the time period for continuous simulation (mark CT) experiments. The meteorological data of the period 12~36 h is cut and merged to one file for CT12 and the period 24~48 h was cut and merged for CT24.

4. Some figures need high PPI like Figure11 and 12.

Response: We have increased the PPI of Figure11 and 12. The new figures are as follows:

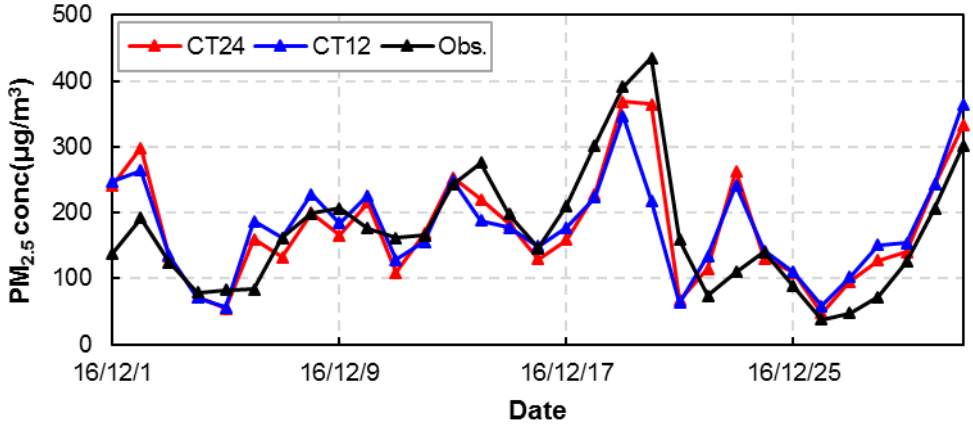

Figure 11. The time series of daily $PM_{2.5}$ concentrations for continuous simulation in Xi'an. The black line represents observations, the blue and red lines show simulated data started at November 26th 00:00UTC and November 26th 12:00UTC, respectively.

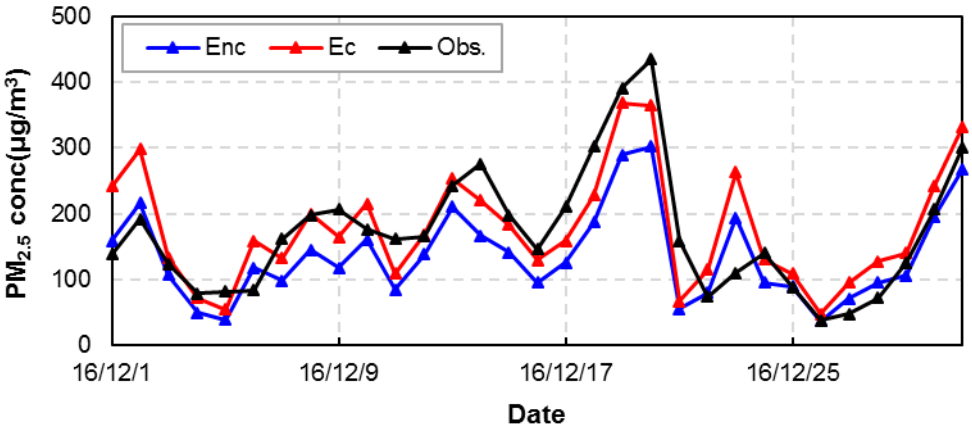

Figure 12. The time series of daily observed and simulated $PM_{2.5}$ concentrations averaged from 13 NSAQ Observation Stations during December 2016 in Xi'an. The black line represents the observations, the blue line represents the simulated by the CAMx model with construction fugitive dust, and the red line represents the simulated values without construction fugitive dust.

5. IN figures 12, Why did that simulated PM2.5 with fugitive dust emissions.is higher than that without fugitive dust emissions.

Response: Thank you for your comment. The concentrations of $PM_{2.5}$ in the model is the sum of multiple types of particulate matter, including 4 primary particulate matter (PEC, POA, FPRM and FCRS). The construction fugitive dust emissions contain primary particulate matter. So the concentrations of primary particulate matter with construction fugitive dust emissions is higher than that not including building dust emissions, resulting the total concentration of $PM_{2.5}$ with fugitive dust is higher.