

Interactive comment on “Impacts of Meteorological Uncertainties on the Haze Formation in Beijing-Tianjin-Hebei (BTH) during Wintertime: A case study” by Naifang Bei et al.

Anonymous Referee #1

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This manuscript addresses a topical and important issue in aerosol researches, i.e. how to improve the simulation and forecast of pollution levels in severe haze events. The influence of meteorological conditions in the regional WRF-CHEM model is explored by employing an ensemble simulation approach with perturbed initial and boundary atmospheric fields. The finding of the substantial sensitivity of the simulated PM_{2.5} concentrations to meteorological conditions on at the city scale highlights the importance of the ensemble approach in model assessment of air quality. Overall, the paper is well written, and I only have some minor comments for the authors to address.

1. The ensemble method needs to be clarified, as some technical details are not

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described clearly. For example: - What variables are perturbed in this method? A list of perturbed fields can be more informative. Are those variables equally important in the contribution to the uncertainty? - L101, the word “perturbations” comes from nowhere. Please clarify how to obtain them. - L102-105, it seems that the boundary conditions are different in each ensemble member as well. However, the authors only mention “initial meteorological uncertainties” in the later discussions. - L111, what is the “average spread”, and what is the “mean of ensemble spreads” in Fig. 2? To my understanding, the spread is calculated as the standard deviation of the perturbations imposed on each ensemble member’s initial field.

2. Readers may remain curious about how important the meteorological impacts on PM simulations are, compared to other uncertainties in the WRF-CHEM model, e.g. emission, or different chemistry/aerosol schemes. Is there a way to quantify the relative importance of each uncertainty source in the model?

3. The quality of figure can be further improved: - Figure 2, better to provide the percentage information as well. An ideal way to illustrate the ensemble experiment is to show the PDF of each quantity using color-coded contour plot. - Figure 3, too busy. Suggest having one panel for each city.

4. A grammar check is needed: - L354, “A climatological ...”; remove “the” before “initial” - L356, “are generally in good agreement”, as ENSM here should refer to the means for each aerosol species. - L359, is it “primary aerosols”? - L372, “measurements” - L375, remove “the” before “ensemble”; replace “avoid” by “minimize”.

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