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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Using a coupled LES-aerosol radiation model to investigate urban haze: Sensitivity to aerosol loading and meteorological conditions" *by* Jessica Slater et al.

Anonymous Referee #1

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Aerosol-radiation interaction has been indicated to play a crucial role in boundary layer meteorology as well as near-surface air pollution by both observational and numerical works recently. This work used a coupled LES-aerosol radiation model to investigate the impact from aerosol loading and meteorological conditions on turbulent kinetic energy and planetary boundary layer evolution. One strength of this work is the coupling of aerosol module and LES model, rather than PBL parameterization, which can better resolve the PBL process, particularly under stagnant condition. Inclusion of aerosol/chemistry in LES model did improve our understanding in aerosol-boundary layer interaction. Overall, this work is well structured and written. Here are some issues that are suggested to be addressed for further improving this work.

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Discussion paper

In experimental setup, please specify how the aerosol size distribution and volume fraction of chemical composition were determined. Were they adopted by in-situ measurements? In addition, why not consider the impact of nitrate and ammonium on radiation transfer given that both of them contribute a large fraction of aerosol mass loading in Beijing. Also, a description of aerosol size bins should be necessary. Like how many bins are separated and what are their ranges?

The simulation was conducted for only three days. Why chose those days, were pollution or meteorology on 24-26 NOV. in 2016 very typical in Beijing during cold season?

Line 18: “aerodynamic diameter “ is more precise here

Line 138: It seems like that the surface energy balance is represented by equation (4) rather than (3)?

Line 198: The constant concentration in the column may not be an appropriate representation of urban pollution since most emissions in the city located at surface (i.e., traffic). Especially the model is initialized at 8am in the morning when most pollutants are confined in a shallow near-surface layer.

Line 203-204:This sentence needs to be rephrased.

Figure 5: The legend is reversed for “high” (should be red) and “low” (should be blue).

Figure 6: Under the high aerosol loading situation, the entire layer of aerosol mass mixing ratio seems to decrease. Excluding the dry deposition why the column aerosol loading experienced a reduction?

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