

Dear Editor,

Thank you for your efficient work in processing our manuscript entitled “Superimposed effects of typical local circulations driven by mountainous topography and aerosol-radiation interaction on heavy haze in the Beijing-Tianjin-Hebei central and southern plains in winter” (egosphere-2022-780). We have carefully read the reviewers’ comments. Based on your suggestions, we considered all reviewers’ comments, and provided convincing and clear responses to the negative comments of Reviewer 1. Furthermore, we have carefully proof-read and revised the manuscript to minimize typographical, grammatical, and bibliographical errors. We sincerely hope the correction will meet with approval. All changes are marked in red in the revised manuscript. The point-by-point responses (in blue) to the comments (in bold) are as following.

Hong Wang

Yue Peng

Authors’ Response to Referee #1

The paper was revised by the authors. However, the main inconveniences are a strong obstacle to the publication of this paper. The first one is the extension of the episodes analysed, which is extremely short. And the second inconvenience is that most of the paper lies on modelling studies without the comparison with experimental measurements. The readers want to know the goodness of the agreement between the meteorological variables modelled and those observed. Without this comparison, we should assume that the calculated atmospheric flow is true, and that the model is a perfect representation of the real world. The opposite thing would be if a complex experimental setup would be used to investigate the atmospheric flow in a short time period. In this case, the results would indicate the real flow, not the modelled one. Consequently, in this reviewer’s opinion this paper should not be published in Atmospheric Chemistry and Physics.

Response: We thank the reviewer for taking the time to review our manuscript. However, we couldn’t agree with the reviewer’s rejection opinion after we have revised so much focusing on the comments proposed by the reviewer last time.

We put a lot of effort into improving the manuscript to meet the requirements of Atmospheric Chemistry and Physics, including extending the study period, adding content and figures, polished the full text, etc. Every comment from the reviewer was

considered seriously and the manuscript was modified carefully (in Reply on RC1). We are so sorry that the reviewer couldn't understand our large work to response to his comments. Therefore, focusing on the reason for rejection, we want to argue as following:

First, what we study is to reveal the interaction between pollution and circulation at the local scale, rather than at the climate or regional scale. Averaging results over a longer period may weaken the features of local scale. Furthermore, considering the reviewer's comment, we have extended 3 days to 14 days including three pollution periods and obtained the consistent results with the previous ones, which further supported our conclusions; Secondly, the ground-level and the valuable sounding observation data were used to compare with the simulation results for PM_{2.5} and meteorological condition, the good evaluation results laid a solid foundation for the later simulation analysis. We achieved a qualitative and quantitative description of the local circulations based on the sensitive experiments.

In summary, we believe this study is of extreme merit and publishable in the journal.

Authors' Response to Referee #2

General comments:

The authors of the manuscript entitled: Superimposed effects of typical local circulations driven by mountainous topography and aerosol-radiation interaction on heavy haze in the Beijing-Tianjin-Hebei central and southern plains in winter, have successfully responded to all my comments and made the necessary changes in their work. Therefore in my opinion this very interesting manuscript, in which clearly the authors have put a lot of effort, deserves to be published in ACP after minor revisions described in the specific comments section of my review.

Response: We appreciate the reviewer for his or her recognition of our work. We revised the manuscript according to the valuable comments. Below is the point-by-point response.

Specific comments:

1. Line 39: Please define the abbreviation PBL.

Response: We revised it in Lines 39-40 of the revised manuscript.

2. Line 71: Please check syntax.

Response: We checked the syntax of this paragraph and revised it in Lines 70-74 of the revised manuscript.

3. Line 109: Please define the type of r.

Response: The “correlation coefficient (r)” was replaced with “Pearson correlation coefficient (R)” in Line 111 of the revised manuscript.

4. Line 129-130: Please correct “green start” to “green stars” and “station” to “stations”.

Response: We corrected them in Line 132 of the revised manuscript.

5. Figure S2: In the legend correct “c: black arrow” to “b: black arrow”.

Response: The error has been corrected in Figure S2 of the Supplement.