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Interactive comment on "Observational Analyses of Dramatic Developments of A Severe Air Pollution Event in the Beijing Area" *by* Ju Li et al.

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This manuscript present a detailed analysis of physical processes leading to a single air pollution episode observed in Beijing, China. The paper appears to be scientifically sound with no major errors. The paper is relatively well structured and clearly written.

We would like to thank Referee 2 for the helpful comments.

The only major challenge with this paper is that, during the past couple of years, a large a number of analyses on air pollution episodes in Chinese cities have already been published. The authors should better bring up in this paper how it differs from or adds to this previous knowledge. Below is a list more detailed comments in this regard + a few other comment that should be considered when revising the paper.

In the revised paper, we emphasized differences between the focus of this paper and those in the literature.

In section 1, the authors summarize several factors found to contribute to the development of an air pollution episode. The authors should explicitly add here the existence of positive feedback processes (e.g. influence of high aerosol concentrations on radiation and BL development discussed in a few recent papers) that enhance air pollutant concentrations further. The authors should also briefly summarize the remaining gaps in our understanding on how air pollution episodes form and evolve in these kind of enviroments.

Those are good points. In the revised paper, we highlighted the importance of turbulent mixing on air pollution transfer, which may differ from the traditional view. We emphasized the role of the stable boundary layer on air pollutant transfer, i.e., the advection process. We also pointed out the role of aerosol positive feedback on the stable boundary layer development at the final stage of the episode.

At the end of section 1, the authors define the goal of this paper. In this context, it would be very important to specifically to list the scientific goals of the paper (i.e. which scientific questions this paper is aiming to answer) and how these goals are related to aims of this work.

In the revised manuscript, we clarified our goals for this study.

Section 4 describes the evolution of the air pollution episode and is the most important original part of this paper. The subsections of this section should be numbered differently, i.e. 4.1.n, not 4.0.n. The second paragraph of section 4.0.5 does not fit there in its present form (except the last sentence referring to figure 11), but should be presented in a separate section. My suggestion is to add a new section (either as the final subsection into section 4 or as a separate short section 5) where the authors put their findings into a broader context, including i) how the pollution event described here compares with pollution events in general in the Beijing areas ii) how the results

of this study add to our understanding on pollution event development, and iii) what broader-scale implications these results have.

The last stage of the episode may not be dramatic as the previous stages, but it is part of the event. We modified the text to describe the period after the oscillation as one of the focusing periods in the development of the pollution episode. Now the new subsection 4.5 fits better in section 4.

Current Section 5 contains mainly a summary of the main findings, not real scientific conclusions. Such conclusions should be added here. In case the authors decide not to write a separate section 5 regarding the previous comment, but simply expand section 4, then some of that material could be presented in "Conclusions".

We prefer to explain the physical process in section 4, but to highlight the important scientific points in the last section. For unknown reasons, the ACP latex macro does not have a format for summary. In the revised manuscript, we made the last section as Summary; hopefully ACP will accept the format.

The caption of figure 11 should be improved to more clearly tie the upper panel of this figure to the 4 follwing figures.

We modified the figure caption for Fig. 11.

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