Supplementary Materials for

Integrated impacts of synoptic forcing and aerosol radiative effect on boundary layer and pollution in the Beijing-Tianjin-Hebei region, China

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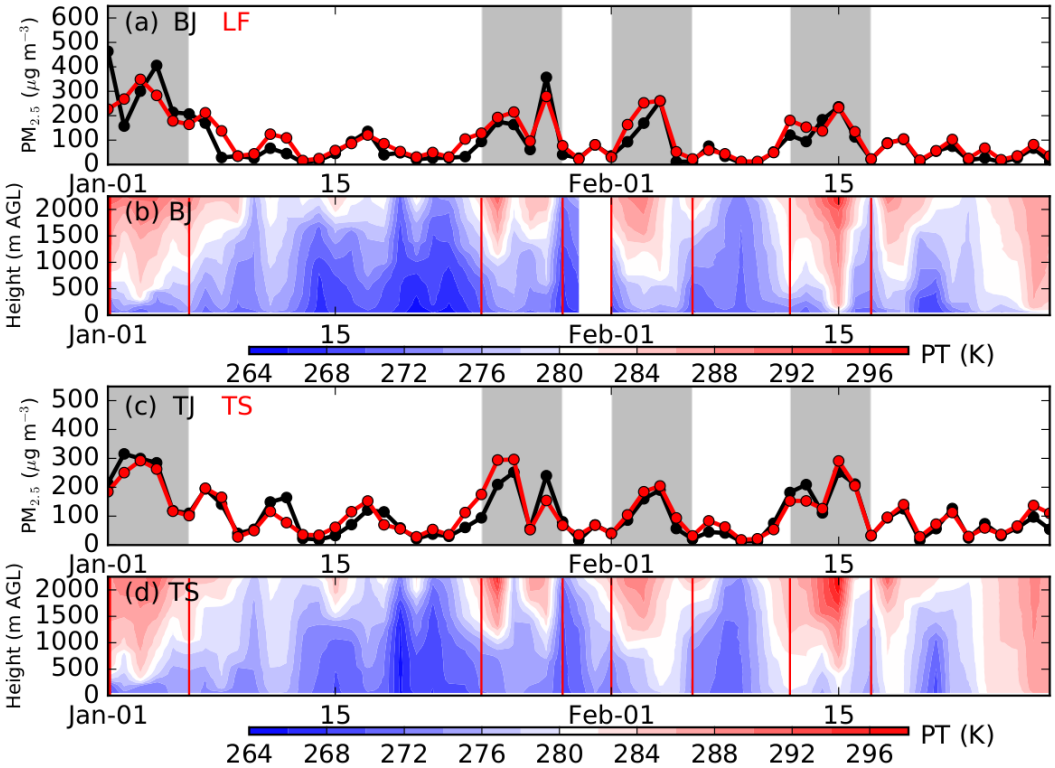

Figure S1: Time series of observed $PM_{2.5}$ concentration from 1 January to 28 February in 2017 in (a) Beijing and Langfang, (c) Tianjin and Tangshan. The vertical structure of potential temperature (PT) derived from the sounding data in (b) Beijing and (d) Tangshan. The heavy pollution episodes associated with strong thermal inversions are marked by the grey shadings.

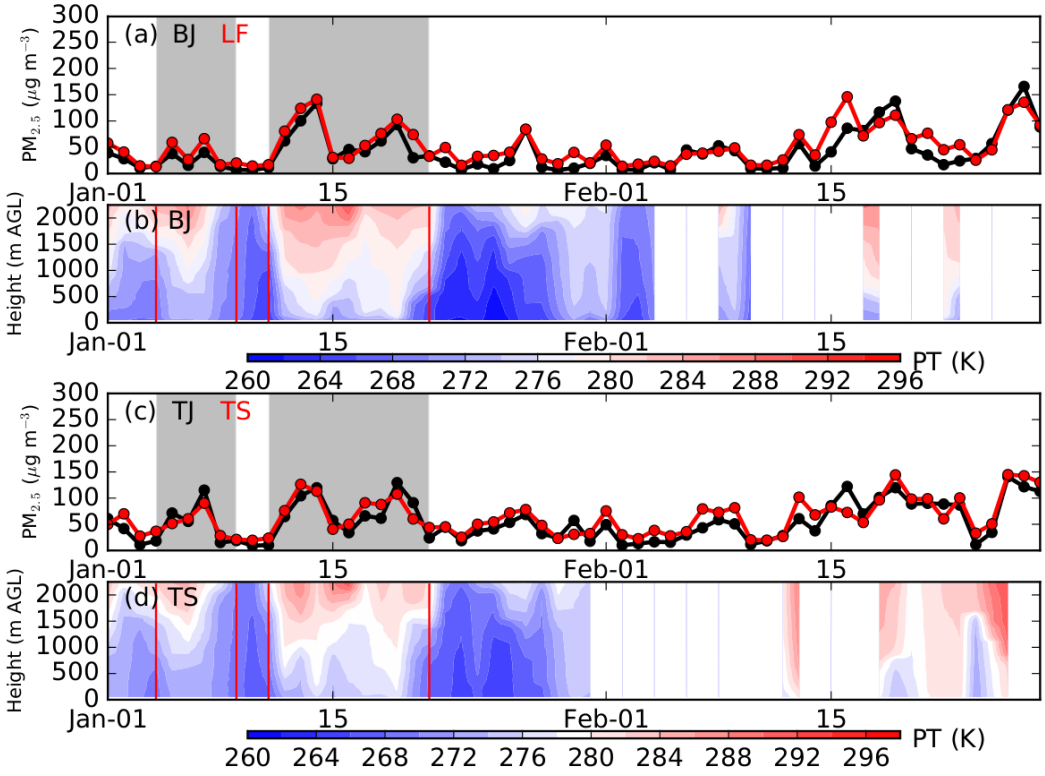

Figure S2: Similar as Fig. S1, but for the PM2.5 concentration and PT from 1 January to 28 February in 2018.

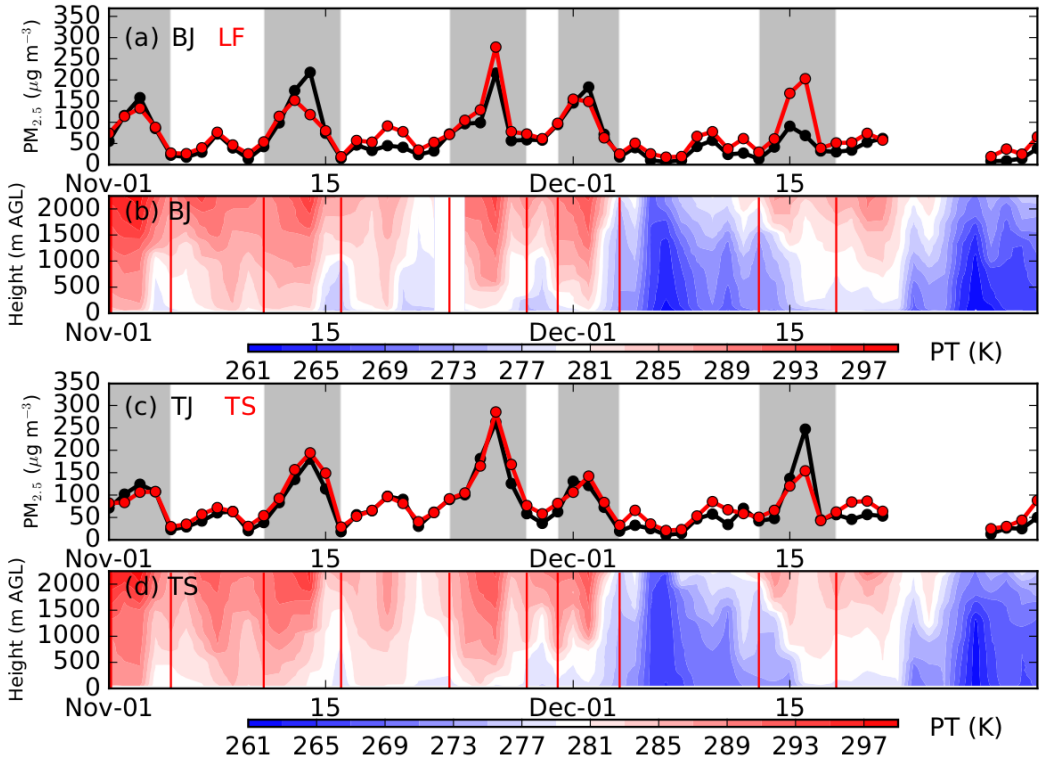

Figure S3: Similar as Fig. S1, but for the $PM_{2.5}$ concentration and PT from 1 November to 31 December in 2018.

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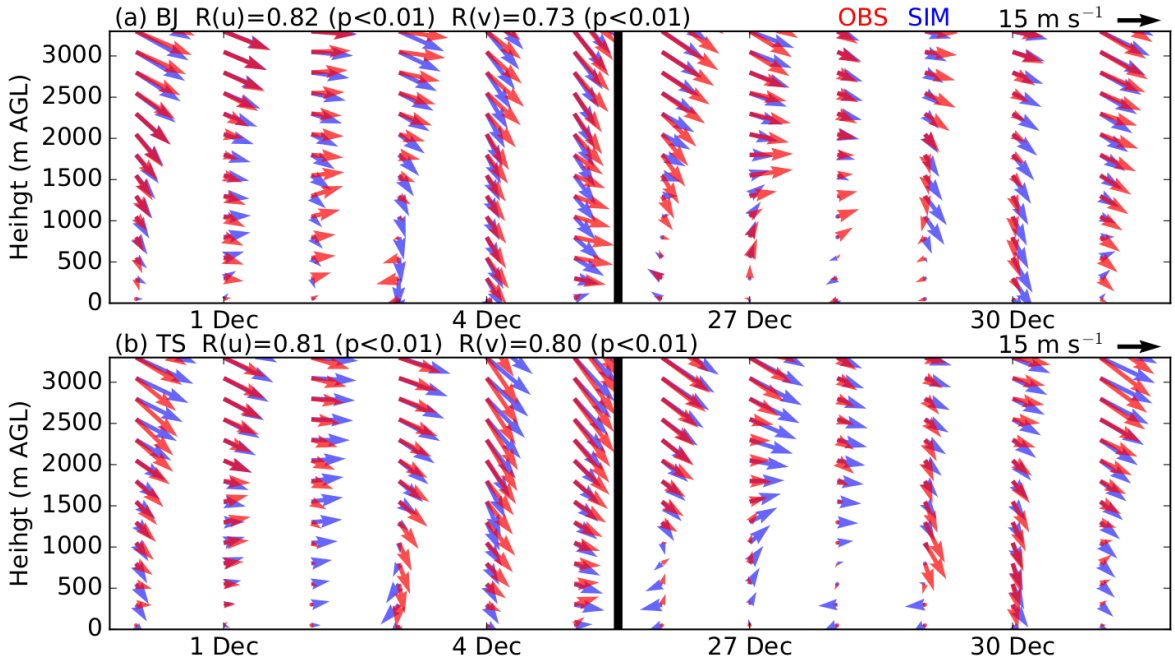

Figure S4: Vertical profiles of observed (in red) and simulated (in blue) horizontal wind vectors in (a) Beijing and (b) Tangshan during the EP1 (30 November to 5 December) and the EP2 (26 to 31 December). The wind profiles are derived from the BASE simulations of the grid nearest to the sounding sites.

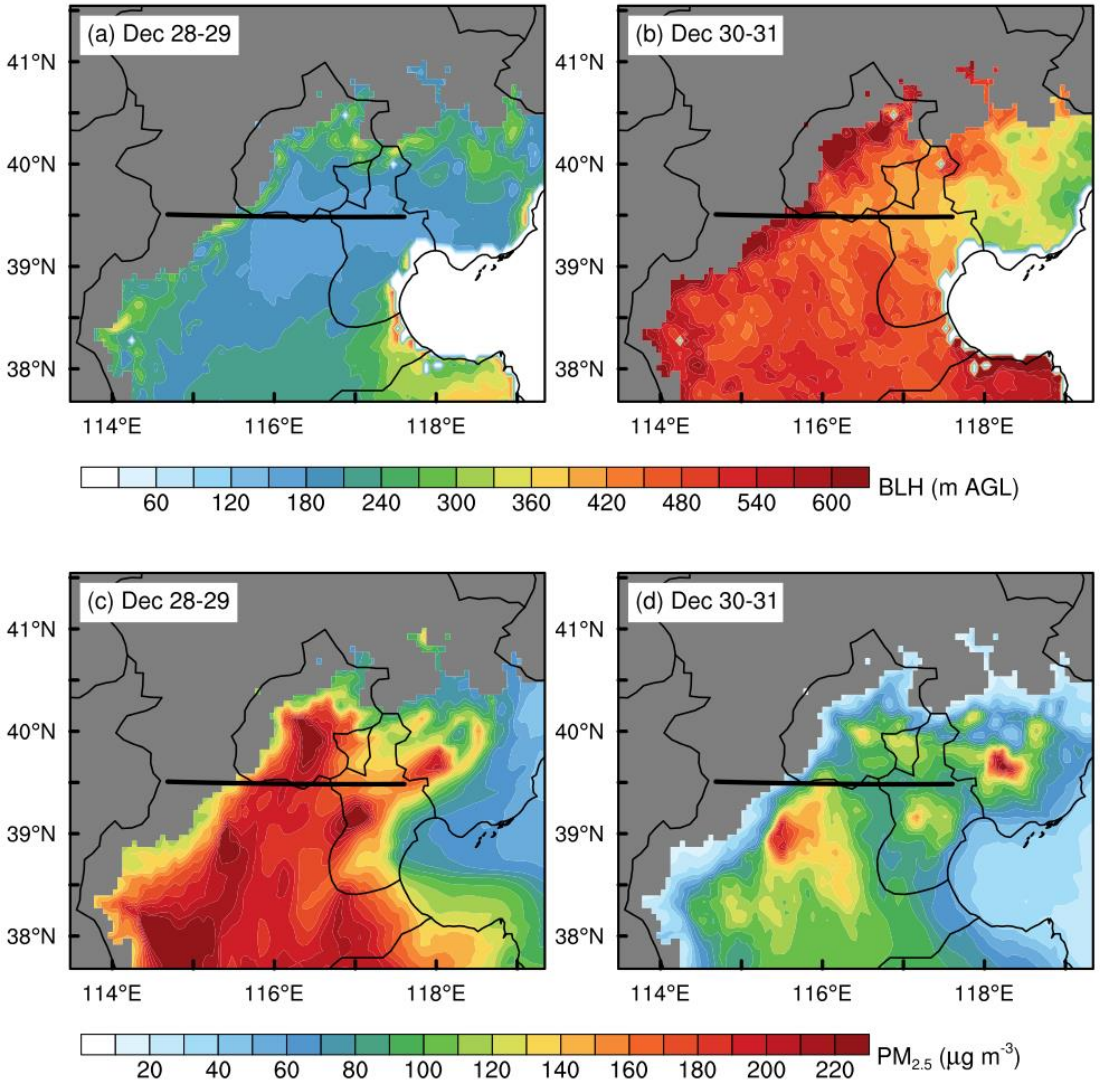

Figure S5: Spatial distribution of averaged (a, b) BLH and (c, d) $PM_{2.5}$ concentration during (left) December 28-29, and (right) December 30-31. The black line across the BTH indicates the locations of cross section shown in Fig. S6.

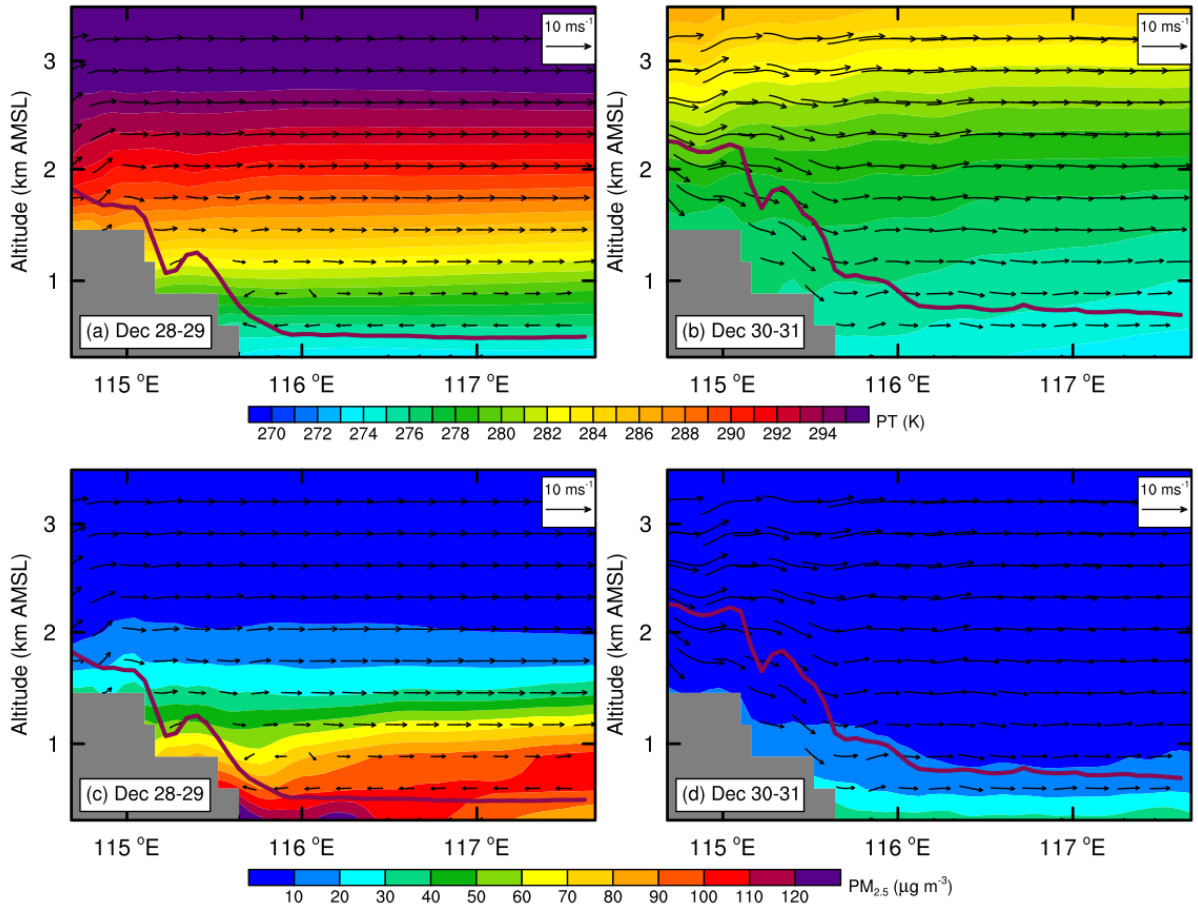

Figure S6: Vertical cross sections of simulated (a, b) PT, (c, d) $PM_{2.5}$ concentration during (left) December 28-29, and (right) December 30-31. The locations of cross section (~39.5 °N) are indicated by the black line in Fig. S5. The locations of BLH are denoted by the red lines for each panel. Note that the vertical velocity is multiplied by a factor of 10 when plotting the wind vectors.

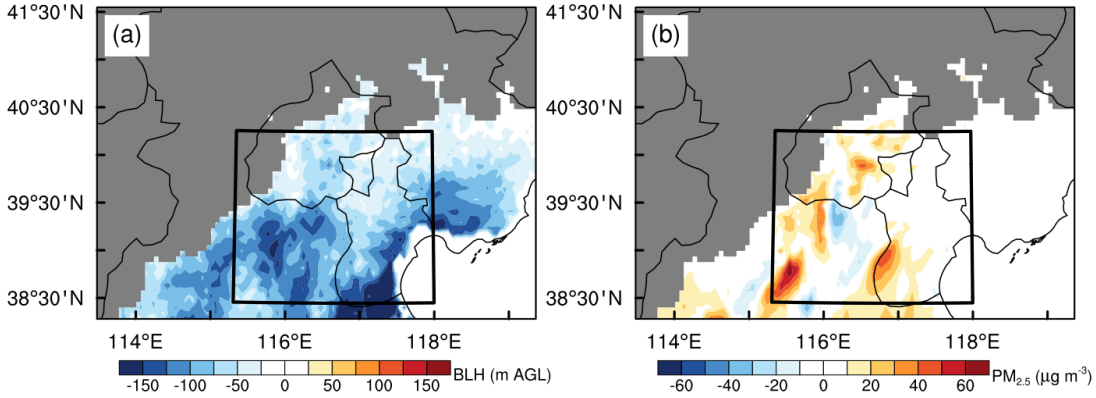

Figure S7: Perturbations induced by the aerosol radiative effect on (a) BLH and (b) near-surface $PM_{2.5}$ concentration during 0800 to 1800 BJT on December 29. The perturbations are estimated as the differences between the BASE and EXP simulations. The black square outlines the region of interest (ROI) for the vertical profiles of $PM_{2.5}$ and PT shown in Fig. S8.

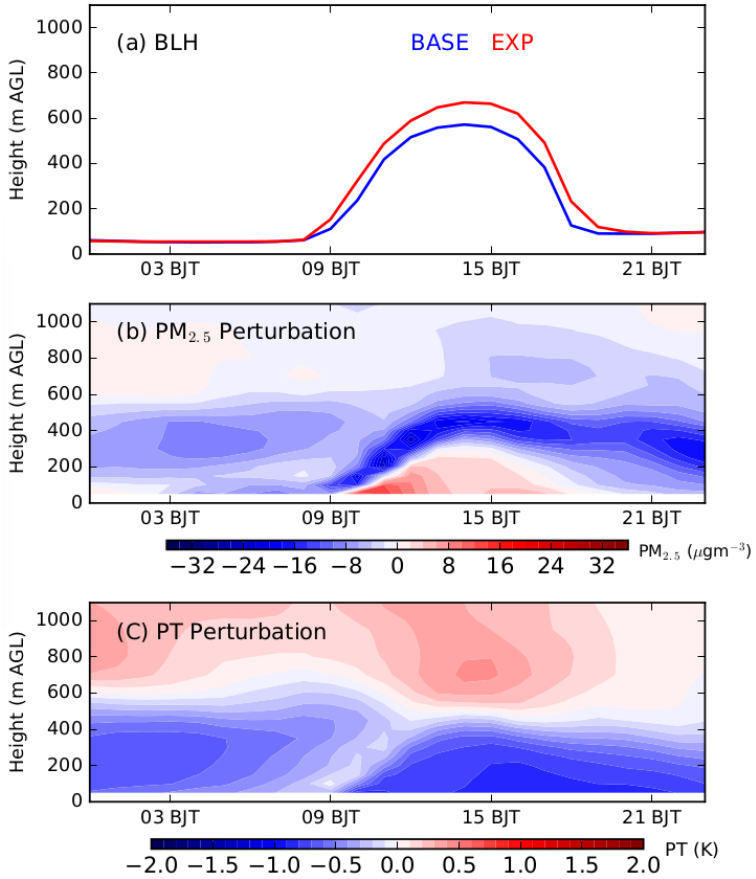

Figure S8: (a) Time series of BLH in the ROI on December 29, derived from the BASE (in blue) and EXP (in red) simulations. Perturbations induced by the aerosol radiative effect on the vertical profile of (b) $PM_{2.5}$ and (c) PT in the ROI.