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Interactive comment on "Impacts of aerosol-radiation interaction on meteorological forecast over northern China by offline coupling the WRF-Chem simulated AOD into WRF: a case study during a heavy pollution event" *by* Yang Yang et al.

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General comments

The article is interesting and treats a topic of utmost relevance, that of aerosol impacts on Numerical Weather Prediction (NWP). The authors have analysed in great detail a pollution case in Northern China during December 2-11, 2015 and examined the impact of including aerosol radiative forcing on several key meteorological vari-

ables. They found that aerosols have a large impact on shortward radiative fluxes at the surface and consequently on 2m temperatures and wind speed using independent observations from various networks to establish that. These results are consistent with finding from other authors who highlighted the importance of a correct inclusion of aerosol fields particularly under extreme aerosol loads.

The paper deserves attention and with some refinements will be acceptable for publication. However, it is worthwhile to stress that case studies such as this may not be statistically significant, especially because extreme aerosol conditions were chosen. It would be necessary to run more cases, possibly entire seasons. I would encourage the authors to get in touch with the rest of the community and join an effort sponsored by WMO via various committees (WGNE, GAW and S2S) to run coordinate experimentation in regional and global models with the goal to gain a fuller picture of the aerosol impacts in NWP. Feel free to contact me directly about this.

Minor comments and typos

line 22, high-frequency

line 66, episodic aerosol events

ine 105, to facilitate the inclusion of. . .

line 116, was included

line 119 For these research studies using operational NWP systems, offline approaches were mostly used. Actually, in Remy et al 2015 and Mulcahy et al 2014 that was not the case and the interactive aerosols were run online.

line 143, in an NWP system

line 152, future applications

line 153, The remainder of the paper is organised. . . Please change all tenses in this paragraph to present.

line 168, National

line 169, Environmental - please re-run the paper through a spell and grammar checker to ensure that typos are corrected

line 171, with a higher

line 174 the Rapid Radiative

line 181 The RRTMG

line 185 was input

line 186 integral

lie 189 which was - please check that verbs are correctly conjugated

line 190 the same configuration

line 206 did you investigate the sensitivity of the model AOD to the choice of these ICs and BCs?

line 216 were CARSNET (https://www.atmos-chem-phys.net/15/7619/2015/) observations available over the area? if yes, why were they not used?

line 237 / Figure 2 I think it would be good to have extra data from CARSNET if possible

line 244 most of them, do you mean the observations during the peak? See comment above.

line 245 were similar to

line 247 you need more observations to establish that

line 265 do you think this was because of the emission inventories used or the skill of the model or both? Please comment.

line 286 In the NoAero experiments were the aerosols completely missing from the

simulation or was a climatology used?

line 302 if a climatology were used would this discrepancy be less severe? I am assuming that in the NoAero simulations there were really no aerosols.

line 304 this type of bias in SW fluxes is huge

line 321/Figure 6 At some stations the bias in SW fluxes is not improved as much as in Beijing - do you have an explanation for that?

line 341 are discussed

line 368 is this an average value? With the biases in SW radiation being so large I would have expected higher temperature biases.

line 420 / Figure 15, the wind profile at Beijing is quite different from observations in both Aero and NoAero experiments, do you have an explanation for that?

line 450 very nice discussion of the impacts on the vertical stratification

line 461, please specify if an aerosol climatology was used in NoAero

line 520 the fact that aerosol-cloud interactions were not included in the study should be mentioned also at the beginning

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