Atmos. Chem. Phys. Discuss.,
https://doi.org/10.5194/acp-2018-1288-RC2, 2019

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Aerosol-radiation feedback deteriorates the wintertime haze in North China Plain" *by* Jiarui Wu et al.

Anonymous Referee #2

Received and published: 8 May 2019

The authors attempt to investigate the effect of aerosol-radiation feedback (ARF) on aerosol pollution at surface by using modeling simulations. The performance of WRF-CHEM simulations were fully evaluated, and the contribution of aerosol-radiation feedback to the near-surface PM2.5 concentration was carefully quantified. However, I still have some minor issues about this work prior to its publication.

1. There are several problems about how the authors explain why ARF shows a negative effect on surface PM2.5 concentration when PM2.5 is less than 50 ug/m3. I understand that the suppressed updrafts result in less PM2.5 at surface, but I don't think it is the case that the enhanced downward motion leads to reduction in PM2.5 at surface (lines 476-578)? Also, what is the vertical velocity in Fig. 13 referring to, updrafts, downdrafts, or the net velocity by combining updrafts and downdrafts? Is panel

(b) for the simulation of base case? The Y-axis label of (c) panel is different from the description in figure caption.

2. This work primarily quantifies to what extent the surface PM2.5 could be enhanced because of the collapse of PBL when ARF is considered. How about the impacts of ARF on AOD, which can be used to denote the column-integrated aerosol abundance? The reason why I am care about how the AOD changes under ARF effect is because the reduced incoming solar radiation might suppress the photochemical formation of PM, which could offset the effect of PBL collapse.

3. Relative to the sensitivity study section, the evaluations of model performance appear as the major portion of the body text. The authors might want to shorten the model evaluation section a little bit, so that the entire manuscript looks more balance.

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