Comments from Review 1:

This paper analyzes a specific haze event in North China, which features high and low PM2.5 concentrations in adjacent two months (December 2015 and January 2016). The seesaw pattern is modulated by circulation patterns related to a super El Nino event and a phase change of the Arctic Oscillation from positive to negative. This is supported by both observations and model results. The authors also conduct some additional model simulations and show similar seesaw features of PM2.5 concentrations during other super El Nino periods (1997-1998 and 1982-1983). The manuscript is scientifically correct and the results are well laid out. My major concern is that the role of removal in affecting PM2.5 concentrations is neglected in the manuscript. There are some points that I hope the authors could discuss or clarify in the revision.

Response: We thank the reviewer for the constructive comments to help us further improve the manuscript. Please see the detailed responses to your comments below.

1、The removal of $PM_{2.5}$, such as wet and dry deposition, is not discussed in the paper. How are these processes represented in the model? Could they also play a role in the seesaw pattern of $PM_{2.5}$ concentrations?

Response: We have added the descriptions about dry and wet deposition in the third paragraph of section 2 in the revised manuscript. The descriptions were also shown below.

"The removal of particulate matter includes dry and wet deposition. For dry deposition, it is in general expressed by the product of dry deposition velocity and concentration of pollutants. The dry deposition velocity is the inverse of resistance including aerodynamic resistance, molecular motion and surface resistance, with more details in Pleim and Ran (2011). The wet deposition of pollutants depends on their concentrations in cloud water and the precipitation rate, and the algorithms were based on regional acid deposition model (RADM; (Chang et al., 1987))."

In order to elucidate the role of depositions in the removal of $PM_{2.5}$, we have re-run the simulations for December 2015 and January 2016 by adding the process analysis. A total of nine process are included, including horizontal and vertical advection/diffusion, dry and wet deposition, aerosol chemistry, gas phase chemistry and emissions. We found that during these two months, the wet deposition plays little role due to small amount of precipitation, and the dry deposition accounts for about 10% (12% December 2015 and 13% January 2016). The comparable contributions from the deposition in December 2015 and January 2016 indicates that the seesaw patterns were not related too much with the deposition. These points have been reflected in the last paragraph of section 4.3 in the revised manuscript.

Pleim, J., and Ran, L.: Surface Flux Modeling for Air Quality Applications, Atmosphere, 2, 271-302, doi:10.3390/atmos2030271, 2011.
Chang, J. S., Brost, R. A., Isaksen, I. S. A., Madronich, S., Middleton, P., Stockwell, W. R., and Walcek, C. J.: A three-dimensional Eulerian acid deposition model: Physical concepts and formulation, J. Geophys. Res., 92, 14681-14700, 10.1029/JD092iD12p14681, 1987.

2、I wonder why the authors compare the difference between anomalies of PM2.5 concentrations rather than the difference between absolute values throughout the paper(except for Fig.7 if I understand it correctly)? I don't think the conclusion would change much if absolute values were used. If the authors decide to use anomalies, some description or figures of climatological values might be helpful.
Response: The anomalies of difference were used to eliminate the effect of climatological mean. As the reviewer suggested, we have added the climatological values of $PM_{2.5}$ in Figures S1 in the supporting information.

3、A more detailed discussion on Fig. 10, in the main text or in the caption, would be helpful. Currently it is not very clear what those arrows in Fig. 10 indicate.

Response: We have added more detailed discussion of this figure (Fig. 9 in the revised manuscript) in the last paragraph of section 4.4.

Technical corrections:
1. The unit for wind vector in Fig.3 and Fig. 4 is missing.

Response: The unit has been added in the revised caption.

2. It might be helpful to show the NCP box in the figures of meteorological conditions (e.g., Figs. 3,4,5) as well.

Response: We tried to add the NCP box in Figures 3,4,5, but found that the box was redundant since Figure 1 has already showed it. Thus, we removed the box.

3. Lines 254-271：In this paragraph, (Fig. 5, Fig. 6) should be (Fig. 4, Fig. 5). Fig. 5 may seem somewhat redundant, as near surface wind anomaly has similar pattern as 850 hPa wind anomaly and does not seem to provide additional information.

Response: The typo was corrected. Figure 5 has been moved to the supporting information based on the reviewer's suggestion.