Dear editors and four reviewers:

Thank you all for your review and comments concerning our manuscript entitled "An important mechanism of regional O_3 transport for summer smog over the Yangtze River Delta in East China" (Manuscript ID: acp-2018-479). Those comments are all valuable and very helpful for revising and improving manuscript. We have studied comments carefully and have accordingly made the revisions. Revised parts are highlighted with Track Changes in the revised manuscript. In the following we quoted each review question in the square brackets and added our response after each paragraph.

For Referee #2:
Many thanks for your encouraging comments. We have revised the manuscript accordingly. Furthermore, following the suggestion of reviewer #4, we have rerun the simulation with the latest **MEIC** emission inventories of 2015 and analyzed the updated simulation over YRD in the revised manuscript, although there are small differences of O_3 simulation over the YRD region between MEIC emissions 2012 and 2015. All the revisions have been highlighted with Track Changes in the revised manuscript. The point-by-point responses to the reviewer's comments are as follows:

General comments:

1. "*In this study, using the observations of surface ozone concentrations and some meteorological parameters and WRF-Chem model simulations, the authors analyzed the mechanism of regional ozone transport in a severe summer smog episode in the YRD region of China. This work revealed the fact that ozone can be transported from the upstream to the downstream through residual layer during nighttime and then from the residual layer to the surface due to the convective turbulence in the ABL after the sunrise, which is an important mechanism of ozone transport and the formation of ozone pollution in the near surface layer. The manuscript is well organized and easily understood.*"

Response 1: We appreciate the reviewer's positive comments on our manuscript. We have revised carefully the manuscript based on the following comments.

Specific comments:

1. *"Please explain the definition of high air temperature in Table 2. Also, in Line 93, what is the daily high air temperature? Do you mean the daily maximum air temperature?"*

Response 1: Thanks for reviewer's comments. The values of high air temperature (in Table 2) are the daily maximum air temperature at 2 m. We have clarified that in the revised manuscript.

2. *"The authors mentioned the effect of dry deposition and NOx titration to O_3 consumption several times in the study when analyzing the change of surface O_3 concentration. Could you show the temporal variation of dry deposition and NOx concentration during the O_3 pollution episode in NJ?"*

Response 2: Thanks for reviewer's comments. The contribution rates of chemical reactions to surface O_3 are minus over nighttime (Fig. 7) due to NOx titration. During the nighttime from August 24 to 25, the average consumption of chemical reactions was about -8.0 μg m^{-3} h^{-1}, while it was -8.5 μg m^{-3} h^{-1} over the preceding nighttime to August 24.

Following the reviewer's comments, we have presented the hourly changes of dry deposition fluxes of O_3 during the O_3 pollution episode in NJ and added the following discussions in the revised manuscript (section 4.3 (paragraph 2)):

Based on the modeling, we have calculated the hourly changes of O_3 dry depositions (Fig. S1) and estimated the daily averages of dry deposition rates with about 0.42 and 0.49 μg m^{-2} s^{-1} respectively for August 24 and 25. The dry depositions of O_3 varied little over these two days with a slight enhancement on August 25, reflecting O_3 dry depositions exerted less impact on surface O_3 change during August 24-25. The contribution of O_3 dry deposition to tropospheric O_3 changes was trivial compared to vertical mixing and chemical reactions (Wang et al., 1998; Fowler et al., 1999; Zavier et al., 2003).

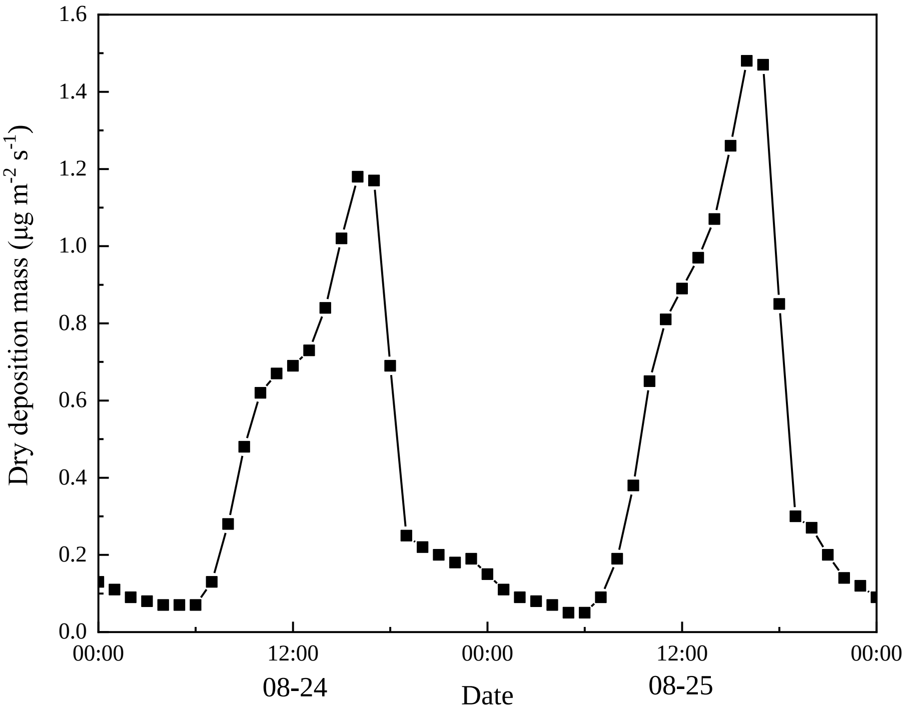

Figure S1. Hourly changes of O_3 dry deposition flux in NJ, an urban area of the western YRD during August 24 (08-24) and 25 (08-25).

Reference:

Wang, Y., Logan, J. A., and Jacob, D. J.: Global simulation of tropospheric O_3-NOx-hydrocarbon chemistry: 2. Model evaluation and global ozone budget, Journal of Geophysical Research Atmospheres, 103, 10713-10725, 1998.

Fowler, D., Cape, J., Coyle, M., Smith, R., Hjellbrekke, A.-G., Simpson, D., Derwent, R., and Johnson, C.: Modelling photochemical oxidant formation, transport, deposition and exposure of terrestrial ecosystems, Environmental Pollution, 100, 43-55, 1999.

Zaveri, R. A., Berkowitz, C. M., Kleinman, L. I., Springston, S. R., Doskey, P. V., Lonneman, W. A., and Spicer, C. W.: Ozone production efficiency and NOx depletion in an urban plume: Interpretation of field observations and implications for evaluating O3-NOx-VOC sensitivity, Journal of Geophysical Research: Atmospheres, 108, 2003.

3. *"Please add the statistics of wind speed and direction in Table 2 and explain the difference in the manuscript."*

Response 3: Following the reviewer's suggestions, we have added wind speed and direction in Table 2 and the discussions (section 2.3 (paragraph 2)) in the revised manuscript as follows:

The near-surface easterly winds prevailed in the directions of 90 deg. and 111 deg. with the daily averaged wind speeds of 2.4 and 2.6 m s^{-1} respectively on August 24 and 25 at NJ (Table 2), indicating the fewer changes in both wind speed and direction over NJ during those two days.

Table 2: Meteorological and environmental elements observed at an urban site NJ of the western YRD from August 24 to 25, 2016 with their daily differences (Δx).

	Aug. 24	Aug. 25	Δx
Maximum 8-hour running mean surface O_3 concentrations (μg m^{-3})	230.1	284.8	54.7
Maximum hourly surface O_3 concentration (μg m^{-3})	256.8	317.2	60.4
Daytime mean surface O_3 concentrations (μg m^{-3})	180.6	230.1	49.5
Daytime mean surface NO_2 concentrations (μg m^{-3})	27.9	27.8	- 0.1
Daily maximum air temperature at 2 m (℃)	34.1	33.9	- 0.2
Maximum surface total radiation irradiance (W m^{-2})	896.0	872.0	- 24.0
Daytime mean surface total radiation irradiance (W m^{-2})	511.8	423.4	- 88.4
Daily mean wind speed at 10 m (m s^{-1})	2.4	2.6	0.2
Daily mean wind direction at 10 m (deg.)	90	111	21

Technical comments:

1. *"Please check all the subscript and superscript throughout the manuscript."*

Response 1: We have checked and corrected all the subscripts and superscripts throughout the manuscript.